



The Printer Working Group

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Working Draft

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Cloud Imaging Requirements and Model (IMAGINGMODEL)

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]

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This specification is available electronically at:

- <ftp://ftp.pwg.org/pub/pwg/cloud/wd/wd-cloudimagingmodel10-20150416.pdf>
- <ftp://ftp.pwg.org/pub/pwg/cloud/wd/wd-cloudimagingmodel10-20150416.docx>
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80 technically competent, has multiple, independent and interoperable implementations with
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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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 226 **defined.**

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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 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 network
301 access to a shared pool of configurable computing resources (e.g., networks, servers,
302 storage, applications, and services) that can be rapidly provisioned and released with
303 minimal management effort or service provider interaction." The NIST Definition of Cloud
304 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 on requests to modify
322 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.

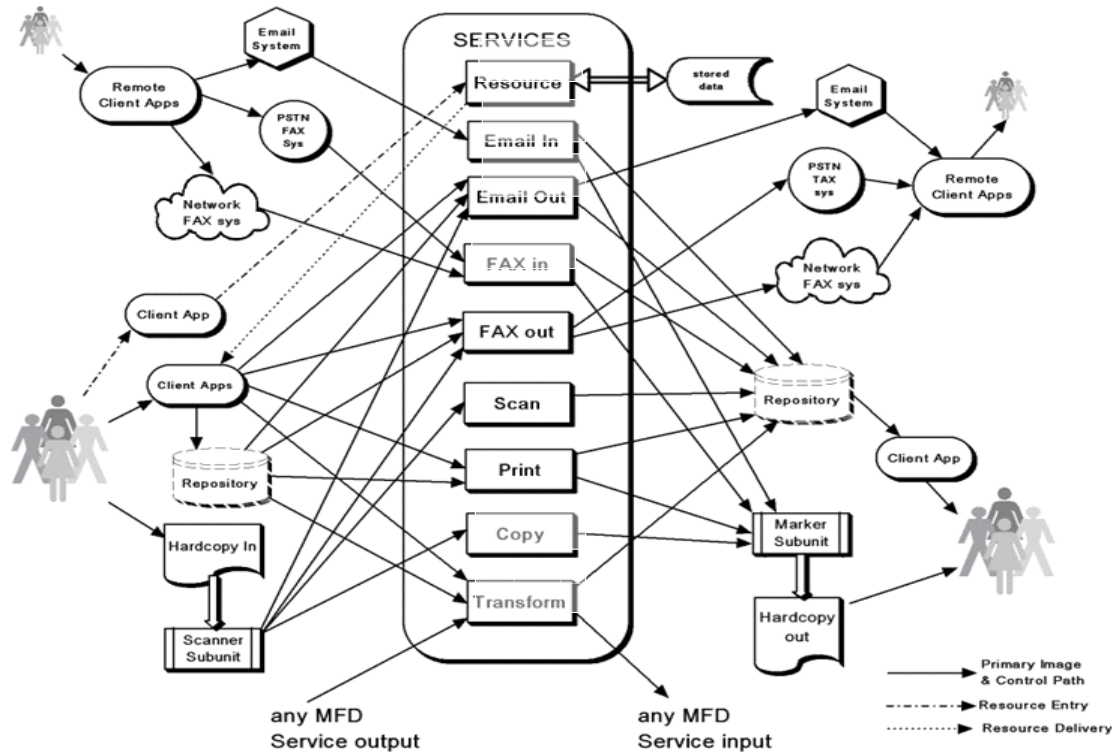
377 **Resource:** Data objects such as Job Tickets pre-configured with User's intent, Logos,
378 Fonts, or Forms that are maintained within an Imaging System to be reused for performing
379 a task or a executing an Imaging Job. There are three categories of Resources:
380 Executable, including Firmware 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, existing
430 standard network Imaging protocols following the MFD Model [PWG5108.01] may be
431 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, the Local Imaging Service need not be part
441 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 those
502 given above. These problems might be jams or out-of-supply issues with the end devices,
503 communication problems somewhere in the path, Administrators taking preemptive
504 actions, or other things that interfere with the execution of a Job. These are called
505 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 Elements and aspects of Cloud Imaging are out of
542 scope for this specification, although they might be referred to in the Model discussion.

543 1. Defining Cloud federation interfaces and associated protocols and
544 technologies.

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

566 **3.5 Design Requirements**

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

572 **3.5.1 Client-to-Cloud Imaging Service - Design Requirements**

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

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

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

595 In addition,

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

598 **3.5.2 Local Imaging Service Proxy-to-Cloud Imaging Service - Design Requirements**

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

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

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

637 In addition,

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

649 **3.5.3 Privacy and Security Policies**

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

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

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

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

684 **4. Cloud Imaging Model**

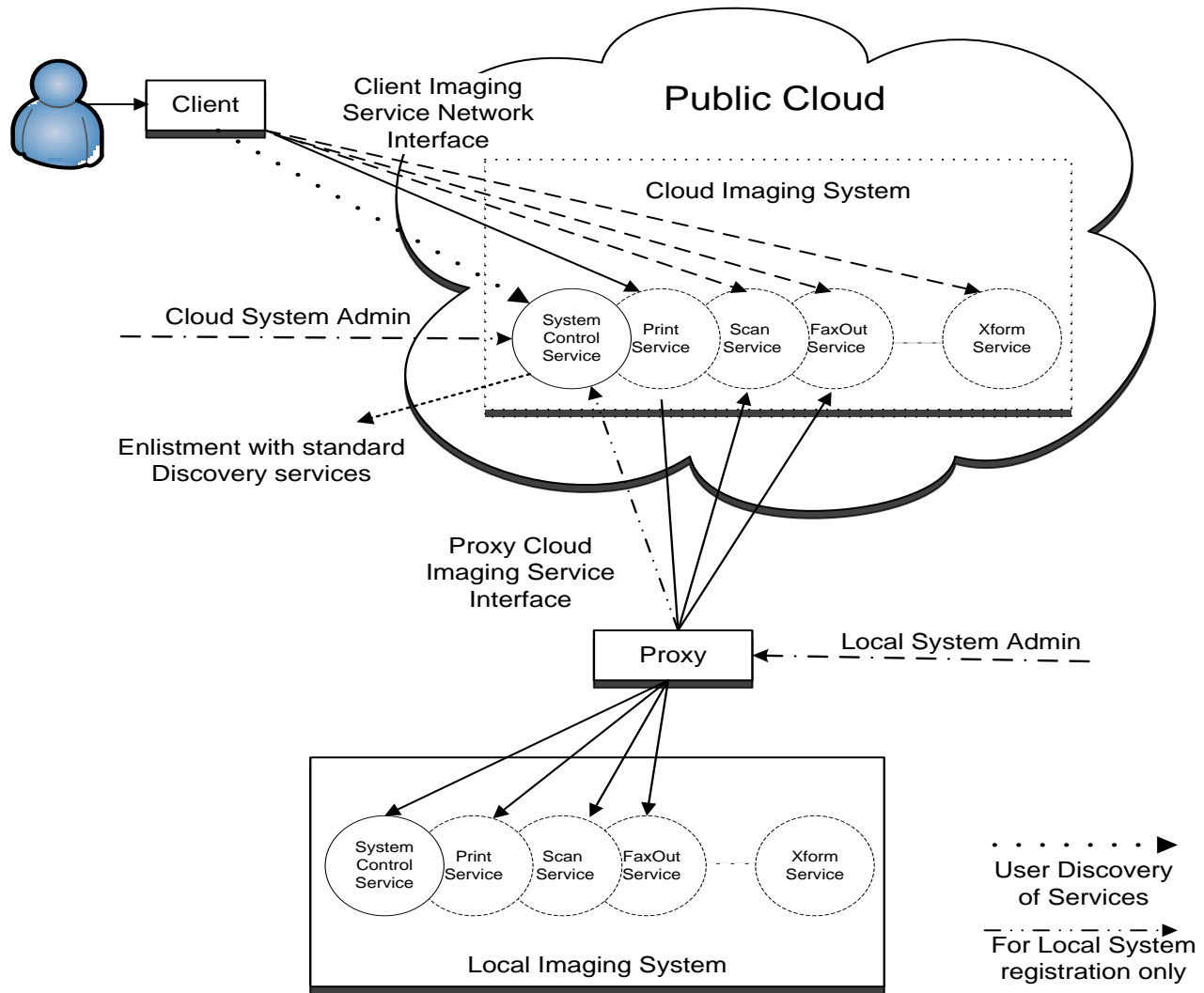
685 **4.1 Cloud Imaging Model Overview**

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

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

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

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



723

724

Figure 2 - PWG Cloud Imaging Model

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

739

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		

740

741 4.1.1 Establishing Relationships

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

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

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

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

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

- 779 • Client-side account credentials point to a specific Cloud System Control Service;
780 Client then uses a ListAllServices operation to get a list of available services.
- 781 • Standard discovery protocols (LDAP, DNS-SD, etc.) are used for providing access
782 to public services (e.g. hotel managed printing services)

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

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

791 **4.1.1.1 Local Imaging System Registration.**

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

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

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

- 855 f. StateReasons
- 856 g. IsAcceptingJobs

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

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

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

868 **4.1.1.2 Loss of Communication**

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

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

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

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

910 **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				

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

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

915

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

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

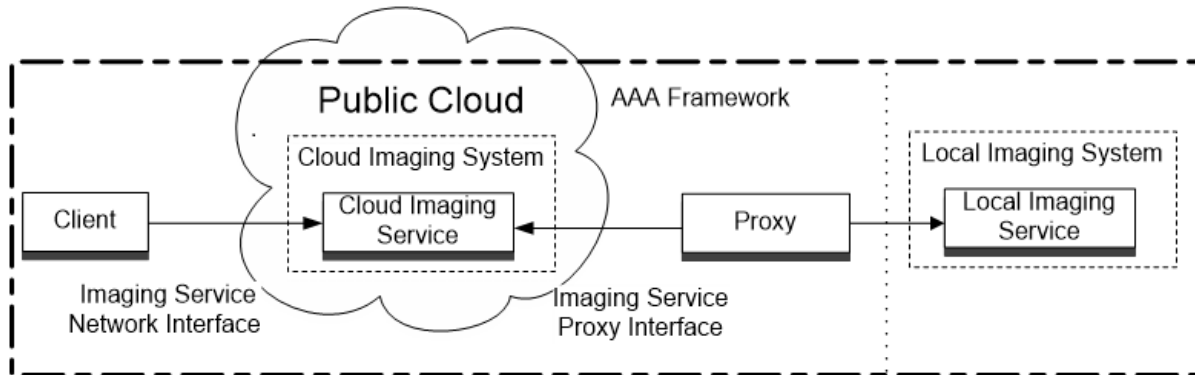
932 **4.1.1.3 Modifying Registration or Deregistering Local Imaging Systems**

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

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

942 **4.1.2 Authentication, Authorization, and Access Control (AAA) Framework**

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

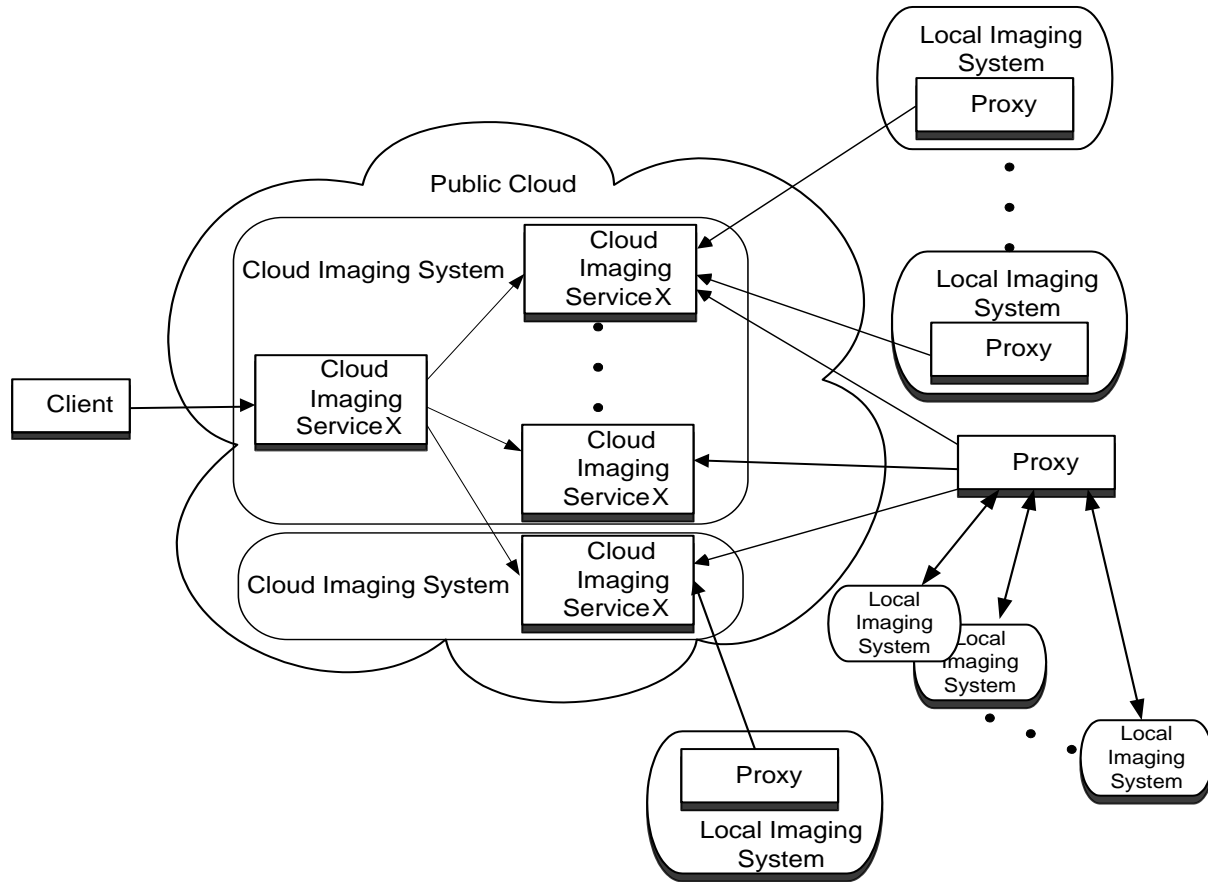


950
951
Figure 3 - AAA Framework

952 **4.1.3 Fanout**

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

- 958
- 959 1. A Cloud Imaging System can contain multiple Imaging Services of the same
 - 960 type (e.g., multiple Print Services).
 - 961 2. A Cloud Imaging Service can interface with one or more 'downstream' Imaging
 - 962 Services of the same type, either within the same Imaging System or in a
 - 963 different Cloud Imaging System.
 - 964 3. A Local Imaging System Proxy can interface with more than one Cloud
 - 965 Imaging Service of the same type (e.g., Print) and with more than one type of
 - 966 Cloud Imaging Service (e.g., Print and Scan).
 - 967 4. A Local Imaging System Proxy can interface with Services in more than one
 - 968 Cloud Imaging System.
 - 969 5. A Local Imaging System Proxy can be embedded within a Local Imaging
 - 970 System equipment set or it can be in separate equipment, including as
 - 971 software in a general purpose computer.
 - 972 6. A Local Imaging System Proxy can interface with the Services in more than
 - 973 one Local Imaging System.



974

975

Figure 4 - Various Fanout Options

976 **4.2 Cloud Imaging Operations**

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

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1. Connections between Client to Cloud Service and Proxy to Cloud Service are subject to security procedures ensuring identification, authentication and authorization of both initiator and respondent to a level appropriate to the value of the service be used and the sensitivity of the information being communicated.
 2. All messages are initiated by the Client to the Cloud Service (for Client-side operations) or by the Proxy (Local Imaging System Proxy Operations) to the Cloud Service.
 3. Unless a message is rejected and a response is precluded by security reasons, every message is to have a response from the addressed Service. In addition to information specific to the operation, a response includes an OperationStatusCode and possibly a text status message indicating the action on the requested operation.

- 992 4. Clients and Proxies do not necessarily need to have a response from a
 993 previous message before sending a subsequent message.
 994 5. Services do not necessarily need to respond to messages in the order
 995 received.

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

1000 4.2.1 Client Side Basic Operations

1001 A basic contention of this Cloud Imaging Model is that Client to Cloud Imaging Service
 1002 communication of imaging operations is no different from established Client to Networked
 1003 Imaging Service operations, as defined in the PWG Semantic Model MFD Model and
 1004 Common Semantics [PWG5108.01]. The common Basic operations are listed in Table 3.
 1005 They are directed from a Client to a specific Imaging Service within a Cloud Imaging
 1006 System and are concerned with creating and controlling Jobs and Documents within Jobs
 1007 in the Cloud Imaging Service. Except for IdentifyDevice and AddDocumentImages, which
 1008 are new, these basic operations are described in detail in MFD Model and Common
 1009 Semantics [PWG5108.01].

1010 Although in most cases, operations affecting Jobs in the Cloud Imaging Service will be
 1011 reflected to corresponding Jobs in the Local Imaging Services by way of the
 1012 communication between the Local Imaging System Proxy and the Cloud Imaging Service,
 1013 these operations from the User/Client do not act on the Local Imaging Services' Jobs
 1014 directly.

1015 The Operations include those by which a Client gets Service Elements to allow the User to
 1016 select Services and formulate Job Tickets. Some of these operations do affect the state of
 1017 a Job. However, none of these operations directly affect the state or configuration of the
 1018 Local Service except to the extent that creating or canceling a Job can initiate a sequence
 1019 that affects the Service.

1020 **Table 3- Client/Cloud Imaging Service Basic Requests and Responses**

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
AddDocumentImages	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	

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
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	
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	

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
SetJobElements	JobUuid; JobId ; JobTicket; OperationMode	UnsupportedElements	
SuspendCurrentJob	JobUuid; JobId;		
ValidateDocumentTicket	DocumentPassword, DocumentTicket	PreferredElements UnsupportedElements	
ValidateJobTicket	JobTicket , DocumentPassword, JobPasswordEncryption, JobPassword	JobId PreferredElements UnsupportedElements	

1021 **Note 1:** Elements in bold font are mandatory for the associated operation. All Client Requests can include the
1022 following Elements.

1023 ElementsNaturalLanguage (if request includes Elements in a Natural Language); Character Set is
1024 defined in binding protocol
1025 ElementsNaturalLanguageRequested (if response is to include Element in a Natural Language)
1026 ServiceUuid (target Cloud Service)
1027 RequestingUserName and/or RequestingUserUri (mandatory)
1028 Message(
1029 RequestingUserName (At a minimum, this Element is used by the Cloud Service to determine
1030 whether the requestor is authorized to make the request. It is anticipated that, in a Cloud
1031 environment, implementations will require further authentication of the requestor's identity using
1032 standard security techniques. If the requestor is not determined to have access, the Service rejects
1033 the request and, unless security procedures dictate no response, informs the Client of the reason
1034 for rejection.)

1035 **Note 2:** Elements in bold font are mandatory for the associated operation. All Cloud Service Responses can
1036 include the following Elements.:

1037 ElementsNaturalLanguage (if response includes an Element in a natural language)
1038 OperationStatusCode (mandatory); indicates that operation has been accepted or not and possibly
1039 error condition (e.g., Request identifies a System, Service, Job or Document that is not
1040 recognized; the Request refers to an inactive Job as though it were active, or there is some error in
1041 the received operation request format.)
1042 Message; Cloud Service response text message identifying any error condition and reason

1043 **Note 3:** Response includes identified but un-cancellable Jobs

1044 **4.2.1.1 AddDocumentImages**

1045 The AddDocumentImages operation allows a Client to prepare a Service to accept a
1046 hardcopy Document via a scanner Subunit and to add it to an identified Job. This operation
1047 replaces and is a more general version of the AddHardcopyDocument operation defined in
1048 MFD Model and Common Semantics [PWG5108.01]. It is analogous to the SendDocument
1049 and SendUri operations which deal with or reference Digital Documents except that
1050 AddDocumentImages refers to hardcopy Documents. This operation therefore is
1051 applicable to Services such as FaxOut for which input Documents are obtained by a scan
1052 of a region of a media sheet side. The AddDocumentImages operation includes
1053 InputElements to specify scanning parameters.

1054 The Service rejects this request and sends an appropriate message if:

- 1055 1. The requestor is not the owner of the identified Job, or is not an Administrator
1056 or Operator;
1057 2. The Service has already closed inputs to the identified Job;
1058 3. The Job is not found; or
1059 4. The InputElements values are invalid or unsupported.

1060 Otherwise, provided the request is properly constructed, complete and references valid
1061 objects, the Service accepts the request, closes the Job if the LastDocument Element is
1062 asserted, and prepares to add Document Data from the identified input to the identified
1063 Job, and sends a response to the request.

1064 **4.2.1.2 GetNextDocumentData**

1065 GetNextDocumentData is a DocumentData flow control operation that can be used when
1066 the Client is pulling DocumentData from the Service. When the Client is informed that a
1067 Job with a DocumentData output is in the 'processing' or 'completed' state, the Client can
1068 send a GetNextDocumentData request. As the DocumentData becomes available, the
1069 Service delivers this data in the response, along with the DocumentNumber, indicating the
1070 Document within the Job to which the data belongs, and the DocumentFormat value,
1071 indicating the file type of the data. If there are multiple Documents in the Job (and
1072 therefore multiple files), the document number changes after the previous document
1073 transmission is complete. The LastDocument Element is returned with a TRUE value when
1074 the transfer of all documents within the Job is complete.

1075 The authenticated Requesting User performing this operation is to be either be the Job
1076 Owner or an Operator or Administrator of the Service. Otherwise, the Service rejects the
1077 operation, possibly returning an appropriate reason.

1078 **4.2.1.2.1 GetNextDocumentData Request**

1079 The following Elements are associated with the GetNextDocumentData Request:

- 1080 1. ElementsNaturalLanguage: (CharacterSet is assumed to be identified in by
1081 the transport binding)
1082 2. ServiceUuid: (identify the Service for this operation)
1083 3. JobId (identify the target for this operation)
1084 4. RequestingUserName and RequestingUserUri Elements
1085 5. DocumentDataWait (A TRUE value indicates that the Client wants to block
1086 waiting for the response. If not included in the request, the Element value is
1087 considered FALSE.

1088 **4.2.1.2.2 GetNextDocumentData Response**

1089 The Service can respond to a GetNextDocumentData Request as follows:

- 1090 1. The Service can reject the request and return the ServerErrorBusy status
1091 code if the Service is too busy to accept this operation at this time. If the

- 1092 Service rejects the request, it returns a DocumentDataGetInterval value to
1093 indicate when the Client can try again.
- 1094 2. If the Client request does not include a TRUE DocumentDataWait value, the
1095 Service immediately returns any available DocumentData of the identified Job
1096 along with a DocumentDataGetInterval value indicating when the Client can
1097 again send a GetNextDocumentData Request to get additional DocumentData
1098 of the identified Job.
 - 1099 3. If the Client request does include a TRUE DocumentDataWait value, and the
1100 Service accepts this mode, the Service immediately returns any available
1101 DocumentData of the identified Job and continues to return Document Data as
1102 it becomes available until all Document Data for the Job has been transferred.
 - 1103 4. If the Client request does include a TRUE DocumentDataWait value, but the
1104 Service does not accept this mode or, if once having accepted it, the Service
1105 decides to terminate the DocumentDataWait mode at any time, the Service
1106 returns a DocumentDataGetInterval value indicating when the Client can
1107 again send a GetNextDocumentData Request. This indicates to the Client that
1108 the Service has left the DocumentDataWait mode and the number of seconds
1109 in the future that the Client can again send the GetNextDocumentData
1110 Request. The Client accepts this response.

1111 The following Elements are part of the GetNextDocumentData Response

- 1112 a. Status Message: This includes a StatusCode and might include a Status Message
1113 or DetailedStatusMessage.
- 1114 b. ElementsNaturalLanguage (CharacterSet is assumed to be identified in by the
1115 transport binding)
- 1116 c. Compression: The value for the compression technique used on the DocumentData
- 1117 d. DocumentFormat: The format of the DocumentData
- 1118 e. DocumentDataGetInterval: The number of seconds before the Client can again
1119 send a GetNextDocumentData Request.
- 1120 f. LastDocument: A TRUE value indicates that the DocumentData being sent is for the
1121 last document in the Job.
- 1122 g. DocumentNumber: The number of the document in the Client requested Job.
- 1123 h. DocumentData: The data, or a portion of the data, of the identified document and
1124 encoded using the identified Compression.

1125 **4.2.1.3 IdentifyDevice**

1126 A User can need to physically locate and/or interact with a piece of equipment that they
1127 are considering using, or that already contains hardcopy intended for them. The
1128 IdentifyDevice operation causes a request to be relayed to the appropriate Service that, if it
1129 supports this operation, will cause the input or output device associated with the service to
1130 generate a visual or audible signal, allowing the User to locate it. The IdentifyDevice
1131 operation is a generalization of the IPP Identify-Printer operation [PWG5100.13] and might
1132 include values for the following Elements. Note that Requesting User and possibly more
1133 involved User authentication and authorization data is required. All other Elements are
1134 optional and will revert to System, Service or Device default values if not supplied:

- 1135 1. Target Device: the SystemUuid, and/or SystemName values specifying the
1136 Target Device that is to provide an Identify signal. Note that this is the identity
1137 of the local input or output device, not the Cloud Service. In some cases, the
1138 Client does not know the identification of the local input or output device of
1139 interest, but wishes to have the physical device receiving or producing
1140 hardcopy for a particular Job identify itself. In such cases, the operation
1141 includes the JobUuid and the Imaging System determined the Target Device.
1142 2. JobUuid: Used to identify the Target Device when the Client wishes the local
1143 input or output device that is handing the indicated Job to identify itself.
1144 3. Requesting User: identity of the requesting User (although the Cloud Service
1145 will probably already have received and authenticated this information.)
1146 4. "message": a message to the User to be displayed by the Target Device.
1147 Supplying this information is optional but, if it is provided, the Cloud Service
1148 response indicates whether this capability is supported by the Target Device.
1149 5. IdentifyActions: request that desired identify signal be a text display on the
1150 Target Device, a flashing light, an audible alert or a spoken message or that
1151 any previously requested IdentifyActions from this Client be canceled.
1152 Supplying this request is optional but, if it is requested, the Cloud Service
1153 response indicates whether the requested capability is supported by the Target
1154 Device.

1155 4.2.2 Local Imaging System Proxy Operations

1156 In the Client to networked Imaging Service model, operations are initiated by the agent
1157 forwarding the Imaging request; i.e., the Client sends requests to a Service and the
1158 Service can send requests to a subordinate Service to which it has network access, such
1159 as one in an MFD. However, in the Cloud Imaging Model, it is likely that a Cloud Imaging
1160 Service is isolated from the Local Imaging Service by a firewall and cannot initiate
1161 requests. Therefore, an alternate set of operations is used by the Local Imaging System
1162 Proxy to get Imaging Job information from and provide Local Imaging Service and Job
1163 status to the Cloud Imaging Service.

1164 Some of these operations are corollaries of the basic Client-Service Imaging operations,
1165 with the operation issued by the Local Imaging System Proxy prompting a response from
1166 the Cloud Service that is the same in content and perhaps form to a Client Operation sent
1167 to a Service. On receiving this response from the Cloud Service, the Local Imaging System
1168 Proxy sends a message to the Cloud Service that corresponds to the response a Service
1169 would send back to the Client. For example, the response to a FetchJob request is
1170 equivalent to a CreateJob request; the subsequent AcknowledgeJob request is equivalent
1171 to the response to a CreateJob request.

1172 The following characteristics of the model are to be observed in understanding these
1173 operation descriptions.

- 1174 1. All Operations are in a request/response form with the request sent by the
1175 Local Imaging System Proxy and the response sent by the Cloud Imaging
1176 Service. The protocol used assures correlation of request to response. The

- 1177 content of requests and responses typically is reversed compared to
 1178 analogous operations in Client to Service Imaging model.
 1179 2. Proxy Operations can be requests for the Cloud System to supply some
 1180 information in its response (e.g., GetFetchableJobs, FetchJob), or they can be
 1181 information that the Proxy is volunteering (e.g., UpdateJobStatus,
 1182 AcknowledgeJob). In either case, the Cloud Service can respond with error or
 1183 other information messages. Errors can refer to structure or contents of
 1184 message (e.g., necessary information not provided)
 1185 3. The Local Imaging System Proxy can interface with multiple Cloud Imaging
 1186 Services.
 1187 4. A Cloud Imaging Service can accept messages from multiple Local Imaging
 1188 System Proxies (but keeps communications with each separate.)
 1189 5. The protocols used by the Local Imaging System Proxy in initiating requests to
 1190 the Cloud Imaging Service provide for the identification and authentication of
 1191 the Local Imaging System Proxy, as well supporting security requirements
 1192 appropriate to the use of the Cloud Imaging facility.
 1193 6. Local Imaging System Proxies can front-end multiple Services in multiple Local
 1194 Imaging Systems. A Local Imaging System Proxy can report capabilities and
 1195 status values for each Service individually; or it can report capabilities and
 1196 status values which are an intersection or a union of capabilities and status of
 1197 the Services it represents. In the former case, the Cloud-accessible
 1198 capabilities of each local imaging Service are reported to the linked Cloud
 1199 Imaging Service and a specific Service is selected by the User. In the latter
 1200 case, the Proxy reports on a composite service of a given type and the linked
 1201 Cloud Imaging Service has no knowledge of capabilities of the individual Local
 1202 Services. In this case, the Local Imaging System Proxy schedules Jobs and
 1203 maps Jobs to Local Imaging Services based on Job requirements versus local
 1204 policy and individual Service capability and state.
 1205

1206 **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

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
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 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
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> , DetailedStatusMessages])		3

Operation	Request Parameters (Note 1)	Response Parameters (Note 2)	Note
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

1207 **Note 1:** Elements in bold font are mandatory for the associated operation. All Cloud Model Proxy Requests
1208 can include the following Elements.

1209 ElementsNaturalLanguage (if request includes Elements in a Natural Language); Character Set
1210 defined in binding protocol
1211 ElementsNaturalLanguageRequested (if response includes an Element in a natural language);
1212 ServiceUuid (target Cloud Service);
1213 LocalServiceUuid (Proxied Local Service) (mandatory);
1214 RequestingUserName and/or; RequestingUserUri (mandatory) (RequestingUser is the Proxy)
1215 The RequestingUserName, can be used by the target Service to determine whether the requestor is
1216 authorized to make the request. Some implementations can require further authentication of the
1217 requestor’s identity. If the requestor is determined to not have access, the Service rejects the
1218 request (unless security procedures dictate no response.)

1219 **Note 2:** Elements in bold font are mandatory for the associated operation. All Cloud Model Proxy Operation
1220 Responses can include the following Elements:

1221 ElementsNaturalLanguage and ElementsCharacterSet(if response includes an Element in a natural
1222 language)
1223 OperationStatusCode (mandatory); indicates that operation has been accepted or not and possibly
1224 error condition (e.g., Request identifies a System, Service, Job or Document that is not
1225 recognized; the Request refers to an inactive Job as though it were active, or there is some error in
1226 the received operation request format.)
1227 Message; Cloud Service response text message identifying any error condition and reason

1228 **Note 3:** Sent to a specific Cloud Imaging Service on behalf of a specific Local Imaging Service

1229 **Note 4:** Sent to the Cloud System Control Service by the Local Imaging System Proxy on behalf of a Local
1230 Imaging System

1231 **Note 5:** In conjunction with System registration, these operations are sent on behalf of all Local Services to be
1232 made accessible via the corresponding Cloud Service to specify the accessible characteristics of the Local
1233 Service. Thereafter, this operation is used to update values of previously identified Elements.

1234 **Note 6:** The FetchDocument response can address the DocumentData in various ways. For example, if
1235 DocumentData is to be sent to the Local Service as for a Print Job, the Document data itself may be supplied
1236 (DocumentData) or a reference to where the DocumentData can be accessed can be returned (DocumentUri).
1237 If the Local Service is to supply the DocumentData for a FaxOut Job, InputElements defining scan parameters
1238 are returned. There is no FetchDocument request for a Scan Job.

1239 **Note 7:** If the Local Service is to supply DocumentData as for a Scan Job, the FetchJob response includes the
1240 scanning parameters (InputElements) and the data destination(s) (DestinationUris) and destination access
1241 information (DestinationAccesses). By the Semantic Model, the Destination complex Element identifies where
1242 the output of the Job is to be delivered and may be either a directory in which the Digital Document is to be
1243 stored or the URI to the Digital Document file.

1244 **Note 8:** Cloud Imaging System returns Resource information only if Resource Directory is supported.

1245 **4.2.2.1 AcknowledgeDocument**

1246 The AcknowledgeDocument operation is sent by the Local Imaging System Proxy after the
1247 Cloud Imaging Service response to the FetchDocument has been received. The operation
1248 informs the Cloud Service of the acceptance (or rejection) of the Document. The
1249 AcknowledgeDocument operation request is analogous to the response to a
1250 SendDocument, SendUri or AddDocumentImages Client Operation. The operation
1251 identifies the Job and Document UUIDs. The FetchStatusCode indicates the success (or
1252 failure) of the Local Imaging Service in accepting the Document.

1253 The Cloud Imaging Service response to this message serves to confirm that the
1254 Acknowledge Imaging Document message was received, as well as to inform the Local
1255 Imaging System Proxy of any error caused by an externally prompted state change (e.g., a
1256 Client Job Cancel) or inconsistency in the message (e.g., reference to a non-existent or
1257 not available Document.)

1258 **4.2.2.2 AcknowledgeJob**

1259 The AcknowledgeJob operation informs the Cloud Service that the Proxy has received the
1260 Job (and presumably has sent it on to the Local Service.) The operation request is
1261 analogous to the response to a CreateJob operation in a Client - Networked Imaging
1262 Service model. The AcknowledgeJob operation provides the JobUuid, a FetchStatusCode
1263 indicating the success (or failure) of the Local Imaging Service in accepting the Job, and
1264 identifies any locally UnsupportedElements. If the Local Service rejects the Job, this is
1265 indicated by the appropriate FetchStatusCode along with an appropriate Message (if
1266 available).

1267 On receipt of the AcknowledgeJob, the Cloud Service removes the Job from the
1268 FetchableJob list for the responding Local Service. Provided that the FetchStatusCode
1269 does not indicate that the Job has been rejected, the Cloud Service also removes the Job
1270 from the FetchableJob list for any other Local Service.

1271 The Cloud Imaging Service response to this message confirms that the AcknowledgeJob
1272 message was received, and informs the Local Imaging System Proxy of any error caused
1273 by an externally prompted Job state change (e.g., a Client Job Cancel) or inconsistency in
1274 the message (e.g., reference to a non-existent or not available Job.)

1275 **4.2.2.3 DeregisterSystem**

1276 If the Owner of a Local Imaging System that has been registered with a Cloud Imaging
1277 System wishes to terminate or suspend the accessibility of all Local Imaging System
1278 Imaging Services, he will instruct the Local Imaging System Proxy for the System to send
1279 a DeregisterSystem request to the appropriate Cloud System Control Service. This
1280 message causes the Cloud Imaging System Control Service to terminate User accessibility
1281 through its Imaging Services with the Local Imaging System and its Imaging Services.
1282 Note that, at this point, the Cloud Imaging Control System will retain the information about
1283 the deregistered Local Imaging System that was provided by the Cloud Imaging System
1284 Owner to allow Local System re-registration, as well as any Job and usage statistics
1285 accumulated relative to Local System Imaging services.

1286 The response to this request will acknowledge receipt. The request can be rejected if there
1287 are errors in form or content, but not for any other reason. Unless the request was
1288 rejected, any transactions in process between the Cloud Service and the Proxy on behalf
1289 of any Services in the deregistered Local Imaging System will be aborted. If the Cloud
1290 Service has any active Jobs with Services in the deregistered Local Imaging System, it
1291 reports the resulting Job State change to the appropriate Client. Such Jobs can be can be
1292 re-routed or aborted by the Cloud Imaging Service, or canceled by the Client. Note that the
1293 DeregisterSystem operation does not directly affect the relationship between the Local
1294 Imaging System Proxy and the Cloud Imaging System Services, and other message
1295 transactions in process can continue to completion.

1296 The Deregister operation is primarily intended to terminate a Cloud-Local relationship,
1297 although administrative operations to both Proxy and Cloud System Control Service can
1298 be necessary to finalize the termination. As long as the Proxy communication with Cloud
1299 System Imaging Services is possible, temporary suspensions, such as for maintenance
1300 actions on a Local Imaging System, can be communicated by sending an Offline status
1301 update for the Local Imaging System

1302 **4.2.2.4 FetchDocument**

1303 After the Local Imaging System Proxy has accepted a Job, it eventually needs specific
1304 information about the Document(s) in that Job. For Service types in which the Document
1305 data is supplied to the Local Imaging Service, the Local Imaging System Proxy
1306 FetchDocument operation obtains the DocumentData or DocumentUri reference along with
1307 operational Elements from the Cloud Service. In addition to Print Service Jobs, this could
1308 include FaxOut Service Jobs where the Document Data is supplied by the Cloud Service
1309 and the facsimile is output by the Local Service. For FaxOut Jobs in which the Local
1310 Service provides Document Data to the Cloud Imaging Service identified destination, the

1311 Local Imaging System Proxy FetchDocument operation obtains InputElements defining the
1312 scan parameters for hardcopy Documents.

1313 The FetchDocument request includes the Job and Document identification corresponding
1314 to the information received in response to the FetchJobs operation. In the case of
1315 FetchDocument operations for Services in which the Document Data is going to the Local
1316 Imaging Service, the Operation can optionally identify the DocumentFormatAccepted and
1317 CompressionAccepted for the destination Local Service. These “accepted” Elements are
1318 complete or subsets of the DocumentFormatSupported and CompressionSupported
1319 Service Description Elements provided in the UpdateServiceElements operation, but are
1320 ordered with respect to Service preference at that time and possibly with respect to the
1321 Document to be fetched. For example, if the AcknowledgeDocument request in response
1322 to a previous FetchDocument operation for the same Document indicated that the
1323 Document had not been accepted, possibly because it was a PDF Document with features
1324 not supported by the Local Service, the Proxy might send a follow up FetchDocument
1325 request with DocumentFormatAccepted listing PWG Raster as the first choice and not
1326 including PDF.

1327 The FetchDocument response corresponds to the request portion of the Client
1328 SendDocument or SendUri operation for Imaging Services in which the Document Data is
1329 consumed by the Local Imaging Service. The FetchDocument. response corresponds to
1330 the request portion of the Client AddDocumentImages operation for Imaging Services in
1331 which the DocumentData is supplied by the Local Imaging Service. If supported, a
1332 DocumentTicket can also be returned.

1333 **4.2.2.5 FetchJob**

1334 Once the Local Imaging System Proxy has received a response to a GetFetchableJobs
1335 request identifying one or more Jobs waiting for a particular Local Imaging Service, it
1336 sends a FetchJob request to the corresponding Cloud Imaging Service. This request
1337 includes the Cloud Imaging Service Job UUID reported in the GetFetchableJobs response
1338 which corresponds to a Job that the Local Imaging System Proxy intends to receive and
1339 direct to the Local Imaging Service.

1340 The FetchJob response is analogous to a CreateJob request. This response includes the
1341 operational attributes of the CreateJob request (e.g., RequestingUserName of the Job
1342 originator, JobPassword) as well as the Job’s ImagingJobTicket information. It does not
1343 include either the Document Data or a reference to Document Data; for Imaging Services
1344 other than Scan, the Local Imaging System Proxy issues a FetchDocument message to
1345 get this data. There is no FetchDocument request for a Scan Job.

1346 The FetchJob response for a Scan Job includes InputElements, defining how the Local
1347 Service is to scan the hardcopy, and the image data DestinationUris and
1348 DestinationAccesses Elements. The Destination Uris Element may be multivalued (if the
1349 scanned image data is to be sent to multiple locations. The DestinationAccesses complex
1350 Element contains authentication information for a referenced Document. Each

1351 DestinationAccesses Element value contains zero or more child Elements which provide
1352 the authentication information required for the Document.

1353 The FetchJob response for a FaxOut Job also includes a Destination Element, which may
1354 be multivalued, but does not include DestinationAccesses (because Fax destinations do
1355 not normally require user authentication) nor InputElements (which are supplied in
1356 response to a FetchDocument request).

1357 The Cloud Imaging Service response includes a status code and optionally a message for
1358 the operation. This would include error information if the identified Job is unknown or is not
1359 available to be fetched by the Proxy for the indicated Local Service. Note that a Proxy is
1360 only allowed to fetch Jobs that have been offered to it in a GetFetchableJobs response
1361 and further that a Cloud Service can make an offered Job non-fetchable for a particular
1362 Local Service at any time before the Job has been fetched. Once a Cloud Imaging Service
1363 receives an AcknowledgeJob request indicating that a Proxy has accepted a Job on behalf
1364 of a Local Imaging Service, the Cloud Service makes that Job non-fetchable to that Local
1365 Imaging Service.

1366 **4.2.2.6 GetFetchableJobs**

1367 GetFetchableJobs is sent by the Local Imaging System Proxy on behalf of each registered
1368 Local Imaging Service to the Cloud Service with which that Local Service is linked, to
1369 request the list of Jobs that are ready to be fetched for processing by that Local Service.

1370 The Model accommodates implementations ranging from Cloud Services that just channel
1371 Jobs to Local Services to those which just use the input/output device capabilities of the
1372 Local Service. Therefore, the criteria that will cause a Cloud Service to report a Job
1373 fetchable by a Proxy for a specific Local Service are out of scope (although, for Jobs
1374 involving Document fetch, it is desirable that the Document Data be available.) However,
1375 unless canceled or aborted, a Job reported fetchable will remain fetchable until the Cloud
1376 Service receives an AcknowledgeJob message for that Job on behalf of a Local Service
1377 for which the Job has been fetched in response to a FetchJob message.

1378 The Local Imaging System Proxy will use the response to the GetFetchableJobs request to
1379 identify the requested Job in its subsequent FetchJob request. The Local Imaging System
1380 Proxy sends a GetFetchableJobs message on behalf of a Local Imaging Service whenever
1381 that service has remaining capacity for new Cloud-supplied Jobs and the
1382 GetServiceNotifications response (or other notification mechanism) has indicated fetchable
1383 Job(s) exist for that Local Service.

1384 The operation can accommodate Job scheduling at either the Cloud Imaging Service or
1385 the Local Imaging System Proxy. When the Cloud Imaging Service is handling Job
1386 scheduling, the Cloud Imaging Service will return a list identifying at most a single Job. The
1387 Job is identified by its JobUuid in the Cloud Imaging Service. If the Local Imaging System
1388 Proxy (or the Imaging Service) does Job scheduling, the Cloud Imaging Service response
1389 is a list of fetchable Jobs. The Proxy can then issue GetJobElements requests for the

1390 identified Jobs to get Job specific information useful for scheduling (e.g., Finishings,
1391 Media, ImagingColorModeType, Sides).

1392 If it does not have any fetchable Jobs for the identified Local Service or if there is an error
1393 in content or form of the request, the Cloud Imaging Service will respond with an empty list
1394 and an appropriate OperationStatusCode.

1395 **4.2.2.7 GetJobDocuments**

1396 For scheduling purposes, a Local Imaging System Proxy or the Local Service it represents
1397 can need to know more about the Documents contained in a particular Job that has been
1398 accepted before it fetches the Document(s). This can be to get information to sequence
1399 the processing of Jobs or the processing of multiple Documents within a Job. The
1400 GetJobDocuments operation is similar to the Client GetDocuments operation, except that
1401 the Proxy can access Document information only for Jobs that have been offered to and
1402 accepted by the identified Local Service. The Cloud Service returns identification of all
1403 Documents in the specified Job along with Elements that are in the corresponding
1404 Document Ticket.

1405 **4.2.2.8 GetJobDocumentElements**

1406 The GetJobDocumentElements operation allows a Local Imaging System Proxy to obtain
1407 detailed information about the specified Document within the specified Job. This operation
1408 is identical in form, content and desired response to the Client GetDocumentElements
1409 operation, except that the Proxy can access Document Element information only for
1410 Documents in Jobs that the Proxy has fetched on behalf of the identified Local Service.

1411 The Proxy requests specific groups of Elements (complex Elements) contained within the
1412 Document. The Document Data is not part of the Document Elements and cannot be
1413 retrieved using this operation. However the location of the Document Data is available.
1414 The allowed values for Requested Elements are DocumentStatus and DocumentTicket.
1415 Vendors can extend the allowed values.

1416 The Cloud Service returns the DocumentDescription Element values that the originating
1417 Client supplied in the Document Creation operation (CreateJob, SendDocument or
1418 SendURI) or provided in SetDocumentElements operation, plus any additional
1419 DocumentDescription Elements that the Service has generated, such as DocumentState.
1420 The Service does not return any JobElements that the Document inherits from the Job
1421 level but does return DocumentElements specified at the Document level. A specific
1422 Document might not include all Elements belonging to a group because some Elements
1423 are optional.

1424 **4.2.2.9 GetJobElements**

1425 The GetJobElements operation allows the Proxy to obtain detailed information on the Job
1426 by its JobUuid. The GetJobElements request does not specify individual Elements. Rather,
1427 the Proxy requests specific groups of Elements contained within the Job. The allowed

1428 values for RequestedElements are JobReceipt, JobStatus, or JobTicket. Vendors can
1429 extend the allowed values.

1430 This operation is identical in form, content and desired response to the Client
1431 GetJobElements operation, except that the Proxy can access JobElements only in Jobs
1432 that the Proxy has fetched on behalf of the identified Local Service. The GetJobElements
1433 operation is used by the Proxy when the Proxy, or some other Local agent, requires
1434 information on Jobs that the Proxy has fetched.

1435 The Cloud Imaging Service responds with an OperationStatusCode which indicates an
1436 error if the Cloud Service does not recognize the identified Job as one that was fetched by
1437 the Proxy and which the Proxy acknowledged receiving.

1438 **4.2.2.10 GetServiceNotifications**

1439 The GetServiceNotifications message is sent periodically from the Local Imaging System
1440 Proxy to each Cloud Imaging Service and to the Cloud System Control Service to maintain
1441 communication, to inform the Cloud Service of the Local Service state, and to allow the
1442 Cloud Imaging Service to notify the Local Imaging System Proxy of some necessary
1443 impending activity for Proxy. (e.g., Proxy to re-register a Local System or to send a
1444 GetFetchableJobs or UpdateActiveJobs). Unlike most of the other Proxy-to-Cloud
1445 operations, GetServiceNotifications does not follow the form or content of a response to an
1446 Imaging Client operation.

1447 It is possible that other mechanisms could be used to check whether there is a Cloud
1448 Service operability or a communications problem. Also, asynchronous notification
1449 initiated by the Cloud Imaging Services could be used to alert the Local Imaging System
1450 Proxy of Cloud Service status. To the extent that these alternate mechanisms are present
1451 and provide the information defined to be in the responses to GetServiceNotifications, they
1452 might reasonably allow significant reduction in the frequency in which
1453 GetServiceNotifications messages are sent without affecting reliability or increasing Job
1454 handling latency.

1455 **4.2.2.10.1 GetServiceNotifications Request**

1456 The GetServiceNotifications request contains:

- 1457 1. The identification (ServiceUuid) and state (ServiceState) of the Local Service,
- 1458 2. IdentifyDeviceState, indicating the state of the Identify Device signal with
1459 respect to a previous IdentifyActions request from that Cloud Service,
1460 specifically whether the latest request:
 - 1461 a. is being signaled (1),
 - 1462 b. was denied (2),
 - 1463 c. was terminated (3), or
 - 1464 d. the Identify signaling is busy with a request from some other source (4).

1465 4.2.2.10.2 GetServiceNotifications Response

1466 The response to this message includes:

- 1467 1. Cloud Service/System Status: UUID and summary status of the Cloud Imaging
1468 Service, or in the case of a Cloud System Control Service response, summary
1469 status of the System including the identification and state of each Cloud
1470 Imaging Service in the System.
- 1471 2. TimeoutError: The Cloud Service has not received a message relating to the
1472 identified Service in a significant time and there may be a synchronization loss.
1473 This response requests the Proxy to do full update operations for the Local
1474 Imaging Service and an UpdateActiveJobs for that Local Service. If this is a
1475 response from the Cloud System Control Service, the updates should be for
1476 the System and for all Local Services and their unterminated Jobs derived
1477 from an Imaging Service in that Cloud System.
- 1478 3. RegistrationSuspended: The Cloud System Control Service has timed out
1479 waiting for a GetServiceNotifications messages from the Local Imaging
1480 System Proxy (or for some other reason) and has suspended all System
1481 registrations handled by that Proxy. Or the Cloud System Control Service,
1482 acting on behalf of the Cloud Imaging System needs to re-characterize Local
1483 Imaging System registration. To resume Cloud support, the Proxy resubmits all
1484 System registrations and Service initializations. The Local Imaging System
1485 Proxy recovers Job synchronization by sending UpdateActiveJobs for all Local
1486 Services after re-registration and Service Update.
- 1487 4. RegistrationTerminated: The Cloud Imaging System has terminated its
1488 relationship with the Local Imaging System and will not accept a re-
1489 registration. (This might be used to discontinue communication with a
1490 problematic Proxy.)
- 1491 5. IdentifyActions: A parameter requesting that the identified Target Device
1492 generate a visual or audible signal, allowing a requesting User to locate it. This
1493 request, if present, specifies the requesting User and the desired type of
1494 signal:
- 1495 a. Do Nothing: (0)
 - 1496 b. Display: Displays the default a Client-provided message; if the message
1497 is provided, it is limited in length and is in a natural language and
1498 character set supported by the Target Device. (1)
 - 1499 c. Flash: Flashes lights or the display. (2)
 - 1500 d. Sound: Makes a sound. (3)
 - 1501 e. Speak: Speaks the default or Client-provided message; if the message is
1502 provided, it is limited in length and is in a natural language and character
1503 set supported by the Target Device. (4)
 - 1504 f. Cancel: end signaling previously requested for this User. (5)
- 1505 The Cloud System Control Service will previously have determined what
1506 identify signaling is supported by the Target Device, and will not request a
1507 signal type of which the Target Device is incapable. The Target Device can
1508 automatically end any requested Device Identify signal, can have this

1509 capability disabled, or can be honoring a request from some other source; the
1510 state of satisfaction of a DeviceIdentifyRequest from a given Cloud Imaging
1511 Control Service is reported in the subsequent GetServiceNotifications
1512 message to that Cloud Imaging Service.

1513 In addition, responses from Cloud Services other than the Cloud System Control Service
1514 can include the following Job-related Elements.

- 1515 6. JobFetchable: An Element indicating that the Cloud Imaging Service has one
1516 or more fetchable Jobs. The Local Imaging System Proxy is to respond with a
1517 GetFetchableJobs message (only in responses for Local Imaging Services).
1518 7. JobTerminated: One or more Elements, each containing a JobUuid and the
1519 state of that Job, indicating that the identified, previously fetched but locally
1520 presumed still active Jobs has been terminated in the Cloud Service (only in
1521 responses for Local Imaging Services).

1522 **4.2.2.11 RegisterSystem**

1523 On Registration, the Local Imaging System Proxy sends a RegisterSystem message for
1524 each Local Imaging System that is to be registered to the corresponding Cloud Imaging
1525 System Control Service. This message identifies the System Elements (PWG Semantic
1526 Model Elements directly under Description and Status) that are to be made known to the
1527 Cloud Imaging System, along with their current values. This set of Elements includes Local
1528 Imaging Services to be made accessible to the Imaging Services of the Cloud Imaging
1529 System and constitutes the proposed Accessible System Element set for the Local
1530 Imaging System. The response from the Cloud Imaging System Control Service
1531 acknowledges receipt of the message and reports any errors.

1532 If there are any Elements in the proposed Accessible System Element set that the Cloud
1533 System Control Service is to ignore, it identifies these in its response as not supported.
1534 That is, the Cloud Imaging System Control Service has the option of ignoring some
1535 reported Local Imaging System Elements. Alternatively, the Cloud Imaging System Control
1536 Service can send an error rejecting the Local Imaging System entirely or the Proxy cannot
1537 accept the reduced Accessible System Element set. In either such case, the Local Imaging
1538 System is not registered with the Cloud Imaging System. In out-of-band consultations, the
1539 Local System Owner can seek to resolve the problem with the Cloud System Owner. The
1540 resolution can be to register the Local Imaging System with a modified proposed
1541 Accessible System Element set.

1542 The proposed Accessible System Element set, possibly with reported not (Cloud)
1543 supported Elements removed, if accepted by the Proxy, constitutes the Registered System
1544 Element Set for the Local Imaging System.

1545 This RegisterSystem message follows the form of the response to a Client-issued
1546 GetSystemElements message, where the Elements included are those which the Local
1547 Imaging System Owner intends to make accessible to the Cloud Imaging System.

1548 If the Registered System Element Set is to be changed (i.e., Elements to be added or
 1549 removed), a new RegisterSystem message is sent with the revised set of Elements and
 1550 their values.

1551 **4.2.2.12 UpdateActiveJobs.**

1552 After a Job “Fetch” has been confirmed by an AcknowledgeJob operation, the Local
 1553 Imaging System Proxy sends UpdateJobStatus messages to communicate Job State
 1554 changes in each Local Imaging Service. However, a service disruption in the Local
 1555 Imaging Service, the Proxy or in communication with the Cloud Imaging Service; or a
 1556 change to the state of a Job prompted by the Client or some other “Upstream” activity can
 1557 result in Cloud and Local Job states to be different. To correct this, the Local Imaging
 1558 System Proxy sends an UpdateActiveJobs message. This message identifies all Active
 1559 Jobs in an identified Local Imaging Service; i.e., Jobs that the Local Imaging System Proxy
 1560 is aware that it has fetched and has acknowledged or has intended to acknowledge, but
 1561 not including Jobs for which the Local Imaging System Proxy has sent and the Cloud
 1562 Imaging Service has acknowledged an UpdateJobStatus message indicating that the Job
 1563 is in a terminating state. Note that UpdateActiveJobs includes Jobs which the Proxy
 1564 considers in a terminated state but for which a response to the UpdateJobStatus indicating
 1565 this terminated state has not been received. The message includes the current states of
 1566 these Jobs. The Cloud Service either resolves the state of all Jobs which it believes have
 1567 been fetched by the Proxy for each identified Local Service, or returns a message
 1568 requiring the Proxy to resolve the Job status.

1569 Table 5 identifies actions in response to an UpdateActiveJobs. Active Jobs from the Cloud
 1570 viewpoint are Jobs which have been acknowledged as being fetched (AcknowledgeJob
 1571 received) but for which an UpdateJobStatus message indicating a Job termination state
 1572 has not been received. Active Jobs from the Proxy viewpoint are Jobs which have been
 1573 acknowledged as being fetched (response to AcknowledgeJob received) but for which an
 1574 UpdateJobStatus message indicating a Job termination state has not been sent.

1575 **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.

1576 An UpdateActiveJobs message for each Service supported is sent by the Local Imaging
1577 System Proxy when the Proxy senses that communication with the Cloud Imaging Service
1578 has been restored after a disruption, when requested by the Cloud Service, after any hard
1579 reset, and after power-up initialization of the Proxy or a supported Local Imaging Service.

1580 An UpdateActiveJobs message for a specific Service is also sent by the Local Imaging
1581 System Proxy when the message in response to a FetchJob, AcknowledgeJob,
1582 UpdateJobStatus, FetchDocument, AcknowledgeDocument, UpdateDocumentStatus,
1583 GetJobElements or UploadJobDocumentData operation indicates an unrecognized Job
1584 UUID.

1585 **4.2.2.13 UpdateDocumentStatus**

1586 The Local Imaging System Proxy sends this message reporting the current status of an
1587 identified Document, along with state message and reasons, whenever the status of that
1588 Document changes. The Document status in the Local Imaging System Proxy considers
1589 the status of the corresponding Job and Document in the Local Imaging Service to which
1590 the Job was directed. In some cases, as when the Local Imaging System Proxy is doing
1591 preprocessing or acquisition of referenced Document Data , Document status can be
1592 determined by the Local Imaging System Proxy rather than the Local Imaging Service.

1593 The Cloud Imaging Service response reports successful receipt of the update or a
1594 message indicating an error in the form or content of the request. For example, a
1595 Document Identification error indicates that the Document being updated was not
1596 considered to be active in the indicated Local Imaging Service either because it had not
1597 been acknowledged as fetched for that Local Service or because it was in a terminated
1598 Job.

1599 **4.2.2.14 UpdateJobStatus**

1600 The Local Imaging System Proxy sends an UpdateJobStatus request reporting the current
1601 status of an identified Imaging Job, along with state message and reasons, whenever the
1602 status of that Job changes. The Job status in the Local Imaging System Proxy considers
1603 the status of the Job in the Local Imaging Service to which it was directed. The operation
1604 includes a sparsely populated object of the appropriate type. For example, if the Local
1605 Imaging Service completes a Job, the UpdateJobStatus message would contain the
1606 Elements in the Local Imaging Service JobStatus that have been changed and a final
1607 version of the Local Imaging Service JobReceipt.

1608 The Cloud Imaging Service response reports successful receipt of the update or an error in
1609 the form or content of the message. For example, an error message might indicate that the
1610 Job being updated was not considered to be an ActiveJob in the identified Local Imaging
1611 Service either because it had not been acknowledged as fetched for that Local Service or
1612 because it was in a terminated state.

1613 **4.2.2.15 UpdateServiceElements**

1614 After the System has been registered, the Local Imaging System Proxy sends an initial
1615 UpdateServiceElements message to the corresponding Cloud Imaging Service for each
1616 Local Service to be made accessible. This initial UpdateServiceElements identifies the
1617 Local Service Elements (Elements under CapabilitesReady, Defaults, Description and
1618 Status) that are to be made known to the Cloud Service, along with their values.

1619 This initial message follows the form of the response to a Client-issued
1620 GetServiceElements message, but rather than providing information on Elements
1621 requested by the Client, the Elements included are all those to be made accessible to the
1622 Cloud Imaging Service. This constitutes the proposed Accessible Service Element set for
1623 the Local Service. The response from the Cloud Imaging Service acknowledges receipt of
1624 the message and reports any errors.

1625 If there are any Elements in the proposed Accessible Service Element set that the Cloud
1626 Service intends to ignore, it identifies these in its response as not supported. That is, the
1627 Cloud Imaging Service has the option of ignoring some reported Local Imaging Service
1628 Elements. Alternatively, the Cloud Imaging Service can send an error rejecting the Local
1629 Imaging Service entirely or the Proxy could act to not accept the reduced Accessible
1630 Service Element set. In either such case the Proxy deregisters the Local System. In out-of-
1631 band consultations, the Local System Owner can seek to resolve the problem with the
1632 Cloud System Owner. The resolution can be to decide to re-register the Local Imaging
1633 System without the rejected Service, or with the Service and a modified proposed
1634 Accessible Service Element set.

1635 The proposed Accessible Service Element set, possibly with reported not (Cloud)
1636 supported Elements removed, if accepted by the Proxy, constitutes the Accessible Service
1637 Element set for the Local Imaging Service.

1638 If the Accessible Service Element set is to be changed for a Local Imaging Service (i.e.,
1639 Elements to be added or removed), the Local Imaging System Proxy re-registers the Local
1640 Imaging System containing that Local Imaging Service and issue new initial
1641 UpdateServiceElements messages for all Local Services in that System with the revised
1642 set of Elements and their values.

1643 Once the Local Imaging System Proxy has sent the initial UpdateServiceElements to
1644 communicate the Accessible Service Element set to the corresponding Cloud Imaging
1645 Service, an UpdateServiceElements message is sent to update the corresponding Cloud
1646 Imaging Service with any change in value of these Elements.

1647 **4.2.2.16 UpdateSystemElements**

1648 After registration, an UpdateSystemElements message is sent by the Local Imaging
1649 System Proxy to update the value of any Element in the Registered System Element Set.
1650 Typically, this will be reporting current System state whenever its state changes, along with

1651 state message and reasons. The Cloud Imaging System Service response is an
1652 acknowledgment of message receipt.

1653 These UpdateSystemElements messages follow the form of the response to a Client-
1654 issued GetSystemElements message, where the Elements included are members of the
1655 Registered System Element set the values of which have changed since
1656 SystemRegistration or the last acknowledged UpdateSystemElements message.

1657 **4.2.2.17 UploadJobDocumentData.**

1658 The Local Imaging System Proxy sends a message containing the Document Data that a
1659 Local Imaging Service has obtained in executing a Job which requires that the Local
1660 Imaging Service output Digital Document Data back to the Cloud Imaging Service, as for
1661 when the specified data destination for a Scan Job is not directly accessible to the Local
1662 Imaging System Proxy or the Local Imaging Service.

1663 The message includes the JobUuid. The response from the Cloud Imaging Service
1664 acknowledges receipt of the data and can include error messages as appropriate.

1665 **4.2.3 Cloud Service Management Operations**

1666 Administrative Service operations are sent from a Client to a specific Cloud Imaging
1667 Service and directly affect only the specific addressed Service within Cloud Imaging
1668 System and/or affect the Jobs within the Service. Access is reserved for Administrators or
1669 Operators. The Administrative Service Operations are identical to the Administrative
1670 Service Operations described in MFD Model and Common Semantics [PWG5108.01], with
1671 the addition of GetLocalServices, and GetLocalServiceElements. These additional
1672 operations allow administrative identification of the Local Imaging Service(s) accessible to
1673 the Cloud Service being queried (a Cloud Service can have access to more than one Local
1674 Service), and an administrative view of Elements of each such Local Service.

1675 The Administrative Service Operations for Cloud Imaging Services are listed in Table 6,
1676 with paragraphs 4.2.3.1 and 4.2.3.2 describing the GetLocalServices and
1677 GetLocalServiceElements operations.

1678 Note that Cloud Service Management operations are accessible to only Users with proper
1679 administrative access rights to the Cloud Imaging Service. These operations do not directly
1680 affect downstream Cloud Imaging Services, Local Imaging System Proxy(s) which connect
1681 to the Cloud Imaging Service, or the Local Imaging Services with which these the Local
1682 Imaging System Proxy(s) interface.
1683

1684

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

1685 **Note 1:** Elements in bold font are mandatory for the associated operation. All Client Administrative Requests
1686 can include the following Elements

1687 ElementsNaturalLanguageRequested;
1688 ServiceUuid (target Cloud Service);
1689 RequestingUserName and/orRequestingUserUri (mandatory) the RequestingUser is the
1690 Administrator;
1691 Message

1692 **Note 2:** The RequestingUserName can be used by the target Service to determine whether the requestor is
1693 authorized to make the request. Some implementations can require further authentication of the requestor's
1694 identity. If the requestor is not determined to have access, the Service rejects the request (unless security
1695 procedures dictate no response.)

1696 **Note 3:** All Cloud Imaging Service Responses correlate to the Request and can include the following
1697 Elements.:

1698 ElementsNaturalLanguage(if response includes Element(s) in natural language);
1699 OperationStatusCode(mandatory): indicates that operation has been accepted or not and possibly an
1700 error condition (e.g., Request identifies a System, Service, Job or Document that is not
1701 recognized; the Request refers to an inactive Job as though it were active, or there is some error in
1702 the received operation request format.)
1703 Message:Cloud Service response text message identifying the error condition and reason

1704 **Note 4:** CancelJobs response includes identified but un-cancellable Jobs with Job States after operation
1705 implemented.

1706 **Note 5:** Operations manage just the addressed Cloud Service, not the associated Local Service(s). However,
1707 these operations can render the Cloud Service in a state where it does not respond to Proxy Operations.

1708 **Note 6:** The Service Elements of a Cloud Imaging Service can depend on the accessible Service Elements of
1709 Proxied Local Services with which it communicates. In no case can this SetServiceElements Operation add to
1710 the Elements made accessible via Proxies, although it can cause the Cloud Imaging Service to ignore some
1711 accessible Elements or Element values.

1712 **Note 7:** Forcing Service Shutdown can also force the state of any active Jobs to Aborted.

1713 **4.2.3.1 GetLocalServices**

1714 The GetLocalServices operation directed to a Cloud Imaging Service allows an authorized
1715 Client to get the name,type and LocalServiceUids of all Local Services with which the
1716 Cloud Imaging Service is (or should be) communicating (via one or more Local Imaging
1717 System Proxies). This communication relationship is established by virtue of the
1718 registration of Local Imaging System(s) containing that Local Service(s) with the Cloud
1719 Imaging System containing the addressed Cloud Imaging Service. Local Services are
1720 listed even if the Local Service is Offline or the local System registration has been
1721 suspended, but not once the local System has been deregistered. The GetLocalServices
1722 response includes only Service identification information rather than the full
1723 ServiceSummary provided in response to a ListAllServices operation.

1724 **4.2.3.2 GetLocalServiceElements**

1725 The GetLocalServiceElements operation allows an authorized Client to get the Service
1726 Elements and values (Description, Status, and CapabilitiesReady) of the specified Local
1727 Service with which a Cloud Imaging Service is communicating. The request can limit
1728 response to specific ElementGroups; allowed values for Requested Elements are
1729 CapabilitiesReady (if appropriate to the Imaging Service), Description, Status and
1730 DefaultJobTicket. The returned information corresponds to the information received from
1731 the Local Imaging System Proxy for that Local Service via the UpdateServiceElements
1732 operations.

1733 **4.2.4 Cloud Imaging System Management Operations**

1734 These Administrative Service operations are sent from a Client to a Cloud Imaging System
1735 Control Service and directly affect the Cloud Imaging System, Cloud Imaging Services
1736 and/or affect the Jobs of multiple Job Owners. Access is reserved for Administrators or
1737 Operators. The Cloud Imaging System Operations are listed in Table 7 and are described
1738 in Section 7 of the System Object and System Control Service Semantics [PWG5108.05],
1739 with the addition of the GetLocalSystems and GetLocalSystemElements described in
1740 4.2.4.1 and 4.2.4.2 below. These additional operations allow administrative view of the
1741 Local Imaging System(s) with which the Cloud Imaging System communicates via a Proxy,
1742 and the accessible Elements of these Local Imaging System(s).

1743 Cloud Imaging System Management operations do not directly affect downstream Imaging
1744 Systems, the Local Imaging System Proxy(s) which connect to the Cloud Imaging Service,
1745 or the Devices with which these Local Imaging System Proxy(s) interface.

1746 Note that, when directed to specific Imaging Services, some operations parallel the
 1747 administrative operations described in paragraph 4.3.3.; when directed to the System
 1748 Control Service without a specific Imaging Service identified, such operations apply to all
 1749 supported Imaging Services in the Cloud Imaging System, other than the System Control
 1750 Service itself.

1751 **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

1752 **Note 1:** Elements in bold font are mandatory for the associated operation. All Client Management Requests
 1753 can include the following Elements.
 1754 ElementsNaturalLanguage;
 1755 ServiceUuid (Cloud System Control Service);
 1756 Message
 1757 RequestingUserName and/or RequestingUserUri (mandatory). The RequestingUser for these
 1758 operations is the Administrator
 1759 The RequestingUserName or RequestingUserUri can be used by the Cloud System Control
 1760 Service to determine whether the requestor is authorized to make the request. Some
 1761 implementations can require further authentication of the requestor's identity. If the requestor is not
 1762 determined to have access, the Service rejects the request (unless security procedures dictate no
 1763 response

1764 **Note 2:** The identification of the Service to be deleted, shutdown or restarted by the mandatory Elements **Id**
 1765 and **ServiceType** is consistent with the DeleteService operation defined in the System Object and System

1766 Control Service Semantics (PWG5108.06). However, particularly for Cloud Services, it is preferable to provide
1767 the ServiceUuid of the Service to be deleted.

1768 **Note 3:** All Cloud Imaging Service Responses correlate to the Request and can include the following
1769 Elements.. Elements in bold font are mandatory for the associated operation.

1770 ElementsNaturalLanguage (if response includes Element(s) in natural language)
1771 OperationStatusCode (mandatory); indicates that operation have been accepted or not and possibly
1772 error condition (e.g., Request identifies a Service that is not recognized or there is some error in
1773 the received operation request format.)
1774 Message; Cloud Service response text message identifying the error condition and reason

1775 **Note 4:** This operation applies only to the Cloud Imaging Services, not the Cloud System Control Service.

1776 **Note 5:** The operation applies only to Job based Services (e.g., FaxOutService, PrintService and
1777 ScanService),, not to the CloudSystemControlService

1778 **Note 6:** When the object Service is the Cloud System Control Service the implementation restarts the
1779 SystemControlService and might restart the other Services as well.

1780 **Note 7:** When the target Service is the Cloud System Control Service the implementation of the restart can be
1781 soft (i.e., affects software only) or hard (i.e., hardware and software reinitialized).

1782 **Note 8:** When the Service startup is complete, the Service state is 'Idle' (See note 9). The Service will then
1783 follow the Service state model as defined in section 7.2.1 of [PWG5108.01].

1784 **Note 9:** When the operation contains the "StartServicePaused" parameter and it is set to TRUE, the resulting
1785 Service state is 'Stopped' (i.e., transitions from 'Down' to 'Idle' then immediately to 'Stopped'). The Service will
1786 then follow the Service state model as defined in section 7.2.1 of [PWG5108.01].

1787 **Note 10:** When the operation contains the "IsAcceptingJobs" parameter with a value of FALSE, the Service
1788 state is 'Idle' (See note 9). The Service will then follow the behaviors as defined in section 7.3.2.2 of
1789 [PWG5108.01]

1790 **Note 11:** These operations result in an error when applied to the Cloud System Control Service.

1791 **Note 12:** ServiceSummary for each service includes ServiceUuid, ServiceName, ServiceState,
1792 ServiceStateReasons for the service's endpoint and other general information.

1793 **4.2.4.1 GetLocalSystems**

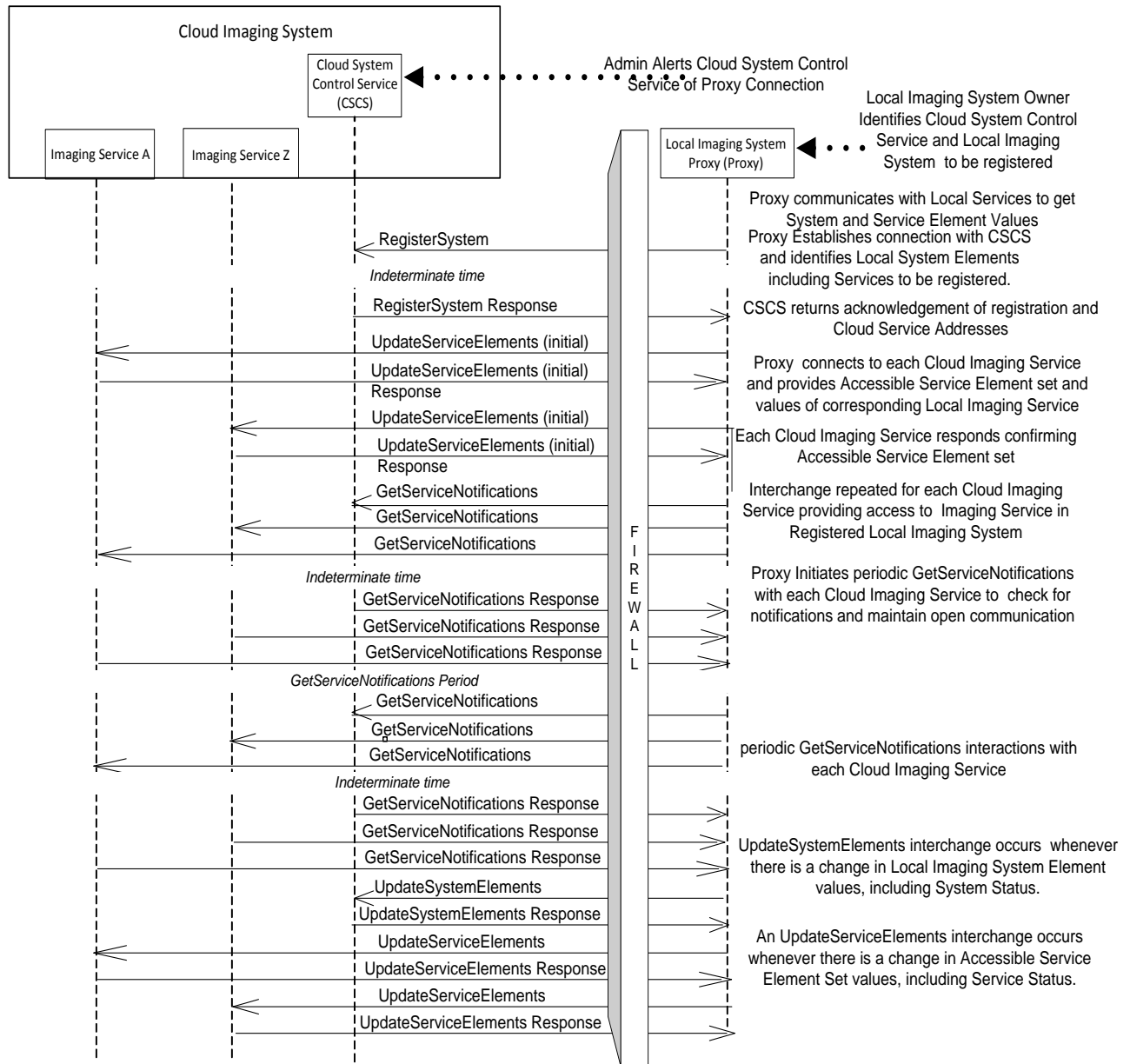
1794 The GetLocalSystems operation allows an authorized User to get the LocalSystemUuids
1795 and names of all Local Systems which are registered with the Cloud Imaging System.
1796 Local Systems are listed even if the System or the interfacing Local Imaging System Proxy
1797 is Offline or has registrations suspended, but not once the local System has been
1798 deregistered.

1799 4.2.4.2 GetLocalSystemElements

1800 The GetLocalSystemElements operation allows an authorized User to get the System
1801 Elements and values (Description, Status, Services) of the specified Local System. The
1802 request can limit response to specific Element groups; the allowed values for Requested
1803 Elements are Description, Status and Services. The returned information corresponds to
1804 the information received from the Local Imaging System Proxy for that Local System via
1805 the RegisterSystem and UpdateSystemElements operations.

1806 4.3 Transaction Sequences**1807 4.3.1 Registration Sequence**

1808 The message sequence in Figure 5 plots the specific interactions outlined in paragraph
1809 4.1.2 for Local Imaging System registration and initialization of the communication with
1810 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

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1812

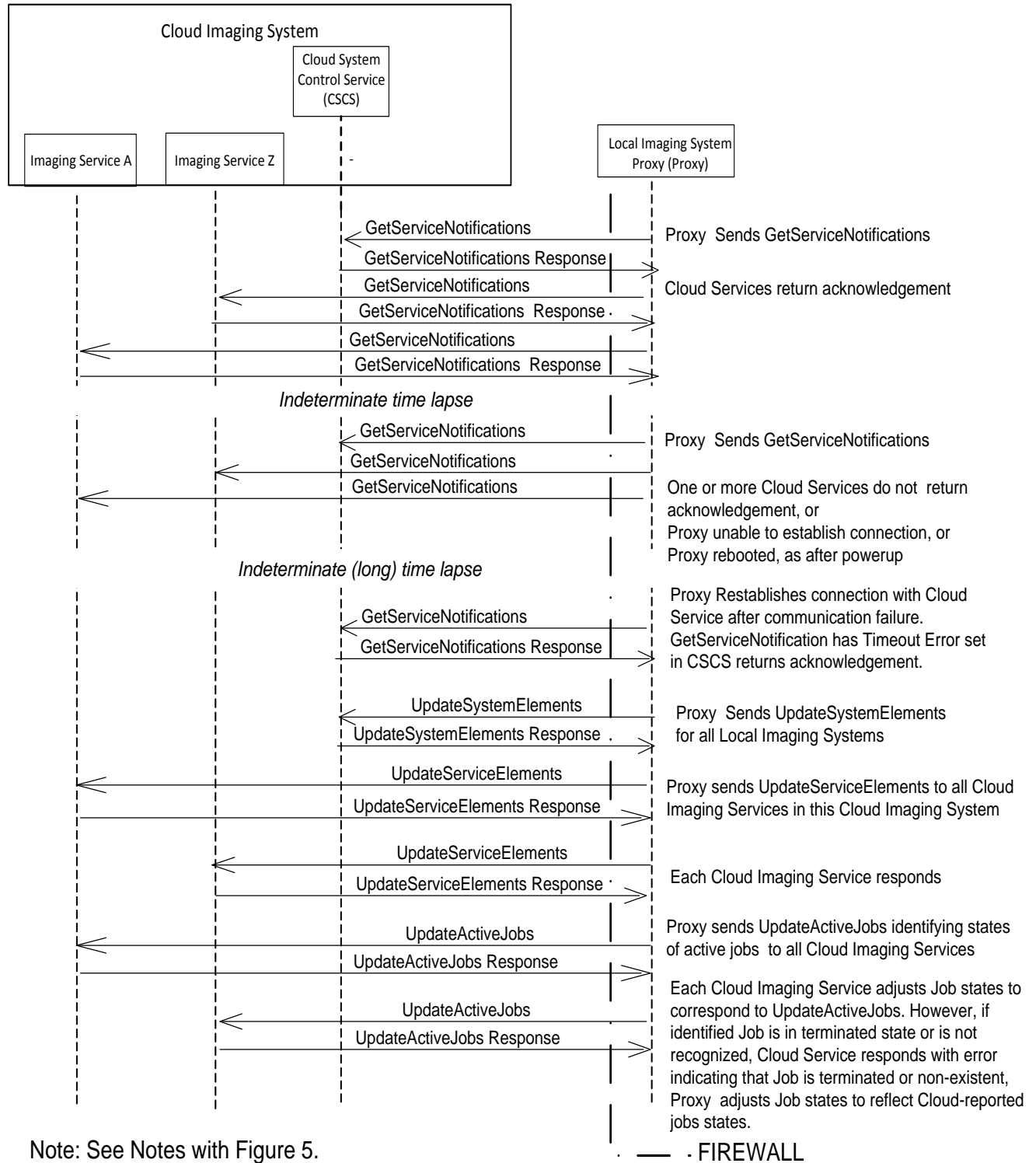
1813 **4.3.2 Status Realignment**

1814 Although there will be multiple connections and disconnections between a Local Imaging
 1815 System Proxy and a Cloud Imaging Service, communication between Proxy and a Cloud
 1816 Services is considered lost:

- 1817
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1. When the Proxy is unable to receive a response from a Cloud Service to which it is sending a message;
 2. When the Cloud Service fails to receive any communication from the Local Imaging System Proxy over an 'Offline time-out' period and returns a time-out message when communication is reestablished; or
 3. When the Proxy can have lost track of the Jobs and or the state of the Jobs it has fetched, as can occur when either the Proxy and/or the Local Imaging System is rebooted or has been powered down and restarted.

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



Note: See Notes with Figure 5.

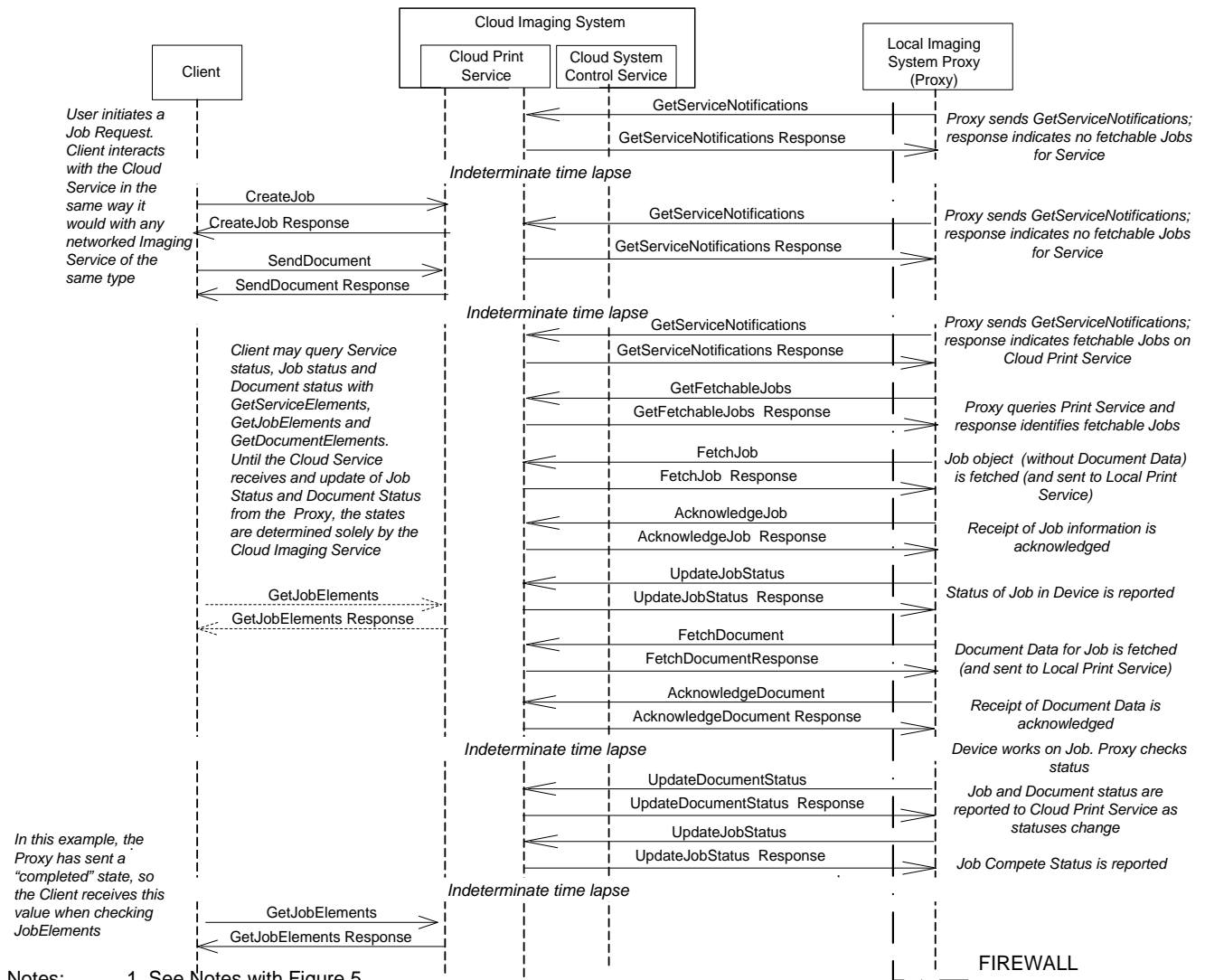
1840

1841

Figure 6 System, Service and Job Status Realignment

1842 **4.3.3 Cloud Print Service Sequence**

1843 The message sequence for Cloud Print is represented in Figure 7. The Client-Cloud Print
 1844 Service interaction is the same as with any Client-Networked Print Service print Job
 1845 request submission. In the general case of the Cloud Local Imaging System Proxy
 1846 supporting several Local Imaging Services, the GetServiceNotifications messages will
 1847 continue periodically during the Print Service interaction. If the GetFetchableJobs response
 1848 indicated more than one Print Job available, the Cloud Local Imaging System Proxy can
 1849 fetch more Jobs after (or during, depending upon the capability of the Local Print Service)
 1850 the processing of the first Job. Note that the basic sequence is the same for FaxOut
 1851 Services.



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

1852

1853

Figure 7 Simple Print Sequence

1854 When DocumentData has been supplied by the Client, the Cloud Print Service response to
1855 the FetchDocument request includes the DocumentData for presentation to the Local Print
1856 Service (as indicated in Figure 7). The Proxy sends the AcknowledgeDocument message
1857 which indicates that the DocumentData is received and accepted, or reporting some
1858 problem with the data. If AcknowledgeDocument reports a problem, the Cloud Print
1859 Service response indicates whether the FetchDocument is to be resubmitted (if, for
1860 example, the Cloud Service will reformat the Document), the Document is to be skipped
1861 (allowing previous and/or following documents to be printed), or the Job is to be aborted.

1862 Once the Document has been acknowledged, the Proxy sends UpdateDocumentStatus
1863 messages to indicate the status of the Document as the Document is being processed. As
1864 with the AcknowledgeDocument interchange, the Proxy can report problems and the Cloud
1865 Service can respond with desired actions.

1866 When the Client submits a print-by-reference Job to the Cloud Print Service, the Cloud
1867 Print Service response to the FetchDocument request normally passes the reference on to
1868 the Proxy, provided that the Proxy has reported that the URI Scheme for the reference is
1869 supported and that the Document Data location is not recognized by the Cloud Service,
1870 perhaps as in an associated Cloud repository. If the Proxy and the Local Print Service
1871 cannot access the DocumentData, the Proxy AcknowledgeDocument message will
1872 indicate and identify the failure. The Cloud Print Service responds with the action that the
1873 Proxy is to take; the FetchDocument is resubmitted (if the Cloud Print Service can de-
1874 reference the DocumentData itself and respond with the de-referenced DocumentData),
1875 the Document is to be skipped, or the Job is to be aborted.

1876 If the Proxy aborts a Job, either because it was instructed to or for some local reason, the
1877 Cloud Service has the option of trying to resolve the problem and making the Job again
1878 'fetchable' or it might possibly redirect the Job to some other Local Print Service. If these
1879 alternatives do not work, the failed Job status is reported to the Client.

1880 **4.3.4 Cloud Scan Service Sequence**

1881 The message interchange sequence for a Scan Job starts in the same way as for a Print
1882 Job, except that the response to the FetchJob request contains InputElements, giving the
1883 hardcopy scan parameters and the Cloud Scan Service specified Document Destination.

1884 The Cloud Scan Service will have been informed of the URI schemes supported by the
1885 Proxy/Local Scan Service. The Cloud Scan Service may have some associated storage
1886 destinations, perhaps provided for Pull Scan Jobs or as a Cloud repository. The Document
1887 Destination provided in response to the FetchJob request is the User defined destination,
1888 unless:

- 1889 1. The Cloud Scan Service determines that the User-defined Document
1890 Destination is not supported by the Proxy/Local Scan Service;
- 1891 2. The Cloud Scan Service recognizes the destination as an associated Cloud
1892 destination;
- 1893 3. The User/Client has requested a Pull Scan mode.

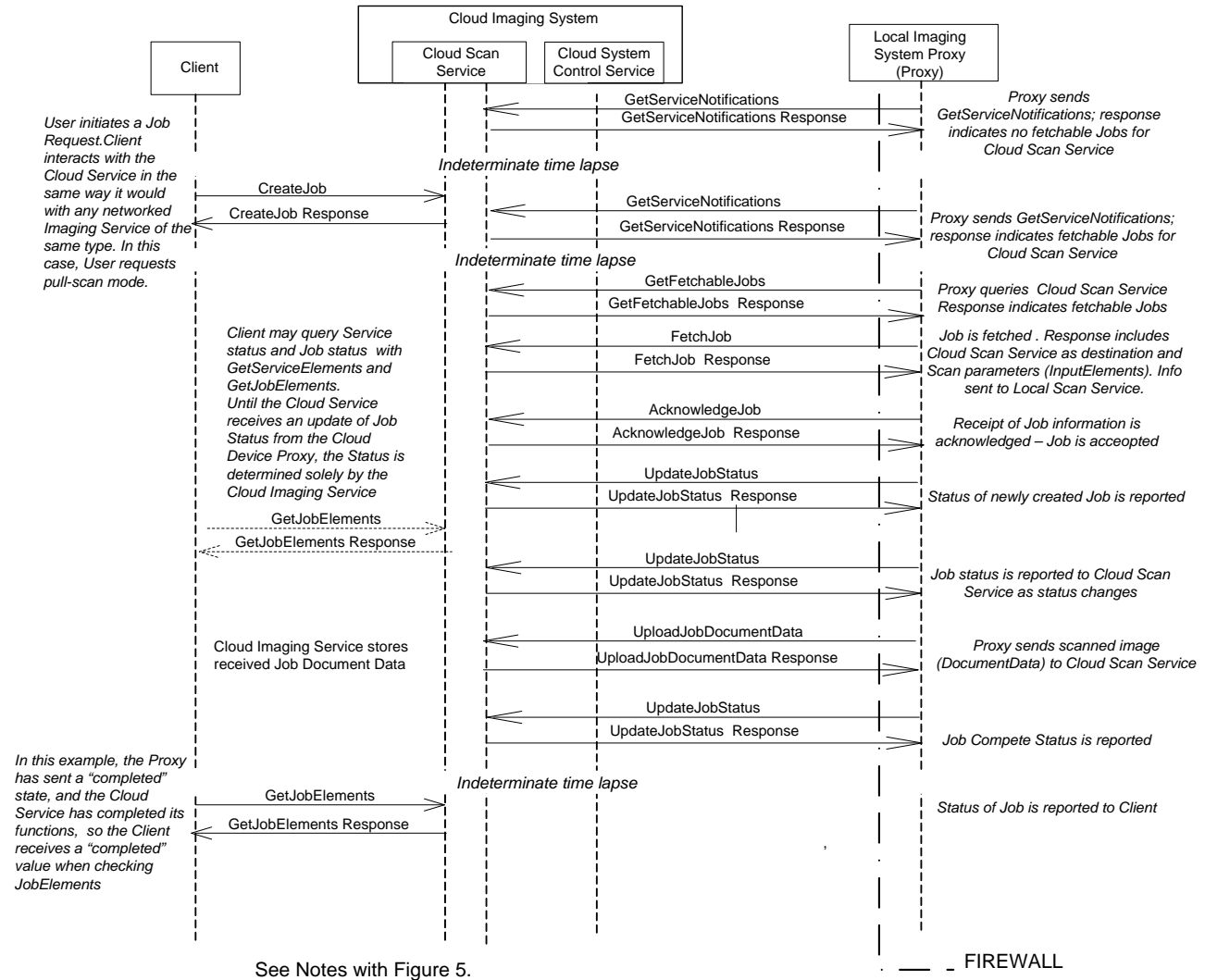
1894 If any one of these conditions exist, the FetchJob response indicates that the Scan data is
1895 to be uploaded to the Cloud Scan Service.

1896 On receiving this FetchJob response, the Proxy determines whether the specified
1897 InputElements are supported and whether it or the Local Scan Service can access the
1898 desired destination(s). If InputElements are supported and the DestinationUris can be
1899 accessed, the Proxy AcknowledgeJob message indicates that the Job is accepted. If
1900 InputElements are not supported and/or the DestinationUris cannot be accessed, the
1901 AcknowledgeJob message rejects the Job and identifies the problem. The Cloud Scan
1902 Service removes the Job from the Fetchable list, whether or not the Proxy
1903 AcknowledgeJob indicates the Job has been accepted or not.

1904 If the Proxy/Local Scan Service cannot access the desired DestinationUris, the Cloud
1905 Scan Service determines whether it can access the desired DestinationUris. If it cannot or
1906 if InputElements are not supported, the Job is aborted and the Client is notified. If the
1907 Cloud Scan Service can access the desired location, it can reconfigure its Job handling
1908 approach and make the Job again fetchable.

1909 If the Cloud Service intends to send the scan Document Data to the desired
1910 DestinationUris (or store it to be 'pulled' by the Client), the DestinationUris provided by the
1911 Cloud Scan Service in response to new FetchJob indicates that the Document Data is to
1912 be uploaded to the Cloud Scan Service.

1913 The message sequence for Scan to a Cloud Scan Service accessible location is in Figure
1914 8. In this example, the scanned image file destination specified by the User is accessible
1915 by the Cloud Scan Service but not the Local Scan Service. Therefore, the Local Imaging
1916 System Proxy uploads this file to the Cloud Scan Service, which stores the file before
1917 reporting the Job complete.



1919 **Figure 8 - Cloud Scan Sequence - Scan Document Data Sent to Cloud Service**

1920 **4.3.5 Cloud FaxOut Service Sequence**

1921 The message interchange sequence for a FaxOut Job is identical to that for a Print Job,
 1922 except that the response to the FetchJob request includes the facsimile destination
 1923 (DestinationUri) and the response to the FetchDocument request can contain
 1924 InputElements, giving the hardcopy scan parameters if the FaxOut Job is to include image
 1925 data locally derived from hardcopy.

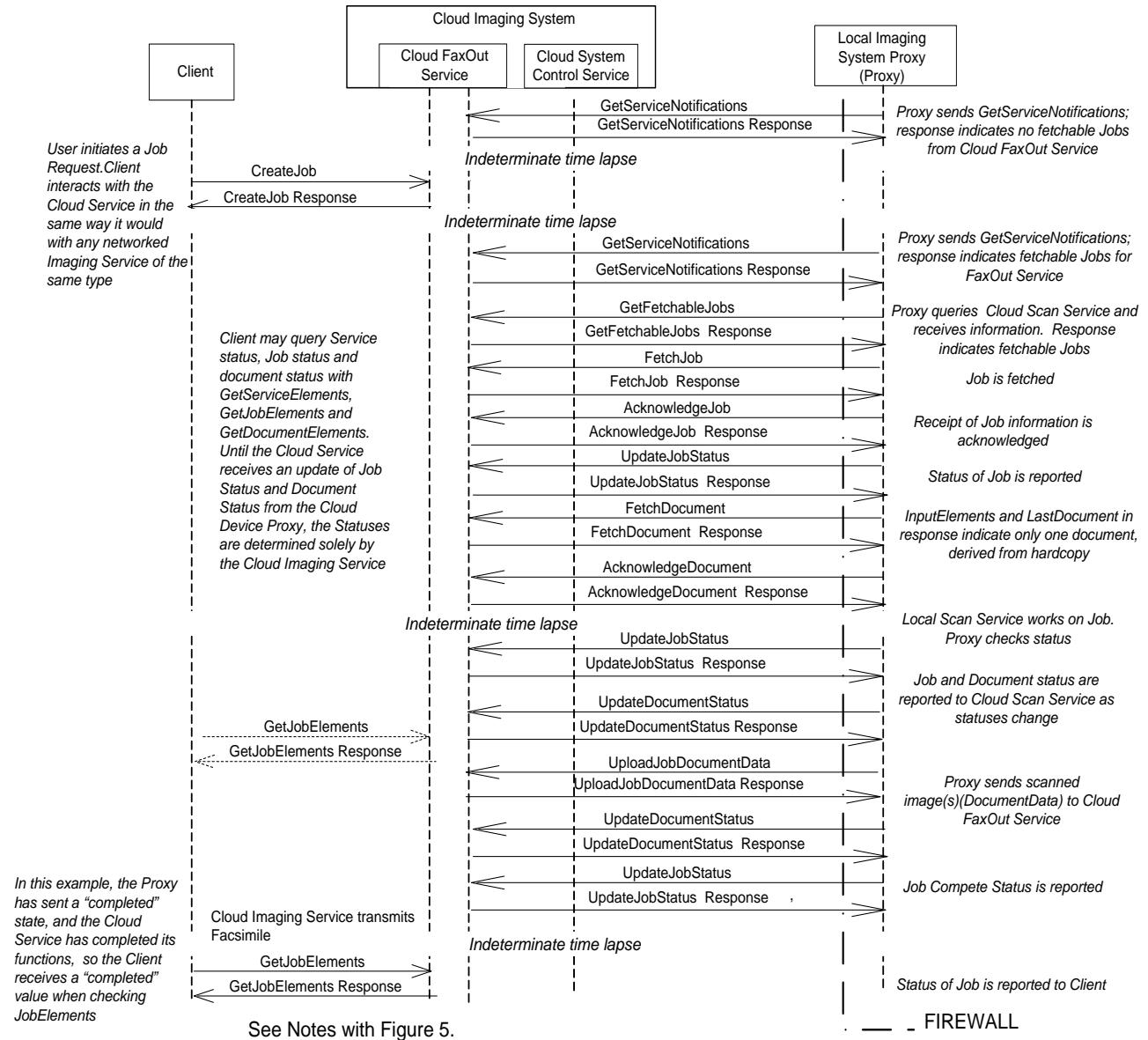
1926 The FaxOut Service can support several different facsimile modes, including telephone
 1927 line (PSTN) and Ethernet (SMTP). The Proxy/Local FaxOut Service capabilities will have
 1928 been communicated to the Cloud Scan Service in terms of URI schemes supported.
 1929 Unless the Cloud Scan Service sees the User-defined Document destination as
 1930 unsupported, the User defined DestinationUri is communicated to the Proxy in the
 1931 FetchJob response and the Proxy or the Local Scan Service is given the opportunity to
 1932 transmit the facsimile.

1933 On receiving this DestinationUris Element, the Proxy determines whether it or the Local
1934 FaxOut Service can transmit the facsimile. If the InputElements are supported and at least
1935 one DestinationUris URI scheme is supported, the Proxy AcknowledgeJob message
1936 indicates that the Job is accepted but any problems (such as inaccessible DestinationUris
1937 URI schemes) are identified. If InputElements are not supported, the AcknowledgeJob
1938 message rejects the Job and identifies the problem. The Cloud FaxOut Service removes
1939 the Job from the Fetchable list, whether or not the Proxy AcknowledgeJob indicates the
1940 Job has been accepted or not.

1941 If the Cloud FaxOut Service determines that it can access URI schemes not supported by
1942 the Proxy/Local FaxOut Service, it can continue with the Job and indicate in the
1943 FetchDocument response that Document Data is to be uploaded to the Cloud FaxOut
1944 service in addition to the Proxy/LocalFaxOut Service transmitting the Document via any
1945 requested DestinationUris URI scheme that it supports.

1946 A FaxOut Job can include both 'soft ' documents available as Document Data supplied
1947 through or referenced by the Cloud FaxOut Service and DocumentData derived from
1948 hardcopy by the Local FaxOut Service. After a FaxOut Job has been accepted in a
1949 AcknowledgeJob message, the Proxy will send a FetchDocument message. The response
1950 to this message can be the Document Data or a reference to the Document Data, just as in
1951 the response to a Print Service FetchDocument, and handling of access (de-referencing)
1952 problems is the same. However, since the FaxOut Job can also contain Digital Documents
1953 derived by scanning hardcopy at the Local FaxOut Service, the response to the
1954 FetchDocument message can be the InputElements for the scanning. As mentioned
1955 above, the FetchDocument response can also include a DocumentTicket which preempts
1956 information in the Job Ticket supplied in response to the FetchJob message.

1957 Figure 9 shows the message sequence for a Facsimile to be derived from a Local FaxOut
1958 hardcopy scan and which uses the Cloud FaxOut Service for transmitting the facsimile to
1959 at least one of the desired destinations.



1960

1961

Figure 9 FaxOut Message Sequence with Cloud FaxOut Service Transmitting

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4.3.6 Device Exception, and Job Abort or Cancel Sequences

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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

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1970

1971 communicated to Cloud Imaging Service interfacing directly with the Client in the same
1972 way that any Job state change is reported. The Client is then informed of altered Job State
1973 using the same mechanisms as in any Client-Networked Imaging Service interaction.

1974 A Client, either at the User's request or for some other reason, can issue a CancelJob or
1975 CancelCurrentJob to the Cloud Imaging Service. If the Job to be canceled is active in a
1976 Local Imaging Service, the servicing Proxy is notified in the GetServiceNotifications
1977 response (or by another notification mechanism.) The Proxy can then send a
1978 GetJobElements message to verify the status of the terminated Job and determine the
1979 circumstances for termination (JobStateReasons) This information can be retained in a
1980 Proxy log. The message sequence is as shown in the lower part of Figure 9.

1981 Although Figure 9 represents the communication of an upstream cancel after a Job is well
1982 into processing, a cancel or abort can occur at any time. Regardless of when the cancel or
1983 abort occurs, there are two methods by which the Cloud Service can provide information to
1984 the Proxy about the 'upstream' abort or cancel.

- 1985 1. The JobTerminated information in the GetServiceNotifications response from
1986 the Cloud Service or in an asynchronous SystemNotification message from the
1987 Cloud Imaging Service.
- 1988 2. An error response to any Proxy message by which the Cloud Service indicates
1989 an identified locally active Job as terminated, not fetchable, or not recognized.
1990

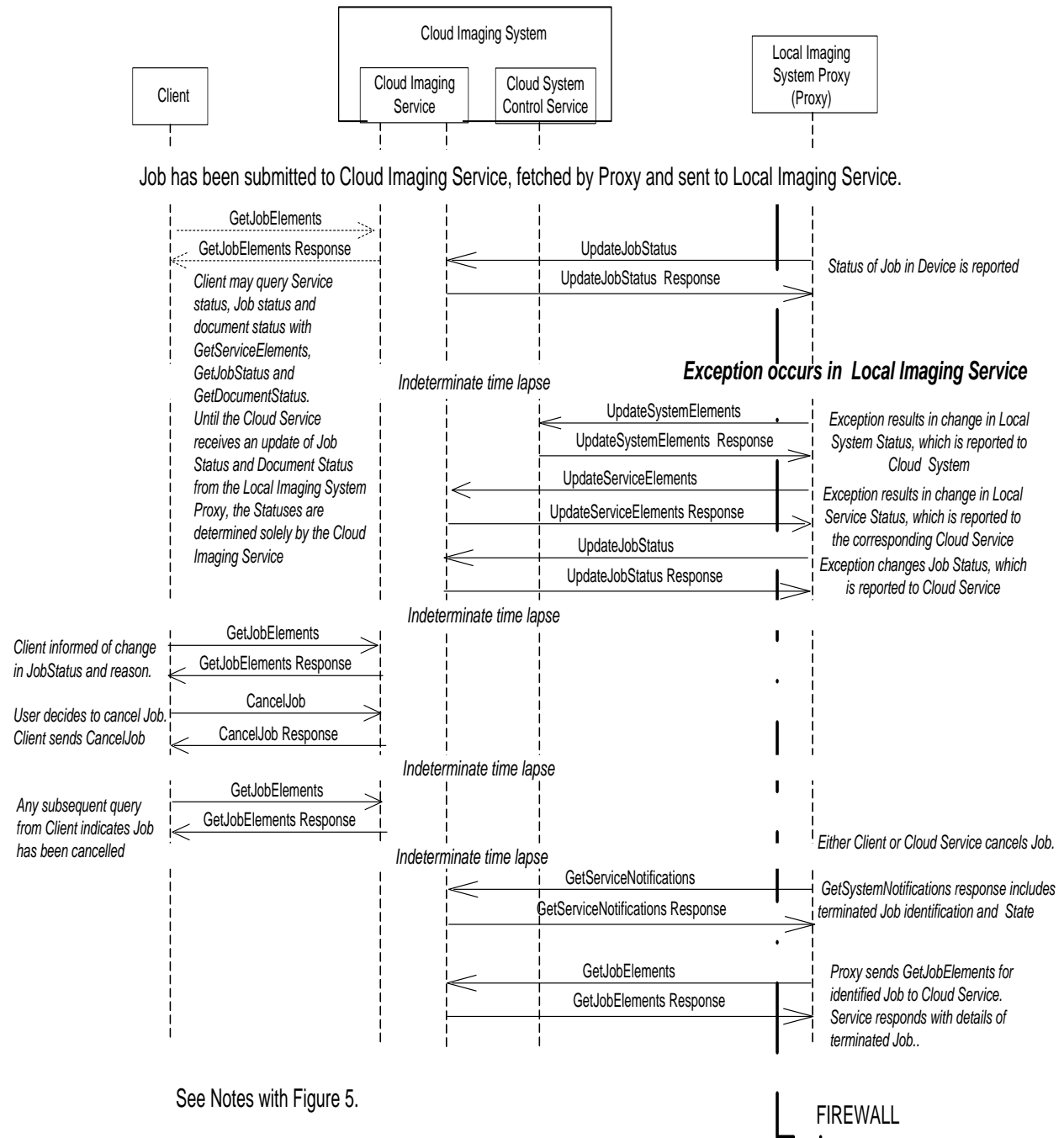
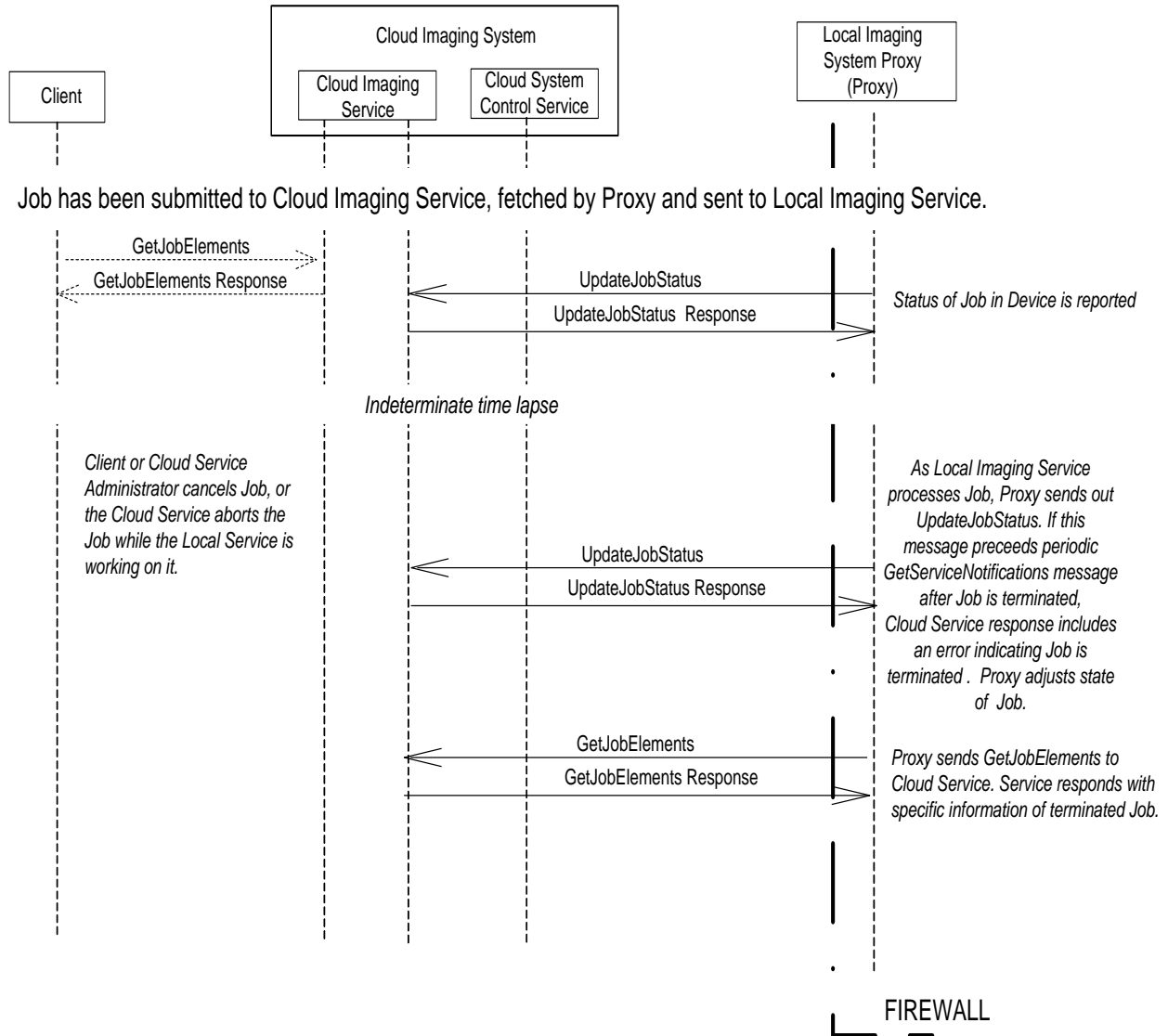


Figure 10 - Device Exception with Resulting Job Cancel

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1992

1993 A message sequence when a Proxy Job message is sent before the Proxy receives or
 1994 implements JobTerminated information in a GetServiceNotifications response is shown in
 1995 Figure 11. The Cloud Service response to the message includes an error indication that
 1996 the identified Job is in a terminated state. The Proxy needs to adjust its state for the Job
 1997 and will send a GetJobElements message to determine the details of the Job status.



1998

See Notes with Figure 5.

1999

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

2000

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2002 **5. Conformance Requirements**

2003 This specification defines a general model for the interaction of Clients, Cloud-based
2004 Imaging Systems and non-cloud but networked Imaging Systems to provide Users with
2005 Imaging Services using the accessibility and capability advantages of Cloud Services. This
2006 specification does not specify a particular implementation or binding, and it is expected
2007 that any binding of this model can depart in some specifics from the nomenclature and
2008 form used in this model description.

2009 The conformance requirements for bindings of this model are:

- 2010 1. Adherence to the general form of the Model including the two-part interface
2011 between:
 - 2012 a. Client-to-Cloud Imaging Service, with a typical Client-to-Networked
2013 Imaging Service interface
 - 2014 b. Local Imaging Service Proxy-to-Cloud Imaging Service interface, with
2015 the Proxy interface defined in this specification.
- 2016 2. Adherence to the functions of the Local Imaging System Proxy interface
2017 operations defined in paragraph 4.2.2 of this specification, although the names
2018 and functional specifics of individual operations can vary.
- 2019 3. Conformance to the standards referenced in Sections 6 and 7 of this
2020 specification.

2021 **6. Internationalization Considerations**

2022 For interoperability and basic support for multiple languages, conforming implementations
2023 MUST support:

- 2024 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
2025 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 2026 2. The Unicode Format for Network Interchange [RFC5198] which requires
2027 transmission of well-formed UTF-8 strings and recommends transmission of
2028 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

2029 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
2030 characters and combining marks) followed by Canonical Composition (into canonical
2031 composed characters wherever Unicode has assigned them).

2032 Implementations of this specification SHOULD conform to the following standards on
2033 processing of human-readable Unicode text strings, see:

- 2034 Unicode Bidirectional Algorithm [UAX9] – left - to - right, right - to - left, and vertical
- 2035 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- 2036 Unicode Normalization Forms [UAX15] – especially NFC f or [RFC 5198]

2037 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

2038 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

2039 Unicode Collation Algorithm [UTS10] – sorting

2040 Unicode Locale Data Markup Language [UTS 35] – locale databases

2041 Implementations of this specification are advised to also consider the following
2042 informational documents on processing of human-readable Unicode text strings:

2043 Unicode Character Encoding Model [UTR17] – multi - layer character model

2044 Unicode in XML and other Markup Languages [UTR20] – XML usage

2045 Unicode Character Property Model [UTR23] – character properties

2046 Unicode Conformance Model [UTR33] – Unicode conformance basis

2047 **7. Security Considerations**

2048 The interfaces defined in this specification require the same security considerations as
2049 defined in MFD Model and Common Semantics [PWG5108.01] In addition, as appropriate,
2050 Clients, Cloud Imaging Services and Local Cloud System Proxies MUST:

- 2051 1. Utilize Transport protocol capabilities to protect against DNS rebinding attacks;
- 2052 2. Provide confidentiality of data in transit;
- 2053 3. Provide confidentiality of Document and Job data at rest; and
- 2054 4. Authenticate Clients, Cloud Imaging Services and Proxies.

2055 **8. IANA and PWG Considerations**

2056 There are no requirements for IANA registration for this specification. However, the Proxy
2057 component and any new Operations and Elements defined in this specification will be
2058 reflected in the PWG Semantic Model. Table 8 in Section 12 of this specification (Semantic
2059 Model Elements Referenced in Cloud Model) specifically identifies the new Elements
2060 defined in this specification.

2061 **9. References**

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2173 **10. Editor's Addresses**

2174 This specification is a product of the PWG Cloud Imaging Requirements and Model
2175 Workgroup, with contributions from many PWG members but no specific author. The
2176 editors and contacts relative to information and comments on this specification are:
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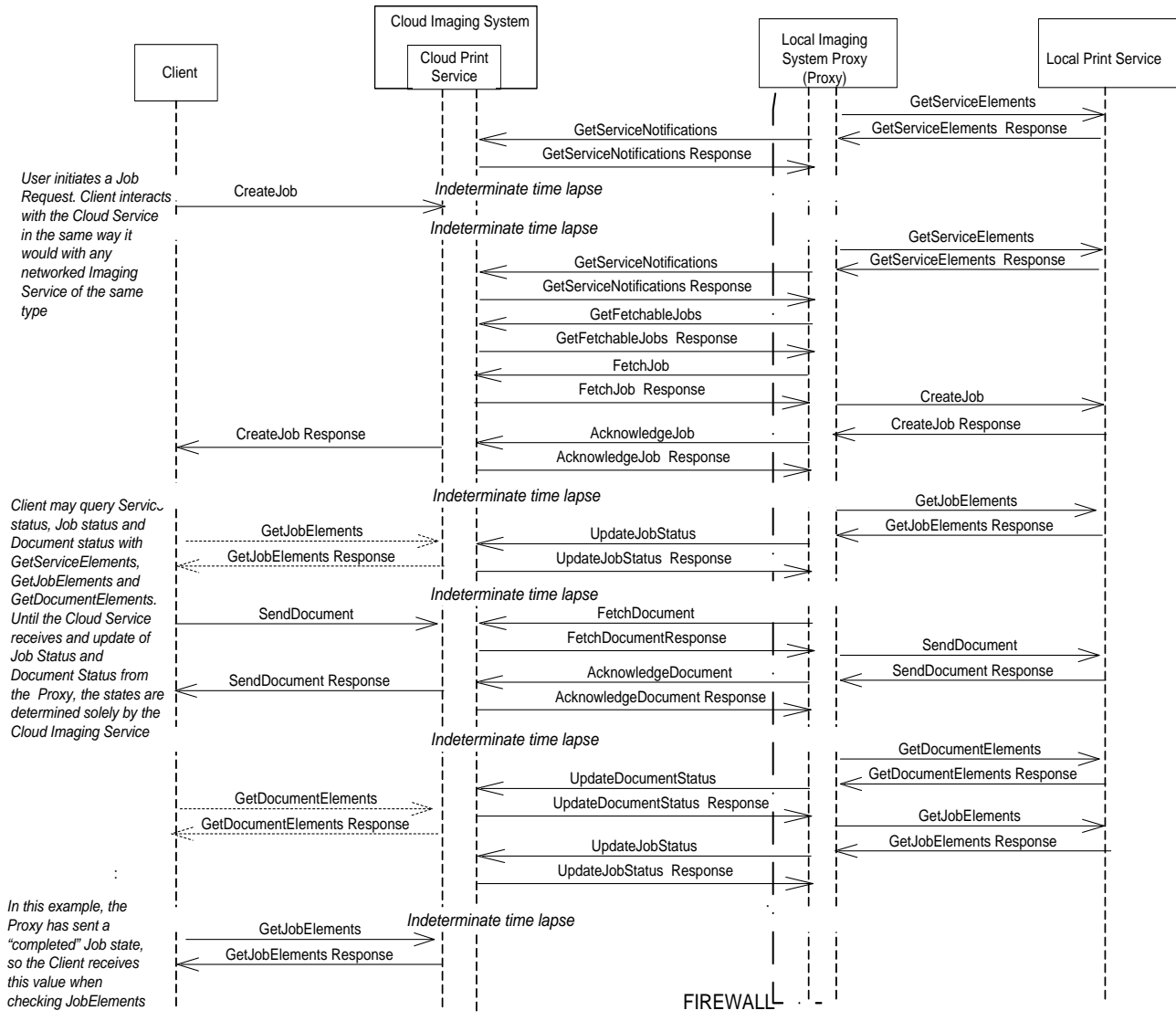
2196 Michael Sweet, Apple
2197 Ira McDonald, High North
2198 Larry Upthegrove
2199 Glen Petrie

2200

2201 **11. Appendix A - Proxy to Local Print Service Interface**
2202 **Example (Informative)**

2203 This specification is concerned with the communication between a Cloud Imaging System
2204 and the Services of a Local Imaging System where the Cloud Imaging System cannot
2205 initiate communication with the Local Services because of a firewall or other security
2206 restriction. The solution requires the use of a Local Imaging System Proxy, essentially a
2207 Client that communicates Local Imaging System, Service, and Job information to the
2208 Cloud Imaging System and Services; and communicates Cloud Imaging System, Service,
2209 and Job information to the Local Imaging System and Services. A set of Proxy Operation
2210 requests and Cloud responses are defined, but recognizing that the Proxy may take many
2211 forms, the interface between the Proxy and the Local Systems and Services is not defined.
2212 The Proxy may be an integral part of the device housing the Local System; an intelligent
2213 independent application interfacing with many Local Imaging Systems and capable of
2214 preprocessing, data storage, and remote file access; or anything in between these two
2215 extremes.

2216 However, the Proxy operations have generally been structured to mirror standard Client to
2217 Imaging Service operations and to use the same Semantic Model Elements so that the
2218 Proxy use standard Client to Service operations as defined in the PWG Semantic Model.
2219 The Proxy-Cloud interactions in a simple Print Job submitted to a Cloud Print Service are
2220 represented in Figure 12, along with possible corresponding Proxy to Local Print Service
2221 interactions.



2222

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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

2225

2226 **12. Appendix B- Reference of Elements (Informative)**

2227 The Operations referenced in this specification refer to Elements on the PWG V2 Semantic
 2228 Model, with a few new Elements added. It is anticipated that these new Elements will be
 2229 included in PWG V3 Semantic Model. Table 8 lists the Elements referenced directly or
 2230 indirectly in the Cloud Imaging Model operations, along with simple definitions as are given
 2231 in the PWG MFD Model and Common Semantics [PWG5108.01] and System Object and
 2232 System Control Service Semantics [PWG5108.06]. Newly added Elements are identified
 2233 by being in bold font.

2234 **Table 8 - Semantic Model Elements Referenced in Cloud Model**

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. <i>CharsetWKV</i>	[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 <i>CompressionWKV KeywordNsExtensionPattern</i>	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 <i>ServiceSummary</i>)	[PWG5108.06], table 3
Copies	int	number of copies to be printed	[RFC2911] para 4.2.5
DefaultJobTicket	complex	<i>DocumentProcessing</i> <i>JobDescription</i> <i>JobProcessing</i>	[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 <i>DocumentReceipt</i> , <i>DocumentStatus</i> and <i>DocumentTicket</i>	[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 <i>document-data-get-interval</i> 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 <i>document-data-get-interval</i> in [PWG5100.17] para 8.1.5	4.2.1.3
DocumentDescription	complex	<i>DocumentDigitalSignature</i> <i>DocumentMessage</i> <i>DocumentName</i>	[PWG5801]

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 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]

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, 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 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
JobPasswordEncryption	keyword	encryption the Client is using for the supplied value	PWG5100.11] para

Element Name	Data Type	Description	Reference
		of the JobPassword Element. JobPasswordEncryptionWKV KeywordNsExtensionPattern	6.2
JobReceipt	complex	Contains the Elements DocumentProcessing JobDescription JobProcessing with 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 Elements	[PWG5801]
JobSummary	complex	Set of complex Elements JobId JobName JobOriginatingUserName JobState JobStateReasons	[PWG5801]
JobTable	complex	Composed of ActiveJobs and JobHistory 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 identified	[PWG5801] Table 79

Element Name	Data Type	Description	Reference
PreferredElements	complex	List of Elements and values returned by Service as preferred in response to any Validate request	PwgSmRev1-185
RegistrationSuspended	boolean	Operation Element: flag indication that proxied system is to be re-registered	4.2.2.10
RequestedElements	List of Element names	Operation Element - Names of Elements requested in a GET operation. What can be requested depends upon the operation	[PWG5801]
RequestingUserName	string	Operation 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	XriUr,i XriAuthentication XriSecurity	[PWG5108.01]
StartServicePaused	boolean	Operation 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]
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].	[PWG5801]

Element Name	Data Type	Description	Reference
		(StateReasonsWKVs)	
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: 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
UnsupportedElements	complex	Operation Element: List of Elements in response that were requested in request that are not supported	[PWG5801]

2235 Notes:

2236 1. Elements in bold font did not appear in Semantic Model V2 and are defined in this specification.

2237 2. Throughout this specification, the Element name "Document" has been used in place of the
2238 Semantic Model 2. Element name ImagingDocument. The Elements are the same.

2239

2240 **13. Change History**

2241 [PWG Secretary: This section must be removed when Document is approved]

2242 **13.1 Update 15 April 2015**

2243 Last Call corrections retrained as red -line. Added changes to sections 6 and 9 to agree
2244 with corresponding Internationalization Considerations in IPP INFRA specification.

2245 **13.2 LCRC 23 March 2015**

2246 See <ftp://ftp.pwg.org/pub/pwg/cloud/wd/lcrc-cloudimagingmodel10.docx>

2247 **13.3 Update 22 January 2015**

2248 Culmination of workgroup last call, as recorded in January 12, 2015 minutes
2249 (<ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20150112.pdf>). All redlines
2250 are accepted and editor's comments are resolved as indicated in minutes. Date, copyright
2251 dates, table of contents, list of tables and list of Illustrations are updated.

2252 **13.4 Update 22 December 2014**

2253 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)
2254 [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.

2255 Following changes made in response to message from Michael Sweet. Line numbers refer
2256 to 8 December draft. (simple style and type corrections are note noted)

2257 Section 1:

2258 - Line 222: The Cloud Imaging System provides access to registered
2259 Imaging Systems, it cannot access them (directly)

2260 - Lines 231-233: Reword last sentence

2261 Section 2.2:

2262 Imaging Service: line 314 should be "appropriately FOR a Cloud
2263 Environment"

2264 line 353 change "under the System Control Service" to "managed by the
2265 System Control Service"

- 2266 Section 2.3: Should come before Section 2.2
- 2267 Section 3.2:
- 2268 Line 415. Break up long sentence, maybe "exists. Also, the Local ..."
- 2269 Section 3.2.x: Drop "(success)" from section titles
- 2270 Section 3.2.2:
- 2271 Line 430: The client software checks (not the Job Originator)
- 2272 Section 3.3: Simplify
- 2273 Section 3.4:
- 2274 Line 518: "Cloud Imaging Model workgroup", use [CHARTER] for reference
- 2275 Line 521-523: move last part of sentence to front: "although the ..., the
- 2276 detailed definition of ..."
- 2277 Line 539-540 (item 8): Isn't this what DocumentAccesses is for?
- 2278 Section 3.5.1:
- 2279 Line 556: "and uses ANY of the same ..."
- 2280 Line 557: "as A corresponding ..."
- 2281 Section 3.5.2:
- 2282 Line 584: Drop "of" ("initiating requests and submissions to ...")
- 2283 Line 602-605: Indent items 4-6 (which probably become 3a, 3b, and 3c)
- 2284 Section 3.5.3:
- 2285 Line 635: Drop "for billing purposes"
- 2286 Section 4.1.1.1:
- 2287 Line 816: "being under the System ..." should be "being the responsibility of
- 2288 the System ..."
- 2289 Line 843: clarify what "for supported services" refers to
- 2290 Section 4.1.1.2:

- 2291 Lines 871-873: Table added to shown handing of Local Active Jobs when
2292 communication problems with Cloud Service
- 2293 Section 4.2.1.1:
- 2294 Line 1019: Missing space after period.
- 2295 Add "4. The InputElements values are invalid or unsupported."
- 2296 Section 4.2.1.2:
- 2297 Not just physical location, also confirmation
- 2298 Section 4.2.2.1:
- 2299 Line 1220: "FetchStatus code" -> "FetchStatusCode"?
- 2300 Section 4.2.2.3:
- 2301 Line 1253: "re-registration" (not initial registration)
- 2302 Section 4.2.2.4:
- 2303 Line 1275: "DocumentUri" instead of "DocumentData reference"?
- 2304 Section 4.2.2.5:
- 2305 Lines 1317-1321: Element is "DestinationUris"
- 2306 Section 4.2.2.6:
- 2307 Line 1364: (and elsewhere) "operation status code" should be
2308 capitalized/element name
- 2309 Section 4.2.2.8:
- 2310 Line 1390: "Job level Elements" -> "Job Elements"?
- 2311 Section 4.2.4:
- 2312 Lines 1706-1707: Drop "Candidate Standard"
- 2313 Section 4.3.6:
- 2314 Line 1932: "can be aborted" (not capitalized)
- 2315 Line 1945-1948: Clear up meaning
- 2316 Section 6:

2317 Update with new boilerplate from IPP Infra spec

2318 Section 8:

2319 add forward reference to Element tables in section 12.

2320 Section 9.2:

2321 Fix NIST reference (no spaces)

2322 Global: DestinationUri becomes DestinationUris

2323 Global: "TRUE" not "true", "FALSE" not "false" for booleans

2324 Global: "Cloud-based" not "cloud based"?

2325 Global: "Internet", not "internet"

2326 **13.5 Update 8 December 2014**

2327 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-20141201.pdf)
2328 [minutes-20141201.pdf](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20141201.pdf)

2329 Elements in tables 2,3,5 and 6 adjusted to agree with SM Schema V1.185 schema

2330 Table 7 modified to include referenced Elements. Unreferenced Elements removed.

2331 Additional Informative references (from Table 7) added

2332 Minor typos fixed.

2333 **13.6 Update 20 November 2014**

2334 Resource support added in paragraphs 2.2, 4.1.1.1, 9.1 and table 3.

2335 Reference to IPP Shared Infrastructure Extensions added to section 9.2.

2336 Minor typos fixed.

2337 **13.7 Update 20 October 2014**

2338 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-20141006.pdf)
2339 [minutes-20141006.pdf](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20141006.pdf).

2340 Section 11 Appendix A - Proxy to Local Print Service Interface Example (Informative)
2341 added

2342 13.8 Update 3 October 2014

2343 Text updated to reflect comments in [cloud-f2f-minutes-20140908.pdf](#)

2344 Changes acknowledge other use cases that could be considered Cloud Imaging modes,
2345 but can be satisfied by existing file transfer and network imaging capabilities

2346 miscellaneous corrections/rewordings

2347 13.9 Update 20 September 2014

2348 Text updated to reflect comments in [cloud-f2f-minutes-20140908.pdf](#)

2349 Table 1 and associated Text added

2350 FaxIn eliminated from Model

2351 13.10 Update 4 September 2014

2352 Specification reformatted to approximate [wd-template-20140815.dotx](#)

2353 Text updated to reflect comments in [cloud-f2f-minutes-20140814.pdf](#)

2354 Handling of Destination in Print-by-reference and in Scan changed to indicate
2355 destination/reference is in FetchDocument response, that de-referencing is typically left to
2356 Proxy/Local Service, and how de-referencing errors are resolved.

2357 13.11 Update 13 August, 2014

- 2358 1. Minor editorial changes and acceptance of previous editorial changes.
2359 2. In 3.4, added that the specifics for management of the Proxy is out of scope.
2360 3. Referenced IPPINTRA in abstract and in informative references.

2361 13.12 Update July 30, 2014

2362 Made changes and corrections in accord with 7 July 2014 Cloud conference call
2363 comments, as identified in meeting minutes at
2364 [ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20140721.pdf](#).

2365 13.13 Update July 18, 2014

2366 Made changes and corrections in accord with 7 July 2014 Cloud conference call
2367 comments, as identified in meeting minutes at
2368 [ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20140707.pdf](#).

2369 13.14 Update June 20, 2014

2370 Made changes and corrections in accord with 9 June 2014 Cloud conference call
2371 comments, as identified in meeting minutes at
2372 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20140609.pdf>.

2373 13.15 Update 28 Can 2014

2374 Made changes and corrections in accord with Can 2014 Face-to-face Cloud meeting, as
2375 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)
2376 [20140513.pdf](ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-f2f-minutes-20140513.pdf).

2377 13.16 Update 18 April

- 2378 1. Corrections following cloud-concall-minutes-20140407.pdf
2379 2. Added Appendix A
2380 3. adjusted Proxy operation Elements (table 2) in accord with semantic model

2381 13.17 Update 3 March and 5 April 2014

- 2382 1. Para 3.5.3 Item 8: clarified that log can be kept by the Cloud System or the
2383 Cloud Services
2384 2. Para 4.1.2: Clarified registration sequence and indicated that registration
2385 inherently provides Proxy notification subscriptions with all Cloud Services
2386 corresponding to Local System Services being made Cloud accessible.
2387 3. Para 4.1.2.2: Added discussion on communication loss with information
2388 removed from GetServiceNotification description.
2389 4. Para 4.2 : Added IAA comment
2390 5. Para 4.2.1: Reworked table 1.
2391 6. Para 4.2.2: Reorganized section into alphabetical order, reworked table,
2392 modified contents to reflect March 24 2014 Concall: Added FetchStatusCode,
2393 message to Acknowledge requests; added CompressionAccepted and
2394 DocumentFormatAccepted to Fetch Document request; added Add
2395 GetProxyJobs, GetProxyJobElements operations;
2396 7. Para 4.2.2.3: Clarified DeregisterSystem
2397 8. Para 4.2.2.10: Reworked GetServiceNotifications to include Cloud System
2398 Control Service queries
2399 9. Para 4.2.3: Added GetLocalServices, GetLocalServiceElements operations;
2400 reworked table 4
2401 10. Para 4.2.4: Added GetLocalSystems and GetLocalSystemElements
2402 operations; reworked table 5.
2403 11. Para 4.3: Added GetServiceNotifications query to Cloud System Control
2404 Service in appropriate transaction diagrams.

2405 13.18 Update 28 February 2014

- 2406 1. Para 4.1.2: Clean up text.
- 2407 2. Table 2: Add requested parameters
- 2408 3. Para 4.2.2.2: add when job fetchable
- 2409 4. 4.2.2.5: GetJobElements Make the access policy for GetJobElements "CAN
- 2410 return an error"?
- 2411 5. 4.2.2.12: Clarified that Jobs with Services in the deregistered System are not
- 2412 necessarily aborted since the jobs can be rerouted to another proxy/Local
- 2413 Imaging System
- 2414 6. Global - Remove specific error names, just talk about reasons for failure
- 2415 7. Table 3: Change headings
- 2416 8. Figure 7: UpdateJobState changed to UpdateJobStatus and
- 2417 UpdateDocumentState to UpdateDocumentStatus
- 2418 9. Section 5. Conformance: reword and make conformance items a Numbered
- 2419 list
- 2420 10. Section 9. References: Added
- 2421 11. Global: Fixed reference forms

2422 13.19 Update 14 February 2014

- 2423 1. 4.1.1 How does client discover cloud services? Added paragraphs discovery
- 2424 and showed lines on diagram
- 2425 2. 4.1.2.1: wording changes
- 2426 3. 4.1.2.2: wording changes
- 2427 4. 4.1.4: Changes made to text and diagram to shown one proxy talking to
- 2428 multiple Cloud Imaging Services of the same or different types.
- 2429 5. Figure 4: Show one Proxy talking to multiple Cloud Imaging Services -
- 2430 6. 4.2.2, item 5: Clarified use of individual versus consolidated local services by
- 2431 proxy
- 2432 7. 4.2.2.3: Clarified use of error responses
- 2433 8. 4.2.2.9: Clarified Cloud refusal to attach Elements
- 2434 9. 4.2.2.11: Chaged deregister to not affect Cloud configuration to accept Proxy.
- 2435 10. 4.2.2.13. Response clarified
- 2436 11. 4.2.2.13/4.2.2.14: Modified UpdateActiveJobs response to return list of
- 2437 canalled or non-recognized job IDs and their updated states.
- 2438 12. 4.2.2.15: Eliminated GetCloudTerminatedJobs. Added GetServiceNotifications:
- 2439 13. Figure 5: Added a second set of GetServiceNotifications requests after the
- 2440 responses
- 2441 14. Figure 6: Drop GetCloudTerminatedJobs
- 2442 15. Figure 9: Drop GetCloudTerminatedJobs; Add GetJobElements operation

2443 13.20 Update 28 January 2014

- 2444 1. Major revision of Element and operation names and functions.

- 2445 2. GetSystemNotifications replaced with GetServiceNotifications to each Cloud
2446 Imaging Service.
2447 3. Sequence Diagrams updated
2448 4. Content added to Sections 5 and 10

2449 **13.21 Update 17 January 2014**

2450 Major changes in text including:

- 2451 1. General avoidance of term “device”
2452 2. Elimination of concept of registering services
2453 3. Adding GetTerminatedJobsStates operation
2454 4. Adjusting names of operations

2455 **13.22 Update 25 November**

2456 Address comments from 18 Nov conference call, including:

- 2457 1. Remove GetSystemNotification IdentifyDevice duration parameter and add
2458 Cancel action
2459 2. Provide Job Uuid and JobState in Job State Change value in
2460 GetSystemNotifications response rather than flag telling proxy to send an
2461 update Job State message
2462 3. Minor rewording and clarifications.

2463 **13.23 Update 15 November 2013**

2464 Address Oct F2F comments per <ftp://ftp.pwg.org/pub/pwg/cloud/white/Cloud-Model-Comments-OCT2013.pdf>
2465

2466 **13.1 Update 12 October**

- 2467 1. Address 30 September comments per Resolution of September 30
2468 comments.docx in <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/>
2469 2. Reversed order of Operations and Sequence in Section 4
2470 3. Added more flags to GetSystemNotifications response
2471 4. Changed response to UpdateJobState and UpdateDocumentState operations
2472 so that Cloud Service can inform Device of changed state
2473 5. Added more sequence Diagrams in Section 4

2474 **13.2 Update 26 August**

- 2475 1. Eliminated Copy Service/Copy Function Use Case
2476 2. Generated Registration discussion in accord with August F2F discussion

- 2477 3. Added IdentifyDevice, DeviceKeepAlive and RegisterSystemElements
2478 operations and discussion
2479 4. Outlined Sequence Diagram paras in Section 4 following August F2F
2480 discussion. Added sequence diagrams for Registration, Reboot and
2481 Synchronize and Simple Print transactions.
2482 5. Various minor editorial changes

2483 **13.3 Update 30 July**

- 2484 1. Put in correct Figure 1
2485 2. Changed figures in Section 4
2486 3. Changed intro to Section 4.
2487 4. Added considerations for Registration (to be replaced with selected approach)
2488 5. Added Breakout configurations in Section 4
2489 6. Added UpdateServiceElements and UpdateSystemElements operations,
2490 Deleted UpdateServiceState

2491 **13.4 Update 21 June 2013**

2492 Modifications according to June 17 Conference call, per notes in
2493 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20130617.pdf>

2494 **13.1 Update 12 June 2013**

- 2495 1. Major rework eliminating much text in section 3 to remove any reference as to
2496 how Use Cases are addressed.
2497 2. Revised terminology (e.g., Cloud Imaging Device Proxy) as decided at Can
2498 F2F
2499 3. added Operations paragraphs to Section 4.

2500 **13.2 Update 8 Can 2013**

2501 Sections 1 through 3 modified to satisfy comments from Cloud Conference Call,
2502 <ftp://ftp.pwg.org/pub/pwg/cloud/minutes/cloud-concall-minutes-20130429.pdf>

2503 **13.3 Update April 25, 2013**

2504 Sections 1 through 3.2.11 modified to reflect requested changes in previous Cloud Printing
2505 Model document, and Cloud Imaging Service approach.

2506 **13.4 Initial Revision: February 6, 2013**