1.1.1 Cloud Print Manager to Cloud Print Service Operations

In a traditional printing model, operations are initiated by the agent forwarding the print request; i.e., the Client sends requests to a Service and the Service may send requests to a subordinate Service, such as one in a Device. However, in this Cloud Printing Model, it is likely that a Cloud Print Service is isolated from the Cloud Print Manager by a firewall and cannot initiate requests. Therefore, the following operations are used by the Cloud Print Manager to get Print Job information from and provide Device and Job status to the Cloud Print Service.

The following characteristics of the model must be observed in understanding these operation descriptions.

- All Operations are in a request/response form with the request sent by the Cloud Print Manager and the response sent by the Cloud Print Service. The protocol used must assure correlation of request to response. The content of requests and responses will typically be reversed compared to analogous operations in a traditional printing model.
- A Cloud Print Manager can interface with multiple Cloud Print Services.
- A Cloud Print Service can interface with no more than one Cloud Print Manager.
- The protocols used by the Cloud Print Manager in initiating requests to the Cloud Print Service must provide for the identification and authentication of the Cloud Print Manager, as well supporting security requirements appropriate to the use of the Cloud Printing facility.
- Some Cloud Print Managers can front-end multiple Printers. However, the Cloud Print Manager reports Capabilities and status values which are an intersection or union of capabilities and status of the devices it feeds. The Cloud Print Service will have no knowledge of the individual devices. If the Cloud Print Manager handles multiple Printers, it is up to the Cloud Print Manager to schedule Jobs and map Jobs to Printers

❖ **GetFetchablePrintJobs**. GetFetchablePrintJobs is a request for the list of jobs ready to be fetched by the Cloud Print Manager. The Cloud Print Manager will use the response to this request to identify the requested Jobs in its subsequent FetchPrintJob request.

The operation can accommodate job scheduling at either the Cloud Print Service or the Cloud Print Manager. When the Cloud Print Service is handling job scheduling, the Cloud Print Server will return a list containing at most a single Job. The Job is identified by its JobUuid in the Cloud Print Server. If the Cloud Print Manager (or the Printer) does job scheduling, the Cloud Print Service response is a list of fetchable jobs including a job summary element group (i.e., job summary collection in IPP) and a minimal set of information useful for scheduling (e.g., Finishings, Media, PrintColorModeType, Sides), in addition to the JobUuids.

When the Cloud Print Manager is registered, the registration information will determine whether the Cloud Print Manager or the Cloud Print Service is to do Job scheduling.

❖ **FetchPrintJob.** Once the Cloud Print Manager has received a response to a GetFetchablePrintJobs request indicating that there are one or more Jobs waiting, it sends a FetchPrintJob request to the Cloud Print Server. This request includes the Cloud Print Manager Job Uuids reported in the GetFetchablePrintJobs response which correspond to the Jobs the Print Manager wishes to receive.

Comment [BL1]: This was documented decision from December F2F. It simplifies things and I am unsure that it significantly limits capabilities.

The FetchPrintJob response is analogous to the request portion of CreatePrintJob. This response includes the operational attributes of the Job request (e.g., RequestingUserName, JobPassword) as well as the Job's PrintJobTicket information. It does not include either the document data or a reference to document data; the Cloud Print Manager must issue a FetchPrintDocument message to get this data.

❖ **AcknowledgePrintJob.** The AcknowledgePrintJob operation is analogous to the CreatePrintJob response in a traditional printing model. This operation identifies the Job by the Cloud Print Service Uuid and correlates this to the newly created Job's Printer JobUuid and Job State along with any UnsupportedElements. If the Job request is rejected, this status along with appropriate reason information is communicated.

The Cloud Print Service response to this message returns the state of the subject Print Job in the Cloud Print Service. This response serves to confirm that the Acknowledge Print Job message was received, as well as to inform the Cloud Print Manager of any externally prompted state change (e.g., a Client Job Cancel) or to inform the Cloud Print Manager of some error or inconsistency in the message (e.g., reference to a non-existent or not available job.)

❖ **FetchPrintDocument.** After the Printer has created the job, it will eventually need specific Document information. The Cloud Print Manager FetchPrintDocument operation retrieves the Document or Document Data reference along with operational elements. The request must include the Job and Document identification corresponding to the information received in response to the Get Fetchable Print Jobs operation.

The FetchPrintDocument response is analogous to the request portion of the SendPrintDocument or SendPrintUri operation. This response includes the operational attributes (e.g., RequestingUserName, JobPassword) as well as the Document's content (i.e., the Document Data itself or a reference to it) for the requested document. If supported, a DocumentTicket can also be passed.

❖ **AcknowledgePrintDocument:** The AcknowledgePrintDocument operation is sent by the Cloud Print Manager after the response to the FetchPrintDocument has been received. The operation is analogous to the SendPrintDocument or SendPrintUri response in a traditional printing model. This operation identifies the newly created Printer DocumentUuid and State along with any UnsupportedElements, if applicable.

The CloudPrintService response to this message returns the state of the subject Document in the Cloud Print Service. This response serves to confirm that the Acknowledge Print Document message was received, as well as to inform the Cloud Print Manager of any externally prompted state change (e.g., a Client Job Cancel) or to inform the Cloud Print Manager of some error or inconsistency in the message (e.g., reference to a non-existent or not available document.)

❖ **UpdatePrintServiceState.** The Cloud Print Manager sends a message reporting its current state whenever its state changes, along with state message and reasons. The state of the Cloud Print Manager considers both its condition and the state of the Printer(s) with which it interfaces. The operation includes a sparsely populated object of the appropriate type. For example if the

configuration of an interfaced Printer changes in a way to affect the composite Cloud Print Manager state, then the UpdatePrinterState request would contain only the relevant portions of the composite PrintServiceConfiguration. If media were added, removed or changed in an input tray, the InputTrays element group would be returned. The state that the Cloud Print Service reports to the Client will usually reflect this Cloud Print Manager state.

The Cloud Print Service response is primarily an acknowledgment of message receipt, but optionally may include the revised state of the Cloud Print Service.

❖ **UpdatePrintJobState.** The Cloud Print Manager sends a message reporting the current state of an identified Print Job whenever that state of that Job changes, along with state message and reasons. The Job state in the Cloud Print Manager considers the state of the Job in the Printer to which it was directed. The operation includes a sparsely populated object of the appropriate type. For example, if the Printer completes a Job, the UpdateJobState request would contain the elements in PrintJobStatus that have been changed and a final version of the PrintJobReceipt. The state that the Cloud Print Service reports to the Client will usually reflect this Cloud Print Manager reported state.

The Cloud Print Service response is primarily an acknowledgment of message receipt, but optionally may include the revised state of the subject Job in the Cloud Print Service.

❖ **UpdatePrintDocumentState:** The Cloud Print Manager may send a message reporting the current state of a identified Print Document whenever that state of that Document changes, along with state message and reasons. The Document state in the Cloud Print Manager considers the state of the corresponding Job and Document in the Printer to which the Job was directed. In some cases, as when the Cloud Print Manager is doing acquisition of referenced Document Data or preprocessing, Document state may be determined by the Cloud Print Manager rather than the servicing Printer. The state that the Cloud Print Service reports to the Client will usually reflect this Cloud Print Manager reported state.

The Cloud Print Service response is primarily an acknowledgment of message receipt, but optionally may include the revised state of the subject Document in the Cloud Print Service.

❖ **UpdateFetchableJobs.** The Cloud Print Service relies upon the AcknowledgePrintJob and UpdatePrintJobState messages from the Cloud Print Manager to follow the state of each Job, and uses this information to synchronize its state for that Job, which is what is communicated to the Client. If the communication from the Cloud Print Manager is disrupted, or if the Cloud Print Manager is reset, this synchronism is lost. The UpdateFetchableJobs message must be sent by the Cloud Print Manager when it senses that communication with the Cloud Print Server has been restored after a disruption, after any hard reset, and after power-up initialization. It allows the Cloud Print Server to resynchronize itself with respect to which of the jobs it has made available to the Cloud Print Manager have been accepted by the Cloud Print Manager and with the states of those Jobs.

The UpdateFetchableJobs message includes a list of Jobs that the Cloud Print Manager has fetched and has acknowledged or has intended to acknowledge, along with their current states. Jobs are

identified by their Cloud Print Service Uuid (i.e., the same way that they were identified in the GetFetchablePrintJobs response).

On receiving the message, the Cloud Print Service moves any jobs it believes have been fetched but are not in the list provided by the Cloud Print Manager to the fetchable job list, and readjusts the state of all Jobs listed in the UpdateFetchableJobs message. The response to this message is a simple message received acknowledge.

How deep into job history should the CPM go with this list?