



The Printer Working Group

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Working Draft

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Cloud Imaging Requirements and Model (CLOUDIMAGINGIMAGINGMODEL)

Status: Stable

Abstract: This specification outlines the requirements of and defines a model to support imaging services using the Cloud, based on the PWG Semantic Model. The IPP Binding for this model is described in IPP Shared Infrastructure Extensions [PWG5100.INFRA]

This specification is a PWG Working Draft. For a definition of a "PWG Working Draft", see: <http://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>.

This specification is available electronically at:

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<ftp://ftp.pwg.org/pub/pwg/cloud/wd/wd-cloudimagingmodel10-201504163.docx>
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90

91 About the Cloud Imaging Work Group

92 Cloud-based applications and solutions are increasingly common, and Cloud-based
93 printing, scanning, and facsimile (collectively called "Cloud Imaging") are emerging in
94 several different forms. Adopting standard protocols and schemas now will help
95 interoperability, speed adoption, and address privacy, security, and legal issues involved in
96 Cloud Imaging.

97 For additional information regarding Cloud Imaging visit:

98 <http://www.pwg.org/cloud/>

99 Implementers of this specification are encouraged to join the Cloud Imaging mailing list in
100 order to participate in any discussions of the specification. Suggested additions, changes,
101 or clarification to this specification, should be sent to the Cloud Mailing list for
102 consideration.
103

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229 1. Introduction

230 This specification identifies the requirements and presents the model for PWG Cloud
231 Imaging. PWG Cloud Imaging is a method by which a User, outside of the Cloud, uses the
232 Imaging Services of a PWG Semantic Model compatible Imaging System (MFD Model and
233 Common Semantics [PWG5108.01]) within the Cloud, and by which this Cloud Imaging
234 System provides access to Imaging Services in registered Imaging Systems outside of the
235 Cloud on behalf of the User.

236 The MFD Model and Common Semantics [PWG5108.01] defines the network interface
237 between a User Client and an Imaging Service. This interface is applicable to the User
238 Client to Cloud Imaging Service connection and can be used in any Cloud Imaging
239 application in which the User Client initiates access to a Cloud-resident Imaging Service.
240 To provide for Imaging Service fan-out, this interface also applies to connections between
241 like Imaging Services. However, because of firewalls, this interface cannot be used for
242 connections from a Cloud Imaging Service to Services in an Imaging System outside of the
243 Cloud, a "Local" Imaging Service. A Cloud Imaging Service will typically need to pass on a
244 Job to a Local Imaging Service when the Job submitted to a Cloud Imaging Service
245 involves physically handling hardcopy documents.

246 Therefore, as part of the Cloud Imaging Model, this specification defines a "reverse"
247 interface by which the Services in a Local PWG Semantic Model Imaging System can
248 communicate with an external Service, such as a Cloud Imaging Service, where the Cloud
249 Imaging Service cannot initiate connections to the Local Imaging Services. . In this
250 specification, such Local Imaging Services are contained within a Local Imaging System.
251 Although this "reverse" interface could be used for any Imaging Service, it is most
252 applicable for Imaging Services handling hardcopy documents and which the User Client
253 accesses via the Cloud, either because the User and the hardcopy device are in different
254 network domains or because there is insufficient processing capability at the hardcopy
255 device. Accordingly, this specification considers the reverse interface with respect to the
256 Print, Scan and FaxOut Services.

257 While the focus of this specification is the interface between Local and Cloud-based
258 Services, the same interface can be used in any situation where the Imaging Devices
259 dealing with the User hardcopy are not network accessible to the upstream Imaging
260 Service with which the User communicates, as is common in many secure and multi-
261 homed network environments. For example, a gateway Service might use the interface
262 defined by this specification to provide guest printing from an open Wi-Fi network to a
263 secure corporate LAN.
264

265 2. Terminology

266 2.1 Conformance Terminology

267 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,
268 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as
269 defined in IETF Key words for use in RFCs to Indicate Requirement Levels [RFC2119] The
270 term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement
271 that applies to a particular capability or feature.

272 2.2 Protocol Role Terminology

273 This specification defines the following protocol roles in order to specify unambiguous
274 conformance requirements:

275 **Client:** Cloud Imaging Client - the software component that implements the interface
276 between the User and the Cloud Imaging Services. [PWG5108.01]

277 **Proxy:** Local Imaging System Proxy - the software component external to the Cloud that
278 implements the interface between the Local Imaging Services and the Cloud Imaging
279 Services in the Cloud Imaging System with which the Local Imaging System is registered.

280 **Service:** Imaging Service - one of the Services performed by an Imaging System as
281 defined in the MFD Model and Common Semantics specification [PWG5108.01]. This
282 specification is concerned with the communication between Cloud-based Imaging Services
283 and Local Imaging Services.

284 2.3 Imaging and Cloud Terminology

285 Normative definitions and semantics of imaging terms used in this specification are derived
286 from MFD Model and Common Semantics [PWG5108.01], which references V1.85 of the
287 PWG Semantic Model Schema. Where it is necessary to denote that an entity is in the
288 Cloud, specific PWG Semantic Model terms are prefixed with the qualifier "Cloud". Where
289 it is necessary to denote an Imaging System entity not in the Cloud but which has direct or
290 indirect network access to the Cloud, the PWG Semantic Model terms are prefixed with the
291 qualifier "Local". Local Imaging System components with which Users physically interact
292 are at some site to which Users have physical access. Both the User-friendly Location and
293 GeoLocation-~~element~~ Elements are applicable to these components.

294 **Association:** the process by which a User or a Client is paired with a Cloud Imaging
295 Service.

296 **Client-side:** referring to the entities and/or processes between the Job Originator and the
297 Cloud Imaging Service.

298 **Cloud:** the environment supporting Cloud Services such as Cloud Computing and Cloud
299 Imaging.

300 **Cloud Computing:** “...“... a model for enabling ubiquitous, convenient, on demand
301 network access to a shared pool of configurable computing resources (e.g., networks,
302 servers, storage, applications, and services) that can be rapidly provisioned and released
303 with minimal management effort or service provider interaction.” The NIST Definition of
304 Cloud Computing [NISTSP800-145].

305 **Cloud Imaging:** a method of allowing Imaging Job Originators to use Cloud-based
306 Imaging Services and, through those Services, to use Imaging Services in registered
307 Imaging Systems that are not in the Cloud (i.e., Local Imaging Systems).

308 **Cloud Imaging Client (Client):** the software component that implements the interface
309 between the User and the Cloud Imaging Services. [PWG5108.01]

310 **Cloud Imaging Service:** a cloud-resident Imaging Service consistent with the PWG
311 Semantic Model, supporting the Semantic Model Imaging Service interface and contained
312 within a Cloud Imaging System. A Cloud Imaging Service can communicate with one or
313 more 'downstream' Cloud Imaging Services and/or with one or more Cloud Imaging Device
314 Proxies.

315 **Cloud Imaging System:** the [Cloud-based](#) System that implements one or more Cloud
316 Imaging Service. A Cloud Imaging System includes one and only one System Control
317 Service.

318 **Cloud Imaging System Control Service:** the System Control Service of a Cloud Imaging
319 System. As defined in System Object and System Control Service Semantics
320 [PWG5108.06], the System Control Service responds to queries about the System
321 Object's configuration, status and descriptive information and [acts upon](#) requests to
322 modify the System Object.

323 **Document:** an object created and managed by an Imaging Service that contains the
324 description, processing, and status information of a data object submitted by a User. A
325 Document object is bound to a single Job (MFD Model and Common Semantics
326 [PWG5108.01].)

327 **Document Data:** the digitized data submitted by a Job Originator as the content of a
328 Document or portion of a Document to be processed by an Imaging Service, or as the
329 resulting data from the scanning of hardcopy Document(s) [PWG5108.01].

330 **Down:** that state of an Imaging System, Service or Local Imaging System Proxy in which it
331 is incapable of performing its functions, as when powered down or broken.

332 [Element: A term used to convey structure and relationships in XML Document instances](#)
333 [\[such as the XML Document used to define the Imaging System Semantic Model\]. An](#)
334 [Element can contain both content and Elements. Complex Elements are composed, at](#)

335 | least in part, of other Elements. [PWG5108.01]. Items referred to as "attributes" in IPP are
336 | call "Elements "in the model.

337 | **Imaging Device:** a hardware entity that supports one or more Imaging Services including
338 | the System. [PWG5108.01]

339 | **Imaging Service:** one of the Services performed by an Imaging System as defined in the
340 | MFD Model and Common Semantics specification [PWG5108.01]. In that specification,
341 | Imaging Services include Print, Copy, Scan, FaxIn, FaxOut, EmailIn, EmailOut, Transform
342 | and Resource Services. The conceptual (not necessarily physical) external interfaces to
343 | these Services are represented in Figure 1. Resource, EmailIn, EmailOut, FaxIn and Copy
344 | Services are not considered appropriate in a Cloud Environment and are not considered in
345 | this Cloud Model. Cloud Imaging System communication with a Local Transform Service is
346 | not considered.

347 | **Imaging System:** a System, implemented in a Device, in software, or some combination
348 | of the two, that provides one or more Imaging Services. An Imaging System includes one
349 | and only one System Control Service.

350 | **Job:** a data object, created and managed by an Imaging Service, that contains the
351 | description, processing, and status information of a Job submitted by a Job Originator. A
352 | Job contains zero or more Document objects [PWG5108.01].

353 | **Job Originator:** the User that submits the initial request to create the Job [PWG5108.01].

354 | **Local Imaging Service:** a networked Imaging Service in a Local Imaging System.

355 | **Local Imaging System:** an Imaging System, such as in an MFD with network access to
356 | the Internet, that the System owner has registered with one or more Cloud Imaging
357 | Systems via a Local Imaging System Proxy. Once registered, the Local Imaging Services
358 | in the Local Imaging System can be accessible to Users through the Services in a Cloud
359 | Imaging System.

360 | **Local Imaging System Proxy (Proxy):** the software component external to the Cloud that
361 | implements the interface between the Local Imaging Services and the Cloud Imaging
362 | Services in the Cloud Imaging System with which the Local Imaging System is registered.

363 | **Offline:** that state of an Imaging System, Service or Local Imaging System Proxy in which
364 | it is totally inactive and unresponsive with respect to the referenced interface although it
365 | might or might not be fully operational otherwise.

366 | **Online:** that state of an Imaging System, Service or Local Imaging System Proxy in which
367 | it is active and responsive with respect to the referenced interface although it might or
368 | might not be fully operational.

369 | **Owner:** the entity that specifies who has access to what Imaging Services of an Imaging
370 | System (Cloud or Local), and under what conditions and limitations.

371 **Pull Scan:** a Scan Job where the resulting scan Document Data is retrieved from the Scan
372 Service by an authorized Scan Client.

373 **Push Scan:** a Scan Job where the resulting scan Document Data is delivered to the
374 specified destination(s) by the Scan Service.

375 **Registration:** the process by which a Local Imaging System becomes known to an
376 Owner-identified Cloud Imaging System.

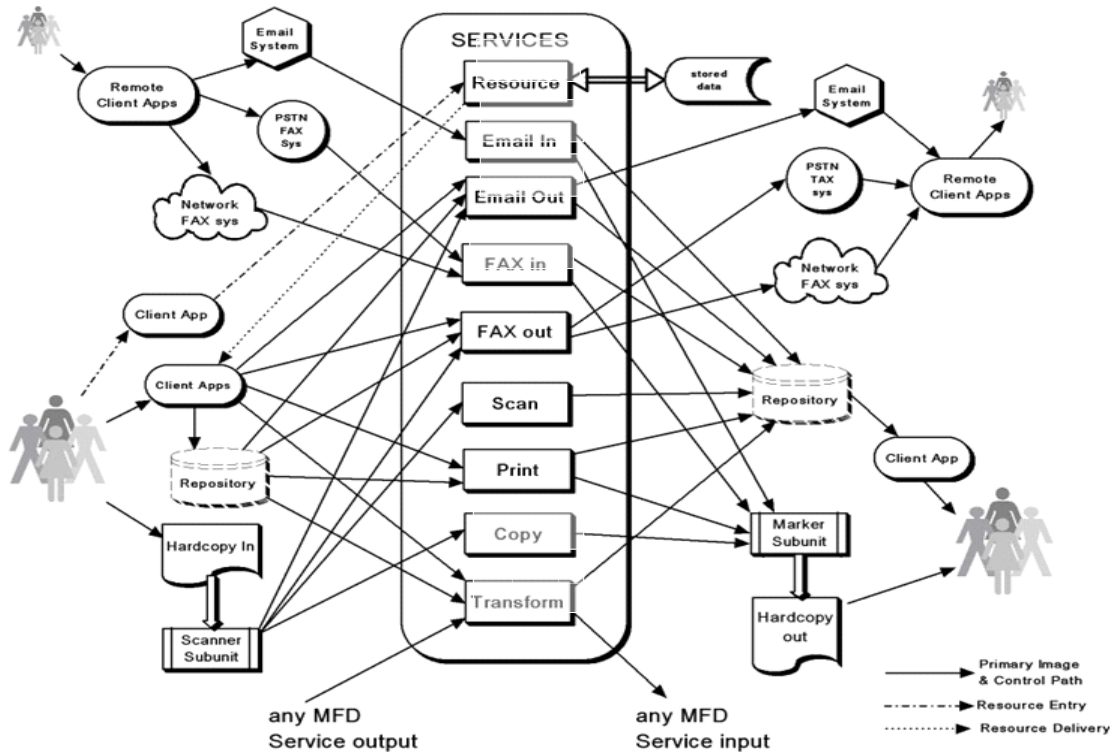
377 **Resource:** Data objects such as Job Tickets pre-configured with User's intent, Logos,
378 Fonts, or Forms that are maintained within an Imaging System to be reused for performing
379 a task or a executing an Imaging Job. There are three categories of Resources:
380 Executable, including Firmware and Software types; Static, including Font, Form, Logo,
381 Image and ICCProfile types; and Template, including Job and Document Templates.
382 Resources are described in Network Resource Service, Semantic Model and Service
383 Interface [PWG5108.03]. Resources are now considered to be managed by the System
384 Control Service.

385 **Security Domain:** a bounded group of security objects and security subjects to which
386 applies a single security policy executed by a single security Administrator. [ECMATR46].

387 **Static Resource:** a category of Resource including Font, Form, Image, Logo, and
388 ICCProfile types, where resources are data objects contained and managed within the
389 Imaging System for use by the system's Imaging Services. Resources are described in
390 Network Resource Service, Semantic Model and Service Interface [PWG5108.03].

391 **Target Device:** the physical equipment with which a User accesses to insert Documents to
392 be scanned or to get Documents that have been printed.

393 **User:** a human or software entity that has access to an Imaging System for Job
394 submission, monitoring, or maintenance, depending upon the User's role is defined in the
395 PWG MFD Model and Common Semantics v1.0 [PWG5108.01]. Users include the
396 Administrators, Job Owners, Operators, members of the Job Owner's group and other
397 authenticated entities.



398 Note: Imaging Services not included in Cloud Imaging Model are shaded.

399 Figure 1 - Networked Imaging Services and their Interfaces [PWG5108.01].

400 **2.4 Acronyms and Organizations**

401 AAA: Authentication, Authorization, and Accounting, <http://www.ietf.org/rfc/rfc2903.txt>,
 402 <http://www.ietf.org/rfc/rfc2904.txt>

403 IANA: Internet Assigned Numbers Authority, <http://www.iana.org/>

404 IETF: Internet Engineering Task Force, <http://www.ietf.org/>

405 ISO: International Organization for Standardization, <http://www.iso.org/>

406 PWG: Printer Working Group, <http://www.pwg.org/>

407

408 3. Requirements

409 3.1 Rationale for Cloud Imaging Requirements and Model

410 Cloud-based applications and solutions are increasingly common and Cloud-based
411 printing, scanning, and facsimile (collectively called "Cloud Imaging Services") are
412 emerging in several different forms. Adopting protocols and schemas compatible with the
413 PWG Semantic model [PWG5108.01] will help ensure the interoperability, speed and
414 adoption of Cloud Imaging Services, and will facilitate addressing privacy, security, and
415 legal issues involved in Cloud Imaging.

416 3.2 Imaging Service Use Cases

417 Use of Cloud Imaging Services requires that the User Client establish a connection to a
418 Cloud-based entity (typically involving authentication and authorization of the User),
419 although this connection might not have been established specifically to use an Imaging
420 Service. There are several imaging use cases in which there is just the locally initiated
421 connection to a Cloud Service, either by a local Imaging Service executing a User initiated
422 Job request, or by the User Client itself. For example:

- 423 1. A Client submits a Scan Job to a Local Scan Service, with the scanned Document
424 Data to be stored at a Cloud location.
- 425 2. A Client submits a Print by reference Job request to a Local Print Service, where
426 the referenced document is stored in a Cloud location.
- 427 3. A Client submits a Job request to a Cloud Imaging Service (such as a Transform
428 Service), with the result to be stored in the Cloud.

429 In the first two cases, standard file access protocols are used; ~~in~~ the third use case,
430 existing standard network Imaging protocols following the MFD Model [PWG5108.01] may
431 be used. That is, these use cases are well addressed by existing models and their
432 implementations.

433 However, for end-to-end Cloud Imaging where a Job request is submitted by a Client to a
434 Cloud Imaging Service and requires the use of a Local Service, interaction is required both
435 between the User and the Cloud Imaging Service and between a Cloud Imaging Service
436 and a Local Imaging Service. Because the Cloud Imaging Service typically cannot initiate
437 access to a Local Imaging Service, standard file access protocols and existing standard
438 network Imaging protocols cannot be used. The User need not be part of the Cloud
439 Service Security Domain and might not be directly connected to the Security Domain in
440 which the Local Imaging Service exists. Also, ~~and~~ the Local Imaging Service need not be
441 part of the Cloud Imaging System Security Domain. This class of use case is the primary
442 concern of this specification.

443 The following use cases envision typical applications of the various Services that can be
444 provided by a Cloud Imaging System. For each such application, exception conditions
445 (such as equipment faults) might arise that affect the interaction with the User. To simplify
446 the text, basic use case outcomes are outlined assuming no such exceptions. The
447 interaction under typical exception conditions is separately described in Section 3.3.

448 **3.2.1 MFD Registration**

449 A company wishes to make selected Imaging Services that are supported by the
450 company's MFD accessible through the Cloud. Access is to be limited to designated
451 Users.

452 **3.2.2 Print Attached Document Data to Remote Print Service**

453 A Job Originator locates a Cloud Print Service that he is authorized to use, that can
454 process his Document, media format and content with his desired print intent and that can
455 make the printed hardcopy available where and when he wants it. The Client software
456 checks the status of the Cloud Print Service and of the Remote Print Service. He then
457 submits a Document for printing. Later he checks the status of his request and ultimately of
458 the printed Document.

459 **3.2.3 FaxOut From Hardcopy Input**

460 The Job Originator physically locates a scanner that supports sending Facsimiles via a
461 Cloud Service and which she is authorized to use. Using a Facsimile Client application on
462 her 'smart' phone, she connects to the Cloud FaxOut Service associated with that scanner.
463 After authentication and authorization steps, the Job Originator identifies the scanner she
464 wishes to use, the facsimile processing information and the facsimile destination(s). On
465 acknowledgement of this information, she loads her original on the Scanner Automatic
466 Document Feeder (ADF) and signals that scanning can start. Under control of the Cloud
467 FaxOut Service, the original is scanned and the Document Data is formatted and
468 transmitted to the specified destinations.

469 Upon completion, a transmission report (and a Transmission Log) is generated by the
470 Cloud FaxOut Service. The transmission report is accessible to the Job Originator.

471 **3.2.4 Print or FaxOut Referenced Document**

472 The User has a URL reference for the Document Data he wishes to print or fax. This
473 Document can be freely accessed on the Web. He locates an appropriate Cloud Imaging
474 Service that he is authorized to use and that reports support of obtaining a source
475 Document by reference. After authentication and authorization steps, the User provides
476 the URL of the source Document, the facsimile or print processing information and the
477 facsimile destination(s) or location of the desired Printer.

478 Job status is available to the User, either in response to a query or by some notification
479 method. For Facsimile Jobs, a transmission report (and a Transmission Log) is generated
480 by the Cloud FaxOut Service. The transmission report is accessible to the User.

481 **3.2.5 Scan Document Initiated from Local Scan Service**

482 The Job Originator connects to the Cloud Scan Service provided for her department. With
483 the User-friendly interface provided by her Scan Client, she enters the scan process
484 parameters and intended destination of the digital image file. She then walks over to the
485 department scanner and, when the scanner indicates that it is ready for her Job, inserts
486 her Document and presses GO.

487 The Cloud Imaging Service receives the scan data, reformats the data as directed and
488 delivers it to the selected destination. This can be a location in the Cloud, a repository at
489 the Users location, or directly to the Users terminal.

490 **3.2.6 Scan Document Initiated from MFD**

491 The Job Originator goes to a publicly accessible MFD in a hotel, enters identifying
492 information, inserts the copy to be scanned in the ADF, and selects SCAN from the MFD
493 control panel. In response to prompting from the panel, she enters scan parameters and
494 intended destination of the digital image file.

495 The MFD sends the scan request to the Cloud Imaging System which checks that the Job
496 Originator is authorized to receive the desired service. Provided that she is so authorized,
497 the Scan Service in the Cloud Imaging System instructs the MFD to scan the original and
498 sends the resulting image file back to the Scan Service. The Scan Service reformats the
499 data as directed and delivers it to the selected destination.

500 **3.3 Use Case Exceptions**

501 | There is the potential for some problem to arise in a use instance, including any of
502 those given above. These problems might be jams or out-of-supply issues with the end
503 devices, communication problems somewhere in the path, Administrators taking
504 preemptive actions, or other things that interfere with the execution of a Job. These are
505 called Exceptions. The model provides for communication of Exceptions to the User Client,
506 | potential recovery procedures and, where necessary, logging of Exception events. This
507 | section describes common exceptions to the use cases in Section 3.2.

508 **3.3.1 Paper Out Exception**

509 In performing some imaging service requiring printing, the Local Print Service can run out
510 of the specified media. This condition is reported to the Cloud Imaging Service which
511 communicates the status to the Client. For an Out-of-Paper fault, the User can be given
512 the option of cancelling the Job or allowing it to remain in a suspended state until the fault
513 is resolved or some other action is taken.

514 3.3.2 Scan Bulb Failure Exception

515 In performing some imaging service requiring scanning, the illumination source within the
516 Scanner fails, rendering the scanner inoperable. In this case, the Service itself can abort
517 the Job (and report this to the Client) or it can communicate the status to the Client and
518 allow the Job Originator to cancel the Job, wait for the failure to be resolved, or select an
519 alternate Imaging Service.

520 3.3.3 Document Data Access Exception

521 During retrieval of Document Data by Reference, a failure occurs in accessing the
522 referenced Document Data. The component doing the access reports the failure.

523 3.3.4 User Client Cancel Job Exception

524 The User cancels a Job that has been accepted by a Cloud Service.

525 3.3.5 Operator Cancel Job Exception

526 An Operator with access to the Local Imaging Service or the Local Imaging System Proxy
527 or an Administrator of the Cloud Imaging Service intentionally cancels a Job. The
528 communication of this changed Job State is communicated back to the User.

529 3.3.6 Local Component Reject or Abort Exception

530 A Job Originator's request is rejected or aborted by a Local Imaging Service or Local
531 Imaging System Proxy. It might be possible for the Cloud Imaging System components to
532 take remedial action to redirect the request. The User Client is informed of the event, and
533 whether or not remedial action is taken. The Job Originator can elect to cancel the Job. If
534 the Job is redirected, the User's intent as expressed in the Job Ticket information is
535 adhered to and the User has access to the revised Job state and status information.

536 3.3.7 Communication Exception

537 Communication is lost between a Cloud Imaging Service and a downstream Component.
538 When communication is restored, the downstream component realigns its Job statuses
539 with those in the Cloud Imaging Service.

540 3.4 Out of scope

541 | The detailed definitions of the following ~~element~~ Elements and aspects of Cloud Imaging
542 are out of scope for this specification, although they might be referred to in the Model
543 discussion.

544 | 1. Defining Cloud federation interfaces and associated protocols and
545 technologies.

- 546 | 2. Defining the interface between the Local Imaging System Proxy and the Local
547 | Imaging Services; this Proxy component can be part of the Local Imaging
548 | System in which case it is an “internal” interface; or it can be external, possibly
549 | serving multiple Local Imaging Systems, in which case it might use
550 | standardized Network Imaging Service interfaces.
- 551 | 3. Defining the interface between the User and the Client.
- 552 | 4. Defining the interface for Association (enrollment) of a Client with a Cloud,
553 | Cloud Imaging System, or Cloud Imaging Service.
- 554 | 5. Defining the management and configuration interface for the Local Imaging
555 | System Proxy.
- 556 | 6. Defining new protocols for authentication, authorization, and access control
557 | (AAA), enumeration, transport, notification, or system management.
- 558 | 7. Defining how authorized User credentials are communicated during Local
559 | Imaging System registration.
- 560 | 8. Defining new Document file formats.
- 561 | 9. Defining new abstract Job Tickets.
- 562 | 10. Defining specific interfaces within the Cloud environment to manage and
563 | configure the Cloud Imaging System.
- 564 | 11. Defining the interface by which Users, including potential Job Originators are
565 | associated with the Cloud.
- 566 | 12. Defining Cloud-based management of the out-of-Cloud Imaging Systems.

567 | **3.5 Design Requirements**

568 | Because the PWG Cloud Imaging Model requires two asynchronous sets of interactions to
569 | complete any Job Originator to Local Imaging Service action, the design requirements of
570 | the PWG Cloud Imaging Model are presented in terms of the requirements on interactions
571 | between the Client and the Cloud Imaging Services and interactions between the Local
572 | Imaging System Proxy and the Cloud Imaging Services.

573 | **3.5.1 Client-to-Cloud Imaging Service - Design Requirements**

574 | With respect to the imaging specific aspects, the Client-Cloud Imaging Service interface
575 | serves the same functions, exercises the same operations, and uses any of the same
576 | imaging protocols as a corresponding Imaging Service that is compatible with the PWG
577 | Semantic Model as specified in the MFD Model and Common Semantics [PWG5108.01].
578 | Therefore, requirements on the Model (but not necessarily on any specific implementation)
579 | are:

- 580 | 1. The Cloud Imaging Service model follows the state and transition definitions
581 | for a Service as defined in Sections 7.1 and 7.2 of the MFD Model and
582 | Common Semantics [PWG5108.01],
- 583 | 2. The Cloud Imaging Service model follows and the Cloud Client model
584 | recognizes the Job and Document states and transitions as defined in sections
585 | 7.2.2 and 7.2.3 of the MFD Model and Common Semantics [PWG5108.01],

- 586 | 3. The Cloud Imaging Service model supports the Service Operation Requests
587 | and Responses as identified described in section 7.3 of MFD Model and
588 | Common Semantics [PWG5108.01] to the extent that the operations are
589 | appropriate to the Service type; the Cloud Client model uses these requests
590 | and accepts the responses to the extent compatible with the capabilities it is to
591 | supply to the User.
- 592 | 4. The Cloud Imaging System Model includes a System Control Service that is in
593 | accord with Section 7 of the System Object and System Control Service
594 | Semantics [PWG5108.05]. This Service allows management of the Cloud
595 | Imaging System by authorized Users.

596 | In addition,

- 597 | 5. All communications between the Client and the Cloud Imaging Service are
598 | made via secure connections ensuring data integrity and confidentiality.

599 | **3.5.2 Local Imaging Service Proxy-to-Cloud Imaging Service - Design Requirements**

600 | The communication between a Cloud Imaging Service and the Local Imaging Service
601 | could be the same as that between Client software in an upstream Imaging Service and an
602 | Imaging Service in a Networked Imaging System were it not for the probable presence of a
603 | firewall preventing the Cloud Imaging Service from initiating requests and submissions to
604 | the Local Imaging Service. Instead, the Cloud Imaging Model includes an intermediary
605 | actor called the Local Imaging System Proxy between the Services in the Local Imaging
606 | System and the Cloud Imaging Services to implement a set of operations that allow the
607 | communication of Local Imaging Service configuration and state information and Job and
608 | Document state information to the Cloud Imaging Service; and the communication of Job
609 | Ticket and Document data to the Local Imaging Service.

- 610 | 1. The Cloud Imaging Service model and the Local Imaging System Proxy model
611 | follow the state and transition definitions for a Service as defined in Sections
612 | 7.1 and 7.2 of the MFD Model and Common Semantics [PWG5108.01],
- 613 | 2. The Local Imaging System Proxy model follows and the Cloud Imaging
614 | Service model recognize the Job and Document states and transitions as
615 | defined in sections 7.2.2 and 7.2.3 of the MFD Model and Common Semantics
616 | [PWG5108.01],
- 617 | 3. The Cloud Imaging Service model supports a set of interface requests and
618 | responses and the Local Imaging System Proxy model issues these requests
619 | and accepts the responses to allow communication of the following types of
620 | information:
- 621 | a. Local Imaging Service Capabilities, Configuration and Status.
 - 622 | b. Job Request Information, including Job Tickets, Document Tickets and
623 | Document Data
 - 624 | c. Job and Document Status
- 625 | 4. The interchange defined by the Cloud Imaging model between the Local
626 | Imaging System Proxy and the Cloud Imaging Service provides some method

- 627 by which the Cloud Imaging Service can determine whether a disruption in the
628 communication has occurred.
- 629 | 5. The Local Imaging System Proxy model provides and the Cloud Imaging
630 Service model supports provisions to allow the synchronization of Job and
631 Document status and the update of Local Imaging Service status in normal
632 operation and on recovery after occurrences such as disruption of
633 communication or hard reset of the Local Imaging System Proxy.
- 634 | 6. Although an optional capability, the Cloud Imaging Model allows for the Cloud
635 Imaging Service to notify the Local Imaging System Proxy that information is
636 available or a request for information is present and that the Local Imaging
637 System Proxy should contact the Cloud Imaging Service.

638 | In addition,

- 639 | 7. All communications between the Local Imaging System Proxy and the Cloud
640 are made via secure connections ensuring data integrity and confidentiality.
- 641 | 8. A log of all Job transactions is maintained, either by the Cloud System Control
642 Service or the individual Cloud Imaging Services. This log includes, at a
643 minimum, Job Identification, Job Originating User, selected Cloud and Local
644 Imaging Services, date/time of transaction, and resources used. The log is
645 necessary for accounting as well as resource monitoring and maintenance
646 purposes. The log follows the format defined in PWG Common Log Format
647 [PWG5110.3]. Log entries are retained long enough to ensure that information
648 can be accessed, according to policy established when the Cloud Imaging
649 System is created.

650 **3.5.3 Privacy and Security Policies**

651 The use of Cloud connections for handling imaging Jobs requires attention to security
652 consistent with the Cloud policy(ies). Requirements include but are not necessarily limited
653 to authentication and authorization for access of Clients and Local Imaging System
654 Proxies to Cloud Imaging Services, ensuring internal and transport integrity and privacy of
655 all imaging data, and secure logging and access to use data.

656 The specifics of security provisions are out of the scope of this specification. However,
657 basic security aspects of the Model require that:

- 658 | 1. In connections between a User and a Cloud Imaging Service, both parties are
659 to be identified and authenticated in accord with the access policies
660 established for the Cloud Imaging Service.
- 661 | 2. User authenticated identity is to be used to determine User Service restrictions
662 and Local Imaging Service access restrictions in accord with the access
663 policies established when the Local Imaging System was registered with the
664 Cloud Imaging System.
- 665 | 3. In connections between a Cloud Imaging Service and a subsequent Cloud
666 Imaging Service that is not a part of the same Cloud Imaging System, both
667 parties are to be identified and authenticated in accord with the policies

- 668 established when the relation between the two Imaging Services was
669 established or last updated.
- 670 | 4. In connections between a Local Imaging System Proxy and a Cloud Imaging
671 | Service, both parties are to be identified and authenticated in accord with the
672 | access policies established when the Local Imaging System was registered
673 | with the Cloud Imaging System.
- 674 | 5. All Document data transmitted between Clients, Cloud Imaging Services and
675 | Local Imaging System Proxies are to be encrypted and protected from
676 | alteration according to security policies established in the relationship between
677 | the components and at a level commensurate with the sensitivity of the
678 | information.
- 679 | 6. All Document data within a Cloud Imaging Service is not to be accessible to
680 | any agent other than the authenticated Job Originator (through his Client) and
681 | the Local Imaging Service selected by the Job Originator.
- 682 | 7. The operations and messages in the model do not require the transmission of
683 | any information that violates standard best practices for data security.
684

685 4. Cloud Imaging Model

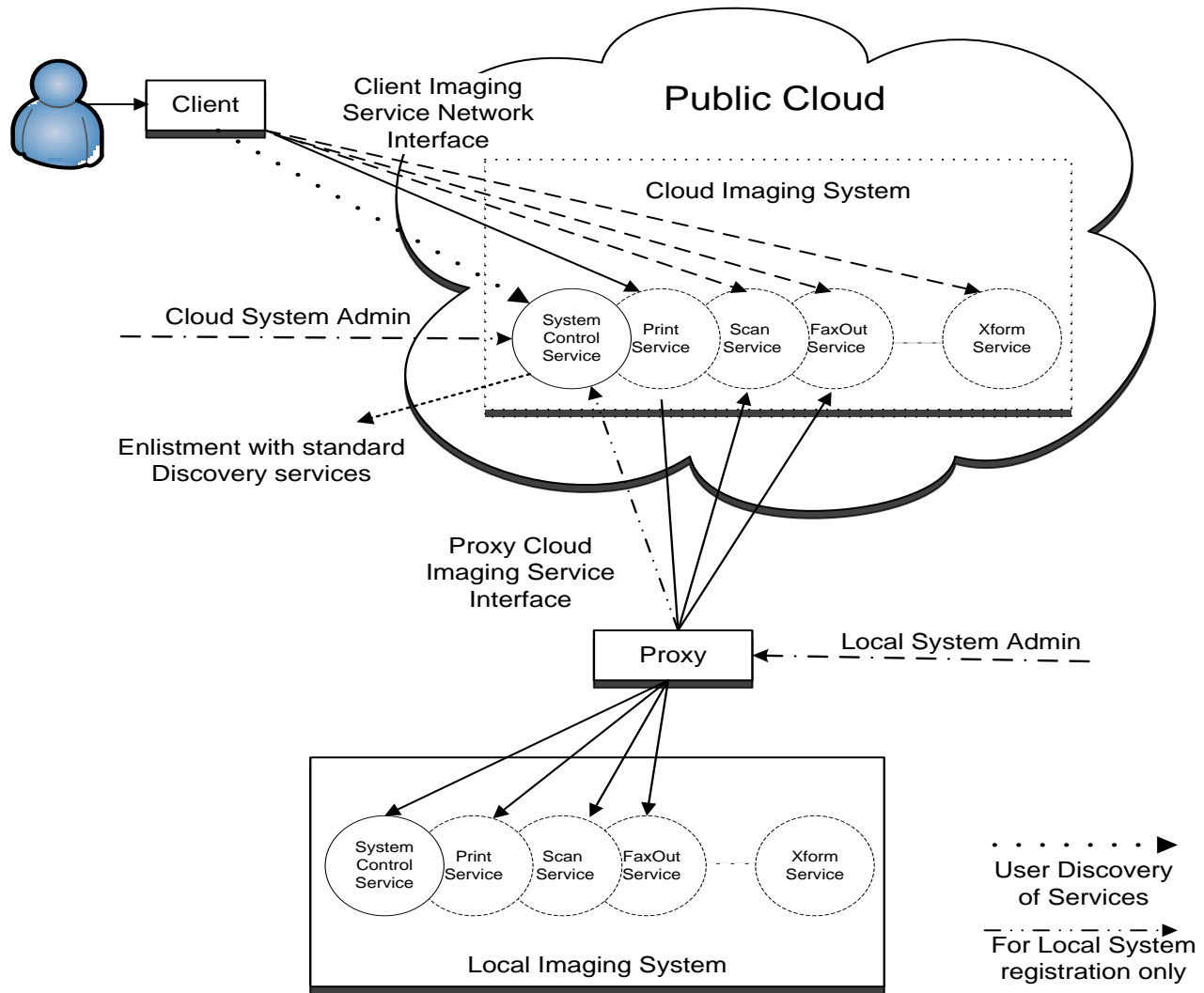
686 4.1 Cloud Imaging Model Overview

687 The PWG Cloud Imaging Model is represented in Figure 2. The Cloud Imaging System
688 contains a System Control Service, and can contain any number and type of Imaging
689 Services. The User, operating through a Client, communicates with a specific Cloud
690 Imaging Service within the Cloud Imaging System in the same way as with any Networked
691 Imaging Service. For Imaging Jobs in which the Cloud Imaging Service stores or transmits
692 the Document Data Job output, this standard Client-Service interface is sufficient.
693 However, because of restrictions on Cloud-based components initiating communication
694 with Local Imaging Services, Services in the Cloud Imaging System cannot send
695 messages to Local Imaging Services. Therefore, for Imaging Jobs in which the Cloud
696 Imaging Service is to pass the Job on to a Local Imaging Service, the Cloud Imaging
697 Model includes a Local Imaging System Proxy (Proxy) which monitors the Cloud Imaging
698 Services to pull Job request information to the Services within the Local Imaging System
699 and to provide Local Services and Job Status information to the Cloud Services.

700 Note that, although the model provides for a Cloud Imaging System User Client to access
701 a Cloud-based Transform Service, it does not provide for access to a Local Imaging
702 System based Transform Service through a Cloud Imaging System. This is because,
703 unlike with the other Imaging Services, there is no need for a User to have physical access
704 to the device performing a Transform Service since both input and output are digital rather
705 than hardcopy. Furthermore, because of the potentially computationally intensive nature of
706 Transform Jobs, broad capability Transform Services are more likely to be found in the
707 Cloud than in Local Imaging Systems. Although Local Imaging System access to Cloud-
708 based Transform Services is useful and likely, and might reasonably use Proxy capability,
709 such an interface is a Client-Service interface with the Local Imaging System acting as the
710 Client. That is, it would use the Client Imaging Service Network interface rather than the
711 Proxy-Cloud Imaging Service interface.

712 The Proxy can be within the Imaging System hardware or external to it; it can serve just
713 one Imaging System or more than one. The interface between the Proxy and the Services
714 in the Local Imaging System(s) is out of scope for this specification but, since the Proxy-
715 Cloud Imaging System interface uses standard Semantic Model ~~element~~ Elements, an
716 interface compatible with the PWG Semantic Model Client-Imaging Service interface is
717 readily accommodated.

718 Any component in the path can contribute to satisfying the Job request. For example, a
719 Cloud Print Service could convert a submitted PDF formatted Document into a complete
720 set of page rasters and pass these through the Proxy to a Local Print Service for marking
721 on paper. At the other extreme, the Cloud Print Service and Proxy could pass the PDF
722 formatted Document unmodified to a Print Service in an MFD. Although the data content
723 can vary, the interfaces remain the same.



724

725

Figure 2 - PWG Cloud Imaging Model

726 Although Figure 2 shows the same communication paths for Print, Scan and FaxOut
 727 services, the sources, destinations and forms of Document Data vary according to Service.
 728 Table 1 summarizes these. The hardcopy produced by the Local Print service can be
 729 derived from Document Data provided by the Cloud Print Service (either provided by the
 730 User/Client or from a reference provided by the User/Client) or obtained by the Local Print
 731 Service or Proxy from a reference provided by the Cloud Print Service. The Document
 732 Data produced from hardcopy by the Scan Service is stored at a destination defined by the
 733 User and communicated by the Cloud Scan Service or uploaded to the Cloud Scan
 734 Service. The DocumentData source for FaxOut is more complicated because it may
 735 consist of Document Data obtained in that same way as for Print, and/or Image Data
 736 obtained in the same way as for Scan. Although the ultimate destination for FaxOut is
 737 defined by the User, this is reached via communication ports (FaxModem or Internet)
 738 located either Locally or in the Cloud Service (or both). The immediate destination for
 739 FaxOut document may be a Local port and/or the Cloud FaxOut Service.

740

Table 1 - Services Document Data Source and Destinations

Service	Document Source	Source Form	Destination	Destination Form
Print	Supplied by Client	digital data	Local Service (Marking Engine)	Hardcopy
	Obtained from Reference			
Scan	Local Service (Scanner)	hardcopy	Defined by User Could be multiple	Digital Data
FaxOut	Supplied by Client	digital data	Fax address defined by User Could be multiple	Fax form defined by User, possibly negotiated with Destination device
	Obtained from Reference			
	Local Service (Scanner)	hardcopy		

741

742 4.1.1 Establishing Relationships

743 It is a prerequisite of this Model that the User and his Client, the Local Imaging System and
 744 its Proxy, and the Cloud Imaging System exist and that the Client and the Proxy can each
 745 connect to the Cloud Imaging System. The Model further assumes (but does not define
 746 specifics for) the following:

- 747 1. The System Control Service in the Cloud Imaging System has an
 748 administration/management interface by which the Cloud Imaging System is
 749 configured:
 - 750 a. With information in regard to Imaging Services and capabilities to be
 751 supported. The Cloud Imaging Services can be created as a result of
 752 this configuration process, or they can be pre-provisioned so that they
 753 are created when a Local Imaging System Proxy communicates the
 754 availability of corresponding Local Imaging Services.
 - 755 b. With information controlling User access in regard to identity and
 756 authorization, and User access policy is defined.
 - 757 c. To allow access by identified Local Imaging System Proxies.
- 758 2. The Local Imaging System Proxy has an administrative/management interface
 759 by which the Local Imaging System Owner can configure the Proxy to register
 760 Local Imaging Systems with Cloud Imaging Systems and cause the selected
 761 Imaging Services in proxied Local Imaging Systems to be linked with
 762 corresponding Cloud Imaging Services.

763 After the Cloud Imaging System and a Local Imaging System Proxy have been configured,
 764 the Proxy connects to the Cloud Imaging System Control Service on behalf of the Local
 765 Imaging System. Standard communication security procedures are used to establish
 766 mutual authentication and authorization. The Proxy communicates Local Imaging System
 767 ~~element~~ Elements, including Local Imaging Services to be made accessible to the Cloud
 768 Imaging System during Registration. Once a Local Imaging System is registered, a
 769 relationship is established between the identified Services in the Local Imaging System
 770 and the corresponding Cloud Imaging Services. The Local Imaging Services can then be
 771 made available to Users through the Cloud Imaging Services.

772 Note that Registration of a Local Imaging System with a Cloud Imaging System inherently
773 creates a very specific type of notification subscription of the Local Imaging System Proxy
774 with each of the Cloud Imaging Services corresponding to the Local Imaging Services that
775 are being made accessible. These inherent subscriptions remain in effect as long as the
776 Local Imaging System remains registered with the Cloud Imaging System.

777 Before any Imaging transactions can occur, the Client 'discovers' the Cloud Imaging
778 System providing the desired Services under the desired conditions of capabilities, cost,
779 location, etc. Typically, this discovery is done in one of two ways:

780

- Client-side account credentials point to a specific Cloud System Control Service;
781 Client then uses a ListAllServices operation to get a list of available services.

782

- Standard discovery protocols (LDAP, DNS-SD, etc.) are used for providing access
783 to public services (e.g. hotel managed printing services)

784 Once the desired Cloud Imaging System is located, communication security procedures
785 are used to establish mutual authentication and authorization between the Client and that
786 Cloud Imaging System (containing the Cloud Imaging Services). This establishes a
787 relationship between the User and the Cloud Imaging Services (which is termed
788 Association).

789 The communication security procedures to be used between Client and Cloud and
790 between Proxy and Cloud, and the procedure for establishing Association are out of the
791 scope of this specification.

792 **4.1.1.1 Local Imaging System Registration.**

793 To register a Local Imaging System, the Owner will have independently communicated
794 with the Administrator of the Cloud Imaging Service to arrange for his Local Imaging
795 System to be registered. The Local Imaging System Owner has the URL of the Cloud
796 Imaging System Control Service, and the Cloud Imaging ~~Service-System~~ has been
797 configured to accept a connection from the Local Imaging System Proxy for the Owner's
798 System.

- 799
 1. The Local Imaging System Owner provides information to the Proxy about
800 which Services of which System are to be registered with what Cloud Imaging
801 System and the address of the Cloud Imaging System Control Service.
 2. The Proxy establishes a connection to the Cloud System Control Service and
802 sends a message that provides information on all System Elements of the
803 Local Imaging System (Description and Status) that are to be made known to
804 the Cloud Imaging System. This is done independently for each proxied Local
805 Imaging System to be registered. This message includes, at a minimum,
806 includes the standard Operation Elements (e.g., ElementsNaturalLanguage,
807 RequestingUserName, RequestingUserUri)-, At a minimum, this message
808 includes the identification of the Services to be made accessible, and the
809 following System Description and System Status-element Elements:
810

- 811 a. CharsetConfigured
812 b. NaturalLanguageConfigured
813 c. MakeAndModel
814 d. OwnerUri
815 e. SystemGeoLocation
816 f. SystemLocation
817 g. SystemName
818 h. ConfiguredServices
819 i. LocalSystemUuid
820 j. State (of the System)
821 k. ResourceKOctetsRequested (if Resource material is to be made
822 available to the Cloud Imaging System.)
- 823 3. The Cloud Imaging Control Service responds with the registration status of the
824 Local Imaging System. The Cloud Imaging Services that are to be linked to
825 identified and accepted Local Imaging Services are created, if they do not
826 already exist. For each accepted Local Imaging Service, the Cloud Imaging
827 Control Service provides the address of the corresponding Cloud Imaging
828 Service.
- 829 4. The Cloud Imaging System can provide a directory for the Cloud storage and
830 hosting of Resources contained in the Local Imaging System being registered.
831 This allows the Resource data objects in the Local Imaging System to be
832 accessed by the Client and the Cloud Imaging System. This directory is unique
833 to the Local Imaging System being registered and is accessible to the Proxy
834 using a standard network file read/write protocol, subject to appropriate
835 authentication and access control provisions. Resource objects are described
836 in the PWG Resource Service Model specification [PWG 5108.03-2009] and
837 are currently considered managed by the System Control Service. If the Cloud
838 Imaging System does provide for Resource storage specific to the Local
839 Imaging System being registered, it includes the following ~~element~~ Elements
840 in its response to the Local Imaging System registration request:
841 a. ResourceDirectoryUri: The URI of the directory.
842 b. ResourceKOctetsSupported: Total capacity of Resource Directory for
843 this Local Imaging System
844 c. ResourceKOctetsFree~~;~~ Remaining free capacity of Resource Directory
845 for this Local Imaging System. Initially this will be the same as
846 ResourceKOctetsSupported.
- 847 5. The Proxy establishes connection to the Cloud Imaging Service for each
848 accepted Local Service and sends a, update message that identifies the Local
849 Imaging Service ~~element~~ Elements and their values that are to be accessible
850 to Users through the Cloud Imaging Service. At a minimum, this initial update
851 message includes the following:
852 a. CharsetConfigured
853 b. NaturalLanguageConfigured
854 c. ServiceName
855 d. ServiceUuid
856 e. State

- 857 | f. StateReasons
- 858 | g. IsAcceptingJobs

859 | After System registration and Service initialization are complete, the Local Imaging System
860 | Proxy updates System Elements to the Cloud System Control Service and updates
861 | Service Elements to the corresponding Cloud Imaging Services as necessary to keep the
862 | Cloud Services aware of the status and configuration of the Local Imaging System and its
863 | Services.

864 | The Proxy also periodically queries each Cloud Imaging Service to verify communication
865 | capability and to check for waiting Jobs, error notifications or identify requests.

866 | This periodic sending of messages acts as a polling of the Cloud Imaging Services by the
867 | Proxy. In some circumstances it is possible to lower the polling rate and/or provide faster
868 | notification of waiting Jobs or other actions by supplementing these periodic queries with
869 | asynchronous notification messages initiated from the specific Cloud Imaging Services.

870 | **4.1.1.2 Loss of Communication**

871 | The effectiveness of Cloud Services relies upon reliable, timely communication between
872 | Client and Cloud Service and between Proxy and Cloud Service. The Client can readily
873 | inform the User when there is a communication difficulty with the Cloud Service. The Proxy
874 | can also determine if there communication problems with the Cloud Service; but Proxy
875 | communication problems are less easily determined by the Cloud Service.

876 | The Cloud Service and the Local Service, operating through the Proxy, are to stay
877 | synchronized, particularly with respect to Jobs. Communication failure typically results in
878 | loss of synchronism. Cloud Imaging implementations might reasonably act as follows with
879 | respect to Proxy-detected communication failures:

- 880 | 1. If a Proxy is unable to connect with a Cloud Imaging Service, or if it does not
881 | receive a timely response to an operation directed to a Cloud Imaging Service,
882 | the Proxy continues to send periodic queries to that Service and to the Cloud
883 | System Control Service containing the Cloud Imaging Service:
- 884 | 2. If the Cloud System Control Service responds that the subject Cloud Imaging
885 | Service is down, the Proxy considers the Cloud Imaging Service Offline
- 886 | 3. If the Cloud System Control Service does not respond for some minimum time,
887 | the Proxy considers the Cloud Imaging System Offline. However, periodic
888 | queries continue.
- 889 | 4. If the Cloud Imaging System does not respond for some minimum time, even if
890 | the Cloud System Control Service reported the Imaging Service as
891 | operational, the Proxy considers the Cloud Imaging Service Offline. However,
892 | periodic queries continue.
- 893 | 5. If the Proxy considers the Cloud Service to be Offline, it causes the Local
894 | Service to adjust the state of Jobs accepted from that Cloud Service as shown
895 | in Table 2.

- 896 6. If connections resume with a Cloud Service (Imaging or System Control) after
- 897 that Service is considered Offline but before that system is considered "Down",
- 898 the Proxy updates the status of the Local System or Service and, for an
- 899 Imaging Service, lists all Active Jobs obtained from the Cloud Service and
- 900 provides the status of Jobs and Documents. In the case of Jobs, the response
- 901 from the Cloud Service can cause the Proxy to resume processing or to cancel
- 902 Jobs in the Local Service.
- 903 7. If communication is not re-established before a "Down" period, the Proxy
- 904 considers the Cloud Service "Down" and causes the Local Service to adjust
- 905 the state of Jobs accepted from that Cloud Service as shown in Table 2.
- 906 8. The Proxy might continue to attempt communication with the Cloud System
- 907 Control Service. If and when communication is re-established with the Cloud
- 908 System Control Service, the Proxy re-registers all Local Imaging Systems that
- 909 were previously registered with that Cloud System (even if communication with
- 910 other Services in that Cloud Imaging System has not been interrupted.)
- 911

912 **Table 2 - Local Service Job State Transitions on Cloud Service Communication Failure**

Job State in Local Service (Note 1)	After Cloud Service Considered			
	Offline		Down	
	Effective Proxy Op (Note 2)	Job State	Effective Proxy Op (Note 2)	Job State
Pending	HoldJob	Pending Held	JobCancel	Canceled
Pending Held				
Processing	PauseService	Processing Stopped		
Processing Stopped				

913 Note 1: Jobs initially in a Completed State (Cancelled, Completed or Aborted) remain in that state.

914 Note 2: Proxy detects communication failure and requests Job State change in Local Service. The effective
 915 Proxy operation assumes standard network interface with Local Imaging Service, but resulting Job State is as
 916 indicated regardless of Proxy-Local Service interface.

917

918 Interruption in the periodic queries of the Cloud Service by the Proxy is part of a procedure
919 by which the Cloud Imaging Service can detect a communication or operational problem
920 with the Proxy. This determination is complicated by the fact that connectivity is a Proxy to
921 Cloud Service function while the periodic queries are specific to a Local Imaging Service.
922 The Proxy potentially sends these queries to several Cloud Services in a given Cloud
923 Imaging System, and on behalf of multiple Imaging Services in multiple Local Imaging
924 Systems. If all of the Cloud Services in a given Cloud Imaging System time out with
925 respect to communication with a given Proxy, there obviously is a connectivity problem or
926 the Proxy is down. However, if queries fail for just one Local Service, the nature of the
927 difficulty is less clear, although the Cloud Service can still notify the Client of the problem
928 and will cause the Cloud Service to consider the Local Service as Offline. Handling of Jobs
929 sent to an Offline or down Local Service is implementation dependent.

930 In general, if there is a communication failure as distinct from an intentional shutdown,
931 communication will eventually be resumed. Although the Proxy will take action to resume
932 synchronization, the Cloud Imaging Services will also have taken some actions in the
933 interim and can also require certain resynchronization operations.

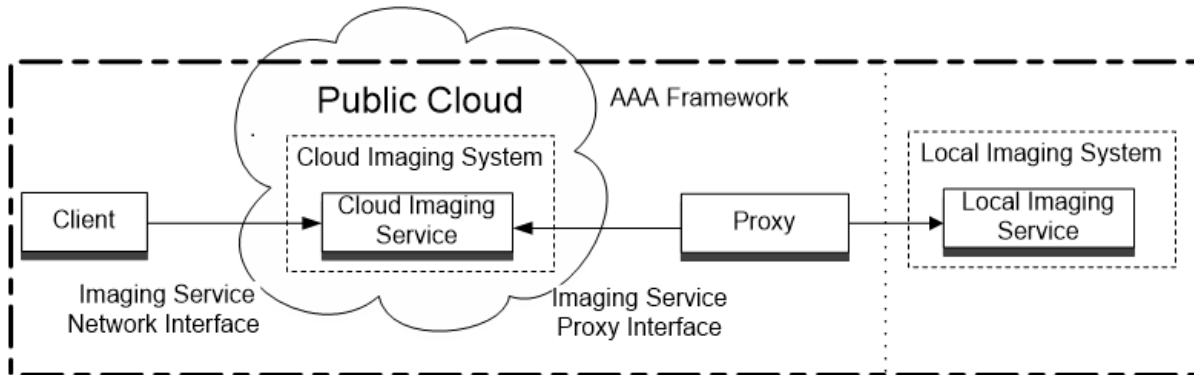
934 **4.1.1.3 Modifying Registration or Deregistering Local Imaging Systems**

935 Although the update operations keep the Cloud Services abreast of changes at the Local
936 Imaging System and its Services, the Local Imaging System Owner might wish to change
937 the Services or ~~element~~ Elements that are available for Cloud use. Such changes are
938 initiated by the Owner communicating with the Local Imaging System Proxy. The Proxy will
939 then re-register, eliminating or adding Services.

940 If a Local Imaging System Registration with a Cloud Imaging System is to be ended, a
941 specific message is sent to deregister the System and all Imaging Services of that System.
942 As indicated above, the failure of the Proxy to communicate with the Cloud Imaging
943 Services for an extended period will also cause registration to be suspended

944 **4.1.2 Authentication, Authorization, and Access Control (AAA) Framework**

945 For the purposes of this specification, the Client, Cloud Imaging System, Proxy, and Local
946 Imaging System are pre-existing entities. All (except for possibly the Local Imaging
947 System) use a common method for performing authentication, authorization, and
948 accounting between multiple entities, referred to as the AAA framework. See the Generic
949 AAA Architecture [RFC2903] and AAA Authorization Framework [RFC2904]. The Local
950 Imaging System can be in the same equipment as the Proxy or can be separate from the
951 Proxy; the Local Imaging System can be either within or outside of the AAA framework.

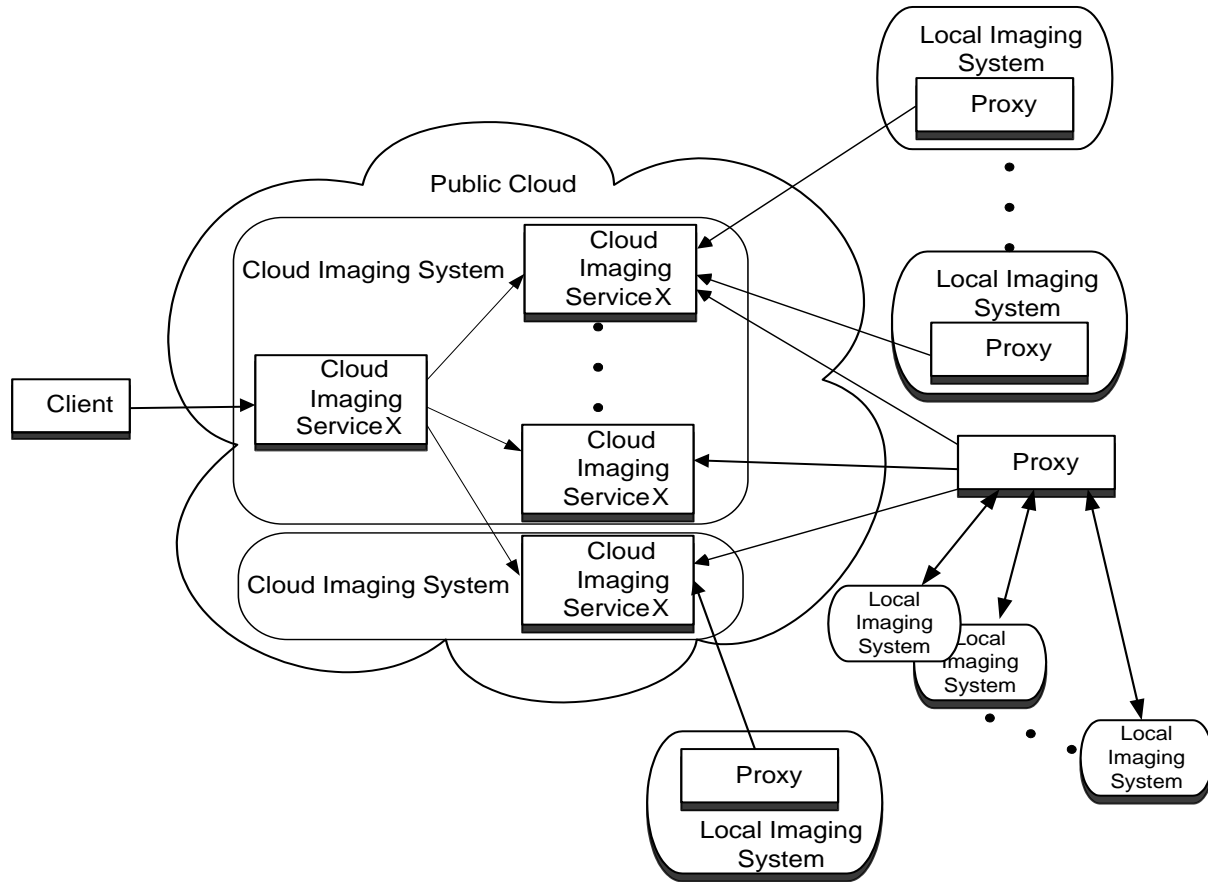


952
953
Figure 3 - AAA Framework

954 **4.1.3 Fanout**

955 The model allows many branching configurations, as represented in Figure 4. Note that,
 956 as suggested in the IPP 1.1 standard [RFC2911], fanout to a "downstream" component
 957 requires a Client interface, and when that component is an Imaging Service, this Client
 958 interface could use the same as the modeled User Client interface. Allowable fanout
 959 configurations are described below.

- 960
- 961 1. A Cloud Imaging System can contain multiple Imaging Services of the same
 962 type (e.g., multiple Print Services).
 - 963 2. A Cloud Imaging Service can interface with one or more 'downstream' Imaging
 964 Services of the same type, either within the same Imaging System or in a
 965 different Cloud Imaging System.
 - 966 3. A Local Imaging System Proxy can interface with more than one Cloud
 967 Imaging Service of the same type (e.g., Print) and with more than one type of
 968 Cloud Imaging Service (e.g., Print and Scan).
 - 969 4. A Local Imaging System Proxy can interface with Services in more than one
 970 Cloud Imaging System.
 - 971 5. A Local Imaging System Proxy can be embedded within a Local Imaging
 972 System equipment set or it can be in separate equipment, including as
 973 software in a general purpose computer.
 - 974 6. A Local Imaging System Proxy can interface with the Services in more than
 975 one Local Imaging System.



976

977

Figure 4 - Various Fanout Options

978

~~7. A Cloud Imaging System can contain multiple Imaging Services of the same type (e.g., multiple Print Services).~~

979

~~8. A Cloud Imaging Service can interface with one or more 'downstream' Imaging Services of the same type, either within the same Imaging System or in a different Cloud Imaging System.~~

980

~~9. A Local Imaging System Proxy can interface with more than one Cloud Imaging Service of the same type (e.g., Print) and with more than one type of Cloud Imaging Service (e.g., Print and Scan).~~

981

982

983

~~10. A Local Imaging System Proxy can interface with Services in more than one Cloud Imaging System.~~

984

985

986

~~11. A Local Imaging System Proxy can be embedded within a Local Imaging System equipment set or it can be in separate equipment, including as software in a general purpose computer.~~

987

988

~~12. A Local Imaging System Proxy can interface with the Services in more than one Local Imaging System.~~

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991

992

993 4.2 Cloud Imaging Operations

994 This section describes Client to Cloud Service and Local Imaging System Proxy to Cloud
995 Service messages in a conceptual rather than implementation-specific context.

- 996 1. Connections between Client to Cloud Service and Proxy to Cloud Service are
997 subject to security procedures ensuring identification, authentication and
998 authorization of both initiator and respondent to a level appropriate to the value
999 of the service be used and the sensitivity of the information being
1000 communicated.
- 1001 2. All messages are initiated by the Client to the Cloud Service (for Client-side
1002 operations) or by the Proxy (Local Imaging System Proxy Operations) to the
1003 Cloud Service.
- 1004 3. Unless a message is rejected and a response is precluded by security
1005 reasons, every message is to have a response from the addressed Service. In
1006 addition to information specific to the operation, a response includes an
1007 OperationStatusCode and possibly a text status message indicating the action
1008 on the requested operation.
- 1009 4. Clients and Proxies do not necessarily need to have a response from a
1010 previous message before sending a subsequent message.
- 1011 5. Services do not necessarily need to respond to messages in the order
1012 received.

1013 Depending on protocol and security capabilities, implementation of this Cloud Imaging
1014 Model might communicate the identified information by other mechanisms. For example,
1015 notification information might be communicated to a Proxy by a Cloud Service using an
1016 asynchronous communications protocol.

1017 4.2.1 Client Side Basic Operations

1018 A basic contention of this Cloud Imaging Model is that Client to Cloud Imaging Service
1019 communication of imaging operations is no different from established Client to Networked
1020 Imaging Service operations, as defined in the PWG Semantic Model MFD Model and
1021 Common Semantics [PWG5108.01]. The common Basic operations are listed in Table 3.
1022 They are directed from a Client to a specific Imaging Service within a Cloud Imaging
1023 System and are concerned with creating and controlling Jobs and Documents within Jobs
1024 in the Cloud Imaging Service. Except for IdentifyDevice and AddDocumentImages, which
1025 are new, these basic operations are described in detail in MFD Model and Common
1026 Semantics [PWG5108.01].

1027 Although in most cases, operations affecting Jobs in the Cloud Imaging Service will be
1028 reflected to corresponding Jobs in the Local Imaging Services by way of the
1029 communication between the Local Imaging System Proxy and the Cloud Imaging Service,
1030 these operations from the User/Client do not act on the Local Imaging Services' Jobs
1031 directly.

1032 The Operations include those by which a Client gets Service Elements to allow the User to
 1033 select Services and formulate Job Tickets. Some of these operations do affect the state of
 1034 a Job. However, none of these operations directly affect the state or configuration of the
 1035 Local Service except to the extent that creating or canceling a Job can initiate a sequence
 1036 that affects the Service.

1037 **Table 3- Client/Cloud Imaging Service Basic Requests and Responses**

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
6. AddDocu mentImages	JobUuid; JobId; DocumentTicket InputElements LastDocument	DocumentNumber UnsupportedElements	
CancelCurrentJob	JobUuid; JobId;		
CancelDocument	JobUuid; JobId; DocumentNumber		
CancelJob	JobUuid; JobId;		
CancelMyJobs	JobIds	JobUuid; JobId	3
CloseJob	JobUuid; JobId;		
CreateJob	JobTicket JobPassword(; JobPasswordEncryption;	JobUuid; JobId; UnsupportedElements	
GetActiveJobs	Limit FirstIndex	ActiveJobs (JobSummaries (including JobId; JobName; JobOriginatingUserName; JobState; ImpressionsCompleted or ImagesCompleted, JobStateReasons)	
GetDocumentElements	JobUuid; JobId; DocumentNumber; RequestedElements	Document (DocumentReceipt, DocumentStatus, DocumentTicket) UnsupportedElements	
GetDocuments	JobUuid; JobId Limit FirstIndex	JobUuid; JobId; Documents (list of DocumentSummaries including DocumentNumber, DocumentState, DocumentStateReasons, ImpressionsCompleted or ImagesCompleted; JobName) UnsupportedElements	
GetJobElements	JobUuid; JobId RequestedElements (JobReceipt; JobStatus; or JobTicket.)	Job; (JobReceipt; JobStatus; JobTicket.) UnsupportedElements	
GetJobHistory	Limit FirstIndex	JobHistory (JobSummaries for subject Jobs including JobId; JobName; JobOriginatingUserName; JobState, ImpressionsCompleted or ImagesCompleted, and perhaps JobStateReasons)	
GetNextDocumentData	DocumentDataWait JobId;	Compression, DocumentFormat, DocumentDataGetInterval, LastDocument(DocumentNumber, DocumentData	
GetServiceElements	Limit FirstIndex, RequestedElements (ServiceCapabilities; ServiceConfiguration; ServiceDescription; ServiceStatus, DefaultJobTicket.)	ServiceElements(DefaultJobTicket, ServiceCapabilities ServiceCapabilitiesReady, ServiceConfiguration, ServiceStatus, as requested) UnsupportedElements	

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
HoldJob	JobHoldUntil or JobHoldUntilTime, JobUuid; JobId,		
HoldNewJobs	JobHoldUntil or JobHoldUntilTime,		
IdentifyDevice	IdentifyActions	DeviceID; MakeAndModel; SystemGeoLocation; SystemName	
ReleaseJob	JobUuid; JobId		
ResubmitJob	JobUuid; JobId	JobUuid; JobId; UnsupportedElements	
ResumeJob	JobUuid; JobId		
SendDocument	JobUuid; JobId DocumentTicket LastDocument DocumentData DocumentPassword	DocumentNumber; UnsupportedElements	
SendUri	JobUuid; JobId, DocumentUri; DocumentTicket LastDocument DocumentPassword	DocumentNumber; UnsupportedElements	
SetDocumentElements	JobUuid; JobId; DocumentNumber; DocumentTicket OperationMode	UnsupportedElements	
SetJobElements	JobUuid; JobId ; JobTicket; OperationMode	UnsupportedElements	
SuspendCurrentJob	JobUuid; JobId;		
ValidateDocumentTicket	DocumentPassword, DocumentTicket	PreferredElements UnsupportedElements	
ValidateJobTicket	JobTicket , DocumentPassword, JobPasswordEncryption, JobPassword	JobId PreferredElements UnsupportedElements	

1038 **Note 1:** Elements in bold font are mandatory for the associated operation. All Client Requests can include the
1039 following [element Elements](#).

1040 ElementsNaturalLanguage (if request includes [element Elements](#) in a Natural Language); Character
1041 Set is defined in binding protocol
1042 ElementsNaturalLanguageRequested (if response is to include [element Element](#) in a Natural
1043 Language)
1044 ServiceUuid (target Cloud Service)
1045 RequestingUserName and/or RequestingUserUri (mandatory)
1046 Message(
1047 RequestingUserName (At a minimum, this [element Element](#) is used by the Cloud Service to
1048 determine whether the requestor is authorized to make the request. It is anticipated that, in a
1049 Cloud environment, implementations will require further authentication of the requestor's identity
1050 using standard security techniques. If the requestor is not determined to have access, the Service
1051 rejects the request and, unless security procedures dictate no response, informs the Client of the
1052 reason for rejection.)

1053 **Note 2:** : Elements in bold font are mandatory for the associated operation. All Cloud Service Responses can
1054 include the following [element Elements](#)..:

1055 ElementsNaturalLanguage (if response includes an [element Element](#) in a natural language)
1056 OperationStatusCode (mandatory); indicates that operation has been accepted or not and possibly
1057 error condition (e.g., Request identifies a System, Service, Job or Document that is not
1058 recognized; the Request refers to an inactive Job as though it were active, or there is some error in
1059 the received operation request format.)

1060 Message; Cloud Service response text message identifying any error condition and reason

1061 Note 3 : Response includes identified but un-cancellable Jobs

1062 **4.2.1.1 AddDocumentImages**

1063 The AddDocumentImages operation allows a Client to prepare a Service to accept a
1064 hardcopy Document via a scanner Subunit and to add it to an identified Job. This operation
1065 replaces and is a more general version of the AddHardcopyDocument operation defined in
1066 MFD Model and Common Semantics [PWG5108.01]. It is analogous to the SendDocument
1067 and SendUri operations which deal with or reference Digital Documents except that
1068 AddDocumentImages refers to hardcopy Documents. This operation therefore is
1069 applicable to Services such as FaxOut for which input Documents are obtained by a scan
1070 of a region of a media sheet side. The AddDocumentImages operation includes
1071 InputElements to specify scanning parameters.

1072 The Service rejects this request and sends an appropriate message if:

- 1073 1. The requestor is not the owner of the identified Job, or is not an Administrator
1074 or Operator;
- 1075 2. The Service has already closed inputs to the identified Job;
- 1076 3. The Job is not found; or
- 1077 4. The InputElements values are invalid or unsupported.

1078 Otherwise, provided the request is properly constructed, complete and references valid
1079 objects, the Service accepts the request, closes the Job if the LastDocument Element is
1080 asserted, and prepares to add Document Data from the identified input to the identified
1081 Job, and sends a response to the request.

1082 **4.2.1.2 GetNextDocumentData**

1083 GetNextDocumentData is a DocumentData flow control operation that can be used when
1084 the Client is pulling DocumentData from the Service. When the Client is informed that a
1085 Job with a DocumentData output is in the 'processing' or 'completed' state, the Client can
1086 send a GetNextDocumentData request. As the DocumentData becomes available, the
1087 Service delivers this data in the response, along with the DocumentNumber, indicating the
1088 Document within the Job to which the data belongs, and the DocumentFormat value,
1089 indicating the file type of the data. If there are multiple Documents in the Job (and
1090 therefore multiple files), the document number changes after the previous document
1091 transmission is complete. The LastDocument-~~element~~ Element is returned with a TRUE
1092 value when the transfer of all documents within the Job is complete.

1093 The authenticated Requesting User performing this operation is to be either be the Job
1094 Owner or an Operator or Administrator of the Service. Otherwise, the Service rejects the
1095 operation, possibly returning an appropriate reason.

1096 4.2.1.2.1 GetNextDocumentData Request

1097 The following ~~element~~ Elements are associated with the GetNextDocumentData Request:

- 1098 1. ElementsNaturalLanguage: (CharacterSet is assumed to be identified in by
1099 the transport binding)
- 1100 2. ServiceUuid: (identify the Service for this operation)
- 1101 3. JobId (identify the target for this operation)
- 1102 4. RequestingUserName and RequestingUserUri ~~element~~ Elements
- 1103 5. DocumentDataWait (A TRUE value indicates that the Client wants to block
1104 waiting for the response. If not included in the request, the ~~element~~ Element
1105 value is considered FALSE.

1106 4.2.1.2.2 GetNextDocumentData Response

1107 The Service can respond to a GetNextDocumentData Request as follows:

- 1108 1. The Service can reject the request and return the ServerErrorBusy status
1109 code if the Service is too busy to accept this operation at this time. If the
1110 Service rejects the request, it returns a DocumentDataGetInterval value to
1111 indicate when the Client can try again.
- 1112 2. If the Client request does not include a TRUE DocumentDataWait value, the
1113 Service immediately returns any available DocumentData of the identified Job
1114 along with a DocumentDataGetInterval value indicating when the Client can
1115 again send a GetNextDocumentData Request to get additional DocumentData
1116 of the identified Job.
- 1117 3. If the Client request does include a TRUE DocumentDataWait value, and the
1118 Service accepts this mode, the Service immediately returns any available
1119 DocumentData of the identified Job and continues to return Document Data as
1120 it becomes available until all Document Data for the Job has been transferred.
- 1121 4. If the Client request does include a TRUE DocumentDataWait value, but the
1122 Service does not accept this mode or, if once having accepted it, the Service
1123 decides to terminate the DocumentDataWait mode at any time, the Service
1124 returns a DocumentDataGetInterval value indicating when the Client can
1125 again send a GetNextDocumentData Request. This indicates to the Client that
1126 the Service has left the DocumentDataWait mode and the number of seconds
1127 in the future that the Client can again send the GetNextDocumentData
1128 Request. The Client accepts this response.

1129 The following ~~element~~ Elements are part of the GetNextDocumentData Response

- 1130 a. Status Message: This includes a StatusCode and might include a Status Message
1131 or DetailedStatusMessage.
- 1132 b. ElementsNaturalLanguage (CharacterSet is assumed to be identified in by the
1133 transport binding)
- 1134 c. Compression: The value for the compression technique used on the DocumentData
- 1135 d. DocumentFormat: The format of the DocumentData

- 1136 e. DocumentDataGetInterval: The number of seconds before the Client can again
- 1137 send a GetNextDocumentData Request.
- 1138 f. LastDocument: A TRUE value indicates that the DocumentData being sent is for the
- 1139 last document in the Job.
- 1140 g. DocumentNumber: The number of the document in the Client requested Job.
- 1141 h. DocumentData: The data, or a portion of the data, of the identified document and
- 1142 encoded using the identified Compression.

1143 4.2.1.3 IdentifyDevice

1144 A User can need to physically locate and/or interact with a piece of equipment that they
1145 are considering using, or that already contains hardcopy intended for them. The
1146 IdentifyDevice operation causes a request to be relayed to the appropriate Service that, if it
1147 supports this operation, will cause the input or output device associated with the service to
1148 generate a visual or audible signal, allowing the User to locate it. The IdentifyDevice
1149 operation is a generalization of the IPP Identify-Printer operation [PWG5100.13] and might
1150 include values for the following ~~element~~ Elements. Note that Requesting User and possibly
1151 more involved User authentication and authorization data is required. All other ~~element~~
1152 Elements are optional and will revert to System, Service or Device default values if not
1153 supplied:-

- 1154 1. Target Device: the SystemUuid, and/or SystemName values specifying the
- 1155 Target Device that is to provide an Identify signal. Note that this is the identity
- 1156 of the local input or output device, not the Cloud Service. In some cases, the
- 1157 Client does not know the identification of the local input or output device of
- 1158 interest, but wishes to have the physical device receiving or producing
- 1159 hardcopy for a particular Job identify itself. In such cases, the operation
- 1160 includes the JobUuid and the Imaging System determined the Target Device.
- 1161 2. JobUuid: Used to identify the Target Device when the Client wishes the local
- 1162 input or output device that is handing the indicated Job to identify itself.
- 1163 3. Requesting User: identity of the requesting User (although the Cloud Service
- 1164 will probably already have received and authenticated this information.)
- 1165 4. -"message": a message to the User to be displayed by the Target Device.
- 1166 Supplying this information is optional but, if it is provided, the Cloud Service
- 1167 response indicates whether this capability is supported by the Target Device.
- 1168 5. IdentifyActions: request that desired identify signal be a text display on the
- 1169 Target Device, a flashing light, an audible alert or a spoken message or that
- 1170 any previously requested IdentifyActions from this Client be canceled.
- 1171 Supplying this request is optional but, if it is requested, the Cloud Service
- 1172 response indicates whether the requested capability is supported by the Target
- 1173 Device.

1174 4.2.2 Local Imaging System Proxy Operations

1175 In the Client to networked Imaging Service model, operations are initiated by the agent
1176 forwarding the Imaging request; i.e., the Client sends requests to a Service and the

1177 Service can send requests to a subordinate Service to which it has network access, such
1178 as one in an MFD. However, in the Cloud Imaging Model, it is likely that a Cloud Imaging
1179 Service is isolated from the Local Imaging Service by a firewall and cannot initiate
1180 requests. Therefore, an alternate set of operations is used by the Local Imaging System
1181 Proxy to get Imaging Job information from and provide Local Imaging Service and Job
1182 status to the Cloud Imaging Service.

1183 Some of these operations are corollaries of the basic Client-Service Imaging operations,
1184 with the operation issued by the Local Imaging System Proxy prompting a response from
1185 the Cloud Service that is the same in content and perhaps form to a Client Operation sent
1186 to a Service. On receiving this response from the Cloud Service, the Local Imaging System
1187 Proxy sends a message to the Cloud Service that corresponds to the response a Service
1188 would send back to the Client. For example, the response to a FetchJob request is
1189 equivalent to a CreateJob request; the subsequent AcknowledgeJob request is equivalent
1190 to the response to a CreateJob request.

1191 The following characteristics of the model are to be observed in understanding these
1192 operation descriptions.

- 1193 1. All Operations are in a request/response form with the request sent by the
1194 Local Imaging System Proxy and the response sent by the Cloud Imaging
1195 Service. The protocol used assures correlation of request to response. The
1196 content of requests and responses typically is reversed compared to
1197 analogous operations in Client to Service Imaging model.
- 1198 2. Proxy Operations can be requests for the Cloud System to supply some
1199 information in its response (e.g., GetFetchableJobs, FetchJob), or they can be
1200 information that the Proxy is volunteering (e.g., UpdateJobStatus,
1201 AcknowledgeJob). In either case, the Cloud Service can respond with error or
1202 other information messages. Errors can refer to structure or contents of
1203 message (e.g., necessary information not provided)
- 1204 3. The Local Imaging System Proxy can interface with multiple Cloud Imaging
1205 Services.
- 1206 4. A Cloud Imaging Service can accept messages from multiple Local Imaging
1207 System Proxies (but keeps communications with each separate.)
- 1208 5. The protocols used by the Local Imaging System Proxy in initiating requests to
1209 the Cloud Imaging Service provide for the identification and authentication of
1210 the Local Imaging System Proxy, as well supporting security requirements
1211 appropriate to the use of the Cloud Imaging facility.
- 1212 6. Local Imaging System Proxies can front-end multiple Services in multiple Local
1213 Imaging Systems. A Local Imaging System Proxy can report capabilities and
1214 status values for each Service individually; or it can report capabilities and
1215 status values which are an intersection or a union of capabilities and status of
1216 the Services it represents. In the former case, the Cloud-accessible
1217 capabilities of each local imaging Service are reported to the linked Cloud
1218 Imaging Service and a specific Service is selected by the User. In the latter
1219 case, the Proxy reports on a composite service of a given type and the linked

1220 Cloud Imaging Service has no knowledge of capabilities of the individual Local
1221 Services. In this case, the Local Imaging System Proxy schedules Jobs and
1222 maps Jobs to Local Imaging Services based on Job requirements versus local
1223 policy and individual Service capability and state.
1224 |

1225

Table 4 - The Local Imaging System Proxy to Cloud Imaging Service Operations

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
AcknowledgeDocument	JobId ; JobUuid; DocumentNumber or DocumentUuid FetchStatusCode UnsupportedElements ImpressionsCompleted DocumentState DocumentStateReasons		3
AcknowledgeJob	JobId ; JobUuid FetchStatusCode UnsupportedElements ImpressionsCompleted JobState JobStateReasons		3
DeregisterSystem	Message		4
FetchDocument	JobId ; JobUuid DocumentNumber or DocumentUuid CompressionAccepted DocumentFormatAccepted	DocumentNumber or DocumentUuid DocumentFormat; CompressionSupplied; DocumentTicket LastDocument DocumentMessage DocumentPassword DocumentData or DocumentUri or InputElements (for FaxOut)	3, 6
FetchJob	JobId , JobUuid	JobTicket; JobPassword JobPasswordEncryption, JobTicket DestinationUris (for Scan and FaxOut) DestinationAccesses (for Scan) InputElements (for Scan)	3,7
GetFetchableJobs		List of JobId , JobUuid; Job summary collection (Copies, Finishings, Impressions, KOctets, Media MediaType, MediaCol, SourceJobUuid, other element Elements)	3
GetJobDocumentElements	JobId , JobUuid DocumentNumber , DocumentUuid; RequestedElements	Document (DocumentReceipt, DocumentStatus, DocumentTicket) UnsupportedElements	3
GetJobDocuments	limit FirstIndex JobId , JobUuid RequestedElements	Documents(list of DocumentSummaries) JobId , JobName UnsupportedElements	3
GetJobElements	JobId ; JobUuid RequestedElements (JobReceipt, JobStatus, or JobTicket.)	Job ((JobReceipt, JobStatus, JobTicket.)ElementsNaturalLanguage UnsupportedElements	3
GetServiceNotifications	ServiceState(Local Service); IdentifyDeviceState	ServiceState (Cloud Service) TimeoutError RegistrationSuspended JobFetchable; JobTerminated; IdentifyActions	3,4

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
RegisterSystem	Elements of Local Imaging System to be registered or re-registered: CharsetConfigured, NaturalLanguageConfigured, MakeAndModel, OwnerUri, SystemGeoLocation, SystemLocation, SystemName, ConfiguredServices, SystemUuid State StateMessages ResourceKOctetsRequested	ServiceUuids of Cloud Services corresponding to identified ConfiguredServices in Local System(s) ResourceDirectoryUri: ResourceKOctetsSupported: ResourceKOctetsFree	4,5,8
UpdateActiveJobs	List of JobUuids with States	List of JobUuids with States (if disagree with request data)	3
UpdateDocumentStatus	DocumentStatusElements		3
UpdateJobStatus	JobTable (listing by Job of JobId, JobUuid and selected JobStatus Elements [e.g., <u>ImpressionsCompleted</u> , or <u>ImagesCompleted</u> <u>JobState</u> , <u>JobStateReasons</u> , <u>DetailedStatusMessages</u>])		3
UpdateServiceElements	(all below relative to Proxied Local Service) CharsetConfigured, NaturalLanguageConfigured, , ServiceName, ServiceUuid ServiceState, ServiceStateReasons, IsAcceptingJobs		3, 5
UpdateSystemElements	List of Changed System Elements and Values State StateReasons StateMessages		5
UploadJobDocumentData	JobId ; JobUuid DocumentNumber or DocumentUuid DocumentFormat; CompressionSupplied: DocumentData; DocumentMessage		3

1226 | **Note 1:** Elements in bold font are mandatory for the associated operation. All Cloud Model Proxy Requests
 1227 | can include the following element Elements.

- 1228 | ElementsNaturalLanguage (if request includes element Elements in a Natural Language); Character
- 1229 | Set defined in binding protocol
- 1230 | ElementsNaturalLanguageRequested (if response includes an element Element in a natural
- 1231 | language);
- 1232 | ServiceUuid (target Cloud Service);
- 1233 | LocalServiceUuid (Proxied Local Service) (mandatory);
- 1234 | RequestingUserName and/or; RequestingUserUri (mandatory) (RequestingUser is the Proxy)
- 1235 | The RequestingUserName, can be used by the target Service to determine whether the requestor is
- 1236 | authorized to make the request. Some implementations can require further authentication of the
- 1237 | requestor’s identity. If the requestor is determined to not have access, the Service rejects the
- 1238 | request (unless security procedures dictate no response.)

1239 | **Note 2:** Elements in bold font are mandatory for the associated operation. All Cloud Model Proxy Operation
 1240 | Responses can include the following ~~element~~ Elements:

1241 | ElementsNaturalLanguage and ElementsCharacterSet(if response includes an ~~element~~ Element in a
 1242 | natural language)
 1243 | OperationStatusCode (mandatory); indicates that operation has been accepted or not and possibly
 1244 | error condition (e.g., Request identifies a System, Service, Job or Document that is not
 1245 | recognized; the Request refers to an inactive Job as though it were active, or there is some error in
 1246 | the received operation request format.)
 1247 | Message; Cloud Service response text message identifying any error condition and reason

1248 | **Note 3:** Sent to a specific Cloud Imaging Service on behalf of a specific Local Imaging Service

1249 | **Note 4:** Sent to the Cloud System Control Service by the Local Imaging System Proxy on behalf of a Local
 1250 | Imaging System

1251 | **Note 5:** In conjunction with System registration, these operations are sent on behalf of all Local Services to be
 1252 | made accessible via the corresponding Cloud Service to specify the accessible characteristics of the Local
 1253 | Service. Thereafter, this operation is used to update values of previously identified ~~element~~ Elements.

1254 | **Note 6:** The FetchDocument response can address the DocumentData in various ways. For example, if
 1255 | DocumentData is to be sent to the Local Service as for a Print Job, the Document data itself may be supplied
 1256 | (DocumentData) or a reference to where the DocumentData can be accessed can be returned (DocumentUri).
 1257 | If the Local Service is to supply the DocumentData for a FaxOut Job, InputElements defining scan parameters
 1258 | are returned. There is no FetchDocument request for a Scan Job.

1259 | **Note 7:** If the Local Service is to supply DocumentData as for a Scan Job, the FetchJob response includes the
 1260 | scanning parameters (InputElements) and the data destination(s) (DestinationUris) and destination access
 1261 | information (DestinationAccesses). By the Semantic Model, the Destination complex ~~element~~ Element
 1262 | identifies where the output of the Job is to be delivered and may be either a directory in which the Digital
 1263 | Document is to be stored or the URI to the Digital Document file.

1264 | **Note 8:** Cloud Imaging System returns Resource information only if Resource Directory is supported.

1265 | **4.2.2.1 AcknowledgeDocument.**

1266 | The AcknowledgeDocument operation is sent by the Local Imaging System Proxy after the
 1267 | Cloud Imaging Service response to the FetchDocument has been received. The operation
 1268 | informs the Cloud Service of the acceptance (or rejection) of the Document. The
 1269 | AcknowledgeDocument operation request is analogous to the response to a
 1270 | SendDocument, SendUri or AddDocumentImages Client Operation. The operation
 1271 | identifies the Job and Document UUIDs. The FetchStatusCode indicates the success (or
 1272 | failure) of the Local Imaging Service in accepting the Document.

1273 | The Cloud Imaging Service response to this message serves to confirm that the
 1274 | Acknowledge Imaging Document message was received, as well as to inform the Local
 1275 | Imaging System Proxy of any error caused by an externally prompted state change (e.g., a
 1276 | Client Job Cancel) or inconsistency in the message (e.g., reference to a non-existent or
 1277 | not available Document.)

1278 4.2.2.2 AcknowledgeJob.

1279 The AcknowledgeJob operation informs the Cloud Service that the Proxy has received the
1280 Job (and presumably has sent it on to the Local Service.) The operation request is
1281 analogous to the response to a CreateJob operation in a Client - Networked Imaging
1282 Service model. The AcknowledgeJob operation provides the JobUuid, a FetchStatusCode
1283 indicating the success (or failure) of the Local Imaging Service in accepting the Job, and
1284 identifies any locally UnsupportedElements. If the Local Service rejects the Job, this is
1285 indicated by the appropriate FetchStatusCode along with an appropriate Message (if
1286 available).

1287 On receipt of the AcknowledgeJob, the Cloud Service removes the Job from the
1288 FetchableJob list for the responding Local Service. Provided that the FetchStatusCode
1289 does not indicate that the Job has been rejected, the Cloud Service also removes the Job
1290 from the FetchableJob list for any other Local Service.

1291 The Cloud Imaging Service response to this message confirms that the AcknowledgeJob
1292 message was received, and informs the Local Imaging System Proxy of any error caused
1293 by an externally prompted Job state change (e.g., a Client Job Cancel) or inconsistency in
1294 the message (e.g., reference to a non-existent or not available Job.)

1295 4.2.2.3 DeregisterSystem

1296 If the Owner of a Local Imaging System that has been registered with a Cloud Imaging
1297 System wishes to terminate or suspend the accessibility of all Local Imaging System
1298 Imaging Services, he will instruct the Local Imaging System Proxy for the System to send
1299 a DeregisterSystem request to the appropriate Cloud System Control Service. This
1300 message causes the Cloud Imaging System Control Service to terminate User accessibility
1301 through its Imaging Services with the Local Imaging System and its Imaging Services.
1302 Note that, at this point, the Cloud Imaging Control System will retain the information about
1303 the deregistered Local Imaging System that was provided by the Cloud Imaging System
1304 Owner to allow Local System re-registration, as well as any Job and usage statistics
1305 accumulated relative to Local System Imaging services.

1306 The response to this request will acknowledge receipt. The request can be rejected if there
1307 are errors in form or content, but not for any other reason. Unless the request was
1308 rejected, any transactions in process between the Cloud Service and the Proxy on behalf
1309 of any Services in the deregistered Local Imaging System will be aborted. If the Cloud
1310 Service has any active Jobs with Services in the deregistered Local Imaging System, it
1311 reports the resulting Job State change to the appropriate Client. Such Jobs can be can be
1312 re-routed or aborted by the Cloud Imaging Service, or canceled by the Client. Note that the
1313 DeregisterSystem operation does not directly affect the relationship between the Local
1314 Imaging System Proxy and the Cloud Imaging System Services, and other message
1315 transactions in process can continue to completion.

1316 The Deregister operation is primarily intended to terminate a Cloud-Local relationship,
1317 although administrative operations to both Proxy and Cloud System Control Service can

1318 be necessary to finalize the termination. As long as the Proxy communication with Cloud
1319 System Imaging Services is possible, temporary suspensions, such as for maintenance
1320 actions on a Local Imaging System, can be communicated by sending an Offline status
1321 update for the Local Imaging System

1322 **4.2.2.4 FetchDocument**

1323 After the Local Imaging System Proxy has accepted a Job, it eventually needs specific
1324 information about the Document(s) in that Job. For Service types in which the Document
1325 data is supplied to the Local Imaging Service, the Local Imaging System Proxy
1326 FetchDocument operation obtains the DocumentData or DocumentUri reference along with
1327 operational ~~element~~ Elements from the Cloud Service. In addition to Print Service Jobs,
1328 this could include FaxOut Service Jobs where the Document Data is supplied by the Cloud
1329 Service and the facsimile is output by the Local Service. For FaxOut Jobs in which the
1330 Local Service provides Document Data to the Cloud Imaging Service identified destination,
1331 the Local Imaging System Proxy FetchDocument operation obtains InputElements defining
1332 the scan parameters for hardcopy Documents.

1333 The FetchDocument request includes the Job and Document identification corresponding
1334 to the information received in response to the FetchJobs operation. In the case of
1335 FetchDocuiment operations for Services in which the Document Data is going to the Local
1336 Imaging Service, the Operation can optionally identify the DocumentFormatAccepted and
1337 CompressionAccepted for the destination Local Service. These “accepted” Elements are
1338 complete or subsets of the DocumentFormatSupported and CompressionSupported
1339 Service Description Elements provided in the UpdateServiceElements operation, but are
1340 ordered with respect to Service preference at that time and possibly with respect to the
1341 Document to be fetched. For example, if the AcknowledgeDocument request in response
1342 to a previous FetchDocument operation for the same Document indicated that the
1343 Document had not been accepted, possibly because it was a PDF Document with features
1344 not supported by the Local Service, the Proxy might send a follow up FetchDocument
1345 request with DocumentFormatAccepted listing PWG Raster as the first choice and not
1346 including PDF.

1347 The FetchDocument response corresponds to the request portion of the Client
1348 SendDocument or SendUri operation for Imaging Services in which the Document Data is
1349 consumed by the Local Imaging Service. The FetchDocument. response corresponds to
1350 the request portion of the Client AddDocumentImages operation for Imaging Services in
1351 which the DocumentData is supplied by the Local Imaging Service. If supported, a
1352 DocumentTicket can also be returned.

1353 **4.2.2.5 FetchJob**

1354 Once the Local Imaging System Proxy has received a response to a GetFetchableJobs
1355 request identifying one or more Jobs waiting for a particular Local Imaging Service, it
1356 sends a FetchJob request to the corresponding Cloud Imaging Service. This request
1357 includes the Cloud Imaging Service Job UUID reported in the GetFetchableJobs response

1358 which corresponds to a Job that the Local Imaging System Proxy intends to receive and
1359 direct to the Local Imaging Service.

1360 The FetchJob response is analogous to a CreateJob request. This response includes the
1361 operational attributes of the CreateJob request (e.g., RequestingUserName of the Job
1362 originator, JobPassword) as well as the Job's ImagingJobTicket information. It does not
1363 include either the Document Data or a reference to Document Data; for Imaging Services
1364 other than Scan, the Local Imaging System Proxy issues a FetchDocument message to
1365 get this data. There is no FetchDocument request for a Scan Job.

1366 The FetchJob response for a Scan Job includes InputElements, defining how the Local
1367 Service is to scan the hardcopy, and the image data DestinationUris and
1368 DestinationAccesses ~~element~~ Elements. The Destination Uris ~~element~~ Element may be
1369 multivalued (if the scanned image data is to be sent to multiple locations. The
1370 DestinationAccesses complex ~~element~~ Element contains authentication information for a
1371 referenced Document. Each DestinationAccesses ~~element~~ Element value contains zero or
1372 more child ~~element~~ Elements which provide the authentication information required for the
1373 Document.

1374 The FetchJob response for a FaxOut Job also includes a Destination ~~element~~ Element,
1375 which may be multivalued, but does not include DestinationAccesses (because Fax
1376 destinations do not normally require user authentication) nor InputElements (which are
1377 supplied in response to a FetchDocument request).

1378 The Cloud Imaging Service response includes a status code and optionally a message for
1379 the operation. This would include error information if the identified Job is unknown or is not
1380 available to be fetched by the Proxy for the indicated Local Service. Note that a Proxy is
1381 only allowed to fetch Jobs that have been offered to it in a GetFetchableJobs response
1382 and further that a Cloud Service can make an offered Job non-fetchable for a particular
1383 Local Service at any time before the Job has been fetched. Once a Cloud Imaging Service
1384 receives an AcknowledgeJob request indicating that a Proxy has accepted a Job on behalf
1385 of a Local Imaging Service, the Cloud Service makes that Job non-fetchable to that Local
1386 Imaging Service.

1387 **4.2.2.6 GetFetchableJobs-**

1388 GetFetchableJobs is sent by the Local Imaging System Proxy on behalf of each registered
1389 Local Imaging Service to the Cloud Service with which that Local Service is linked, to
1390 request the list of Jobs that are ready to be fetched for processing by that Local Service.

1391 The Model accommodates implementations ranging from Cloud Services that just channel
1392 Jobs to Local Services to those which just use the input/output device capabilities of the
1393 Local Service. Therefore, the criteria that will cause a Cloud Service to report a Job
1394 fetchable by a Proxy for a specific Local Service are out of scope (although, for Jobs
1395 involving Document fetch, it is desirable that the Document Data be available.) However,
1396 unless canceled or aborted, a Job reported fetchable will remain fetchable until the Cloud

1397 Service receives an AcknowledgeJob message for that Job on behalf of a Local Service
1398 for which the Job has been fetched in response to a FetchJob message.

1399 The Local Imaging System Proxy will use the response to the GetFetchableJobs request to
1400 identify the requested Job in its subsequent FetchJob request. The Local Imaging System
1401 Proxy sends a GetFetchableJobs message on behalf of a Local Imaging Service whenever
1402 that service has remaining capacity for new Cloud-supplied Jobs and the
1403 GetServiceNotifications response (or other notification mechanism) has indicated fetchable
1404 Job(s) exist for that Local Service.

1405 The operation can accommodate Job scheduling at either the Cloud Imaging Service or
1406 the Local Imaging System Proxy. When the Cloud Imaging Service is handling Job
1407 scheduling, the Cloud Imaging Service will return a list identifying at most a single Job. The
1408 Job is identified by its JobUuid in the Cloud Imaging Service. If the Local Imaging System
1409 Proxy (or the Imaging Service) does Job scheduling, the Cloud Imaging Service response
1410 is a list of fetchable Jobs. The Proxy can then issue GetJobElements requests for the
1411 identified Jobs to get Job specific information useful for scheduling (e.g., Finishings,
1412 Media, ImagingColorModeType, Sides).

1413 If it does not have any fetchable Jobs for the identified Local Service or if there is an error
1414 in content or form of the request, the Cloud Imaging Service will respond with an empty list
1415 and an appropriate OperationStatusCode.

1416 **4.2.2.7 GetJobDocuments**

1417 For scheduling purposes, a Local Imaging System Proxy or the Local Service it represents
1418 can need to know more about the Documents contained in a particular Job that has been
1419 accepted before it fetches the Document(s). This can be to get information to sequence
1420 the processing of Jobs or the processing of multiple Documents within a Job. The
1421 GetJobDocuments operation is similar to the Client GetDocuments operation, except that
1422 the Proxy can access Document information only for Jobs that have been offered to and
1423 accepted by the identified Local Service. The Cloud Service returns identification of all
1424 Documents in the specified Job along with Elements that are in the corresponding
1425 Document Ticket.

1426 **4.2.2.8 GetJobDocumentElements**

1427 The GetJobDocumentElements operation allows a Local Imaging System Proxy to obtain
1428 detailed information about the specified Document within the specified Job. This operation
1429 is identical in form, content and desired response to the Client GetDocumentElements
1430 operation, except that the Proxy can access Document Element information only for
1431 Documents in Jobs that the Proxy has fetched on behalf of the identified Local Service.

1432 The Proxy requests specific groups of Elements (complex Elements) contained within the
1433 Document. The Document Data is not part of the Document Elements and cannot be
1434 retrieved using this operation. However the location of the Document Data is available.

1435 The allowed values for Requested Elements are DocumentStatus and DocumentTicket.
1436 Vendors can extend the allowed values.

1437 The Cloud Service returns the DocumentDescription Element values that the originating
1438 Client supplied in the Document Creation operation (CreateJob, SendDocument or
1439 SendURI) or provided in SetDocumentElements operation, plus any additional
1440 DocumentDescription Elements that the Service has generated, such as DocumentState.
1441 The Service does not return any JobElements that the Document inherits from the Job
1442 level but does return DocumentElements specified at the Document level. A specific
1443 Document might not include all Elements belonging to a group because some Elements
1444 are optional.

1445 **4.2.2.9 GetJobElements**

1446 The GetJobElements operation allows the Proxy to obtain detailed information on the Job
1447 by its JobUuid. The GetJobElements request does not specify individual Elements. Rather,
1448 the Proxy requests specific groups of Elements contained within the Job. The allowed
1449 values for RequestedElements are JobReceipt, JobStatus, or JobTicket. Vendors can
1450 extend the allowed values.

1451 This operation is identical in form, content and desired response to the Client
1452 GetJobElements operation, except that the Proxy can access JobElements only in Jobs
1453 that the Proxy has fetched on behalf of the identified Local Service. The GetJobElements
1454 operation is used by the Proxy when the Proxy, or some other Local agent, requires
1455 information on Jobs that the Proxy has fetched.

1456 The Cloud Imaging Service responds with an OperationStatusCode which indicates an
1457 error if the Cloud Service does not recognize the identified Job as one that was fetched by
1458 the Proxy and which the Proxy acknowledged receiving.

1459 **4.2.2.10 GetServiceNotifications**

1460 The GetServiceNotifications message is sent periodically from the Local Imaging System
1461 Proxy to each Cloud Imaging Service and to the Cloud System Control Service to maintain
1462 communication, to inform the Cloud Service of the Local Service state, and to allow the
1463 Cloud Imaging Service to notify the Local Imaging System Proxy of some necessary
1464 impending activity for Proxy. (e.g., Proxy to re-register a Local System or to send a
1465 GetFetchableJobs or UpdateActiveJobs). Unlike most of the other Proxy-to-Cloud
1466 operations, GetServiceNotifications does not follow the form or content of a response to an
1467 Imaging Client operation.

1468 It is possible that other mechanisms could be used to check whether there is a Cloud
1469 Service operability or a communications problem. Also, asynchronous notification
1470 initiated by the Cloud Imaging Services could be used to alert the Local Imaging System
1471 Proxy of Cloud Service status. To the extent that these alternate mechanisms are present
1472 and provide the information defined to be in the responses to GetServiceNotifications, they
1473 might reasonably allow significant reduction in the frequency in which

1474 GetServiceNotifications messages are sent without affecting reliability or increasing Job
1475 handling latency.

1476 **4.2.2.10.1 GetServiceNotifications Request**

1477 The GetServiceNotifications request contains:

- 1478 1. The identification (ServiceUuid) and state (ServiceState) of the Local Service,
- 1479 2. IdentifyDeviceState, indicating the state of the Identify Device signal with
1480 respect to a previous IdentifyActions request from that Cloud Service,
1481 specifically whether the latest request:
 - 1482 a. is being signaled (1),
 - 1483 b. was denied (2),
 - 1484 c. was terminated (3), or
 - 1485 d. the Identify signaling is busy with a request from some other source (4).

1486 **4.2.2.10.2 GetServiceNotifications Response**

1487 The response to this message includes:

- 1488 1. Cloud Service/System Status: UUID and summary status of the Cloud Imaging
1489 Service, or in the case of a Cloud System Control Service response, summary
1490 status of the System including the identification and state of each Cloud
1491 Imaging Service in the System.
- 1492 2. TimeoutError: The Cloud Service has not received a message relating to the
1493 identified Service in a significant time and there may be a synchronization loss.
1494 This response requests the Proxy to do full update operations for the Local
1495 Imaging Service and an UpdateActiveJobs for that Local Service. If this is a
1496 response from the Cloud System Control Service, the updates should be for
1497 the System and for all Local Services and their unterminated Jobs derived
1498 from an Imaging Service in that Cloud System.
- 1499 3. RegistrationSuspended: The Cloud System Control Service has timed out
1500 waiting for a GetServiceNotifications messages from the Local Imaging
1501 System Proxy (or for some other reason) and has suspended all System
1502 registrations handled by that Proxy. Or the Cloud System Control Service,
1503 acting on behalf of the Cloud Imaging System needs to re-characterize Local
1504 Imaging System registration. To resume Cloud support, the Proxy resubmits all
1505 System registrations and Service initializations. The Local Imaging System
1506 Proxy recovers Job synchronization by sending UpdateActiveJobs for all Local
1507 Services after re-registration and Service Update.
- 1508 4. RegistrationTerminated: The Cloud Imaging System has terminated its
1509 relationship with the Local Imaging System and will not accept a re-
1510 registration. (This might be used to discontinue communication with a
1511 problematic Proxy.)
- 1512 5. IdentifyActions: A parameter requesting that the identified Target Device
1513 generate a visual or audible signal, allowing a requesting User to locate it. This

1514 request, if present, specifies the requesting User and the desired type of
1515 signal:

- 1516 a. Do Nothing: (0)
- 1517 b. Display: Displays the default a Client-provided message; if the message
1518 is provided, it is limited in length and is in a natural language and
1519 character set supported by the Target Device. (1)
- 1520 c. Flash: Flashes lights or the display. (2)
- 1521 d. Sound: Makes a sound. (3)
- 1522 e. Speak: Speaks the default or Client-provided message; if the message is
1523 provided, it is limited in length and is in a natural language and character
1524 set supported by the Target Device. (4)
- 1525 f. Cancel: end signaling previously requested for this User. (5)

1526 The Cloud System Control Service will previously have determined what
1527 identify signaling is supported by the Target Device, and will not request a
1528 signal type of which the Target Device is incapable. The Target Device can
1529 automatically end any requested Device Identify signal, can have this
1530 capability disabled, or can be honoring a request from some other source; the
1531 state of satisfaction of a DeviceIdentifyRequest from a given Cloud Imaging
1532 Control Service is reported in the subsequent GetServiceNotifications
1533 message to that Cloud Imaging Service.

1534 In addition, responses from Cloud Services other than the Cloud System Control Service
1535 can include the following Job-related ~~element~~ Elements.

- 1536 6. JobFetchable: An ~~element~~ Element indicating that the Cloud Imaging Service
1537 has one or more fetchable Jobs. The Local Imaging System Proxy is to
1538 respond with a GetFetchableJobs message (only in responses for Local
1539 Imaging Services).
- 1540 7. JobTerminated: One or more ~~element~~ Elements, each containing a JobUuid
1541 and the state of that Job, indicating that the identified, previously fetched but
1542 locally presumed still active Jobs has been terminated in the Cloud Service
1543 (only in responses for Local Imaging Services).

1544 4.2.2.11 RegisterSystem

1545 On Registration, the Local Imaging System Proxy sends a RegisterSystem message for
1546 each Local Imaging System that is to be registered to the corresponding Cloud Imaging
1547 System Control Service. This message identifies the System ~~element~~ Elements (PWG
1548 Semantic Model Elements directly under Description and Status) that are to be made
1549 known to the Cloud Imaging System, along with their current values. This set of ~~element~~ Elements
1550 Elements includes Local Imaging Services to be made accessible to the Imaging Services
1551 of the Cloud Imaging System and constitutes the proposed Accessible System Element set
1552 for the Local Imaging System. The response from the Cloud Imaging System Control
1553 Service acknowledges receipt of the message and reports any errors.

1554 If there are any ~~element~~ Elements in the proposed Accessible System Element set that the
1555 Cloud System Control Service is to ignore, it identifies these in its response as not

1556 supported. That is, the Cloud Imaging System Control Service has the option of ignoring
1557 some reported Local Imaging System ~~element~~ Elements. Alternatively, the Cloud Imaging
1558 System Control Service can send an error rejecting the Local Imaging System entirely or
1559 the Proxy cannot accept the reduced Accessible System Element set. In either such case,
1560 the Local Imaging System is not registered with the Cloud Imaging System. In out-of-band
1561 consultations, the Local System Owner can seek to resolve the problem with the Cloud
1562 System Owner. The resolution can be to register the Local Imaging System with a modified
1563 proposed Accessible System Element set.

1564 The proposed Accessible System Element set, possibly with reported not (Cloud)
1565 supported ~~element~~ Elements removed, if accepted by the Proxy, constitutes the
1566 Registered System Element Set for the Local Imaging System.

1567 This RegisterSystem message follows the form of the response to a Client-issued
1568 GetSystemElements message, where the Elements included are those which the Local
1569 Imaging System Owner intends to make accessible to the Cloud Imaging System.

1570 If the Registered System Element Set is to be changed (i.e., ~~element~~ Elements to be
1571 added or removed), a new RegisterSystem message is sent with the revised set of
1572 element Elements and their values.

1573 **4.2.2.12 UpdateActiveJobs.**

1574 After a Job “Fetch” has been confirmed by an AcknowledgeJob operation, the Local
1575 Imaging System Proxy sends UpdateJobStatus messages to communicate Job State
1576 changes in each Local Imaging Service. However, a service disruption in the Local
1577 Imaging Service, the Proxy or in communication with the Cloud Imaging Service; or a
1578 change to the state of a Job prompted by the Client or some other “Upstream” activity can
1579 result in Cloud and Local Job states to be different. To correct this, the Local Imaging
1580 System Proxy sends an UpdateActiveJobs message. This message identifies all Active
1581 Jobs in an identified Local Imaging Service; i.e., Jobs that the Local Imaging System Proxy
1582 is aware that it has fetched and has acknowledged or has intended to acknowledge, but
1583 not including Jobs for which the Local Imaging System Proxy has sent and the Cloud
1584 Imaging Service has acknowledged an UpdateJobStatus message indicating that the Job
1585 is in a terminating state. Note that UpdateActiveJobs includes Jobs which the Proxy
1586 considers in a terminated state but for which a response to the UpdateJobStatus indicating
1587 this terminated state has not been received. The message includes the current states of
1588 these Jobs. The Cloud Service either resolves the state of all Jobs which it believes have
1589 been fetched by the Proxy for each identified Local Service, or returns a message
1590 requiring the Proxy to resolve the Job status.

1591 ~~The~~ Table 5 identifies actions in response to an UpdateActiveJobs. Active Jobs from the
1592 Cloud viewpoint are Jobs which have been acknowledged as being fetched
1593 (AcknowledgeJob received) but for which an UpdateJobStatus message indicating a Job
1594 termination state has not been received. Active Jobs from the Proxy viewpoint are Jobs
1595 which have been acknowledged as being fetched (response to AcknowledgeJob received)

1596 but for which an UpdateJobStatus message indicating a Job termination state has not
1597 been sent.

1598 **Table 5 - Resolution of Disparate Job Status in Response to UpdateActiveJobs**

Cloud Job Fetchability	Proxy Reports in UpdateActiveJobs	Action
Job not fetched for identified Local Service (or not recognized)	Job Not Listed	none
	Job Listed for Local Service	Cloud reports error, identifying Jobs listed in UpdateActiveJobs which are invalid. Proxy removes Jobs from Active Jobs list .
Job Fetched & Active in identified Local Service	Job Listed for Local Service	Cloud aligns Job State with Proxy reported Job state
	Job Not Listed for the same Local Service	Cloud makes Job fetchable for appropriate Local Service
Job Fetched but in Terminated State	Job Not Listed or listed in terminated state	none
	Job Listed for the same Local Service but not in terminated state	Cloud reports error and identifies Jobs listed as not terminated in UpdateActiveJobs operation for given Local Imaging Service along with their terminated state. Proxy aligns its state for such Jobs.

1599 An UpdateActiveJobs message for each Service supported is sent by the Local Imaging
1600 System Proxy when the Proxy senses that communication with the Cloud Imaging Service
1601 has been restored after a disruption, when requested by the Cloud Service, after any hard
1602 reset, and after power-up initialization of the Proxy or a supported Local Imaging Service.

1603 An UpdateActiveJobs message for a specific Service is also sent by the Local Imaging
1604 System Proxy when the message in response to a FetchJob, AcknowledgeJob,
1605 UpdateJobStatus, FetchDocument, AcknowledgeDocument, UpdateDocumentStatus,
1606 GetJobElements or UploadJobDocumentData operation indicates an unrecognized Job
1607 UUID.

1608 **4.2.2.13 UpdateDocumentStatus:**

1609 The Local Imaging System Proxy sends this message reporting the current status of an
1610 identified Document, along with state message and reasons, whenever the status of that
1611 Document changes. The Document status in the Local Imaging System Proxy considers
1612 the status of the corresponding Job and Document in the Local Imaging Service to which
1613 the Job was directed. In some cases, as when the Local Imaging System Proxy is doing
1614 preprocessing or acquisition of referenced Document Data , Document status can be
1615 determined by the Local Imaging System Proxy rather than the Local Imaging Service.

1616 The Cloud Imaging Service response reports successful receipt of the update or a
1617 message indicating an error in the form or content of the request. For example, a
1618 Document Identification error indicates that the Document being updated was not
1619 considered to be active in the indicated Local Imaging Service either because it had not
1620 been acknowledged as fetched for that Local Service or because it was in a terminated
1621 Job.

1622 **4.2.2.14 UpdateJobStatus.**

1623 The Local Imaging System Proxy sends an UpdateJobStatus request reporting the current
1624 status of an identified Imaging Job, along with state message and reasons, whenever the
1625 status of that Job changes. The Job status in the Local Imaging System Proxy considers
1626 the status of the Job in the Local Imaging Service to which it was directed. The operation
1627 includes a sparsely populated object of the appropriate type. For example, if the Local
1628 Imaging Service completes a Job, the UpdateJobStatus message would contain the
1629 ~~element~~ Elements in the Local Imaging Service JobStatus that have been changed and a
1630 final version of the Local Imaging Service JobReceipt.

1631 The Cloud Imaging Service response reports successful receipt of the update or an error in
1632 the form or content of the message. For example, an error message might indicate that the
1633 Job being updated was not considered to be an ActiveJob in the identified Local Imaging
1634 Service either because it had not been acknowledged as fetched for that Local Service or
1635 because it was in a terminated state.

1636 **4.2.2.15 UpdateServiceElements**

1637 After the System has been registered, the Local Imaging System Proxy sends an initial
1638 UpdateServiceElements message to the corresponding Cloud Imaging Service for each
1639 Local Service to be made accessible. This initial UpdateServiceElements identifies the
1640 Local Service ~~element~~ Elements (Elements under CapabilitesReady, Defaults, Description
1641 and Status) that are to be made known to the Cloud Service, along with their values.

1642 This initial message follows the form of the response to a Client-issued
1643 GetServiceElements message, but rather than providing information on ~~element~~ Elements
1644 requested by the Client, the Elements included are all those to be made accessible to the
1645 Cloud Imaging Service. This constitutes the proposed Accessible Service Element set for
1646 the Local Service. The response from the Cloud Imaging Service acknowledges receipt of
1647 the message and reports any errors.

1648 If there are any ~~element~~ Elements in the proposed Accessible Service Element set that the
1649 Cloud Service intends to ignore, it identifies these in its response as not supported. That is,
1650 the Cloud Imaging Service has the option of ignoring some reported Local Imaging Service
1651 ~~element~~ Elements. Alternatively, the Cloud Imaging Service can send an error rejecting the
1652 Local Imaging Service entirely or the Proxy could act to not accept the reduced Accessible
1653 Service Element set. In either such case the Proxy deregisters the Local System. In out-of-
1654 band consultations, the Local System Owner can seek to resolve the problem with the
1655 Cloud System Owner. The resolution can be to decide to re-register the Local Imaging
1656 System without the rejected Service, or with the Service and a modified proposed
1657 Accessible Service Element set.

1658 The proposed Accessible Service Element set, possibly with reported not (Cloud)
1659 supported ~~element~~ Elements removed, if accepted by the Proxy, constitutes the Accessible
1660 Service Element set for the Local Imaging Service.

1661 | If the Accessible Service Element set is to be changed for a Local Imaging Service (i.e.,
1662 | ~~element~~ Elements to be added or removed), the Local Imaging System Proxy re-registers
1663 | the Local Imaging System containing that Local Imaging Service and issue new initial
1664 | UpdateServiceElements messages for all Local Services in that System with the revised
1665 | set of ~~element~~ Elements and their values.

1666 | Once the Local Imaging System Proxy has sent the initial UpdateServiceElements to
1667 | communicate the Accessible Service Element set to the corresponding Cloud Imaging
1668 | Service, an UpdateServiceElements message is sent to update the corresponding Cloud
1669 | Imaging Service with any change in value of these ~~element~~ Elements.

1670 | **4.2.2.16 UpdateSystemElements**

1671 | After registration, an UpdateSystemElements message is sent by the Local Imaging
1672 | System Proxy to update the value of any ~~element~~ Element in the Registered System
1673 | Element Set. Typically, this will be reporting current System state whenever its state
1674 | changes, along with state message and reasons. The Cloud Imaging System Service
1675 | response is an acknowledgment of message receipt.

1676 | These UpdateSystemElements messages follow the form of the response to a Client-
1677 | issued GetSystemElements message, where the Elements included are members of the
1678 | Registered System Element set the values of which have changed since
1679 | SystemRegistration or the last acknowledged UpdateSystemElements message.

1680 | **4.2.2.17 UploadJobDocumentData.**

1681 | The Local Imaging System Proxy sends a message containing the Document Data that a
1682 | Local Imaging Service has obtained in executing a Job which requires that the Local
1683 | Imaging Service output Digital Document Data back to the Cloud Imaging Service, as for
1684 | when the specified data destination for a Scan Job is not directly accessible to the Local
1685 | Imaging System Proxy or the Local Imaging Service.

1686 | The message includes the JobUuid. The response from the Cloud Imaging Service
1687 | acknowledges receipt of the data and can include error messages as appropriate.

1688 | **4.2.3 Cloud Service Management Operations**

1689 | Administrative Service operations are sent from a Client to a specific Cloud Imaging
1690 | Service and directly affect only the specific addressed Service within Cloud Imaging
1691 | System and/or affect the Jobs within the Service. Access is reserved for Administrators or
1692 | Operators. The Administrative Service Operations are identical to the Administrative
1693 | Service Operations described in MFD Model and Common Semantics [PWG5108.01], with
1694 | the addition of GetLocalServices, and GetLocalServiceElements. These additional
1695 | operations allow administrative identification of the Local Imaging Service(s) accessible to
1696 | the Cloud Service being queried (a Cloud Service can have access to more than one Local
1697 | Service), and an administrative view of ~~element~~ Elements of each such Local Service.

1698 The Administrative Service Operations for Cloud Imaging Services are listed in Table 6,
1699 with paragraphs 4.2.3.1 and 4.2.3.2 describing the GetLocalServices and
1700 GetLocalServiceElements operations.

1701 Note that Cloud Service Management operations are accessible to only Users with proper
1702 administrative access rights to the Cloud Imaging Service. These operations do not directly
1703 affect downstream Cloud Imaging Services, Local Imaging System Proxy(s) which connect
1704 to the Cloud Imaging Service, or the Local Imaging Services with which these the Local
1705 Imaging System Proxy(s) interface.
1706

1707

1708

Table 6 Imaging Service Specific Administrative Operations

Operation	Request Parameters (Note 1, 2)	Response Parameters (Note 3)	Notes
CancelJobs	JobIds	JobIds	4
DisableService			5
EnableService		-	5
GetLocalServiceElements	LocalServiceUuid; RequestedElements; FirstIndex; Limit	LocalServiceUuid; ServiceElements, Unsupported Elements	
GetLocalServices		List of (LocalServiceUuid, ServiceName, ServiceType)	
HoldNewJobs	JobHoldUntil, JobHoldUntilTime		
PauseService			5
PauseServiceAfterCurrentJob			5
PromoteJob	JobId ; PredecessorJobId		
ReleaseHeldJobs			
ReleaseNewJobs			
RestartService	IsAcceptingJobs; StartServicePaused		
ResumeJob	JobId		
ResumeService			
SetServiceElements	ServiceElements(DefaultJobTicket, ServiceCapabilities, ServiceCapabilitiesReady, ServiceDescription); OperationMode	Unsupported Elements	6
ShutdownService			5, 7

1709 **Note 1:** Elements in bold font are mandatory for the associated operation. All Client Administrative Requests
 1710 can include the following ~~element~~ Elements
 1711 ElementsNaturalLanguageRequested;
 1712 ServiceUuid (target Cloud Service);
 1713 RequestingUserName and/orRequestingUserUri (mandatory) the RequestingUser is the
 1714 Administrator;
 1715 Message

1716 **Note 2:** The RequestingUserName can be used by the target Service to determine whether the requestor is
 1717 authorized to make the request. Some implementations can require further authentication of the requestor's
 1718 identity. If the requestor is not determined to have access, the Service rejects the request (unless security
 1719 procedures dictate no response.)

1720 **Note 3:** All Cloud Imaging Service Responses correlate to the Request and can include the following ~~element~~
 1721 Elements.:
 1722 ElementsNaturalLanguage(if response includes ~~element~~ Element(s) in natural language);
 1723 OperationStatusCode(mandatory): indicates that operation has been accepted or not and possibly an
 1724 error condition (e.g., Request identifies a System, Service, Job or Document that is not
 1725 recognized; the Request refers to an inactive Job as though it were active, or there is some error in
 1726 the received operation request format.)
 1727 Message:Cloud Service response text message identifying the error condition and reason

1728 **Note 4:** CancelJobs response includes identified but un-cancellable Jobs with Job States after operation
 1729 implemented.

1730 | **Note 5:** Operations manage just the addressed Cloud Service, not the associated Local Service(s). However,
1731 | these operations can render the Cloud Service in a state where it does not respond to Proxy Operations.

1732 | **Note 6:** The Service Elements of a Cloud Imaging Service can depend on the accessible Service Elements of
1733 | Proxied Local Services with which it communicates. In no case can this SetServiceElements Operation add to
1734 | the ~~element~~ Elements made accessible via Proxies, although it can cause the Cloud Imaging Service to ignore
1735 | some accessible Elements or ~~element~~ Element values.

1736 | **Note 7:** Forcing Service Shutdown can also force the state of any active Jobs to Aborted.

1737 | **4.2.3.1 GetLocalServices**

1738 | The GetLocalServices operation directed to a Cloud Imaging Service allows an authorized
1739 | Client to get the name,type and LocalServiceUids of all Local Services with which the
1740 | Cloud Imaging Service is (or should be) communicating (via one or more Local Imaging
1741 | System Proxies). This communication relationship is established by virtue of the
1742 | registration of Local Imaging System(s) containing that Local Service(s) with the Cloud
1743 | Imaging System containing the addressed Cloud Imaging Service. Local Services are
1744 | listed even if the Local Service is Offline or the local System registration has been
1745 | suspended, but not once the local System has been deregistered. The GetLocalServices
1746 | response includes only Service identification information rather than the full
1747 | ServiceSummary provided in response to a ListAllServices operation.

1748 | **4.2.3.2 GetLocalServiceElements**

1749 | The GetLocalServiceElements operation allows an authorized Client to get the Service
1750 | Elements and values (Description, Status, and CapabilitiesReady) of the specified Local
1751 | Service with which a Cloud Imaging Service is communicating. The request can limit
1752 | response to specific ElementGroups; allowed values for Requested Elements are
1753 | CapabilitiesReady (if appropriate to the Imaging Service), Description, Status and
1754 | DefaultJobTicket. The returned information corresponds to the information received from
1755 | the Local Imaging System Proxy for that Local Service via the UpdateServiceElements
1756 | operations.

1757 | **4.2.4 Cloud Imaging System Management Operations**

1758 | These Administrative Service operations are sent from a Client to a Cloud Imaging System
1759 | Control Service and directly affect the Cloud Imaging System, Cloud Imaging Services
1760 | and/or affect the Jobs of multiple Job Owners. Access is reserved for Administrators or
1761 | Operators. The Cloud Imaging System Operations are listed in Table 7 and are described
1762 | in Section 7 of the System Object and System Control Service Semantics [PWG5108.05],
1763 | with the addition of the GetLocalSystems and GetLocalSystemElements described in
1764 | 4.2.4.1 and 4.2.4.2 below. These additional operations allow administrative view of the
1765 | Local Imaging System(s) with which the Cloud Imaging System communicates via a Proxy,
1766 | and the accessible ~~element~~ Elements of these Local Imaging System(s).

1767 Cloud Imaging System Management operations do not directly affect downstream Imaging
 1768 Systems, the Local Imaging System Proxy(s) which connect to the Cloud Imaging Service,
 1769 or the Devices with which these Local Imaging System Proxy(s) interface.

1770 Note that, when directed to specific Imaging Services, some operations parallel the
 1771 administrative operations described in paragraph 4.3.3.; when directed to the System
 1772 Control Service without a specific Imaging Service identified, such operations apply to all
 1773 supported Imaging Services in the Cloud Imaging System, other than the System Control
 1774 Service itself.

1775 **Table 7 - Administrative Cloud Imaging System Service Operations**

Operation	Request Parameters (Note 1)	Response Parameters (Note 3)	Notes
DeleteService	ServiceUuid, Id, ServiceType (of Service to be deleted)		2, 4, 11
DisableAllServices			4
EnableAllServices			4
GetLocalSystemElements	LocalSystemUuid; RequestedElements (Services, SystemConfiguration, SystemDescription, SystemStatus)	LocalSystemUuid; SystemElements (Services, SystemConfiguration, SystemDescription, SystemStatus), Unsupported Elements	
GetLocalSystems		List of (LocalSystemUuid; SystemName)	
GetSystemElements	ElementsNaturalLanguageRequested; RequestedElements (Services, SystemConfiguration, SystemDescription, SystemStatus)	SystemElements (Services, SystemConfiguration, SystemDescription, SystemStatus); Unsupported Elements	
ListAllServices	ElementsNaturalLanguageRequested	List of ServiceSummary (9)	12
PauseAllServices			4, 5
PauseAllServicesAfterCurrentJob			5,
RestartAllServices	IsAcceptingJobs; StartServicePaused		4, 8, 9, 10
RestartService	IsAcceptingJobs; Id ; StartServicePaused; ServiceUuid; ServiceType		6, 7, 8, 9, 10
ResumeAllServices			4, 5
SetSystemElements	OperationMode; SystemElements	UnsupportedElements	
ShutdownAllServices			4
ShutdownService	ServiceUuid; Id , ServiceType		11
StartupAllServices	IsAcceptingJobs; StartSystemPaused		4, 8, 9, 10
StartupService	IsAcceptingJobs; StartServicePaused; ServiceType	Id ; ServiceUuid	4, 8, 9, 10

1776 **Note 1:** Elements in bold font are mandatory for the associated operation. All Client Management Requests
 1777 can include the following ~~element~~ Elements.

1778 ElementsNaturalLanguage;
 1779 ServiceUuid (Cloud System Control Service);
 1780 Message
 1781 RequestingUserName and/or RequestingUserUri (mandatory). The RequestingUser for these
 1782 operations is the Administrator
 1783 The RequestingUserName or RequestingUserUri can be used by the Cloud System Control
 1784 Service to determine whether the requestor is authorized to make the request. Some
 1785 implementations can require further authentication of the requestor's identity. If the requestor is not
 1786 determined to have access, the Service rejects the request (unless security procedures dictate no
 1787 response

1788 | **Note 2:** The identification of the Service to be deleted, shutdown or restarted by the mandatory ~~element~~
 1789 | Elements, **Id** and **ServiceType** is consistent with the DeleteService operation defined in the System Object
 1790 | and System Control Service Semantics (PWG5108.06). However, particularly for Cloud Services, it is
 1791 | preferable to provide the ServiceUuid of the Service to be deleted.

1792 | **Note 3:** All Cloud Imaging Service Responses correlate to the Request and can include the following ~~element~~
 1793 | Elements.. Elements in bold font are mandatory for the associated operation.

1794 | ElementsNaturalLanguage (if response includes ~~element~~ **Element**(s) in natural language)
 1795 | OperationStatusCode (mandatory); indicates that operation have been accepted or not and possibly
 1796 | error condition (e.g., Request identifies a Service that is not recognized or there is some error in
 1797 | the received operation request format.)
 1798 | Message; Cloud Service response text message identifying the error condition and reason

1799 | **Note 4:** This operation applies only to the Cloud Imaging Services, not the Cloud System Control Service.

1800 | **Note 5:** The operation applies only to Job based Services (e.g., FaxOutService, PrintService and
 1801 | ScanService),, not to the CloudSystemControlService

1802 | **Note 6:** When the object Service is the Cloud System Control Service the implementation restarts the
 1803 | SystemControlService and might restart the other Services as well.

1804 | **Note 7:** When the target Service is the Cloud System Control Service the implementation of the restart can be
 1805 | soft (i.e., affects software only) or hard (i.e., hardware and software reinitialized).

1806 | **Note 8:** When the Service startup is complete, the Service state is 'Idle' (See note 9). The Service will then
 1807 | follow the Service state model as defined in section 7.2.1 of [PWG5108.01].

1808 | **Note 9:** When the operation contains the "StartServicePaused" parameter and it is set to TRUE, the resulting
 1809 | Service state is 'Stopped' (i.e., transitions from 'Down' to 'Idle' then immediately to 'Stopped'). The Service will
 1810 | then follow the Service state model as defined in section 7.2.1 of [PWG5108.01].

1811 | **Note 10:** When the operation contains the "IsAcceptingJobs" parameter with a value of FALSE, the Service
 1812 | state is 'Idle' (See note 9). The Service will then follow the behaviors as defined in section 7.3.2.2 of
 1813 | [PWG5108.01]

1814 | **Note 11:** These operations result in an error when applied to the Cloud System Control Service.

1815 | **Note 12:** ServiceSummary for each service includes ServiceUuid, ServiceName, ServiceState,
 1816 | ServiceStateReasons for the service's endpoint and other general information.

1817 | **4.2.4.1 GetLocalSystems**

1818 | The GetLocalSystems operation allows an authorized User to get the LocalSystemUuids
 1819 | and names of all Local Systems which are registered with the Cloud Imaging System.
 1820 | Local Systems are listed even if the System or the interfacing Local Imaging System Proxy
 1821 | is Offline or has registrations suspended, but not once the local System has been
 1822 | deregistered.

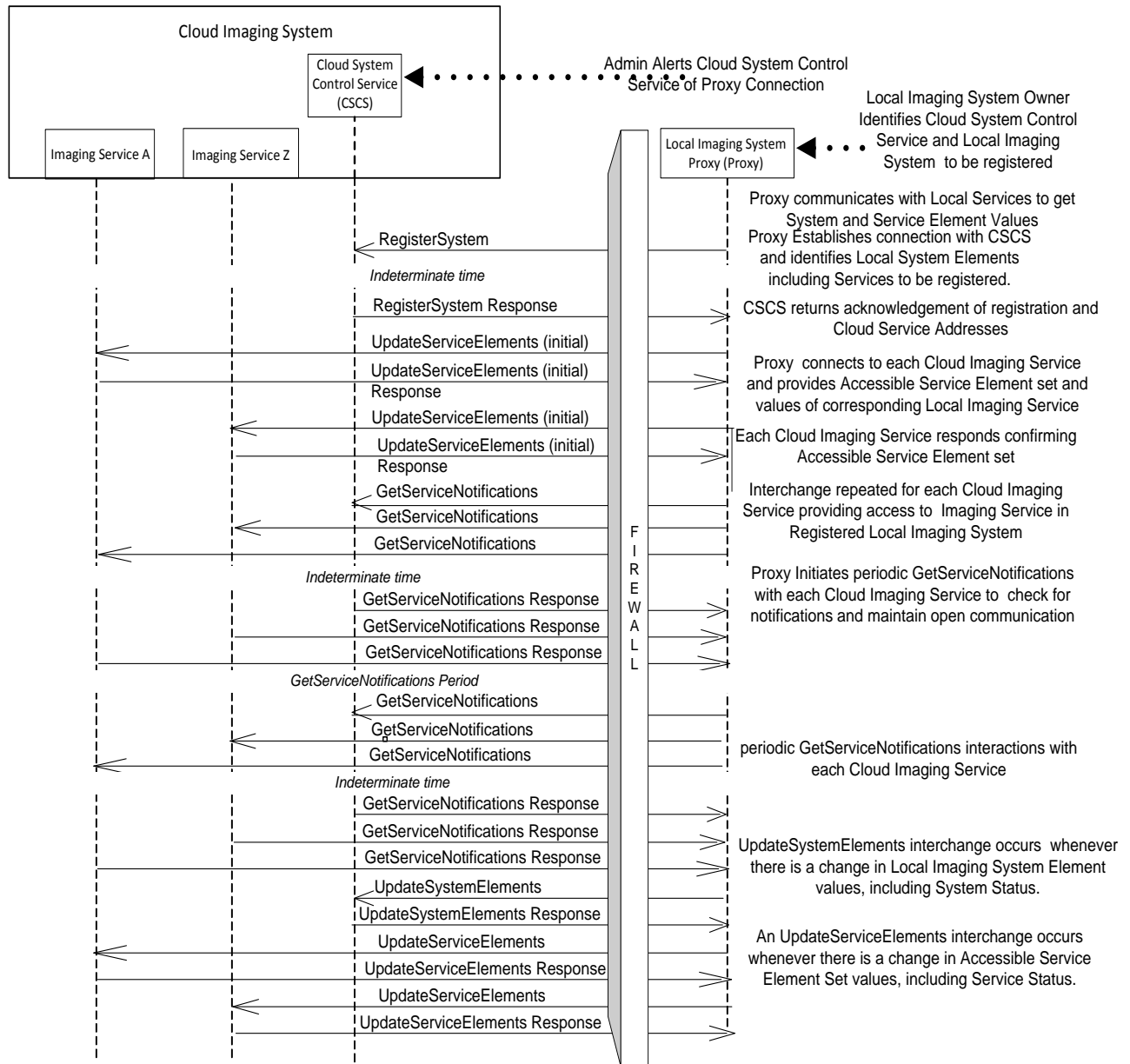
1823 **4.2.4.2 GetLocalSystemElements**

1824 The GetLocalSystemElements operation allows an authorized User to get the System
1825 Elements and values (Description, Status, Services) of the specified Local System. The
1826 request can limit response to specific ~~element~~ Element groups; the allowed values for
1827 Requested Elements are Description, Status and Services. The returned information
1828 corresponds to the information received from the Local Imaging System Proxy for that
1829 Local System via the RegisterSystem and UpdateSystemElements operations.

1830 **4.3 Transaction Sequences**

1831 **4.3.1 Registration Sequence**

1832 The message sequence in Figure 5 plots the specific interactions outlined in paragraph
1833 4.1.2 for Local Imaging System registration and initialization of the communication with
1834 each of the Cloud Imaging Services.



- Note: 1. All messages are initiated by the Local Imaging System Proxy.
 2. Every message has a response from the addressed Service.
 3. Proxy does not need to have a response from a previous message before sending a subsequent message.
 4. Services do not necessarily need to respond to messages in the order received.

Figure 5 System/Service Registration

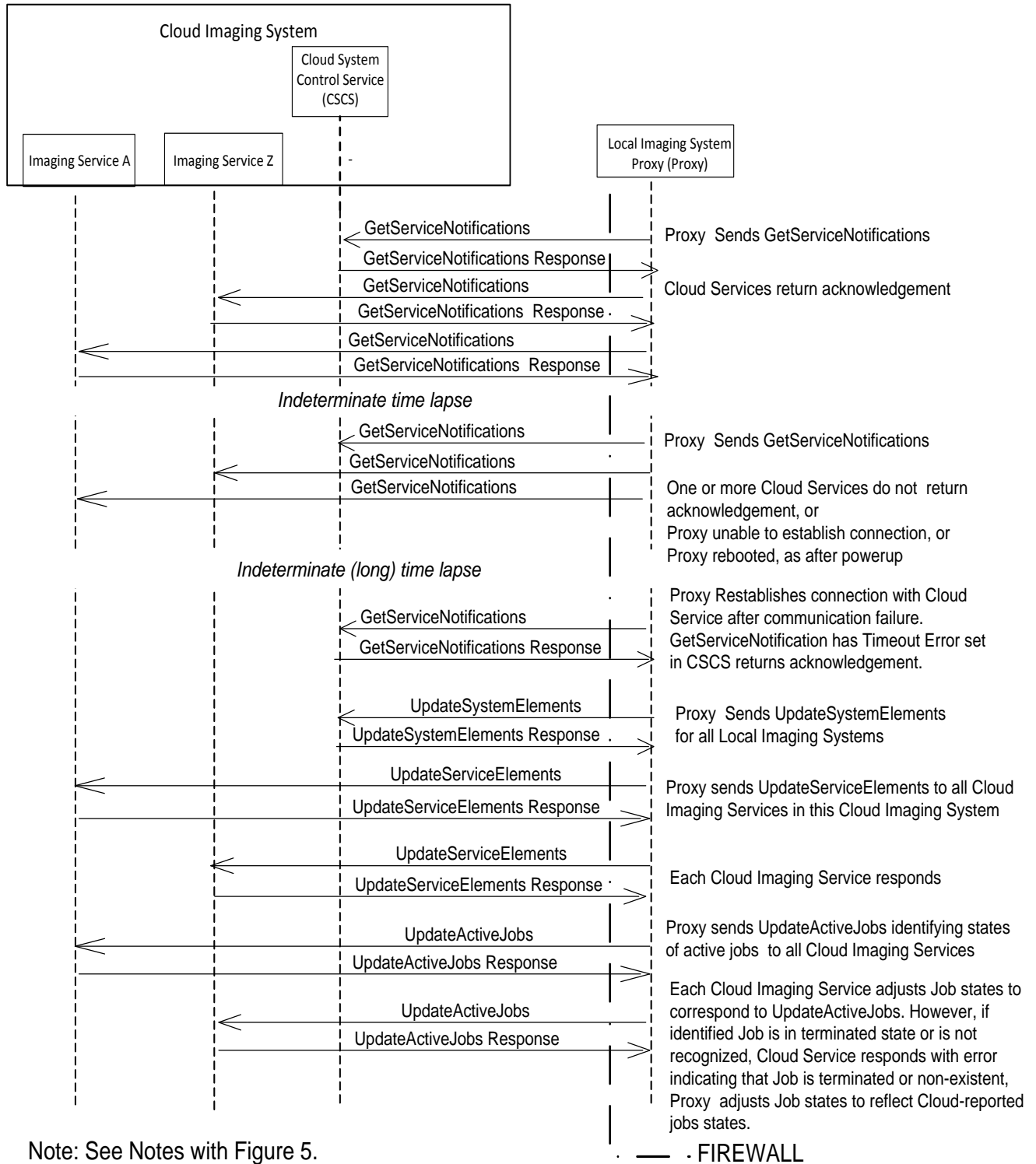
1835
1836

1837 **4.3.2 Status Realignment**

1838 Although there will be multiple connections and disconnections between a Local Imaging
 1839 System Proxy and a Cloud Imaging Service, communication between Proxy and a Cloud
 1840 Services is considered lost:

- 1841 | 1. When the Proxy is unable to receive a response from a Cloud Service to which
1842 | it is sending a message;
1843 | 2. When the Cloud Service fails to receive any communication from the Local
1844 | Imaging System Proxy over an 'Offline time-out' period and returns a time-out
1845 | message when communication is reestablished; or
1846 | 3. When the Proxy can have lost track of the Jobs and or the state of the Jobs it
1847 | has fetched, as can occur when either the Proxy and/or the Local Imaging
1848 | System is rebooted or has been powered down and restarted.

1849 | In any of these circumstances, Service and Job status information in the Cloud Services
1850 | and the Local Services are to be realigned. The message sequence for resynchronization
1851 | is in Figure 6 and consists of UpdateSystemElements, Update ServiceElements and
1852 | UpdateActiveJobs messages sent by the Proxy to the corresponding Cloud Services. By
1853 | the UpdateActiveJobs message, the Proxy informs the Cloud Service of the identification
1854 | and states of Jobs that it considers fetched from the Cloud Service and still active. Usually
1855 | System, Service and Job states are adjusted in the Cloud Services to agree with update
1856 | information from the Proxy. Jobs which a Cloud Service understands to be active but
1857 | which are not reported by the Proxy are again made 'fetchable. However, if Jobs have
1858 | been canceled or aborted by the Client or some upstream Service, the Cloud Service can
1859 | be unable to align status with the Proxy update information. In this case, the Cloud
1860 | Imaging Service returns an error message in response to the UpdateActiveJobs message
1861 | identifying Jobs that were listed in the UpdateActiveJobs message but are in a terminating
1862 | state, and indicates their terminating state. The Proxy adjusts its state for such Jobs
1863 | accordingly.



Note: See Notes with Figure 5.

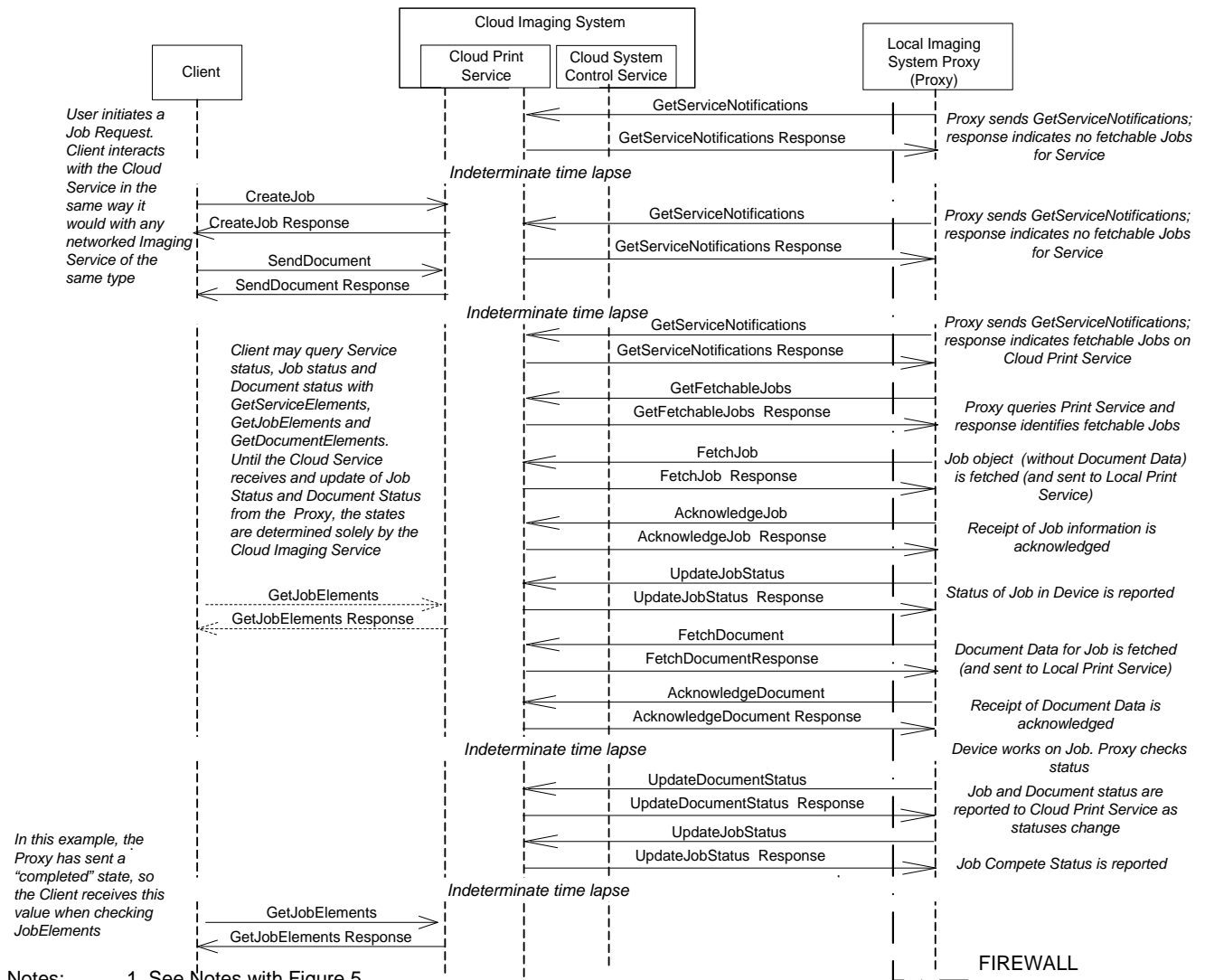
1864

1865

Figure 6 System, Service and Job Status Realignment

1866 **4.3.3 Cloud Print Service Sequence**

1867 The message sequence for Cloud Print is represented in Figure 7. The Client-Cloud Print
 1868 Service interaction is the same as with any Client-Networked Print Service print Job
 1869 request submission. In the general case of the Cloud Local Imaging System Proxy
 1870 supporting several Local Imaging Services, the GetServiceNotifications messages will
 1871 continue periodically during the Print Service interaction. If the GetFetchableJobs response
 1872 indicated more than one Print Job available, the Cloud Local Imaging System Proxy can
 1873 fetch more Jobs after (or during, depending upon the capability of the Local Print Service)
 1874 the processing of the first Job. Note that the basic sequence is the same for FaxOut
 1875 Services.



- Notes:
1. See Notes with Figure 5.
 2. UpdateDocumentStatus may precede AcknowledgeDocument

1876

1877

Figure 7 Simple Print Sequence

1878 When DocumentData has been supplied by the Client, the Cloud Print Service response to
1879 the FetchDocument request includes the DocumentData for presentation to the Local Print
1880 Service (as indicated in Figure 7). The Proxy sends the AcknowledgeDocument message
1881 which indicates that the DocumentData is received and accepted, or reporting some
1882 problem with the data. If AcknowledgeDocument reports a problem, the Cloud Print
1883 Service response indicates whether the FetchDocument is to be resubmitted (if, for
1884 example, the Cloud Service will reformat the Document), the Document is to be skipped
1885 (allowing previous and/or following documents to be printed), or the Job is to be aborted.

1886 Once the Document has been acknowledged, the Proxy sends UpdateDocumentStatus
1887 messages to indicate the status of the Document as the Document is being processed. As
1888 with the AcknowledgeDocument interchange, the Proxy can report problems and the Cloud
1889 Service can respond with desired actions.

1890 When the Client submits a print-by-reference Job to the Cloud Print Service, the Cloud
1891 Print Service response to the FetchDocument request normally passes the reference on to
1892 the Proxy, provided that the Proxy has reported that the URI Scheme for the reference is
1893 supported and that the Document Data location is not recognized by the Cloud Service,
1894 perhaps as in an associated Cloud repository. If the Proxy and the Local Print Service
1895 cannot access the DocumentData, the Proxy AcknowledgeDocument message will
1896 indicate and identify the failure. The Cloud Print Service responds with the action that the
1897 Proxy is to take; the FetchDocument is resubmitted (if the Cloud Print Service can de-
1898 reference the DocumentData itself and respond with the de-referenced DocumentData),
1899 the Document is to be skipped, or the Job is to be aborted.

1900 If the Proxy aborts a Job, either because it was instructed to or for some local reason, the
1901 Cloud Service has the option of trying to resolve the problem and making the Job again
1902 'fetchable' or it might possibly redirect the Job to some other Local Print Service. If these
1903 alternatives do not work, the failed Job status is reported to the Client.

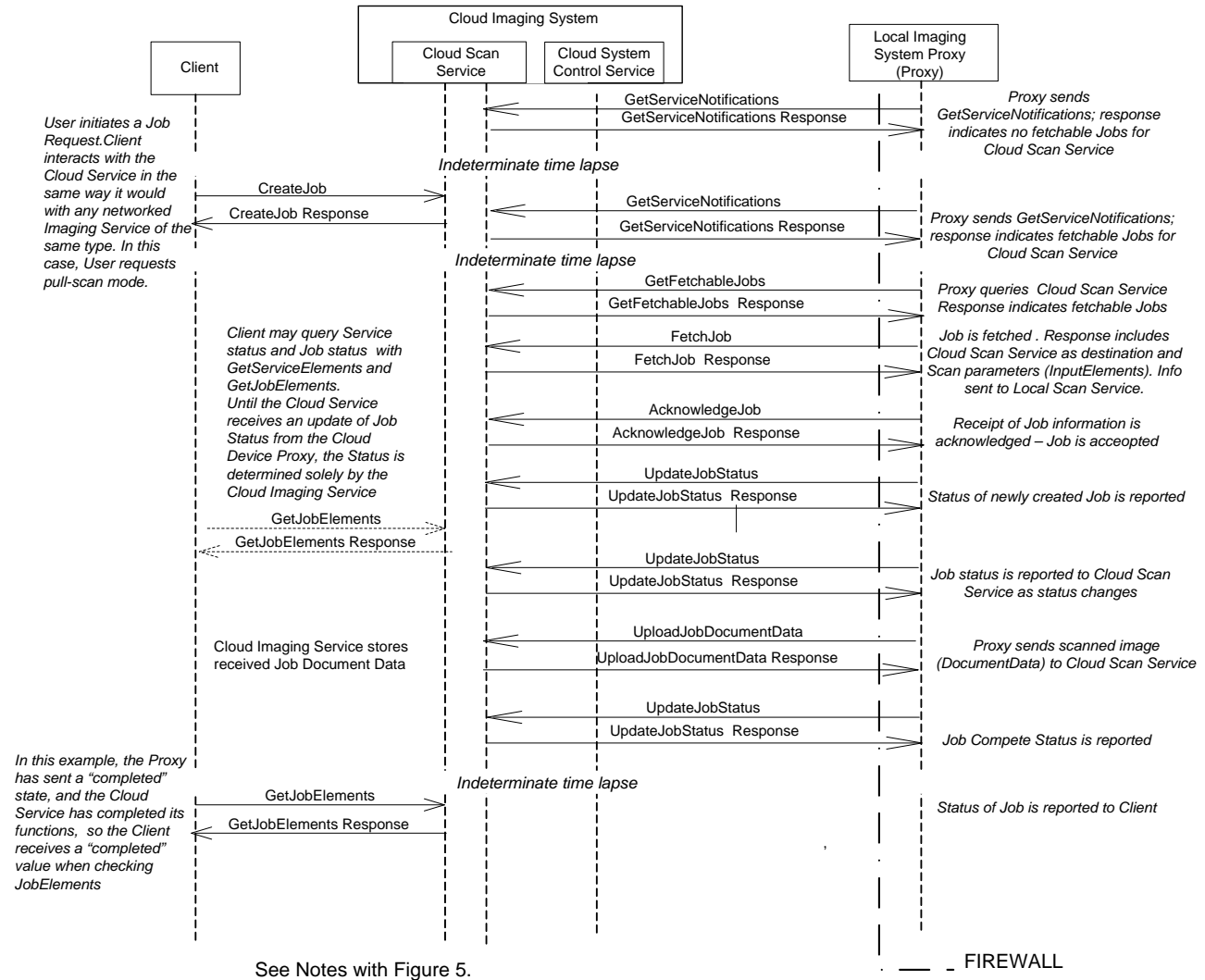
1904 **4.3.4 Cloud Scan Service Sequence**

1905 The message interchange sequence for a Scan Job starts in the same way as for a Print
1906 Job, except that the response to the FetchJob request contains InputElements, giving the
1907 hardcopy scan parameters and the Cloud Scan Service specified Document Destination.

1908 The Cloud Scan Service will have been informed of the URI schemes supported by the
1909 Proxy/Local Scan Service. The Cloud Scan Service may have some associated storage
1910 destinations, perhaps provided for Pull Scan Jobs or as a Cloud repository. The Document
1911 Destination provided in response to the FetchJob request is the User defined destination,
1912 unless:

- 1913 1. The Cloud Scan Service determines that the User-defined Document
1914 Destination is not supported by the Proxy/Local Scan Service;
- 1915 2. The Cloud Scan Service recognizes the destination as an associated Cloud
1916 destination;
- 1917 3. The User/Client has requested a Pull Scan mode.

- 1918 If any one of these conditions exist, the FetchJob response indicates that the Scan data is
1919 to be uploaded to the Cloud Scan Service.
- 1920 On receiving this FetchJob response, the Proxy determines whether the specified
1921 InputElements are supported and whether it or the Local Scan Service can access the
1922 desired destination(s). If InputElements are supported and the DestinationUris can be
1923 accessed, the Proxy AcknowledgeJob message indicates that the Job is accepted. If
1924 InputElements are not supported and/or the DestinationUris cannot be accessed, the
1925 AcknowledgeJob message rejects the Job and identifies the problem. The Cloud Scan
1926 Service removes the Job from the Fetchable list, whether or not the Proxy
1927 AcknowledgeJob indicates the Job has been accepted or not.
- 1928 If the Proxy/Local Scan Service cannot access the desired DestinationUris, the Cloud
1929 Scan Service determines whether it can access the desired DestinationUris. If it cannot or
1930 if InputElements are not supported, the Job is aborted and the Client is notified. If the
1931 Cloud Scan Service can access the desired location, it can reconfigure its Job handling
1932 approach and make the Job again fetchable.
- 1933 If the Cloud Service intends to send the scan Document Data to the desired
1934 DestinationUris (or store it to be 'pulled' by the Client), the DestinationUris provided by the
1935 Cloud Scan Service in response to new FetchJob indicates that the Document Data is to
1936 be uploaded to the Cloud Scan Service.
- 1937 The message sequence for Scan to a Cloud Scan Service accessible location is in Figure
1938 8. In this example, the scanned image file destination specified by the User is accessible
1939 by the Cloud Scan Service but not the Local Scan Service. Therefore, the Local Imaging
1940 System Proxy uploads this file to the Cloud Scan Service, which stores the file before
1941 reporting the Job complete.

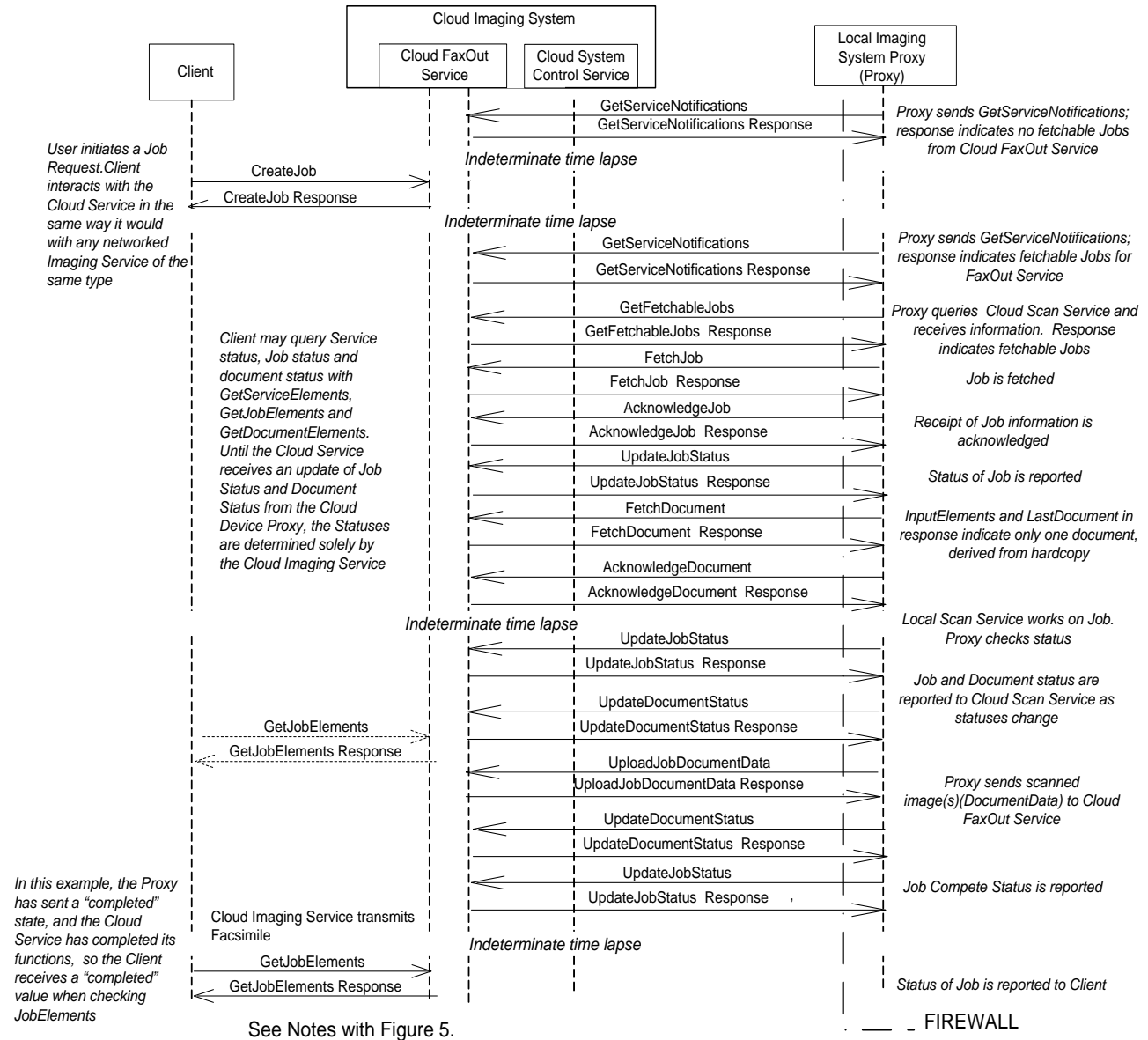


1957 On receiving this DestinationUri~~s~~~~element~~ ~~Element~~, the Proxy determines whether it or the
1958 Local FaxOut Service can transmit the facsimile. If the InputElements are supported and at
1959 least one DestinationUri URI scheme is supported, the Proxy AcknowledgeJob message
1960 indicates that the Job is accepted but any problems (such as inaccessible DestinationUri
1961 URI schemes) are identified. If InputElements are not supported, the AcknowledgeJob
1962 message rejects the Job and identifies the problem. The Cloud FaxOut Service removes
1963 the Job from the Fetchable list, whether or not the Proxy AcknowledgeJob indicates the
1964 Job has been accepted or not.

1965 If the Cloud FaxOut Service determines that it can access URI schemes not supported by
1966 the Proxy/Local FaxOut Service, it can continue with the Job and indicate in the
1967 FetchDocument response that Document Data is to be uploaded to the Cloud FaxOut
1968 service in addition to the Proxy/LocalFaxOut Service transmitting the Document via any
1969 requested DestinationUri URI scheme that it supports.

1970 A FaxOut Job can include both 'soft ' documents available as Document Data supplied
1971 through or referenced by the Cloud FaxOut Service and DocumentData derived from
1972 hardcopy by the Local FaxOut Service. After a FaxOut Job has been accepted in a
1973 AcknowledgeJob message, the Proxy will send a FetchDocument message. The response
1974 to this message can be the Document Data or a reference to the Document Data, just as in
1975 the response to a Print Service FetchDocument, and handling of access (de-referencing)
1976 problems is the same. However, since the FaxOut Job can also contain Digital Documents
1977 derived by scanning hardcopy at the Local FaxOut Service, the response to the
1978 FetchDocument message can be the InputElements for the scanning. As mentioned
1979 above, the FetchDocument response can also include a DocumentTicket which preempts
1980 information in the Job Ticket supplied in response to the FetchJob message.

1981 Figure 9 shows the message sequence for a Facsimile to be derived from a Local FaxOut
1982 hardcopy scan and which uses the Cloud FaxOut Service for transmitting the facsimile to
1983 at least one of the desired destinations.



1984

1985

Figure 9 FaxOut Message Sequence with Cloud FaxOut Service Transmitting

1986

4.3.6 Device Exception, and Job Abort or Cancel Sequences

1987

A Local Imaging Service subunit fault, such as a paper jam or a scanner bulb failure is reported to the applicable Cloud Imaging Service via an UpdateServiceElements message. Furthermore, if such an occurrence affects an Imaging Job submitted through the Cloud, additional Job-specific messages are exchanged among the components. These are represented in Figure 10.

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A Job can be aborted by a Cloud Imaging Service or a Local Imaging Service, or it can be canceled by an Administrator of either a Cloud or Local Imaging Service. In the case of Abort or Cancel at Local Imaging Services or downstream Cloud Services, the Job State is

1993

1994

1995 communicated to Cloud Imaging Service interfacing directly with the Client in the same
1996 way that any Job state change is reported. The Client is then informed of altered Job State
1997 using the same mechanisms as in any Client-Networked Imaging Service interaction.

1998 A Client, either at the User's request or for some other reason, can issue a CancelJob or
1999 CancelCurrentJob to the Cloud Imaging Service. If the Job to be canceled is active in a
2000 Local Imaging Service, the servicing Proxy is notified in the GetServiceNotifications
2001 response (or by another notification mechanism.) The Proxy can then send a
2002 GetJobElements message to verify the status of the terminated Job and determine the
2003 circumstances for termination (JobStateReasons) This information can be retained in a
2004 Proxy log. The message sequence is as shown in the lower part of Figure 9.

2005 Although Figure 9 represents the communication of an upstream cancel after a Job is well
2006 into processing, a cancel or abort can occur at any time. Regardless of when the cancel or
2007 abort occurs, there are two methods by which the Cloud Service can provide information to
2008 the Proxy about the 'upstream' abort or cancel.

- 2009 | 1. The JobTerminated information in the GetServiceNotifications response from
2010 | the Cloud Service or in an asynchronous SystemNotification message from the
2011 | Cloud Imaging Service.
- 2012 | 2. An error response to any Proxy message by which the Cloud Service indicates
2013 | an identified locally active Job as terminated, not fetchable, or not recognized.
2014

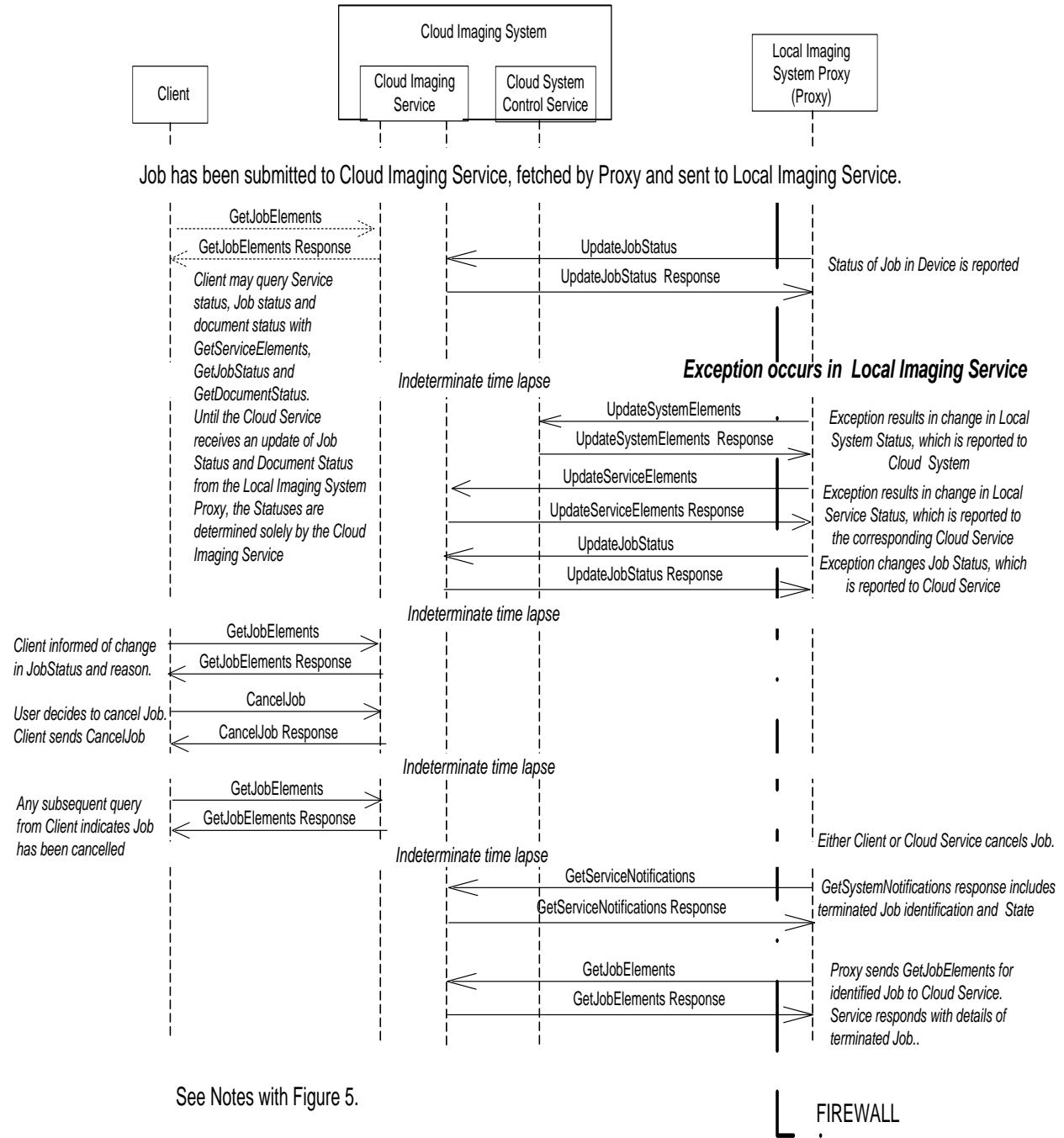
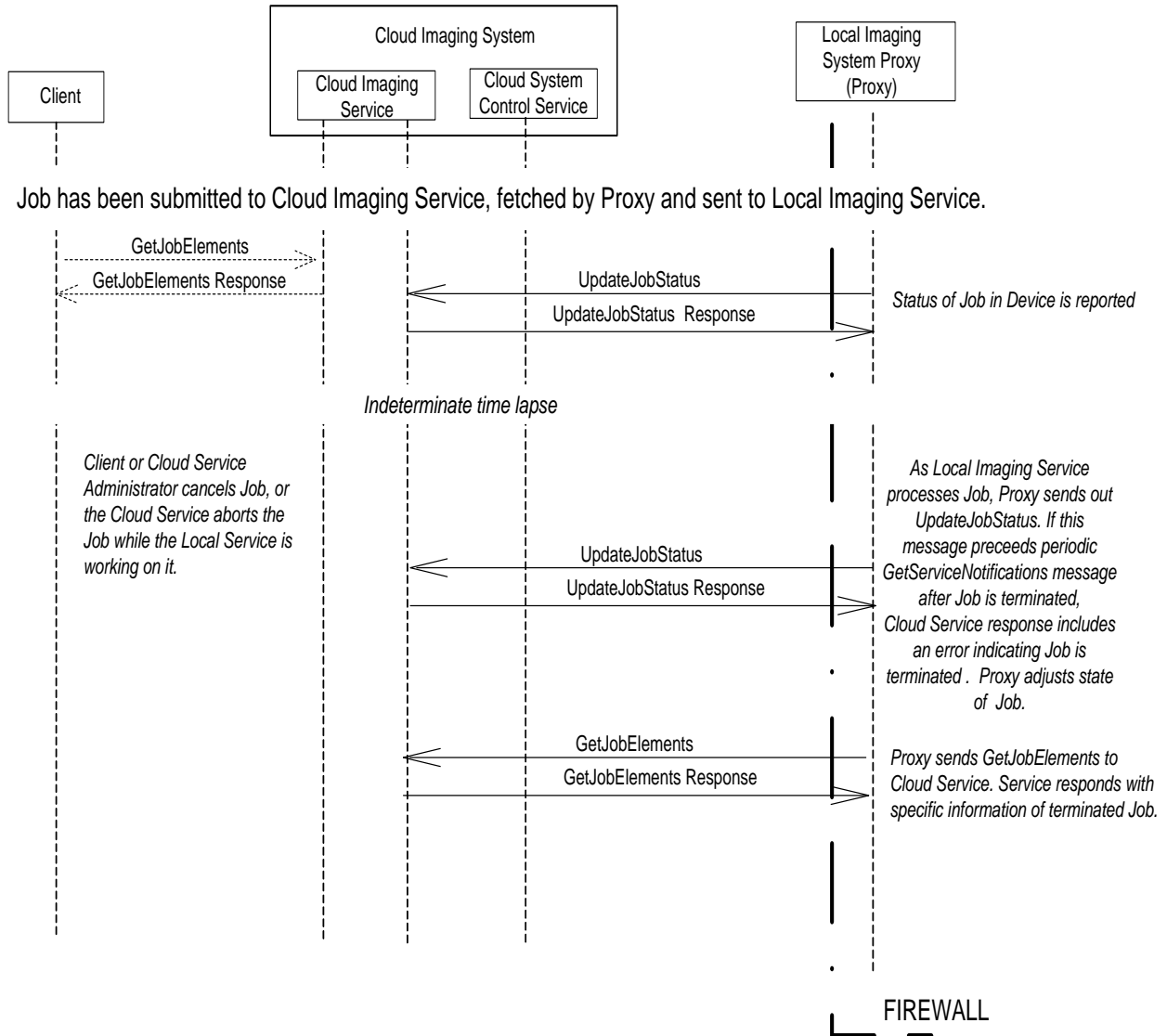


Figure 10 - Device Exception with Resulting Job Cancel

2015

2016

2017 A message sequence when a Proxy Job message is sent before the Proxy receives or
 2018 implements JobTerminated information in a GetServiceNotifications response is shown in
 2019 Figure 11. The Cloud Service response to the message includes an error indication that
 2020 the identified Job is in a terminated state. The Proxy needs to adjust its state for the Job
 2021 and will send a GetJobElements message to determine the details of the Job status.



2022 See Notes with Figure 5.

2023 **Figure 11 - Sequence after Upstream Abort or Cancel when UpdateJobStatus precedes**
 2024 **GetServiceNotifications.**

2025

2026 5. Conformance Requirements

2027 This specification defines a general model for the interaction of Clients, Cloud-based
2028 Imaging Systems and non-cloud but networked Imaging Systems to provide Users with
2029 Imaging Services using the accessibility and capability advantages of Cloud Services. This
2030 specification does not specify a particular implementation or binding, and it is expected
2031 that any binding of this model can depart in some specifics from the nomenclature and
2032 form used in this model description.

2033 The conformance requirements for bindings of this model are:

- 2034 1. Adherence to the general form of the Model including the two-part interface
2035 between:
 - 2036 a. Client-to-Cloud Imaging Service, with a typical Client-to-Networked
2037 Imaging Service interface
 - 2038 b. Local Imaging Service Proxy-to-Cloud Imaging Service interface, with
2039 the Proxy interface defined in this specification.
- 2040 2. Adherence to the functions of the Local Imaging System Proxy interface
2041 operations defined in paragraph 4.2.2 of this specification, although the names
2042 and functional specifics of individual operations can vary.
- 2043 2-3. Conformance to the standards referenced in Sections 6 and 7 of this
2044 specification.

2045 6. Internationalization Considerations

2046 For interoperability and basic support for multiple languages, conforming implementations
2047 MUST support:

- 2048 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
2049 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 2050 2. The Unicode Format for Network Interchange [RFC5198] which requires
2051 transmission of well-formed UTF-8 strings and recommends transmission of
2052 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

2053 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
2054 characters and combining marks) followed by Canonical Composition (into canonical
2055 composed characters wherever Unicode has assigned them).

2056 Implementations of this specification SHOULD conform to the following standards on
2057 processing of human-readable Unicode text strings, see:

2058 Unicode Bidirectional Algorithm [UAX9] – left - to - right, right - to - left, and vertical

2059 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

2060 Unicode Normalization Forms [UAX15] – especially NFC f or [RFC 5198]

2061 [Unicode Text Segmentation \[UAX29\] – grapheme clusters, words, sentences](#)

2062 [Unicode Identifier and Pattern Syntax \[UAX31\] – identifier use and normalization](#)

2063 [Unicode Collation Algorithm \[UTS10\] – sorting](#)

2064 [Unicode Locale Data Markup Language \[UTS 35\] – locale databases](#)

2065 [Implementations of this specification are advised to also consider the following](#)
2066 [informational documents on processing of human-readable Unicode text strings:](#)

2067 [Unicode Character Encoding Model \[UTR17\] – multi - layer character model](#)

2068 [Unicode in XML and other Markup Languages \[UTR20\] – XML usage](#)

2069 [Unicode Character Property Model \[UTR23\] – character properties](#)

2070 [Unicode Conformance Model \[UTR33\] – Unicode conformance basis](#)

2071 **7. Security Considerations**

2072 The interfaces defined in this specification require the same security considerations as
2073 defined in MFD Model and Common Semantics [PWG5108.01] In addition, as appropriate,
2074 Clients, Cloud Imaging Services and Local Cloud System Proxies MUST:

- 2075 1. Utilize Transport protocol capabilities to protect against DNS rebinding attacks;
2076 2. Provide confidentiality of data in transit;
2077 3. Provide confidentiality of Document and Job data at rest; and
2078 4. Authenticate Clients, Cloud Imaging Services and Proxies.

2079 **8. IANA and PWG Considerations**

2080 There are no requirements for IANA registration for this specification. However, the Proxy
2081 component and any new Operations and Elements defined in this specification will be
2082 reflected in the PWG Semantic Model. Table 8 in Section 12 of this specification (Semantic
2083 Model Elements Referenced in Cloud Model) specifically identifies the new Elements
2084 defined in this specification.

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2197

2198 **11.10. Editor's Addresses**

2199 This specification is a product of the PWG Cloud Imaging Requirements and Model
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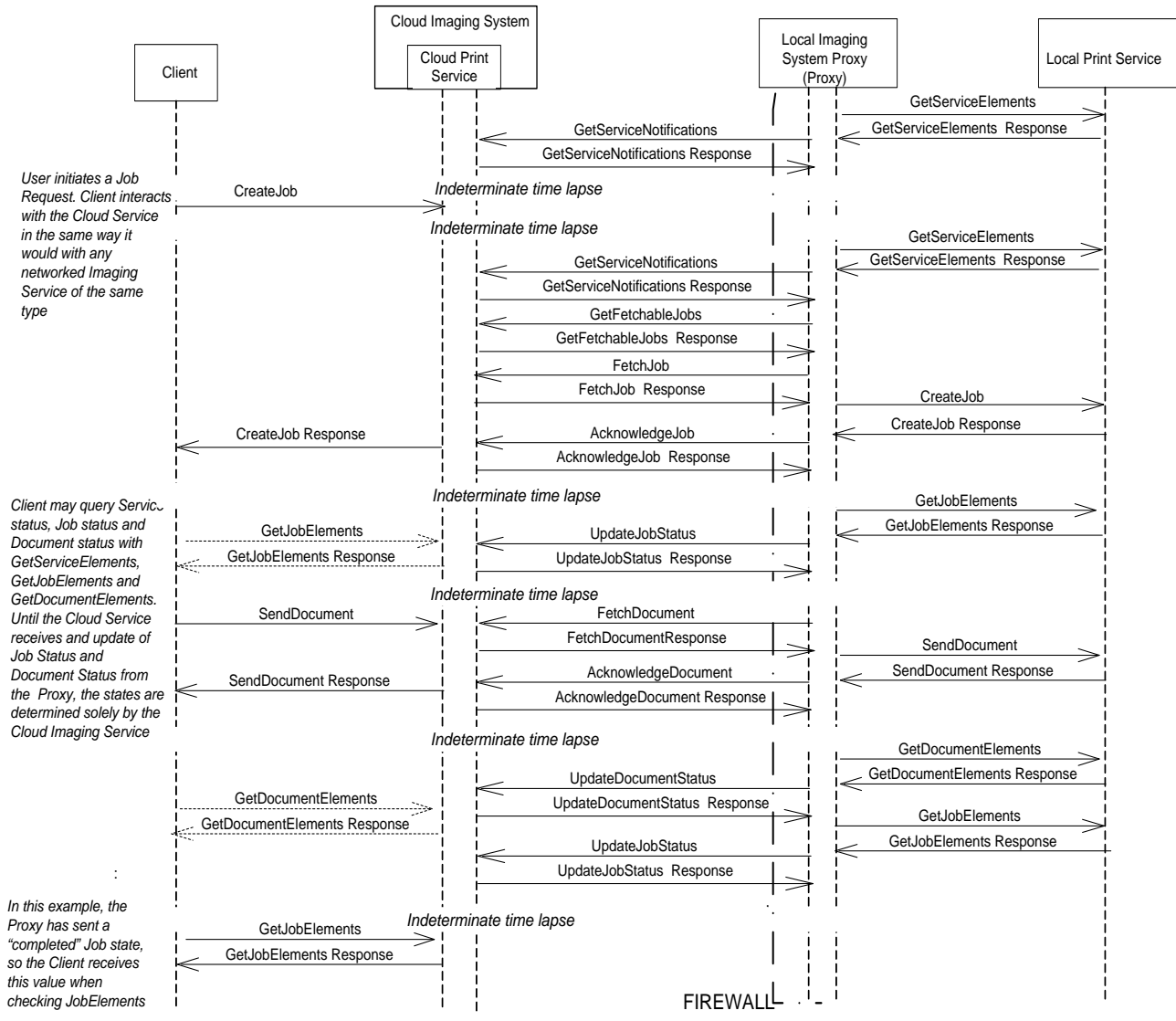
2221 Michael Sweet, Apple
2222 Ira McDonald, High North
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2224 Glen Petrie

2225

2226 **12.11. Appendix A - Proxy to Local Print Service Interface**
2227 **Example (Informative)**

2228 This specification is concerned with the communication between a Cloud Imaging System
2229 and the Services of a Local Imaging System where the Cloud Imaging System cannot
2230 initiate communication with the Local Services because of a firewall or other security
2231 restriction. The solution requires the use of a Local Imaging System Proxy, essentially a
2232 Client that communicates Local Imaging System, Service, and Job information to the
2233 Cloud Imaging System and Services; and communicates Cloud Imaging System, Service,
2234 and Job information to the Local Imaging System and Services. A set of Proxy Operation
2235 requests and Cloud responses are defined, but recognizing that the Proxy may take many
2236 forms, the interface between the Proxy and the Local Systems and Services is not defined.
2237 The Proxy may be an integral part of the device housing the Local System; an intelligent
2238 independent application interfacing with many Local Imaging Systems and capable of
2239 preprocessing, data storage, and remote file access; or anything in between these two
2240 extremes.

2241 However, the Proxy operations have generally been structured to mirror standard Client to
2242 Imaging Service operations and to use the same Semantic Model Elements so that the
2243 Proxy use standard Client to Service operations as defined in the PWG Semantic Model.
2244 The Proxy-Cloud interactions in a simple Print Job submitted to a Cloud Print Service are
2245 represented in Figure 12, along with possible corresponding Proxy to Local Print Service
2246 interactions.



2247

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Figure 12 - Example of Client-Cloud Print Service-Proxy-Local Print Service Interaction for Simple Print Job Submitted to the Cloud Print Service

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2251 **13.12. Appendix B- Reference of Elements (Informative)**

2252 The Operations referenced in this specification refer to ~~element~~ **Elements** on the PWG V2
 2253 Semantic Model, with a few new ~~element~~ **Elements** added. It is anticipated that these new
 2254 ~~element~~ **Elements** will be included in PWG V3 Semantic Model. Table 8 lists the ~~element~~
 2255 **Elements** referenced directly or indirectly in the Cloud Imaging Model operations, along
 2256 with simple definitions as are given in the PWG MFD Model and Common Semantics
 2257 [PWG5108.01] and System Object and System Control Service Semantics [PWG5108.06].
 2258 Newly added ~~element~~ **Elements** are identified by being in bold font.

2259 **Table 8 - Semantic Model Elements Referenced in Cloud Model**

5.	Element Name	Data Type	Description	Reference
	ActiveJobs	complex	A Service instance-specific queue containing all the Jobs that are waiting to be processed or are currently processing	[PWG5801] table 1
	CharsetConfigured	keyword	The character set to which a Service or System is configured. CharsetWKV	[RFC2911] Para 4.3.19
	Compression	keyword	compression algorithm used on the Document Data, if any. <i>CompressionWKV</i>	[RFC2911] para 4.4.32
	CompressionAccepted	list of keywords	set of supported compression algorithms for Document content, ordered higher preference first	[RFC2911] Para 4.4.32
	CompressionSupplied	keyword	compression algorithm used for the Documents Data CompressionWKV KeywordNsExtensionPattern	PWG5100.7 para 5.2.1
	ConfiguredServices	list of ServiceSummary	The list of Services that have been administratively configured to run on this system instance. (Contains ServiceSummary)	[PWG5108.06], table 3
	Copies	int	number of copies to be printed	[RFC2911] para 4.2.5
	DefaultJobTicket	complex	DocumentProcessing JobDescription JobProcessing	[PWG5801]
	DestinationAccesses	complex	authentication information for a referenced Document	4.2.2.5
	DestinationUri	uri	URL used to transfer a Digital Document to its Destination.	PWG5801] Para 5.2.3.1
	DetailedStatusMessages	list of strings	additional detailed and technical information about the Job. Element	[RFC2911] para 4.3.10
	DeviceID	string	IEEE 1284 Device ID	[PWG 5105.1] Para 11.1
	Document	complex	Composed of DocumentReceipt, DocumentStatus and DocumentTicket	[PWG5801] Para 6
	DocumentData	complex	Digital data to be printed or derived from scanned image	[PWG5801]
	DocumentDataGetInterval	int	number of seconds that the scan Client should wait before trying the "GetNextDocumentData" operation again. .Derived from document-data-get-interval in [PWG5100.17] para 8.1.4	4.2.1.3
	DocumentDataWait	boolean	TRUE value indicates that Scan Client wants to wait for additional DocumentData. .Derived from document-data-get-interval in [PWG5100.17] para 8.1.5	4.2.1.3
	DocumentDescription	complex	DocumentDigitalSignature DocumentMessage DocumentName	[PWG5801]

5.	Element Name	Data Type	Description	Reference
			DocumentNaturalLanguage LastDocument CompressionSupplied DocumentCharsetSupplied DocumentDigitalSignatureSupplied DocumentFormatDetailsSupplied DocumentFormatSupplied DocumentFormatVersionSupplied DocumentMessageSupplied DocumentNameSupplied	
	DocumentElements	complex	DocumentNumber ElementsNaturalLanguageRequested JobId RequestedElements RequestingUserName RequestingUserUri	[PWG5801]
	DocumentFormat	list of keywords	Digital Document formats supported by the Service. values are MIME types. DocumentFormatWKV	[PWG5801]
	DocumentFormatAccepted*	list of keywords	Digital Document formats supported by the Service. values are MIME types, in priority order DocumentFormatWKV	[RFC2911] Para 3.2.1.1, 4.4.21 [PWG5100.5] Para 9.1.12
	DocumentMessage	string	message from either 1) the User to the Operator about the Document or 2) from the Operator system Administrator or "intelligent" process to indicate to the End User the reasons for modification or other management action taken on the Document.	[PWG5100.5] para 9.1.20
	DocumentName	string	name for this Document to be used in an implementation specific manner.	[RFC2911] para 3.2.1.1
	DocumentNumber	int	uniquely identifies a Document within a Job.	[PWG5100.4] [PWG5100.5]
	DocumentPassword	string	the unencrypted passphrase to be used to access the document content	[PWG5100.13] para 5.1.2
	DocumentReceipt	complex	Values of element Elements in DocumentTicket used by the Service for processing the Document	PWG5801] Para 6.3
	Documents	complex	List of Documents	PWG5801] Para 6
	DocumentState	keyword	current state of Document. DocumentStateWKV	[PWG5100.5] para 9.1.25
	DocumentStateReasons	list of keywords	additional detail about the Document state. The specific keywords allowed are defined within the specification for the Service. <i>DocumentStateReasonsWKV</i> , <i>KeywordNsExtensionPattern</i>	[PWG5100.5] para 9.1.27 and {RFC2911] para 4.3.8
	DocumentStatus	complex	See [PWG5108.01] tables 70, 71.	[PWG5108.01] para 6.1
	DocumentSummaries	complex	DocumentNumber DocumentState DocumentStateReasons ImpressionsCompleted ImagesCompleted	[PWG5801]
	DocumentTicket	complex	DocumentDescription DocumentProcessing	[PWG5801]
	DocumentUri	anyUri	An urn::uuid unique URI value identifying the Document	[RFC4122]
	DocumentUuid	anyUri	An urn::uuid unique URI value	[RFC4122]
	ElementsNaturalLanguage	list of keywords	supported natural languages for the Elements with a string syntax (See [RFC3066] NaturalLanguageWKV	[PWG5801]

5.	Element Name	Data Type	Description	Reference
	ElementsNaturalLanguageRequested	keyword	natural languages for the Elements with a string syntax (See [RFC3066] NaturalLanguageWKV	[PWG5801]
	FetchStatusCode	int	Operation Element: indicates status of identified Job or Document fetch	4.2.2.2
	FirstIndex	int	specifies the first object or element Element, starting at 1, to be returned in a response	PwgSmRev1-185 PWG 5100.13 para 5.1.3
	Id	complex	Identification of Service	PwgSmRev1-185
	IdentifyActions	int	Operation Element: indicates type of identify action desired	4.2.1.2
	IdentifyDeviceState	int	Operation Element: Indicates state of previous IdentifyDevice request	4.2.2.10.1
	ImagesCompleted	int	Progress measure in terms of output images. May be for Job or as subunit counter	[PWG5106.1] para. 5.2.1
	ImpressionsCompleted	int	Progress measure in terms of output impressions May be for Job or as subunit counter	[RFC2911] para. 4.3.18.2
	InputElements	complex	specifies the scanning source and other element Elements for hardcopy documents in an AddDocumentImages operation (from input-attributes)	[PWG5100-15]
	IsAcceptingJobs	boolean	If True, Service is currently able to accept CreateJob operation. Method of configuring the value for this Element is implementation-specific e.g. local console web page.	[PWG5801]
	Job	complex	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.	[PWG5801] para 5
	JobDescription	complex	See [PWG5108.01] tables 47, 48, 49 entries are single-valued	[PWG5108.01] para 4.3.3
	JobElements	complex	JobReceipt JobStatusJobTicket	[PWG5801] para 5
	JobFetchable	boolean	Operation Element: If TRUE, Cloud Imaging Service has one or more fetchable Jobs	4.2.2.10
	JobHistory	complex	A Service instance specific queue containing all the Jobs that have reached a terminating state. The terminating states are defined as Completed, Aborted and Canceled.	[PWG5801] para 4.1
	JobHoldUntil	keyword	duration of time that a Job is put on hold. HoldUntilWKV	[RFC2911] para 4.2.2
	JobHoldUntilTime	dateTime	absolute date and time a Jos Element allows you to hold a remotely submitted Job until a specific time for processing.	[PWG5100.11] para 5.4
	JobId	int	JobId of the Job to which this Document belongs.	[PWG5100.5] para 9.1.18
	JobIds	Listof JobId	List of JobIds	[PWG5100.5] para 9.1.18
	JobName	string	Service sets this to the Client-supplied end-User friendly name for the Job. When it is not supplied by the Client the Service generates a name from other information.	[RFC2911] para 4.3.5
	JobOriginatingUserName	string	Service sets this to the most authenticated printable name that it can obtain (example: "John Doe" \authDomain\John Doe")	[RFC2911] para. 4.3.6
	JobOriginatingUserUri	anyUri	URI of the User originating the Job	[PWG5801]
	JobPassword	octetString	password supplied by the Client encrypted according to method specified by the Client in the JobPasswordEncryption Element.	[PWG5100.11] para 6.1

5.	Element Name	Data Type	Description	Reference
	JobPasswordEncryption	keyword	encryption the Client is using for the supplied value of the JobPassword Element. JobPasswordEncryptionWKV KeywordNsExtensionPattern	PWG5100.11] para 6.2
	JobReceipt	complex	Contains the element Elements DocumentProcessing JobDescription JobProcessing with element Elements ' values used by Service	[PWG5801]
	JobState	keyword	current state of Job. The state values cannot be extended by an implementation. From RFC2911 JobStateWKV	[RFC2911], para. 4.3.7
	JobStateMessages	string	information about the Job State and StateReasons in human readable text. If the Service supports this Element it is able to generate the messages in any of the natural languages supported by the Service.	[RFC2911], para. 4.3.6
	JobStateReasons	list of keywords	additional detail about the Job state. The typical keyword values are listed below. Values specific to a service are identified in the specification for that service. JobStateReason	para. 4.3.8 of [RFC2911] and para. 4.5.1.3 of [WS-Scan].
	JobStatus	complex	See [PWG5801] tables 58, 59, 60	[PWG5801] para 5.1
	JobSummaries	complex	:list of JobSummary element Elements	[PWG5801]
	JobSummary	complex	Set of complex element Elements JobId JobName JobOriginatingUserName JobState JobStateReasons	[PWG5801]
	JobTable	complex	Composed of ActiveJobs and JobHistory element Elements	PWG5801] para 4.1
	JobTerminated	complex	Table of JobUUID, JobState for terminated Jobs	new
	JobTicket	complex	DocumentProcessing JobDescription JobProcessing	[PWG5801]
	JobUuid	anyUri	An urn:uuid unique URI value [RFC4122]	[RFC4122]
	KOctets	int	total size of this Job's Digital Document(s) in integral units of 1024 octets.	[RFC2911] para 4.3.17.1
	LastDocument	Boolean	last Document in the Job. (Element set to FALSE or omitted for Document which is not the last)	[RFC2911] para 3.3.1
	Limit	int	Argument in operation request setting a limit to the maximum number of instances to be provided in the response.	RFC2911
	LocalServiceUuid	anyUri	The ServiceUuid of a Local Service when communicated by a Local Imaging System Proxy to a Cloud Service.	
	LocalServiceUuid	anyUri	ServiceUuid of proxied Local service	table 3
	MakeAndModel	string	Device manufacturer and model	[RFC2911] Para 4.4.9
	Message	text	User readable message provided in operation request or response	
	NaturalLanguageConfigured	keyword	NaturalLanguageWKV	[RFC2911] Para 4.4.19
	OperationMode	keyword	Values are "add, modify, delete" indicating the nature of a Set operation : OperationModeWKV	[PWG5108.06]
	OperationStatusCode	int	Code in response to an operation request indicating state of operation	table 2
	OwnerUri	anyUri	URI, that is an authoritative identifier (e.g. a 'mailto:' URI) of the authenticated Owner of this Service instance.	[RFC3986]
	PredecessorJobId	int	JobId of Job of immediately higher priority than Job	[PWG5801] Table

5.	Element Name	Data Type	Description	Reference
			identified	79
	PreferredElements	complex	List of element Elements and values returned by Service as preferred in response to any Validate request	PwgSmRev1-185
	RegistrationSuspended	boolean	Operation element Element : flag indication that proxied system is to be re-registered	4.2.2.10
	RequestedElements	List of element Element names	Operation element Element - Names of element Elements requested in a GET operation. What can be requested depends upon the operation	[PWG5801]
	RequestingUserName	string	Operation element Element - name of User derived from requesting-user-name in [RFC2911]	[PWG5801] [RFC2911]
	RequestingUserUri	anyUri	An urn::uuid unique URI value identifying the requesting User	[PWG5801]
	ResourceDirectoryUri:	anyUri	Address of the directory provided by the Cloud System Control Service for Local Imaging System Proxy storage of Resource material	4.1.1.1
	ResourceKOctetsFree	int	Number of KOctets available in Resource directory for identified Local Imaging Service	4.1.1.1
	ResourceKOctetsRequested	int	Number of KOctets requested in Resource directory by Local Imaging System Proxy for identified Local Imaging System	4.1.1.1
	ResourceKOctetsSupported	int	Total Number of KOctets provided in Resource directory for identified Local Imaging System.	4.1.1.1
	ServiceCapabilities	complex	DocumentTicketCapabilities, JobTicketCapabilities	[PWG5801]
	ServiceCapabilitiesReady	complex	DocumentTicketCapabilities, JobTicketCapabilities	[PWG5801]
	ServiceDescription	complex	See [PWG5801] table 52, 53	[PWG5801] para 4.6
	ServiceElements	complex	ServiceCapabilities; ServiceConfiguration; ServiceDescription; ServiceStatus DefaultJobTicket	[PWG5801]
	ServiceGeoLocation	anyURI	Geographic location code of service	[RFC5870]
	ServiceLocation	string	User friendly indication of Service location (e.g., travel office)	[RFC2911] Para 4.4.5
	ServiceName	string	User friendly identification of Service (e.g., Accounting Copier)	[RFC2911] Para 4.4.4
	Services	complex	Referring to the Services in an Imaging System, including Copy, FaxOut, Scan, Resource, SystemControl	[PWG5108.01]
	ServiceState	keyword	current state of service. The state is a unification of the service states from IPP and the Host Resource MIB (ObjectStateWKV)	[RFC2911] and [RFC2790].
	ServiceStatus	complex	See [PWG5108.01] table 55 and 56.	[PWG5108.01] 4.7
	ServiceType	keyword	Type of service in Imaging System (e.g. Scan, Print, Copy)	PWG5108.06]
	ServiceUuid	anyUri	An urn::uuid unique URI value identifying a Service. For Cloud model Proxy-originated operation, ServiceUuid normally refers to a Cloud Service while LocalServiceUuid refers to a Local Service.	[RFC4122]
	ServiceXriSupported	complex	XriUri, XriAuthentication XriSecurity	[PWG5108.01]
	StartServicePaused	boolean	Operation element Element :	[PWG5108.06]
	State	keyword	Current state of subject (System Service Job or Document) Appropriate keywords depend on subject	[PWG5801]
	StateMessages	List of strings	information about the State and StateReasons in human readable text. If the Service supports this Element it is able to generate the messages in any of the natural languages supported by the Service.	[PWG5801]

5.	Element Name	Data Type	Description	Reference
	StateReasons	List of keywords	additional detail about the state. The keywords are extensible. The standard keyword values are defined in paragraph 4.4.12 of [RFC2911] and paragraph 4.4.3.1 of [WS-Scan]. (StateReasonsWKVs)	[PWG5801]
	SystemConfiguration	complex	Consoles Covers FaxModems Finishers InputChannels InputTrays Interfaces Interpreters Markers MediaPaths Output Channels OutputTrays Processors ScanMediaPaths Scanners Storages Vendor Subunits	[PWG5801]
	SystemDescription	complex	CharsetConfigured CharsetSupported DeviceId MakeAndModel MessageFromOperator NaturalLanguageConfigured NaturalLanguageSupported OwnerUri OwnerVCard PowerCalendar PowerEvent PowerTimeout SystemGeoLocation SystemInfo SystemLocation ServicesSupported SystemName	[PWG5801]
	SystemElements	complex	Services SystemConfiguration SystemDescription SystemStatus	[PWG5801]
	SystemGeoLocation	anyURI	Geographic location code of system	[RFC5870]
	SystemLocation	string	User friendly indication of system location (e.g., travel office)	[RFC2911] Para 4.4.5
	SystemName	string	User friendly identification of system (e.g., Accounting MFD)	[RFC2911] Para 4.4.4
	SystemStatus	complex	<u>AccessModes</u> <u>ConditionTable</u> <u>ConfiguredResources</u> <u>ConfiguredServices</u> <u>CreateDate</u> <u>CurrentTime</u> <u>MessageDateTime</u> <u>MessageTime</u> <u>NaturalLanguage</u> <u>PowerCounters</u> <u>PowerGeneral</u> <u>PowerLog</u> <u>PowerMeters</u> <u>PowerMonitor</u> <u>PowerSupport</u> <u>PowerTransition</u> <u>SerialNumber</u> <u>SystemUuid</u> <u>State</u> <u>StateMessages</u> <u>StateReasons</u> <u>SystemHealth</u> <u>SystemConfigChangeNumber</u> <u>SystemTotals</u> <u>UpTime</u>	[PWG5801]
	SystemUuid	anyUri	A urn::uuid unique URI value [RFC4122] - This is of the System being identified, Local or Cloud	[RFC4122]
	TimeoutError	boolean	Operation- element <u>Element</u> : if TRUE Cloud Service requests the Proxy to do full update operations for the Local Imaging Service and an UpdateActiveJobs for that Local Service.	4.2.2.10.2

5. Element Name	Data Type	Description	Reference
UnsupportedElements	complex	Operation element Element : List of element Element s in response that were requested in request that are not supported	[PWG5801]

2260 Notes:

2261 1. Elements in bold font did not appear in Semantic Model V2 and are defined in this specification.

2262 2. Throughout this specification, the Element name "Document" has been used in place of the

2263 Semantic Model 2. Element name ImagingDocument. The Elements are the same.

2264

2265

2266 14.13. Change History

2267 [PWG Secretary: This section must be removed when Document is approved]

2268 14.13.1 Update 15~~3~~ April 2015

2269 Last Call corrections retrained as red -line. Added changes to sections 6 and 9 to agree
2270 with corresponding Internationalization Considerations in IPP INFRA specification.

2271 14.213.2 LCRC 23 March 2015

2272 See <ftp://ftp.pwg.org/pub/pwg/cloud/wd/lcrc-cloudimagingmodel10.docx>

2273 14.313.3 Update 22 January 2015

2274 Culmination of workgroup last call, as recorded in January 12, 2015 minutes
2275 (<ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20150112.pdf>). All redlines
2276 are accepted and editor's comments are resolved as indicated in minutes. Date, copyright
2277 dates, table of contents, list of tables and list of Illustrations are updated.

2278 14.413.4 Update 22 December 2014

2279 Text updated to reflect comments in [ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20141215.pdf)
2280 [minutes-20141215.pdf](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20141215.pdf) and editorial corrections in 12/22 message from Geoff Soord.

2281 Following changes made in response to message from Michael Sweet. Line numbers refer
2282 to 8 December draft. (simple style and type corrections are note noted)

2283 Section 1:

2284 - Line 222: The Cloud Imaging System provides access to registered
2285 Imaging Systems, it cannot access them (directly)

2286 - Lines 231-233: Reword last sentence

2287 Section 2.2:

2288 Imaging Service: line 314 should be "appropriately FOR a Cloud
2289 Environment"

- 2290 line 353 change "under the System Control Service" to "managed by the
2291 System Control Service"
- 2292 Section 2.3: Should come before Section 2.2
- 2293 Section 3.2:
- 2294 Line 415. Break up long sentence, maybe "exists. Also, the Local ..."
- 2295 Section 3.2.x: Drop "(success)" from section titles
- 2296 Section 3.2.2:
- 2297 Line 430: The client software checks (not the Job Originator)
- 2298 Section 3.3: Simplify
- 2299 Section 3.4:
- 2300 Line 518: "Cloud Imaging Model workgroup", use [CHARTER] for reference
- 2301 Line 521-523: move last part of sentence to front: "although the ..., the
2302 detailed definition of ..."
- 2303 Line 539-540 (item 8): Isn't this what DocumentAccesses is for?
- 2304 Section 3.5.1:
- 2305 Line 556: "and uses ANY of the same ..."
- 2306 Line 557: "as A corresponding ..."
- 2307 Section 3.5.2:
- 2308 Line 584: Drop "of" ("initiating requests and submissions to ...")
- 2309 Line 602-605: Indent items 4-6 (which probably become 3a, 3b, and 3c)
- 2310 Section 3.5.3:
- 2311 Line 635: Drop "for billing purposes"
- 2312 Section 4.1.1.1:
- 2313 Line 816: "being under the System ..." should be "being the responsibility of
2314 the System ..."
- 2315 Line 843: clarify what "for supported services" refers to

- 2316 Section 4.1.1.2:
- 2317 Lines 871-873: Table added to shown handing of Local Active Jobs when
2318 communication problems with Cloud Service
- 2319 Section 4.2.1.1:
- 2320 Line 1019: Missing space after period.
- 2321 Add "4. The InputElements values are invalid or unsupported."
- 2322 Section 4.2.1.2:
- 2323 Not just physical location, also confirmation
- 2324 Section 4.2.2.1:
- 2325 Line 1220: "FetchStatus code" -> "FetchStatusCode"?
- 2326 Section 4.2.2.3:
- 2327 Line 1253: "re-registration" (not initial registration)
- 2328 Section 4.2.2.4:
- 2329 Line 1275: "DocumentUri" instead of "DocumentData reference"?
- 2330 Section 4.2.2.5:
- 2331 Lines 1317-1321: Element is "DestinationUris"
- 2332 Section 4.2.2.6:
- 2333 Line 1364: (and elsewhere) "operation status code" should be
2334 capitalized/element name
- 2335 Section 4.2.2.8:
- 2336 Line 1390: "Job level Elements" -> "Job Elements"?
- 2337 Section 4.2.4:
- 2338 Lines 1706-1707: Drop "Candidate Standard"
- 2339 Section 4.3.6:
- 2340 Line 1932: "can be aborted" (not capitalized)
- 2341 Line 1945-1948: Clear up meaning

- 2342 Section 6:
- 2343 Update with new boilerplate from IPP Infra spec
- 2344 Section 8:
- 2345 add forward reference to ~~element~~ Element tables in section 12.
- 2346 Section 9.2:
- 2347 Fix NIST reference (no spaces)
- 2348 Global: DestinationUri becomes DestinationUris
- 2349 Global: "TRUE" not "true", "FALSE" not "false" for booleans
- 2350 Global: "~~cloud-based~~Cloud-based" not "cloud based"?
- 2351 Global: "Internet", not "internet"
- 2352 **14.513.5 Update 8 December 2014**
- 2353 Text updated to reflect comments in ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-
2354 minutes-20141201.pdf
- 2355 Elements in tables 2,3,5 and 6 adjusted to agree with SM Schema V1.185 schema
- 2356 Table 7 modified to include referenced ~~element~~ Elements. Unreferenced ~~element~~ Elements
2357 removed.
- 2358 Additional Informative references (from Table 7) added
- 2359 Minor typos fixed.
- 2360 **14.613.6 Update 20 November 2014**
- 2361 Resource support added in paragraphs 2.2, 4.1.1.1, 9.1 and table 3.
- 2362 Reference to IPP Shared Infrastructure Extensions added to section 9.2.
- 2363 Minor typos fixed.
- 2364 **14.713.7 Update 20 October 2014**
- 2365 Text updated to reflect comments in ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-
2366 minutes-20141006.pdf.

2367 Section 11 Appendix A - Proxy to Local Print Service Interface Example (Informative)
2368 added

2369 **14.813.8 Update 3 October 2014**

2370 Text updated to reflect comments in [cloud-f2f-minutes-20140908.pdf](#)

2371 Changes acknowledge other use cases that could be considered Cloud Imaging modes,
2372 but can be satisfied by existing file transfer and network imaging capabilities

2373 miscellaneous corrections/rewordings

2374 **14.913.9 Update 20 September 2014**

2375 Text updated to reflect comments in [cloud-f2f-minutes-20140908.pdf](#)

2376 Table 1 and associated Text added

2377 FaxIn eliminated from Model

2378 **14.1013.10 Update 4 September 2014**

2379 Specification reformatted to approximate [wd-template-20140815.dotx](#)

2380 Text updated to reflect comments in [cloud-f2f-minutes-20140814.pdf](#)

2381 Handling of Destination in Print-by-reference and in Scan changed to indicate
2382 destination/reference is in FetchDocument response, that de-referencing is typically left to
2383 Proxy/Local Service, and how de-referencing errors are resolved.

2384 **14.1113.11 Update 13 August, 2014**

- 2385 1. Minor editorial changes and acceptance of previous editorial changes.
2386 2. In 3.4, added that the specifics for management of the Proxy is out of scope.
2387 3. Referenced IPPINTRA in abstract and in informative references.

2388 **14.1213.12 Update July 30, 2014**

2389 Made changes and corrections in accord with 7 July 2014 Cloud conference call
2390 comments, as identified in meeting minutes at
2391 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20140721.pdf>.

2392 ~~14.13~~13.13 **Update July 18, 2014**

2393 Made changes and corrections in accord with 7 July 2014 Cloud conference call
2394 comments, as identified in meeting minutes at
2395 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20140707.pdf>.

2396 ~~14.14~~13.14 **Update June 20, 2014**

2397 Made changes and corrections in accord with 9 June 2014 Cloud conference call
2398 comments, as identified in meeting minutes at
2399 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20140609.pdf>.

2400 ~~14.15~~13.15 **Update 28 Can 2014**

2401 Made changes and corrections in accord with Can 2014 Face-to-face Cloud meeting, as
2402 identified in meeting minutes at [ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-f2f-minutes-](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-f2f-minutes-20140513.pdf)
2403 [20140513.pdf](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-f2f-minutes-20140513.pdf).

2404 ~~14.16~~13.16 **Update 18 April**

2405 1. Corrections following cloud-concall-minutes-20140407.pdf
2406 2. Added Appendix A
2407 3. adjusted Proxy operation ~~element~~ Elements (table 2) in accord with semantic
2408 model

2409 ~~14.17~~13.17 **Update 3 March and 5 April 2014**

2410 1. Para 3.5.3 Item 8: clarified that log can be kept by the Cloud System or the
2411 Cloud Services
2412 2. Para 4.1.2: Clarified registration sequence and indicated that registration
2413 inherently provides Proxy notification subscriptions with all Cloud Services
2414 corresponding to Local System Services being made Cloud accessible.
2415 3. Para 4.1.2.2: Added discussion on communication loss with information
2416 removed from GetServiceNotification description.
2417 4. Para 4.2 : Added IAA comment
2418 5. Para 4.2.1: Reworked table 1.
2419 6. Para 4.2.2: Reorganized section into alphabetical order, reworked table,
2420 modified contents to reflect March 24 2014 Concall: Added FetchStatusCode,
2421 message to Acknowledge requests; added CompressionAccepted and
2422 DocumentFormatAccepted to Fetch Document request; added Add
2423 GetProxyJobs, GetProxyJobElements operations;
2424 7. Para 4.2.2.3: Clarified DeregisterSystem
2425 8. Para 4.2.2.10: Reworked GetServiceNotifications to include Cloud System
2426 Control Service queries

- 2427 9. Para 4.2.3: Added GetLocalServices, GetLocalServiceElements operations;
 2428 reworked table 4
 2429 10. Para 4.2.4: Added GetLocalSystems and GetLocalSystemElements
 2430 operations; reworked table 5.
 2431 11. Para 4.3: Added GetServiceNotifications query to Cloud System Control
 2432 Service in appropriate transaction diagrams.

2433 ~~14.18~~**13.18 Update 28 February 2014**

- 2434 1. Para 4.1.2: Clean up text.
 2435 2. Table 2: Add requested parameters
 2436 3. Para 4.2.2.2: add when job fetchable
 2437 4. 4.2.2.5: GetJobElements Make the access policy for GetJobElements "CAN
 2438 return an error"?
 2439 5. 4.2.2.12: Clarified that Jobs with Services in the deregistered System are not
 2440 necessarily aborted since the jobs can be rerouted to another proxy/Local
 2441 Imaging System
 2442 6. Global - Remove specific error names, just talk about reasons for failure
 2443 7. Table 3: Change headings
 2444 8. Figure 7: UpdateJobState changed to UpdateJobStatus and
 2445 UpdateDocumentState to UpdateDocumentStatus
 2446 9. Section 5. Conformance: reword and make conformance items a Numbered
 2447 list
 2448 10. Section 9. References: Added
 2449 11. Global: Fixed reference forms

2450 ~~14.19~~**13.19 Update 14 February 2014**

- 2451 1. 4.1.1 How does client discover cloud services? Added paragraphs discovery
 2452 and showed lines on diagram
 2453 2. 4.1.2.1: wording changes
 2454 3. 4.1.2.2: wording changes
 2455 4. 4.1.4: Changes made to text and diagram to shown one proxy talking to
 2456 multiple Cloud Imaging Services of the same or different types.
 2457 5. Figure 4: Show one Proxy talking to multiple Cloud Imaging Services -
 2458 6. 4.2.2, item 5: Clarified use of individual versus consolidated local services by
 2459 proxy
 2460 7. 4.2.2.3: Clarified use of error responses
 2461 8. 4.2.2.9: Clarified Cloud refusal to attach ~~element~~ Elements
 2462 9. 4.2.2.11: Chaged deregister to not affect Cloud configuration to accept Proxy.
 2463 10. 4.2.2.13. Response clarified
 2464 11. 4.2.2.13/4.2.2.14: Modified UpdateActiveJobs response to return list of
 2465 canalled or non-recognized job IDs and their updated states.
 2466 12. 4.2.2.15: Eliminated GetCloudTerminatedJobs. Added GetServiceNotifications:

- 2467 13. Figure 5: Added a second set of GetServiceNotifications requests after the
2468 responses
2469 14. Figure 6: Drop GetCloudTerminatedJobs
2470 15. Figure 9: Drop GetCloudTerminatedJobs; Add GetJobElements operation

2471 ~~14.20~~13.20 **Update 28 January 2014**

- 2472 1. Major revision of ~~element~~ Element and operation names and functions.
2473 2. GetSystemNotifications replaced with GetServiceNotifications to each Cloud
2474 Imaging Service.
2475 3. Sequence Diagrams updated
2476 4. Content added to Sections 5 and 10

2477 ~~14.21~~13.21 **Update 17 January 2014**

2478 Major changes in text including:

- 2479 1. General avoidance of term “device”
2480 2. Elimination of concept of registering services
2481 3. Adding GetTerminatedJobsStates operation
2482 4. Adjusting names of operations

2483 ~~14.22~~13.22 **Update 25 November**

2484 Address comments from 18 Nov conference call, including:

- 2485 1. Remove GetSystemNotification IdentifyDevice duration parameter and add
2486 Cancel action
2487 2. Provide Job Uuid and JobState in Job State Change value in
2488 GetSystemNotifications response rather than flag telling proxy to send an
2489 update Job State message
2490 3. Minor rewording and clarifications.

2491 ~~14.23~~13.23 **Update 15 November 2013**

2492 Address Oct F2F comments per <ftp://ftp.pwg.org/pub/pwg/cloud/white/Cloud-Model-Comments-OCT2013.pdf>
2493

2494 ~~14.1~~13.1 **Update 12 October**

- 2495 1. Address 30 September comments per Resolution of September 30
2496 comments.docx in <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/>
2497 2. Reversed order of Operations and Sequence in Section 4
2498 3. Added more flags to GetSystemNotifications response

- 2499 4. Changed response to UpdateJobState and UpdateDocumentState operations
2500 so that Cloud Service can inform Device of changed state
2501 5. Added more sequence Diagrams in Section 4

2502 **14.213.2 Update 26 August**

- 2503 1. Eliminated Copy Service/Copy Function Use Case
2504 2. Generated Registration discussion in accord with August F2F discussion
2505 3. Added IdentifyDevice, DeviceKeepAlive and RegisterSystemElements
2506 operations and discussion
2507 4. Outlined Sequence Diagram paras in Section 4 following August F2F
2508 discussion. Added sequence diagrams for Registration, Reboot and
2509 Synchronize and Simple Print transactions.
2510 5. Various minor editorial changes

2511 **14.313.3 Update 30 July**

- 2512 1. Put in correct Figure 1
2513 2. Changed figures in Section 4
2514 3. Changed intro to Section 4.
2515 4. Added considerations for Registration (to be replaced with selected approach)
2516 5. Added Breakout configurations in Section 4
2517 6. Added UpdateServiceElements and UpdateSystemElements operations,
2518 Deleted UpdateServiceState

2519 **14.413.4 Update 21 June 2013**

2520 Modifications according to June 17 Conference call, per notes in
2521 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20130617.pdf>

2522 **14.113.1 Update 12 June 2013**

- 2523 1. Major rework eliminating much text in section 3 to remove any reference as to
2524 how Use Cases are addressed.
2525 2. Revised terminology (e.g., Cloud Imaging Device Proxy) as decided at Can
2526 F2F
2527 3. added Operations paragraphs to Section 4.

2528 **14.213.2 Update 8 Can 2013**

2529 Sections 1 through 3 modified to satisfy comments from Cloud Conference Call,
2530 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20130429.pdf>

2531 **14.313.3 Update April 25, 2013**

2532 Sections 1 through 3.2.11 modified to reflect requested changes in previous Cloud Printing
2533 Model document, and Cloud Imaging Service approach.

2534 **14.413.4 Initial Revision: February 6, 2013**