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Statement of Requirements

The Printer Working Group

Multifunction Device Service Model Requirements

Status: Approved

Abstract

The Multifunction Device Service Models represent an abstraction of the characteristics, capabilities, and interfaces of each of the imaging services potentially provided by a Multifunction Device (MFD), as they are accessible to an outside client. The effort to model these services as a group and the associated effort in representing these models in a MFD Semantic Model is intended to highlight the commonality in the elements of these services while preserving the distinct functions of each service. The ultimate objective is to exploit the commonality to provide a consistent interface to services that have evolved in different environments and under different circumstances, but now are typically executed in the same device and used in the same environment.

This document provides the rationale and summarizes the requirements for the modeling activity,

This document is a PWG Statement of Requirements. For a definition of a "PWG Statement of Requirements", see:

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

This document is available electronically at:

ftp://ftp.pwg.org/pub/pwg/informational/req-mfdreq10-20100901.pdf

Title: Multifunction Device Service Model Requirements

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In general, a PWG standard is a specification that is stable, well understood, and is technically competent, has multiple, independent and interoperable implementations with substantial operational experience, and enjoys significant public support.

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http://www.pwg.org/mailhelp.html

Members of the PWG and interested parties are encouraged to join the PWG and MFD WG mailing lists in order to participate in discussions, clarifications and review of the MFD Working Group product.

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1 Introduction

The purpose of this document is to specify the requirements for a set of specifications defining the semantic models for each of the Imaging Services, and for the major support elements associated with an imaging Multifunction Device (MFD).

The models are intended to represent an abstraction of the Services' characteristics, capabilities, and interfaces as accessible to an outside client. The models are not intended to represent the internal structure or implementation of the specific Service or of the Device. They are not specifically linked to any protocol but are applicable to all user, administrator and Client interactions. By using a consistent modeling approach for all services, it is intended to expose both a consistent mode of interaction across all services and an inherent commonality in concepts, subunits and elements. An objective of the modeling is to provide for a consistent user experience with document-handling Jobs and a consistent administrator environment in working with Devices performing Imaging Services.

Although the modeling will show commonality among services, the models deal with individual services only and not the concatenation or paralleling of services in a "workflow". However, the advantages of combining Imaging Services in a workflow implementation are well recognized and it is intended that the consistency in interacting with the different services provided by the modeling will assist and simplify workflow implementations using established workflow protocols.

2 Terminology

An important aspect of a consistent modeling of MFD services is consistent terminology. The terms to be used in the MFD Services modeling are generally consistent with those used in PWG Semantic Model V1.0 [SemanticModel], but have been expanded to apply to multiple Imaging Services. The following table identifies terms used in this document and constitutes a subset of the full MFD modeling terminology which will be presented in a separate "Overall MFD' document.

Table 1 - MFD Services Terminology

Term	Definition
<service>	An identification of the specific Imaging Service involved, sometimes preceding (and sometimes embedded in) terms dealing with Devices, Clients, Jobs and Job elements, Documents and document elements. For example, Print Document Ticket, Scan Intent, FaxIn Job. See definition of Service on page 8.
Automatic Document Feeder (ADF)	A mechanism for handling Hard Copy Documents for scanning. The mechanism selects a media sheet from its bin and passes it to the image acquisition subsystem of the Scan Device. After the Scan is complete the ADF transports the Hardcopy Document's media sheet to its final destination (e.g. output bin, ADF bin).
Capabilities	Used in the context of <service> Capabilities, this term refers to those elements of a Service that can be used in the processing or description of a Job or Document. The models include Job Procesing Capabilities, Job Description Capabilities and Document Processing Capabilities. Generally, a Service must be able to report its Capabilities and JobTickets may include the desired values of these Capabilities elements to describe the User's Intent.
Client	The local or remote software entity that interfaces with the Job Originator and interacts with an Imaging Service.
Default Job Ticket, Default <service>Job Ticket	A Job Ticket data object that is bound to an instance of an Imaging Service. The Job Ticket Default <service>Job Ticket values are used by the Imaging Service when the Job Ticket for Job being processed does not specify a different value.
Device	An abstract object representing a hardware component that implements one or more Imaging Services. The term may be preceded with the name of the specific Imaging Service (represented here by <service>). A Device exposes every Subunit on the associated host system involved in performing the functions of the indicated Imaging Service. For example a Print Device Scan Device.
Digital Document	A Document in digitally encoded form as distinguished from a Hardcopy Document.
Document Data	The digitized data submitted by a Job Originator as the Document or portion of a Document to be processed by an MFD service, or as the resulting data from the scanning of Hardcopy Document(s) in an MFD. The images from the scanned Hardcopy Document(s) are encoded in a specified format and stored at a Destination.
Document Repository	A local or remote data store where Digital Documents are stored by or recovered from an MFD Service.
Document Ticket	A data object that contains a User's <service>Intent for Document processing and descriptive properties of a Document in a Job. Any Document processing properties in the Document Ticket for a particular Job will override the values specified in the Job Ticket's Document processing properties. The content of a Document Ticket is configured by a User through a <service> Client.

Document	An object created and managed by an Imaging Service that contains the description, processing, and status information of a data object submitted by a User. A Document object is bound to a single Job.
Element	A term used to convey structure and relationships in XML Document instances. An Element can contain both content and Elements. Complex Elements are composed, at least in part, of other Elements.
End User	A User (Administrator, Job Owner, Operator, member of the Owner's group or other authenticated entity) for whom the Job output is intended.
Hardcopy Document	A Document on physical media such as paper, transparency or film that is the input source to Scan, Copy and FaxOut Services and the output from Print, Copy and FaxIn Services.
Imaging Device	A hardware entity that supports one or more Imaging Services (as defined below), including the System. A more general alternate term for Multifunction Device, which name suggest that more than one Imaging Service is supported.
Imaging Service	One of the Services considered in the modeling of a Multifunction Device, including Print, Scan, Copy, FaxIn, FaxOut, EmailIn, EmailOut, Transform and Resource.
Intent	The User's preferences for the processing and description properties of a Job or Document.
Job	A data object, created and managed by a Service, that contains the description, processing, and status information of a Job submitted by a User. The Job can contain one or more Document objects.
Job History	An MFD Service instance specific queue containing all the <service>Jobs that have reached a terminating state. The terminating states are defined as Completed, Aborted and Canceled. The length of this queue is determined by the implementer. The Jobs should remain in the Job History for a time sufficient for interested parties to obtain information on completed Jobs.
Job Originator	The User that submits the initial request to create the Job.
Job Owner (or Owner)	Normally the User who submits a Job is the Job Owner, although under certain circumstances an administrator can reassign ownership. The Job owner has certain administrative privileges with respect to his Jobs.
Job Receipt	An Element of the Service that contains information on the actual values of processing Elements used by the Service for processing a Job. The content of a Job Receipt is populated by the Service when a Job is processed.
Job Resource	A Resource associated with a Job.
Job Template	A Job Ticket data object representing a User's preconfigured Intent that is not bound to a specific Service or Job.
Job Ticket	A data object that contains a User's Job-level Intent for Document processing, Job processing and descriptive Job properties of a Job, sent to an MFD Service. Job Elements apply to the entire Job. Document processing Elements apply to all Documents within the Job unless overridden at the Document level (See Document Ticket). The content of a Job Ticket is configured by a User through a Client.
Local Client	A software application entity that is co-located with the Service and interacts on behalf of a User. May also be referred to as Local <service> client, where <service> is one of the Services supported by the MFD.
Multifunction Device , MFD	A hardware entity that supports one or more Imaging Services, including the System. Generally abbreviated MFD, this also includes Imaging Devices commonly called Multifunction Peripherals or Multifunction Printers (MFPs) and All-In-Ones.
Physical Document Ticket, Physical <service>Document Ticket	A printed, encoded Document Ticket submitted by the Job Originator with the Hardcopy Document to be scanned, which becomes a Document Ticket data object after being scanned and processed. This may be used for Scan, Copy and Fax-Out Services.

Physical Job Ticket, Physical <service>Job Ticket	A printed encoded Job Ticket, submitted by the Job Originator with the Hardcopy Document to be scanned, that becomes a Job Ticket data object after being scanned and processed. This may be used for Scan, Copy and Fax-Out Services.
Remote Client	The Remote Client is a Client external to the MFD that interfaces with the End User and interacts with a Service.
Resource	A data object that can be served by the Resource Service when required by an MFD system for performing a task or a Job. There are two categories of Resources required by an MFD: Executable Resource, and Static Resource. (See the definitions of Executable Resource and Static Resource).
Resource Client	The local or remote software entity that interfaces with the Job Originator and interacts with a Resource Service.
Service	An Imaging Service (or MFD Service) that accepts and processes requests to create, monitor and manage Jobs, or to directly support other Imaging Services in an imaging-specific way (i.e., the Resource Service). The Service accepts and processes requests to monitor and control the status of the Service itself and its associated Resources. A Service may be hosted either locally or remotely to the MFD.
Subunit	A physical entity contained within or controlled by an Imaging Device that performs a specific process necessary to support one or more Imaging Services; (e.g., Marker, Console, Covers, Interfaces, Input Channels, Output Channels, etc). Note that, for historical reasons, the term Scanner may refer to either a Subunit or a Scan Device.
System	The object handling interaction that needs to be with the MFD as an entity rather than a specific Service. The System is modeled to include all of the subunits of the MFD, as well as device identification and overall status.
Template	A data object that contains descriptive information and the pre-configured content of a Job or Document Ticket for a specific MFD service. A Template is not bound to a specific Job or Document. It can be stored or retrieved from a Resource Service, collocated on the MFD or hosted on a remote system. Template is a type of Resource that can be retrieved and stored by a PWG MFD Resource Service.
User	Users include the Administrators, Job Owners, Operators, members of the Job Owner's group and other authenticated entities.

3 Background and Goals of the MFD Modeling Effort

3.1 Evolution of Imaging Services

Office imaging functions were once limited to copying, formed letter printing and PSTN facsimile, each performed by a different device. Impact printers gave way to high quality image printers with complex interpreters and network communication. Optical copying devices were replaced by digital scanners driving image printers. Facsimile matured to wed digital scanners and image printers with more complex encoding and transports. From the viewpoints of utility, functionality and efficiency, it made sense to integrate these Imaging Services in a Multifunction Device, and such devices are becoming increasingly prevalent.

Despite the commonality of technology and the related functionality, the terminology, method of use, and anticipated user interaction of the office imaging functions has been tied to the different cultures associated with these functions and has been slow to coalesce. Indeed, even within the industry, the Facsimile, Copier, Printer and scanner groups were usually separate and distinct with different manufacturing, marketing, sales and support, even when they were all nominally from the same company. The attempt to integrate the structures manufacturing and supporting the devices providing MFD Services has been much more difficult than the actual integration of those Services on an MFD.

But the modern user simply wants to deal with Documents, Hardcopy or digital versions, in a consistent way, using the Imaging Service most appropriate to his needs (perhaps not even considering which Service is most appropriate.) He wants to get Hardcopy and received Documents into his data system. He wants to put Documents out from his data system, whether via Hardcopy or by an appropriate means of transmission. He wants to make copies of Hardcopy Documents and perhaps copy Digital Documents into some other format or encoding. Furthermore, he needs intelligent user interfaces using a consistent terminology in doing these functions.

A consistent model of MFD Services is also useful to equipment manufacturers and software providers to allow a more efficient implementation of the devices and the use of a more standard set of drivers.

Considering this situation, there is a need to develop a semantic model and a set of abstract operations and Elements for each MFD Service and to ensure that these abstract operations and Elements exploit the inherent areas of commonality among the MFD Services.

3.2 Considerations in a Consolidated MFD Semantic Model

3.2.1 Benefits of the Semantic Model

The PWG Semantic Model V1.0 was approved as PWG Candidate Standard 5105.1 in 2004 [SemanticModel]**.** Establishing industry wide consensus on the semantics of printing has had many benefits. The semantics are applicable to a number of capabilities including:

- Service Location,
- Representation in Directory Services,
- Device Monitoring and Management, and
- Job Submission, monitoring and control.

Industry wide consensus has allowed the alignment of Print related semantics across many environments, promoting consistent behavior regardless of the specific mapping.

The consensus on a common model has benefited device and service vendors by permitting rapid development of new protocol bindings (e.g., WS-Print) and industry specific applications (e.g., JDF Digital Print). The common model has resulted in reduced product development cost, increased reliability, and quicker time to market for Print Service related product implementations. This is possible because the

semantic Elements need be instrumented and/or implemented only once, with thin Protocol Gateways providing the syntactic translation required by the multiple protocol implementations (e.g., IPP, WS-Print, JDF Digital Print, SNMP, CIM).

The trend of Hardcopy Document processing in both enterprise and SOHO environments has been from locally attached or network connected printers and scanners to MFDs. As the Operating System and Application vendors evolve their systems to take advantage of the more user-friendly 'Imaging Services' approach, it will benefit device vendors to have a comprehensive, integrated model for these services. Therefore, it is desirable to extend the Semantic Model to a complete data and operational model of the user facing services common in today's MFDs. An industry-wide, comprehensive model allows the use of a common set of MFD semantics that can be applied to different environments and applications to allow environment specific solutions including Service advertisement, discovery, monitoring, management, Job submission and tracking that facilitate workflow solutions.

3.2.2 Source of the Model

Version 1.1 of the Internet Printing Protocol (IPP1.1 [RFC2911]) formed the basis for PWG Semantic Model 1.0. Therefore, in considering the MFD, IPP must remain the Print Service model. Because the structure, Elements and operations defined in IPP have been established, embellished and well exercised for a significant time period. It is reasonable to use the Print Service model (although not necessarily the protocol) defined by IPP as the starting point for the modeling of the other Services. Indeed, based on the benefits of the IPP effort, one might consider the MFD modeling Rationale as the need to extend the structuring of the IPP Print Service model to all Imaging Services.

3.2.3 Model Extensibility and Vendor Differentiation

Although adherence to a common model makes use easier for the consumer and benefits both application and device manufacturers, vendors need to differentiate their products by adding unique features and capabilities. A model that is limited to a common subset of Elements and operations does not provide adequate benefit to PWG members. The modeling approach is designed to easily be extended with vendor specific features. The extended capabilities will be discoverable and the application of appropriate features will be easily incorporated into Job submissions. Furthermore, the PWG MFD Semantic Model is structured to allow a mechanism for revisions to accommodate the inclusion of additional features. These features may be extensions that are sufficiently common to be incorporated in the core MFD model, or they may be new features made possible by new technology or made necessary by consumer requirements. Along with extension capability, the model provides for compliant implementations of defined feature subsets to allow simplified Service bindings and to permit resource-constrained or low cost products to be fully integrated into any environment supporting the model.

4 Scope of MFD Modeling Activity

4.1 MFD Services and Elements to be Modeled

Although the modeling is intended to deal with Imaging Services as they are perceived by Users, practical considerations require a somewhat expanded consideration of the true nature of these Services. The Services generally attributed to an MFD are:

- **Print**
- **Scan**
- **Copy**
- **Fax**

In considering the facsimile service modeling, it was initially thought necessary to distinguish between facsimile services using the Public Switched Telephone Network (PSTN) and facsimile services using digital data networks such as the Internet (Network). However, it was decided that the models were the same with the difference being in the specific transports and encoding used. On the other hand, from a modeling viewpoint, it became desirable to separate the functions providing for outgoing facsimile products from those dealing with incoming facsimile products. So Fax is divided into **FaxIn** and **FaxOut**.

Further, many MFDs support an imaging/text transmission and receiving capability using the standard Email transport. This translates into **EmailIn** and **EmailOut** Services.

In pursuing the “Ticket” concept for submitting Jobs to an imaging service, it became apparent that there was a need for a common supporting Service that maintained “Ticket Templates”. On further consideration, it was realized that there were other aspects that the supporting Service could reasonable maintain and supply to the other Services (such as fonts, logos, forms, etc) and so the **Resource** Service was defined. The Resource Service is intended to support the image-processing MFD Services, although it could be used as an independent, but limited, Element storage/retrieval service.

Finally, although an encoding or interpreter capability is to be included in the MFD imaging processing Services, a separate Service to transform formats was also envisioned. The **Transform** Service is modeled as an independent primary service, accepting Digital Documents from clients and delivering transformed Digital Documents to clients. It is analogous to the Copy Service that takes in Hardcopy Document and outputs one or more Hardcopy Documents, perhaps with some scaling or other transformation. The Transform Service may also be used in tandem with one or more other MFD Services in a workflow mode.

The MFD Services to be modeled therefore include:

1. **Print**
2. **Scan**
3. **Copy**
4. **FaxIn**
5. **FaxOut**
6. **EmailIn**
7. **EmailOut**
8. **Transform**
9. **Resource**

The MFD Services and their primary interfaces are represented in Figure 1. All MFD Services other than the Resource Service process Jobs that deal with Documents. The Documents may be in either Hardcopy

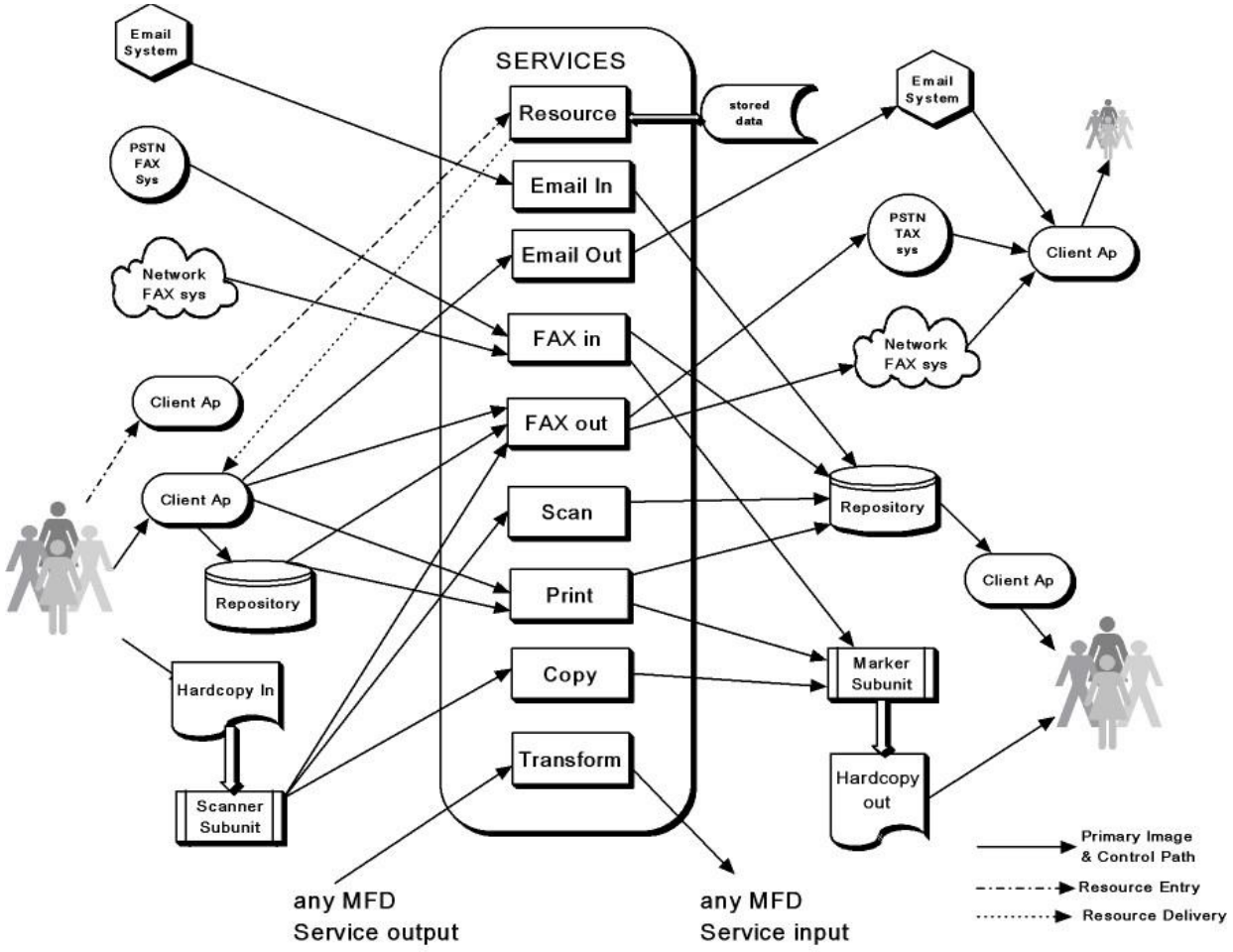

Figure 1 - Primary Interfaces with Services

form, processed by scanner or marker subunit, or electronic (digital) form, communicated through a network, Fax or email interface subunit. All MFD Services are integral in themselves, interfacing with an external client, repository or communication facility. (Note that “repository” in this context refers to an external Digital Document source or destination, such as a storage medium.)

All Services other than Resource actually operate on Digital Documents, using the scanner subunit and/or Marker subunit for the Hardcopy/Digital conversion. (Note that, for Copy Service, the Digital Document is totally internal and neither it nor its characteristics are accessible outside the service; therefore, for modeling purposes the Digital Document is not included in the Copy Service.) Users’ Hardcopy interface with a Service is either through a scanner or Marker subunit. Users’ “softcopy” and control interface is always through a Client, which may be a remote application or may be access via a local Console contained in the MFD. The Repository, which stores Digital Documents before and/or after servicing, may be either contained within the MFD or may be remote (such as a network file server), or may be some combination. The Fax transmission/reception facilities may be fully external (e.g., digital network Fax) or partially internal (e.g., PSTN Fax Modem). For functional modeling of the Services, it makes no difference if these subunits are facilities internal to the physical MFD or not.

The Resource Service interfaces represented in the figure are those to enter and maintain Resources, and those creating a Job Template for submission of a Job Creation request to a Document-processing MFD Service. It would also be possible for the Document-processing MFD Services to include or interface with clients which would directly access Resources to be used in a Job, such as fonts or forms, from a Resource Service.

A work flow could route a Job though multiple Services or otherwise use multiple Services to execute a complex Job. However, although the modeling of the Services should facilitate the handling of Hardcopy imaging workflow using standard workflow methods, it is not the intent of this modeling activity itself to address workflow.

Finally, although the modeling is done on a Service basis thereby making interaction largely independent of specific implementation, some interaction needs to be with the MFD as an entity. For modeling purposes, these MFD-wide Elements are considered to be manifest in the System. The System is modeled to include all of the subunits of the MFD, as well as device identification and overall status.

4.2 Mode of Modeling

The baselines of the Imaging Service models are as follows:

4.2.1 Purpose and Degree

The purpose of the model is to fully describe, in an abstract context, the Service characteristics as observed from the outside. It is not intended to describe how the Service is implemented internally, and it is expected that different implementations may use vastly different internal architectures. The models define semantics only for Elements that are accessible or about which information is somehow accessible via an interface. The models do not define a protocol or protocol specific encoding by which this access is achieved.

4.2.2 Modeling Method

The Service models use XML schema. This is for convenience and does not require a protocol mapping involving XML. The top level objects such as the Subunits, the Services, and their associated Jobs and Documents can be represented in any number of ways. Abstractly they are objects which contain attributes or properties that express characteristics of the object. References to Attribute or Element refer to XML Attributes and XML Elements respectively. Either of these can be abstractly considered to be attributes or properties of abstract objects.

4.2.3 Target Environment

The modeling of Multifunction Device Services is intended to cover imaging Services in all environments, from SOHO to production. Some aspects may be applicable primarily to production level applications while others will be applicable primarily to SOHO level applications. The model is to be sufficiently flexible to allow adherence at all levels.

4.3 Out of Scope

The following are out of scope for the Service modeling documents.

1. Semantics of any compound Service or workflow such as -To-EmailOut, FaxIn-To-Print, -To-Transform-to-FaxOut, Print-To-Copy.
2. Specifics related to the security of the Document or administrative information, protection of the communication mechanisms or the implementing Imaging Devices from abuse, or methods of usage accounting. However, the models structure must not inhibit addressing these requirements by other appropriate means.

3. Any semantics related to a specific protocol. Rather, it is intended to make the semantics protocol and transport agnostic.
4. Semantics of any workflow protocol, i.e., sequencing and coordination of Jobs across multiple Services.

5 Use Cases and Considerations

Because each of the basic Imaging Services have been provided for many years, there would be little new information in considering the capabilities Users want when they Print, Scan, Fax or Copy Documents. The significant considerations are that:

- Users want Document handling and processing to be transparent. Once they have created or selected a Document, they do not want to be concerned with the specifics of how that Document gets printed or faxed or copied; they just want the right people to get it in the right form at the right time. Because most of the complexity of printing is hidden by applications, user interfaces and Print Devices, the typical user thinks printing is simple. By extending Print Semantics to all Imaging Services, all Document processing and handing should appear simple and intuitive to Users.
- Administrators and operators want the setup, maintenance and monitoring of devices performing Imaging Services to be capable of supporting the Users' requirements in an efficient and consistent way across all Services, especially when multiple Services are performed by a one device. A consistent modeling must support accounting of Service utilization, ensuring availability of consumables, and handing of problems in capacity, utilization, security issues and equipment malfunction.
- Developers of applications, drivers and user interfaces need to support the user requirements. The developers want a consistent terminology and capability in operations and messages.

5.1 Service Basic Functions

The basic functionality of scanning/printing/faxing/copying, although it must be covered in the Service models, is well established with the scenarios known and understood. Although IPP [RFC2911] specifically applies to the Print Service, a majority of the IPP operations and attributes are applicable to one or more of the other Imaging Services. By applying the IPP-like operations and attributes to structure the functionality of the other Imaging Services, much of the desired consistency across Services is achieved. The well defined IPP operations and attributes therefore form the basis for the modeling of the other Services.

5.2 Consideration of Subunits

In modeling the MFD Services after the IPP Print Service, the major areas of difference will be the form of the input and the form of the output. Input and output are both functions of the physical/functional modules that are termed Subunits.

1. Scan, Copy, FaxOut Services need a scanner subunit
2. Copy, Print, FaxIn, EmailIn Services need a marker subunit
3. FaxIn and FaxOut Services need a FaxModem

5.3 MFD Service Use Scenarios

The following scenarios deal with extended functionality of an MFD and the interaction of Services sharing common subunits. These scenarios are not intended to cover all ways in which the Imaging Services would be used.

5.3.1 Use Case 1: Create Job Template from a Remote Network Client Application

Imaging Services are often used in recurring ways: e.g., printing company memos in a particular format; sending out orders via Facsimile; scanning accident reports and storing in a repository. Job Templates simplify these actions by providing the recurring parameters for Job Tickets.

5.3.1.1 Scan Service Example

Nancy, working in the human resource department, is conducting an “anonymous” employee survey. To preclude apprehensions of electronic input being traced, the survey sheets are provided in Hardcopy form. The completed forms must to be scanned and processed to analyze the survey results. Nancy wants to use the group MFD to Scan then store the scanned survey forms in the survey project directory. However, she does not want to set up the Job parameters for each filled-in form as the forms filter in. Therefore Nancy launches her Imaging Service Client application and requests the creation of a new Job Template. Nancy sets up her Job Template with her <service>Intent and the repository location for the Documents associated with this new activity. Finally, Nancy requests that her Job Template be stored on the group MFD under her account. Nancy closes her Imaging Service Client application.

5.3.1.2 Copy Service Example

Joe, manager of a sales department, has dictated that internal memos must be distributed on recycled paper and, if more than one page, must be printed in duplex. He is tired of employees saying that they don’t know how to set up the MFD to do this, or that they forgot. So he wants to set up the MFD with a Job Template so that Users need just select “internal memo” and number of copies. Therefore, Joe launches a Job Template Client that allows him to define a Job Template tag and the Copy parameters to create a Job Template that is to be stored in the MFD Resource Service and that is readily accessible to walk-up Copy-Service Users.

5.3.1.3 FaxOut Example

Dick is a legal aid working on a commercial case that involves a series of contracts, with copies to be delivered via facsimile to a set of recipients. The contracts are generated by several attorneys on their computers and Dick wants a reliable way to ensure that all intended recipients get their copies promptly and in the proper way, and that each record of transmission and successful reception be sent to the proper repository. Dick launches a Job Template Client that asks him to set up the facsimile parameters, the destinations, and the handling of the transmission and reception reports. He sets this up to be stored in a central location so that each attorney can call it up as needed.

5.3.1.4 Example Processing Steps

Listed below are processing flow requirements for the scenarios.

1. The User invokes a Template generation application.
2. The User may select an Imaging Device to use to constrain their <service> Intent
3. The User requests the creation of a new <service> Job Template.
4. If the specific Imaging Device has been identified in the User request, the Template generation application may contact the appropriate Service in that Device to request the associated description attributes and the range of values for each attribute of the Service (i.e., the <service> Capabilities).
5. The Template generation application presents the <service> Job Template to the User.
6. The User modifies the <service> Job Template attributes to meet their specific <service> Intent.
7. The Template generation application validates the modified <service> Job Template.
8. The User designates storage of the modified <service> Job Template to be at the specified Resource Service.
9. The Template generation application requests the Resource Service to store the modified <service> Job Template on behalf of the specified User(s).
10. The Resource Service stores the modified <service> Job Template.
11. The Template generation application informs the User that their modified <service> Job Template has been stored.
12. The User exits the Template generation application.

5.3.2 Use Case 2: Handling Multiple Hardcopy Documents from a Computer

After the Hardcopy Document is placed on the platen or in the ADF of a Scanner Subunit, a User is to control scanning operations using the remote Imaging Service Client from the User's desktop computer. The User continues to place the next set of Hardcopy originals on the scanner subunit when requested, and repeats the process until all sets of the User's Hardcopy Documents have been scanned and processed according to the specified <service> Intent. This use case can apply to all Imaging Services that use the Scanner Subunit.

5.3.2.1 Service Examples

Clara has to Scan, Copy, or FaxOut a multipage Document in a busy office environment. Every time she goes up to the MFD, either someone else is standing there or the machine is busy processing some long Job. Clara does not have the time to stand there and wait for the machine to become available and then spend time setting up her Job Ticket. She needs to be able to set up the proper Job Ticket from her workstation, get a notice from the MFD when the Service she needs is available. She can then go to the machine, load her original, identify her Job Ticket and start the Job. Also, since her Job is very large, she will need to reload the ADF several times. She does not want to wait by the MFD, but needs a notice from the MFD when more input must be loaded.

5.3.2.2 Example Processing Steps

The following are the processing steps for this scenario.

1. From the Resource Service Client application on their computer, the User obtains a local copy of the Job Template to use for their <service>Intent.
2. The Imaging Service Client modifies the local copy of the Job Template to the user's <service> Intent for use as a Job Ticket. This modification may include noting the Job includes multiple Documents with the same or different destinations.
3. The Imaging Service Client application sends a Create Job operation including the Job Ticket to the Service.
4. The <service> creates a Job but puts the Job into a 'Hold' state (inhibiting scheduling).
5. The Imaging Service Client application is monitoring the Job and the state of the Imaging Device. It notifies the User of the Job Identification and notifies the User when the Imaging Device is free.
6. When the Imaging Device is free and the User is ready, the User comes to the Device, identifies their Job and requests that it be released from the 'Hold" state. The Service schedules and begins to process the Job.
7. The Service requests the User to place the Hardcopy Document(s) in the Automatic Document Feeder.
8. The User provides the Document and presses the "Continue" button on the MFD.
9. The Service scans the individual pages of the Hardcopy Document. If the entire Document has not been placed on the MFD's ADF, the Service detects that more Hardcopy must be inserted and requests the User to put in the next sheet(s).
10. The User presses the "Stop" button when all of the Hardcopy Document's pages have been scanned.
11. The Service processes and delivers the Digital Document according to the nature of the Service and the Job Ticket instructions.
12. Repeat Steps 9 through 13 until the last Document is complete.
13. The User presses the "Stop" button to indicate that there are no more Documents for this Job.
14. The <service> notifies the Service Client application on the User's computer that the Job is complete based on the information in the Job Ticket.

5.3.3 Use Case 3: Walk-Up Batch-Scanned Input

This scenario can apply to any Imaging Service using the Scanner Subunit with an Automatic Document Feeder, although the Document boundaries may be lost with the FaxOut Service.

5.3.3.1 Service Example

Glen needs to scan a stack of Hardcopy Documents. For each Document to be scanned, Glen prepares a Physical Document Ticket and places it in front of the corresponding Document. Glen then prepares a Physical Job Ticket and places it in front of the stack and places the stack in the MFD's Automatic Document Feeder. Glen selects "batched" and presses the green button.

5.3.3.2 Example Processing Steps

The following are the processing steps for this scenario.

1. Glen places the stack of Hardcopy Documents on the ADF.
2. From the Local Client, Glen selects the "batch" mode of the Service.
3. The Local Client requests the Service to switch to "batch" mode.
4. Glen pushes the Start button.
5. The Local Client requests the Service to start "batch mode" operation.
6. The Service creates a "batch mode" Job.
7. The Service creates a Job Ticket from the Job Ticket Default Job Ticket.
8. The Service schedules the Job.
9. The Service executes the Job.
10. The Service scans the first sheet, recognizes it as a Physical Job Ticket and modifies the Job Ticket based on the information obtained from the digital image data of the Physical Job Ticket.
11. The Service scans the sheet at the start of the first Document and recognizes it as Physical Document Ticket.
12. The Service creates a Document within the Job, creates and fills in the Document Ticket based on the information obtained from the digital image data of the physical Document Ticket.
13. The Service scans the Hardcopy Document and stores the Digital Document at the specified Destination until the end of the Document is detected.
14. If another Physical Document Ticket is detected, the Service creates another Document within the Job, creates and fills in the Document Ticket based on the information obtained from the digital image data of the Physical Document Ticket.
15. Return to Step 13 until the scanning of all Documents in the Job, as identified on the Job Ticket, has been competed.
16. The Service completes processing of the scanned information and notifies the Local Client that the Job is complete.
17. The Local Client notifies the User that the Job is complete based on the information in the Job Ticket.

5.3.4 Use Case 4: Pause Service for Pre-emptive use of Subunits

Some Imaging Services have traditionally allowed a Job to be paused to allow a higher priority Job to go to completion. Because Services share subunits in an MFD, this pause capability must be extended to pausing a Service so that a different Service with a higher priority Job can use a common subunit. The following examples show how this may apply.

5.3.4.1 Pausing Scan Service

Anne urgently needs to Copy a few Documents while a long Scan Job is running. Since she has administrative rights, she pauses the Scan Service until she has copied her Documents and then resumes the Scan Service (which resumes the Job previously in progress).

5.3.4.2 Pausing Print Service

Joan needs to Scan some critical Documents but the MFD is tied up with a long Print Job. As the president's executive assistant, Joan has admin rights. She pauses the Print Service and gives her Scan Job highest priority. Of course, she must remember to unpause the Print Service when she is done.

5.3.4.3 Processing Steps

The following processing flow steps apply to this use case:

1. The User walks up to the MFD with a Job and sees the Imaging Device engaged in a Service using the same subunit that they need. Using the Local Client, they bring up the Service configuration menu for the currently active Service and request that that Service Pause.
2. The Local Client requests that the currently active Service pause and the Service performs a 'pause' operation.
3. The Service notifies the Client the 'paused' status.
4. The User removes any sheets from the ADF and from the output bin and puts the Hardcopy Documents on the platen or the ADF.
5. The User initiates a Job for their Documents. Since no specific Job Ticket information is added, the Service uses the Job Ticket Default Job Ticket.
6. After the User's Job is complete, the User removes their originals and any copies, restores the previous Documents to the scanner subunit and brings up the Service configuration menu from the console to resume the paused Service.
7. The Local Client requests the paused Service to resume and that Service performs a 'resume' operation.
8. The resumed Service notifies the Local Client of the 'resumed' status.

5.3.5 Use Case 5: Service Discovery

This scenario applies to all Imaging Services. Bill wants to discover the Services available in his enterprise network, so that he knows what he can choose in the future when he wants to submit a Job. Bill wants to discover Services both statically (via enterprise directories) and dynamically (via discovery protocols).

5.3.5.1 Processing Steps

For static discovery via a directory service, the following flow step requirements are identified:

1. At start-up, each Service authenticates with and connects (binds) to the Directory Service of the network domain of the MFD, then registers the Service information with the Directory Service.
2. At any time, a Discovery Client sends the Directory Service a "lookup" search request for the specific Service type in order to locate a Service.
3. The Directory Service returns an appropriate list of Services.

For dynamic discovery via a Service discovery protocol, the following processing requirements are identified:

1. At start-up, each Service announces its Service type and location to the multicast group in which all Services and discovery clients reside. Any listening Discovery Client will detect newly-available Services automatically.
2. To initiate a discovery at any time, a Discovery Client sends a “search-by-service-type” query to this multicast group.
3. Each Service responds to a search query with a “service-type-matched” message.
4. In a network environment where a discovery proxy server is preferred, the proxy server listens to this multicast group for Service announcements from all Services and announces its Service in response to each search query received.
5. If a discovery proxy server is preferred, the Client sends a “search-by-type” message to this proxy server to discover all available Services.
6. The discovery proxy server returns the list of Services that match the specific Service type to the client.

5.3.6 Use Case 6: Service Capability Discovery

An MFD is setup on the network. The MFD has been previously discovered and is known to the application software that will query the Imaging Device for capabilities. Ira wants to learn if the capabilities of various Services, such as whether the Scan Service is capable of sending his Document as a PDF file to his mailbox. He would also like to know if the Print Service is capable of duplex operation and whether the FaxOut Service accepts Digital Data input coded in PDF. From the application on his computer, Ira is able to select options available knowing that the application has determined what the capabilities of the Services are and that the indicated options will be supported.

5.3.6.1 Processing Steps

From the Remote Client at User’s computer, the User selects a target Service and requests the list of capabilities of the Service.

1. The Remote Client requests the Service the list of capabilities of the Service.
2. The Service returns the Service Capabilities to the Remote Client.
3. The Remote Client requests the UI to display the list of Service Capabilities to the User.

6 Design Requirements

Consideration of the Use Cases results in certain common design requirements for the Service models. There may be additional Service specific requirements that must be identified in each of the Service Documents. The following requirements are derived from the considerations and use cases in Section 5.

6.1 Basic Operations

The operations in the following table, which are primarily based on those defined for the Printer Service in IPP (REF), are operations reasonably required to be supported in the modeling of MFD Services.

Table 2 MFD Common Operations

MDF Service Operation
Add<service>HardcopyDocument
CancelCurrent<service>Job
Cancel<service>Document
Cancel<service>Job
Cancel<service>Jobs
CancelMy<service>Jobs
Close<service>Job
Create<service>Job
Disable<service>Service
Enable<service>Service
Get<service>DocumentElements
Get<service>Documents
Get<service>JobElements
Get<service>Job History
GetActive<service>Jobs
Get<service>ServiceElements
Get<service>ServiceElements
Hold<service>Job
HoldNew<service>Jobs
Pause<service>Service
Pause<service>ServiceAfterCurrentJob
Promote<service>Job
ReleaseNew<service>Jobs
Release<service>Job
Restart<service>Service
Resubmit<service>Job
Resume<service>Job
Resume<service>Service
Promote<service>Job
Send<service>Document
Send<service>URI
Set<service>DocumentElements
Set<service>JobElements
Set<service>ServiceElements
Shutdown<service>Service
Startup<service>Service
SuspendCurrent<service>Job

6.2 Requirements from Common Use of Subunits

An MFD includes many subunits, some of which are used by all Services, and some a subset of the supported Services. Indeed, there may be MFD implementations that include multiple subunits of a given type. (In use case 4 for example, multiple markers or multiple scanners would prevent the need for having to pause a currently active service.) In modeling the MFD Services, all of the MFD subunits that might be used by the Service must be identified.

6.3 Design Requirements from Use Cases

The Use Cases below suggest certain requirements of the Service models and of the MFD System model that go beyond having an operational capability analogous to IPP.

6.3.1 Requirement for a System

An MFD potentially supports several Services, and those Services share the Subunits constituting the MFD. One Subunit is the Console, with which a User interfaces to request Job creation in any of the Services, as well as to configure and control the individual Services. Therefore, there must be something starting and controlling the Services, managing the access to shared Subunits, and providing overall status and reporting information. That is, the set of Service models must include a System.

6.3.2 Job Related Requirements

Each Service must accommodate:

1. A consistent Job structure, including a Job Ticket defining the User <service>Intent for the Service to act on the Job Document(s).
2. A Default Job Ticket, to be used when a Job Ticket does not specify the values of all necessary Elements.
3. A Job Template, containing the Elements characteristic of a recurring type of Job, to prevent the User having to make up a full Job ticket in all cases.
4. A repository for storing and recalling prepared Job Templates, with each Service having access to this repository.

6.3.3 Service Status and Description Requirements

In this context, Status refers to characteristics of a Service which are not settable by an administrator. This generally includes capabilities and state. Description refers to Elements which are settable, and includes Elements such as name, and settable parameters. In being able to report Status and Description Elements, each Service shall make this information available, although it may in fact be the System that satisfies some of the requirements below.

1. For supporting dynamic Service discovery, the Service type, Service instance, and endpoint address information must be supplied to the multicast group in which it resides at start-up of the Service.
2. For supporting static Service discovery, an entry record must be sent to a specified Directory Service at Service start-up for registering Service information.
3. In response to a discovery or search query from a Discovery Client, the Service type, Service instance, and endpoint address information must be supplied to the client.
4. A Service must respond to a Client's query for Service status and descriptive Elements and the range of each descriptive Element. This response must include the capabilities supported by the Service and the default values of descriptive and processing Elements of a Job Ticket.

7 IANA and PWG Considerations

Once an Imaging Services Model specification and associated schema generated in conjunction with this Requirements document is approved and published, the registration of extensions to the Service model defined in that specification will require a revision to that specification.

Vendors may use extensions in their own namespace until such time as an update to the specification is under review.

8 Internationalization Considerations

The Imaging Services Model specifications will identify element values defined by enumerations (e.g. State) that represent keywords. Keywords are never localized by the device. A <service> Client may convert the values into a form acceptable to the User. This conversion may include not only localization but also transformations into graphical representation.

In each operation request, the <service> Client identifies a natural language that applies to the Imaging Service generated strings returned by the Service in operation responses. The Service must provide the localized value as requested by the user for any supported natural languages. A request for a language not supported results in a response with the string in the default localization.

No localization is performed on string values supplied by an administrator or End User. These strings are returned in operation responses as they were sent by the administrator or End User.

9 Security Considerations

Imaging Services may contain, process, and/or communicate sensitive data that site policy requires be protected against confidentiality and integrity threats. Imaging Services include resources and also interact with and access external resources, which may pose security threats to these resources. The specification of Imaging Services should consider the following security measures in protecting sensitive data, operational security and interfacing resource and network security:

1. Include the ability to use industry standard network security protocols to authenticate users' right to MFD operations that have direct or indirect impacts on the confidentiality and integrity of the sensitive data at rest according to the local site security policy.
2. Include the ability to use industry standard secure network protocols to transmit sensitive data over the network according to the local site security policy.
3. Include the ability to use Industry standard cryptographic algorithms compliant to the local site policy to protect internal MFD data at rest.
4. Include security state attributes that can be monitored and/or validated by Industry standard network access protocols to prevent or minimize the threats that the MFD can pose to other network resources if these security state attributes are compromised.
5. Include service operation and internal data access control policies in order to support the local site security policy.
6. Include the ability to generate and store audit log records in Industry standard formats for all security related events in accordance with the local site security policy.

10 References

[SemanticModel]**.**

"Printer Working Group (PWG); Semantic Model; Version 1.0". Candidate Standard 5105.1-2004, January, 2004

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"Internet Printing Protocol/1.1: Model and Semantics", RFC 2911, September 2000.

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