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5 The Printer Working Group

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System Object and
System Control Service
Semantics

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11 Status: Approved

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14 **Abstract**: Network print devices have evolved to support additional functions. The Multifunction Device (MFD) includes
15 one or more services such as print, scan, copy and facsimile. The MFD Model and Common Semantics [PWG5108.1]
16 extends the original PWG Semantic Model v1 [PWG5105.1] from printing to all of the services that typically may be
17 performed by an MFD. We refer to a device hosting one or more of these services as an Imaging Device.

18 The [PWG5108.1] model extension requires a root element to represent the Imaging Device and to move the print service
19 to be one of the hosted imaging related services.   The root of the data model is the System Object. The System Object
20 represents the Imaging Device. The System Object contains the elements that represent the Imaging Device status,
21 description and services.   The extension of the model includes bringing in elements that until now were primarily
22 accessed via SNMP. This includes the configuration (i.e., Subunits) and conditions that are represented in the Printer
23 MIB [RFC3805] as entries in the Alert Table (i.e., prtAlertTable). The System Object's elements contain information that is
24 not visible via any individual service. For example the Imaging Device total usage counters, all conditions from every
25 service, and all Subunits.

26 The Imaging Device hosts a number of services. Many of these services are document related such as print, scan and
27 copy. This specification defines the SystemControlService. The SystemControlService is needed to start (create)
28 services and to restart services that have been previously shut down.   It is desirable to be able to monitor and manage an
29 Imaging Device as a whole or all the document related services at once. The Imaging Device's SystemControlService
30 provides this functionality.

31

32 This document is a PWG Working Draft. For a definition of "PWG
33 Working Draft", see:

34

35 ftp://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf

36

37 This document is available electronically at:

38
39   ftp://ftp.pwg.org/pub/pwg/candidates/cs-sm20-system10-20120217-5108.06.pdf

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About the Semantic Model Work Group

103 The Semantic Model Working Group is responsible for the modeling of the services - Print, Copy,
104 Scan, Fax, Email, Resource, System Control, and Transform hosted on Multifunction Devices .
105 Standardization of the Multifunction Device (MFD) model and semantics will support interoperability of
106 devices and services in local and enterprise networks enabling improved job submission, job
107 management, remote administration, and support. The goal of the project is to define a unified
108 semantic model and set of abstract operations for the most common and essential service and device
109 features of the Multifunction Device.

110 For additional information regarding Semantic Model visit:

111   http://www.pwg.org/mfd/

112 Implementers of this specification are encouraged to join the Semantic Model mailing list in order to
113 participate in any discussions of the specification. Suggested additions, changes, or clarification to
114 this specification, should be sent to the Semantic Model list for consideration.

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116 **Table of Contents**

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1   Introduction

This document specifies the PWG abstract model for the System Object and the SystemControlService of an Imaging Device. Included in this document is the content specific terminology, data model, the theory of operation, the SystemControlService interfaces and the conformance requirements.

2   Overview

The Imaging Device service addressed in this specification is the SystemControlService. The SystemControlService responds to queries about the System Object's configuration, status and descriptive information. The SystemControlService acts upon requests to modify the System Object.

A client application interacting with the SystemControlService contains a SystemControl Client. A SystemControl Client interacts with the End User to obtain the End User's directives and uses the SystemControl Client to communicate with the SystemControlService that will execute the directive.

The System scenarios addressed in this specification include walk-up users that use Imaging Device's front panel to initiate requests, and remote users that use their computers to initiate requests. The assumption is that it is possible to implement a network-connected SystemControl Client that is accessible via the device's front panel. The model also supports external security services that protect against unauthorized use of the SystemControlService and access to the System Object's data.

3   Terminology

3.1   Conformance Terminology

See [RFC2119] for conformance terminology used.   There are no SystemControlService specific conformance terms.

3.2   Content Specific Terminology

See [PWG5108.01] for common MFD terminology used. For this service the "<service>" in the MFD Terminology section is replaced with "System".

Term	Definition
SystemControl Client	The local or remote software entity that interfaces with the User and interacts with the SystemControlService.

4   Requirements

4.1   Rationale for System Object and System Control Service

In order to support common functionality for managing and monitoring multifunction devices, there is a need to develop a semantic model and a set of abstract operations and elements for System related services. In order to implement an abstract model of the operations and elements for the the SystemControlService of the Imaging Device, there is need to map them to applications and communication protocols that support interactions between SystemControl Clients and SystemControlService. Associated with this specification is a binding of the abstract model into XML Schema. Associated with the SystemControlService's operations is a Web Services Definition Language (WSDL) representation.

4.2   Out of Scope for System Object and System Control Service

The basic SystemControlService model defined in this document is targeted to support enterprise SystemControlService applications. However this document does not specify any application specific semantics. The following are out of scope:

1. Semantics of any compound service such as Copy-And-Email.

2. Semantics of any workflow protocol, i.e., sequencing and coordination of Jobs across multiple services.

4.3   Conventions for Mapping the Model to XML Schema

The SystemControlService model is described in this document as an XML schema. This is for the sake of convenience and does not require a protocol mapping involving XML. The elements such as System, PrintService, and InputTray can be represented in any number of ways. Abstractly they are objects which contain attributes or properties that express characteristics of the object.   For the remainder of this document references to attribute or element refer to XML attributes and XML elements respectively. Either of these can be considered to be attributes or properties of objects.

4.4   Conventions used in figures

In the figures within this specification the following conventions are used. Required semantic elements (e.g., Element1) are shown in a solid box and optional elements (e.g., Element3) are shown in a dashed box. A sequence of elements (e.g., Element2, Element3, any) is represented by the connector to the right of Element1. When only one of a set of elements can be used (e.g., Element4 or Element5) that group is represented by the connector to the right of Element2. All sequences of lists have an extension point at the end (i.e., any) that allows vendors or sites to add their own properly qualified extensions. See PWG5108.1 section 10. All processing elements are decorated with the MustHonor attribute. The element may also be decorated with properly qualified vendor extension attributes.
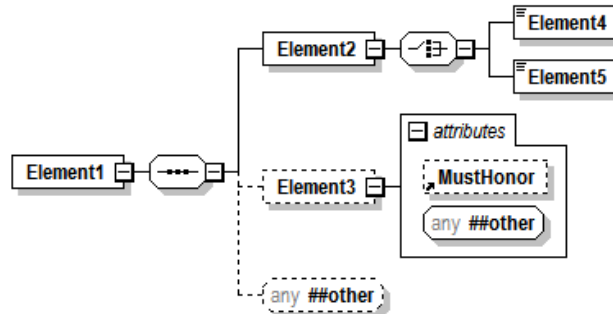
Figure 1 Model Conventions

5   Imaging Device Model

There is both a SystemControlService and a System Object in the Imaging Device Model. The distinction between them is that the System Object represents the Imaging Device as a whole and is the root container for all the Imaging Device attributes, components and services. The SystemControlService acts upon the System Object on behalf of SystemControl Clients to query the state of the System Object and to affect the System Object state through a well-defined set of operations

The SystemControlService fits within the Imaging Device model as one of a number of services that can be hosted on a multifunction device (i.e., System or System Object). One difference between the SystemControlService and other hosted services is that there can only be a single instance.   Another difference is that that since this service is not job oriented there are no Jobs coming in or output produced and therefore no subordinate DefaultJobTicket or Capabilities. Since the SystemControlService provides a management interface for the entire Imaging Device, the mandatory SystemControlService is always active while the Imaging Device is available. (See [PWG5108.01])

Figure 2and §6 define the System Object schema which represents the Imaging Device.
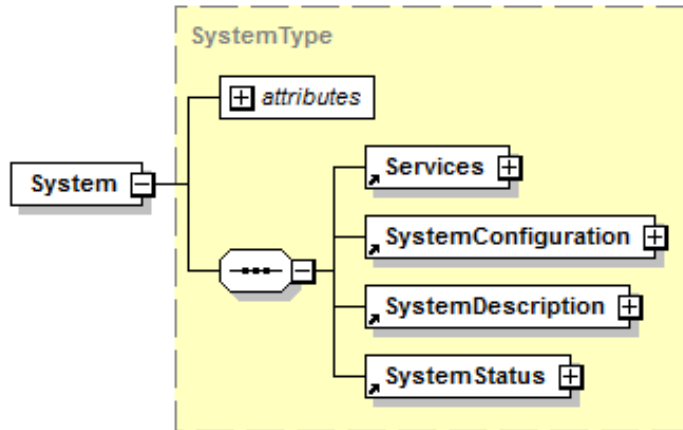
Figure 2 System Object

6 System Object

The System Object elements SystemConfiguration, SystemDescription and SystemStatus are defined in §6.1, §6.2 and §6.3 respectively. The Services element contains all the hosted services. See §7 below for the description of the SystemControlService.

6.1 SystemConfiguration

The System Object has a SystemConfiguration element that contains all the Subunits configured onSubunit the Imaging Device. (See Figure 3) Note that each service instance contains a service specific view of the Subunits used by that service instance. For example a PrintService has a Marker Subunit but ScanService does not.   The MFD Model and Common Semanticsspecification [PWG5108.01] defines all the Subunits.
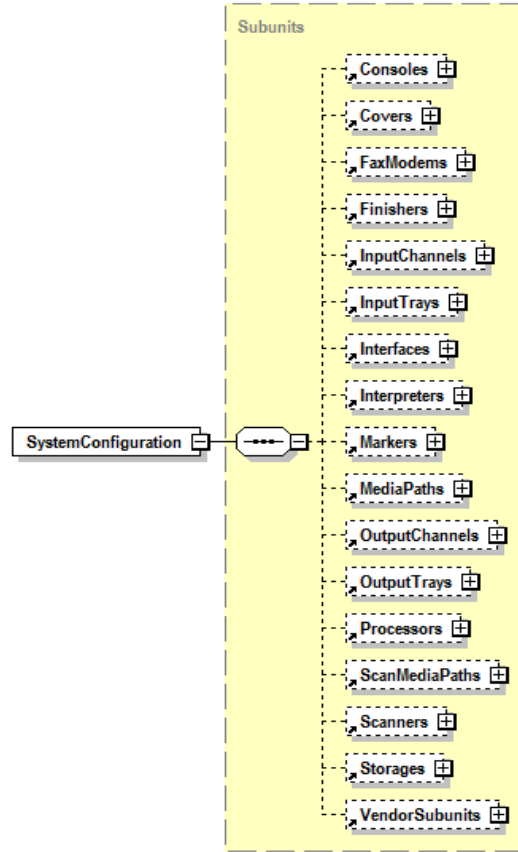
Figure 3 SystemConfiguration

6.2   SystemDescription

Figure 4 is a view of the Imaging Device's SystemDescription.   SystemDescription provides descriptive information for the entire Imaging Device. The element values are administratively set.   The element values can be modified directly or modified indirectly through an operation. The SystemDescription group element includes descriptive information such as system name and location, and has an extension point for vendor specific information. The MFD Model and Common Semantics specification [PWG5108.01] defines most of the elements that are used in the SystemDescription element. Table 1 lists the SystemControlService specific SystemDescription elements.
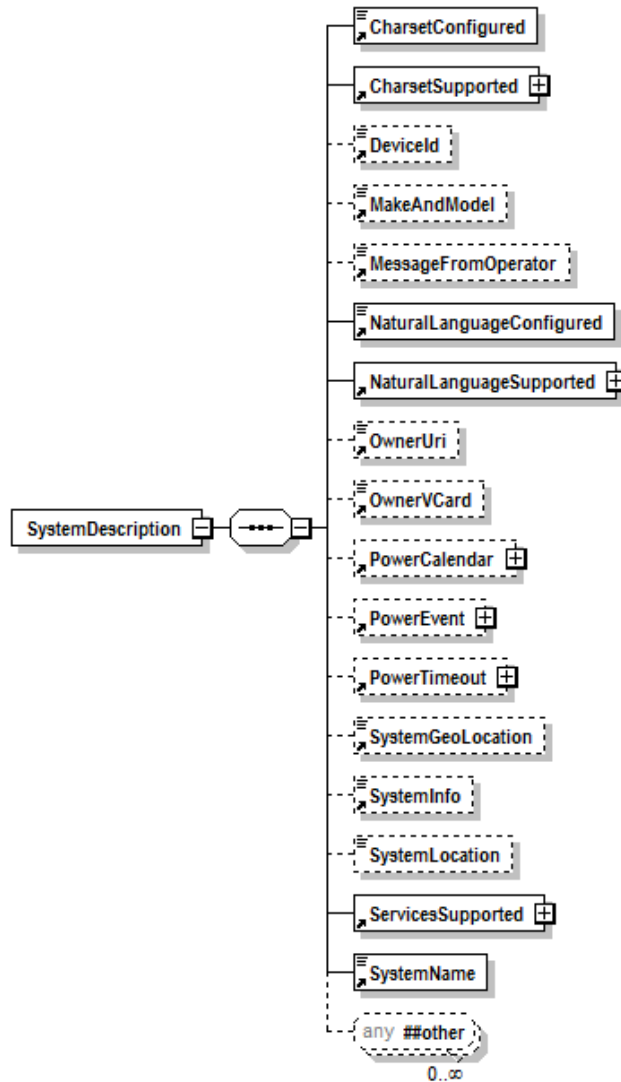
Figure 4 SystemDescription

Table 1 SystemDescription Elements

Element Name	Multivalued	Syntax	Constraint	Group	Reference
Description (values)					
ServicesSupported	Yes	List of Keywords		Description	
The list of types of services that can be administratively configured to run on this system. *(Contains ServiceType)*					
ServiceType	No	Keyword	Type 3	Description	
The keyword for the type of configured service. Values: ServiceTypeWKV, KeywordNsExtensionPattern *(e.g., Copy, EmailIn, EmailOut, FaxIn, FaxOut, Print, Resource, Scan, SystemControl, Transform, Vendor) (Included in ConfiguredServices)*					

6.3   SystemStatus

Figure 5 is a view of the Imaging Device's SystemStatus. SystemStatus provides an optimistic roll-up of state information for the hosted services. What is meant by that is if any service is 'Processing', the SystemStatus State element will be 'Processing'. This is the case even if one or more of the services are in the 'Stopped' state. Table 2 shows the conditions for all SystemStatus "State" values.

The elements values are maintained by automata and cannot be directly set.   The element values can be modified indirectly through an operation. For example the PauseAllSystemServices operation on the SystemControlService may result in the change of the State and StateReasons elements. The MFD Model and Common Semantics specification [PWG5108.01] defines most of the the elements that are used in the SystemStatus element. Table 3 lists the new SystemControlService specific SystemStatus elements.

Table 2 Optimistic Status Roll-up

System Status	Condition
Unknown	Initialization phase. State of hosted services are not known
Down	All the hosted services are Down or Unknown. The System Service has completed initialization
Testing	All the hosted services are Testing, Down or Unknown. At least one hosted service state is Testing.
Stopped	All the hosted services are Stopped, Testing, Down or Unknown. At least one service state is Stopped.
Idle	All the hosted services are Idle, Stopped, Testing, Down or Unknown. At least one service state is Idle.
Processing	All the hosted services are Processing, Idle, Stopped, Testing, Down or Unknown. At least one service state is Processing.
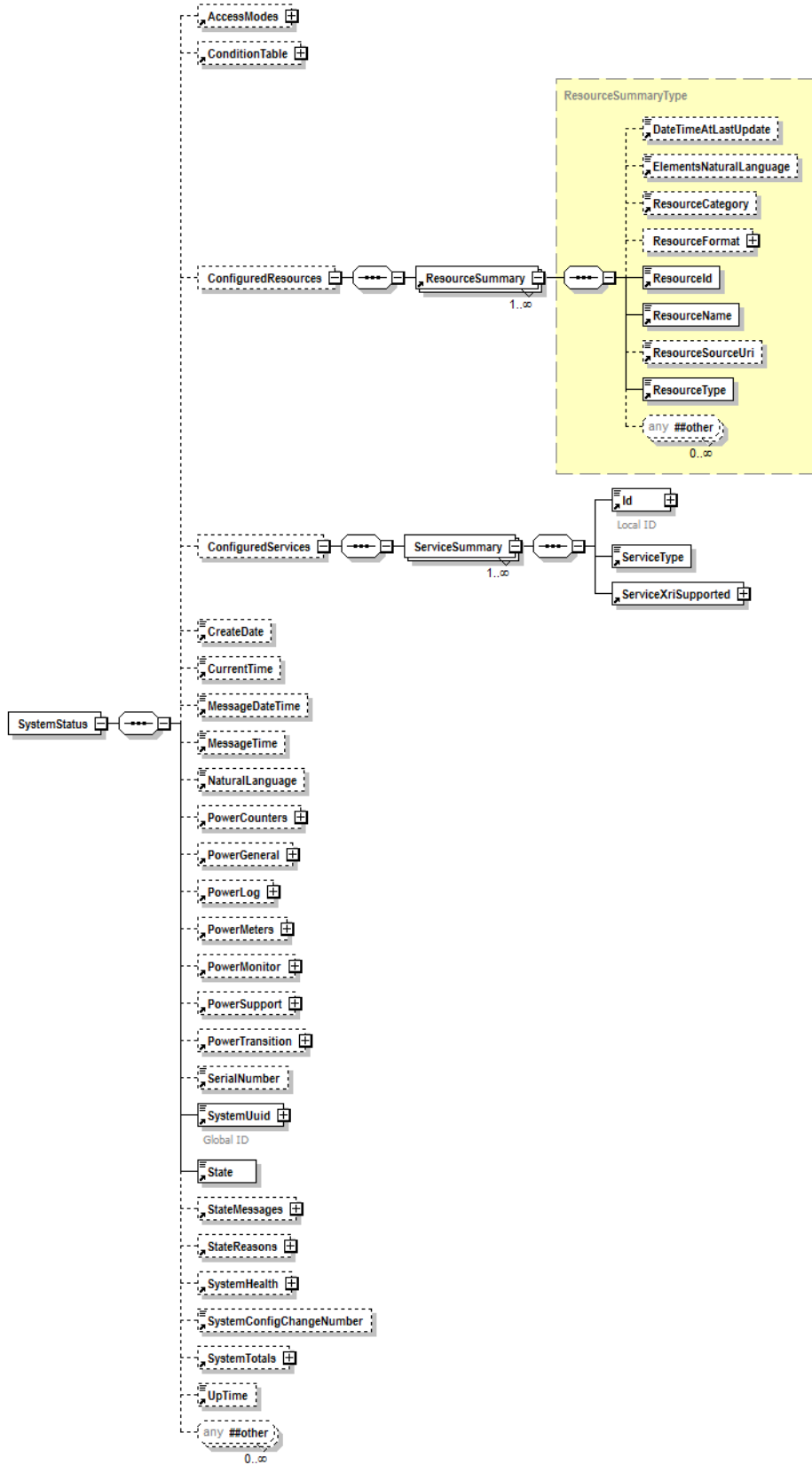
Figure 5 SystemStatus

Table 3 SystemStatus Elements

Element Name	Multivalued	Syntax	Constraint	Group	Reference
Description (values)					
ConfiguredResources	Yes	List of ResourceSummary		Status	
The list of summary information for the available resources of the system. *(Contains ResourceSummary)*					
ResourceSummary	No	Complex		Status	[PWG5108.03] § 8.1.5.2, §7.4.2 (See also ResourceSourceUri below)
The summary information for the available resource. *(Contains DateTimeAtLastUpdate, ElementsNaturalLanguage, ResourceCategory, ResourceFormat, ResourceId, ResourceName, ResourceSourceUri, ResourceType)*					
ResourceSourceUri	No	URI		Status	
An identifier for the resource assigned by the creator/supplier of the resource. The value SHOULD be a URN.					
ConfiguredServices	Yes	List of ServiceSummary		Status	
The list of service that have been administratively configured to run on this system instance. *(Contains ServiceSummary)*					
ServiceSummary	Yes	Complex		Status	
Information about the services that have been administratively configured to run on this system instance. *(Contains ServiceType, Id, ServiceXriSupported) (Included in ConfiguredServices)*					
ServiceType	No	Keyword	Type 3	Status	
The keyword for the type of configured service. Values: ServiceTypeWKV, KeywordNsExtensionPattern *(e.g., Copy, EmailIn, EmailOut, FaxIn, FaxOut, Print, Resource, Scan, SystemControl, Transform, Vendor) (Included in ServiceSummary)*					
SystemConfigChangeNumber	No	Integer		Status	[RFC3805] §6
Counts configuration changes within the System. A configuration change is defined to be an action that results in a change to any element other than those that reflect status or level, or those that act as counters. (*Maps to Printer MIB's prtGeneralConfigChanges*)					
SystemTotals	No	Complex		Status	[PWG5106.1] §6.1
The SystemTotals counters aggregates counters from all the services offered by the System.					

7   SystemControlService

7.1   SystemControlService Model

The Imaging Device supports exactly one SystemControlService (See Figure 6). A SystemControlService is hosted locally on an Imaging Device or remotely on another computer. The SystemControlService contains elements for SystemControlService status and description.

While the SystemControlService provides operations to obtain an Imaging Device wide view of the Subunits that are configured on the Imaging Device, they are not subordinate to the SystemControlService. The Subunits (i.e., SystemConfiguration) appear at the root of the model and are defined in §6.1.

The SystemControlServiceDescription group element includes descriptive information such as service name and information, and has an extension point for vendor specific information. These description elements are settable by Administrators. The details of the SystemControlServiceDescription elements are specified in §7.2.

The SystemControlServiceStatus group element is an extension of SystemServiceStatus class that includes elements such as ID, state, state messages and state reasons. State messages are localized state reasons. The details of the elements in the SystemControlServiceStatus group are specified in §7.3.
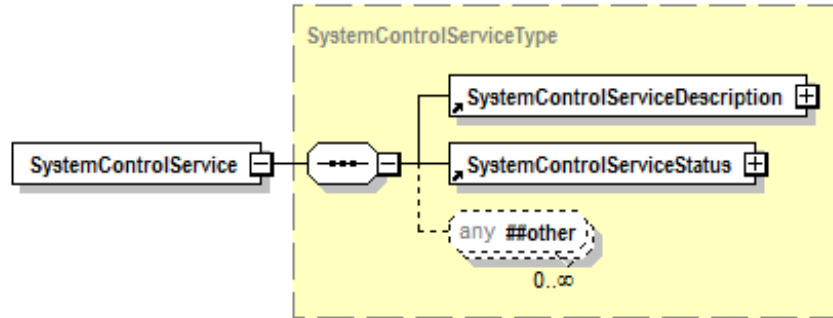
Figure 6 SystemControlService

7.2   SystemControlServiceDescription

Figure 7 is a view of the SystemControlServiceDescription.   SystemControlServiceDescription provides Descriptive information for the SystemControlService. The element values are administratively set.   The element values can be modified directly or modified indirectly through an operation. The SystemControlServiceDescription group element includes descriptive information such as service name and information, and has an extension point for vendor specific information. The MFD Model and Common Semantics specification [PWG5108.01] defines the SystemControlServiceDescription elements.
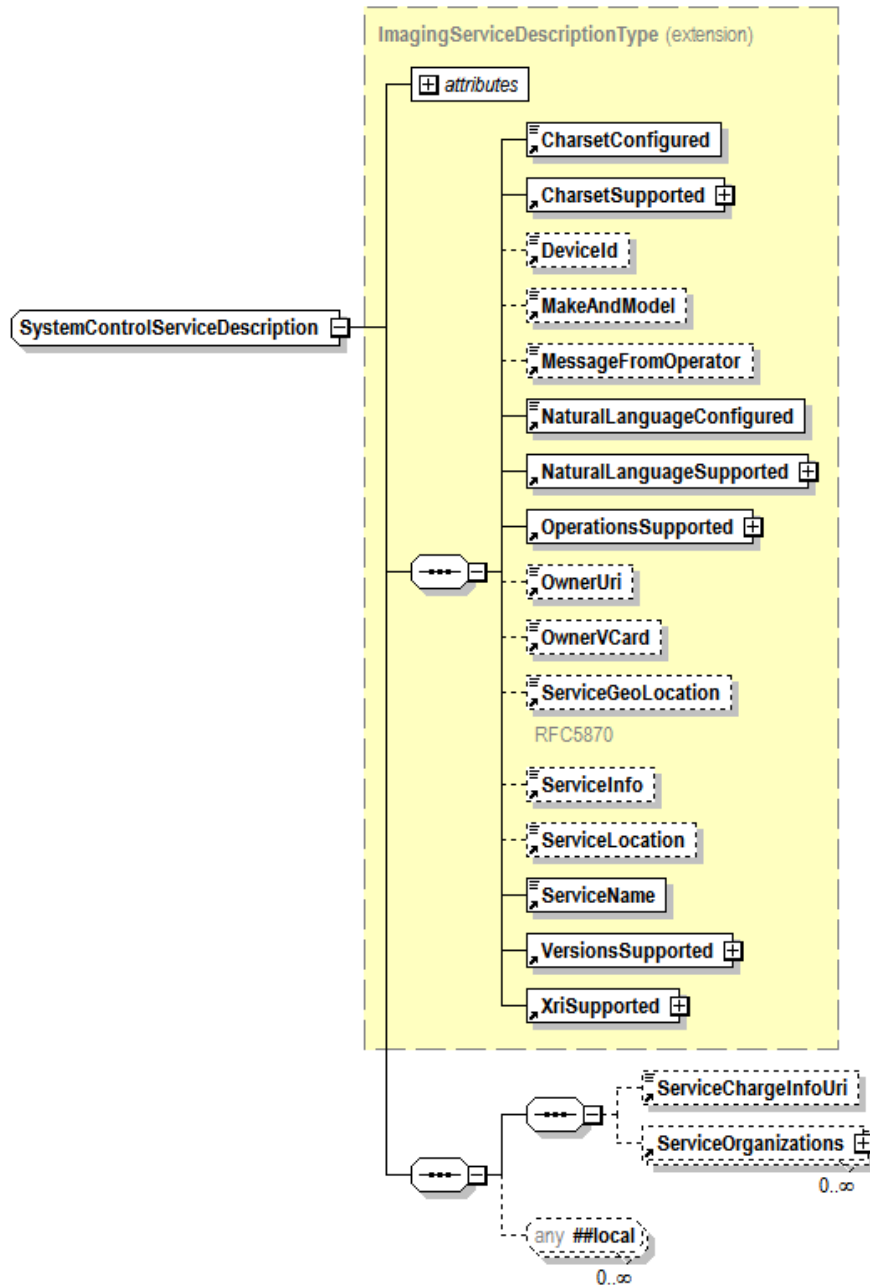
Figure 7 SystemControlServiceDescription

The elements common to all <service>ServiceDescriptions are defined in the MFD Model and Common Semantics specification [PWG5108.01]. Those elements are identified in the above diagram by being included in the yellow box. The remaining elements also are taken from <service> ServiceDescription. These elements are defined in the MFD Model and Common Semantics specification [PWG5108.01].

7.3   SystemControlServiceStatus

Figure 8 is a view of the SystemControlService's SystemControlServiceStatus. SystemControlServiceStatus provides state information for the SystemControlService. The elements values are maintained by automata and cannot be directly set. The element values can be modified indirectly through an operation. For example PauseAllServices operation on the SystemControlService may result in the change of the State and StateReasons elements.
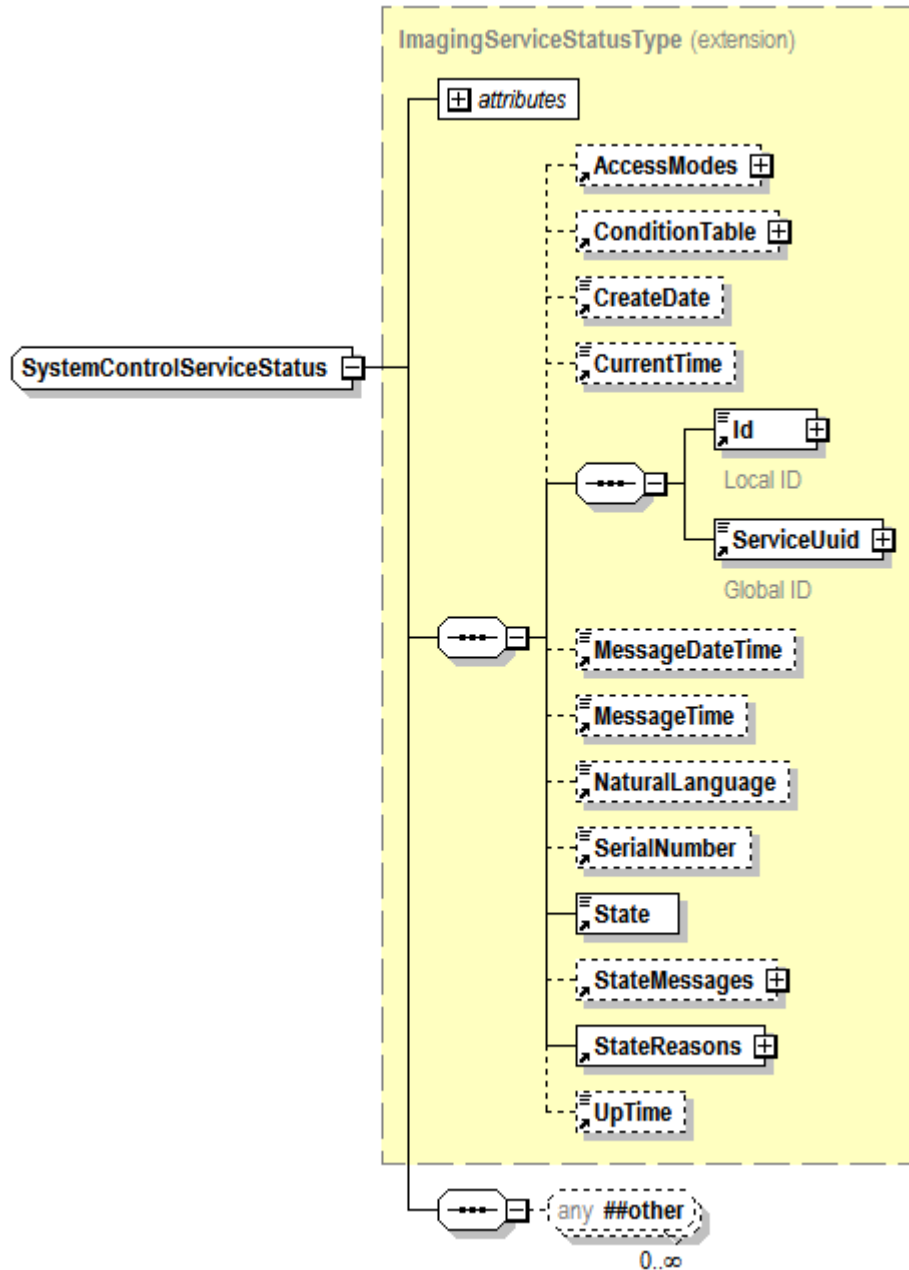
Figure 8 SystemControlServiceStatus

The elements common to all <service>ServiceStatus are defined in the MFD Model and Common Semantics specification [PWG5108.01]. Those elements are identified in the above diagram by being included in the yellow box. There are no elements specific to the SystemControlServiceStatus except the usual extension point (i.e., Any).

7.4   SystemControlService Operations

The SystemControlService provides a service interface that is the same for a co-located local SystemControl Client or a Remote SystemControl Client via a local interface, a local area network, or the Internet. A user makes a SystemControlService request by interacting directly with the SystemControlService or indirectly through a local SystemControl Client via the Imaging Device UI or a Remote SystemControl Client via its software application UI.

Table 4 and Table 5 list the input and output parameters for the defined operations. Responses to operations that fail are expected to return a fault.

The semantics for these operations are similar to the operations specified in the MFD Model and Common Semantics specification [PWG5108.01]. One difference is that many of the operations affect all the hosted document related services instead of an individual service. In the tables below the required parameters are in **bold** and optional parameters are in normal font.

Notes for Table 4 *follow* Table 5

Table 4 Mandatory System Operations

User Operation Name	Input Parameters	Output Parameters
DisableAllServices [1]	*ElementsNaturalLanguage, Message,* **RequestingUserName**	
EnableAllServices [1]	*ElementsNaturalLanguage, Message*, **RequestingUserName**	
GetSystemElements	*ElementsNaturalLanguageRequested*, **RequestedElements, RequestingUserName**	*ElementsNaturalLanguage, System Elements,*
ListAllServices	*ElementsNaturalLanguageRequested*, , **RequestingUserName**	*ElementsNaturalLanguage*, **List of service summary**,
PauseAllServices [2]	*ElementsNaturalLanguage, Message*, **RequestingUserName**	
RestartAllServices [1, 5, 6, 7]	*ElementsNaturalLanguage, IsAcceptingJobs | IsAcceptingResources, Message*, **RequestingUserName,** *StartServicePaused*	
RestartService [3, 4, 5, 6, 7]	*ElementsNaturalLanguage*, **Id**, *IsAcceptingJobs | IsAcceptingResources, Message*, **RequestingUserName**, *ServiceType, StartServicePaused*	
ResumeAllServices [2]	*ElementsNaturalLanguage, Message,* **RequestingUserName**	
ShutdownAllServices [1]	*ElementsNaturalLanguage, Message,* **RequestingUserName**	
ShutdownService [1, 8]	*ElementsNaturalLanguage*, **Id**, *Message*, **RequestingUserName ServiceType**	
StartupAllServices [1, 5, 6, 7]	*ElementsNaturalLanguage, IsAcceptingJobs, Message*, **RequestingUserName**, *StartSystemPaused*	
StartupService [1, 5, 6, 7]	*ElementsNaturalLanguage, IsAcceptingJobs, Message,* **RequestingUserName ServiceType,** *StartServicePaused*	**Id**

Notes for Table 5 *follow* Table 5

Table 5 Optional System Operations

Administrative Operation Name	Input Parameters	Output Parameters
DeleteService [1, 8]	**Id**, *ElementsNaturalLanguage*, *Message*, **RequestingUserName**, **ServiceType**	
PauseAllServicesAfterCurrentJob [2]	*ElementsNaturalLanguage*, *Message*, **RequestingUserName**	
SetSystemElements	*ElementsNaturalLanguage*, *Message,* **OperationMode**, **RequestingUserName SystemElements**	*UnsupportedElements*

Notes for Table 4 **and** Table 5**:**

1 The operations do not apply to the SystemControlService.

2 The operation only applies to Job based services (e.g., CopyService, FaxOutService, FaxInService, PrintService, ScanService, and TransformService),

3 When the target service is the SystemControlService the implementation MUST restart the SystemControlService and MAY restart the other services as well.

4 When the target service is the SystemControlService the implementation of the restart may be soft (i.e., affects software only) or hard (i.e., hardware and software reinitialized).

5 When the service startup is complete the service state is 'Idle' (See note 6). The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01]

6 When the operation contains the "StartServicePaused" parameter and it is set to 'true', the resulting service state is 'Stopped' (i.e., transitions from 'Down' to 'Idle' then immediately to 'Stopped'). The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01]

7 When the operation contains the "IsAcceptingJobs" or "IsAcceptingResources" parameter and it is set to 'false', the service state is 'Idle' (See note 6). The service will then follow the behaviors as defined in section 7.3.2.2 of [PWG5108.01] or section 8.2.1 of [PWG5108.03] respectively.

8 This operations results in an error when applied to the SystemControlService.

7.4.1 DeleteService

The DeleteService operation removes an instance of a service. The result is that all data associated with the service is deleted and the service can no longer be restarted.   It is an error to specify a service that is not shutdown or to specify the SystemControlService itself.

7.4.2 DisableAllServices

The DisableAllServices operation is consistent with the operation Disable<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and MUST set the IsAcceptingJobs/ IsAcceptingResources Element to 'false' for all hosted services. This operation does not affect the SystemControlService itself. This operation has no effect upon the Services' State elements.

7.4.3 EnableAllServices

The EnableAllServices operation is consistent with the operation Enable<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and MUST set the IsAcceptingJobs/ IsAcceptingResources Element to 'true' for all hosted services. This

operation has no effect upon the Services' State elements. This operation does not affect the SystemControlService itself.

7.4.4 GetSystemElements

Unlike the Get<service>ServiceElements [PWG5108.01] operation that allows access to only the elements of the specified <service>, the GetSystemElements operation allows a SystemControl Client to obtain detailed information about the System Object as well as the SystemControlService.

For the SystemControlService, this operation can request the elements directly below the SystemControlService element (e.g., ServiceDescription, ServiceStatus). This operation MUST NOT query information from any other Service.

For the System Object, this operation can request the elements directly below the System element (e.g., SystemConfiguration, SystemDescription, and SystemStatus).

The elements constitutingSystemConfiguration have a special representation. Some SystemConfiguration Subunits contain complex groups that have either "referenced" or "contained" associations. Examples of the two types of associations are represented in the simplified figure below (Figure 9). A referenced association is a pointer to another Subunit as shown for InputChannelInterface. For Subunits with a contained association, the constituents of the complex element (e.g., MarkerColorants) are fully contained within the Subunit (e.g., Marker). Table 6 list all the SystemConfiguration sub-elements with an association and their type.

When the GetSystemElements operation accesses a Subunit with a referenced association, it follows the reference and responds with the contained elements conceptually in that Subunit. This was done so that references would not have to be chased by SystemControl Client software and so that a Subunit element such as InputChannel would contain all its associated information. Note that this dereferencing is not done for the SetSystemElements operation; see § 7.4.15 for SetSystemElement's handling of a referenced association.
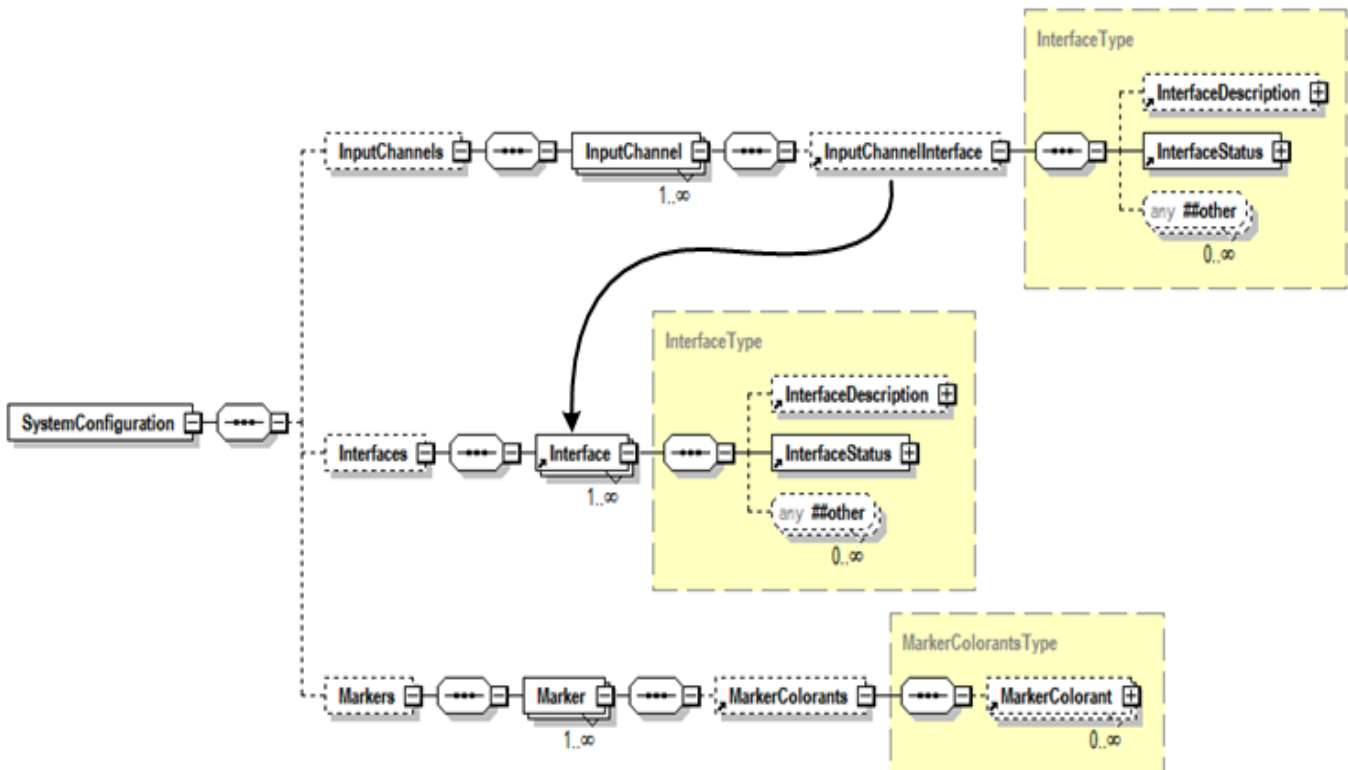

Figure 9 Association Types

Table 6 SystemConfiguration sub-element associations

Element Name	Association Type
FinisherSupply	Contained
FinisherSupplyMediaInput	Contained
InputChannelInterface	Referenced
InputChannelDefaultJobControlLanguage	Referenced
InputChannelDefaultPageDescriptionLanguage	Referenced
MarkerColorant	Contained
MarkerSupply	Contained
OutputChannelInterface	Referenced
OutputChannelDefaultJobControlLanguage	Referenced

7.4.5 ListAllServices

This operation is unique to the SystemControlService. This operation provides summary information on all Imaging Device hosted services including the SystemControlService.   The response returns a ServiceSummary for each service that includes Id, ServiceName, ServiceState, ServiceStateReasons for the service's endpoint and other general information.

7.4.6 PauseAllServices

The PauseAllServices operation is consistent with the operation Pause<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and transition all the currently active job based Services (e.g., CopyService, FaxOutService, FaxInService, PrintService, ScanService, TransformService) to the Stopped state. During the transition each <service>ServiceStateReasons MUST contain the reason 'MovingToPaused'.   This operation does not affect the SystemControlService.

7.4.7 PauseAllServicesAfterCurrentJob

The PauseAllServicesAfterCurrentJob operation is consistent with the operation Pause<service>ServiceAfterCurrentJob specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and transition all the currently active job based Services (e.g., CopyService, FaxOutService, FaxInService, PrintService, ScanService, TransformService) to the Stopped state in an orderly manner. During the transition each <service>ServiceStateReasons MUST contain the reason 'MovingToPaused'. No pending jobs may be scheduled and all processing jobs will complete. This operation does not affect the SystemControlService.

7.4.8 RestartAllServices

The RestartAllServices operation is consistent with the operation Restart<service>Service specified in [PWG5108.01]. This operation does not affect the SystemControlService. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and MUST reinitialize all hosted services, except the SystemControlService. This includes setting the State to 'Idle', clearing the StateReasons Element and setting the IsAcceptingJobs/IsAcceptingResources Element to 'true' if applicable. Note that parameters control subsequent service behavior (See the last paragraph in this section). When the service startup is complete the service state is 'Idle' (See below). The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01].

When the operation contains the "StartServicePaused" parameter and it is set to 'true', the resulting service state is 'Stopped' (i.e., transitions from 'Down' to 'Idle' then immediately to 'Stopped'). The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01]. When the operation contains the "IsAcceptingJobs" or "IsAcceptingResources" parameter and it is set to 'false', the service state is 'Idle' (See note

6). The service will then follow the behaviors as defined in section 7.3.2.2 of [PWG5108.01] or section 8.2.1 of [PWG5108.03] respectively. Parameters that do not apply to target service are silently ignored.

7.4.9   RestartService

The RestartService operation is consistent with operation Restart<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and MUST reinitialize the specified service State to 'Idle', clear the StateReasons Element and set the IsAcceptingJobs/IsAcceptingResources Element to 'true' if applicable. Note that parameters control subsequent service behavior (See the last paragraph in this section). When the service startup is complete the service state is 'Idle' (See below). The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01]. This operation can specify any service including the SystemControlService.

When the SystemControlService is the target of this operation the system behavior is implementation specific. The implementation may reinitialize the existing service or shutdown and instantiate the SystemControlService. It is also implementation specific whether or not restarting the SystemControlService also causes a restart of all the other hosted services.

When the operation contains the "StartServicePaused" parameter and it is set to 'true', the resulting service state is 'Stopped' (i.e., transitions from 'Down' to 'Idle' then immediately to 'Stopped'). The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01]. When the operation contains the "IsAcceptingJobs" or "IsAcceptingResources" parameter and it is set to 'false', the service state is 'Idle' (See note 6). The service will then follow the behaviors as defined in section 7.3.2.2 of [PWG5108.01] or section 8.2.1 of [PWG5108.03] respectively. Parameters that do not apply to target service are silently ignored.

7.4.10 ResumeAllServices

The ResumeAllServices operation is consistent with the operation Resume<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and transition every job based Service (e.g., CopyService, FaxOutService, FaxInService, PrintService, ScanService, and TransformService) to the 'Idle' state. The service will then follow the service state model as defined in section 7.2.1 of [PWG5108.01]. This operation does not affect the SystemControlService.

7.4.11 ShutdownAllServices

The ShutdownAllServices operation is consistent with the operation Shutdown<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and forces each of the services, except the SystemControlService, to the 'Down' state from any state that it is in, in an orderly manner. This operation does not affect the SystemControlService itself.

7.4.12 ShutdownService

The ShutdownService operation is consistent with the operation Shutdown<service>Service specified in [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and force the specified service to the 'Down' state from any state that it is in, in an orderly manner. It is an error to specify the SystemControlService itself.

7.4.13 StartupAllServices

The StartupAllServices operation initializes all the shutdown services and takes them through the 'Down' state to 'Idle', assuming that there are no inhibiting conditions See sections 7.2.1 of [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request and initializes each of the services, except the SystemControlService. This operation does not affect the SystemControlService itself.

7.4.14 StartupService

The StartupService operation creates a new instance of the specified service type and takes it through the 'Down' state to 'Idle', assuming that there are no inhibiting conditions See section 7.2.1 of [PWG5108.01]. If the requestor is determined to have proper access, the SystemControlService MUST accept this request, create a new instance and initialize the service of the specified type. It is an error to specify the SystemControlService type.

7.4.15 SetSystemElements

Unlike the Set<service>ServiceElements [PWG5108.01] operation, the SetSystemElements operation allows a SystemControl Client to modify information about the System Object as well as the SystemControlService Elements.

For the SystemControlService, this operation can set the SystemControlService's settable elements (i.e., elements in ServiceDescription and none in ServiceStatus). This operation MUST NOT set elements from any other service (i.e. any other service under the Services element at the System root).

For the System Object, this operation can set settable elements the elements directly below the System element (i.e., elements in SystemConfiguration and SystemDescription but not in SystemStatus). The SystemConfiguration element in a SetSystemElements operation has additional rules and an alternative syntax.

The alternative syntax for SystemConfiguration permits schema enforcement of setting only a few elements within a SystemConfiguration element. Although an element may be mandatory in the model, the SetSystemElements operation need not contain a mandatory element unless it is the element being set.

An alternative syntax is also used when an element is a reference to another element instead of a contained element (e.g., InputChannelInterface in System.SystemConfiguration.InputChannels.InputChannel). See § 7.4.4 for a discussion of elements with referenced associations versus elements with contained association.   For simplicity and convenience of the GetServiceElements operation, when accessing an element with a referenced association to another element, the entire referenced element is replicated in place. Thus there is no need to use the reference identifier and make another query to obtain the information. However when the SetSystemElements operation acts upon an element with a referenced association, it action is to modify the reference identification and not the referenced element. Therefore when a SetSystemElements operation modifies an element with a referenced association, the element value will be an integer that corresponds to the identifier of the referenced element. To modify the referenced element itself, the elements themselves (e.g., Interface in System.SystemConfiguration.Interfaces) are modified using the SetSystemElements operation.

Table 7 SetSystemElements Contained/Referenced Datatypes

Element Name	Parent Element Name	Association Type	Name in SetSystemElements	Syntax in SetSystemElements
FinisherSupply	Finisher	Contained	FinisherSupply	FinisherSupplySet Type
FinisherSupplyMediaInput	FinisherSupply	Contained	FinisherSupplyMediaInput	FinisherSupply MediaInputSetType
InputChannelInterface	InputChannel	Referenced	InputChannelInterfaceId	Integer
InputChannelDefaultJob ControlLanguage	InputChannel	Referenced	InputChannelDefaultJob ControlLanguageId	Integer
InputChannelDefaultPage DescriptionLanguage	InputChannel	Referenced	InputChannelDefaultPage DescriptionLanguageId	Integer
MarkerColorant	Marker	Contained	MarkerColorant	MarkerColorantSet Type
MarkerSupply	Marker	Contained	MarkerSupply	MarkerSupplySet Type
OutputChannelInterface	OutputChannel	Referenced	OutputChannelInterfaceId	Integer
OutputChannelDefaultJob ControlLanguage	OutputChannel	Referenced	OutputChannelDefaultJob ControlLanguageId	Integer

The SetSystemElements operation has some special rules when setting a virtual row in a virtual table. In the Printer MIB these rows are represented as rows. In the schema associated with this specification the table is represented as an element whose name ends in 's' (e.g., Finishers, InputChannels, Interfaces) that contains multiple instances of the element itself (e.g., Finisher, InputChannel, Interface). The elements in the row that can be directly set by an authorized client are grouped together in a Description element and the elements that are maintained by automata or can only be modified by a first class operation are grouped together in the Status element. When setting a row in a table the request MUST be limited to operate only on the one row in one table. It is an error to include multiple rows or to include elements not part of the row. The alternative schema for the SetSystemElements enforces this by limiting the element that represents rows to a single instance. Where applicable a choice construct is used to insure that when a row is the target of the operation no other elements can be included in the request.

8   Conformance Requirements

This section describes conformance requirements. This document introduces model entities such as SystemControl Clients, SystemControlService, objects, operations, elements and element values. The sections below describe the conformance requirements which apply to these model entities.

8.1   SystemControl Client Conformance Requirements

1) A conforming client MUST support all REQUIRED operations as defined in this document. For each parameter included in an operation request, a conforming client MUST supply a value whose type and value syntax conforms to the requirements of the Model document as specified in Section 7.4.

2) A client MUST be able to accept any of the elements defined in the model, including their full range that may be returned to it in a response from a SystemControlService.

3) An operation response may contain elements and/or values that the client does not expect. Therefore, a conforming client implementation MUST gracefully handle such responses and not refuse to interoperate with a conforming SystemControlService that is returning extended elements and/or values that conform to Section 8.3. SystemControl Clients may choose to ignore any parameters, elements, or values that they do not understand.

4) A conforming client MAY supply any extensions in an operation request, as long as they meet the requirements in Section 8.3.

5) When sending a request, a conforming client MAY supply any parameters that are indicated as OPTIONAL to be supplied by the client.

8.2   SystemControlService Conformance Requirements

This section specifies the conformance requirements for conforming Imaging Device and SystemControlService implementations with respect to objects, operations, and extensions.

8.2.1   Objects

This section specifies the conformance requirements for conforming Imaging Device and SystemControlService implementations with respect to objects.

1) Conforming implementations MUST implement all of the model objects and the mandatory elements they contain as defined in this specification in the indicated section 6.

2) If an object supports an element, it MUST support only those values specified in this document or through the extension mechanism defined in section 8.3.

3) If an object supports an element, it MAY support any non-empty subset of these values. That is, it MUST support at least one of the specified values.

8.2.2 Operations

This section specifies the conformance requirements for conforming Imaging Device and SystemControlService implementations with respect to operations.

1) Conforming SystemControlService implementations MUST implement all of the REQUIRED SystemControlService operations, including REQUIRED requests and responses, as defined in this specification in Table 4.

2) Conforming SystemControlService MUST support all REQUIRED operation elements and all values of such elements if so indicated in the description.

3) Conforming SystemControlService MUST ignore all unsupported or unknown operation elements received in a request.

8.3 Extensions

This section specifies the conformance requirements for conforming Imaging Device and SystemControlService implementations with respect to extensions.

1) To extend the model the extensions MUST be fully qualified.

2) The qualified name MUST NOT be in the PWG target namespace.

3) When extending the model with new elements the new elements MUST be added at the extension points at the end of the associated sequence of elements.

4) Extended values for elements MUST conform to the extension patterns defined in the element schema.

5) Conforming SystemControlService MAY support extensions.

9   PWG Registration Considerations

This specification is consistent with the guidelines set forth in the MFD Model and Common Semantics specification [PWG5108.01] (section 10).

10 Internationalization Considerations

This specification is consistent with the guidelines set forth in the MFD Model and Common Semantics specification [PWG5108.01] (section 11).

11 Security Considerations

This specification is consistent with the guidelines set forth in the MFD Model and Common Semantics specification [PWG5108.01] (section 12).

12 References

12.1 Normative References

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