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SERIES M: TELECOMMUNICATION MANAGEMENT,
INCLUDING TMN AND NETWORK MAINTENANCE

Integrated services digital networks

**Common management services – Test
management – Protocol neutral requirements
and analysis**

Recommendation ITU-T M.3706



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Recommendation ITU-T M.3706

Common management services – Test management – Protocol neutral requirements and analysis

Summary

Recommendation ITU-T M.3706 provides the requirements and analysis for test management which is one of the common management services. Test management functions are used to assist in various high level management function sets such as fault management or performance management. The purpose of testing is to obtain information about the functionality and performance of the managed network subjected to the test.

The functional requirements for the test management interface include the management functions for test object controlling, test category, test object state monitoring, test result reporting, etc.

In the analysis part, the detailed information model supporting the above functions across the management interface is provided.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Common management service, test management, test management IRP.

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Recommendation ITU-T M.3706

Common management services – Test management – Protocol neutral requirements and analysis

1 Scope

The purpose of this Recommendation is to define an interface through which a manager can perform test functions on an agent. This document specifies the overall requirements and the analysis for test management and defines the semantics of operations (and their parameters) visible via the management interface.

This Recommendation provides the protocol neutral model definition for notification. It defines, for the purpose of performing test functions on an agent, the information is observable and controlled by the management system's client and it also specifies the semantics of the interactions used to carry this information.

This Recommendation does not define the syntax or encoding of the operations and their parameters.

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 (2009), *Management interface specification methodology*.
- [ITU-T M.3160] Recommendation ITU-T M.3160 (2008), *Generic, protocol-neutral management information model*.
- [ITU-T M.3702] Recommendation ITU-T M.3702 (2010), *Common management services – notification management – Protocol neutral requirement and analysis*.
- [ITU-T X.680] Recommendation ITU-T X.680 (2008) | ISO/IEC 8824-1:2008, *Information technology – Abstract syntax Notation One (ASN.1): Specification of basic notation*.
- [ITU-T X.737] Recommendation ITU-T X.737 (1995) | ISO/IEC 10040:1998, *Information technology – Open Systems Interconnection – Systems Management: Confidence and diagnostic test categories*.
- [ITU-T X.745] Recommendation ITU-T X.745 (1993) | ISO/IEC 10164-12:1994, *Information technology – Open Systems Interconnection – Systems Management: Test management function*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 **agent** [ITU-T M.3020]
- 3.1.2 **information object class** [ITU-T M.3020]
- 3.1.3 **manager** [ITU-T M.3020]
- 3.1.4 **test category** [ITU-T X.745]
- 3.1.5 **test conductor** [ITU-T X.745]
- 3.1.6 **test object** [ITU-T X.745]
- 3.1.7 **managed object referring to test** [ITU-T X.745]

3.2 Terms defined in this Recommendation

This Recommendation has no new terms or definitions.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

EMS	Element Management System
FS	Function Set
ID	Identifier
IOC	Information Object Class
IRP	Integration Reference Point
MORT	Managed Object Referring to Test
NE	Network Element
NMS	Network Management System
OS	Operating System
TO	Test Object

5 Conventions

This Recommendation follows the conventions defined in [ITU-T M.3020].

In this Recommendation, Test management IRP is an interface in an agent providing test management functions.

6 Requirements

6.1 Concepts and background

The test management function is used to assist in various high level management function sets such as fault management or performance management. The purpose of testing is to obtain information about the functionality and performance of the managed network subjected to the test.

Testing is an activity that involves the operator, the managing system (operating system (OS)) and the managed system (network element (NE)). Generally the operator requests the execution of tests from the OS and the managed NE autonomously executes the tests without any further support from the operator.

Based on the descriptions in [ITU-T X.737], there are eight test categories: Connection test, Connectivity test, Data integrity test, Loopback test, Protocol integrity test, Resource boundary test, Resource self-test and Test infrastructure test. This Recommendation reuses the above test categories and provides a test category extension mechanism.

In the case of intrusive tests it is required that the network resources to be tested are locked prior to test execution. During the test execution the telecommunication service provided by the network resources is interrupted. After completion of the test, depending on the test result, the network resources shall be set to the most appropriate state.

Test management capabilities should be provided over the NMS-EMS in order to allow the NMS operator to perform tests on network resources. This capability is especially important at times when only the NMS but not the EMS is attended, which might be the case at night or during weekends.

In the context of fault management the NMS operator may use the testing capabilities over the NMS-EMS interface for numerous purposes:

- When a fault has been detected and if the information provided in the alarm report is not sufficient to localise the faulty resource, tests can be executed in order to localise the fault.
- When a fault has been detected and if the information provided in the alarm report specifies the faulty resource, tests can be executed on that resource in order to determine the required repair action.
- During normal operation of the NE, tests can be executed for the purpose of discovering undetected faults.
- After a faulty resource has been repaired or replaced and before it is restored to service, tests can be executed on that resource in order to make sure that it is fault free.

However, regardless of the context where the testing is used, its target is always the same: verify if a system's physical or functional resource performs properly and, in case it happens to be faulty, provide all the information to help the operator to localise and correct the fault.

The test management IRP bases its design on work referenced in [ITU-T X.745].

6.2 Business level requirements

6.2.1 Requirements

The test management requirements can be grouped into one of the following categories:

- General, i.e., the test management requirements for general purposes, e.g., test identification, test result header format, etc.
- Test object management, e.g., initiate test object, terminate test object, subscribe test object, resume test object, query test object information.
- Test category, e.g., query or specify test types.
- Test result reporting, e.g., report test results.

6.2.1.1 General

The following requirements apply for general purposes.

- | | |
|---------------|--|
| REQ-TM-FUN-01 | An agent shall provide a mechanism for managers to perform test functions on managed networks. |
| REQ-TM-FUN-02 | An agent shall provide a mechanism to identify each test object initiated by a manager. |

REQ-TM-FUN-03 It is required that all test results generated by agents support the same header format that contains enough information to identify the test category, the managed entities that are tested and the time stamp at which the test result is generated.

6.2.1.2 Test object management

The following requirements apply to the test management interface.

REQ-TM-FUN-04 A manager shall be able to initiate a test object to be performed in an agent.

REQ-TM-FUN-05 A manager shall be able to query the detailed information of a specified test object in an agent.

REQ-TM-FUN-06 A manager shall be able to suspend the execution of a specified test object in an agent.

REQ-TM-FUN-07 A manager shall be able to resume the execution of a suspended test object in agent.

REQ-TM-FUN-08 A manager shall be able to terminate a specified test object in an agent.

REQ-TM-FUN-09 The agent shall provide managers with the capability to monitor the states of a test object. The test state may assume one of the following values: not initialised, idle, initialising, testing, terminating or disabled. The actual test state value shall be derived from the actual operational state and procedural status according to the mapping table specified in [ITU-T X.745]. Any state change shall be reported to the manager using notifications.

6.2.1.3 Test category discovery

The following requirements apply for test category discovery.

REQ-TM-FUN-10 An agent shall provide managers with the capability to discover the test categories (types) supported by the agent. The possible test categories include but are not limited to: Connection test, Connectivity test, Data integrity test, Loopback test, Protocol integrity test, Resource boundary test, Resource self-test and Test infrastructure test. These test categories are defined in [ITU-T X.737]. When there are new test categories to be used in the test management interface, an agent should provide means for a manager to discover the new test categories.

6.2.1.4 Test result management

The following requirements apply for test result management.

REQ-TM-FUN-11 When predefined trigger events occur, the test result of the test object should be generated and stored in an agent. The test results shall be made available to the manager by one or more notifications. The notifications may contain either the test results themselves or the information of data files which store the test result in the case of a large amount of data. The triggering events depend on the test category and shall be defined in the behaviour of the test object.

REQ-TM-FUN-12 A manager shall be able to specify the destination to which test results should be forwarded by an agent.

- REQ-TM-FUN-13 A manager shall be able to request a list of available files related to a specified test object.
- REQ-TM-FUN-14 A manager shall be able to manage the transfer of data files contained the test result.

The above requirements are documented in the subsequent use cases.

6.2.2 Actor roles

The capabilities described in this document are available and relevant to all agents and managers.

6.2.3 Telecommunication resources

The test management functionality is applicable to all types of telecommunication resources.

6.2.4 High-level use case diagrams

The first overview use case diagram in Figure 6-1 shows the overall interaction of the notification management interface.

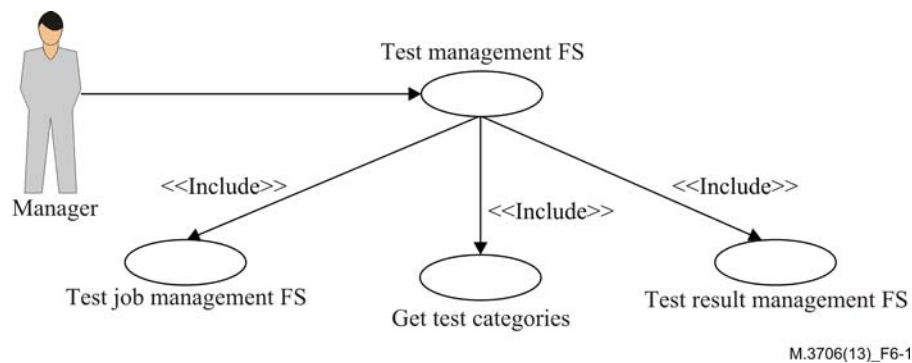


Figure 6-1 – Use case diagram of the test management function set – overview

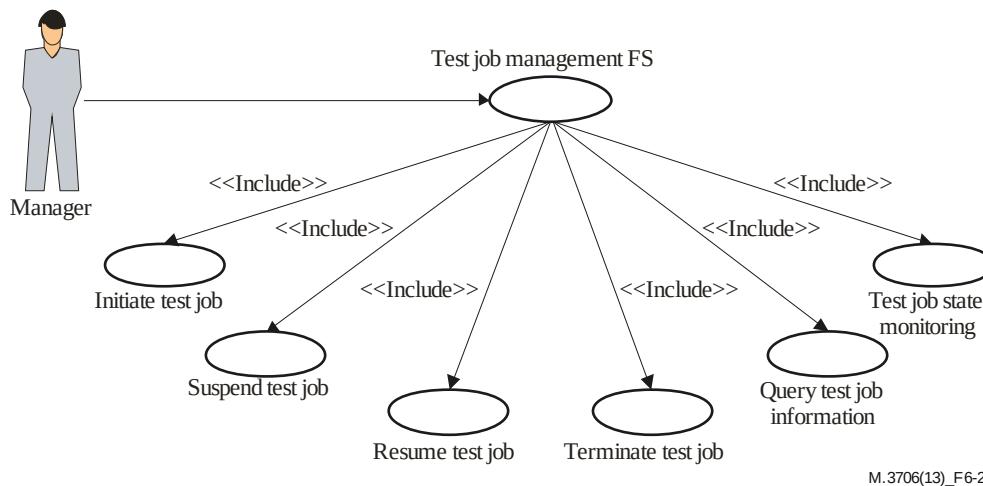


Figure 6-2 – Use case diagram of the test object management function set

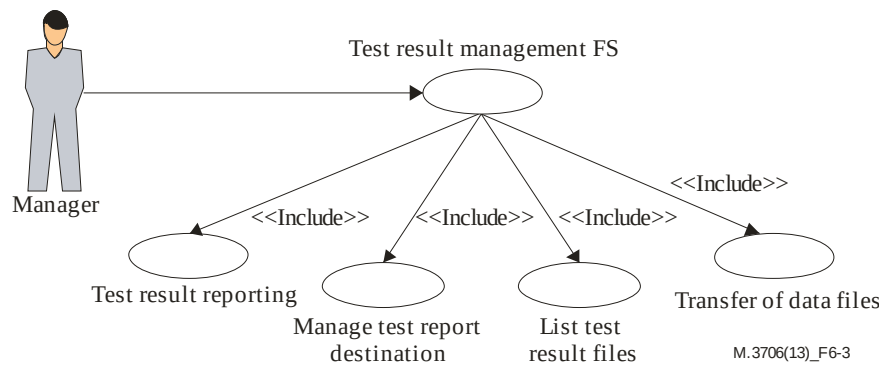


Figure 6-3 – Use case diagram of the test result management function set

6.3 Specification-level requirements

6.3.1 Requirements

There are no specification level requirements.

6.3.2 Actor roles

See clause 6.2.2.

6.3.3 Telecommunications resources

See clause 6.2.3.

6.3.4 Use cases

The general exceptions (e.g., communication error, processing error) related to all uses cases will not be described in the following uses cases and will only be handled in design phases.

6.3.4.1 Initiate test object

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	The manager can request the agent to initiate a test object through the management interface.	
Actor and roles	The manager invokes an operation on the agent.	
Telecom resources	All types of telecommunication resources.	
Assumptions	The communication between the agent and the manager is available.	
Pre-conditions	–	
Begins when	The manager sends a request to the agent to initiate a test object on one or more managed entity instances.	
Step 1	The manager sends a request to the agent to start a test object. The test request may contain: – the ID or criteria for the managed entities (network resources) to be tested, – the test category to be performed, – the test parameters to be performed on the managed entities (optional), – the start time of the test task (optional), – the stop time of the test task (optional).	