

Recommendation **ITU-T M.3164.2 (08/2024)**

SERIES M: Telecommunication management, including
TMN and network maintenance

Telecommunications management network

Interface for on-site generic telecommunication smart maintenance – Protocol neutral analysis

ITU-T M-SERIES RECOMMENDATIONS

Telecommunication management, including TMN and network maintenance

Introduction and general principles of maintenance and maintenance organization	M.10-M.299
International transmission systems	M.300-M.559
International telephone circuits	M.560-M.759
Common channel signalling systems	M.760-M.799
International telegraph systems and phototelegraph transmission	M.800-M.899
International leased group and supergroup links	M.900-M.999
International leased circuits	M.1000-M.1099
Mobile telecommunication systems and services	M.1100-M.1199
International public telephone network	M.1200-M.1299
International data transmission systems	M.1300-M.1399
Designations and information exchange	M.1400-M.1999
International transport network	M.2000-M.2999
Telecommunications management network	M.3000-M.3599
Integrated services digital networks	M.3600-M.3999
Common channel signalling systems	M.4000-M.4999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T M.3164.2

Interface for on-site generic telecommunication smart maintenance – Protocol neutral analysis

Summary

Recommendation ITU-T M.3164.2 provides the analysis specification of the interface for on-site generic telecommunication smart maintenance (TSM). It describes the interface operation interactions for on-site TSM, including the managed entities and their relationships for the TSM interface, the interactive control information exchanged through this interface, and detailed parameter definitions of each interface operation at a technology-independent level (protocol-neutral).

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T M.3164.2	2024-08-13	2	11.1002/1000/16015

Keywords

Analysis, management interface, protocol-neutral, telecommunication smart maintenance.

* To access the Recommendation, type the URL <https://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, and information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents/software copyrights, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the appropriate ITU-T databases available via the ITU-T website at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2024

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1 Scope	1
2 References.....	1
3 Definitions	1
3.1 Terms defined elsewhere	1
3.2 Terms defined in this Recommendation.....	2
4 Abbreviations and acronyms	2
5 Conventions	2
6 Overview	2
7 Interface analysis	3
7.1 Class diagram	3
7.2 Interface operations provided by SMAT	4
7.3 Interface operations provided by TSMS.....	15
Bibliography.....	27

Recommendation ITU-T M.3164.2

Interface for on-site generic telecommunication smart maintenance – Protocol neutral analysis

1 Scope

This Recommendation provides the analysis specification of the interface for on-site generic telecommunication smart maintenance (TSM). It defines the interface operation interactions for on-site TSM, including the managed entities and their relationships for the TSM interface, the interactive control information exchanged through this interface, and detailed parameter definitions of each interface operation.

The maintenance information and interactions provided in this Recommendation follow the ITU-T M.3020 management interface specification methodology in the interface analysis phase. It also follows the interface requirements provided in [ITU-T M.3164.1] and is developed in a protocol-neutral manner.

This Recommendation applies to the design, development, inter-connection and inter-operation of on-site generic telecommunication smart maintenance.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T M.3020] Recommendation ITU-T M.3020 (2023), *Management interface specification methodology*.
- [ITU-T M.3164] Recommendation ITU-T M.3164 (2020), *Generic information model for on-site telecommunication smart maintenance*.
- [ITU-T M.3164.1] Recommendation ITU-T M.3164.1 (2024), *Interface for on-site generic telecommunication smart maintenance – Protocol neutral requirements*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 information object class** [ITU-T M.3020]: Describes the information that can be passed/used in management interfaces and is modelled using the stereotype "Class" in the UML meta-model.
- 3.1.2 on-site overhaul** [b-ITU-T M.3040]: A kind of on-demand preventive maintenance performed at a facility site in the condition of natural disasters or major events.
- 3.1.3 on-site patrol** [b-ITU-T M.3040]: A kind of routine preventive maintenance periodically performed at a facility site.

3.1.4 on-site troubleshooting [b-ITU-T M.3040]: A kind of corrective maintenance performed at a facility site when the quality of equipment degrades.

3.1.5 telecommunication smart maintenance [b-ITU-T M.3040]: The maintenance carried out with advanced technology-based (IoT, AR, wearable technology, etc.) toolkit and system, which can provide strong human-computer interaction capabilities and online guidance to personnels, to achieve higher efficiency and precision of actions.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AR	Augmented Reality
FUN	Function
ID	Identifier
IOC	Information Object Class
IoT	Internet of Things
IP	Internet Protocol
M	Mandatory
O	Optional
OO	On-site Overhaul
OP	On-site Patrol
OTS	On-site Trouble Shooting
REQ	Requirements
SA	Service Activation
SMAT	Smart Maintenance Assistant Toolkit
TSM	Telecommunication Smart Maintenance
TSMS	Telecommunication Smart Maintenance System
UML	Unified Modeling Language

5 Conventions

In this Recommendation:

- For the qualifiers of an operation or a parameter in the analysis template, "**M**" stands for Mandatory, and "**O**" stands for Optional.
- Text in the font of `Courier New` indicates it is an abstract data type as indicated in [ITU-T M.3020] and will be mapped to a protocol-specific data type in the design phase.

6 Overview

According to [ITU-T M.3020], which defines the management interface specification methodology, each interface specification should include three phases: requirements phase, analysis phase and design phase. The requirements and analysis phases can be protocol neutral, which are independent

from the implementation technologies. The design phase is protocol specific, and can be mapped to multiple implementation technologies.

[ITU-T M.3164.1] specifies the interface position and the protocol neutral requirements of the interface for on-site TSM. Based on the information provided in [ITU-T M.3164.1], the interface analysis is provided for the interface I1 (between smart maintenance assistant toolkit (SMAT) and telecommunication smart maintenance system (TSMS), see Figure 2 in [ITU-T M.3164.1]), which supports the main functions of on-site TSM.

This Recommendation specifies the protocol neutral analysis for the interface for on-site generic TSM, following the management interface specification methodology in [ITU-T M.3020] and the interface requirements specified in [ITU-T M.3164.1]. The interface design part will be provided in other separate Recommendation(s).

[ITU-T M.3164] provides the general information model for TSM, and the information object classes (IOCs) are reused in the interface interactions part in this Recommendation.

7 Interface analysis

Recommendation [ITU-T M.3164] provides the IOCs which are only related to data model. This clause provides the entities that perform the controlling functions across the interface I1.

7.1 Class diagram

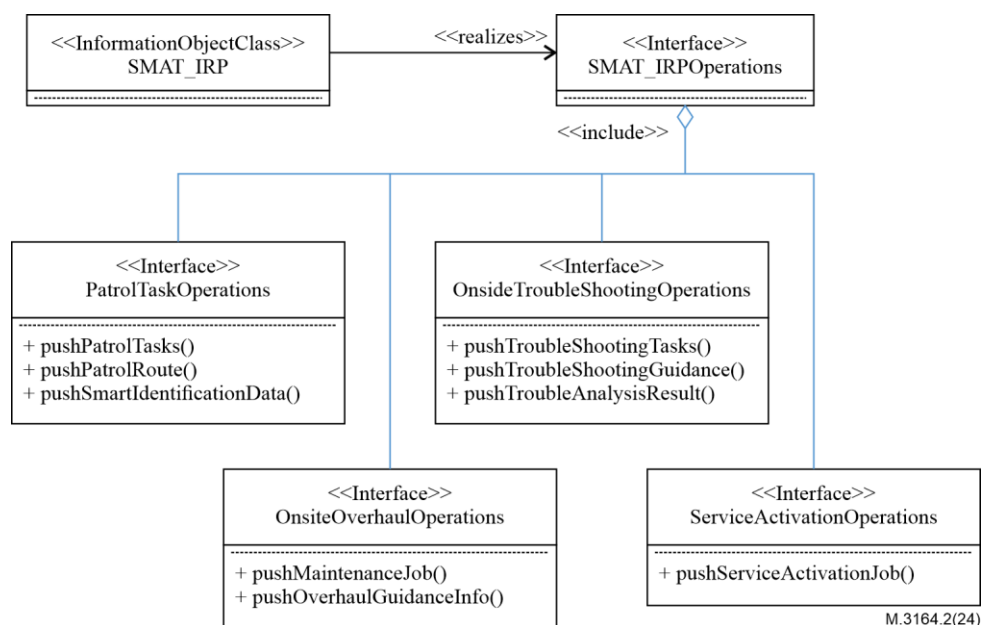


Figure 1 – Class diagram for SMAT_IRP IOC

Figure 1 provides the class diagram for SMAT_IRP Information Object Class (IOC), which contains the interface functions provided by the SMAT to the TSMS. The TSMS initiates the invocation on the operations in the above interface, pushing all kind of maintenance tasks and related information to the SMAT.

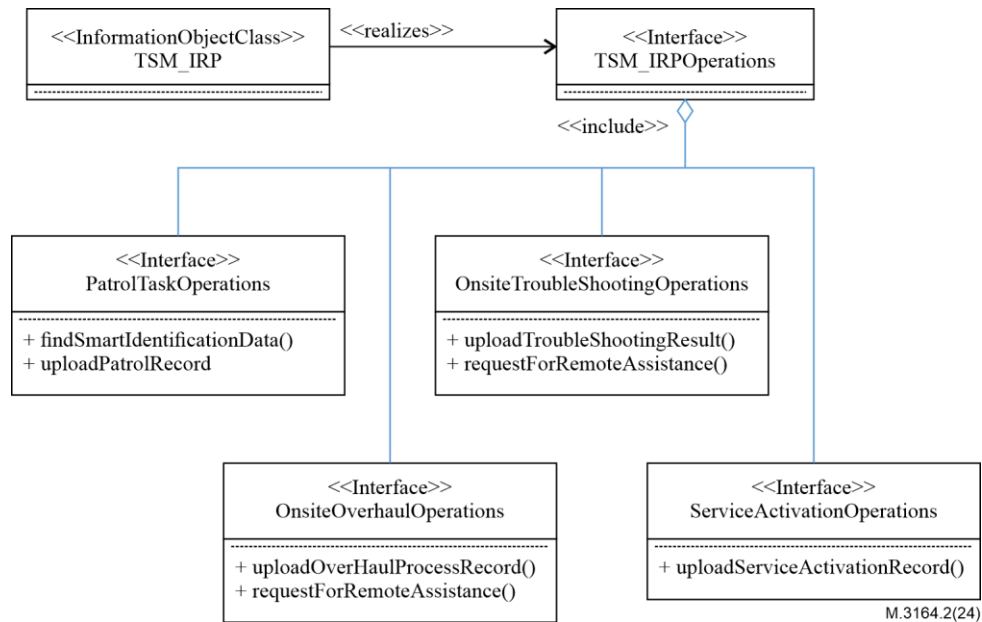


Figure 2 – Class diagram for TSM_IRP IOC

Figure 2 provides the class diagram for TSM_IRP Information Object Class, which contains the functions provided by the TSMS to the SMAT. The SMAT initiates the invocation on the operations in the above interface, uploading maintenance result to the TSMS, or getting some needed information from the TSMS.

7.2 Interface operations provided by SMAT

This clause provides the detailed definitions for each operation that is provided by the SMAT, and the TSM can invoke these operations to send maintenance related information to the SMAT.

7.2.1 Interface PatrolTaskOperations (M)

Operation name	Qualifier	Requirement IDs
pushPatrolTasks	M	REQ-OP-FUN-01
pushPatrolRoute	M	REQ-OP-FUN-02
pushSmartIdentificationData	M	REQ-OP-FUN-03

7.2.1.1 Operation pushPatrolTasks (M)

7.2.1.1.1 Definition

This operation is used for the TSMS to push the patrol information to a SMAT. If the operation succeeds, the SMAT will receive the information of the patrol task list, create an instance of the patrol, and give the TSMS a response to indicate the information has been successfully received.

7.2.1.1.2 Input parameters

Name	Qualifier	Information type/ Legal values	Comment
SMAT_ID	M	String	This attribute specifies the unique identifier of the SMAT which is the receiver of this operation.
patrolInfoID	M	String	This attribute specifies the unique identifier of the patrol of the OnsitePatrolInfo to be performed.

Name	Qualifier	Information type/ Legal values	Comment
patrolTaskList	M	SEQUENCE OF OnSitePatrolTask OnSitePatrolTask ::= SET {taskID String, taskType String, patrolExecutor String, startTime Date, endTime Date, pointSequence SEQUENCE OF String, orderID String, resourceSet SET OF String }	This parameter specifies the information of the on-site patrol activities. The detailed explanation of the attributes inside this parameter can be found in clause 6.3.2.2.2 of [ITU-T M.3164].

7.2.1.1.3 Output parameters

Name	Qualifier	Matching information/ Information type/Legal values	Comment
opStatus	M	ENUMERATED {successful, failed}	Indicates whether this operation is successful or failed.

7.2.1.1.4 Pre-condition

Assertion name	Definition
patrolTaskAlreadyCreated	The patrol information of the on-site patrol tasks has been established in the TSMS.
valid_input_parameter	All input parameters shall be valid regarding their information type.

7.2.1.1.5 Post-condition

Assertion name	Definition
patrolInfoReceived	The patrol information is successfully received and stored by the SMAT.

7.2.1.1.6 Exceptions

Name	Definition
invalid_parameter	Condition: At least one of the input parameters is invalid. Returned Information: the name of the input parameter which is invalid. Exit state: Entry state.
operation_failed_internal_problem	Condition: An internal problem occurs and the operation cannot be completed. Returned Information: None. Exit state: Entry state.

7.2.1.2 Operation pushPatrolRoute (M)

7.2.1.2.1 Definition

This operation is used for the TSMS to push the patrol route information to a SMAT. If the operation succeeds, the SMAT will receive the information of the patrol route and give the TSMS a response to indicate the information has been received.