GTI 5G New Calling Open Ecosystem White Paper

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Version:	v1.0
Deliverable Type	☐ Procedural Document ☑ Working Document
Confidential Level	☑ Open to GTI Operator Members ☑ Open to GTI Partners ☑ Open to Public
Working Group	5G Technology and Product
Task	5GNC
Source members	CMCC, EB, Huawei, iFlytek, ZTE
Support members	CMRI(China Mobile Intelligence)
Editor	CMCC: Wei YU, Lei YANG, Yue LIU, Shenxiu DU, Yangguang SHANGGUAN EB: Jianxin LIAO, Dongwu ZHI Huawei: Xiaokun HU, Guoxing LI iFlytek: Ruize CHEN, Pingping LIU ZTE: Zhijun LI, Yongsheng MIAO
Last Edit Date	22-12-2023
Approval Date	DD-MM-2023

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Document History

Date	Meeting #	Version #	Revision Contents
22-12-2023		V1.0	Initial draft

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Abbreviations

Abbreviation	Explanation
3GPP	3rd Generation Partnership Project
5G	5th Generation
5GNC	5G New Calling
AI	Artificial Intelligence
API	Application Programming Interface
AR	Augmented Reality
B2C	Business to Consumer
C2B	Consumer to Business
DC	Data Channel
DCSF	DC Signaling Function
GSMA	Global System for Mobile communications Association
IMS	IP Multimedia Sub-system
MNO	Mobile Network Operator
NE	Network Element
NG	Network Group
NR	New Radio
OTT	Over the Top
PRD	Permanent Reference Document
SDO	Standards Developing Organization
TG	Technology Group
TSG	Terminal Steering Group
UE	User equipment
VoLTE	Voice over LTE
ViLTE	Video over LTE
VoNR	Voice over NR
W3C	World Wide Web Consortium

1 EXECUTIVE SUMMARY

- 5G New Calling (5GNC) will have the opportunity to create a new open ecosystem and all parties in the industry will have the opportunity to participate in 5GNC by taking on one or more roles. In this new open ecosystem, the voice/video call service will burst into unprecedented vitality, show new value, attract more users, and bring more revenue. And this revenue will not only flow through the user to the Mobile Network Operator (MNO), but will also be shared by all parties in the open ecosystem.

- In order to compete with the richness of service experience provided by OTT applications, MNOs need to collaborate with other players in the content, capabilities and devices world in a way that goes beyond the legacy vendor-customer relationship.

- A vibrant and high-quality developer community will be a crucial component of the 5GNC open ecosystem. In the early stages, MNOs could team up with industry partners to create a number of demonstration 5GNC services to build benchmark cases and spearhead the development of the developer community.

2 OVERVIEW OF 5G NEW CALLING OPEN ECOSYSTEM

Voice is the longest-established mobile service and remains crucial today. With the advancement of mobile communication technology and the

popularization of smartphone, user expectations of the quality and diversity of mobile voice/video call service continue to rise. This drives the innovation for native call services and the result is 5GNC.

The 5GNC is an upgrade of the MNO's basic mobile voice/video call service. By harnessing 5G networks and new technologies, such as Artificial Intelligence (AI) and Augmented Reality (AR), 5GNC brings lots of innovative, user-friendly and convenient applications into the basic mobile voice/video call service to enhance the user experience.

5GNC have three basic "new" features:

- New experience: the traditional voice/video call is enhanced to have an ultra-high-definition, intelligent, and interactive experience;

- New capabilities: media and data interaction capabilities can be seamlessly integrated into voice and video calls to create rich applications that transform a regular call into a more rewarding and more efficient, and more attractivecommunication;

- New ecosystem: 5GNC is now creating a new open ecosystem which involves all parties. This is the more significant and important "new" features of 5GNC.

In general, the business model of traditional voice/video call services is as follows: MNOs design their own voice/video call services, provide these

services to their users through the MNO network, and the revenue generated by these services will be collected only by the MNOs. For such a business model, the revenue generated by the voice/video call services is actually only related to the MNOs and their users. While the revenue of the network equipment vendors or content providers will be paid directly by the MNOs, independent of the revenue that the voice/video call services themselves can earn. Other roles, such as application developer, vertical industry and enterprise, actually cannot participate in such a business model.

5GNC has the potentiality to change such a business model of the traditional voice/video call services. 5GNC services are no longer limited to being designed only by MNOs. Any interested application developers can participate in the design of 5GNC services, which means that 5GNC provides the opportunity for innovation of call services. 5GNC services will have the opportunity to gain access to a wealth of development experience from various large and established developer communities of internet technologies etc., for the purpose of creating a novel 5GNC developer community.

Benefiting from 5GNC developer community, MNOs will provide a unified platform that can be used to deploy and manage 5GNC services. These 5GNC services can be provided by MNOs or developers, and they

are either developed according to user needs or tailored to address diversified use cases for vertical industries and enterprises.

And this unified platform will also be used to host a variety of advanced media technology and other capabilities from MNOs or capability providers to help developers, vertical industries and enterprises to enhance their services.

In fact, all parties in the industry will have the opportunity to participate in 5GNC by taking on one or more roles. In this new open ecosystem, the voice/video call service will burst into unprecedented vitality, show new value, attract more users, and bring more revenue. And this revenue will not only flow through the user to the MNO, but will also be shared by all parties in the open ecosystem.

3   VALUE CHAIN OF 5G NEW CALLING OPEN ECOSYSTEM

3.1   Overview

An ecosystem is a collection of entities acting as components, interacting to solve problems or create opportunities within an industry. Nowadays, customers no longer differentiate communications from entertainment, marketing, shopping and other activities. In order to compete with the richness of service experience provided by OTT applications, MNOs need to collaborate with other players in the content, capabilities and devices world in a way that goes beyond the legacy vendor-customer

relationship.

This clause describes the potential value chain model that may be present in the 5GNC open ecosystem. The following business models are examples only and should not be interpreted as recommendations. Individual MNOs remain free to devise their own business models under applicable market conditions and laws. Companies may also assume roles outside their traditional scope, e.g. MNOs may also take the role of media capability providers or content providers. When taking a particular role, the corresponding agreement within the same business framework shall also be applied to the participant to ensure framework consistency.
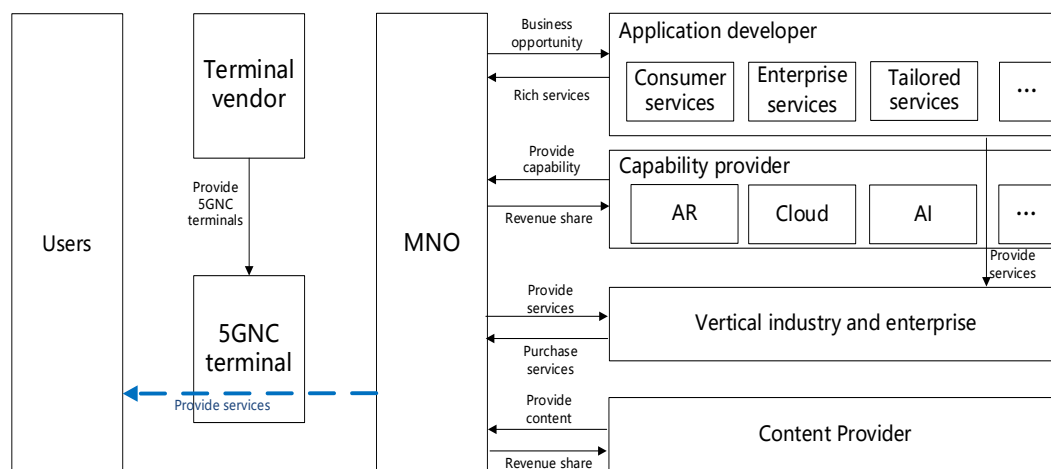

Figure 1   Potential value chain model

The main roles in the potential value chain of 5GNC open ecosystem in Figure 1 are as follows:

- MNO: a dominant platform to connect users, capability provider, vertical industry and enterprise, terminal vendor and application

developer.

- Capability provider: providing capabilities, such as advanced media technology, AI capabilities, etc., to 5GNC open ecosystem.

- Vertical industry and enterprise: developing or purchasing tailored 5GNC services to provide better businesses to their users through tailored 5GNC services.

- Terminal vendor: providing 5GNC enabled terminals to meet users' requirements for using 5GNC.

- Content provider: providing rich and diverse content services to partners.

- Application developer: developing 5GNC services for end users, vertical industry and enterprise.

3.2   Mobile network operator

5GNC offers a straightforward route for MNOs to be more than simple connectivity providers. In this new value chain, MNOs will play as a dominant platform to connect users, capability provider, vertical industry and enterprise, terminal vendor and application developer..

The transformation of the roles brings new revenue generating opportunities for MNOs, allowing them to create value through both direct models and indirect models. For the direct models, the MNOs

receive revenue directly from users or vertical industries and enterprises either through charging for the call session or charging for the usage of specific value-added service of 5GNC, e.g. usage of AI capabilities. For the indirect models, the revenue can be received elsewhere in the open ecosystem, e.g. MNOs could receive a share of the revenue from vertical industry and enterprise or application developers.

3.3 Capability provider

The capability providers could provide various capabilities in different facets, such as network and calling events exposure, advanced media technology, AI capabilities, etc., to the 5GNC open ecosystem. Within the 5GNC open system, these capabilities can be invoked by 5GNC applications or services. By doing so, the capability providers can leverage their offerings and monetize them. They may choose to charge based on the frequency of invoking or may implement a subscription-based model with a fixed fee. As a participant in the 5GNC open ecosystem, the capability providers will have the opportunity to share in the business benefits that 5GNC brings.

3.4 Vertical industry and enterprise

For the vertical industries and enterprises, 5GNC provides a trusted, interactive and highly efficient way to communicate with their customers. The vertical industries and enterprises could develop or purchase tailored

5GNC services and enable these services for C2B (Consumer to Business) and B2C (Business to Consumer) 5GNC sessions. These 5GNC services will bring better service experience to customers of vertical industries and enterprises, and help them to increase their user engagement and expand their user scale. These 5GNC services will further help vertical industries and enterprises generate more revenue from users

3.5 Terminal vendor

The popularization of terminals supporting 5GNC is crucial for the large-scale promotion of 5GNC services, making terminal vendors an essential part of the open ecosystem. 5GNC services introduce a new requirement for terminals, i.e. supporting for IMS Data Channel (DC), while the mainstream terminals currently available in the market do not support IMS DC. Therefore, with the promotion of 5GNC services and the construction of the 5GNC open ecosystem users will be inclined to replace existing terminals to access the latest 5GNC services, and thus terminal vendor will have opportunity to generate revenue from this trend.

3.6 Content provider

Content providers can provide rich and diverse content to partners in the 5GNC open ecosystem, including providing content copyrights, such as avatar licenses, celebrity licences, and other well-known licences, and

innovative content, such as user generated content, AI generated content, etc. In 5GNC open ecosystem, content providers will not only be companies, but also individual content creators, who will all benefit from the content services they provide.

3.7 Application developer

A vibrant and high-quality developer community will be a crucial component of the 5GNC open ecosystem. In the early stages, MNOs could team up with industry partners to create a number of demonstration 5GNC services to build benchmark cases and spearhead the development of the developer community. In 5GNC open ecosystem, MNOs and vertical industries and enterprises may purchase some 5GNC applications they need from 5GNC application providers /developers, or pay to subscribe to some services. And the application developers can also gain revenue from users or share revenue with MNOs.

4 5G NEW CALLING OPEN ECOSYSTEM TECHNICAL FRAMEWORK

4.1 Overview

The Figure 2 shows the 5GNC system architecture diagram. The main network elements (NEs) include capability platform, operation platform, open platform and application server. The user equipment (UE) can access 5GNC system during the call through the core network to use the 5GNC service. The core network, capability platform and operation

platform could be implemented by operators and provide service

capability through open platform to application servers, which could be

implemented by operators or 3rd party service providers.
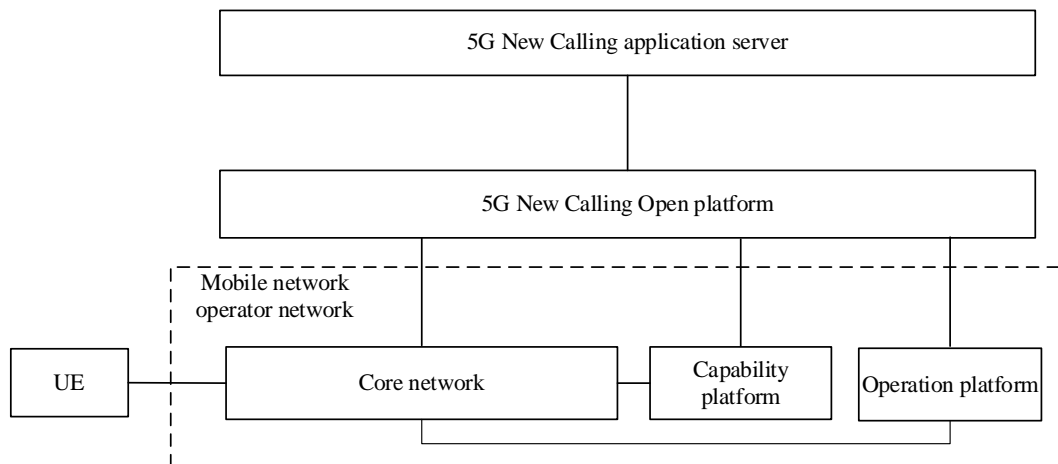

Figure 2   5GNC System Architecture

The functionalities of the main NEs in the 5GNC system architecture are

as follows:

- Mobile network operator network: include NEs of the core network,

  capability platform and operation platform. The core network

  supporting 5GNC service provides high quality end to end

  connectivity to the network for end users for VoLTE/ViLTE access

  connected to evolved packet core network and VoNR access

  connected to 5G core network and provide access to service providers

  with secure and reliable network capability. The capability platform

  hosts 5GNC capabilities, such as AI capabilities, and will provide in a

specified way on network or open platform needs. And the operation

platform provides operation and management capabilities for 5GNC,

which can be invoked by the core network or open platform in a

defined manner.

- Open platform: the platform encapsulates the operator's network

  capabilities, i.e. the capabilities provided by capability platform and

  open platform. The application servers access the MNO's network and

  invokes these capabilities through the way specified by the open

  platform.

- Application server: the server can provide required functions for

  MNOs hosted or 3rd party applications.

4.2   Mobile network operator network

The MNO's network consists of three parts: core network, capability

platform and operation platform.

- Core network

Enhanced from traditional IMS network, core network also contains new

NEs to support 5GNC, such as Media Function (MF), Data Channel

Signaling Function(DCSF), etc. Nevertheless, for the application

ecosystem, the interactions between core NEs can be viewed as a black

box. And the core network capabilities that can be made available to the

outside may include:

1) media stream replication/transmit capability: providing capability to replicate/transmit the audio or video media streams of a call to a specified location such as a capability platform for processing to provide 5GNC services;

2) new calling events subscription and notification: providing capability to the capability platform and third-party 5GNC service to subscribe the network and new calling events so as to facilitate the developing of new calling applications;

3) service subscription capability: providing subscription capability to 3rd party 5GNC services when they require users to subscribe or pay through telephone billing;

4) New Calling Mini-App storage capability: for 5GNC IMS DC services (commonly supported by New Calling Mini-App), the Mini-App storage capability could be provided. When a user initiates a call, the New Calling Mini-App could be pushed to the user terminal.

> **What is "New Calling Mini-App"**
>
> *The "New Calling Mini-App" is an application stored on the MNO's network and pushed to the user terminal during the call. Compared to regular applications, the New Calling Mini-App is more akin to WebApps currently being defined in the World Wide Web Consortium (W3C) Consortium. A New Calling Mini-App is generally invoked before the completion of the call establishment or during a call.*
> *The "New Calling Mini-App" relies on native features of the mobile devices. But unlike regular Apps consumers are familiar with today, the New Calling Mini-Apps do not require pre-installation, and are always up to date and secure,. The New Calling Mini-Apps are not tied to a specific operation system and make use of the binding between user identities and their mobile number.*

- Capability platform

As a platform hosting 5GNC capabilities, the capability platform provides the corresponding 5GNC capabilities after receiving a request from the core network or the open platform. A typical scenario is as follows:

1) an application server requests the AI translation capability to convert the user's voice content into text through the open platform;

2) the open platform requests the core network to copy the user's audio media stream to the capability platform through open platform;

3) the capability platform converts the specified audio media stream into text and sends the result to the specified address.

Although the capability platform is a part of MNO's network, the 5GNC capabilities hosted on it can come from all parties in the 5GNC industry. In addition, for any general-purpose 5GNC capability, its provider can

partner with the MNO to host this capability on the capability platform, and this 5GNC capability can then be invoked by all 5GNC services.

- Operation platform

Operation platform is the user unified portal, resource storage warehouse and operation center of 5GNC services in the operator's network.

1) As the user unified portal, operation platform is open to 5GNC users. Users can configure their 5GNC services on this portal, such as subscription or personal settings. The operation platform reflects the user's configuration to the corresponding 5GNC NEs by sending the subscription to the core network, or synchronizing the user's personal settings with the core network and application server.

2) As resource storage warehouse, operation platform stores all media resources of 5GNC and, after receiving a request, sends the required media resources to the specified NE.

3) As operation center, operation platform will provide all the operational capabilities required by the 5GNC services, such as service charging, data analysis, service management, etc.

4.3   5G New Calling Open platform

Generally, NEs in the operator's network interact with each other through the dedicated transmission network belonged to the trusted domain.

However, to build a 5GNC application ecosystem, it is essential to introduce the 3rd party NEs and ensure their interaction with NEs in the operator's network. The 3rd party NEs always interact with operator's networks through fixed broadband or other IP networks, which belong to an untrusted domain. Therefore, the open platform between the 3rd party NEs and the operator's network NEs is necessary.

Although the open platform needs to ensure the security of the interaction between the 3rd party NEs and the operator's network NEs, it is not only a security gateway in the traditional sense but also given more responsibilities in the 5GNC application ecosystem. The open platform will encapsulate operator's network capabilities and make them available to the 3rd party NEs such as the 3rd party application servers. In addition, the open platform can accept requests to encapsulate the capabilities of a specified 3rd party application server and make them available for other 3rd party NEs. The open platform will serve as the platform on which interconnection depend.

4.4 5G New Calling application

5GNC applications can be divided into two categories, i.e. voice and video call based, and IMS data channel based. (which is commonly supported by New Calling Mini-App)

The specific implementation of the first category application is dependent

on the application server and the operator's network. They need to define the interaction between NEs, usually in the form of interfaces, which means that such applications require the upgrade the operator's network. In other words, these types of applications are usually operator's services, or the services that rely on the partnerships with the operator.

While the specific implementation of the second category application is simpler and more standardized. The application based on IMS data channel is supported by New Calling Mini-App. In the developer community, 5GNC application providers can utilize development documentation, Mini-App development suites, service quality testing tools,etc.,which lower entry barriers and help develop 5GNC application efficiently.

The operation platform takes the role of Mini-App management and review. With the New Calling Mini-App uploaded to the operation platform, (through the open platform) and the connection between the corresponding application server and the open platform established, this service can be offered to all users of this operator after the operation platform completes the review process.

5 CASES OF 5G NEW CALLING OPEN ECOSYSTEM COLLABORATION FOR

5.1 Smart translation

Smart translation is a 5GNC service which enables users speaking different languages or either may be hearing-impaired to enjoy effective video communication. Smart translation service supports both voice transcriptions and real-time translations. When voice transcription is activated, the audio stream of the other party will be converted into text and overlaid in real time as captions on the video stream. The real-time translation function goes one step further displaying the captions translated into the desired language.

Smart translation service is one of the typical example of the 5GNC open ecosystem collaboration.

The MNO is expected to support the video call service with high quality network and media capabilities. The application developer will develop applications and deploy application server based on service needs. While the capability provider need to introduce capabilities to enhance the service. China Mobile's smart translation service has already proved the feasibility of this model. EB, as an application developer, cooperated with China Mobile to develop tailored smart translation applications and deployed the application server. iFlytek, as a capability provider, deployed AI capabilities (e.g. Speech to Text) on the capability platform

to enhance smart translation service.

5.2 Smart customer service

Smart customer service is an upgrade of traditional telephone-based customer service.Rather than relying on traditional voice and keypad inputs, smart customer service provides a new interactive interface, e.g. an interactive menu, combined with human customer service.

While dialing to customer service on device with IMS DC capability, through presented smart customer service Mini-App, users can choose different services within the customized menu, or human customer service for business service handling under the guidance of a customer service staff. Smart customer service can be highly customized, enabling the creation of dedicated customer service for different enterprises.

- For example, MNOs could use smart customer serviceto provide billing or other service information.

- For home appliance manufacturers, bidirectional video marking functions could be provided, so that with the user's on-site scene provided in real time (with the user's authorization), the customer service staff can guide user with use of home appliances functions or handling of simple error operations .

- For insurance companies or banks, smart customer service can be

used to assist users in the process of handling services, such as face verification and real-time digital signatures, making life easier for customers and improving enterprise work efficiency.

- For vertical industries and enterprises users, smart customer service could increase user reach rates, enhance user stickiness and bring extra income, as well as improving business processing efficiency.

Smart customer service is also one of the typical example of the 5GNC open ecosystem collaboration. Vertical industries and enterprises can purchase tailored 5GNC applications from application developers based on their needs and partner with MNOs to deploy these services. And they can also work with capability providers to introduce some new capabilities to meet their needs. Through this tailored smart customer service, vertical industries and enterprises users could increase user reach rates, enhance user stickiness and bring extra income, as well as improving business processing efficiency.

6 STANDARDIZATION PROGRESS OF 5G NEW CALLING OPENNESS

6.1 Standard progress

Developing of the 5GNC open ecosystem needs the support from the whole industry, it is critical to deeply root 5GNC in 3GPP specifications, GSMA profiles and other relevant standards to leverage the benefits of standardization.

- 3GPP

As the technical basis of 5GNC, the concept of IMS data channel technology is developed by 3GPP SA4 in Rel-16 and specified in 3GPP TS 26.114. SA1 studied the service requirement of enhanced multimedia calling in Rel-18 and the potential service requirements are captured in 3GPP TR 22.873 and 3GPP TS 22.261.

Based on the stage 1 requirements and data channel technology, SA2 specified the enhanced IMS architecture with data channel usage in Rel-18 under work item NG_RTC. The normative work of the architecture is captured in 3GPP TS 23.228.

3GPP SA6 has started a study on the service level capability exposure and necessary application layer procedures in 5GNC service in Rel-19. The objective of this study is to provide 5GNC capabilities to the enterprises.

The security and charging aspects of 5GNC is studied by 3GPP SA3 and SA5 respectively. Based on SA2's stage 2 normative work, CT1, CT3 CT4 and CT6 groups have started the normative work for enhanced MMTel service, IMS data channel interfaces and protocols. These works are expected to be completed before Q2, 2024.

- GSMA

5GNC related standardization are also done in GSMA. Tthe work is done or ongoing in GSMA Network Group (NG), Terminal Sheering Group (TSG) and Technology Group (TG).

In December 2021, GSMA NG released IMS Data Channel White Paper NG.129 and GSMA TG released a Business Voice Calling White Paper (TGY.02) which covers 5GNC relevant aspects.

In May 2023, GSMA NG released PRD NG.134 which defines a minimum mandatory set of features that user equipment and networks are required. GSMA TSG has initiated the IMSDCAS work item in April 2023 to specify an open and standardized IMS DC API specification for application developers. Immediately after that, GSMA TSG also initiated the UEIMSDC work item in May 2023 to define IMS DC specific functional and non-functional test cases for voice-centric UE with DCMTSI client

6.2   Ongoing progress and further vision

More standardization work is still needed to evolve the service and network capabilities of 5GNC, especially for the open ecosystem aspect. Work in Standards Developing Organization (SDO)s will continue to evolve the support of 5GNC and fill the identified gaps in the coming years.

Further standardization work is likely to focus on the technical enhancement such as support of interworking and roaming of 5GNC services, support of standalone data channel which does not require accompanying audio/video media in an IMS session, support of AR media processing (e.g. negotiation of AR media handling capability) in 5GNC, and network and service capabilities exposure of 5GNC to enable enterprises to empower B2C/C2B service innovation, etc.

For the open ecosystem aspect, there are already some ongoing projects in several SDOs.

In 3GPP, SA2 has started a study item FS_NG_RTC_Ph2 in Rel-19 to study the enhance IMS framework for exposure of IMS capability in the context of IMS data channel session. SA6 has also started a study item FS_eMMTelAPP study item in Rel-19 to study the application layer architecture for enabling eMMTel service to enterprises. Some value-added capabilities which can be used in 5GNC service will also be covered in the SA6 study item. These two study items will study network level and service level capability exposure for 5GNC service respectively and expected to be finished in Rel-19.

In GSMA, Open Gateway and CAMARA project will develop a set of Northbound service APIs to applications. Currently no 5GNC related APIs has been developed. It is expected to start the 5GNC open

ecosystem related work in GSMA based on technical output from 3GPP.

In addition, other ecosystem issues and barriers for adoption/success of 5GNC open ecosystem, such as business model and settlement etc, are also expected to be studied in the coming years.

7 INDUSTRY COLLABORATION

7.1 Challenges faced by 5G New Calling open ecosystem

5GNC open ecosystem is facing challenges in development. Cooperation among all industry partners is the key to success. The main challenges include:

- Support from chip and terminal vendor is key in driving 5GNC realization and also heavily impact the 5GNC open ecosystem.

- Standardization leading is requested to promote such support. Competitive and innovative calling applications are necessary to attract users and guide terminal vendor.

- More participation of application developers are expected to build a thriving 5GNC open ecosystem.

7.2 5G New Calling industrial activities

In order to overcome these challenges and call for collaboration, many 5GNC industrial activities are held in the past years.

China Mobile initiated a 5GNC discussion topic in the GSMA board meeting during MWC Barcelona 2023 and initiated the 5GNC Cooperation Initiative during the 5GNC summit held at the same time to call for collaboration.

> **5GNC Industry Cooperation Initiative**
>
> *We propose that global MNOs, network equipment manufacturers, terminal and chip vendors, audio, video, and AI technology providers, and industry partners collaborate to develop New call services and business models, create global standards, and promote interconnection，driving the maturity and prosperity of the New Calling industry and creating a brand-new future for calling.*

After MWC Barcelona 2023, the GSMA Board established the 5GNC Task Force under the board level. The objectives of 5GNC Task Force include knowledge sharing, discussing service aspect of 5GNC, capturing gaps in 5GNC standards and ecosystem, and engaging with infrastructure vendors, terminal vendors and chip vendors.

GSMA Foundry has also published a white paper named " 5G New Calling: revolutionising the Communications Services Landscape" in October 2023 to call for industry collaboration.

7.3   5G New Calling Joint Innovation Center

In order to actively promote the construction of 5GNC open ecosystem, China Mobile is now building a 5GNC Joint Innovation Center to assist industry, academia, research institutions and other industry parties to

jointly improve the ecosystem. The 5GNC Joint Innovation Center aims to attract 5GNC capability providers, terminal vendors and application developers to enrich 5GNC services and build 5GNC open ecosystem.`

5GNC Joint Innovation Center provides a high-quality innovation incubation environment that aligns with the commercial network infrastructure. By partnering with terminal vendors, China Mobile is committed to services integration and experience optimization, while working with equipment manufacturers to construct unified platforms and optimize network architecture. Additionally, China Mobile collaborates with capability provider to foster innovative capabilities and work with application developer to expand application scenarios and enrich 5GNC services. This collaborative platform serves as a catalyst for various technological innovations.

5GNC Joint Innovation Center has independently developed a convenient, flexible and intuitive service quality inspection tool to streamline the acceptance inspection process for MNOs. This inspection tool boosts a range of features including data collection, filtering and analysis, enabling rapid and efficient online assessment of 5GNC services. With its intuitive interface and flexible functionality, this tool is the key to unlocking the potential of 5GNC open ecosystem.

7.4 Recommendations

It is hoped that this white paper will be taken as an opportunity for all parties especially application providers, capability providers in the industry to exchange views, explore the related business models, network interconnection and global standards, and jointly participate in the construction of 5GNC open ecosystem, in order to to promote the maturity and prosperity of 5GNC industry.

It is also expected that the necessary specifications for 5GNC open ecosystem can be addressed through this white paper and specifications future developed by suitable SDO(s).