Draft new Recommendation ITU-T Y.ESBN

Enhanced service-based network in IMT-2020 networks and beyond

Summary

The service-based network (SBN) is a type of network architecture that is based on the concept of service-based architecture (SBA). In an SBN, network resources and services are exposed as standardized, reusable building blocks that can be easily integrated and composed to create new and innovative network services. This Recommendation specifies the general considerations, requirements, framework, network function enhancements, procedures, and security considerations of service-based network in IMT-2020 networks and beyond.

Keywords

Service-based network, IMT-2020 networks and beyond, service-based architecture

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Draft new Recommendation ITU-T Y.ESBN

Enhanced service-based network in IMT-2020 networks and beyond

1. Scope

This Recommendation specifies the service-based network in IMT-2020 networks and beyond.

The service-based network (SBN) is a type of network architecture that is based on the concept of service-based architecture (SBA). In an SBN, network resources and services are exposed as standardized, reusable building blocks that can be easily integrated and composed to create new and innovative network services.

This Recommendation addresses the following aspects of service-based network in IMT-2020 networks and beyond:

- General considerations;
- Requirements;
- Framework;
- Network function enhancements;
- Procedures;
- Security considerations;

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 Y.3101] Recommendation ITU-T Y.3101 (2018), *Requirements of the IMT-2020 network.*

[ITU-T Y.3102] Recommendation ITU-T Y.3102 (2018), *Framework of the IMT-2020 network.*

[ITU-T Y.3104] Recommendation ITU-T Y.3104 (2018), *Architecture of the IMT-2020 network.*

[ITU-T Y.3114] Recommendation ITU-T Y.3114 (2022), *Future networks including IMT-2020: requirements and functional architecture of lightweight core for dedicated networks.*

3. Definitions

3.1. Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 control plane [b-ITU-T Y.2011]: The set of functions that controls the operation of entities in the stratum or layer under consideration, plus the functions required to support this control.

3.1.2 data plane [b-ITU-T Y.2011]: The set of functions used to transfer data in the stratum or layer under consideration.

3.1.3 IMT-2020 [b-ITU-T Y.3100]: Systems, system components, and related technologies that provide far more enhanced capabilities than those described in [b-ITU-R M.1645].

NOTE – [b-ITU-R M.1645] defines the framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000 for the radio access network.

3.1.4 network function [b-ITU-T Y.3100]: In the context of IMT-2020, a processing function in a network.

3.1.5 service level agreement (SLA) [b-ITU-T E.860]: A formal agreement between two or more entities reached after a negotiating activity with the scope to assess service characteristics, responsibilities and priorities of every part. A SLA may include statements about performance, billing, service delivery but also legal and economic issues.

3.1.6 user plane [b-ITU-T Y.2011]: A synonym for data plane.

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:

SLA	Service Level Agreement
SMF	Session Management Function
UE	User Equipment
UPF	User Plane Function

5. Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

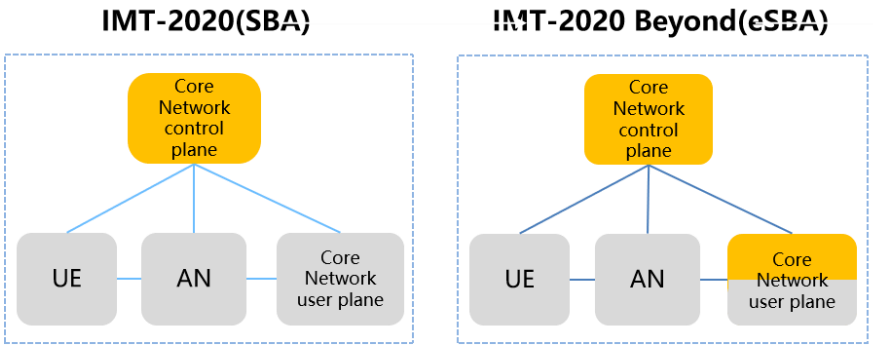
The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

6. Overview on service-based network

[Editor's Note] This clause presents the overview on service-based network, in the context of IMT-2020 and beyond.

SBN is a key technology for the future of networking. They provide the flexibility, agility, and scalability that businesses need to meet the demands of the digital age. However the service-based architecture still have not yet been comprehensive specified. In the current ITU-T Y.3012, the similar concepts of service-based network are mentioned like network service framework, network service functions and etc. However, the service-based network lack of systematic sorting, the problem of what capabilities it has, its role in the network, and the benefits it brings haven't be addressed, etc. Also the service-based of UPF, even for UE and AN are still far from being achieved, and further enhancements for IMT-2020 network are needed based on the these specifications. Therefore, further study is needed on enhancement of service-based network in IMT-2020 networks and beyond.



Editor's note[20240307]: Figure needs to be modified, the concepts of IMT 2030 haven't reach the consensus, thus, better to move out. Further clarification maybe needed for logically coherent.

This draft Recommendation will form a high-level service-based architecture analysis to facilitate future in-depth studies on service evolution from the following aspects；

1）Expansion of service domains, may include service-based of UPF, even for UE and AN.

NOTE: This draft Recommendation only specify the general service method for UE and AN, and how each domain can collaborate through a common service-based mechanism, rather than the service-based mechanism itself used in UE and AN.

2）Optimizing service-based mechanisms, may include:

1. Adhering to the service-based design philosophy, exploring further decoupling mechanisms for services. Conducting usage method on service mesh/mecha technology to achieve a deeper loose coupling between service requirements and distributed networks.

2. Enhancing API query efficiency. Exploring the introduction of GraphQL technology, which helps in more efficiently querying data stored in graph data structures.

3）Expanding the capabilities of service-based, may include: Introducing service-based coordination of networking and computing, and data plane. Incorporating "computing" and "data" elements, integrating them with communication resource elements in a fusion design, and defining brand new computational and data planes based on the service-based design philosophy.

7. Requirements of service-based network

[Editor's Note] This clause specifies the requirements of service-based network, in the context of IMT-2020 and beyond, which include general requirements, requirements on framework, requirements on network functions, and requirements on network performance.

7.1. General requirements

TBD

7.2. Requirements on framework

TBD

7.3. Requirements on network functions

TBD

7.4. Requirements on network performance

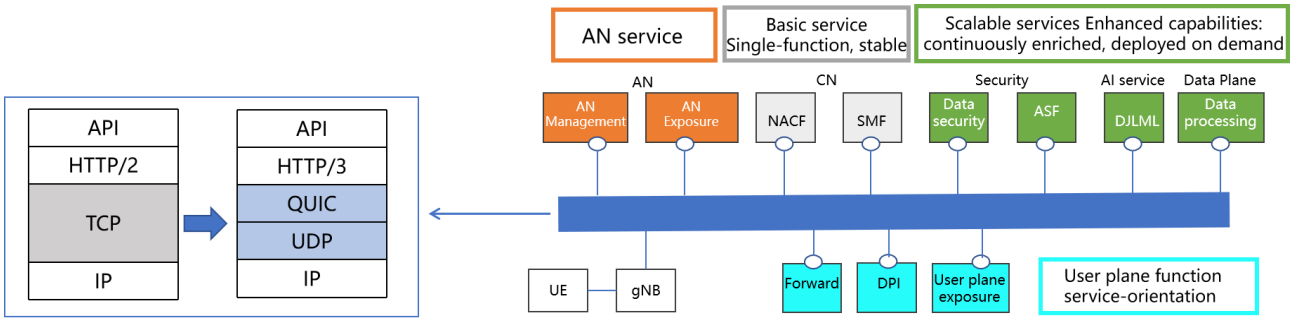
TBD

8. Framework of service-based network

[Editor's Note] This clause specifies the framework of service-based network, in the context of IMT-2020 and beyond, which includes framework enhancements and reference points.

8.1. service-based network framework

The design of this 8.1.framework aims to optimize service mechanisms, expand service-based domains, and upgrade service-based interfaces, all on the basis of being compatible with IMT-2020 network architecture, in order to provide a foundation for network distribution and autonomy.



8.2. Reference points

TBD

9. Network function enhancements for service-based network

[Editor's Note] The new service-based network support function is to be addressed, at least to extend to support UE/RAN/UPF.

TBD

10. Procedures of service-based network

[Editor's Note] This clause specifies the procedures of service-based network, in the context of IMT-2020 and beyond.

TBD

11. Security considerations

[Editor's Note] This clause presents the security considerations of service-based network, in the context of IMT-2020 and beyond, which include network security, service security, and user privacy.

TBD

Appendix I

Standardization landscape on dedicated networks for IMT-2020 and beyond

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

The standardization landscape for service-based networks (SBNs) is led by the following organizations:

1) 3GPP: 3GPP is the organization responsible for developing standards for cellular mobile communications. 3GPP has published several SBN-related standards, including:

TS 23.501: System Architecture for the 5G System; Stage 2

TS 23.502: Procedures for the 5G System; Stage 2

TS 28.533: Management and Orchestration; Stage 3

2) IETF: The IETF is the organization responsible for developing standards for the Internet. The IETF has published several SBN-related standards, including:

RFC 7641: Service-oriented Network (SON) Architecture

RFC 7642: Service-oriented Network (SON) Information Model

RFC 7643: Service-oriented Network (SON) Interfaces

3) TM Forum: TM Forum is a global telecommunications industry association. TM Forum has published several SBN-related white papers and reports.

4) Open Networking Foundation (ONF): ONF is a non-profit organization dedicated to promoting open networking technologies. ONF has published several SBN-related technical reports and white papers.

SBN standardization is an ongoing process, but significant progress has been made. These standards provide a foundation for the development of SBN and help ensure their interoperability and scalability.

The ITU-T has published several SBN-related standards, including:

Y.3102: Mentioned IMT-2020 network service framework

In the current ITU-T Y.3012, the similar concepts of service-based network are mentioned like network service framework, network service functions and etc. However, the service-based network lack of systematic sorting, the problem of what capabilities it has, its role in the network, and the benefits it brings haven’t be addressed, etc. Also the service-based of UPF, even for UE and AN are still far from being achieved, and further enhancements for IMT-2020 network are needed based on the these specifications. Therefore, further study is needed on enhancement of service-based network in IMT-2020 networks and beyond.

Bibliography

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

[b-ITU-T Y.3100] Recommendation ITU-T Y.3100 (2017), *Terms and definitions for IMT-2020 network.*

[b-ITU-T E.860] Recommendation ITU-T E.860 (2002), *Framework of a service level agreement.*

[b-ITU-R M.1645] Recommendation ITU-R M.1645 (2003), *Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000.*

Annex A
A.1 justification for proposed draft new Recommendation ITU-T Y.ESBN "Enhanced service-based network in IMT-2020 networks and beyond"

Question:	Q21/13	**Proposed new ITU-T Recommendation**	Geneva, 4-15 March 2024	
Reference and title:	ITU-T Y.ESBN "Enhanced service-based network in IMT-2020 networks and beyond"			
Base text:	SG13-TDxxx/WP1		**Timing:**	2026-03
Editor(s):	Yushuang Hu, China Mobile, e-mail: huyushuang@chinamobile.com Lu Lu, China Mobile, e-mail: lulu@chinamobile.com		**Approval process:**	AAP

Scope (defines the intent or object of the Recommendation and the aspects covered, thereby indicating the limits of its applicability):

This Recommendation specifies the service-based network in IMT-2020 networks and beyond. The service-based network (SBN) is a type of network architecture that is based on the concept of service-based architecture (SBA). In an SBN, network resources and services are exposed as standardized, reusable building blocks that can be easily integrated and composed to create new and innovative network services. This Recommendation addresses the following aspects of service-based network in IMT-2020 networks and beyond:

- General considerations;
- Requirements;
- Framework;
- Network function enhancements;
- Procedures;
- Security considerations;

Summary (provides a brief overview of the purpose and contents of the Recommendation, thus permitting readers to judge its usefulness for their work):

The service-based network (SBN) is a type of network architecture that is based on the concept of service-based architecture (SBA). In an SBN, network resources and services are exposed as standardized, reusable building blocks that can be easily integrated and composed to create new and innovative network services.

In the current ITU-T Y.3012, the similar concepts of service-based network are mentioned like network service framework, network service functions and etc. However, the service-based network lack of systematic sorting, the problem of what capabilities it has, its role in the network, and the benefits it brings haven't be addressed, etc. Also the service-based of UPF, even for UE and AN are still far from being achieved, and further enhancements for IMT-2020 network are needed based on the these specifications. Therefore, further study is needed on enhancement of service-based network in IMT-2020 networks and beyond.

This Recommendation specifies the general considerations, requirements, framework, network function enhancements, procedures, and security considerations of service-based network in IMT-2020 networks and beyond.

Relations to ITU-T Recommendations or to other standards (approved or under development):

ITU-T Y.3101, ITU-T Y.3102, ITU-T Y.3104, ITU-T Y.3114

Liaison SBN with other study groups or with other standards bodies:

ITU-T SG11, 3GPP SA1, 3GPP SA2, IETF NMRG, ETSI NFV

Supporting members that are committing to contributing actively to the work item:

China Mobile, China Unicom, China Telecom