OIIE Use Case 7 – Condition-Based Maintenance Triggering

This Use Case describes the process for the triggering of maintenance work based on the condition of a functional location segment or serialized asset. Measurements from measurement locations or tags originate from a condition monitoring system (CMS) or an operational process control system or data historian (CONTROL). These measurements are then processed by an operational risk management (ORM) system, such as an Asset Health Management System (AHMS), which analyzes the condition data to generate an actionable condition-based maintenance (CBM) Request for Work to be sent to a maintenance management system (MMS), optionally with a desired pre-defined Solution Package, or pre-planned work order.

Background

The benefits of interoperability start to pay significant dividends when the near-real time decision support systems (such as ORM) begin to properly interact with the transaction processing-oriented business systems (such as EAM) based on data/information feeds from true real-time systems involved in monitoring and control. While it is fairly easy to show a hierarchy of data/information/knowledge on a PowerPoint slide, the nature of the use cases needs to be fully contemplated when the transforms are taking place as part of the systems interaction scenarios. This involves several categories of systems spanning three basic layers (real-time, near real-time and transaction processing) in the interoperability stack and they are normally provided by several communities of solutions providers, with multiple vendors in each community. Providing sustainable interoperability for all of these systems of systems is a critical focal-point for open standards-based interoperability.

This use case does not assume interaction with operations planning and scheduling oriented systems. It is limited to the current practice where specialized condition monitoring, asset health, reliability, quality and safety systems are able to diagnose or prognose a need for a maintenance action. When an ORM system (PSMS, AHMS, QMS, EMS) determines that a maintenance action is required; it must be able to generate a CBM-driven request for action/work advisories with an optional pre-planned solution package (sometimes called a “pre-planned work order”) using an open interface to an EAM system. The ORM should be smart enough to check beforehand to see if similar maintenance work entries are outstanding on an asset so as not to “flood” an EAM system with the exact same CBM request for action/work. In addition, the ORM system needs to be able to check the status of the work submitted.

Scope

The scope of this use case is limited to the triggering of maintenance tasks and reacting to updates as the maintenance tasks are carried out.

Preconditions

This Use Case is predicated on Use Case 1, Use Case 4 (at least the provisioning of make/model information workflow), and Use Case 10 occurring prior so that the Control System, Operational Risk Management System and Maintenance Management System are populated with functional location, equipment asset information with make/model information, and measurement location “tags”.

In addition, this Use Case is predicated on Use Case 14 occurring prior such that active Control Systems and Condition Monitoring Systems have generated measurements, alarms, and events with which the ORM system determines the requirement for a maintenance action.

MMS Solution Packages applicable to a specific function a location, model, or asset and MMS Agents that can be assigned work are provisioned to the ORM system. (Use case not in currently defined set.)

Successful End Condition

Rectification work has been undertaken to remedy a (potential) equipment failure and process is ready for startup.

Actors

Business Actors

- Maintenance Supervisor
- Maintenance Planner
- Technician

System Actors

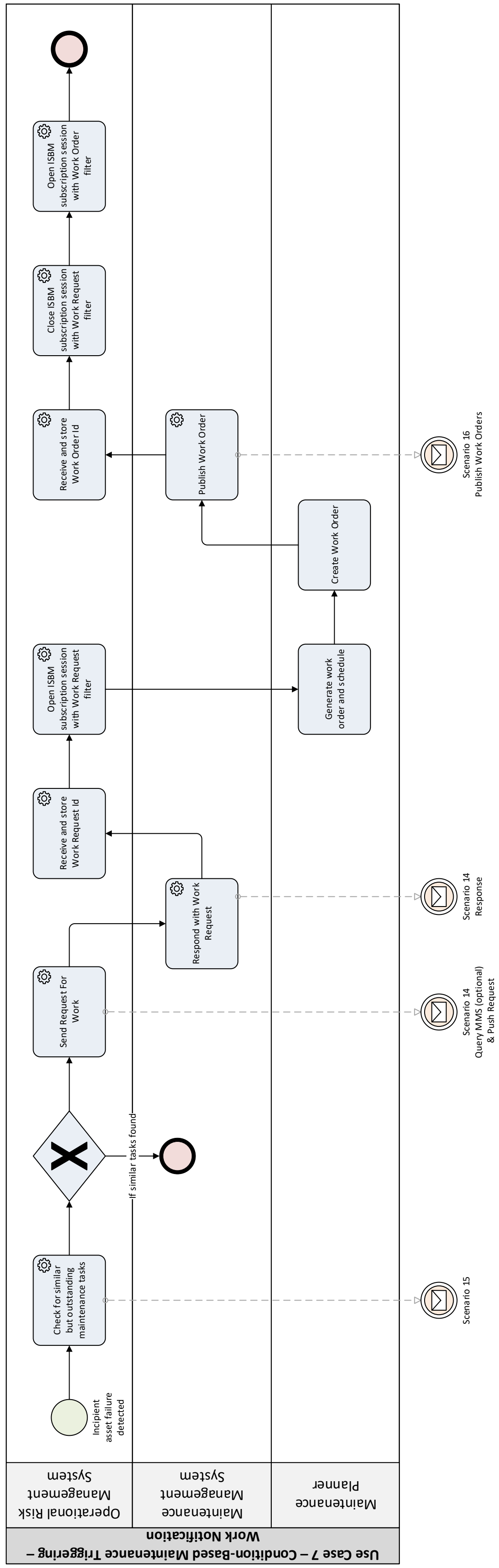
- Control System
- Operational Risk Management System
- Maintenance Management System

Triggers

Detection of incipient failure by Operational Risk Management System.

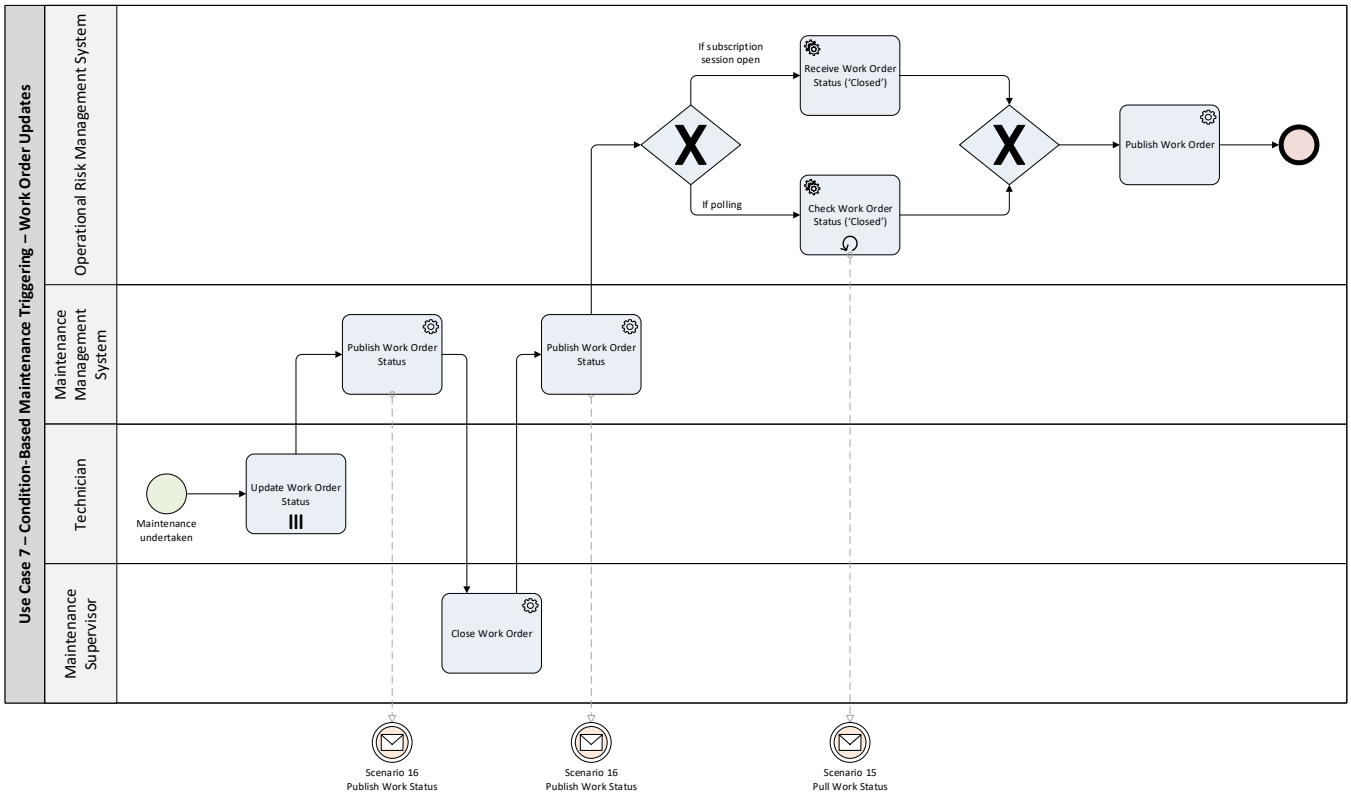
Main Success Scenario

The main success scenario is illustrated in two parts. The first is a simplified workflow indicating the general activities for organizing maintenance Work Orders in response to a notification (advisory, diagnostic, or prognostic) from an ORM regarding the incipient failure of a piece of equipment. It does not cover the actual performance of the maintenance.



Detect failure and request work	When the ORM detects a (possible) failure, it first confirms that there are no outstanding work requests/orders by querying the MMS via Scenario 15. If no outstanding maintenance tasks are found, the ORM instigates the maintenance process via Scenario 14, Push Request for Work Event. This will indicate that a particular equipment is about to/has failed and a Request for Work is sent.
Receive work request	The MMS will receive the Request for Work from the ORM and respond with an official Work Request, allowing the ORM to track the progress of the work task.
(Optional) **Open filtered subscription session**	The ORM can open a new subscription session on the ISBM to detect any new Work Order/s for the recently received Work Request. This is done via ISBM content-based filtering and specifying the Work Request ID previously received. The purpose of the new ISBM session is to not overload the ORM by receiving every single new work order, but only to be notified of relevant ones. If the ORM does not open a session, it should periodically check for the creation of the Work Order associated with the Work Request ID.
Create and publish work order	At a later point in time, a maintenance planner/scheduler will create a work order/s based on the Work Request (and maybe other work requests). The MMS will publish the creation of the Work Order via Scenario 16, Publish Work Orders Event. The Work Order/s will have ID references to corresponding Work Request/s.
Receive and record work order	The ORM receives the newly created Work Order through the filtered subscription or by matching the Work Request ID (or by periodically checking for a newly associated Work Order via Scenario 15). The ORM records the Work Order ID.
(Optional) **Open filtered subscription sessions**	The ORM can open a new subscription session on the ISBM to detect when the particular Work Order is set to a “Closed” status via an XPath filter. If the ORM does not open a session, it should periodically check for updates to the Work Order to detect the change to “Closed” status. NOTE The “Closed” status is a special, agreed-upon reference data *WorkStatusType* between the MMS and other O&M systems. It will likely need to be a configuration option by an application and may be in most cases (but not necessarily depending on how an enterprise wants to structure their RDL) the MIMOSA CCOM Reference Data “Closed” *WorkStatusType*.

The following is a simplified workflow for the updates to the Work Order that occur as a technician performs the maintenance work. In the process above, if the ORM has opened a subscription session on the ISBM for the Work Order, it will receive notifications of changes to the Work Order. Otherwise, it is the responsibility of the ORM to periodically check for changes to the Work Order via the Scenario 15, Pull Work Status Event using the stored Work Order ID.



Field work and work order status change	Field work results in status changes of the work order. The MMS publishes the Status change via Scenario 16 using Publish Work Status Event.
Close work order	When the ORM detects that the Work Order status is set to “Closed” (either through content-based filtering of the ISBM subscription or matching the Work Order ID in a query, Scenario 15), the ORM can indicate that the equipment is ready to be brought online.

System Interoperability Scenarios

- Scenario 14 – Push CBM Advisories from ORM to MMS
- Scenario 15 – Pull Maintenance Work Status/Work History from MMS to O&M
- Scenario 16 – Publish Maintenance Work Status/Work History from MMS to O&M

Document Versioning

Version	Date	Major Changes
1.2	2020-06-29	Updated to use OpenO&M template
1.1	2019-02-06	Moving Scenarios 29, 30, 31, 32 into new Use Case 14. Removed references to specific BODs.
1.0	2018-11-04	Imported from website-based documentation. Revised description around the main success scenario.