



JRC VALIDATED METHODS, REFERENCE METHODS AND MEASUREMENTS REPORT



LPIS Quality Assessment Framework

Model Test Suite v.2.0

Assessment Methodology

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Abstract

The quality assessment framework of Land Parcel Identification System (LPIS) is an integral part of LPIS management and upkeep processes. In this framework, the LPIS of a Member State or Region is regarded as a implementation under test (IUT), which is composed of two major components: the local application schema and the data records stored in the system. Both components are inspired by the methodology of conformance testing. The Model Test Suite (MTS) investigates metadata and evaluates the application schema against the LPIS core model (LCM) provided by DG JRC. The LCM is the application schema used for defining data value tests of the Executive Test Suite (ETS). The testing procedures are based on ISO standards (19105:2000) and are driven by the traditional best practice examples of the European LPIS community.

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1 Release notes (changes/updates from version 2.0)

1.1.1 This is an original version. There is no earlier MTS guidance document.

1.1.2 June 2016 version:

- Table 1 was modified to reflect the availability of agricultural land by the RP
- The delivery was renamed MTS package for conformance report
- The delivery was extended with choice of tools and deadlines for upload in the annual assessment cycle (9.1.2 – 9.1.4)

1.1.3 June 2016 second version after IACS workshop:

- Points 4.2.2. and 4.2.4: Number of IXIT qualifiers changed from 6 to 8
- Points 4.1.1 and 4.3: The scope and purpose of the ICS has been further clarified.
- Point 4.4.1: Full name of the abbreviation LCML has been given in the footnote.
- Point 7.3.1: It has been clarified that the OTSC imagery refers to the imagery provided by JRC
- Point 9.1.3: Delivery deadline for the MTS package has been changed to January 2017.

2 Introduction

2.1 Background

2.1.1 This document presents the technical guidance on the Model Test Suite (MTS) for the Land Parcel Identification System.

2.1.2 This TG MTS is the successor of the 2010 ATS; the main differences with its predecessor are:

1. Implementation decisions and choices are targeted in an explicit and structured TG IXIT.
2. The LCM has been upgraded to incorporate the requirements of the 2013 CAP reform. This introduced a number conceptual elements (e.g. relating to EFA, differentiation of agriculture **area**), which, if not in scope of the annual data assessment, are ignored for this MTS.
3. With the introduction of structured upkeep reporting in ETS v6.0, feature metadata elements have been added
4. The testing environment has migrated from worksheet to a GI exchange environment. Despite the risk associated with redundancy, the worksheet is kept as an alternative.
5. Relevant system metadata has been introduced, referencing to selected elements of the INSPIRE implementing rules on metadata and orthoimagery.

2.2 Scope

2.2.1 The Model Test Suite serves to document every individual LPIS implementation so that it can correctly perform and report the data value testing procedures of the annual quality assessment. It is therefore an essential part of the LPIS QA framework.

2.2.2 The MTS, as a TG document, covers three distinct aspects of the LPIS implementation.

1. The choices made regarding source data, stakeholder role and other options implied by the CAP Regulations.
2. The data model elements that relate to relevant feature data and metadata values specified in the LCM.

3. The system metadata that relates to selected metadata of the INSPIRE implementing rule on metadata.
- 2.2.3 Under this scope, the document provides a comprehensive series of questions and/or tests, often based on conformity testing, to the answers necessary for a correct understanding of the various LPIS implementations, developed to address the common requirements in the CAP regulations and their supporting guidance documents.
 - 2.2.4 For the data value aspects, this technical guidance sets up the abstract and executable test cases that identify all data elements necessary for the data quality assessment. It does so by describing the content and steps of the conformance testing process of the local LPIS implementation against the LCM.
 - 2.2.5 The LPIS Core Model (LCM) has been designed considering the regulatory requirements, best practices and interoperability challenges in geographic information. The conformity testing verdict is not the objective of this TG MTS, the goal is to record a common and complete description, as required for the LPIS QA reporting and screening.
 - 2.2.6 The modelling technique used by TG MTS is two tiered:
 1. It defines a standardized Abstract Tests Suite (ATS) for testing an individual application schema against the LCM. Such conformance can be claimed for any LPIS implementation and data set.
 2. It provides input guidelines for a series of executable test cases relevant for the LPIS QA reporting, which tests the data and concentrates on such data quality elements as completeness, thematic and temporal accuracy.

2.3 Terms and definitions

Term	Definition (ISO/TC211 2000)
abstract test suite (ATS)	Set of abstract test cases specifying all the requirements to be satisfied for conformance.
abstract test case	Generalized test for a particular requirement. NOTE. An abstract test case is a formal basis for deriving executable test cases. One or more test purposes are encapsulated in the abstract test case. An abstract test case is independent of both the implementation and the values. It should be complete in the sense that it is sufficient to enable a test verdict to be assigned unambiguously to each potentially observable test outcome (i.e. sequence of test events) application schema conceptual schema for data required for one or more applications [ISO19101].
basic test	Initial capability test intended to identify clear cases of non-conformance.
capability test	Test designed to determine whether an Implementation Under Test (IUT) conforms to a particular characteristic of an International Standard as described in the test purpose.
conformance	Fulfilment of specified requirements.
conformance testing	Testing of a product to determine the extent to which the product is a conforming implementation.
conformance test report	summary of the conformance to core elements as well as all the details of the testing that supports the given overall summary conforming.
implementation	Implementation which satisfies the requirements.
executable test case	specific test of an implementation to meet particular requirements NOTE Instantiation of an abstract test case with values.
executable tests suite (ETS)	Set of executable test cases

feature	Abstraction of real world phenomena [ISO 19101]. EXAMPLE. The phenomenon named 'Eiffel Tower' may be classified with other similar phenomena into a feature type 'tower'.
feature association	Relationship that links instances of one feature type with instances of the same or a different feature type.
feature attribute	characteristic/properties of a feature
feature catalogue	Catalogue containing definitions and descriptions of the feature types, feature attributes, and feature associations occurring in one or more sets of geographic data, together with any feature operations that may be applied.
non-conformance	Failure to fulfil one or more specified requirements.

2.4 Abbreviations

Abbreviation	Definition
MTS	Model Test Suite
ATS	Abstract Test Suite
ETS	Executable Test Suite
IUT	Implementation Under Test
IXIT	Implementation eXtra Information for Testing
ICS	Implementation Conformance Statement
SUT	System Under Test
CAP	Common Agricultural Policy
IACS	Integrated Administration and Control System
MS	Member State
LPIS	Land Parcel Identification System
LCM	LPIS Core Model
MBT	Model Based Testing
UML	Unified Modelling Language
XML	Extensible Markup Language
XSD	XML Schema Definition
GIS	Geographic Information System
DB	Data base
RDBMS	Relational Database Management System
QAF	Quality Assessment Framework
TG	Technical Guidance
GDB	Geographical Data Base
GUID	Globally Unique IDentifier

2.5 Related documents

- Annex X: MTS 2.0 - TG IXIT [LINK](#)
- Annex XI: MTS 2.0 - log form (xls) - optional [LINK](#)
- INSPIRE METADATA IMPLEMENTING RULES
http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf
- INSPIRE Data Specification on Orthoimagery
- http://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_OI_v3.0.pdf
- LPIS schema registry: <http://lpis.jrc.ec.europa.eu/registry/6.0.0/>
- Location of the MTS test schema registry: <https://lpis.jrc.ec.europa.eu/GTCAP/registry/>
- TG ETS (v6.0), https://marswiki.jrc.ec.europa.eu/wikicap/index.php/LPIS_TG_ETS
- UML model of the Model Test Suite (v 2.0):
<https://lpis.jrc.ec.europa.eu/GTCAP/ModelTestSuite/index.htm>
- UML model of the IXIT: <https://lpis.jrc.ec.europa.eu/GTCAP/Ixit/index.htm>
- UML model of the system metadata:
<https://lpis.jrc.ec.europa.eu/GTCAP/Metadata/index.htm>
- Guidance on the Land Parcel Implementation system (LPIS):
https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Main_Page
- Guidance on aid application and payment claims:
https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Main_Page
- Technical guidance on management of layers in LPIS:
https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Category:LPIS_TG_MLL
- Technical guidance on LPIS update:
https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Category:TG_update

3 Conformance testing methodology

- 3.1.1 An abstract test suite (ATS) has a hierarchical structure consisting of abstract test cases that may be arranged in abstract test modules. An executable test suite (ETS) is an instantiation (=operational case) of an ATS, after specific values to all implementation-dependent parameters have been assigned. Each executable test case (within an ETS) is derived from an abstract test case (within its ATS) and so formulated that it can be run on the IUT. Examples are provided in “Example of result analysis” chapter of this document.
- 3.1.2 In the LPIS QA framework such ATS-ETS interaction is theoretically applied twice
- For the model test suite (subject of this document TG MTS), where the common model ATS may need to be instantiated by each LPIS implementation into an individual “model ETS”.
 - For the data test suite, where the data ATS was not published but a common data ETS was directly published under the name TG ETS.
- 3.1.3 To ensure continuity with the past documentation, the short name “ETS”, whenever unspecified, always refers to the common “data ETS” described in TG ETS.
- 3.1.4 The (conformance) assessment process involves four phases as shown in Figure 1 (ISO/TC211 2000):
- preparation for testing;
 - testing campaign;
 - analysis of results;
 - (conformance) test report.
- 3.1.5 All phases of the testing campaign that constitute the model-based testing (MBT), and are compiled within the given Model Test Suite (MTS), are addressed in this document.

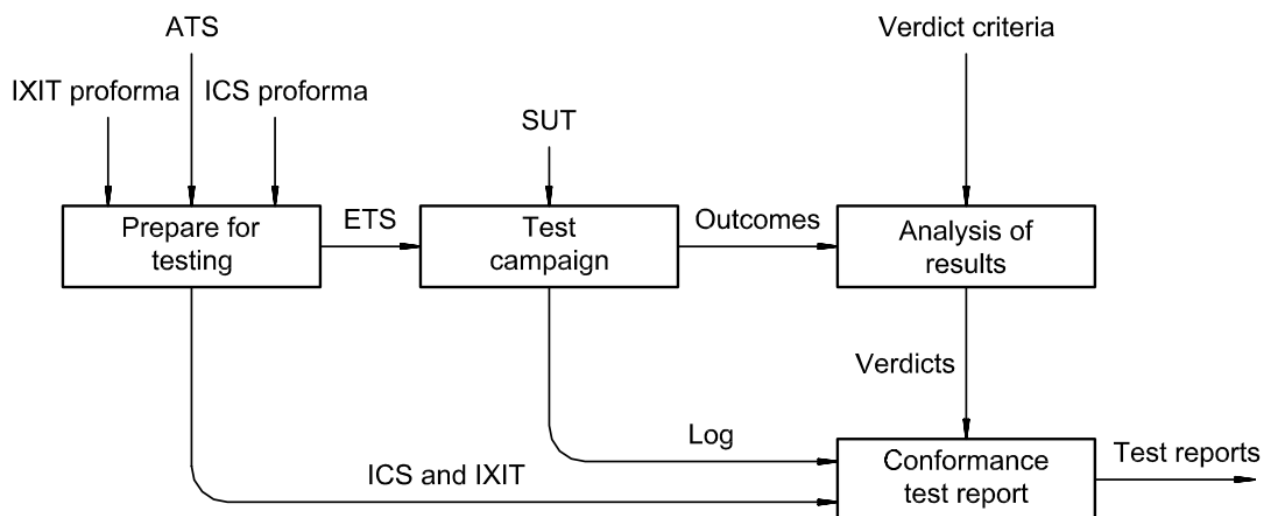


Figure 1. Conformance assessment process overview (ISO/TC211 2000)

4 Conduction of conformance testing

4.1 Preparation for the testing

- 4.1.1 The preparation for the testing phase should involve the following activities:
- a) production of administrative information;
 - b) production of ICS and IXIT for testing;
 - c) identification of test: name, purpose, method, type, testing type and ATS (Figure 2);
 - d) definition of executable tests **adapted to the IUT** by selection of initial **executive test cases (see point 5.1.4) derived from the** abstract test cases and assignment of parameter values based on the ICS and the IXIT;
 - e) setting up hierarchy and unique identifiers for the abstract and executable test cases¹;
 - f) preparation of the SUT (NOTE This enables a client to run executable test cases on the IUT before presenting the IUT for the test campaign);

4.2 IXIT proforma

- 4.2.1 The Implementation eXtra Information for Testing is a statement containing all of the information related to the implementation under test (IUT) and its corresponding system under test (SUT) which will enable the testing laboratory to run an appropriate test suite against that IUT and perform correct analysis afterwards. An IXIT typically provides the details on the organization and storage of concepts in the SUT as well as on the means of access to and modification of the SUT.
- 4.2.2 In the context of LPIS QA, The IXIT probes into **eight** implementation options that any LPIS custodian must have made at one point to address the choices or options offered by the Regulations:
- The author/actor of the primary boundary of the reference parcel. The primary boundary or perimeter represents the land corresponding to the reference parcel identifier. The outcome defines the reference parcel type
 - The process that lead to the delineation of the physical borders of the agricultural land to be used as maximum eligible area.
 - The way the eligible landscape features, if applicable, have been adjudicated to the reference parcel
 - The processing of the spatial themes above to assemble a maximum eligible area for each individual reference parcel perimeter
 - The application of pro rata reduction of permanent grasslands with scattered ineligible features
 - The validation and documentation of the required positional accuracy requirements.
- 4.2.3 These issues are addressed under IXIT rather than the ICS below or than metadata because the IXIT results play an important role in the inspection procedures and automatic screening of the annual data value tests.
- 4.2.4 The procedure to test, document and report these **8** choices are described in the separate document: annex X TG IXIT. **Please follow the instructions of this TG IXIT in Annex X.**

¹ For the purpose of this MTS, a standardized and common coding of the executable test cases for all EU MS is proposed, based on 5 -digit number.

4.3 ICS proforma

- 4.3.1 The implementation conformance statement (ICS) provides a statement of the options available in the LCM which have been **adopted** by a particular implementation. The ICS provides a better understanding of the LPIS implementation under test (IUT) and helps to identify the boundaries of the testing domain. **ICS can describe the specific options implemented in the IUT that serve as a basis for the adaptation of the initial executable test cases (see point 5.1.4).** These relevant options are only those specified within the framework of requirements in the LCM.
- 4.3.2 **Since the particular implementation options can be reflected in the revised executive test cases, there** is no ICS required in this version of TG MTS. It is an optional document.

4.4 Other IXIT/ICS-related information components

- 4.4.1 There are two other LPIS QA information components that are not in the scope of the IXIT and ICS, but are part of the MTS 2.0 since they provide other essential information on the choices and lineage regarding the IUT:
- The eligibility profile which provides an LCML²-compatible catalogue of the land cover classes deemed eligible by the LPIS custodian. The eligibility profile methodology and format are described in Annex III of the TG ETS.
 - Metadata on the source and reference datasets involved in the assemblage of the reference parcel with respect to perimeters and borders (see Annex X IXIT). This particular metadata is sufficiently structured by the INSPIRE implementing rules on metadata and the relevant data specifications. The selected metadata elements relevant for MTS are given in tables 2 and 3, as well as separately in Annex XI (MTS log).

² Land Cover Meta Language (ISO 19144-2)

5 Model ATS - Abstract Test Suite

- 5.1.1 A model ETS is produced as a result of selecting abstract test cases and assigning parameter values based on the model ATS. At this point, the IUT and the scope of the conformance assessment process are fixed and cannot be changed subsequently.
- 5.1.2 The scope of this TG MTS covers 3 abstract test cases (model ATS) upon which initial executable test cases (model ETS) are proposed. These abstract test cases are strictly within the LCM scope. They are design based on the assumption that the IUT and the correspondent SUT are well documented (feature catalogue, conceptual model, system implementation and architecture, database structure, etc.). Separate "system definition" tests, dedicated to check the availability of the relevant documentation and retrieve information about the MS's system (unrelated to LCM), are not required for this version of the MTS (v2.0).
- 5.1.3 The naming of the 3 abstract test cases is quite self-explanatory on their intended purpose:
 - 1. featureTypeCompleteness – check for availability all required features types
 - 2. attributeTypeCompleteness – check for the availability of all require attributes for a given feature type
 - 3. codeListEnumerationCompleteness – check for availability of a complete list of values in the required enumeration
- 5.1.4 A set of 41 initial executable test cases has been proposed to test model properties regarding 4 LCM entities. For the purpose of the data testing of the annual quality assessment, only these four entities are relevant.
 - 1. ReferenceParcel
 - 2. AgriculturalLand
 - 3. LandscapeFeature
 - 4. Anomaly
- 5.1.5 A test log report template (ModelTestSuite.XML) is derived from a regular, standard application schema (ModelTestSuite.XSD), using an UML class diagram (*Figure 2*).

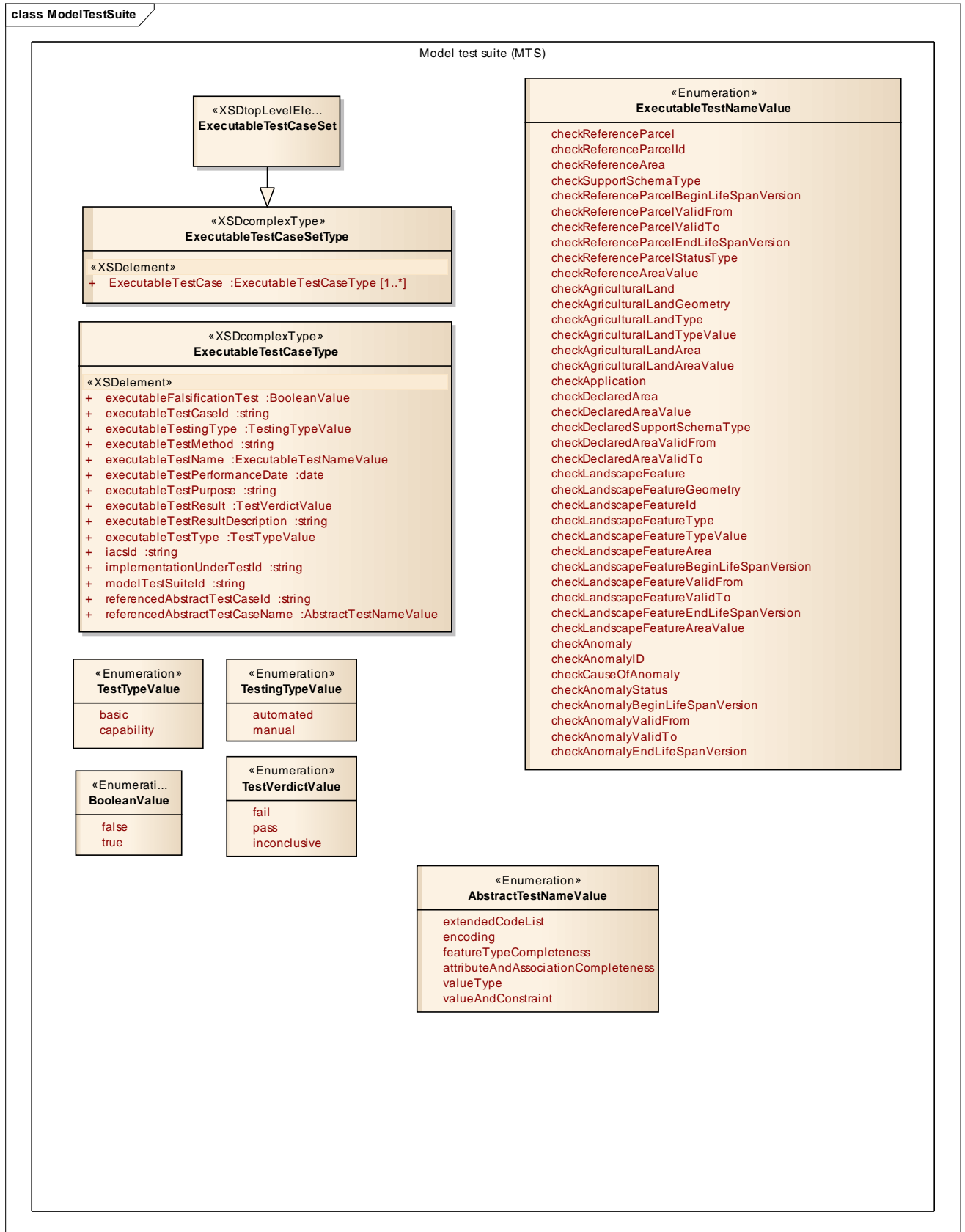


Figure 2. Application schema ModelTesSuite.XSD

5.1.6 These 41 executable test cases derived from the 3 abstract test cases have been prepared by DG JRC without providing a hierarchy of the tests. The specific hierarchy depends on the SUT implementation options. Although initial descriptions for each executable test case have been prepared by DG JRC, some of these descriptions can be considered as indicative. MS can adapt them depending on their system. The resulting hierarchy, IUT, identifiers, descriptions of methods and

purposes together with the applicable parameters should be extensively documented by MS.

- 5.1.7 In addition to the diagram in *Figure 2*, all 3 abstract and all 41 executable test cases are provided in *Table 1* below. The names of columns are derived from application schema (ModelTesSuite.XSD) directly. The exact element description can be retrieved by the online http://lpis.jrc.ec.europa.eu/CAP_IACS/index.htm (European Commission DG JRC 2015); simply remove the string "check" from the mnemonic name of executable test case name below (**Executable Test Case Name** column).
- 5.1.8 E.g. For the executable test case name "checkreferenceArea" the corresponding element in LCM online will be "referenceArea". All descriptions of each element then can be found by navigating within it in LCM.
- 5.1.9 In *Table 1* there is no column "Executable test method". This is on purpose as to avoid redundancy in the table, as it implied by the column "executable test type". There is only one method for all executable test cases within TG MTS which is the **capability test**.
- 5.1.10 This capability test performs a source (LCM) to target (SUT) element mapping, identifies the model element in the SUT that corresponds to the specified LCM element. If a correspondence is found or if there is a documented evidence that for the given IUT this element is not applicable (case of landscape features), the test will pass and the names of corresponding element(s) or evidences shall be documented in the test result.
- 5.1.11 The feature elements expected to be present in any IUT, are the Reference parcel, the Agriculture Land, Aid Application, and Anomaly. If any of these elements is absent in the SUT, the test will fail. The presence feature elements Landscape Feature is optional, depending on the choices made by the EU Member State.

Table 1. The list of abstract and executable test cases. Each test case has its purpose, type and example of result description (in case test verdict – “Pass”).

ID	executableTestName	referencedAbstractTestCaseName	executableTestPurpose	executableTestType	executableTestResultDescription (example of a test outcome; given values should be considered not exhaustive and purely indicative)
10	Group of tests related to the Reference Parcel feature type				
1210	checkReferenceParcel	featureTypeCompleteness	Check availability of corresponding LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. there is a feature class named "referenceParcel" within GDB (LPIS)
1411	checkReferenceParcelId	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. feature class "referenceParcel" within GDB has attribute field "RPIId" (thematic identifier or GUID)
1412	checkReferenceArea	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. feature class "referenceParcel" within GDB has attribute fields "BPS area", "SAPS area", "NATURA 2000 area"
1413	checkSupportSchemaType	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. "SupportSchema" domain in GDB with following values: "BPS", "SAPS area", "NATURA 2000", "young farmer scheme"; "small farmer scheme". For a given reference parcel, there is a specific maximum eligible area value for each of the support schemes defined
1414	checkReferenceParcelBeginLifeSpanVersion	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. "InitialDate" attribute within "referenceParcel" table in GDB.
1415	checkReferenceParcelValidFrom	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. "EffectiveDate" attribute within "referenceParcel" table in GDB.
1416	checkReferenceParcelValidTo	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. "EndEffectiveDate" attribute within "referenceParcel" table in GDB.

1417	checkReferenceParcelendLifeSpanVersion	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. "EndDate" attribute within "referenceParcel" table in GDB.
1418	checkReferenceParcelStatusType	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. "Status" attribute within "referenceParcel" table in GDB.
1519	checkReferenceAreaValue	ValueTypeCompleteness	Check availability of corresponding value type for attribute field in LCM ReferenceParcel element within SUT.	Capability test	Result description e.g. The values for the maximum eligible area in attribute fields "BPS area", "NATURA 2000 area" of the feature class "RreferenceParcel" are stored in hectares . The data type is "double". Note: The minimum information required is: (1) the type of unit used for the area values; (2) the data type of the attribute field, together with the precision if applicable.
20	Group of tests related to the BPS/SAPS layer feature types				
1220	checkAgriculturalLand	featureTypeCompleteness	Check availability of corresponding LCM Agriculture Area element within SUT.	Capability test	Result description e.g. there is a feature class named "agriculture area" within GDB (LPIS)
1421	checkAgricultureLandGeometry	attributeAndAssociationCompleteness	Check availability of geometric representation for the LCM Agriculture Area element within SUT.	Capability test	Result description e.g. feature class named "agriculture area" has/has not a geometry. The geometric representation used for all classes is polygon.
1422	checkAgriculturalLandType	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Agriculture Area element within SUT.	Capability test	Result description e.g. "AgriculturalArea" domain assigned to "AgriculturalAreaType" field within feature class "ReferenceParcel".
1323	checkAgriculturalLandTypeValue	codeListEnumerationCompleteness	Check the completeness of the enumeration list for the corresponding attribute field of LCM Agriculture Area element within SUT.	Capability test	Result description e.g. "AgriculturalArea" domain in GDB with following values: "ArableLand", "PermanentCrop"; "PermanentGrassland"

1424	checkAgriculturalLandArea	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Agriculture Area element within SUT.	Capability test	Result description e.g. feature class "ReferenceParcel" within GDB has attribute fields " available agriculture area per agriculture type"
1525	checkAgriculturalLandAreaValue	ValueTypeCompleteness	Check availability of corresponding value type for attribute field in LCM Agriculture Area element within SUT.	Capability test	Result description e.g. The values for the available agriculture area in attribute fields " available agriculture per agriculture type" are stored in hectares. The data type is "double". Note: The minimum information required is: (1) the type of unit used for the area values; (2) the data type of the attribute field, together with the precision if applicable.
30	Group of tests related to the aid application feature type				
1230	checkApplication	featureTypeCompleteness	Check availability of corresponding LCM Application element within SUT.	Capability test	Result description e.g. there is a feature class named "aid application" within GDB (IACS)
1431	checkDeclaredArea	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Application element within SUT.	Capability test	Result description e.g. feature class "aid application" within GDB has attribute field "Declared_Area"
1532	checkDeclaredAreaValue	ValueTypeCompleteness	Check availability of corresponding value type for attribute field in LCM Application element within SUT.	Capability test	Result description e.g. The values for the area declared by the farmer in attribute field "Declared_Area" are stored in hectares. The data type is "double". Note: The minimum information required is: (1) the type of unit used for the area values; (2) the data type of the attribute field, together with the precision if applicable.
1433	checkDeclaredSupportSchemaType	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Application element within SUT.	Capability test	Result description e.g. "DeclaredSupportSchema" domain in GDB with following values: "BPS", "NATURA 2000", "young farmer schema"; "small farmer schema"

1434	checkDeclaredAreaValidFrom	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM Application element within SUT.	Capability test	Result description e.g. "EffectiveDate" attribute within "aid application" table in GDB.
1435	checkDeclaredAreaValidTo	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM Application element within SUT.	Capability test	Result description e.g. "EndEffectiveDate" attribute within "aid application" table in GDB.
40	<i>Group of tests related to the landscape element feature type</i>				
1240	checkLandscapeFeature	featureTypeCompleteness	Check availability of corresponding LCM Landscape Feature element within SUT.	Capability test	Result description e.g. there is a feature class named "Landscape elements" within GDB (LPIS)
1441	checkLandscapeFeatureGeometry	attributeAndAssociationCompleteness	Check availability of geometric representation for the LCM Landscape Feature element within SUT.	Capability test	Result description e.g. feature class named "landscape element" has/has not a geometry. The geometric representation: line for the following landscape feature types..., and polygon for the following landscape feature types.
1442	checkLandscapeFeatureId	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Landscape Feature element within SUT.	Capability test	Result description e.g. feature class "Landscape element" within GDB has attribute field "LFId" (thematic identifier or GUID)
1443	checkLandscapeFeatureType	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Landscape Feature element within SUT.	Capability test	Result description e.g. feature class "Landscape element" within GDB has attribute field "Type"
1344	checkLandscapeFeatureValueType	codeListEnumerationCompleteness	Check the completeness of the enumeration list for the corresponding attribute field of LCM Landscape Feature element within SUT.	Capability test	Result description e.g. "LandscapeFeatureType" domain in GDB with following values: "ponds", "groupOfTrees", "hedges"
1445	checkLandscapeFeatureArea	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Landscape Feature element within SUT.	Capability test	Result description e.g. feature class "referenceParcel" within GDB has attribute fields "Area"
1446	checkLandscapeFeatureBeginLifeSpanVersion	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM LandscapeFeature element within SUT.	Capability test	Result description e.g. "InitialDate" attribute within "LandscapeFeature" table in GDB.

1447	checkLandscapeFeatureValidFrom	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM LandscapeFeature element within SUT.	Capability test	Result description e.g. "EffectiveDate" attribute within "LandscapeFeature" table in GDB.
1448	checkLandscapeFeatureValidTo	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM LandscapeFeature element within SUT.	Capability test	Result description e.g. "EndEffectiveDate" attribute within "LandscapeFeature" table in GDB.
1449	checkLandscapeFeatureendLifeSpanVersion	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM LandscapeFeature element within SUT.	Capability test	Result description e.g. "EndDate" attribute within "LandscapeFeature" table in GDB.
15491	checkLandscapeFeatureAreaValue	ValueTypeCompleteness	Check availability of corresponding value type for attribute field in LCM Landscape Feature element within SUT.	Capability test	Result description e.g. The values for the eligible area in attribute fields "Area" of the feature class "Landscape Feature" are stored in hectares. The data type is "double". Note: The minimum information required is: (1) the type of unit used for the area values; (2) the data type of the attribute field, together with the precision if applicable.
50	<i>Group of tests related to the anomaly feature type</i>				
1250	checkAnomaly	featureTypeCompleteness	Check availability of corresponding LCM Anomaly element within SUT.	Capability test	Result description e.g. there is a feature class named "Anomalies" within GDB (IACS)
1451	checkAnomalyID	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Anomaly element within SUT.	Capability test	Result description e.g. feature class "Anomalies" within GDB has attribute field "ID" (Unique or thematic identifier)
1452	checkCauseOfAnomaly	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Anomaly element within SUT.	Capability test	Result description e.g. feature class "Anomalies" within GDB has attribute field "Anomaly Cause".
1453	checkAnomalyStatus	attributeAndAssociationCompleteness	Check availability of corresponding attribute field in LCM Anomaly element within SUT.	Capability test	Result description e.g. feature class "Anomalies" within GDB has attribute field "Status".
1454	checkAnomalyBeginLifeSpanVersion	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM Anomaly element within SUT.	Capability test	Result description e.g. "InitialDate" attribute within "Anomalies" table in GDB.

1455	checkAnomalyValidFrom	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM Anomaly element within SUT.	Capability test	Result description e.g. "EffectiveDate" attribute within "Anomalies" table in GDB.
1456	checkAnomalyValidTo	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM Anomaly element within SUT.	Capability test	Result description e.g. "EndEffectiveDate" attribute within "Anomalies" table in GDB.
1457	checkAnomalyEndLifeSpanVersion	attributeAndAssociationCompleteness	Check availability of corresponding metadata for LCM Anomaly element within SUT.	Capability test	Result description e.g. "EndDate" attribute within "Anomalies" table in GDB.

6 Test campaign – performing the Model ETS

- 6.1.1 The model test campaign is the process of executing the model ETS and recording the observed test outcome and relevant information in the conformance log. Both the input to the IUT and the observed test outcome for each test case shall be recorded in the conformance test log report file (MTS - ModelTesSuite.XML). This recording and retention of all information is necessary for the analysis phase and for auditing purposes (ISO/TC211 2000).
- 6.1.2 During this testing phase, both manual and automatic testing are possible and allowed. A feature catalogue will always require manual testing while computer based testing can be possible when an application schema is available in an appropriate machine readable presentation (for example XML). DG JRC does not provide computer software for such automatic MTS tests.
- 6.1.3 Elements that are related to the environment in which the implementation shall be tested and considered important can still be collected as "Extra Information for Testing (IXIT}". In particular, this additional information should provide the details on organization and storage in the system and on the means of access. If needed, conversion methods between the concepts of the tested LPIS implementation and the LCM have to be developed.
- 6.1.4 The testing phase involves the following loop:
- For each of the 41 executable test cases:**
- a) Retrieve the executable test case from the predefined (by DG JRC) list which is stored in application schema (ModelTestSuite.XSD) *Table 1*.
 - b) Review whether the case has to be complemented with parameters. An executive test may be supplemented according to the specificities of the MS SUT. Where and when appropriate, document the resulting executive test case on test purpose, test method and other characteristics.
 - c) Run the (modified) executable test case against your SUT. Each test call can be executed either manually, or automatically (with or without dedicated testing software) *Figure 3*.
 - d) Document all informative messages in the test log file.
- 6.1.5 All 41 executable test cases should be conducted. A verdict should be given (assigned) to each of them.

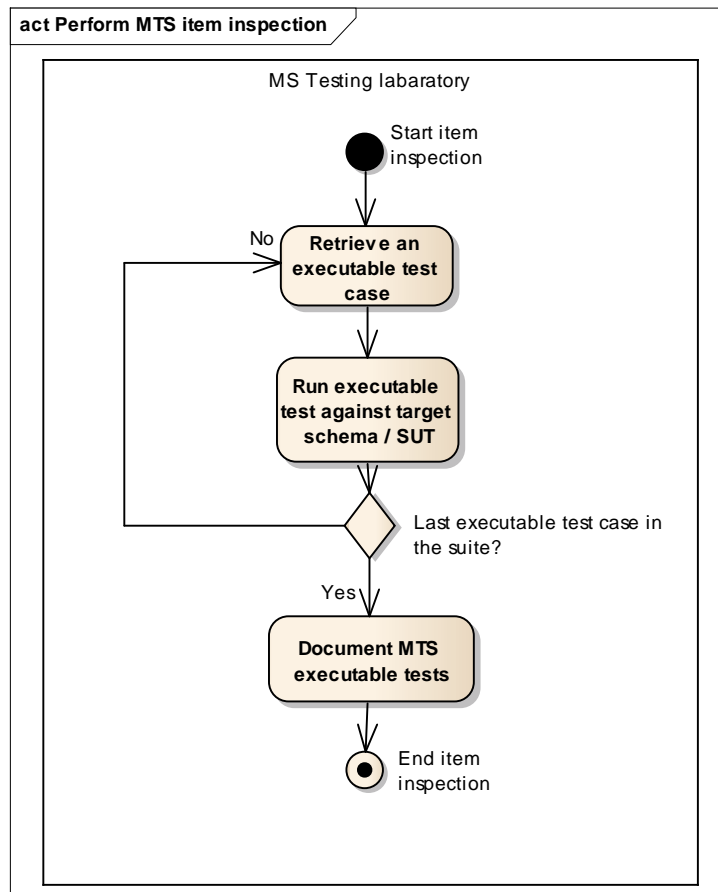


Figure 3. MTS item inspection

- 6.1.6 After all model executive test cases have been performed, the criteria and testing outcomes should be described in the (conformance) test log report file (ModelTesSuite.XML). The test log report should also hold the executable test case descriptions as informative messages for those that are defined/modified by the MS. Examples of each test are described in different documentation parts of application schema (ModelTesSuite.XSD) and the example case of Figure 24.

7 Test campaign – Finding system metadata values

7.1 Introduction

- 7.1.1 The INSPIRE metadata implementing rules set out the requirements for the creation and maintenance of metadata for spatial data sets, spatial data set series and spatial data services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC. It defines a number of metadata elements, their multiplicities and the value domains to be used in the metadata.
- 7.1.2 Whether the IUT is subject to above requirements depends on the Member State's designation of its LPIS as dataset under one of the INSPIRE themes. This TG MTS merely selects the metadata elements for datasets, if these are relevant under 2013R1306 art 48.1 (Access to information) and in particular linked to 2013R640 art 6.2 (LPIS quality assessment). Only the information that is relevant for the processing and understanding of the LPIS QA activities has been selected.
- 7.1.3 One can consider the INSPIRE metadata and orthoimagery implementing rules as the reference model for a common ATS/ETS. Hence the methodology for retrieving and reporting the system metadata is identical to the methodology above used for the data value mapping (test campaign – Model ETS). The only difference is that not the LCM but the INSPIRE metadata/orthoimagery model is referenced to. The model elements are referenced, but not duplicated here.
- 7.1.4 As a consequence, TG MTS uses two metadata reference sources:
- **IR MD:** "*INSPIRE Metadata Implementing Rules constitute technical Guidelines based on EN ISO 19115 and EN ISO 19119*" support Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata - http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf
 - **DS OI:** "*D2.8.II.3 Data Specification on Orthoimagery – Technical Guidelines*" describes the INSPIRE Data Specification for the spatial data theme Orthoimagery - http://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_OI_v3.0.pdf
- 7.1.5 This TG MTS provides two types of system metadata records: one for the spatial themes in vector/grid format and one for the ortho-rectified imagery.
- 7.1.6 Although many elements of these two metadata record types match those from IR MD, TG MTS does **not** require the creation of the record as specified in that IR MD. However, if an IR MD record is already available, much of TG MTS system metadata can be directly extracted from there.

7.2 System metadata for vector/thematic datasets

- 7.2.1 Relevant vector/thematic datasets in the IUT, are the theme of reference parcels, as well as optional source datasets.
- Each LPIS must hold a theme with the assembled reference parcels, each of which holds a maximum eligible area for direct payments, as it used during the crosscheck. This theme delivers the population of reference parcels that is subject to the ETS data value inspection. It is the output of the processes identified by the IXIT qualifier "D".
 - There may be ancillary source vector (or even raster) thematic data, applicable when identified by the IXIT; perimeters from a cadastral map, borders from a land cover inventory, a collection of land scape features. These datasets are identified respectively by IXIT qualifiers "A", "B" or "C".

7.2.2 The MTS system metadata record for a vector dataset holds these values:

Table 2

Metadata element name	Xsd-element type	Reference document	Reporting instruction
resourceTitle	gmd:CI_Citation_Type		
	gmd:title	IR MD	2.2.1 Resource title
	gmd:date	IR MD	TG Requirement 23 and TG Recommendation 15
	gmd:dateType	IR MD	(publication/creation/revision)
ixitQualifier	cap:ixitQualifierType	TG IXIT	(A/B/C/D)
temporalExtent	gmd:EX_TemporalExtent_Type	IR MD	2.6.1 Temporal extent
	gml:beginPosition		
	gml:endPosition		
resourceLocator	gmd:CI_OnlineResource_Type	IR MD	TG Requirement 3 and TG Recommendation 7
identifier	gmd:MD_Identifier_PropertyType	DS CP/DS LC	8.1 Metadata elements defined in INSPIRE Metadata Regulation
	gmd:code	IR MD	TG Requirement 5
	gmd:codeSpace	IR MD	TG Requirement 6
lineage	gmd:LI_Lineage_Type	IR MD	TG Requirement 26 (statement)
spatialResolution	gmd:MD_Resolution_Type	IR MD	TG Requirement 27 (equivalent scale, denominator)
responsibleParty	gmd:CI_ResponsibleParty_Type		
	gmd:organisationName	IR MD	TG Requirement 35
	gmd:role	IR MD	TG Recommendation 24
metadataPointOfContact	gmd:CI_ResponsibleParty_Type	IR MD	TG Requirement 37
	gmd:organisationName		
	gmd:electronicMailAddress		
	gmd:role		(pointOfContact)

7.3 System metadata for ortho datasets

- 7.3.1 Relevant ortho image data sets are the 1/5000 or larger scale ortho-image dataset(s), aerial and/or satellite, that, as a combination covers the whole territory and provides the most recent capture for a given site. It is in use for the graphical processes (application, LPIS upkeep) of the direct payments.
- If two or more distinct datasets cover the entire territory of the IUT, a separate metadata record for each is appropriate.
 - The OTSC (ortho) imagery, acquired for the annual OTSC processes **and provided by JRC**, is not considered.

7.3.2 The MTS system metadata record for an ortho image dataset holds these values:

Table 3

Metadata element name	Xsd-element type	Reference document	Reporting instruction
-----------------------	------------------	--------------------	-----------------------

resourceTitle	gmd:CI_Citation_Type		
	gmd:title	IR MD	2.2.1 Resource title
	gmd:date	IR MD	TG Requirement 23 and TG Recommendation 15
	gmd:dateType	IR MD	(publication/creation/revision)
resourceLocator	gmd:CI_OnlineResource_Type	IR MD	TG Requirement 3 and TG Recommendation 7
identifier	gmd:MD_Identifier_PropertyType	DS CP/DS LC	8.1 Metadata elements defined in INSPIRE Metadata Regulation
	gmd:code	IR MD	TG Requirement 5
	gmd:codeSpace	IR MD	TG Requirement 6
lineage	gmd:LI_Lineage_Type	IR MD	TG Requirement 26 (statement)
spatialResolution	gmd:MD_Resolution_Type	IR MD	TG Requirement 27 (ground sample distance)
responsibleParty	gmd:CI_ResponsibleParty_Type		
	gmd:organisationName	IR MD	TG Requirement 35
	gmd:role	IR MD	TG Recommendation 24
metadataPointOfContact	gmd:CI_ResponsibleParty_Type	IR MD	TG Requirement 37
	gmd:organisationName		
	gmd:electronicMailAddress		
	gmd:role		(pointOfContact)
imageSource	cap:imageSourceType	DS OI	8.3.6 Data source
sensorPlatform	cap:sensorPlatformType	n/a	(aerial film/aerial CCD / satellite)
sensorDistance	gmd:MD_Resolution_Type	IR MD	TG Requirement 27
sensorOrganisationName	gmd:CI_ResponsibleParty_Type	IR MD	TG Requirement 35
	gmd:organisationName		
	gmd:electronicMailAddress		
	gmd:role		
phenomenonTime	cap:phenomenonTimeType	DS OI	IR Requirement Annex III, Section 3.5.2; TG Recommendation 9
	sensorBegin		
	sensorEnd		
elevationData	cap:elevationDataType	DS OI	8.3.6 Data source
demPlatform	cap:demPlatformType	n/a	(stereorestitution/lidar/radar)
surfaceType	el-bas:SurfaceTypeValueType	DS EL	5.7.2.2.5. SurfaceTypeValue
demDistance	gmd:MD_Resolution_Type	IR MD	TG Requirement 27
demOrganisationName	gmd:CI_ResponsibleParty_Type		

	gmd:organisationName	IR MD	TG Requirement 35
	gmd:electronicMailAddress		
	gmd:role		

7.4 Metadata reporting requirements

- 7.4.1 For each separate spatial dataset identified or mentioned in the IXIT, whether vector, raster or imagery, an individual system metadata record is required.
- 7.4.2 By consequence, for any given IUT, at least two metadata records are expected
 - 1. One vector metadata record for the assembled reference parcels (IXIT-qualifier "D").
 - 2. One image metadata record for the latest image coverage.
- 7.4.3 Depending on the use of ancillary data, the state of the image coverage and the dates of the last systematic update of the datasets, additional metadata records have to be delivered.

8 Analysis of results

- 8.1.1 The analysis of results shall be performed by evaluating the observed test outcome against the verdict criteria which are prescribed by the abstract test case. Although there is a clear conceptual distinction between the test campaign and the analysis phase, in the TG MTS context, the two may overlap in time. A test verdict is a statement of pass, fail or inconclusive. A (rare) verdict of inconclusive or failure needs a justification.
- a) A "pass verdict" means that the observed test outcome gives evidence of conformance to the conformance requirement on which the test purpose is focused, and is valid with respect to the relevant LCM element and with respect to the ICS (if provided).
 - b) a "fail verdict" means that the observed test outcome demonstrates non-conformance with respect to either a test purpose or at least one conformance requirement in the relevant element in LCM. In the LPIS context this means that the IUT doesn't fulfill a specific requirement from the LCM. This can be either a lack of required features type, or incompleteness of enumeration list, or omission of required attribute.
 - c) an "inconclusive verdict" means that the observed test outcome produces neither a pass nor a fail verdict. This should occur only in very rare circumstances. EXAMPLE: "Test-case error".
- 8.1.2 A justification shall be given with each fail or inconclusive verdict (in a separate document); informative messages or additional log files may also be provided.
- 8.1.3 The executable test case verdict shall be assigned to a particular test outcome using the verdict criteria relevant to that particular abstract test case. The test verdicts assigned shall then be synthesized into an overall summary for the IUT (Done later by DG JRC).
- 8.1.4 For example, a particular IUT has certain commitments to record in the LPIS landscape features subject to retention (under GAEC 7). An abstract test case could therefore be formulated as "featureTypeCompleteness" test. The corresponding executable test case would be phrased as "checkLandscapeFeature". If the LPIS (SUT) has implemented this requirement by creating a feature class "Landscape Feature" within its GIS/RDBMS then "Pass" verdict should be assigned and textual description should be provided. Example table (Table 4) is provided below. The MS LPIS would be conformant to the abstract test case "featureTypeCompleteness" if the verdicts of all executable test cases within it are assigned as "Pass".

Table 4. Analysis and documentation. Example of executable test case Nr. 1240 of Table 1.

Executable Test Case Name	Referenced Abstract Test Case Name	Executable Test Purpose	Executable Test Method	Executable Test Type	Executable Test Case Result Description	Executable Test Case Verdict
checkLandscapeFeature*	featureTypeCompleteness*	Check corresponding LCM EcologicalFocusArea element availability within SUT.	Check availability of corresponding LCM Landscape Feature element within SUT.	Capability test	Result description e.g. there is a feature class named "Landscape elements" within GDB (LPIS)	Pass

*- abstract test cases and initial executable test cases are provided by JRC.

9 Delivery – MTS package

9.1 XML-delivery of the MTS package

- 9.1.1 The MTS is an element of the LPIS quality assessment framework. The MTS precedes the data conformance testing procedures of TG ETS. The MTS procedure above shall be performed each time when a new LCM or a local LPIS implementation (new eligibility profile, new database structure) is installed. In case no system redesign or substantial system upgrade are made on the SUT, there is no need to repeat the MTS for the annual quality assessment. It is sufficient to refer to the latest MTS report. The annual data ETS report shall indicate which year the last MTS was done and what the result of conformance statement was.
- 9.1.2 The upload and update of the MTS package values is synchronous with the upload of the ETS reporting package, set to the 31st of January following the assessment year.
- 9.1.3 As a result, **for 2016, an initial, complete MTS package shall be uploaded by 31 January 2017.**
- 9.1.4 Any change of the MTS or metadata values that are rather dynamic by nature (such as temporalExtent of SUT, a change of image specification / lineage / contractor or a change of third party metadata) can be reported by the 31st of January by manually updating the affected values in the MTS database. An LPIS QA portal application will be available for data entry and these edits avert the need to upload a complete MTS package.

9.2 XML-delivery of the MTS package

- 9.2.1 The results of conformance testing are documented in a conformance test log (ModelTesSuite.XML). As documented above, this file shall provide an overview of the actual executive test cases executed in the assessment process and their verdicts (i.e. descriptions of the executable test cases and results). All necessary documents relating to the conduct of the model conformance assessment process for MTS are packaged in the MTS reporting package.
- 9.2.2 It consists of:
- a) The mandatory MTS conformance testing log report file (ModelTesSuite.XML). A prefilled example is provided on:
<http://lpis.jrc.ec.europa.eu/GTCAP/registry/examples/>
 - b) The conditional MTS application schema (ModelTesSuite.XSD). This schema becomes mandatory when the default JRC application schema of the model ETS has been extended/modified by the MS. Otherwise it is optional.
The default application schema is provided on:
<http://lpis.jrc.ec.europa.eu/GTCAP/registry/>
 - c) The mandatory IXIT report file (Ixit.XML). A prefilled example is provided on:
<http://lpis.jrc.ec.europa.eu/GTCAP/registry/examples/>
 - d) The eligibility profile in xml (EligibilityProfile.xml). A prefilled example is provided on: https://marswiki.jrc.ec.europa.eu/wikicap/index.php/ETS_Downloads
 - e) INSPIRE-related metadata records for the implementation and source datasets in xml (under development)
 - f) Separate free-style document with justifications/explanations for each test case that resulted with "fail" and "inconclusive" verdicts
- 9.2.3 The example of one executable test case (within ModelTesSuite.XML) within Conformance test log report file is presented in the *Figure 4*.

```

<?xml version="1.0" encoding="UTF-8"?>
<cap:ExecutableTestCaseSet
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://lpis.jrc.ec.europa.eu/registry/6.0.0 http://lpis.jrc.ec.europa.eu/registry/6.0.0/ModelTestSuite.xsd"
  xmlns:cap="http://lpis.jrc.ec.europa.eu/registry/6.0.0"
  xmlns="http://lpis.jrc.ec.europa.eu/registry/6.0.0">
  <ExecutableTestCase>
    <executableFalsificationTest>false</executableFalsificationTest>
    <executableTestCaseId>1210</executableTestCaseId>
    <executableTestingType>manual</executableTestingType>
    <executableTestMethod>Perform source (LCM) target (SUT) element mapping. If there are corresponding LCM element within SUT then test will
    - pass. If there is no element (s) within the SUT - then test will - fail. Names of corresponding element(s) shall be provided in test
    result description.</executableTestMethod>
    <executableTestName>checkReferenceParcel</executableTestName>
    <executableTestPerformanceDate>2016-04-13</executableTestPerformanceDate>
    <executableTestPurpose>Check availability of corresponding LCM ReferenceParcel element within SUT.</executableTestPurpose>
    <executableTestResult>pass</executableTestResult>
    <executableTestResultDescription>feature classes within GDB "Sklypai2010".</executableTestResultDescription>
    <executableTestType>capability</executableTestType>
    <classId>{3F2504E0-4F89-11D3-9A0C-0305E82C3301}</classId>
    <implementationUnderTestId>Lithuanian LPIS</implementationUnderTestId>
    <modelTestSuiteId>1</modelTestSuiteId>
    <referencedAbstractTestCaseId>12</referencedAbstractTestCaseId>
    <referencedAbstractTestCaseName>FeatureTypeCompleteness</referencedAbstractTestCaseName>
  </ExecutableTestCase>
  <ExecutableTestCase>
    <executableFalsificationTest>false</executableFalsificationTest>
    <executableTestCaseId>1411</executableTestCaseId>
    <executableTestingType>manual</executableTestingType>
    <executableTestMethod>Perform source (LCM) target (SUT) element mapping. If there are corresponding LCM element within SUT then test will
    - pass. If there is no element (s) within the SUT - then test will - fail. Names of corresponding element (s) shall be provided in test
    result description.</executableTestMethod>
    <executableTestName>checkReferenceParcelId</executableTestName>
    <executableTestPerformanceDate>2016-04-13</executableTestPerformanceDate>
    <executableTestPurpose>Check availability of corresponding attribute field in LCM ReferenceParcel element within SUT.
    </executableTestPurpose>
    <executableTestResult>pass</executableTestResult>
    <executableTestResultDescription>Result description e.g. feature class "Sklypai2010" within GDB has attribute field "RPId".
    </executableTestResultDescription>
    <executableTestType>capability</executableTestType>
    <classId>{3F2504E0-4F89-11D3-9A0C-0305E82C3301}</classId>
    <implementationUnderTestId>Lithuanian LPIS</implementationUnderTestId>
    <modelTestSuiteId>1</modelTestSuiteId>
    <referencedAbstractTestCaseId>14</referencedAbstractTestCaseId>
    <referencedAbstractTestCaseName>attributeAndAssociationCompleteness</referencedAbstractTestCaseName>
  </ExecutableTestCase>
</cap:ExecutableTestCaseSet>

```

Figure 4. An extract of one executable test case from ModelTestSuite.XML

9.2.4 After all conformance report log file (ModelTestSuite.XML) are filled with data then it should be validated against corresponding application schema (ModelTestSuite.XSD)³. Only valid ModelTestSuite.XML files with at least 41 executable test case descriptions should be sent back to DG JRC.

³ Please note that there is a new version of the LpisCommonTypes.xsd, adapted to handle the MTS checks. It is available on: <http://lpis.jrc.ec.europa.eu/GTCAP/registry/>

9.3 Alternative delivery: MTS-log worksheet

- 9.3.1 For 2016, all requested information, except for the eligibility profile and the document with justifications and explanations, can –alternatively – still be delivered via the MTS log located at <https://lpis.jrc.ec.europa.eu/GTCAP/registry>. Worksheet delivery implies a complete manual performance of the MTS, which is not recommended.
- 9.3.2 The worksheet template holds 5 tabs (Table 5) to cover the various components of the TG MTS.

Table 5

Worksheet TAB	instruction
IXIT	Fill in all values of this tab is required for the TG MTS lot
Module_M11	Fill in all values of this tab for the IUT
Module_M12	Fill in all values of this tab for the IUT
Vector Metadata	Fill in a separate tab for each individual vector/thematic dataset identified in the IXIT
Ortho Metadata	Fill in a separate tab for each individual ortho dataset that is part of the current coverage of the IUT territory

- 9.3.3 The values to be filled in the worksheet template are colour coded by the [ISO colour legend](#) to indicate the requirement on the value field.

Legend

yellow: mandatory

green: conditional

blue: optional

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