SOFTWARE COMMUNICATIONS ARCHITECTURE SPECIFICATION

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TABLE OF CONTENTS

LIST OF FIGURES

FOREWORD

Introduction. The Software Communications Architecture (SCA) is published by the Joint Tactical Networking Center (JTNC). This architecture was developed to assist in the development of Software Defined Radio (SDR) communication systems, capturing the benefits of recent technology advances which are expected to greatly enhance interoperability of communication systems and reduce development and deployment costs. The SCA has been structured to:

1. provide for portability of applications software between different SCA implementations,
2. leverage commercial standards to reduce development cost,
3. reduce software development time through the ability to reuse design modules,
4. build on evolving commercial frameworks and architectures.

The SCA is deliberately designed to meet commercial application requirements as well as those of military applications. Since the SCA is intended to become a self-sustaining standard, a wide cross-section of industry has been invited to participate in the development and validation of the SCA. The SCA is not a system specification but an implementation independent set of rules that constrain the design of systems to achieve the objectives listed above.

Core Framework. The Core Framework (CF) defines the essential "core" set of open software interfaces and profiles that provide for the deployment, management, interconnection, and intercommunication of software application components in an embedded, distributed-computing communication system. In this sense, all interfaces defined in the SCA are part of the CF.

1 INTRODUCTION

The SCA establishes an implementation-independent framework with baseline requirements for the development of software for SDRs. The SCA is an architectural framework that was created to maximize portability, configurability of the software (including changing waveforms), and component interoperability while still allowing the flexibility to address domain specific requirements and restrictions. Constraints on software development imposed by the framework are on the interfaces and the structure of the software and not on the implementation of the functions that are performed. The framework places an emphasis on areas where reusability is affected and allows implementation unique requirements to determine a specific application of the architecture.

1.1 SCOPE

This document together with its appendices as specified in the Table of Contents provides a complete definition of the SCA.

The goal of this specification is to provide for the deployment, management, interconnection, and intercommunication of software components in embedded, distributed-computing communication systems.

1.2 DOCUMENT CONVENTIONS AND TERMINOLOGY

1.2.1 File and Directory Nomenclature

The terms "file" and "filename" as used in the SCA, refer to both a "plain file" (equivalent to a POSIX "regular file") and a directory. An explicit reference is made within the text when referring to only one of these.

Pathnames are used in accordance with the POSIX specification definition and may reference either a plain file or a directory. An "absolute pathname" is a pathname which starts with a "/" (forward slash) character - a "relative pathname" does not have the leading "/" character. A "path prefix" is a pathname which refers to a directory and thus does not include the name of a plain file.

1.2.2 Requirements Language

The word "shall" is used to indicate absolute requirements of this specification which must be strictly followed in order to achieve compliance. No deviations are permitted.

The phrase "shall not" is used to indicate a strict and absolute prohibition of this specification.

The word "should" is used to indicate a recommended course of action among several possible choices, without mentioning or excluding others. "Should not" is used to discourage a course of action without prohibiting it.

The word "may" is used to indicate an optional item or allowable course of action within the scope of the specification. A product which chooses not to implement the indicated item must be able to interoperate with one that does without impairment of required behavior.

The word "is" (or equivalently "are") used in conjunction with the association of a value to a data type indicates a required value or condition when multiple values or conditions are possible.

1.2.3 Core Framework Interface, Component and Operation Identification

References to *interface names*, their *operations* and *defined XML elements/attributes* within this specification are presented in italicized text. All interface names are capitalized. Interface attributes, operation parameters, and components are presented in plain text. "CF" precedes references to Core Framework Base Types (3.1.3.1.3)

1.3 DOCUMENT CONTENT

The **Foreword** and **Section 1, Introduction,** of this document provide an introduction to this specification and identifies the definitions and rules for its usage.

Section 2, **Overview**, provides an overview of the SCA as well as a description of the interfaces and behaviors prescribed by the specification.

Section 3, **SCA Platform Independent Model (PIM)**, provides the detailed description of the architecture framework and the specification requirements.

Section 1,

Conformance, defines the authorities, requirements and criteria for product certification in accordance with this specification.

Appendix A: **Glossary**, contains a glossary of terms and acronyms used in this specification.

Appendix B: **SCA Application Environment Profiles**, provides the specific requirements for the SCA Application Environment Profiles (AEP) required as part of compliance to this specification.

Appendix C: **Core Framework Interface Definition Language (IDL)**, contains the IDL code used to define the interfaces required by this specification.

Appendix D: **Platform Specific Model (PSM) - Domain Profile Descriptor Files**, provides a mapping of the SCA PIM to specific descriptor file representations as part of compliance to this specification.

Appendix E: **Platform Specific Model (PSM) – Transfer Mechanisms and Enabling Technologies**, provides a mapping of the SCA PIM to specific platform transports and technologies as part of compliance to this specification.

Appendix F: **Units of Functionality and Profiles**, defines Units of Functionality (UOFs) and Profiles used to achieve scalable levels of conformance with this specification

1.4 NORMATIVE REFERENCES

The following documents contain provisions or requirements which by reference constitute requirements of this specification. Applicable versions are as stated.

[1] OMG Lightweight Log Service Specification, Version 1.1 formal/05-02-02, February 2005.

[2] OMG Event Service Specification, Version 1.2 formal/04-10-02, October 2004.

[3] SOFTWARE COMMUNICATIONS ARCHITECTURE SPECIFICATION, Version 2.2.2, 15 May 2006

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1.5 INFORMATIVE REFERENCES

The following is a list of documents referenced within this specification or used as reference or guidance material in its development.

[~~3~~4] OMG Unified Modeling Language™ (OMG UML), Infrastructure, Version 2.4.1 formal/2011-08-05, August 2011.

[~~4~~5] OMG Unified Modeling Language™ (OMG UML), Superstructure, Version 2.4.1 formal/2011-08-06, August 2011.

[~~5~~6] Common Object Request Broker Architecture (CORBA) Specification, Version 3.1.1 Part 1: CORBA Interfaces, Version 3.2 formal/2011-11-01, November 2011.

[~~6~~7] Extensible Markup Language (XML) 1.1 (Second Edition), W3C Recommendation, 16 August 2006.

[~~7~~8] Information technology — Portable Operating System Interface (POSIX®) Base Specifications, Issue 7, ISO/IEC/IEEE 9945:2009, 15 September 2009.

[~~8~~9] E. Gamma, et al., *Design Patterns: Elements of Reusable Object-Oriented Software*. Boston, MA: Addison-Wesley, 1994.

2 OVERVIEW

This section presents an architectural overview of the SCA which defines the fundamental organization of the components that compose this specification. A high-level description of the interfaces and components, their responsibilities, as well as their relationship to each other and the environment are also provided. Technical details and specific requirements of the architecture and individual components are contained in section 3.

The goal of this specification is to provide for the deployment, management, interconnection, and intercommunication of software components in embedded, distributed-computing communication systems. This specification is targeted towards facilitating the development of SDRs with the additional goals of maximizing software application portability, reusability, and scalability through the use of commercial protocols and products.

Although there are many definitions of a SDR, it is in essence a radio or communication system whose output signal is determined by software. In this sense, the output is entirely reconfigurable at any given time, within the limits of the radio or system hardware capabilities (e.g. processing elements, power amplifiers, antennas, etc.) merely by loading new software as required by the user. Since this software determines the output signal of the system, it is typically referred to as "waveform software" or simply as the "waveform" itself. This ability to add, remove, or modify the output of the system through reconfigurable and re-deployable software, leads to communication systems capable of multiple mode operation (including variable signal formatting, data rates, and bandwidths) within a single hardware configuration. Simultaneous multi-mode operation is possible when a multi-channel configuration is available.

2.1 ARCHITECTURE DEFINITION METHODOLOGY

The architecture has been developed using an object-oriented approach including current best practices from software component models and software design patterns. Unless stated, no explicit grouping or separation of interfaces is required within an implementation. The interface definitions and required behaviors that follow in section 3, define the responsibilities, roles, and relationships of their component realizations.

The specification uses the Unified Modeling Language (UML) [~~3~~4], [~~4~~5], defined by the Object Management Group (OMG), to graphically represent interfaces, components, operational scenarios, use cases, and sequence diagrams; the OMG defined Interface Definition Language (IDL) [~~5~~6] to provide the textual representation of the interfaces (see Appendix E-3 for the mapping); and eXtensible Markup Language (XML) [~~6~~7] is used to create the SCA Domain Profile elements which identify the capabilities, properties, inter-dependencies, and location of the hardware devices and software components that make up an SCA-compliant system.

IDL fragments appear in section 3 to illustrate interfaces but the IDL in Appendix C takes precedence. The terms "Domain Profile" and "profile" are used to refer to either the raw XML format of these files as well as these same files in a parsed format. References to a specific Domain Profile file (e.g. Software Assembly Descriptor (SAD), Device Configuration Descriptor (DCD)) refer to the raw XML format per the definitions in section 3.1.3.6.

2.1.1 Component and Interface Definitions

The SCA specifies requirements using both interface and component definitions. An interface definition includes the formal operation signatures and associated behaviors.

A component is "an autonomous unit within a system or subsystem" which has the following characteristics:

- Provides one or more Interfaces which users may access
- Hides its internals and makes them inaccessible other than as provided by its Interfaces.

The component definitions reference interface definitions (which may not be component-unique) and specify any required behaviors, constraints or associations that must be adhered to when their corresponding SCA products are built.

Within this specification components are defined as stereotypes that represent the bridge between the interface definitions and the products that will be built in accordance with the SCA.

2.1.2 Component Implementation

Component implementations must realize a component definition and satisfy all of its aggregated requirements as shown in Figure 2-1. The term "component" in this document will alternatively refer to a component definition or a concrete implementation depending on the context. Where the distinction is not obvious, the text will append "definition" or "implementation" as a modifier.

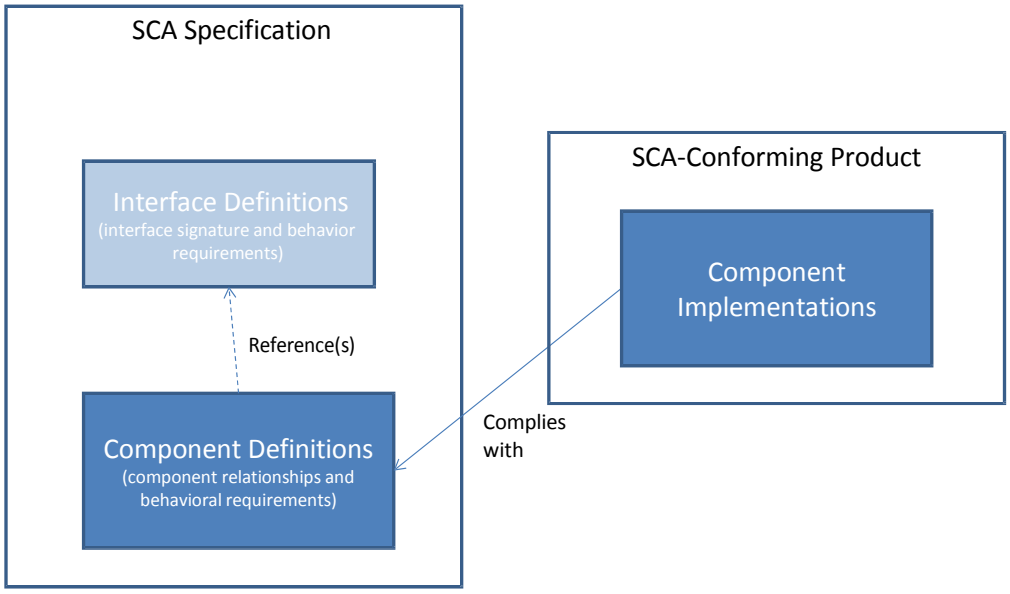


Figure 2-1: Relationship between Component Definition and Implementation

2.2 ARCHITECTURE OVERVIEW

Since the functionality of software itself is virtually limitless, there is a large dependency placed on the ability to select and configure the appropriate hardware to support the software available or required for a specific system. The selection of hardware is not restricted to the input/output (I/O) devices typically associated with communication systems (analog-to-digital converters,

power amplifiers, etc.). It is dependent on the type and capabilities of the processing elements (General Purpose Processors (GPP), Digital Signal Processors (DSP), Field-Programmable Gate Arrays (FPGA), etc.) that are required to be present, since typically the software required to generate a given output signal will consist of many components of different types based on performance requirements. From an illustrative view, this results in a system that is represented by a variable collection of hardware elements which need to be connected together to form communication pathways based on the specific software loaded onto the system. The role of the SCA is then to provide a common infrastructure for managing the software and hardware elements present in a system and ensuring that their requirements and capabilities are commensurate. The SCA accomplishes this function by defining a set of interfaces that isolate the system applications from the underlying hardware. This set of interfaces is referred to as the Core Framework of the SCA.

Additionally, the SCA provides the infrastructure and support elements needed to ensure that once software components are deployed on a system, they are able to execute and communicate with the other hardware and software elements present in the system.

2.2.1 System Architecture

An SCA-based system consists of an Operating Environment (OE) and one or more Applications as shown in Figure 2-2.

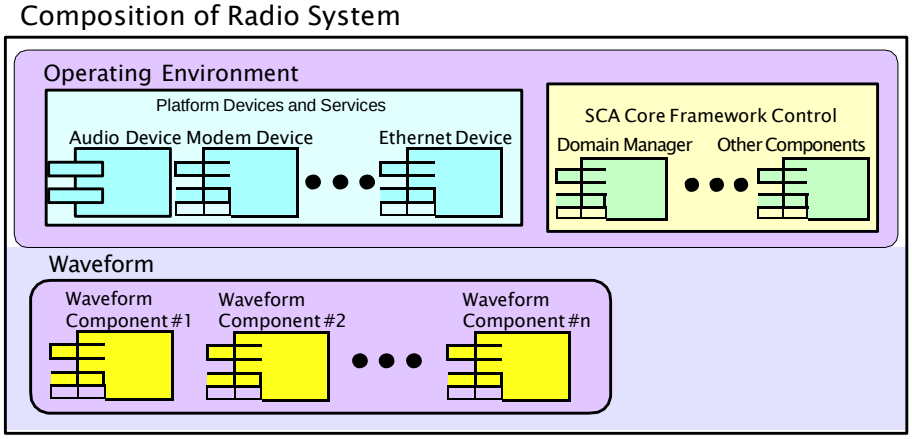


Figure 2-2: Composition of a SCA System

The SCA differentiates between application, i.e. waveform, software that manipulates input data and determines the output of the system and OE software that provides the capabilities to host waveforms and allow them to access system resources. The software components that provide access to the system hardware resources are referred to as SCA devices, which implement the Base Device Interfaces. Non-hardware (software-only) components provided by the system for use by multiple applications are generically referred to as services; however the SCA does not specify an interface for these components.

The SCA standardizes a collection of component definitions, but does not place implementation requirements (e.g. transport mechanisms) on the realized software. A notional representation of the hierarchy of the significant SCA components is shown in Figure 2-3.

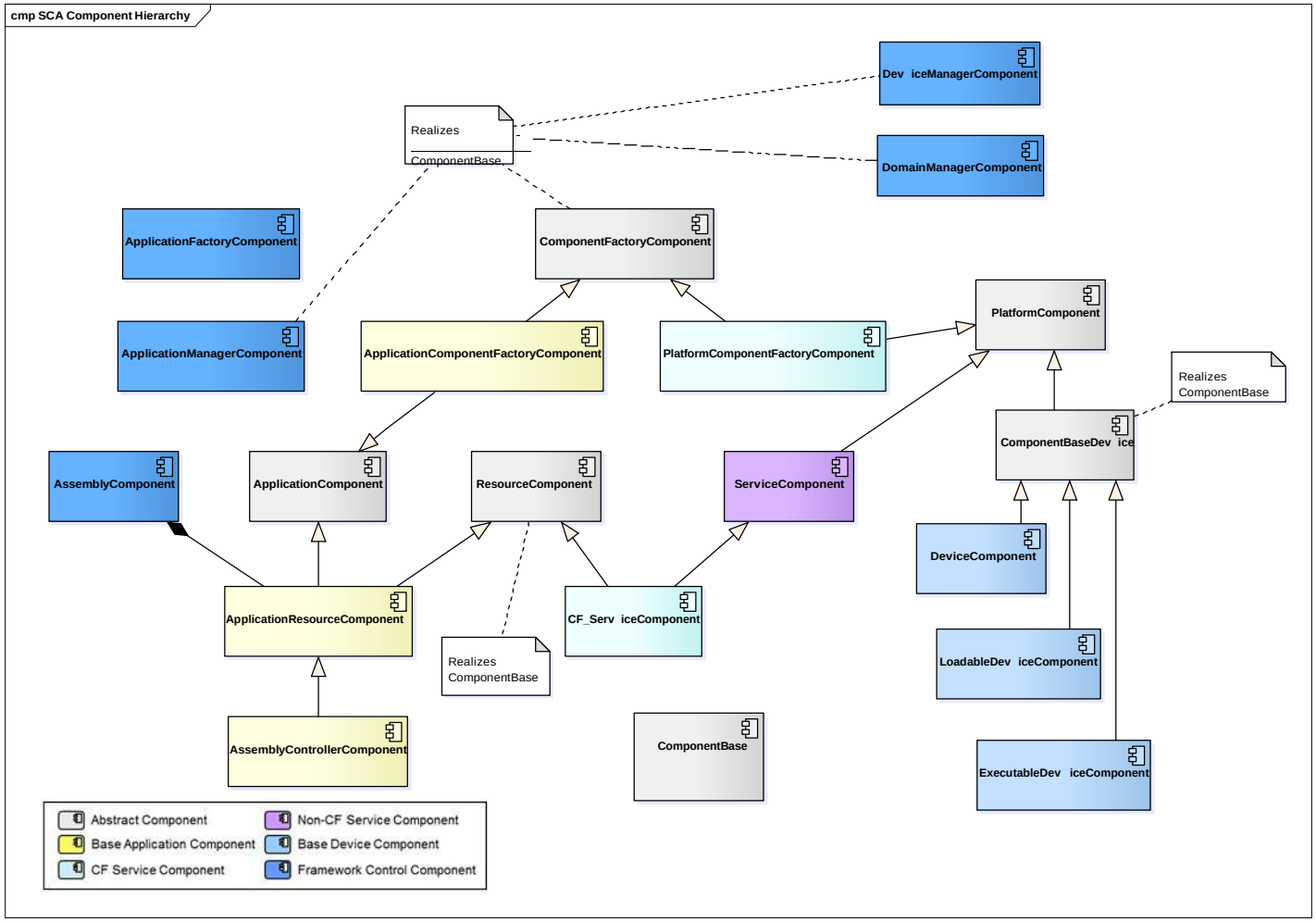


Figure 2-3: SCA Component Hierarchy

The OE provides the capability to manage and execute SCA components and consists of the Operating System, Transfer Mechanism, Core Framework Control and Platform Devices and Services.

The SCA includes real-time embedded operating system (RTOS) functions that provide multi-threaded support for all software executing on the system, including applications, devices, and services.

The SCA leverages transfer mechanisms to provide standardized client/server operations. Client/server communications may be co-located or distributed across different processors. The transfer mechanism structure may be comprised of object request semantics, transfer and message syntax, and transports.

The following sections describe the architectural structure of the constituent portions of an SCA-based system with the exception of the Operating System and Transfer Mechanism whose architecture is not specified by the SCA.

2.2.2 Application Architecture

SCA Applications (typically waveforms) contain the following components:

Base Application Components: ResourceComponent, ApplicationComponentFactoryComponent (optional), ApplicationResourceComponent and AssemblyControllerComponent, which utilize the Base Application Components and provide management of application software.

Application components realize the *Resource* and *ComponentFactory* interfaces that are described below:

Base Application Interfaces: *ComponentIdentifier*, *ControllableComponent*, *PortAccessor*, *LifeCycle*, *Resource*, *TestableObject*, and *PropertySet*.

Common Interfaces: *ComponentFactory*.

The *Resource* interface provides an API for the control and configuration of software components. Application developers may extend these capabilities by creating specialized *Resource* interfaces for the application. At a minimum, the extension inherits the *Resource* interface. The design of a resource's internal functionality is not dictated by the SCA and is left to the application developer.

Applications interface with the other components of an SCA-based system as presented in Figure 2-4. An application consists of multiple software components, e.g. ApplicationResourceComponents, which are loaded onto the appropriate processing resource. These components are managed by the Framework Control Components. ApplicationResourceComponents communicate with each other or with the services and devices provided by the system via extensions of the *PortAccessor* interface. It is intended that the APIs used by Platform Devices and Service Components be standardized for a given system or domain so that all communications to and from the application are uniform across multiple systems. However, the standardization of these interfaces is outside the scope of this specification since they are system and domain specific.

An application may access OS functionality but is restricted to the operations enumerated in the Appendix B which is a subset of the Portable Operating System Interface (POSIX) specification [7]. The specification contains multiple POSIX profiles to allow an implementation to tailor a product to a minimal set of POSIX features.

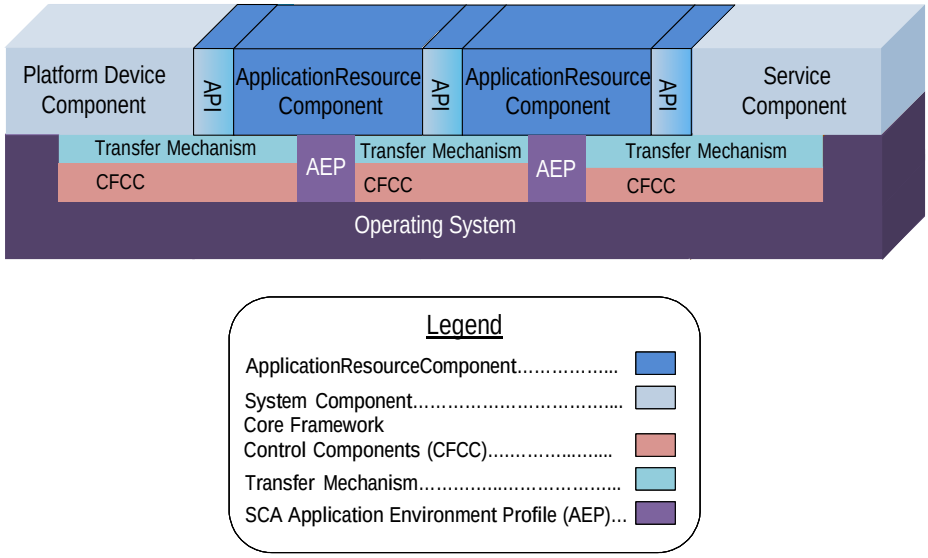


Figure 2-4: Application Use of OE

2.2.2.1 Reference Model

All applications are comprised of resources and use devices. Specific resources and devices can be identified corresponding to their functional entities but that mapping is not identified or required by this specification.

Figure 2-5 shows example inheritance hierarchies for a *Resource*. As illustrated, the developer can determine which optional interfaces are required for a specific component, denoted by the comment tag over the association line (e.g. CONNECTABLE) in the UML diagram. Each comment tag corresponds to a Unit of Functionality defined in Appendix F. The operations and attributes provided by the *LifeCycle*, *TestableObject*, *PortAccessor*, *ComponentIdentifier*, *ControllableComponent* and *PropertySet* interfaces establish a common approach for interfacing with a resource in an SCA environment. The *PortAccessor* interface is used for pushing or pulling messages between resources and devices. A resource may consist of zero or more input and output message ports. Figure 2-5 also shows examples of more specialized resources that could be realized to provide implementation specific functionality (Note: the specialized resources shown represent generic examples).

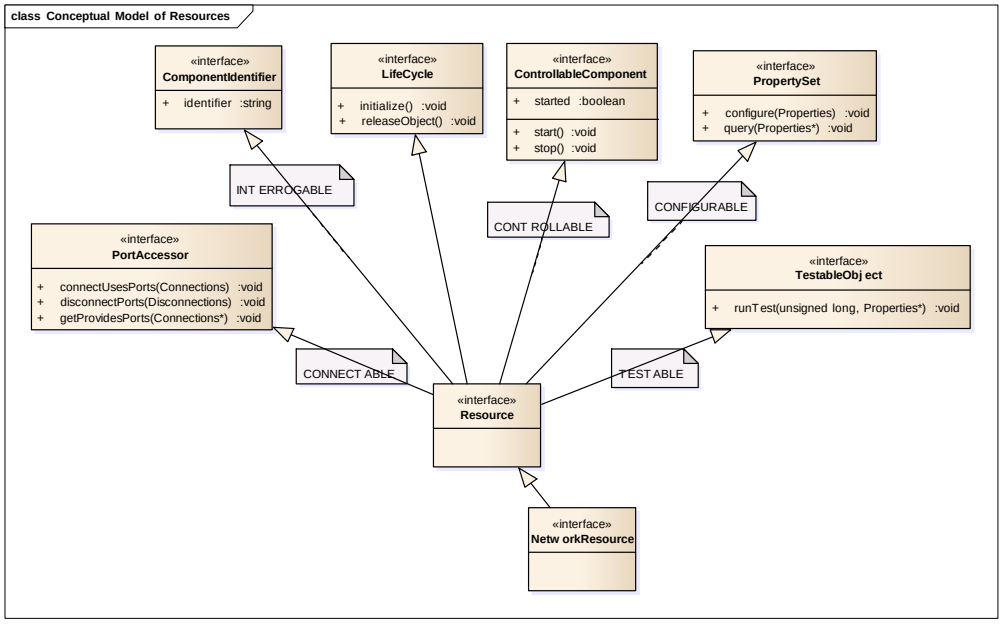


Figure 2-5: Conceptual Model of Resources

2.2.3 Platform Devices and Services Architecture

Platform devices and services provide device or service specific functionality in support of applications by way of the following components:

Base Device Components: DeviceComponent, LoadableDeviceComponent, ExecutableDeviceComponent, AggregateDeviceComponent and ComponentBaseDevice, which provide management and control of hardware devices within the system.

Framework Services Components: PlatformComponentFactoryComponent, ServiceComponent or CF_ServiceComponent which provides additional support functions and services.

These components realize interfaces that are described below:

Base Device Interfaces: *CapacityManagement, DeviceAttributes, Device, ManageableComponent, LoadableDevice, LoadableObject, ExecutableDevice, AggregateDevice*, and *ParentDevice*.

Base Application Interfaces: *ComponentIdentifier, ControllableComponent, PortAccessor, LifeCycle, Resource, TestableObject* and *PropertySet*.

2.2.4 Core Framework Control Architecture

The Core Framework is the essential set of open application-layer interfaces and services which provide an abstraction of the underlying system software and hardware. Core Framework Control provides management of domains consisting of the following SCA defined components:

Framework Control Components: AssemblyComponent, ApplicationManagerComponent, ApplicationFactoryComponent, DomainManagerComponent, and DeviceManagerComponent, which control the instantiation, management, and destruction/removal of software from the system.

Framework Services Components: FileComponent, FileSystemComponent and FileManagerComponent, which provide additional support functions and services.

Common Components: ComponentFactoryComponent and ComponentManagerComponent.

These components realize interfaces described below:

Framework Control Interfaces: *Application*, *ApplicationDeploymentData*, *ApplicationFactory*, *ComponentRegistry*, *DomainInstallation*, *DomainManager*, *DeviceManagerAttributes*, *EventChannelRegistry*, *FullComponentRegistry*, *ManagerRegistry*, *ManagerRelease*, *FullManagerRegistry*, and *DeviceManager*.

Framework Services Interfaces: *File*, *FileSystem* and *FileManager*.

Base Application Interfaces: *ComponentIdentifier*, *ControllableComponent*, *PortAccessor*, *LifeCycle*, *TestableObject* and *PropertySet*.

Common Interfaces: *ComponentFactory* and *ComponentManager*.

2.2.5 Structure

All SCA compliant systems require certain software components to be present in order to provide for component deployment, management, and interconnection. These include a DomainManagerComponent (including support for the ApplicationFactoryComponent and ApplicationManagerComponent), DeviceManagerComponent, FileManagerComponent, and FileSystemComponent. The management hierarchy of these entities is depicted in Figure 2-6.

An SCA compliant system includes a domain manager which contains knowledge of all existing implementations installed or loaded onto the system including references to all file systems (through the file manager), device managers, application factories and applications (and their resources).

Each device manager, in turn, contains complete knowledge of a set of devices and/or services. A system may have multiple device managers but each device manager registers with the domain manager to assure that the domain manager has complete cognizance of the system. A device manager may have an associated file system (or file manager to support multiple file systems) as indicated in the Figure 2-6.

An application manager, created by the ApplicationFactoryComponent, provides access to a specific application that is instantiated on the system.

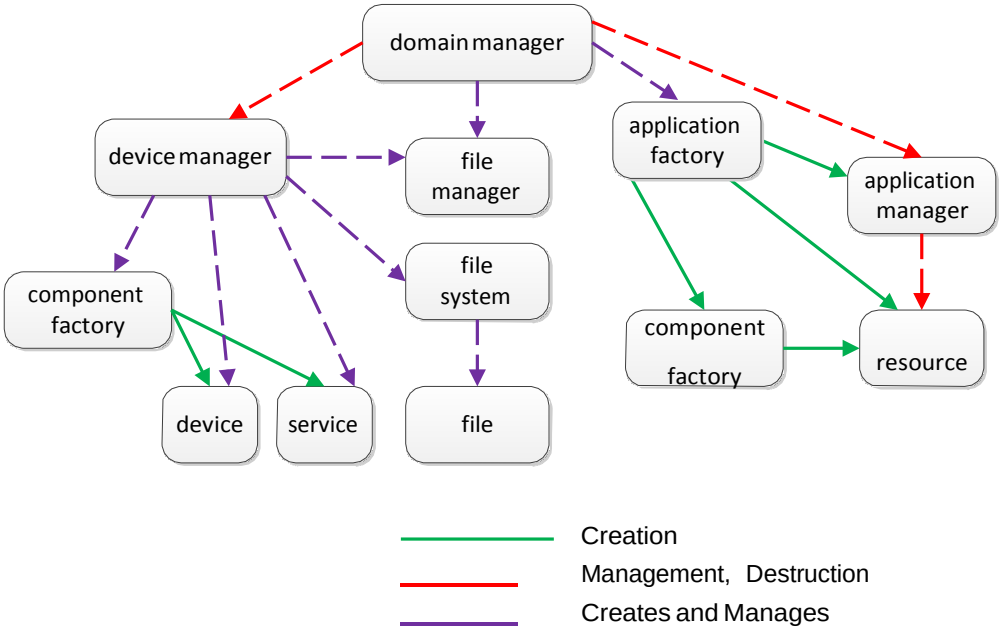


Figure 2-6: SCA Creation and Management Hierarchy

2.2.6 Domain Profile

The SCA defines a set of files referred to as the Domain Profile, depicted in Figure 2-7, which describes the characteristics and attributes of the services, devices, and applications installed on the system. The Domain Profile is a hierarchical collection of descriptor files that define the properties of all software components in the system.

Each software element in the system is described by a Software Package Descriptor (SPD) and a Software Component Descriptor (SCD) file. An SPD file contains the details of a software module that are to be loaded and executed. The SPD provides identification of the software (title, author, etc.) as well as the name of the code file (executable, library or driver), implementation details (language, OS, etc.), dependencies to other SPDs and devices, and references to Properties Descriptor (PRF) and SCD files. The SCD defines interfaces supported and used by a specific component.

The SAD file describes the composition and configuration of an application. The SAD references all SPDs and SADs needed for this application, defines required connections between application components (connection of provides and uses ports / interfaces), defines needed connections to devices and services, provides additional information on how to locate the needed devices and services, defines any co-location (deployment) dependencies, and identifies component(s) within the application as the assembly controller. A SAD may also reference an Application Deployment Descriptor (ADD) that defines the channel deployment precedence order for the application.

The Device Configuration Descriptor (DCD) identifies all devices and services associated with a device manager, by referencing its associated SPDs. The DCD also defines properties of the specific device manager, enumerates the needed connections to services (e.g. file systems), and provides additional information on how to locate the domain manager. A DCD may also contain a reference to a Device Package Descriptor (DPD) file which provides a detailed description of the associated hardware device.

The Domain Manager Configuration Descriptor (DMD) provides the location of the SPD file for a specific domain manager. The DMD also specifies connections to other software components (e.g. services) which are required by the domain manager. The DMD may also reference a Platform Deployment Descriptor (PDD) that describes the channels for a platform.

The PRF contains information about the properties applicable to a software package or a device package. A PRF provides information about the properties of a component such as its default values or configuration types.

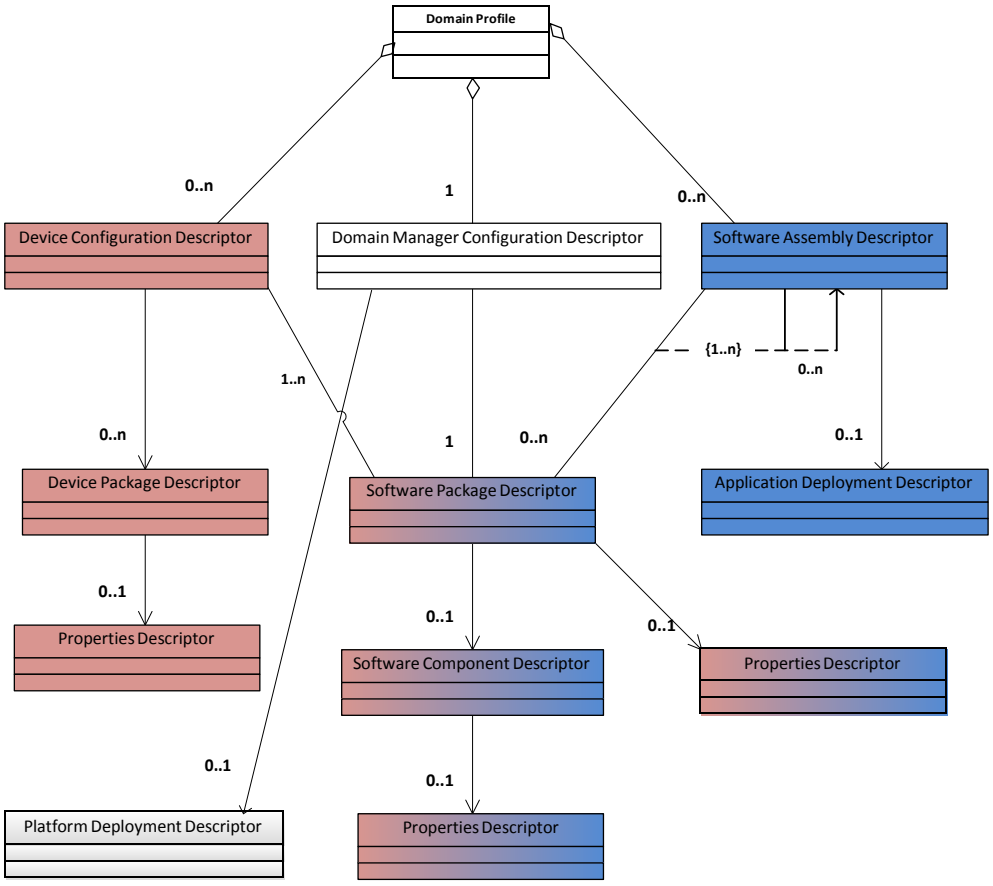


Figure 2-7: Relationship of Domain Profile Descriptor File Types

3 SCA PLATFORM INDEPENDENT MODEL (PIM)

This section documents a platform independent representation of the SCA. Technology specific mappings of the SCA PIM are documented in Appendix E. OMG IDL is the standard representation for the standalone interface definitions within the SCA platform independent model.

3.1 OPERATING ENVIRONMENT

This section contains the requirements of the operating system, transfer mechanism, and the CF interfaces and operations that comprise the SCA Operating Environment.

3.1.1 Operating System

The processing environment and the functions performed in the architecture impose differing constraints on the architecture. Appendix B is defined to support portability of waveforms, scalability of the architecture, and commercial viability. POSIX specifications are used as a basis for this profile. The notional relationship of the OE and applications to Appendix B is depicted in Figure 3-1. SCA451 The OE shall provide the functions and options designated as mandatory by a profile defined in Appendix B. The OE is not limited to providing the functions and options designated as mandatory by the profile. OE implementations are not limited to using the services designated as mandatory by Appendix B.

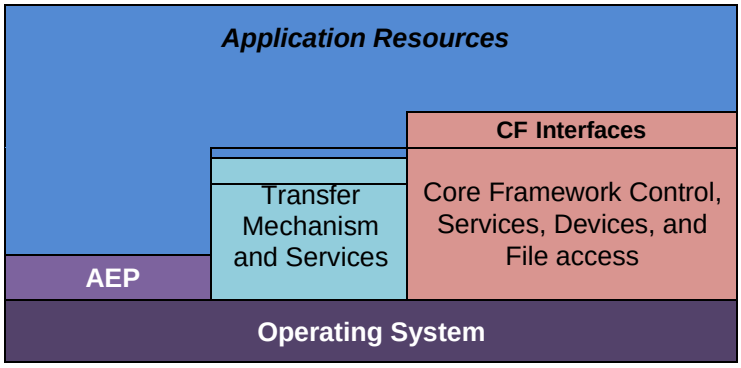


Figure 3-1: Notional Relationship of OE and Application to an SCA AEP

SCA1 The OE and related file systems shall support a maximum filename length of 40 characters and a maximum pathname length of 1024 characters.

Applications are limited to using the OS services that are designated as mandatory for the profile. Applications perform file access through the CF (application requirements are covered in section 3.1.3.3.2.1).

3.1.2 Transfer Mechanism & Services

SCA452 The OE shall provide a transfer mechanism that, at a minimum, provides the features specified in Appendix E for the specific platform technology implemented.

3.1.2.1 Log Service

An SCA compliant implementation may include a log service. SCA453 The log service shall conform to the OMG Lightweight Log Service Specification [1].

3.1.2.2 Event Service and Standard Events

3.1.2.2.1 **Event Service**

SCA2 The OE shall provide an implementation of an Event Service. SCA454 The Event Service shall implement the *PushConsumer* and *PushSupplier* interfaces of the CosEventComm module as described in OMG Event Service Specification [2] consistent with the IDL found in that specification.

The Event Service has the capability to create event channels. An event channel allows multiple suppliers to communicate with multiple consumers asynchronously. An event channel is both a consumer and a producer of events. For example, event channels may be standard objects and communication through those channels is accomplished using standard requests. SCA3 The OE shall provide two standard event channels: Incoming Domain Management and Outgoing Domain Management. The Incoming Domain Management Channel name is "IDM_Channel". The Outgoing Domain Management Channel name is "ODM_Channel". The Incoming Domain Management event channel is used by components within the domain to generate events (e.g., device state change event) that are consumed by domain management components (e.g., ApplicationFactoryComponent, ApplicationManagerComponent, DomainManagerComponent, etc.). The Outgoing Domain Management Channel is used by domain clients (e.g., HCI) to receive events (e.g., additions or removals from the domain) generated from domain management components (e.g., ApplicationFactoryComponent, ApplicationManagerComponent, DomainManagerComponent, etc.). Besides these two standard event channels, the OE allows other event channels to be set up by application developers.

3.1.2.2.2 **StandardEvent Module**

The StandardEvent module specifies type definitions that are used for passing events from event producers to event consumers. The IDL for this module is specified in Appendix C of this specification.

3.1.2.2.3 **Types**

3.1.2.2.3.1 StateChangeCategoryType

The type StateChangeCategoryType is an enumeration that is utilized in the StateChangeEventType. It is used to identify the category of state change that has occurred.

```
enum StateChangeCategoryType
{
     ADMINISTRATIVE_STATE_EVENT,
     OPERATIONAL_STATE_EVENT,
     USAGE_STATE_EVENT
};
```

3.1.2.2.3.2 StateChangeType

The type StateChangeType is an enumeration that is utilized in the StateChangeEventType. It is used to identify the specific states of the event source before and after the state change occurred.

```
enum StateChangeType
```

```
{
     LOCKED,         /*Administrative State Event */
     UNLOCKED,       /*Administrative State Event */
     SHUTTING_DOWN,  /*Administrative State Event */
     ENABLED,        /*Operational State Event */
     DISABLED,       /*Operational State Event */
     IDLE,           /*Usage State Event */
     ACTIVE,         /*Usage State Event */
     BUSY            /*Usage State Event */
};
```

3.1.2.2.3.3 StateChangeEventType

The type StateChangeEventType is a structure used to indicate that the state of the event source has changed.

```
struct StateChangeEventType
{
     string                   producerId;
     string                   sourceId;
     StateChangeCategoryType  stateChangeCategory;
     StateChangeType          stateChangeFrom;
     StateChangeType          stateChangeTo;
};
```

3.1.2.2.3.4 SourceCategoryType

The type SourceCategoryType is an enumeration that is utilized in the DomainManagementObjectAddedEventType and DomainManagementObjectRemovedEventType. It is used to identify the type of object that has been added to or removed from the domain.

```
enum SourceCategoryType
{
     DEVICE_MANAGER,
     DEVICE,
     APPLICATION_FACTORY,
     APPLICATION,
     SERVICE
};
```

3.1.2.2.3.5 DomainManagementObjectRemovedEventType

The type DomainManagementObjectRemovedEventType is a structure used to indicate that an event source has been removed from the domain.

```
struct DomainManagementObjectRemovedEventType
{
     string              producerId;
     string              sourceId;
     string              sourceName;
     SourceCategoryType  sourceCategory;
};
```

3.1.2.2.3.6 DomainManagementObjectAddedEventType

The type DomainManagementObjectAddedEventType is a structure used to indicate that an event source has been added to the domain.

```
struct DomainManagementObjectAddedEventType
{
     string              producerId;
     string              sourceId;
     string              sourceName;
     SourceCategoryType  sourceCategory
     Object              sourceIOR;
};
```

3.1.2.3 Additional Services

The OE may include services other than those (i.e. log, file system, and event services) defined within the SCA. Those additional services may be launched by a device manager and managed by the framework through the CF based interfaces.

Service definitions should consist of APIs, behavior, state, priority and additional information in order to establish a clear contract between the service provider and user. IDL is the technology used to represent the service interfaces to foster reuse, extensibility and interoperability among SCA components.

3.1.3 Core Framework

This section includes a detailed description of the purpose of each CF interface, component, the purpose of each supported operation within the interface, and interface class diagrams to support these descriptions. The corresponding IDL for the CF is specified in Appendix C.

Figure 3-2 depicts the key elements of the CF and the UML relationships between those elements. A DomainManagerComponent manages the software applications, application factories, hardware devices (represented by software devices) and device managers within the system. Some software components may directly control the system's internal hardware devices; these components are logical devices, which implement the *Device*, *LoadableDevice*, or *ExecutableDevice* interfaces. Other software components have no direct relationship with a hardware device, but perform application services for the user and may implement the *Resource* interface. This interface provides a consistent way of configuring and tearing down these components. Each resource can potentially communicate with other resources. An application is a collection of one or more resources which provides a specific service or function that is managed through the *Application* interface. The resources of an application are allocated to one or more hardware devices by the application factory based upon various factors including the current availability of hardware devices, the behavior rules of a resource, and the loading requirements of each resource. The resources may then be created by using the *ComponentFactory* interface or through the *Device*, *LoadableDevice, or ExecutableDevice* interfaces and connected to other resources, services, or devices resident on the system.

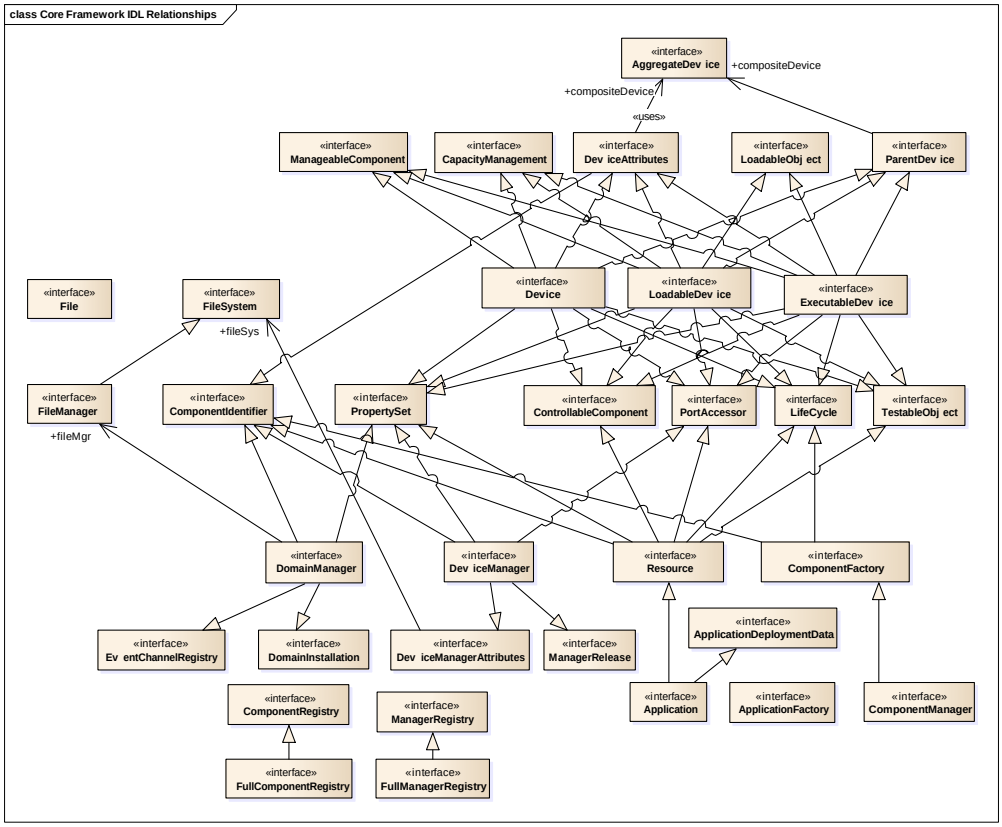


Figure 3-2: Core Framework IDL Relationships

The file service interfaces (*FileManager*, *FileSystem*, and *File*) are used for installation and removal of application files, and for loading and unloading application files on the various processors that the devices execute upon.

3.1.3.1 Common Elements

3.1.3.1.1 **Interfaces**

The Common Interfaces provide abstractions for common features, constraints and associations of SCA products that will be utilized by device, service or application developers.

3.1.3.1.1.1 ComponentFactory

3.1.3.1.1.1.1 Description

The *ComponentFactory* interface provides an optional mechanism for the management (i.e. creation and tear down) of components. The *ComponentFactory* interface is designed after the Factory Design Patterns [98]. The *ComponentFactory* interface UML is depicted in Figure 3-3.

3.1.3.1.1.1.2 UML

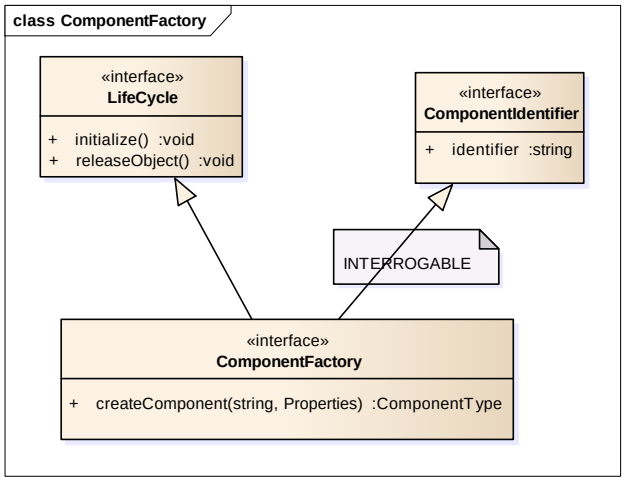


Figure 3-3: *ComponentFactory* Interface UML

3.1.3.1.1.1.3 Types

3.1.3.1.1.1.3.1 CreateComponentFailure

The CreateComponentFailure exception indicates that the *createComponent* operation failed to create the component. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception CreateComponentFailure { ErrorNumberType errorNumber;
string msg; };
```

3.1.3.1.1.1.4 Attributes

N/A

3.1.3.1.1.1.5 Operations

3.1.3.1.1.1.5.1 createComponent

3.1.3.1.1.1.5.1.1 Brief Rationale

The *createComponent* operation provides the capability to create components in the same process space as the component factory. This behavior is an alternative approach to the *Device::execute* operation for creating a component.

3.1.3.1.1.1.5.1.2 Synopsis

```
ComponentType createComponent (in string componentId, in
Properties qualifiers) raises (CreateComponentFailure);
```

3.1.3.1.1.1.5.1.3 Behavior

The componentId parameter is the identifier for a component. The qualifiers parameter contains values used by the component factory in creation of the component. The qualifiers may be used to identify, for example, specific subtypes of components created by a component factory.

SCA386 The *createComponent* operation shall create a component if no component exists for the given componentId. SCA387 The *createComponent* operation shall assign the given componentId to a new component.

3.1.3.1.1.1.5.1.4 Returns

SCA388 The *createComponent* operation shall return a ComponentType structure that contains a reference to the created component.

3.1.3.1.1.1.5.1.5 Exceptions/Errors

SCA389 The *createComponent* operation shall raise the CreateComponentFailure exception when it cannot create the component or the component already exists.

3.1.3.1.1.2 ComponentManager

3.1.3.1.1.2.1 Description

The *ComponentManager* interface extends the *ComponentFactory* interface by adding a component management capability for created components. The *ComponentManager* interface UML is depicted in Figure 3-4.

3.1.3.1.1.2.2 UML

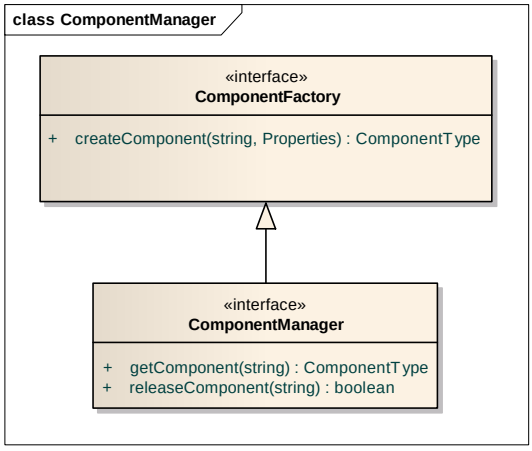


Figure 3-4: *ComponentManager* Interface UML

3.1.3.1.1.2.3 Types

N/A

3.1.3.1.1.2.4 Attributes

N/A

3.1.3.1.1.2.5 Operations

3.1.3.1.1.2.5.1 getComponent

3.1.3.1.1.2.5.1.1 Brief Rationale

The *getComponent* operation provides the capability to return a reference to a component that has already been created.

3.1.3.1.1.2.5.1.2 Synopsis

```
ComponentType getComponent (in string componentId);
```

3.1.3.1.1.2.5.1.3 Behavior

The *getComponent* operation provides the component reference indicated by the input componentId parameter to requesting clients.

3.1.3.1.1.2.5.1.4 Returns

SCA391 The *getComponent* operation shall return a structure that contains a reference to the existing component identified by the componentId parameter.

3.1.3.1.1.2.5.1.5 Exceptions/Errors

SCA392 The *getComponent* operation shall return a structure with a nil object reference when the component does not exists.

3.1.3.1.1.2.5.2 releaseComponent

3.1.3.1.1.2.5.2.1 Brief Rationale

There is a client side and server side representation of a component. The *releaseComponent* operation provides the mechanism of releasing the component in the component manager on the server side when all clients are through with a specific component. The client still has to release its component reference. The *releaseComponent* operation may be utilized when a component manager is used outside of an application (e.g. as part of the OE).

3.1.3.1.1.2.5.2.2 Synopsis

```
boolean releaseComponent (in string componentId);
```

3.1.3.1.1.2.5.2.3 Behavior

The *releaseComponent* operation releases the component from the component manager.

3.1.3.1.1.2.5.2.4 Returns

SCA395 The *releaseComponent* operation shall return TRUE for a successful release, or FALSE if the release is not successful or an invalid componentId is specified.

3.1.3.1.1.2.5.2.5 Exceptions/Errors

N/A.

3.1.3.1.2 **Components**

The Common Components provide abstractions for common features, constraints and associations of SCA products that will be utilized by device, service or application developers.

3.1.3.1.2.1 ComponentBase

3.1.3.1.2.1.1 Description

A ComponentBase is an abstract component that extends the UML component. ComponentBase provides an abstraction for the core associations and requirements that are used by many of the SCA components.

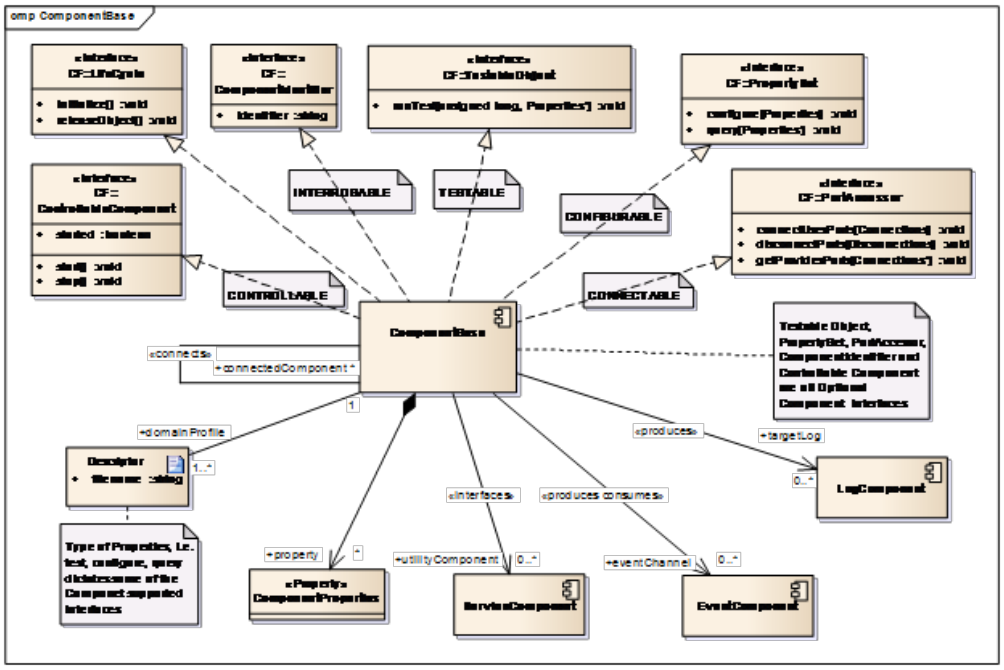


Figure 3-5: ComponentBase UML

3.1.3.1.2.1.2 Associations

- domainProfile: A ComponentBase is associated with a SPD and zero to many other domain profile files.
- eventChannel: A ComponentBase produces and consumes event messages to and from event channels.
- targetLog: A ComponentBase produces log messages and sends them to system log(s).
- utilityComponent: A ComponentBase leverages capabilities provided by ServiceComponent(s).
- property: A ComponentBase configuration is dictated via the categories of configure properties contained within its domainProfile.
- connectedComponent: A ComponentBase can be connected with and leverage capabilities provided by other ComponentBase(s).

3.1.3.1.2.1.3 Semantics

SCA420 A ComponentBase shall implement a 'configure' kind of property with a name of PRODUCER_LOG_LEVEL. The PRODUCER_LOG_LEVEL configure property provides the ability to filter the log message output of a component. This property may be configured via the *PropertySet* interface to output only specific log levels. SCA421 A ComponentBase shall output only those log records to a log service that correspond to enabled log level values in the PRODUCER_LOG_LEVEL attribute. Log levels that are not in the PRODUCER_LOG_LEVEL attribute are disabled. A ComponentBase uses its identifier in the

producerId field of the log record output to the log service. SCA423 A ComponentBase shall operate normally in the case where the connections to a log service are nil or an invalid reference.

The *PropertySet configure* and *query*, *Testable*::*runTest*, and *ControllableComponent*::*start* operations are not inhibited by the *ControllableComponent*::*stop* operation. SCA518 The *releaseObject* operation shall disconnect any ports that are still connected.

The CosEventComm module is used by consumers for receiving events and by producers for generating events. SCA444 A ComponentBase (e.g., ResourceComponent, DomainManagerComponent, etc.) that consumes events shall implement the *CosEventComm*::*PushConsumer* interface. SCA424 A ComponentBase that produces events shall implement the *CosEventComm*::*PushSupplier* interface and use the *CosEventComm*::*PushConsumer* interface for generating the events. SCA425 A producer ComponentBase shall not forward or raise any exceptions when the connection to a *CosEventComm*::*PushConsumer* is a nil or invalid reference.

3.1.3.1.2.1.4 Constraints

SCA426 A ComponentBase shall realize the *ComponentIdentifier* interface.

SCA427 A ComponentBase shall be associated with an SPD file.

SCA428 A ComponentBase shall provide a test implementation for all properties whose *kindtype* is test defined in its descriptor files.

SCA429 A ComponentBase shall configure or retrieve query values for all properties whose *kindtype* is configure defined in its descriptor file. Configure properties are configure readwrite and writeonly properties. Query properties are all configure properties whose *mode* element is "readwrite" or "readonly" and any allocation properties with an action value of "external".

SCA430 A ComponentBase shall supply ports for all the ports defined in its descriptor file.

SCA432 A ComponentBase shall realize the *LifeCycle* interface. The *LifeCycle* operations are used during deployment and teardown of a component.

SCA433 A ComponentBase shall realize the *ControllableComponent* interface to provide overall management control of the component.

3.1.3.1.2.2 ComponentFactoryComponent

3.1.3.1.2.2.1 Description

A ComponentFactoryComponent is an abstract component which provides an optional mechanism that may be used to create components. The factory mechanism provides client-server isolation among components and provides a standard mechanism of obtaining a component without knowing its identity.

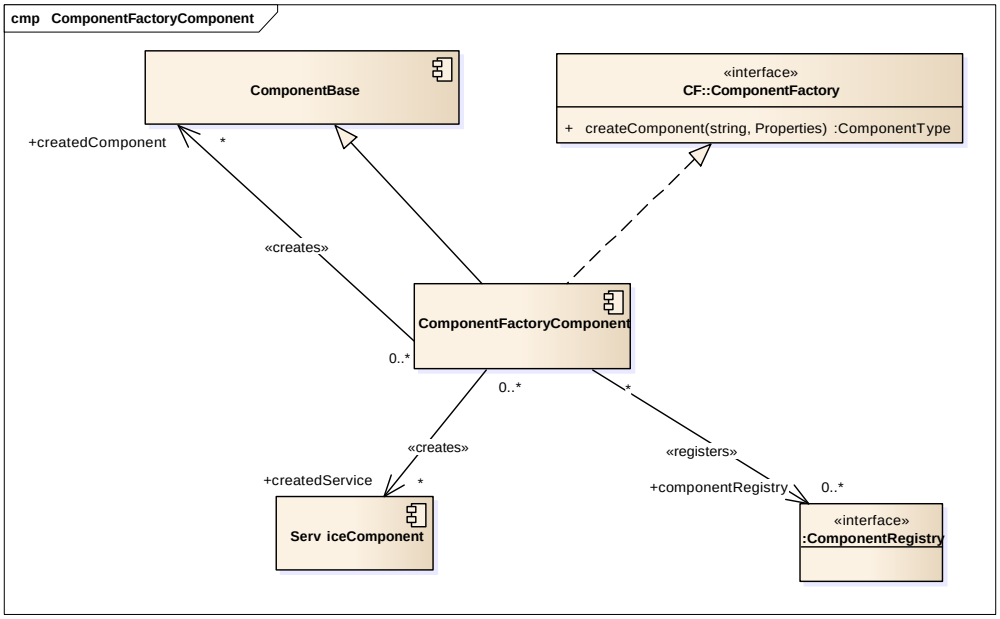


Figure 3-6: ComponentFactoryComponent UML

3.1.3.1.2.2.2 Associations

- createdComponent: A ComponentFactoryComponent provides a mechanism to create new component instances.
- createdService: A ComponentFactoryComponent provides a mechanism to create new ServiceComponent instances.
- componentRegistry: A ComponentFactoryComponent registers with a *componentRegistry* instance upon its creation.

3.1.3.1.2.2.3 Semantics

A ComponentFactoryComponent is used to create a Component. The ComponentFactoryComponent provides the mechanism of creating separate process threads for each component created in the component factory. A ComponentFactoryComponent should contain a collection of configurable initialization and component creation properties.

SCA540 Each ComponentFactoryComponent shall support the mandatory Component Identifier execute parameter as described in section 3.1.3.3.1.3.5.1, in addition to their user-defined execute properties in the component's SPD. SCA541 Each executable ComponentFactoryComponent shall set its identifier attribute using the Component Identifier execute parameter.

3.1.3.1.2.2.4 Constraints

SCA413 A ComponentFactoryComponent shall realize the *ComponentFactory* interface.
SCA414 A ComponentFactoryComponent shall fulfill the ComponentBase requirements.

3.1.3.1.2.3 ComponentManagerComponent

3.1.3.1.2.3.1 Description

A ComponentManagerComponent is an optional mechanism that may be used to create and tear down components. The ComponentManagerComponent extends the ComponentFactoryComponent by adding component management capability to the factory.

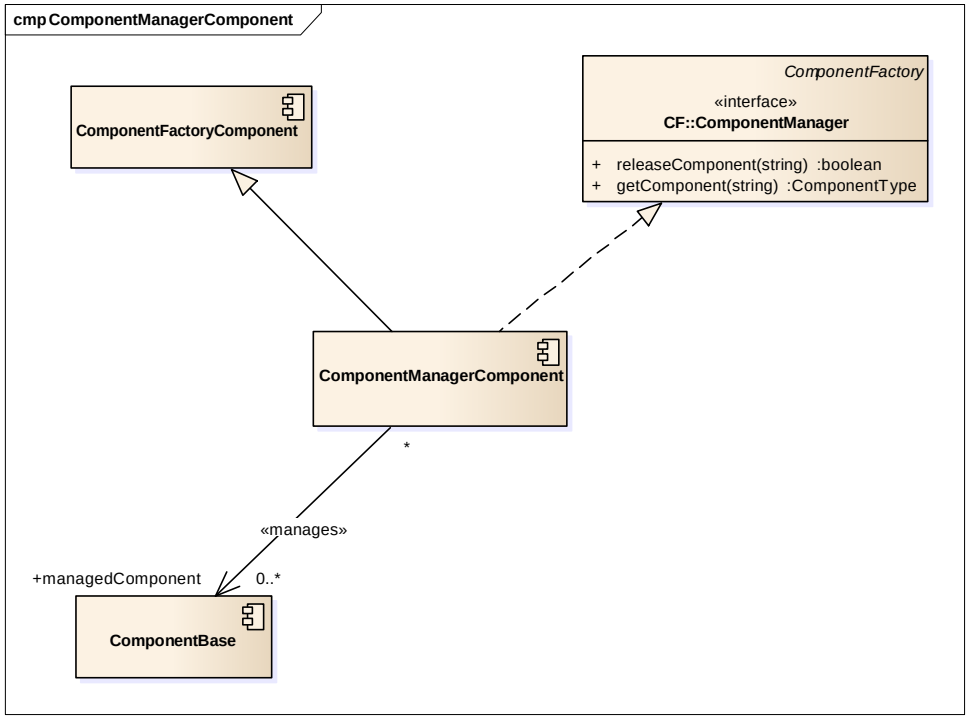


Figure 3-7: ComponentManagerComponent UML

3.1.3.1.2.3.2 Associations

- managedComponent: A ComponentManagerComponent provides a mechanism to remove and to retrieve ComponentBase(s).

3.1.3.1.2.3.3 Semantics

A ComponentManagerComponent manages a component by its *getComponent* and *releaseComponent* operations. When multiple clients have obtained a reference to the same component, the ComponentManagerComponent must not release the component until release requests have been received from all the clients that issued the create request. Application and waveform developers are not required to use ComponentManagerComponents for their application definition.

SCA417 The *createComponent* operation shall set the reference count for the component indicated by the componentId parameter to one. SCA390 The *getComponent* operation shall increment the reference count for the component indicated by the componentId parameter by

one. SCA393 The *releaseComponent* operation shall decrement the reference count for the component indicated by the componentId parameter by one. SCA533 The *releaseComponent* operation shall release the component from the OE when the reference count of the component indicated by the componentId parameter is zero. The reference count is indicates the number of times that a specific component reference has been given to requesting clients.

3.1.3.1.2.3.4 Constraints

SCA418 A ComponentManagerComponent shall realize the *ComponentManager* interface.
SCA419 A ComponentManagerComponent shall fulfill the ComponentFactoryComponent requirements.

3.1.3.1.3 **Core Framework Base Types**

The CF Base Types are the underlying types used in the CF interfaces.

3.1.3.1.3.1 DataType

This type is an IDL structure, which may be used to hold any basic type or static IDL type. The id attribute indicates the kind of value and type (e.g., frequency, preset, etc.). The id may be an UUID string, an integer string, or a name identifier depending on context. The value attribute may be any static IDL type or basic type.

```
struct DataType
{
     string id;
     any value;
};
```

3.1.3.1.3.2 ObjectSequence

The CF ObjectSequence type defines an unbounded sequence of objects.

```
typedef sequence <Object> ObjectSequence;
```

3.1.3.1.3.3 FileException

The CF FileException indicates a file-related error occurred. The error number indicates a CF ErrorNumberType value. The message provides information describing the error. The message may be used for logging the error.

```
exception FileException {ErrorNumberType errorNumber; string msg; };
```

3.1.3.1.3.4 InvalidFileName

The CF InvalidFileName exception indicates an invalid file name was passed to a file service operation. The error number indicates a CF ErrorNumberType value. The message provides information describing why the file name was invalid.

```
exception InvalidFileName {ErrorNumberType errorNumber; string msg; };
```

3.1.3.1.3.5 InvalidObjectReference

The CF InvalidObjectReference exception indicates an invalid object reference error.

```
exception InvalidObjectReference {string msg;};
```

3.1.3.1.3.6 InvalidProfile

The CF InvalidProfile exception indicates an invalid profile error.

```
exception InvalidProfile{};
```

3.1.3.1.3.7 OctetSequence

This type is an unbounded sequence of octets.

```
typedef  sequence <octet> OctetSequence;
```

3.1.3.1.3.8 Properties

The CF Properties is an IDL unbounded sequence of CF DataType(s), which is used in defining a sequence of name and value pairs.

```
typedef sequence <DataType> Properties;
```

3.1.3.1.3.9 StringSequence

This type defines a sequence of strings.

```
typedef sequence <string> StringSequence;
```

3.1.3.1.3.10 UnknownProperties

The CF UnknownProperties exception indicates the unsuccessful retrieval of a component's properties. The invalidProperties returned indicate the properties that were unknown.

```
exception UnknownProperties {Properties invalidProperties; };
```

3.1.3.1.3.11 DeviceAssignmentType

The CF DeviceAssignmentType defines a structure that associates a component with the device which the component either uses, is loaded upon or on which it is executed.

```
struct DeviceAssignmentType
{
     string    componentId;
     string    assignedDeviceId;
};
```

3.1.3.1.3.12 DeviceAssignmentSequence

The IDL sequence, CF DeviceAssignmentSequence, provides an unbounded sequence of CF DeviceAssignmentTypes.

```
typedef sequence <DeviceAssignmentType>DeviceAssignmentSequence;
```

3.1.3.1.3.13 ErrorNumberType.

This enum is used to pass error number information in various exceptions. Those exceptions starting with "CF_E" map the POSIX definitions (with the "CF_" removed), and is found in reference [7]. CF_NOTSET is not defined in the POSIX specification. CF_NOTSET is an SCA specific value that is applicable for any exception when the method specific or standard POSIX error values are not appropriate.

```
enum ErrorNumberType
{
CF_NOTSET, CF_E2BIG, CF_EACCES, CF_EAGAIN, CF_EBADF, CF_EBADMSG,
CF_EBUSY, CF_ECANCELED, CF_ECHILD, CF_EDEADLK, CF_EDOM,
CF_EEXIST, CF_EFAULT, CF_EFBIG, CF_EINPROGRESS,
CF_EINTR,CF_EINVAL, CF_EIO, CF_EISDIR, CF_EMFILE, CF_EMLINK,
CF_EMSGSIZE, CF_ENAMETOOLONG, CF_ENFILE, CF_ENODEV, CF_ENOENT,
CF_ENOEXEC, CF_ENOLCK, CF_ENOMEM, CF_ENOSPC, CF_ENOSYS,
CF_ENOTDIR, CF_ENOTEMPTY, CF_ENOTSUP ,CF_ENOTTY, CF_ENXIO,
CF_EPERM, CF_EPIPE, CF_ERANGE , CF_EROFS, CF_ESPIPE, CF_ESRCH,
CF_ETIMEDOUT ,CF_EXDEV
};
```

3.1.3.1.3.14 PortAccessType

The PortAccessType structure defines a port. The portName field is the name of the port. The portReference field is object reference of the port.

```
struct PortAccessType
{
     string portName;
     Object portReference;
};
```

3.1.3.1.3.15 Ports

The Ports type defines a name/value sequence of PortAccessType structures.

```
typedef sequence <PortAccessType>  Ports;
```

3.1.3.1.3.16 ComponentEnumType

The ComponentEnumType enumeration defines the basic type of a component. The APPLICATION_COMPONENT field is a component which is launched as part of a Software Assembly. The DEVICE_COMPONENT field is a ComponentBaseDevice launched by a DeviceManagerComponent. The CF_SERVICE_COMPONENT field is a CF_ServiceComponent launched by a DeviceManagerComponent that the framework can manage through the CF based interfaces. The NON_CF_SERVICE_COMPONENT is a ServiceComponent launched by a DeviceManagerComponent that could implement possibly any interface (e.g. Log, FileSystem, etc.). The FRAMEWORK_COMPONENT is a DeviceManagerComponent, DomainManagerComponent, ApplicationManagerComponent, or ApplicationFactoryComponent.

```
enum ComponentEnumType
{
APPLICATION_COMPONENT,
     DEVICE_COMPONENT,
     CF_SERVICE_COMPONENT,
     NON_CF_SERVICE_COMPONENT,
     FRAMEWORK_COMPONENT
};
```

3.1.3.1.3.17 ComponentType

The ComponentType structure defines the basic elements of a component. The identifier field is the id of the component as specified through execparams. The softwareProfile field is either the component's SPD filename or the SPD itself. The type field is the type of component. The componentObject field is the object reference of the component. The providesPorts field is a sequence of static ports provided by the component.

```
struct ComponentType
{
     string identifier;
     string softwareProfile;
     ComponentEnumType type;
     Object componentObject;
     Ports providesPorts;
};
```

3.1.3.1.3.18 Components

The Components type defines a sequence of ComponentType structures.

```
typedef sequence <ComponentType> Components;
```

3.1.3.1.3.19 ManagerType

The ManagerType structure defines the basic elements of a manager component (e.g. DeviceManagerComponent). The managerComponent field provides component information including id, type, object reference, and static provides ports of the manager component. The registeredComponents field is a sequence of components that have registered with this manager component. The fileSys field is the file system used by this manager component. The profile field is either the manager component's filename (e.g. DCD) or the domain profile file contents utilized by the manager component.

```
struct ManagerType
{
     ComponentType managerComponent;
     Components registeredComponents;
     FileSystem fileSys;
     string profile;
};
```

3.1.3.1.3.20 RegisterError

The RegisterError exception indicates that an internal error has occurred to prevent the *ComponentRegistry* or *ManagerRegistry* interface registration operations from successful completion. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception RegisterError { ErrorNumberType errorNumber; string
msg; };
```

3.1.3.1.3.21 UnregisterError

The UnregisterError exception indicates that an internal error has occurred to prevent the *FullComponentRegistry* or *FullManagerRegistry* interface unregister operations from successful completion. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception UnregisterError { ErrorNumberType errorNumber; string
msg; };
```

3.1.3.1.3.22 InvalidState

The InvalidState exception indicates that the device is not capable of executing the requested behavior due to the device's current state. The message is component-dependent, providing additional information describing the reason for the error.

```
exception InvalidState {string msg;};
```

3.1.3.1.3.23 ApplicationType

The ApplicationType defines the elements of an application. The name field is the user-friendly name of this application or the application created by this application factory and is identical to the name passed into the *ApplicationFactory*::*create* call. The profile field is either the SAD filename or the SAD itself which represents this application or the application created by this ApplicationFactoryComponent. The app field is the reference to the ApplicationManagerComponent.

```
struct ApplicationType
{
     string name;
     string profile;
     Application app;
};
```

3.1.3.1.3.24 ApplicationFactoryType

The ApplicationFactoryType defines the elements of an application factory. The name field is the name of this application factory and is identical to the *softwareassembly* element name attribute of the SAD. The profile field is either the SAD filename or the SAD itself which represents this application or the application created by this application factory. The appFactory field is the reference to the ApplicationFactoryComponent.

```
struct ApplicationFactoryType
{
     string name;
     string profile;
     ApplicationFactory appFactory;
};
```

3.1.3.2 Base Application

3.1.3.2.1 **Interfaces**

Base Application Interfaces are defined by the Core Framework requirements and implemented by application developers; see section 3.1.3.3.2.1 for application requirements.

Base Application Interfaces are implemented using the appropriate Platform Specific interface definitions presented in Appendix E.

3.1.3.2.1.1 ComponentIdentifier

3.1.3.2.1.1.1 Description

The *ComponentIdentifier* interface provides a readonly identifier attribute for a component. The interface for a *ComponentIdentifier* is based upon its identifier attribute, which is the instance-unique identifier for this component.

3.1.3.2.1.1.2 UML

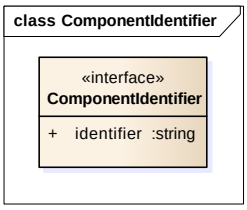


Figure 3-8: *ComponentIdentifier* Interface UML

3.1.3.2.1.1.3 Types

N/A.

3.1.3.2.1.1.4 Attributes

3.1.3.2.1.1.4.1 identifier

SCA6 The readonly identifier attribute shall return the instance-unique identifier for a component.

```
readonly attribute string identifier;
```

3.1.3.2.1.1.5 Operations

N/A.

3.1.3.2.1.2 PortAccessor

3.1.3.2.1.2.1 Description

This interface provides operations for managing associations between ports. The *PortAccessor* interface UML is depicted in Figure 3-9. An application establishes the operations for transferring data and control. The application also establishes the meaning of the data and control values. Examples of how applications may use ports in different ways include: push or pull, synchronous or asynchronous, mono- or bi-directional, or whether to use flow control (e.g., pause, start, and stop).

The nature of *PortAccessor* fan-in, fan-out, or one-to-one is component dependent. How components' ports are connected is described in the SAD and the DCD files of the Domain Profile (3.1.3.6).

3.1.3.2.1.2.2 UML

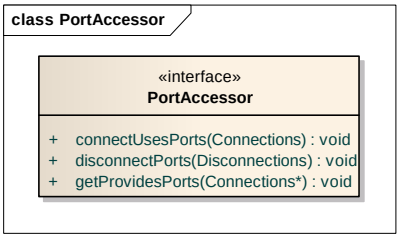


Figure 3-9: *PortAccessor* Interface UML

3.1.3.2.1.2.3 Types

3.1.3.2.1.2.3.1 ConnectionType

The ConnectionType structure defines a type for information needed to make a connection. The connectionId field is the id of the connection. The portReference field is the object reference of the provided port.

```
struct ConnectionType
{
     ConnectionIdType portConnectionId;
     Object portReference;
};
```

3.1.3.2.1.2.3.2 Connections

The Connections type defines a sequence of ConnectionType structures.

```
typedef sequence <ConnectionType>  Connections;
```

3.1.3.2.1.2.3.3 ConnectionErrorType

The ConnectionErrorType structure identifies a port and associated error code to be provided in the InvalidPort exception defined in 3.1.3.2.1.2.3.6

```
struct ConnectionErrorType
{
     ConnectionIdType portConnectionId;
     unsigned short errorCode;
};
```

3.1.3.2.1.2.3.4 ConnectionIdType

The ConnectionIdType structure defines a type for information needed to disconnect a connection. The connectionId field is the id of the connection. The portName field is the name of the (uses or provides) port.

```
struct ConnectionIdType
{
     string connectionId;
     string portName;
};
```

3.1.3.2.1.2.3.5 Disconnections

The Disconnections type defines a sequence of ConnectionIdType structures.

```
typedef sequence <ConnectionIdType>  Disconnections;
```

3.1.3.2.1.2.3.6 InvalidPort

The InvalidPort exception indicates one of the following errors has occurred in the specification of a *connection*:

1. An errorCode of 1 indicates the provides portReference is invalid (e.g. unable to narrow object reference) or illegal object reference,
2. An errorCode of 2 indicates the connectionId is invalid,
3. An errorCode of 3 indicates uses or provides port portName does not exist for the given connectionId,
4. An errorCode of 4 indicates the port has reached its maximum number of connections and is unable to accept any additional connections.

```
exception InvalidPort {ConnectionErrorType invalidConnections};
```

3.1.3.2.1.2.4 Attributes

N/A.

3.1.3.2.1.2.5 Operations

3.1.3.2.1.2.5.1 connectUsesPorts

3.1.3.2.1.2.5.1.1 Brief Rationale

Applications require the *connectUsesPorts* operation to establish associations between ports. Ports provide channels through which data and/or control pass.

The *connectUsesPorts* supplies a component with a sequence of connection information. The input portConnections parameter is a sequence of connectionIds, uses port names, and provides port object references.

3.1.3.2.1.2.5.1.2 Synopsis

```
void connectUsesPorts (in Connections portConnections) raises
(InvalidPort);
```

3.1.3.2.1.2.5.1.3 Behavior

SCA7 The *connectUsesPorts* operation shall make the connection(s) to the component identified by its input portConnections parameter. A port may support several connections. The resulting portConnectionIds are used by the *disconnectPorts* operation when breaking specific connection(s). SCA519 The *connectUsesPorts* operation shall disconnect any connections it formed if any connections in the input portConnections parameter cannot be successfully established.

3.1.3.2.1.2.5.1.4 Returns

This operation does not return a value.

3.1.3.2.1.2.5.1.5 Exceptions/Errors

SCA8 The *connectUsesPorts* operation shall raise the InvalidPort exception when the input portConnections parameter provides an invalid connection for the specified port.

3.1.3.2.1.2.5.2 disconnectPorts

3.1.3.2.1.2.5.2.1 Brief Rationale

Applications require the *disconnectPorts* operation to allow consumer/producer components to disassociate themselves from their counterparts (consumer/producer).

The *disconnectPorts* operation releases a sequence of uses or provides ports from the connection(s). The input portDisconnections is a sequence of connectionIds and (uses or provides) port names.

3.1.3.2.1.2.5.2.2 Synopsis

```
void disconnectPorts (in Disconnections portDisconnections)
raises (InvalidPort);
```

3.1.3.2.1.2.5.2.3 Behavior

SCA10 The *disconnectPorts* operation shall break the connection(s) to the component identified by the input portDisconnections parameter.

SCA11 The *disconnectPorts* operation shall release all ports if the input portDisconnections parameter is a zero length sequence.

3.1.3.2.1.2.5.2.4 Returns

This operation does not return a value.

3.1.3.2.1.2.5.2.5 Exceptions/Errors

SCA12 The *disconnectPorts* operation shall raise the InvalidPort exception when the input portDisconnections parameter provides an unknown connection to the *PortAccessor* component.

3.1.3.2.1.2.5.3 getProvidesPorts

3.1.3.2.1.2.5.3.1 Brief Rationale

The *getProvidesPorts* operation provides a mechanism to obtain specific provides ports. The exact number of ports is specified in the component's software profile SCD (section 3.1.3.6). The input/output portConnections is a sequence of connectionIds and provides port object references.

3.1.3.2.1.2.5.3.2 Synopsis

```
void getProvidesPorts (inout Connections portConnections) raises
(InvalidPort);
```

3.1.3.2.1.2.5.3.3 Behavior

The *getProvidesPorts* operation returns the object references associated with the input port names and connection IDs.

3.1.3.2.1.2.5.3.4 Returns

SCA13 The *getProvidesPorts* operation shall return the object references that are associated with the input port names and the connectionIds.

3.1.3.2.1.2.5.3.5 Exceptions/Errors

SCA14 The *getProvidesPorts* operation shall raise an InvalidPort exception when the input portConnections parameter requests undefined connection(s).

3.1.3.2.1.3 LifeCycle

3.1.3.2.1.3.1 Description

The *LifeCycle* interface defines the generic operations for initializing or releasing instantiated component-specific data and/or processing elements. The *LifeCycle* interface UML is depicted in Figure 3-10.

3.1.3.2.1.3.2 UML

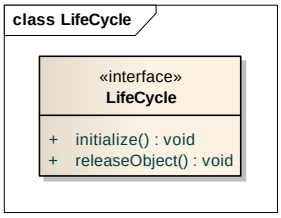


Figure 3-10: *LifeCycle* Interface UML

3.1.3.2.1.3.3 Types

3.1.3.2.1.3.3.1 InitializeError

The InitializeError exception indicates an error occurred during component initialization. ErrorMessages is component-dependent, providing additional information describing the reason why the error occurred.

```
exception InitializeError { StringSequence errorMessages; };
```

3.1.3.2.1.3.3.2 ReleaseError

The ReleaseError exception indicates an error occurred during the component *releaseObject* operation. ErrorMessages is component-dependent, providing additional information describing the reason why the error occurred.

```
exception ReleaseError { StringSequence errorMessages; };
```

3.1.3.2.1.3.4 Attributes

N/A.

3.1.3.2.1.3.5 Operations

3.1.3.2.1.3.5.1 initialize

3.1.3.2.1.3.5.1.1 Brief Rationale

The purpose of the *initialize* operation is to provide a mechanism to set a component to a known initial state. For example, data structures may be set to initial values, memory may be allocated, component may be configured to some state, etc.

3.1.3.2.1.3.5.1.2 Synopsis

```
void initialize() raises (InitializeError);
```

3.1.3.2.1.3.5.1.3 Behavior

Initialization behavior is implementation dependent.

3.1.3.2.1.3.5.1.4 Returns

This operation does not return a value.

3.1.3.2.1.3.5.1.5 Exceptions/Errors

SCA15 The *initialize* operation shall raise an InitializeError exception when an initialization error occurs.

3.1.3.2.1.3.5.2 releaseObject

3.1.3.2.1.3.5.2.1 Brief Rationale

The purpose of the *releaseObject* operation is to provide a means by which an instantiated component may be torn down. There is client side and server side representation of instantiated component. The *releaseObject* operation provides the mechanism for releasing the instantiated component from the OE on the server side. The client has the responsibility to release its client side reference of the instantiated component.

3.1.3.2.1.3.5.2.2 Synopsis

```
void releaseObject() raises (ReleaseError);
```

3.1.3.2.1.3.5.2.3 Behavior

SCA16 The *releaseObject* operation shall release all internal memory allocated by the component during the life of the component.

SCA17 The *releaseObject* operation shall tear down the component and release it from the operating environment. Tearing down a component implies its port connections have been disconnected and all component ports and interfaces have been deactivated and terminated

3.1.3.2.1.3.5.2.4 Returns

This operation does not return a value.

3.1.3.2.1.3.5.2.5 Exceptions/Errors

SCA18 The *releaseObject* operation shall raise a ReleaseError exception when a release error occurs.

3.1.3.2.1.4 TestableObject

3.1.3.2.1.4.1 Description

The *TestableObject* interface defines an operation that is used to test a component implementation. The *TestableObject* interface UML is depicted in Figure 3-11.

3.1.3.2.1.4.2 UML

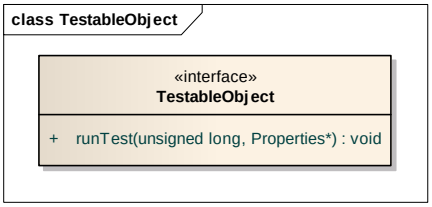


Figure 3-11: *TestableObject* Interface UML

3.1.3.2.1.4.3 Types

3.1.3.2.1.4.3.1 UnknownTest

The UnknownTest exception indicates the input testId parameter is not known by the component.

```
exception UnknownTest{};
```

3.1.3.2.1.4.4 Attributes

N/A.

3.1.3.2.1.4.5 Operations

3.1.3.2.1.4.5.1 runTest

3.1.3.2.1.4.5.1.1 Brief Rationale

The *runTest* operation allows components to be "black box" tested. This allows built-in tests (BITs) to be implemented which provide a means to isolate faults (both software and hardware) within the system.

3.1.3.2.1.4.5.1.2 Synopsis

```
void runTest (in unsigned long testId, inout Properties
testValues) raises (UnknownTest, UnknownProperties);
```

3.1.3.2.1.4.5.1.3 Behavior

SCA19 The *runTest* operation shall use the input testId parameter to determine which of its predefined test implementations should be performed. The id/value pair(s) of the testValues parameter should be used to provide additional information to the implementation-specific test to be run. SCA21 The *runTest* operation shall return the result(s) of the test in the testValues parameter.

Tests to be implemented by a component are component-dependent and are specified in the component's PRF. The testId parameter corresponds to the XML attribute *testId* of the property element *test* in a propertyfile.

The *runTest* operation does not execute any testing when the input testId or any of the input testValues are not known by the component or are out of range.

3.1.3.2.1.4.5.1.4 Returns

This operation does not return a value.

3.1.3.2.1.4.5.1.5 Exceptions/Errors

SCA23 The *runTest* operation shall raise the UnknownTest exception when there is no underlying test implementation that is associated with the input testId given.

SCA24 The *runTest* operation shall raise the CF UnknownProperties exception when the input parameter testValues contains any CF DataTypes that are not known by the component's test implementation or any values that are out of range for the requested test. SCA25 The exception parameter invalidProperties shall contain the invalid testValues properties id(s) that are not known by the component or the value(s) are out of range.

3.1.3.2.1.5 PropertySet

3.1.3.2.1.5.1 Description

The *PropertySet* interface defines *configure* and *query* operations to access component properties/attributes. The *PropertySet* interface UML is depicted in Figure 3-12.

3.1.3.2.1.5.2 UML

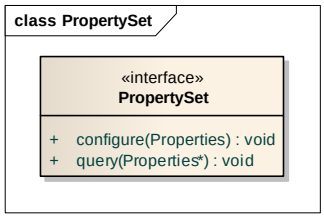


Figure 3-12: *PropertySet* Interface UML

3.1.3.2.1.5.3 Types

N/A.

3.1.3.2.1.5.3.1 InvalidConfiguration

The InvalidConfiguration exception indicates the configuration of a component has failed (no configuration at all was done). The message is component-dependent, providing additional information describing the reason why the error occurred. The invalidProperties returned indicate the properties that were invalid.

```
exception InvalidConfiguration { string msg; Properties
invalidProperties; };
```

3.1.3.2.1.5.3.2 PartialConfiguration

The PartialConfiguration exception indicates the configuration of a Component was partially successful. The invalidProperties returned indicate the properties that were invalid.

```
exception PartialConfiguration { Properties invalidProperties;};
```

3.1.3.2.1.5.4 Attributes

N/A.

3.1.3.2.1.5.5 Operations

3.1.3.2.1.5.5.1 configure

3.1.3.2.1.5.5.1.1 Brief Rationale

The *configure* operation allows id/value pair configuration properties to be assigned to components implementing this interface.

3.1.3.2.1.5.5.1.2 Synopsis

```
void configure (in Properties configProperties) raises
(InvalidConfiguration, PartialConfiguration);
```

3.1.3.2.1.5.5.1.3 Behavior

SCA26 The *configure* operation shall assign values to the properties as indicated in the input configProperties parameter.

3.1.3.2.1.5.5.1.4 Returns

This operation does not return a value.

3.1.3.2.1.5.5.1.5 Exceptions/Errors

SCA27 The *configure* operation shall raise a PartialConfiguration exception when some configuration properties were successfully set and some configuration properties were not successfully set.

SCA28 The *configure* operation shall raise an InvalidConfiguration exception when a configuration error occurs and no configuration properties were successfully set.

3.1.3.2.1.5.5.2 query

3.1.3.2.1.5.5.2.1 Brief Rationale

The *query* operation allows a component to be queried to retrieve its properties.

3.1.3.2.1.5.5.2.2 Synopsis

```
void query (inout Properties configProperties) raises
(UnknownProperties);
```

3.1.3.2.1.5.5.2.3 Behavior

SCA29 The *query* operation shall return all component properties when the inout parameter configProperties is zero size. SCA30 The *query* operation shall return only those id/value pairs specified in the configProperties parameter if the parameter is not zero size.

3.1.3.2.1.5.5.2.4 Returns

This operation does not return a value.

3.1.3.2.1.5.5.2.5 Exceptions/Errors

SCA31 The *query* operation shall raise the CF UnknownProperties exception when one or more properties being requested are not known by the component.

3.1.3.2.1.6 ControllableComponent

3.1.3.2.1.6.1 Description

The *ControllableComponent* interface provides a common API for the control of a software component. The *ControllableComponent* interface UML is depicted in Figure 3-13.

3.1.3.2.1.6.2 UML.

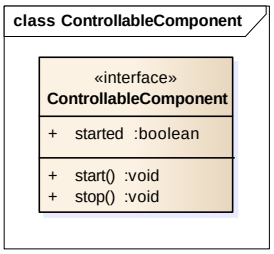


Figure 3-13: *ControllableComponent* Interface UML

3.1.3.2.1.6.3 Types

3.1.3.2.1.6.3.1 StartError

The StartError exception indicates that an error occurred during an attempt to start the component. The errorNumber indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception StartError { ErrorNumberType errorNumber; string msg;
};
```

3.1.3.2.1.6.3.2 StopError

The StopError exception indicates that an error occurred during an attempt to stop the component. The errorNumber indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception StopError { ErrorNumberType errorNumber; string msg;
};
```

3.1.3.2.1.6.4 Attributes

3.1.3.2.1.6.4.1 started

SCA32 The readonly started attribute shall return the component's started value.

```
readonly attribute boolean started;
```

3.1.3.2.1.6.5 Operations

3.1.3.2.1.6.5.1 start

3.1.3.2.1.6.5.1.1 Brief Rationale

The *start* operation is provided to command the component implementing this interface to start internal processing.

3.1.3.2.1.6.5.1.2 Synopsis

```
void start() raises (StartError);
```

3.1.3.2.1.6.5.1.3 Behavior

The *start* operation puts the component in an operating condition. The *start* operation is ignored if the component is already in an operating condition. SCA33 The *start* operation shall set the started attribute to a value of TRUE.

3.1.3.2.1.6.5.1.4 Returns

This operation does not return a value.

3.1.3.2.1.6.5.1.5 Exceptions/Errors

SCA34 The *start* operation shall raise the StartError exception if an error occurs while starting the component.

3.1.3.2.1.6.5.2 stop

3.1.3.2.1.6.5.2.1 Brief Rationale

The *stop* operation is provided to command the component implementing this interface to stop internal processing.

3.1.3.2.1.6.5.2.2 Synopsis

```
void stop() raises (StopError);
```

3.1.3.2.1.6.5.2.3 Behavior

The *stop* operation should disable all current component operations and put it in a non-operating condition. The *stop* operation is ignored if the component is already in a non-operating condition. SCA36 The *stop* operation shall set the started attribute to a value of FALSE.

3.1.3.2.1.6.5.2.4 Returns

This operation does not return a value.

3.1.3.2.1.6.5.2.5 Exceptions/Errors

SCA37 The *stop* operation shall raise the StopError exception if an error occurs while stopping the component.

~~3.1.3.2.1.7 Resource~~

~~3.1.3.2.1.7.1 Description~~

~~The *Resource* interface provides a common API for the control and configuration of a software component. The *Resource* interface UML is depicted in Figure 3-14.~~

~~The Resource interface inherits from the *LifeCycle* interface. The *Resource* interface may also inherit from the *ControllableComponent*, *ComponentIdentifier*, *PropertySet*, *TestableObject*, and *PortAccessor* interfaces.~~

~~The *LifeCycle*, *ControllableComponent*, *ComponentIdentifier*, *PropertySet*, *TestableObject*, and *PortAccessor* interface operations are documented in their respective sections of this document.~~

3.1.3.2.1.7.2 UML.

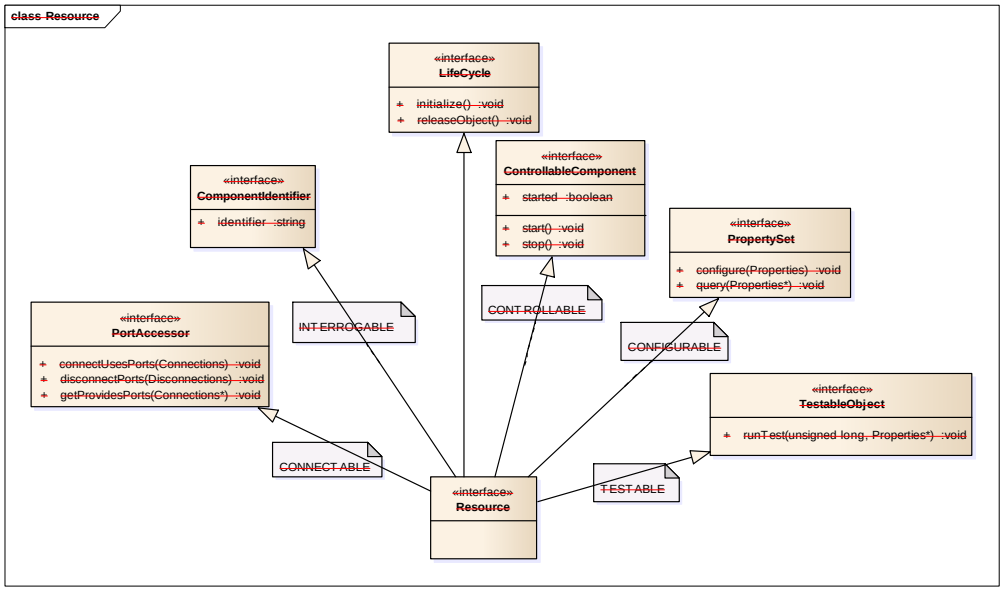


Figure 3-14: *Resource* Interface UML

3.1.3.2.1.7.3 Types

N/A

3.1.3.2.1.7.4 Attributes

N/A

3.1.3.2.1.7.5 Operations

N/A

3.1.3.2.2 **Components**

Base Application Components provide the structural definitions that will be utilized by application developers.

3.1.3.2.2.1 ResourceComponent

3.1.3.2.2.1.1 Description

ResourceComponent is an abstract component and provides a basic management capability to internal and external components.

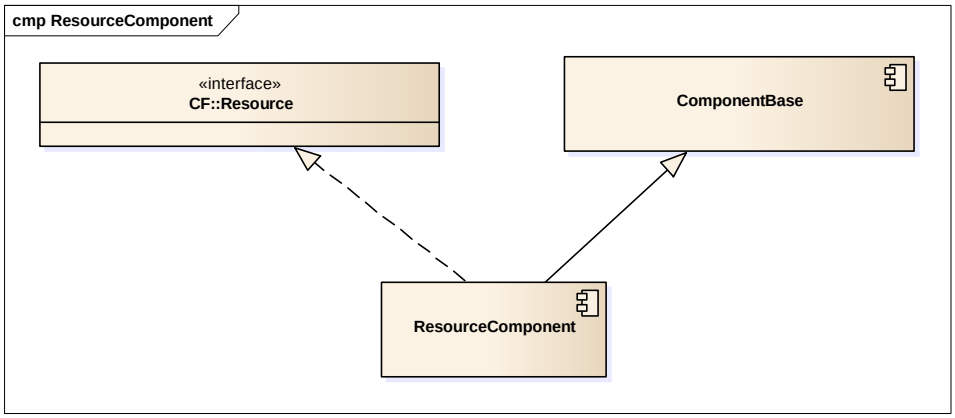


Figure 3-15: ResourceComponent UML

3.1.3.2.2.1.2 Associations

- property: A ResourceComponent may have zero to many query properties.
- domainProfile: A ResourceComponent has an SPD and zero to many other domain profile files.

3.1.3.2.2.1.3 Semantics

ResourceComponents have associated properties (e.g. test properties) that determine which interfaces need to be supported by the component.

3.1.3.2.2.1.4 Constraints

SCA38 A ResourceComponent shall realize the *Resource* interface. SCA39 A ResourceComponent shall fulfill the ComponentBase requirements.

3.1.3.2.2.2 ApplicationResourceComponent

3.1.3.2.2.2.1 Description

An ApplicationResourceComponent is a constituent part of an AssemblyComponent. An ApplicationResourceComponent, a specialization of ResourceComponent, provides a common API for control and configuration of ResourceComponent within the context of a deployed application.

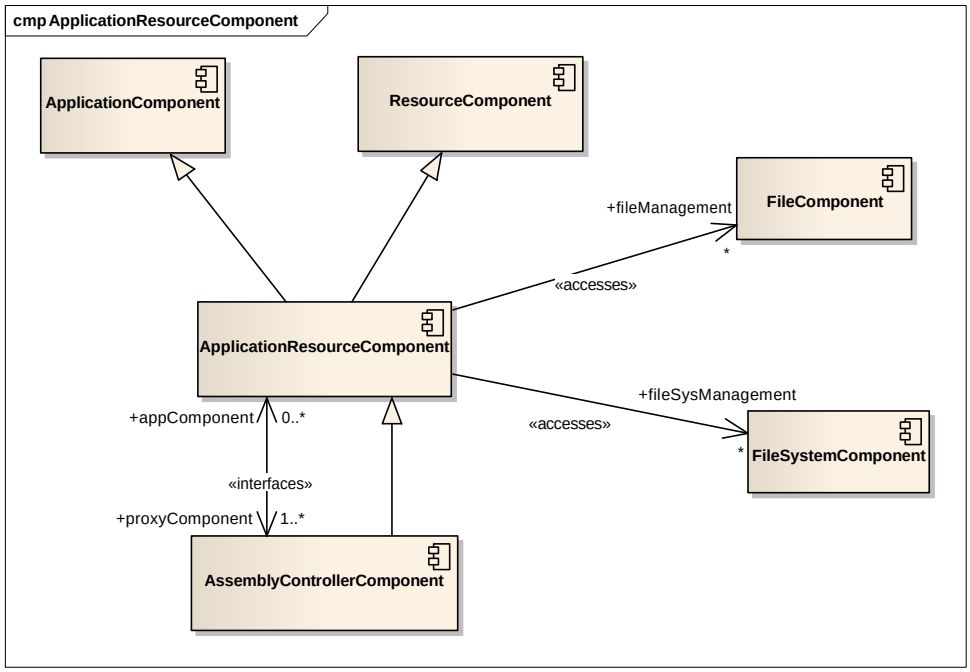


Figure 3-16: ApplicationResourceComponent UML

3.1.3.2.2.2.2 Associations

- domainProfile: An ApplicationResourceComponent identifies its provided and required ports in its SCD and associated domain profile files.
- fileManagement: An ApplicationResourceComponent accesses files via a FileComponent.
- fileSysManagement: An ApplicationResourceComponent accesses file systems via a FileSystemComponent.

3.1.3.2.2.2.3 Semantics

SCA455 Each ApplicationResourceComponent shall support the mandatory Component Identifier execute parameter as described in section 3.1.3.3.1.3.5.1, in addition to their user-defined execute properties in the component's SPD. SCA168 Each executable ApplicationResourceComponent shall set its identifier attribute using the Component Identifier execute parameter. SCA456 Each executable ApplicationResourceComponent shall accept executable parameters as specified in section 3.1.3.4.1.8.5.1.3 (*ExecutableDevice::execute*).

In addition to supporting the CF Base Application interfaces, an ApplicationResourceComponent may implement and use component-specific interfaces for data and/or control. Interfaces provided by an ApplicationResourceComponent are described in a SCD file as provides ports. Interfaces required by an ApplicationResourceComponent are described in an SCD file as uses ports.

3.1.3.2.2.2.4 Constraints

SCA172 An ApplicationResourceComponent shall fulfill the ResourceComponent requirements.

SCA520 An ApplicationResourceComponent shall fulfill the ApplicationComponent requirements.

Dynamically-created stringified IORs may be used to provide an IOR reference value parameter.

3.1.3.2.2.3 AssemblyControllerComponent

3.1.3.2.2.3.1 Description

The AssemblyControllerComponent is the intermediary between the ApplicationManagerComponent and the deployed ApplicationResourceComponent. The AssemblyControllerComponent is the overall controller for an application.

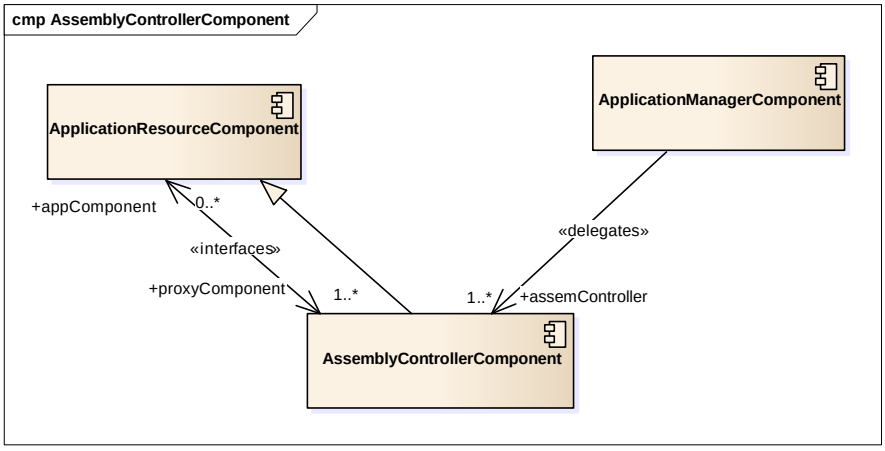


Figure 3-17: AssemblyControllerComponent UML

3.1.3.2.2.3.2 Associations

- appComponent: An AssemblyControllerComponent provides the intermediary between an ApplicationResourceComponent and external entities. Operation invocations, event messages, log messages and exceptions are representative of the type of information that may be exchanged between the components.

3.1.3.2.2.3.3 Semantics

N/A.

3.1.3.2.2.3.4 Constraints

SCA175 An AssemblyControllerComponent shall fulfill the ApplicationResourceComponent requirements. SCA176 An AssemblyControllerComponent shall realize the *ControllableComponent* interface.

3.1.3.2.2.4 ApplicationComponent

3.1.3.2.2.4.1 Description

An ApplicationComponent is an abstract component that captures the common requirements of the SCA Base Application Components.

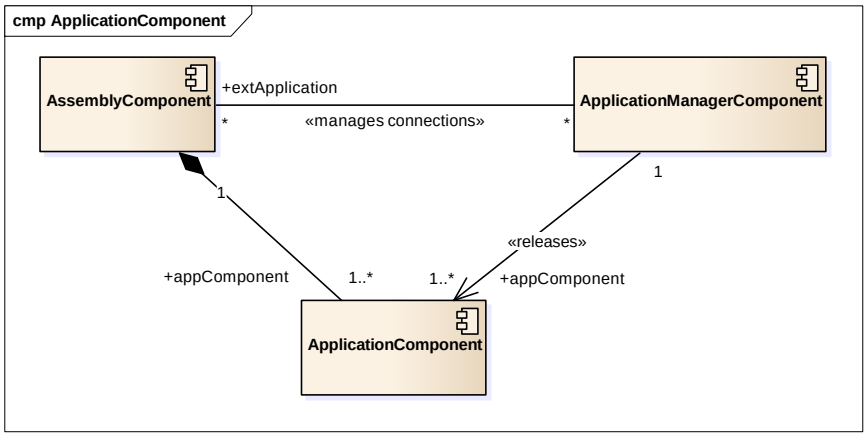


Figure 3-18: Application Component UML

3.1.3.2.2.4.2 Associations

N/A.

3.1.3.2.2.4.3 Semantics

SCA82 An ApplicationComponent created via an ExecutableDeviceComponent shall register with its launching ApplicationFactoryComponent via the *ComponentRegistry::registerComponent* operation.

3.1.3.2.2.4.4 Constraints

SCA166 An ApplicationComponent shall perform file access through the *FileSystem and File* interfaces. The application filename syntax is specified in section 3.1.3.5.1.1.4.1.

SCA167 All ApplicationComponent processes shall have a handler registered for the AEP SIGQUIT signal.

SCA169 Each ApplicationComponent shall be accompanied by the appropriate Domain Profile files per section 3.1.3.6.

SCA173 An ApplicationComponent shall be limited to using the mandatory OS services designated in Appendix B as specified in the SPD.

SCA457 An ApplicationComponent shall be limited to using transfer mechanisms features specified in Appendix E for the specific platform technology implemented.

3.1.3.2.2.5 ApplicationComponentFactoryComponent

3.1.3.2.2.5.1 Description

An application component factory is an optional mechanism that may be used to create application components exclusively.

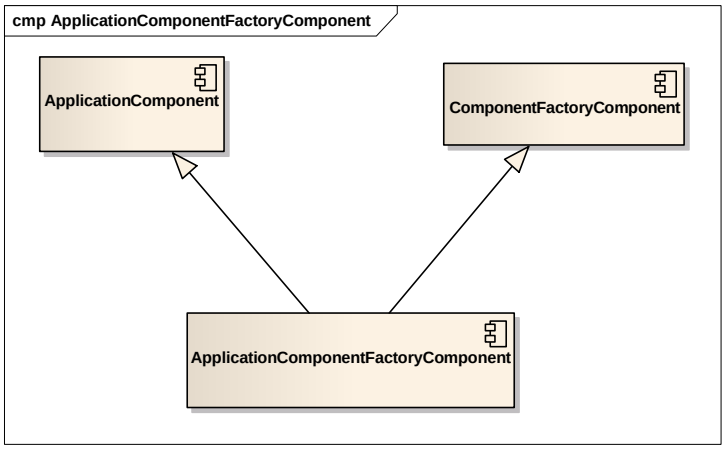


Figure 3-19: ApplicationComponentFactoryComponent UML

3.1.3.2.2.5.2 Associations

- createdComponent: An ApplicationComponentFactoryComponent provides a mechanism to create new ApplicationResourceComponents.

3.1.3.2.2.5.3 Semantics

An ApplicationComponentFactoryComponent is used to create an ApplicationResourceComponent. An AssemblyComponent is not required to use an ApplicationComponentFactoryComponent to create application components. A software profile specifies which ApplicationComponentFactoryComponents are to be used by the ApplicationFactoryComponent.

3.1.3.2.2.5.4 Constraints

SCA521 An ApplicationComponentFactoryComponent shall fulfill the ComponentFactoryComponent requirements.

SCA522 An ApplicationComponentFactoryComponent shall fulfill the ApplicationComponent requirements.

SCA415 The ApplicationComponentFactoryComponent shall only launch ApplicationResourceComponents.

3.1.3.3 Framework Control

3.1.3.3.1 **Interfaces**

Framework control within a Domain is accomplished by domain management and device management interfaces.

The management interfaces are *Application*, *ApplicationDeploymentData*, *ApplicationFactory*, *ComponentRegistry*, *EventChannelRegistry*, *DeviceManager*, *DeviceManagerAttributes*, *DomainInstallation*, *DomainManager*, *FullComponentRegistry*, *ManagerRegistry*, *ManagerRelease*, and *FullManagerRegistry*. These interfaces manage the registration, unregistration, and deployment of applications, devices, and device managers within the domain and the controlling of applications within the domain.

Device management is accomplished through the *DeviceManager* interface. The device manager creates logical devices and launches services on these logical devices.

Framework Control Interfaces are implemented using interface definitions expressed in a Platform Specific representation of one of the Appendix E enabling technologies.

3.1.3.3.1.1 Application

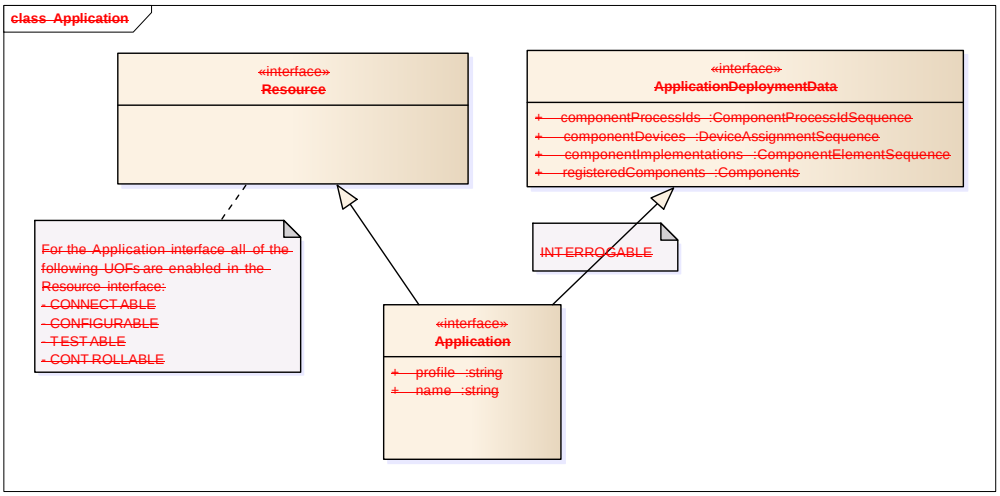
3.1.3.3.1.1.1 Description

The *Application* class provides the interface for the control, configuration, and status of an instantiated application in the domain.

The *Application* interface inherits the *Resource* interface. The *Application* interface supports most of the *Resource* base application interfaces (i.e. *LifeCycle*, *ControllableComponent*, *PropertySet*, *TestableObject*, and *PortAccessor*) and can optionally support the *ApplicationDeploymentData* interface. The *Application* interface UML is depicted in Figure 3-20.

The *Application::releaseObject* operation provides the interface to release the computing resources allocated during the instantiation of the application, and de-allocate the devices associated with *Application* instance.

3.1.3.3.1.1.2 UML



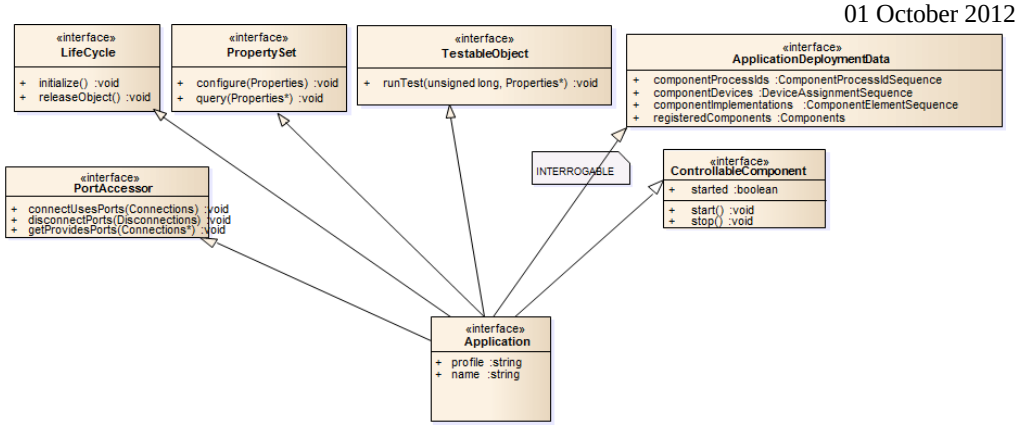


Figure 3-20: *Application* Interface UML

3.1.3.3.1.1.3 Types

N/A.

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3.1.3.3.1.1.4 Attributes

3.1.3.3.1.1.4.1 profile

SCA40 The readonly profile attribute shall return either the application's SAD filename or the SAD itself. The filename is an absolute pathname relative to a mounted FileSystemComponent and the file is obtained via the DomainManagerComponent's FileManagerComponent. Files referenced within the profile are obtained via a FileManagerComponent.

```
readonly attribute string profile;
```

3.1.3.3.1.1.4.2 name

SCA41 This readonly name attribute shall return the name of the created application. The *ApplicationFactory* interface's *create* operation name parameter provides the name content.

```
readonly attribute string name;
```

3.1.3.3.1.1.5 Operations

3.1.3.3.1.1.5.1 releaseObject

3.1.3.3.1.1.5.1.1 Brief Rationale

The *releaseObject* operation terminates execution of the application, returns all allocated computing resources, and de-allocates the resources' capacities in use by the devices associated with the application. Before terminating, the application removes the message connectivity with its associated applications (e.g., ports, resources, and logs) in the domain.

3.1.3.3.1.1.5.1.2 Synopsis

```
void releaseObject() raises (ReleaseError);
```

3.1.3.3.1.1.5.1.3 Behavior

The following behavior extends the *LifeCycle::releaseObject* operation requirements (see section 3.1.3.2.1.3.5.2)

SCA42 The *Application::releaseObject* operation shall release each application component by utilizing *LifeCycle::releaseObject* operation. SCA43 The *Application::releaseObject* operation shall terminate the processes / tasks on allocated executable devices belonging to each application component.

SCA44 The *Application::releaseObject* operation shall unload each application component instance from its allocated ComponentBaseDevice.

SCA45 The *Application::releaseObject* operation shall deallocate the ComponentBaseDevice capacities that were allocated during application creation.

SCA46 The *Application::releaseObject* operation shall release all object references to the components making up the application.

SCA47 The *Application::releaseObject* operation shall disconnect ports (including an Event Service's event channel consumers and producers) that were previously connected based upon the application's associated SAD. The *Application::releaseObject* operation may destroy an Event Service's event channel when no more consumers and producers are connected to it.

The *Application::releaseObject* operation for an application should disconnect ports first, then release its components, call the *terminate* operation, and lastly call the *unload* operation on the ComponentBaseDevices.

SCA49 The *Application::releaseObject* operation shall, upon successful application release, write an ADMINISTRATIVE_EVENT log record.

SCA50 The *Application::releaseObject* operation shall, upon unsuccessful application release, write a FAILURE_ALARM log record.

SCA51 The *Application::releaseObject* operation shall send a DomainManagementObjectRemovedEventType event to the Outgoing Domain Management event channel upon successful release of an application. For this event,

1. The *producerId* is the identifier attribute of the releasing application manager.
2. The *sourceId* is the identifier attribute of the released application.
3. The *sourceName* is the name attribute of the released application.
4. The *sourceCategory* is "APPLICATION".

The following steps demonstrate one scenario of the application's behavior for the release of an application that contains *ComponentFactory* behavior:

1. Client invokes *Application::releaseObject* operation.
2. Disconnect ports.
3. Release the application components.
4. Terminate the application components' and component factories processes.
5. Unload the components' executable images.
6. Deallocate capacities based upon the Device Profile and SAD.
7. Unregister application components from the component registry.
8. Generate an event to indicate the application has been removed from the domain.

Figure 3-21 is a sequence diagram depicting the behavior as described above.

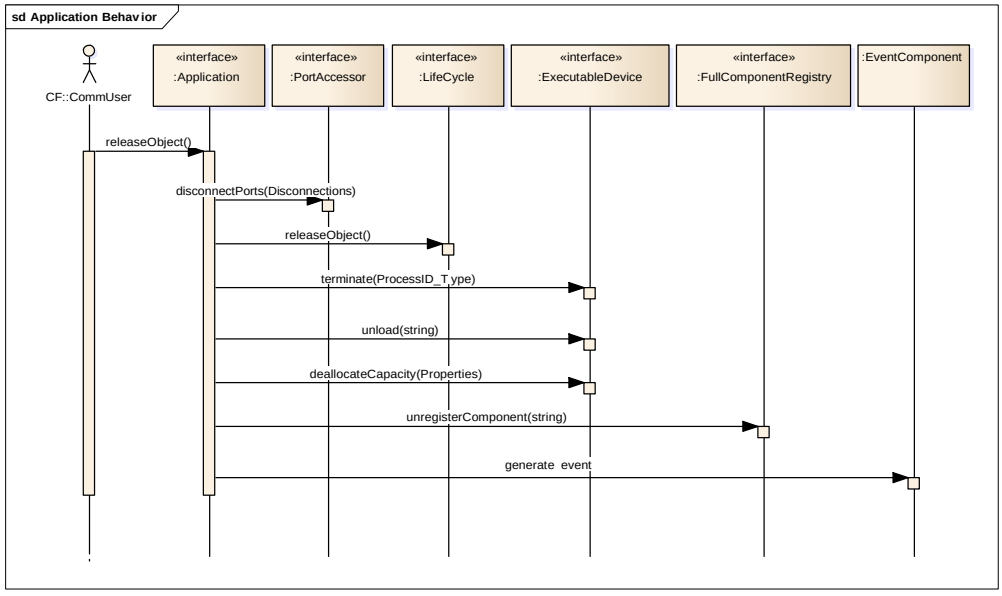

Figure 3-21: *Application* Behavior

3.1.3.3.1.1.5.1.4 Returns

This operation does not return a value.

3.1.3.3.1.1.5.1.5 Exceptions/Errors

The *Application::releaseObject* operation raises a *ReleaseError* exception when internal processing errors prevent the successful release of any application component. See section 3.1.3.2.1.3.5.2.5 for exception handling.

3.1.3.3.1.1.5.2 getProvidesPorts

3.1.3.3.1.1.5.2.1 Brief Rationale

The *getProvidesPorts* operation is used to retrieve the application external provides ports as defined in the associated SAD (profile attribute). This operation overrides the definition in *PortAccessor::getProvidesPorts* section 3.1.3.2.1.2.5.3.

3.1.3.3.1.1.5.2.2 Synopsis

```
void getProvidesPorts (inout Connections portConnections) raises
(InvalidPort);
```

3.1.3.3.1.1.5.2.3 Behavior

The *getProvidesPorts* operation returns the external provides port object references for the external provides ports as stated in the associated SAD (profile attribute).

3.1.3.3.1.1.5.2.4 Returns

SCA53 The *getProvidesPorts* operation shall return the object references that are associated with the input provides port names for the application external ports as identified in the associated SAD (profile attribute).

3.1.3.3.1.1.5.2.5 Exceptions/Errors

Exception requirement(s) are described in the *PortAccessor* interface section 3.1.3.2.1.2.5.3.5.

3.1.3.3.1.1.5.3 connectUsesPorts

3.1.3.3.1.1.5.3.1 Brief Rationale

The *connectUsesPorts* operation is used to connect to the application external uses ports as defined in the associated SAD (profile attribute). This operation overrides the definition in *PortAccessor::connectUsesPorts* section 3.1.3.2.1.2.5.1.

3.1.3.3.1.1.5.3.2 Synopsis

```
void connectUsesPorts (in Connections portConnections) raises
(InvalidPort);
```

3.1.3.3.1.1.5.3.3 Behavior

SCA55 The *connectUsesPorts* operation shall make a connection to the application components by input portConnections parameter, which identifies the application external uses ports to be connected to. Application external ports are associated with the application components. SCA523 The *connectUsesPorts* operation shall disconnect any connections it formed if any connections in the input portConnections parameter cannot be successfully established.

3.1.3.3.1.1.5.3.4 Returns

This operation does not return a value.

3.1.3.3.1.1.5.3.5 Exceptions/Errors

Exception requirement(s) are described in the *PortAccessor* interface section 3.1.3.2.1.2.5.1.5.

3.1.3.3.1.1.5.4 disconnectPorts

3.1.3.3.1.1.5.4.1 Brief Rationale

The *disconnectPorts* operation is used to disconnect the application external ports as defined in the associated SAD (profile attribute). This operation overrides the definition in *PortAccessor::disconnectPorts* section 3.1.3.2.1.2.5.2.

3.1.3.3.1.1.5.4.2 Synopsis

```
void disconnectPorts (in Disconnections portDisconnections)
raises (InvalidPort);
```

3.1.3.3.1.1.5.4.3 Behavior

SCA58 The *disconnectPorts* operation shall break the connection(s) to the application external ports as identified by the connectionIds referenced in the input portDisconnections parameter.

SCA59 The *disconnectPorts* operation shall release all external ports if the input portDisconnections parameter is a zero length sequence.

3.1.3.3.1.1.5.4.4 Returns

This operation does not return a value.

3.1.3.3.1.1.5.4.5 Exceptions/Errors

Exception requirement(s) are described in the *PortAccessor* interface section 3.1.3.2.1.2.5.2.5.

3.1.3.3.1.2 ApplicationDeploymentData

3.1.3.3.1.2.1 Description

The *ApplicationDeploymentData* interface provides deployment attributes for an application.

3.1.3.3.1.2.2 UML

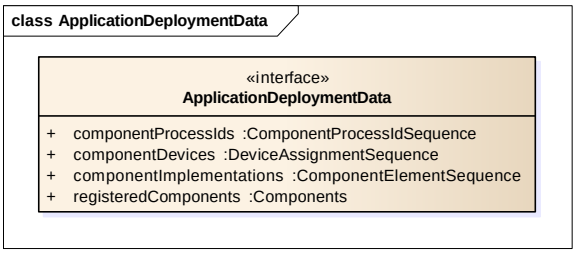

Figure 3-22: *ApplicationDeploymentData* Interface UML

3.1.3.3.1.2.3 Types

3.1.3.3.1.2.3.1 ComponentProcessIdType

The ComponentProcessIdType defines a type for associating a component with its process ID.

```
struct ComponentProcessIdType
{
     string componentId;
     unsigned long processId;
};
```

3.1.3.3.1.2.3.2 ComponentProcessIdSequence

The ComponentProcessIdSequence type defines an unbounded sequence of components' process IDs.

```
typedef sequence  <ComponentProcessIdType>
ComponentProcessIdSequence;
```

3.1.3.3.1.2.3.3 ComponentElementType

The ComponentElementType defines a type for associating a component with an element (e.g., implementation ID).

```
struct ComponentElementType
{
     string componentId;
     string elementId;
};
```

3.1.3.3.1.2.3.4 ComponentElementSequence

The ComponentElementSequence defines an unbounded sequence of ComponentElementType.

```
typedef sequence  <ComponentElementType>
ComponentElementSequence;
```

3.1.3.3.1.2.4 Attributes

3.1.3.3.1.2.4.1 componentProcessIds

SCA61 The componentProcessIds attribute shall return the list of components' process IDs within the application for components that are executing on a device.

```
readonly attribute ComponentProcessIdSequence
componentProcessIds;
```

3.1.3.3.1.2.4.2 componentDevices

SCA62 The componentDevices attribute shall return a list of associations between a component and the ComponentBaseDevices, which it uses, is loaded on or is executed on.

```
readonly attribute DeviceAssignmentSequence componentDevices;
```

3.1.3.3.1.2.4.3 componentImplementations

SCA63 The componentImplementations attribute shall return the list of associations between the components created for an application and their corresponding SPD implementation IDs.

```
readonly attribute ComponentElementSequence
componentImplementations;
```

3.1.3.3.1.2.4.4 registeredComponents

SCA64 The registeredComponents attribute shall return the list of ApplicationComponents that have registered during instantiation or a sequence length of zero if no ApplicationComponents have registered.

```
readonly attribute Components registeredComponents;
```

3.1.3.3.1.2.5 Operations

N/A.

3.1.3.3.1.3 ApplicationFactory

3.1.3.3.1.3.1 Description

The *ApplicationFactory* interface class provides an interface to request the creation of a specific application in the domain.

The *ApplicationFactory* interface class is designed using the Factory Design Pattern [8].

3.1.3.3.1.3.2 UML

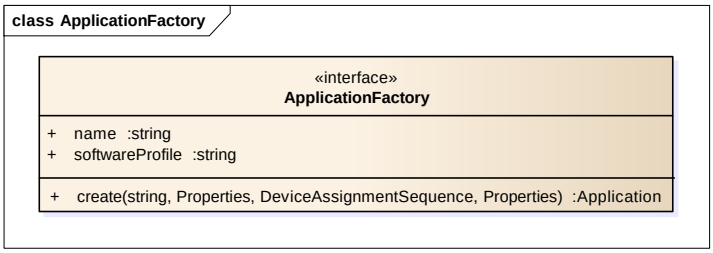

Figure 3-23: *ApplicationFactory* Interface UML

3.1.3.3.1.3.3 Types

3.1.3.3.1.3.3.1 CreateApplicationRequestError Exception

The CreateApplicationRequestError exception is raised when the parameter CF DeviceAssignmentSequence contains one or more invalid application component-to-device assignment(s).

```
exception CreateApplicationRequestError {
DeviceAssignmentSequence invalidAssignment; };
```

3.1.3.3.1.3.3.2 CreateApplicationError Exception

The CreateApplicationError exception is raised when a *create* request is valid but the application is unsuccessfully instantiated. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception CreateApplicationError { ErrorNumberType errorNumber;
string msg; };
```

3.1.3.3.1.3.3.3 Exception InvalidInitConfiguration

The InvalidInitConfiguration exception is raised when the input initConfiguration parameter is invalid.

```
exception InvalidInitConfiguration { Properties
invalidProperties; };
```

3.1.3.3.1.3.4 Attributes

3.1.3.3.1.3.4.1 name

SCA65 The readonly name attribute shall return the name of the application instantiated by an application factory. The name attribute is identical to the *softwareassembly* element name attribute of the application's SAD file.

```
readonly attribute string name;
```

3.1.3.3.1.3.4.2 softwareProfile

SCA67 The readonly softwareProfile attribute shall return the filename of the SAD or the SAD itself that is used to create the ApplicationFactoryComponent. The filename is an absolute pathname relative to a mounted FileSystemComponent and the file is obtained via the DomainManagerComponent's FileManagerComponent. Files referenced within the profile are obtained via a FileManagerComponent.

```
readonly attribute string softwareProfile;
```

3.1.3.3.1.3.5 Operations

3.1.3.3.1.3.5.1 create

3.1.3.3.1.3.5.1.1 Brief Rationale

The *create* operation is used to create an application within the system domain.

The *create* operation provides a client interface to request the creation of an application on client requested device(s) and/or the creation of an application in which the application factory determines the necessary device(s) required for instantiation of the application.

3.1.3.3.1.3.5.1.2 Synopsis

```
Application create (in string name, in Properties
initConfiguration, in DeviceAssignmentSequence
deviceAssignments, in Properties deploymentDependencies) raises
(CreateApplicationError, CreateApplicationRequestError,
InvalidInitConfiguration);
```

3.1.3.3.1.3.5.1.3 Behavior

The *create* operation locates candidate DomainManagerComponents, ApplicationFactoryComponents or ComponentBaseDevices capable of deploying application software modules based upon information in its associated SAD (softwareProfile attribute).

The *create* operation validates all component-device associations in the input deviceAssignments parameter by verifying that the ComponentBaseDevice indicated by the assignedDeviceId element provides the necessary capacities and properties required by the component indicated by the componentId element.

SCA68 The *create* operation shall identify valid component-device associations for the application by matching the allocation properties of the application to those of each candidate ComponentBaseDevice, for those ApplicationResourceComponent properties whose *kindtype* is *allocation* and whose *action* element is not *external*.

SCA69 The *create* operation shall use the allocation property values contained in the input deploymentDependencies parameter over the application *deploymentdependencies* elements or components *dependency* allocation properties of application factory profile when they reference the same property.

SCA70 The *create* operation shall pass the input deploymentDependencies parameter for nested *assemblyinstantiation* elements creation.

The *create* operation may also use the input deploymentDependencies parameter for other deployment decisions.

The *create* operation ignores input deploymentDependencies parameter properties that are unknown.

SCA71 The *create* operation shall allocate capacities to candidate ComponentBaseDevices of the ApplicationComponent properties whose *kindtype* is *allocation* and whose *action* element is *external.*

SCA72 The *create* operation shall deallocate any capacity allocations on ComponentBaseDevices that do not satisfy the ApplicationComponent's allocation requirements or that are not utilized due to an unsuccessful application creation.

SCA73 The *create* operation shall load application modules onto ComponentBaseDevices that have been granted successful capacity allocations and that satisfy the ApplicationComponent's allocation requirements.

SCA74 The create operation shall execute the application software modules as specified in the AssemblyComponent's SAD file. SCA75 The create operation shall use each ApplicationComponent's SPD implementation code's stack size and priority elements, when specified, for the execute options parameters.

SCA76 When the *create* operation creates an ApplicationComponent via an ExecutableDeviceComponent, it shall include a Component Identifier, as defined in this section, in the parameters parameter of the *ExecutableDevice::execute* operation. SCA542 When the create operation creates an ApplicationComponent via an ExecutableDeviceComponent, it shall include a ComponentRegistry IOR, as defined in this section, in the parameters parameter of the *ExecutableDevice::execute* operation when the SAD *componentinstantiation stringifiedobjectref* element is null value. SCA77 When the *create* operation creates an ApplicationComponent via an ApplicationComponentFactoryComponent, it shall provide the Component Identifier parameter as defined in this section.

The Component Identifier is a CF *Properties* type with an id element set to "COMPONENT_IDENTIFIER" and a value element set to a string in the format of "Component_Instantiation_Identifier:Application_Name". The Component_Instantiation_Identifier is the *componentinstantiation* element *id* attribute for the component in the application's SAD file. The Application_Name field is identical to the *create* operation's input name parameter. The Application_Name field provides a specific instance qualifier for executed components. The ComponentRegistry IOR is a CF *Properties* type with an id element set to "COMPONENT_REGISTRY_IOR" and a value of the element set to a stringified ComponentRegistry IOR that the ApplicationComponent should use for registration.

SCA81 When an ApplicationComponent is created via an ExecutableDeviceComponent, the *create* operation shall pass the values of the execparam properties of the *componentinstantiation componentproperties* element contained in the SAD, as parameters to the *execute* operation. The *create* operation passes execparam parameters values as string values.

The *create* operation may obtain a component in accordance with the SAD via an ApplicationComponentFactoryComponent. SCA83 The *create* operation, when creating a ApplicationResourceComponent from an ApplicationComponentFactoryComponent, shall pass the *componentinstantiation componentfactoryref* element properties whose *kindtype* element is factoryparam as the qualifiers parameter to the referenced ApplicationComponentFactoryComponent's *createComponent* operation. SCA524 The *create* operation shall add the ApplicationResourceComponent(s) launched by an ApplicationComponentFactoryComponent to the registeredComponents attribute of the ApplicationFactoryComponent.

SCA84 The *create* operation shall, in order, initialize all ApplicationComponents, then establish connections for those components, and finally configure ApplicationResourceComponent (s) as identified in the *assemblycontroller* element in the SAD. The *create* operation connects the ports of the application components with the ports of other components within the application as well as the devices and services they use in accordance with the SAD.

SCA85 The *create* operation shall establish connections for an AssemblyComponent which are specified in the SAD *connections* element. SCA86 The *create* operation shall use the SAD *connectinterface* element *id* attribute appended with ":Application_Name" as the unique identifier for a specific connection when provided. SCA87 The *create* operation shall create a unique identifier appended with ":Application_Name" and use it to designate a connection when no SAD *connectinterface* element *id* attribute is specified. SCA88 For connections to an event channel, the *create* operation shall connect a *CosEventComm::PushConsumer* or *CosEventComm::PushSupplier* object to the event channel as specified in the SAD's *domainfinder* element. SCA89 The *create* operation shall create the specified event channel if the event channel does not exist.

SCA90 The *create* operation shall configure the ApplicationResourceComponent(s) indicated by the *assemblycontroller* element in the SAD that have properties with a *kindtype* of "configure" and a *mode* of "readwrite" or "writeonly" along with the union of properties contained in the input initConfiguration parameter of the create operation.

SCA91 The *create* operation shall use the property values contained in the input initConfiguration parameter over the property values of the SAD's *assemblycontroller* element when they reference the same property.

SCA92 The *create* operation shall recognize application deployment channel preferences contained within an ADD file.

SCA93 The *create* operation shall recognize a deploymentDependencies property which is a CF *Properties* type with an id of "DEPLOYMENT_CHANNEL" and a value that is a string sequence.

SCA94 The *create* operation shall recognize channel preferences contained within a "DEPLOYMENT_CHANNEL" deploymentDependency property contained within the deploymentDependencies parameter.

SCA95 The *create* operation shall attempt to allocate an application to the PDD file channel alternatives provided within a "DEPLOYMENT_CHANNEL" property or an ADD file in a sequential manner.

SCA96 The *create* operation shall utilize channel preferences expressed within a "DEPLOYMENT_CHANNEL" property rather than those contained within an ADD file if both exist.

SCA97 The *create* operation shall recognize a deployment option with a deployedname attribute value of "DEFAULT" which matches all application instance names that are not explicitly identified by a deployedname attribute value within the same descriptor file.

For connections to a ServiceComponent using the servicename type of the *domainfinder* element, the *create* operation will search for a matching name from the set of service name identifiers that have been registered with the domain. For connections to a ServiceComponent using the servicetype type of the *domainfinder* element, the *create* operation will search for a matching type from the set of service types that have been registered with the domain. The

search strategy used to select a specific instance of a service type when multiple instances of the same service type have been registered with the domain is implementation dependent.

SCA98 For *domainfinder* element "servicetype" connections to a ServiceComponent whose service type is provided by a service contained within a *channel* element servicelist, the *create* operation shall only attempt to establish connections to services within the list. If multiple instances of the same service type exist within the servicelist, then an implementation dependent search strategy is used to select a specific instance.

The *TestableObject*::*runTest* operation (3.1.3.2.1.4.5.1), *ControllableComponent*::*stop* operation (3.1.3.2.1.6.5.2), and *ControllableComponent*::*start* operation (3.1.3.2.1.6.5.1) are not called as part of the application creation process.

SCA_TBD The *create* operation shall create a SCA V2.2.2 Application [3]. A SCA V2.2.2 being created adheres to the requirements in SCA V2.2.2.

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SCA99 The *create* operation shall, upon successful application creation, write an ADMINISTRATIVE_EVENT log record.

SCA100 The *create* operation shall, upon unsuccessful application creation, write a FAILURE_ALARM log record.

SCA101 The *create* operation shall send a DomainManagementObjectAddedEventType event to the Outgoing Domain Management event channel upon successful creation of an application. For this event:

1. The *producerId* is the identifier attribute of the application factory.
2. The *sourceId* is the identifier attribute of the created application.
3. The *sourceName* is the name attribute of the created application.
4. The *sourceIOR* is the object reference for the created application.
5. The *sourceCategory* is "APPLICATION".

3.1.3.3.1.3.5.1.4 Returns

SCA102 The *create* operation shall return an ApplicationManagerComponent for the created application when the application is successfully created.

3.1.3.3.1.3.5.1.5 Exceptions/Errors

SCA103 The *create* operation shall raise the CreateApplicationRequestError exception when the input deviceAssignments parameter contains one or more invalid application component to device assignment(s).

SCA104 The *create* operation shall raise the CreateApplicationError exception when the *create* request is valid but the application cannot be successfully instantiated due to internal processing error(s).

SCA105 The *create* operation shall raise the CreateApplicationError exception when the CF implementation provides enhanced deployment support via the use of a PDD file if the CF is not able to allocate the application to any of the provided channel alternatives .

SCA106 The *create* operation shall raise the CreateApplicationError exception when the CF implementation provides enhanced deployment support via the use of a PDD file and a *domainfinder* element "servicetype" connection to a ServiceComponent whose service type is provided by a service contained within a *channel* element servicelist cannot be established to a service identified within that list.

SCA107 The *create* operation shall raise the InvalidInitConfiguration exception when the input

initConfiguration parameter contains properties that are unknown by a SAD's assemblycontroller

element. SCA108 The InvalidInitConfiguration invalidProperties parameter shall identify the invalid properties.

3.1.3.3.1.4 DomainManager

3.1.3.3.1.4.1 Description

The *DomainManager* interface operations are used to configure the domain and manage the domain's devices, services, and applications.

3.1.3.3.1.4.2 UML

The DomainManager interface UML is depicted in Figure 3-24.

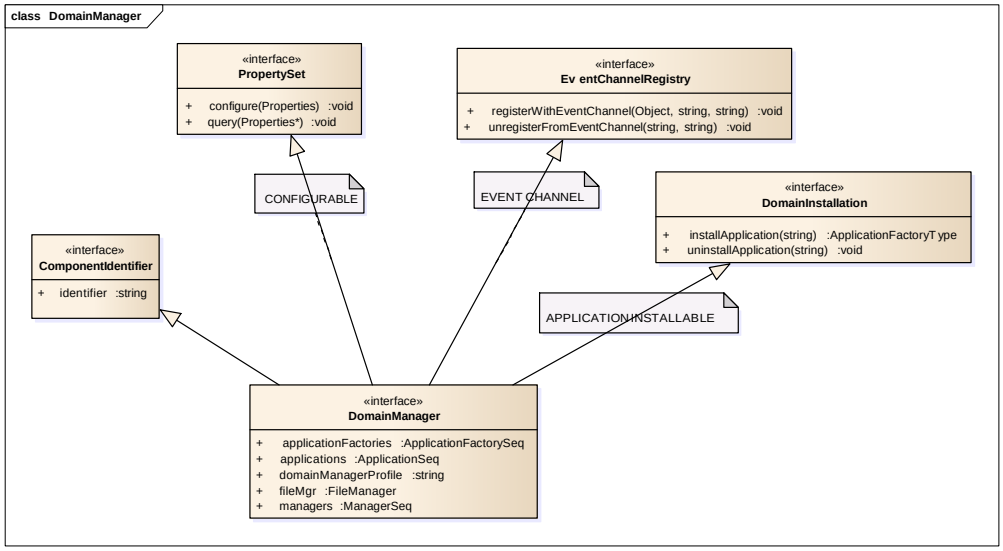

Figure 3-24: *DomainManager* Interface UML

3.1.3.3.1.4.3 Types

3.1.3.3.1.4.3.1 ManagerSeq

This type defines an unbounded sequence of ManagerType structures.

```
typedef sequence <ManagerType> ManagerSeq
```

3.1.3.3.1.4.3.2 ApplicationSeq

This type defines an unbounded sequence of deployed applications.

```
typedef sequence < ApplicationType> ApplicationSeq
```

3.1.3.3.1.4.3.3 ApplicationFactorySeq

This type defines an unbounded sequence of installed application factories.

```
typedef sequence < ApplicationFactoryType> ApplicationFactorySeq
```

3.1.3.3.1.4.4 Attributes

3.1.3.3.1.4.4.1 managers

The managers attribute is read-only, containing a sequence of registered DeviceManagerComponents in the domain. SCA109 The readonly managers attribute shall return a list of DeviceManagerComponents that have registered with the DomainManagerComponent.

```
readonly attribute ManagerSeq managers;
```

3.1.3.3.1.4.4.2 applications

The applications attribute is read-only containing a sequence of ApplicationManagerComponents in the domain. SCA110 The readonly applications attribute shall return the list of ApplicationManagerComponents that have been instantiated.

```
readonly attribute ApplicationSeq applications;
```

3.1.3.3.1.4.4.3 applicationFactories

SCA435 The readonly applicationFactories attribute shall return a list with one ApplicationFactoryComponent per AssemblyComponent (SAD file and associated files) successfully installed (i.e. no exception raised).

```
readonly attribute ApplicationFactorySeq applicationFactories;
```

3.1.3.3.1.4.4.4 fileMgr

SCA111 The readonly fileMgr attribute shall return the DomainManagerComponent's FileManagerComponent.

```
readonly attribute FileManager fileMgr;
```

3.1.3.3.1.4.4.5 domainManagerProfile

SCA112 The readonly domainManagerProfile attribute shall return the filename of the DomainManagerComponent's DMD or the DMD itself. The filename is an absolute pathname relative to a mounted FileSystemComponent and the file is obtained via the DomainManagerComponent's FileManagerComponent. Files referenced within the profile are obtained via the DomainManagerComponent's FileManagerComponent.

```
readonly attribute string domainManagerProfile;
```

3.1.3.3.1.4.5 Operations

N/A

3.1.3.3.1.5 DomainInstallation

3.1.3.3.1.5.1 Description

The *DomainInstallation* interface is used for the control of application installation within the system domain.

3.1.3.3.1.5.2 UML

The *DomainInstallation* interface UML is depicted in Figure 3-25.

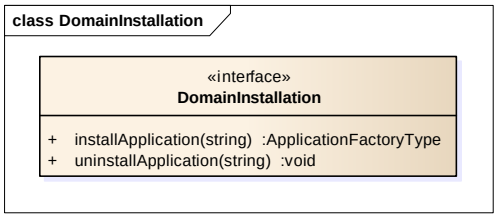

Figure 3-25: *DomainInstallation* Interface UML

3.1.3.3.1.5.3 Types

3.1.3.3.1.5.3.1 ApplicationInstallationError

The ApplicationInstallationError exception type is raised when an application installation has not completed correctly. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception ApplicationInstallationError { ErrorNumberType
errorNumber; string msg; };
```

3.1.3.3.1.5.3.2 InvalidIdentifier

The InvalidIdentifier exception indicates an application identifier is invalid.

```
exception InvalidIdentifier{};
```

3.1.3.3.1.5.3.3 ApplicationUninstallationError

The ApplicationUninstallationError exception type is raised when the uninstallation of an application has not completed correctly. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception ApplicationUninstallationError { ErrorNumberType
errorNumber; string msg; };
```

3.1.3.3.1.5.3.4 ApplicationAlreadyInstalled

The ApplicationAlreadyInstalled exception indicates that the application being installed is already installed.

```
exception ApplicationAlreadyInstalled{};
```

3.1.3.3.1.5.4 Attributes.

N/A

3.1.3.3.1.5.5 Operations

3.1.3.3.1.5.5.1 installApplication

3.1.3.3.1.5.5.1.1 Brief Rationale

The *installApplication* operation is used to install new application software in the domain.

3.1.3.3.1.5.5.1.2 Synopsis

```
ApplicationFactoryType installApplication (in string
profileFileName) raises (InvalidProfile, InvalidFileName,
ApplicationInstallationError, ApplicationAlreadyInstalled);
```

3.1.3.3.1.5.5.1.3 Behavior

The input profileFileName parameter is the absolute pathname of the AssemblyComponent SAD.

SCA113 The *installApplication* operation shall verify the existence of the AssemblyComponent's SAD file and all files upon which the SAD depends, within the DomainManagerComponent's file manager.

SCA TBD The *installApplication* operation shall install a SCA V2.2.2 application [3]. A SCA V2.2.2 application being installed adheres to the requirements in SCA V2.2.2.

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SCA114 The *installApplication* operation shall write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log, upon successful application installation.

SCA115 The *installApplication* operation shall, upon unsuccessful application installation, write a FAILURE_ALARM log record to a DomainManagerComponent's log.

SCA116 The *installApplication* operation shall send a DomainManagementObjectAddedEventType event to the Outgoing Domain Management event channel, upon successful installation of an application. For this event,

1. The *producerId* is the *identifier* attribute of the domain manager.
2. The *sourceId* is the name field of the installed application factory.
3. The *sourceName* is the name field of the installed application factory.
4. The *sourceIOR* is the object reference for the installed application factory.
5. The *sourceCategory* is "APPLICATION_FACTORY".

3.1.3.3.1.5.5.1.4 Returns

This operation returns the ApplicationFactoryType which includes the name that is required for *uninstallApplication* (this is the *softwareassembly* element *name* attribute of the ApplicationFactory's SAD file).

3.1.3.3.1.5.5.1.5 Exceptions/Errors

SCA117 The *installApplication* operation shall raise the ApplicationInstallationError exception when the installation of the application file(s) was not successfully completed.

SCA118 The *installApplication* operation shall raise the CF InvalidFileName exception when the input SAD file or any of the SAD's referenced filenames do not exist in the file system identified by the absolute path of the input profileFileName parameter. SCA119 The *installApplication* operation shall log a FAILURE_ALARM log record to a DomainManagerComponent's Log with a message consisting of "installApplication::invalid file is xxx", where "xxx" is the input or referenced filename, when the CF InvalidFileName exception occurs.

SCA120 The *installApplication* operation shall raise the CF InvalidProfile exception when any referenced property definition is missing.

SCA121 The *installApplication* operation shall write a FAILURE_ALARM log record to a DomainManagerComponent's log when the CF InvalidProfile exception is raised. The value of the logData attribute of this record is "installApplication::invalid Profile is yyy", where "yyy" is the input or referenced file name.

SCA122 The *installApplication* operation shall raise the ApplicationAlreadyInstalled exception when the *softwareassembly* element *name* attribute of the referenced application is the same as a previously registered application.

SCA TBD The *installApplication* operation shall raise the ApplicationInstallationError exception when SCA 2.2.2 application installation is not supported.

3.1.3.3.1.5.5.2 uninstallApplication

3.1.3.3.1.5.5.2.1 Brief Rationale

The *uninstallApplication* operation is used to uninstall an application factory from the domain.

3.1.3.3.1.5.5.2.2 Synopsis

```
void uninstallApplication (in string identifier)raises
(InvalidIdentifier, ApplicationUninstallationError);
```

3.1.3.3.1.5.5.2.3 Behavior

The identifier parameter is the *softwareassembly* element *name* attribute of the AssemblyComponent's SAD file.

SCA436 The *uninstallApplication* operation shall make the ApplicationFactoryComponent unavailable from the DomainManagerComponent (i.e. its services no longer provided for the application).

SCA_TBD The *uninstallApplication* operation shall uninstall SCA V2.2.2 application [3]. A SCA V2.2.2 application being uninstalled adheres to the requirements in SCA V2.2.2.

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SCA123 The *uninstallApplication* operation shall, upon successful uninstall of an application, write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log.

SCA124 The *uninstallApplication* operation shall, upon unsuccessful uninstall of an application, write a FAILURE_ALARM log record to a DomainManagerComponent's log.

SCA125 The *uninstallApplication* operation shall send a DomainManagementObjectRemovedEventType event to the Outgoing Domain Management event channel, upon the successful uninstallation of an application. For this event,

1. The *producerId* is the identifier attribute of the domain manager.
2. The *sourceId* is the name field of the uninstalled application factory.
3. The *sourceName* is the name field of the uninstalled application factory.
4. The *sourceCategory* is "APPLICATION_FACTORY".

3.1.3.3.1.5.5.2.4 Returns

This operation does not return a value.

3.1.3.3.1.5.5.2.5 Exceptions/Errors

SCA126 The *uninstallApplication* operation shall raise the InvalidIdentifier exception when the ApplicationId is invalid.

SCA127 The *uninstallApplication* operation shall raise the ApplicationUninstallationError exception when an internal error causes an unsuccessful uninstallation of the application.

3.1.3.3.1.6 DeviceManager

3.1.3.3.1.6.1 Description

The *DeviceManager* interface is used to manage a set of logical devices and services.

3.1.3.3.1.6.2 UML

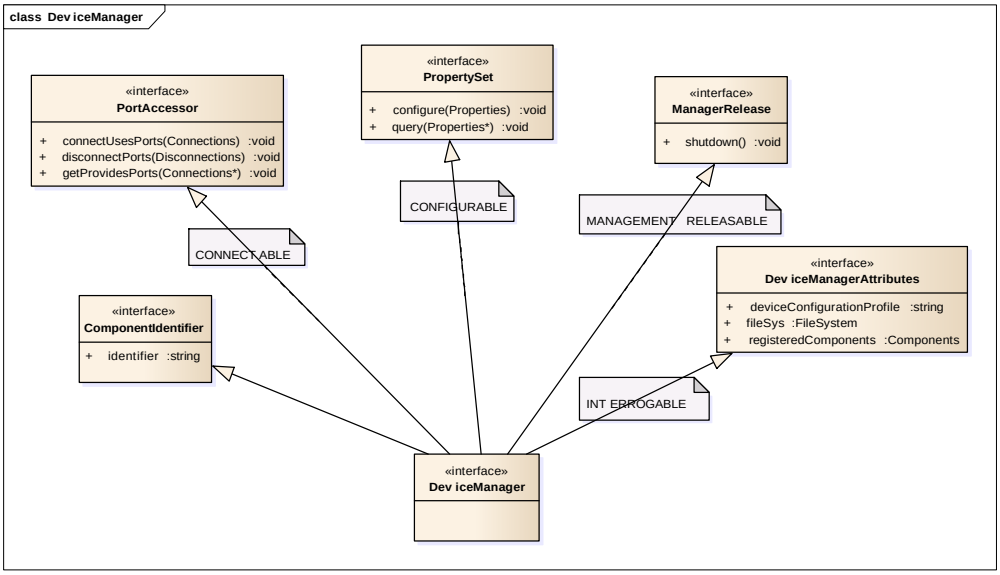

Figure 3-26: *DeviceManager* Interface UML

3.1.3.3.1.6.3 Types

N/A.

3.1.3.3.1.6.4 Attributes

N/A.

3.1.3.3.1.6.5 Operations

N/A.

3.1.3.3.1.7 DeviceManagerAttributes

3.1.3.3.1.7.1 Description

The *DeviceManagerAttributes* interface provides attributes for a device manager. The interface for a device manager is based upon its attributes, which are:

1. Device Configuration Profile - a mapping of physical device locations to meaningful labels (e.g., audio1, serial1, etc.), along with the devices and services to be deployed.
2. File System - the file system associated with this device manager.
3. Registered Components - a list of devices or services that have registered with this device manager.

3.1.3.3.1.7.2 UML

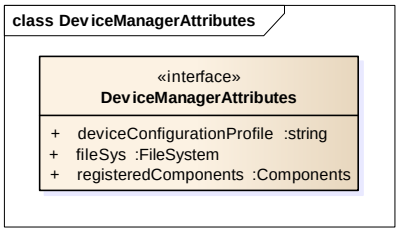

Figure 3-27: *DeviceManagerAttributes* Interface UML

3.1.3.3.1.7.3 Types

N/A.

3.1.3.3.1.7.4 Attributes

3.1.3.3.1.7.4.1 fileSys

SCA128 The readonly fileSys attribute shall return the FileSystemComponent associated with this DeviceManagerComponent.

```
readonly attribute FileSystem fileSys;
```

3.1.3.3.1.7.4.2 deviceConfigurationProfile

SCA129 The readonly deviceConfigurationProfile attribute shall return either the DeviceManagerComponent's DCD filename or the DCD itself. The filename is an absolute pathname relative to a mounted FileSystemComponent and the file is obtained via a DeviceManagerComponent's FileSystemComponent.

```
readonly attribute string deviceConfigurationProfile;
```

3.1.3.3.1.7.4.3 registeredComponents

SCA130 The readonly registeredComponents attribute shall return a list of PlatformComponents that have registered or a sequence length of zero if no components have registered.

```
readonly attribute Components registeredComponents;
```

3.1.3.3.1.7.5 Operations

N/A.

3.1.3.3.1.8 ComponentRegistry

3.1.3.3.1.8.1 Description

The *ComponentRegistry* interface is used to manage the registration of components.

3.1.3.3.1.8.2 UML

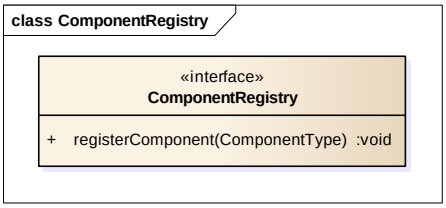

Figure 3-28: *ComponentRegistry* Interface UML

3.1.3.3.1.8.3 Types

N/A

3.1.3.3.1.8.4 Attributes

N/A

3.1.3.3.1.8.5 Operations

3.1.3.3.1.8.5.1 registerComponent

3.1.3.3.1.8.5.1.1 Brief Rationale

This *registerComponent* operation registers a component and its provides ports.

3.1.3.3.1.8.5.1.2 Synopsis

```
void registerComponent (in ComponentType registeringComponent)
raises (InvalidObjectReference, RegisterError);
```

3.1.3.3.1.8.5.1.3 Behavior

The *registerComponent* operation verifies that the input registeringComponent parameter contains a valid component reference.

SCA131 The *registerComponent* operation shall register the component indicated by the input registeringComponent parameter, if it does not already exist.

The *registerComponent* operation ignores already existing registrations.

3.1.3.3.1.8.5.1.4 Returns

This operation does not return any value.

3.1.3.3.1.8.5.1.5 Exceptions/Errors

SCA132 The *registerComponent* operation shall raise the CF InvalidObjectReference when the input registeringComponent contains a nil componentObject object reference.

SCA133 The *registerComponent* operation shall raise the RegisterError exception when registration is unsuccessful.

3.1.3.3.1.9 FullComponentRegistry

3.1.3.3.1.9.1 Description

The *FullComponentRegistry* interface extends the *ComponentRegistry* interface with unregistration capability.

3.1.3.3.1.9.2 UML

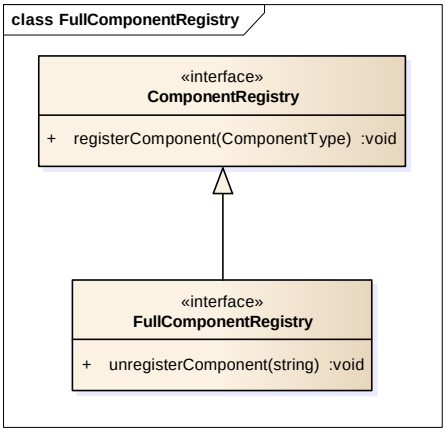

Figure 3-29: *FullComponentRegistry* Interface UML

3.1.3.3.1.9.3 Types

N/A

3.1.3.3.1.9.4 Attributes

N/A

3.1.3.3.1.9.5 Operations

3.1.3.3.1.9.5.1 unregisterComponent

3.1.3.3.1.9.5.1.1 Brief Rationale

The *unregisterComponent* operation unregisters the component as identified by the input identifier parameter.

3.1.3.3.1.9.5.1.2 Synopsis

```
void unregisterComponent (in string identifier) raises
(UnregisterError);
```

3.1.3.3.1.9.5.1.3 Behavior

SCA134 The *unregisterComponent* operation shall unregister a registered component entry specified by the input identifier parameter.

3.1.3.3.1.9.5.1.4 Returns

This operation does not return any value.

3.1.3.3.1.9.5.1.5 Exceptions/Errors

SCA135 The *unregisterComponent* operation shall raise the UnregisterError exception when unregistration is unsuccessful.

3.1.3.3.1.10 EventChannelRegistry

3.1.3.3.1.10.1 Description

The *EventChannelRegistry* interface is used to manage the registration processes with the event channel.

3.1.3.3.1.10.2 UML

The *EventChannelRegistry* interface UML is depicted in Figure 3-30.

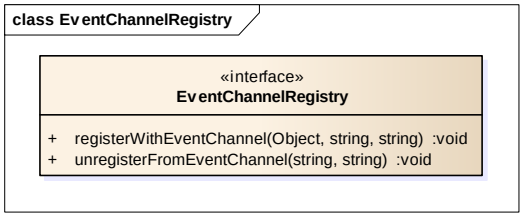

Figure 3-30: *EventChannelRegistry* Interface UML

3.1.3.3.1.10.3 Types

3.1.3.3.1.10.3.1 InvalidEventChannelName

The InvalidEventChannelName exception indicates an event channel name that is unknown.

```
exception InvalidEventChannelName{};
```

3.1.3.3.1.10.3.2 AlreadyConnected

The AlreadyConnected exception indicates that a registering consumer is already connected to the specified event channel.

```
exception AlreadyConnected{};
```

3.1.3.3.1.10.3.3 NotConnected

The NotConnected exception indicates that the unregistering consumer was not connected to the specified event channel.

```
exception NotConnected{};
```

3.1.3.3.1.10.4 Attributes.

N/A.

3.1.3.3.1.10.5 Operations

3.1.3.3.1.10.5.1 registerWithEventChannel

3.1.3.3.1.10.5.1.1 Brief Rationale

The *registerWithEventChannel* operation is used to connect a consumer to a domain's event channel.

3.1.3.3.1.10.5.1.2 Synopsis

```
void registerWithEventChannel (in Object registeringObject, in
string registeringId, in string eventChannelName) raises
(InvalidObjectReference, InvalidEventChannelName,
AlreadyConnected);
```

3.1.3.3.1.10.5.1.3 Behavior

SCA136 The *registerWithEventChannel* operation shall connect, with a connection named by the input registeringId parameter, the object contained within the input registeringObject parameter to an event channel specified by the input eventChannelName parameter.

3.1.3.3.1.10.5.1.4 Returns

This operation does not return a value.

3.1.3.3.1.10.5.1.5 Exceptions/Errors

SCA137 The *registerWithEventChannel* operation shall raise the CF InvalidObjectReference exception when the input registeringObject parameter contains an invalid reference to a *CosEventComm::PushConsumer* interface.

SCA138 The *registerWithEventChannel* operation shall raise the InvalidEventChannelName exception when the input eventChannelName parameter contains an invalid event channel name.

SCA139 The *registerWithEventChannel* operation shall raise AlreadyConnected exception when the object contained within the input registeringObject parameter already contains a connection identified by the input registeringId parameter.

3.1.3.3.1.10.5.2 unregisterFromEventChannel

3.1.3.3.1.10.5.2.1 Brief Rationale

The *unregisterFromEventChannel* operation is used to disconnect a consumer from a domain's event channel.

3.1.3.3.1.10.5.2.2 Synopsis

```
void unregisterFromEventChannel (in string unregisteringId, in
string eventChannelName) raises (InvalidEventChannelName,
NotConnected);
```

3.1.3.3.1.10.5.2.3 Behavior

SCA140 The *unregisterFromEventChannel* operation shall disconnect a registered component from the event channel as identified by the input parameters.

3.1.3.3.1.10.5.2.4 Returns

This operation does not return a value.

3.1.3.3.1.10.5.2.5 Exceptions/Errors

SCA141 The *unregisterFromEventChannel* operation shall raise the InvalidEventChannelName exception when the input eventChannelName parameter can't be located as a named event channel within the domain.

SCA142 The *unregisterFromEventChannel* operation shall raise the NotConnected exception when the input unregisteringId parameter is not associated with the input eventChannelName parameter.

3.1.3.3.1.11 ManagerRegistry

3.1.3.3.1.11.1 Description

The *ManagerRegistry* interface is used to manage the registration of managers.

The registration operation is used to register managers at startup or during run-time for dynamic device, service, and application insertion.

3.1.3.3.1.11.2 UML

The *ManagerRegistry* interface UML is depicted in Figure 3-31.

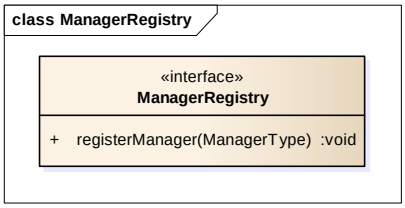

Figure 3-31: *ManagerRegistry* Interface UML

3.1.3.3.1.11.3 Types

N/A.

3.1.3.3.1.11.4 Attributes.

N/A.

3.1.3.3.1.11.5 Operations

3.1.3.3.1.11.5.1 registerManager

3.1.3.3.1.11.5.1.1 Brief Rationale

The *registerManager* operation is used to register a manager and its registered components. Software profiles may be obtained from the manager's file system.

3.1.3.3.1.11.5.1.2 Synopsis

```
void registerManager (in ManagerType registeringManager) raises
(InvalidObjectReference, InvalidProfile, RegisterError );
```

3.1.3.3.1.11.5.1.3 Behavior

The *registerManager* operation verifies that the input registeringManager parameter contains a valid component reference.

SCA143 The *registerManager* operation shall register the manager indicated by the input registeringManager parameter, if it does not already exist.

SCA144 The registerManager operation shall register the input registeringManager's components.

The *registerManager* operation ignores already registered managers.

3.1.3.3.1.11.5.1.4 Returns

This operation does not return a value.

3.1.3.3.1.11.5.1.5 Exceptions/Errors

SCA145 The *registerManager* operation shall raise the CF InvalidObjectReference exception when the input registeringManager contains a nil managerComponent componentObject object reference.

SCA146 The *registerManager* operation shall raise the CF InvalidProfile exception when the registeringManager's profile file or any of the profile's referenced files do not exist.

SCA147 The *registerManager* operation shall raise the RegisterError exception when registration is unsuccessful.

3.1.3.3.1.12 FullManagerRegistry

3.1.3.3.1.12.1 Description

The *FullManagerRegistry* interface extends the *ManagerRegistry* interface with manager unregistration capability. The *unregisterManager* operation is used to unregister managers and provide dynamic device, service, and application extraction.

3.1.3.3.1.12.2 UML

The *FullManagerRegistry* interface UML is depicted in Figure 3-32.

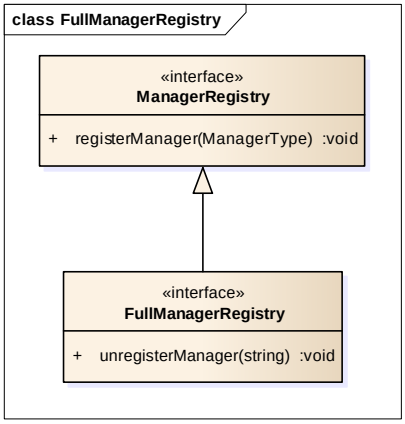

Figure 3-32: *FullManagerRegistry* Interface UML

3.1.3.3.1.12.3 Types

N/A.

3.1.3.3.1.12.4 Attributes.

N/A.

3.1.3.3.1.12.5 Operations

3.1.3.3.1.12.5.1 unregisterManager

3.1.3.3.1.12.5.1.1 Brief Rationale

The *unregisterManager* operation is used to unregister a manager. A manager may be unregistered during run-time for dynamic extraction or maintenance of the manager.

3.1.3.3.1.12.5.1.2 Synopsis

```
void unregisterManager (in string identifier) raises
(UnregisterError);
```

3.1.3.3.1.12.5.1.3 Behavior

SCA148 The *unregisterManager* operation shall unregister a manager component specified by the input identifier parameter.

SCA149 The *unregisterManager* operation shall unregister all components associated with the manager that is being unregistered.

3.1.3.3.1.12.5.1.4 Returns

This operation does not return a value.

3.1.3.3.1.12.5.1.5 Exceptions/Errors

SCA150 The *unregisterManager* operation shall raise the UnregisterError exception when an unregistration is unsuccessful.

3.1.3.3.1.13 ManagerRelease

3.1.3.3.1.13.1 Description

The *ManagerRelease* interface is used for terminating a manager.

3.1.3.3.1.13.2 UML

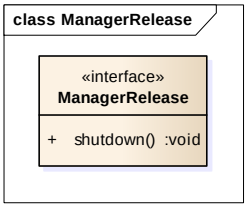

Figure 3-33: *ManagerRelease* Interface UML

3.1.3.3.1.13.3 Types

N/A.

3.1.3.3.1.13.4 Attributes

N/A.

3.1.3.3.1.13.5 Operations

3.1.3.3.1.13.5.1 shutdown

3.1.3.3.1.13.5.1.1 Brief Rationale

The *shutdown* operation provides the mechanism to terminate a manager.

3.1.3.3.1.13.5.1.2 Synopsis

```
void shutdown();
```

3.1.3.3.1.13.5.1.3 Behavior

SCA151 The *shutdown* operation shall unregister the manager from the domain.

SCA152 The *shutdown* operation shall perform a *releaseObject* on all of the manager's registered components that were created as specified in the profile attribute that supports the *LifeCycle* interface.

SCA153 The *shutdown* operation shall terminate the execution of each component that was created as specified in the profile attribute after they have unregistered with the manager.

SCA437 The *shutdown* operation shall cause the manager to be unavailable (i.e. released from the operating environment and its process terminated on the OS), when all of the manager's registered components are unregistered and all created components are terminated.

3.1.3.3.1.13.5.1.4 Returns

This operation does not return any value.

3.1.3.3.1.13.5.1.5 Exceptions/Errors

This operation does not raise any exceptions.

3.1.3.3.2 **Components**

Framework Control Components provide the structural definitions for the components that perform deployment behavior within a platform. Framework control within a Domain is accomplished by the DomainManagerComponent and DeviceManagerComponent.

All Framework Control Components provide a management capability. These components manage the registration and unregistration of applications, devices, and device managers within the domain and the controlling of applications within the domain. The implementation of the ApplicationManagerComponent, ApplicationFactoryComponent, and DomainManagerComponent components are logically coupled to provide a complete domain management implementation and service.

PlatformComponent management is performed by the DeviceManagerComponent. The DeviceManagerComponent is responsible for creation of ComponentBaseDevices and launching ServiceComponents.

3.1.3.3.2.1 AssemblyComponent

3.1.3.3.2.1.1 Description

AssemblyComponents provide an abstraction for a capability that performs the functions of a specific SCA-compliant product (e.g. a waveform). They are designed to meet the requirements of a specific acquisition and are not defined by the SCA except as they interface to the OE. An AssemblyComponent contains dependencies to services, specified as connections, within the descriptor. A created AssemblyComponent contains a collection of ApplicationResourceComponent(s) and non-SCA components.

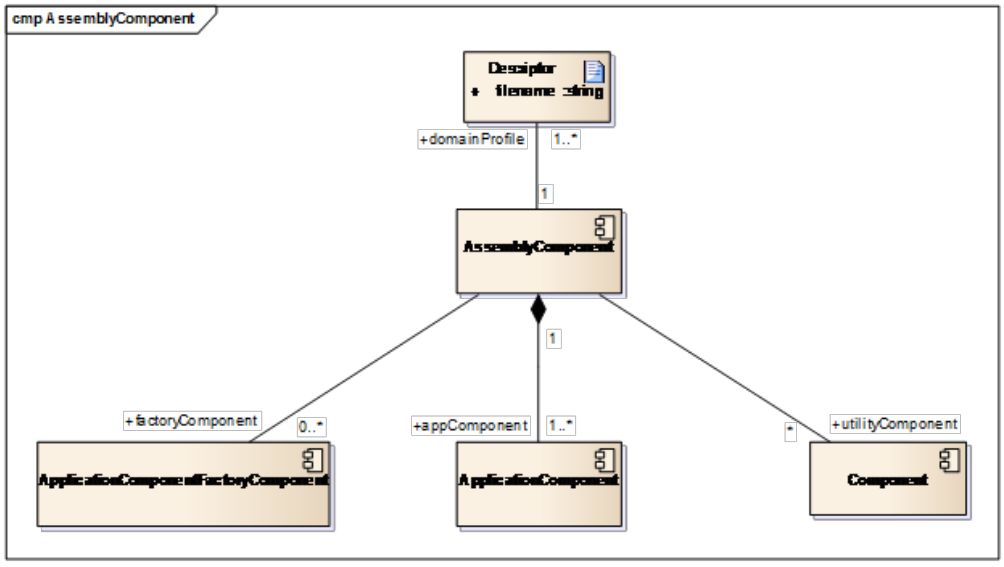

Figure 3-34: AssemblyComponent UML

3.1.3.3.2.1.2 Associations

- domainProfile: A ResourceComponent has a SAD and zero to many other domain profile files.
- appComponent: The collection of ApplicationResourceComponents identified within the SAD.
- factoryComponent: The collection of ApplicationComponentFactoryComponents identified within the SAD.
- utilityComponent: The collection of components that don't realize the *Resource* interface identified within the SAD.

3.1.3.3.2.1.3 Semantics

An AssemblyComponent's dependencies to the log, file system, Event Service, and other ServiceComponents are specified as connections in the SAD using the *domainfinder* element. Use of an ApplicationComponentFactoryComponent per section 3.1.3.1.2.2 is optional.

An AssemblyComponent may define interfaces that are visible to entities external to the application. These external interfaces are *Ports*, referenced in the AssemblyComponent SAD *externalports* element.

3.1.3.3.2.1.4 Constraints

SCA155 An AssemblyComponent shall be accompanied by the appropriate Domain Profile files per section 3.1.3.6.

SCA156 An AssemblyComponent shall have at least one AssemblyControllerComponent.

3.1.3.3.2.2 ApplicationManagerComponent

3.1.3.3.2.2.1 Description

The ApplicationManagerComponent provides the means for the control, configuration, and status of an AssemblyComponent in the domain. The ApplicationManagerComponent is the proxy for the deployed AssemblyComponent.

An ApplicationManagerComponent is returned by the *create* operation of an ApplicationFactoryComponent.

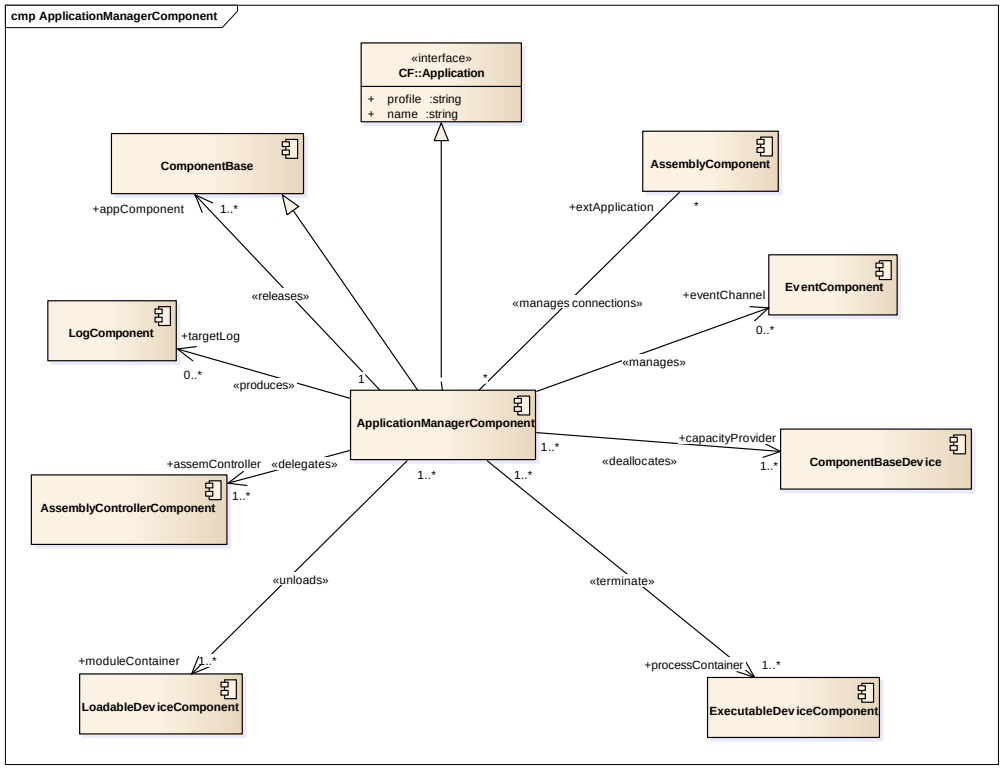

Figure 3-35: ApplicationManagerComponent UML

3.1.3.3.2.2.2 Associations

- domainProfile: An ApplicationManagerComponent is associated with a SAD and zero to many other domain profile files.
- extApplication: An ApplicationManagerComponent may contain ports which may be connected to or disconnected from external AssemblyComponent(s).
- eventChannel: An ApplicationManagerComponent sends event messages to event channels, disconnects producers and consumers from event channels and may destroy event channels.
- capacityProvider: An ApplicationManagerComponent deallocates capacities from its managed components from the ComponentBaseDevice(s) upon which they are deployed .
- targetLog: An ApplicationManagerComponent produces log messages and disseminates them to system log(s).
- assemController: An ApplicationManagerComponent delegates requests for an AssemblyComponent to its AssemblyControllerComponent.
- processContainer: An ApplicationManagerComponent terminates its processes from their containing ExecutableDeviceComponent(s).

- moduleContainer: An ApplicationManagerComponent unloads its constituent software modules from their containing LoadableDeviceComponent(s).
- appComponent: The collection of ComponentBase(s) (i.e. ApplicationResourceComponents or ApplicationComponentFactoryComponents) identified within the SAD which are managed by the ApplicationManagerComponent.

3.1.3.3.2.2.3 Semantics

SCA158 An ApplicationManagerComponent shall delegate the implementation of the *runTest*, *start*, *stop*, *configure*, and *query* operations to the AssemblyControllerComponent(s) as identified by the AssemblyComponent's SAD assemblycontroller element (Assembly Controller).

SCA159 The ApplicationManagerComponent shall propagate exceptions raised by the AssemblyComponent's AssemblyControllerComponent(s).

SCA160 The ApplicationManagerComponent shall not delegate the *initialize* operation to its ApplicationComponentFactoryComponent(s), ApplicationResourceComponent(s) or AssemblyControllerComponent(s).

SCA161 The ApplicationManagerComponent shall delegate the *runTest* operation to all Component(s) as identified by the AssemblyComponent's SAD *assemblycontroller* element (Assembly Controller) which have matching test IDs.

SCA162 The ApplicationManagerComponent shall delegate *configure* and *query* operations to all ApplicationResourceComponent(s) as identified by the AssemblyComponent's SAD *assemblycontroller* element (Assembly Controller), which have matching property IDs.

SCA163 The ApplicationManagerComponent shall raise *configure* operation InvalidConfiguration exception when the input configProperties parameter contains unknown properties. A property is considered unknown if it can't be recognized by a component designated by the ApplicationManagerComponent profile attribute's *assemblycontroller* element.

SCA543 The ApplicationManagerComponent shall raise the *query* operation UnknownProperties exception when the input configProperties parameter contains unknown properties.

3.1.3.3.2.2.4 Constraints

SCA164 An ApplicationManagerComponent shall realize the *Application* interface. SCA165 An ApplicationManagerComponent shall fulfill the ComponentBase requirements.

SCA525 An ApplicationManagerComponent shall realize the *ControllableComponent*, ~~*ComponentIdentifier,*~~ *PropertySet*, *TestableObject*, and *PortAccessor* interfaces.

SCA_TBD An ApplicationManagerComponent shall release a SCA V2.2.2 application [3]. An SCA V2.2.2 application being release adheres to the requirements in SCA V2.2.2.

SCA_TBD An ApplicationManagerComponent shall delegate configure, query, start, stop, and runTest operations to a SCA V2.2.2 application assembly controller.

3.1.3.3.2.3 ApplicationFactoryComponent

3.1.3.3.2.3.1 Description

The ApplicationFactoryComponent provides a dynamic mechanism to create a specific type of ApplicationManagerComponent in the domain.

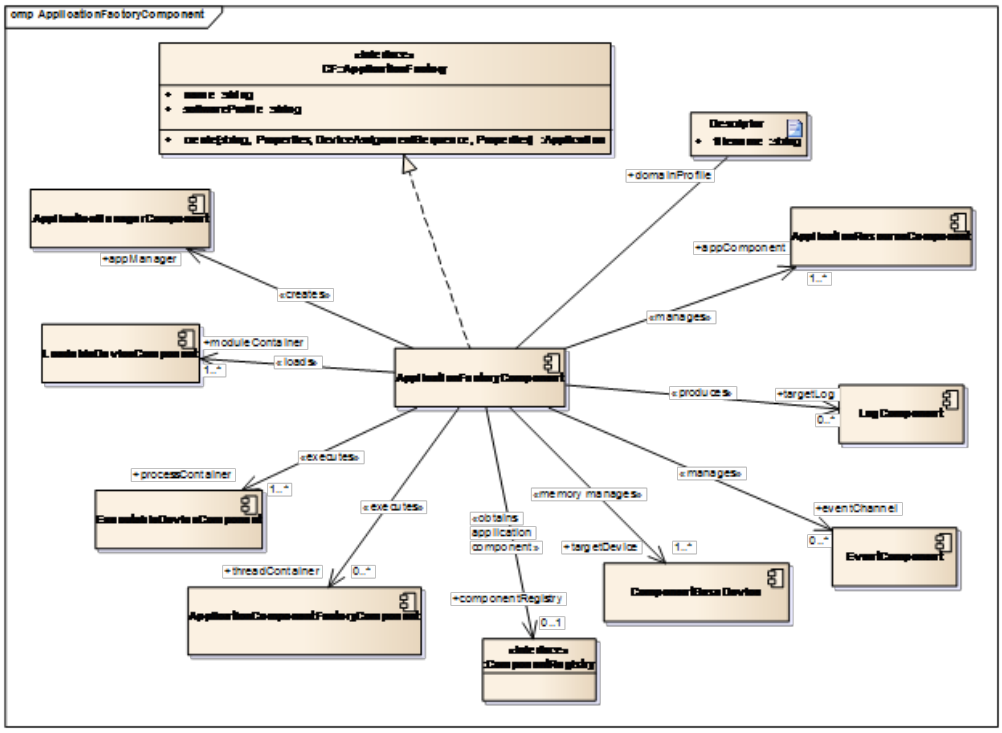

Figure 3-36: ApplicationFactoryComponent UML

3.1.3.3.2.3.2 Associations

- domainProfile: An ApplicationFactoryComponent is associated with a SAD and zero to many other domain profile files.
- eventChannel: An ApplicationFactoryComponent sends event messages to event channels, disconnects producers and consumers from event channels and may destroy event channels.
- targetLog: An ApplicationFactoryComponent produces log messages and disseminates them to system log(s).
- processContainer: An ApplicationFactoryComponent initiates processes on ExecutableDeviceComponent(s).
- moduleContainer: An ApplicationFactoryComponent loads modules onto LoadableDeviceComponent(s).
- targetDevice: An ApplicationFactoryComponent allocates and deallocates ComponentBaseDevice(s) capacities.
- appComponent: An ApplicationFactoryComponent initializes, configures and manages connections for its ApplicationResourceComponent(s).
- threadContainer: An ApplicationFactoryComponent initiates threads via ApplicationComponentFactoryComponent(s).

- appManager: An ApplicationFactoryComponent creates an ApplicationManagerComponent which acts as a proxy for the instantiated AssemblyComponent.
- componentRegistry: An ApplicationFactoryComponent obtains componentRegistries that contain an inventory of the created application component(s).

3.1.3.3.2.3.3 Semantics

The following steps demonstrate one scenario of the behavior of an application factory for the creation of an application:

1. Client invokes the *create* operation. Evaluate the Domain Profile for available devices that meet the application's memory and processor requirements, available dependent applications, and dependent libraries needed by the application.
2. Allocate the device(s) memory and processor utilization. Update the memory and processor utilization of the devices.
3. Create an instance of an *Application*, if the requested application can be created.
4. Application Factory component creates a *ComponentRegistry* instance to be used for deployed application component registration.
5. Load the application software modules on the devices using the appropriate *Device*(s) interface provided the application software modules haven't already been loaded.
6. Execute the application software modules on the devices using the appropriate *ExecutableDevice* instance as indicated by the application's software profile. If the component launched is a resource component supporting the *Resource* interface, then narrow the component reference to a resource component. If the component launched is a component factory, then narrow the reference to be a component factory component.
7. The launched application components register via the *ComponentRegistry interface.*
8. The *create* operation writes a log message indicating that a new application was created.
9. Return the *Application* object reference.

Figure 3-37 is a sequence diagram depicting the behavior as described above.

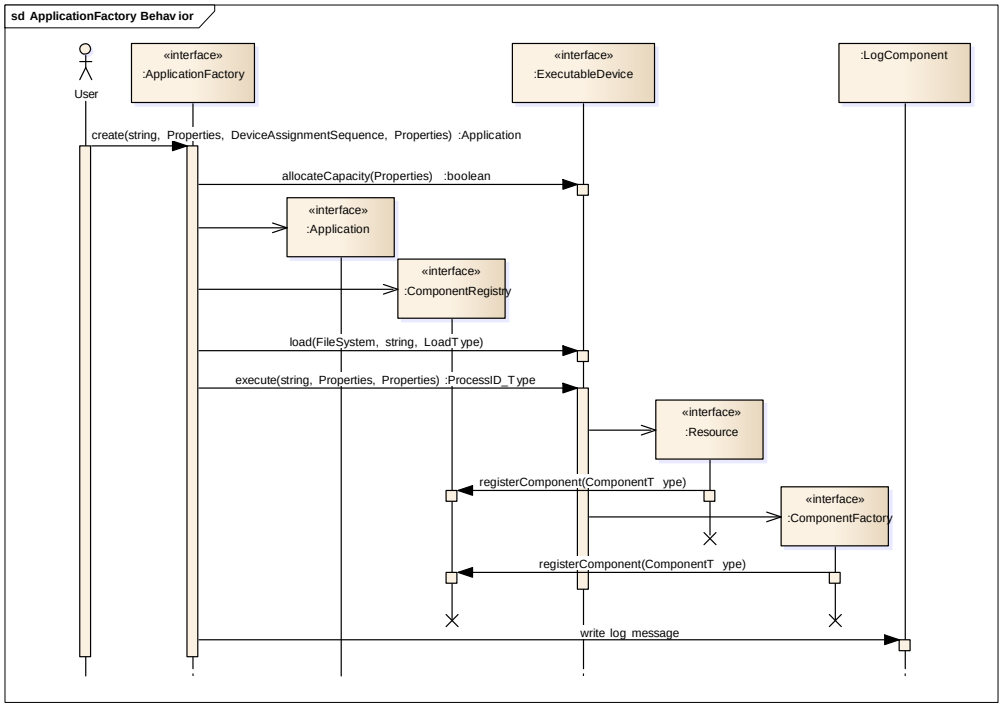

Figure 3-37: *ApplicationFactory* Application Creation Behavior

3.1.3.3.2.3.4 Constraints

SCA174 An ApplicationFactoryComponent shall realize the *ApplicationFactory* interface.

3.1.3.3.2.4 DomainManagerComponent

3.1.3.3.2.4.1 Description

The *DomainManager*Component is used for the control and configuration of the system domain.

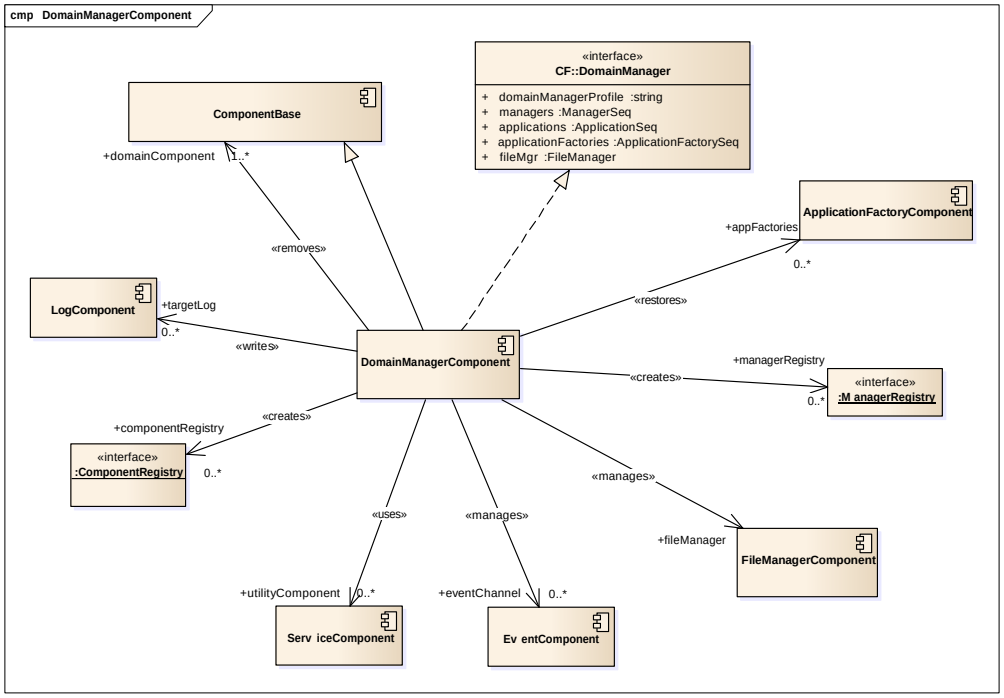

Figure 3-38: DomainManagerComponent UML

3.1.3.3.2.4.2 Associations

- domainProfile: A DomainManagerComponent is associated with a DMD and zero to many other domain profile files.
- eventChannel: A DomainManagerComponent creates event channels, sends event messages to event channels, disconnects producers and consumers from event channels and may destroy event channels.
- targetLog: A DomainManagerComponent creates the system log, produces and disseminates log messages.
- managerRegistry: A DomainManagerComponent creates managerRegistries that contain an inventory of the registered manager components (e.g. DeviceManagerComponent or DomainManagerComponent).
- fileManager: A DomainManagerComponent creates and manages FileManagerComponents within the domain.
- appFactories: A DomainManagerComponent restores any ApplicationFactoryComponent(s) instantiated in previous incarnations of the domain.
- domainComponent: A DomainManagerComponent removes and disconnects, as necessary, components registered within the domain.
- utilityComponent: A DomainManagerComponent utilizes the capabilities provided by ServiceComponent(s) within the domain.

- componentRegistry: A DomainManagerComponent creates componentRegistries that contain an inventory of the registered platform components.

3.1.3.3.2.4.3 Semantics

SCA177 The DomainManagerComponent identifier shall be identical to the *domainmanagerconfiguration* element *id* attribute of the DMD file.

Since a log service is not a required component, a DomainManagerComponent may, or may not have access to a log. However, if log service(s) are available, a DomainManagerComponent may use one or more of them. SCA178 A DomainManagerComponent shall define its utilized ServiceComponents in the DMD.

SCA179 A DomainManagerComponent shall write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log, when the managers attribute is obtained by a client.

SCA180 A DomainManagerComponent shall write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log, when the applications attribute is obtained by a client.

SCA181 A DomainManagerComponent shall write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log, when the applicationFactories attribute is obtained by a client.

SCA182 A DomainManagerComponent shall write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log, when the fileMgr attribute is obtained by a client.

A DomainManagerComponent may begin to use a service specified in the DMD only after the service has successfully registered with the DomainManagerComponent via the *ComponentRegistry::registerComponent* operation.

SCA184 A DomainManagerComponent shall create its own FileManagerComponent that consists of all registered DeviceManagerComponent's FileSystemComponents.

SCA185 Upon system startup, a DomainManagerComponent shall restore ApplicationFactoryComponents for AssemblyComponents that were previously installed by the *DomainManager::installApplication* operation.

SCA186 A DomainManagerComponent shall add the restored application factories to the *DomainManager* interface applicationFactories attribute.

SCA187 A DomainManagerComponent shall create the Incoming Domain Management and Outgoing Domain Management event channels.

SCA189 The *registerComponent* operation shall write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent log upon successful component registration.

SCA191 The *registerComponent* operation shall write a FAILURE_ALARM log record to a DomainManagerComponent log upon unsuccessful component registration.

SCA193 The *registerComponent* operation shall send a DomainManagementObjectAddedEventType event to the Outgoing Domain Management event channel, upon successful registration of a component. For this event,

1. The *producerId* is the identifier attribute of the domain manager.
2. The *sourceId* is the identifier attribute of the registered component.
3. The *sourceIOR* is the object reference for the registered component.
4. The *sourceCategory* is the SourceCategoryType of the registered component.

SCA194 The *registerComponent* operation shall establish any pending connections from the registeringComponent.

The *unregisterComponent* operation may destroy the Event Service event channel when no more consumers and producers are connected to it.

SCA195 The *unregisterComponent* operation shall, upon the successful unregistration of a component, write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log.

SCA196 The *unregisterComponent* operation shall send a DomainManagementObjectRemovedEventType event to the Outgoing Domain Management event channel, upon successful unregistration of a component. For this event,

1. The *producerId* is the identifier attribute of the domain manager.
2. The *sourceId* is the identifier attribute of the unregistered component.
3. The *sourceCategory* is the SourceCategoryType of the unregistered component.

SCA197 The *unregisterComponent* operation shall, upon unsuccessful unregistration of a component, write a FAILURE_ALARM log record to a DomainManagerComponent's log.

SCA198 The *unregisterComponent* operation shall disconnect any connections (including those made to the Event Service event channels) to the unregistering component indicated by the input identifier parameter. SCA199 Connections broken as a result of this *unregisterComponent* operation shall be considered as pending for future connections when the component to which the component was connected still exists.

SCA201 The *registerManager* operation shall establish any connections for the DeviceManagerComponent indicated by the input registeringManager parameter, which are specified in the *connections* element of the DeviceManagerComponent's DCD file, that are possible with the current set of registered components. Connections not currently possible are left unconnected pending future component registrations.

SCA202 For connections established for an Event Service's event channel, the *registerManager* operation shall connect a *CosEventComm::PushConsumer* or *CosEventComm::PushSupplier* object to the event channel as specified in the DCD's *domainfinder* element. SCA203 If the event channel does not exist, the *registerManager* operation shall create the event channel.

SCA204 The registerManager operation shall mount the DeviceManagerComponent's FileSystemComponent to the DomainManagerComponent's FileManagerComponent. SCA205 The mounted *FileSystem* name shall have the format, "/DomainName/HostName", where DomainName is the name of the domain and HostName is the identifier of the input registeringManager.

SCA206 The *registerManager* operation shall, upon unsuccessful DeviceManagerComponent registration, write a FAILURE_ALARM log record to a DomainManagerComponent's Log.

SCA207 The *registerManager* operation shall send a DomainManagementObjectAddedEventType event to the Outgoing Domain Management event channel upon successful registration of a device manager. For this event,

1. The *producerId* is the identifier attribute of the domain manager.
2. The *sourceId* is the identifier attribute of the registered device manager.
3. The *sourceIOR* is the object reference for the registered device manager.
4. The *sourceCategory* is “DEVICE_MANAGER”.

The DomainManagerComponent associates the input DeviceManagerComponent's registered components with the DeviceManagerComponent in order to support the *unregisterManager* operation.

SCA208 The *unregisterManager* operation shall disconnect the established connections (including those made to the Event Service event channels) of the unregistering manager as well as for its registered components that have not already been disconnected by the unregistering manager.

SCA209 Connections broken as a result of the *unregisterManager* operation shall be considered as pending for future connections.

The *unregisterManager* operation may destroy the Event Service channel when no more consumers and producers are connected to it.

SCA210 The *unregisterManager* operation shall unmount all DeviceManagerComponent's file systems from its FileManagerComponent.

SCA211 The *unregisterManager* operation shall, upon the successful unregistration of a DeviceManagerComponent, write an ADMINISTRATIVE_EVENT log record to a DomainManagerComponent's log.

SCA212 The *unregisterManager* operation shall, upon unsuccessful unregistration of a DeviceManagerComponent, write a FAILURE_ALARM log record to a DomainManagerComponent's log.

SCA213 The *unregisterManager* operation shall send a DomainManagementObjectRemovedEventType event to the Outgoing Domain Management event channel, upon successful unregistration of a device manager. For this event,

1. The *producerId* is the identifier attribute of the domain manager.
2. The *sourceId* is the identifier attribute of the unregistered device manager.
3. The *sourceCategory* is “DEVICE_MANAGER”.

3.1.3.3.2.4.4 Constraints

SCA214 A DomainManagerComponent shall realize the *DomainManager* interface.

SCA532 A DomainManagerComponent shall fulfill the ComponentBase requirements with the exception that support for the *LifeCycle* interface is optional.

3.1.3.3.2.5 DeviceManagerComponent

3.1.3.3.2.5.1 Description

A DeviceManagerComponent manages a set of ComponentBaseDevice and ServiceComponent components on a node. The DeviceManagerComponent provides the capability of starting up the managed component(s)' main processes on a given node.

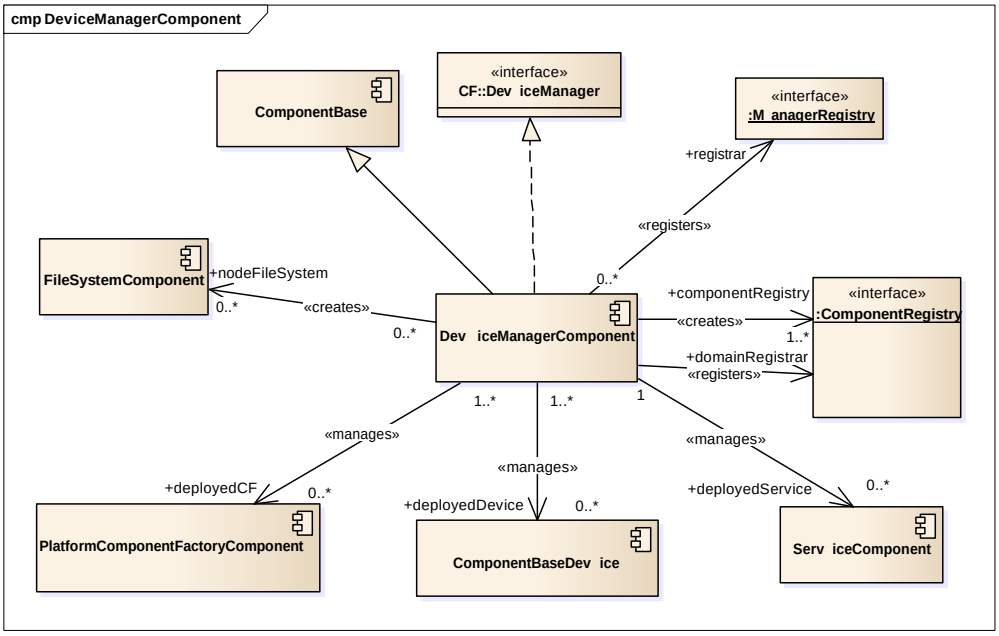

Figure 3-39: DeviceManagerComponent UML

3.1.3.3.2.5.2 Associations

- domainProfile: A DeviceManagerComponent is associated with a DCD and zero to many other domain profile files.
- registrar: A DeviceManagerComponent registers with a DomainManagerComponent via its associated *ManagerRegistry* instance.
- nodeFileSystem: A DeviceManagerComponent creates FileSystemComponent(s) and mounts them on a FileManagerComponent, if applicable.
- deployedCF: A DeviceManagerComponent deploys, initializes and configures PlatformComponentFactoryComponent(s) as necessary.
- deployedService: A DeviceManagerComponent deploys, initializes and configures ServiceComponent(s) as necessary.
- deployedDevice: A DeviceManagerComponent deploys, initializes and configures ComponentBaseDevice (s) as necessary.
- componentRegistry: A DeviceManagerComponent creates componentRegistries that contain an inventory of the created PlatformComponent(s).
- domainRegistrar: A DeviceManagerComponent registers with a DomainManagerComponent via the DomainManagerComponent's associated *ComponentRegistry* instance.

3.1.3.3.2.5.3 Semantics

SCA215 A DeviceManagerComponent shall be accompanied by the appropriate Domain Profile files per section 3.1.3.6.

SCA216 A DeviceManagerComponent upon start up shall register with a DomainManagerComponent via the *ManagerRegistry* interface. SCA450 A DeviceManagerComponent shall use the information in its DCD for determining:

1. Services to be deployed for this DeviceManagerComponent (for example, *log*(s)),
2. ComponentBaseDevices to be created for this device manager (when the DCD *deployondevice* element is not specified then the DCD *componentinstantiation* element is deployed on the same hardware device as the device manager),
3. ComponentBaseDevices to be deployed on (executing on) another ComponentBaseDevice,
4. ComponentBaseDevices to be aggregated to another ComponentBaseDevice,
5. Mount point names for file systems,
6. The DeviceManagerComponent's identifier attribute value which is the DCD's *id* attribute value, and
7. DomainManagerComponent's *ManagerRegistry* and *ComponentRegistry* references

SCA217 A DeviceManagerComponent shall create FileSystemComponents implementing the *FileSystem* interface for each OS file system. SCA218 If multiple FileSystemComponents are to be created, the DeviceManagerComponent shall mount created FileSystemComponents to a FileManagerComponent (widened to a FileSystemComponent through the FileSys attribute). The mount points used for the created file systems are identical to the values identified in the *filesystemnames* element of the DeviceManagerComponent's DCD.

The DeviceManagerComponent can launch ComponentBaseDevices, PlatformComponentFactoryComponents and ServiceComponents directly (e.g. *thread*, *posix_spawn*) or by using an ExecutableDeviceComponent. These components register with the launching DeviceManagerComponent via the *ComponentRegistry::registerComponent* operation. SCA219 Upon successful registration via the *ComponentRegistry* interface, the DeviceManagerComponent shall add the components to its registeredComponents attribute. SCA221 The DeviceManagerComponent shall add the ComponentBaseDevice and ServiceComponent components launched by a PlatformComponentFactoryComponent to the registeredComponents attribute of the DeviceManagerComponent.

SCA442 When a ComponentBaseDevice is launched directly (e.g. *thread*, *posix_spawn*) or by using an ExecutableDeviceComponent, the DeviceManagerComponent shall supply execute operation parameters for a device consisting of:

1. Component Registry IOR when the DCD *componentinstantiation stringifiedobjectref* element is null value - The ID is "COMPONENT_REGISTRY_IOR" and the value is a string that is the *ComponentRegistry* stringified IOR;
2. Profile Name - The ID is "PROFILE_NAME" and the value is a string that is the full mounted file system file path name;
3. Device Identifier - The ID is "DEVICE_ID" and the value is a string that corresponds to the DCD *componentinstantiation id* attribute;
4. Composite Device IOR - The ID is "Composite_DEVICE_IOR" and the value is a string that is an AggregateDeviceComponent stringified IOR (this parameter is only used when the DCD *componentinstantiation* element represents the child device of another *componentinstantiation* element);

5. The execute ("execparam") properties as specified in the DCD for a *componentinstantiation* element (a DeviceManagerComponent passes execparam parameters' IDs and values as string values).

SCA224 A DeviceManagerComponent shall use the *stacksize* and *priority* elements as specified in the *componentinstantiation* element's SPD implementation code for the *execute* operation options parameter.

SCA449 If a PlatformComponentFactoryComponent is deployed by the DeviceManagerComponent, a DeviceManagerComponent shall supply *execute* operation parameters consisting of:

1. Component Registry IOR - The ID is "COMPONENT_REGISTRY_IOR" and the value is a string that is the *ComponentRegistry* stringified IOR when the DCD *componentinstantiation stringifiedobjectref* element is null value;
2. Component Identifier - The ID is "COMPONENT_IDENTIFIER" and the value is a string that corresponds to the DCD *componentinstantiation id* attribute;
3. The execute ("execparam") properties as specified in the DCD for a *componentinstantiation* element (a DeviceManagerComponent passes execparam parameters' IDs and values as string values).

SCA538 If a ServiceComponent is deployed by the DeviceManagerComponent, a DeviceManagerComponent shall supply *execute* operation parameters consisting of:

1. Component Registry IOR - The ID is "COMPONENT_REGISTRY_IOR" and the value is a string that is the *ComponentRegistry* stringified IOR when the DCD *componentinstantiation stringifiedobjectref* element is null value;
2. Service Name when the DCD *componentinstantiation usagename* element is non-null value - The ID is "SERVICE_NAME" and the value is a string in an "identifier\type" format that corresponds to the DCD *componentinstantiation usagename* element;
3. The execute ("execparam") properties as specified in the DCD for a *componentinstantiation* element (a DeviceManagerComponent passes execparam parameters' IDs and values as string values).

SCA438 When a ComponentBaseDevice is created via PlatformComponentFactoryComponent, the DeviceManagerComponent shall supply the following properties as the qualifiers parameter to the referenced *ComponentFactory::createComponent* operation:

1. Profile Name - The ID is "PROFILE_NAME" and the value is a string that is the full mounted file system file path name;
2. Device Identifier - The ID is "DEVICE_ID" and the value is a string that corresponds to the DCD *componentinstantiation id* attribute;
3. Composite Device IOR - The ID is "Composite_DEVICE_IOR" and the value is a string that is an AggregateDeviceComponent stringified IOR (this parameter is only used when the DCD *componentinstantiation* element represents the child device of another *componentinstantiation* element);
4. The *componentinstantiation componentfactoryref* element properties whose *kindtype* element is factoryparam.

SCA226 The DeviceManagerComponent shall use the *stacksize* and *priority* elements as specified in the *componentinstantiation* element's SPD implementation code as qualifiers parameter for the *ComponentFactory::createComponent* operation.

SCA439 When a ServiceComponent is created via a PlatformComponentFactoryComponent, the DeviceManagerComponent shall supply the following properties as the *qualifiers* parameter to the referenced PlatformComponentFactoryComponent's *createComponent* operation:

1. Service Name when the DCD componentinstantiation usagename element is non-null value - The ID is "SERVICE_NAME" and the value is a string in an "identifier\type" format that corresponds to the DCD *componentinstantiation usagename* element;
2. The *componentinstantiation componentfactoryref* element properties whose *kindtype* element is factoryparam.

SCA227 The DeviceManagerComponent shall initialize registered components that are instantiated by the DeviceManagerComponent provided they realize the *LifeCycle* interface. Registered components may also be obtained from a PlatformComponentFactoryComponent. SCA228 After component initialization, the DeviceManagerComponent shall configure registered components that are instantiated by the DeviceManagerComponent, provided they realize the *PropertySet* interface. SCA229 The DeviceManagerComponent shall configure a DCD's *componentinstantiation* element provided the *componentinstantiation* element has configure readwrite or writeonly properties with values.

SCA230 The *registerComponent* operation shall register the registeringComponent with the domain manager when the device manager has already registered and the registeringComponent has been successfully added to the DeviceManagerComponent's registeredComponents attribute.

SCA231 The *registerComponent* operation shall, upon unsuccessful component registration, write a FAILURE_ALARM log record to a domain manager's log.

SCA232 The *unregisterComponent* operation shall, upon unsuccessful unregistration of a component, write a FAILURE_ALARM log record to a DomainManagerComponent's log.

SCA233 The *unregisterComponent* operation shall unregister the registered component specified by the input identifier parameter from the domain manager if it is registered with the device manager and the device manager is not shutting down.

Figure 3-40: depicts a device manager startup scenario as follows:

1. Process DCD and create a *ComponentRegistry* instance.
2. Launch platform components passing the component registry object reference for registration.
3. Deployed components register with the *ComponentRegistry* instance.
4. Initialize all deployed components.
5. Configure all deployed components.

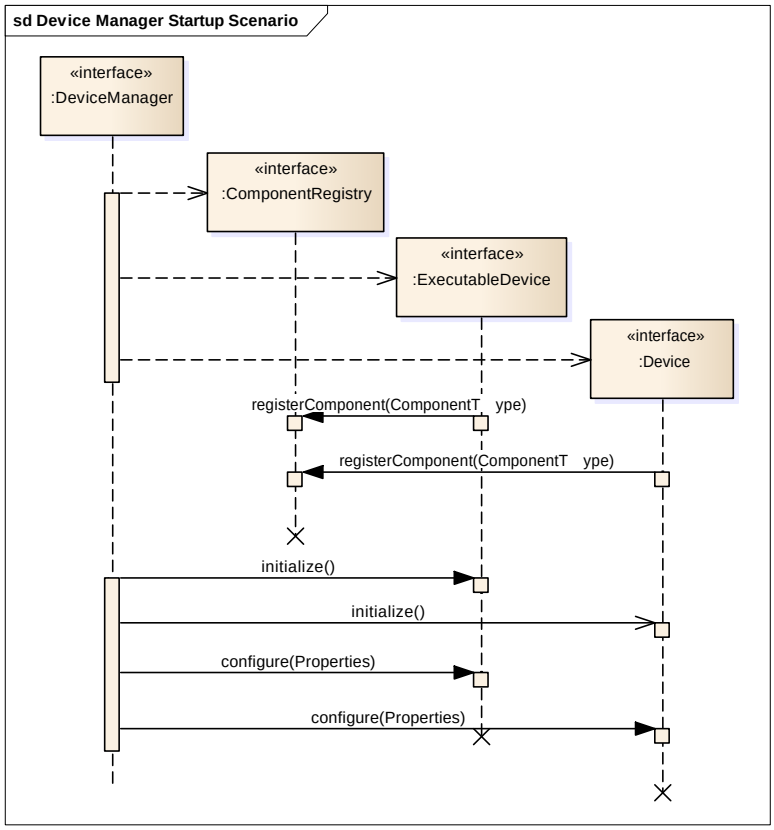

Figure 3-40: Device Manager Startup Scenario

3.1.3.3.2.5.4 Constraints

SCA234 A DeviceManagerComponent shall realize the *DeviceManager* interface. SCA235 A DeviceManagerComponent shall fulfill the ComponentBase requirements with the exception that support for the *LifeCycle* interface is optional. SCA236 Each mounted file system name shall be unique within a DeviceManagerComponent.

3.1.3.4 Base Device

3.1.3.4.1 **Interfaces**

The device interfaces are for the implementation and management of logical devices within the domain. The devices within the domain may be simple devices with no loadable, executable, or aggregate device behavior, or devices with a combination of these behaviors. The device interfaces are *Device*, *LoadableDevice* and *ExecutableDevice*.

Base Device Interfaces are implemented using interface definitions expressed in a Platform Specific representation of one of the Appendix E enabling technologies.

3.1.3.4.1.1 Device

3.1.3.4.1.1.1 Description

The *Device* interface inherits from the *LifeCycle* interface. The *Device* interface may also inherit from the *PropertySet*, *TestableObject*, *ControllableComponent*, *DeviceAttributes*, *CapacityManagement*, *ParentDevice*, *ManageableComponent*, and *PortAccessor* interfaces.

The *LifeCycle*, *PropertySet*, *TestableObject*, *ControllableComponent*, *DeviceAttributes*, *CapacityManagement*, *ParentDevice*, *ManageableComponent*, and *PortAccessor* interface operations are documented in their respective sections of this document.

3.1.3.4.1.1.2 UML

The *Device* interface UML is depicted in Figure 3-41.

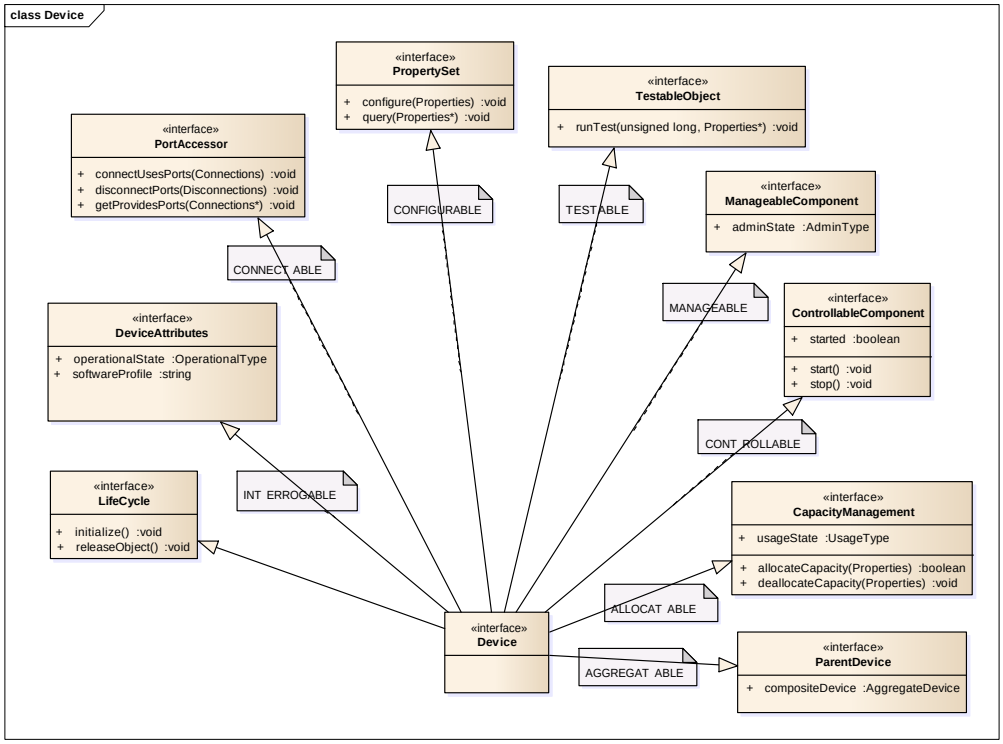

Figure 3-41: *Device* Interface UML

3.1.3.4.1.1.3 Types

N/A.

3.1.3.4.1.1.4 Attributes

N/A.

3.1.3.4.1.1.5 Operations

3.1.3.4.1.1.5.1 releaseObject

3.1.3.4.1.1.5.1.1 Description

This section describes additional release behavior for a logical device.

3.1.3.4.1.1.5.1.2 Synopsis

```
void releaseObject() raises (ReleaseError);
```

3.1.3.4.1.1.5.1.3 Behavior

The following behavior extends the *LifeCycle::releaseObject* operation requirements (see section 3.1.3.2.1.3.5.2).

SCA241 The *releaseObject* operation shall unregister its device from its DeviceManagerComponent.

Figure 3-42 depicts a release scenario for removal of a child device as follows:

1. Invoke *releaseObject* operation on child device.
2. Remove child device from its parent.
3. Unregister child device from its associated *componentRegistry* instance.
4. Terminate processes / threads associated with the child device.

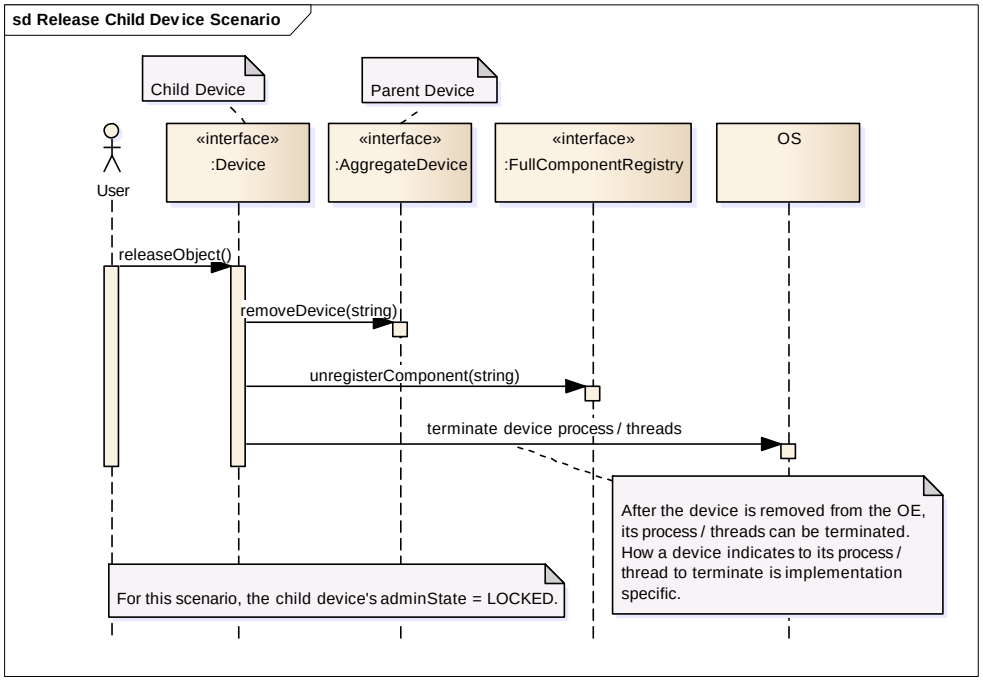

Figure 3-42: Release Child *Device* Scenario

Figure 3-43 depicts a release scenario for removal of a parent device as follows:

1. Invoke *releaseObject* operation on parent device.
2. Obtain list of child devices from the parent device's compositeDevice attribute.
3. Remove all of the parent device's child devices (see Figure 3-42).
4. Unregister parent device from its associated *componentRegistry* instance.
5. Terminate processes / threads associated with the parent device.

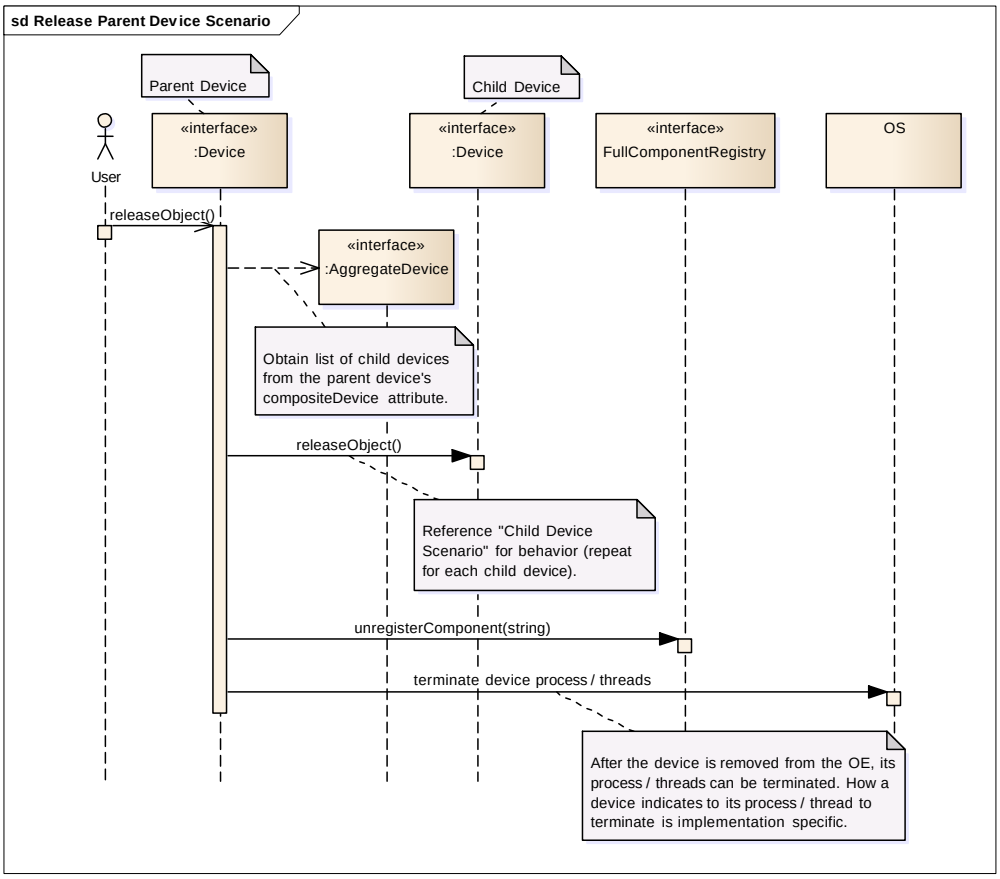

Figure 3-43: Release Parent *Device* Scenario

3.1.3.4.1.1.5.1.4 Returns

The *releaseObject* operation does not return a value.

3.1.3.4.1.1.5.1.5 Exceptions/Errors

The *releaseObject* operation raises the ReleaseError exception when *releaseObject* is not successful in releasing a logical device due to internal processing errors that occurred within the device being released. See section 3.1.3.2.1.3.5.2.5 for exception handling.

3.1.3.4.1.2 ManageableComponent

3.1.3.4.1.2.1 Description

The *ManageableComponent* interface defines an administrative attribute for any logical device in the domain. A logical device provides the adminState attribute, which describes the administrative state of the device.

3.1.3.4.1.2.2 UML

The *ManageableComponent* interface UML is depicted in Figure 3-44.

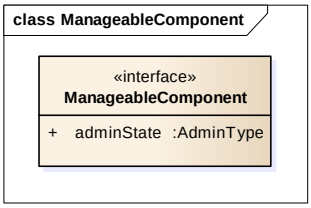

Figure 3-44: *ManageableComponent* Interface UML

3.1.3.4.1.2.3 Types

3.1.3.4.1.2.3.1 AdminType

This is an IDL enumeration type that defines a device's administrative states. The administrative state indicates the permission to use or prohibition against using the device.

```
enum AdminType
{
      LOCKED,
      SHUTTING_DOWN,
      UNLOCKED
};
```

3.1.3.4.1.2.4 Attributes

3.1.3.4.1.2.4.1 adminState

SCA243 The adminState attribute shall return the device's admin state value.

SCA244 The adminState attribute shall only allow the setting of LOCKED and UNLOCKED values, where setting LOCKED is only effective when the adminState attribute value is UNLOCKED, and setting UNLOCKED is only effective when the adminState attribute value is LOCKED or SHUTTING_DOWN. Illegal state transition commands are ignored.

```
attribute AdminType adminState;
```

3.1.3.4.1.2.5 Operations

N/A.

3.1.3.4.1.3 CapacityManagement

3.1.3.4.1.3.1 Description

The *CapacityManagement* interface defines additional capabilities and an attribute for any logical device in the domain. A logical device provides the following attribute and operations:

1. Usage State Management Attribute - This information describes the usage states of the device.

2. Capacity Operations - In order to use a device, certain capacities (e.g., memory, performance, etc.) are obtained from the device. A device may have multiple capacities which need to be allocated, since each device has its own unique capacity model which is described in the associated software profile.

3.1.3.4.1.3.2 UML

The *CapacityManagement* interface UML is depicted in Figure 3-45.

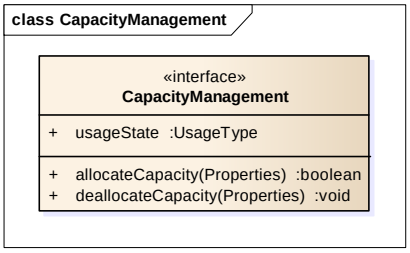

Figure 3-45: *CapacityManagement* Interface UML

3.1.3.4.1.3.3 Types

3.1.3.4.1.3.3.1 InvalidCapacity

The InvalidCapacity exception returns the capacities that are not valid for this device.

```
exception InvalidCapacity {string msg; Properties capacities;};
```

3.1.3.4.1.3.3.2 UsageType

This is an IDL enumeration type that defines the device's usage states. The usage state indicates which of the following states a device is in:

IDLE - not in use

ACTIVE - in use, with capacity remaining for allocation, or

BUSY - in use, with no capacity remaining for allocation

```
enum UsageType
{
      IDLE,
      ACTIVE,
      BUSY
};
```

3.1.3.4.1.3.4 Attributes

3.1.3.4.1.3.4.1 usageState.

SCA248 The readonly usageState attribute shall return the device's usage state (IDLE, ACTIVE, or BUSY). UsageState indicates whether or not a device is actively in use at a specific instant, and if so, whether or not it has spare capacity for allocation at that instant.

```
readonly attribute UsageType usageState;
```

3.1.3.4.1.3.5 Operations

3.1.3.4.1.3.5.1 allocateCapacity

3.1.3.4.1.3.5.1.1 Brief Rationale

The *allocateCapacity* operation provides the mechanism to request and allocate capacity from the device.

3.1.3.4.1.3.5.1.2 Synopsis

```
boolean allocateCapacity (in Properties capacities) raises
(InvalidCapacity, InvalidState);
```

3.1.3.4.1.3.5.1.3 Behavior

SCA250 The *allocateCapacity* operation shall reduce the current capacities of the device based upon the input capacities parameter, when usageState attribute is not BUSY.

SCA251 The *allocateCapacity* operation shall set the device's usageState attribute to BUSY, when the device determines that it is not possible to allocate any further capacity. SCA252 The *allocateCapacity* operation shall set the usageState attribute to ACTIVE, when capacity is being used and any capacity is still available for allocation.

SCA253 The *allocateCapacity* operation shall only accept properties for the input capacities parameter which are simple properties whose *kindtype* is allocation and whose *action* element is external contained in the component's SPD.

3.1.3.4.1.3.5.1.4 Returns

SCA254 The *allocateCapacity* operation shall return TRUE, if the capacities have been allocated, or FALSE, if not allocated.

3.1.3.4.1.3.5.1.5 Exceptions/Errors

SCA255 The *allocateCapacity* operation shall raise the InvalidCapacity exception, when the input capacities parameter contains invalid properties or when attributes of those CF Properties contain an unknown *id* or a value of the wrong data type.

3.1.3.4.1.3.5.2 deallocateCapacity

3.1.3.4.1.3.5.2.1 Brief Rationale

The *deallocateCapacity* operation provides the mechanism to return capacities back to the device, making them available to other users.

3.1.3.4.1.3.5.2.2 Synopsis

```
void deallocateCapacity (in Properties capacities) raises
(InvalidCapacity, InvalidState);
```

3.1.3.4.1.3.5.2.3 Behavior

SCA257 The *deallocateCapacity* operation shall increment the current capacities of the device based upon the input capacities parameter.

SCA258 The *deallocateCapacity* operation shall set the usageState attribute to ACTIVE when, after adjusting capacities, any of the device's capacities are still being used.

SCA259 The *deallocateCapacity* operation shall set the usageState attribute to IDLE when, after adjusting capacities, none of the device's capacities are still being used.

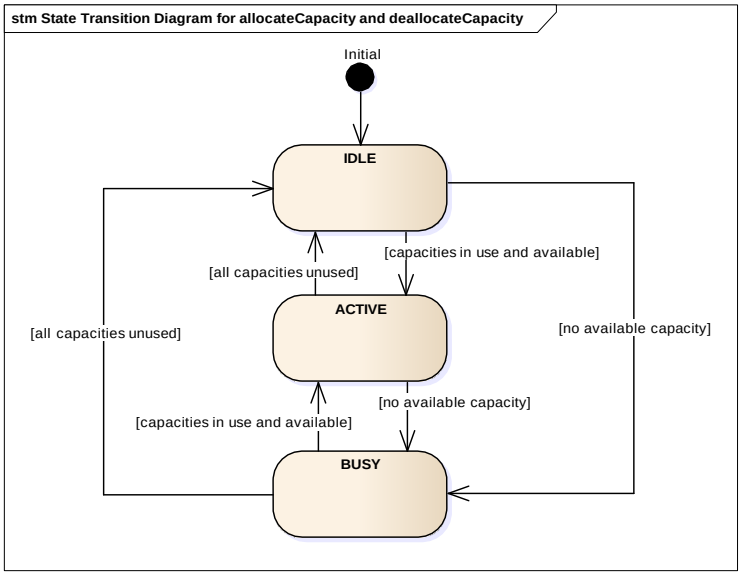

Figure 3-46: State Transition Diagram for *allocateCapacity* and *deallocateCapacity*

3.1.3.4.1.3.5.2.4 Returns

This operation does not return any value.

3.1.3.4.1.3.5.2.5 Exceptions/Errors

SCA261 The *deallocateCapacity* operation shall raise the InvalidCapacity exception, when the capacity ID is invalid or the capacity value is the wrong type. The InvalidCapacity exception msg parameter describes the reason for the exception.

3.1.3.4.1.4 DeviceAttributes

3.1.3.4.1.4.1 Description

The *DeviceAttributes* interface inherits the *ComponentIdentifier* interface.

The *DeviceAttributes* interface defines attributes for any logical device in the domain. A logical device may provide the following attributes:

1. Software Profile Attribute - Either the filename of the SPD or the raw SPD that defines the logical device capabilities (data/command uses and provides ports, configure and query properties, capacity properties, status properties, etc.), which could be a subset of the hardware device's capabilities
2. Operational State Management - This information describes the operational states of the device.

3.1.3.4.1.4.2 UML

The *DeviceAttributes* interface UML is depicted in Figure 3-41.

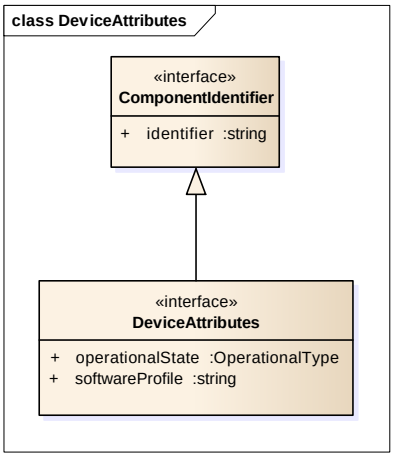

Figure 3-47: *DeviceAttributes* Interface UML

3.1.3.4.1.4.3 Types

3.1.3.4.1.4.3.1 OperationalType

This is an IDL enumeration type that defines a device's operational states. The operational state indicates whether or not the object is functioning.

```
enum OperationalType
{
      ENABLED,
      DISABLED
};
```

3.1.3.4.1.4.4 Attributes

3.1.3.4.1.4.4.1 operationalState

SCA263 The readonly operationalState attribute shall return the device's operational state (ENABLED or DISABLED). The operational state indicates whether or not the device is active.

```
readonly attribute OperationalType operationalState;
```

3.1.3.4.1.4.4.2 softwareProfile

SCA265 The readonly softwareProfile attribute shall return either the device's SPD filename or the SPD itself. The filename is an absolute pathname relative to a mounted FileSystemComponent and the file is obtained via the DomainManagerComponent's FileManagerComponent.

```
readonly attribute string softwareProfile;
```

3.1.3.4.1.4.5 Operations

N/A.

3.1.3.4.1.5 ParentDevice

3.1.3.4.1.5.1 Description

The *ParentDevice* interface defines attributes for any logical device in the domain. A logical device may provide the compositeDevice attribute which contains a reference to a component that aggregates a sequence of child devices.

3.1.3.4.1.5.2 UML

The *ParentDevice* interface UML is depicted in Figure 3-48.

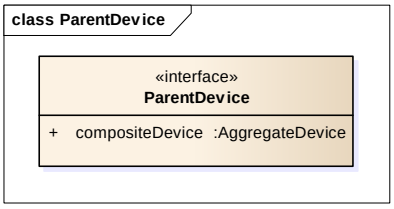

Figure 3-48: *ParentDevice* Interface UML

3.1.3.4.1.5.3 Types

N/A

3.1.3.4.1.5.4 Attributes

3.1.3.4.1.5.4.1 compositeDevice

SCA266 The readonly compositeDevice attribute shall return the object reference of the AggregateDeviceComponent. SCA267 The readonly compositeDevice attribute shall return a nil object reference when this ComponentBaseDevice is not a parent.

```
readonly attribute AggregateDevice compositeDevice;
```

3.1.3.4.1.5.5 Operations

N/A

3.1.3.4.1.6 LoadableDevice

3.1.3.4.1.6.1 Description

The *LoadableDevice* interface inherits the *LifeCycle* and *LoadableObject* interfaces. The *LoadableDevice* interface may also inherit the *PropertySet, TestableObject, ControllableComponent, LoadableObject, DeviceAttributes, CapacityManagement, ManageableComponent, ParentDevice*, and *PortAccessor* interfaces.

3.1.3.4.1.6.2 UML

The *LoadableDevice* interface UML is depicted in Figure 3-49.

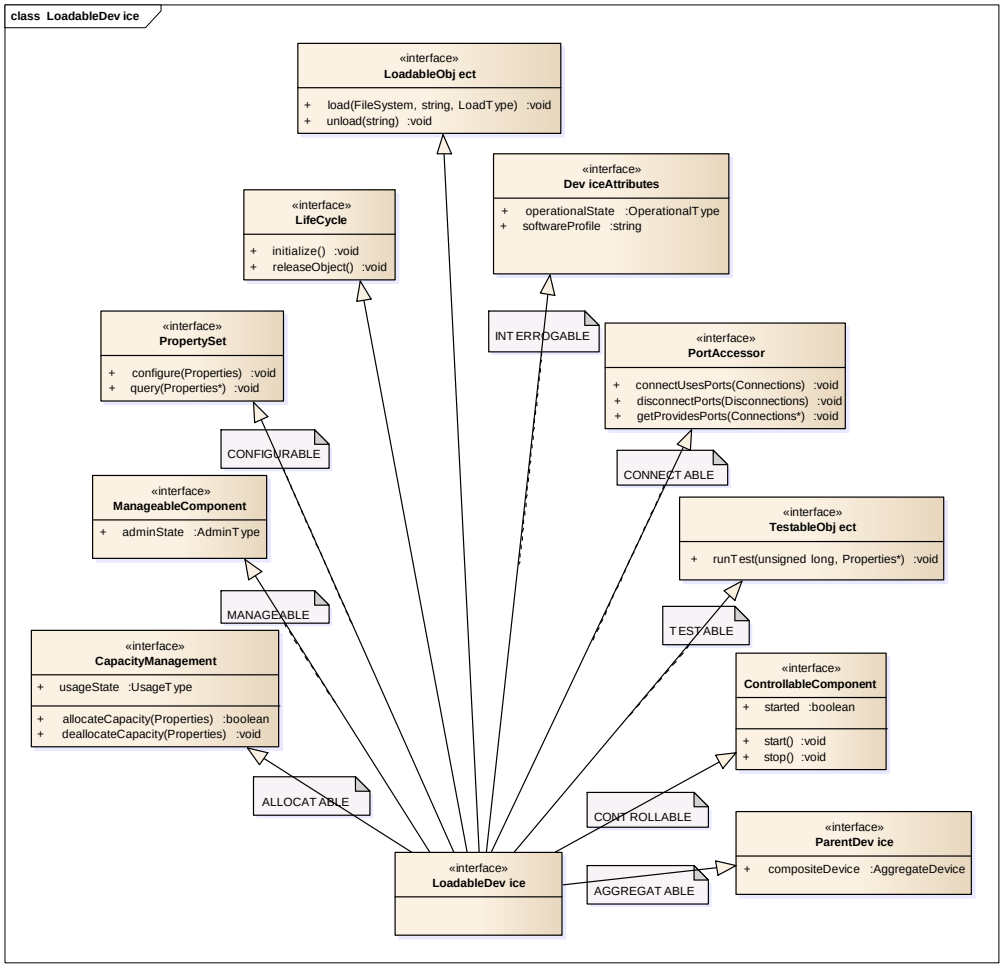

Figure 3-49: *LoadableDevice* Interface UML

3.1.3.4.1.6.3 Types

N/A

3.1.3.4.1.6.4 Attributes

N/A

3.1.3.4.1.6.5 Operations

3.1.3.4.1.6.5.1 releaseObject

See the *Device* interface's section for a description of the *releaseObject* operation (section 3.1.3.4.1.1.5.1) and its expected behavior.

3.1.3.4.1.7 LoadableObject

3.1.3.4.1.7.1 Description

This interface extends the *LoadableDevice* interface by adding software loading and unloading behavior to a device.

3.1.3.4.1.7.2 UML

The *LoadableObject* interface UML is depicted in Figure 3-50.

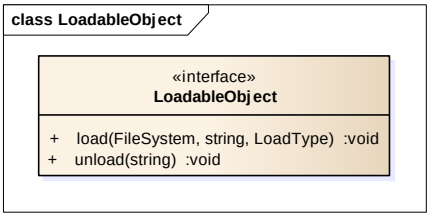

Figure 3-50: *LoadableObject* Interface UML

3.1.3.4.1.7.3 Types

3.1.3.4.1.7.3.1 LoadType

The LoadType defines the type of load to be performed. The load types are in accordance with the *code* element within the *softpkg* element's *implementation* element, which is defined in Appendix D-1.1.1.6.

enum LoadType

{

KERNEL_MODULE,

DRIVER,

SHARED_LIBRARY,

EXECUTABLE

};

3.1.3.4.1.7.3.2 InvalidLoadKind

The InvalidLoadKind exception indicates that the loadable device is unable to load the type of file designated by the loadKind parameter.

```
exception InvalidLoadKind{};
```

3.1.3.4.1.7.3.3 LoadFail

The LoadFail exception indicates that the *load* operation failed due to device dependent reasons. The LoadFail exception indicates that an error occurred during an attempt to load the input file onto the loadable device. The error number indicates a CF ErrorNumberType. The message is component-dependent, providing additional information describing the reason for the error.

```
exception LoadFail { ErrorNumberType errorNumber; string msg; };
```

3.1.3.4.1.7.4 Attributes

N/A

3.1.3.4.1.7.5 Operations

3.1.3.4.1.7.5.1 load

3.1.3.4.1.7.5.1.1 Brief Rationale

The *load* operation provides the mechanism for loading software on a loadable device. The loaded software may be subsequently executed on the device, if the device is an executable device.

3.1.3.4.1.7.5.1.2 Synopsis

```
void load (in FileSystem fs, in string fileName, in LoadType
loadKind) raises (InvalidState, InvalidLoadKind,
InvalidFileName, LoadFail);
```

3.1.3.4.1.7.5.1.3 Behavior

SCA268 The *load* operation shall load the file identified by the input fileName parameter on the ComponentBaseDevice based upon the input loadKind parameter. The input fileName parameter is a pathname relative to the file system identified by the input fs parameter

SCA269 Multiple loads of the same file as indicated by the input fileName parameter shall not result in an exception. However, the *load* operation should account for this multiple load so that the *unload* operation behavior can be performed.

3.1.3.4.1.7.5.1.4 Returns

This operation does not return any value.

3.1.3.4.1.7.5.1.5 Exceptions/Errors

SCA271 The *load* operation shall raise the InvalidLoadKind exception when the input loadKind parameter is not supported.

SCA272 The *load* operation shall raise the CF InvalidFileName exception when the file designated by the input fileName parameter cannot be found.

SCA273 The *load* operation shall raise the LoadFail exception when an attempt to load the device is unsuccessful.

3.1.3.4.1.7.5.2 unload

3.1.3.4.1.7.5.2.1 Brief Rationale

The *unload* operation provides the mechanism to unload software that is currently loaded.

3.1.3.4.1.7.5.2.2 Synopsis

```
void unload (in string fileName) raises (InvalidState,
InvalidFileName);
```

3.1.3.4.1.7.5.2.3 Behavior

SCA274 The *unload* operation shall unload the file identified by the input fileName parameter from the loadable device when the number of unload requests matches the number of load requests for the indicated file.

3.1.3.4.1.7.5.2.4 Returns

This operation does not return a value.

3.1.3.4.1.7.5.2.5 Exceptions/Errors

SCA276 The *unload* operation shall raise the CF InvalidFileName exception when the file designated by the input fileName parameter cannot be found.

3.1.3.4.1.8 ExecutableDevice

3.1.3.4.1.8.1 Description

This interface provides execute and terminate behavior for a device. The *ExecutableDevice* interface inherits from the *LifeCycle* and *LoadableObject* interfaces. The *ExecutableDevice* interface may also inherit from the *PropertySet*, *TestableObject*, *ControllableComponent*, *DeviceAttributes*, *CapacityManagement*, *ManageableComponent*, *ParentDevice*, and *PortAccessor* interfaces.

3.1.3.4.1.8.2 UML

The *ExecutableDevice* interface UML is depicted in Figure 3-51.

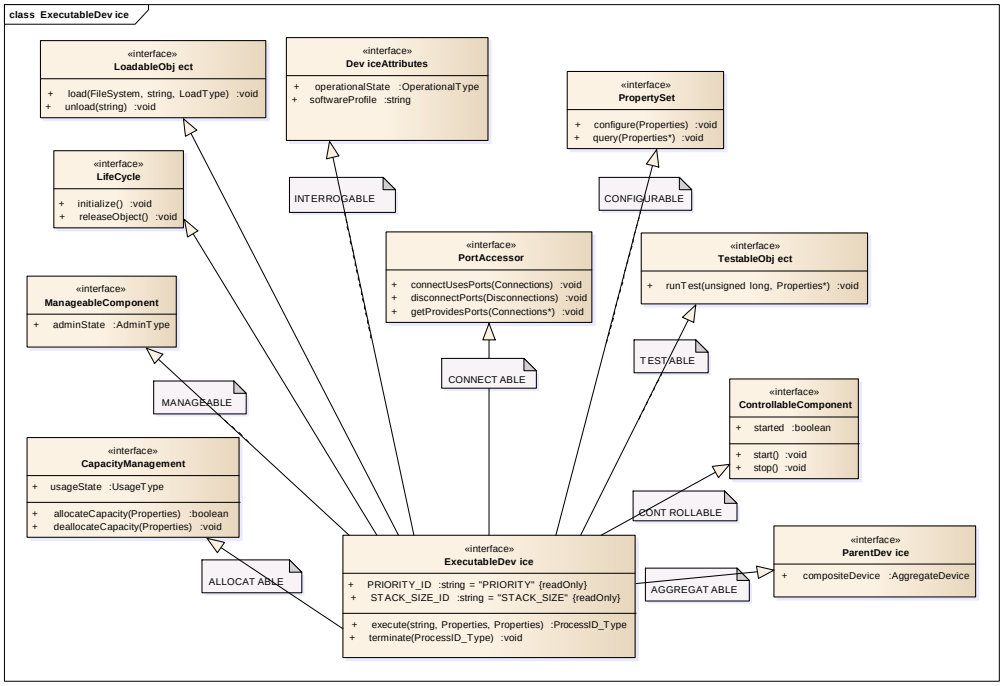

Figure 3-51: *ExecutableDevice* Interface UML

3.1.3.4.1.8.3 Types

3.1.3.4.1.8.3.1 InvalidProcess

The InvalidProcess exception indicates that a process, as identified by the processId parameter, does not exist on this device. The errorNumber parameter indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception InvalidProcess { ErrorNumberType errorNumber; string
msg; };
```

3.1.3.4.1.8.3.2 InvalidFunction

The InvalidFunction exception indicates that a function, as identified by the input name parameter, hasn't been loaded on this device.

```
exception InvalidFunction{};
```

3.1.3.4.1.8.3.3 ProcessID_Type

The ProcessID_Type defines a process number within the system. The process number is unique to the processor operating system that created the process.

```
typedef long ProcessID_Type;
```

3.1.3.4.1.8.3.4 InvalidParameters

The InvalidParameters exception indicates the input parameters are invalid on the *execute* operation. The InvalidParameters exception is raised when there are invalid execute parameters. The invalidParms parameter is a list of invalid parameters specified in the *execute* operation.

```
exception InvalidParameters { Properties invalidParms; };
```

3.1.3.4.1.8.3.5 InvalidOptions

The InvalidOptions exception indicates the input options are invalid on the *execute* operation. The invalidOpts parameter is a list of invalid options specified in the *execute* operation.

```
exception InvalidOptions { Properties invalidOpts; };
```

3.1.3.4.1.8.3.6 STACK_SIZE_ID

The STACK_SIZE_ID is the identifier for the *execute* operation options parameter. SCA277 The value for a stack size shall be an unsigned long.

```
const string STACK_SIZE_ID = "STACK_SIZE";
```

3.1.3.4.1.8.3.7 PRIORITY_ID

The PRIORITY_ID is the identifier for the *execute* operation options parameters. SCA278 The value for a priority shall be an unsigned long.

```
const string PRIORITY_ID = "PRIORITY";
```

3.1.3.4.1.8.3.8 ExecuteFail

The ExecuteFail exception indicates that the *execute* operation failed due to device dependent reasons. The ExecuteFail exception indicates that an error occurred during an attempt to invoke the operating system "execute/thread" function on the device. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception ExecuteFail { ErrorNumberType errorNumber; string msg;
};
```

3.1.3.4.1.8.4 Attributes

N/A.

3.1.3.4.1.8.5 Operations

3.1.3.4.1.8.5.1 execute

3.1.3.4.1.8.5.1.1 Brief Rationale

The *execute* operation provides the mechanism for starting up and executing a software process/thread on a device.

3.1.3.4.1.8.5.1.2 Synopsis

```
ProcessID_Type execute (in string name, in Properties options,
in Properties parameters) raises (InvalidState, InvalidFunction,
InvalidParameters, InvalidOptions, InvalidFileName,
ExecuteFail);
```

3.1.3.4.1.8.5.1.3 Behavior

SCA279 The *execute* operation shall execute the function or file identified by the input name parameter using the input parameters and options parameters. Whether the input name parameter is a function or a file name is device-implementation-specific.

SCA280 The *execute* operation shall map the input parameters (id/value string pairs) parameter as an argument to the operating system "execute/thread" function. The argument (e.g. argv) is an array of character pointers to null-terminated strings where the last member is a null pointer and the first element is the input name parameter. Thereafter the second element is mapped to the input parameters[0] id, the third element is mapped to the input parameters[0] value and so forth until the contents of the input parameters parameter are exhausted.

The *execute* operation input options parameters are STACK_SIZE_ID and PRIORITY_ID. SCA281 The *execute* operation shall use these options, when specified, to set the operating system's process/thread stack size and priority, for the executable image of the given input name parameter.

3.1.3.4.1.8.5.1.4 Returns

SCA282 The *execute* operation shall return a unique process ID for the process that it created.

3.1.3.4.1.8.5.1.5 Exceptions/Errors

SCA284 The *execute* operation shall raise the InvalidFunction exception when the function indicated by the input name parameter does not exist for the device to be executed.

SCA285 The *execute* operation shall raise the CF InvalidFileName exception when the file name indicated by the input name parameter does not exist for the device to be executed.

SCA286 The *execute* operation shall raise the InvalidParameters exception when the input parameter ID or value attributes are not valid strings.

SCA287 The *execute* operation shall raise the InvalidOptions exception when the input options parameter does not comply with sections 3.1.3.4.1.8.3.6 STACK_SIZE_ID and 3.1.3.4.1.8.3.7 PRIORITY_ID.

SCA288 The *execute* operation shall raise the ExecuteFail exception when the operating system "execute/thread" function is not successful.

3.1.3.4.1.8.5.2 terminate

3.1.3.4.1.8.5.2.1 Brief Rationale

The *terminate* operation provides the mechanism for terminating the execution of a process/thread on a specific device that was started up with the *execute* operation.

3.1.3.4.1.8.5.2.2 Synopsis

```
void terminate (in ProcessID_Type processId) raises
(InvalidProcess, InvalidState);
```

3.1.3.4.1.8.5.2.3 Behavior

SCA289 The *terminate* operation shall terminate the execution of the process/thread designated by the processId input parameter on the device to be executed.

3.1.3.4.1.8.5.2.4 Returns

This operation does not return a value.

3.1.3.4.1.8.5.2.5 Exceptions/Errors

SCA291 The *terminate* operation shall raise the InvalidProcess exception when the process Id does not exist for the device.

3.1.3.4.1.8.5.3 releaseObject

See the *Device* interface's section regarding the *releaseObject* operation (section 3.1.3.4.1.1.5.1) for release description and behavior.

3.1.3.4.1.9 AggregateDevice

3.1.3.4.1.9.1 Description

The *AggregateDevice* interface provides the required behavior that is needed to add and remove child devices from a parent device. This interface may be provided via inheritance or as a provides port for any device that is used as a parent device. Child devices use this interface to add or remove themselves to a parent device when being created or torn-down.

3.1.3.4.1.9.2 UML

The *AggregateDevice* interface UML is depicted in Figure 3-52.

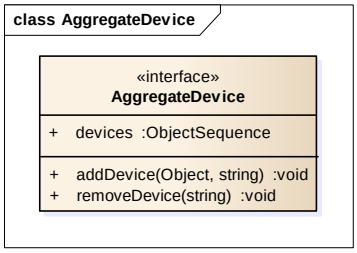

Figure 3-52: *AggregateDevice* Interface UML

3.1.3.4.1.9.3 Types

N/A.

3.1.3.4.1.9.4 Attributes

3.1.3.4.1.9.4.1 devices

SCA292 The readonly devices attribute shall return a list of devices that have been added to this device or a sequence length of zero if the device has no aggregation relationships with other devices.

```
readonly attribute ObjectSequence devices;
```

3.1.3.4.1.9.5 Operations

3.1.3.4.1.9.5.1 addDevice

3.1.3.4.1.9.5.1.1 Brief Rationale

The *addDevice* operation provides the mechanism to associate a device with another device. When a device changes state or it is being torn down, its associated devices are affected.

3.1.3.4.1.9.5.1.2 Synopsis

```
void addDevice (in Object associatedDevice, string identifier)
raises (InvalidObjectReference);
```

3.1.3.4.1.9.5.1.3 Behavior

SCA293 The *addDevice* operation shall add the input associatedDevice parameter to the AggregateDevice's devices attribute when the associatedDevice associated with the input identifier parameter does not exist in the devices attribute. The associatedDevice is ignored when the identifier duplicated.

3.1.3.4.1.9.5.1.4 Returns

This operation does not return any *value*.

3.1.3.4.1.9.5.1.5 Exceptions/Errors

SCA295 The *addDevice* operation shall raise the CF InvalidObjectReference when the input associatedDevice parameter is a nil object reference.

SCA531 The *addDevice* operation shall raise the CF InvalidObjectReference if the component represented within the input associatedDevice parameter does not realize the *Device*, *LoadableDevice* or *ExecutableDevice* interface.

3.1.3.4.1.9.5.2 removeDevice

3.1.3.4.1.9.5.2.1 Brief Rationale

The *removeDevice* operation provides the mechanism to disassociate a device from another device.

3.1.3.4.1.9.5.2.2 Synopsis

```
void removeDevice (in string identifier) raises
(InvalidObjectReference);
```

3.1.3.4.1.9.5.2.3 Behavior

SCA296 The *removeDevice* operation shall remove the device that corresponds to the input identifier parameter from the *AggregateDevice's* devices attribute.

3.1.3.4.1.9.5.2.4 Returns

This operation does not return any value.

3.1.3.4.1.9.5.2.5 Exceptions/Errors

SCA297 The *removeDevice* operation shall raise the CF InvalidObjectReference when the device that corresponds to the input identifier parameter is a nil object reference or does not exist in the *AggregateDevice* devices attribute.

3.1.3.4.2 **Components**

Base Device Components provide the structural definitions that will be utilized for the implementation and management of physical devices within the domain. The physical devices within the domain may be simple devices with no loadable, executable, or aggregate device behavior, or devices with a combination of these behaviors.

3.1.3.4.2.1 ComponentBaseDevice

3.1.3.4.2.1.1 Description

A ComponentBaseDevice is an abstract component that extends ComponentBase. ComponentBaseDevice contains the core associations and requirements that are used by the SCA device oriented components (DeviceComponent, LoadableDeviceComponent and

ExecutableDeviceComponent). This abstraction is necessary because even though the corresponding interfaces for those components do not share an inheritance relationship among themselves they share a common collection of interfaces. This secondary relationship allows the components to have the same baseline capabilities.

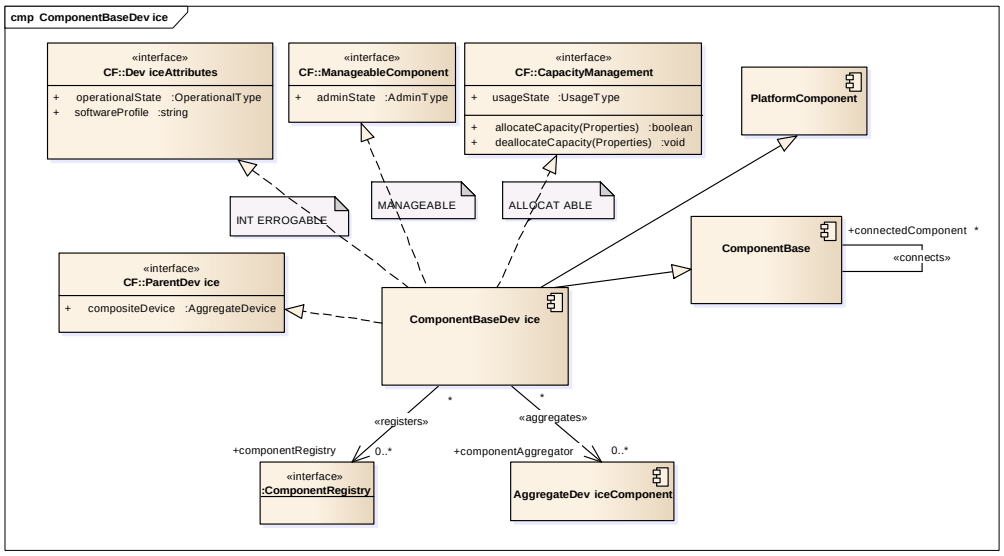

Figure 3-53: ComponentBaseDevice UML

3.1.3.4.2.1.2 Associations

- componentRegistry: A ComponentBaseDevice registers and unregisters with a DeviceManagerComponent via a componentRegistry upon creation.
- componentAggregator: A ComponentBaseDevice associates and disassociates itself with another ComponentBaseDevice via an AggregateDeviceComponent.

3.1.3.4.2.1.3 Semantics

A ComponentBaseDevice is a functional abstraction for a set (e.g., zero or more) of physical hardware devices and includes a collection of capability and capacity properties. ComponentBaseDevices communicate with a physical hardware devices via device drivers. They are typically used by applications but there is nothing restricting them being utilized by any other type of platform component.

SCA298 A ComponentBaseDevice shall register with its launching DeviceManagerComponent via the *ComponentRegistry::registerComponent* operation. SCA458 A child ComponentBaseDevice shall add itself to a parent device using the executable Composite Device IOR and DEVICE_ID parameters per 3.1.3.3.2.5.3. SCA299 The values associated with the parameters (PROFILE_NAME, COMPOSITE_DEVICE_IOR, and DEVICE_ID) as described in 3.1.3.3.2.5.3 shall be used to set the ComponentBaseDevice's softwareProfile, compositeDevice, and identifier attributes, respectively.

Each ComponentBaseDevice may have a DPD as described in 3.1.3.6. For each ComponentBaseDevice, allocation properties should be defined in its referenced SPD's property file.

3.1.3.4.2.1.3.1 State Model Behavior

SCA237 The *releaseObject* operation shall assign the LOCKED state to the adminState attribute, when the adminState attribute is UNLOCKED.

SCA238 The *releaseObject* operation shall call the *releaseObject* operation on all of the ComponentBaseDevices contained within its referenced AggregateDeviceComponent when the ComponentBaseDevice is a parent device.

SCA239 The *releaseObject* operation shall cause the removal of a ComponentBaseDevice from the referenced AggregateDeviceComponent of its parent when this ComponentBaseDevice is a child device.

SCA240 The *releaseObject* operation shall cause the device to be unavailable and released from the operating environment when the adminState attribute transitions to LOCKED. The transition to the LOCKED state signifies that the usageState attribute is IDLE and, if the device is a parent device that its child devices have been removed.

SCA256 The *allocateCapacity* operation shall raise the InvalidState exception when the device's adminState is not UNLOCKED.

SCA260 The *deallocateCapacity* operation shall set the adminState attribute to LOCKED as specified in this section.

SCA262 The *deallocateCapacity* operation shall raise the InvalidState exception, when the device's adminState is LOCKED.

SCA511 The *allocateCapacity* operation shall raise the InvalidState exception when the device's operationalState is DISABLED.

SCA516 The *deallocateCapacity* operation shall raise the InvalidState exception, when the device's operationalState is DISABLED.

SCA245 The adminState attribute, upon being commanded to be LOCKED, shall set the adminState to LOCKED for its entire aggregation of ComponentBaseDevices (if it has any). Refer to Figure 3-54 for an illustration of the above state behavior.

The adminState transitions to the LOCKED state when the device's usageState is IDLE and its entire aggregation of ComponentBaseDevices are LOCKED.

SCA247 The ComponentBaseDevice shall send a StateChangeEventType event to the Incoming Domain Management event channel, whenever the *adminState* attribute changes. For this event,

1. The *producerId* field is the identifier attribute of the device.
2. The *sourceId* field is the identifier attribute of the device.
3. The *stateChangeCategory* field is "ADMINISTRATIVE_STATE_EVENT".
4. The *stateChangeFrom* field is the value of the adminState attribute before the state change.
5. The *stateChangeTo* field is the value of the adminState attribute after the state change.

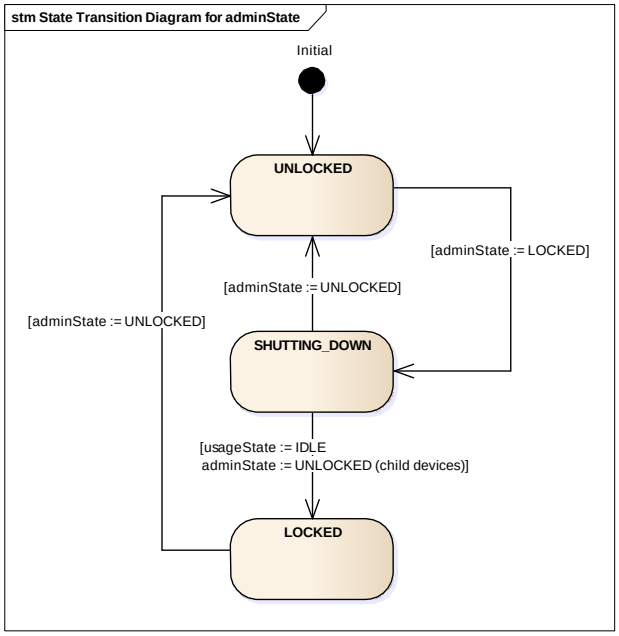

Figure 3-54: State Transition Diagram for adminState

SCA249 The ComponentBaseDevice shall send a StateChangeEventType event to the Incoming Domain Management event channel, whenever the usageState attribute changes. For this event,

1. The *producerId* field is the identifier attribute of the device.
2. The *sourceId* field is the identifier attribute of the device.
3. The *stateChangeCategory* field is "USAGE_STATE_EVENT".
4. The *stateChangeFrom* field is the value of the usageState attribute before the state change
5. The *stateChangeTo* field is the value of the usageState attribute after the state change.

SCA264 The ComponentBaseDevice shall send a StateChangeEventType event to the Incoming Domain Management event channel, whenever the operationalState attribute changes. For this event,

1. The *producerId* field is the identifier attribute of the device.
2. The *sourceId* field is the identifier attribute of the device.
3. The *stateChangeCategory* field is "OPERATIONAL_STATE_EVENT".
4. The *stateChangeFrom* field is the value of the operationalState attribute before the state change.
5. The *stateChangeTo* field is the value of the operationalState attribute after the state change.

3.1.3.4.2.1.4 Constraints

SCA303 A ComponentBaseDevice shall fulfill the ComponentBase requirements. SCA526 A ComponentBaseDevice shall fulfill the PlatformComponent requirements.

SCA534 A ComponentBaseDevice shall realize the *DeviceAttributes* interface.

SCA535 A ComponentBaseDevice shall realize the *ManageableComponent* interface.

SCA536 A ComponentBaseDevice shall realize the *CapacityManagement* interface.

SCA539 A ComponentBaseDevice shall realize the *ParentDevice* interface.

3.1.3.4.2.2 DeviceComponent

3.1.3.4.2.2.1 Description

The DeviceComponent description is represented by the ComponentBaseDevice.

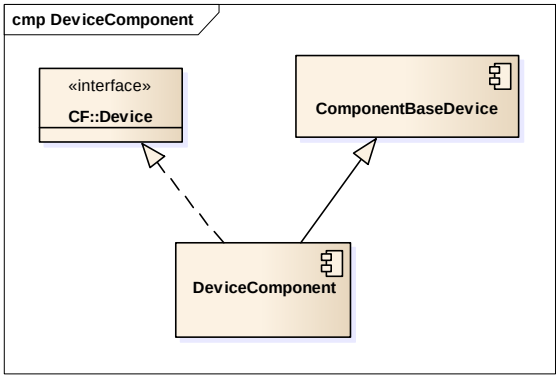

Figure 3-55: DeviceComponent UML

3.1.3.4.2.2.2 Associations

See section 3.1.3.4.2.1.2

3.1.3.4.2.2.3 Semantics

The DeviceComponent semantics are represented by the ComponentBaseDevice.

3.1.3.4.2.2.3.1 State Model Behavior

See section 3.1.3.4.2.1.3.1.

3.1.3.4.2.2.4 Constraints

SCA304 A DeviceComponent shall realize the *Device* interface.

SCA305 A DeviceComponent shall fulfill the ComponentBaseDevice requirements.

3.1.3.4.2.3 LoadableDeviceComponent

3.1.3.4.2.3.1 Description

The LoadableDeviceComponent extends the ComponentBaseDevice component by adding software loading and unloading behavior.

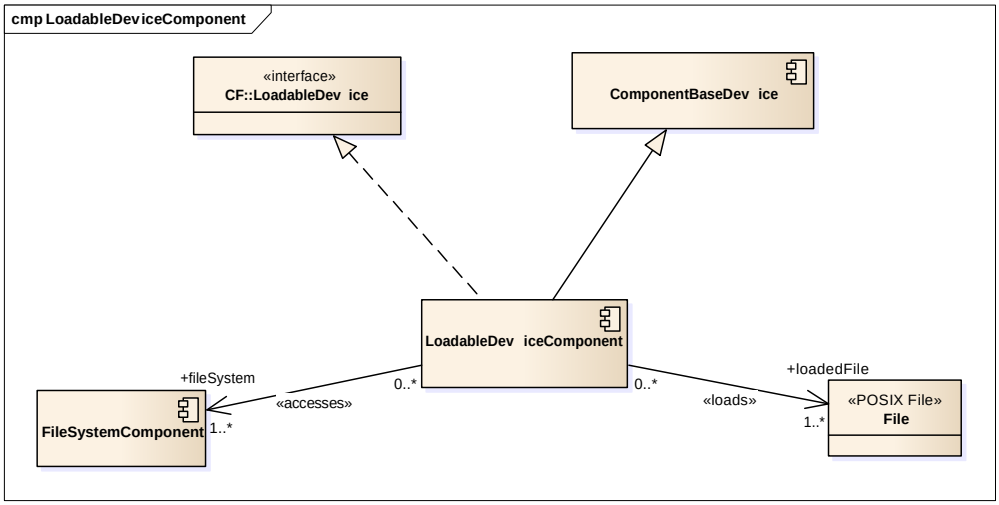

Figure 3-56: LoadableDeviceComponent UML

3.1.3.4.2.3.2 Associations

- fileSystem: A LoadableDeviceComponent accesses FileSystemComponent(s) in order to retrieve files which are to be loaded.
- loadedFile: A LoadableDeviceCompoment loads and unloads files into the domain.

3.1.3.4.2.3.3 Semantics

SCA306 The *load* operation shall support the load types as stated in the LoadableDeviceComponent's software profile LoadType allocation properties. SCA307 When a LoadType is not defined for the LoadableDeviceComponent, the *load* operation shall support all code types.

3.1.3.4.2.3.3.1 State Model Behavior

See section 3.1.3.4.2.1.3.1.

SCA512 The *load* operation shall raise the InvalidState exception if upon entry the device's operationalState attribute is DISABLED.

SCA513 The *unload* operation shall raise the InvalidState exception if upon entry the device's operationalState attribute is DISABLED.

SCA270 The *load* operation shall raise the InvalidState exception if upon entry the device's adminState attribute is either LOCKED or SHUTTING_DOWN.

SCA275 The *unload* operation shall raise the InvalidState exception if upon entry the device's adminState attribute is LOCKED.

3.1.3.4.2.3.4 Constraints

SCA308 A LoadableDeviceComponent shall realize the *LoadableDevice* interface.

SCA309 A LoadableDeviceComponent shall fulfill the ComponentBaseDevice requirements.

3.1.3.4.2.4 ExecutableDeviceComponent

3.1.3.4.2.4.1 Description

The ExecutableDeviceComponent extends the ComponentBaseDevice by adding execute and terminate process/thread behavior. An ExecutableDeviceComponent accepts executable parameters as specified in the (*ExecutableDevice::execute)* section.

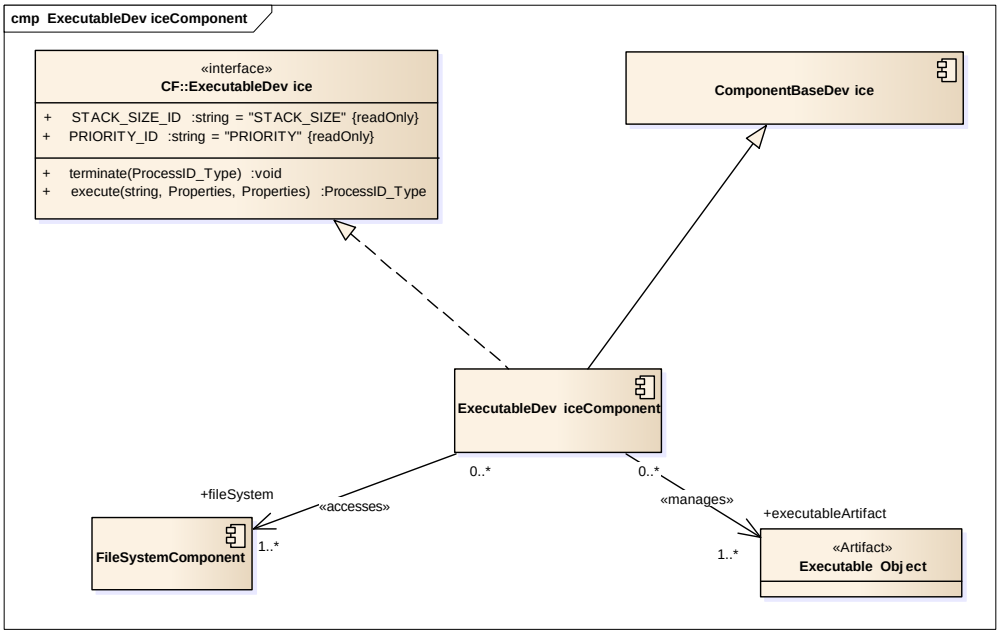

Figure 3-57: ExecutableDeviceComponent UML

3.1.3.4.2.4.2 Associations

- executableArtifact: An ExecutableDeviceComponent loads, unloads, executes and terminates artifact(s) (i.e. processes, executables or modules) within a processing environment.
- fileSystem: An ExecutableDeviceCompoment accesses FileSystemComponent(s) in order to retrieve files which are to be executed.

3.1.3.4.2.4.3 Semantics

SCA310 An ExecutableDeviceComponent shall accept the executable parameters as specified in section 3.1.3.4.1.8.5.1.3 (*ExecutableDevice::execute*).

See section 3.1.3.4.2.3.3.

3.1.3.4.2.4.3.1 State Model Behavior

SCA283 The *execute* operation shall raise the InvalidState exception if upon entry the device's adminState attribute is either LOCKED or SHUTTING_DOWN.

SCA514 The *execute* operation shall raise the InvalidState exception if upon entry the device's operationalState attribute is DISABLED.

SCA290 The *terminate* operation shall raise the InvalidState exception if upon entry the device's adminState attribute is LOCKED.

SCA515 The *terminate* operation shall raise the InvalidState exception if upon entry the device's operationalState attribute is DISABLED.

3.1.3.4.2.4.4 Constraints

SCA311 An ExecutableDeviceComponent shall realize the *ExecutableDevice* interface.

SCA312 An ExecutableDeviceComponent shall fulfill the ComponentBaseDevice requirements.

3.1.3.4.2.5 AggregateDeviceComponent

3.1.3.4.2.5.1 Description

An AggregateDeviceComponent provides behavior to add and remove child ComponentBaseDevices from a parent ComponentBaseDevice. Child ComponentBaseDevices are provided with and use a reference to an AggregateDeviceComponent to introduce or remove an association between themselves and a parent ComponentBaseDevice that manages the composition. When a parent ComponentBaseDevice changes state or is released, its associated ComponentBaseDevices change correspondingly.

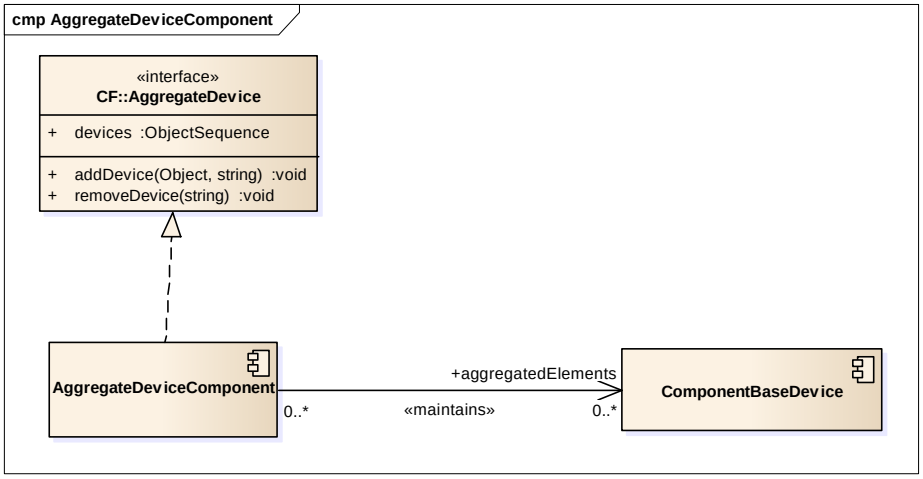

Figure 3-58: AggregateDeviceComponent UML

3.1.3.4.2.5.2 Associations

- aggregatedElements: An AggregateDeviceComponent manages, adds and deletes, ComponentBaseDevice(s) that are children of its associated ComponentBaseDevice.

3.1.3.4.2.5.3 Semantics

N/A

3.1.3.4.2.5.4 Constraints

SCA313 An AggregateDeviceComponent shall realize the *AggregateDevice* interface.

3.1.3.5 Framework Services

3.1.3.5.1 **Interfaces**

Framework Services Interfaces are implemented using interface definitions expressed in a Platform Specific representation of one of the Appendix E enabling technologies.

3.1.3.5.1.1 File

3.1.3.5.1.1.1 Description

The *File* interface provides the ability to read and write files residing within a compliant, distributed file system. The *File* interface is modeled after the POSIX/C file interface.

3.1.3.5.1.1.2 UML

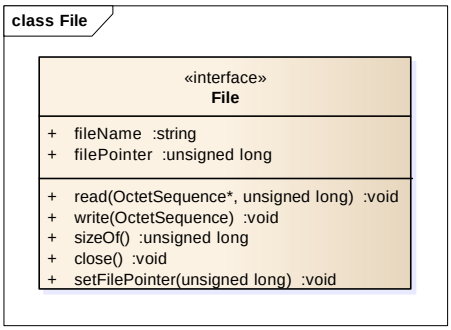

Figure 3-59: *File* Interface UML

3.1.3.5.1.1.3 Types

3.1.3.5.1.1.3.1 IOException

The IOException exception indicates an error occurred during a *read* or *write* operation to a file. The error number indicates a CF ErrorNumberType value. The message is component-dependent, providing additional information describing the reason for the error.

```
exception IOException { ErrorNumberType errorNumber; string msg;
};
```

3.1.3.5.1.1.3.2 InvalidFilePointer

The InvalidFilePointer exception indicates the file pointer is out of range based upon the current file size.

```
exception InvalidFilePointer{};
```

3.1.3.5.1.1.4 Attributes

3.1.3.5.1.1.4.1 fileName

SCA320 The readonly fileName attribute shall return the pathname used as the input fileName parameter of the *FileSystem::create* operation when the file was created.

```
readonly attribute string fileName;
```

3.1.3.5.1.1.4.2 filePointer

SCA321 The readonly filePointer attribute shall return the current file position. The filePointer attribute value dictates where the next read or write will occur.

```
readonly attribute unsigned long filePointer;
```

3.1.3.5.1.1.5 Operations

3.1.3.5.1.1.5.1 read

3.1.3.5.1.1.5.1.1 Brief Rationale

Applications require the *read* operation in order to retrieve data from remote files.

3.1.3.5.1.1.5.1.2 Synopsis

```
void read (out OctetSequence data, in unsigned long length)
raises (IOException);
```

3.1.3.5.1.1.5.1.3 Behavior

SCA322 The *read* operation shall read, from the referenced file, the number of octets specified by the input length parameter and advance the value of the filePointer attribute by the number of octets actually read. SCA323 The *read* operation shall read less than the number of octets specified in the input length parameter, when an end-of-file is encountered.

3.1.3.5.1.1.5.1.4 Returns

SCA324 The *read* operation shall return a CF OctetSequence that equals the number of octets actually read from the file via the out data parameter. SCA325 If the filePointer attribute value reflects the end of the file, the *read* operation shall return a zero-length CF OctetSequence.

3.1.3.5.1.1.5.1.5 Exceptions/Errors

SCA326 The *read* operation shall raise the IOException when a read error occurs.

3.1.3.5.1.1.5.2 write

3.1.3.5.1.1.5.2.1 Brief Rationale

Applications require the *write* operation in order to write data to remote files.

3.1.3.5.1.1.5.2.2 Synopsis

```
void write (in OctetSequence data) raises (IOException);
```

3.1.3.5.1.1.5.2.3 Behavior

SCA327 The *write* operation shall write data to the file referenced. SCA328 The *write* operation shall increment the filePointer attribute to reflect the number of octets written, when the operation is successful. SCA329 If the *write* operation is unsuccessful, the value of the filePointer attribute shall maintain or be restored to its value prior to the *write* operation call. If the file was opened using the *FileSystem::open* operation with an input read_Only parameter value of TRUE, writes to the file are considered to be in error.

3.1.3.5.1.1.5.2.4 Returns

This operation does not return any value.

3.1.3.5.1.1.5.2.5 Exceptions/Errors

SCA330 The *write* operation shall raise the IOException when a write error occurs.

3.1.3.5.1.1.5.3 sizeOf

3.1.3.5.1.1.5.3.1 Brief Rationale

An application may need to know the size of a file in order to determine memory allocation requirements.

3.1.3.5.1.1.5.3.2 Synopsis

```
unsigned long sizeOf() raises (FileException);
```

3.1.3.5.1.1.5.3.3 Behavior

There is no significant behavior beyond the behavior described by the following section.

3.1.3.5.1.1.5.3.4 Returns

SCA331 The *sizeOf* operation shall return the number of octets stored in the file.

3.1.3.5.1.1.5.3.5 Exceptions/Errors

SCA443 The *sizeOf* operation shall raise the CF FileException when a file-related error occurs (e.g., file does not exist anymore).

3.1.3.5.1.1.5.4 close

3.1.3.5.1.1.5.4.1 Brief Rationale

The *close* operation is needed in order to release file resources once they are no longer needed.

3.1.3.5.1.1.5.4.2 Synopsis

```
void close() raises (FileException);
```

3.1.3.5.1.1.5.4.3 Behavior

SCA332 The *close* operation shall release any OE file resources associated with the component.
SCA333 The *close* operation shall make the file unavailable to the component.

3.1.3.5.1.1.5.4.4 Returns

This operation does not return any value.

3.1.3.5.1.1.5.4.5 Exceptions/Errors.

SCA334 The *close* operation shall raise the CF FileException when it cannot successfully close the file.

3.1.3.5.1.1.5.5 setFilePointer

3.1.3.5.1.1.5.5.1 Brief Rationale

The *setFilePointer* operation positions the file pointer where the next read or write will occur.

3.1.3.5.1.1.5.5.2 Synopsis

```
void setFilePointer (in unsigned long filePointer) raises
(InvalidFilePointer, FileException);
```

3.1.3.5.1.1.5.5.3 Behavior

SCA335 The *setFilePointer* operation shall set the filePointer attribute value to the input filePointer.

3.1.3.5.1.1.5.5.4 Returns

This operation does not return any value.

3.1.3.5.1.1.5.5.5 Exceptions/Errors

SCA336 The *setFilePointer* operation shall raise the CF FileException when the file pointer for the referenced file cannot be set to the value of the input filePointer parameter.

SCA337 The *setFilePointer* operation shall raise the InvalidFilePointer exception when the value of the filePointer parameter exceeds the file size.

3.1.3.5.1.2 FileSystem

3.1.3.5.1.2.1 Description

The *FileSystem* interface defines operations that enable remote access to a physical file system (see Figure 3-60).

3.1.3.5.1.2.2 UML

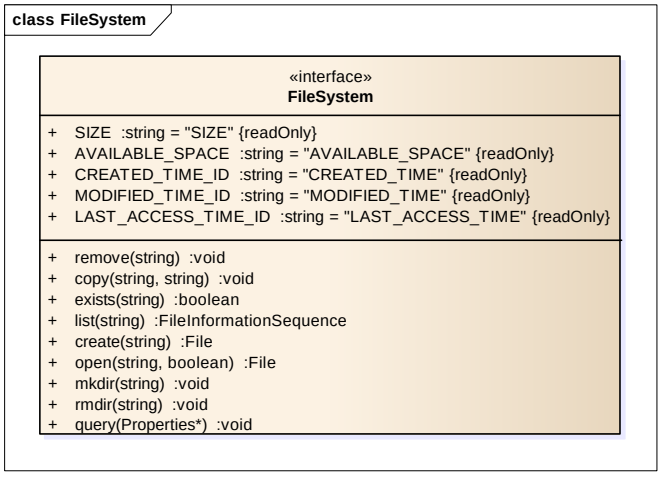

Figure 3-60: *FileSystem* Interface UML

3.1.3.5.1.2.3 Types

3.1.3.5.1.2.3.1 UnknownFileSystemProperties.

The UnknownFileSystemProperties exception indicates a set of properties unknown by the component.

```
exception UnknownFileSystemProperties { properties
invalidProperties; };
```

3.1.3.5.1.2.3.2 fileSystemProperties Query Constants

Constants are defined to be used for the *query* operation (see section 3.1.3.5.1.2.5.9).

```
const string SIZE = "SIZE";
const string AVAILABLE_SPACE = "AVAILABLE_SPACE";
```

3.1.3.5.1.2.3.3 FileInformationType

The FileInformationType indicates the information returned for a file. Not all the fields in the FileInformationType are applicable for all file systems. SCA338 At a minimum, the *FileSystem* interface implementation shall support name, kind, and size information for a file. Examples of other file properties that may be specified are created time, modified time, and last access time.

```
struct FileInformationType
{
     string              name;
     FileType            kind;
     unsigned long long  size;
```

```
    Properties          fileProperties;
};
```

The name field of the FileInformationType struct indicates the simple name of the file. The kind field of the FileInformationType struct indicates the type of the file entry. The size field of the FileInformationType struct indicates the size in octets.

3.1.3.5.1.2.3.4 FileInformationSequence

The FileInformationSequence type defines an unbounded sequence of FileInformationTypes.

```
typedef sequence<FileInformationType>FileInformationSequence;
```

3.1.3.5.1.2.3.5 FileType

The FileType indicates the type of file entry. A file system may have PLAIN or DIRECTORY files and mounted file systems contained in a file system.

```
enum FileType
{
    PLAIN,
    DIRECTORY,
    FILE_SYSTEM
};
```

3.1.3.5.1.2.3.6 CREATED_TIME_ID

The fileProperties field of the FileInformationType struct may be used to indicate the time a file was created. SCA445 For this property, the identifier is CREATED_TIME_ID and the value shall be an unsigned long long data type containing the number of seconds since 00:00:00 UTC, Jan 1, 1970.

```
const string CREATED_TIME_ID = "CREATED_TIME";
```

3.1.3.5.1.2.3.7 MODIFIED_TIME_ID

The fileProperties element of the FileInformationType struct may be used to indicate the time a file was last modified. SCA446 For this property, the identifier is MODIFIED_TIME_ID and the value shall be an unsigned long long data type containing the number of seconds since 00:00:00 UTC, Jan 1, 1970.

```
const string MODIFIED_TIME_ID="MODIFIED_TIME";
```

3.1.3.5.1.2.3.8 LAST_ACCESS_TIME_ID

The fileProperties element of the FileInformationType struct may be used to indicate the time a file was last accessed. SCA447 For this property, the identifier is LAST_ACCESS_TIME_ID and the value shall be an unsigned long long data type containing the number of seconds since 00:00:00 UTC, Jan 1, 1970.

```
const string LAST_ACCESS_TIME_ID="LAST_ACCESS_TIME";
```

3.1.3.5.1.2.4 Attributes

N/A

3.1.3.5.1.2.5 Operations

3.1.3.5.1.2.5.1 remove

3.1.3.5.1.2.5.1.1 Brief Rationale

The *remove* operation provides the ability to remove a plain file from a file system.

3.1.3.5.1.2.5.1.2 Synopsis

```
void remove (in string fileName) raises (FileException,
InvalidFileName);
```

3.1.3.5.1.2.5.1.3 Behavior

SCA339 The *remove* operation shall remove the plain file which corresponds to the input fileName parameter.

3.1.3.5.1.2.5.1.4 Returns

This operation does not return any value.

3.1.3.5.1.2.5.1.5 Exceptions/Errors

SCA340 The *remove* operation shall raise the CF InvalidFileName exception when the input fileName parameter is not a valid absolute pathname.

SCA341 The *remove* operation shall raise the CF FileException when a file-related error occurs.

3.1.3.5.1.2.5.2 copy

3.1.3.5.1.2.5.2.1 Brief Rationale

The *copy* operation provides the ability to copy a plain file to another plain file.

3.1.3.5.1.2.5.2.2 Synopsis

```
void copy (in string sourceFileName, in string
destinationFileName) raises (InvalidFileName, FileException);
```

3.1.3.5.1.2.5.2.3 Behavior

SCA342 The *copy* operation shall copy the source file identified by the input sourceFileName parameter to the destination file identified by the input destinationFileName parameter.

SCA343 The *copy* operation shall overwrite the destination file, when the destination file already exists and is not identical to the source file.

3.1.3.5.1.2.5.2.4 Returns

This operation does not return any value.

3.1.3.5.1.2.5.2.5 Exceptions/Errors

SCA344 The *copy* operation shall raise the CF FileException exception when a file-related error occurs.

SCA345 The *copy* operation shall raise the CF InvalidFileName exception when the destination pathname is identical to the source pathname.

SCA346 The *copy* operation shall raise the CF InvalidFileName exception when the sourceFileName or destinationFileName input parameter is not a valid absolute pathname.

3.1.3.5.1.2.5.3 exists

3.1.3.5.1.2.5.3.1 Brief Rationale

The *exists* operation provides the ability to verify the existence of a file within a file system.

3.1.3.5.1.2.5.3.2 Synopsis

```
boolean exists (in string fileName) raises (InvalidFileName);
```

3.1.3.5.1.2.5.3.3 Behavior

SCA347 The *exists* operation shall check to see if a file exists based on the fileName parameter.

3.1.3.5.1.2.5.3.4 Returns

SCA348 The *exists* operation shall return TRUE if the file exists, or FALSE if it does not.

3.1.3.5.1.2.5.3.5 Exceptions/Errors

SCA349 The *exists* operation shall raise the CF InvalidFileName exception when input fileName parameter is not a valid absolute pathname.

3.1.3.5.1.2.5.4 list

3.1.3.5.1.2.5.4.1 Brief Rationale

The *list* operation provides the ability to obtain a list of files along with their information in the file system according to a given search pattern. The *list* operation may be used to return information for one file or for a set of files.

3.1.3.5.1.2.5.4.2 Synopsis

```
FileInformationSequence list (in string pattern) raises
(FileException, InvalidFileName);
```

3.1.3.5.1.2.5.4.3 Behavior

SCA448 The *list* operation shall support the "*" and "?" wildcard characters (used to match any sequence of characters, including null, and any single character, respectively). SCA350 These wildcards shall only be applied following the right-most forward-slash character ("/") in the pathname contained in the input pattern parameter.

3.1.3.5.1.2.5.4.4 Returns

SCA351 The *list* operation shall return a FileInformationSequence for files that match the search pattern specified in the input pattern parameter. SCA352 The *list* operation shall return a zero length sequence when no file is found which matches the search pattern.

3.1.3.5.1.2.5.4.5 Exceptions/Errors

SCA353 The *list* operation shall raise the CF InvalidFileName exception when the input pattern parameter is not an absolute pathname or cannot be interpreted due to unexpected characters.

SCA354 The *list* operation shall raise the CF FileException when a file-related error occurs.

3.1.3.5.1.2.5.5 create

3.1.3.5.1.2.5.5.1 Brief Rationale

The *create* operation provides the ability to create a new plain file on the file system.

3.1.3.5.1.2.5.5.2 Synopsis

```
File create (in string fileName) raises (InvalidFileName,
FileException);
```

3.1.3.5.1.2.5.5.3 Behavior

SCA355 The *create* operation shall create a new file based upon the input fileName parameter.

3.1.3.5.1.2.5.5.4 Returns

SCA356 The *create* operation shall return a file object reference to the created file.

3.1.3.5.1.2.5.5.5 Exceptions/Errors

SCA357 The *create* operation shall raise the CF FileException if the file already exists or another file error occurred.

SCA358 The *create* operation shall raise the CF InvalidFileName exception when the input fileName parameter is not a valid absolute pathname.

3.1.3.5.1.2.5.6 open

3.1.3.5.1.2.5.6.1 Brief Rationale

The *open* operation provides the ability to open a plain file for read or write.

3.1.3.5.1.2.5.6.2 Synopsis

```
File open (in string fileName, in boolean read_Only) raises
(InvalidFileName, FileException);
```

3.1.3.5.1.2.5.6.3 Behavior

SCA359 The *open* operation shall open the file referenced by the input fileName parameter. SCA360 The *open* operation shall open the file with read-only access when the input read_Only parameter is TRUE. SCA361 The *open* operation shall open the file for write access when the input read_Only parameter is FALSE.

3.1.3.5.1.2.5.6.4 Returns

SCA362 The *open* operation shall return a FileComponent reference for the opened file. SCA363 The *open* operation shall set the filePointer attribute of the returned file instance to the beginning of the file.

3.1.3.5.1.2.5.6.5 Exceptions/Errors

SCA364 The *open* operation shall raise the CF FileException if the file does not exist or another file error occurred.

SCA365 The *open* operation shall raise the CF InvalidFileName exception when the input fileName parameter is not a valid absolute pathname.

3.1.3.5.1.2.5.7 mkdir

3.1.3.5.1.2.5.7.1 Brief Rationale

The *mkdir* operation provides the ability to create a directory on the file system.

3.1.3.5.1.2.5.7.2 Synopsis

```
void mkdir (in string directoryName) raises (InvalidFileName,
FileException);
```

3.1.3.5.1.2.5.7.3 Behavior

SCA366 The *mkdir* operation shall create a file system directory based on the directoryName given. SCA367 The *mkdir* operation shall create all parent directories required to create the directoryName path given.

3.1.3.5.1.2.5.7.4 Returns.

This operation does not return any value.

3.1.3.5.1.2.5.7.5 Exceptions/Errors

SCA368 The *mkdir* operation shall raise the CF FileException if the directory indicated by the input directoryName parameter already exists or if a file-related error occurred during the operation.

SCA369 The *mkdir* operation shall raise the CF InvalidFileName exception when the directoryName is not a valid directory name.

3.1.3.5.1.2.5.8 rmdir

3.1.3.5.1.2.5.8.1 Brief Rationale

The *rmdir* operation provides the ability to remove a directory from the file system.

3.1.3.5.1.2.5.8.2 Synopsis

```
void rmdir (in string directoryName) raises (InvalidFileName,
FileException);
```

3.1.3.5.1.2.5.8.3 Behavior

SCA370 The *rmdir* operation shall remove the directory identified by the input directoryName parameter.

SCA371 The *rmdir* operation shall not remove the directory identified by the input directoryName parameter when the directory contains files.

3.1.3.5.1.2.5.8.4 Returns

This operation does not return any value.

3.1.3.5.1.2.5.8.5 Exceptions/Errors

SCA372 The *rmdir* operation shall raise the CF FileException when the directory identified by the input directoryName parameter does not exist, the directory contains files, or an error occurs which prohibits the directory from being deleted.

SCA373 The *rmdir* operation shall raise the CF InvalidFileName exception when the input directoryName parameter is not a valid path prefix.

3.1.3.5.1.2.5.9 query

3.1.3.5.1.2.5.9.1 Brief Rationale

The *query* operation provides the ability to retrieve information about a file system.

3.1.3.5.1.2.5.9.2 Synopsis

```
void query (inout Properties fileSystemProperties) raises
(UnknownFileSystemProperties);
```

3.1.3.5.1.2.5.9.3 Behavior

SCA374 The *query* operation shall return file system information to the calling client based upon the given fileSystemProperties' ID.

SCA440 The *FileSystem::query* operation shall recognize and provide the designated return values for the following fileSystemProperties (section 3.1.3.5.1.2.3.2):

1. SIZE - an ID value of "SIZE" causes the *query* operation to return an unsigned long long containing the file system size (in octets);
2. AVAILABLE_SPACE - an ID value of "AVAILABLE_SPACE" causes the *query* operation to return an unsigned long long containing the available space on the file system (in octets).

See section 3.1.3.5.1.2.3.2 for the constants for the fileSystemProperties.

3.1.3.5.1.2.5.9.4 Returns

This operation does not return any value.

3.1.3.5.1.2.5.9.5 Exceptions/Errors

SCA375 The *query* operation shall raise the UnknownFileSystemProperties exception when the given file system property is not recognized.

3.1.3.5.1.3 FileManager

3.1.3.5.1.3.1 Description

Multiple, distributed file systems may be accessed through a file manager. The *FileManager* interface, shown in Figure 3-61, appears to be a single file system although the actual file storage

may span multiple physical file systems. This is called a federated file system. A federated file system is managed using the *mount* and *unmount* operations. Typically, the domain manager or system initialization software will invoke these operations.

The *FileManager* inherits the IDL interface of a *FileSystem.*

3.1.3.5.1.3.2 UML

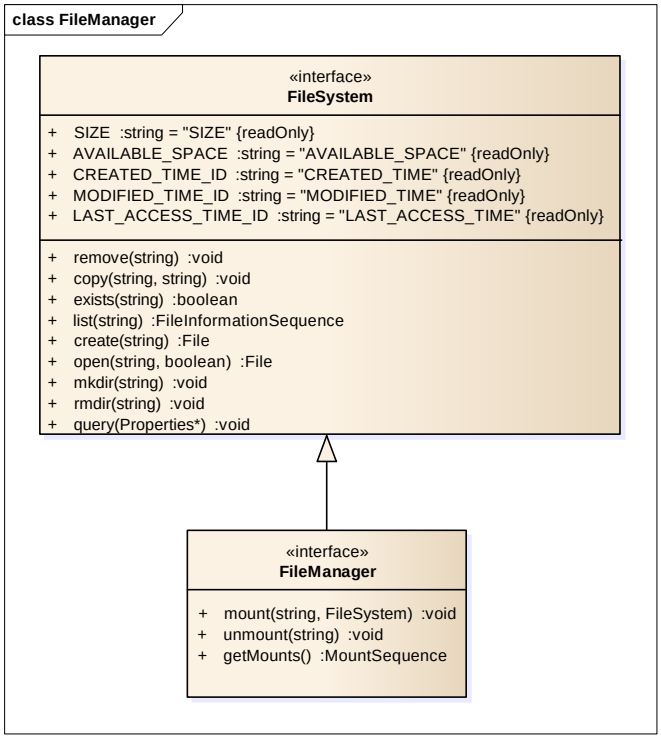

Figure 3-61: *FileManager* Interface UML

3.1.3.5.1.3.3 Types

3.1.3.5.1.3.3.1 MountType

The MountType structure identifies the file systems mounted within the file manager.

```
struct MountType
{
     string mountPoint;
     FileSystem fs;
};
```

3.1.3.5.1.3.3.2 MountSequence

The MountSequence is an unbounded sequence of MountTypes.

```
typedef sequence <MountType> MountSequence;
```

3.1.3.5.1.3.3.3 NonExistentMount

The NonExistentMount exception indicates a mount point does not exist within the file manager.

```
exception NonExistentMount{};
```

3.1.3.5.1.3.3.4 MountPointAlreadyExists

The MountPointAlreadyExists exception indicates the mount point is already in use in the file manager.

```
exception MountPointAlreadyExists{};
```

3.1.3.5.1.3.3.5 InvalidFileSystem

The InvalidFileSystem exception indicates the *FileSystem* is a null (nil) object reference.

```
exception InvalidFileSystem{};
```

3.1.3.5.1.3.4 Attributes

N/A

3.1.3.5.1.3.5 Operations

3.1.3.5.1.3.5.1 mount

3.1.3.5.1.3.5.1.1 Brief Rationale

The *FileManager* interface supports the notion of a federated file system. To create a federated file system, the *mount* operation associates a file system with a mount point (a directory name).

3.1.3.5.1.3.5.1.2 Synopsis

```
void mount (in string mountPoint, in FileSystem file_System)
raises (InvalidFileName, InvalidFileSystem,
MountPointAlreadyExists);
```

3.1.3.5.1.3.5.1.3 Behavior

SCA376 The *mount* operation shall associate the specified file system with the mount point referenced by the input mountPoint parameter. SCA377 A mount point name shall begin with a "/" (forward slash character). The input mountPoint parameter is a logical directory name for a file system.

3.1.3.5.1.3.5.1.4 Returns.

This operation does not return any value.

3.1.3.5.1.3.5.1.5 Exceptions/Errors.

SCA461 The *mount* operation shall raise the CF InvalidFileName exception when the input mount point does not conform to the file name syntax in section 3.1.3.5.2.2.3.

SCA378 The *mount* operation shall raise the MountPointAlreadyExists exception when the mount point already exists in the file manager.

SCA379 The *mount* operation shall raise the InvalidFileSystem exception when the input *FileSystem* is a null object reference.

3.1.3.5.1.3.5.2 unmount

3.1.3.5.1.3.5.2.1 Brief Rationale

Mounted file systems may need to be removed from a file manager.

3.1.3.5.1.3.5.2.2 Synopsis

```
void unmount (in string mountPoint) raises (NonExistentMount);
```

3.1.3.5.1.3.5.2.3 Behavior

SCA380 The *unmount* operation shall remove a mounted file system from the file manager whose mounted name matches the input mountPoint name.

3.1.3.5.1.3.5.2.4 Returns

This operation does not return any value.

3.1.3.5.1.3.5.2.5 Exceptions/Errors

SCA381 The *unmount* operation shall raise the NonExistentMount exception when the mount point does not exist.

3.1.3.5.1.3.5.3 getMounts

3.1.3.5.1.3.5.3.1 Brief Rationale

File management user interfaces may need to list a file manager's mounted file systems.

3.1.3.5.1.3.5.3.2 Synopsis

```
MountSequence getMounts();
```

3.1.3.5.1.3.5.3.3 Behavior

The *getMounts* operation returns a MountSequence that describes the mounted file systems.

3.1.3.5.1.3.5.3.4 Returns

SCA382 The *getMounts* operation shall return a MountSequence that contains the file systems mounted within the file manager.

3.1.3.5.1.3.5.3.5 Exceptions/Errors

This operation does not raise any exceptions.

3.1.3.5.1.3.5.4 query

3.1.3.5.1.3.5.4.1 Brief Rationale

The inherited *query* operation provides the ability to retrieve the same information for a set of file systems.

3.1.3.5.1.3.5.4.2 Synopsis

```
void query (inout Properties fileSystemProperties) raises
(UnknownFileSystemProperties);
```

3.1.3.5.1.3.5.4.3 Behavior

SCA383 The *query* operation shall return the combined mounted file systems information to the calling client based upon the given input fileSystemProperties' ID elements. SCA441 As a minimum, the *query* operation shall support the following input fileSystemProperties ID elements:

1. SIZE - a property item ID value of "SIZE" causes the *query* operation to return the combined total size of all the mounted file system as an unsigned long long property value.
2. AVAILABLE_SPACE - a property item ID value of "AVAILABLE_SPACE" causes the *query* operation to return the combined total available space (in octets) of all the mounted file system as unsigned long long property value.

3.1.3.5.1.3.5.4.4 Returns

This operation does not return any value.

3.1.3.5.1.3.5.4.5 Exceptions/Errors

SCA384 The *query* operation shall raise the UnknownFileSystemProperties exception when the input fileSystemProperties parameter contains an invalid property ID element.

3.1.3.5.2 **Components**

Framework Services Components provide general software capabilities (not directly associated with logical devices) that will be utilized by platform developers.

The File Services (FileComponent, FileSystemComponent and FileManagerComponent) consist of interfaces and components that are used to manage and access a potentially distributed file system. The File Services are used for installation and removal of application and artifact files within the system, and for loading and unloading those files on the various processors that they execute upon.

3.1.3.5.2.1 FileComponent

3.1.3.5.2.1.1 Description

The FileComponent provides the ability to read and write files residing within a file system**.**

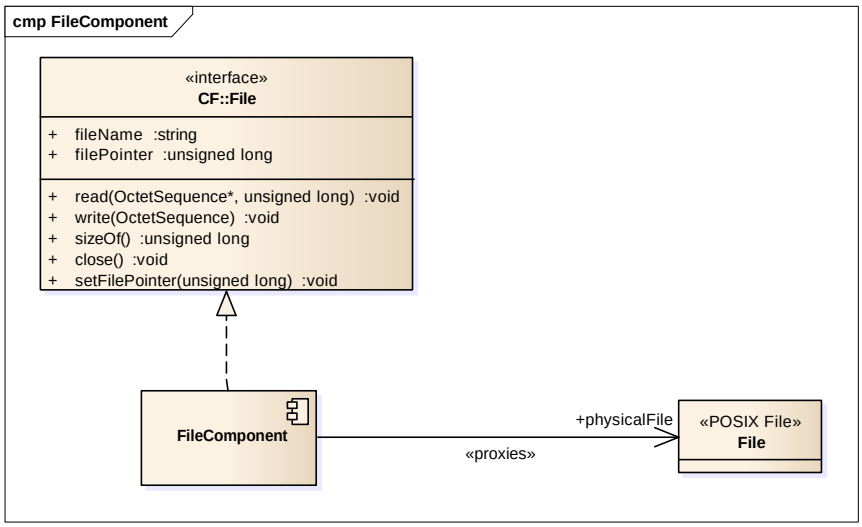

Figure 3-62: FileComponent UML

3.1.3.5.2.1.2 Associations

- physicalFile: A FileComponent is the logical proxy for a physical file that resides on the actual file system.

3.1.3.5.2.1.3 Semantics

SCA397 A FileComponent's filePointer attribute shall be set to the beginning of the file when a FileComponent is opened for read only or created for the first time. SCA398 A FileComponent's filePointer attribute shall be set at the end of the file when a FileComponent already exists and is opened for write.

3.1.3.5.2.1.4 Constraints

SCA399 A FileComponent shall realize the *File* interface.

3.1.3.5.2.2 FileSystemComponent

3.1.3.5.2.2.1 Description

A FileSystemComponent realizes the *FileSystem* interface, may be associated with a FileManagerComponent and consists of many FileComponents. The FileSystemComponent provides a container for managing the lifespan and organization of FileComponents.

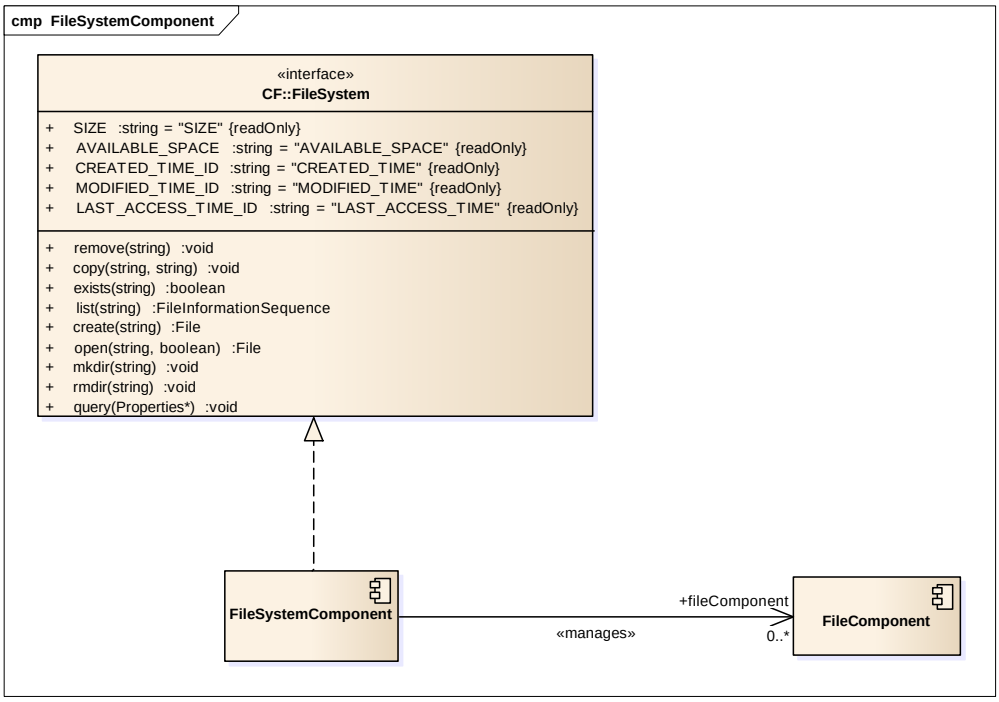

Figure 3-63: FileSystemComponent UML

3.1.3.5.2.2.2 Associations

- fileComponent: A FileSystemComponent manages the creation, deletion and manipulation of FileComponents within a file system.

3.1.3.5.2.2.3 Semantics

The files stored on a file system may be plain files or directories. SCA400 Valid characters for a FileSystemComponent file name and file absolute pathname shall adhere to POSIX compliant file naming conventions. Valid characters for a filename or directory name are the 62 alphanumeric characters (Upper, and lowercase letters and the numbers 0 to 9) in addition to the "." (period), "_" (underscore) and "-" (hyphen) characters. The filenames "." ("dot") and ".." ("dot-dot") are invalid in the context of a file system. Valid pathnames include the "/" (forward

slash) character in addition to the valid filename characters. A valid pathname may consist of a single filename.

3.1.3.5.2.2.4 Constraints

SCA401 A FileSystemComponent shall realize the *FileSystem* interface. SCA402 Valid individual filenames and directory names for a FileSystemComponent shall be 40 characters or less. SCA403 A valid pathname for a FileSystemComponent shall not exceed 1024 characters.

3.1.3.5.2.3 FileManagerComponent

3.1.3.5.2.3.1 Description

The FileManagerComponent extends a FileSystem Component by adding the capability to allow multiple, distributed FileSystemComponents to be accessed through a FileManagerComponent. The FileManagerComponent appears as a single file system although the actual file storage may span multiple physical file systems. A FileManagerComponent implements the inherited *FileSystem* operations defined in section 3.1.3.5.1.2 for each mounted FileSystemComponent.

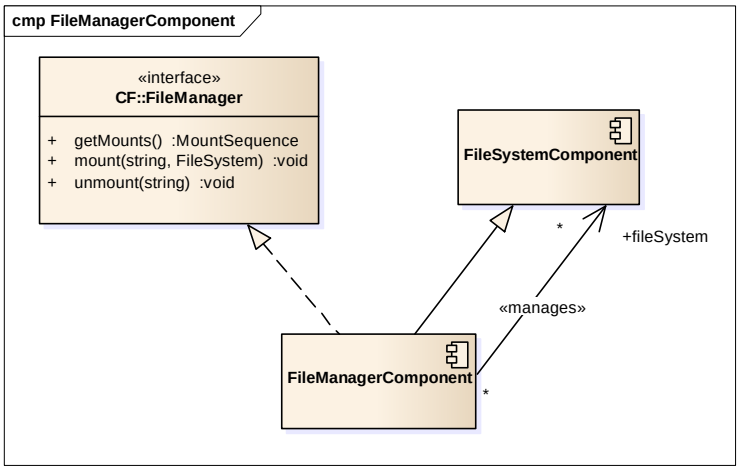

Figure 3-64: FileManagerComponent UML

3.1.3.5.2.3.2 Associations

- fileSystem: A FileManagerComponent manages the mounting and un-mounting of its contained FileSystemComponent(s)

3.1.3.5.2.3.3 Semantics

Based upon the pathname of a directory or file and the set of mounted file systems, the file manager delegates the FileSystemComponent operations to the appropriate file system. For example, if a file system is mounted at "/ppc2", an *open* operation for a file called "/ppc2/profile.xml" would be delegated to the mounted file system. The mounted file system will be given the filename relative to it. In this example the FileSystemComponent's *open* operation would receive "/profile.xml" as the fileName argument.

Another example of this concept is shown using the *copy* operation. When a client invokes the *copy* operation, the FileManagerComponent delegates the operation to the appropriate

FileSystemComponents (based upon supplied pathnames) thereby allowing copy of files between FileSystemComponents.

If a client does not need to mount and unmount FileSystemComponents, it may treat the FileManagerComponent as a FileSystemComponent by widening a *FileManager* interface reference to a *FileSystem* interface reference (because the *FileManager* interface is derived from a *FileSystem* interface*)*.

The *FileSystem* operations ensure the filename/directory arguments given are absolute pathnames relative to a mounted file system. SCA404 The *FileSystem* operations realized by a FileManagerComponent shall remove the name of the mounted file system from input pathnames before passing the pathnames to any operation on a mounted file system. SCA405 A FileManagerComponent shall propagate exceptions raised by a mounted file system. SCA406 A FileManagerComponent shall use the *FileSystem* operations of the FileSystemComponent whose associated mount point exactly matches the input fileName parameter to the lowest matching subdirectory.

The system may support multiple FileSystemComponents. Some file systems correspond directly to a physical file system within the system. A FileManagerComponent supports a federated, or distributed, file system that may span multiple FileSystemComponents. From the client perspective, the FileManagerComponent may be used just like any other FileSystemComponent since the FileManagerComponent inherits all the *FileSystem* operations.

3.1.3.5.2.3.4 Constraints

SCA408 A FileManagerComponent shall realize the *FileManager* interface.

SCA409 A FileManagerComponent instantiation shall fulfill the FileSystemComponent component requirements.

3.1.3.5.2.4 PlatformComponent

3.1.3.5.2.4.1 Description

A PlatformComponent is an abstract component utilized by the SCA Base Device Components and Framework Services Components.

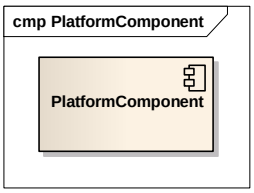

Figure 3-65: PlatformComponent UML

3.1.3.5.2.4.2 Associations

N/A

3.1.3.5.2.4.3 Semantics

A PlatformComponent is not limited to using the services designated as mandatory by Appendix B and thus may use any service provided by the OE.

3.1.3.5.2.4.4 Constraints

N/A

3.1.3.5.2.5 PlatformComponentFactoryComponent

3.1.3.5.2.5.1 Description

A platform component factory is an optional mechanism that may be used to create device or service components.

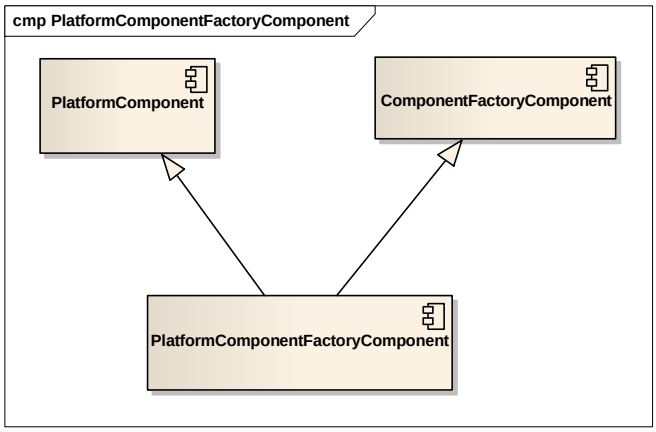

Figure 3-66: PlatformComponentFactoryComponent UML

3.1.3.5.2.5.2 Associations

N/A

3.1.3.5.2.5.3 Semantics

A PlatformComponentFactoryComponent is used to create a service or device component. A DeviceManagerComponent is not required to use platform component factories to create devices and services. A software profile specifies which PlatformComponentFactoryComponents are to be used by the DeviceManagerComponent.

SCA412 A PlatformComponentFactoryComponent shall register with the launching DeviceManagerComponent via the *ComponentRegistry::registerComponent* operation.

3.1.3.5.2.5.4 Constraints

SCA527 A PlatformComponentFactoryComponent instantiation shall fulfill the ComponentFactoryComponent requirements.

A PlatformComponentFactoryComponent instantiation is a PlatformComponent.

SCA416 The PlatformComponentFactoryComponent shall only launch ComponentBaseDevices or ServiceComponents.

3.1.3.5.2.6 ServiceComponent

3.1.3.5.2.6.1 Description

A ServiceComponent is a platform software component that can implement any interface(s) and does not manage hardware. A ServiceComponent usually comes into existence at platform startup. The SCA identifies its services in section 3.1.2, defining some such as event and lightweight log, which are known as the SCA Services. ServiceComponents may use any operating system APIs provided by the OE and as such are not restricted to using only the APIs

as specified in Appendix B. ServiceComponents that do not implement the SCA Base Application interfaces are known as non_CF_Service_Components.

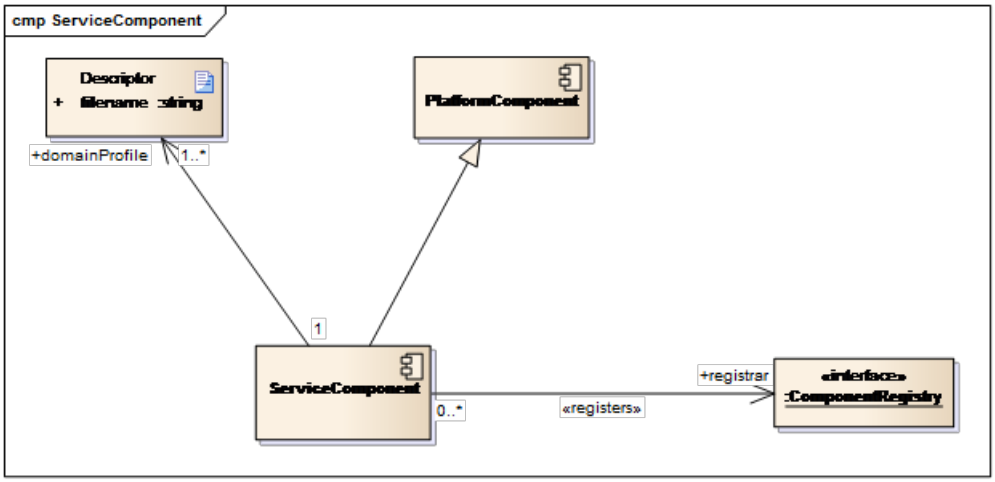

Figure 3-67: ServiceComponent UML

3.1.3.5.2.6.2 Associations

- domainProfile: A ServiceComponent has a SPD and zero to many other domain profile files.
- registrar: A ServiceComponent registers with a DeviceManagerComponent via its associated *ComponentRegistry* instance.

3.1.3.5.2.6.3 Semantics

ServiceComponents are typically used by AssemblyComponents but there is nothing restricting platform services being utilized by any type of PlatformComponent (e.g. ComponentBaseDevices).

SCA314 All ServiceComponents started up by a DeviceManagerComponent shall have a handler registered for the POSIX SIGQUIT signal.

A ServiceComponent may realize an interface directly without ports, similar to an SCA service, or have ports. SCA316 A ServiceComponent shall register with the launching DeviceManagerComponent via the *ComponentRegistry::registerComponent* operation. SCA317 The values associated with the parameters (SERVICE_NAME) as described in 3.1.3.3.2.5.3 shall be used to set the platform service's ComponentIdentifier interface identifier attribute.

Constraints

A ServiceComponent instantiation is a PlatformComponent. SCA460 Each ServiceComponent shall have an SPD as described in section 3.1.3.6.4. The ServiceComponent abstraction can represent non_CF_Service_Components implemented by a third party (e.g. commercial) provider. In those cases the implementation oriented ServiceComponent requirements are not applicable.

3.1.3.5.2.7 CF_ServiceComponent

3.1.3.5.2.7.1 Description

A CF_ServiceComponent extends the ServiceComponent by adding support for the SCA Base Application interfaces and is known as a CF_Service_Component.

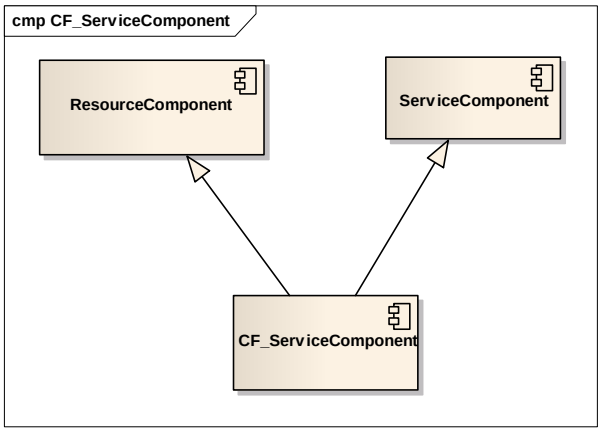

Figure 3-68: CF_ServiceComponent UML

3.1.3.5.2.7.2 Associations

N/A

3.1.3.5.2.7.3 Semantics

N/A.

3.1.3.5.2.7.4 Constraints

SCA529 A CF_ServiceComponent shall fulfill the ResourceComponent requirements. SCA530 A CF_ServiceComponent shall fulfill the ServiceComponent requirements.

3.1.3.6 Domain Profile

The hardware devices and software components that make up an SCA system domain are described by a set of files that are collectively referred to as a Domain Profile. These files describe the identity, capabilities, properties, inter-dependencies, and location of the hardware devices and software components that make up the system. All of the descriptive data about a system is expressed in the descriptor vocabulary.

The types of descriptor files that are used to describe a system's hardware and software assets are depicted in Figure 3-69. The descriptor vocabulary within each of these files describes a distinct aspect of the hardware and software assets. The collection of descriptor files which are associated with a particular software component is referred to as that component's software profile. The contents of a profile depends on the component being described, although every profile contains a SPD - all profiles for components contain a SCD. A software profile for an application contains a SAD, the device manager profile contains a Device Configuration Descriptor (DCD), and the domain manager software profile contains a DMD.

SCA463 Domain Profile files shall be compliant to the descriptor files provided in Appendix D.

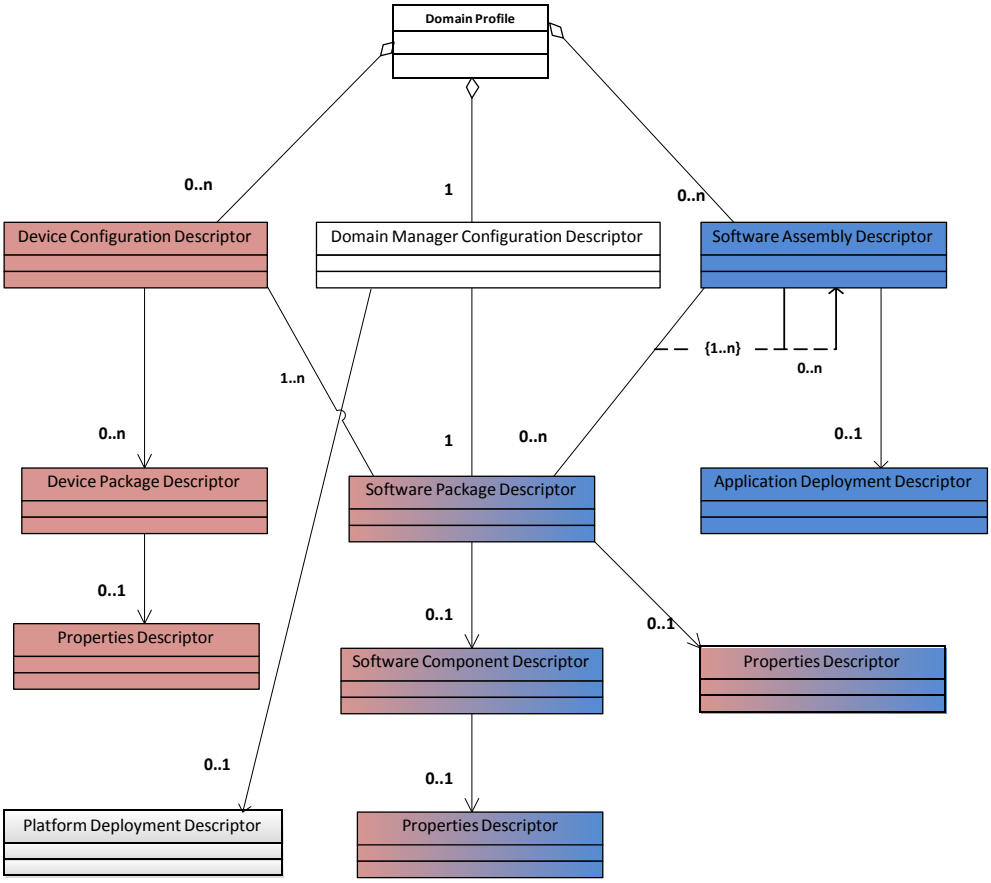

Figure 3-69: Relationship of Domain Profile Descriptor File Types

3.1.3.6.1 **Software Package Descriptor (SPD)**

An SPD identifies a software component implementation(s). General information about a software package, such as the name, author, property file, and implementation code information and hardware and/or software dependencies are contained in an SPD file.

3.1.3.6.2 **Software Component Descriptor (SCD)**

An SCD contains information about a specific SCA software component. An SCD file contains information about the interfaces that a component provides and/or uses.

3.1.3.6.3 **Software Assembly Descriptor (SAD)**

An SAD contains information about the components that make up an application. The application factory uses this information when creating an application.

3.1.3.6.4 **Properties Descriptor (PRF)**

A PRF contains information about the properties applicable to a software package or a device package. A PRF contains information about the properties of a component such as configuration, test, execute, and allocation types.

3.1.3.6.5 **Device Package Descriptor (DPD)**

A DPD identifies a class of a device. A DPD also has properties that define specific properties (capacity, serial number, etc.) for this class of device. The use of the DPD is optional within a system, however if it is used the reference to this file will be made from the DCD file.

3.1.3.6.6 **Device Configuration Descriptor (DCD)**

A DCD contains information about the devices associated with a device manager, how to find the domain manager, and the configuration information for the components that it deploys.

3.1.3.6.7 **Domain Manager Configuration Descriptor (DMD)**

A DMD contains configuration information for the domain manager.

3.1.3.6.8 **Platform Deployment Descriptor (PDD)**

A PDD identifies the logical relationships between platform resources within the OE's registered services and devices. The use of the PDD is optional within a system, however if it is used the reference to this file will be made from the DMD file. A PDD file may be used to exert a greater degree of control over the application deployment process. The file contains information that describes the composition (i.e. included services and devices) of virtual channels within a platform domain.

3.1.3.6.9 **Application Deployment Descriptor (ADD)**

An ADD contains precedence lists that are used for deploying application instances within a platform domain. The use of the ADD is optional within a system, however if it is used the reference to this file will be made from a SAD file. An ADD file contains application names and references the virtual channels defined in the PDD file.

4 CONFORMANCE

SCA conformance is achieved when a product successfully implements all applicable requirements identified within the scope of its declared conformance statement. Language used to identify requirements within this specification is defined in section 1.2.2. Requirements stated in this specification take precedence when they are in conflict with other existing standards/specifications, cited or not cited.

The JTNC is the Specification Authority (SA) is responsible for developing, maintaining, evolving and interpreting the standard.

4.1 CONFORMANCE CRITERIA

SCA conformance language is referenced in several parts of the specification:

- The SCA technology independent model representation (i.e. Platform Independent Model) is summarized in this specification.
    - The SCA technology independent model comprises a set of interfaces and component definitions that are appropriate for building SCA products (e.g. applications, devices and services). SCA products may be realized using a variety of technologies (e.g., CORBA, JAVA, MHAL Communications Service, etc.).
- The SCA technology specific model representations (i.e. Platform Specific Models) are defined in the corresponding appendix.
    - The SCA technology specific models comprise of technology specific mappings, transformations, and model representations used in the realization of the technology on a specific platform.

SCA Conformance can be achieved using multiple methods. Therefore, several separate conformance points are defined below.

4.1.1 Conformance on the Part of an SCA Product

The interfaces and components of this specification are not required to be used solely for a particular platform or application. An SCA product uses the interfaces and component definitions that meet their needs.

Conformance for an SCA Product is at the level of usage as follows:

- A technology independent representation of an interface defined in this specification needs to be conformant with an identified Profile or collection of UOFs as described in Appendix F.
- A technology specific representation (no matter what language) of an interface defined in this specification needs to be conformant (signature equivalent) to the technology independent interface definition as described in this specification.
- A technology specific implementation (no matter what language) of a component defined in this specification needs to be conformant to both the component technology independent representation (e.g. semantics, ports, interfaces, properties) and any associated technology specific semantics and interface definitions as described in this specification.

For example, a component is considered to be conformant to the Component Framework CORBA/XML platform if it does all of the following:

- Realizes the OMG IDL defined interfaces referred to by the SCA CORBA component representation
- Implements XML Domain Profile file serialization in accordance with the format defined in Appendix D.
- Implements the behavioral requirements identified by the component stereotype's technology independent representation.

Note that the semantics for an interface identified in the component technology independent representation are defined by the interface signature, associations and semantics of the corresponding interface in the SCA technology independent representation.

4.1.2 Conformance on the Part of an SCA OE component

The SCA OE contains the requirements of the operating system, transfer mechanism, and the CF interfaces and operations. Conformance of the CF elements is governed by the SCA Product rules defined in Section 2.2; however the other OE elements (i.e. those without components or interfaces defined within the main body of the specification) are subject to a unique conformance rule.

Conformance for an OE element (without a corresponding component or interface definition) is at the level of usage as follows:

- Realizes the applicable interfaces associated with its OE capability, or the interfaces associated with a documented profile of that capability.
- Implements the applicable behavioral requirements defined within its capability description (i.e. the corresponding SCA Appendix).

Thus, an OE implementation as defined in this specification could provide support for an AEP POSIX layer per Appendix B; and provide distributed communications in accordance with the CORBA (full profile) per Appendix E.

The DomainManagerComponent indicates the levels of Units of Functionality conformance by its DMD attributes.

The DeviceManagerComponent indicates the levels of Units of Functionality conformance by its DCD attributes

4.2 SAMPLE CONFORMANCE STATEMENTS

An SCA product can be identified as being conformant to a specific version of the SCA and the specific technology that the product realizes.

- "Product A is an SCA conformant waveform for the CORBA/XML platform."
- "Product B is an SCA conformant Audio Device for the J2EE/XML platform."
- "Product C is an SCA conformant Core Framework for the CORBA/XML platform."
- "Product D is an SCA conformant Operating Environment containing a lightweight AEP conforming POSIX layer and a CORBA (full profile) transfer mechanism."