



Working Draft

MEF 133.1

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

June 2023

EXPORT CONTROL: This document contains technical data. The download, export, re-export or disclosure of the technical data contained in this document may be restricted by applicable U.S. or foreign export laws, regulations and rules and/or applicable U.S. or foreign sanctions ("Export Control Laws or Sanctions"). You agree that you are solely responsible for determining whether any Export Control Laws or Sanctions may apply to your download, export, reexport or disclosure of this document, and for obtaining (if available) any required U.S. or foreign export or reexport licenses and/or other required authorizations.

Disclaimer

© MEF Forum 2022. All Rights Reserved.

The information in this publication is freely available for reproduction and use by any recipient and is believed to be accurate as of its publication date. Such information is subject to change without notice and MEF Forum (MEF) is not responsible for any errors. MEF does not assume responsibility to update or correct any information in this publication. No representation or warranty, expressed or implied, is made by MEF concerning the completeness, accuracy, or applicability of any information contained herein and no liability of any kind shall be assumed by MEF as a result of reliance upon such information.

The information contained herein is intended to be used without modification by the recipient or user of this document. MEF is not responsible or liable for any modifications to this document made by any other party.

The receipt or any use of this document or its contents does not in any way create, by implication or otherwise:

- a) any express or implied license or right to or under any patent, copyright, trademark or trade secret rights held or claimed by any MEF member which are or may be associated with the ideas, techniques, concepts or expressions contained herein; nor
- b) any warranty or representation that any MEF members will announce any product(s) and/or service(s) related thereto, or if such announcements are made, that such announced product(s) and/or service(s) embody any or all of the ideas, technologies, or concepts contained herein; nor
- c) any form of relationship between any MEF member and the recipient or user of this document.

Implementation or use of specific MEF standards, specifications, or recommendations will be voluntary, and no Member shall be obliged to implement them by virtue of participation in MEF Forum. MEF is a non-profit international organization to enable the development and worldwide adoption of agile, assured, and orchestrated network services. MEF does not, expressly, or otherwise, endorse or promote any specific products or services.



Table of Contents

50		
51	1	List of Contributing Members..... 1
52	2	Abstract..... 1
53	3	Release Notes 1
54	4	Terminology and Abbreviations..... 2
55	5	Compliance Levels 4
56	6	Numerical Prefix Conventions..... 4
57	7	Scope..... 5
58	8	Introduction..... 6
59	9	Use Cases Summary..... 9
60	10	Fault Management Use Cases 16
61	10.1	FM Job 16
62	10.1.1	Create FM Job Use Case 16
63	10.1.2	Modify FM Job Use Case..... 21
64	10.1.3	Delete FM Job Use Case 22
65	10.1.4	Suspend FM Job Use Case 23
66	10.1.5	Resume FM Job Use Case..... 24
67	10.1.6	Subscribe to FM Job Notifications Use Case..... 25
68	10.1.7	Generation of FM Job Notifications Use Case..... 26
69	10.1.8	Unsubscribe from FM Job Notifications Use Case 27
70	10.1.9	List Fault Management Reports 28
71	10.1.10	Collect Fault Management Reports 28
72	11	Performance Monitoring Use Cases..... 32
73	11.1	Performance Monitoring Profiles Use Cases..... 33
74	11.1.1	Create Performance Monitoring Profile Use Case 34
75	11.1.2	Retrieve Performance Monitoring Profile List Use Case..... 37
76	11.1.3	Retrieve Performance Monitoring Profile by Profile Identifier Use Case 38
77	11.1.4	Modify Performance Monitoring Profile Use Case 39
78	11.1.5	Delete Performance Monitoring Profile Use Case 40
79	11.1.6	Subscribe to Performance Monitoring Profile Notifications Use Case..... 41
80	11.1.7	Performance Monitoring Profile Notifications Use Case..... 41
81	11.1.8	Unsubscribe from Performance Monitoring Profile Notifications Use Case 42
82	11.2	Performance Monitoring Job, Collection and Notification Use Cases..... 43
83	11.2.1	Create PM Job Use Case 44
84	11.2.2	Modify PM Job Use Case..... 48
85	11.2.3	Delete PM Job Use Case 49
86	11.2.4	Suspend PM Job Use Case 50
87	11.2.5	Resume PM Job Use Case..... 51
88	11.2.6	Retrieve List of PM Jobs Use Case..... 52
89	11.2.7	Retrieve PM Job by Job Identifier..... 55
90	11.2.8	Subscribe to PM Job Notifications Use Case..... 56
91	11.2.9	Unsubscribe from PM Job Notifications Use Case 57
92	11.2.10	Generation of PM Job Notifications..... 58
93	11.2.11	List Performance Measurement Reports 59



94	11.2.12 Collect Performance Measurement Report	60
95	12 Passive Statistics Use Cases and Business Process Definitions	63
96	12.1 High-Level Use Cases	63
97	12.2 Passive Statistics Collection Use Cases.....	63
98	12.2.1 Create Passive PM Job Use Case	64
99	12.2.2 Modify Passive PM Job Use Case.....	66
100	12.2.3 Delete Passive PM Job Use Case	67
101	12.2.4 List Passive Statistics Reports.....	68
102	12.2.5 Collect Passive Statistics Report.....	69
103	13 Threshold Crossing Alerts	72
104	13.1 Threshold Crossing Alert Profile Management Use Cases	73
105	13.1.1 Create TCA Profile	74
106	13.1.2 Modify TCA Profile	77
107	13.1.3 Delete TCA Profile	77
108	13.1.4 Retrieve List of TCA Profiles	78
109	13.1.5 Retrieve TCA Profile by Identifier.....	79
110	13.1.6 Subscribe to TCA Profile Notifications	80
111	13.1.7 Unsubscribe to TCA Profile Notifications	82
112	13.1.8 Stateful TCA Notification (Alarm)	82
113	13.1.9 Stateless TCA Notification (Alarm).....	84
114	14 Streaming Use Cases.....	87
115	14.1 Streaming (Topics) Use Cases.....	88
116	14.2 Subscribe/Publish Streaming Use Cases	89
117	14.2.1 Retrieve Topic by Identifier Use Case	90
118	14.2.2 Retrieve Available Topic List Use Case	91
119	14.2.3 Retrieve Subscribed Topic List Use Case	91
120	14.2.4 Subscribe to Topic Use Case.....	92
121	14.2.5 Unsubscribe from Topic Use Case.....	94
122	14.2.6 Publish Topic Message Use Case.....	95
123	14.2.7 Retrieve Topic Message Use Case	96
124	15 Alarm Management Use Cases and Business Process Definitions	97
125	15.1 High-Level Use Cases	97
126	15.2 Alarm Management Use Cases.....	97
127	15.2.1 Create Alarm	98
128	15.2.2 Modify Alarm.....	101
129	15.2.3 Delete Alarm	101
130	15.2.4 Generate Alarm	102
131	15.2.5 Acknowledge Alarm	102
132	15.2.6 Clear Alarm.....	103
133	16 Process Flows.....	104
134	16.1 Fault Management Job.....	104
135	16.1.1 Fault Management Job Process Flow	104
136	16.1.2 Fault Management (FM) Job States	105
137	16.1.3 Modify Fault Management Job Process Flow	106
138	16.1.4 Modify Fault Management Job States.....	107



139	16.1.5	Delete Fault Management Job Process Flow	108
140	16.1.6	Delete Fault Management (FM) Job States	108
141	16.1.7	Suspend Fault Management Job Process Flow	109
142	16.1.8	Suspend Fault Management (FM) Job States	109
143	16.1.9	Resume Fault Management Job Process Flow	110
144	16.1.10	Resume Fault Management (FM) Job States	110
145	16.2	Performance Monitoring Job	111
146	16.2.1	PM Job Process Flow	112
147	16.2.2	PM Job States	114
148	16.2.3	Modify PM Job Process Flow	115
149	16.2.4	Modify PM Job States	116
150	16.2.5	Cancel PM Job Process Flow	117
151	16.2.6	Delete PM Job Process Flow	117
152	16.2.7	Delete PM Job States	118
153	16.2.8	Suspend PM Job Process Flow	118
154	16.2.9	Suspend PM Job States	119
155	16.2.10	Resume PM Job Process Flow	120
156	16.2.11	Resume PM Job States	120
157	17	References	121
158	Appendix A	Performance Management Options for Proactive Provisioning	122
159	Appendix B	Event Streaming – Events, Notifications, TCAs and Streams	123
160	Appendix C	Data Formats	123
161	C.1	JSON Formatted Data	124
162	C.2	Avro Formatted Data	124
163	C.3	Protobuf Formatted Data	124
164	Appendix D	Performance Metrics, Statistics and Reporting	124
165	Appendix E	Schedule Definition	125
166	Appendix F	File Transfer Data	126
167	Appendix G	Streaming Additional Attributes	127
168	Appendix H	Tracking Record Schema	128
169	Appendix I	Acknowledgements	129

List of Figures

Figure 1-Fault Management Job Use Cases.....	16
Figure 2-Fault Management Job Notification and Collection Use Cases.....	16
Figure 3-Performance Monitoring Process Diagram.....	32
Figure 4-Performance Monitoring Profile Use Cases.....	34
Figure 5-Performance Monitoring Profile Notification Use Cases	34
Figure 6-PM Job Use Cases.....	43
Figure 7-PM Job Notification and Collection Use Cases	44
Figure 8-Passive Statistics Job and Collection Use Cases.....	64
Figure 9-Threshold Crossing Alert Process Diagram.....	72
Figure 10-TCA Profile Use Cases	74
Figure 11-Event Driven Architecture	87
Figure 12-Broker-to-Broker Event Driven Architecture	88
Figure 13-Streaming (Topics) Use Cases	89
Figure 14-Subscriber/Publish Streaming Use Cases.....	89
Figure 15-Alarm Management Use Cases	98
Figure 16-Fault Management Job Process Flow.....	104
Figure 17-Fault Management Job Notification Actions	105
Figure 18-Modify Fault Management Job Process Flow.....	107
Figure 19-Delete Fault Management Job Process Flow	108
Figure 20-Suspend Fault Management Job Process Flow	109
Figure 21-Resume Fault Management Job Process Flow	110
Figure 22-PM Overall Process Flow.....	111
Figure 23-PM Profile Process Flow.....	112
Figure 24-PM Job Process Flow	113
Figure 25-PM Job Notifications.....	114
Figure 26-Modify PM Job Process Flow	116
Figure 27-Cancel PM Job Process Flow	117
Figure 28-Delete PM Job Process Flow.....	118
Figure 29-Suspend PM Job Process Flow	119
Figure 30-Resume PM Job Process Flow	120
Figure 31-SLS Activation via E/OVC Service Ordering Example	122
Figure 32-SLS Activation via Legato Example.....	122



List of Tables

205	
206	Table 1-Abbreviations 2
207	Table 2-Terminology 3
208	Table 3-Numerical Prefix Conventions 4
209	Table 4-Use Case Summary..... 15
210	Table 5-Create FM Job Use Case 18
211	Table 6-FM Job Attributes..... 20
212	Table 7-Modify FM Job Use Case..... 22
213	Table 8-Delete FM Job Use Case 22
214	Table 9-Suspend FM Job Use Case 23
215	Table 10-Resume FM Job Use Case..... 24
216	Table 11-Subscribe to FM Job Notifications Use Case..... 25
217	Table 12-Buyer/Client Request Attributes for Subscribe to Notifications 26
218	Table 13-FM Job Notifications Use Case..... 26
219	Table 14-FM Notification Attributes 27
220	Table 15-Unsubscribe from FM Job Use Case 28
221	Table 16-List Performance Measurement Reports Use Case 28
222	Table 17-Collect Fault Measurement Report Use Case..... 31
223	Table 18-FM Job Results 31
224	Table 19-Retrieve Fault Management Results in Payload Attributes..... 31
225	Table 20-Create PM Profile Use Case 35
226	Table 21-Create PM Profile Attributes 37
227	Table 22-Retrieve PM Profile List Use Case..... 38
228	Table 23-Retrieve PM Profile Use Case 39
229	Table 24-Modify PM Profile Use Case 40
230	Table 25-Delete PM Profile Use Case 40
231	Table 26-Subscribe to PM Profile Notifications Use Case..... 41
232	Table 27-PM Profile Notifications Use Case..... 42
233	Table 28-Unsubscribe from PM Profile Notifications Use Case..... 43
234	Table 29-Create PM Job Use Case 46
235	Table 30-Create PM Job Attributes 48
236	Table 31-Modify PM Job Use Case..... 49
237	Table 32-Delete PM Job Use Case 50
238	Table 33-Suspend PM Job Use Case 51
239	Table 34-Resume PM Job Use Case 52
240	Table 35-Retrieve PM Job List Use Case 55
241	Table 36-Retrieve PM Job Use Case 56
242	Table 37-Subscribe to PM Job/Collection Notifications 56
243	Table 38-Subscribe to PM Job Notifications Attributes 57
244	Table 39-Unsubscribe from PM Job/Collection Notifications Use Case 58
245	Table 40-PM Job/Collection Notifications Use Case 58
246	Table 41-PM Job States 59
247	Table 42-List Performance Measurement Reports Use Case 60
248	Table 43-Collect Performance Measurement Report Use Case 62
249	Table 44-PM Job Results 62
250	Table 45-Retrieve Results Attributes..... 63



251	Table 46-Create Passive PM Job Use Case	66
252	Table 47-Modify Passive PM Job Use Case.....	67
253	Table 48-Delete Passive PM Job Use Case	68
254	Table 49-List Performance Measurement Reports Use Case	69
255	Table 50-Collect Statistics Report Use Case	71
256	Table 51-Create TCA Profile Use Case.....	76
257	Table 52-TCA Attributes	76
258	Table 53-Modify TCA Profile Use Case	77
259	Table 54-Delete TCA Profile Use Case.....	78
260	Table 55-Retrieve TCA Profile List Use Case	79
261	Table 56-Retrieve TCA Profile Use Case.....	80
262	Table 57-Subscribe TCA Profile Notifications Use Case.....	81
263	Table 58-Register for TCA Notification Attributes.....	82
264	Table 59-Unsubscribe TCA Profile Notifications Use Case	82
265	Table 60-Stateful TCA Notification (Alarm) Use Case	83
266	Table 61-Stateful TCA Notification (Alarm) Attributes	84
267	Table 62-Stateless TCA Profile Notification Use Case.....	85
268	Table 63-Stateless TCA Reporting Notification Attributes.....	85
269	Table 64-Damping Factor TCA Notification attributes.....	86
270	Table 65-Get Subscriber Topic Use Case	90
271	Table 66-Topic Attributes.....	91
272	Table 67-Retrieve Available Topic List Use Case	91
273	Table 68-Get Subscribed Topic List Use Case	92
274	Table 69-Subscribe to Topic Use Case	93
275	Table 70-Subscribed or Available to Topic Attributes	94
276	Table 71-Unsubscribe from a Topic Use Case	94
277	Table 72-Publish Topic Use Case.....	95
278	Table 73-Publish Topic Message Attributes.....	96
279	Table 74-Retrieve Messages from a Topic Use Case	96
280	Table 75-Create Alarm Use Case	98
281	Table 76-Alarm Attributes	101
282	Table 77-Modify Alarm Use Case.....	101
283	Table 78-Delete Alarm Use Case	102
284	Table 79-Generate Alarm Use Case	102
285	Table 80-Acknowledge Alarm Use Case.....	103
286	Table 81-Clear Alarm Use Case	103
287	Table 82-Fault Management Job States.....	106
288	Table 83-Modify Fault Management Job States.....	108
289	Table 84-Delete Fault Management Job States	108
290	Table 85-Suspend Fault Management Job States	110
291	Table 86-Resume FM Job States	111
292	Table 87-PM Profile States.....	112
293	Table 88-PM Profile/Job States	115
294	Table 89-Modify PM Job States	116
295	Table 90-Cancel PM Job States	117
296	Table 91-Delete PM Job States.....	118
297	Table 92-Suspend PM Job States.....	119



298	Table 93-Resume PM Job States	120
299	Table 94-File Transfer Data Attributes	127
300	Table 95-Streaming On-boarding Attributes	128
301	Table 95-Tracking Record Schema	129
302		

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
- Bloomberg
- 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 for the development of a suite of automated APIs based interaction.

3 Release Notes

This document represents the results of Call for Comments Ballot #1 with all comments received on the Call for Comments Ballot resolved. Call for Comments Ballot #2 is ongoing, and the document is undergoing revision. The contents may change subject to comments received during future Call for Comments Ballots. The following is a list potential changes to BR&UCs:

- Update to include Retrieve FM Report List.
- Subscribe to Topic/Unsubscribe from Use Cases to support scheduling. This would include lifecycle management with a defined state machine.
- Add TCA Job Create, Delete and Modify Use Cases. TCA Job shown in Threshold Crossing Alert Process Diagram. TCA can also be set using PM Job with a TCA Profile.
- Suspend PM Job from Scheduled State (See Use Case 21).
- Passive statistics currently does not support Notifications. Review needs to support Notifications.
- Verify TCA Attributes (Table 50) aligns with MEF 35.1 and MEF W105.
- Update FM state machine to check for Scheduled state to determine where to return.
- Complete state machine descriptions.

4 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
Alarm	A specific type of notification concerning detected faults or abnormal conditions.	ITU-T M.3703
Alert	Synonymous to <i>Alarm</i> in the scope of this document	This document.
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]
Event	A specific occurrence or a change in state that is noteworthy to the system administrator.	ITU-T Rec. X.734 [10]
Message	Typically defined as a unit of information exchanged between components or services in a distributed system. In context of this standard, we scope this definition to an unit of information, that is a manifestation on an event, exchanged between producer and consumer using event drive architectural pattern.	This document
Notification	In general, a mechanism used to inform the recipient about certain event in the system. In context of this document notification is a synchronous communicate from the observed system towards recipient.	This document.
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	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.
UBC(k)	Upper Bin Count (k)	MEF 35.1 [4]

Term	Definition	Reference
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]
Threshold Crossing Alert (TCA)	Mechanism used to monitor and notify when specific thresholds or performance limits are exceeded or crossed	This document.

Table 2-Terminology

5 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.

6 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

7 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 Statistics Collection
- Threshold Crossing Alert Profile Management
- Threshold Crossing Alert Jobs, Notifications, Alerts (Alarms)
- Alarm Management
- Streaming Management

8 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

- 413 ○ Buyer/Client requests Performance Monitoring Profile creation, modification, and
414 deletion.
- 415 ○ Seller/Server notifies the Buyer/Client when Performance Monitoring Profile
416 changes occur.
- 417 • On-Demand Performance Monitoring
 - 418 ○ Buyer/Client requests On-Demand Performance Monitoring Job for a given service
419 including all attributes of the Job.
 - 420 ○ Buyer/Client requests modification of an On-Demand Performance Monitoring Job
421 for a given service including all attributes of the Job.
 - 422 ○ Buyer/Client requests deletion of an On-Demand Performance Monitoring Job for
423 a given service including all attributes of the Job.
 - 424 ○ Buyer/Client requests suspension of an On-Demand Performance Monitoring Job
425 for a given service including all attributes of the Job.
 - 426 ○ Buyer/Client requests resumption of an On-Demand Performance Monitoring Job
427 for a given service including all attributes of the Job.
 - 428 ○ Seller/Server notifies the Buyer/Client when results of the PM Job are ready.
 - 429 ○ Buyer/Client retrieves a list of Performance Monitoring Jobs.
 - 430 ○ Buyer/Client retrieves a Performance Monitoring Job by Performance Monitoring
431 Job ID.
- 432 • Proactive Performance Monitoring
 - 433 ○ Buyer/Client requests a Proactive Performance Monitoring Job for a given service
434 including all attributes of the Job.
 - 435 ○ Buyer/Client requests modification of a Proactive Performance Monitoring Job for
436 a given service including all attributes of the Job.
 - 437 ○ Buyer/Client requests deletion of a Proactive Performance Monitoring Job for a
438 given service including all attributes of the Job.
 - 439 ○ Buyer/Client requests suspension of a Proactive Performance Monitoring Job for a
440 given service including all attributes of the Job.
 - 441 ○ Buyer/Client requests resumption of a Proactive Performance Monitoring Job for a
442 given service including all attributes of the Job.
 - 443 ○ Seller/Server notifies Buyer/Client when results of the Performance Monitoring Job
444 are ready.

- 445 ○ Buyer/Client retrieves a list of Performance Monitoring Jobs.
- 446 ○ Buyer/Client retrieves a Performance Monitoring Job by Performance Monitoring
- 447 Job ID.
- 448 • Passive Statistics Monitoring
- 449 ○ Buyer/Client requests a Passive Statistics Monitoring Job for a given service in-
- 450 cluding all attributes of the Job.
- 451 ○ Buyer/Client requests a modification to a Passive Statistics Monitoring Job for a
- 452 given service including all attributes of the Job.
- 453 ○ Buyer/Client requests a deletion of a Passive Statistics Monitoring Job for a given
- 454 service including all attributes of the Job.
- 455 ○ Seller/Server notifies Buyer/Client when results of the Passive Monitoring Statis-
- 456 tics Collection is ready.
- 457 ○ Buyer/Client retrieves a Passive Statistics Monitoring Job collection.
- 458 ○ Buyer/Client retrieves a Passive Statistics Job by Passive Statistics Job ID.
- 459 • Performance Monitoring Job Notifications
- 460 ○ Buyer/Client subscription to PM Job Notifications.
- 461 ○ Seller/Server generation of PM Job Notifications.
- 462 • Performance Monitoring Results
- 463 ○ Buyer/Client retrieves a list of Performance Monitoring Jobs.
- 464 ○ Buyer/Client retrieves PM Job results in one of four (*JSON XML, AVRO, CSV*)
- 465 formats as indicated in the request.
- 466 ○ Results are in the API as payload or retrieved as an attachment.
- 467 ○ Results are in a referenced file.
- 468 ○ Buyer/Client retrieves results from multiple PM Jobs with a single request. An ex-
- 469 ample is a Buyer/Client performing two or more PM Jobs and requesting the results
- 470 being retrieved in a single request.
- 471 ○ Buyer/Client subscribes to streaming Performance Monitoring.
- 472 ○ Buyer/Client receives streaming Performance Monitoring results where
- 473 Seller/Server sends results to one or more target addresses.

9 Use Cases Summary

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

Performance Monitoring not Performance

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.	10.1.1
2	Modify FM Job	A request is initiated by the Buyer/Client to modify a FM Job on a Service.	10.1.2
3	Delete FM Job	A request is initiated by the Buyer/Client to delete an existing FM Job on a Service.	10.1.3
4	Suspend FM Job	A request is initiated by the Buyer/Client to suspend an existing FM Job on a Service.	10.1.4
5	Resume FM Job	A request is initiated by the Buyer/Client to resume a suspended existing FM Job on a Service.	10.1.5
6	Subscribe to FM Job Notifications	A request is initiated by the Buyer/Client to a subscribe to an existing FM Job on a Service.	10.1.6
7	Generation of FM Job Notifications	The Seller/Server generates and sends FM Job Notifications to subscribed Buyer/Client.	10.1.7
8	Unsubscribe from FM Job Notifications	A request is initiated by the Buyer/Client to unsubscribe from FM Job Notifications.	10.1.8
9	List Fault Management Report	A request initiated by the Buyer/Client to the Seller/Server to list the	10.1.9

UC #	Use Case Name	Use Case Description	Reference Section
Fault Management Use Cases			
		Fault Measurement Reports based on filtered criterion.	

479

UC #	Use Case Name	Use Case Description	Reference Section
Fault Management Use Cases			
10	Collect Fault Management Report	A request initiated by the Buyer/Client to the Seller/Server to collect a Fault Measurement Report.	10.1.10
Performance Monitoring Profiles Use Cases			
11	Create Performance Monitoring Profile	A request initiated by the Buyer/Client to the Seller/Server to create a PM Profile.	11.1.1
12	Retrieve PM Profile List	A request initiated by the Buyer/Client to the Seller/Server to retrieve a list of PM Profiles.	11.1.2
13	Retrieve PM Profile	A request initiated by the Buyer/Client to the Seller/Server to retrieve a PM Profile.	11.1.3
13	Modify PM Profile	A request initiated by the Buyer/Client to the Seller/Server to modify a PM Profile.	11.1.4
14	Delete PM Profile	A request initiated by the Buyer/Client to the Seller/Server to delete a PM Profile.	11.1.5
15	Subscribe to PM Profile Notifications	A request initiated by the Client to the Seller/Server to subscribe to PM Profile Notifications.	11.1.6
16	PM Profile Notification	A PM Profile Notification is initiated by the Seller/Server to a subscribed Buyer/Client.	11.1.7



UC #	Use Case Name	Use Case Description	Reference Section
Fault Management Use Cases			
17	Unsubscribe from PM Profile Notifications	A request initiated by the Buyer/Client to unsubscribe from PM Profile Notifications.	11.1.8
Performance Monitoring Job, Collection and Notification Use Cases			
18	Create PM Job	A request initiated by the Buyer/Client to create a PM Job.	11.2.1

480

UC #	Use Case Name	Use Case Description	Reference Section
Performance Monitoring Job, Collection and Notification Use Cases			
19	Modify PM Job	A request initiated by the Client to the Seller/Server to modify a PM Job.	11.2.2
20	Delete PM Job	A request initiated by the Client to the Seller/Server to delete a PM Job.	11.2.3
21	Suspend PM Job	A request initiated by the Client to the Seller/Server to suspend a PM Job.	11.2.4
22	Resume PM Job	A request initiated by the Client to the Seller/Server to resume a PM Job.	11.2.5
23	Retrieve PM Job List	A request initiated by the Buyer/Client to retrieve a PM Job List based on a filtered criterion.	11.2.6
24	Retrieve PM Job by ID	A request initiated by the Buyer/Client to retrieve a PM Job based on a unique identifier, ID.	11.2.7
25	Subscribe to PM Job/Collection Notifications	A request initiated by the Buyer/Client to subscribe to PM Job/Collection Notifications.	11.2.8
26	Unsubscribe from PM Job/Collection Notifications	A request initiated by the Buyer/Client to unsubscribe from PM Job/Collection Notifications.	11.2.9
27	PM Job/Collection Notification	A PM Job/Collection Notifications is initiated by the Seller/Server to a subscribed Buyer/Client.	11.2.10
28	List Performance Measurement Reports	A request initiated by the Buyer/Client to the Seller/Server to list the Performance Measurement Reports based on a filtered criterion.	11.2.11
29	Collect Performance Measurement Report	A request initiated by the Buyer/Client to the Seller/Server to collect a Performance Measurement Report.	11.2.12

UC #	Use Case Name	Use Case Description	Reference Section
Passive Statistics Collection Use Cases			
30	Create Statistics Collection Job	A request initiated by the Buyer/Client to create a Statistics Collection Job.	12.2.1
31	Modify Statistics Collection Job	A request initiated by the Client to the Seller/Server to modify a Statistics Collection Job.	12.2.2
32	Delete Statistics Collection Job	A request initiated by the Client to the Seller/Server to delete a Statistics Collection Job.	12.2.3
33	List Statistics Collection Reports	A request initiated by the Buyer/Client to the Seller/Server to list the Passive Statistics Reports based on a filtered criterion.	12.2.4
34	Collect Statistics Collection Report	A request initiated by the Buyer/Client to the Seller/Server to collect a Statistics Collection Report.	12.2.5
Threshold Crossing Alert Profile Management Use Cases			
35	Create TCA Profile	A request is initiated by the Administrator (Client) to create a TCA Profile.	13.1.1
36	Modify TCA Profile	A request is initiated by the Administrator (Client) to modify a TCA Profile.	13.1.2
37	Delete TCA Profile	A request is initiated by the Administrator (Client) to delete a TCA Profile.	13.1.3
38	Retrieve List of TCA Profiles	A request is initiated by the Administrator (Client) to retrieve a list of TCA Profiles.	13.1.4
39	Retrieve TCA Profile by Identifier	A request is initiated by the Administrator (Client) to retrieve a TCA Profile.	13.1.5

UC #	Use Case Name	Use Case Description	Reference Section
Threshold Crossing Alert Use Cases			
40	Subscribe TCA Notifications	A request is initiated by the Client to the Seller/Server to subscribe to TCA Profile Notifications.	13.1.6
41	Unsubscribe TCA Notifications	A request initiated by the Client to unsubscribe from TCA Profile Notifications.	13.1.7
42	Stateful TCA Notifications	A TCA Profile lifecycle Notification is initiated by the Seller/Server to a subscribed Client.	13.1.8
43	Stateless TCA Notifications	A TCA Profile lifecycle Notification is initiated by the Seller/Server to a subscribed Client.	13.1.9
Streaming (Topics) Use Cases			
44	Retrieve Topic by Identifier	A request is initiated by the Buyer/Client to retrieve a Topic that match the provided filter criteria.	14.2.1
45	Retrieve Available Topic List	A request is initiated by the Buyer/Client (Subscriber) to retrieve a Topic list.	14.2.2
46	Retrieve Subscribed Topic List	A request is initiated by the Buyer/Client (Subscriber) to retrieve a Topic list which the Subscriber is currently subscribed.	14.2.3
Subscriber/Publisher Streaming Use Cases			
47	Subscribe to Topic	A request is initiated by the Buyer/Client (Subscriber) to subscribe to a Topic.	14.2.4
48	Unsubscribe from a Topic	A request is initiated by the Buyer/Client (Subscriber) to unsubscribe from a Topic.	14.2.5

UC #	Use Case Name	Use Case Description	Reference Section
49	Publish Topic Message	A Seller/Server (Publisher) publishes a Topic/Message to Buyers/Sellers (Subscriber(s)).	14.2.6
50	Retrieve Topic/Messages	A Buyer/Client retrieves the Topic/Message that it is subscribed to.	14.2.7
Alarm Management Use Cases			
51	Create Alarm	A request is made by Seller/Server to create an Alarm based on an event.	15.2.1
52	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).	15.2.2
53	Delete Alarm	A request initiated by the Seller/Server to delete an Alarm.	15.2.3
54	Generate Alarm	The Seller/Server generates an Alarm.	15.2.4
55	Acknowledge Alarm	A request is initiated by the Buyer/Client to Acknowledge an Alarm.	15.2.5
56	Clear Alarm	A request is initiated by the Buyer/Client to Clear an Alarm.	15.2.6

Table 4-Use Case Summary

10 Fault Management Use Cases

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

10.1 FM Job

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

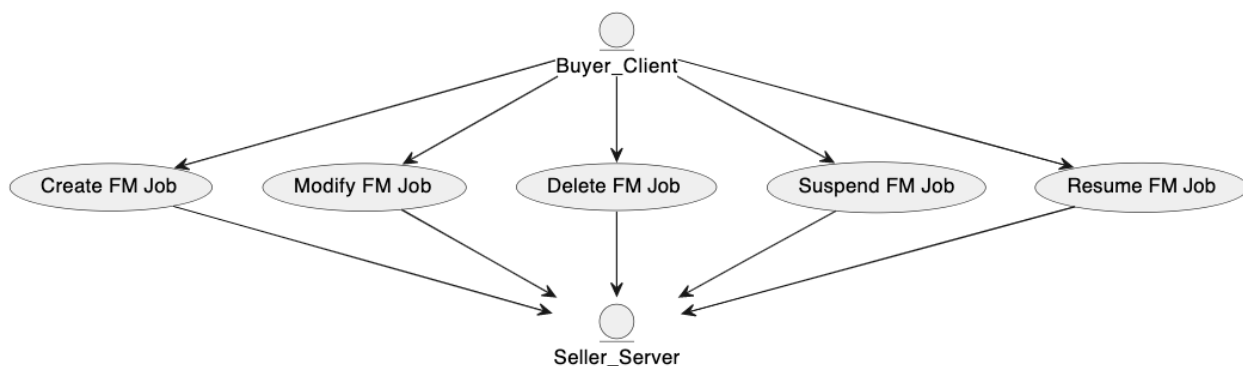


Figure 1-Fault Management Job Use Cases

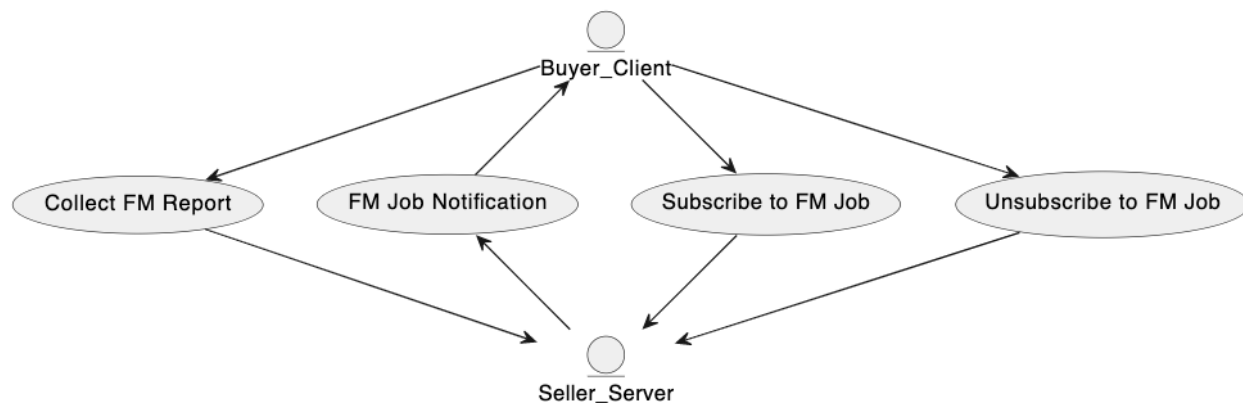


Figure 2-Fault Management Job Notification and Collection Use Cases

10.1.1 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	<p>1. The Buyer/Client creates a FM Job request using the attributes show in Table FM Job Attribute.</p> <p>[R1] The Buyer/Client's Create FM Job request MUST contain the following attributes:</p> <ul style="list-style-type: none"> • Job Type (On-Demand, Proactive, Passive) • Output Format • Granularity • Service Specific Attributes <ul style="list-style-type: none"> ○ Service ID or set of Service IDs to request multi-Service report. <p>[O1] The Buyer/Client's Create FM Job request MAY contain the following attributes:</p> <ul style="list-style-type: none"> • Description • FM Job Priority • Schedule Definition <p>2. The Seller/Server responds with an acknowledgement and notifies the Buyer/Client when results are available.</p> <p>[R2] The Seller/Server sets the Creation Time attribute.</p> <ul style="list-style-type: none"> • Creation Time <p>[R3] The Seller's/Server's response MUST echo back all Buyer/Client provided attributes.</p> <p>[R4] The Seller's/Server's response MUST include the FM Job Identifier.</p> <p>[R5] The FM Job Identifier supplied by the Seller/Server MUST be unique within the Seller/Server's network.</p>

Field	Description
Post-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client receives a Response, including a FM Job ID. 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. <p style="text-align: center;">[R6] If the Buyer/Client registered for FM Notifications, the Seller/Server MUST notify the Buyer/Client when FM Job results are available.</p>
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server returns an error message if an error is encountered while constructing and persistently storing the FM Job.

500

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 Seller/Server
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: <i>JSON</i> <i>XML</i> <i>AVRO</i> <i>CSV</i>	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

	Including Instance Criteria.		
Granularity	The sampling rate of the collection of fault indicators.	String One of the following: 32 <i>milli-seconds</i> , <i>100 milliseconds</i> , <i>1 second</i> , 33 <i>second</i> <i>1 minute</i> <i>5 minutes</i> <i>15 minutes</i> <i>30 minutes</i> , <i>1 hour</i> <i>24 hours</i> <i>1 month</i> <i>1 year</i> <i>Not Applicable</i>	Set by Buyer/Client
Reporting Period	The time-period for the report.	One of the following: 34 <i>milli-seconds</i> <i>100 milliseconds</i> <i>1 second</i> 35 <i>seconds</i> <i>1 minute</i> <i>5 minutes</i> <i>15 minutes</i> <i>30 minutes</i> <i>1 hour</i> <i>24 hours</i> <i>1 month</i> <i>1 year</i> <i>Not Applicable</i>	
Schedule Definition	The definition of schedule attributes	See Appendix E	



State	State of FM Job.	See Table 82-Fault Management Job States	
Tracking Record	A list of tracking records. Tracking records allow the tracking of modifications on the Job. The tracking records should not be embedded in the Job to allow retrieving the Job without the tracking records.	See Appendix H	

Table 6-FM Job Attributes

501

10.1.2 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	<ol style="list-style-type: none"> The Client is authorized to request a modification to an existing FM Job on a Service in the Seller/Server system.
Process Steps	<ol style="list-style-type: none"> Buyer/Client creates a Modify FM Job request that includes the FM Job Identifier and the attributes to modify. <ul style="list-style-type: none"> [R7] The Buyer's/Client's Modify FM Job request MUST include the FM Job Identifier. [R8] The Buyer's/Client's Modify FM Job request MUST contain one or more of the following attributes: <ul style="list-style-type: none"> • Output Format • Granularity • Instance Criteria • Description • FM Job Priority • Schedule Definition • Service Payload Specific Attributes The Seller/Server responds to the Modify FM Job request and if accepted updates the attribute(s). <ul style="list-style-type: none"> [R9] 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. [R10] 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	<ol style="list-style-type: none"> The Buyer/Client receives a FM Job response with attributes that have been modified. The FM Job is modified with requested attributes changes. 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	<ol style="list-style-type: none"> If errors occurred, the Seller/Server returns all identified errors in a reject response. If the modification request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

Table 7-Modify FM Job Use Case

10.1.3 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	<p>1. The Buyer/Client creates a Delete FM Job request that includes the FM Job Identifier.</p> <p style="padding-left: 40px;">[R11] The Buyer's/Client's Delete FM Job request MUST include the FM Job Identifier.</p> <p>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.</p> <p style="padding-left: 40px;">[R12] 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.</p> <p style="padding-left: 40px;">[R13] If the Seller/Server accepts the Buyer's/Client's Delete FM Job request, the Job MUST stop.</p> <p style="padding-left: 40px;">[R14] If the Seller/Server declines the Client's Delete FM Job request, the Job MUST NOT stop.</p> <p style="padding-left: 40px;">[R15] If the Seller/Server declines the Client's Delete FM Job request, they MUST provide a reason the request was declined.</p>
Post-Conditions	<p>1. The Buyer/Client receives a confirmation that the FM Job has been deleted.</p> <p>2. All resources on the Seller/Server side associated with the FM Job are deleted.</p> <p>3. All FM results generated prior to deletion remain available for collection.</p>
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

Table 8-Delete FM Job Use Case

506

10.1.4 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Client creates a Suspend FM Job request that includes the FM Job Identifier. <ul style="list-style-type: none"> [R16] The Client's Suspend FM Job request MUST include the Job Identifier. [R17] 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. <ul style="list-style-type: none"> [R18] The Seller/Server's response to the Client's Suspend FM Job request MUST indicate if the request is Accepted or Declined. [R19] If the Seller/Server accepts the Client's Suspend FM Job request, the Job MUST be suspended. [R20] If the Seller/Server declines the Client's Suspend FM Job request, the Job MUST NOT be suspended. [R21] If the Seller/Server declines the Client's Suspend FM Job request, they MUST provide a reason the request was declined.
Post-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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).

507

Table 9-Suspend FM Job Use Case

508

10.1.5 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Client creates a Resume FM Job request that includes the FM Job Identifier. <ul style="list-style-type: none"> [R22] The Client's Resume FM Job request MUST include the Job Identifier. [R23] 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. <ul style="list-style-type: none"> [R24] The Seller/Server's response to the Client's Resume FM Job request MUST indicate if the request is Accepted or Declined. [R25] If the Seller/Server accepts the Client's Resume FM Job request, the Job MUST be resumed and return to the In-Progress state. [R26] If the Seller/Server declines the Client's Resume FM Job request, the Job MUST NOT be resumed. [R27] If the Seller/Server declines the Client's Resume FM Job request, they MUST provide a reason the request was declined.
Post-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. If errors occurred, the Seller/Server returns all identified errors in a reject response. 2. If the resume request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

509

Table 10-Resume FM Job Use Case

510 10.1.6 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Client subscribes to FM Job Notifications by specifying the notification types and target addresses for the notifications to be sent to. <div style="text-align: center;"> [R28] The Client request MUST contain the following: <ul style="list-style-type: none"> • FM Job Notification Target Information • List of Job Notification Types </div> 2. The Seller/Server responds to indicate acceptance of the request. <div style="text-align: center;"> [R29] The Seller/Server MUST respond to the Client's Register for FM Job Notifications request to indicate that the request was accepted or rejected. [R30] If the Seller/Server rejects the Client's Register for FM Job Notifications request, the response MUST include a reason for the rejection. </div>
Post-Conditions	<ol style="list-style-type: none"> 1. If the Seller/Server encounters errors, they should return an error with explanation to the Client.

511 Table 11-Subscribe to FM Job Notifications Use Case

512

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 FM 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

10.1.7 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	<p>1. The Seller/Server generates and sends FM Job Notifications to subscribed Client(s).</p> <p>[R31] The Seller/Server's FM Job Notification MUST include the following attributes:</p> <ul style="list-style-type: none"> Fault Date/Time FM Job Notification Type FM Job Notification Identifier Fault Description Severity <p>2. The Seller/Server generates and sends FM Notifications to subscribed Buyer/Clients.</p> <p>[R32] The Seller/Server FM Notifications MUST be sent to Buyer/Clients who have subscribed to FM Notifications.</p> <p>[R33] The Seller/Server FM Notifications MUST Not be sent to Buyer/Clients who have not subscribed to FM Notifications.</p> <p>[R34] The Seller/Server's FM Notification MUST include the attributes in Table 14-FM Notification Attributes.</p>
Post-Conditions	<p>1. The Client has received the FM Job Notification sent by Seller/Server.</p> <p>2. If the Seller/Server encounters errors, they should return an error with explanation to the Client.</p>
Alternative Paths	

Table 13-FM Job Notifications Use Case

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: <ul style="list-style-type: none"> FM Job created, FM Job modified, FM Job deleted, FM Collection ready. 	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: <i>Warning</i> <i>Minor</i> <i>Major</i> <i>Critical</i> <i>Information</i>	Only used if FM Notification Type = Alarm

Table 14-FM Notification Attributes

10.1.8 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.

Table 15-Unsubscribe from FM Job Use Case

10.1.9 List Fault Management Reports

Field	Description
Use Case Number	28
Use Case Name	List Fault Management Reports
Description	A request initiated by the Buyer/Client to the Seller/Server to list the Fault Management Reports based on a filtered criterion.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to retrieve a list of Fault Management Reports in the Seller/Server system.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer/Client submits a Retrieve List of Fault Management Reports 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 Fault Management Reports match the filter criteria in the request. <p>[R35] The Seller/Server MUST support the retrieval of a List of Fault Management Reports Use Case.</p> <p>[R36] Buyer/Client MUST support the retrieval of a List of Fault Management Reports Use Case.</p> <p>[R37] The Seller/Server's response to the Buyer's/Client's retrieve List of Fault Management Reports MUST include the following attributes as applicable:</p> <ul style="list-style-type: none"> • Description • Report ID <ol style="list-style-type: none"> 4. If the Seller/Server validates the Buyer's/Client's request but finds no matching Fault Management Reports, the Seller/Server MUST return an empty list.
Post-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client receives a list of all Fault Management Reports 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 Fault Management Reports based on unique identifier.

Table 16-List Performance Measurement Reports Use Case

10.1.10 Collect Fault Management Reports

Field	Description
Use Case Number	9
Use Case Name	List Fault Management Reports
Description	A request initiated by the Buyer/Client to the Seller/Server to collect a Fault Measurement Report.
Actors	Buyer/Client, Seller/Server



Field	Description
Pre-Conditions	1. The Buyer/Client is authorized to collect a Fault Measurement Report in the Seller/Server system.



Process Steps	<ol style="list-style-type: none">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.2. The Client sends the Service identifier used in the FM Job Create request to identify the Service to collect the report. [R38] The Seller MUST support returning results as Service Payload or URI. [O2] The Seller MAY support multiple methods of retrieving results.2. Retrieve Result:<ol style="list-style-type: none">a. The Buyer/Client submits a Retrieve Results in Service Payload request to the Seller/Server. [R39] The Retrieve Results in Service Payload request MUST include the following attributes shown in Table-Retrieve Results in Service Payload Attributes:<ul style="list-style-type: none">• Report Identifier• Report Format = Payloadb. The Buyer/Client submits a Retrieve Results as Attachment request to Seller/Server. [R40] The Retrieve Results in Attachment request MUST include the following attributes shown in Table-Retrieve as Attachment Attributes:<ul style="list-style-type: none">• Report Identifier• Report Format = Attachmentc. The Buyer/Client submits a Retrieve Results as FTP to the Seller. [R41] The Retrieve Results in Payload request MUST include the following attributes shown in Table-Retrieve Results in Payload Attributes:<ul style="list-style-type: none">• Report Identifier• Report Format = FTP• FTP Address3. The Seller/Server receives the request and validates the request.
---------------	--



Field	Description
	<ol style="list-style-type: none"> 4. The Seller/Server determines if a Fault Management Report matches the filter criteria in the request. 5. The Seller/Server-side results: <ol style="list-style-type: none"> 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 attachment. c. The Seller/Server's response allows the Buyer/Client to retrieve the results via FTP.
Post-Conditions	<ol style="list-style-type: none"> 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.

523

Table 17-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

524

Table 18-FM Job Results

Attribute Name	Description	Value	Comments
Report Identifier	The unique identifier within the Seller/Server network identifier of the results report.	String	
Result Format	The format of the results that are retrieved	JSON	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

525

Table 19-Retrieve Fault Management Results in Payload Attributes

526

[R42] The results regardless of the format **MUST** contain the FM results as specified with FM Job request.

527

11 Performance Monitoring Use Cases

The Use Cases for Performance Monitoring are defined in this section. The Service Level Specification 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 specify 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 Collections. There are three types of PM Jobs – Proactive, On-Demand and Passive.

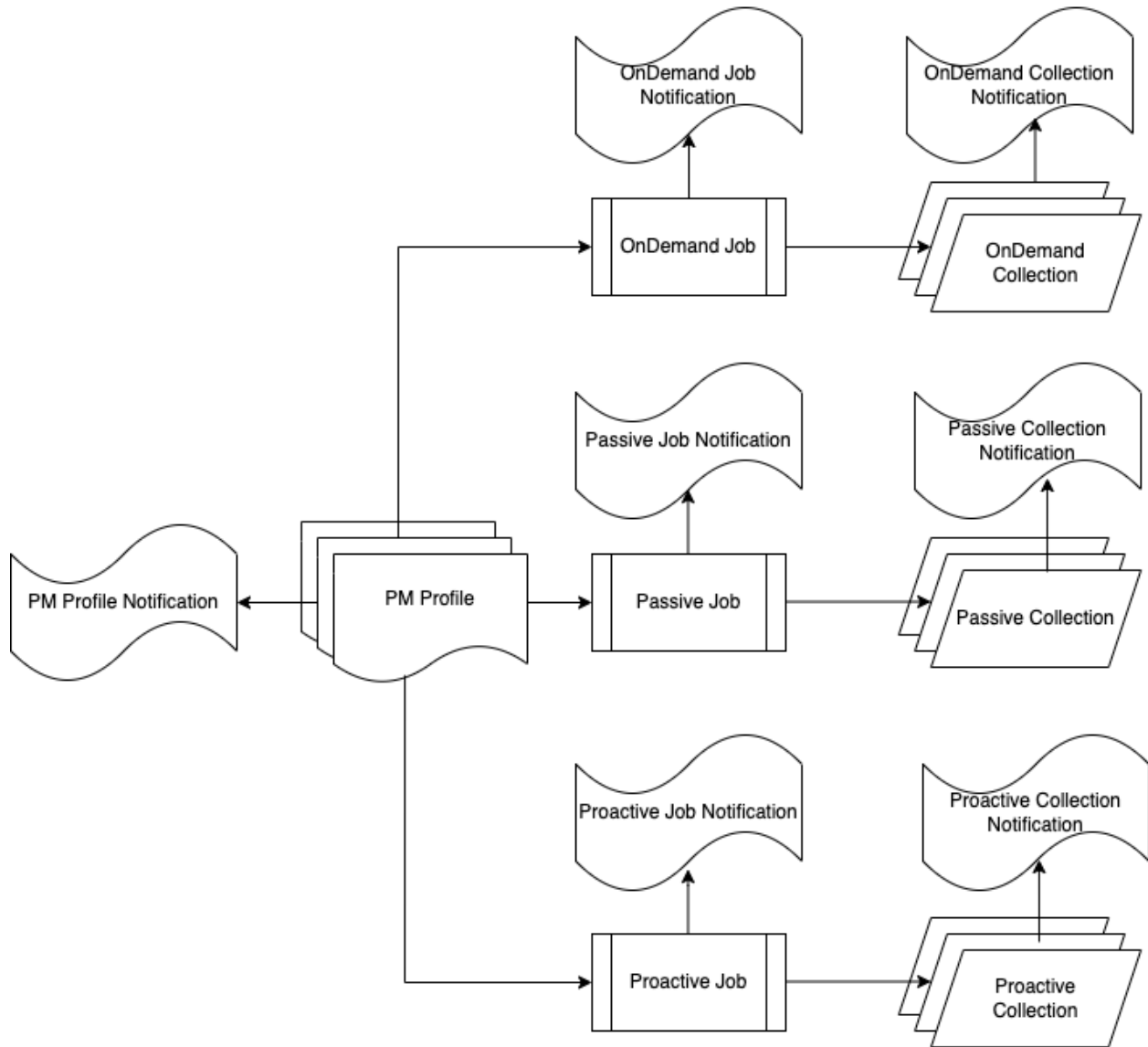


Figure 3-Performance Monitoring Process Diagram

PM Profile provisioning is the lifecycle process of defining performance attributes of a PM Profile. A PM Profile Notification is defined such that a client can subscribe to PM Profile Notifications 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. Performance objectives are typically associated with an SLS but can be used for an On-Demand Job for making measurements as part of a troubleshooting procedure. 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 12. 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.

An On-Demand PM Job is typically a single run or non-continual run performed during service assurance. A Proactive PM Job is typically in support of a SLS measurement and will run indefinitely, while an On-Demand is a short duration performance management test. On-Demand PM Job has an end date while Proactive PM Job runs indefinitely.

Proactive, On-Demand and Passive PM Jobs use PM Profiles for the provisioning lifecycle. The performance objectives include, but are not limited to frame/packet delay, frame/packet loss ratio, inter-frame/packet delay variation. A PM Profile can be reused for multiple Proactive, On-Demand and Passive PM Jobs or can be created for a specific Proactive, On-Demand or Passive PM Jobs. Proactive, On-Demand and Passive PM Jobs support Notifications. A client can subscribe to these respective Notifications and be asynchronously informed when a Job is created, deleted, or modified.

The proactive, On-Demand and Passive Collections are where a client requests the retrieval of performance management and/or fault management reports. ~~Both the~~ Proactive, On-Demand and Passive Collections support Notifications. A client can subscribe to these Notifications and be asynchronously notified when a Collection is ready for retrieval.

There are no restrictions on a Proactive and On-Demand PM Job running on the same Service. For example, a Proactive PM Job could be associated with SLA during Service Activation. While the Service is active a Service Assurance-based On-Demand PM Job may be requested to immediate (real-time) feedback purposes. A Passive PM Job can be associated with a Service or Entity (i.e., Interface, Port, VLAN). An Entity is defined as an object other than a Service that can be monitored and have associated telemetry.

11.1 Performance Monitoring Profiles Use Cases

This section defines the use cases that support Performance Monitoring (PM) Profiles. PM Profiles are a mechanism used to simplify the PM Job provisioning. Some or all attributes of a PM Job are defined in the PM Profiles which can be centralized and leveraged across multiple job requests. See Table 21-Create PM Profile Attributes. A PM Profile can be used for multiple PM Jobs, or it can be for a specific PM Job.

NOTE: Threshold Crossing Alerts (TCAs) can be provisioned within the context of an PM Profile provisioning.

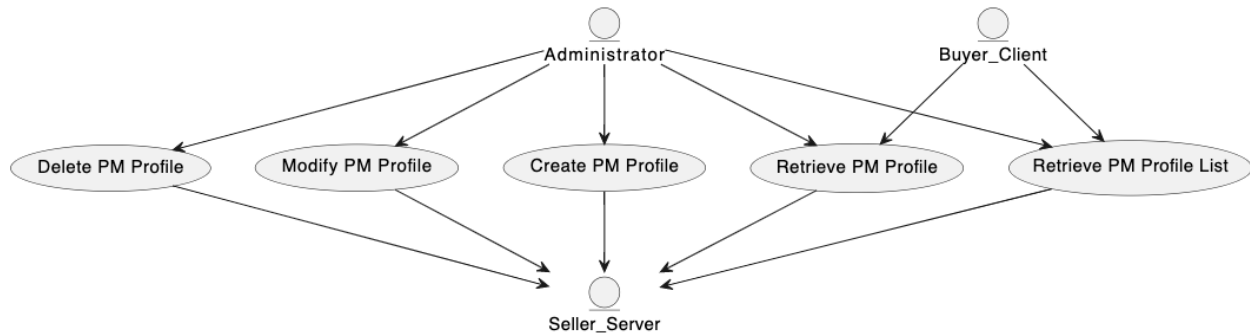


Figure 4-Performance Monitoring Profile Use Cases

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

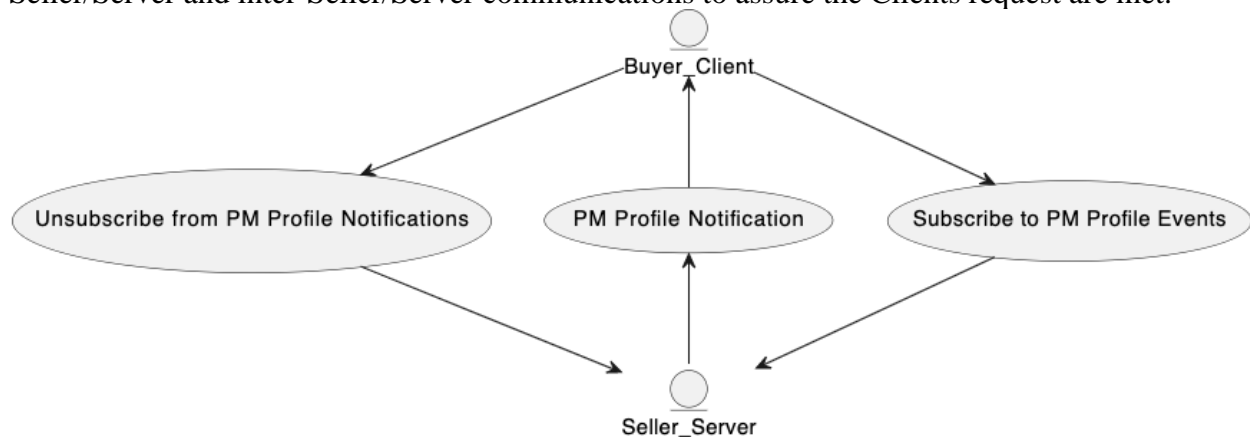


Figure 5-Performance Monitoring Profile Notification Use Cases

The Buyer/Client can subscribe, unsubscribe to and from PM Profile Notifications. In the case of a Partner providing Profiles, the Service Provider will subscribe to PM Profile Notifications and the Partner will send corresponding Notifications. These scenarios are dependent upon the IRP on the operation of Notifications and actors. The Seller/Server (SOF) is responsible for providing PM Profile Notifications to the Client (BA) specified callback.

11.1.1 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 Administrator to the Seller/Server to create a PM Profile.
Actors	Administrator, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> PM Profile with intended Profile does not exist. <i>Note: Uniqueness is based on the envelope level exact match.</i> The Administrator is authorized to perform the request.

Field	Description
Process Steps	<ol style="list-style-type: none"> The Administrator determines what PM objectives will be needed. <p style="text-align: center;">[R43] The Administrator's Create PM Profile MUST support the following attributes:</p> <ul style="list-style-type: none"> PM Profile ID Buyer PM Profile ID PM Job Type Granularity Reporting Period Schedule Definition <p style="text-align: center;">[O3] The Administrator's Create PM Profile MAY contain the following attributes:</p> <ul style="list-style-type: none"> Description PM Job Priority <ol style="list-style-type: none"> The Seller/Server receives request and determines if the PM Profile is valid.
Post-Conditions	<ol style="list-style-type: none"> PM profile is allocated and available with set of specified PM objectives. Service returns PM Profile. The PM Profile is available for PM Job provisioning.
Alternative Paths	<ol style="list-style-type: none"> The Seller/Server returns an error message if an error is encountered while constructing and persistently storing the PM profile. The Seller/Server returns a specific error message that the requested PM Job will collect to much data.

599

Table 20-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.	<i>PM_Profile</i>	Set by Administrator <i>NOTE: If set by Buyer/Client the remainder of attributes in this table are not needed given they are in the Profile.</i>
PM Job Type	The type of PM Job	One of the following: <i>Proactive</i>	Set by Administrator

Attribute Name	Description	Value	Comments
		<i>OnDemand</i> <i>Passive</i>	
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 PM Profile was modified.	Date-Time	Set by Seller/Server
Output Format	The format of the output report	One of the following: <i>XML</i> <i>AVRO</i> <i>CSV</i> <i>JSON</i>	Set by the Administrator
File Transfer Data	The definition of File Transfer Data.	See Appendix F	Set by Administrator
Granularity	The sampling rate of the collection of performance indicators.	One of the following: <i>10 milliseconds</i> <i>100 milliseconds</i> <i>1 second</i> <i>10 second</i> <i>1 minute</i> <i>5 minutes</i> <i>15 minutes</i> <i>30 minutes</i> <i>1 hour</i> <i>24 hours</i> <i>1 month</i> <i>1 year</i> <i>Not Applicable</i>	Set by Administrator
Schedule Definition	The definition of schedule attributes	See Appendix E	



Attribute Name	Description	Value	Comments
State	State of PM Profile.	See Table 88-PM Profile/Job States	
Tracking Record	A list of tracking records. Tracking records allow the tracking of modifications to the PM Profile. The tracking records should not be embedded in the PM Profile to allow retrieving the PM Profile without the tracking records.	See Appendix H	

Table 21-Create PM Profile Attributes

11.1.2 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	<ol style="list-style-type: none"> 1. The Administrator or Buyer/Client submits a Retrieve List of PM Profile request including filter criteria for profile 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. <p>[R44] The Seller/Server MUST support the retrieval of a PM Profile List Use Case.</p> <p>[R45] The Administrator or Buyer/Client MUST support the retrieval of a PM Profile List Use Case.</p> <p>[R46] 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:</p> <ul style="list-style-type: none"> • Description • PM Profile ID <p>[R47] 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.</p>

Field	Description
Post-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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.

Table 22-Retrieve PM Profile List Use Case
11.1.3 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	<ol style="list-style-type: none"> 1. The Administrator or Buyer/Client is authorized to perform the query.

Field	Description
Process Steps	<ol style="list-style-type: none"> 1. The Administrator or Buyer/Client submits a PM Profile request with the following filters: <ul style="list-style-type: none"> • Buyer Profile ID • State • Creation Date • Job Type • Granularity • Reporting Period • Job Priority 2. The Seller/Server receives the request and validates the request. 3. The Seller/Server returns the PM Profile. <p>[R48] The Seller/Server MUST support the retrieval of a PM Profile Use Case.</p> <p>[R49] The Administrator or Buyer/Client MUST support the retrieval of a PM Profile Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Administrator or Buyer/Client receives the PM Profile that match the Administrator or Buyer's/Client's filtered selection criteria. Returned list includes the attributes: <ul style="list-style-type: none"> • Buyer Profile ID • Creation Date • Granularity • Job Priority • Job Type • Reporting Period • State
Alternative Paths	<ol style="list-style-type: none"> 1. If errors occurred, the Seller/Server returns all identified errors in a reject response.

Table 23-Retrieve PM Profile Use Case

11.1.4 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	<ol style="list-style-type: none"> 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 by a PM Job.

Field	Description
Process Steps	<ol style="list-style-type: none"> 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. <p>[O4] The Seller/Server MAY support the modification of a PM Profile Use Case.</p> <p>[O5] The Administrator MAY support the modification of a PM Profile Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. Seller/Server initiates the modification process and notifies Administrator with a success message.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server returns and error message if an error is encountered while processing that prevents the Seller/Server from completing the modification.

Table 24-Modify PM Profile Use Case

11.1.5 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	<ol style="list-style-type: none"> 1. A PM Profile exists in Seller/Server's system. 2. The Administrator can delete PM Profiles. 3. The PM Profile is not being used by a PM Job.
Process Steps	<ol style="list-style-type: none"> 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. <p>[O6] The Seller/Server MAY support the deletion of a PM Profile Use Case.</p> <p>[O7] The Administrator MAY support the deletion of a PM Profile Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. Seller/Server deletes the PM Profile and notifies Administrator with a success message.
Alternative Paths	<ol style="list-style-type: none"> 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 25-Delete PM Profile Use Case

609

11.1.6 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, Administrator <i>NOTE: A Buyer may or may not be interested in PM Profile Notifications. The Client responsible (i.e., Administrator) will be interested in the Notifications.</i>
Pre-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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. PM Notification Types include: <ul style="list-style-type: none"> • PM Profile Created • PM Profile Modified • PM Profile Deleted 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. <p style="text-align: right;">[O8] The Seller/Server MAY support subscription to PM Profile Notifications Use Case.</p> <p style="text-align: right;">[O9] The Buyer/Client MAY support subscription to PM Profile Notifications Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server is aware of where to send notifications.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

610

Table 26-Subscribe to PM Profile Notifications Use Case

611

11.1.7 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, Administrator

Field	Description
Pre-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server supports PM Profile Notifications. 2. The Buyer/Client has subscribed to PM Profile Notifications.
Process Steps	<ol style="list-style-type: none"> 1. The Seller/Server sends the notifications to the location(s) registered by the Buyer/Client. <p style="text-align: center;">[O10] The Seller/Server MAY support PM Profile Notifications Use Case.</p> <p style="text-align: center;">[O11] The Buyer/Client MAY support PM Profile Notifications Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server has sent related PM Profile Notification.

Table 27-PM Profile Notifications Use Case

11.1.8 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, Administrator
Pre-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client has previously subscribed to PM Profile Notifications. 2. The Buyer/Client is authorized to unsubscribe to PM Profile Notifications in the Seller/Server system. 3. The Seller/Server support PM Profile Notifications.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer/Client sends the Unsubscribe from 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. <p style="text-align: center;">[O12] The Seller/Server MAY support unsubscribing from PM Profile Notifications Use Case.</p> <p style="text-align: center;">[O13] The Buyer/Client MAY support unsubscribing from PM Profile Notifications Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Service discontinues sending PM Profile Notifications to Buyer/Client specific to Buyer/Client Unsubscribe request.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server returns an error message if an error is encountered while processing that prevents the Seller/Server from completing the request.

Table 28-Unsubscribe from PM Profile Notifications Use Case

11.2 Performance Monitoring Job, Collection and Notification Use Cases

A Performance Monitoring Job is where the client specifies the performance monitoring objectives specific to each measurement point which could be an ordered pair (i.e., two UNIs) or an entity (i.e., port). An ordered pair is an association between two end points. A PM Job has start and stop times specified in the schedule definition.

NOTE: A customer could have multiple services each with an associated PM Job. Each PM Job would have it associated measurement point(s).

For the cases where the SLS is an attribute of the VC (Virtual Circuit) it is not necessary for a Proactive PM Job provisioning [Appendix A]. This use case results in a Collect PM Report without an associated PM Job reference. However, the Legato/Allegro/Interlude IRP could be used for PM Profile or Job provisioning. The PM Job implemented at MEF LSO Legato/Allegro/Interlude is specific to an implementation that is using a Legato/Allegro/Interlude Performance Management Provisioning process.

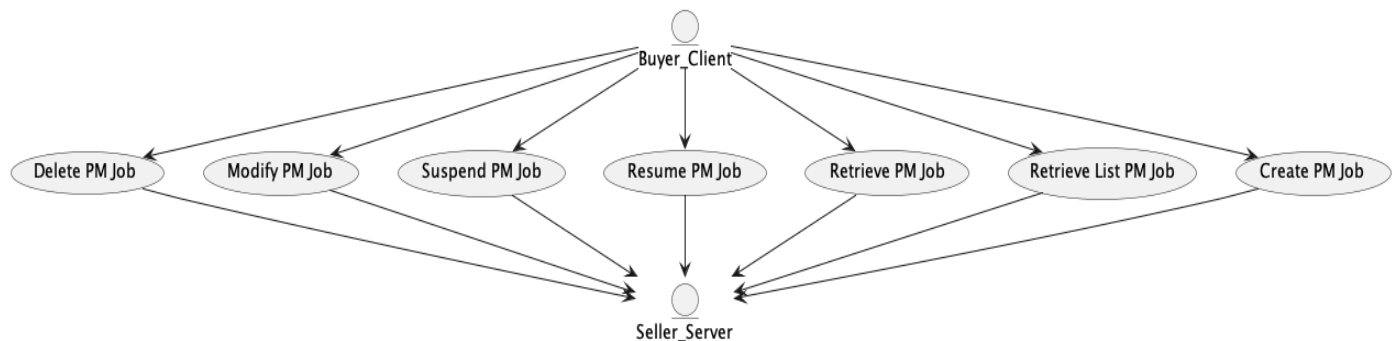


Figure 6-PM Job Use Cases

The Buyer/Client can create, retrieve, modify, and delete PM Jobs. The PM Jobs should result in Performance Management collections that will provide the Buyer/Client with performance objective results. A PM Profile does not need to be used if the Buyer/Client decides to communicate all attributes associated with a PM Job. The Seller/Server is responsible for interpreting the PM Job requests and performing the necessary intra-SOF and inter-SOF communications to assure the Buyer/Client requests are met.

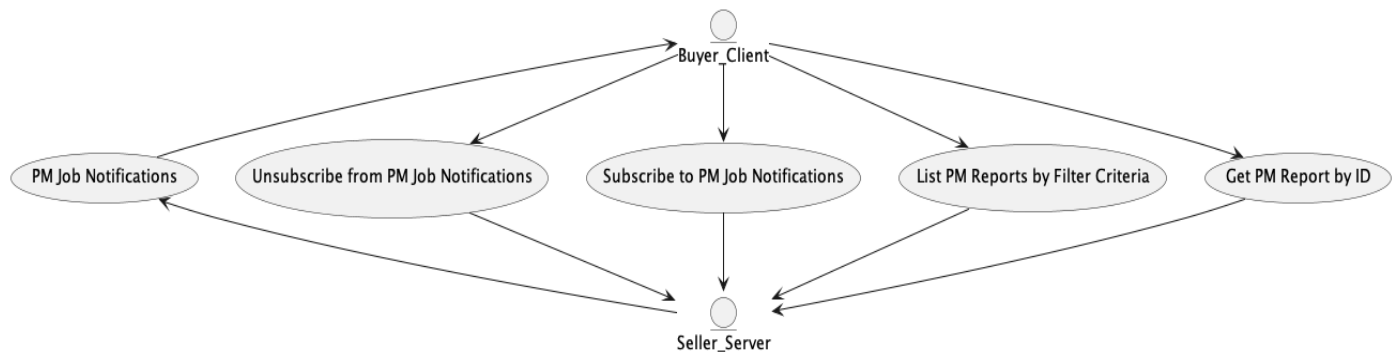


Figure 7-PM Job Notification and Collection Use Cases

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

11.2.1 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	<ol style="list-style-type: none"> The Buyer/Client determines the performance objectives, measurement interval and needed attributes as specified in PM payload which is specific to each service technology and not covered in this document. The Buyer/Client initiates and submits a PM Job request that contains a Schedule Definition. <p>[R50] The Buyer's/Client's Create PM Job MUST support the following attributes:</p> <ul style="list-style-type: none"> PM Job Type Granularity Reporting Period PM Profile ID (if used) Job Type Output Result Format Service Specific Payload Service Specific Attributes <ul style="list-style-type: none"> Service ID. Schedule Definition <p>[O14] The Buyer's/Client's Create PM Job MAY contain the following attributes:</p> <ul style="list-style-type: none"> Description PM Job Priority TCA Profile ID The Seller/Server validates the PM Job request and responds with PM Job including a unique identifier, ID in response. <p>[R51] The Seller/Server MUST assign a Job Identifier to the PM Job that is unique within the network.</p> <p>[R52] The PM Job Identifier supplied by the Seller/Server MUST be unique within the Seller/Server's network.</p> <p>[R53] The PM Job MUST use the attributes included in the Buyer's/Client's Create PM Job request.</p>

Field	Description
Post-Conditions	<ol style="list-style-type: none"> 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 if the Buyer/Client subscribed to these specific notifications. <p>[R54] If the Buyer/Client registered for PM Notifications, the Seller/Server MUST notify the Buyer/Client when PM Job results are available.</p>
Alternative Paths	<ol style="list-style-type: none"> 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 29-Create PM Job Use Case

Attribute Name	Description	Value	Comments
Description	A textual description of the PM Job	String	Set by Buyer/Client
Creation Date	Time the Job is started or created.	Date-Time	Set by Seller/Server
PM Profile ID	Reference to Performance Management Profile.	<i>PM_Profile</i>	Set by Administrator <i>NOTE: If set by Buyer/Client the remainder of attributes in this table are not needed given they are in the Profile.</i> <i>NOTE: PM Profile is NOT mandatory when creating a PM Job.</i>
PM Job Type	The type of PM Job	One of the following: <i>Proactive,</i> <i>On-Demand,</i> <i>Passive</i>	Set by Buyer/Client
PM Job Identifier	The identifier of the management Job.	String	Set by the Seller/Server

Attribute Name	Description	Value	Comments
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 Modified Date	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: <i>XML</i> <i>AVRO</i> <i>CSV</i> , <i>JSON</i>	Set by the Buyer/Client
File Transfer Data	The definition of File Transfer Data.	See Appendix F	Set by Buyer/Client
Granularity	The sampling rate of the collection of performance indicators.	One of the following: <i>10 milliseconds</i> <i>100 milliseconds</i> <i>1 second</i> <i>10 second</i> <i>1 minute</i> <i>5 minutes</i> <i>15 minutes</i> <i>30 minutes</i> <i>1 hour</i> <i>24 hours</i> <i>1 month</i> <i>1 year</i> <i>Not Applicable</i>	Set by Buyer/Client
Service Payload Specific Attributes	List of payload specific attributes	JSON object	Set by Buyer/Client
Producing Application Identifier	The identifier of the application that produces performance indicators.	String	Set by Buyer/Client



Attribute Name	Description	Value	Comments
Consuming Application Indicator	The identifier of the application that consumes performance indicators.	String	Set by the Buyer/Client
Reporting Period	The time-period for the report.	One of the following: <i>10 milliseconds</i> <i>100 milliseconds</i> <i>1 second</i> <i>10 seconds</i> <i>1 minute</i> <i>5 minutes</i> <i>15 minutes</i> <i>30 minutes</i> <i>1 hour</i> <i>24 hours</i> <i>1 month</i> <i>1 year</i> <i>Not Applicable</i>	
Schedule Definition	The definition of schedule attributes	See Appendix E	
Buyer Job ID			
Result Format (Payload/Attachment)			
Href			
Tracking Record	A list of tracking records. Tracking records allow the tracking of modifications on the problem or Job. The tracking records should not be embedded in the problem to allow retrieving the problem without the tracking records.	See Appendix H	
State	State of PM Job.	See Table 88-PM Profile/Job States	

Table 30-Create PM Job Attributes

11.2.2 Modify PM Job Use Case

Field	Description
Use Case Number	19
Use Case Name	Modify PM Job

Field	Description
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 PM Job in the Seller/Server system.
Process Steps	<p>1. The Buyer/Client submits a modify PM Job request with unique identifier and specific attribute or set of attributes for modification.</p> <p>2. The Buyer/Client creates a Modify PM Job request that includes the PM Job Identifier and the attribute(s) to be modified.</p> <p><i>NOTE: A modification of a PM Job can be directly modifying attributes of the PM Job or modifying the PM Job Profile. The PM Profile can only be modified by the Administrator.</i></p> <p>[R55] The Buyer's/Client's Modify PM Job request MUST include the PM Job Identifier.</p> <p>[O15] A PM Job can be scheduled as reoccurring.</p> <p>[O16] The Buyer's/Client's Modify PM Job request MAY include one or more of the following attributes as defined in Table 30-Create PM Job Attributes.</p> <p>3. The Seller/Server receives the request and validates the request.</p> <p>[R56] The Seller/Server MUST support PM Job modifications.</p> <p>4. The Seller/Server determines if any PM Job can be modified.</p> <p>5. The Seller/Server returns the modified PM Job.</p>
Post-Conditions	<p>1. The Buyer/Client receives a PM Job response with attributes that have been modified.</p> <p>2. The PM Job is modified with requested attributes changes.</p> <p>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.</p>
Alternative Paths	<p>1. If errors occurred, the Seller/Server returns all identified errors in a reject response.</p> <p>2. If the modification request cannot be serviced the Seller/Server returns an error code with specific reason(s).</p>

Table 31-Modify PM Job Use Case

11.2.3 Delete PM Job Use Case

Field	Description
Use Case Number	20

Field	Description
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
Pre-Conditions	1. The Buyer/Client is authorized to delete a PM Job in the Seller/Server system.
Process Steps	<p>1. The Buyer/Client submits a delete PM Job request with PM Job unique identifier.</p> <p style="text-align: center;">[R57] The Buyer's/Client's Delete PM Job request MUST include the PM Job Identifier.</p> <p>2. The Seller/Server receives the request and validates the request.</p> <p style="text-align: center;">[R58] If the PM Job is In-Progress or Suspended, the Seller/Server MUST NOT delete the PM Job as requested by the Client.</p> <p>3. The Seller/Server determines if any PM Job exists and can be deleted.</p> <p>4. The Seller/Server deletes the PM Job.</p>
Post-Conditions	<p>1. The Buyer/Client receives a confirmation that the PM Job has been deleted.</p> <p>2. All resources on the Seller/Server side associated with the PM Job are deleted.</p> <p>3. All measurement results generated prior to deletion remain available for collection.</p>
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

Table 32-Delete PM Job Use Case

11.2.4 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	<ol style="list-style-type: none"> The Buyer/Client creates a Suspend PM Job request that includes the PM Job Identifier. <ul style="list-style-type: none"> [R59] The Buyer/Client's Suspend PM Job request MUST include the PM Job Identifier. [R60] The PM Job MUST be in the In-Progress state. <i>Note: in the case of a short running job, it may not be possible to suspend a job.</i> The Seller/Server validates the Buyer/Client's Suspend PM Job request and suspends the PM Job. <ul style="list-style-type: none"> [R61] The Seller/Server's response to the Buyer/Client's Suspend PM Job request MUST indicate if the request is Accepted or Declined. [R62] 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. [R63] If the Seller/Server declines the Buyer/Client's Suspend PM Job request, the PM Job MUST NOT be suspended. [R64] If the Seller/Server declines the Buyer/Client's Suspend PM Job request, they MUST provide a reason the request was declined.
Post-Conditions	<ol style="list-style-type: none"> The Buyer/Client receives a confirmation that the PM Job has been suspended. During a suspended state reports are not being generated. All resources on the Seller/Server side associated with the PM Job are suspended.
Alternative Paths	<ol style="list-style-type: none"> If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

Table 33-Suspend PM Job Use Case

11.2.5 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

Field	Description
Pre-Conditions	1. The Buyer/Client is authorized to resume a PM Job in the Seller/Server system.
Process Steps	<p>1. The Buyer/Client creates a Resume PM Job request that includes the PM Job Identifier.</p> <p>[R65] The Buyer/Client's Resume PM Job request MUST include the PM Job Identifier.</p> <p>[R66] The PM Job MUST be in the Suspended state.</p> <p>2. The Seller/Server validates the Buyer/Client's Resume PM Job request and resumes the PM Job.</p> <p>[R67] The Seller/Server's response to the Buyer/Client's Resume PM Job request MUST indicate if the request is Accepted or Declined.</p> <p>[R68] 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.</p> <p>[R69] If the Seller/Server declines the Buyer/Client's Resume PM Job request, the PM Job MUST NOT be resumed.</p> <p>[R70] If the Seller/Server declines the Buyer/Client's Resume PM Job request, they MUST provide a reason the request was declined.</p> <p>3. The Seller/Server determines if any PM Job exists and can be resumed.</p> <p>4. The Seller/Server resumes the PM Job.</p>
Post-Conditions	<p>1. The Buyer/Client receives a confirmation that the PM Job has been resumed.</p> <p>2. All resources on the Seller/Server side associated with the PM Job are resumed.</p>
Alternative Paths	1. If errors occurred, the Seller/Server returns all identified errors in a reject response, including error codes and specific reasons(s).

Table 34-Resume PM Job Use Case

11.2.6 Retrieve List of PM Jobs Use Case

Field	Description
Use Case Number	23
Use Case Name	Retrieve PM Job List



Field	Description
Description	A request initiated by the Buyer/Client to retrieve a PM Job List based on a filtered criterion.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to perform the query.



Process Steps	<ol style="list-style-type: none">2. The Buyer/Client submits a Retrieve List of PM Job request.3. The Buyer's/Client's Retrieve List of PM Jobs request MAY contain none or more of the following attributes as filter criteria:<ul style="list-style-type: none">• Buyer Job ID• Performance Profile ID• State• Job Type• Producing Application ID• Creation Time• Granularity• Reporting Period• Schedule Definition• Consuming Application Indicator• Job Priority <p><i>NOTE: A Service Identifier would be useful to filter on. Given the Service is payload specific, it may be necessary to have a Service Identifier as an attribute in the envelope part of the payload. Filtering criteria for payload will be service specific and can be incorporated in corresponding API using MEF Blending.</i></p> <ol style="list-style-type: none">1. The Seller/Server receives the request and validates the request.2. The Seller/Server determines if any PM Jobs match the filter criteria in the request.3. The Seller/Server returns a list of summarized PM Job instances.4. The Seller/Server's response to the Buyer's/Client's retrieve List of PM Jobs MUST include the following attributes as applicable:<ul style="list-style-type: none">• Job Identifier• Creation Time• Granularity• Reporting Period• Schedule Definition• Consuming Application Indicator• Job Priority• Description• Buyer Job ID• Job Type• Performance Profile Reference• Producing Application ID• State
---------------	---

Field	Description
	5. 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	<ol style="list-style-type: none"> 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.
Alternative Paths	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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.

Table 35-Retrieve PM Job List Use Case

11.2.7 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	<ol style="list-style-type: none"> 1. The Buyer/Client creates a Retrieve PM Job by Job Identifier request. <p>[R71] The Buyer/Client's Retrieve PM Job by Job Identifier request MUST contain the PM Job Identifier.</p> 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. <p>[R72] The Seller/Server's response MUST contain all the PM Job attributes.</p> 3. The Seller/Server determines if a PM Jobs match the filter criteria in the request. 4. The Seller/Server returns the detailed PM Job instances.

Field	Description
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.

Table 36-Retrieve PM Job Use Case

11.2.8 Subscribe to PM Job Notifications Use Case

Field	Description
Use Case Number	25
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.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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. <p style="text-align: center;">[R73] The Buyer/Client's Subscribe to PM Job Notifications request MUST include the attributes defined in Subscribe to PM Job Notifications Attributes Table.</p> <ol style="list-style-type: none"> 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.

Table 37-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: <ul style="list-style-type: none"> PM Job Created PM Job Modified PM Job Suspended PM Job Deleted PM Job Completed Results Available TCA Profile Created. TCA Profile Modified. TCA Profile Deleted. 	This is a list of attributes

Table 38-Subscribe to PM Job Notifications Attributes
11.2.9 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	<ol style="list-style-type: none"> The Buyer/Client has previously subscribed to PM Job/Collection Notifications. The Buyer/Client is authorized to unsubscribe from PM Job/Collection Notifications in the Seller/Server system. The Seller/Server support PM Job/Collection Notifications.
Process Steps	<ol style="list-style-type: none"> The Buyer/Client sends the Unsubscribe for PM Job/Collection Notifications to the Seller/Server specifying which PM Notification Types the Buyer/Client is unsubscribing from listening. The Seller/Server receives the Unsubscribe request for PM Job/Collection Notifications. The Seller/Server discontinues PM Job/Collection Notification Types to Buyer/Client specific to Unsubscribe request. The Seller/Server returns an acknowledgement to the Buyer/Client.
Post-Conditions	<ol style="list-style-type: none"> The Seller/Server discontinues sending PM Job/Collection Notification Types to Client specific to Buyer/Client Unsubscribe request.

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 completing the request.

Table 39-Unsubscribe from PM Job/Collection Notifications Use Case

11.2.10 Generation of PM Job Notifications

Field	Description
Use Case Number	27
Use Case Name	PM Job/Collection Notification
Description	A PM Job/Collection Notifications is initiated by the Seller/Server to a subscribed Buyer/Client.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server supports PM Job/Collection Notifications. 2. The Client has subscribed to PM Job/Collection Notifications.
Process Steps	<ol style="list-style-type: none"> 1. The Seller/Server sends the PM Job/Collection Notifications to the location(s) registered by the Buyer/Client. <p>[R74] The Seller/Server MUST send PM Job State Change and PM Collection Notifications to a Buyer/Client who has subscribed to notifications.</p> <p><i>NOTE: A PM Job state change and corresponding Notification is different from a Collection Report Notification.</i></p> <p>[R75] The Seller/Server MUST NOT send PM Job State Change Notifications to a Buyer/Client who has not subscribed to notifications.</p> <p>[R76] The Seller/Server MUST include the following attributes in the PM Job State Change Notification:</p> <ul style="list-style-type: none"> • Job Identifier • PM Job State • Report Identifier for Collection Notification
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server has sent related PM Job/Collection Notification.

Table 40-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 InProgress Pending Rejected	Set by the Seller/Server

		Suspended Scheduled	
--	--	------------------------	--

Table 41-PM Job States

11.2.11 List Performance Measurement Reports

Field	Description
Use Case Number	28
Use Case Name	List Performance Measurement Reports
Description	A request initiated by the Buyer/Client to the Seller/Server to list the Performance Measurement Reports based on a filtered criterion.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to retrieve a list of Performance Measurement Reports in the Seller/Server system.
Process Steps	<p>1. The Buyer/Client submits a Retrieve List of Performance Measurement Reports request including filter criteria the Seller/Server should apply.</p> <p>[O17] The Buyer's/Client's Retrieve List of Performance Measurement Reports request MAY contain none or more of the following attributes as filter criteria:</p> <ol style="list-style-type: none"> Job Identifier Creation Time Granularity Reporting Period Schedule Definition Consuming Application Indicator Job Priority <p>2. The Seller/Server receives the request and validates the request.</p> <p>3. The Seller/Server determines if any Performance Measurement Reports match the filter criteria in the request.</p> <p>[R77] The Seller/Server MUST support the retrieval of a List of Performance Measurement Reports Use Case.</p> <p>[R78] Buyer/Client MUST support the retrieval of a List of Performance Measurement Reports Use Case.</p> <p>[R79] The Seller/Server's response to the Buyer's/Client's retrieve List of Performance Measurement Reports MUST include the following attributes as applicable:</p> <ul style="list-style-type: none"> Description Report ID <p>4. If the Seller/Server validates the Administrator or Buyer's/Client's request but finds no matching Performance Measurement Reports, the Seller/Server MUST return an empty list.</p>

Field	Description
Post-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client receives a list of all Performance Measurement Reports 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 Performance Measurement Reports based on unique identifier.

Table 42-List Performance Measurement Reports Use Case

11.2.12 Collect Performance Measurement Report

Field	Description
Use Case Number	29
Use Case Name	Collect Performance Measurement Report
Description	<p>A request initiated by the Buyer/Client to the Seller/Server to collect a Performance Measurement Report.</p> <p><i>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. This involves getting a report that is not associated to any PM Job.</i></p>
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client is authorized to collect a Performance Measurement Report in the Seller/Server system.

<p>Process Steps</p>	<ol style="list-style-type: none"> 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 PM Job identifier used in the PM Job Create. <p><i>NOTE: Service identifier (attribute of payload) should be used to list all reports available for a given service ID. These reports could be described with some details (e.g., reporting period) to help client understand which reports to query. Selected report ids can then be used to query the content.</i></p> <p>[R80] The Seller MUST support at least one of the three methods of retrieving results mentioned above.</p> <p>[O18] The Seller MAY support multiple methods of retrieving results.</p> 2. Retrieve Result: <ol style="list-style-type: none"> a. The Buyer/Client submits a Retrieve Results in Service Payload request to the Seller/Server. <p>[R81] The Retrieve Results in Service Payload request MUST include the following attributes shown in Table-Retrieve Results in Service Payload Attributes:</p> <ul style="list-style-type: none"> • Report Identifier • Report Format = JSON, AVRO, CSV, XML b. The Buyer/Client submits a Retrieve Results as Attachment request to Seller/Server. <p>[R82] The Retrieve Results in Attachment request MUST include the following attributes shown in Table-Retrieve Results in Payload Attachment Attributes:</p> <ul style="list-style-type: none"> • Report Identifier • Report Format = Attachment • Attachment Type c. The Buyer/Client submits a Retrieve Results as FTP to the Seller. <p>[R83] The Retrieve Results as FTP request MUST include the following attributes shown in Table-Retrieve Results in Payload Attributes:</p> <ul style="list-style-type: none"> • Report Identifier • Report Format = JSON, AVRO, CSV, XML • File Transfer Data = reference Appendix F.
----------------------	---

Field	Description
	<ol style="list-style-type: none"> 3. The Seller/Server receives the request and validates the request. 4. The Seller/Server determines if a Performance Measurement Report matches the filter criteria in the request. 5. The Seller/Server-side results: <ol style="list-style-type: none"> a. The Seller/Server's response includes the results from the specified report as payload in the envelope. b. The Seller/Server's response includes the results from the specified reports as payload in the attachment. c. The Seller/Server's response allows the Buyer/Client to retrieve the results via FTP.
Post-Conditions	<ol style="list-style-type: none"> 1. The Client receives the Performance Measurement Report that match the Client's filtered selection criteria. <p><i>NOTE: In some cases of late events, the same collection queried twice may return different results.</i></p> <ol style="list-style-type: none"> 2. If errors occurred, the Seller/Server returns all identified errors in a reject response.
Alternative Paths	<ol style="list-style-type: none"> 1. The Client receives the call location where the file collection for the Performance Measurement Report.

675

Table 43-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
Service Identifier		String	
Results which are technology/service specific.			

676

Table 44-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 (URI)	Set by the Buyer/Client
Output Format	The type of file attached to the API Envelope	Content-Type: application/<Encoding> Encoding = <ul style="list-style-type: none"> • XML • AVRO 	Set by the Buyer/Client

		<ul style="list-style-type: none"> • <i>CSV</i> • <i>JSON</i> 	
FTP Address	The address or URI for the file to be FTP'd from	URL	Set by the Buyer/Client

Table 45-Retrieve Results Attributes

[R84] The results regardless of the format **MUST** contain the PM Metric results as specified with PM Job request.

12 Passive Statistics Use Cases and Business Process Definitions

The following section details the set of use cases needed to support the collection and reporting of network and service performance (i.e., bandwidth utilization) and error 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.

The statistics measured in this section are outside the realm of measuring and reacting to performance objectives. Performance objectives are associated with a Service Level Specification (SLS). In some cases, these are statistics that do not need to be configured, but are enabled and ready for collection on an interface, VLAN, etc.

The representation of a unique identifier can be associated with a service, or entity. An entity could be a port, interface, VLAN, etc.

12.1 High-Level Use Cases

These Use Cases are based on business process standards of interactivity between Buyer/Client and Seller/Server for the purpose of requesting statistics on a variety of objects. The statistics collection may not require a Job to be instantiated prior to the collection. It may be the case that a Job while not necessary to initiate the statistics collection is create for purposes of tracking the collection. The statistics defined in this set of use cases are different Passive statistics which may or may not have a Job association.

12.2 Passive Statistics Collection Use Cases

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

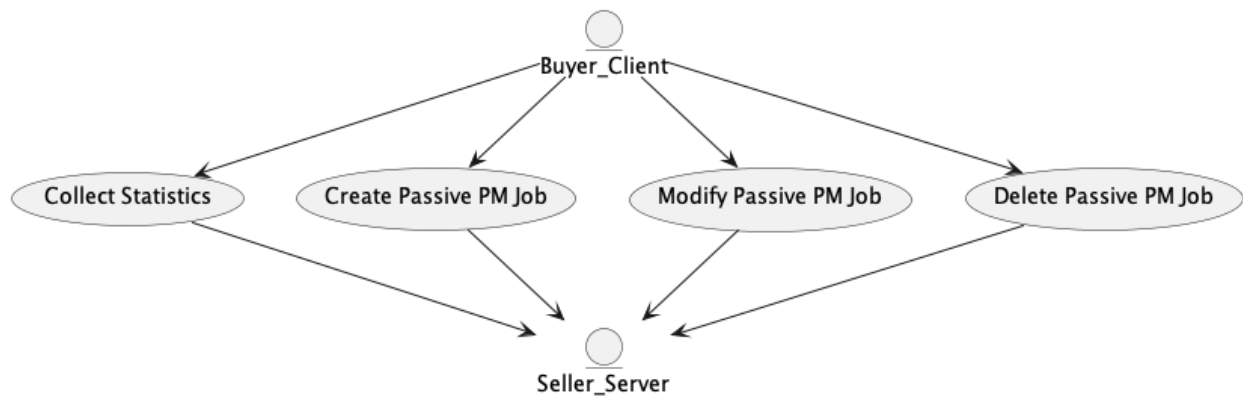


Figure 8-Passive Statistics Job and Collection Use Cases

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

12.2.1 Create Passive PM Job Use Case

Field	Description
Use Case Number	30
Use Case Name	Create Passive PM Job
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.

Field	Description
Process Steps	<ol style="list-style-type: none"> 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 (Service Specific Attributes) and Schedule Definition. <p>[R85] The Buyer's/Client's Create Statistics Collection Job MUST support the following attributes:</p> <ul style="list-style-type: none"> • Granularity • Buyer Profile ID • State • Creation Date • Job Type • Reporting Period • Job Priority • Service Specific Attributes • Schedule Definition • Consumer Application Indicator <p>[O19] The Buyer's/Client's Statistics Collection Job MAY contain the following attributes:</p> <ul style="list-style-type: none"> • Description • TCA Profile ID 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. <p>[R86] The Seller/Server MUST assign a Job Identifier to the Statistics Collection Job that is unique within the network.</p> <p>[R87] The Statistics Collection Job Identifier supplied by the Seller/Server MUST be unique within the Seller/Server's network.</p> <p>[R88] The Statistics Collection Job MUST use the attributes included in the Buyer's/Client's Create Statistics Collection Job request.</p>

Field	Description
Post-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client receives a Response, including a Statistics Collection Job Identifier. 2. The Seller/Server initiates a Statistics (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. <p>[R89] If the Buyer/Client registered for PM Notifications, the Seller/Server MUST notify the Buyer/Client when Statistics Collection Job results are available.</p>
Alternative Paths	<ol style="list-style-type: none"> 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.

Table 46-Create Passive PM Job Use Case

12.2.2 Modify Passive PM Job Use Case

Field	Description
Use Case Number	31
Use Case Name	Modify Passive PM Job
Description	A request initiated by the Buyer/Client to the Seller/Server to modify a Statistics Collection Job.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client is authorized to modify a Statistics Collection PM Job in the Seller/Server system.

Field	Description
Process Steps	<ol style="list-style-type: none"> The Buyer/Client creates a Modify Statistics Collection Job request that includes the Statistics Collection Job Identifier and the attribute(s) to be modified. <ul style="list-style-type: none"> [R90] The Buyer's/Client's Modify Statistics Collection Job request MUST include the Statistics Collection Job Identifier. [O20] The Buyer's/Client's Modify Statistics Collection Job request MAY include one or more of the following attributes: <ul style="list-style-type: none"> Granularity Reporting Period Service Specific Attributes Schedule Definition Description Consuming Application Indicator Job Priority The Seller/Server receives the request and validates the request. <ul style="list-style-type: none"> [R91] The Seller/Server MUST support Statistics Collection Job modifications. The Seller/Server determines if any Statistics Collection Job can be modified. The Seller/Server returns the modified Statistics Collection Job.
Post-Conditions	<ol style="list-style-type: none"> The Buyer/Client receives a Statistics Collection Job response with attributes that have been modified. The Statistics Collection Job is modified with requested attributes changes. 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	<ol style="list-style-type: none"> If the modification request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

Table 47-Modify Passive PM Job Use Case

12.2.3 Delete Passive PM Job Use Case

Field	Description
Use Case Number	32
Use Case Name	Delete Passive PM 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	<p>1. The Buyer/Client submits a delete Statistics Collection Job request with Statistics Collection Job unique identifier.</p> <p>[R92] The Buyer's/Client's Delete Statistics Collection Job request MUST include the Statistics Collection Job Identifier.</p> <p>2. The Seller/Server receives the request and validates the request.</p> <p>[R93] If the Delete Statistics Collection Job is In-Progress or Suspended, the Seller/Server MUST NOT delete the PM Job as requested by the Client.</p> <p>3. The Seller/Server determines if any Statistics Collection Job exists and can be deleted.</p> <p>4. The Seller/Server deletes the Statistics Collection Job.</p>
Post-Conditions	<p>1. The Buyer/Client receives a confirmation that the Statistics Collection Job has been deleted.</p> <p>2. All resources on the Seller/Server side associated with the Statistics Collection Job are deleted.</p>
Alternative Paths	1. If the deletion request cannot be serviced, the Seller/Server returns an error code with specific reason(s).

Table 48-Delete Passive PM Job Use Case
12.2.4 List Passive Statistics Reports

Field	Description
Use Case Number	28
Use Case Name	List Passive Statistics Reports
Description	A request initiated by the Buyer/Client to the Seller/Server to list the Passive Statistics Reports based on a filtered criterion.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Buyer/Client is authorized to retrieve a list of Performance Measurement Reports in the Seller/Server system.

Field	Description
Process Steps	<ol style="list-style-type: none"> 2. The Buyer/Client submits a Retrieve List of Performance Measurement Reports request including filter criteria the Seller/Server should apply. 3. The Seller/Server receives the request and validates the request. 4. The Seller/Server determines if any Performance Measurement Reports match the filter criteria in the request. <p>[R94] The Seller/Server MUST support the retrieval of a List of Performance Measurement Reports Use Case.</p> <p>[R95] Buyer/Client MUST support the retrieval of a List of Performance Measurement Reports Use Case.</p> <p>[R96] The Seller/Server's response to the Buyer's/Client's retrieve List of Performance Measurement Reports MUST include the following attributes as applicable:</p> <ul style="list-style-type: none"> • Description • Report ID <ol style="list-style-type: none"> 5. If the Seller/Server validates the Administrator or Buyer's/Client's request but finds no matching Performance Measurement Reports, the Seller/Server MUST return an empty list.
Post-Conditions	<ol style="list-style-type: none"> 1. The Buyer/Client receives a list of all Performance Measurement Reports 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 Performance Measurement Reports based on unique identifier.

Table 49-List Performance Measurement Reports Use Case

12.2.5 Collect Passive Statistics Report

Field	Description
Use Case Number	33
Use Case Name	Collect Passive Statistics 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	<ol style="list-style-type: none"> 1. The Buyer/Client is authorized to collect a Statistics Collection Report in the Seller/Server system.

<p>Process Steps</p>	<ol style="list-style-type: none"> 1. The Buyer/Client submits a Retrieve Statistics Collection 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 Report identifier used in the request to identify the Report to collect the report. <ul style="list-style-type: none"> [R97] The Seller MUST support at least one of the three methods of retrieving results mentioned above. [O21] 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. <ul style="list-style-type: none"> [R98] The Retrieve Results in Payload request MUST include the following attributes shown in Table-Retrieve Results in Payload Attributes: <ul style="list-style-type: none"> • Report Identifier (List) • Report Format = JSON 3. The Buyer/Client submits a Retrieve Results as Attachment request to Seller/Server. <ul style="list-style-type: none"> [R99] The Retrieve Results in Attachment request MUST include the following attributes shown in Table-Retrieve Results in Payload Attributes: <ul style="list-style-type: none"> • Report Identifier • Report Format = Attachment • Attachment Type 4. The Buyer/Client submits a Retrieve Results as FTP to the Seller. <ul style="list-style-type: none"> [R100] The Retrieve Results in FTP request MUST include the following attributes shown in Table-Retrieve Results in Payload Attributes: <ul style="list-style-type: none"> • Report Identifier • Report Format = JSON, AVRO, CSV, XML • File Transfer Data = reference Appendix F. 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
	<p>a. The Seller/Server-side results:\The Seller/Server's response includes the results from the specified reports as payload in the envelope.</p> <p>[R101] The Seller/Server MUST provide the specified result in the API payload.</p> <p>7. The Seller/Server's response includes the results from the specified reports as an Attachment.</p> <p>[R102] The Seller/Server MUST provide the specified results as an attachment.</p> <p>8. The Seller/Server's response allows the Buyer/Client to retrieve the results via FTP.</p> <p>[R103] The Seller/Server MUST provide the specified results as an FTP'd file in JSON, AVRO, CSV, XML format.</p>
Post-Conditions	<ol style="list-style-type: none"> 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.

Table 50-Collect Statistics Report Use Case

723

13 Threshold Crossing Alerts

Threshold Crossing Alerts are a mechanism for configuring alerts to be generated when a specific performance metric that is being measured is not met. The use of TCAs requires a coordination with a Proactive, On-Demand and/or Passive PM configurations. A Proactive and/or On-Demand PM Job is associated with a specific service. Therefore, a TCA Profile should be used as an identifier for PM Job invocations.

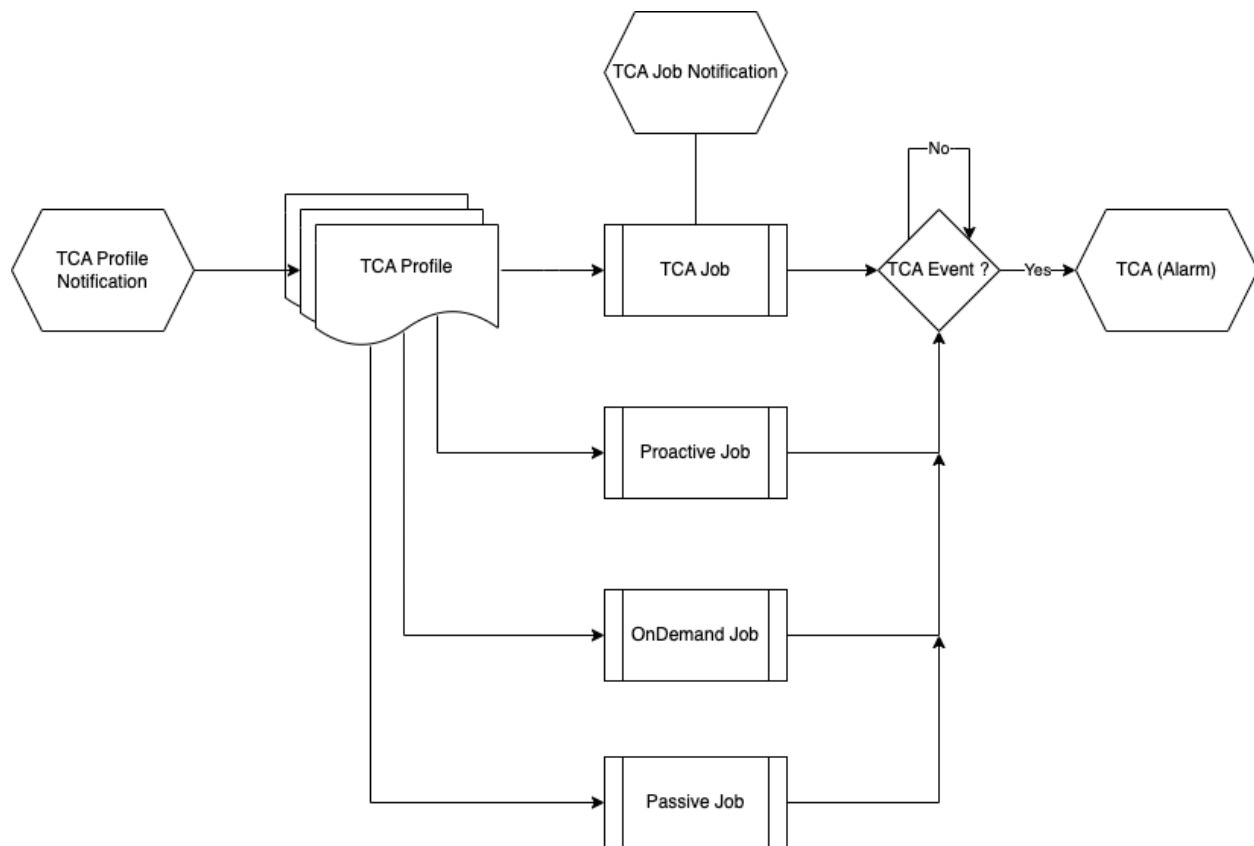


Figure 9-Threshold Crossing Alert Process Diagram

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

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

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

TCAs can be used as a warning notification of possible service degradation, thus allowing more timely action to further investigate or address the problem. For example, if the maximum One-way Frame/Package Delay threshold was set to 10 milliseconds, and a One-way Frame/Package Delay value was measured at more than 10 milliseconds, a TCA would be generated.

There are two types of TCA reporting: stateless and stateful. 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. The definitions of TCA attributes and operation are detailed in [4] and [7].

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 (*i.e., clear threshold*). This contrasts with Stateless TCA reporting, in which TCAs are generated continuously for as long as the degradation lasts.

In the case of Stateless TCA reporting a Damping Factor is used to suppress new TCAs. The Damping Factor Value defines consecutive PM Metric Calculation 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 PM Metric Calculation Intervals.

These Use Cases are based on business process standards of interactivity between Client (Subscriber) and Seller/Server (Publisher) of TCA management.

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

- Create TCA Profile
- Modify TCA Profile
- Delete TCA Profile
- Retrieve TCA Profile List
- Retrieve TCA Profile
- Subscribe to TCAs
- Unsubscribe to TCAs
- TCA Event

13.1 Threshold Crossing Alert Profile Management Use Cases

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

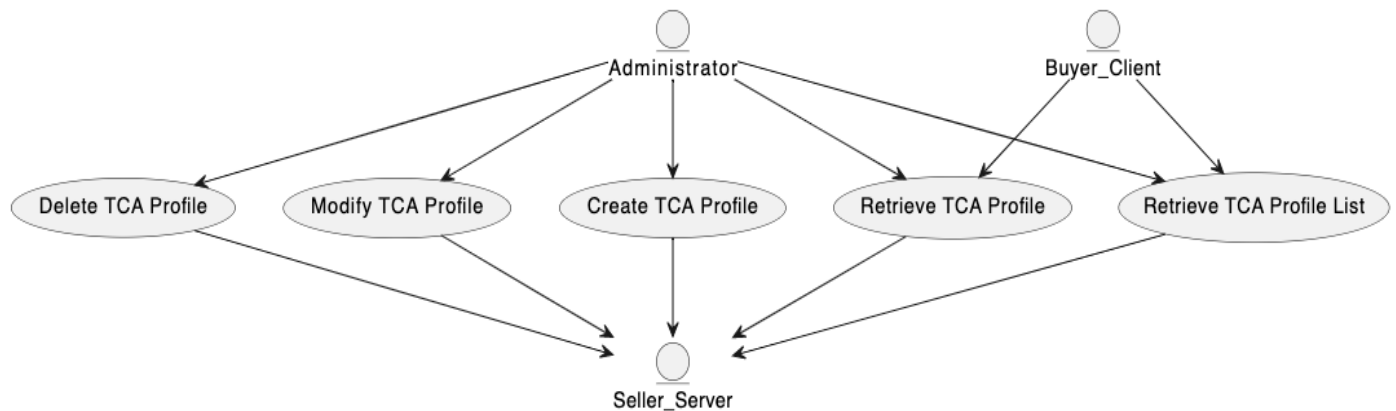


Figure 10-TCA Profile Use Cases

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

13.1.1 Create TCA Profile

Field	Description
Use Case Number	34
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.

<p>Process Steps</p>	<ol style="list-style-type: none"> 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. <ol style="list-style-type: none"> a. TCA Stateful has the following attributes: <ol style="list-style-type: none"> i. TCA Performance Threshold Value (in payload). ii. TCA Window Threshold iii. TCA Window Size b. TCA Stateless has the following attributes: <ol style="list-style-type: none"> i. TCA Performance Threshold Value (in payload). ii. PM Metric Calculation Interval iii. PM Metric Value iv. Damping Factor (optional) <p>[R104] For a Stateful TCA, the Buyer/Client MUST include the following attributes in their request:</p> <ul style="list-style-type: none"> • TCA Reporting Type = Stateful • TCA Performance Threshold Value • Stateful Window Threshold • Stateful Window Size <p>[R105] For a Stateless TCA, the Buyer/Client MUST include the following attributes in their request:</p> <ul style="list-style-type: none"> • TCA Reporting Type = Stateless • TCA Performance Threshold Value <p>[R106] For a Stateless TCA with the Damping Factor, the Buyer/Client MUST include the following attributes in their request:</p> <ul style="list-style-type: none"> • 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. <p>[R107] The Seller/Server's response MUST echo all Buyer/Client provided attributes and include the TCA Profile Identifier.</p> <p>[R108] The TCA Profile Identifier supplied by the Seller/Server MUST be unique within the Seller/Server's network.</p>
----------------------	---

Field	Description
Post-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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. <p><i>Mandatory attributes for the TCA Profile include time interval with start and stop times, measurement intervals, measurements, and performance objectives.</i></p>

785

Table 51-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: <i>Stateful</i> <i>Stateless</i>	Set by Buyer/Client
TCA Performance Threshold Value	The PM Metric Value (i.e., Frame Loss Ratio Threshold) 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

786

Table 52-TCA Attributes

787 **13.1.2 Modify TCA Profile**

Field	Description
Use Case Number	35
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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Client sends a Modify TCA Profile request that includes the attributes to be modified. <p style="margin-left: 40px;"> [R109] If the TCA Reporting Type is Stateful, the Client's Modify TCA Profile MUST include one or more of the following attributes: <ul style="list-style-type: none"> • TCA Performance Threshold Value • Stateful Window Threshold • Stateful Window Size </p> <p style="margin-left: 40px;"> [R110] If the TCA Reporting Type is Stateless, the Client's Modify TCA Profile MUST include one or more of the following attributes: <ul style="list-style-type: none"> • TCA Performance Threshold Value • Stateless Damping Factor </p> 2. The Seller/Server responds with an indication if they accept or decline the modification request. <p style="margin-left: 40px;"> [R111] The Seller/Server's response MUST indicate if the Modify TCA Profile is Accepted or Declined. </p>
Post-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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.

788 **Table 53-Modify TCA Profile Use Case**

789 **13.1.3 Delete TCA Profile**

Field	Description
Use Case Number	36
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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Buyer/Client sends a Delete TCA Profile request that includes the TCA Profile Identifier. <div style="margin-left: 40px;">[R112] The Buyer/Client's Delete TCA Profile MUST include the TCA Profile Identifier.</div> 2. The Seller/Server responds with an indication if they accept or decline the delete request. <div style="margin-left: 40px;">[R113] The Seller/Server's response MUST indicate if the Delete TCA Profile is Accepted or Declined.</div> 3. If the Seller/Server encounters errors, they should return an error with explanation to the Buyer/Client.
Post-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Seller/Server will return an error message if an error is encountered during processing.

Table 54-Delete TCA Profile Use Case

13.1.4 Retrieve List of TCA Profiles

Field	Description
Use Case Number	37
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	<ol style="list-style-type: none"> 1. The Client is authorized to retrieve Threshold Crossing Alert Profiles in the Seller/Server system.

Field	Description
Process Steps	<ol style="list-style-type: none"> The Buyer/Client sends a Retrieve List of TCA Profiles request that includes filter criteria. <ul style="list-style-type: none"> [R114] The Buyer/Client's Retrieve List of TCA Profiles MUST include none or more of the following attributes: <ul style="list-style-type: none"> TCA Performance Threshold Value Stateful Window Threshold Stateful Window Size TCA Performance Threshold Value Stateless Damping Factor The Seller/Server's response includes a list of TCA Profile Identifiers that match the filter criteria sent by the Buyer/Client. <ul style="list-style-type: none"> [R115] The Seller/Server's response MUST include a list of TCA Profiles that match the filter criteria. [R116] The list returned by the Seller/Server MUST contain the TCA Profile Identifier for each matching TCA Profile. [R117] 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. If the Seller/Server encounters errors, they should return an error with explanation to the Buyer/Client.
Post-Conditions	<ol style="list-style-type: none"> The Client receives a Response, including a set of TCA Profiles based on the TCA Profile IDs.
Alternative Paths	<ol style="list-style-type: none"> The Seller/Server will return an error message if an error is encountered during processing.

Table 55-Retrieve TCA Profile List Use Case

13.1.5 Retrieve TCA Profile by Identifier

Field	Description
Use Case Number	38
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	<ol style="list-style-type: none"> The Client is authorized to retrieve Threshold Crossing Alert Profiles in the Seller/Server system.

Field	Description
Process Steps	<ol style="list-style-type: none"> The Buyer/Client sends a Retrieve TCA Profile by Identifier request that includes the TCA Profile Identifier. <p>[R118] The Buyer/Client's Retrieve TCA Profile by Identifier MUST include the TCA Profile Identifier.</p> The Seller/Server's response includes the details for a TCA Profile that matches the TCA Profile Identifier specified by the Buyer/Client. <p>[R119] 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:</p> <ul style="list-style-type: none"> TCA Reporting Type = Stateful TCA Performance Threshold Value Stateful Window Threshold Stateful Window Size <p>[R120] 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:</p> <ul style="list-style-type: none"> TCA Reporting Type = Stateless TCA Performance Threshold Value <p>[R121] 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:</p> <ul style="list-style-type: none"> TCA Reporting Type = Stateless TCA Performance Threshold Value Stateless Damping Factor If the Seller/Server encounters errors, they should return an error with explanation to the Buyer/Client.
Post-Conditions	<ol style="list-style-type: none"> The Client receives a Response, including a unique TCA Profile.
Alternative Paths	<ol style="list-style-type: none"> The Seller/Server will return an error message if an error is encountered during processing. The Seller/Server returns an error message if any mandatory attributes are missing.

Table 56-Retrieve TCA Profile Use Case

13.1.6 Subscribe to TCA Profile Notifications

Field	Description
Use Case Number	39

Field	Description
Use Case Name	Subscribe TCA Profile Notifications
Description	<p>A request is initiated by the Client to the Seller/Server to subscriber to TCA Profile Notifications.</p> <p><i>NOTE: Notifications that should be supported include but are not limited to:</i></p> <ul style="list-style-type: none"> • TCA Profile Created • TCA Profile Modified • TCA Profile Deleted
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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. <p>[R122] The Buyer/Client's Subscribe to TCA Notification MUST include the attributes in Register for TCA Notification.</p> 2. The Seller/Server response indicates if the subscription was successful. <p>[R123] The Seller/Server's response MUST indicate if the subscription was successful.</p> 3. The Seller/Server records which TCA Profile Notifications to send, where to send such notifications for this Client.
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server is aware of where to send TCA Profile Notifications.
Alternative Paths	<ol style="list-style-type: none"> 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.

796

Table 57-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. There	String	This is the Callback target in the API

	can be multiple locations for one Buyer/Client.		
List of Notification Types	The types of notifications that the Buyer/Client wishes to receive.	List of one or more of: TCA	This is a list of attributes

Table 58-Register for TCA Notification Attributes

13.1.7 Unsubscribe to TCA Profile Notifications

Field	Description
Use Case Number	40
Use Case Name	Unsubscribe TCA Profile Notifications
Description	A request initiated by the Client to unsubscribe from TCA Profile Notifications.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 1. The Client has previously subscribed to TCA Profile Notifications. 2. The Client is authorized to subscribe to TCA Profile Notifications in the Seller/Server system. 3. The Seller/Server supports TCA Profile Notifications.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer/Client sends a Subscribe to TCA Notification request to the Seller/Server. <p style="text-align: center;">[R124] To unsubscribe from TCA Notifications, the Buyer/Client's MUST send an Unsubscribe message.</p> <ol style="list-style-type: none"> 2. The Seller/Server response indicates if the unsubscribe was successful. <p style="text-align: center;">[R125] The Seller/Server's response MUST indicate if the unsubscribe was successful.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server discontinues send TCA Profile Notification Types to Client specific to Client Unsubscribe request.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server will return an error message if an error is encountered during processing.

Table 59-Unsubscribe TCA Profile Notifications Use Case

13.1.8 Stateful TCA Notification (Alarm)

Field	Description
Use Case Number	41
Use Case Name	Stateful TCA Notification (Alarm)
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	<ol style="list-style-type: none"> 1. The Seller/Server supports Stateful TCA Notifications. 2. The Client has subscribed to Stateful TCA Notifications.
Process Steps	<ol style="list-style-type: none"> 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. <p>[R126] When sending a notification for a TCA Reporting Type of Stateful, the Seller/Server notification MUST include the attributes in Stateful TCA Notifications table.</p> <p>[R127] 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.</p> <p>[R128] 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.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server has sent related Stateful TCA Notification.

Table 60-Stateful TCA Notification (Alarm) 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. 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	Numeric values 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.

Table 61-Stateful TCA Notification (Alarm) Attributes
13.1.9 Stateless TCA Notification (Alarm)

Field	Description
Use Case Number	42
Use Case Name	Stateless TCA Notification (Alarm)
Description	A Stateless TCA lifecycle Notification is initiated by the Seller/Server to a subscribed Client.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server supports Stateless TCA Notifications. 2. The Client has subscribed to Stateless TCA Notifications.

Field	Description
Process Steps	<p>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.</p> <p>[R129] 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.</p> <p>[R130] 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.</p>
Post-Conditions	1. The Seller/Server has sent related Stateless TCA Notification.

Table 62-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.

Table 63-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 \geq the TCA Performance Threshold Value

807

Table 64-Damping Factor TCA Notification attributes

14 Streaming Use Cases

Buyer/Clients may desire to receive streaming telemetry. 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 telemetry using similar mechanisms as they use for Notifications. Because the streaming telemetry is 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 telemetry 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 telemetry 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 telemetry is sent by the Seller/Server to the Buyer/Client for the Topic as Messages.

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 figures below. The architecture has three main components – Event Producer, Broker, and Event Consumer.

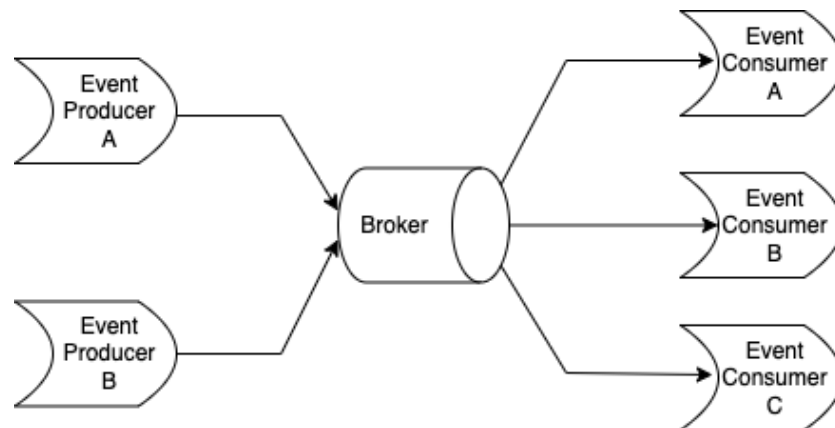


Figure 11-Event Driven Architecture

A similar architecture between LSO Domains occurs with a Broker-to-Broker communication path is illustrated below.

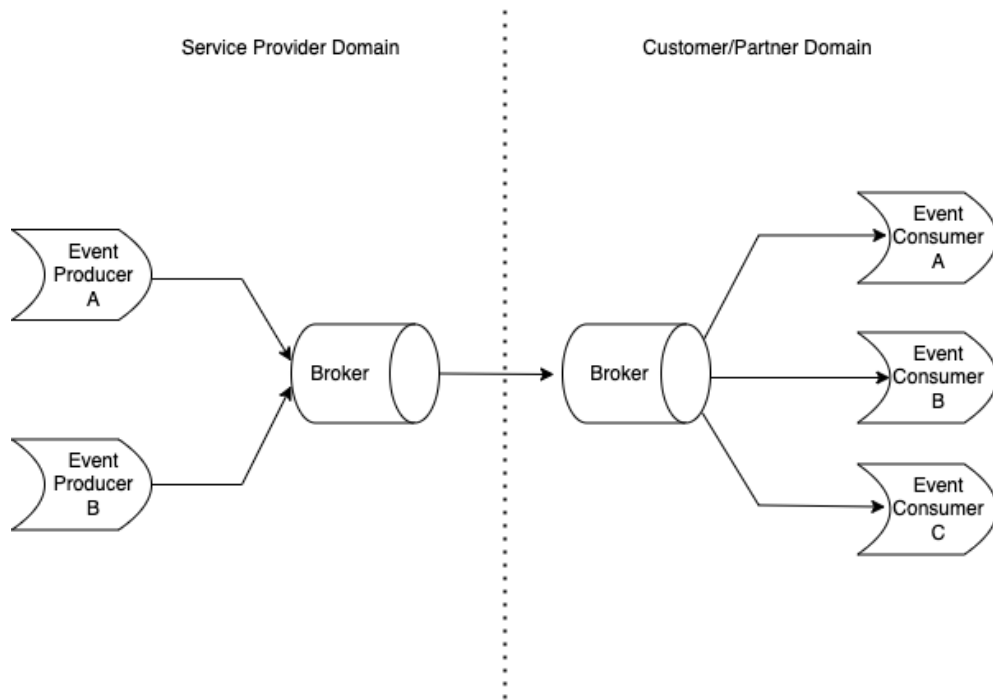


Figure 12-Broker-to-Broker Event Driven Architecture

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.

14.1 Streaming (Topics) Use Cases

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

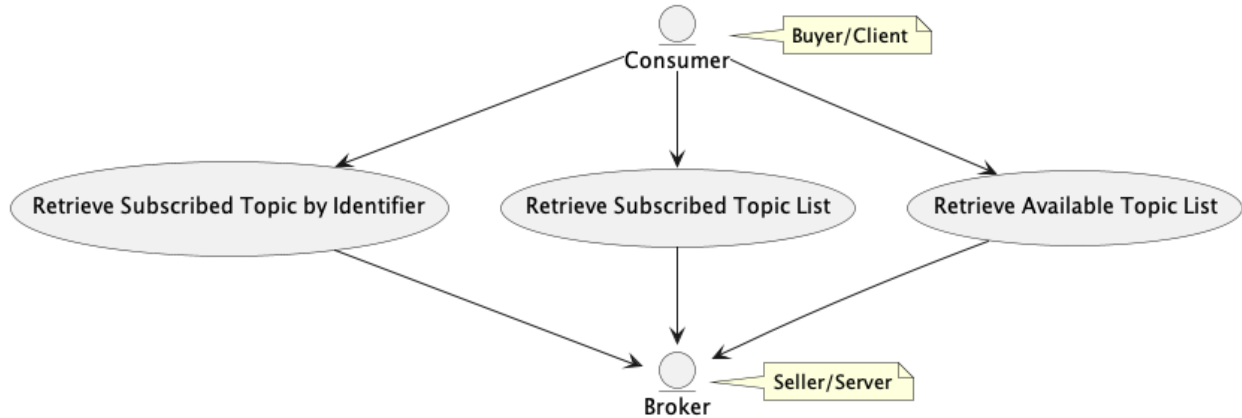


Figure 13-Streaming (Topics) Use Cases

14.2 Subscribe/Publish Streaming Use Cases

The following sub-section defines use cases for the subscribe and publish streaming use cases. The Consumer can subscriber and unsubscribe to/from a Topic. The Consumer can retrieve potentially missed Topics due to a loss of communication based on an unfiltered or filtered query. The Publisher can publish Topics.

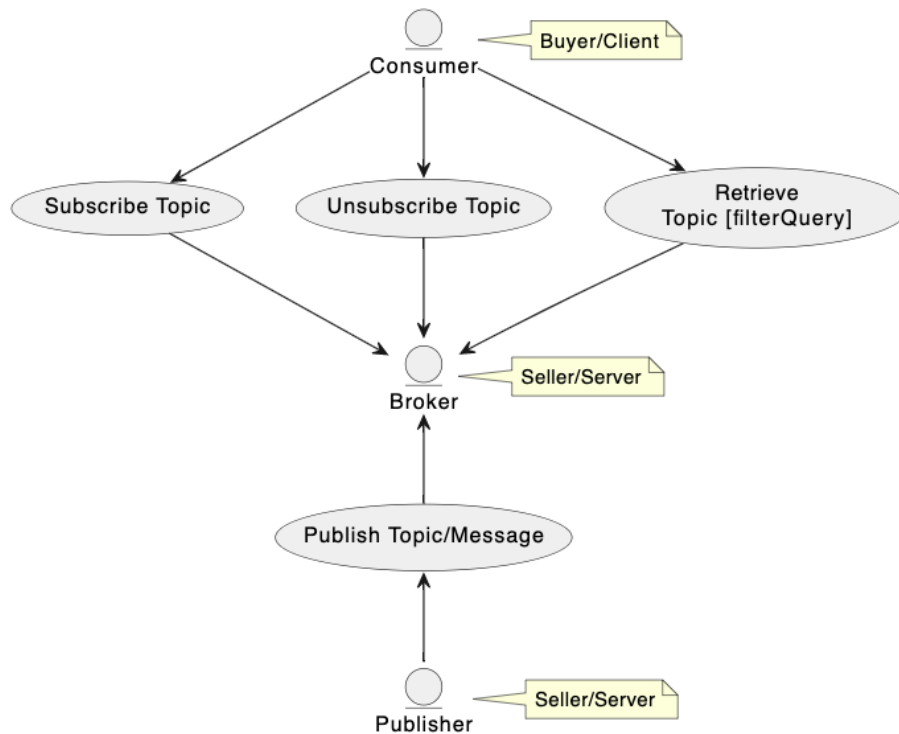


Figure 14-Subscriber/Publish Streaming Use Cases

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

861

14.2.1 Retrieve Topic by Identifier Use Case

Field	Description
Use Case Number	43
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	<ol style="list-style-type: none"> The Buyer/Client submits a Retrieve Topic by Topic Identifier request that includes the Topic Identifier. <p>[R131] The Buyer/Client's Retrieve Topic by Topic Identifier MUST contain the Topic Identifier.</p> <p>[R132] The Topic Identifier supplied by the Seller/Server MUST be unique within the Seller/Server's network.</p> <ol style="list-style-type: none"> 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 Topic that match the Topic Identifier specified in the request.
Alternative Paths	<ol style="list-style-type: none"> If errors are encountered, the Seller/Server returns all identified errors in a reject response. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either: <ol style="list-style-type: none"> An empty list and message that indicates the result set is too large and submit a new more specific query A response that indicates the result is too large and includes a subset of the matching Topics. 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.

862

Table 65-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
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 onboarding. The enumeration may include additional items as agreed to by the Buyer/Client and Seller/Server.

Field Name	Field Value	Field Format	Field Description
Service Specific Attributes	Defined per the Service Specification		Set by the Seller/Server Describes the Topic Attributes that are returned for the Topic.

Table 66-Topic Attributes

14.2.2 Retrieve Available Topic List Use Case

Field	Description
Use Case Number	44
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 list of available Topics that the Seller/Server supports.
Process Steps	<p>1. The Buyer/Client submits a Retrieve Available Topic List request with that contain any filter criteria.</p> <p style="padding-left: 40px;">[O22] The Buyer's/Client's Retrieve Available Topic List request MAY contain filter criteria of the Topic Category.</p> <p>2. The Seller/Server validates the Buyer's/Client's request and responds with a list of Topics that the Buyer/Client are available and that match the filter criteria.</p> <p style="padding-left: 40px;">[R133] If there are no Topics that match the filter criteria, the Seller/Server MUST return an empty list.</p>
Post-Conditions	1. The Buyer/Client receives a Response with the list of or Available Topics.
Alternative Paths	<p>1. If errors are encountered, the Seller/Server returns all identified errors in a reject response.</p> <p>2. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either:</p> <ul style="list-style-type: none"> 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. <p>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.</p>

Table 67-Retrieve Available Topic List Use Case

14.2.3 Retrieve Subscribed Topic List Use Case

Field	Description
Use Case Number	45

Field	Description
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	<p>1. The Buyer/Client submits a Get Subscriber Topic List request with that contain any filter criteria.</p> <p>[O23] The Client's Retrieve Subscribed Topic List request MAY contain filter criteria of the Topic Category.</p> <p>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.</p> <p>[R134] The Seller/Server's response MUST include a list of Topics that the Client has subscribed to and match the filter criteria.</p> <p>[R135] If there are no Topic Identifiers that match the filter criteria, the Seller/Server MUST return an empty list.</p>
Post-Conditions	1. The Buyer/Client receives a Response with the list of Subscriber Topics currently subscribed to as in Table 70.
Alternative Paths	<p>1. If errors are encountered, the Seller/Server returns all identified errors in a reject response.</p> <p>2. If the quantity of records exceeds a Seller/Server's policy, the Seller/Server must choose to respond with either:</p> <ul style="list-style-type: none"> 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. <p>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.</p>

Table 68-Get Subscribed Topic List Use Case

14.2.4 Subscribe to Topic Use Case

Field	Description
Use Case Number	46
Use Case Name	Subscribe to Topic
Description	A request is initiated by the Buyer/Client (Subscriber) to subscribe to a Topic.
Actors	Buyer/Client, Seller/Server

Field	Description
Pre-Conditions	1. The Client is authorized to request an Available Topic List in the Seller/Server system.
Process Steps	<p>1. The Buyer/Client requests a subscribe to a specific Topic.</p> <p>[R136] The Buyer/Client's Subscribe to Topic request MUST include the attributes (with exception of those set by Seller/Server) shown in Subscribe Topic Attributes Table 70.</p> <p>[R137] The Seller/Server validates the Buyer/Client's request and responds with an indication of whether the request was accepted or declined.</p> <p>2. If accepted the response includes the Stream Identifier as shown in Subscribe Topic Attributes table.</p> <p>[R138] The Seller/Server's response to the Buyer/Client's Subscribe to Topic request MUST indicate if the request was accepted or declined.</p> <p>[R139] If declined, the Seller/Server MUST include the reason the request was declined.</p> <p>[R140] If accepted, the Seller/Server MUST include the Stream Identifier in their response and start streaming the PM reports to the Buyer/Client.</p>
Post-Conditions	1. The Buyer/Client receives subscription confirmation that includes all necessary details that will allow for consumption of message from the topic.
Alternative Paths	1. If errors are encountered, the Seller/Server returns all identified errors in a reject response.

869

Table 69-Subscribe to Topic Use Case

Field Name	Field Value	Field Format	Field Description
Topic Identifier		String	Set by the Seller/Server. The Seller/Server assigned Topic Identifier
Stream Identifier		String	Set by Seller/Server. Unique identifier for each stream.
Description		String	An explanatory of the stream.

Field Name	Field Value	Field Format	Field Description
Title		String	The title of the stream.
Priority		String	Priority of stream.
ipAddress		String	IP Address for callback.
Port		String	Port for callback.
Protocol		String	Protocol for callback.

Table 70-Subscribed or Available to Topic Attributes

14.2.5 Unsubscribe from Topic Use Case

Field	Description
Use Case Number	47
Use Case Name	Unsubscribe from a Topic
Description	A request is initiated by the Buyer/Client (Subscriber) to unsubscribe from a Topic.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	1. The Client is authorized to unsubscribe from a Topic in the Seller/Server system.
Process Steps	<p>1. The Client submits an Unsubscribe to Topic request that includes the Subscription Name.</p> <p style="padding-left: 40px;">[R141] The Client's Unsubscribe to Topic request MUST contain the Subscription Name that is to be unsubscribed.</p> <p>2. The Seller/Server Validates the Client's request and responds with an indication whether the request was accepted or declined.</p> <p style="padding-left: 40px;">[R142] The Seller/Server's response to the Client's Unsubscribe to Topic request MUST indicate if the request was accepted or declined.</p> <p style="padding-left: 40px;">[R143] If declined, the Seller/Server MUST include the reason the request was declined.</p> <p style="padding-left: 40px;">[R144] If accepted, the Seller/Server MUST stop streaming the PM reports to the Client.</p>
Post-Conditions	<p>1. The Client receives a Response indicating a Topic has been unsubscribed from.</p> <p>2. The Client will no longer receive any Messages from the specified Topic.</p>
Alternative Paths	<p>1. The Seller/Server will return an error message if an error is encountered during processing.</p> <p>2. The Seller/Server returns an error message if any mandatory attributes are missing.</p>

Table 71-Unsubscribe from a Topic Use Case

873

14.2.6 Publish Topic Message Use Case

Field	Description
Use Case Number	48
Use Case Name	Publish Topic Message
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 subscribe to Topics in the Seller/Server system.
Process Steps	<p>[R145] The Seller/Server MUST publish Topic Messages to Buyer/Clients who have subscribed to the Topic.</p> <p>[R146] The Topic Message MUST contain the attributes shown in Publish Topic Attributes table.</p> <p>[R147] The Seller/Server MUST NOT publish Topic Messages to Buyer/Clients who have not subscribed to the Topic.</p> <p>[R148] The Seller/Server MAY stop publishing Topic Messages to a Buyer/Client if no acknowledgement is received from the Buyer/Client.</p> <p>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.</p> <p>[R149] The Buyer/Client receives the Topic Message.</p>
Post-Conditions	1. The Client receives a Topic/Message with all attributes.

874

Table 72-Publish Topic Use Case

Attribute Name	Description	Value	Comments
Stream Identifier	The Seller/Server assigned unique identifier.	String	Set by the 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

Attribute Name	Description	Value	Comments
Priority	A priority.	String	Set by Seller/Server
Message	Actual event		

Table 73-Publish Topic Message Attributes

14.2.7 Retrieve Topic Message Use Case

Field	Description
Use Case Number	49
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	<p>1. The Buyer/Client submits a Retrieve Topic Message request that includes the Stream Identifier and a range of Event Dates.</p> <p style="padding-left: 40px;">[O24] The Buyer/Client's Retrieve Topic Message MAY include the Stream Identifier and a range of Event Dates.</p> <p style="padding-left: 40px;">[O25] The Buyer/Client's Retrieve Topic Message MAY include other attributes from Table 73.</p> <p>2. The Seller/Server returns a list of Topic Messages that match the filter criteria provided by the Buyer/Client.</p> <p style="padding-left: 40px;">[R150] The Seller/Server's response MUST include a list of Topic Messages including all attributes that are shown in Table 73 that match the filter criteria.</p> <p>3. If the Seller/Server finds no Topic Messages that match the filter criteria, they MUST return an empty list.</p>
Post-Conditions	1. The Client receives a Message with all attributes.

Table 74-Retrieve Messages from a Topic Use Case

15 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.

15.1 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.

15.2 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.

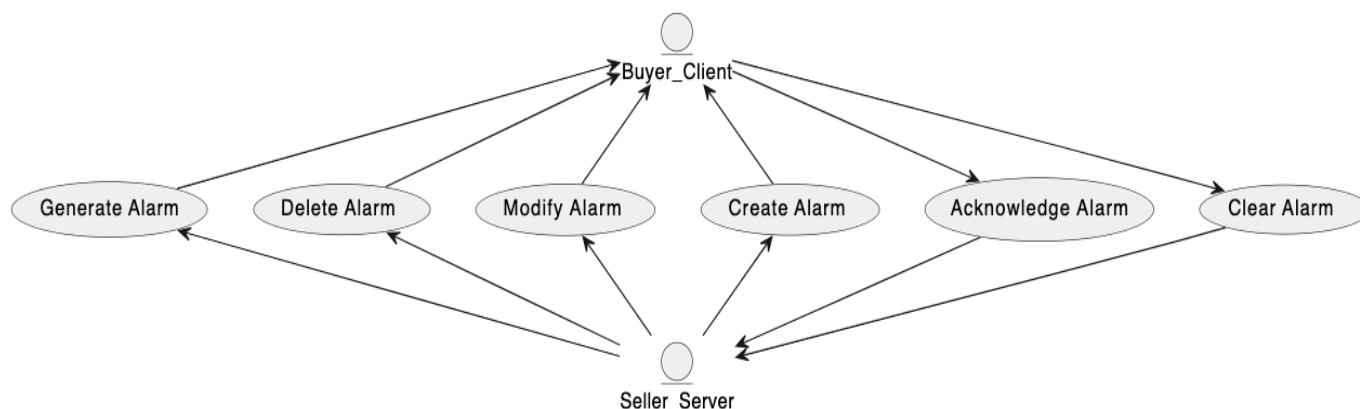


Figure 15-Alarm Management Use Cases

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

15.2.1 Create Alarm

Field	Description
Use Case Number	50
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	

Table 75-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 STATELESS or STATEFUL-SET) or INFO (for STATEFUL-CLEAR).	String	

Table 76-Alarm Attributes

15.2.2 Modify Alarm

Field	Description
Use Case Number	51
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 Seller/Server is supporting the ability to modify alarms.
Process Steps	1. The Seller/Server modifies alarm. [R151] The Seller/Server MUST support the Modify Alarm Use Case. [R152] The Client MUST support the Modify Alarm Use Case.
Post-Conditions	1. The Client(s) Alarm identified by unique identifier is modified.
Alternative Paths	

Table 77-Modify Alarm Use Case

15.2.3 Delete Alarm

Field	Description
Use Case Number	52
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 Seller/Server is supporting the ability to delete alarms and resources from system.

Field	Description
Process Steps	<ol style="list-style-type: none"> The Seller/Server deletes alarm and associated resources. <p>[R153] The Seller/Server MUST support the Delete Alarm Use Case.</p> <p>[R154] The Client MUST support the Delete Alarm Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> The Server(s) request alarm is deleted.
Alternative Paths	<ol style="list-style-type: none"> The Seller/Server will return an error message if an error is encountered during processing.

Table 78-Delete Alarm Use Case

15.2.4 Generate Alarm

Field	Description
Use Case Number	53
Use Case Name	Generate Alarm
Description	The Seller/Server generates an Alarm.
Actors	Buyer/Client, Seller/Server
Pre-Conditions	<ol style="list-style-type: none"> The Seller/Server is supporting the persistent capabilities of alarms.
Process Steps	<ol style="list-style-type: none"> The Seller/Server determines the unique identifier of the Alarm they intend to generate. The Seller/Server communicates a generate request of an Alarm using a unique identifier and alarm attributes defined in Table 76-Alarm Attributes.
Post-Conditions	<ol style="list-style-type: none"> The Buyer/Client(s) receive the Alarm.
Alternative Paths	<ol style="list-style-type: none"> The Seller/Server will return an error message if an error is encountered during processing.

Table 79-Generate Alarm Use Case

15.2.5 Acknowledge Alarm

Field	Description
Use Case Number	54
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	<ol style="list-style-type: none"> The Client is authorized to acknowledge alarms from the Seller/Server system. The Seller/Server is supporting the persistent capabilities of alarms.

Field	Description
Process Steps	<ol style="list-style-type: none"> 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. <p>[R155] The Seller/Server MUST support the Acknowledge Alarm Use Case.</p> <p>[R156] The Client MUST support the Acknowledge Alarm Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server acknowledges the Alarm.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server will return an error message if an error is encountered during processing.

Table 80-Acknowledge Alarm Use Case

15.2.6 Clear Alarm

Field	Description
Use Case Number	55
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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. The Client determines the unique identifier of the Alarm they intend to clear. 2. The Client communicates a clear request of an Alarm using a unique identifier. <p>[R157] The Seller/Server MUST support the Clear Alarm Use Case.</p> <p>[R158] The Client MUST support the Clear Alarm Use Case.</p>
Post-Conditions	<ol style="list-style-type: none"> 1. The Seller/Server clears the Alarm.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller/Server will return an error message if an error is encountered during processing.

Table 81-Clear Alarm Use Case

16 Process Flows

This section of the document defines the process flows and states within the Fault Management Job and Performance Monitoring Job process flows.

16.1 Fault Management Job

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

16.1.1 Fault Management Job Process Flow

The Fault Management Job Process Flow is shown in Figure 16.

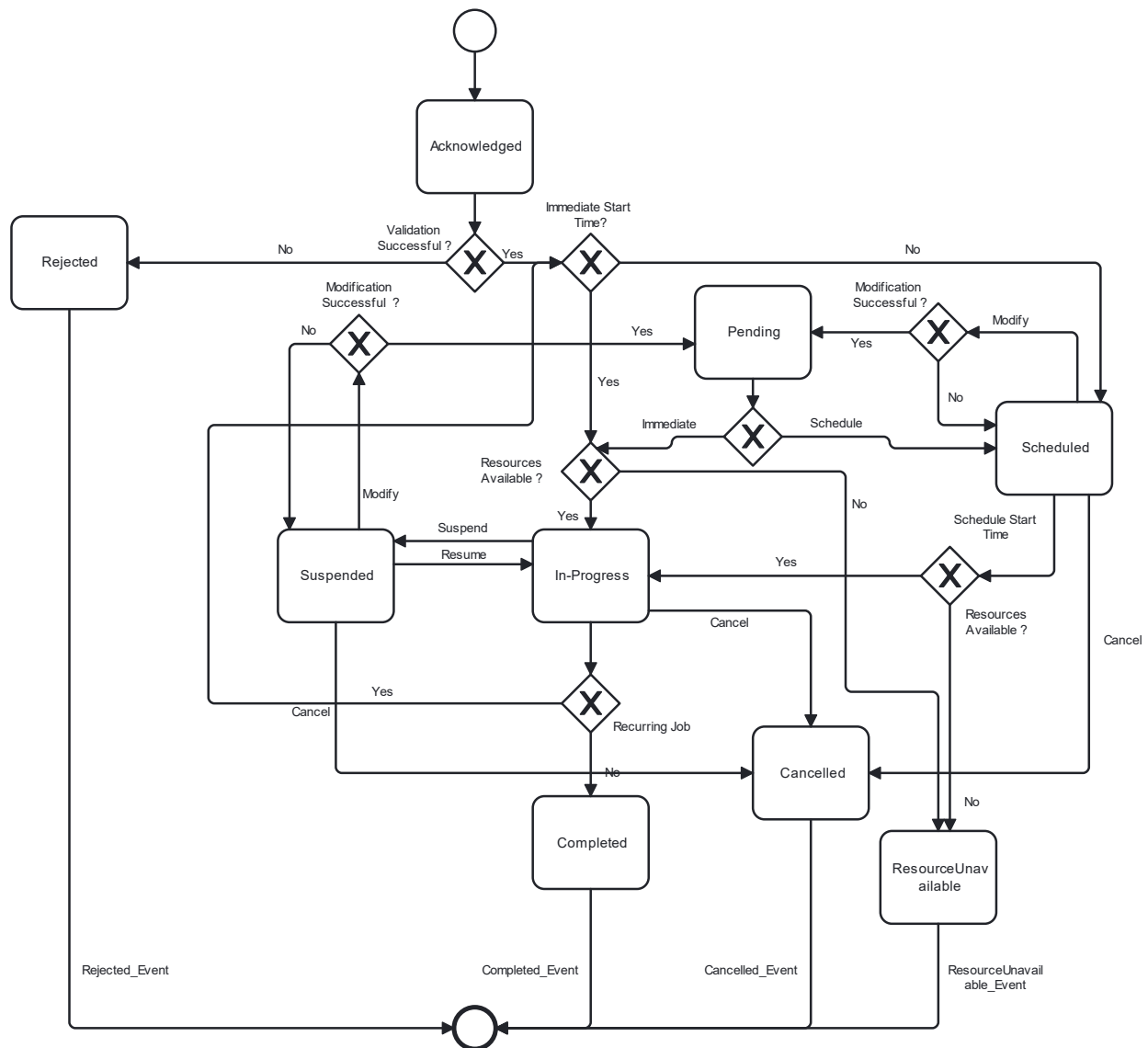


Figure 16-Fault Management Job Process Flow

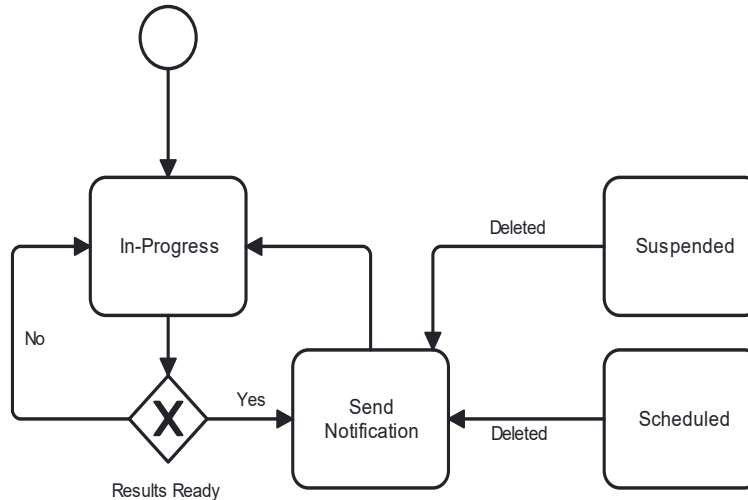


Figure 17-Fault Management Job Notification Actions

Figure 17-Fault Management Job Notification Actions shows the actions that are possible in the In-Progress state. The Fault Management Job is Running when measurements and calculations are being performed. While the Fault Management Job is Running Notifications can be generated.

16.1.2 Fault Management (FM) Job States

The Fault Management Job states are defined in Table 82.

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, Scheduled or Suspended 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 recurring, the FM Job circles back to determine

	if it has an immediate start time or a scheduled start time. If a Suspend FM Job request is accepted, the Job moves to the Suspended state. If a Modify FM Job request is accepted, 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 or Scheduled state if modified.
Resources Unavailable	A state representing that FM Job resources are currently unavailable.
Rejected	A create FM Job fails validation and is rejected with error indications by the Seller/Server.
Scheduled	A FM Job is created that does not have an immediate 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 Suspended state until a Resume FM Job request is accepted by the Seller/Server at which time the Job returns to the In-Progress state.

Table 82-Fault Management Job States

16.1.3 Modify Fault Management Job Process Flow

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

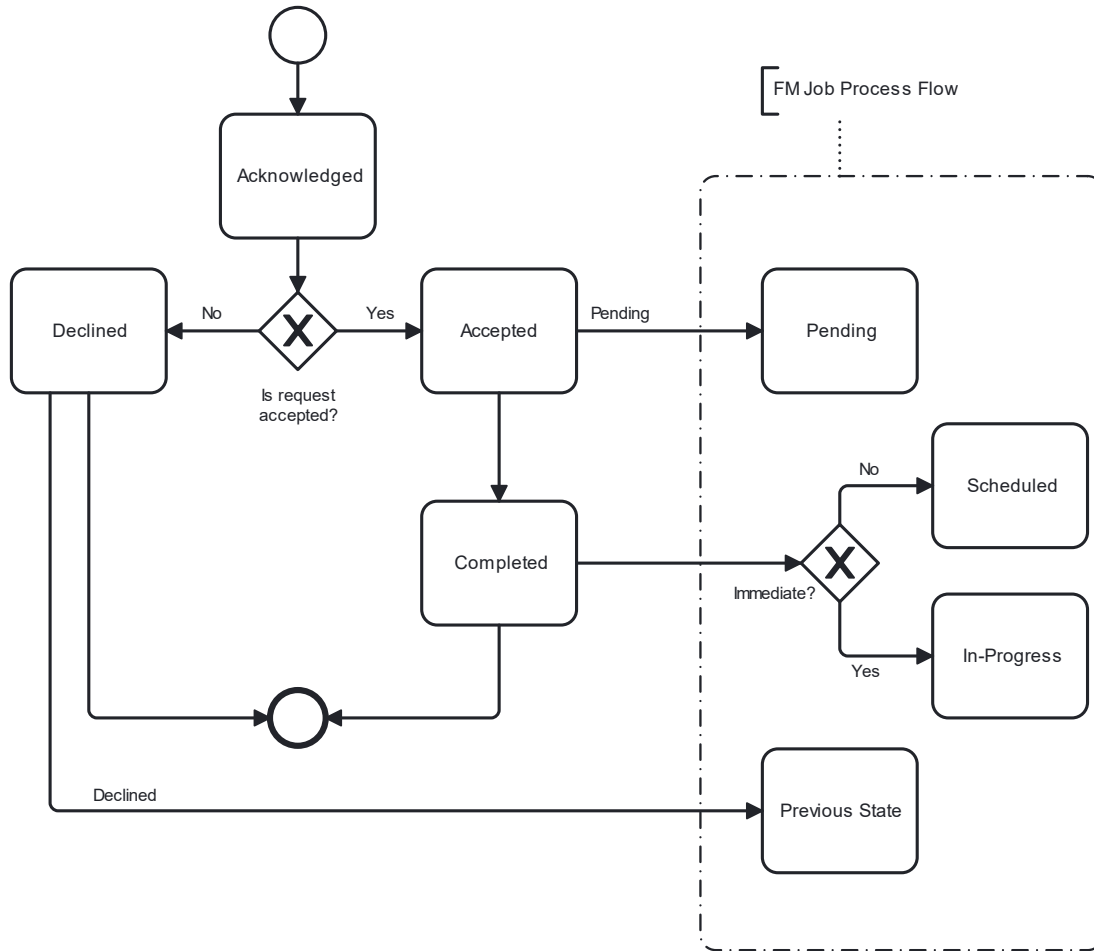


Figure 18-Modify Fault Management Job Process Flow

16.1.4 Modify Fault Management Job States

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

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.
Completed	
Declined	The Modify FM Job has failed validation and been declined by the Seller/Server.
In-progress	

Pending	
Scheduled	

Table 83-Modify Fault Management Job States

16.1.5 Delete Fault Management Job Process Flow

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

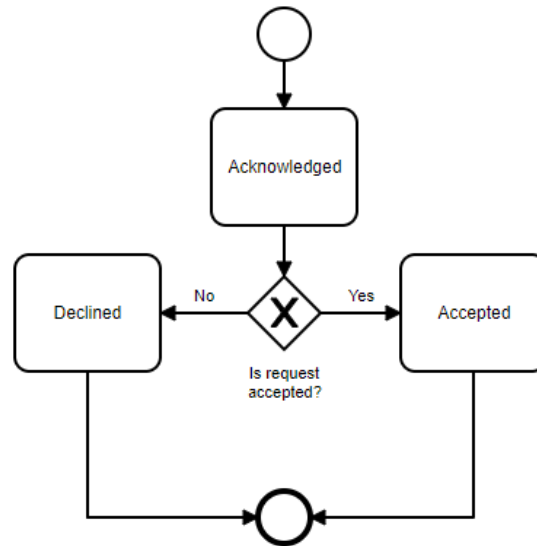


Figure 19-Delete Fault Management Job Process Flow

16.1.6 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 validated and accepted by the Seller/Server.
Acknowledged	A Delete 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 Delete FM Job has failed validation and been declined by the Seller/Server.

Table 84-Delete Fault Management Job States

16.1.7 Suspend Fault Management Job Process Flow

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

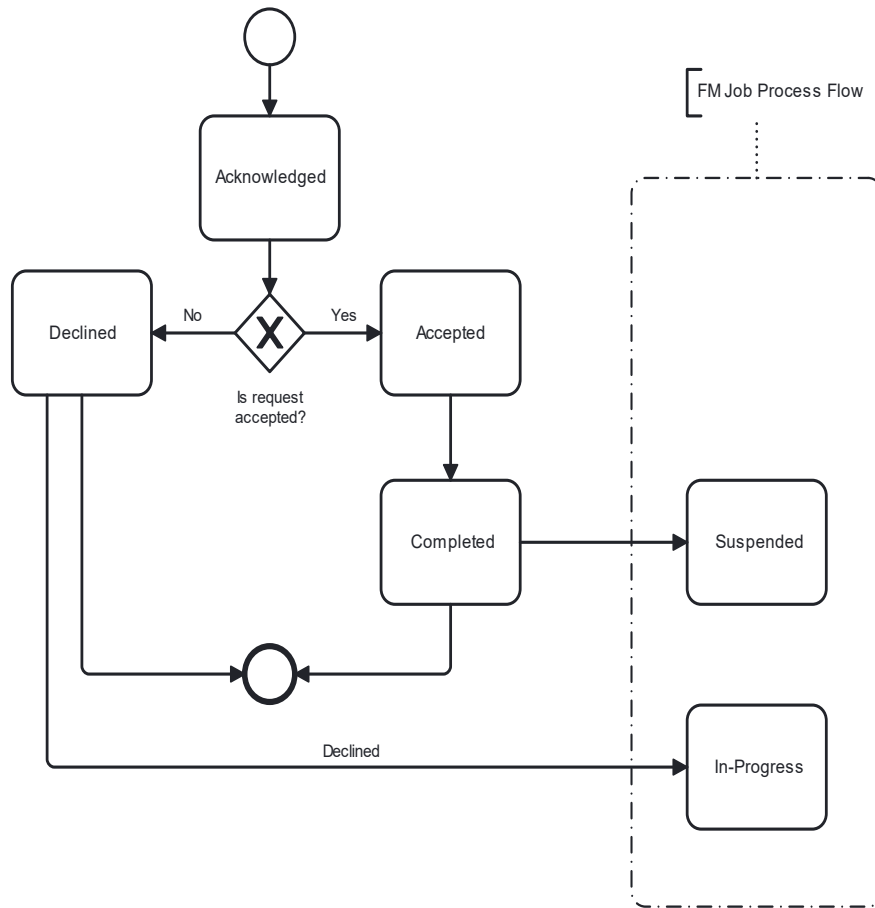


Figure 20-Suspend Fault Management Job Process Flow

16.1.8 Suspend Fault Management (FM) Job States

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

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.
Completed	

Declined	The Suspend FM Job has failed validation and been declined by the Seller/Server.
In-progress	
Suspended	

Table 85-Suspend Fault Management Job States

16.1.9 Resume Fault Management Job Process Flow

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

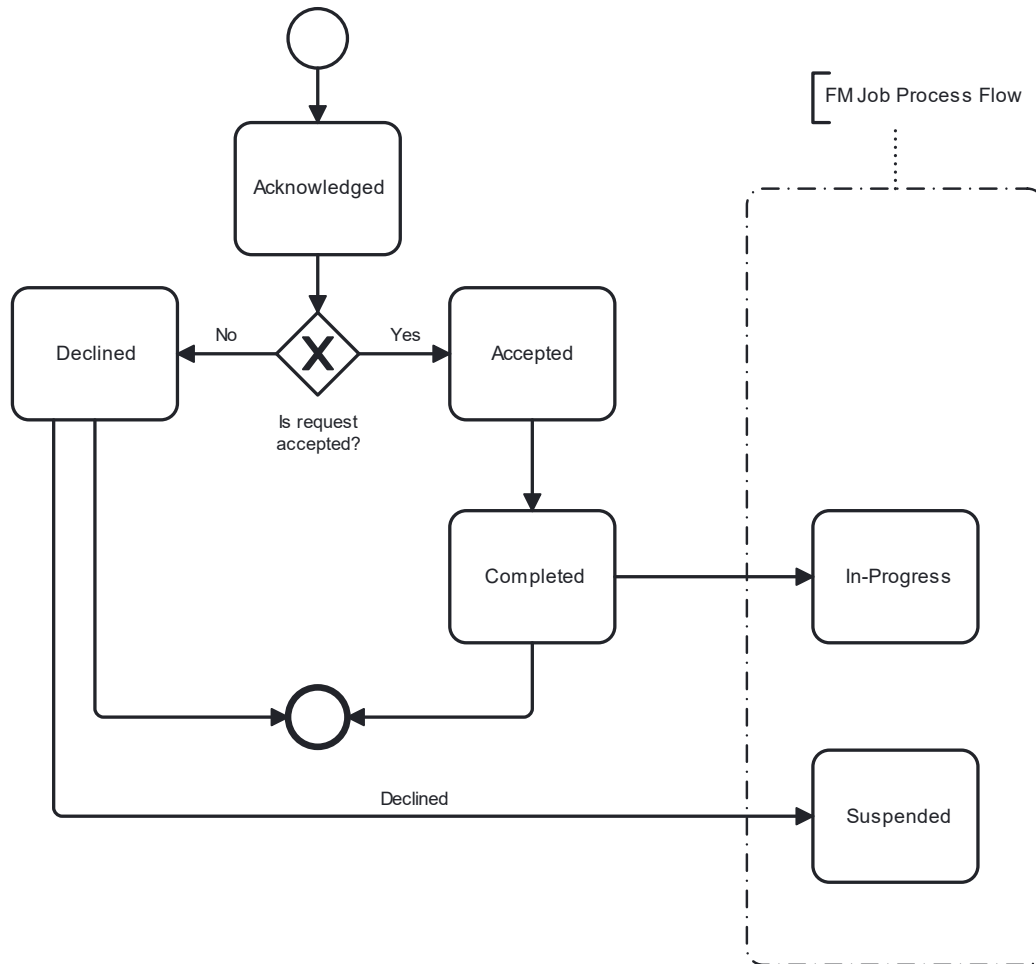


Figure 21-Resume Fault Management Job Process Flow

16.1.10 Resume Fault Management (FM) Job States

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

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.
In-progress	
Suspended	

Table 86-Resume FM Job States

16.2 Performance Monitoring Job

The Performance Monitoring Job Process Flow and states are shown in this section. The general flow for the PM Process is show in Figure 22-PM Overall Process Flow.

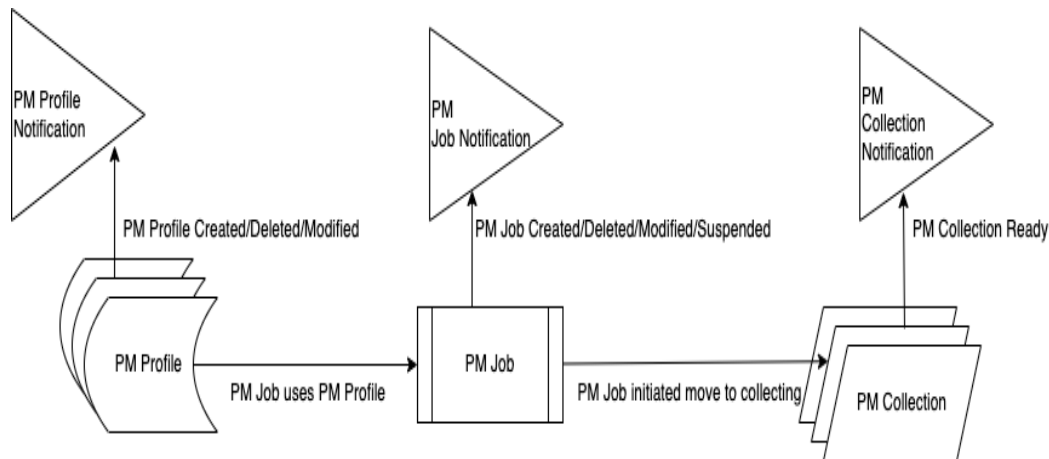


Figure 22-PM Overall Process Flow

16.2.1 PM Job Process Flow

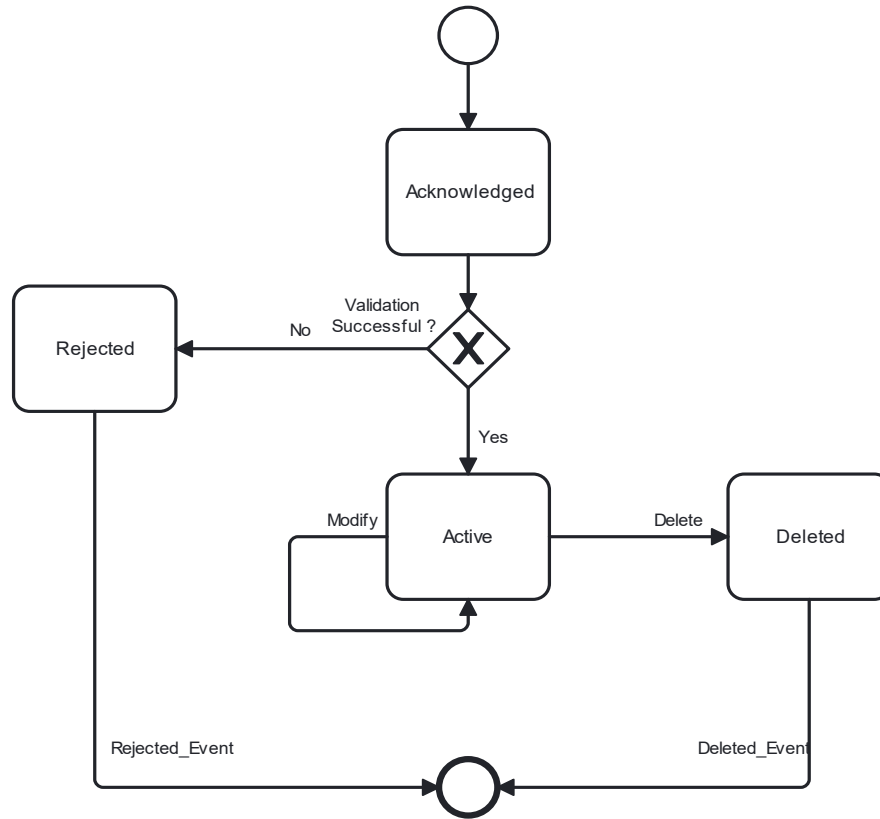


Figure 23-PM Profile Process Flow

The PM Profile states are defined in this section.

State	Description
Active	
Acknowledged	
Deleted	
Rejected	

Table 87-PM Profile States

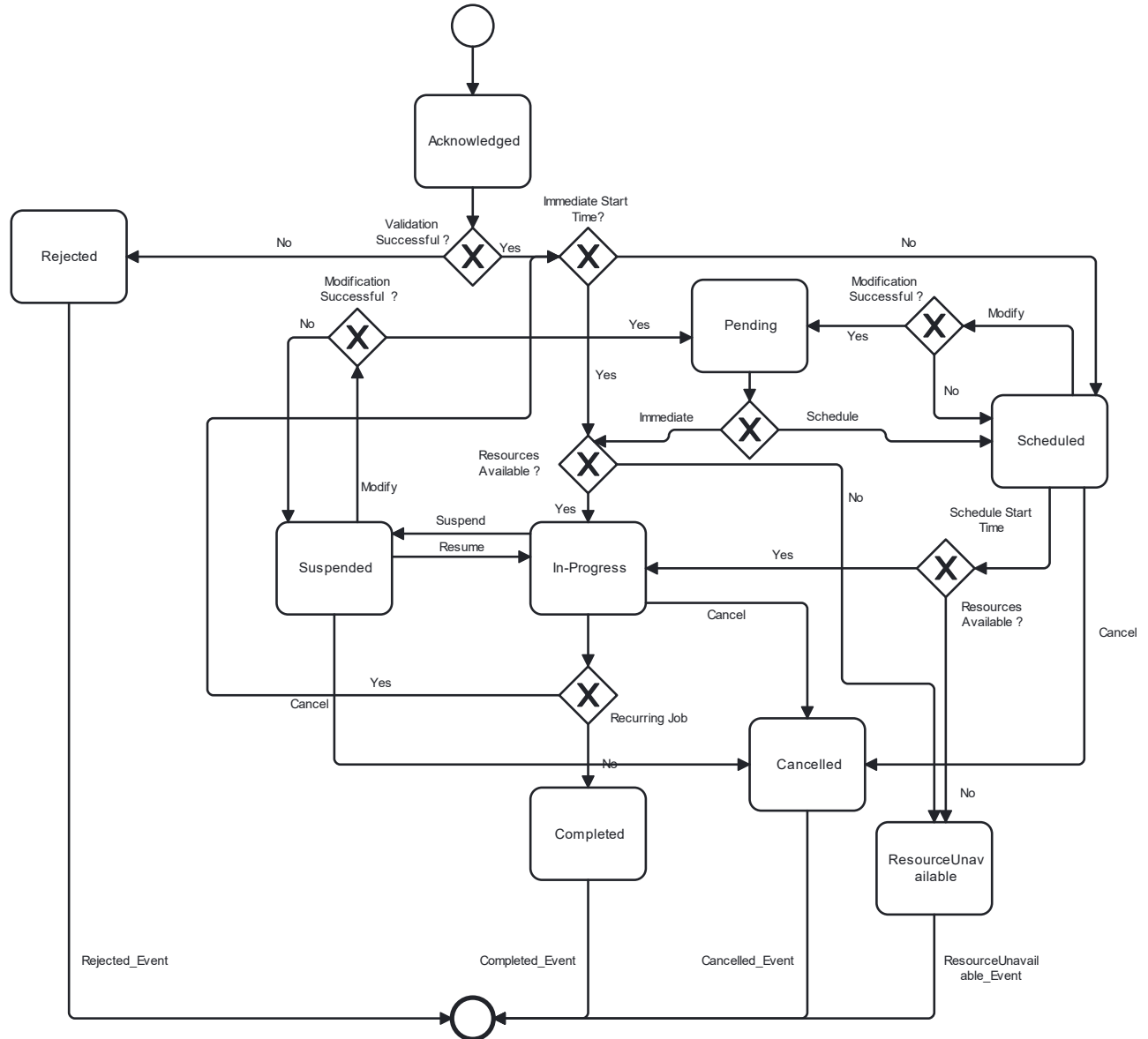


Figure 24-PM Job Process Flow

[O26] In case job is running e.g., once a day for a short period of time, it may be difficult to change its state. If action arrives when PM job is running, it is recommended to run until the end and only afterwards action should be applied.

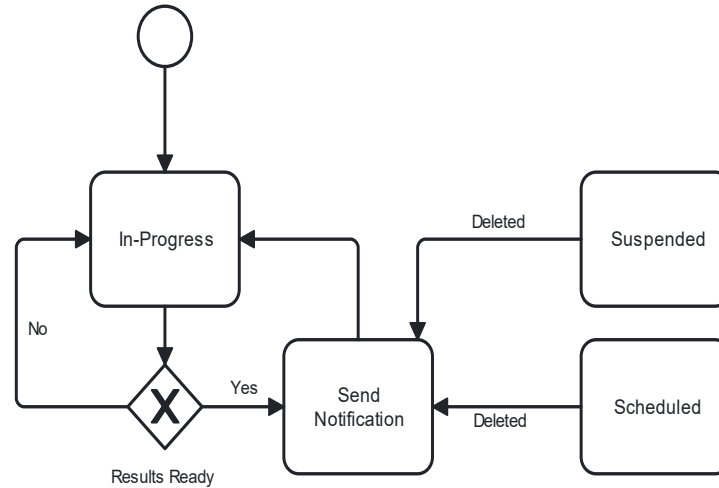


Figure 25-PM Job Notifications

Figure 25-PM Job Notifications shows the actions that are possible in the In-Progress state. The PM Job is Running when measurements and calculations are being performed. While the PM Job is Running Notifications can be generated.

16.2.2 PM Job States

The PM Job states are defined in Table 82.

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, Scheduled or Suspended 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 re- curring, the PM Job circles back to determine if it has an immediate start time or a sched- uled 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 De- lete 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.
Resources Unavailable	
Rejected	A create PM Job fails validation and is re- jected with error indications by the Seller/Server.
Scheduled	A PM Job is created that does not have an im- mediate 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 Sus- pended state until a Resume PM Job request is accepted by the Seller/Server at which time the Job returns to the In-Progress state.

Table 88-PM Profile/Job States

16.2.3 Modify PM Job Process Flow

The Modify PM Job process flow is described in this section.

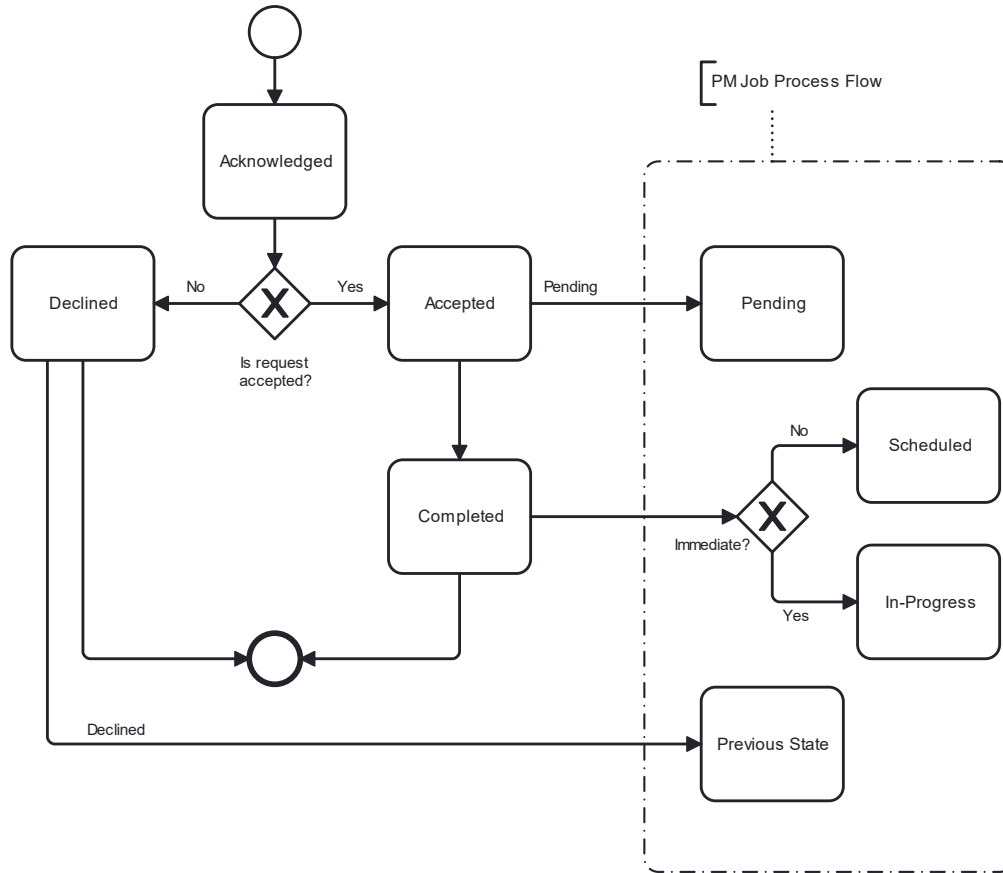


Figure 26-Modify PM Job Process Flow

16.2.4 Modify PM Job States

The Modify PM Job states are defined in this section.

State	Description
Accepted	The Modify PM Job request has been validated and accepted by the Seller/Server.
Acknowledged	A Modify 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 Modify PM Job has failed validation and been declined by the Seller/Server.

Table 89-Modify PM Job States

16.2.5 Cancel PM Job Process Flow

The Cancel PM Job process flow is described in this section.

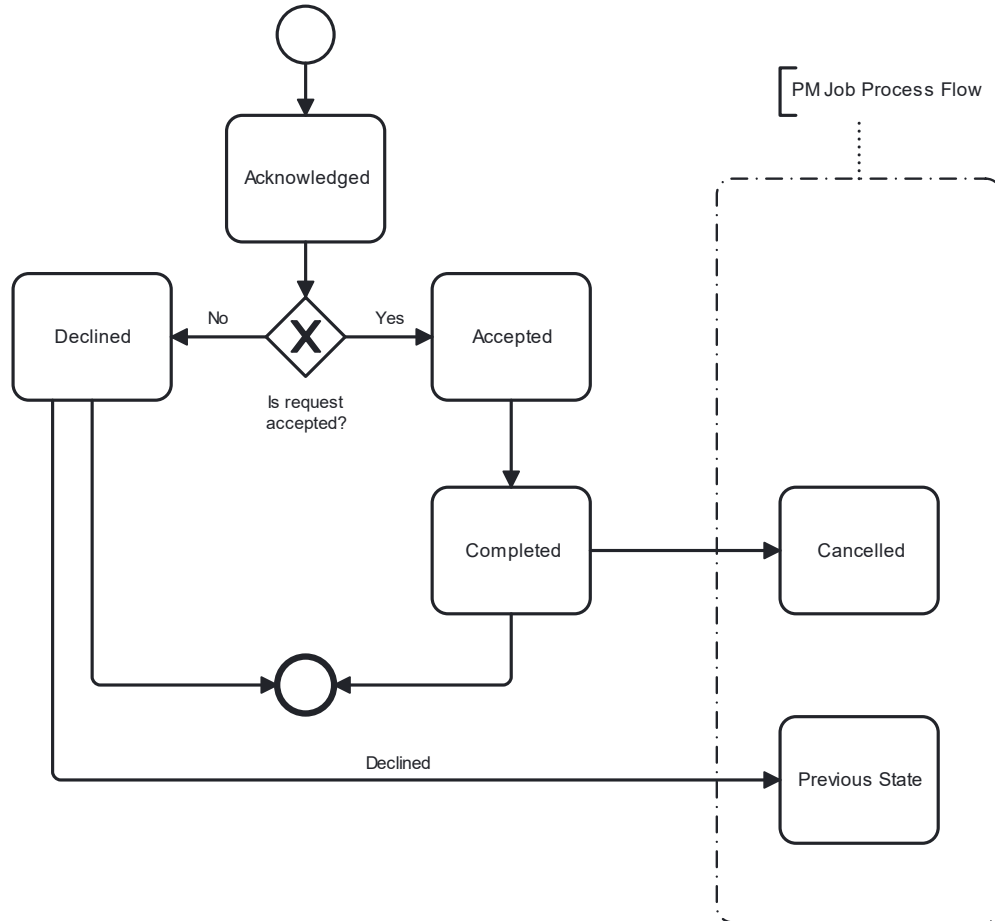


Figure 27-Cancel PM Job Process Flow

State	Description
Accepted	The Cancel PM Job request has been validated and accepted by the Seller/Server.
Acknowledged	A Cancel PM Job request has been received by the Seller/Server and has passed basic validation.
Cancelled	
Completed	
Declined	The Cancel PM Job has failed validation and been declined by the Seller/Server.

Table 90-Cancel PM Job States

16.2.6 Delete PM Job Process Flow

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

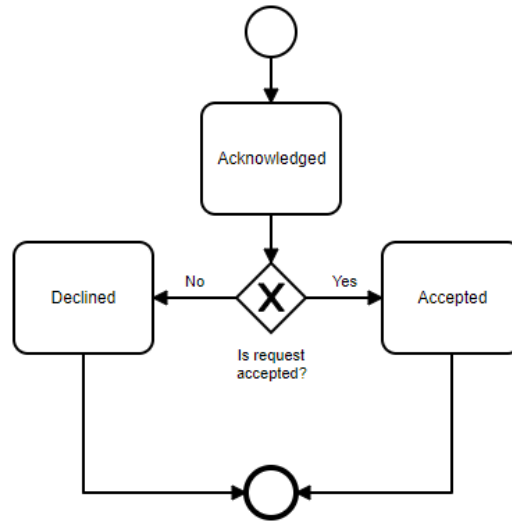


Figure 28-Delete PM Job Process Flow

16.2.7 Delete PM Job States

The Delete FM Job states are defined in this section.

State	Description
Accepted	The Delete PM Job request has been validated and accepted by the Seller/Server.
Acknowledged	A Delete 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 Delete PM Job has failed validation and been declined by the Seller/Server.

Table 91-Delete PM Job States

16.2.8 Suspend PM Job Process Flow

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

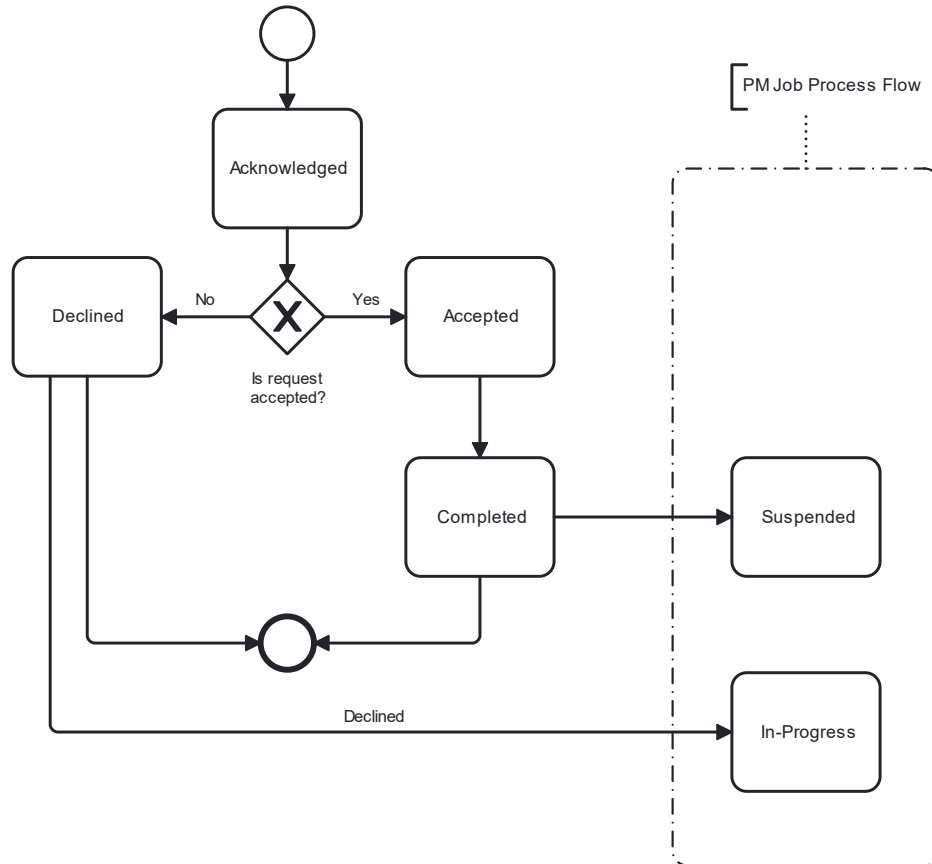


Figure 29-Suspend PM Job Process Flow

16.2.9 Suspend PM Job States

The Suspend PM Job states are defined in this section.

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.

Table 92-Suspend PM Job States

16.2.10 Resume PM Job Process Flow

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

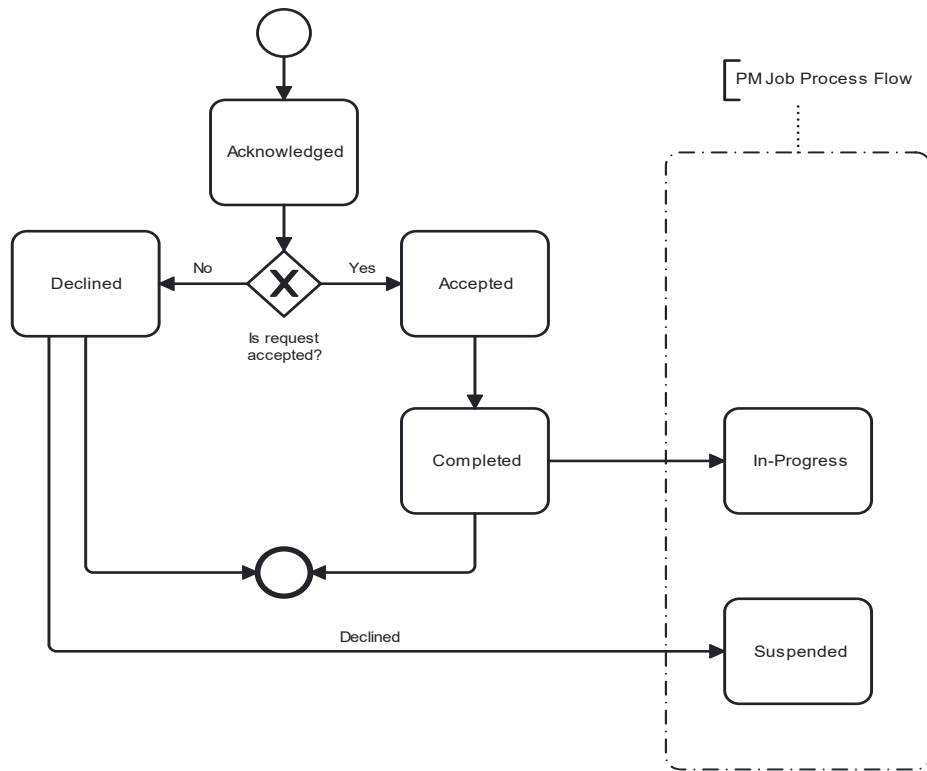


Figure 30-Resume PM Job Process Flow

16.2.11 Resume PM Job States

The Resume PM Job states are defined in this section.

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.

Table 93-Resume PM Job States

17 References

- [1] IETF RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, by S. Bradner, March 1997.
- [2] IETF RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, by B. Leiba, Copyright © 2017 IETF Trust and the persons identified as the document authors. All rights reserved. May 2017.
- [3] ITU-T X.733 Information Technology-Open Systems Interconnection-Systems Management: Alarm Reporting Function, February 1994.
- [4] MEF 35.1, Service OAM Performance Monitoring Implementation Agreement, May 2015.
- [5] MEF 50.1, *MEF Services Lifecycle Process Flows*, August 2017.
- [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.
- [9] ONF *TR-548 Streaming TAPI v2.1.3 Reference Implementation Agreement*, Version 1.0 Draft, March 2021.
- [10] International Telecommunication Union. (1992). *ITU-T Rec. X.734 (09/92) Information technology – Open Systems Interconnection – Systems Management: Event report management function*. Retrieved from https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-X.734-199209-I!!PDF-E&type=items

Appendix A Performance Management Options for Proactive Provisioning

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

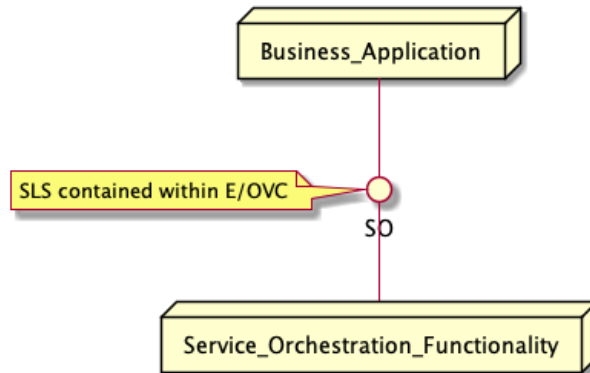


Figure 31-SLS Activation via E/OVC Service Ordering Example

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

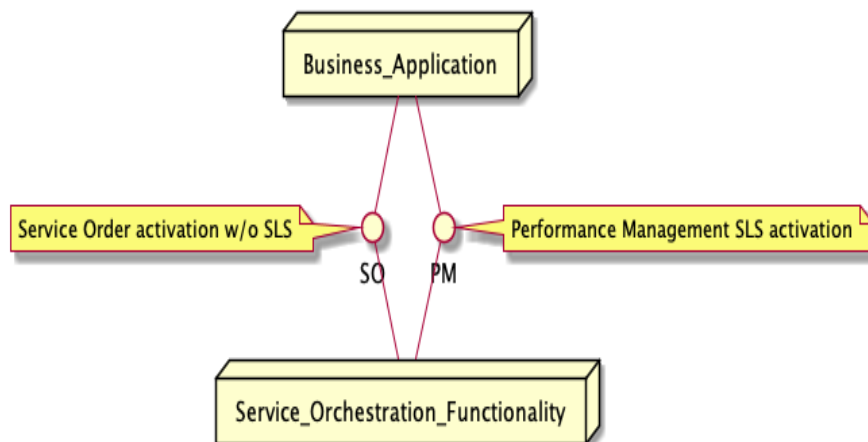


Figure 32-SLS Activation via Legato Example

Appendix B Event Streaming – Events, Notifications, TCAs and Streams

As defined in the terminology section an event is a significant occurrence or change in system state that is important from the perspective of system administration. Other systems might be informed about these events using notifications.

From the data modeling perspective a notification is a representation of an event that is exchanged between interested parties. A specific type of notification is Threshold Crossing Alert that is used to notify that a specific threshold or performance limit was crossed or exceeded.

The information about various types of event is available through classical pull model or using event streaming paradigm. It is worth noting that that in context of pull model the term notification has a specific meaning. In essence a Notification is a certain synchronous push communication pattern that is associated with certain event that are related to the lifecycle of the object exposed via MEF APIs. It is worth noting that the volume of notifications in this context is rather low. In this document, an example of such object which uses Notifications to inform about lifecycle events is PM Job. In the remainder of this section, we will use term Message to indicate event notification exchanged through event streaming mechanisms.

An Event Streaming is a data integration and processing paradigm that deals with the ordered stream of events in real time. Event streaming platforms typically use publish and subscribe pattern. A published message (created by producer) is broadcasted to all registered subscribers (clients). Event streaming can be realized by centralized (for example Apache Kafka) or decentralized platforms. In the first case, the message exchange depends on central broker system that decouples producers and consumers, ensures reliable delivery, fault tolerance, and scalability of the solution. Broker centric architectures allow for temporal decoupling. In other words, client consumes messages asynchronously on its own pace and does not need to be active when producer pushes new messages. Certain platforms support event stream rewind that allows for subsequent processing of already consumed messages. In the latter case the communicating parties communicate directly instead of relying on central entity. This might result in simpler architectures or performance improvements. However, depending on a specific solution this might also lead to a data loss in case notification client is not available.

The choice of a particular technical solution to support event streaming might be dictated by various internal or external factors like for example a technical capability of interacting parties or security constraints. Important factors are the data volume patterns and required delivery guarantees.

Appendix C 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.

C.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.

C.2 Avro Formatted Data

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

C.3 Protobuf Formatted Data

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

Appendix D Performance Metrics, Statistics and Reporting

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

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

Appendix E Schedule Definition

```
openapi: 3.0.0
paths: {}
info:
  description: Schedule definition
  title: Schedule definition
  version: 0.0.1
components:
  schemas:
    ScheduleDefinition:
      type: object
      description: The schedule definition for running jobs.
      properties:
        scheduleDefinitionStartTime:
          type: string
          format: date-time
          description: >-
            The Start time of the Schedule Definition. If the attribute is empty
            the Schedule starts immediately after provisioning of the Job.
        scheduleDefinitionEndTime:
          type: string
          format: date-time
          description: >-
            The Endtime of the Schedule Definition. If the attribute is empty
            the Schedule runs forever, not having a time constraint.
        recurringFrequency:
          $ref: '#/components/schemas/RecurringFrequency'
        scheduleDefinitionHourRange:
          type: array
          items:
            type: object
            properties:
              start:
                type: string
                format: date-time
              end:
                type: string
                format: date-time
            description: >-
              A list of time ranges within a specific day that the schedule will
              be active on, for example 08:00-12:00, 16:00-19:00.
        monthlyScheduleDayOfWeekDefinition:
          $ref: '#/components/schemas/MonthlyScheduleDayOfWeekDefinition'
        weeklyScheduledDefinition:
          type: array
          items:
            $ref: '#/components/schemas/DayOfWeek'
          minItems: 1
          description: >-
            The weekly schedule is used to define a schedule that is based on
            the days of the week, e.g. a schedule that will be active only on
            Monday and Tuesday.
        MonthlyScheduleDayOfWeekDefinition:
          type: object
          description: Monthly scheduled day of week.
          properties:
            recurringDaySequence:
              items:
                $ref: '#/components/schemas/DayOfWeek'
              minItems: 1
            dayOfMonthRecurrence:
              items:
```

```

1215         $ref: '#/components/schemas/DayOfMonth'
1216         minItems: 1
1217     DayOfWeek:
1218         type: integer
1219         minimum: 1
1220         maximum: 7
1221         description: >-
1222             Day of the week for recurrence. 1=Sunday, 2=Monday, 3=Tuesday,
1223             4=Wednesday, 5=Thursday, 6=Friday, 7=Saturday.
1224     DayOfMonth:
1225         type: integer
1226         minimum: 1
1227         maximum: 31
1228         description: Day of the month for recurrence
1229     RecurringFrequency:
1230         type: object
1231         description: >-
1232             A recurring frequency to run a job within timeframe
1233             defined by schedule definition, for example:
1234             every 5 minutes, 15 minutes, 1 hour, 1 day
1235         properties:
1236             recurringFrequencyValue:
1237                 description: >-
1238                     The value of the recurrence as an integer. For example,
1239                     if the recurring frequency is 2 weeks this value is 2.
1240                 type: integer
1241                 minimum: 1
1242             recurringFrequencyUnits:
1243                 description: >-
1244                     The unit of measure in recurring frequency. For example,
1245                     if a recurring frequency is 2 weeks this value is WEEKS.
1246                 type: string
1247                 enum:
1248                     - MINUTES
1249                     - HOURS
1250                     - DAYS
1251                     - WEEKS
1252                     - MONTHS
1253         required:
1254             - recurringFrequencyValue
1255             - recurringFrequencyUnits

```

Appendix F File Transfer Data

The following section provides a detailed set of attributes specific to the complex data type, File Transfer Data.

Field Name	Field Value	Field Format	Field Description
File format		String	The file format of file to be transfer.
File Location		String (\$uri)	File location.

Field Name	Field Value	Field Format	Field Description
Transport Protocol		String	Transport protocol to use for file transfer.
Compression Type		Enumeration: <ul style="list-style-type: none"> • NO_PACKING • GZIP • TAR • VENDOR_EXT • MINOR_EXT 	Different file compression types.
Packing Type			Specify if the output file(s) are to be packed.
Retention Period			A time interval to retain the file(s).

Table 94-File Transfer Data Attributes

Appendix G Streaming Additional Attributes

The following section provides additional streaming attributes that should be considered by the Buyer/Client and Seller/Server. The attributes are specific to the system or technology solution and therefore are not called out in the business requirements and use cases. These set of attributes could be part of a pre-configuration discussion or an on-boarding process. See

Field Name	Field Value	Field Format	Field Description
loadInterval		Integer	Measurement interval in milliseconds.
segmentSize		<Integer,Units>	Size of substructure log.
recordRetention[9]		TimePeriod	Time period to persist the records for retrieval. The Seller/Server provides a period to persistently retain records.
recordContent[9]		String	Identifies the structure of the content. Defines the streaming type – i.e., Web-Sockets.
logRecordStrategy[9]		LogRecordStrategy Enum: <ul style="list-style-type: none"> • WHOLE_ENTITY_ON_CHANGE, • CHANGE_ONLY, • WHOLE_ENTITY_PERIODIC 	Defines how the log records will be implemented by the Seller/Server or requested by the Buyer/Client. The Seller/Server provides a log record strategy for logging. The Buyer/Client can also request a methodology.
logStorageStrategy[9]		LogStorageStrategy Enum: <ul style="list-style-type: none"> • COMPACTED, • TRUNCATED, • FULL_HISTORY, • FULL_HISTORY_WITH_PERIODIC_BASELINE. 	Defines how the log storage will be implemented by the Seller/Server or requested by Buyer/Client. The Seller/Server provides a log storage strategy for logging. The Buyer/Client can also request a methodology.

1266 **Table 95-Streaming On-boarding Attributes**

1267 **Appendix H Tracking Record Schema**

1268
1269 The following section provides a YAML schema definition for Tracking Record.

1270
1271 TrackingRecord:
1272 type: object
1273 description: >-
1274 Tracking Records allow the tracking of modifications of
1275 Performance Job, Profile or Report.
1276 properties:
1277 creationDate:
1278 type: string
1279 format: date-time
1280 description: Date when record was created
1281 description:
1282 type: string
1283 description: >-
1284 Free-text field describing the action that
1285 created the Tracking Record and its details
1286 id:
1287 type: string
1288 description: Identifier of the Tracking Record
1289 relatedObjectId:

```
1290         type: string
1291         description: Identifier of Performance Job, Profile or Report
1292     request:
1293         type: string
1294         description: Request that created the Tracking Record
1295     system:
1296         type: string
1297         description: Describes the system from which the action was done
1298     user:
1299         type: string
1300         description: Describes the user doing the action
1301     required:
1302     - creationDate
1303     - id
1304     - relatedObjectId
```

Table 96-Tracking Record Schema

Appendix I Acknowledgements

Jack Pugaczewski

Mike Bencheck

Dominik Ogrodnik

Bartosz Michalik

Andrea Mazzini

Michal Laczynski

Miguelina Rios

Boris Trinajstic

Karthik Sethuraman

Mehmet Toy