

# **Guidelines and Methodologies for Developing Technical Recommendations**

## **Summary**

This document presents rules for the uniform, efficient preparation of Technical Recommendations by ITU-T SG13 for publication, covering the main types of Technical Recommendations. The methodologies and guidelines developed in this document will serve as a basis and remain stable unless future publication procedures necessitate their modification.

NOTE – The development of this document has benefited from the methodologies used for developed Technical Recommendations in the cloud computing, NGN(e) and IMT-2020 areas of ITU-T SG13 studies.

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# **Guidelines and Methodologies for Developing Technical Recommendations**

## **1 Scope**

This document, Guidelines and Methodologies for Developing Technical Recommendations, is intended to introduce the development of methodologies based on the successful experience of cloud computing, NGN(e) and IMT-2020 related Recommendations developed in ITU-T SG13, and provides guidelines for developing the main types of Technical Recommendations within ITU-T SG13.

It attempts to cover the kinds of questions which are likely to arise in the preparation of an ITU-T Technical Recommendation and provides, through application of its rules, an illustration of drafting a Technical Recommendation in the context of SG13 studies.

In this document, clause 6 provides the methodologies used for developed Technical Recommendations in the cloud computing, NGN(e) and IMT-2020 areas of SG13 studies. Clause 7 describes the general methodologies for developing Technical Recommendations building on the content of clause 6. In clause 8, guidelines for developing Technical Recommendations for the different identified technical contents are introduced.

## **2 References**

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this document. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this document 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 document does not give it, as a stand-alone document, the status of a Recommendation.

None

A list of non-normative references can be found in the Bibliography.

## **3. Definitions**

### **3.1 Terms defined elsewhere**

This Recommendation uses the following terms defined elsewhere:

None

### **3.2 Terms defined in this Recommendation**

This Recommendation defines the following terms:

None.

## **4 Abbreviations and acronyms**

This Recommendation uses the following abbreviations and acronyms:

NGN Next Generation Network

NGNe Next Generation Network evolution

OSS Operating Support System

UML Unified Modelling Language

XaaS X as a Service

## **5 Conventions**

None

## **6 Methodologies used for developed Technical Recommendations**

### **6.1 Methodology used for developed cloud computing related Recommendations**

The approach to develop Recommendations related to cloud service categories needs to be unified to allow future implementation by interested operators. The unified approach needs to be applied for developing Recommendations related to representative, emerging or any other proposed cloud service categories.

On the basis of the current experience in developing standards related to cloud service categories, the proposed steps are as follows:

- Step 1: identify cloud capabilities types relations with cloud service category (according to [b-ITU-T Y.3500] clause 6.4 and Annex A)
- Step 2: describe general use-case illustrating the cloud service category (according to [b-ITU-T Y.3501] Appendix I)
- Step 3: derive general requirements for the cloud service category (according to [b-ITU-T Y.3501])
- Step 4: describe at least one cloud service specific use-case illustrating cloud service category (following [b-ITU-T Y.3503] Appendix III; [b-ITU-T Y.3512] Appendix II; [b-ITU-T Y.3513] Appendix I)
- Step 5: derive functional requirements for the cloud service category (following e.g. [b-ITU-T Y.3503] clause 8; [b-ITU-T Y.3512] clauses 7, 8, 9; [b-ITU-T Y.3513] clause 7)
- Step 6: describe the functional architecture for the cloud service category based on functional requirements, by specifying:
  - functionalities based on functional requirements, if needed,
  - functional components for the support of the cloud service category, which include:

- reuse of components already described in [b-ITU-T Y.3502] (e.g. OSS, resource related components) and provide further details for the support of the cloud service category identifying any required sub-components/sub-functions of these components;
- define new components as necessary (not covered in [b-ITU-T Y.3502]). These may be common/generic (and therefore will need to be added later in a new version of [b-ITU-T Y.3502]) or specific to the cloud service category support.
- mapping between the cloud computing reference architecture functional view and the functional architecture for cloud service category (according to [b-ITU-T Y.3502] clause 9);
- interactions (information flows/procedures) and reference points between functional components;
- proposal for necessary additions to a future revision of [b-ITU-T Y.3502] (if identified, presented in Appendix).

For each cloud service category, the following Recommendations need to be developed:

- Y.35xx: Cloud computing – Functional requirements of XaaS
  - covering Steps 1-5;
- Y.35xy: Cloud computing – XaaS functional architecture
  - covering Step 6.

NOTE – Similar methodology has been used for developed big data related Recommendations.

## **6.2 Methodology used for developed NGN(e) related Recommendations**

The approach to develop requirements and functional architecture Recommendations related to NGN (evolution) (NGN(e)) needs to be unified to allow future implementation by interested parties. The unified approach needs to be applied for developing requirements and functional architecture Recommendations related to NGN(e).

On the basis of the experience in developing technical Recommendations related to NGN(e), the proposed steps are as follows:

- Step 1: identify the technical requirements of a technical area/network/technology, based on related use case(s) and scenario(s) (e.g. [b-ITU-T Y.2301] clause 6)
- Step 2: address these requirements in an appropriate manner from a high-level prospective (e.g. [b-ITU-T Y.2301] clause 6)
- Step 3: describe the requirements one by one in detail (e.g. [b-ITU-T Y.2201])
- Step 4: according to the technical requirements of NGN(e), describe the general functional architecture of NGN(e) from a high-level perspective (e.g. [b-ITU-T Y.2012] clause 6)
- Step 5: identify the functional architecture including functions, functional entities, sub functional entities, and reference points (e.g. [b-ITU-T Y.2012] clause 7)

- Step 6: describe the detailed functional architecture of NGN(e), by specifying:
  - o functionalities of functions, functional entities and sub functional entities
  - o interactions and reference points between functions, functional entities and sub functional entities (e.g. [b-ITU-T Y.2012] clause 9)
- Step 7: provide information flows/procedures as normative or non normative part of the recommendations (optional)

By adopting the above steps, technical Recommendations including those on requirements and functional architecture related to NGN(e) can be developed.

### **6.3 Methodology used for developed IMT2020 related Recommendations**

The approach to develop Recommendations related to IMT-2020 needs to be unified to allow future implementation by interested parties. The unified approach needs to be applied for developing Recommendations related to IMT-2020.

On the basis of the experience in developing technical Recommendations related to IMT-2020, the proposed steps are as follows:

- Step 1: Identify and define basic terms (for inclusion in [b-ITU-T Y.3100]) which will be used across multiple IMT-2020 Recommendations, in order to have consensus on basic conceptual understanding.

NOTE 1 – This does not prevent that some additional basic terms are defined along the development of the following steps according to further identified needs.

- Step 2: Address the requirements of IMT-2020 in each technical area, e.g. functional architecture, network slicing and orchestration, fixed and mobile convergence.

NOTE 2 – Examples of already approved specifications in terms of requirements [b-ITU-T Y.3101], [b-ITU-T Y.3110]), [b-ITU-T Y.3130].

- Step 3: Specify high level frameworks and functional architectures at both global IMT-2020 network perspective and IMT-2020 network functional components perspective.

NOTE 3 – Examples of framework and functional architecture related specifications include [b-ITU-T Y.IMT2020-frame Framework of IMT-2020 network], [b-ITU-T Y.3111], [b-ITU-T Y.IMT2020-arch], [b-ITU-T Y.FMC-ARCH].

- Step 4: Specify detailed functions and mechanisms for each technical area based on high level frameworks and functional architectures specified in step

NOTE 4 – Examples of detailed functions and mechanisms related specifications include [b-ITU-T Y.IMT2020-CEF], [b-ITU-T Y.IMT2020-ADPP], [b-ITU-T Y.NSOM], [b-ITU-T Y.FMC-SS].

NOTE 5- Other IMT2020 specifications out of scope of SG13 activities (e.g., but not limited to, protocol specifications, transport network specific specifications, security specific specifications) are expected to be developed by the appropriate ITU-T Study Groups (including SG11, SG15 and SG17).

## 7 Methodologies for Developing Technical Recommendations

Generally speaking, technical Recommendations developed in SG13 can be classified into two categories, including technical area related Recommendations and specific technology related Recommendations.

A technical area is intended to cover a group of specific technologies. Taking as examples the technical areas of “cloud computing” and “NGN”:

- [b-ITU-T Y.3501] and [b-ITU-T Y.2301] can be considered as technical area related Recommendations because they focus on the requirements and architecture of, respectively, cloud computing and NGN technical areas as a whole;
- on the other hand, [b-ITU-T Y.3512] and [b-ITU-T Y.2304] can be considered as specific technology related Recommendations because they focus on specific technologies (in particular, Network as a Service and Network intelligence capability enhancement) within the respective cloud computing and NGN technical areas.

NOTE – A specific technology is normally associated to one or some technical areas. However, specific technology related Recommendations do not always require the preliminary development of related technical area Recommendations.

Therefore, the methodology for developing technical Recommendations should address the two categories of technical Recommendations: 1) the methodology for the whole technical area and 2) the methodology for specific technologies. Figure 7-1 illustrates the methodologies for developing technical area-related Recommendations and specific technology-related Recommendations.

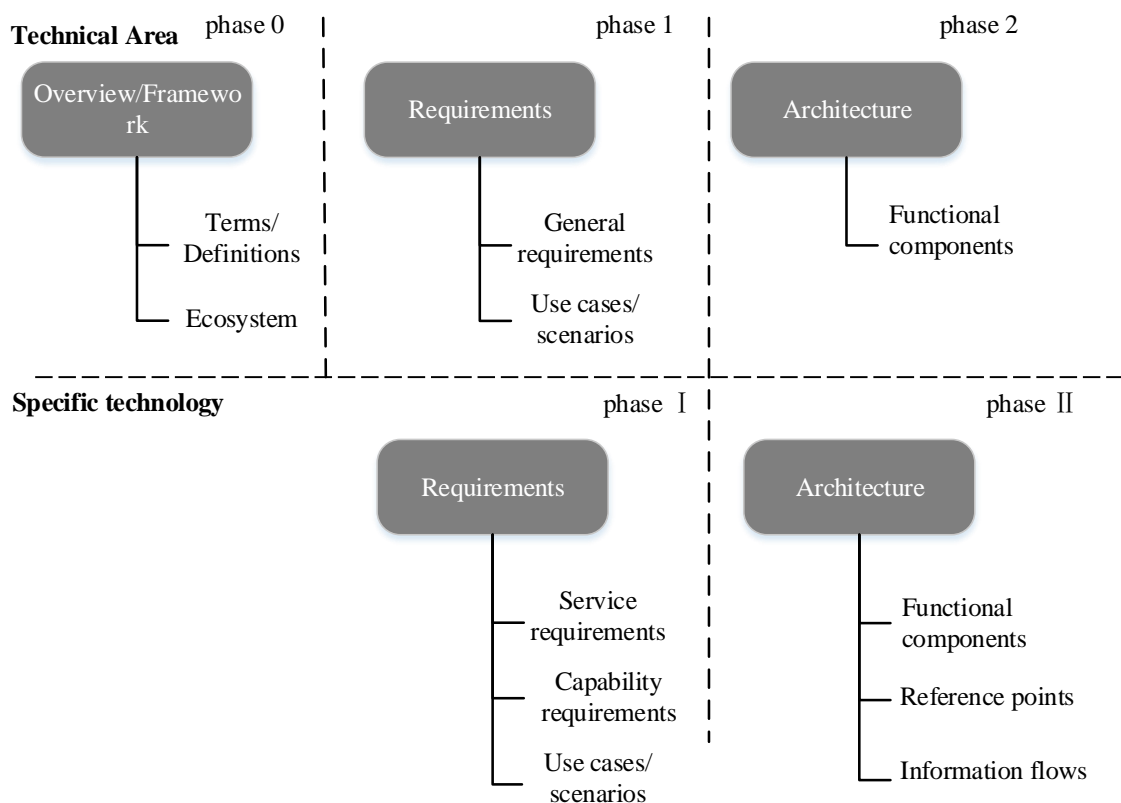


Figure 7-1 – Methodologies for developing technical Recommendations

The types of technical Recommendations related to the two categories include:

- Overview/Framework
- Requirements
- Architecture

Each type of technical Recommendations includes one or more technical contents, as follows:

- Terms/Definitions
- Ecosystem
- Use case(s)/Scenario(s)
- General requirements
- Service requirements
- Capability requirements
- Functional components
- Reference points
- Information flows/Procedures

## **7.1 Technical Area**

The methodology for developing technical area related Recommendations includes three phases:

- Phase 0: describes the Overview/Framework of a technical area, by:
  - o describing the terms and definitions of the technical area
  - o describing the ecosystem of the technical area
- Phase 1: identifies the general requirements of the technical area, by:
  - o describing the general use case(s)/scenario(s) of the technical area using the ecosystem developed in Phase 1
  - o deriving general requirements from the use-case(s)/scenario(s)
- Phase 2: describes the functional architecture for the technical area based on the general requirements derived in Phase 1, by:
  - o identifying functional components to satisfy the general requirements developed in Phase 1.

NOTE – In some cases, general architecture aspects such as reference architecture or reference model related content could also be addressed in functional architecture related Recommendations.

It is recommended that these three phases should be developed successively, at least Phase 1/2 Recommendations should be published after Phase 0/1 Recommendations get stable.

## **7.2 Specific technology**

The methodology for developing specific technology related Recommendations includes two phases:



- Phase I: identifies detailed requirements of the specific technology, by:
  - o providing use case(s)/scenario(s) related to the specific technology within the technical area or according to the evolution of the technical area.
  - o specifying service requirements of the specific technology.
  - o deriving capability requirements of the specific technology.

NOTE 1 – In some cases, other requirements, such as requirements for networking, system and functions etc., could also be addressed as Phase I requirements related Recommendations.

- Phase II: describes the detailed functional architecture for the specific technology based on the service requirements and capability requirements in Phase I, by:
  - o identifying functional components to satisfy the service requirements and capability requirements developed in Phase I.
  - o specifying reference points according to the detailed functional architecture for the specific technology
  - o describing information flows/procedures related to the detailed functional architecture of the specific technology

It is recommended that these two phases be developed successively, at least Phase II Recommendations should be published only after that Phase I Recommendations get stable.

NOTE 2 – Phase I and Phase II Recommendations should be developed and published separately, however, in some cases, especially for emerging technologies, contents addressed in Phase I and Phase II Recommendations could be merged into one single (or reduced number of) Recommendation(s).

NOTE 3 – In some cases, especially for emerging technologies (whose associated technical area(s) is – at least initially – usually uncertain), content related to Phase 0 Recommendations of technical areas (concerning Overview/ Framework or other) could be also included in the Phase I and Phase II Recommendations for a specific technology.

NOTE 4 - In some cases, reference architecture or reference model related content could also be addressed in functional architecture related Recommendations.

## **8 Guidelines for developing Technical Recommendations**

In this clause, guidelines for developing Technical Recommendations are introduced. The following 9 technical contents have been identified for developing technical Recommendation according to clause 7:

- Terms/ Definitions
- Ecosystem
- Use case(s)/Scenario(s)
- General requirements

- Service requirements
- Capability requirements
- Functional components
- Reference points
- Information flows/Procedures

### 8.1 Terms/ Definitions

The terms/definitions related Recommendation describes the overview of a technical area, by specifying:

- concepts related to the technical area
- specialized vocabulary of the technical area

### 8.2 Ecosystem

The Ecosystem-related Recommendation describes roles, sub-roles and activities. The terms of activity, roles and sub-role are defined in [b-ITU-T Y.3502] as follows:

- **activity**: A specified pursuit or set of tasks.
- **role**: A set of **activities** that serves a common purpose.
- **sub-role**: A subset of the **activities** of a given **role**.

Figure 8-1 illustrates the ecosystem (roles, sub-roles and activities)

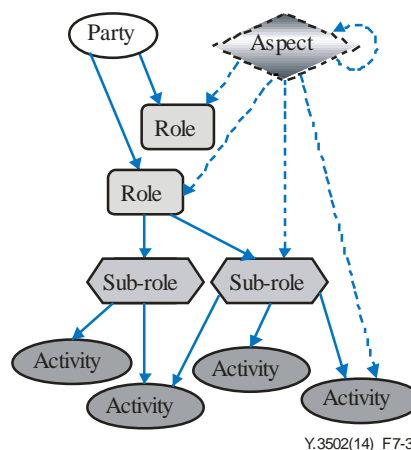


Figure 8-1 – Ecosystem (roles, sub-roles and activities)

### 8.3 Use case(s)/Scenario(s)

The use case(s)/scenario(s)-related Recommendation describes the use case(s) or scenario(s) of a technical area/network/technology, by specifying:

- who is going to use this technical area/network/technology?
- in which circumstance can this technical area/network/technology be used?

Table 8.1 shows the template used for the description of the use cases.

**Table 8.1 – Template for the description of a use case**

Use case	
<b>Name</b>	Title of the use case
<b>Description</b>	Overview and features of the use case
<b>Roles</b>	Roles relating to/appearing in the use case
<b>Figure</b>	Figure to describe the use case. (A UML-like diagram is suggested for clarifying relations between roles)
<b>Pre-conditions (optional)</b>	Pre-conditions represent the necessary conditions or use cases that should be achieved before operating the described use case. NOTE – As dependency may exist among different use cases, pre-conditions and post-conditions are introduced to help understand the relationships among use cases.
<b>Post-conditions (optional)</b>	In contrast to the pre-condition, the post-conditions describe conditions or use cases that will be carried out after the operation of a currently described use case.
<b>Requirements</b>	The title of requirements derived from the use case.

#### **8.4 General requirements**

A general requirements-related Recommendation describes the technical area as a whole. The objective of a general requirements related Recommendation is to provide high level requirements of the technical areas a whole. Detailed requirements such as the service requirements and the capability requirements might be addressed in separate recommendations related to the technical area. The roles/sub roles defined in the Ecosystem (related Recommendation) are normally used to describe the general requirements. The general requirements of a technical area are derived from related general use case(s)/scenario(s).

#### **8.5 Service requirements**

A service requirements-related Recommendation describes technical requirements from the service perspective. The objective of a service requirements related Recommendation is to identify the technical requirements of the service. The service requirements should also be used to drive the identification of the functionalities of the related functional components. The roles/sub roles defined in the ecosystem (related Recommendation) are also normally used to describe the service requirements, while the service requirements are derived from related use case(s)/scenario(s) of the specific technology.

#### **8.6 Capability requirements**

A capability requirements-related Recommendation describes the capability requirements can be derived from related use case(s)/scenario(s) of the specific technology from the capability perspective. The objective of a capability requirements related Recommendation is to identify the detailed requirements of the technical capabilities which are necessary to support the services requirements. The capability requirements should also be used to drive the identification of the functionalities of the related functional components.

## 8.7 Functional components

A functional architecture-related Recommendation describes the distribution of functions/functional components, functional layers and multi-layer functions which are necessary for fulfilling the related functional requirements.

NOTE - The NGN related recommendations use the term “functional entity” instead of “functional component” while the two terms convey the same meaning.

Figure 8-2 illustrates the concepts of functions, layers and functional components [b-ITU-T Y.3502]:

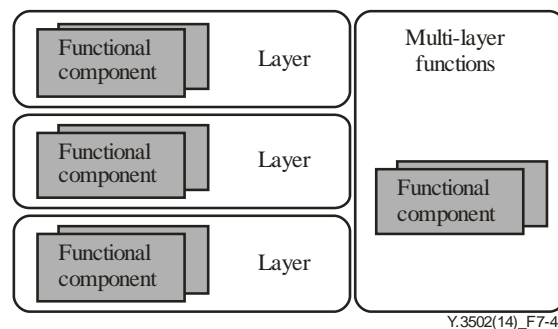


Figure 8-2 – Functional layering

A functional component is a functional building block needed to engage in an activity, backed by an implementation.

A layer is a set of functional components that provide similar capabilities or serve a common purpose. The functional architecture is partially layered (e.g., has layers and a set of multi-layer functions).

The multi-layer functions include functional components that provide capabilities to be used across multiple functional layers. Multi-layer functions are grouped into subsets.

## 8.8 Reference points

A reference points-related recommendation describes the detailed interactions and information exchanges among different functional components based on the functional architecture-related Recommendations. The objective of a reference points-related recommendation is to specify the roles of the different reference points of a specific technology in terms of service offering and guide the related physical implementation. The reference points specified in a reference points-related Recommendation might be used as input to signaling architecture-related recommendations (e.g. developed by ITU-T SG11).

## 8.9 Information flows/Procedures

Information flows/procedures describe how multiple functional components work together sequentially through the corresponding reference points in order to accomplish a specific task associated to the support of given functionality(ies). In order to describe information flows/procedures, the following aspects shall be addressed:

- General description explaining what functionality(ies) is(are) associated to each information flow/procedure;
- Illustration of all related functional components and all steps in sequence;
- Associated to the illustration, for each information flow/procedure, description of each step including actions concerning the involved functional components, information exchanges between the different pairs of the involved functional components through the related reference points.

The information flows/procedures specified in the related Recommendations might be used as input to protocol-related recommendations (e.g. developed by ITU-T SG11).

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