MEF 133

Allegro, Interlude and Legato Fault Management and Performance Monitoring BR&UC

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1 List of Contributing Members

The following members of the MEF participated in the development of this document and have requested to be included in this list.

- Lumen Technologies
- Spirent
- Nokia
- Amartus
- NEC/Netcracker
- Verizon

2 Abstract

This document defines the Business Requirements and Use Cases to support Performance Monitoring at the Allegro, Interlude and Legato Interface Reference Points (IRPs). The requirements and use cases contained in this document support Service Performance and Fault Management. Information contained within this specification will be utilized by both the Buyer/Client and Seller/Server/Seller/Server for the development of a suite of automated APIs based interaction.

3 Terminology and Abbreviations

This section defines the terms used in this document. In many cases, the normative definitions to terms are found in other documents. In these cases, the third column is used to provide the reference that is controlling, in other MEF or external documents.

Term	Definition	Reference
API	Application Programming Interface	MEF 55.1 [6]

Table 1-Abbreviations

Term	Definition	Reference
Application Programming Interface	In the context of LSO, API describes one of the Management Interface Reference Points based on the requirements specified in an Interface Profile, along with a data model, the protocol that defines operations on the data and the encoding format used to encode data according to the data model.	MEF 55.1 [6]
CLEAR-TCA Window Threshold	The number of PM Metric Calculation Intervals, within the TCA Window Size, for which the PM Metric Value must be below the TCA Performance Threshold to generate a CLEAR-TCA, when using Stateful TCA Reporting.	MEF W105 [7]

Term	Definition	Reference
On-Demand	FM/PM Job actions that are initiated for a limited time to carry out the FM/PM Job or measurements.	This document.
Passive	FM/PM Job action to support the collection and reporting of network and service statistics. The statistics collections include but are not limited to telemetry associated with an interface, (Net/Application) Flow, VLAN, bridging/Ethernet, IP, TCP, UDP layers.	This document.
PM Metric	A metric that is measured or calculated as a part of Performance Monitoring.	MEF W105 [7]
Proactive	FM/PM Job actions that are carried on continuously to permit timely reporting of fault and/or performance status.	This document.
SET-TCA Window Threshold	The number of PM Metric Calculation Intervals, within the TCA Window Size, for which the PM Metric Value must be at or above the TCA Performance Threshold to generate a SET TCA, when using Stateful TCA Reporting.	MEF W105 [7]
Stateless TCA	The stateless TCA reporting treats each Measurement Interval separately. When using stateless TCA reporting, each TCA Function has a single configured threshold. As soon as the threshold is reached or crossed in a Measurement Interval for a given performance metric, a TCA is generated. A TCA reporting mechanism whereby TCAs are generated whenever an alert condition is detected.	MEF 35.1 [4] MEF W105 [7]
Stateful TCA	The stateful TCA reporting is another option for how TCAs are generated, that can reduce the total number of TCAs. The intent is to provide a notification when a degradation is first encountered, followed by another when the problem is resolved. A TCA reporting mechanism whereby a SET-TCA is generated when an alert condition begins, and a CLEAR-TCA is generated when it ends.	MEF 35.1 [4] MEF W105 [7]
TCA Performance Threshold	The PM Metric Value that is compared against, for each PM Metric Calculation Interval, when determining whether to generate a TCA.	MEF W105 [7]
Use Case	A Use Case within a UML represents one a system's behavior based on stimuli from an external source (i.e., an actor). A system may have several Use Cases that define all its behavior.	OMG [8]

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Table 2-Terminology

4   Compliance Levels

The key words **"MUST"**, **"MUST NOT"**, **"REQUIRED"**, **"SHALL"**, **"SHALL NOT"**, **"SHOULD"**, **"SHOULD NOT"**, **"RECOMMENDED"**, **"NOT RECOMMENDED"**, **"MAY"**, and **"OPTIONAL"** in this document are to be interpreted as described in BCP 14 (RFC 2119 [1], RFC 8174 [2]) when, and only when, they appear in all capitals, as shown here. All key words must be in bold text.

Items that are **REQUIRED** (contain the words **MUST** or **MUST NOT**) are labeled as **[Rx]** for required. Items that are **RECOMMENDED** (contain the words **SHOULD** or **SHOULD NOT**) are labeled as **[Dx]** for desirable. Items that are **OPTIONAL** (contain the words **MAY** or **OPTIONAL**) are labeled as **[Ox]** for optional**.**

A paragraph preceded by **[CRa]<** specifies a conditional mandatory requirement that **MUST** be followed if the condition(s) following the "<" have been met. For example, "**[CR1] <** [D38]" indicates that Conditional Mandatory Requirement 1 must be followed if Desirable Requirement 38 has been met. A paragraph preceded by **[CDb]<** specifies a Conditional Desirable Requirement that **SHOULD** be followed if the condition(s) following the "<" have been met. A paragraph preceded by **[COc]<** specifies a Conditional Optional Requirement that **MAY** be followed if the condition(s) following the "<" have been met.

5   Numerical Prefix Conventions

This document uses the prefix notation to indicate multiplier values as shown in Table 3.

Decimal		Binary	
Symbol	**Value**	**Symbol**	**Value**
k	10^3	Ki	2^{10}
M	10^6	Mi	2^{20}
G	10^9	Gi	2^{30}
T	10^{12}	Ti	2^{40}
P	10^{15}	Pi	2^{50}
E	10^{18}	Ei	2^{60}
Z	10^{21}	Zi	2^{70}
Y	10^{24}	Yi	2^{80}

Table 3-Numerical Prefix Conventions

6   Scope

This specification defines the process in multiple functional areas at the Allegro, Interlude and Legato Interface Reference Points (IRPs). The use cases detailed in this document are intended to support all network services including, but not limited to Carrier Ethernet, IP/IPVPN, SD-WAN and L1CS.

The scope of the project for the initial release is the ability for Seller/Server system to perform the lifecycle management operations in each of the functional areas specified above. The following Use Case categories are included in the scope of this specification:

- Fault Management

- Performance Monitoring Profile Management

- Performance Monitoring Jobs, Notifications and Collection

- Passive Real-time and Historical Statistics Collection

- Threshold Crossing Alert Profile Management

- Threshold Crossing Alert Jobs, Notifications, Alerts (Alarms)

- Alarm Management

- Streaming Management

7   Introduction

The requirements and use cases are the same for the Allegro, Interlude and Legato Interface Reference Point (IRPs). There are no differences identified within this document between them. The requirements and Use Cases within this document will be used to develop an API specification and Developer's Guide.

NOTE: The use cases and business requirements in this document assume a two-actor relationship based on the set of actors in the LSO architecture. The names of the relationship are specific to the Interface Reference Point. For both Allegro and Interlude there is a Buyer and Seller. For Allegro the Buyer is the Customer and the Seller is the Service Provider. For Interlude the Buyer is the Service Provider and the Seller is the Partner. In the case of the Legato IRP, given this is within a single Service Provider or Partner, the relationship is Client and Seller/Server, where the Business Application (BA) is the Client, and the Service Orchestration Functionality (SOF) is the Seller/Server.

These Use Cases are intended to allow the Buyer/Client to perform tasks related to SOAM including receiving alarms and warnings, creating on-demand and proactive PM Jobs, retrieving PM results for the PM Jobs, and receiving notifications when PM results are available.

Fault Management

- Fault Job
  - Buyer/Client requested Fault Job.
- Fault Notifications
  - Fault (Alarms and TCAs) Notifications.
  - Buyer/Client Subscription to Fault Job Notifications.
  - Seller/Server generation of Fault Job Notifications.
- Fault Management Results
  - Buyer/Client retrieves FM Job results in one of two formats as indicated in the request.
  - Results are in the API.
  - Results are in a referenced file.
  - Buyer/Client retrieves a list of Fault Management Jobs that have results using filter criteria.

Performance Monitoring

- Performance Monitoring Profiles

370   o   Buyer/Client requests Performance Monitoring Profile creation, modification, and
371   deletion.

372   o   Seller/Server notifies the Buyer/Client when Performance Monitoring Profile
373   changes occur.

374   •   On-Demand Performance Monitoring

375   o   Buyer/Client requests On-Demand Performance Monitoring Job for a given service
376   including all attributes of the Job.

377   o   Seller/Server notifies the Buyer/Client when results of the PM Job are ready.

378   o   Buyer/Client retrieves a list of Performance Monitoring Jobs.

379   o   Buyer/Client retrieves a Performance Monitoring Job by Performance Monitoring
380   Job ID.

381   •   Proactive Performance Monitoring

382   o   Buyer/Client requests a Proactive Performance Monitoring Job for a given service
383   including all attributes of the Job.

384   o   Seller/Server notifies Buyer/Client when results of the Performance Monitoring Job
385   are ready.

386   o   Buyer/Client retrieves a list of Performance Monitoring Jobs.

387   o   Buyer/Client retrieves a Performance Monitoring Job by Performance Monitoring
388   Job ID.

389   •   Passive Real-time and Historical Statistics Monitoring

390   o   Buyer/Client requests a Passive Real-time/Historical Statistics Monitoring Job for
391   a given service including all attributes of the Job.

392   o   Seller/Server notifies Buyer/Client when results of the Passive Monitoring Statis-
393   tics Collection is ready.

394   o   Buyer/Client modifies/deletes a Passive Statistics Monitoring Job.

395   o   Buyer/Client retrieves a Passive Statistics Monitoring Job collection.

396   •   Performance Monitoring Job Notifications

397   o   Buyer/Client subscription to PM Job Notifications.

398   o   Seller/Server generation of PM Job Notifications.

399 • Performance Monitoring Results

400 o Buyer/Client retrieves PM Job results in one of two formats as indicated in the re-
401 quest.

402 o Results are in the API.

403 o Results are in a referenced file.

404 o Buyer/Client retrieves a list of Performance Monitoring Jobs that have results using
405 filter criteria.

406 o Buyer/Client retrieves results from multiple PM Jobs with a single request.

407 o Buyer/Client subscribes to streaming Performance Monitoring.

408 o Buyer/Client receives streaming Performance Monitoring results where
409 Seller/Server sends results to one or more target addresses.

410 8   Use Cases Summary

411 The following section provides a use case summary with use case name, use case description and
412 corresponding reference section where detailed use case procedures are provided.

413

UC #	Use Case Name	Use Case Description	Reference Section
Fault Management Use Cases			
1	Create FM Job	A request is initiated by the Buyer/Client to perform a FM Job on a Service.	9.1.1
2	Modify FM Job	A request is initiated by the Buyer/Client to modify a FM Job on a Service.	9.1.2
3	Delete FM Job	A request is initiated by the Buyer/Client to delete an existing FM Job on a Service.	9.1.3
4	Suspend FM Job	A request is initiated by the Buyer/Client to suspend an existing FM Job on a Service.	9.1.4
5	Resume FM Job	A request is initiated by the Buyer/Client to resume a suspended existing FM Job on a Service.	9.1.5
6	Subscribe to FM Job Notifications	A request is initiated by the Buyer/Client to resume a suspended existing FM Job on a Service.	9.1.6
7	Generation of FM Job Notifications	The Seller/Server generates and sends FM Job Notifications to subscribed Buyer/Client.	9.1.7
8	Unsubscribe from FM Job Notifications	A request is initiated by the Buyer/Client to unsubscribe from FM Job Notifications.	9.1.8
9	Collect Fault Management Report	A request initiated by the Buyer/Client to the Seller/Server to collect a Fault Measurement Report.	9.1.9

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	Performance Monitoring Profiles Use Cases		
10	Create Performance Monitoring Profile	A request initiated by the Buyer/Client to the Seller/Server to create a PM Profile.	10.1.1
11	Retrieve PM Profile List	A request initiated by the Buyer/Client to the Seller/Server to retrieve a list of PM Profiles.	10.1.2
12	Retrieve PM Profile	A request initiated by the Buyer/Client to the Seller/Server to retrieve a PM Profile.	10.1.3
13	Modify PM Profile	A request initiated by the Buyer/Client to the Seller/Server to modify a PM Profile.	10.1.4
14	Delete PM Profile	A request initiated by the Buyer/Client to the Seller/Server to delete a PM Profile.	10.1.5
15	Subscribe to PM Profile Notifications	A request initiated by the Client to the Seller/Server to subscribe to PM Profile Notifications.	10.1.6
16	PM Profile Notification	A PM Profile Notification is initiated by the Seller/Server to a subscribed Buyer/Client.	10.1.7
17	Unsubscribe from PM Profile Notifications	A request initiated by the Buyer/Client to unsubscribe from PM Profile Notifications.	10.1.8
	Performance Monitoring Job, Collection and Notification Use Cases		
18	Create PM Job	A request initiated by the Buyer/Client to create a PM Job.	10.2.1
19	Modify PM Job	A request initiated by the Client to the Seller/Server to modify a PM Job.	10.2.2
20	Delete PM Job	A request initiated by the Client to the Seller/Server to delete a PM Job.	10.2.3
21	Suspend PM Job	A request initiated by the Client to the Seller/Server to suspend a PM Job.	10.2.4

	Performance Monitoring Job, Collection and Notification Use Cases		
22	Resume PM Job	A request initiated by the Client to the Seller/Server to resume a PM Job.	10.2.5
23	Retrieve PM Job List	A request initiated by the Buyer/Client to retrieve a PM Job List based on a filtered criterion.	10.2.6
24	Retrieve PM Job by ID	A request initiated by the Buyer/Client to retrieve a PM Job based on a unique identifier, ID.	10.2.7
25	Subscribe to PM Job/Collection Notifications	A request initiated by the Buyer/Client to unsubscribe from PM Job/Collection Notifications.	10.2.8
26	Unsubscribe from PM Job/Collection Notifications	A request initiated by the Buyer/Client to unsubscribe from PM Job/Collection Notifications.	10.2.9
27	PM Job/Collection Notification	A PM Job/Collection Notifications is initiated by the Seller/Server to a subscribed Buyer/Client.	10.2.10
28	Collect Performance Management Report	A request initiated by the Buyer/Client to the Seller/Server to collect a Performance Measurement Report.	10.2.11
	Threshold Crossing Alert Profile Management Use Cases		
29	Create TCA Profile	A request is initiated by the Administrator (Client) to create a TCA Profile.	11.1.1
30	Modify TCA Profile	A request is initiated by the Administrator (Client) to modify a TCA Profile.	11.1.2
31	Delete TCA Profile	A request is initiated by the Administrator (Client) to delete a TCA Profile.	11.1.3
32	Retrieve List of TCA Profiles	A request is initiated by the Administrator (Client) to retrieve a list of TCA Profiles.	11.1.4

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		Threshold Crossing Alert Profile Management Use Cases	
33	Retrieve TCA Profile by Identifier	A request is initiated by the Administrator (Client) to retrieve a TCA Profile.	11.1.5
34	Subscribe TCA Notifications	A request is initiated by the Client to the Seller/Server to subscriber to TCA Profile Notifications.	11.1.6
35	Unsubscribe TCA Notifications	A request initiated by the Client to unsubscribe from TCA Profile Notifications.	11.1.7
36	Stateful TCA Notifications	A TCA Profile lifecycle Notification is initiated by the Seller/Server to a subscribed Client.	11.1.8
37	Stateless TCA Notifications	A TCA Profile lifecycle Notification is initiated by the Seller/Server to a subscribed Client.	11.1.9
		Streaming Use Cases and PM Results	
38	Retrieve Topic by Identifier	A request is initiated by the Buyer/Client to retrieve a Topic that match the provided filter criteria.	12.2.1
39	Retrieve Available Topic List	A request is initiated by the Buyer/Client (Subscriber) to retrieve a Topic list.	12.2.2
40	Retrieve Subscribed Topic List	A request is initiated by the Buyer/Client (Subscriber) to retrieve a Topic list which the Subscriber is currently subscribed.	12.2.3
41	Subscribe to Topic	A request is initiated by the Buyer/Client (Subscriber) subscribe to a Topic.	12.2.4

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	Streaming Use Cases and PM Results		
42	Unsubscribe from a Topic	A request is initiated by the Buyer/Client (Subscriber) to unsubscribe from a Topic.	12.2.5
43	Publish Topic Message	A Seller/Server (Publisher) publishes a Topic/Message to Buyers/Sellers (Subscriber(s)).	12.2.6
44	Retrieve Topic/Messages	A Buyer/Client retrieves the Topic/Message that it is subscribed to.	12.2.7
	Passive Real-time/Historical Statistics Collection Use Cases		
45	Create Statistics Collection Job	A request initiated by the Buyer/Client to create a Statistics Collection Job.	13.2.1
46	Modify Statistics Collection Job	A request initiated by the Client to the Seller/Server to modify a Statistics Collection Job.	13.2.2
47	Delete Statistics Collection Job	A request initiated by the Client to the Seller/Server to delete a Statistics Collection Job.	13.2.3
48	Collect Statistics Collection Report	Collect Statistics Collection Report	13.2.4
	Alarm Management Use Cases		
49	Create Alarm	A request is made by Seller/Server to create an Alarm based on an event.	14.2.1
50	Modify Alarm	A request is made by Seller/Server to modify an Alarm based on event condition change and communicates to Buyer(s)/Client(s).	14.2.2
50	Delete Alarm	A request initiated by the Seller/Server to delete an Alarm.	14.2.3
51	Generate Alarm	The Seller/Server generates an Alarm.	14.2.4

417

Alarm Management Use Cases			
52	Acknowledge Alarm	A request is initiated by the Buyer/Client to Acknowledge an Alarm.	14.2.5
53	Clear Alarm	A request is initiated by the Buyer/Client to Clear an Alarm.	14.2.6

418

Table 4-Use Case Summary

419 # 9 Fault Management Use Cases

420 This section provides a comprehensive set of Use Cases needed to support Fault Management Job.
421 These Use Cases are based on business process standards of interactivity between Client and
422 Seller/Server.

423 ## 9.1 FM Job

424 The Buyer/Client can request that the Seller/Server perform FM Job on a Service. Examples of
425 FM Job are Link Trace or Loopback using FM protocols. The following sub-section defines use
426 cases for the Fault Management Job. Included are the ability for a client to initiate a Fault Man-
427 agement test and retrieve the results of the test. The use cases also provide the ability for the Client
428 to subscribe and unsubscribe to Fault Management Job. Examples of FM Job are Link Trace or
429 Loopback using FM protocols.

430
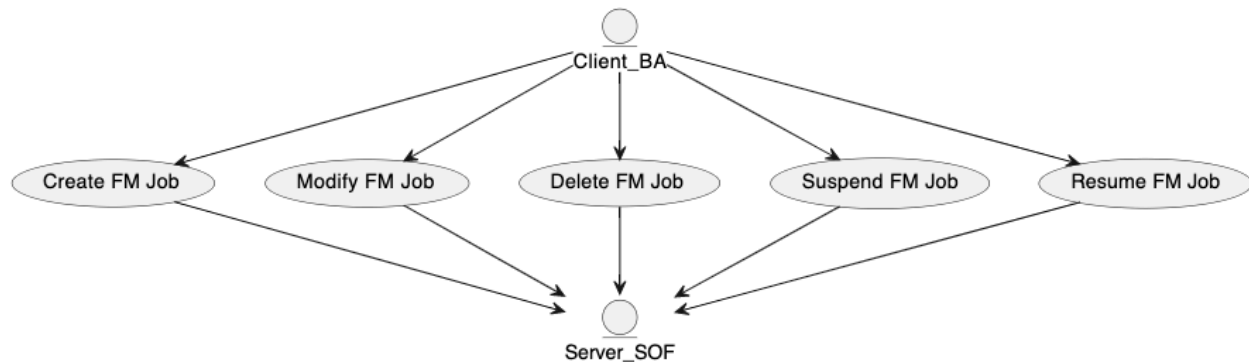
Figure 1-Fault Management Job Use Cases
431

432
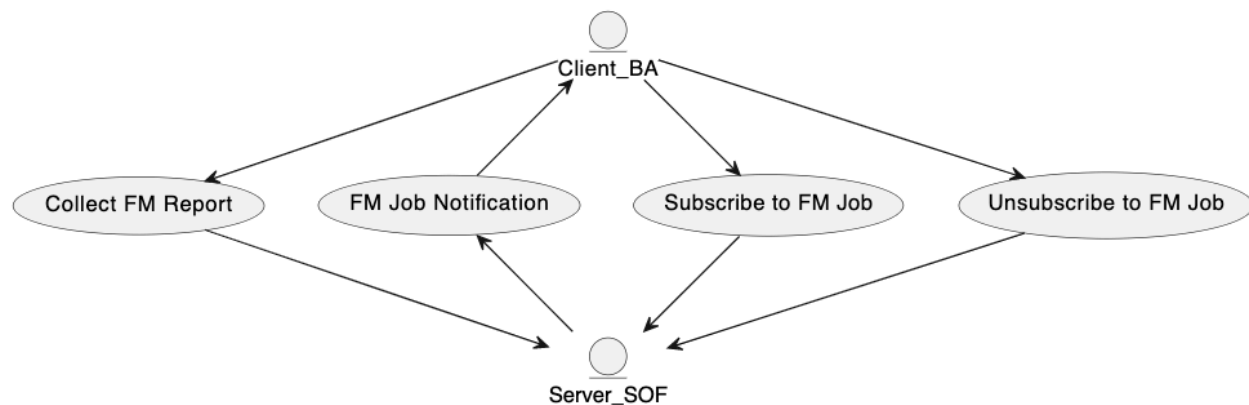
Figure 2-Fault Management Job Notification and Collection Use Cases
433

434 ### 9.1.1 Create FM Job Use Case

Field	Description
Use Case Number	1
Use Case Name	Create FM Job
Description	A request is initiated by the Buyer/Client to perform a FM Job on a Service.

Field	Description
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to request a FM Job on a Service in the Seller/Server system.
Process Steps	1. The Buyer/Client creates a FM Job request using the attributes show in Table FM Job Attribute. **[R1]** The Buyer/Client's Create FM Job request **MUST** contain the following attributes: • Creation Time • Output Format • Granularity • Instance Criteria ○ Specifies a list of individuals monitored instances (typed as object names). • Service Payload Specific Attributes **[O1]** The Buyer/Client's Create FM Job request **MAY** contain the following attributes: • Description • FM Job Priority • Schedule Definition 2. The Seller/Server responds with an acknowledgement and notifies the Buyer/Client when results are available. **[R2]** The Seller's/Server's response **MUST** echo back all Buyer/Client provided attributes. **[R3]** The Seller's/Server's response **MUST** include the FM Job Identifier. **[R4]** The FM Job Identifier supplied by the Seller/Server **MUST** be unique within the Seller/Server's network. **[R5]** The Seller's/Server's response **MUST** echo back all Client provided attributes. **[R6]** The Seller's/Server's response **MUST** include the FM Job Identifier.

Field	Description
Post-Conditions	1. The Buyer/Client receives a Response, including a FM Job. 2. The Seller/Server initiates a FM Job. 3. If the Seller/Server supports notifications and the Buyer/Client has registered for notifications, the Seller/Server notifies the Buyer/Client of commitment to provide the request. 4. The Seller/Server notifies the Buyer/Client when Job results are available. **[R7]** If the Buyer/Client registered for FM Notifications, the Seller/Server **MUST** notify the Buyer/Client when FM Job results are available.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while constructing and persistently storing the FM Job.

435 **Table 5-Create FM Job Use Case**

Attribute Name	Description	Value	Comments
Description	A textual description of the FM Job	String	Set by Buyer/Client
Creation Time	Time the Job is started	String	Set by Buyer/Client
FM Job Identifier	The identifier of the management Job.	String	Set by the Seller/Server
FM Job Priority	The priority of the management Job. The way the management application will use the Job priority to schedule Job execution is application specific and out the scope.	Integer	Set by the Buyer/Client The priority is on a 1-10 scale with 1 being highest priority and 10 being lowest priority
Last Time Modified	The last time a FM Job was modified.	Date-Time	Set by Seller/Server
Output Format	The format of the output report	One of the following: *JSON XML AVRO CSV*	Set by Buyer/Client
Producing Application Identifier	The identifier of the application that produces fault indicators.	String	Set by Buyer/Client
Service Payload Specific Attributes	Attributes that are obtained from the applicable Service definition		Set by Buyer/Client
Granularity	The sampling rate of the collection of fault indicators.	String One of the following:	Set by Buyer/Client

		10 milli-seconds, 100 milli-seconds, 1 second, 10 second 1 minute 5 minutes 15 minutes 30 minutes, 1 hour 24 hours 1 month 1 year Not Applicable	
Instance Criteria	List of instances.	String	Set by Buyer/Client
Reporting Period	The time-period for the report.	One of the following: *10 milli-seconds 100 milli-seconds 1 second 10 seconds 1 minute 5 minutes 15 minutes 30 minutes 1 hour 24 hours 1 month 1 year Not Applicable*	
Schedule Definition	The definition of schedule attributes	See below	

	Recurring Frequency	A recurring frequency to run a Job that is included in schedule definition	One of the following: *10 milliseconds 100 milliseconds 1 second 10 second 1 minute 5 minutes 15 minutes 30 minutes 1 hour 24 hours 1 month 1 year*	
	Schedule Definition Start Time	The start time of the Schedule Definition.	Date-Time	
	Schedule Definition End Time	The end time of the Schedule Definition	Date-Time	
State	State of FM Job.		See Table 79-Fault Management Job States	
Tracking Record	A list of tracking records. Tracking records allow the tracking of modifications on the problem. The tracking records should not be embedded in the problem to allow retrieving the problem without the tracking records.			

436

Table 6-FM Job Attributes

437 **9.1.2   Modify FM Job Use Case**

Field	Description
Use Case Number	2
Use Case Name	Modify FM Job
Description	A request is initiated by the Buyer/Client to modify a FM Job on a Service.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request a modification to an existing FM Job on a Service in the Seller/Server system.
Process Steps	1. Buyer/Client creates a Modify FM Job request that includes the FM Job Identifier and the attributes to modify. **[R8]** The Buyer's/Client's Modify FM Job request **MUST** include the FM Job Identifier. **[R9]** The Buyer's/Client's Modify FM Job request **MUST** contain one or more of the following attributes: • Output Format • Granularity • Instance Criteria • Description • FM Job Priority • Schedule Definition • Service Payload Specific Attributes 2. The Seller/Server responds to the Modify FM Job request and if accepted updates the attribute(s). **[R10]** The Seller's/Server's response to the Buyer's/Client's Modify FM Job request **MUST** echo back the attributes in the Client's request. **[R11]** The Seller's/Server's response to the Buyer's/Client's Modify FM Job request **MUST** indicate if the request has been accepted or rejected.
Post-Conditions	1. The Buyer/Client receives a FM Job response with attributes that have been modified. 2. The FM Job is modified with requested attributes changes. 3. If the Seller/Server supports notifications and the Buyer/Client has registered for notifications, the Seller/Server notifies the Buyer/Client of commitment to provide the request.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response. 2. If the modification request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

438   **Table 7-Modify FM Job Use Case**

439   **9.1.3   Delete FM Job Use Case**

Field	Description
Use Case Number	3
Use Case Name	Delete FM Job
Description	A request is initiated by the Buyer/Client to delete an existing FM Job on a Service.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to request a deletion of an existing FM Job on a Service in the Seller/Server system.
Process Steps	1. The Buyer/Client creates a Delete FM Job request that includes the FM Job Identifier. **[R12]** The Buyer's/Client's Delete FM Job request **MUST** include the FM Job Identifier. 2. The Seller/Server acknowledges the Buyer's/Client's Delete FM Job request and indicates if the request has been accepted or declined in their response. **[R13]** The Seller's/Server's response to the Buyer's/Client's Delete FM Job request **MUST** indicate if the request is Accepted or Declined. **[R14]** If the Seller/Server accepts the Buyer's/Client's Delete FM Job request, the Job **MUST** stop. **[R15]** If the Seller/Server declines the Client's Delete FM Job request, the Job **MUST NOT** stop. **[R16]** If the Seller/Server declines the Client's Delete FM Job request, they **MUST** provide a reason the request was declined.
Post-Conditions	1. The Buyer/Client receives a confirmation that the FM Job has been deleted. 2. All resources on the Seller/Server side associated with the FM Job are deleted. 3. All measurement results generated prior to deletion remain available for collection.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

440   **Table 8-Delete FM Job Use Case**

441 **9.1.4   Suspend FM Job Use Case**

Field	Description
Use Case Number	4
Use Case Name	Suspend FM Job
Description	A request is initiated by the Buyer/Client to suspend an existing FM Job on a Service.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request a suspension of an existing FM Job on a Service in the Seller/Server system. 2. An existing FM Job is running on an existing Service.
Process Steps	1. The Client creates a Suspend FM Job request that includes the FM Job Identifier. **[R17]** The Client's Suspend FM Job request **MUST** include the Job Identifier. **[R18]** The FM Job **MUST** be in the In-Progress state. 2. The Seller/Server acknowledges the Client's Suspend FM Job request and indicates if the request has been accepted or declined in their response. **[R19]** The Seller/Server's response to the Client's Suspend FM Job request **MUST** indicate if the request is Accepted or Declined. **[R20]** If the Seller/Server accepts the Client's Suspend FM Job request, the Job **MUST** be suspended. **[R21]** If the Seller/Server declines the Client's Suspend FM Job request, the Job **MUST NOT** be suspended. **[R22]** If the Seller/Server declines the Client's Suspend FM Job request, they **MUST** provide a reason the request was declined.
Post-Conditions	1. If the Seller/Server encounters errors, they should return an error with explanation to the Client. 2. If the Client is subscribed to FM Job Notifications the Seller/Server transmits a Notification.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response. 2. If the suspended request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

442   **Table 9-Suspend FM Job Use Case**

443   **9.1.5   Resume FM Job Use Case**

Field	Description
Use Case Number	5
Use Case Name	Resume FM Job
Description	A request is initiated by the Buyer/Client to resume a suspended existing FM Job on a Service.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request a resumption of an existing FM Job on a Service in the Seller/Server system. 2. An existing FM Job is in a Suspended state on an existing Service.
Process Steps	1. The Client creates a Resume FM Job request that includes the FM Job Identifier. **[R23]**　The Client's Resume FM Job request **MUST** include the Job Identifier. **[R24]**　The FM Job **MUST** be in the Suspended state. 2. The Seller/Server acknowledges the Client's Resume FM Job request and indicates if the request has been accepted or declined in their response. **[R25]**　The Seller/Server's response to the Client's Resume FM Job request **MUST** indicate if the request is Accepted or Declined. **[R26]**　If the Seller/Server accepts the Client's Resume FM Job request, the Job **MUST** be resumed and return to the In-Progress state. **[R27]**　If the Seller/Server declines the Client's Resume FM Job request, the Job **MUST NOT** be resumed. **[R28]**　If the Seller/Server declines the Client's Resume FM Job request, they **MUST** provide a reason the request was declined.
Post-Conditions	1. If the Seller/Server encounters errors, they should return an error with explanation to the Client. 2. If the Client is subscribed to FM Job Notifications the Seller/Server transmits a Notification.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response. 2. If the deletion request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

444   **Table 10-Resume FM Job Use Case**

445   **9.1.6   Subscribe to FM Job Notifications Use Case**

Field	Description
Use Case Number	6
Use Case Name	Subscribe to FM Job Notifications
Description	A request is initiated by the Buyer/Client to subscribe to FM Job Notifications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to subscribe to FM Job/Collection Notifications in the Seller/Server system. 2. The Seller/Server support FM Job/Collection Notifications.
Process Steps	1. The Client subscribes to FM Job Notifications by specifying the notification types and target addresses for the notifications to be sent to. **[R29]** The Client request **MUST** contain the following: • FM Job Notification Target Information • List of Job Notification Types • Action 2. The Seller/Server responds to indicate acceptance of the request. **[R30]** The Seller/Server **MUST** respond to the Client's Register for FM Job Notifications request to indicate that the request was accepted or rejected. **[R31]** If the Seller/Server rejects the Client's Register for FM Job Notifications request, the response **MUST** include a reason for the rejection.
Post-Conditions	1. If the Seller/Server encounters errors, they should return an error with explanation to the Client.

446   **Table 11-Subscribe to FM Job Notifications Use Case**

447

Attribute	Description	Value	Definition
Notification Target Information	*The detailed information on the technical API endpoint address specifying where the Seller/Server is to send any PM Job Notifications. There can be multiple locations for one Buyer/Client.*	*String*	*This is the Callback target in the API*

List of Notification Types	The types of notifications that the Buyer/Client wishes to receive.	List of one or more of: *Alarm* *Job*	*This is a list of attributes*

Table 12-Buyer/Client Request Attributes for Subscribe to Notifications

449 **9.1.7 Generation of FM Job Notifications Use Case**

Field	Description
Use Case Number	7
Use Case Name	Generation of FM Job Notifications
Description	The Seller/Server generates and sends FM Job Notifications to subscribed Buyer/Client.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client has subscribed to FM Job Notifications.
Process Steps	1. The Seller/Server generates and sends FM Job Notifications to subscribed Client(s). **[R32]** The Seller/Server's FM Job Notification **MUST** include the following attributes: • Fault Date/Time • FM Job Notification Type • FM Job Notification Identifier • Fault Description • Severity 2. The Seller/Server generates and sends FM Notifications to subscribed Buyer/Clients. **[R33]** The Seller/Server FM Notifications **MUST** be sent to Buyer/Clients who have subscribed to FM Notifications. **[R34]** The Seller/Server FM Notifications **MUST** Not be sent to Buyer/Clients who have not subscribed to FM Notifications. **[R35]** The Seller/Server's FM Notification **MUST** include the attributes in Table 14-FM Notification Attributes.
Post-Conditions	1. The Client has received the FM Job Notification sent by Seller/Server. 2. If the Seller/Server encounters errors, they should return an error with explanation to the Client.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

450 **Table 13-FM Job Notifications Use Case**

451

Attribute Name	Description	Value	Comments
Fault Date/Time	The date and time that the fault was detected	Date-Time	
FM Notification Type	The type of FM Notification	One of the following: *Alarm* *Job*	Alarm notification occurs based on a fault condition or Threshold Crossing Alert. Job notification occurs when a FM Job (i.e., Link Trace) is complete with results.
FM Notification Identifier	The identifier of the FM Notification	String	The FM Notification Identifier is assigned by the Seller/Server
Fault Description	A brief textual description of the fault.	String	The specific text to be used is for future study.
Severity	The severity of an Alarm	One of the following: *Warning* *Minor* *Major* *Critical* *Information*	Only used if FM Notification Type = Alarm

452
<p align="center">Table 14-FM Notification Attributes</p>

453 **9.1.8   Unsubscribe from FM Job Notifications Use Case**

Field	Description
Use Case Number	8
Use Case Name	Unsubscribe from FM Job Notifications
Description	A request is initiated by the Buyer/Client to unsubscribe from FM Job Notifications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request an unsubscribe from FM Job Notifications on a Service in the Seller/Server system.
Process Steps	1. The Client unsubscribes from FM Job Notifications by specifying the unique identifier of the listener.
Post-Conditions	1. The Seller/Server discontinues sending FM Job/Collection Notification Types to Client specific to Buyer/Client Unsubscribe request. 2. The Client is no longer receiving FM Job Notifications.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

454
Table 15-Unsubscribe from FM Job Use Case

455 **9.1.9   Collect Fault Management Report**

Field	Description
Use Case Number	9
Use Case Name	Collect Fault Management Report
Description	A request initiated by the Buyer/Client to the Seller/Server to collect a Fault Measurement Report.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to collect a Fault Measurement Report in the Seller/Server system.

Process Steps	1. The Buyer/Client submits a Retrieve Fault Measurement Report request as for Results in Service Payload, Results as Attachment or Results via FTP including filter criteria the Seller/Server should apply. The Client sends the Service identifier used in the FM Job Create request to identify the Service to collect the report.

         [R36]   The Seller **MUST** support at least one of the three methods of retrieving results mentioned above.

         [O2]   The Seller **MAY** support multiple methods of retrieving results.

1. Retrieve Result:
   a. The Buyer/Client submits a Retrieve Results in Service Payload request to the Seller/Server.

         [R37]   The Retrieve Results in Service Payload request **MUST** include the following attributes shown in Table-Retrieve Results in Service Payload Attributes:

- Report Identifier
- Report Format = Payload

      b. The Buyer/Client submits a Retrieve Results as Attachment request to Seller/Server.

         [R38]   The Retrieve Results in Attachment request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:

- Report Identifier
- Report Format = Attachment
- Attachment Type

      c. The Buyer/Client submits a Retrieve Results as FTP to the Seller.

         [R39]   The Retrieve Results in Payload request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:

- Report Identifier
- Report Format = FTP
- FTP Address

2. The Seller/Server receives the request and validates the request.
3. The Seller/Server determines if a Fault Management Report matches the filter criteria in the request.

Field	Description

	4. The Seller/Server-side results:
	   a. The Seller/Server's response includes the results from the specified reports as payload in the envelope.
	   b. The Seller/Server's response includes the results from the specified reports as payload in the envelope.
	   c. The Seller/Server's response allows the Buyer/Client to retrieve the results via FTP.

Post-Conditions	1. The Client receives the Fault Measurement Report that match the Client's filtered selection criteria. 2. The Client receives the call location where the file collection for the Fault Measurement Report. 3. If errors occurred, the Seller/Server returns all identified errors in a reject response.

456   **Table 16-Collect Fault Measurement Report Use Case**

Attribute Name	Description	Value	Comments
FM Job Identifier	The identifier of the FM Job	String	
Report Identifier	The identifier of the FM Job Result Report	String	Set by the Seller/Server

457   **Table 17-FM Job Results**

Attribute Name	Description	Value	Comments
Report Identifier	*The unique identifier within the Seller/Server network identifier of the results report.*	*List of identifiers*	
Result Format	*The format of the results that are retrieved*	*One of:* *Payload* *Attachment* *FTP*	*Set by the Buyer/Client*
Attachment Type	*The type of file attached to the API Envelope*	*Content-Type: application/json*	*Set by the Buyer/Client*
FTP Address	*The address or URI for the file to be FTP'd from*	*String*	*Set by the Buyer/Client*

458   **Table 18-Retrieve Fault Management Results in Payload Attributes**

459   **[R40]**   The results regardless of the format **MUST** contain the FM results as specified
460   with FM Job request.

10 Performance Monitoring Use Cases

The Use Cases for Performance Monitoring are defined in this section. The Service Level Speci-
fication describes the performance objectives for the performance of conformant traffic (i.e.,
frames, packets) that flow over a VC (i.e., EVC, IPVC, etc.). For example, objectives specified
in the SLS might be specified for frame or packet delay (latency). The performance objectives
specified in the SLS often form part of a Service Level Agreement (SLA), which can also spec-
ify penalties for the SP or Operator providing the service if the objectives are not met. The PM
use cases are divided into the following specific operations: PM Profiles, PM Jobs, and PM Col-
lections. There are three types of PM Jobs – Proactive, On-Demand and Passive.
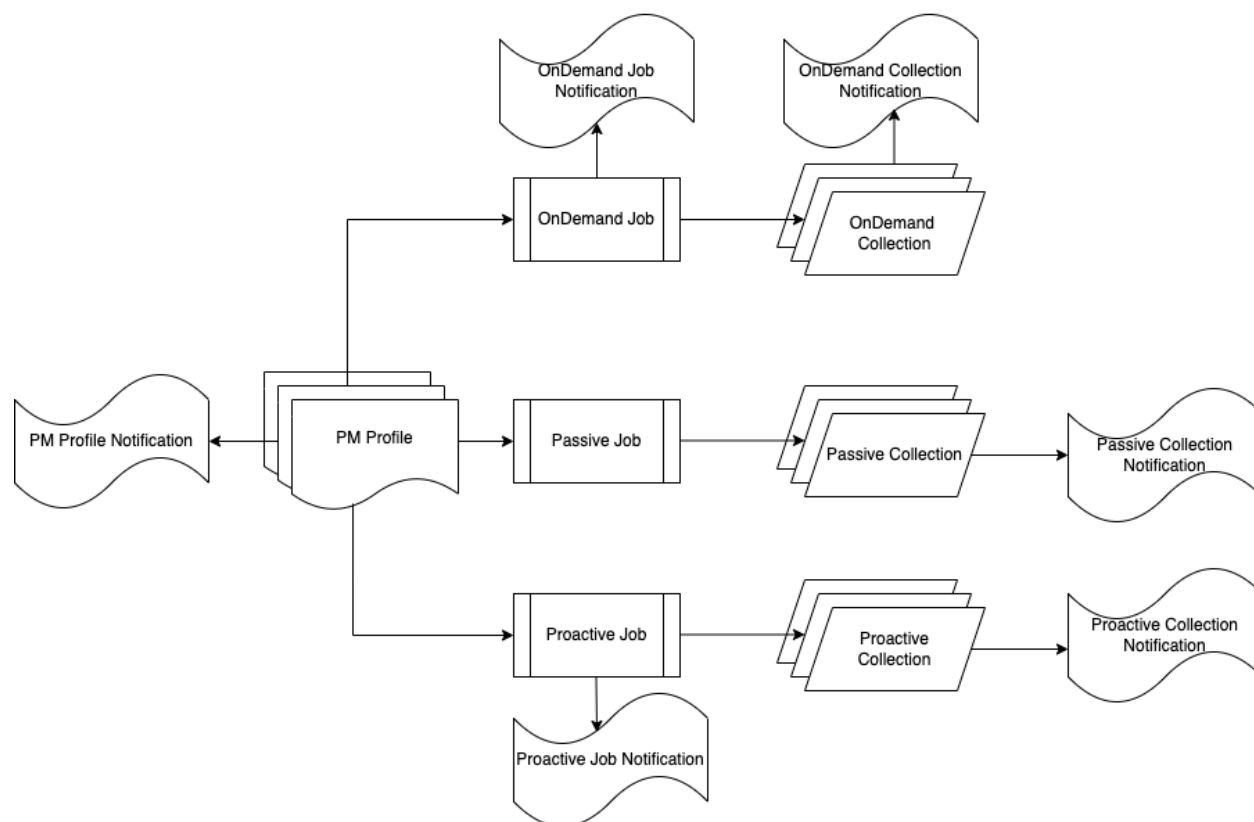
Figure 3-Performance Monitoring Process Diagram

PM Profile provisioning is the lifecycle process of defining performance attributes of a PM Pro-
file. A PM Profile Notification is defined such that a client can subscribe to PM Profile Notifica-
tions and be asynchronously informed when PM Profiles are created, modified, or deleted.

Jobs are responsible for the provisioning of measurement intervals, schedules, and performance
objectives. There are three types of Jobs – Proactive, On-Demand and Passive, with the time
schedule of the Job being the main difference between Proactive and On-Demand. Passive is
discussed in detail later in this document. The Proactive PM Job is in support of provisioning an
SLS between one or more ordered pairs. An individual PM Job is assigned to each ordered pair.
An ordered pair is an association between two end points.

484 An On-Demand PM Job is typically a single run or non-continual run performed during service
485 assurance. A Proactive PM Job is typically in support of a SLS measurement and will run indefi-
486 nitely, while an On-Demand is a short duration performance management test.
487
488 Proactive and On-Demand PM Jobs use PM Profiles for the provisioning lifecycle. The perfor-
489 mance objectives include, but are not limited to frame/packet delay, frame/packet loss ratio, in-
490 ter-frame/packet delay variation. A PM Profile can be reused for multiple Proactive and On-De-
491 mand PM Jobs or can be created for a specific Proactive or On-Demand PM Job. Both Proactive
492 and On-Demand PM Jobs support Notifications. A client can subscribe to these respective Noti-
493 fications and be asynchronously informed when a Job is created, deleted, or modified.
494
495 The Proactive and On-Demand Collections are where a client requests the retrieval of perfor-
496 mance management reports. Both the Proactive and On-Demand Collections support Notifica-
497 tions. A client can subscribe to these Notifications and be asynchronously notified when a Col-
498 lection is ready for retrieval.
499
500 There are no restrictions on a Proactive and On-Demand PM Job running on the same Service.
501 For example, a Proactive PM Job could be associated with SLA during Service Activation.
502 While the Service is active a Service Assurance-based On-Demand PM Job may be requested to
503 immediate (real-time) feedback purposes.

10.1 Performance Monitoring Profiles Use Cases

505 This section defines the use cases that support Performance Monitoring (PM) Profiles. PM Profiles
506 are a mechanism used to simplify the PM Job provisioning. The attributes of a PM Job are defined
507 in the PM Profiles. See Table 20-Create PM Profile Attributes. A PM Profile can be used for
508 multiple PM Jobs, or it can be for a specific PM Job.
509
510 *NOTE: Threshold Crossing Alerts (TCAs) can be provisioned within the context of an PM Pro-*
511 *file provisioning.*
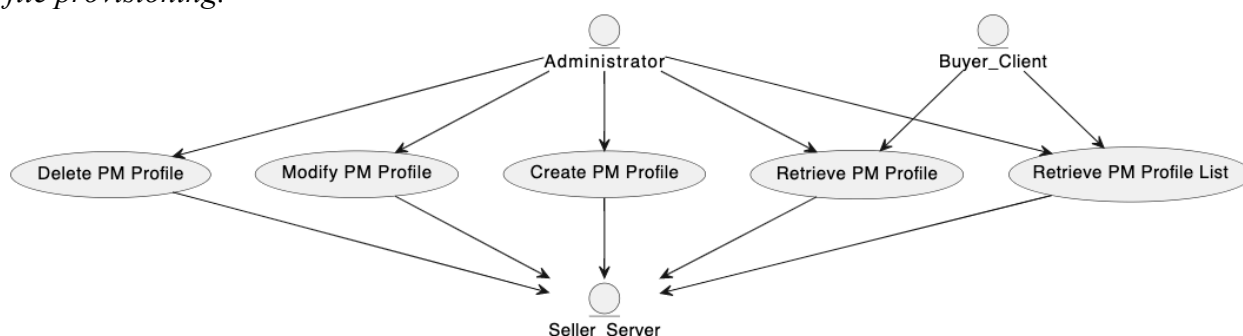
513 **Figure 4-Performance Monitoring Profile Use Cases**

514 The Client can create, retrieve, modify, and delete PM Profiles. The Seller/Server is responsible
515 for interpreting the Client PM Profile requests and performing any necessary intra-Seller/Server
516 and inter-Seller/Server communications to assure the Clients request are met.

517
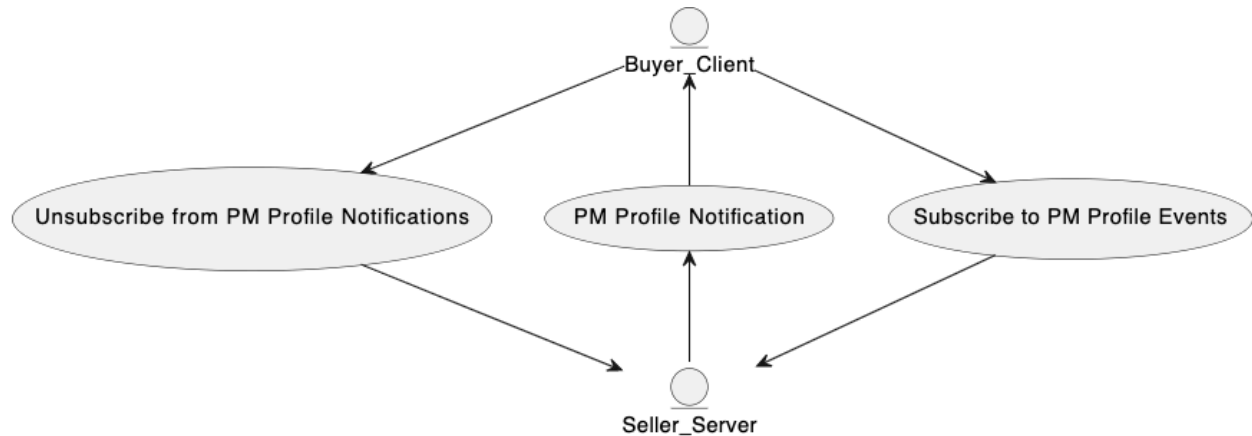
518 **Figure 5-Performance Monitoring Profile Notification Use Cases**

519 The Client (BA) can subscribe, unsubscribe to and from PM Profile Notifications. The
520 Seller/Server (SOF) is responsible for providing PM Profile Notifications to the Client (BA) spec-
521 ified callback.

522 **10.1.1 Create Performance Monitoring Profile Use Case**

Field	Description
Use Case Number	10
Use Case Name	Create Performance Monitoring Profile
Description	A request initiated by the Buyer/Client to the Seller/Server to create a PM Profile.
Actors	Administrator, Seller/Server
Pre-Conditions	1. PM Profile with intended Profile does not exist. 2. The Administrator is authorized to perform the request.

Process Steps	1. The Administrator determines what PM objectives will be needed.
	
	    [R41] The Administrator's Create PM Profile **MUST** support the following attributes:
	• PM Profile ID
	• PM Job Type
	• Granularity
	• Reporting Period
	• Product Specific Attributes
	• Schedule Definition
	
	    [O3] The Administrator's Create PM Profile **MAY** contain the following attributes:
	• Description
	• PM Job Priority
	
	2. The Seller/Server receives request and determines if the PM Profile is valid.

Field	Description
Post-Conditions	1. PM profile is allocated and available with set of specified PM objectives. 2. Service returns PM Profile. 3. The PM Profile is available for PM Job provisioning.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while constructing and persistently storing the PM profile.

523

Table 19-Create PM Profile Use Case

Attribute Name	Description	Value	Comments
Description	A textual description of the PM Job	String	Set by Administrator
PM Profile ID	Unique identifier of existing Performance Management Profile.	*PM_Profile*	Set by Administrator *NOTE: If set by Buyer/Client the remainder of attributes in this table are not needed given they are in the Profile.*
PM Job Type	The type of PM Job	One of the following: *Proactive* *OnDemand* *Passive*	Set by Administrator
PM Job Priority	The priority of the management Job. The way the management application will use the Job priority to schedule Job execution is application specific and out the scope.	Integer	Set by the Administrator The priority is on a 1-10 scale with 1 being highest priority and 10 being lowest priority
Last Time Modified	The last time a measurement Job was modified.	Date-Time	Set by Seller/Server
Output Format	The format of the output report	One of the following: *XML* *AVRO* *CSV*	Set by the Administrator
File Transfer Data	Specific attributes for supporting file transfer of PM Job results.	String	Set by Administrator
Granularity	The sampling rate of the collection of performance indicators.	One of the following:	Set by Administrator

Attribute Name	Description		Value	Comments
			10 milliseconds *100 milliseconds* *1 second* *10 second* *1 minute* *5 minutes* *15 minutes* *30 minutes* *1 hour* *24 hours* *1 month* *1 year* *Not Applicable*	
Service Payload Specific Attributes	List of payload specific attributes		List	Set by Administrator
Schedule Definition	The definition of schedule attributes		See below	
	Recurring Frequency	A recurring frequency to run a Job that is included in schedule definition	One of the following: *10 milliseconds* *100 milliseconds* *1 second* *10 seconds* *1 minute* *5 minutes* *15 minutes* *30 minutes* *1 hour* *24 hours* *1 month* *1 year*	
	Schedule Definition Start Time	The start time of the Schedule Definition.	Date-Time	
	Schedule Definition End Time	The end time of the Schedule Definition	Date-Time	

Attribute Name	Description	Value	Comments
State	State of PM Profile.	See Table 84-PM Profile/Job States	
Tracking Record	A list of tracking records. Tracking records allow the tracking of modifications on the problem. The tracking records should not be embedded in the problem to allow retrieving the problem without the tracking records.		

524   **Table 20-Create PM Profile Attributes**

525   **10.1.2   Retrieve Performance Monitoring Profile List Use Case**

Field	Description
Use Case Number	11
Use Case Name	Retrieve PM Profile List
Description	A request initiated by the Administrator or Buyer/Client to the Seller/Server to retrieve a list of PM Profiles.
Actors	Administrator or Buyer/Client, Seller/Server
Pre-Conditions	1. The Administrator or Buyer/Client is authorized to perform the query.
Process Steps	1. The Administrator or Buyer/Client submits a Retrieve List of PM Profile request including filter criteria the Seller/Server should apply. 2. The Seller/Server receives the request and validates the request. 3. The Seller/Server determines if any PM Profiles match the filter criteria in the request. **[R42]** The Seller/Server **MUST** support the retrieval of a PM Profile List Use Case. **[R43]** The Administrator or Buyer/Client **MUST** support the retrieval of a PM Profile List Use Case. **[R44]** The Seller/Server's response to the Administrator or Buyer's/Client's retrieve List of PM Profiles **MUST** include the following attributes as applicable: • Description • PM Profile ID **[R45]** If the Seller/Server validates the Administrator or Buyer's/Client's request but finds no matching PM Profiles, the Seller/Server **MUST** return an empty list.

Field	Description
Post-Conditions	1. The Administrator or Buyer/Client receives a list of all PM Profiles that match the Client's filtered selection criteria. 2. The Administrator or Buyer/Client may initiate a request to obtain detailed information for a specific PM Profile based on unique identifier.

Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response.
	2. If the quantity of the records requested to be returned exceeds a Seller/Server policy, the Seller/Server must choose to respond with either:
	   a. An empty list and message that indicates the result set is too large and submit a new more specific filtered query or
	   b. A response that indicates the result is too large and includes a subset of the matching PM Profiles.
	3. If the query does not find any matching records, then the Seller/Server responds with an indication of this result by sending an empty list with a success code.

526 **Table 21-Retrieve PM Profile List Use Case**

527 **10.1.3 Retrieve Performance Monitoring Profile by Profile Identifier Use Case**

Field	Description
Use Case Number	12
Use Case Name	Retrieve PM Profile by Profile ID
Description	A request initiated by the Administrator or Buyer/Client to the Seller/Server to retrieve a PM Profile.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Administrator or Buyer/Client is authorized to perform the query.
Process Steps	1. The Administrator or Buyer/Client submits a PM Profile request with Profile ID parameter. 2. The Seller/Server receives the request and validates the request. 3. The Seller/Server returns the PM Profile. **[R46]** The Seller/Server **MUST** support the retrieval of a PM Profile Use Case. **[R47]** The Administrator or Buyer/Client **MUST** support the retrieval of a PM Profile Use Case.
Post-Conditions	1. The Administrator or Buyer/Client receives the PM Profile that match the Administrator or Buyer's/Client's filtered selection criteria.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response.

528 **Table 22-Retrieve PM Profile Use Case**

529 **10.1.4 Modify Performance Monitoring Profile Use Case**

Field	Description
Use Case Number	13
Use Case Name	Modify PM Profile
Description	A request initiated by the Administrator to the Seller/Server to modify a PM Profile.
Actors	Administrator, Seller/Server
Pre-Conditions	1. A PM Profile exists in the Seller/Server's system. 2. The Administrator can modify the PM Profile. 3. The PM Profile is not being used.
Process Steps	1. The Administrator initiates a modify request for PM Profile with specific attributes to modify. 2. The Seller/Server validates the modification request and provides a response with PM Profile with modifications. **[O4]** The Seller/Server **MAY** support the modification of a PM Profile Use Case. **[O5]** The Administrator **MAY** support the modification of a PM Profile Use Case.
Post-Conditions	1. Seller/Server initiates the modification process and notifies Administrator with a success message.
Alternative Paths	1. The Seller/Server returns and error message if an error is encountered while processing that prevents the Seller/Server from completing the modification.

530 **Table 23-Modify PM Profile Use Case**

531 **10.1.5 Delete Performance Monitoring Profile Use Case**

Field	Description
Use Case Number	14
Use Case Name	Delete PM Profile
Description	A request initiated by the Administrator to the Seller/Server to delete a PM Profile.
Actors	Administrator, Seller/Server
Pre-Conditions	1. A PM Profile exists in Seller/Server's system. 2. The Administrator can delete PM Profiles. 3. The PM Profile is currently not in use.

Field	Description
Process Steps	1. The Administrator initiates a delete request for PM Profile with unique identifier. 2. The Seller/Server validates the PM Profile exists, deletes it and all the PM Profile associated resources. 3. The Seller/Server provides a response indicating the PM Profile has been deleted. **[O6]** The Seller/Server **MAY** support the deletion of a PM Profile Use Case. **[O7]** The Administrator **MAY** support the deletion of a PM Profile Use Case.
Post-Conditions	1. Seller/Server deletes the PM Profile and notifies Administrator with a success message.
Alternative Paths	1. The Seller/Server returns and error message if an error is encountered while processing that prevents the Seller/Server from completing the deletion.

Table 24-Delete PM Profile Use Case

10.1.6 Subscribe to Performance Monitoring Profile Notifications Use Case

Field	Description
Use Case Number	15
Use Case Name	Subscribe to PM Profile Notifications
Description	A request initiated by the Client to the Seller/Server to subscribe to PM Profile Notifications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to subscribe to PM Profile Notifications in the Seller/Server system. 2. The Seller/Server support notifications.
Process Steps	1. The Buyer/Client sends the Subscribe for PM Profile Notifications to the Seller/Server specifying where to send notifications and which PM Profile Notification Types to include in notifications. 2. The Seller/Server receives the Subscribe request for PM Profile Notifications. 3. The Seller/Server records which PM Profile Notifications to send, where to send such notifications for this Buyer/Client. 4. The Seller/Server returns an acknowledgement to the Buyer/Client. **[O8]** The Seller/Server **MAY** support subscription to PM Profile Notifications Use Case. **[O9]** The Buyer/Client **MAY** support subscription to PM Profile Notifications Use Case.

Field	Description
Post-Conditions	1. The Seller/Server is aware of where to send notifications.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

534   **Table 25-Subscribe to PM Profile Notifications Use Case**

10.1.7   Performance Monitoring Profile Notifications Use Case

Field	Description
Use Case Number	16
Use Case Name	PM Profile Notification
Description	A PM Profile Notification is initiated by the Seller/Server to a subscribed Buyer/Client.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Seller/Server supports PM Profile Notifications. 2. The Buyer/Client has subscribed to PM Profile Notifications.
Process Steps	1. The Seller/Server sends the notifications to the location(s) registered by the Buyer/Client. **[O10]** The Seller/Server **MAY** support PM Profile Notifications Use Case. **[O11]** The Buyer/Client **MAY** support PM Profile Notifications Use Case.
Post-Conditions	1. The Seller/Server has sent related PM Profile Notification.

536   **Table 26-PM Profile Notifications Use Case**

10.1.8   Unsubscribe from Performance Monitoring Profile Notifications Use Case

Field	Description
Use Case Number	17
Use Case Name	Unsubscribe from PM Profile Notifications
Description	A request initiated by the Buyer/Client to unsubscribe from PM Profile Notifications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client has previously subscribed to PM Profile Notifications. 2. The Buyer/Client is authorized to subscribe to PM Profile Notifications in the Seller/Server system. 3. The Seller/Server support PM Profile Notifications.

Field	Description
Process Steps	1. The Buyer/Client sends the Unsubscribe for PM Profile Notifications to the Seller/Server specifying which PM Profile Notifications the Buyer/Client is unsubscribing from listening. 2. The Seller/Server receives the Unsubscribe request for PM Profile Notifications. 3. The Seller/Server discontinues PM Profile Notifications to Buyer/Client specific to Unsubscribe request. 4. The Seller/Server returns an acknowledgement to the Buyer/Client. **[O12]** The Seller/Server **MAY** support unsubscribing from PM Profile Notifications Use Case. **[O13]** The Buyer/Client **MAY** support unsubscribing from PM Profile Notifications Use Case.
Post-Conditions	1. The Service discontinues sending PM Profile Notifications to Buyer/Client specific to Buyer/Client Unsubscribe request.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

538

Table 27-Unsubscribe from PM Profile Notifications Use Case

539 **10.2   Performance Monitoring Job, Collection and Notification Use Cases**

540 A Performance Monitoring Job is where the client specifies the performance monitoring objec-
541 tives specific to each ordered pair. An individual PM Job is assigned to each ordered pair. An
542 ordered pair is an association between two end points. A PM Job has start and stop times speci-
543 fied in the schedule definition.
544
545 For the cases where the SLS is an attribute of the VC (Virtual Circuit) it is not necessary for a
546 Proactive PM Job provisioning. However, the Legato/Allegro/Interlude IRP could be used for
547 PM Profile provisioning. The PM Job implemented at MEF LSO Legato/Allegro/Interlude is
548 specific to an implementation that is using a Legato/Allegro/Interlude Performance Management
549 Provisioning process.
550

551
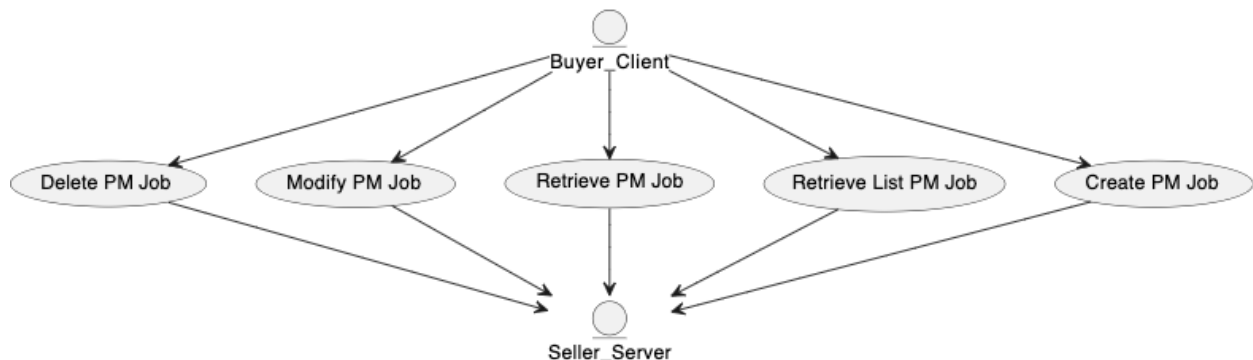
552 **Figure 6-PM Job Use Cases**

553 The Buyer/Client can create, retrieve, modify, and delete PM Jobs. The PM Jobs should result in
554 Performance Management collections that will provide the Buyer/Client with performance objec-
555 tive results. The Seller/Server is responsible for interpreting the PM Job requests and performing
556 the necessary intra-SOF and inter-SOF communications to assure the Buyer/Client requests are
557 met.

558
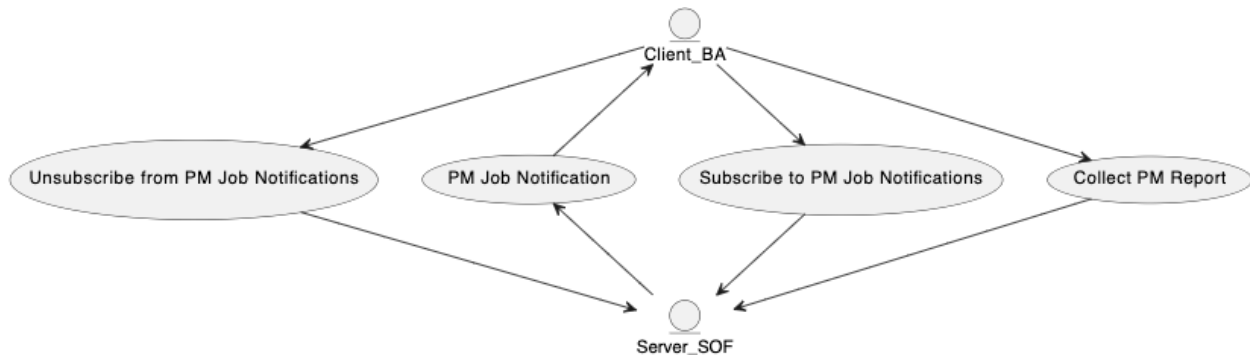
559 **Figure 7-PM Job Notification and Collection Use Cases**

560 The Buyer/Client can subscribe, unsubscribe to and from PM Job/Collection Notifications. The
561 Seller/Server is responsible for providing PM Job Notifications to the Buyer/Client specified
562 callback. The Buyer/Client can perform Performance Management collections based on previ-
563 ously requested PM Jobs. The Collect Performance Management Use Case is responsible for the
564 report(s) collection which will have the actual results of the performance measurement attributes
565 specified in the Create PM Job Use Case. There is a Use Case for retrieving PM Job which will
566 have the performance measurement objectives and schedule attributes.

567 **10.2.1 Create PM Job Use Case**

Field	Description
Use Case Number	18
Use Case Name	Create PM Job
Description	A request initiated by the Buyer/Client to create a PM Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to create a PM Job from the Seller/Server.

Field	Description
Process Steps	1. The Buyer/Client determines the performance objectives, measurement interval and needed attributes as specified in PM Job Attributes Table below. that will be used in initiate a PM Job. 2. The Buyer/Client initiates and submits a PM Job request that contains a Service Identifier, Performance Indicator Specification and Schedule Definition. **[R48]** The Buyer's/Client's Create PM Job **MUST** support the following attributes: • PM Job Type • Granularity • Reporting Period • Service Specific Attributes • Schedule Definition **[O14]** The Buyer's/Client's Create PM Job **MAY** contain the following attributes: • Description • PM Job Priority 3. The Seller/Server validates the PM Job request and responds with PM Job including a unique identifier, ID in response. The Seller/Server validates the Buyer/Client Create PM Job request, creates the Job, and returns the Job ID to the Client. **[R49]** The Seller/Server **MUST** assign a Job Identifier to the PM Job that is unique within the network. **[R50]** The PM Job Identifier supplied by the Seller/Server **MUST** be unique within the Seller/Server's network. **[R51]** The PM Job **MUST** use the attributes included in the Buyer's/Client's Create PM Job request. *NOTE: A Service Identifier is needed to perform the Collection Performance Report.*
Post-Conditions	1. The Buyer/Client receives a Response, including a PM Job. 2. The Seller/Server initiates a PM Job. 3. If the Seller/Server supports notifications and the Buyer/Client has registered for notifications, the Seller/Server notifies the Buyer/Client of commitment to provide the request. 4. The Seller/Server notifies the Buyer/Client when Job results are available. **[R52]** If the Buyer/Client registered for PM Notifications, the Seller/Server **MUST** notify the Buyer/Client when PM Job results are available.

Field	Description
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from creating the PM Job.

Table 28-Create PM Job Use Case

Attribute Name	Description	Value	Comments
Description	A textual description of the PM Job	String	Set by Buyer/Client
Creation Time	Time the Job is started	String	Set by Buyer/Client
PM Profile ID	Reference to Performance Management Profile.	*PM_Profile*	Set by Administrator *NOTE: If set by Buyer/Client the remainder of attributes in this table are not needed given they are in the Profile.*
PM Job Type	The type of PM Job	One of the following: *Proactive On-Demand Passive*	Set by Buyer/Client
PM Job Identifier	The identifier of the management Job.	String	Set by the Seller/Server
PM Job Priority	The priority of the management Job. The way the management application will use the Job priority to schedule Job execution is application specific and out the scope.	Integer	Set by the Buyer/Client The priority is on a 1-10 scale with 1 being highest priority and 10 being lowest priority
Last Time Modified	The last time a measurement Job was modified.	Date-Time	Set by Seller/Server
Output Format	The format of the output report	One of the following: *XML AVRO CSV*	Set by the Buyer/Client

Attribute Name	Description	Value	Comments
File Transfer Data	Specific attributes for supporting file transfer of PM Job results.	String	Set by Buyer/Client
Granularity	The sampling rate of the collection of performance indicators.	One of the following: *10 milliseconds* *100 milliseconds* *1 second* *10 second* *1 minute* *5 minutes* *15 minutes* *30 minutes* *1 hour* *24 hours* *1 month* *1 year* *Not Applicable*	Set by Buyer/Client
Service Payload Specific Attributes	List of payload specific attributes	List	Set by Buyer/Client
Producing Application Identifier	The identifier of the application that produces performance indicators.	String	Set by Buyer/Client
Consuming Application Indicator	The identifier of the application that consumes performance indicators.	String	Set by the Buyer/Client

Attribute Name	Description		Value	Comments
Reporting Period	The time-period for the report.		One of the following: *10 milliseconds* *100 milliseconds* *1 second* *10 seconds* *1 minute* *5 minutes* *15 minutes* *30 minutes* *1 hour* *24 hours* *1 month* *1 year* *Not Applicable*	
Schedule Definition	The definition of schedule attributes		See below	
	Recurring Frequency	A recurring frequency to run a Job that is included in schedule definition	One of the following: *10 milliseconds* *100 milliseconds* *1 second* *10 seconds* *1 minute* *5 minutes* *15 minutes* *30 minutes* *1 hour* *24 hours* *1 month* *1 year*	
	Schedule Definition Start Time	The start time of the Schedule Definition.	Date-Time	
	Schedule Definition End Time	The end time of the Schedule Definition	Date-Time	

Attribute Name	Description	Value	Comments
Tracking Record	A list of tracking records. Tracking records allow the tracking of modifications on the problem. The tracking records should not be embedded in the problem to allow retrieving the problem without the tracking records.		
State	State of PM Job.	See Table 84-PM Profile/Job States	

<div align="center">

Table 29-Create PM Job Attributes

</div>

10.2.2 Modify PM Job Use Case

Field	Description
Use Case Number	19
Use Case Name	Modify PM Job
Description	A request initiated by the Client to the Seller/Server to modify a PM Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to modify a Proactive PM Job in the Seller/Server system.

Field	Description

Process Steps	1. The Buyer/Client submits a modify PM Job request with unique identifier and specific attribute or set of attributes for modification.
	2. The Buyer/Client creates a Modify PM Job request that includes the PM Job Identifier and the attribute(s) to be modified.
	
	  [R53] The Buyer's/Client's Modify PM Job request **MUST** include the PM Job Identifier.
	
	  [O15] The Buyer's/Client's Modify PM Job request **MAY** include one or more of the following attributes:
	• Granularity
	• Reporting Period
	• Product Specific Attributes
	• Schedule Definition
	• Description
	• Consuming Application Indicator
	• Job Priority
	
	3. The Seller/Server receives the request and validates the request.
	
	  [R54] The Seller/Server **MUST** support PM Job modifications.
	4. The Seller/Server determines if any PM Job can be modified.
	5. The Seller/Server returns the modified PM Job.

Post-Conditions	1. The Buyer/Client receives a PM Job response with attributes that have been modified. 2. The PM Job is modified with requested attributes changes. 3. If the Seller/Server supports notifications and the Buyer/Client has registered for notifications, the Seller/Server notifies the Buyer/Client of commitment to provide the request.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response. 2. If the modification request cannot be serviced (i.e., corresponding request is not all with specific PM Profile), the Seller/Server returns an error code with specific reason(s).

572

Table 30-Modify PM Job Use Case

573   **10.2.3 Delete PM Job Use Case**

Field	Description
Use Case Number	20
Use Case Name	Delete PM Job
Description	A request initiated by the Client to the Seller/Server to delete a PM Job.
Actors	Buyer/Client, Seller/Server

Field	Description
Pre-Conditions	1. The Buyer/Client is authorized to delete a PM Job in the Seller/Server system.
Process Steps	1. The Buyer/Client submits a delete PM Job request with PM Job unique identifier. **[R55]** The Buyer's/Client's Delete PM Job request **MUST** include the PM Job Identifier. 2. The Seller/Server receives the request and validates the request. **[R56]** If the PM Job is In-Progress, the Seller/Server **MUST** delete the PM Job as requested by the Client. 3. The Seller/Server determines if any PM Job exists and can be deleted. 4. The Seller/Server deletes the PM Job.
Post-Conditions	1. The Buyer/Client receives a confirmation that the PM Job has been deleted. 2. All resources on the Seller/Server side associated with the PM Job are deleted. 3. All measurement results generated prior to deletion remain available for collection.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

574 **Table 31-Delete PM Job Use Case**

575 **10.2.4 Suspend PM Job Use Case**

Field	Description
Use Case Number	21
Use Case Name	Suspend PM Job
Description	A request initiated by the Client to the Seller/Server to suspend a PM Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to suspend a PM Job in the Seller/Server system.

Field	Description
Process Steps	1. The Buyer/Client creates a Suspend PM Job request that includes the PM Job Identifier.
	[R57] The Buyer/Client's Suspend PM Job request **MUST** include the PM Job Identifier.
	[R58] The PM Job **MUST** be in the In-Progress state.
	2. The Seller/Server validates the Buyer/Client's Suspend PM Job request and suspends the PM Job.
	[R59] The Seller/Server's response to the Buyer/Client's Suspend PM Job request **MUST** indicate if the request is Accepted or Declined.
	[R60] If the Seller/Server accepts the Buyer/Client's Suspend PM Job request, the PM Job **MUST** be suspended and move to the Suspended state.
	[R61] If the Seller/Server declines the Buyer/Client's Suspend PM Job request, the PM Job **MUST NOT** be suspended.
	[R62] If the Seller/Server declines the Buyer/Client's Suspend PM Job request, they **MUST** provide a reason the request was declined.
Post-Conditions	1. The Buyer/Client receives a confirmation that the PM Job has been suspended.
	2. All resources on the Seller/Server side associated with the PM Job are suspended.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

576
Table 32-Suspend PM Job Use Case

577 **10.2.5 Resume PM Job Use Case**

Field	Description
Use Case Number	22
Use Case Name	Resume PM Job
Description	A request initiated by the Buyer/Client to the Seller/Server to resume a PM Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to resume a PM Job in the Seller/Server system.

Field	Description

Process Steps	1. The Buyer/Client creates a Resume PM Job request that includes the PM Job Identifier.
	
	    [R63] The Buyer/Client's Resume PM Job request **MUST** include the PM Job Identifier.
	
	    [R64] The PM Job **MUST** be in the Suspended state.
	
	2. The Seller/Server validates the Buyer/Client's Resume PM Job request and resumes the PM Job.
	
	    [R65] The Seller/Server's response to the Buyer/Client's Resume PM Job request **MUST** indicate if the request is Accepted or Declined.
	
	    [R66] If the Seller/Server accepts the Buyer/Client's Resume PM Job request, the PM Job **MUST** be resumed and return to the In-Progress state.
	
	    [R67] If the Seller/Server declines the Buyer/Client's Resume PM Job request, the PM Job **MUST NOT** be resumed.
	
	    [R68] If the Seller/Server declines the Buyer/Client's Resume PM Job request, they **MUST** provide a reason the request was declined.
	
	3. The Seller/Server determines if any PM Job exists and can be resumed.
	4. The Seller/Server resumes the PM Job.

Post-Conditions	1. The Buyer/Client receives a confirmation that the PM Job has been resumed. 2. All resources on the Seller/Server side associated with the PM Job are resumed.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

578 **Table 33-Resume PM Job Use Case**

579 **10.2.6 Retrieve List of PM Jobs Use Case**

Field	Description
Use Case Number	23
Use Case Name	Retrieve PM Job List
Description	A request initiated by the Buyer/Client to retrieve a PM Job List based on a filtered criterion.
Actors	Buyer/Client, Seller/Server

Field	Description
Pre-Conditions	1. The Buyer/Client is authorized to perform the query.
Process Steps	1. The Buyer/Client submits a Retrieve List of PM Job request. **[O16]** The Buyer's/Client's Retrieve List of PM Jobs request **MAY** contain none or more of the following attributes as filter criteria: • Job Identifier • Creation Time • Granularity • Reporting Period • Schedule Definition • Consuming Application Indicator • Job Priority 2. The Seller/Server receives the request and validates the request. 3. The Seller/Server determines if any PM Jobs match the filter criteria in the request. 4. The Seller/Server returns a list of summarized PM Job instances. **[R69]** The Seller/Server's response to the Buyer's/Client's retrieve List of PM Jobs **MUST** include the following attributes as applicable: • Job Identifier • Creation Time • Granularity • Reporting Period • Schedule Definition • Consuming Application Indicator • Job Priority • Description **[R70]** If the Seller/Server validates the Buyer's/Client's request but finds no matching PM Jobs, the Seller/Server **MUST** return an empty list.
Post-Conditions	1. The Buyer/Client receives a list of all PM Jobs that match the Buyer's/Client's filtered selection criteria. 2. The Buyer/Client may initiate a finer granularity query to obtain detailed information for a specific PM Job based on unique identifier.

Field	Description

Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response.
	2. If the quantity of the records requested to be returned exceeds a Seller/Server policy, the Seller/Server must choose to respond with either:
	  a. An empty list and message that indicates the result set is too large and submit a new more specific filtered query or
	  b. A response that indicates the result is too large and includes a subset of the matching PM Jobs.
	3. If the query does not find any matching records, then the Seller/Server responds with an indication of this result by sending an empty list with a success code.

580 **Table 34-Retrieve PM Job List Use Case**

581 **10.2.7 Retrieve PM Job by Job Identifier**

Field	Description
Use Case Number	24
Use Case Name	Retrieve PM Job by ID
Description	A request initiated by the Buyer/Client to retrieve a PM Job based on a unique identifier, ID.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to perform the query.

Process Steps	1. The Buyer/Client creates a Retrieve PM Job by Job Identifier request.
	
	  [R71] The Buyer/Client's Retrieve PM Job by Job Identifier request **MUST** contain the PM Job Identifier.
	2. The Seller/Server validates the Buyer/Client's request and returns the details on the PM Job but not the results of the PM Job.
	
	  [R72] The Seller/Server's response **MUST** contain all the PM Job attributes.
	3. The Seller/Server determines if a PM Jobs match the filter criteria in the request.
	4. The Seller/Server returns the summarized PM Job instances.

Post-Conditions	1. The Buyer/Client receives a PM Job that match the Buyer's/Client's filtered selection criteria.
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response.

582 **Table 35-Retrieve PM Job Use Case**

583 **10.2.8 Subscribe to PM Job Notifications Use Case**

Field	Description
Use Case Number	25

Field	Description
Use Case Name	Subscribe to PM Job/Collection Notifications
Description	A request initiated by the Buyer/Client to the Seller/Server to subscribe to PM Job Notifications. *NOTE: Notifications that should be supported include but are not limited to:* • *PM Job Created* • *PM Job Deleted* • *Collection Ready*
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to subscribe to PM Job/Collection Notifications in the Seller/Server system. 2. The Seller/Server support PM Job/Collection Notifications.
Process Steps	1. The Buyer/Client sends the Subscribe for PM Job/Collection Notifications as shown in table below to the Seller/Server specifying where to send notifications and which PM Job Notification Types to include in notifications. **[R73]** The Buyer/Client's Subscribe to PM Job Notifications request **MUST** include the attributes defined in Subscribe to PM Job Notifications Attributes Table. 2. The Seller/Server receives the Subscribe request for PM Job/Collection Notifications. 3. The Seller/Server records which PM Job/Collection Notifications to send, where to send such notifications for this Client. 4. The Seller/Server returns an acknowledgement to the Client.
Post-Conditions	1. The Seller/Server is aware of where to send PM Job/Collection Notifications.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

584 **Table 36-Subscribe to PM Job/Collection Notifications**

Attribute Name	Description	Value	Comments
Notification Target Information	The detailed information on the technical API end-point address specifying where the Seller/Server is to send any PM Job Notifications. There can be multiple locations for one Buyer/Client.	String	This is the Callback target in the API

Attribute Name	Description	Value	Comments
List of Notification Types	The types of notifications that the Buyer/Client wishes to receive.	List of one or more of: • PM Job State Change • Results Available	This is a list of attributes

585 **Table 37-Subscribe to PM Job Notifications Attributes**

586 **10.2.9   Unsubscribe from PM Job Notifications Use Case**

Field	Description
Use Case Number	26
Use Case Name	Unsubscribe from PM Job/Collection Notifications
Description	A request initiated by the Client to unsubscribe from PM Job/Collection Notifications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client has previously subscriber to PM Job/Collection Notifications. 2. The Buyer/Client is authorized to subscribe to PM Job/Collection Notifications in the Seller/Server system. 3. The Seller/Server support PM Job/Collection Notifications.
Process Steps	1. The Buyer/Client sends the Unsubscribe for PM Job/Collection Notifications to the Seller/Server specifying which Proactive Notification Types the Buyer/Client is unsubscribing from listening. 2. The Seller/Server receives the Unsubscribe request for PM Job/Collection Notifications. 3. The Seller/Server discontinues PM Job/Collection Notification Types to Buyer/Client specific to Unsubscribe request. 4. The Seller/Server returns an acknowledgement to the Buyer/Client.
Post-Conditions	5. The Seller/Server discontinues sending PM Job/Collection Notification Types to Client specific to Buyer/Client Unsubscribe request.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

587 **Table 38-Unsubscribe from PM Job/Collection Notifications Use Case**

588 **10.2.10 Generation of PM Job Notifications**

Field	Description
Use Case Number	27
Use Case Name	PM Job/Collection Notification

Field	Description
Description	A PM Job/Collection Notifications is initiated by the Seller/Server to a subscribed Buyer/Client.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Seller/Server supports PM Job/Collection Notifications. 2. The Client has subscribed to PM Job/Collection Notifications.
Process Steps	1. The Seller/Server sends the PM Job/Collection Notifications to the location(s) registered by the Buyer/Client. **[R74]** The Seller/Server **MUST** send PM Job State Change Notifications to a Buyer/Client who has subscribed to notifications. **[R75]** The Seller/Server **MUST NOT** send PM Job State Change Notifications to a Buyer/Client who has not subscribed to notifications. **[R76]** The Seller/Server **MUST** include the following attributes in the PM Job State Change Notification: • Job Identifier • PM Job State
Post-Conditions	1. The Seller/Server has sent related PM Job/Collection Notification.

Table 39-PM Job/Collection Notifications Use Case

Attribute Name	Description	Value	Comments
PM Job State	The state of the PM Job	One of: Acknowledged Cancelled Completed Failed InProgress Pending Rejected Suspended	Set by the Seller/Server

Table 40-PM Job States

10.2.11 Collect Performance Management Report

Field	Description
Use Case Number	28
Use Case Name	Collect Performance Management Report

Field	Description
Description	A request initiated by the Buyer/Client to the Seller/Server to collect a Performance Measurement Report. *NOTE: This use case covers the two scenarios where the PM Job is explicitly called and where the SLS is passed within the Service Order activations.*
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to collect a Performance Measurement Report in the Seller/Server system.

Process Steps	1. The Buyer/Client submits a Retrieve Performance Measurement Report request as for Results in Service Payload, Results as Attachment or Results via FTP including filter criteria the Seller/Server should apply. The Client sends the Service identifier used in the PM Job Create request to identify the Service to collect the report.
	[R77] The Seller **MUST** support at least one of the three methods of retrieving results mentioned above.
	[O17] The Seller **MAY** support multiple methods of retrieving results.
	2. Retrieve Result:
	a. The Buyer/Client submits a Retrieve Results in Service Payload request to the Seller/Server.
	[R78] The Retrieve Results in Service Payload request **MUST** include the following attributes shown in Table-Retrieve Results in Service Payload Attributes:
	• Report Identifier
	• Report Format = Payload
	b. The Buyer/Client submits a Retrieve Results as Attachment request to Seller/Server.
	[R79] The Retrieve Results in Attachment request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:
	• Report Identifier
	• Report Format = Attachment
	• Attachment Type
	c. The Buyer/Client submits a Retrieve Results as FTP to the Seller.
	[R80] The Retrieve Results in Payload request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:
	• Report Identifier
	• Report Format = FTP
	• FTP Address
	3. The Seller/Server receives the request and validates the request.
	4. The Seller/Server determines if a Performance Management Report matches the filter criteria in the request.
	5. The Seller/Server-side results:

Field	Description
	a. The Seller/Server's response includes the results from the specified reports as payload in the envelope.
	b. The Seller/Server's response includes the results from the specified reports as payload in the envelope.
	c. The Seller/Server's response allows the Buyer/Client to retrieve the results via FTP.
Post-Conditions	1. The Client receives the Performance Measurement Report that match the Client's filtered selection criteria.
	2. The Client receives the call location where the file collection for the Performance Measurement Report.
	3. If errors occurred, the Seller/Server returns all identified errors in a reject response.

Table 41-Collect Performance Measurement Report Use Case

Attribute Name	Description	Value	Comments
PM Job Identifier	The identifier of the PM Job	String	
Report Identifier	The identifier of the PM Job Result Report	String	Set by the Seller/Server

Table 42-PM Job Results

Attribute Name	Description	Value	Comments
Report Identifier	*The unique identifier within the Seller/Server network identifier of the results report.*	*List of identifiers*	
Result Format	*The format of the results that are retrieved*	*One of: Payload Attachment FTP*	*Set by the Buyer/Client*
Attachment Type	*The type of file attached to the API Envelope*	*Content-Type: application/json*	*Set by the Buyer/Client*
FTP Address	*The address or URI for the file to be FTP'd from*	*String*	*Set by the Buyer/Client*

Table 43-Retrieve Results in Payload Attributes

[R81] The results regardless of the format **MUST** contain the PM Metric results as specified with PM Job request.

597 **11 Threshold Crossing Alerts**

598

599 Threshold Crossing Alerts are a mechanism for configuring alerts to be generated when a spe-
600 cific performance metric that is being measured is not met. The use of TCAs requires a coordi-
601 nation with a Proactive and/or On-Demand PM configuration. A Proactive and/or On-Demand
602 PM Job is associated with a specific service. Therefore, a TCA should reference a Proactive or
603 On-Demand PM Job identifier.

604
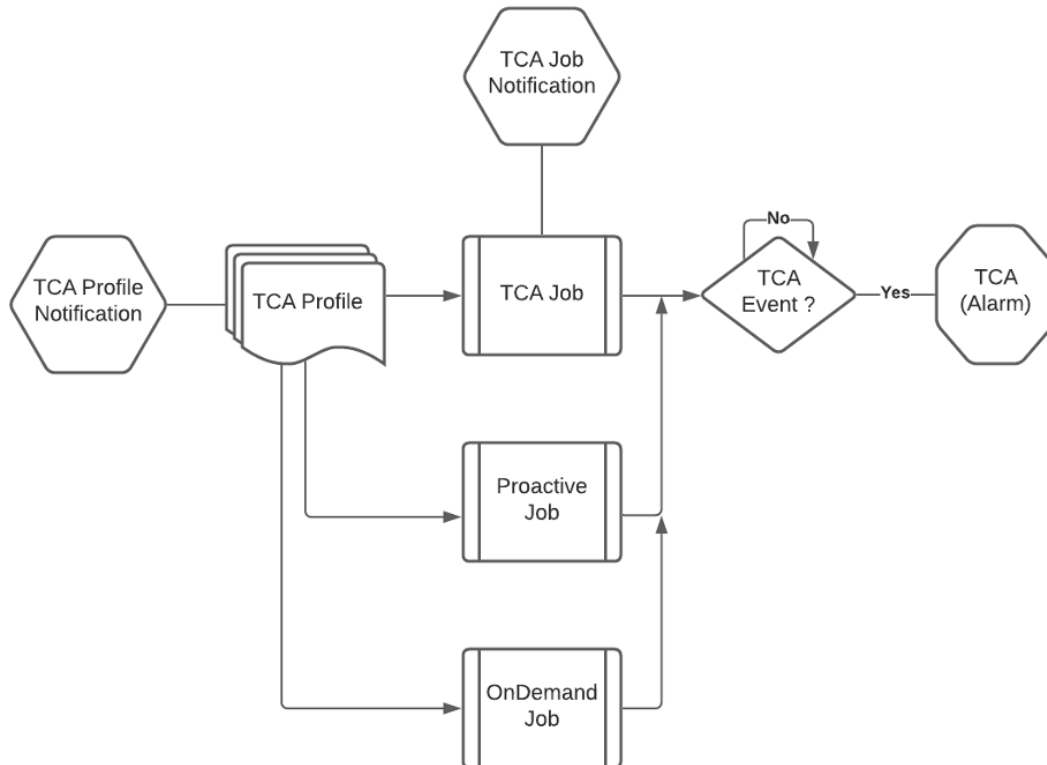
605 **Figure 8-Threshold Crossing Alert Process Diagram**

606 TCA Profiles provide a mechanism for reuse of TCAs across multiple clients. A TCA Profile will
607 have the performance measurement, performance objective and TCA type as part of the profile
608 attributes.

609 Performance thresholds, and corresponding Threshold Crossing Alerts (TCAs), can be config-
610 ured for certain performance metrics, and used to detect when service performance is degraded
611 beyond a given pre-configured level. Thresholds are always specific to a particular performance
612 metric and a particular PM Job. When the measured performance in a Measurement Interval for
613 that Job reaches or exceeds the configured threshold level, a TCA can be generated.

614 This section provides a comprehensive set of Use Cases needed to support Threshold Crossing
615 Alert (TCA) Management. Performance thresholds, and corresponding Threshold Crossing Alerts
616 can be configured for certain performance metrics and used to detect when service performance is
617 degraded beyond a given pre-configured level.

618 Thresholds are always specific to a particular performance metric. TCAs can be used as a warning
619 notification of possible service degradation, thus allowing more timely action to further investigate
620 or address the problem. For example, if the maximum One-way Frame/Packet Delay threshold was
621 set to 10 milliseconds, and a One-way Frame/Packet Delay value was measured at more than 10
622 milliseconds, a TCA would be generated.

623 Thresholds and associated TCAs are specific to a particular performance metric in each TCA Job
624 configuration. There are two types of TCA reporting: stateless and stateful. The stateless TCA
625 reporting treats each Measurement Interval separately. When using stateless TCA reporting, each
626 TCA Function has a single configured threshold. As soon as the threshold is reach or crossed in a
627 Measurement Interval for a given performance metric, a TCA is generated.

628 Stateful TCA reporting is another option for how TCAs are generated, that can reduce the total
629 number of TCAs. The intent is to provide a notification when a degradation is first encountered,
630 followed by another when the problem is resolved. This contracts with Stateless TCA reporting,
631 in which TCAs are generate continuously for as long as the degradation lasts.

632 In the case of Stateless TCA reporting a Damping Factor is used to suppress new TCAs. The
633 Damping Factor Value defines several consecutive PM Metric Calculation Intervals where the PM
634 Metric Value is equal to or greater than the TCA Performance Threshold Value and the new TCAs
635 are suppressed for that number of PM Metric Calculation Intervals.

636 Threshold Crossing Alerts (TCAs) can be configured for a certain metrics and used to detect when
637 service performance degraded beyond a given pre-configured level. When the measured perfor-
638 mance in a Measurement Interval for that Job reaches or exceeds the configured threshold level, a
639 TCA can be generated and sent to a subscriber. These Use Cases are based on business process
640 standards of interactivity between Client (Subscriber) and Seller/Server (Publisher) of TCA man-
641 agement.

642 Threshold Crossing Alert Profiles are provided by the Seller/Server to the Buyer/Client based on
643 PM measurements. Threshold Crossing Alert (TCA) Profiles include the following use cases:

644 • Create TCA Profile

645 • Modify TCA Profile

646 • Delete TCA Profile

647 • Retrieve TCA Profile List

648 • Retrieve TCA Profile

649 • Subscribe to TCAs

650 • Unsubscribe to TCAs

651 • TCA Event

652 **11.1   Threshold Crossing Alert Profile Management Use Cases**

653 This section defines the use cases that support Performance Management Threshold Crossing
654 Alert Profile Management. There are likely two different clients for the Threshold Crossing Alert
655 Use Cases. The first client is the Administrator function within the SOF that is responsible for
656 the lifecycle of TCA profiles. The second client is the user of TCAs (i.e., BA).

657
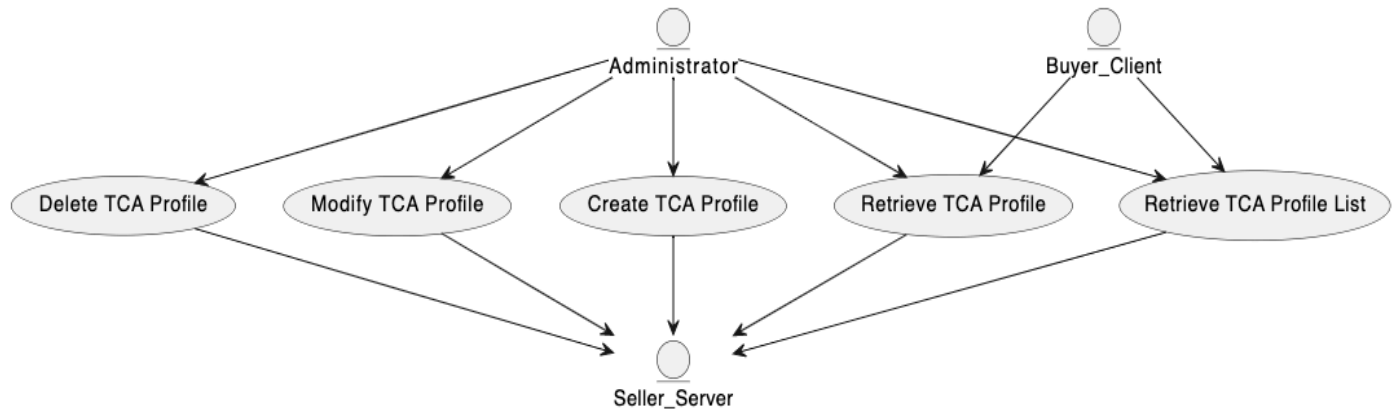
658   **Figure 9-TCA Profile Use Cases**

659 The diagram above has an Administrator role which is responsible for lifecycle of TCA Profiles.
660 A Client can subscribe to TCA Profile Notifications. A TCA Profile Notification is transmitted
661 when a TCA Profile is created, deleted, or modified.

662 **11.1.1 Create TCA Profile**

Field	Description
Use Case Number	29
Use Case Name	Create TCA Profile
Description	A request is initiated by the Administrator to create a TCA Profile.
Actors	Administrator, Seller/Server
Pre-Conditions	1. The Client is authorized to create Threshold Crossing Alert Profiles in the Seller/Server system.

Process Steps	1. The Client determines the performance metrics, attribute values and TCA values. The TCA attributes and corresponding values are based on the TCA Type. There are three TCA Types. They are Stateful and Stateless and Stateless with Damping Factor.

	a. TCA Stateful has the following attributes:
	    i. TCA Performance Threshold Value (in payload).
	    ii. TCA Window Threshold
	    iii. TCA Window Size
	b. TCA Stateless has the following attributes:
	    i. TCA Performance Threshold Value (in payload).
	    ii. PM Metric Calculation Interval
	    iii. PM Metric Value
	    iv. Damping Factor (optional)

	[R82] For a Stateful TCA, the Buyer/Client **MUST** include the following attributes in their request: • TCA Reporting Type = Stateful • TCA Performance Threshold Value • Stateful Window Threshold • Stateful Window Size
	[R83] For a Stateless TCA, the Buyer/Client **MUST** include the following attributes in their request: • TCA Reporting Type = Stateless • TCA Performance Threshold Value
	[R84] For a Stateless TCA with the Damping Factor, the Buyer/Client **MUST** include the following attributes in their request: • TCA Reporting Type = Stateless • TCA Performance Threshold Value • Stateless Damping Factor
	2. The Client initiates and submits a request with metrics, attribute values and TCA values. 3. The Seller/Server validates the request based on business rules. 4. The Seller/Server responds with an acknowledgement of the request that includes the TCA Profile Identifier.
	[R85] The Seller/Server's response **MUST** echo all Buyer/Client provided attributes and include the TCA Profile Identifier.
	[R86] The TCA Profile Identifier supplied by the Seller/Server **MUST** be unique within the Seller/Server's network.

Field	Description
Post-Conditions	1. The Client receives a Response, including a unique identifier along with the TCA Profile and all attributes. 2. The Seller/Server will take up action and send necessary request through set of system to create the TCA Profile.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing. 2. The Seller/Server returns an error message if any mandatory attributes are missing. *Mandatory attributes for the TCA Profile include time interval with start and stop times, measurement intervals, measurements, and performance objectives.*

663   **Table 44-Create TCA Profile Use Case**

| Attribute Name	Description	Value	Comments
Description	A textual description of the TCA Profile	String	Set by Buyer/Client
TCA Profile Identifier	An identifier of the TCA Profile	String	Set by Seller/Server
Creation Time	Time the TCA is started	String	Set by Seller/Server
TCA Reporting Type	The type of TCA Reporting.	One of: *Stateful* *Stateless*	Set by Buyer/Client
TCA Performance Threshold Value	The PM Metric Value (i.e., Frame Loss Ratio) for a set of intervals	String	Set by Buyer/Client
Stateful Window Threshold	The number of intervals where the measured value is either below, or meets or exceeds, the TCA Performance Threshold Value	String	Set by Buyer/Client
Stateful Window Size	The sliding window of the number of consecutive intervals that are used as the value of SET-TCA Window Threshold or TCA Window Threshold	String	Set by Buyer/Client
Stateless Damping Factor	The number of consecutive intervals where the PM Metric Value is equal to or greater than the TCA Performance Threshold Value and the new TCAs are suppressed for that number of intervals	String	Set by Buyer/Client

664   **Table 45-TCA Attributes**

665 **11.1.2 Modify TCA Profile**

Field	Description
Use Case Number	30
Use Case Name	Modify TCA Profile
Description	A request is initiated by the Administrator (Client) to modify a TCA Profile.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to create Threshold Crossing Alert Profiles in the Seller/Server system. 2. The TCA Profile is not currently be used by any Client.
Process Steps	1. The Client sends a Modify TCA Profile request that includes the attributes to be modified. **[R87]** If the TCA Reporting Type is Stateful, the Client's Modify TCA Profile **MUST** include one or more of the following attributes: • TCA Performance Threshold Value • Stateful Window Threshold • Stateful Window Size **[R88]** If the TCA Reporting Type is Stateless, the Client's Modify TCA Profile **MUST** include one or more of the following attributes: • TCA Performance Threshold Value • Stateless Damping Factor 2. The Seller/Server responds with an indication if they accept or decline the modification request. **[R89]** The Seller/Server's response **MUST** indicate if the Modify TCA Profile is Accepted or Declined.
Post-Conditions	1. The Client receives a Response and modified TCA Profile. 2. The Seller/Server will take up action and send necessary request through set of system to modify the TCA Profile.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing. 2. The Seller/Server returns an error message if any mandatory attributes are missing.

666 **Table 46-Modify TCA Profile Use Case**

667 **11.1.3 Delete TCA Profile**

Field	Description
Use Case Number	31
Use Case Name	Delete TCA Profile
Description	A request is initiated by the Administrator (Client) to delete a TCA Profile.

Field	Description
Actors	Client, Seller/Server
Pre-Conditions	1. The Client is authorized to delete a Threshold Crossing Alert Profile in the Seller/Server system. 2. The TCA Profile is not currently be used by any Client.
Process Steps	1. The Buyer/Client sends a Delete TCA Profile request that includes the TCA Profile Identifier. **[R90]** The Buyer/Client's Delete TCA Profile **MUST** include the TCA Profile Identifier. 2. The Seller/Server responds with an indication if they accept or decline the delete request. **[R91]** The Seller/Server's response **MUST** indicate if the Delete TCA Profile is Accepted or Declined. 3. If the Seller/Server encounters errors, they should return an error with explanation to the Buyer/Client.
Post-Conditions	1. The Buyer/Client receives a Response indicating the successful deletion of the TCA Profile. 2. The Seller/Server will take up action and send necessary request through set of system to delete the TCA Profile.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

668 **Table 47-Delete TCA Profile Use Case**

669 **11.1.4 Retrieve List of TCA Profiles**

Field	Description
Use Case Number	32
Use Case Name	Retrieve TCA Profile List
Description	A request is initiated by the Administrator (Client) to retrieve a list of TCA Profiles.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to retrieve Threshold Crossing Alert Profiles in the Seller/Server system.

Field	Description

Process Steps	1. The Buyer/Client sends a Retrieve List of TCA Profiles request that includes filter criteria.
	
	    [R92] The Buyer/Client's Retrieve List of TCA Profiles **MUST** include none or more of the following attributes:
	
	    • TCA Performance Threshold Value
	    • Stateful Window Threshold
	    • Stateful Window Size
	    • TCA Performance Threshold Value
	    • Stateless Damping Factor
	
	2. The Seller/Server's response includes a list of TCA Profile Identifiers that match the filter criteria sent by the Buyer/Client.
	
	    [R93] The Seller/Server's response **MUST** include a list of TCA Profiles that match the filter criteria.
	
	    [R94] The list returned by the Seller/Server **MUST** contain the TCA Profile Identifier for each matching TCA Profile.
	
	    [R95] If the Buyer/Client's Retrieve List of TCA Profiles is validated but no matching TCA Profiles are found, the Seller/Server **MUST** return an empty list.
	
	3. If the Seller/Server encounters errors, they should return an error with explanation to the Buyer/Client.

Post-Conditions	1. The Client receives a Response, including a set of TCA Profiles based on the TCA Profile IDs.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

Table 48-Retrieve TCA Profile List Use Case

11.1.5 Retrieve TCA Profile by Identifier

Field	Description
Use Case Number	33
Use Case Name	Retrieve TCA Profile by Identifier
Description	A request is initiated by the Administrator (Client) to retrieve a TCA Profile.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to retrieve Threshold Crossing Alert Profiles in the Seller/Server system.

Field	Description
Process Steps	1. The Buyer/Client sends a Retrieve TCA Profile by Identifier request that includes the TCA Profile Identifier. **[R96]** The Buyer/Client's Retrieve TCA Profile by Identifier **MUST** include the TCA Profile Identifier. 2. The Seller/Server's response includes the details for a TCA Profile that matches the TCA Profile Identifier specified by the Buyer/Client. **[R97]** The Seller/Server's response to the Buyer/Client's Retrieve TCA Profile by Identifier **MUST** include the following attributes if the TCA Reporting Type is Stateful: • TCA Reporting Type = Stateful • TCA Performance Threshold Value • Stateful Window Threshold • Stateful Window Size **[R98]** The Seller/Server's response to the Buyer/Client's Retrieve TCA Profile by Identifier **MUST** include the following attributes if the TCA Reporting Type is Stateless: • TCA Reporting Type = Stateless • TCA Performance Threshold Value **[R99]** The Seller/Server's response to the Buyer/Client's Retrieve TCA Profile by Identifier **MUST** include the following attributes if the TCA Reporting Type is Stateless with the Damping Factor: • TCA Reporting Type = Stateless • TCA Performance Threshold Value • Stateless Damping Factor 3. If the Seller/Server encounters errors, they should return an error with explanation to the Buyer/Client.
Post-Conditions	1. The Client receives a Response, including a unique TCA Profile.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing. 2. The Seller/Server returns an error message if any mandatory attributes are missing.

672

Table 49-Retrieve TCA Profile Use Case

673 **11.1.6 Subscribe to TCA Profile Notifications**

Field	Description
Use Case Number	34

Field	Description
Use Case Name	Subscribe TCA Profile Notifications
Description	A request is initiated by the Client to the Seller/Server to subscriber to TCA Profile Notifications. *NOTE: Notifications that should be supported include but are not limited to:* • *TCA Profile Created* • *TCA Profile Modified* • *TCA Profile Deleted*
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to subscribe to TCA Profile Notifications in the Seller/Server system. 2. The Seller/Server supports TCA Profile Notifications.
Process Steps	1. The Buyer/Client send the Subscribe for TCA Profile Notifications as shown in Register for TCA Notification table to the Seller/Server specifying where to send notifications and which TCA Profile Notification Types to include in the notifications. 　**[R100]** The Buyer/Client's Subscribe to TCA Notification **MUST** include the attributes in Register for TCA Notification. 2. The Seller/Server response indicates if the subscription was successful. 　**[R101]** The Seller/Server's response **MUST** indicate if the subscription was successful. 3. The Seller/Server records which TCA Profile Notifications to send, where to send such notifications for this Client.
Post-Conditions	1. The Seller/Server is aware of where to send TCA Profile Notifications.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

674　　　　　　　　　**Table 50-Subscribe TCA Profile Notifications Use Case**

Attribute	Description	Value	Definition
Notification Target Information	*The detailed information on the technical API endpoint address specifying where the Seller/Server is to send any TCA Notifications.*	*String*	*This is the Callback target in the API*

	There can be mul-tiple locations for one Buyer/Client.		
List of Notification Types	The types of noti-fications that the Buyer/Client wishes to receive.	List of one or more of: *TCA*	*This is a list of at-tributes*

Table 51-Register for TCA Notification Attributes

11.1.7 Unsubscribe to TCA Profile Notifications

Field	Description
Use Case Number	35
Use Case Name	Unsubscribe TCA Profile Notifications
Description	A request initiated by the Client to unsubscribe from TCA Profile Noti-fications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client has previously subscribed to TCA Profile Notifica-tions. 2. The Client is authorized to subscribe to TCA Profile Notifica-tions in the Seller/Server system. 3. The Seller/Server supports TCA Profile Notifications.
Process Steps	1. The Buyer/Client sends a Subscribe to TCA Notification request to the Seller/Server. **[R102]** To unsubscribe from TCA Notifications, the Buyer/Client's **MUST** send an Unsubscribe message. 2. The Seller/Server response indicates if the unsubscribe was suc-cessful. **[R103]** The Seller/Server's response **MUST** indicate if the unsubscribe was successful.
Post-Conditions	1. The Seller/Server discontinues send TCA Profile Notification Types to Client specific to Client Unsubscribe request.
Alternative Paths	1. The Seller/Server will return an error message if an error is en-countered during processing.

Table 52-Unsubscribe TCA Profile Notifications Use Case

11.1.8 Stateful TCA Notification

Field	Description
Use Case Number	36
Use Case Name	Stateful TCA Notification
Description	A Stateful TCA lifecycle Notification is initiated by the Seller/Server to a subscribed Client.
Actors	Buyer/Client, Seller/Server

Field	Description
Pre-Conditions	1. The Seller/Server supports Stateful TCA Notifications. 2. The Client has subscribed to Stateful TCA Notifications.
Process Steps	1. For a Stateful TCA notification, the Seller/Server generates a Stateful TCA Notification to a Buyer/Client who has subscribed to Stateful TCA Notifications that include the attributes shown in Stateful TCA Notifications table. **[R104]** When sending a notification for a TCA Reporting Type of Stateful, the Seller/Server notification **MUST** include the attributes in Stateful TCA Notifications table. **[R105]** When sending a notification for a TCA Reporting Type of Stateful, the TCA Type **MUST** be STATEFUL-SET when the notification is for a TCA-SET event. **[R106]** When sending a notification for a TCA Reporting Type of Stateful, the TCA Type **MUST** be STATEFUL-CLEAR when the notification is for a TCA-CLEAR event.
Post-Conditions	1. The Seller/Server has sent related Stateful TCA Notification.

679

Table 53-Stateful TCA Notification Use Case

680

Field Name	Field Value	Field Format	Field Description
Date and Time	Date and Time in UTC	Date-Time	Time of the event, in UTC. For Stateful SET-TCA and CLEAR-TCA this is the time of the completion of the PM Metric Calculation Interval for which the PM Metric Value triggered the TCA to be generated.
Performance Metric Name	Payload Specific Attributes	String	Human readable text for the Performance Metric for which the TCA Function was configured.
TCA Performance Threshold Value	Numeric value	Integer	The configured TCA Performance Threshold Value for the Performance Metric.
SET-TCA Window Threshold Value	Numeric value	Integer	The value of the SET-TCA Window Threshold. Only used for SET-TCA notification messages.
CLEAR-TCA Window Threshold Value	Numeric value	Integer	The value of the CLEAR-TCA Window Threshold. Only used for CLEAR-TCA notification messages.

Field Name	Field Value	Field Format	Field Description
TCA Window Size Value	Numeric value	Integer	The number of PM Metric Calculation Intervals included in the sliding window for the SET-TCA or CLEAR-TCA process.
PM Metric Value	List of Numeric value for each PM Metric Calculation Interval	Integer	
TCA Type	STATEFUL-SET, or STATEFUL-CLEAR	String	The type of TCA, i.e., STATEFUL-SET or STATEFUL-CLEAR
Severity Level	CRITICAL, MAJOR, MINOR, WARNING, or CLEARED	String	CRITICAL, MAJOR, MINOR, or WARNING apply to STATEFUL-SET, CLEARED applies to STATEFUL-CLEAR.

681 **Table 54-Stateful TCA Notification Attributes**

682 **11.1.9 Stateless TCA Notification**

Field	Description
Use Case Number	37
Use Case Name	Stateless TCA Notification
Description	A Stateless TCA lifecycle Notification is initiated by the Seller/Server to a subscribed Client.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Seller/Server supports Stateless TCA Notifications. 2. The Client has subscribed to Stateless TCA Notifications.

Field	Description
Process Steps	1. For a Stateless TCA notification, the Seller/Server generates a TCA Notification to a Buyer/Client who has subscribed to TCA Notifications that include the attributes shown in TCA Stateless Reporting Attributes table. **[R107]** When sending a notification for a TCA Reporting Type of Stateless, the Seller/Server notification **MUST** include the attributes in TCA Stateless Reporting Attributes table. **[R108]** If the Damping Factor is included in the TCA Profile, the TCA Notification **MUST** include the attributes shown in Damping Factor TCA Reporting Attributes table.
Post-Conditions	1. The Seller/Server has sent related Stateless TCA Notification.

683

Table 55-Stateless TCA Profile Notification Use Case

Field Name	Field Value	Field Format	Field Description
Date and Time	Date and Time in UTC	Date-Time	Time of the event, in UTC. This is the time of the end of the PM Metric Calculation Interval for which the TCA is generated.
Performance Metric Name	Service Payload Specific Attributes	String	Human readable text for Performance Metric for which the TCA Function was configured.
TCA Performance Threshold Value	Numeric value	Integer	The TCA Performance Threshold Value
Performance Metric Value	Numeric value	Integer	The PM Metric Value for the PM Metric Calculation
TCA Type	STATELESS	String	The type of TCA
Severity Level	One of CRITICAL, MAJOR, MINOR, WARNING	String	CRITICAL, MAJOR, MINOR, or WARNING.

684

Table 56-Stateless TCA Reporting Notification Attributes

Field Name	Field Value	Field Format	Field Description
Damping Factor	Numeric value	Integer	The value that identifies the number of PM Metric Calculation Intervals included in the Damping Factor process.

Field Name	Field Value	Field Format	Field Description
Number of PM Metric Calculation Intervals	Numeric value	Integer	The number of PM Metric Calculation Intervals in the hopping window in which the PM Metric Value ≥ the TCA Performance Threshold Value

685

Table 57-Damping Factor TCA Notification attributes

12 Streaming Use Cases and PM Results

Buyer/Clients may desire to receive streaming PM results. Event streaming is the practice of capturing data in real-time from event sources like databases, sensors, mobile devices, cloud services, and software applications in the form of streams of events; storing these event streams durably for later retrieval; manipulating, processing, and reacting to the event streams in real-time as well as retrospectively; and routing the event streams to different destination technologies as needed.

Buyer/Clients subscribe to streaming PM results using similar mechanisms as they use for Notifications. Because the streaming PM results are provided in real-time or near real-time, the existing PM Notifications and retrieval is not expected to support streaming. Instead, it is expected that streamed PM results will use some other mechanism to deliver results. While it is outside of the scope of this document to define how API implementations support streaming, discussions on binary implementations such as Kafka are thought to have the potential to support the requirements defined within this document.

The available PM results that may be streamed are described as Topics within this document. The Buyer/Client can retrieve a list of available Topics, a list of Topics they have subscribed to, and a specific Topic. The Buyer/Client is then able to select a Topic and subscribe to that Topic. Streaming PM results are then sent by the Seller/Server to the Buyer/Client for the Topic.

Event streaming is the practice of capturing data in real-time from event sources like databases, sensors, mobile devices, cloud services, and software applications in the form of streams of events; storing these event streams durably for later retrieval; manipulating, processing, and re-acting to the event streams in real-time as well as retrospectively; and routing the event streams to different destination technologies as needed. Event streaming thus ensures a continuous flow and interpretation of data so that the right information is at the right place, at the right time.

Streaming is an implementation of a specific Pub/Sub pattern. A major characteristic of streaming is the events are in most cases being produced, ingested, and consumed at a high rate. An Event Driven Architecture (EDA) is needed to implement a streaming service and corresponding API. A general EDA is shown in the figure below. The architecture has three main components – Even Producer, Event Ingestion and Event Consumer.

The Legato IRP provides a demarcation between the Event Producer/Event Ingestion and the corresponding Event Consumers. The EDA requires a mechanism for the Event Consumer to subscribe to a specific topic. The Event Producer will send the asynchronous Events to the Event Ingestion where the set of Event Consumers will receive the subscribed Events.

The major goal of the use cases defined for streaming will be in the development of a streaming API. The streaming API will enable streaming of events using the EDA push technology and provide a subscription mechanism. The API will need to support multiple types of streaming events, including, but not limited to generic events, platform events.

723 ## 12.1   Streaming (Topics) Use Cases

724 The following sub-section defines use cases for the Topic management. Use cases are provided
725 for a Consumer to get a list of available topics to listen to, Consumer to get their subscribed topic
726 list and Consumer to get their specific subscriber topic.

727
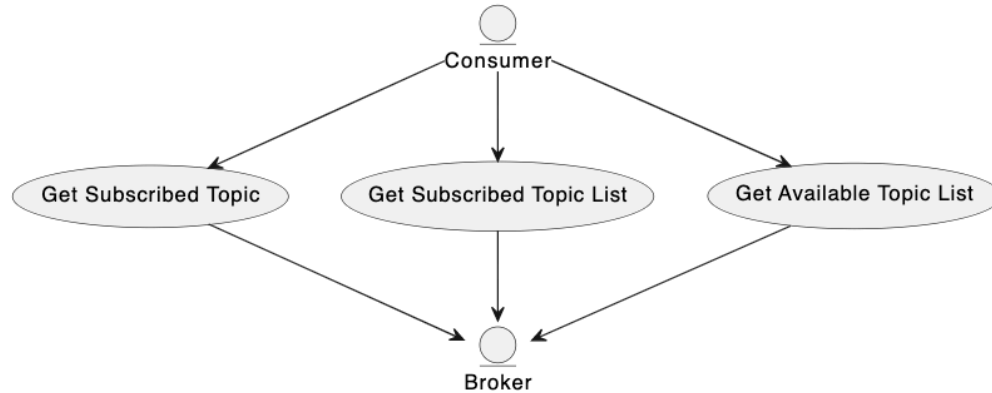
728   **Figure 10-Streaming (Topics) Use Cases**

729 ## 12.2   Subscribe/Publish Streaming Use Cases

730

731 The following sub-section defines use cases for the subscribe and publish streaming use cases.
732 The Consumer can subscriber and unsubscribe to/from a Topic. The Consumer can retrieve po-
733 tentially missed Topics based on filtered query. The Publisher can publish Topics.

734
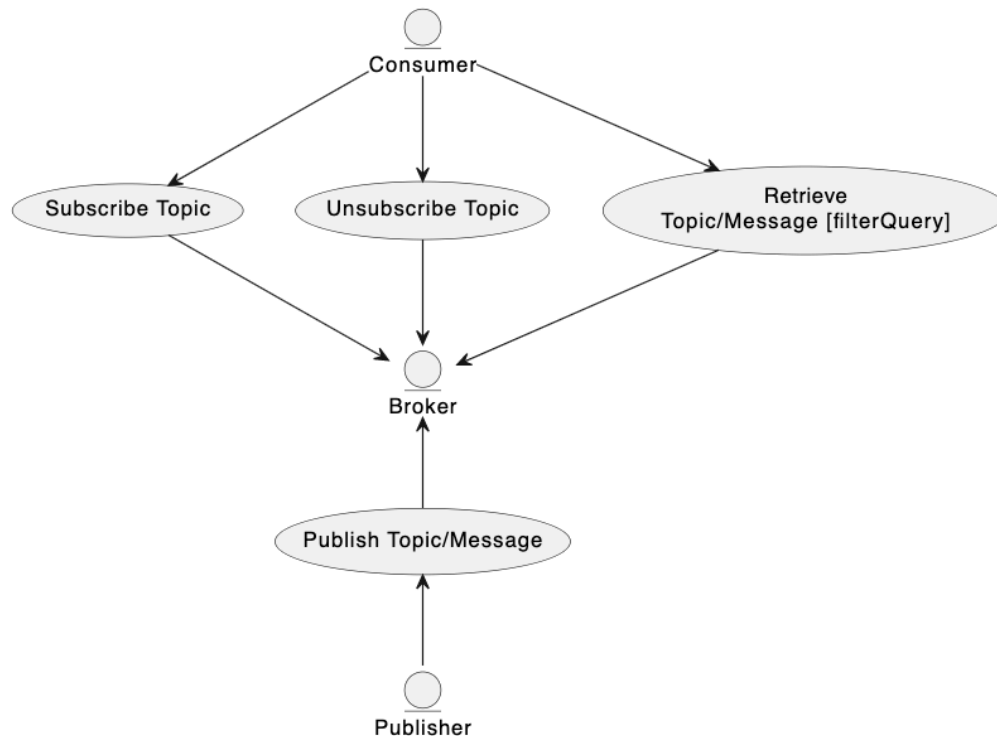
735   **Figure 11-Subscriber/Publish Streaming Use Cases**

736 The communications between a Publisher and Consumer are not direct, but through a Broker. The
737 Broker is responsible for the distribution of Topics with respective Messages to the set of Con-
738 sumers that have subscribed to the specific Topic.

739 **12.2.1 Retrieve Topic by Identifier Use Case**

Field	Description
Use Case Number	38
Use Case Name	Retrieve Topic by Identifier
Description	A request is initiated by the Buyer/Client (Subscriber) to retrieve a Topic that match the provided filter criteria.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to perform a Topic query.
Process Steps	1. The Buyer/Client submits a Retrieve Topic by Topic Identifier request that includes the Topic Identifier. **[R109]** The Buyer/Client's Retrieve Topic by Topic Identifier **MUST** contain the Topic Identifier. **[R110]** The Topic Identifier supplied by the Seller/Server **MUST** be unique within the Seller/Server's network. 2. The Seller/Server validates the Buyer/Client's Retrieve Topic by Topic Identifier and returns the attributes in Topics Attribute table.
Post-Conditions	1. The Buyer/Client receives a list of all Topics that match the Buyer's/Client's selection criteria.
Alternative Paths	1. If errors are encountered, the Seller/Server returns all identified errors in a reject response. 2. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either: a. An empty list and message that indicates the result set is too large and submit a new more specific query b. A response that indicates the result is too large and includes a subset of the matching Topics. 3. If the query does not find any matching records, then the Seller/Server responds with an indication of this result by sending an empty list with a success code.

740 **Table 58-Get Subscriber Topic Use Case**

Field Name	Field Value	Field Format	Field Description
Topic Identifier	The Seller/Server assigned Topic Identifier	String	Set by the Seller/Server

Field Name	Field Value	Field Format	Field Description
Topic Category	A description of the area that the Topic covers.	One of: Layer 1 Ethernet IP SD-WAN Computing Storage Memory	Agreed to by the Buyer/Client and Seller/Server during on-boarding. The enumeration may include additional items as agreed to by the Buyer/Client and Seller/Server.
Service Specific Attributes	Defined per the Service Specification		Set by the Seller/Server Describes the PM Attributes that are returned for the Topic.

741 **Table 59-Topic Attributes**

742 **12.2.2 Retrieve Available Topic List Use Case**

Field	Description
Use Case Number	39
Use Case Name	Retrieve Available Topic List
Description	A request is initiated by the Buyer/Client (Subscriber) to retrieve a Topic list.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to retrieve a Subscriber Topic List in the Seller/Server system.
Process Steps	1. The Buyer/Client submits a Get Subscriber Topic List request with that contain any filter criteria. **[O18]** The Buyer's/Client's Retrieve Subscribed Topic List request **MAY** contain filter criteria of the Topic Category. 2. The Seller/Server validates the Buyer's/Client's request and responds with a list of Topics that the Buyer/Client has subscribed to and that match the filter criteria. **[R111]** The Seller/Server's response **MUST** include a list of Topics that the Client has subscribed to and match the filter criteria. **[R112]** If there are no Topic Identifiers that match the filter criteria, the Seller/Server **MUST** return an empty list.
Post-Conditions	1. The Buyer/Client receives a Response with the list of Subscriber Topics currently subscribed to.

Field	Description

Alternative Paths	1. If errors are encountered, the Seller/Server returns all identified errors in a reject response.
	2. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either:
	    a. An empty list and message that indicates the result set is too large and submit a new more specific query
	    b. A response that indicates the result is too large and includes a subset of the matching Topics.
	3. If the query does not find any matching records, then the Seller/Server responds with an indication of this result by sending an empty list with a success code.

743 **Table 60-Get Subscriber Topic List Use Case**

744 ### 12.2.3 Retrieve Subscribed Topic List Use Case

Field	Description
Use Case Number	40
Use Case Name	Retrieve Subscribed Topic List
Description	A request is initiated by the Buyer/Seller (Subscriber) to retrieve a Topic list which the Subscriber is currently subscribed.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to retrieve a Subscriber Topic List in the Seller/Server system.

Process Steps	1. The Buyer/Client submits a Get Subscriber Topic List request with that contain any filter criteria.
	
	    [O19] The Client's Retrieve Subscribed Topic List request **MAY** contain filter criteria of the Topic Category.
	
	2. The Seller/Server validates the Buyer's/Client's request and responds with a list of Topics that the Buyer/Client has subscribed to and that match the filter criteria.
	
	    [R113] The Seller/Server's response **MUST** include a list of Topics that the Client has subscribed to and match the filter criteria.
	
	    [R114] If there are no Topic Identifiers that match the filter criteria, the Seller/Server **MUST** return an empty list.

Post-Conditions	1. The Buyer/Client receives a Response with the list of Subscriber Topics currently subscribed to.

Field	Description

Alternative Paths	1. If errors are encountered, the Seller/Server returns all identified errors in a reject response.
	 2. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either:
	    a. An empty list and message that indicates the result set is too large and submit a new more specific query
	    b. A response that indicates the result is too large and includes a subset of the matching Topics.
	 3. If the query does not find any matching records, then the Seller/Server responds with an indication of this result by sending an empty list with a success code.

745
<center>**Table 61-Get Subscriber Topic List Use Case**</center>

746 **12.2.4 Subscribe to Topic Use Case**

Field	Description
Use Case Number	41
Use Case Name	Subscribe to Topic
Description	A request is initiated by the Buyer/Client (Subscriber) subscribe to a Topic.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request an Available Topic List in the Seller/Server system.
Process Steps	1. The Buyer/Client requests a subscribe to a specific Topic. **[R115]** The Buyer/Client's Subscribe to Topic request **MUST** include the attributes shown in Subscribe Topic Attributes table. **[R116]** The Seller/Server validates the Buyer/Client's request and responds with an indication of whether the request was accepted or declined. 2. If accepted the response includes the Stream Identifier as shown in Subscribe Topic Attributes table. **[R117]** The Seller/Server's response to the Buyer/Client's Subscribe to Topic request **MUST** indicate if the request was accepted or declined. **[R118]** If declined, the Seller/Server **MUST** include the reason the request was declined. **[R119]** If accepted, the Seller/Server **MUST** include the Stream Identifier in their response and start streaming the PM reports to the Buyer/Client.

Field	Description
Post-Conditions	1. The Buyer/Client receives all Topic messages.

Alternative Paths	1. If errors are encountered, the Seller/Server returns all identified errors in a reject response.
	2. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either:
	    a. An empty list and message that indicates the result set is too large and submit a new more specific query
	    b. A response that indicates the result is too large and includes a subset of the matching Topics.
	3. If the query does not find any matching records, then the Seller/Server responds with an indication of this result by sending an empty list with a success code.

747

Table 62-Subscribe to Topic Use Case

Field Name	Field Value	Field Format	Field Description
Topic Identifier	The Seller/Server assigned Topic Identifier	String	Set by the Seller/Server
Stream Identifier	Unique identifier for each stream.	String	Set by Seller/Server
Description	An explanatory of the stream.	String	
title	The title of the stream.	String	
priority	Priority of stream.	String	
loadInterval	Measurement interval in milliseconds.	Integer	
recordRetention		TimePeriod	
recordContent		String	
logStorageStrategy		LogStorageStrategy	
logRecordStrategy		LogRecordStrategy	
segmentSize	Size of substructure log.	<Integer,Units>	
ipAddress	IP Address for callback.	String	
port	Port for callback.	String	
protocol	Protocol for callback.	String	

748

Table 63-Subscribe to Topic Attributes

749 **12.2.5 Unsubscribe from Topic Use Case**

Field	Description
Use Case Number	42

Field	Description
Use Case Name	Unsubscribe from a Topic
Description	A request is initiated by the Buyer/Client (Subscriber) to unsubscribe from a Topic. *NOTE: This use case covers a schedule and non-scheduled unsubscribe request.*
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to unsubscribe from a Topic in the Seller/Server system.

Process Steps	1. The Client submits an Unsubscribe to Topic request that includes the Subscription Name.
	
	    [R120] The Client's Unsubscribe to Topic request **MUST** contain the Subscription Name that is to be unsubscribed.
	2. The Seller/Server Validates the Client's request and responds with an indication whether the request was accepted or declined.
	
	    [R121] The Seller/Server's response to the Client's Unsubscribe to Topic request **MUST** indicate if the request was accepted or declined.
	
	    [R122] If declined, the Seller/Server **MUST** include the reason the request was declined.
	
	    [R123] If accepted, the Seller/Server **MUST** stop streaming the PM reports to the Client.

Post-Conditions	1. The Client receives a Response indicating a Topic has been unsubscribed from. 2. The Client will no longer receive any Messages from the specified Topic.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing. 2. The Seller/Server returns an error message if any mandatory attributes are missing.

750

Table 64-Unsubscribe from a Topic Use Case

751 **12.2.6 Publish Topic Message Use Case**

Field	Description
Use Case Number	43
Use Case Name	Publish Topic Message

Field	Description
Description	A Seller/Server (Publisher) publishes a Topic/Message to Buyers/Sellers (Subscriber(s)).
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request a Topic in the Seller/Server system.
Process Steps	**[R124]** The Seller/Server **MUST** publish Topic Messages to Buyer/Clients who have subscribed to the Topic. **[R125]** The Topic Message **MUST** contain the attributes shown in Publish Topic Attributes table. **[R126]** The Seller/Server **MUST NOT** publish Topic Messages to Buyer/Clients who have not subscribed to the Topic. **[R127]** The Seller/Server **MAY** stop publishing Topic Messages to a Buyer/Client if no acknowledgement is received from the Buyer/Client. 1. It is recommended that if the Seller/Server opts to stop publishing Topic Messages to a Buyer/Client, that they make this decision based on multiple messages that receive no acknowledgement rather than a single message. **[R128]** The Buyer/Client receives the Topic Message.
Post-Conditions	1. The Client receives a Topic/Message with all attributes.

752

Table 65-Publish Topic Use Case

Attribute Name	Description	Value	Comments
Stream Identifier	The Seller/Server assigned Stream Identifier	String	Set by the Seller/Server
Description	The notification data structure.	String	Set by Seller/Server
Event ID	The identifier of the Notification.	String	Set by Seller/Server
Event Time	Time of the Event occurrence.	Date-Time	Set by Seller/Server
Event Type	The type of Notification.	String	Set by Seller/Server
Correlation ID	The correlation ID for this Event.	String	Set by Seller/Server
Domain	The Domain of this Event.	String	Set by Seller/Server

Attribute Name	Description	Value	Comments
Priority	A priority.	String	Set by Seller/Server
Source	Source of Event.	String	Set by Seller/Server

Table 66-Topic Message Attributes

12.2.7 Retrieve Topic Message Use Case

Field	Description
Use Case Number	44
Use Case Name	Retrieve Topic/Messages
Description	A Buyer/Client retrieves the Topic/Message that it is subscribed to.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request a Topic in the Seller/Server system.
Process Steps	1. The Buyer/Client submits a Retrieve Topic Message request that includes the Stream Identifier and a range of Event Dates. **[R129]** The Buyer/Client's Retrieve Topic Message **MUST** include the Stream Identifier and a range of Event Dates. **[O20]** The Buyer/Client's Retrieve Topic Message **MAY** include other attributes from Table 66. 2. The Seller/Server returns a list of Topic Messages that match the filter criteria provided by the Buyer/Client. **[R130]** The Seller/Server's response **MUST** include a list of Topic Messages including all attributes that are shown in Table 66 that match the filter criteria. 3. If the Seller/Server finds no Topic Messages that match the filter criteria, they **MUST** return an empty list.
Post-Conditions	1. The Client receives a Topic/Message with all attributes.

Table 67-Retrieve Messages from a Topic Use Case

756 **13 Passive Real-time/Historical Statistics Use Cases and Business Process Defi-**

757 **nitions**

758

759 The following section details the set of use cases needed to support the collection and reporting
760 of network and service performance (i.e., bandwidth utilization) and error statistics. The statistics
761 collections include but are not limited to telemetry associated with an interface, (Net/Applica-
762 tion) Flow, VLAN, bridging/Ethernet, IP, TCP, UDP layers.

763

764 The statistics measured in this section are outside the realm of measuring and reacting to perfor-
765 mance objectives. In some cases, these are statistics that do not need to be configured, but are
766 enabled and ready for collection on an interface, VLAN, etc.

767 **13.1 High-Level Use Cases**

768 These Use Cases are based on business process standards of interactivity between Client and
769 Seller/Server for the purpose of requesting statistics on a variety of objects. The statistics collec-
770 tion does not typically require a Job to be instantiated prior to the collection. The statistics de-
771 fined in this set of use cases are different from PM Job initiated which are based on performance
772 objectives.

773

774 **13.2 Real-time/Historical Statistics Collection Use Cases**

775 This section defines the set use cases that can be queried with the creation and management of a
776 Job. There are two types of statistics collections, real-time and historical. A real-time request is
777 a snapshot of the current statistics being requested. A historical request requires a specified
778 query filter with such attributes as start time and end time.

779

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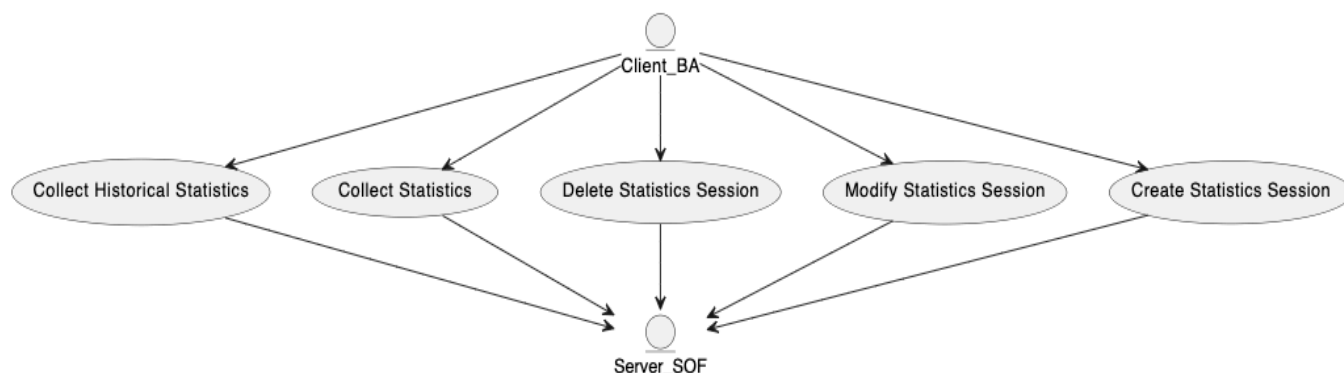
781 **Figure 12-Real-time/Historical Statistics Collection Use Cases**

782 The Client can retrieve specified statistics. The Seller/Server will respond to the query request with
783 the aggregated statistics per attribute.

784 **13.2.1 Create Statistics Collection Job Use Case**

Field	Description
Use Case Number	45
Use Case Name	Create Statistics Collection Job

Field	Description
Description	A request initiated by the Buyer/Client to create a Statistics Collection Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to create a Statistics Collection Job from the Seller/Server.

Process Steps	1. The Buyer/Client determines the statistics, measurement interval that will be used in initiate a Statistics Collection Job.
	2. The Buyer/Client initiates and submits a Statistics Collection Job request that contains a Service Identifier, Performance Indicator Specification and Schedule Definition.
	
	[R131] The Buyer's/Client's Create Statistics Collection Job **MUST** support the following attributes:
	
	• Statistics Collection Job Type
	    ○ Real-time
	    ○ Historical
	• Granularity
	• Reporting Period
	• Specific Attributes
	• Schedule Definition
	
	[O21] The Buyer's/Client's Statistics Collection Job **MAY** contain the following attributes:
	
	• Description
	• Statistics Collection Job Priority
	
	3. The Seller/Server validates the Statistics Collection Job request and responds with Statistics Collection Job including a unique identifier, ID in response. The Seller/Server validates the Buyer/Client Create Statistics Collection Job request, creates the Job, and returns the Job ID to the Client.
	
	[R132] The Seller/Server MUST assign a Job Identifier to the Statistics Collection Job that is unique within the network.
	
	[R133] The Statistics Collection Job Identifier supplied by the Seller/Server **MUST** be unique within the Seller/Server's network.
	
	[R134] The Statistics Collection Job MUST use the attributes included in the Buyer's/Client's Create Statistics Collection Job request.

Field	Description
Post-Conditions	1. The Buyer/Client receives a Response, including a Statistics Collection Job Identifier. 2. The Seller/Server initiates a Statistics Collection Job. 3. If the Seller/Server supports notifications and the Buyer/Client has registered for notifications, the Seller/Server notifies the Buyer/Client of commitment to provide the request. 4. The Seller/Server notifies the Buyer/Client when Job results are available. **[R135]** If the Buyer/Client registered for PM Notifications, the Seller/Server **MUST** notify the Buyer/Client when Statistics Collection Job results are available.
Alternative Paths	1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from creating the Statistics Collection Job.

785 **Table 68-Create Statistics Collection Job Use Case**

786 **13.2.2 Modify Statistics Collection Job Use Case**

Field	Description
Use Case Number	46
Use Case Name	Modify Statistics Collection Job
Description	A request initiated by the Client to the Seller/Server to modify a Statistics Collection Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to modify a Statistics Collection PM Job in the Seller/Server system.

Field	Description
Process Steps	1. The Buyer/Client creates a Modify Statistics Collection Job request that includes the Statistics Collection Job Identifier and the attribute(s) to be modified.
	[R136] The Buyer's/Client's Modify Statistics Collection Job request MUST include the Statistics Collection Job Identifier.
	[O22] The Buyer's/Client's Modify Statistics Collection Job request MAY include one or more of the following attributes:
	• Granularity
	• Reporting Period
	• Product Specific Attributes
	• Schedule Definition
	• Description
	• Consuming Application Indicator
	• Job Priority
	2. The Seller/Server receives the request and validates the request.
	[R137] If the Statistics Collection Job is active or not active, the Seller/Server MUST modify the Statistics Collection Job attributes requested by the Buyer/Client.
	3. The Seller/Server determines if any Statistics Collection Job can be modified.
	4. The Seller/Server returns the modified Statistics Collection Job.
Post-Conditions	1. The Buyer/Client receives a Statistics Collection Job response with attributes that have been modified.
	2. The Statistics Collection Job is modified with requested attributes changes.
	3. If the Seller/Server supports notifications and the Buyer/Client has registered for notifications, the Seller/Server notifies the Buyer/Client of update to state of Statistics Collection Job.
Alternative Paths	1. If the modification request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

787   **Table 69-Modify Statistics Collection Job Use Case**

788   **13.2.3 Delete Statistics Collection Job Use Case**

Field	Description
Use Case Number	47
Use Case Name	Delete Statistics Collection Job
Description	A request initiated by the Client to the Seller/Server to delete a Statistics Collection Job.
Actors	Buyer/Client, Seller/Server

Field	Description
Pre-Conditions	1. The Buyer/Client is authorized to delete a Statistics Collection Job in the Seller/Server system.
Process Steps	1. The Buyer/Client submits a delete Statistics Collection Job request with Statistics Collection Job unique identifier. **[R138]** The Buyer's/Client's Delete Statistics Collection Job request MUST include the Statistics Collection Job Identifier. 2. The Seller/Server receives the request and validates the request. **[R139]** If the Statistics Collection Job is active, the Seller/Server MUST deactivate before deleting the Statistics Collection Job as requested by the Client. 3. The Seller/Server determines if any Statistics Collection Job exists and can be deleted. 4. The Seller/Server deletes the Statistics Collection Job.
Post-Conditions	1. The Buyer/Client receives a confirmation that the Statistics Collection Job has been deleted. 2. All resources on the Seller/Server side associated with the Statistics Collection Job are deleted.
Alternative Paths	1. If the deletion request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

789   **Table 70-Delete Statistics Collection Job Use Case**

790   **13.2.4 Collect Statistics Collection Report**

Field	Description
Use Case Number	48
Use Case Name	Collect Statistics Collection Report
Description	A request initiated by the Buyer/Client to the Seller/Server to collect a Statistics Collection Report.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to collect a Statistics Collection Report in the Seller/Server system.

Process Steps	1. The Buyer/Client submits a Retrieve Performance Measurement Report request as for Results in Payload, Results as Attachment or Results via FTP including filter criteria the Seller/Server should apply. The Client sends the Service identifier used in the request to identify the Service to collect the report.
	[R140] The Seller MUST support at least one of the three methods of retrieving results mentioned above.
	[O23] The Seller MAY support multiple methods of retrieving results.
	2. Retrieve Result: The Buyer/Client submits a Retrieve Results in Payload request to the Seller/Server.
	[R141] The Retrieve Results in Payload request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:
	• Report Identifier • Report Format = Payload
	3. The Buyer/Client submits a Retrieve Results as Attachment request to Seller/Server.
	[R142] The Retrieve Results in Attachment request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:
	• Report Identifier • Report Format = Attachment • Attachment Type
	4. The Buyer/Client submits a Retrieve Results as FTP to the Seller.
	[R143] The Retrieve Results in FTP request **MUST** include the following attributes shown in Table-Retrieve Results in Payload Attributes:
	• Report Identifier • Report Format = FTP • FTP Address
	5. The Seller/Server receives the request and validates the request. 6. The Seller/Server determines if a Performance Management Report matches the filter criteria in the request.

Field	Description
	a. The Seller/Server-side results:\The Seller/Server's response includes the results from the specified reports as payload in the envelope. **[R144]** The Seller/Server MUST provide the specified result in the API payload. 7. The Seller/Server's response includes the results from the specified reports as an Attachment. **[R145]** The Seller/Server MUST provide the specified results as an attachment. 8. The Seller/Server's response allows the Buyer/Client to retrieve the results via FTP. **[R146]** The Seller/Server MUST provide the specified results as an FTP'd file in JSON format.
Post-Conditions	1. The Client receives the Statistics Collection Report that match the Client's filtered selection criteria. 2. The Client receives the call location where the file collection for the Statistics Collection Report in FTP mode only. 3. If errors occurred, the Seller/Server returns all identified errors in a reject response.

791

Table 71-Collect Statistics Report Use Case

14 Alarm Management Use Cases and Business Process Definitions

An alarm is defined in ITU-T X.733 [3] as a notification of a specific event. An alarm may or may not represent an error. Not all alarms are an indication of a failure. Early detection of faults before significant effects have occurred is a desirable requirement of communicating systems. Degradation of service may be detected by monitoring error rates. Threshold mechanisms (e.g., TCAs) on counters and gauges are a method of detecting such trends and providing a warning when the rate becomes high.

Alarms are specific types of notifications concerning detected faults or abnormal conditions. An important criterion by which failures of communications resources are to be reported is the level to which the fault degrades the quality of the service that was originally requested by (or promised to) the service user. Malfunctions will range in severity from Warning, where there is no impact upon the quality of service offered to the user, to Critical, where it is no longer possible to provide the service requested by (or promised to) the service user. The level of severity can be described generically, and criteria specified based upon the level of degradation that the fault causes to the service: Critical, Major, Minor or Warning.

This section provides a set of Use Cases needed to support Alarm Management. The reason for supporting Alarm Use Cases is that a TCA Crossing results in an Alarm (not an Event or Notification).

14.1   High-Level Use Cases

These Use Cases are based on business process standards of interactivity between Client and Seller/Server of Alarm management. The Alarm resource should be represented by the information model defined in ITU-T X.733 [3]. The use cases defined in this section are specific to supporting TCAs. Other alarms (i.e., Loss of Signal) are beyond the scope of this document.

14.2   Alarm Management Use Cases

This section defines the use cases that support Alarm Management Use Cases. Alarms are used to inform the listening client that a Threshold Crossing Alert has occurred. Specifically, a TCA is considered an Alarm with severity of Informative. The alarm indicates a TCA has been crossed, which is independent of the state of the service. The service will have its own operational state.

NOTE: Given the interaction between a TCA and an Alarm there is likely an interaction between intra-SOF functional components. For example, a TCA is a combination of a Performance Management functional component and Fault Management functional component.

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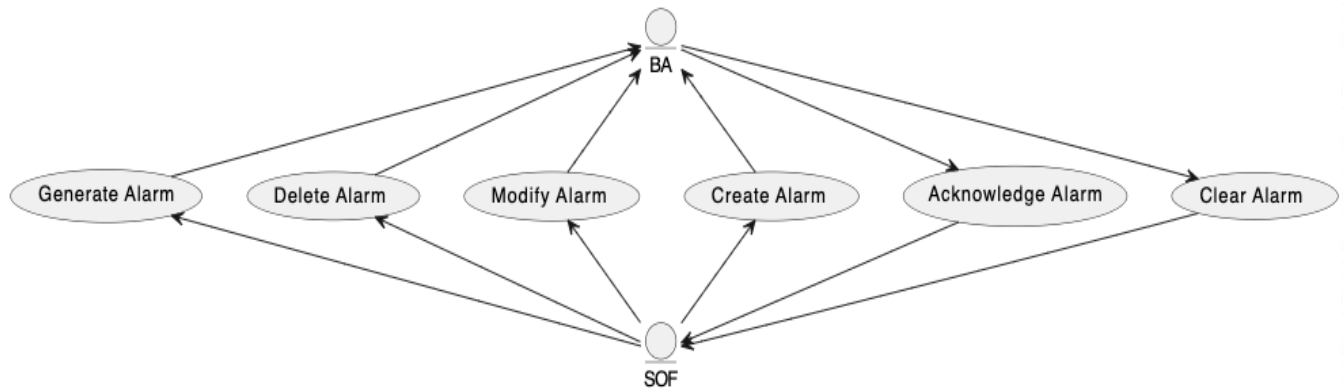
Figure 13-Alarm Management Use Cases

827 The Client can acknowledge and clear alarms. The Seller/Server will create, delete, modify, and
828 generate alarms.

829 **14.2.1 Create Alarm**

Field	Description
Use Case Number	49
Use Case Name	Create Alarm
Description	A request is made by Seller/Server to create an Alarm based on an event.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Seller/Server has determined that an Event (i.e., TCA) has occurred and can be mapped and communicated to subscribers with an Alarm.
Process Steps	1. The Seller/Server determines the set of Clients (Subscribers) that are listening for TCA. 2. The Seller/Server generates and communicates the Alarm to all subscribers.
Post-Conditions	1. The Client(s) receives an Alarm indicating the TCA Event has occurred. 2. The Client will take up action upon the Alarm.
Alternative Paths	

830

Table 72-Create Alarm Use Case

Attributes	Description	Type	Comments
Alarm Identifier	Unique identifier.	String	

Attributes	Description	Type	Comments
Alarm Time	Time of the event, in UTC. For stateless TCAs, and stateful SET TCAs this is the time the threshold was crossed; for stateful CLEAR TCAs, it is the time at the end of the Measurement Interval for which the CLEAR TCA is being generated.	Date-Time	
PM Job	Identification of the PM Job for which the TCA Function was configured. The specific parameters needed to uniquely identify a PM Job are implementation specific.	String	
Measurement Interval	The time, in UTC, at the start of the Measurement Interval for which the TCA was generated.	Date-Time	
Performance Metric Name	Performance Metric for which the TCA Function was configured.	Complex data type	
Configured Threshold	The configured threshold parameters. For bin-based thresholds, this includes the bin number and the total count, i.e., (N, k).	Complex data type	

Attributes	Description	Type	Comments
Measured Performance Metric	Measured value that caused the TCA to be generated. For bin-based thresholds configured as (N, k), this is always equal to N for stateless TCAs and stateful SET TCAs; for stateful CLEAR TCAs, it is the value of UBC(k) at the end of the Measurement Interval. For "maximum" performance metrics, for stateless TCAs and stateful SET TCAs, this is the first value in the Measurement Interval that reaches or exceeds the configured threshold; for stateful CLEAR TCAs it is the maximum value at the end of the Measurement Interval. For HLI and CHLI thresholds, this is always equal to the configured threshold value for stateless TCAs and stateful SET TCAs; for stateful CLEAR TCAs it is the total count at the end of the Measurement Interval.	Complex data type	
Suspect Flag	Value of the Suspect Flag for the Measurement Interval for which the TCA was generated. Suspect Flag is true when there is a discontinuity in the performance measurements conducted during the Measurement Interval.	String	

Attributes	Description	Type	Comments
TCA Type	The type of TCA, i.e. one of STATELESS (if stateless TCA reporting was configured for the TCA Function), STATEFUL-SET (if stateful TCA reporting was configured and this is a SET TCA) or STATEFUL- CLEAR (if stateful TCA reporting was configured and this is a CLEAR TCA).	String	
Severity	WARNING (for STATE-LESS or STATEFUL-SET) or INFO (for STATEFUL-CLEAR).	String	

831   **Table 73-Alarm Attributes[1]**

832   **14.2.2   Modify Alarm**

Field	Description
Use Case Number	50
Use Case Name	Modify Alarm
Description	A request is made by Seller/Server to modify an Alarm based on event condition change and communicates to Buyer(s)/Client(s).
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to modify alarms from the Seller/Server system. 2. The Seller/Server is supporting the ability to modify alarms.
Process Steps	1. The Client sends a unique identifier and attributes of an alarm to modify. 2. The Seller/Server modifies alarm per client request. **[R147]** The Seller/Server **MUST** support the Modify Alarm Use Case. **[R148]** The Client **MUST** support the Modify Alarm Use Case.
Post-Conditions	1. The Client(s) Alarm identified by unique identifier is modified per Client(s) request.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

833   **Table 74-Modify Alarm Use Case**

---

[1] MEF 35.1 Service OAM Performance Monitoring Implementation Agreement – TCA Notification Message

834 **14.2.3 Delete Alarm**

Field	Description
Use Case Number	47
Use Case Name	Delete Alarm
Description	A request initiated by the Seller/Server to delete an Alarm.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to delete alarms from the Seller/Server system. 2. The Seller/Server is supporting the ability to delete alarms and resources from system.
Process Steps	1. The Client sends a delete alarm request with unique identifier. 2. The Seller/Server deletes alarm and associated resources. **[R149]** The Seller/Server MUST support the Delete Alarm Use Case. **[R150]** The Client MUST support the Delete Alarm Use Case.
Post-Conditions	1. The Client(s) request alarm is deleted.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

835 **Table 75-Delete Alarm Use Case**

836 **14.2.4 Generate Alarm**

Field	Description
Use Case Number	48
Use Case Name	Generate Alarm
Description	The Seller/Server generates an Alarm.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to request that an alarm be generated by the Seller/Server system. 2. The Seller/Server is supporting the persistent capabilities of alarms.
Process Steps	1. The Client determines the unique identifier of the Alarm they intend to generate. 2. The Client communicates a generate request of an Alarm using a unique identifier and alarm attributes defined in Table 73-Alarm Attributes.
Post-Conditions	1. The Seller/Server generates the Alarm.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

837 **Table 76-Generate Alarm Use Case**

838 **14.2.5 Acknowledge Alarm**

Field	Description
Use Case Number	49

Field	Description
Use Case Name	Acknowledge Alarm
Description	A request is initiated by the Buyer/Client to Acknowledge an Alarm.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to acknowledge alarms from the Seller/Server system. 2. The Seller/Server is supporting the persistent capabilities of alarms.

Process Steps	1. The Client determines the unique identifier of the Alarm they intend to acknowledge.
	2. The Client communicates an acknowledge request of an Alarm using a unique identifier.
	
	    [R151] The Seller/Server MUST support the Acknowledge Alarm Use Case.
	
	    [R152] The Client MUST support the Acknowledge Alarm Use Case.

Post-Conditions	1. The Seller/Server acknowledges the Alarm.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

839 **Table 77-Acknowledge Alarm Use Case**

840 **14.2.6 Clear Alarm**

Field	Description
Use Case Number	50
Use Case Name	Clear Alarm
Description	A request is initiated by the Buyer/Client to Clear an Alarm.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to clear alarms from the Seller/Server system. 2. The Seller/Server is supporting the persistent capabilities of alarms.

Process Steps	1. The Client determines the unique identifier of the Alarm they intend to clear.
	2. The Client communicates a delete request of an Alarm using a unique identifier.
	
	    [R153] The Seller/Server MUST support the Clear Alarm Use Case.
	
	    [R154] The Client MUST support the Clear Alarm Use Case.

Post-Conditions	1. The Seller/Server clears the Alarm.
Alternative Paths	1. The Seller/Server will return an error message if an error is encountered during processing.

841 **Table 78-Clear Alarm Use Case**

842 ## 15 Process Flows

843 This section of the document defines the process flows and states within the Fault Management
844 Job and Performance Monitoring Job process flows.
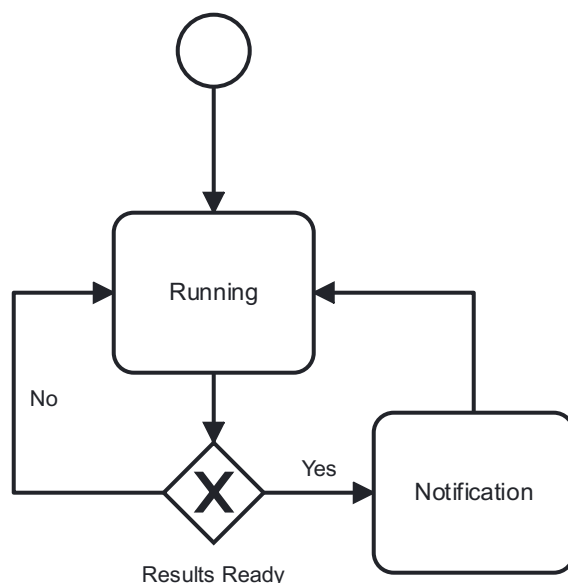
845 ### 15.1 Fault Management Job

846 The Fault Management Job Process Flow and states are shown in this section.

847 #### 15.1.1 Fault Management Job Process Flow

848 The Fault Management Job Process Flow is shown in Figure 14.

849

850 **Figure 14-Fault Management Job Process Flow**

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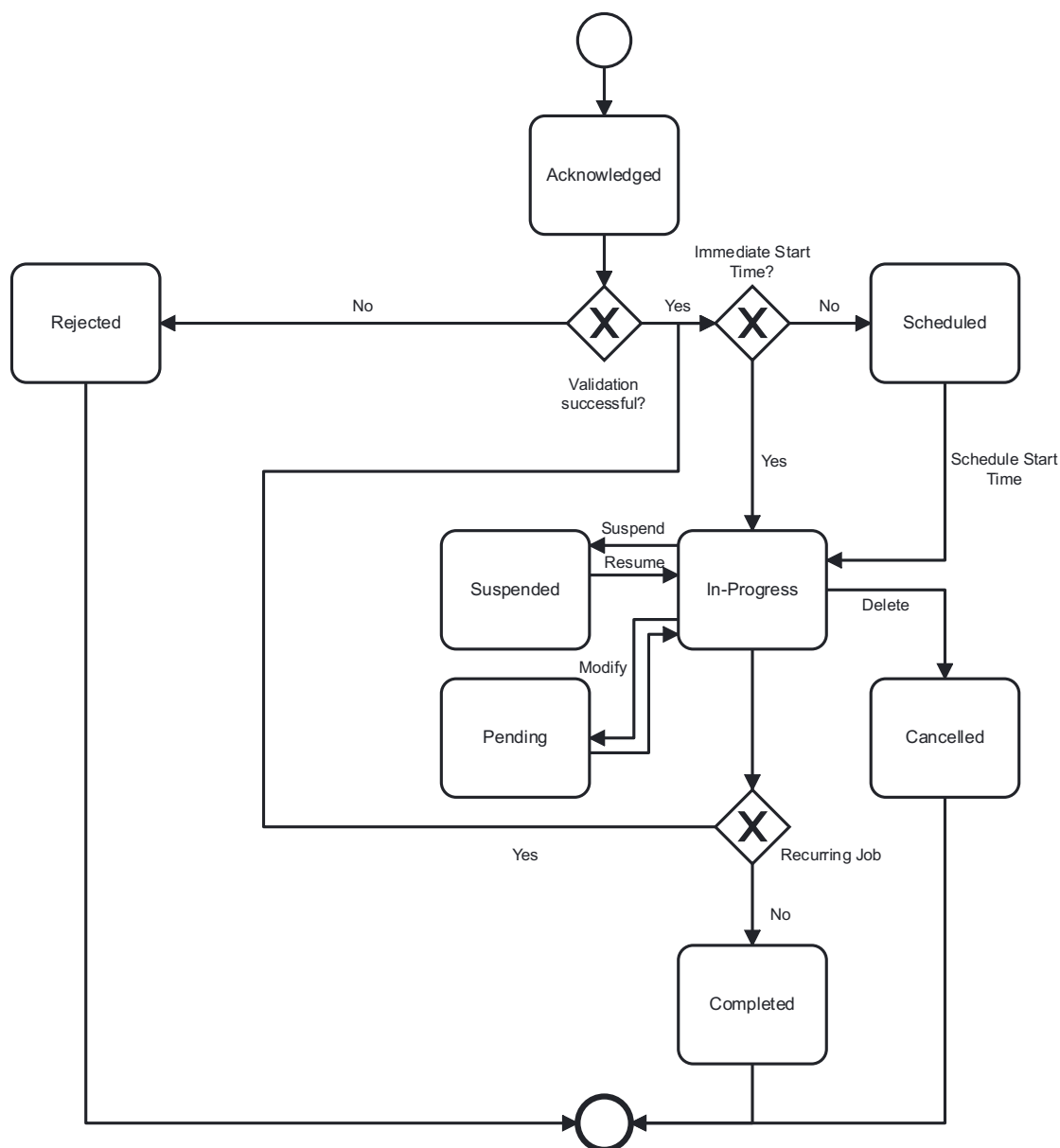
Figure 15-Fault Management Job In-Progress Actions

</div>

853 Figure 14-Fault Management Job Process Flows shows the actions that are possible in the In-
854 Progress state. The Fault Management Job is Running when measurements and calculations are
855 being performed. While the Fault Management Job is Running Notifications can be generated.
856 The Fault Management Job stays in the In-Progress state when notifications are sent.

857 **15.1.2   Fault Management (FM) Job States**

858 The Fault Management Job states are defined in Table 79.

State	Description
Acknowledged	*A FM Job request has been received by the Seller/Server and has passed basic validation. FM Job Identifier is assigned in the Acknowledged state. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request determines if the start time is immediate or scheduled. If immediate, the FM Job moves to the In-Progress state. If scheduled, the FM Job moves to the Scheduled state. If all attributes are not validated, the request moves to the Rejected state.*
Cancelled	*A FM Job that is In-Progress is deleted.*
Completed	*A FM Job is Completed.* *NOTE: All results from FM Job must persist in order for a collection of results.*
In-Progress	*A FM Job is running. Upon completion of the Job, a determination if the FM Job is a one-time Job or is recurring. If the FM Job is a one-time Job, the state of the FM Job moves*

	to the Completed state. If the PM Job is re-curring, the FM Job circles back to determine if it has an immediate start time or a sched-uled start time. If a Suspend FM Job request is accepted, the Job moves to the Suspended state. If a Modify FM Job request is ac-cepted, the Job moves to the Pending state. If a Delete FM Job request is accepted, the Job moves to the Cancelled state.
Pending	*A Modify FM Job request has been accepted by the Seller/Server. The FM Job remains in the Pending state while updates to the Job are completed. Once updates are complete, the Job returns to the In-Progress state.*
Rejected	*A create FM Job fails validation and is re-jected with error indications by the Seller/Server.*
Scheduled	*A FM Job is created that does not have an im-mediate start time. The FM Job stays in the Scheduled state until the start time is reached. The FM Job then moves to In-Progress.*
Suspended	*A Suspend FM Job request is accepted by the Seller/Server. The Job remains in the Sus-pended state until a Resume FM Job request is accepted by the Seller/Server at which time the Job returns to the In-Progress state.*

859 **Table 79-Fault Management Job States**

860 **15.1.3 Modify Fault Management Job Process Flow**

861 The Modify Fault Management Job process flow is described in this section.

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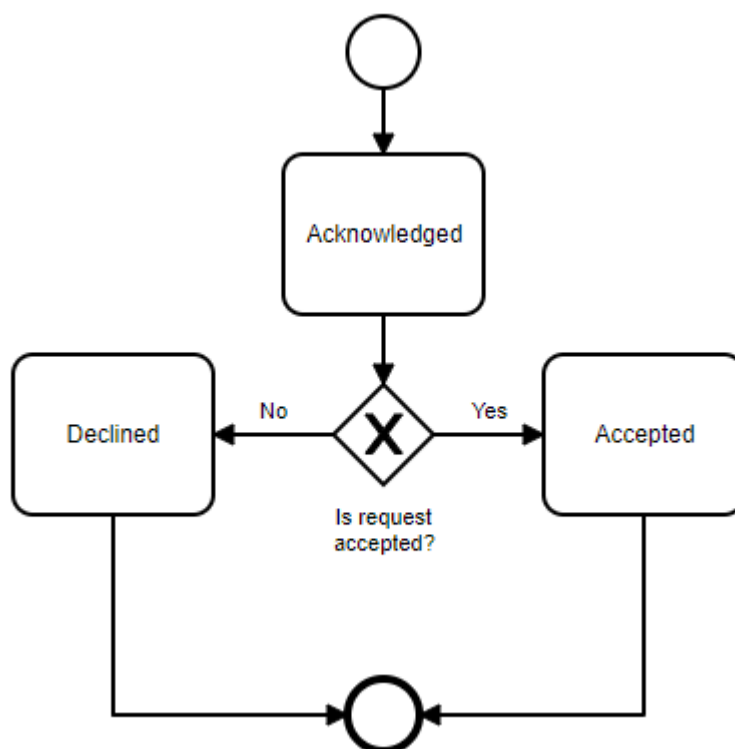
Figure 16-Modify Fault Management Job Process Flow

15.1.4   Modify Fault Management Job States

865   The Modify Fault Management (FM) Job states are defined in this section.

866

State	Description
Accepted	*The Modify FM Job request has been validated and accepted by the Seller/Server.*
Acknowledged	*A Modify FM Job request has been received by the Seller/Server and has passed basic validation. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Modify FM Job has failed validation and been declined by the Seller/Server.*

867   **Table 80-Modify Fault Management Job States**

15.1.5   Delete Fault Management Job Process Flow

869   The Delete Fault Management Job process flow is described in this section.

870

Figure 17-Delete Fault Management Job Process Flow
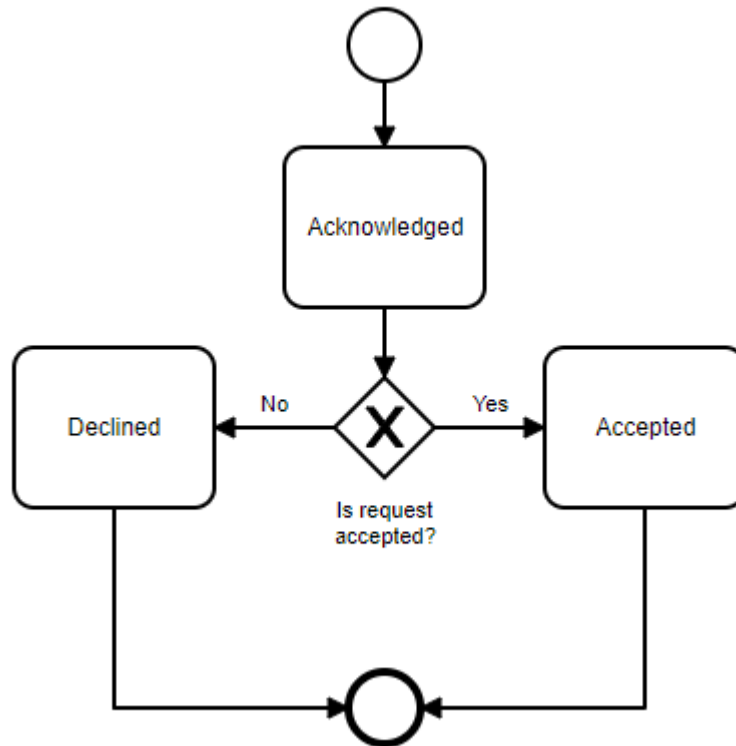
15.1.6   Delete Fault Management (FM) Job States

The Delete FM Job states are defined in this section.

State	Description
Accepted	*The Delete FM Job request has been vali-dated and accepted by the Seller/Server.*
Acknowledged	*A Delete FM Job request has been received by the Seller/Server and has passed basic val-idation. The request remains in the Acknowl-edged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Delete FM Job has failed validation and been declined by the Seller/Server.*

Table 81-Delete Fault Management Job States

15.1.7   Suspend Fault Management Job Process Flow

The Suspend Fault Management Job process flow is described in this section.

878
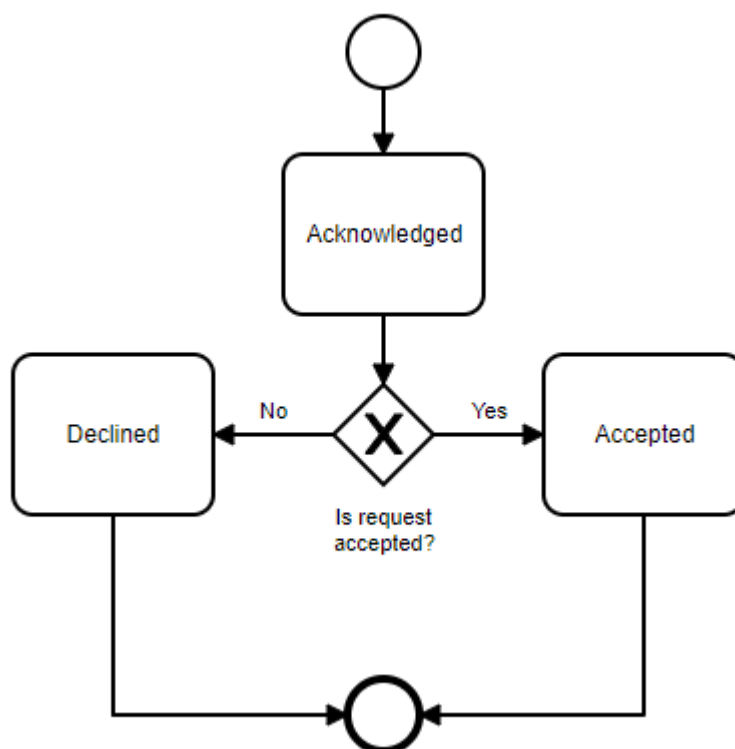
879 **Figure 18-Suspend Fault Management Job Process Flow**

880 **15.1.8   Suspend Fault Management (FM) Job States**

881 The Suspend Fault Management Job states are defined in this section.
882

State	Description
Accepted	*The Suspend FM Job request has been validated and accepted by the Seller/Server.*
Acknowledged	*A Suspend FM Job request has been received by the Seller/Server and has passed basic validation. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Suspend FM Job has failed validation and been declined by the Seller/Server.*

883 **Table 82-Suspend Fault Management Job States**

884 **15.1.9   Resume Fault Management Job Process Flow**

885 The Resume Fault Management Job process flow is described in this section.

886

887   **Figure 19-Resume Fault Management Job Process Flow**
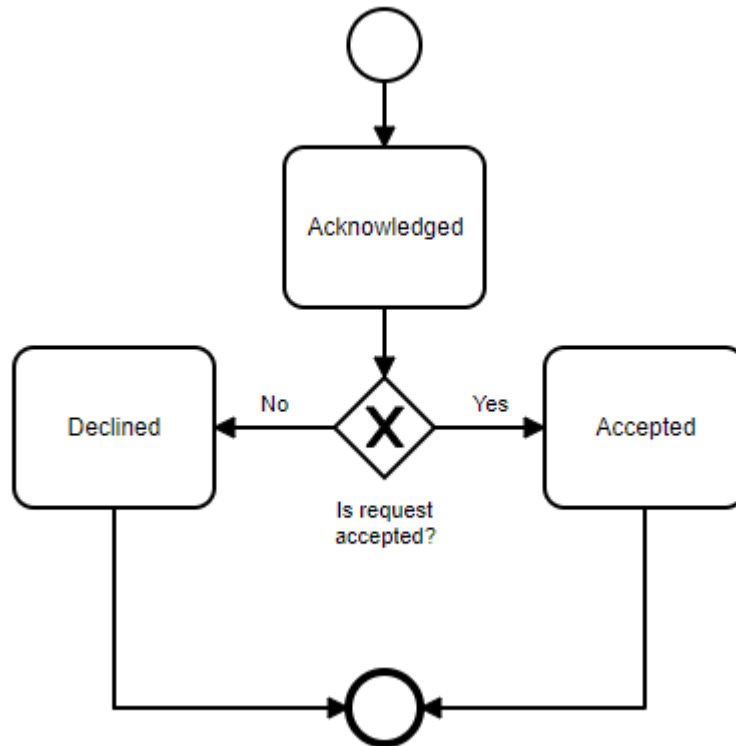
888   **15.1.10 Resume Fault Management (FM) Job States**

889   The Resume Fault Management Job states are defined in this section.
890

State	Description
Accepted	*The Resume FM Job request has been validated and accepted by the Seller/Server.*
Acknowledged	*A Resume FM Job request has been received by the Seller/Server and has passed basic validation. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Resume FM Job has failed validation and been declined by the Seller/Server.*

891   **Table 83-Resume FM Job States**

892   **15.2 Performance Monitoring Job**

893   The Performance Monitoring Job Process Flow and states are shown in this section.

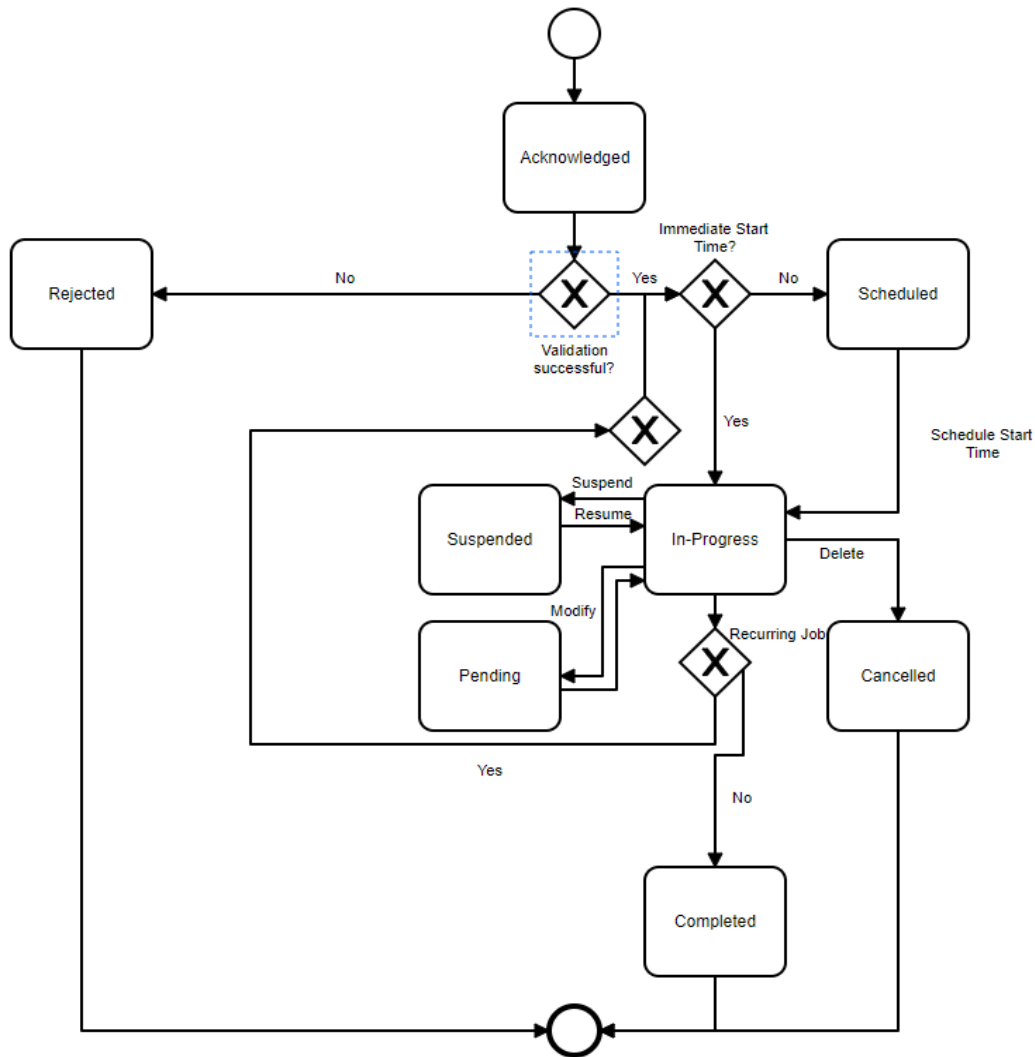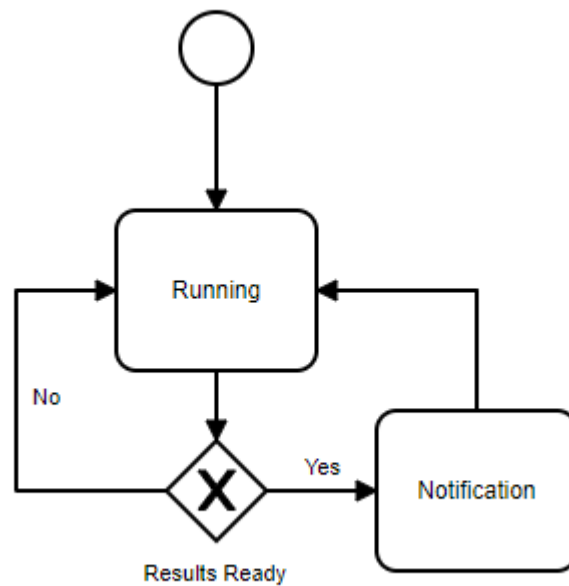894 **15.2.1 PM Job Process Flow**

895

896 **Figure 20-PM Job Process Flow**

897

Figure 21-PM Job In-Progress Actions

899 Figure 21 shows the actions that are possible in the In-Progress state. The FM Job is Running
900 when measurements and calculations are being performed. While the FM Job is Running Notifi-
901 cations can be generated. The FM Job stays in the In-Progress state when notifications are sent.

902 **15.2.2 PM Job States**

903 The PM Job states are defined in Table 79.

904

State	Description
Acknowledged	*A PM Job request has been received by the Seller/Server and has passed basic validation. PM Job Identifier is assigned in the Acknowledged state. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request determines if the start time is immediate or scheduled. If immediate, the PM Job moves to the In-Progress state. If scheduled, the PM Job moves to the Scheduled state. If all attributes are not validated, the request moves to the Rejected state.*
Cancelled	*A PM Job that is In-Progress is deleted.*
Completed	*A PM Job is Completed.* *NOTE: All results from PM Job must persist in order for a collection of results.*

In-Progress	*A PM Job is running. Upon completion of the Job, a determination if the PM Job is a one-time Job or is recurring. If the PM Job is a one-time Job, the state of the PM Job moves to the Completed state. If the PM Job is recurring, the PM Job circles back to determine if it has an immediate start time or a scheduled start time. If a Suspend PM Job request is accepted, the Job moves to the Suspended state. If a Modify PM Job request is accepted, the Job moves to the Pending state. If a Delete PM Job request is accepted, the Job moves to the Cancelled state.*
Pending	*A Modify PM Job request has been accepted by the Seller/Server. The PM Job remains in the Pending state while updates to the Job are completed. Once updates are complete, the Job returns to the In-Progress state.*
Rejected	*A create PM Job fails validation and is rejected with error indications by the Seller/Server.*
Scheduled	*A PM Job is created that does not have an immediate start time. The PM Job stays in the Scheduled state until the start time is reached. The PM Job then moves to In-Progress.*
Suspended	*A Suspend PM Job request is accepted by the Seller/Server. The Job remains in the Suspended state until a Resume PM Job request is accepted by the Seller/Server at which time the Job returns to the In-Progress state.*

905   **Table 84-PM Profile/Job States**

906   **15.2.3   Modify PM Job Process Flow**

907   The Modify PM Job process flow is described in this section.
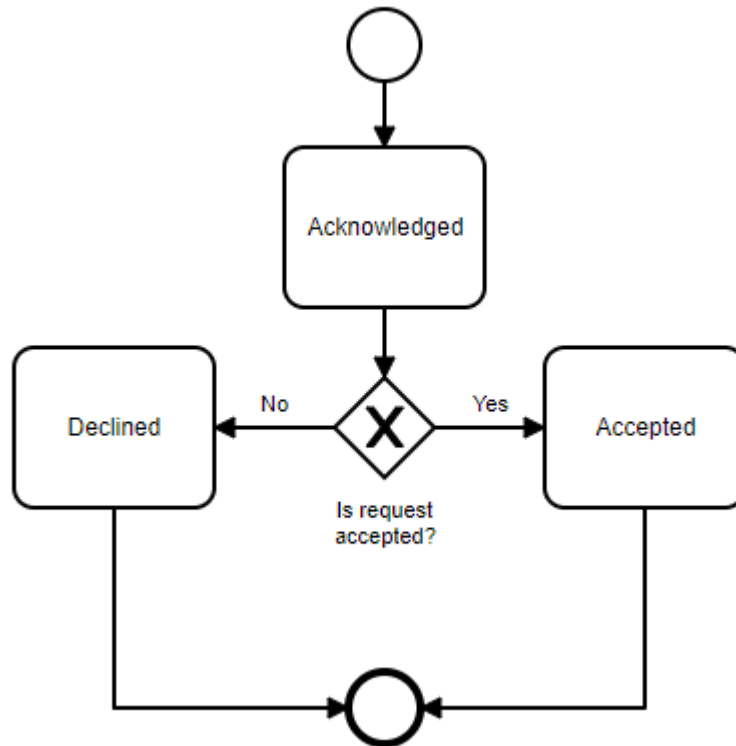
909 **Figure 22-Modify PM Job Process Flow**

15.2.4 Modify PM Job States

911 The Modify PM Job states are defined in this section.
912

State	Description
Accepted	*The Modify PM Job request has been vali-dated and accepted by the Seller/Server.*
Acknowledged	*A Modify PM Job request has been received by the Seller/Server and has passed basic val-idation. The request remains in the Acknowl-edged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Modify PM Job has failed validation and been declined by the Seller/Server.*

913 **Table 85-Modify PM Job States**

15.2.5 Delete PM Job Process Flow

915 The Delete PM Job process flow is described in this section.

916

Figure 23-Delete PM Job Process Flow

15.2.6   Delete PM Job States

919   The Delete FM Job states are defined in this section.

920

State	Description
Accepted	*The Delete PM Job request has been vali-dated and accepted by the Seller/Server.*
Acknowledged	*A Delete PM Job request has been received by the Seller/Server and has passed basic val-idation. The request remains in the Acknowl-edged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Delete PM Job has failed validation and been declined by the Seller/Server.*

921   **Table 86-Delete PM Job States**

15.2.7   Suspend PM Job Process Flow

923   The Suspend PM Job process flow is described in this section.

924

925   **Figure 24-Suspend PM Job Process Flow**

926   **15.2.8   Suspend PM Job States**

927   The Suspend PM Job states are defined in this section.

928

State	Description
Accepted	*The Suspend PM Job request has been validated and accepted by the Seller/Server.*
Acknowledged	*A Suspend PM Job request has been received by the Seller/Server and has passed basic validation. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Suspend PM Job has failed validation and been declined by the Seller/Server.*

929   **Table 87-Suspend PM Job States**

930   **15.2.9   Resume PM Job Process Flow**

931   The Resume PM Job process flow is described in this section.

932
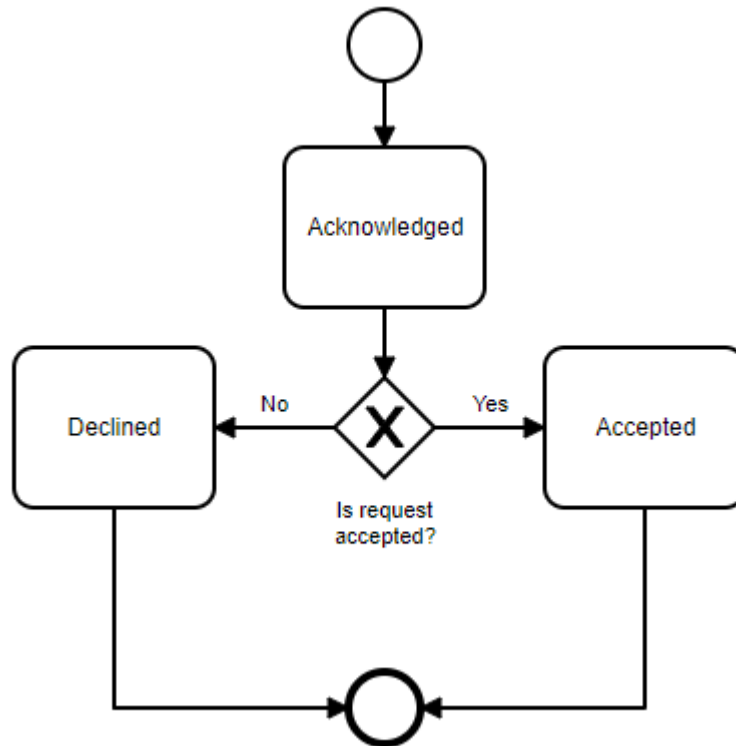
933
Figure 25-Resume PM Job Process Flow

15.2.10 Resume PM Job States

935   The Resume PM Job states are defined in this section.

936

State	Description
Accepted	*The Resume PM Job request has been validated and accepted by the Seller/Server.*
Acknowledged	*A Resume PM Job request has been received by the Seller/Server and has passed basic validation. The request remains in the Acknowledged state until all validations as applicable are completed. If the attributes are validated the request moves to the Accepted state. If all attributes are not validated, the request moves to the Declined state.*
Declined	*The Resume PM Job has failed validation and been declined by the Seller/Server.*

937   **Table 88-Resume PM Job States**

16 References

[1] IETF RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, by S. Bradner, March 1997.

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[6] MEF 55.1, *LSO Reference Architecture and Framework*, January 2021.

[7] MEF 105 *Draft Release 3 Performance Monitoring and Service Readiness Testing for SD-WAN*, September 2022.

[8] Object Management Group (OMG) Unified Modelling Language, Version 2.5, May 2015.

Appendix A   Performance Management Options for Proactive Provisioning

955

956

957 The following section discusses the two use case paths for SLS provisioning over the Legato in-
958 terface. The information provided is to assist in the future API design and development. The
959 first option is the SLS is provisioning with the Legato Service Order request given it is embed-
960 ded as an attribute within the service request. An example of this is with MEF Carrier Ethernet
961 Services. In this case the EVC or OVC has an attribute for Service Level Specification.

962

963
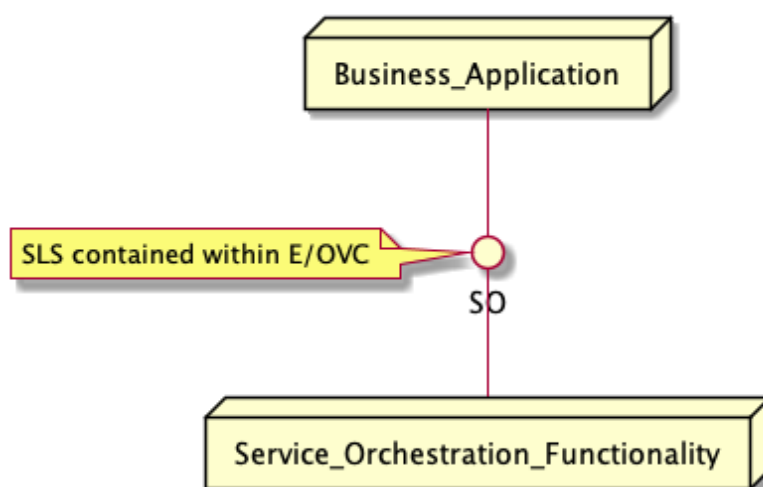
Figure 26-SLS Activation via E/OVC Service Ordering Example

964

965 The second option for SLS activation is where the Business Application is responsible for making
966 the SLS request as a Performance Management activation outside of the earlier mention Service
967 Management activation.

968
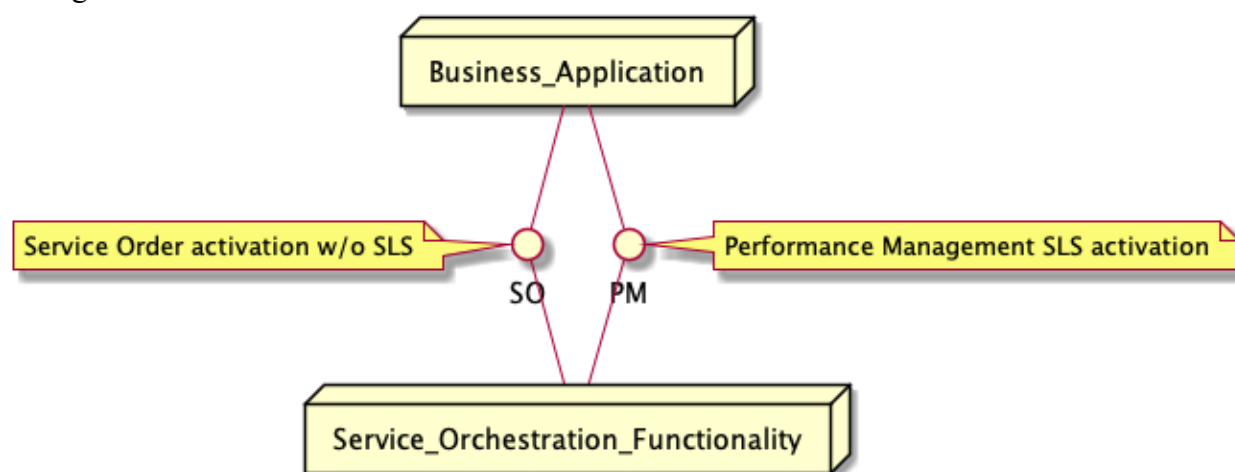
Figure 27-SLS Activation via Legato Example

969

970

Appendix B   Events, Notifications, TCAs and Streams

The following section provides definitions and distinctions between events, notifications, Threshold Crossing Alerts (TCAs) and stream communication across an API as well as the internal client and Seller/Server-side systems. It is important to distinguish between an events, notifications, TCAs (Threshold Crossing Alerts) and Streams.

- An Event is a specific change in a state or condition that happens at a specific time.
- A Notification is an autonomous report of that Event, sent to registered subscribers/ob-Seller/Servers watching for that condition (or it could be an unsolicited broadcast too).
- A log is a store of historical records of Events.
- It is necessary for an API and EDA system to support the retrieval of historical records of Events.

Normally you would not expect to retrieve "Notifications" as they are transient in nature and contain header/meta-data in addition to the Event information (and typically that is not what is expected to be retrieved, although it is useful/required in certain auditing applications). You should be able to retrieve an Event log, given specific time -range and condition filters.

The architecture must support the client's ability to connect, subscribe to specific topic and receive published topics. In addition, the solution must support the client's ability to connect and retrieve historical events with temporal accuracy. Temporal accuracy means that the client receives the topic events in the order in which the events occurred.

There are likely performance distinctions between notifications, TCAs and event streaming and therefore a need for different Pub/Sub patterns. Example uses of Notifications are for order, quote, etc. APIs to provide asynchronous behavior. More specifically, a client will subscribe to specific functional API events. The Seller/Server will asynchronously transmit notifications to the client upon event transitions from one state to the next. The rate of these notification transmissions during the lifecycle of a functional request is expected to be low.

The client request for a TCA setting is a performance management action. The resulting TCA event is considered an alarm or fault management action.

The client request for an event streaming is a low volume, single action API call. The corresponding stream is likely a high-volume communication across the wire. Due to the likely high volume of communications a REST return response used for Notifications will like not be scalable for streaming. It is practical that a binary protocol (i.e., Kafka) will be need for streaming.

Notifications are used to provide state transitions to a client. In the event of loss of communications between a client and Seller/Server during the transmission of one or more notifications if the client needs to get the current resource state, they would have to perform a query on the resource. In other words, the Seller/Server-side is not responsible for notification replay.

Appendix C   Event Driven Architecture - Events, Notifications, TCAs and Streams

The use of the Pub/Sub pattern for APIs are needed to support a scalable solution for event/notification, API asynchronous behavior and streaming functionality. This document provides detailed description of API and microservice support for these Pub/Sub instances. These collection of software API patterns are necessary to support an Event-Driven Architecture (EDA).

The use of an EDA architecture must support events, notifications, and streams communication across an API as well as the internal client and Seller/Server-side systems. It is important to distinguish between an events and notifications. An Event occurs as part of a state change, the creation, update, delete, or undelete or a record. An Event may trigger a notification. A Notification is a message in response to an event. A Notification is a message in response to an Event. The Notification is sent to a Channel to which one or more Clients are subscribed. A Channel is a stream of Events to which a Client can subscribe to receive Events.

- An Event is a specific change in a state or condition that happens at a specific time.
- A Notification is an autonomous report of that Event, sent to registered subscribers watching for that condition (or it could be an unsolicited broadcast too).
- A log is a store of historical records of Events.
- It is necessary for an API and EDA system to support the retrieval of historical records of Events.

Normally you would not expect to retrieve "Notifications" as they are transient in nature and contain header/meta-data in addition to the Event information (and typically that is not what is expected to be retrieved, although it is useful/required in certain auditing applications). You should be able to retrieve an Event log, given specific time -range and condition filters.

The architecture must support the client's ability to connect, subscribe to specific topic and receive published topics. In addition, the solution must support the client's ability to connect and retrieve historical events with temporal accuracy. Temporal accuracy means that the client receives the topic events in the order in which the events occurred.

Appendix D   Data Formats

The collection of performance measurements because of a Performance Management Job must support multiple formats. There are reasons for different formatting of collected performance data. One reason is that the amount of collected data may be large whereby compressing the information is required. The following data formats are listed as examples – JSON, Avro and Protobuf.

D.1   JSON Formatted Data

JSON (JavaScript Object Notation, is an open standard file format and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and arrays (or other serializable values). It is a common data format with diverse uses in electronic data interchange, including that of web applications with Seller/Servers.

1054 **D.2   Avro Formatted Data**

1055 Avro is an open-source data serialization system that helps with data exchange between systems,
1056 programming languages, and processing frameworks. Avro helps define a binary format for your
1057 data, as well as map it to the programming language of your choice.

1058 **D.3   Protobuf Formatted Data**

1059 Protocol Buffers (Protobuf) is a free and open-source cross-platform data format used to serialize
1060 structured data. It is useful in developing programs to communicate with each other over a net-
1061 work or for storing data. The method involves an interface description language that describes
1062 the structure of some data and a program that generates source code from that description for
1063 generating or parsing a stream of bytes that represents the structured data.

1064

Appendix E   Performance Metrics, Statistics and Reporting

1066

1067 This document discusses various types of performance and fault measurement techniques. An
1068 important distinction is performance and fault measurements configured and collected versus
1069 general statistics configuration and collection.

1070

1071 Performance measurements configured and collected for supporting Service Level Specifications
1072 are typically done using synthetic or test frames/packets injected into the bearer plane and used
1073 to measure performance metrics such as frame/packet loss, frame/packet transfer delay and inter-
1074 frame/packet delay variation.

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