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## **Draft new Recommendation ITU-T Y.KNO**

### **Requirements and framework of knowledge-based network optimization in IMT-2020 networks and beyond**

#### **Summary**

This draft Recommendation specifies the requirements and framework of knowledge-based network optimization in IMT-2020 networks and beyond. It provides the knowledge enhancement functional capabilities within the architecture of IMT-2020 networks and beyond. The objective is to realize knowledge-based network optimization through closed loop capabilities of network traffic awareness, intelligent intent perception, network knowledge construction, and knowledge-based network optimization policy generation and verification.

#### **Keywords**

Knowledge, network optimization, IMT-2020 networks

#### **1 Scope**

This draft recommendation specifies the requirements and framework of knowledge-based network optimization in IMT-2020 networks and beyond.

The scope of the draft Recommendation includes:

- 1) Requirements of knowledge-based network optimization in IMT-2020 and beyond
- 2) Framework of knowledge-based network optimization in IMT-2020 and beyond

#### **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.3110]	Recommendation ITU-T Y.3110 (2017), IMT-2020 network management and orchestration requirements
[IEEE P2807]	IEEE P2807-2022, IEEE Standard for Framework of Knowledge Graphs
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#### **3 Definitions**

##### **3.1 Terms defined elsewhere**

This Recommendation uses the following terms defined elsewhere:

**3.1.1 knowledge** [b-ETSI GS ENI 005]: Analysis of data and information, resulting in an understanding of what the data and information mean.

NOTE - Knowledge represents a set of patterns that are used to explain, as well as predict, what has happened, is happening, or is possible to happen in the future; it is based on acquisition of data, information, and skills through experience and education.

**3.1.2 knowledge base** [ITU-T F.746.3]: A collection of knowledge resources that consist of structured and unstructured data. The knowledge base is used to provide information to the various applications that are related to information provision such as the QA system and search system.

**3.1.3 knowledge graph** [ITU-T F.748.25]: Assemblies of knowledge elements and their relations described in a structured form.

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## 3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

**3.2.1 <Term>**: <definition>.

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## 4 Abbreviations

This Recommendation uses the following abbreviations and acronyms:

5G	fifth Generation
AI	Artificial Intelligence
DL	Deep Learning
KGs	Knowledge graphs
KNO	knowledge-based network optimization
ML	Machine Learning

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## 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" and "may" 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 Introduction of knowledge-based network optimization

In both [ISO 30401: 2018 Knowledge management systems Requirements] and [b-ETSI GS ENI 005], knowledge has been clearly defined and studied. As specified in [b-ETSI GS ENI 005], Knowledge is defined as analysis of data and information, resulting in an understanding of what the data and

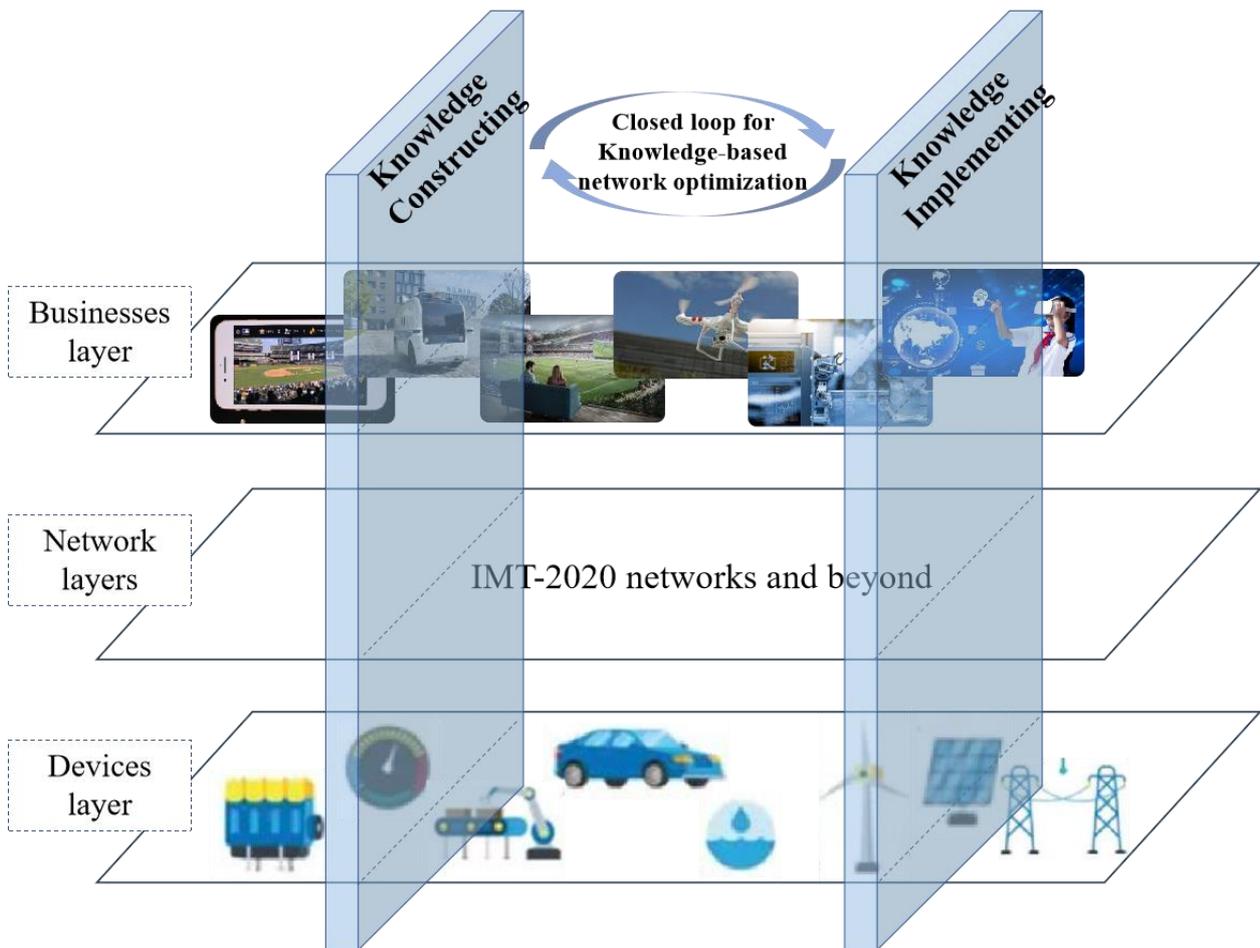
information mean. Knowledge represents a set of patterns that are used to explain, as well as predict, what has happened, is happening, or is possible to happen in the future; it is based on acquisition of data, information, and skills through experience and education.

In this draft Recommendation, knowledge primarily refers to network knowledge graphs and knowledge models constructed based on multimodal data, such as network data, network topology, expert experience, etc. Knowledge has apriority and universality. Based on the apriority of knowledge, the training speed and accuracy of AI/ML models can be enhanced in the process of network optimization policy generation and root cause diagnostic. Based on the universality of knowledge, the knowledge formed in one scenario can be reused and evolved to improve the efficiency of relevant network optimization tasks.

The knowledge-based network optimization can be realized by knowledge constructing and knowledge implementing.

- 1) Knowledge constructing refers to fully mining and refining the hidden information in big data, integrating external knowledge, and finally transforming massive data into multi-dimensional and multi-level related knowledge.
- 2) Knowledge implementing refers to utilization of constructed knowledge in the network to realize automatic reasoning and intelligent decision-making in network management, operation, control, and optimization (only network optimization is included in the scope of this Recommendation).
- 3) Knowledge-based network optimization refers to realizing global, automated, and intelligent network optimization capabilities, as well as enhancing the root cause diagnostic capabilities, based on multimodal data (network data, network topology, expert experience, etc.), machine learning, and knowledge technologies, through closed loop capabilities of network traffic awareness, intelligent intent perception, network knowledge construction, and knowledge-based network optimization policy generation and verification.

Figure 7-1 describes the conceptual diagram of knowledge-based network optimization (KNO) in IMT-2020 networks and beyond, which consists of two vertical planes: knowledge construction and knowledge implementation. These two planes run vertically through each layer of the network, realizing a closed loop of knowledge-based capabilities collaboration. At the network layer, knowledge construction and knowledge implementation capabilities can facilitate global, intelligent, and automated network optimization; at the business layer, they can help to understand the different demands of different services and enable customer-oriented dynamic, precise, and diverse service requests.



**Figure 7-1 - Conceptual diagram of knowledge-based network optimization in IMT-2020 networks and beyond**

*Editor's note: further consideration of this figure is needed, e.g., layering description etc.*

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## **7 Requirements of knowledge-based network optimization in IMT-2020 networks and beyond**

### **7.1 General requirements**

<TBD>

### **7.2 Network traffic and network intent awareness**

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### **7.3 Network knowledge construction**

<TBD>

### **7.4 Knowledge-based network optimization policy generation**

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### **7.5 Knowledge-based network optimization policy verification**

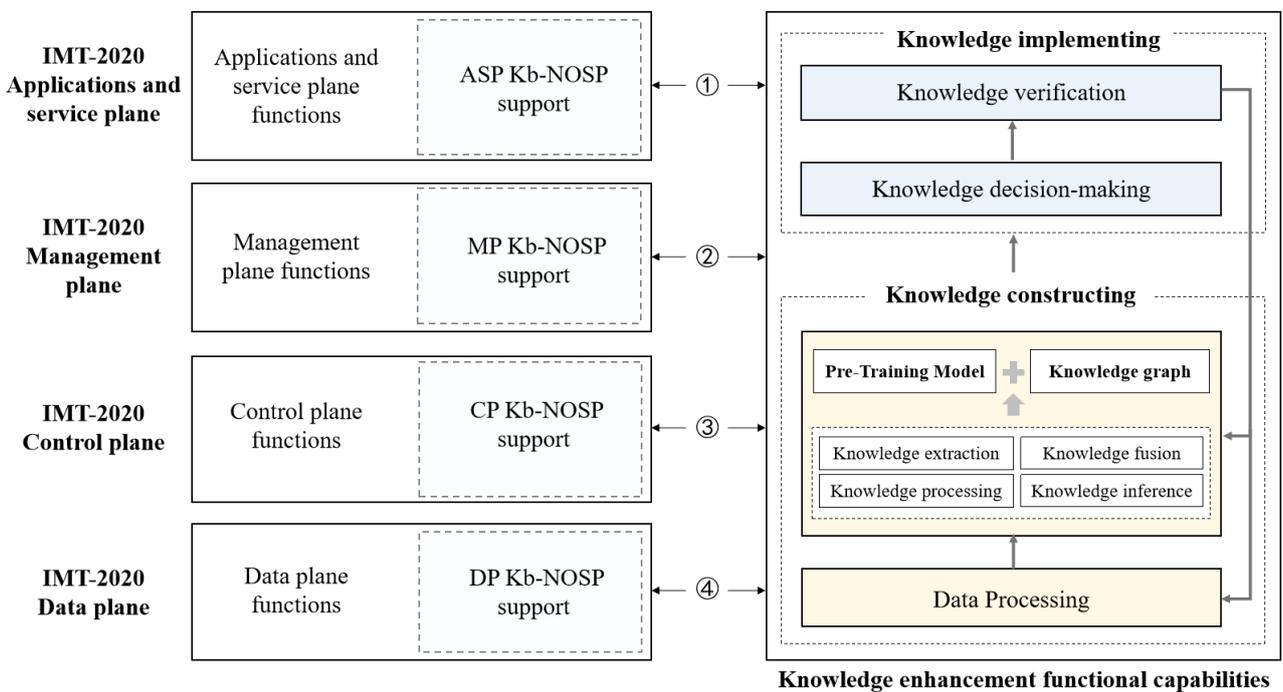
<TBD>

## 8 Framework of knowledge-based network optimization in IMT-2020 networks and beyond

### 8.1 Framework of knowledge enhancement functional capabilities

*Editor's note: the following figure is an initial input for further consideration together with the related description to be developed. It has not been discussed in detail.*

Figure 8-1 illustrates the framework of knowledge enhancement functional capabilities in IMT-2020 networks and beyond. Knowledge enhancement functional capabilities mainly includes two parts: knowledge constructing and knowledge implementing. The knowledge constructing capabilities is responsible for constructing the network knowledge graphs and knowledge models based on network data and external data and by leveraging IMT-2020 network resources. knowledge implementing capabilities provides knowledge-related applications and services to the IMT-2020 network based on network knowledge graphs and knowledge models and incorporating AI/ML capabilities if needed.



**Figure 8-1 - Framework of knowledge enhancement functional capabilities in IMT-2020 and beyond**

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## 9 Security considerations

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## **Appendix I - Use cases of knowledge-based network optimization in IMT-2020 networks and beyond**

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

### **I.1 Network abnormal state detection**

Network anomalies often involve multiple levels of services, applications, and systems. Also, fault location and resolution require many log analyses, indicator analyses, system research and judgment. Meanwhile, the utilization of knowledge constructing and implementing can improve the accuracy and efficiency of network anomaly detection, which includes network status awareness, real-time indicator collection, online/offline learning, strategy generation, strategy issuance and strategy verification, thus forms a closed loop of intelligent decision making.

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### **I.2 Network intelligent routing optimization**

With the rapid development of the Internet, network performance and reliability have become important issues and challenges currently faced, mainly including bandwidth limitation, network delay, packet loss, network congestion, and network security. Traditional intelligent routing algorithms are mainly based on static rules and basic network topology information, which cannot adapt to the rapid changes and complexity of the network environment.

When the network undergoes large changes, it is still difficult for current ML-based reinforcement learning techniques to capture new network environment features quickly and accurately. Knowledge-based network optimization can form a global automatic and intelligent network optimization by focusing on the introduction of external knowledge generated by External and multi-modal data based on the pre-trained model generated by ML. In the future network including IMT-2020, the knowledge-based intelligent routing algorithm can help the reinforcement learning model to accelerate the learning by learning the massive network data and experience, and automatically adjust the routing strategy during the learning process of the reinforcement learning model, and ultimately improve the interpretability of the model, so as to realize the diagnosis of the root cause of the network problems and ensure the smooth operation of the network service.

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## Appendix II – Gaps analysis with ITU-T and other SDOs

### II.1 Gap analysis with ITU-T

Organizations and projects	Description and applicability	Gap Analysis
ITU-T SG13	<p>The draft Recommendation ITU-T Y.bDDN-ArchMec-KC, “Big data driven networking - architecture and mechanism of knowledge constructing”.</p> <p>This recommendation specifies the architecture and mechanism of knowledge constructing for big data driven networking.</p> <p>The scope of this recommendation includes:</p> <p>1) Overview of knowledge constructing of bDDN; 2) The architecture to realize knowledge constructing of bDDN; 3) The mechanism of knowledge constructing in each plane of bDDN; 4) The interfaces ability related to mechanism for knowledge constructing of bDDN; 5) Security considerations.</p>	<p>The draft Recommendation ITU-T Y.bDDN-ArchMec-KC focuses on the mechanism of constructing knowledge within the bDDN architecture,</p> <p>This new work item aims to further study and define the knowledge enhancement functional entity within the future network including IMT-2020, and provides the requirements and framework for network optimization and service provision based on knowledge enhancement functional entity.</p> <p>Thus, this new proposal won't be overlapping with the scope of ITU-T Y.bDDN-ArchMec-KC.</p>
ITU-T SG2	<p>The draft Recommendation ITU-T M.fkmtom, “Framework of knowledge management for telecom operation and management”.</p> <p>This recommendation provides the overview of knowledge and introduces knowledge management to further improve the usage efficiency of AI while fulfilling the service requirements in different scenarios. It proposes a framework of knowledge management for telecom operation and management.</p> <p>The scope of this recommendation includes:</p> <p>1) Background and overview of knowledge management; 2) Knowledge classification in telecom operation and management; 3) Framework of knowledge management for telecom operation and management.</p>	<p>The draft Recommendation ITU-T M.fkmtom focuses on knowledge management itself, with the main emphasis on knowledge classification, knowledge management, framework of knowledge management for telecom operation and management.</p> <p>This new work item focuses on studying how to enhance network optimization and service provision by providing and utilizing knowledge enhancement functional entity, which includes knowledge constructing functions and knowledge implementation functions, rather than the management aspect of knowledge.</p> <p>Thus, this new proposal won't be overlapping with the scope of ITU-T M.fkmtom.</p>
ITU-T SG13	<p>The draft Recommendation ITU-T Y.IMT2020-AINDO-req-frame, “Requirements and framework for AI-based network design optimization in future networks including IMT-2020”.</p> <p>This recommendation specifies functional requirements, framework and procedures for AI-based network design optimization in IMT-2020 networks and beyond.</p> <p>The scope of this recommendation includes:</p> <p>1) Requirements for the framework of AI-based network design optimization; 2) Description of the framework and its components; 3) Description of the procedures of AI-based network design optimization.</p>	<p>The draft Recommendation ITU-T Y.IMT2020-AINDO-req-frame focuses on the comprehensive application of AI technologies in network design optimization with low cost, including network topology, link capacity, routing orchestration etc. AINDO is primarily based on the architectural framework for machine learning in Y.3172.</p> <p>This new work item focuses on the knowledge-based techniques, which utilize external and multi-modal data, such as expert experience, operation, and maintenance manuals. Combining with pre-trained models generated by ML, it can realize global, automatic, and intelligent network optimization.</p> <p>Thus, this new proposed scopes are different with that of ITU-T Y.IMT2020-AINDO-req-frame.</p>

<p>ITU-T SG13</p>	<p>The draft Recommendation ITU-T Y.CNAO-reqts, “Requirement and framework for Customer-oriented Network Auto Optimization with Artificial Intelligence”.</p> <p>This recommendation specifies the requirements and functional framework of Customer-oriented Network Quality Auto Optimization with Artificial Intelligence.</p> <p>The scope of this recommendation includes:</p> <p>1) The requirements for the network capabilities to realize customer-oriented network quality auto optimization with AI; 2) The functional framework to realize Network Quality Auto Optimization and function analysis of each component module; 3) Scenarios for Network Quality Auto Optimization with AI in context of intelligent customer services.</p>	<p>The draft Recommendation ITU-T Y.CNAO-reqts focuses on intelligently analyzing the root causes of poor network quality using artificial intelligence methods such as graph neural networks and knowledge graphs. Its main emphasis is on making AI decisions and assigning differentiated operational strategies based on AI analysis.</p> <p>“Knowledge” in this new item refers not only to knowledge graphs, but also to a summary of “information, experiences, theories, opinions, etc.” according to ETSI, ISO and ITU definitions of knowledge. This new work item provides solutions for network optimization and service provision based on knowledge related techniques, which is not discussed in draft Recommendation ITU-T Y.CNAO-reqts.</p> <p>Thus, the new proposal won’t be overlapping with the scopes from ITU-T Y.CNAO-reqts.</p>
<p>ITU-T SG13</p>	<p>Proposed new work item on Y.KM-AN “Knowledge management for autonomous networks”.</p> <p>This contribution specifies knowledge management for autonomous networks to ensure that knowledge can be effectively managed and utilized in autonomous networks.</p> <p>The scope of this draft recommendation includes:</p> <p>1) Overview; Classification of knowledge; 2) Requirements of knowledge management in autonomous networks; 3) Knowledge management functional architecture; 4) Sequence diagrams of knowledge management in autonomous networks; 5) Security consideration.</p>	<p>This document specifies knowledge management for autonomous networks, it focuses on further complete the standardization work of knowledge management in AN that knowledge base subsystem has been introduced into autonomous network in Y.3061.</p> <p>This new work item focuses on studying how to enhance network optimization and service provision by providing and utilizing knowledge enhancement functional entity, which includes knowledge constructing functions and knowledge implementation functions, rather than the management aspect of knowledge.</p> <p>Thus, the new proposal won’t be overlapping with the scopes from ITU-T Y.KM-AN.</p>
<p>ITU-T SG13</p>	<p>Recommendation ITU-T Y.3179: “Architectural framework for machine learning model serving in future networks including IMT-2020”.</p> <p>This recommendation aims to study architectural framework for machine learning model serving in future networks including IMT-2020 to enable the application of ML model inference to ML underlay networks.</p> <p>The scope of this recommendation includes:</p> <p>1) Background and motivations; 2) High level requirements; 3) High-level architecture description including the definition of architectural components, reference points and sequence diagrams.</p>	<p>Recommendation ITU-T Y.3179 focuses on how to prepare and deploy ML models in different deployment environments to enable the application of ML model inference to ML underlay networks. That is, the meaning of ML model serving.</p> <p>This new item focus on studying how to enhance network optimization and service provision by providing and utilizing knowledge enhancement functional entity. ML is considered as one of the basic technologies/tools in knowledge enhancement functional entity, and it will not be detailed discussed in this new work item. Moreover, knowledge-based network optimization and service provision are not discussed and within the scope of ITU-T Y.3179.</p> <p>Thus, this new proposal won't be overlapping with the scope of ITU-T Y.3179.</p>
<p>ITU-T SG13</p>	<p>Recommendation ITU-T Y.3178: “Functional framework for artificial intelligence-based network service provisioning in future networks including IMT-2020”.</p> <p>This recommendation specifies a functional framework for network service provisioning based on artificial intelligence (AI) in future networks.</p> <p>The scope of this recommendation includes:</p> <p>1) A business role-based model for AI-based network service provisioning; 2) High-level requirements for the roles and their interactions from an AI-based operational perspective; 3) Functional components and their interactions for AI-based operations for network service provisioning.</p>	<p>The Y.3178 focuses on AI-based network service provisioning including interactions between business roles through defining a business role-based model, and it aims to describe the application service offerings, which is integrated by network services provisioned by network providers. in administrative domains.</p> <p>This new work item will study how to enhance network optimization and service provision by providing and using an integrated knowledge-based functional entity, and the requirements and framework for utilizing knowledge enhancement functional entity to achieve will be discussed, which is not include in ITU-T Y.3178.</p> <p>Thus, this new proposal study area is different from Y.3178, won't be overlapping with the scope of ITU-T Y.3178.</p>

<p>ITU-T SG13</p>	<p>Y.3061 Autonomous networks - Architecture framework This Recommendation provides requirements, architecture components and related sequence diagrams which together comprise an architecture framework for autonomous networks. The scope of this Recommendation includes: - Requirements for the architecture - Description of the architecture and its components - Sequence diagrams explaining the interactions between the architecture components</p>	<p>Y.3061 provides requirements, architecture components and related sequence diagrams which together comprise an architecture framework for autonomous networks.  This new work item focus on providing requirement and framework of knowledge enhancement capabilities within the IMT-2020 networks architecture, rather than AN architecture, to enhance network optimization capabilities. The requirements and framework of AN is not included in the scope of this draft recommendation.</p>
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## II.2 Gap analysis with other SDOs, including IEEE, ETSI, IETF, and 3GPP

### 1. ETSI GS ENI 019 V3.1.1 - Experiential Networked Intelligence (ENI)-Representing, Inferring, and Proving Knowledge in ENI

ETSI GS ENI 019 specifies the ENI information model. It provides several examples of how to derive technology-specific data models from the ENI information model. Meanwhile, it explains how ontologies can be incorporated to augment, enhance, and specify meaning and different relationships between modelled entities, which is critical to provide semantic reasoning. Overall, ENI define a Cognitive Network Management architecture that is based on the “observe-orient-decide-act” control model.

#### **Gap analysis with ETSI GS ENI 019 V3.1.1**

The ETSI GS ENI 019 is specific to and enhances the current ENI System Architecture, However, the NWI C751 focuses on studying how to provide and utilized knowledge-related technologies within the IMT-2020 network and beyond architecture to enhance network optimization. Although both works involves knowledge-related technologies, the standardized subjects, scope, context, and purpose of two works are very different.

### 2. ETSI GS ENI 005 V3.1.1 - Experiential Networked Intelligence (ENI)-System Architecture

ETSI GS ENI 005 specifies the functional architecture of an ENI System, which is a high-level decomposition of an ENI System into its major components, along with a characterization of the externally visible behavior of the components. The standardization defines the functionality and behavior of a system that satisfy the ENI Requirements (ETSI GS ENI 002) and a functional architecture, in terms of Functional Blocks, that addresses the goals specified by the ENI Use Cases (ETSI GS ENI 001 [3]);

#### **Gap analysis with ETSI GS ENI 005 V3.1.1**

ETSI GS ENI 005 V3.1.1 aims to continue the development of ETSI GS ENI 005 [i.53] (V2.1.1) to define and specify APIs, Interfaces, and protocols used by ENI based on information and data models. However, the NWI C751 specifies the reequipments and framework of knowledge-related capabilities and knowledge-based network optimization within IMT-2020 network architecture. NWI C751 will study and explain how knowledge-related capabilities interacts with data, control, management, and service planes of IMT-2020 and beyond.

### 3. IEEE 2807 - Framework of Knowledge Graphs

IEEE 2807 defines the framework of knowledge graphs (KGs). The framework describes the input requirement of KG; construction process of KG, that is, extraction, storage, fusion, and understanding; performance metrics; applications of KG; verticals; KG-related artificial intelligence (AI) technologies; and

other required digital infrastructure.

#### **Gap analysis with IEEE 2807**

IEEE 2807 provides a very comprehensive standard for knowledge graph technology itself, which provides an excellent reference for knowledge graph technology. NWI C751, on the other hand, focuses on the utilization and application of knowledge-related technologies (including knowledge graph) in IMT-2020 networks and beyond, and how it can help improve network optimization. Therefore, the scopes do not overlap.

#### **4. ISO 30401:2018 - Knowledge management systems requirements**

**ISO 30401:2018** provides requirements and guidelines for establishing, implementing, maintaining, reviewing and improving an effective management system for knowledge management in organizations. It provides the guidance for organizations that aim to be competent in optimizing the value of organizational knowledge. It can be considered as a basis for auditing, certifying, evaluating, and recognizing such competent organizations by internal and external recognized auditing bodies.

#### **Gap analysis with ISO 30401:2018**

The word “knowledge” in ISO 30401 refers to organizational knowledge. ISO 30401 mainly provides a set of process guidelines for enterprise knowledge management, and the technologies such as knowledge graph, machine learning, NLP is not necessarily required. However, NWI C751 primarily focus on how to provide and utilize knowledge-related technologies, such as knowledge graph, NLP, etc., to enhance IMT-2020 and beyond network optimization.

#### **5. Other SDOs**

**3GPP** mainly develops standards in conjunction with the technology and protocols of the current network, etc., and there are no knowledge related standards published.

**IETF** standards mainly focus on network protocols, security protocols, application protocols and other protocols, and there is no knowledge related direction of the standards published.

### **Appendix III - The relationship between knowledge-based study for IMT-2020 networks and beyond (Y.KNO) versus knowledge-based study for AN (Y.KM-AN)**

The Y.KM-AN specifies knowledge management for autonomous network (AN) by studying knowledge base system within AN architecture. Knowledge base system is a subsystem which manages storage, querying, export, import and optimization and update knowledge. Y.KM-AN provides the classification of knowledge, requirements, functional architecture, and sequence diagrams explaining the interactions between Knowledge Base subsystem and other subsystems of AN.

This Y.KNO specifies requirements and framework of knowledge enhancement capabilities within the IMT-2020 architecture, rather than AN architecture. The knowledge enhancement capabilities leverage IMT-2020 networks capabilities and utilize knowledge related technologies, such as knowledge representation, knowledge decision-making, knowledge verification, etc., to enhance network optimization.

Knowledge enhancement capabilities in Y.KNO does not need to be realized through the AN architecture, but can be realized in a lightweight manner solely based on the existing IMT-2020 network architecture. In another words, Y.KNO provides an alternative technical solution for countries, regions, or companies that have not reached or adopted AN architecture, but wish to use the knowledge related technologies IMT-2020 networks and beyond to enhance network optimization at this point in time.

*NOTE: However, as the IMT network evolves, if the AN becomes an integral part of the IMT network, we will also ensure that the knowledge enhancement capabilities defined in Y.KNO will collaborate with the Knowledge base system defined by Y.KM-AN to provide more comprehensive knowledge capabilities for the network. For example, Knowledge base system will more focus on the management aspect of knowledge in networks, and Knowledge enhancement capabilities will more focus on the application and service aspect of knowledge in networks.*

## **Bibliography**

- [b-ETSI GS ENI 005] ETSI GS ENI 005 Experiential Networked Intelligence (ENI)  
[ITU-T M.fkmtom] Recommendation ITU-T M.fkmtom (2023), Framework of knowledge management for telecom operation and management

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## Attachment 1 A.1 justification for proposed draft new Recommendation ITU-T Y.KNO "Requirements and framework for knowledge-based network optimization in IMT-2020 networks and beyond"

<b>Question:</b>	Q20/13	<b>Proposed new ITU-T Recommendation</b>	Geneva, 4-15 March 2024	
<b>Reference and title:</b>	Requirements and framework for knowledge-based network optimization in IMT-2020 networks and beyond			
<b>Base text:</b>	TD764/WP1	<b>Timing:</b>	2026-Q1	
<b>Editor(s):</b>	Chen Cheng, China Unicom, chengc40@chinaunicom.cn Ya'nan Zhang, China Unicom, zhangyn152@chinaunicom.cn Tianyi Wang, China Unicom, wangty65@chinaunicom.cn Jinyou Dai, CICT, PCL, dji@fiberhome.com Xingyu Shang, China Telecom, shangxy1@chinatelecom.cn	<b>Approval:</b>	AAP	
<b>Scope:</b>	<p>The scope of the draft Recommendation includes:</p> <ol style="list-style-type: none"> <li>1) Requirements of knowledge-based network optimization in IMT-2020 network and beyond</li> <li>2) Framework of knowledge-based network optimization in IMT-2020 network and beyond</li> </ol>			
<b>Summary:</b>	<p>In this draft Recommendation, knowledge refers to network knowledge graphs and knowledge models constructed based on multimodal data, such as network data, network topology, expert experience, etc. Knowledge has apriority and universality. Based on the apriority of knowledge, the training speed and accuracy of AI/ML models can be enhanced in the process of network optimization policy generation and root cause diagnostic. Based on the universality of knowledge, the knowledge formed in one scenario can be reused and evolved to improve the efficiency of relevant network optimization tasks.</p> <p>Currently, there are several work items in ITU-T that address the utilization of knowledge-related technologies to enhance the intelligence level of the networks. Such work items mainly focus on the mechanism of knowledge construction in big data driven network, the specification of knowledge base in autonomous network, and the management aspect of knowledge in telecom operation.</p> <p>This draft Recommendation will further study how to provide and utilize knowledge enhancement functional capabilities within the architecture of IMT-2020 networks and beyond. The objective is to realize knowledge-based network optimization through closed loop capabilities of network traffic awareness, intelligent intent perception, network knowledge construction, and knowledge-based network optimization policy generation and verification.</p>			
<b>Relations to ITU-T Recommendations or to other standards (approved or under development):</b>	ITU-T Y.3101, ITU-T Y.3102, ITU-T Y.3110, ITU-T Y.3061, ITU-T M.fkmtom, ITU-T Y.bDDN-ArchMec-KC, ITU-T Y.KM-AN			
<b>Liaisons with other study groups or with other standards bodies:</b>	ITU-T SG16, IEEE Knowledge Graph Working Group, ETSI ENI, 3GPP			
<b>Supporting members that are committing to contributing actively to the work item:</b>	China Unicom, China Telecom, China Information Communication Technologies Group Corporation, Peng Cheng Laboratory, Beijing University of Posts and Telecommunication, China Mobile			