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SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN – Testing for NGN networks

Formalized presentation of testing results

Recommendation ITU-T Q.3903

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Recommendation ITU-T Q.3903

Formalized presentation of testing results

Summary

Recommendation ITU-T Q.3903 describes the main requirements for a knowledge base as per testing results formalization on model networks.

This Recommendation describes the principles of knowledge base filling as per testing results formalization, requirements to store various types of testing data and format of data presentation.

Source

Recommendation ITU-T Q.3903 was approved on 14 October 2008 by ITU-T Study Group 11 (2005-2008) under Recommendation ITU-T A.8 procedures.

Keywords

Knowledge base (KB), model networks, next generation networks (NGNs), public switched telephone networks (PSTNs), testing.

FOREWORD

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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.

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1 Scope

This Recommendation assumes conformance with the functionality and purpose defined in [ITU-T Y.2001], [ITU-T Y.2011], [ITU-T Q.3900] and [ITU-T Q.3901].

It defines a common requirements knowledge base (KB) and knowledge base as per testing results formalization (KBt), including principles of KBt filling, requirements to store various types of testing data and the format of data presentation.

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 Q.3900] Recommendation ITU-T Q.3900 (2006), *Methods of testing and model network architecture for NGN technical means testing as applied to public telecommunication networks*.

[ITU-T Q.3901] Recommendation ITU-T Q.3901 (2008), *Testing topology for networks and services based on NGN technical means*.

[ITU-T Y.2001] Recommendation ITU-T Y.2001 (2004), *General overview of NGN*.

[ITU-T Y.2011] Recommendation ITU-T Y.2011 (2004), *General principles and general reference model for Next Generation Networks*.

[ITU-T Y.2012] Recommendation ITU-T Y.2012 (2006), *Functional requirements and architecture of the NGN release 1*.

3 Definitions

This Recommendation defines the following terms:

3.1 knowledge base: Intelligence media ensuring user query processing and information analysing with subsequent brief or detailed query processing result.

3.2 model network: Communication network simulating functional capabilities peculiar to communication networks, possessing relevant architecture and functionality and using the same technical means.

3.3 NGN technical means: NGN base equipment yielding next generation network decisions which may be also employed in public switched telephone networks.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CDR Call Detail Record

KB Knowledge Base

KBt subsystem of Knowledge Base responsible for testing

SIP Session Initiation Protocol

SMCN Standard Model Communication Network

URI Uniform Resource Identifier

5 Conventions

None.

6 General requirements for KB

KB is a unified means for accumulation, storage and presentation of related data on various topics.

KB includes the following main subsystems: testing, system and network consulting, standardization, publications and training.

Subsystem "Testing" deals with formalization and unification of all data on telecommunication means testing (devices, protocols, system and network decisions, services, etc.).

Subsystem "System consulting" unifies data on elaborated decisions and their implementation on the basis of communication operator networks.

Subsystem "Standardization" formalizes and unifies international and national industry standards in the communication field.

Subsystem "Publications" contains data on acting research and general information publications in the telecommunication field.

Subsystem "Training" includes data on training seminars and courses in the telecommunication field.

KB structure is given in Figure 1.

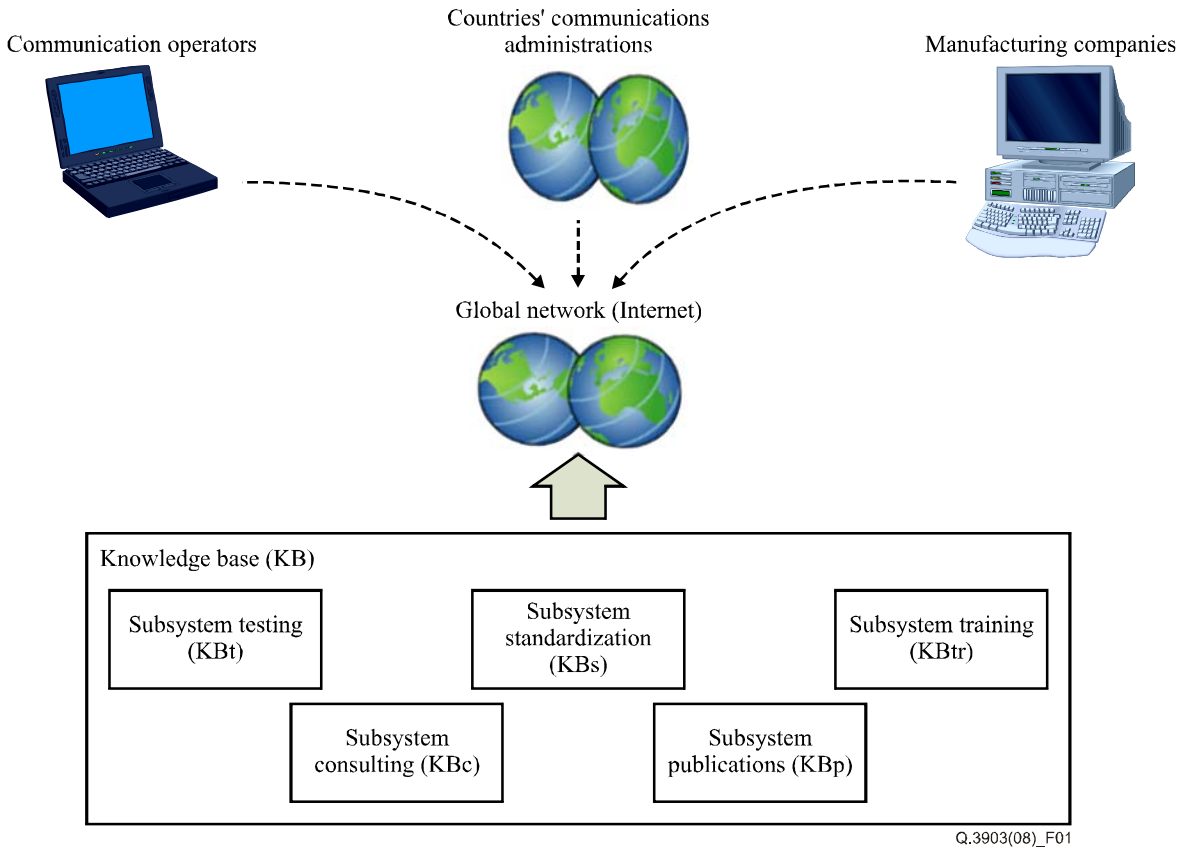

Figure 1 – KB structure chart

6.1 Requirements for KBt functionality

KBt provides for user query processing and information analysing with subsequent yielding of brief or detailed query processing results to users.

A list of main user queries and KBt analysis results is given in Table 1.

Table 1 – Main queries of users and KBt analysis results

User query	KB analysis result
1. Company name	1. In which projects this company participated
	2. Data on equipment checked within projects framework
	3. Testing results
	4. List of checks
	……..
2. Project name	1. Project general data
	2. Participating companies
	3. Test programme
	4. Project results conclusion
	…….
3. Date	1. List and number of projects performed before shown date
	2. List and number of companies participating in projects
	3. Tests statistics
	……
4. Test No.	1. Test description
	2. List of projects which included this test
	3. List of companies which performed this test
	4. Test performance results
	……
…….	……

6.2 Requirements for KBt data structure

KBt data structure consists of the following types of data:

1) Type No. 1 – Project general data;
2) Type No. 2 – Test object data;
3) Type No. 3 – Test charts and configuration of standard model communication network (SMCN);
4) Type No. 4 – Data on the project participants;
5) Type No. 5 – Test description;
6) Type No. 6 – Reference data;
7) Type No. 7 – Test performance results;
8) Type No. 8 – Statistical data.

All information types, except type No. 8, shall be put into the KBt by users in conformity with the access rights. Type No. 8 will be formed automatically based on the first seven data types. The subclauses here below provide a concise description of these data types. Specific fields to be filled in the process of downloading of every data type into the KBt are described in detail in clause 7.1, KBt structure.

6.2.1 Data type No. 1

This data type contains general project data including project aim, test performance terms data, list of participating companies and test performance location.

In the course of entering data type No. 1 into the KB, the following obligatory fields should be filled:

– project No.

6.2.2 Data type No. 2

This data type contains data about tested equipment and includes auxiliary data about equipment model, software version, functionality and some other useful information.

In the course of entering data type No. 2 into the KB, the following obligatory fields should be filled:

– company;
– equipment model name;
– software base version;
– auxiliary software;
– functionality;
– used protocols;
– IP addresses;
– signalling point code.

6.2.3 Data type No. 3

This data type contains general test charts and initial configurations for various test groups.

In the course of entering data type No. 3 into the KB, the following obligatory fields should be filled:

– figure No.;
– figure name.

6.2.4 Data type No. 4

This data type contains general information on the companies manufacturing the telecommunications equipment, telecom operators and testing facilities including the contact information.

When downloading into the KBt the type No. 4 data, one should fill the compulsory fields as follows:

– name of company;
– company essential details;
– company representatives;
– contact information.

6.2.5 Data type No. 5

This data type is a detailed test description including initial configuration.

In the course of entering data type No. 5 into the KB, the following obligatory fields should be filled:

– tests group;
– test No.;
– test aim;
– normative reference;
– configuration;

– test procedure;
– expected result.

6.2.6 Data type No. 6

This data type contains reference manuals on terminology, definitions, abbreviations and normative documents. Referential information is required during the formation of the documents "Test programme and techniques", "Test report", "Findings and conclusions on test results".

When data type No. 6 is downloaded into the KBt, it is necessary to fill in the following compulsory fields:

– entity-developer of a normative document;
– normative document type;
– number;
– name;
– symbolic designation/abbreviation;
– term;
– definition.

6.2.7 Data type No. 7

This data type contains tests performance results and information about used telephone numbers/addresses SIP URIs of terminal devices and IP addresses and signalling point codes of other devices. This data type also includes files with traces, call detail records (CDRs), statistical data and any other information containing test results.

In the course of entering data type No. 7 into the KB, the following obligatory fields should be filled:

– test performance date and time;
– telephone numbers/addresses SIP URIs;
– IP addresses;
– signalling point codes;
– name of file with traces;
– test results;
– test comments;
– responsible investigator;
– other test participants.

6.2.8 Data type No. 8

This data type contains information on the parameters of filters and the templates of reports of statistical investigations.

7 Requirements for KBt architecture

7.1 KBt structure

Dependent on its type, the data is kept in various KBt sections. Such sections and their interrelation are shown in Figure 2.

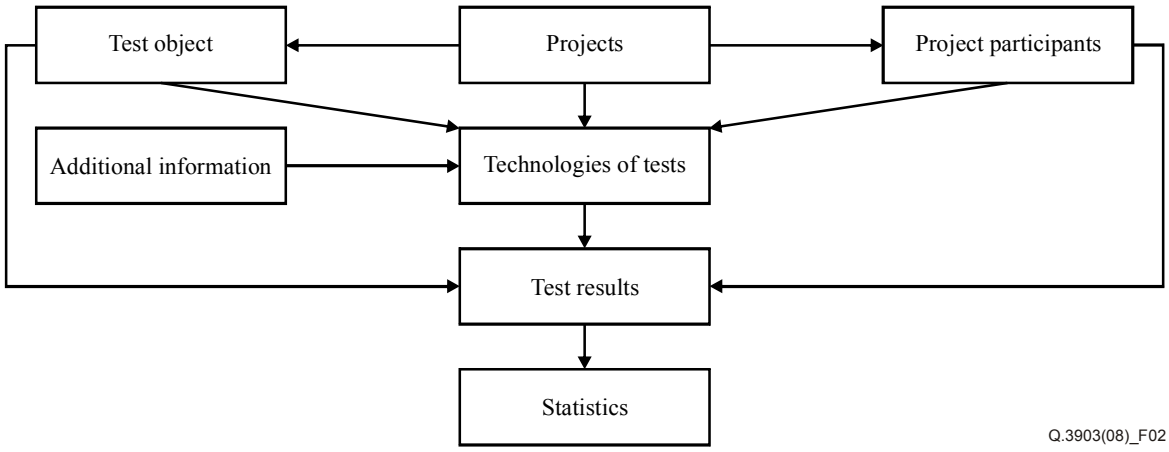

Figure 2 – KBt structural diagram

The KBt structure is represented in seven sections. In Table 2, the KBt data is presented and the content of each particular section is specified.

Table 2 – Principle KBt sections and their filling information

Section name	Section information
1. Projects	1. Project filing number
	2. Project identification number
	3. Project name
	4. Person in charge
	5. Starting date
	6. Termination date
	7. Companies
2. Project participants	1. Companies (vendors, operators, etc.)
	2. Testing facilities
3. Test object	1. Configuration of a model telecom network
	2. System-and-network solutions
	3. Services
	4. Protocols
4. Testing technologies	1. Testing programme and procedure
	2. Tests
5. Test results	1. Daily summary of test results
	2. Preliminary protocol
	3. Test protocol
	4. Test findings and conclusions
6. Statistics	A filtering system has been established to form the criteria of statistical investigations
7. Additional information	1. Normative documents
	2. Terms and definitions
	3. Symbolic designations and abbreviations

This section "Projects" is a basic one. According to the classifier of the projects at the stage of filing a new entry record, there will be committed allocation of a filing number record into the "Projects" section.

By an identification number, one should understand a unique sequence of symbols consisting of digits, letters, symbols "_" (undescore) and "." (dot). The identification number is formed out of the fragments of a filing (registration) number and, compared to the latter, has a minimal possible symbol sequence length. An identification number is designed to simplify a project searching procedure in the knowledge base.

Information on the project name shall be entered by a KBt user at the new project filing/registration stage. This information will have the format of a letter-symbol sequence and will be designed to form up project documents, such as a test programme or procedure, test protocol or test result findings.

A person in charge shall be a representative of the organization implementing the project; such a person shall be responsible for the timely execution of procedures under the project, as well as for the submission of reports accounting for the project implementation results, etc. Should the project comprise a few stages, it will be possible to appoint a person in charge for every individual phase. In this case, the information on a person in charge under the project shall be filled by the KBt user manually or automatically formulated based on the conglomerated data on the persons in charge taking into consideration the project structural phases.

Information on the project starting date shall be entered into the KBt by the user at the new project registration phase.

Information on the project termination date shall be entered into the KBt by the user at the new project registration phase. At the new project registration phase, a company shall be chosen which has initiated performance of the tests. Such a choice should be based on a preliminary created companies reference book (file) being kept in the project participants section.

The "Project participants" section will contain information on the companies interested in performance of tests, as well as on the test performers directly involved in testing procedures.

Among the companies interested in the test performance there may be vendors and carriers. Subsection "Vendors" will contain general information on an entity, including such company's details, representatives and a reference to the equipment (hardware) subsection providing a detailed description of this vendor's products to undergo testing.

Based on a specification of the tests to be performed for the telecom operators, the carriers subsection will contain general information on an entity, including such company's details, description of its representatives and a reference message to the services subsection containing detailed information on additional services to be tested in the model network environment.

On those who will personally perform the test procedures, the testing crew subsection will provide data concerning their full names, staff number, position, contact phones, e-mail address.

The content of the "Test object" section will specify the equipment to be tested and the auxiliary hardware being used in the model network for the purposes of arranging for testing procedures.

The subsection "Configuration of the model telecom network" will contain information on configuration data pertaining to the model telecom network; this data will be modified to meet a specific test project, including the model network configuration data, model network diagram, number capacity, codes of signalling points, IP address ranges, domain names, etc.

Information of the "Protocols" subsection is represented in the protocols reference file, which incorporates data on the names of protocols, whose implementation effect it will be possible to verify within the test project framework, as well as data on the versions in use, and a concise reference on the field of utilization of these protocols.

The section "Test procedures" is of an utmost significance for the project participants engaged in the practical part of a test procedure. This section contains a standard format test procedure reference file covering the procedures represented in the section in compliance with the test classifier; it also contains a reference file of test programmes and testing practices represented in compliance with the programme and procedure classifier.

The subsection "Test programme and procedure" comprises general information describing a document, such as registration and identification numbers, name, registration number of a project for whose implementation the programme has been designed; as well as the procedure, the person in charge of the development of this document, and the document origination date. There is a programme constructor designed to facilitate creation of a new document of the test programme and procedure. There also exist references to sections "Equipment" and "Projects" relevant to the highlighted programmes and procedures.

Besides the unified registration information, the "Tests" subsection represents the test performance technologies arranged in standard format tables. Registration information comprises the data of a registration number, test name and test type specified in conformity with the test classifier. It is only a KBt administrator who will have access to the options of test creation, editing and removal.

The section "Test results and findings" contains data acquired during the procedure of tests. There is a possibility of stage-to-stage presentation of the test results. There is a provision of a daily summary to report in detail on the successfully, or otherwise, performed tests, including relaying the reasons of an incorrectly terminated test procedure, configuration data and the name of a file with the traces. Subsection "Daily summary of test results" provides for a filtration system within a project.

Subsection "Preliminary protocol" contains general information on the tests' time protocol: a registration number of the programme and methodology of the performed test procedure, as well as on the equipment under testing. The section provides for project filtering. Data of the "Test protocol" subsection reflects general registration information similar to the registration data for subsection "Preliminary protocol"; this data also provides test protocol reference information. A test protocol constructor serves to create a new test protocol document. The section provides for filtering within a project. Data of the section provides some general registration information similar to the registration data for subsections "Preliminary protocol", "Tests protocol", as well as a reference file for the test findings and conclusions documents. A Test Findings Constructor will serve to create a new test protocol document. The "Statistics" section will help to specify the parameters of filtering and those of standard-format statistical data submission upon a user's request.

This section "Additional information" comprises a reference file of normative documents, and the data on normative document names, the developer entity of such documents, the types of normative documents with regard to the classifier, and the registration numbers. There is an option provided to refer to a source containing such a normative document, and to save the document on a data medium according to the user's access rights.

In the "Symbolic designations and abbreviations" subsection, there is a symbol and abbreviation reference file describing the symbols and abbreviations used in the KBt documents together with the generally accepted interpretation version.

Subsection "Terms and abbreviations" represents a symbol and abbreviation reference file describing the terms used in the KBt documents together with the corresponding generally accepted definitions.

7.2 KBt main elements structure and functionality

As shown in Figure 3, KBt is composed of three main functional elements: primary processing system, data storage system and data presentation system.

A primary processing system is used to convert incoming data into a format fit to be stored in KBt. After that, the processed data is transferred to a data storage system.

A data storage system ensures reliably structured storage of data and transmits inquired data to a data presentation system.

The data presentation system transmits queries of KBt users to the data storage system. The data storage system answers queries of the data presentation system which converts received answers into a format fit to be perceived by a KBt user and transmits these answers to KBt users. Access to data inquired by a KBt users is performed in compliance with security policies determined by KBt manager.

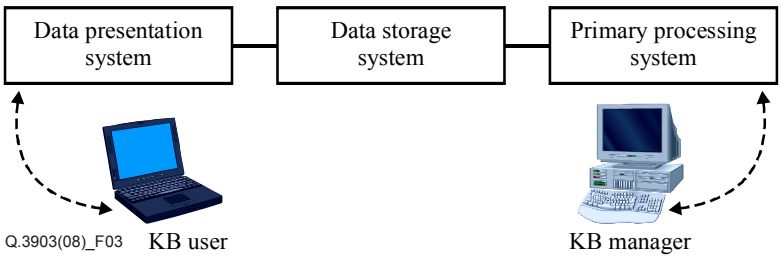

Figure 3 – KBt functional elements

7.3 KBt operating procedure description

A user will get authorized in the system and then, regarding his or her rights of access, perform the necessary actions. Within the KBt, the user profiles are defined as follows:

1) Profile No. 1 – KBt administrator.
2) Profile No. 2 – Nations' telecommunication administrations.
3) Profile No. 3 – Telecom operator.
4) Profile No. 4 – Vendor.
5) Profile No. 5 – Test performer.
6) Another profile specifiable in compliance with a specific user profile.

The user may perform various actions: to compliment, alter, remove and review the data. Also it is possible to save the necessary documents on a data medium.

Complementation of data will be performed by way of inputting the data by the user into the templates followed by data inflow, upon acknowledgement of data saving, into the system of data primary processing and further on into the data storage system.

Data review is achieved by outputting the data requested by the user upon having specified the request parameters. These parameters are transferred into the system of primary data processing, from where a full-fledged request is generated to address the data storage system. Upon having such a request processed, the data storage system transfers into the data presentation system (if there is any within the data storage system) all the data requested by the user. When the user receives the necessary data, he or she – on top of being able to review this data – will have an opportunity, if his or her rights permit, to access, remove or alter the data.

If the data need to be altered, the system of data preliminary processing will form a corresponding request to the data storage system. Resulted from processing of the request, the data requested by the user for removal will be transferred into the KBt archive and marked as removed.

All the data alteration processes will be done in accordance with the protocols of user activities and will be accompanied by the inputting of the following data into the KBt administrative space:

– time of making the alteration;
– person who has introduced the alteration;
– type of data undergoing the alteration;
– object of the data being altered;
– new value placed into the KBt data storage system.

Thus, filtering of the user's activity protocols allows to obtain a complete history of alterations made on particular data in the KBt.

8 Requirements for KBt operating procedures

8.1 Requirements for KB filling

KBt may be filled up both automatically and by the knowledge base administrator.

Automatic mode operation is performed through processing of standard format files by means of the system of data primary processing.

A knowledge base user, based on his or her access rights, will fill it by entering the data into standard forms.

The users should enter full data or, as sometimes specified, abbreviated data. Besides, when complementing a certain object of one of the major categories, the KBt should allow its entry only on indication of all of the necessary object parameters: thus, all the fields of obligatory filling should be highlighted or marked with a "*" symbol together with proper explanations to the user. Should the user leave any fields obligatory for filling empty, the KBt will have to accordingly notify the user offering him or her to put data into the required fields without saving the data already entered. If the user happens to have filled up all the obligatory fields, the KBt will transfer the data into its data storage system. On top of that, the KBt should warn the user of an attempt to save the data entered previously, if such an action contradicts the concept of the data storage system.

The KBt facilities should allow for varied verification of the entered data, including:

– technical verification of entered data, namely: compliance of the data type kept in the data storage system with the type of data being entered by the user, except for cases of data type conversion by the data primary processing system;
– spell checking in sections "Programme and procedure constructor" and "Test findings constructor";
– any other checks specifiable by the administrator according to the specifications of the testing participants.

8.2 Requirements for data storage in KBt

KBt should provide for an opportunity to keep the necessary data not only in the structured data format, but also as files.

KBt should provide for an opportunity to keep the vast volumes of text data (notes, conclusions, etc.).

KBt should provide for an opportunity to keep the data in two languages – English and Russian.

With the end of a year, the last 12 months' projects will be placed into an archive; at that time, the project enumeration pattern in the new year should go on, and the KBt should provide for an opportunity to review the archive data.

Such data record entries as a project, programme and procedure, test, daily summary, preliminary protocol, protocol and findings statement on the test results should be attributed with a unique identification number and have a unique name.

KBt should provide for a facility of data backup storage. There may be a few systems implemented for backup copying:

– automatic system of making the backup copies, whose next backup procedure time phase and volume will be regulated with regard to the volume of data accumulated in the KBt;
– automatic system of making the backup copies, whose next backup procedure time phase will be specified by the timetable;
– manual system of making the backup copies, whose functionality will depend on instructions from the KBt administrator.

Storage of the backup copies should be effected on a few physically distributed media.

The KBt facilities should provide for protection against unauthorized access to the data. Access to the KBt should be granted upon completion of the authentication and authorization procedures.

8.3 Requirements for data presentation from KBt

KBt should provide for an opportunity of representing the stored data in the format of the following documents:

– test programme and procedure;
– testing journal;
– corrections journal;
– testing protocol and findings conclusion.

8.3.1 Structure of programme and methods of tests

Programme and methods of tests should include test charts, equipment configuration description, list of tests and groups of tests performed within the given project framework including test No., test aim, test procedure, normative reference and expected result.

Format of data presentation from KBt in the form of programme and methods of tests is given in Appendix I.

8.3.2 Structure of testing journal

The testing journal should include data on a performed test list, date and time. The test log should also contain data on scheduled tests and tests which have not been performed due to relevant reasons.

Format of data presentation from KB in the form of test log is given in Appendix II.

8.3.3 Structure of corrections journal

The corrections journal should include data on list of tests in which certain remarks have been revealed. Each remark should be classified by its type, state (corrected/not corrected) and method of remedy.

Format of data presentation from KB in the form of a revealed remarks log is given in Appendix III.

8.3.4 Structure of testing protocol and findings conclusion

The testing protocol and findings conclusion includes data on performed tests, date and time of performance, investigators responsible for testing, list of used equipment, results on each test, sequence of signalling messages on each test (only for tests with the use of signalling), etc. The test results conclusion contains data on the fulfilment of the project aim, characteristic features revealed during testing, etc.

The format of data presentation from KB in the form of a test log and results conclusion is given in Appendix IV.

Appendix I

Format of programme and methods of tests

(This appendix does not form an integral part of this Recommendation)

I.1 Document "Programme and methods of tests" should include the following sections:

– introduction;

– test charts;

– programme of tests;

– methods of tests.

I.2 Section "Introduction" contains data on the aim of the tests and general data on the given test type.

I.3 Section "Test charts" contains general and particular charts of tests with a relevant description of indicated objects interrelation.

I.4 Section "Programme of tests" contains a full list of performed checks with reference to relevant paragraphs of methods of tests.

I.5 Section "Methods of tests" contains detailed descriptions of tests as specified in Table I.1.

Table I.1 – Test description format

Test No.	This field indicates a unique identifier of the given test
Test aim	This field describes test aim
Normative reference	This field indicates document (including section) which specifies checked parameters or procedure
Configuration	This field includes a test chart or gives reference to test chart
Initial state	This field gives reference to initial state description or initial state description proper
Test procedure	This field describes actions required for test performance
Expected result	This field gives expected results as per test success

Appendix II

Format of testing journal

(This appendix does not form an integral part of this Recommendation)

II.1 The main part of the testing journal should be as shown below (Table II.1).

Table II.1 – Testing journal presentation format

Company	Daily summary No. on the tests performed	Test performer	Test No.	Result	Comment
This field is to indicate a company name	This field is to indicate a registration number of a daily summary on the tests performed	This field is to indicate a full name of a person in charge of the testing procedure performance	This field is to indicate a test number	This field is to indicate results of test performance (successful; with comments; unsuccessful)	This field is to show commentaries

Appendix III

Format of corrections journal

(This appendix does not form an integral part of this Recommendation)

III.1 The major part of the corrections journal should be as shown below (Table III.3).

Table III.1 – Corrections journal presentation format

Test No.	Description of a problem found out	Rectification remedy
This field is to indicate a test No.	This field is to indicate a description of the encountered problem	This field is to indicate a remedy in response to a comment on any drawback found out (for instance, installation of a patch into the software)

Appendix IV

Format of testing protocol and findings conclusion

(This appendix does not form an integral part of this Recommendation)

IV.1 The test protocol and findings conclusion document should consist of the following major sections:

– introduction;

– test purposes;

– test objects;

– configuration data;

– test results and findings;

– conclusion of the test results.

IV.2 Section "Introduction" will provide general information on a specific test type and a description of the document structure.

IV.3 Section "Test purposes" will explain the targets of tests.

IV.4 Section "Configuration data" will contain a full list of configuration data applicable for test accomplishment.

IV.5 Section "Test results and findings" will offer the descriptions of test results in compliance with Table IV.1.

IV.6 Section "Conclusion of the test results" will provide a conclusion on achievement of the targets set in the project.

Table IV.1 – Test results presentation format

Test No.	Test name	Notes
This field is to indicate a No. of the test	This field is to indicate a test name	This field is to indicate any comments on the test

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