**SA WG2 Meeting #168 S2-250xxxxv1**

**07 - 11 April, 2025, Goteborg**

**Source: Moderator**

**Title: Discussion on work areas of 6G SA2 study**

**Document for: Discussion**

**Agenda Item: 30.7**

**Work Item / Release: Rel-20**

*Abstract of the contribution:* *This paper discuss the work areas of 6G SA2 study.*

# 1 Discussion

Several input papers on the technique areas of 6G are submitted into SA2#168 and a summary is provided in the following link.

<https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_168_Goteborg_2025-04/INBOX/DRAFTS/6G%20SID/6G%20Input%20Summary%20v2.xlsx>

Based on the input paper the moderator generates an initial set of work areas for SA2 6G study. It is proposed to discuss the initial set of work areas and figure out the contentious aspects that need further NWM discussion, and identify any missing aspects.

NWM discussion on the 6G SID is expected after SA2#168, from Apr. 15(Tue)-25(Fri), 2025. After the NWM discussion the moderator will provide a summary and a proposal of 6G SID for SA2#169 meeting.

The following are moderator proposals on the work areas and NWM questions

# System Architecture

## 1.0 Architecture requirement

**Moderator proposal:**

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| Work Area | Investigating architectural requirements, assumptions and principles for 6G system |
| Questions for NWM discussion: | * Which proposed aspects should be reworded?
* Which aspects should additionally be studied?
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## 1.1 Architecture (20)

General Architecture has been mentioned in the following company inputs:

SK TELECOM, China Telecom, MEDIATEK INC., NTT DOCOMO, AT&T, Lenovo, Qualcomm, NOKIA, Spark NZ Ltd , OPPO, Ericsson, NEC, Apple, Samsung, Vodafone, CATT , Charter Communications, Deutsche Telekom, LG Electronics, InterDigital Canada

The following aspects are mentioned:

* Study 5GC features to be reused, or redesigned, or new added.
* Targeting only standalone architecture
* 6G Network simplification
* common framework for supporting operator services over the user-plane
* Modular NAS framework(see 1.8)
* SBI enhancement (see 1.7)

**Moderator proposal:**

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| Work Area | Study the overall architecture including at least the following aspects:* Study and identify functionalities, NFs etc. that use 5GC as basis and any potential enhancements.
* Study and identify functionalities, NFs etc. that are redesigned
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| Questions for NWM discussion: | * Which proposed aspects should be reworded?
* Which aspects should additionally be studied?
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| SK TELECOM | 1 | Architecture related to SBA | 7. Simplification of NFs’ features, Interfaces, UE/session context, procedures, including backward compatibilities. |
| China Telecom | *1* | *6G Network simplification*  | *This study will focus on 6G network simplification, and study how to redesign network functions and procedures to simplify interoperability between network functions of different vendors, and reduce the complexity of network architecture.* |
| MEDIATEK INC. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | ❑ WT-1.1 Identify Key Technical Areas to be addressed• Basic architecture principles• Migration and interworking: Migration path from 5G NR to 6GR as well as interworking and mobility between 5G NR and 6GR, in coordination with RAN (and WGs) where necessary such that o Standalone 6G operation shall be enabled o Any additional architectural option for migration (if such option is deemed necessary) should be carefully considered and documented in terms of need, UE impact, RAN impact, Core Network impact, overall specification impact and workload in applicable WGs.• Network access control and PLMN selection• Registration and mobility handling aspects• Session management, UP, Policy Control and QoS Model aspects• SBI framework enhancements• Network capability exposure framework• Energy Efficiency• Native AI/ML framework (incl. data management)• Network slicing • Roaming• Non-3GPP access support• Security aspects❑ WT-1.2 Shape the baseline assumptions based on Key Technical Areas❑ WT-1.3 Distinguish independent / additional Technical Areas to be discussed in parallel for Phase 2 |
| NTT DOCOMO | 1 | 6G Simplified architecture | -Simplify architectural framework in comparison with 5G-Only standalone architecture-Reduced number of NFs-Categorize NFs into Mandatory NFs and Optional NFs•To study level of disaggregation in 6GC and optimize the network for it |
| 13 | RAN-Core Service Based Interface | -Simplifying the system architecture by combining overlapping functions in RAN and CN (mobility management, paging) |
| AT&T | 1 | High Level 6G System Design | •To study any modifications to basic 5G Control and User Plane components and how they interact e.g.•To study interfaces like N4 and N2 (or their equivalent) for conversion to SBA •To study level of disaggregation in 6GC and optimize the network for it•To study QoS enhancements in support of new services•To study NAS layer changes that can be justified•To study support for roaming to minimize disruptions in current deployments |
| Lenovo | 1 | Common 6G system architecture aspects | Based on the 5GS SBI architecture, study 6G system architecture which should allow for simplified deployment of new features and services, i.e. with minimal impact to the baseline 6G architecture. Study which NFs and functionalities from 5GS can be re-used, which NFs needs to be re-designed. This may include IWK and migration aspects with 5G/4G. |
| Qualcomm | #1 | Common framework for operator services over the user-plane | WT#1: Study a common framework for supporting operator services over the user-plane including •UE configuration and discovery of operator services,•authentication, authorization and security establishment;•binding of operator services to specific DNNs and slices.•UE identification in presence of NAT |
| NOKIA, Spark NZ Ltd  | 1 | Architecture principles | Architecture principles and assumptions that would apply for 6G System |
| 2 | 6G System Architecture | 6G System Architecture – Roaming & Non-Roaming |
| 3 | Registration, Connection and Session Management procedures | Modular NAS framework with distributed NAS termination  impact to RM, CM and SM procedures should be studied. System procedure impact due to NAS protocol optimizations.  |
| 4 | 6G Identifiers & Subscription aspects | Temporary and permanent identifiers, Temporary and permanent subscription, Onboarding and system impact due to network selection for PLMN and SNPN, SNPN ID, Equivalent SNPN list support. |
| OPPO | WT#1 | System Architecture evolution | 1. NAS for basic functionality (i.e. RM, CM, MM, SM, UE Policy) routing over CP locally;2. NAS for MNO services (e.g. LCS, AI, Sensing) routing over UP;3. Related RM, CM, MM and UE Policy procedures . |
| Ericsson | 1 (For Dec-25 | 6G System architecture baseline | Study and identify aspects, NFs etc that can be reused from 5GC. Focus on analyzing existing basic functionality (mobility, session, RAN-CN functional split, QoS model, UP model, slicing, roaming, policy control, user data management, exposure framework etc) to support legacy services (voice incl roaming, MBB, FWA).Focus on business-relevant multi-vendor interfaces and a standalone architecture for 6G RAT. |
| 4 After Dec-25 | Simplification and enhancements | Study simplification opportunities of core network architecture based on learnings from 5G. Consider areas of improvement, e.g. consolidation or split of NFs/NF Services.  |
| NEC | 1 | Basic network architecture | Study the basic 6G architecture including:•Network Functions and interfaces (e.g., SBI) that support UE communication (e.g., Voice/SMS, IP or non-IP traffic) and beyond-communication services (e.g., AI/Computing/Sensing).•Core network architecture supporting interaction with UE/RAN/Application Function.•Support for Multi NAS/Modular NAS/Distributed NAS and related security issues.•NGAP as an SBI-based interface.•Support for 5G-6G Dynamic MRSS.•Integrated RAN CU-UP and UPF.•Dual Registration support.•Cloud and AI-Native design from Day 1. |
| Apple | *1* | *6G Core Network Architecture* | -Identifiers-Functional division and interfaces-Interworking with 5G-Mobility Management-Session Management-QoS and policy to support new services-Unified exposure framework across 5GS and 6GS-General enhancements to SBI framework and optimizations (e.g. support for HTTP/3 and QUIC, manage the number of new NFs for 6G features) |
| Samsung | X | Compact and Simple Architecture | 1. Identify impacts of legacy features/services that are rarely deployed, in the architectural perspectives, and study the network architecture to address them efficiently in 6G while alleviating backwards compatibility issues2. Identify and redesign features defined over-complicated or multiple options without well-justified use cases, e.g., network slicing, XRM, edge computing, etc.3. Identify areas for improvement on RAN and CN functions, e.g., optimize functionalities in RAN and CN that are defined for duplicated or similar purposes |
| Vodafone | 1 | Reuse 5GC, evolve 5GC, or new Core? | -identify key pain points with 5GC-identify modifications to use with 6G RAN and justify (identify business drivers) |
| 3 | Simplification of procedures / non-continuation of unused 5G features with 6G RAT | - Study which 5GC procedures do not need to be supported with 6G RAT, and which procedures need radical simplification |
| 6 | RRC Inactive | Investigate RRC Inactive and alternative solutions for fast idle-active change taking into account a multi-RAT environment |
| 7 | Roaming | - Preserve with zero changes- Start all studies from the roaming architecture |
| 8 | Enable MNO to operate across multiple countries | Study how to enable Core Network Functions to operate across multiple countries, e.g. remove all LI aspects from AMF |
| CATT  | *1* | System Architecture | -Design a new 6G Core, identify which NFs should be re-used, re-designed and new added.-Support of RAN and CN functionalities split.-Support of 6G Standalone Architecture as the baseline.-Support of new 6G RAT (including satellite access and terrestrial access) and non-3GPP access, architecture design should minimize access dependencies. |
| Charter Communications | 4 | Enhanced 5G SBA based on 5GC evolution | •6G standalone architecture while 6G coexist with 5G. |
| Deutsche Telekom | 1 | SBA as basis for 6G System Architecture | •Consider 5G-SBA as starting point for 6G |
| 4 | Reshaping of NFs | •Improve procedure flows •Improvement of NFs / NF Services •Re-use 5G NFs where possible, enhance where needed |
| LG Electronics | 1 | General Architecture | The following objective can be considered regarding General Architecture of 6G:1) How to design 6G Architecture, e.g. 5GC evolution or clean state design2) How to design interface between 6GC and RAN, e.g. whether to keep NG-like interface between 6GC and RAN3) Native support of NPNa)  Whether to re-use CAG mechanism or define a new mechanism for access control b) Network selection for NPN4) Roaming support5) Mobility management framework6) Session management framework including Edge Computing aspects7) QoS framework considering support of XR and Multi-modality8) UE / AM / SM policy control framework9) NAS framework, e.g. whether to keep 5G NAS framework or enhance 5G NAS framework10)  Security framework, e.g. whether to keep 5G security framework or enhance 5G security framework11)  Data management framework, e.g. how to efficiently collect and manage data in the network, and expose data12)  Native support of MINT (i.e. disaster roaming), e.g. whether to re-use Rel-17 MINT mechanism or define a new mechanism13)  Support of Energy Efficiency and Energy Savinga)  How to apply functions and mechanisms specified by Rel-19 EnergySys to 6GS such as EIF(Energy Information Function), collecting/calculating/exposing the energy related information, etc.14)  Slicing supporta)  Which sling features specified in 5GS should be supported by mandatory in the UE and networkb)  Whether and how to simplify slicing mechanisms specified in 5GS |
| InterDigital Canada | 1 | Access and Mobility Management | Study to how to reduce redundancies between RAN and the core network’s in paging (e.g., simplify core network involvement and UE state management) |

## 1.2 Migration and interworking(19)

Migration and interworking has been mentioned in the following company inputs:

SK TELECOM, Google, China Telecom, MEDIATEK INC., InterDigital Canada, NTT DOCOMO, AT&T, KPN, Qualcomm, NOKIA, Spark NZ Ltd, OPPO, Ericsson, Apple, Samsung, Vodafone, CATT, Deutsche Telekom, ZTE, LG ELECTRONICS.

The following aspects are mentioned:

* Study principles for interworking. it should be determined as early in the study, including MRSS, Single registration, dual registration, MRSS, 6G-6G CA, dual connectivity, dual steer/dual stack, etc.
* How to interwork with 5G. Whether 6GS can interwork with 4G.
* Backward compatibility on various interfaces e.g. roaming interfaces, RAN-CN interface level, NAS level, 3rd party API level etc.
* Interworking Architecture and Procedure

**Moderator proposal:**

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| Work area | Study the migration and interworking with legacy systems. |
| Questions for NWM discussion: | * Which proposed aspects should be reworded?
* Which aspects should additionally be studied?
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| SK TELECOM | 2 | Migration and Interworking  | •This item identifies to analyze pros and cons for potential 6G migration options under key criteria, especially while considering core network impacts. •MRSS, 6G-6G CA, dual connectivity, dual stack, and the related charging, policies, authentication, voice service, etc. •Also, this item can identify scenario how to interwork with exiting legacy systems (i.e., 5G, 4G), which can be dependent with 6G migration options. •Key criteria can include, e.g., (user experience aspects (e.g., peak throughput, service continuity), cost for migration, device evolution plan (e.g., battery, chipset), etc.) |
| Google | *2* | *Network migration for 5GS and 6GS* | - Support 3GPP access including 5G-RAN and 6G-RAN in 5GS/6GS  |
| China Telecom | 5 | *Interworking and Migration* | *Target at a stand-alone 6GC in Day-1, to study how to support different levels of service continuity offered in:* *•Interworking and migration Scenarios within an operator (nonroaming), 5G system and 6G system**•Roaming without interworking Scenarios.**•Roaming and Interworking Scenarios, between one operator deploys an 5G system and one deploys 6G system.**•Dual Stack/mode/steer to support two 3GPP access* |
| MEDIATEK INC. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | •Migration and interworking: Migration path from 5G NR to 6GR as well as interworking and mobility between 5G NR and 6GR, in coordination with RAN (and |
| InterDigital Canada | 2 | Interworking with 5G | Study principles for interworking (e.g. single/ dual registration, dual steer/dual stack). These principle should be agreed early in the study and solutions to other work tasks should account for interworking with 5G and follow these principles. |
| NTT DOCOMO | 6 | Interworking with 5G | -Dual registration: support UE dual registration in 6GC and 5GC network using same subscriber identifier-No combo nodes in Control Plane and User Plane-shared subscription information between 5G and 6G networks |
| AT&T | 2 | Interworking with 5G | •To study Backwards Compatibility /Co-existence / Interworking with 5G of new NFs in 6G (e.g. at SBI level)•To Study and agree to the right level of backward compatibility on various interfaces e.g. roaming interfaces, RAN-CN interface level, NAS level, 3rd party API level etc. |
| KPN | 1 | 6G Migration & Interworking Architecture | -Definition of a 6G SA core architecture, with support for roaming.-Support for interworking with 5G only.-Support for service continuity between 6G and 5G coverage. |
| Qualcomm | #7 | Migration to 6G | WT#1: Study 5G/6G service steering and aggregation solutions that allow MNOs to leverage both 5G and 6G bands in scenarios where MRSS is not available |
| #9 | Traffic steering and switching for non-migration scenarios | WT#1: Study solutions for traffic steering and switching over two 3GPP access networks for non-migration scenarios |
| NOKIA, Spark NZ Ltd  | 8 | Interworking with 5G | Single registration based Interworking with 5G needs to be specified,  |
| OPPO | WT#5 | Interworking and migration | 1. Inter-RAT mobility with N26 between 5GS and 6GS as default option;2. Dual steer with dual registration based on single subscription as complementary option. |
| Ericsson | For Dec-25 | Interworking | Study/define the principles for:Interworking between 5G and 6G Interworking between 4G and 6GIt is assumed that interworking between 6G and 2G/3G is not required |
| Apple | *4* | *Network Migration* | *Support of 5G/6G migration* |
| Samsung | X | Migration and Interworking | 1. Migration scenarios from 5G deployment to 6G/5G deployments2. Interworking Architecture and Procedure2-1. Architecture and procedures for supporting Inter-RAT mobility with single registration2-2. Architecture and procedure for supporting dual registration/dual stack; one accessing 5G System and the other accessing 6G System |
| Vodafone | 2 | Migration to 6G (if no inter-RAT dual connectivity) | Amongst other tasks, study techniques for:-Handover to 5G in case 6G connection quality degrades very early in the 6G connection-Signalling free idle mode mobility between 5G <-> 6G to enable idle mode mobiles to be easily pushed to the 6G layers |
| Vodafone | 5 | Inter-System / Inter-RAT Mobility | Study:1.How to ensure 6G-5G-4G-5G-6G mobility works 2.Connected mode N26 mobility from 6G to 4G (but not 4G to 6G) – aim for zero MME impact |
| CATT  | 1 | System Architecture | -Support of interworking with 5G system. |
| Deutsche Telekom | 2 | Migration, co-existence and Interworking | •Migration, co-existence and interworking from/with 5G. No 2G/3G/4G IWK•Fallback solutions should be avoided |
| ZTE | WT#4 | Interworking and Migration aspect | Investigate the mechanism on interworking with legacy network, including at least 5G system. |
| LG ELECTRONICS  | 5 | Interworking with legacy systems | The following objective can be considered to support interworking with 5GS and EPS:1)  which scenario needs to be supported e.g. single registration, dual registration2)  which nodes, interfaces are impacted in 5GS3)  which nodes, interfaces are impacted in EPS |

## 1.3 Native AI(34)

Native AI in 6G has been mentioned in the following company inputs:

SK TELECOM, China Unicom, Rakuten Mobile, Google, China Telecom, vivo, MEDIATEK INC., Xiaomi, NTT DOCOMO, AT&T, China Mobile, KPN, Intel, Lenovo, ETRI, SK Telecom, KT, LG Uplus, Huawei, HiSilicon, Futurewei,NOKIA, Spark NZ Ltd ,OPPO, Ericsson, NEC, Apple, Samsung, Vodafone, CATT ,Charter Communications, Deutsche Telekom, ZTE, LG ELECTRONICS ,

The following aspects are mentioned:

* E2E AI framework across RAN and CN
* AI-Agent communication
* AI native architecture design including both NET4AI and AI4NET to support new service and improve the network efficiency and performance.

**Moderator proposal:**

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| Work area | Study all aspects of AI/ML in 6G, including at least the following:* AI based framework(e.g. AI as a capability embedded into the NFs)
* AI Agent communication
* Coordination between RAN and CN for AI/ML

NOTE: The AI Agent part will be updated based on progress of SA1 study progress.NOTE: The work area should take the outcome of existing 5G studies into account.NOTE: Whether and how to use common data framework for AIML data will be considered during the study |
| Questions for NWM discussion: | * Which of the proposed aspects do you support for the study?
* Which of the proposed aspects do you not support for the study?
* Which proposed aspects should be reworded?
* Which aspects should additionally be studied?
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| SK TELECOM | 3 | AI4Net / Net4AI computing and service-related NF capabilities | Potential objectives/WTs related to, 1. How to support and provide xPU optimized NFs and capability handlings2. Whether and how to provide closed-loop analytics for all NFs (RAN, Core) efficiently with open interface between NFs and analytics producer3. In-network computing (including storage, caching, computing) features for new/or existing NFs4. How to support new/existing signalling/data processing between NFs (procedures, feature) using LLMs5. How to provide AI-based dynamic power saving for all NFs in real-time. e.g., functional, algorithm, reduction of signalling and data, etc. |
| China Unicom | 2 | Native AI | How to define an E2E AI framework in 6GS for realizing network native AI.How to define the flexible network exposure mechanism for providing AI services to 3rd party.How to define AI service specific quality evaluation system (i.e. QoS for AI services). |
| Rakuten Mobile | 2 | AI Agent collaboration | How can multiple AI agents collaborate with each other (AI agent in 6G <-> authorized 3rd party AI agent) |
| 3 | RAG for Generative AI | Network knowledge as part of Retrieval Augmented Generation for Generative AI |
| 5 | Cloud and AI native Architecture | AI Native and Cloud Native 6G Architecture from day 1 with Open APIs Service Based Architecture continuation |
| 7 | AI driven QoE/QoD | AI driven user quality/user experience management |
| 8 | AI driven energy efficient network including UE | Energy Efficient future networks managed by Core , Core to accelerate /optimize energy attributes considering high data demand for user equipment |
| Google | 8 | New 6G services | - *AI agent services* |
| *10* | Migration with 5G-A services/features | - AI native and communication in 6G |
| China Telecom | 7 | *Natvie AI support* | *Architecture design to support centralized AI capability management and distributed AI-enabled subnet.**Support of unified AI resource (e.g., ML model, data, computing resource, etc.) management and orchestration.**AI support of on-demand autonomous networking, adaptive QoS management, policy control, network configuring, etc.**AI as a service exposed to the 3rd party.* |
| vivo | 1 | Native AI support in 6G |  Key Work Tasks：• WT-1: AI/ML native architecture for 6G system • Wt#1.1: Architecture support for all 6G NFs (including 6G AI Function) with built-in AI/ML capabilities e.g. AI Agent embedded in 6G NF(s) • WT#1.2: AI/ML(e.g. AI Agent) assisted 6G basic procedure e.g. MM/SM/policy, etc. • WT#2: Unified data collection framework to support AI/ML related activities e.g. data collection, data storage, data exposure, data privacy and security management, model sharing/delivery, etc. Note: UE data collection and 5GC data collection Framework for AI/ML will be considered • WT-3: Unified AI/ML Framework across SA/RAN e.g. unified AI/ML terminology/feature and unified AIML lifecycle management • WT-4: Multi-vendors AI/ML Model sharing with e.g. open Model format |
| MEDIATEK INC. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | •Native AI/ML framework (incl. data management) |
| Xiaomi | 2 | Supporting Native AI | Potential objective/Work Tasks:• 6G system architecture supporting AI for 6G system and 6G system for AI cases.• 6G system provides AI services to UE/6G network/3rd party, including: AI model training service, AI model inference services, etc.• AI for 6G system, including AI based network procedure optimization, e.g., AI based policy control, etc.• New QoS for AI services |
| NTT DOCOMO | 3 | AI native 6G Core | -Every network function is empowered by AI/ML to optimize the operation/functionality of the NF.-Support efficient data collection and standardized open ML model life-cycle management capabilities to support the AI empowered NFs in multi-vendor deployment-Supports advanced AI/ML techniques such as transfer learning, etc. |
| 4 | Network for AI | -Data & Model Training: 6G exposes data (e.g., sensing, network data) for application layer model training, and supports both offloaded and distributed application layer ML model training.-Inference & Deployment: 6G enables offloaded, distributed, and federated ML inference for AI/ML-based applications. |
| AT&T | 7 | Integrated and native AI | •To study all aspects of AI/ML that would help develop a 6G system that leverages AI/ML from grounds up. This includes but not limited to AI capabilities distributed across NFs and AI being a capability embedded into the NFs.  |
| China Mobile | 2 | 6G AI native design and AI-agent communication | 6G native AI: 1.NF support Native AI functionalities;2.Collaboration of AI tasks (e.g., model inference/training) between AI functions;3.AI services exposure, including data, AI/ML model.AI-agent communication:1.Management of digital identity of AI-agent;2.Dynamic creation of subnets/group for multiple AI-agent interaction;3.Support multi-dimensional service requirements of AI agents, e.g., computing offloading, environment sensing, or AI model coordination. |
| KPN | 3 | AI-native architecture and AI agent support | -Definition of an AI-native architecture.-Support for AI agent deployment and communications.- Support for Network Digital Twins. |
| Intel | 4 | AI Support  | Enabling AI agent communication•How to identify an AI Agent, how to authorise access to a different AI Agent and how to establish and maintain secure association between AI Agents.•Interoperability between the AI Agents needs to be provided when the collaborating AI Agents are implemented in different networks. •Communication domain dynamically created for users and AI agents from multiple groups to communicate with each other for a specific task during a specific time.6G network support for AI applications (AI-as-a-Service)•The 6G network should be able to securely provide the trained AI/ML model between the operator managed data network (e.g. edge compute domain) and the authorized 3rd party.Supporting AI model training, inference, and management•Subject to operator’s policy, the 6G network should be able to provide AI service (e.g., AI model inference) to a UE. |
| Lenovo | 6 | Support of Native AI within the 6G system architecture | 6.1 NWDAF framework enhancements: enhance the existing NWDAF framework supporting new AI/ML learning techniques and define new analytics to enable intelligent automation and improved service delivery.6.2 AI for Network: Study how to enable "native AI" support within the system architecture. Study whether and how a new signalling plane is needed to be defined to support AI-related communications to AI-enabled functions across the system architecture including UE, RAN and core network functions. |
| ETRI, SK Telecom, KT, LG Uplus | 1 | AI/ML Framework and AI-Native Design | Integrating AI/ML frameworks natively into 6G system for intelligent automation, optimization, and improved efficiencyKey Work Tasks include defining – 1.Cross-domain AI/ML framework (AI Plane, Life Cycle Management Capabilities, etc.)2.AI Agent based Network Automation (e.g., LLM/GenAI Driven Autonomous Capabilities , AI Agent Communication for NFs, Intent-driven automation, etc.)3.Network Cooperative AI Infra Enhancement (SDN-like SB/NB/EWB Interfaces, etc.)4.AI-Service Collaborative Network Orchestration |
| Huawei, HiSilicon |  | *AI native architecture design including both NET4AI and AI4NET* | *AI native architecture design including both NET4AI and AI4NET* |
|  | *AI native control plane design* | *AI native control plane design* |
| Futurewei | 1 | AI-Integrated 6G core network | AI for Network•Study AI integration for 6G network optimization, including how to integrate AI for network performance enhancement, autonomous network configuration, AI for smart energy and sensing •Study whether and how to enhance each 6G NF to support AI/ML capabilities•Study network architecture enhancements to support new AI/ML technologies such as Federated Transfer Learning (FTL) where a pre-trained model is shared between different domains, Online learning and Reinforcement learning•Study architecture enhancements to support AI agent deployment and collaboration between multiple AI agentsNetwork for AI•Study how 6G can better support native AI applications, including introducing additional 6G services, such as computation offload and 6G data-as-service •Study architecture enhancements to provide AI/ML services such as AI/ML training service to AI/ML service consumers with a defined QoS•Study architecture enhancements to support AI agent deployment and collaboration between multiple AI agents |
| NOKIA, Spark NZ Ltd  | 13 | AI/ML native 6G System | Native AI/ML for 6G System, including data collection for AIML |
| OPPO | WT#4 | MNO services | 1. AI; |
| Ericsson | 7 | New value add services – support for AI based management | Based on SA5 lead, study enablers for intent-based management of the network  |
| NEC | 6 | AI Agent communication | Study AI Agent integration in 6GS including:•Architecture for Agent communications.•APIs allowing authorized third parties to consume Agent-based services.•Access from UEs to AI Agents in 6GS. |
| Apple | *1* | *Native AI/ML*  | *AI for Network:**-AI/ML lifecycle management operations incl new NFs and services**-E2E cross-domain AI/ML interactions (UE-RAN-6GC-AF) enabling interoperability and controllability**-Use of device intelligence as an input to system optimization, considering user consent and privacy**Network for AI:**-Optimized resource usage and traffic handling for AI/ML-based applications**-Adaptation and configuration of AI/ML-based applications**-Awareness of AI/ML-based application KPI* |
| Samsung | X | Native AI | 1. Identify impacts on system architecture and NF behaviors for embedding and supporting AI functionalities at the NFs.2. Support of collaboration and/or interworking among AI functions at different NFs (e.g., MM, SM, Policy, etc.) in the control procedure. 3. Architecture and protocol design to support collaboration and/or interworking of AI functions across RAN, CN and OAM for, e.g., data collection, model training, inference, performance monitoring etc. NOTE: “Service Plane” can be used for collaboration and/or interworking between AI functions. |
| Vodafone | 4 | AI | •Identify how AI in the core can reduce the cost per Giga Byte•Identify potential new services enabled by AI in the core network•Identify how AI framework in CN can assist other parts of the network (e.g. RAN) |
| CATT  | 5 | Native AI + AI Agent Communication  | -6GS Architecture model to support native AI, including e.g. defining new NF(s) and interfaces for 6G AI;-How to leverage AI in UE, RAN and CN NFs functionalities and procedures to support communication services, potential new beyond communication services (e.g. Sensing) and improve system performance, e.g. MM+AI, SM+AI;-How to support AI as a Service (e.g. AI related data collection, model training and analytics sharing) in 6GS, and between 6GS and the third party (i.e. external AF);-How to support AI applications and services, e.g. AI Agent Communications and applications |
| Charter Communications | 7 | AI-Native Support | •Enhance AI capabilities developed in 5G.•Inclusion of cloud resource orchestration. |
| Deutsche Telekom | 5 | Consistent AI/ML framework | •Cross-domain AI/ML model life cycle management (led by SA5)•Multi-vendor-interoperability |
| ZTE | WT#2 | System improvement for on existing services | Common AI/ML framework for both RAN and CN |
| WT#3 | Support New services | AI Agent Communication |
| LG ELECTRONICS  | 3 | End-to-End AI framework | The following objective can be considered for End-to-End AI framework taking consideration on new control functions, path for AIML operation or AI service, crossdomain and cross-layer:1)  Model delivery/transfer, Model training/retraining, Inference, Data collection for model training and testing, Model performance monitoring, etc.2)  AI task allocation, processing, and coordination in the distributed manner.3)  Interaction between AI agent/module which are embedded in UE, Network, and Application server.4)  Exposure of AI services (including AI model, Inference, model performance) and adjustment of the system for AI services5)  From the perspective of “System for AI”a)  Resource handling and optimization for AI operations/trafficsb)  Identification/Detection and QoS handling for AI operations/trafficsc)   Assistance for AI App/Service (e.g. member UE selection for AI operation)6)  From the perspective of “AI for system”a)  Performance enhancement/optimization based on AI model/inference |

## 1.4 Common Data framework(28)

Data framework has been mentioned in the following company inputs:

Boost Mobile, EchoStar,China Unicom,Rakuten Mobile,China Telecom,vivo,InterDigital Canada,Xiaomi,KDDI, US Cellular, Verizon,China Mobile,Intel,Lenovo,Qualcomm,ETRI, SK Telecom, KT, LG Uplus,Huawei, HiSilicon,Futurewei,OPPO,Ericsson,NEC,Samsung,CATT ,ZTE,

The following aspects are mentioned:

* Common Data framework for all data handling including data collection, distribution, processing, storage and exposure
* Service plane: Support of accommodation of 6G services in a separate plane from the control/user plane functions for independent scalable deployment of 6G services

**Moderator proposal:**

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| Work area | Study common Data framework for all data handling including data collection, distribution, processing, storage and exposure, considering at least of AI/MLand Sensing.  |
| Questions for NWM discussion: | * Which proposed aspects should be reworded?
* Which aspects should additionally be studied?
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| Boost Mobile, EchoStar |  |  | Data Management and Data Collection Framework |
| China Unicom | 3 | Data as a Service | How to define a unified data management and control framework for different data based services (e.g. positioning, AI, sensing, etc..), including unified data collection, processing, storage, usage and exposure. How to realize the privacy and security of the data under the unified data management and control framework. |
| Rakuten Mobile | 9 | Data as a Service | Data Anonymization, exposure (Data as a Service)APIs to allow authorized third parties to retrieve relevant anonymized data |
| China Telecom | 3 | *Highperformance network data interaction* | *To study new mechanisms and architectural enhancements within the core network to enable high-performance data interaction (for new data types as in, e.g., AI, sensing, digital twin service), which includes data collection, transmission, processing, exposure, etc.* |
| vivo | 4 | Unified Data Collection Framework | Key Work Tasks:• WT-1: Architecture support for unified data collection ramework to perform data collection, data storage, data management and data exposure for multiple ervices(.e.g. AI/ML,sensing) for multiple services(.e.g. AI/ML,sensing)• WT-2: Guarantee data security and privacy for data ervice• WT-3: UE data visibility/controllability and user consent• WT-4: on-demand data exposure to UE or 6G NF(s)  |
| InterDigital Canada | 9 | Arch Enhancements to support new services | Study the architectural enhancements to support service/data plane |
| Xiaomi | 3 | Data centric framework | the unified Data Management Framework or network service(s), e.g. AI for 6G System, 6G System for AI, ISAC, including:- Unified Data collection framework- Unified Data Storage/processing framework- Unified Data exposure framework |
| KDDI, US Cellular, Verizon |  | Data framework | How a common framework can be used to be collect, store and transport data in the network? Including how data can be exposed to third parties and application functions. Framework shall include who is authorized to perform any such actions using the framework, policies regarding data retention, user consent, local and regional regulations etc.E.g. - Subscription, Policy, Context, State data from Stateless NF to Backend database NF, ISAC, AI/ML data, training data |
| China Mobile | 4 | Common Data Framework-Data as a Service | 1.Support efficient data retrieving, transmission, storage and handling. The typical data type like sensing or AI data. 2.Protocol Design to support the efficient data transmission |
| Intel | 3 | Unified data framework  | A unified data framework which is use case agnostic :•Standardized unified data service interface for data collection/exposure across diverse providers and consumers (UE, RAN, OAM, AF)•Unified logical storage functionality centralized or distributed modes to cater for scalability and resilience.•Unified security and privacy protection mechanisms, addressing varying sensitivity levels (e.g., anonymization for user data, encryption for ML models).•Standardized data formats, ensuring compatibility and seamless integration across heterogeneous data sources.•The data life cycle management includes handling data from its creation to its destruction, encompassing the following stages: data creation (e.g. collection, produce), storage, exposure, and deletion. |
| Lenovo | 3 | Enhancements to the communicaiton between UE and 6G CN(including 6G NAS protocol) | -Introduce a new data plane for data collection.  |
| 6 | Support of Native AI within the 6G system architecture | 6.3: Unified Data Collection: Study whether and how a unified data collection framework can support AI-related operations. The aim is to support a data collection from different sources including OAM, RAN and CN NFs and retrieving data for different types (e.g., sensing data, AI-generated data) in a unified way ensuring efficient data management and reduced complexity. |
| Qualcomm | #10 | Converged data management for 6G | WT#1: Study a converged, generic data management framework for 6G, which includes-procedures for data collection from different data sources;-data storage;-data exposure. |
| ETRI, SK Telecom, KT, LG Uplus | 6 | Unified Data Management Framework with User Consent | Unifying cross domain data discovery, collection, storage, transmission, correlation, and exposure for various applicationsKey Work Tasks include defining – 1.Data detection across diverse sources and types (e.g., AI-generated data, sensing data, etc.)2.Data collection, storage, processing, and exposure (covering UE, network functions, and third parties).3.Robust validation mechanisms for data sources and consumers.4.Data traceability and privacy mechanisms to ensure transparency, security, and trustworthiness in data operations. |
| Huawei, HiSilicon |  | *Unified Data framework including data collection, distribution, processing, storage and exposure* | *Unified Data framework including data collection, distribution, processing, storage and exposure* |
| Futurewei | 2 | Data handling for Beyond Connectivity Services (e.g., AI/ML, Sensing, etc.) | •Study whether and how to support a unified data collection and storage•Study whether and how to support data exchange between 6G service functions and data consumers/producers (study new Data Plane vs User Plane)•Study whether and how to support control functionality for data subscription, data access, mobility management, data exposure and policy |
| OPPO |  |  | 2. Unified Data Framework. |
| Ericsson | 9 | Multi-purpose data architecture | Based on SA5 lead, study architecture and enablers for a distributed data management architecture for data collection, that is common for RAN, Core and OAM. SA2 should be a user of the data architecture and integrate it with relevant SA2 features.  |
| NEC | 5 | Data Service | Study data as a service consumed by UEs or authorized third parties including:•Architecture for data service (e.g., collect, store, retrieve, expose).•APIs allowing authorized third parties to retrieve data.•Data plane protocols in 6GS. |
| Samsung | X | Service Plane | Support of accommodation of 6G services in a separate plane from the control/user plane functions for independent scalable deployment of 6G services1. Architecture and protocol of service plane for 6G services (e.g., sensing, network AI, AI agent, data management, user consent management, configurations for UE)2. Data and signal transmission mechanisms for 6G services in the service plane3. Discovery/selection mechanisms for service plane entities4. Data management functionality with consideration of user consent |
| CATT  | 4 | Data Plane for Unified Data Framework | -Introduce Data Plane to support unified data framework (including data collection, transmission, processing and storage) for different use cases, e.g., sensing service, AI/ML service.-Architecture, network function and high-level procedures of Data Plane.-Support Data Plane between UE, RAN, and CN NFs.-Data service exposure. |
| ZTE | WT#3 | Support New services | Unified Data Framework |

## 1.5 Sensing(26)

Sensing has been mentioned in the following company inputs:

SK TELECOM, Google, China Telecom, vivo, MEDIATEK INC., Xiaomi, NTT DOCOMO, AT&T, KDDI, US Cellular, Verizon, KPN, Intel, Lenovo, ETRI, SK Telecom, KT, LG Uplus, Huawei, HiSilicon, OPPO, Ericsson, NEC, Apple, Vodafone, CATT, ZTE

The following aspects are mentioned:

* ISAC Architecture and Function Enhancements: Support all six sensing modes and integrate 3GPP/non-3GPP sensing.
* Develop a framework for sensing data detection, collection, processing, and exposure.
* Multi-Source Sensing Data Integration: Integrate data from various sensing sources and ensure privacy protection.
* AI-based ISAC Capability: Enhance sensing accuracy and efficiency using AI for in-network computing and data processing.
* Location and Sensing Service Integration: Study architecture for integrating location and sensing services in 6G.
* Integration of communication, sensing and computing, including: new interface, new protocols, new NAS to support ISAC

**Moderator proposal:**

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| Work area | Common framework for all modes of integration of sensing and communication |
| Questions for NWM discussion: | * No need for NWM discussion now
* Sensing aspect will be updated jointly with TSG RAN during SA#108. Try to avoid duplication with 5GA R20 work.
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| SK TELECOM | 8 | ISAC | Potential objectives/WTs related to,1. How to support/provide ISAC NFs and services 2. How to support/provide network/edge AI-based ISAC capability enhancement3. How to support/provide multi-source sensing data integration including sensing data detection, collection, processing, and exposure |
| Google | *10* | Migration with 5G-A services/features | - Integrated Sensing and communication in 6G |
| China Telecom | 9 | *Integrated Sensing and communication* | *Architecture and function enhancements to support all 6 sensing modes.**Support the integration of 3GPP RAT sensing and non-3GPP RAT sensing.**Support the integration of communication, sensing and computing.**New interface, new protocols, new NAS to support ISAC.* |
| vivo | 3 | Sensing |  Key Work Tasks：• WT#1: Generic sensing architecture to support: •-various sensing modes and sensing devices; •-common sensing measurements and sensing results reused by multiple cases. • WT#2: Unified data collection framework to support sensing related activities, e.g. sensing measurement collection, sensing data/result exposure, data privacy protection and data authorization, etc.  |
| MEDIATEK INC. | *Phase 2 (Track 2)* | WT-3: Study system architecture support on how to enable existing or new beyond communication services | ❑ WT-3.4 Study how to support Sensing for 6G. This includes study on how to support Session Management, UP, Policy Control and QoS Model aspects for sensing services. |
| Xiaomi | 1 | Integrated Sensing and Communication service | Potential objectives/Work Tasks: •Support all sensing modes/cases in 6G ISAC architecture•Support integration of 3GPP and non-3GPP sensing.•Support sensing service continuity, e.g., objects Tracking, or Sensors mobility•Support AI based sensing |
| NTT DOCOMO | 7 | Integrated Sensing and Communication | -Mechanisms to support sensing result calculation and processing using In-network computing.-Transport mechanisms for result calculation.-Integration of sensing and computing. |
| AT&T | 8 | Sensing And Positioning | •To study supporting all sensing modes + non-3GPP sensing |
| KDDI, US Cellular, Verizon |  | New Opportunities | Evolution of ISAC to support bi-static and multi static operations using both RAN, UE and non 3GPP technologies |
| KPN | 5 | Integrated Sensing and Communication | -Sensing data and processing support.-Support for 3GPP and non-3GPP sensing. |
| Intel | 5 | Integrated Sensing and communication | •Architecture and function enhancements to support sensing.•Sensing data and the associated information collection and transport mechanisms for result calculation.•Discovery and selection of sensing entities based on service requirements triggered by the service request and capability of the sensing entities. |
| Lenovo | 5 | ISAC | Study how to support the ISAC service requirements in the 6G system including at least the RAN based sensing with or without UE assistance (it is FFS whether to study the UE-based sensing). Study mechanisms (e.g. AI based) how to improve the accuracy of the sensing result generation.  |
| ETRI, SK Telecom, KT, LG Uplus | 5 | Integration of Sensing and Communication (ISAC) | Providing a framework for integrating communication and sensing tasks. Key Work Tasks include defining – 1.Support for Multi-source sensing data integration, support including sensing data detection, collection, processing, and exposure2.AI-driven optimization to enhance ISAC efficiency and accuracy |
| Huawei, HiSilicon | 　 | *Full integration of sensing and communication* | *Full integration of sensing and communication* |
| OPPO | WT#4 | MNO services | 2. ISAC; |
| Ericsson | 6 | New value add services – e2e Integrated Sensing and Communication (ISAC) architecture | Study support for ISAC services  |
| NEC | 7 | Sensing | Study the 6G framework for integrating communication and sensing tasks including:•RAN and UE-based sensing.•Sensing Data Support, including detection, collection, processing, and exposure of sensing data.•Fusion of 3GPP and non-3GPP sensing. |
| Apple | *2* | *Integrated Sensing and Communication* | *Support of UE-based Mono-static Sensing* *Support of UE-centric Bi-static Sensing**Ensure privacy including users that are not involved in the sensing operation* |
| Vodafone | 10 | Sensing | Study architecture |
| CATT  | 6 | Location Service and Sensing Service Integration | -Architecture to support location service and sensing service integration.-Network functions and high-level procedures to support location service and sensing service.-Location service and sensing service exposure. |
| ZTE | WT#3 | Support New services | Integration of Sensing and Communication |
| InterDigital Canada | *7* | User Subscription Management | Study how to enhance UE context management to enable new services e.g. sensing Study impact of new user identities e.g. human user, app user and non-3GPP devices |

## 1.6 Computing(25)

Computing service has been mentioned in the following company inputs:

AT&T,CATT, China Mobile, China Telecom, China Unicom, NTT DOCOMO, ETRI, SK Telecom, KT, LG Uplus, Google, Intel, InterDigital Canada, KDDI, US Cellular, Verizon, Lenovo, MEDIATEK INC., NEC, NOKIA, Spark NZ Ltd ,OPPO,SK TELECOM, vivo, ZTE,

The following aspects are mentioned:

* How to define the metrics of computing resource and how to expose the computing resource as service to third parties.
* Computing and Network Coordination: Computing task(at lease including AI, XR) offloading from UE to network
* Computing as service

**Moderator proposal:** This topic has received very high support and should be a work area. The following question is proposed for NWM discussion

* Question 1: whether the work area includes the study of Integrated communication and computing framework to support coordinated computing between UE and core network, and to enable computing as a service

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| SK TELECOM | 7 | AI enabling Infra  | 1. Supporting for device-edge coordinated computing (e.g., splitting/routing/load balancing of AI tasks between device and edge)  |
| China Unicom | 4 | Computing and Network Convergence | How to define the metrics of computing resource.How to control and manage the computing resources, e.g. the discovery of computing resource, the optimization of E2E scheduling, etc. |
| Google | 8 | New 6G services | *Network and Compute Convergence* |
| China Telecom | 8 | *Computing as service* | *To define the metrics of computing resource from different sources;* *To support the computing resource offloading from the network to UEs;**To support the network be aware of and manage different sources of computing resources;**To coordinate the computing resource allocation between the UE and 6G network* |
| vivo | 2 | Convergence of Mobile Network and Computing | Key Work Tasks：• WT#1: Architecture support for integrated communication and computing • WT#2: support offload UE Computing task to NW• WT#3: Joint control and optimization of computing resource and communication resource• WT#4: computing metric definition• WT#5: policy and QoS mechanism to meet the computing service needs• WT#6: charging aspects |
| MEDIATEK INC. | *Phase 2 (Track 2)* | WT-3: Study system architecture support on how to enable existing or new beyond communication services | WT-3.3 Study how to enable an Integrated Communication and Compute framework for 6G compute services to end users and authorized third parties. |
| InterDigital Canada | 9 | Arch Enhancements to support new services | Study and identify new NFs to support new services e.g. sensing and compute |
| NTT DOCOMO | 2 | In network compute | Integration of computation and communication capabilities in the mobile network; the 3GPP System-Exposes compute resources to (third party) applications and receives service requirements from application layer.-Executes data processing and offloads application workloads within the operator's network.-Ensures continuous compute availability during UE mobility. |
| AT&T | 5 | Integrated communications and compute | •To study introduction of new NF(s) and SBI(s) in 6GC Architecture for a new service that provides compute as a service |
| KDDI, US Cellular, Verizon |  | New Opportunities | How can network computing be supported allowing offloading of processing capacity from end user devices (UEs) or other NFS? |
| China Mobile | 3 | Computing and Network Coordination | 1.UE offloads computing tasks to network.2.Computing node registration and management, including status monitoring and exposing computing capability to 3rd party. |
| Intel | 2 | Compute and communication convergence in 6G network  | •UE to Network Compute offload•Define unified SBI-based interfaces for compute resource advertisement, discovery, orchestration, and service invocation across UE, RAN, CN, edge, and AFs.•Enable compute-aware session management and routing (e.g., mobility and handover with compute affinity, session continuity with compute location awareness).•Enable AI-driven compute workload distribution across UE, edge, and cloud•Enable API exposure and authorize 3rd parties to the computation network. |
| Lenovo | 10 | Compute as a Service (CaaS) | Study how to provide compute resources to 3rd party service providers (i.e. Compute as a Service).Study how to expose network-based compute services on-demand (e.g. similar to the exposure of existing network services).  |
| ETRI, SK Telecom, KT, LG Uplus | 2 | Network and Computing Convergence | Seamless integration of communication networks and computing resources to enable intelligent, ultra-low latency, and highly efficient data processing at the UE, edge, cloud, and across 6G network.Key Work Tasks include defining – 1.SBA Enhancement including distributed NAS and Service-Based N2 Interface2.Cloud-native Core support3.Computing-integrated Core support4.Service-differentiated transport-integrated Core support |
| NOKIA, Spark NZ Ltd  | 15 | Edge Computing, Compute Offload and AI as a Service | Enablers for the support of edge computing for the optimal use of locally deployed services and content (including, e.g., edge application server selection and traffic steering)Enablers for compute offload for low latency or compute intensive applications such as XREnablers for AI as a service use cases |
| OPPO | WT#3 | Key Enablers for new MNO services | 1. UE and network Coordinated Computing; |
| NEC | 4 | Computation Service | Study computation as a service consumed by UEs or authorized third parties including:•Architecture to leverage computational resources by UEs or authorized third parties.•APIs allowing authorized third parties to retrieve availability information about computational resources (e.g., storage, AI processing units, xPUs, etc.).•Monitoring and reporting of computational resource usage.•Discovery and selection of computation resources. |
| CATT  | 9 | Computing and Network Coordination | -Whether and what computing power resources can be provided and/or managed by the 6G network.-Architecture, network function, and high-level procedures to support the coordination between computing and communication.-How to support offloading computing from the end-user device to the network, including how UE requests to use computing capabilities should be discussed.-How to support the computing coordination between the device, the network and the edge/cloud servers. -How to monitor computing power status.-How to support computing capabilities exposure. |
| ZTE | WT#2 | System improvement for on existing services | Enhancement on Edge Computing |
| ZTE | WT#3 | Support New services | Network and Computing Convergence |

## 1.7 SBI enhancement (16)

SBI enhancement has been mentioned in the following company inputs:

SK TELECOM, Rakuten Mobile, Google, MEDIATEK INC., NTT DOCOMO, AT&T, China Mobile, Intel, Lenovo, Qualcomm, Vodafone, CATT, Charter Communications, Deutsche Telekom, ZTE, InterDigital Canada

The following aspects are mentioned:

* SBA Enhancements, e.g. for flexibility, reliability, security, and performance.
* Service-Mesh/SCP NF Framework: Analyze service-mesh/SCP NF for indirect (re)discovery and (re)selection of 5G SA/NSA NFs.
* SBI N2 interface: integrate SBI in RAN-CN interfaces
* SBI N4.
* Direct RAN-CN Communication for both UE-associated and non-UE-associated procedures.
* evolve SBA/SBI with HTTP/3 over QUIC
* Legacy Protocol Support: Explore how SBA/SCP NF can support legacy protocols via SBI or conversion functions.

**Moderator proposal:** This topic has received very high support and should be a work area. The detailed scope of this work area depends on company input. The following questions are proposed for NWM discussion.

* No need for NWM discussion?TBD

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| SK TELECOM | 1 | Architecture related to SBA | 1. Whether and how to design SBA enhancements for flexibility, reliability, security, and performance aspects.2. Analysis and use of Service-mesh / evolved SCP NF as a new framework, including a common indirect (re)discovery and (re)selection, for all 5G SA/NSA NFs 3. How SBA/SCP NF can support legacy protocols using a single and/or common interface such as SBI, and/or provide legacy protocols with conversion function within SBA/SCP.4. Analysis of new or enhanced Managements, e.g., MM, SM, PM, etc. |
| Rakuten Mobile | 6 | RAN Core Convergence | Replace N2 interface with SBI to remove transport level stickiness |
| Google | *1* | *6G system non-roaming/roaming architecture* | - Reuse 5G SBA/SBI framework- Evolve 6G SBA/SBI architecture with http/3 over QUIC, programmability, AI native, and data driven network- Enable SBI in RAN-CN interface, converge UE RRC/CM states, and evaluate potential signaling optimization on MM/SM procedures |
| MEDIATEK INC. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | •SBI framework enhancements |
| NTT DOCOMO | 13 | RAN-Core Service Based Interface | -Study whether to adopt RAN-Core interface to be service-based design. |
| AT&T | 1 | High Level 6G System Design | •To study interfaces like N4 and N2 (or their equivalent) for conversion to SBA  |
| China Mobile | 1 | 6G SBA architecture enhancement | 1. Enhance SBA to create a more powerful platform, e.g., NF decoupling and reconstructing to reduce interactions, online NF service customization. 2. NAS enhancement or redesign to support new parameter/functionality on-demand adding in UE side.3.User Plane fully integrated into SBA and to be smarter.4.SBI protocol enhancement, Network Reliability improvement. |
| Intel | 1 | SBI Enhancements related  | •Evolve 6G RAN CP to core network interface (“N2”) to SBI•Evolve 6G UPF to the core network control plane for session management (“N4”) to SBI |
| Lenovo | 2 | Introduce SBI for the N2 interface | Study how to enable a direct communication between the RAN and CN NFs in 6G. The following use cases will be studied:-Whether to allow direct data/signalling exchange triggered by the CN NFs to the RAN or also by the RAN to the CN NFs. -Whether partial (e.g. only limited network services supported like Sensing) or full integration of the RAN in the service-based interfaces. |
| Qualcomm | #2 | Forward compatibility of NAS procedures, for flexible evolution and addition of new NAS services.  | WT#2: Study mechanisms for enabling signaling between new NFs and NG-RAN without having to upgrade the AMF specifically for each new NF - NG-RAN signaling. |
| Qualcomm | #5 | Direct communication between RAN and CN NFs | WT#1: Study framework for direct communication procedures between RAN and CN network functions for non-UE associated procedures (e.g., fetching radio capability mapping, data collection, exposure).WT#2: Study framework for direct communication procedures between RAN and CN network functions for UE associated procedures (e.g., LCS, sensing) |
| Vodafone | 11 | Increase use of SBI and open interfaces | •Study use of SBI for N4 interface•Study how to remove options from N4 to improve multi-vendor opportunities |
| 12 | SCTP replacement | Study the replacement of SCTP with more modern protocols in the core network  |
| CATT | *1* | System Architecture | -Support of full service-based architecture, at least including service-based N2 and N4 interfaces. |
| 3 | Full Service based Architecture for 6G System | -Study the new service-based architecture for 6G system-All CP interfaces within the 6G CN are service-based-All interfaces (N4) between CP and UP are service-based;-All interfaces between the CP and Data Plane are service based;-The interface between the 6G RAN and 6G CN is service-based;-Enhance the service performance and reliability; |
| Charter Communications | 4 | Enhanced 5G SBA based on 5GC evolution | •Extend SBI between RAN & Core.•Leverage QUIC vs HTTP/2 + TLS1.2 for all SBI. |
| Deutsche Telekom | 1 | SBA as basis for 6G System Architecture | •Study more cloud-friendly architecture and protocols within CN and between CN/RAN functions, including benefits of a full SBA and full SBI •Replacement of remaining P2P interfaces by SBI (N2, N4) |
| ZTE | WT#2 | System improvement for on existing services | Enhancement on Service Based Interface |
| InterDigital Canada | 1 | Access and Mobility Management | Study whether/what functional enhancement(s) are needed to support SBA procedures independently for each network function |

## 1.8 NAS enhancement(14)

NAS enhancement has been mentioned in the following company inputs:

SK TELECOM, Google, vivo, InterDigital Canada, AT&T, China Mobile, Lenovo, Futurewei, Apple, CATT, Deutsche Telekom, ZTE, Qualcomm, OPPO.

The following aspects are mentioned:

* Distributed NAS Architecture. E.g. Enable NAS transmission via CP/UP, allowing UE-NF communication without AMF involvement.
* Enhance NAS security for distributed NAS
* Reduced MM Reliance: Explore minimizing MM state reliance to support distributed NAS and independent SBA procedures.
* Direct UE-NF Interaction: Investigate direct NAS communication between UE and NFs for improved security and connectivity services.

**Moderator proposal:** This topic can be a work area. The detailed scope of this work area depends on company input. The following questions are proposed for NWM discussion.

* No need for NWM discussion?TBD

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| SK TELECOM | 1 | Architecture related to SBA | 5. New or enhanced protocols for effective control and data related context, including distributed Non-access stratum. |
| Google | 3 | Protocol aspects | - Study distributed NAS over CP/UP with minimized UE impacts |
| 5 | Security and Privacy Aspects | -  Evolve 6G AS/NAS security for distributed NAS |
| vivo | 7 | Distributed NAS | Key Work Tasks：• WT-1: Architecture support for distributed NAS,e.g. NAS transmission via control plane (CP) or user plane (UP). • WT-2: Transmission of NAS messages between UE and NF without AMF involvement, especially when UE is in idle state.. • WT-3: Study on service types applicable to distributed NAS, e.g. AI, ISAC. • WT-4: End-to-end security between UE and NF without AMF involvement |
| InterDigital Canada | 1 | Access and Mobility Management | Study whether/how to reduce reliance on MM state, to enable distributed NAS functionalityStudy and identify what AMF functionalities should be distributed to new/other NFs e.g., Access Control, Registration Management, Security Anchor point, reachability |
| 3 | Session Management | Study whether/what functional enhancement(s) are needed to support SBA procedures independently of MM.Study session management with secondary authentication procedure |
| 4 | 6G CN Architecture | Study whether/how a RAN node can have direct access to Core Network function |
| 9 | Arch Enhancements to support new services | Study the interaction between NFs (new NFs and existing NFs) and with RAN |
| AT&T | 1 | High Level 6G System Design | •To study NAS layer changes that can be justified |
| China Mobile | 1 | 6G SBA architecture enhancement | 2.NAS enhancement or redesign to support new parameter/functionality on-demand adding in UE side. |
| Lenovo | 3 | Enhancements to the communicaiton between UE and 6G CN (including 6G NAS protocol) | Study how to design the communication between the UE and the 6G CN NFs. It may include the following aspects:-Possible enhancements to the NAS over the control plane;-Possible enhancements to the User Plane for exchange with network services;-Introduce a new data plane for data collection. |
| Futurewei | 3 | Non-Access Stratum considerations | •Study whether and how to enhance NAS mechanisms including signaling and function distribution•Study whether and how to optimize transport for NAS (e.g., QUIC) between RAN and core |
| Apple | *2* | *Evolved NAS* | *Support the control of new services while preserving the fundamental MM and SM functionalities over the Control Plane* |
| CATT  | 2 | 6G New NAS | -Support new NAS for connectivity and beyond connectivity services.-Study NAS termination and routing in core network for security, connectivity services and beyond connectivity services; and high-level procedures. |
| Deutsche Telekom | 7 | NAS evolution | •Direct NAS communication between UE and NFs including msg. distribution |
| ZTE | WT#2 | System improvement for on existing services | Distributed NAS |
| Qualcomm | #2 | Forward compatibility of NAS procedures, for flexible evolution and addition of new NAS services.  | WT#1: Study solutions to enable operators to introduce new NAS services without having to upgrade the AMF for each new NAS service. |
| OPPO | WT#1 | System Architecture evolution | 1. NAS for basic functionality (i.e. RM, CM, MM, SM, UE Policy) routing over CP locally;2. NAS for MNO services (e.g. LCS, AI, Sensing) routing over UP; |

## 1.9 Network Slicing enhancement (13)

Network Slicing has been mentioned in the following company inputs:

InterDigital Canada, Lenovo, Qualcomm, NOKIA, Spark NZ Ltd ,Ericsson, Apple,ZTE, MEDIATEK INC., Samsung, LG Electronics, OPPO, CATT.

The following aspects are mentioned:

* Network slicing needs to be simplified in 6G
* smooth interworking and mobility between 5G and 6G for network slicing

**Moderator proposal:** This topic can be a work area. The detailed scope of this work area depends on company input. The following questions are proposed for NWM discussion.

* No need for NWM discussion? TBD

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| InterDigital Canada | 6 | Network Slicing | void enhancements in future releases because backwards compatibility makes the design more complicated. |
| Lenovo | 7 | Network slicing  | Study whether and how to improve the network slicing to avoid extensive configuration of the UE. For example:-Minimize the pre-configuration in the UE.-Avoid configuration of area restrictions for a network slice. |
| Qualcomm | #4 | Network Slicing for 6G | WT#2: Study how to enable exposure of KPIs per Network Slice to the UE. |
| NOKIA, Spark NZ Ltd  | 10 | Network slicing  | Support for network slicing •smooth interworking and mobility between 5G and 6G for network slicing, •discussion on the UE impacting features to be supported in the first release and any improvement of URSP rules support for network slicing•consider enhancements that improve monetization |
| Ericsson | 10 | Network slicing | Study support for network slicing in 6G including interworking with 5GS. |
| Ericsson | After Dec-25 |  | Study whether network slicing can be simplified compared to 5G. |
| Apple | *1* | *Network Slicing* | *Simplification of network slicing functionality* |
| Apple | *4* | *Privacy preserving traffic management*  | Study whether network slicing can be simplified compared to 5G. |
| ZTE | WT#2 | System improvement for on existing services | Simplification on Network slicing |
| MEDIATEK INC. |  |  | •Network slicing  |
| Samsung |  |  | 2. Identify and redesign features defined over-complicated or multiple options without well-justified use cases, e.g., network slicing, XRM, edge computing, etc. |
| LG Electronics | 1 | General Architecture | 14)  Slicing supporta)  Which sling features specified in 5GS should be supported by mandatory in the UE and networkb)  Whether and how to simplify slicing mechanisms specified in 5GS |
| OPPO |  |  | 5. Network slicing simplification. |
| CATT  |  |  | -Support of interworking with Network Slicing and SNPN. |

## 1.10 QoS enhancement (11)

Qos has been mentioned in the following company inputs:

Google, vivo, Xiaomi, AT&T, Lenovo, Futurewei, NOKIA, Spark NZ Ltd, OPPO, CATT, InterDigital Canada.

The following aspects are mentioned:

* Extend Policy and QoS framework to support of new services
* Content awareness, elastic and agilely adaptive QoS
* support adaptive QoS framework

**Moderator proposal:** This topic can be a work area. The detailed scope of this work area depends on company input. The following questions are proposed for NWM discussion.

* No need for NWM discussion?TBD

|  |  |  |  |
| --- | --- | --- | --- |
| SK TELECOM | 7 | AI enabling Infra  | 2. Effective way of handling QoS between RAN and CN because edge AI services are mostly provided close to the based stations. |
| Google | 4 | Granular QoS framework | - Extend QoS framework to accommodate variant QoS requirements for new 6G services  |
| vivo | 5 | QoS: Energy Efficiency, Smart, Elastic, Agilely adaptive QoS | WT#1 Content awareness, elastic and agilely adaptive QoS-WT#1.1 study the awareness of content for different services data (e.g. XR, AI, computing, sensing, other data).-WT#1.2 study how to support dynamical agilely adaptive QoS for the content. WT#2 Energy efficient Control-WT#2.1 study how to support energy efficiency differentiation and control together with high throughput and low latency WT#3 A unified, smart framework compatible to new services |
| Xiaomi | 5 | QoS and Policy framework | Potential objectives/Work Tasks: - 6G QoS framework with 5G QoS framework as starting point, and support improved QoS- 6G Policy framework with 5G policy framework as starting point, and support improved policy for new 6G features |
| AT&T | 1 | High Level 6G System Design | •To study QoS enhancements in support of new services |
| Lenovo | 4 | Enhancements to QoS framework | Study enhancements to the QoS framework to support applications with dynamic traffic characteristics  |
| Futurewei | 4 | Adaptive Quality-of-Service | Study whether and how to support adaptive QoS for 6G PDU sessions:•Enhanced capability to adapt QoS for flows of a non-GBR PDU session based on application traffic or other factors such as energy efficiency considerations•Enhanced capability for UE to adapt to changes in QoS of flows based on network policy changes within a best effort PDU session |
| NOKIA, Spark NZ Ltd  | 5 | QoS enhancements | Enhancement needed to support adaptive QoS framework for adaptive and high bandwidth applications, mobile AI traffic |
| OPPO | WT#2 | Evolved basic functionality based on 5G design | 1. QoS Model enhancement; |
| CATT  | 8 | 6G QoS Architecture | -Study the unified 6G Policy and QoS Architecture for different connectivity services and beyond connectivity services.-QoS control granularity ;-QoS control mechanism (CN control, UE control , UE+CN control, QoS binding);-Policy rules for UE, RAN, CN NFs;-Packet filters for QoS binding.-Study the unified 6G QoS parameters-New QoS parameters are introduced;-Procedures to provide dynamic QoS parameters. -Study how to leverage AI for the QoS -Policy rules decision;-QoS parameter selection;-Service identification. |
| InterDigital Canada | 8 | Policy control | Study whether/how to enhance the policy framework to enable new 6G services |

## 1.11 User plane enhancement (10)

User plane enhancement has been mentioned in the following company inputs:

China Telecom, Lenovo, Huawei, HiSilicon, Futurewei, NOKIA, Spark NZ Ltd, Charter Communications, Deutsche Telekom, Apple

The following aspects are mentioned:

* flexible and programmable user plane path selection, functionalities, interface protocol
* In-band and On-path application Network interaction
* MASQUE on CP and UP between UE and Core Network
* Study more flexible, efficient and stateless UP communication

**Moderator proposal:** This topic can be a work area. The detailed scope of this work area depends on company input. The following questions are proposed for NWM discussion.

* No need for NWM discussion? TBD

|  |  |  |  |
| --- | --- | --- | --- |
| China Telecom | 4 | Programmable user plane | This study will consider the following aspects to better support 6G services on the user plane:-flexible and programmable user plane path selection, functionalities, interface protocol, etc.-Enhanced QoS mechanism to support new capabilities |
| Lenovo | 3 | Enhancements to the communicaiton between UE and 6G CN (including 6G NAS protocol) | -Possible enhancements to the User Plane for exchange with network services; |
| Huawei, HiSilicon |  | *User plane design* | *User plane design* |
| Futurewei | 5 | User Plane enhancements | Study whether and how to design user plane mechanisms to support:•Non-session traffic (i.e., beyond connectivity, handling of large data or a few messages that are aperiodic in nature)•Simplified setup/connection handling to support very large number of devices•Study simplified layer 3 mobility |
| NOKIA, Spark NZ Ltd  | 14 | PDU Session types & User plane architecture | Enablers needed for enhanced UP architecture, SSC modes and related aspects.Protocols to be supported for PDU Sessions, including unstructured, ETH and IP sessions. Transparent integration 6GS in industrial ethernet networks especially using the bridge model. |
| 17 | In-band and On-path application Network interaction | Introduce a capability to securely exchange information and expose services between application (client/UE and server/AS) and network (UPF) in-band and on-path with regards to application’s end-to-end communication. |
| Charter Communications | 4 | Enhanced 5G SBA based on 5GC evolution | •Incorporate MASQUE on CP and UP between UE and Core Network, enabling a common transport across accesses. |
| Deutsche Telekom | 3 | User Plane Improvements | •Study more flexible, efficient and stateless UP communication •Include both N3 and N9 |
| Apple | 4 | Privacy preserving traffic management | *Enhanced traffic management for end-to-end encrypted traffic without compromising user privacy(e.g. integrate MASQUE framework with 6GS architecture)* |

## 1.12 IMS enhancement (6)

IMS enhancement has been mentioned in the following company inputs:

China Unicom, Huawei, HiSilicon, NEC, ZTE, China Mobile

The following aspects are mentioned:

* simplification of IMS system, including converged network elements and the unified interface protocols
* IMS architecture enhancement
* Study 6G system to support for IMS Multimedia Telephony Service

**Moderator proposal:** The following question is proposed for NWM discussion

Question 1: Should IMS enhancement including simplification be a work area in 6G

|  |  |  |  |
| --- | --- | --- | --- |
| China Unicom | 5 | Evolution for IMS system | How to define the converged network elements and the unified interface protocols for the simplification of IMS system.How to utilize 6G new service capabilities (e.g. native AI) for enabling intelligent experiences for user’s realtime communications. |
| Huawei, HiSilicon | 　 | *IMS architecture enhancement* | *IMS architecture enhancement* |
| NEC | 2 | Supporting operator provided multimedia services and IMS enhancement | Study 6G system to support for IMS Multimedia Telephony Service including:•Real-time resource allocation and adaptation within the network.•Efficient network capabilities for Multimedia Telephony Service, simplifying UE and network operations for voice-centric, satellite-access UEs, or devices with AI agents.•Seamless continuity of IMS Multimedia Telephony Service between 6G and 5G VoNR for users moving between the two.•Regional/national regulatory requirements for IMS Multimedia Telephony Service. |
| ZTE | WT#2 | System improvement for on existing services | IMS enhancement to support Voice and immersive communication service |
| China Mobile | 6 | Native Immersive and Intelligent RTC Services  | 1. Support the immersive, integrated, and intelligent RTC services by new NFs, NFs enhancement or third-party capability integration;2. Support the simplified IMS network with lower cost and higher flexibility. |

## 1.13 Distributed Autonomous Network (5)

Subnet has been mentioned in the following company inputs:

China Telecom, China Mobile, KPN, CATT, ZTE.

The following aspects are mentioned:

* Architecture to support Distributed Autonomous Sub-network
* Sub-network discovery and selection.
* How the centralized and a sub-network, or inter sub-networks cooperate

**Moderator proposal:** The following question is proposed for NWM discussion

Question 1: Should distributed simplified networking in localized deployment be a work area in 6G

|  |  |  |  |
| --- | --- | --- | --- |
| China Telecom | *2* | *Support for Distributed Network* | *To study the functionalities and capabilities for centralized and distributed 6G network architecture towards diverse subnetwork requirements:**•Which network functionalities need to be in the central network and in the smallest set for a distributed sub-network**•Sub-network discovery and selection to support UE’s service requirement**•How the centralized and a sub-network, or inter sub-networks cooperate for a specific service or for network resilience* |
| China Mobile | 5 | Distributed Autonomous Sub-Network | 1. Sub-network discovery and access. A simplified local network to support local subscription, signaling control, and traffic routing. The functionality support on-demand plug-in/out.
2. Efficient interaction and capability negotiation between local network, and between local network and PLMN network.
 |
| KPN | 1 | 6G Migration & Interworking Architecture | -Support of distributed subnets for 6G verticals. |
| CATT  | 11 | Distributed Autonomous Subnetwork | -Architecture to support Distributed Autonomous Subnetwork -Network functions and high-level procedures to support Distributed Autonomous Subnetwork.-Support of interworking with Network Slicing and SNPN.Note: Subnetwork is an extension of the PLMN network; It provides network services with a certain degree of autonomy, localization, topology hiding, cross domain collaboration and diversified functions in specific areas during specific time periods based on the needs of individual customers. |
| ZTE | WT#3 | Support New services | Distributed Autonomous network |

## 1.14 User consent framework (3)

User consent framework has been mentioned in the following company inputs:

Google, AT&T, Apple.

The following aspects are mentioned:

* Evolved User consent framework.
* Unified API exposure framework with a centralized user consent management
* User centric privacy control for data driven network.

**Moderator proposal:** The following question is proposed for NWM discussion

Question 1: Should User consent framework enhancement be a work area in 6G

|  |  |  |  |
| --- | --- | --- | --- |
| Google | 5 | Security and Privacy Aspects | -  Study user consent framework and user centric privacy control for data driven network |
| AT&T | 6 | Network Programmability & Service Exposure | •To study Unified API exposure framework (across all SA WGs) exposing service-oriented northbound APIs with a centralized user consent management•To study Network programmability & Intent-based APIs |
| Apple | *3* | *Architectural framework for user consent management*  | *Enhance the 6GS architecture to support an evolved user consent management framework*  |

## 1.15 Network Sharing (5)

Network Sharing has been mentioned in the following company inputs:

China Unicom, vivo, NOKIA, Spark NZ Ltd, Samsung

The following aspects are mentioned:

* Support of different network sharing mode in 6G
* RAN sharing, core sharing, compute sharing
* dynamic/on-demand network sharing

**Moderator proposal:** The following question is proposed for NWM discussion

Question 1: Should Network Sharing be a work area in 6G

|  |  |  |  |
| --- | --- | --- | --- |
| China Unicom | 1 | Network Sharing | How to support the network sharing for the connection resources flexibly, e.g. considering the different network sharing modes.How to support the network sharing for the resources beyond connection (e.g. computing resource, etc..). |
| vivo |  | Other | Basic Communication  • Network Sharing |
| NOKIA, Spark NZ Ltd  | 24 | Sharing scenarios | Study the ability to share any resource: RAN, core network, compute,  |
| Samsung | 6 | Network Resilience and Always-on Connections | 1. New architecture and functionalities for dynamic/on-demand network sharing 2. How to support detection/prediction of need for network sharing (e.g., disaster occurrence, network failure, overloaded situation)3. How to support network sharing activation, including shared network resource selection (e.g., host network RAN) for a given area4. Service interruption minimization (e.g., via mobility management) during network sharing activation5. Inter-operator monitoring for the shared network resource, e.g., monitoring the shared resource usage (e.g., represented by traffic volume in a shared network) and quality of connectivity service via the shared resource (e.g., QoS and shared network coverage) |

# System requirements

## 2.1 Sustainability and Energy Efficiency (16)

Energy saving has been mentioned in the following company inputs:

Google, vivo, MEDIATEK INC., NTT DOCOMO, AT&T, KPN, Lenovo, ETRI, SK Telecom, KT, LG Uplus, NOKIA, Spark NZ Ltd , NEC, Samsung, CATT, Charter Communications, LG Electronics

The following aspects are mentioned:

* 6GS Architecture to support Energy Efficiency and Energy Saving, integrate energy efficiency into all 6G features
* energy-as-a-service
* Accurate energy consumption calculation (including RAN)
* AI-based energy estimation, prediction, and management for 6G networks.
* Create distributed, collaborative frameworks and optimize data exchange for improved energy efficiency
* Enhance UE energy savings in IoT, XR, AI, balance service quality with power reduction.

**Moderator proposal:** Sustainability and Energy Efficiency is included as a separated work area. However this requirement need to be further discussed during the study and check whether existing 5GC is enough or any further enhancement. The following questions are proposed for NWM discussion.

* No need for NWM discussion?TBD

|  |  |  |  |
| --- | --- | --- | --- |
| Google |  | 　 | - Energy efficiency in 6G |
| vivo | 6 | End-to-end energy ,saving and energy ,efficiency | Key Work Tasks：• WT#1: Support UE energy saving in various 6G services, e.g. IoT, XR, Robot, AI enabled devices. • WT#2: Support mechanisms to enable energy saving/efficiency as a service. • WT#3: Network Energy information awareness and determination for the UE. Accurate energy consumption calculation for the RAN based on the radio resource usage is expected. • WT#4: Network energy saving considering the balance of network energy consumption reduction and users’ service experience. |
| MEDIATEK INC. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | •Energy Efficiency |
| NTT DOCOMO | 5 | Sustainability  | Reliable energy-related information determinationSustainable AI/ML-6G should support sustainable AI/ML deployment-6G should exploit AI/ML as a tool to optimize energy efficiency of the network Reliable energy-related information determination -6G should supports accurate determination of energy-related information which are reliable enough for the charging purposes and credit control. |
| AT&T | 9 | Energy Efficiency | •To study a grounds up Energy Efficiency aware cloud network based AI enabled 6G System (excludes OAM aspects) |
| KPN | 2 | Sustainability | -Support for energy-efficient 6G features and procedures.-Support for AI-based energy estimation, prediction and saving. |
| Lenovo | 9 | Energy Efficiency | Study the support of mechanism which lead to energy efficiency, e.g. enable multiple energy states for NFs/RAN, consider energy-related analytics and/or AI, consider energy budget information. |
| ETRI, SK Telecom, KT, LG Uplus | 3 | Energy Efficiency and Energy-Native Design | Native and joint design to deliver network and UE energy efficiency/savingsKey Work Tasks include defining – 1.Energy efficiency metrics & KPI definition 2.Optimization framework for energy efficiency vs. 6G Core performance3.Distributed architecture for enhanced energy efficiency in 6G Core 4.Collaborative framework for AI-native 6G Core5.Optimized data exchange with RAN and UE |
| NOKIA, Spark NZ Ltd  | 12 | Energy savings and energy related work. | Ensure energy efficient system from day-1. Study system impact due to energy savings and other aspects related to energy. |
| NEC | 3 | Energy saving | Study energy efficiency and saving architecture including:•End-to-end Energy Efficiency improvements in the 6G system compared to the 5G system.•Differentiated energy efficiency services to subscribers. Based on UE indication, the network applies power-saving technology to improve UE energy efficiency according to user requirements.•Energy-related information collection from the radio access network (e.g., per UE granularity) to consider the impact of UE location (e.g., cell edge vs. cell center) on energy consumption. |
| Samsung | X | Energy Saving | 1. Energy-related regulations in different regions should be taken into account to formulate them as service requirements2. Macro-level energy management system to reduce total energy use in the network and achieve cost-optimal methodology3. B2B support to manage carbon emissions, e.g. as a platform for carbon emission trading |
| CATT  | 10 | Energy Efficiency and Energy Saving | -6GS Architecture to support Energy Efficiency and Energy Saving, including e.g. defining new NF(s) and interfaces for 6G energy control;-Coordinated system energy efficiency and energy saving between CN, RAN and UE;-UE awareness and assistance to 6G network energy efficiency and energy saving;-AI assisted 6G system energy efficiency and energy saving. |
| Charter Communications | 6 | Energy Efficiency and Sustainability | •Improved reduction on network power consumption.•Improved Energy as a Service feature.•Energy Efficiency to be native/considered in all 6G features (when possible). |
| LG Electronics | 1 | General Architecture | The following objective can be considered regarding General Architecture of 6G:1) How to design 6G Architecture, e.g. 5GC evolution or clean state design2) How to design interface between 6GC and RAN, e.g. whether to keep NG-like interface between 6GC and RAN3) Native support of NPNa)  Whether to re-use CAG mechanism or define a new mechanism for access control b) Network selection for NPN4) Roaming support5) Mobility management framework6) Session management framework including Edge Computing aspects7) QoS framework considering support of XR and Multi-modality8) UE / AM / SM policy control framework9) NAS framework, e.g. whether to keep 5G NAS framework or enhance 5G NAS framework10)  Security framework, e.g. whether to keep 5G security framework or enhance 5G security framework11)  Data management framework, e.g. how to efficiently collect and manage data in the network, and expose data12)  Native support of MINT (i.e. disaster roaming), e.g. whether to re-use Rel-17 MINT mechanism or define a new mechanism13)  Support of Energy Efficiency and Energy Savinga)  How to apply functions and mechanisms specified by Rel-19 EnergySys to 6GS such as EIF(Energy Information Function), collecting/calculating/exposing the energy related information, etc.14)  Slicing supporta)  Which sling features specified in 5GS should be supported by mandatory in the UE and networkb)  Whether and how to simplify slicing mechanisms specified in 5GS |

## 2.2 Cloud native (9)

Cloud native has been mentioned in the following company inputs:

SK TELECOM,Boost Mobile, EchoStar,KPN,ETRI, SK Telecom, KT, LG Uplus, Rakuten Mobile

The following aspects are mentioned:

* How to include a new or existing framework of distributed cloud-native architecture.
* Cloud Native 6G Architecture from day 1 with Open APIs Service Based Architecture continuation

**Moderator proposal:** Cloud native is not a dedicated work area. It is proposed to move the discussion in the study phase. The following questions are proposed for NWM discussion.

* No need for NWM discussion? TBD

|  |  |  |  |
| --- | --- | --- | --- |
| SK TELECOM | 　 | 　 | 6. How to include a new or existing framework of distributed cloud-native architecture |
| Boost Mobile, EchoStar | 　 |  | 6G system needs to support cloud-native by design. |
| KPN | 4 | Cloud-native architecture and support for XaaS | -Support for cloud-native network architecture with seamless NF onboarding and service migration. |
| ETRI, SK Telecom, KT, LG Uplus | 2 | Network and Computing Convergence | Seamless integration of communication networks and computing resources to enable intelligent, ultra-low latency, and highly efficient data processing at the UE, edge, cloud, and across 6G network.Key Work Tasks include defining – 2.Cloud-native Core support |
| Rakuten Mobile | 5 | Cloud and AI native Architecture | AI Native and Cloud Native 6G Architecture from day 1 with Open APIs Service Based Architecture continuation |

## 2.3 Robustness and Resiliency (7)

Robust and resilient aspect has been mentioned in the following company inputs:

SK TELECOM, Rakuten Mobile, NTT DOCOMO, Futurewei, NOKIA, Spark NZ Ltd, Samsung

The following aspects are mentioned:

* Study how to support 6G System Resiliency

**Moderator proposal:**  Robustness and Resiliency is included as a separated work area. However this requirement need to be further discussed during the study and check whether existing 5GC is enough or any further enhancement. The following questions are proposed for NWM discussion.

* No need for NWM discussion? TBD

|  |  |  |  |
| --- | --- | --- | --- |
| SK TELECOM | 4 | Robust and resilient | Potential objectives/WTs related to, 1. NF to ensure reliable operation with advanced fault tolerance (even under various load, misbehaving conditions), including Monitoring and analysis of the NF's performance to maintain optimal performance2. Whether and how to provide enhanced NF Sets, including In-service Upgrade/Rollback mechanisms within and or between NFs (providing multiple mechanisms for real-time upgrade, downgrade (rollbacks, canary, blue/green). 3. How to provide Disaster Recovery mechanisms for all NFs. Provide NDT capable NFs4. (Emergency Data Service) Whether and how to provide Emergency data service with a limited QoS/QoE5. (Emergency Data Service) Whether and how to provide network security, temporality for Emergency scenario. |
| Rakuten Mobile | 4 | Resilient Networks | Zero Outage, Ultra-resilient networks |
| NTT DOCOMO | 10 | Robustness and resiliency | -Identify potential architectural principles and study mechanisms to avoid, or lower the risk of, network failures, network modification operation mishandling, and network overload.-Study mechanisms to recover from the above-mentioned incidents. |
| Futurewei | 6 | Resilient E2E connectivity | Study whether and how to design mechanisms (e.g., UP enhancements, network selection) to support ubiquitous connectivity in congested or sparsely connected areas to enhance coverage, QoE, and resilience (e.g., minimum service interruption when transitioning between access networks).Resilient E2E connectivity |
| NOKIA, Spark NZ Ltd  | 6 | Resiliency | Support for 6G System Resiliency, especially control plane resiliency |
| Samsung | 6 | Network Resilience and Always-on Connections | 1. New architecture and functionalities for dynamic/on-demand network sharing 2. How to support detection/prediction of need for network sharing (e.g., disaster occurrence, network failure, overloaded situation)3. How to support network sharing activation, including shared network resource selection (e.g., host network RAN) for a given area4. Service interruption minimization (e.g., via mobility management) during network sharing activation5. Inter-operator monitoring for the shared network resource, e.g., monitoring the shared resource usage (e.g., represented by traffic volume in a shared network) and quality of connectivity service via the shared resource (e.g., QoS and shared network coverage) |

# Service aspects

## 3.1 Legacy service (18)

Legacy service support has been mentioned in the following company inputs:

Google, NTT DOCOMO, AT&T, KDDI, US Cellular, Verizon, KPN, Qualcomm, NOKIA, Spark NZ Ltd, OPPO, Ericsson, Apple, Vodafone, CATT, Deutsche Telekom, ZTE, MEDIATEK INC..

The following aspects are mentioned:

* 6G shall support IMS voice, SMS/RCS, MPS, Mission Critical services, PWS.
* 6G shall support Emergency Services: Include NG911/112, E-call, and emergency SMS over NAS, .
* Maintain Regulatory Features: Support Wireless Emergency Alerts, Priority Services, and compliance with CALEA/LI.
* 6G shall support basic positioning/location services, basic time sync service,

**Moderator proposal:** Support of legacy services is one 6G work area. The following questions are proposed for NWM discussion.

* No need for NWM discussion? TBD

|  |  |  |  |
| --- | --- | --- | --- |
| Google | *7* | Specific Services Migration from 5GS to 6G | - IMS voice - Messaging service migration and enhancement (SMS, RCS)- Emergency services (E-call, NG911/112 using RCS, emergency SMS over NAS), - Other regulatory services support: MPS, MCX - CIoT services |
| NTT DOCOMO | 12 | Legacy services | Legacy services (e.g. Voice, SMS, Emergency service, Priority service, etc.) |
| AT&T | 8 | Sensing And Positioning | •To ensure positioning/location service support stays in 6G systems (both for regulatory and commercial uses) |
| 12 | Mission Critical Services  | •Support all 5G Mission Critical services•Study additional new 6G use cases for such services |
| 13 | 6G Voice | •Support all 5G baseline voice services•Study additional new 6G use cases for such service |
| 14 | 6G Messaging | •Support all 5G baseline messaging services•Study additional new 6G use cases for such services |
| 15 | Regulatory Features for 6G | •Study to ensure support for all regulatory features from 5G exists in a 6G system as well. This for example includes Wireless Emergency Alerts, Wireless Priority Service, Multi-media Priority Service, CALEA/LI, Emergency Calls, Messaging to Emergency Services.  |
| KDDI, US Cellular, Verizon | *x* | Existing services | How existing services (Voice, 911/112, E-Call, PWS, WPS, MPS, MCS) shall be supported? |
| KPN | 1 | 6G Migration & Interworking Architecture | -Definition of the 6G architecture to support voice with no fallback to 5G/VoNR. |
| Qualcomm | #8 | Voice support | WT#1: Specify IMS voice support over 6G radioWT#2: Study transitional solutions to enable MNOs to rely on previous Gs (potentially including 4G) for voice support |
| NOKIA, Spark NZ Ltd  | 7 | Basic and auxiliary services | SMS, PWS, IMS multimedia services (MMTEL), Emergency services, Basic location services, basic time sync (with the ability for 3GPP system to have the same time reference), considering also GNSS independent positioning and time sync support. Access specific enhancements needed for IMS should be part of 6G SID. |
| OPPO | WT#4 | MNO services | 1. Voice;
2. Emergence service.
 |
| Ericsson | 3 | Support for basic/regulatory communication services | Study how to support Voice, SMS and Emergency services via 6G RAN, including interactions with legacy voice services. It is our assumption that a 6G voice solution should be based on IMS. |
| Apple | *3* | *Support for Basic Services* | *Support for basic services in non-roaming and roaming scenarios (voice service, emergency services and SMS based on IMS; PWS, location services, etc.)* |
| Vodafone | 9 | Day 1 (regulatory) voice support | -Identify what issues prevented day 1 support for (regulated) voice in 5G-Identify techniques to mitigate these issues with 6G RAT  |
| CATT  | *1* | System Architecture | -IMS-based voice. |
| Deutsche Telekom | 2 | Migration, co-existence and Interworking | •Voice, IMS and roaming from Day 1 |
| ZTE | WT#2 | System improvement for on existing services | IMS enhancement to support Voice and immersive communication service |
| MEDIATEK INC. | Phase 2 (Track 2) | WT-3: Study system architecture support on how to enable existing or new beyond communication services | WT-3.1 Study how to enable existing services from Day 1: PWS, SMSoNAS, IMS MMTel, Emergency, MPS, MC, LCS. |

## 3.2 Immersive service(7)

Immersive service has been mentioned in the following company inputs:

Xiaomi, AT&T, China Mobile, KPN, Ericsson, Samsung, Google

The following aspects are mentioned:

* Architecture support for Immersive service
* QoS framework enhancement to support Immersive service
* Migration with 5G-A services/features

**Moderator proposal:** The following question is proposed for NWM discussion

* Can support of Immersive service as a 6G work area?

|  |  |  |  |
| --- | --- | --- | --- |
| Xiaomi | 6 | Immersive service | Potential objectives/Work Tasks: • E2E QoS study for the immersive and interactive media services, including:- QoS for bidirectional delivery of haptic traffic- QoS for Avatar-based XRM service- Synchronization and Coordination of multiple UEs with diverse devices• Potential network architecture requirements and technical solutions for immersive services (e.g., holographic video, XR)  |
| AT&T | 10 | XR and Immersive Communication | •Design network support and service layer support for a service that provides Immersive experience through multi-sensory interactions and In-depth integration between physical and digital worlds |
| China Mobile | 6 | Native Immersive and Intelligent RTC Services  | 1. Support the immersive, integrated, and intelligent RTC services by new NFs, NFs enhancement or third-party capability integration;2. Support the simplified IMS network with lower cost and higher flexibility. |
| KPN | 6 | Immersive communications support | - Architecture for support of immersive communications use cases: Holographic communications, Immersive XR and Metaverse. |
| Ericsson | 8 | New value add services – immersive comm services | Study capabilities to support immersive communication based on the relevant stage 1 KPIs.  |
| Samsung | X | Immersive Communication | 1. QoS framework to handle correlated service flow(s) together in a unified manner. 2. QoS framework to support effective QoS control for immersive communication e.g. dynamic in-time QoS control adjustment.3. QoS framework to consider whole the data path to end user. |
| Google | *10* | Migration with 5G-A services/features | - XRM in 6G |

# Ubiquitous Aspects

## 4.1 NTN (22)

NTN has been mentioned in the following company inputs:

MEDIATEK INC., Google, China Telecom, Xiaomi, NTT DOCOMO, AT&T, KDDI, US Cellular, Verizon, Intel, ETRI, SK Telecom, KT, LG Uplus, OPPO, Ericsson, NEC, Apple, CATT , Deutsche Telekom, ZTE, LG ELECTRONICS.

The following aspects are mentioned:

* Study on enhancements for TN-NTN
* Support of Core Network NFs onboard satellites by means of enhanced SBA
* Multiple satellite orbits
* Positioning independently of non-3GPP positioning technologies (e.g., GNSS)
* Resilient notification
* IoT support over 6G NTN
* Support IMS Voice over GEO
* Goal should be to re-use to a large extent the solution defined for 5GS

**Moderator proposal:** NTN is one 6G work area, however it has high dependency on RAN progress. The following questions are proposed for NWM discussion.

* No need for NWM discussion?

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| MEDIATEK INC. | *Phase 2 (Track 2)* | WT-3: Study system architecture support on how to enable existing or new beyond communication services | WT-3.2 Study on enhancements for TN-NTN incl. Service Continuity for 6G |
| Google | 6 | *Network migration for 5GS and 6GS* | - support satellite access for NTN interworking  |
| *10* | Migration with 5G-A services/features | - Satellite network in 6G |
| China Telecom | 6 | *NTN-TN converged network* | *1. Support of Core Network NFs onboard satellites by means of enhanced SBA**2. Support of coordination between different satellite orbits, including selection and switching across orbit based on policy(e.g. specific service, QoS requirement, UE power saving, coverage…)* |
| Xiaomi | 4 | Integration of Satellite technology | Potential objectives/Work Tasks: • Multi-orbit satellite communication• Positioning independently of non-3GPP positioning technologies (e.g., GNSS)• Resilient notification to users about a missed MT service• Enhance user experience with sparse LEO deployment, including service continuity, etc. |
| NTT DOCOMO | 8 | Access integrations  | -NTN-System architecture design for Multi-Orbit NTN e.g., mobility management, Roaming, etc.-System architecture design for Edge Computing using NTN with real-time processing-System architecture design for PWS extension to use NTN and mechanism to support geo-targeted warning notifications.-Indoor coverage support-The 6G architecture is designed to facilitate millimetre wave coverage, especially indoors. |
| AT&T | 4 | Seamless and Ubiquitous Connectivity  | •To study continued and enhanced support for a heterogenous set of access networks including UE connectivity (e.g. authentication, roaming) beyond terrestrial cellular network coverage area |
| KDDI, US Cellular, Verizon | *x* | Connectivity | How can ubiquitous connectivity be achieved with terrestrial, non-terrestrial and non 3GPP technologies?  |
| Intel | 6 | Ubiquitous Connectivity | •Standardized service and control interface for dynamic coordination across heterogeneous access types, including terrestrial (macro/small cell), non-terrestrial (LEO/MEO satellites, HAPS, UAV), and non-3GPP networks (e.g., Wi-Fi, fixed).•Unified mobility management architecture supporting seamless inter-access mobility and service•Unified data and session management for multi-access devices with simultaneous connectivity (multi-link), enabling predictive handover and session persistence across coverage domains.•Support for NTN-specific QoS mechanisms, slicing extensions, and session/policy retention across TN-NTN transitions.•Network-aware resiliency framework for fallback, coverage recovery, and service assurance under limited or degraded connectivity (e.g., in disaster scenarios, rural zones, or edge-of-coverage zones). |
| ETRI, SK Telecom, KT, LG Uplus | 4 | Integration of Non-Terrestrial Networks (NTN) | NTN-Native Core : NTN not just as an “Add-on” but as a “Native Component” of 6GKey Work Tasks include defining – 1.NTN-native Session and Policy Management2.Extended Analytics and AI/ML for NTN3.Scalable Architecture for Massive Constellations4.Multi-connectivity and Seamless Handover for NTN |
| Ericsson | 11 | Support for NTN | Goal should be to re-use to a large extent the solution defined for 5GS |
| NEC | 8 | Ubiquitous Connectivity | Study Ubiquitous Connectivity including:•Ubiquitous coverage through seamless integration of terrestrial and non-terrestrial networks.•Resilient notification: Addressed user expectations for satellite-reliant communications in areas lacking terrestrial coverage. A notification mechanism was proposed to inform users when incoming calls or messages fail due to poor satellite reception.•Multi-Orbit Satellite Access for Different Services: Examined potential benefits of using multi-orbit satellite networks (LEO, MEO, GEO) within 5G systems. This capability could enhance service experiences by leveraging different orbital characteristics, though simultaneous UE connections across orbits were deemed out of scope. |
| Apple | *5* | *Integration of Satellite access (NTN)* | *Unified design for ubiquitous coverage**System level integration and interworking to provide consistent service provisioning across TN and NTN* |
| CATT  | 7 | Terrestrial and Satellite Networks Convergence for 6G | -Support of new 6G RAT for satellite access -How to support high level procedures (e.g., registration/session management) for terrestrial and satellite networks convergence-How to support service continuity when UE moves between terrestrial and satellite networks, including between multi-orbit satellite networks. -How to maintain connectivity through satellite networks when terrestrial networks become unavailable, e.g., due to disasters.-Support positioning for satellite networks with GNSS independence. -IoT support over 6G NTN -Whether and how to support diverse IoT connectivity types over satellite networks-Support IMS Voice over GEO -Support robust notification  |
| ZTE | WT#2 | System improvement for on existing services | Integration of NonTerrestrial Networks (NTN) |
| LG ELECTRONICS | 2 | Support of various and multiple accesses | The following objective can be considered to support various and multiple accesses:1) Native inclusion of NTN featuresa) Support for both Transparent and Regenerative payloadb) Support of existing 5GC features specified to support NTN2) Support of non-3GPP access including FWA3) Support of registration over simultaneous 3GPP accesses, e.g. TN-NTN, NTN-NTN (e.g. multi-orbits satellite accesses)4) CN controlled traffic steering, switching and splitting over multiple accesses, e.g. TNNTN, NTN-NTN (e.g. multi orbit satellite), 3GPP-Non-3GPP |

## 4.2 Non 3GPP access (19)

Non 3GPP access has been mentioned in the following company inputs:

MEDIATEK INC., AT&T, Google, KDDI, US Cellular, Verizon, Intel, Lenovo, Qualcomm, NOKIA, Spark NZ Ltd, OPPO, Ericsson, Apple, CableLabs, Charter Communications, Comcast, Deutsche Telekom, ZTE

The following aspects are mentioned:

* Study common solution to support non-3GPP access(including WIFI and Fixed wireless) (whether to migrate with/without N3IWF)
* Unified data and session management for multi-access devices with simultaneous connectivity.
* Network-aware resiliency framework for fallback coverage recovery, and service assurance under limited or degraded connectivity
* Study how to support operator voice service over non-3GPP access
* Support of ATSSS over re-designed non-3GPP access
* Non-3GPP ISAC(see 2.5)
* Non-3GPP AIoT

**Moderator proposal:** Non 3GPP access has received high support and can be a work area in 6G. The following questions are proposed for NWM discussion.

* No need for NWM discussion?TBD

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| MEDIATEK INC. | Phase 1(Single Track) | *WT-1: Preliminary Pilot Study* | •Non-3GPP access support |
| AT&T | 11 | *Fixed Wireless Access* | •Develop architectural optimizations to support Fixed Wireless Access  |
| Google | 6 | *Network migration for 5GS and 6GS* | - support N3GPP access (whether to migrate with/without N3IWF) |
| AT&T | 4 | Seamless and Ubiquitous Connectivity  | •To study continued and enhanced support for a heterogenous set of access networks including UE connectivity (e.g. authentication, roaming) beyond terrestrial cellular network coverage area |
| KDDI, US Cellular, Verizon | *x* | Connectivity | How can ubiquitous connectivity be achieved with terrestrial, non-terrestrial and non 3GPP technologies?  |
| Intel | 6 | Ubiquitous Connectivity | •Standardized service and control interface for dynamic coordination across heterogeneous access types, including terrestrial (macro/small cell), non-terrestrial (LEO/MEO satellites, HAPS, UAV), and non-3GPP networks (e.g., Wi-Fi, fixed).•Unified mobility management architecture supporting seamless inter-access mobility and service•Unified data and session management for multi-access devices with simultaneous connectivity (multi-link), enabling predictive handover and session persistence across coverage domains.••Network-aware resiliency framework for fallback, coverage recovery, and service assurance under limited or degraded connectivity (e.g., in disaster scenarios, rural zones, or edge-of-coverage zones). |
| Lenovo | 8 | Integration of non-3GPP access into 6GS | Study the integration of non-3GP access in the 6G system to provide easier deployment and offer a more seamless continuity experience for the users, e.g., by enabling seamless mobility between 3GPP and non-3GPP access and network-triggered handovers. |
| Qualcomm | #6 | Non-3GPP access for operator voice service | WT#1: Study how to support operator voice service over non-3GPP access |
| NOKIA, Spark NZ Ltd | 9 | Access agnostic system | Support for non-3GPP access functionality. Non-3GPP access related specifics of RM and CM states and registration procedures. |
| 11 | Fixed wireless access | Study any optimizations needed for FWA, critical to enable mobility and UP optimizations needed for FWA devices |
| OPPO | WT#2 | Evolved basic functionality based on 5G design | 4. Non-3GPP access support; |
| Ericsson | 12 | Non-3GPP access | Solution for interworking between non-3GPP access and the Core Network for 6G. Strive for a common solution for all non 3GPP accesses. |
| Apple | *2* | *Non-3GPP Access* | *Simplification of untrusted non-3GPP access support**Support of ATSSS over re-designed non-3GPP access* |
| CableLabs, Charter Communications Communications, Comcast | 1 | Inherent non-3GPP access support | •From Day 1, 6G UE can access network services (e.g., data, voice) through 3GPP access and/or non-3GPP access (e.g., Wi-Fi, wireline).•Access-agnostic control mechanisms between core and AN. |
| 2 | Native multi-access support | •Support for fast user plane policy-based traffic management.•Enhanced policies considering link and access-based metrics.•Enhanced traffic differentiation to accommodate new multimedia streaming. |
| 3 | Support and identification of diverse device types across access networks | •Support devices with different capabilities including robust authentication and authorization mechanisms for each.•Identification of a device across access networks. |
| 4 | Differentiated services | •Enable differentiated QoS per individual device, per user-of-device, and per service.•Mechanisms to ensure consistent QoS across access networks. |
| 5 | AI/ML capability across access networks | •Collection and exposure of network analytics from non-3GPP access.•Support operation of AI/ML applications both on core and AN edge. |
| 6 | Non-3GPP ISAC | •Incorporating non-3GPP sensing within the 6G sensing framework. |
| 7 | Non-3GPP AIoT | •Extend the AIoT framework to include non-3GPP access nodes and spectrum. |
| Charter Communications | 1 | Network Convergence, Access Agnostic, Seamless Mobility | •Provide access agnostic service between Cellular (TN & NTN), WiFi, Wireline accesses to a common core network (i.e., all accesses converge to the same core network, to provide 6G services).•Seamless transition among and across all access networks.•Non-3GPP network control plane procedures should not be dependent on 3GPP networks.•Control plane procedures independent of any access. |
| 2 | Native Multi-access Data Sessions  | •Leverage native MA PDU sessions with data flow across different accesses.•Strive to offload traffic from 3GPP network to non-3GPP (WiFi & Wireline) networks.•3GPP tight integration with WiFi. |
| 3 | QoS differentiation over non-3GPP access | •QoS distinction over non-3GPP networks (e.g., L4S, DSCP marking, etc.). |
| Deutsche Telekom | 6 | Integration of Non-3GPP accesses | •Converged control plane for non-3GPP accesses (Wifi, Fixed, Cable)•N3IWF as basis |
| ZTE | WT#2 | System improvement for on existing services | Common architecture for non 3GPP accesses, including at least FWA and WiFi |

## 4.3 New IoT (3)

Network exposure has been mentioned in the following company inputs:

NTT DOCOMO, AT&T, Ericsson,

The following aspects are mentioned:

* Integrate support for IoT devices in the 6G system from day 1.
* To Study 6G LPWA support from initial release that can span multiple generations
* Study required support for Massive IoT. Build on learnings from 4G M-IoT deployments. Consider areas of improvement, e.g. simplified architecture with reduced number of options, avoid DoNAS.

**Moderator proposal:** This work area has high dependency on RAN progress, The following questions are proposed for NWM discussion.

* No need for NWM discussion? TBD

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| NTT DOCOMO | 9 | IoT | Integrate support for IoT devices in the 6G system from day 1. |
| AT&T | 3 | Support for LPWA | •To Study 6G LPWA support from initial release that can span multiple generations |
| Ericsson | 5 | Massive IoT | Study required support for Massive IoT. Build on learnings from 4G M-IoT deployments. Consider areas of improvement, e.g. simplified architecture with reduced number of options, avoid DoNAS. |

# System aspect for security (17)

Security aspect has been mentioned in the following company inputs:

SK Telecom, China Unicom, Google, vivo, MediaTek Inc., InterDigital Canada, KPN N.V., Intel, Qualcomm, ETRI, SK Telecom, KT, LG Uplus, NOKIA, Spark NZ Ltd , NEC Corporation, CATT , LG Electronics,

The following aspects are mentioned:

* Security framework for 6G
* AI-based Spam filtering
* zero-trust management
* integrate MASQUE framework with 6GS architecture
* Security aspect on distributed NAS

**Moderator proposal:** System aspects for security is one 6G work area in SA2. Coordination with SA3 is needed during the study.

MASQUE framework can be discussed in 1.11.

Distrusted NAS can be discussed in 1.8

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| SK Telecom | 1 | Architecture related to SBA | 1. Whether and how to design SBA enhancements for flexibility, reliability, security, and performance aspects. |
| 4 | Robust and resilient  | 5. (Emergency Data Service) Whether and how to provide network security, temporality for Emergency scenario. |
| 10 | Security | 1. Enhanced NF design for AI-based Spam filtering (high accuracy without exposing sensitive information) 2. How to enhance security protocols of NFs for zero-trust management |
| China Unicom | 3 | Data as a Service | How to define a unified data management and control framework for different data based services (e.g. positioning, AI, sensing, etc..), including unified data collection, processing, storage, usage and exposure. How to realize the privacy and security of the data under the unified data management and control framework. |
| Google | 5 | Security and Privacy Aspects | -  Evolve 6G AS/NAS security for distributed NAS |
| vivo | 1 | Native AI support in 6G |  Key Work Tasks： • WT#2: Unified data collection framework to support AI/ML related activities e.g. data collection, data storage, data exposure, data privacy and security management, model sharing/delivery, etc. Note: UE data collection and 5GC data collection Framework for AI/ML will be considered |
| 4 | Unified Data Collection Framework |  Key Work Tasks: • WT-2: Guarantee data security and privacy for data service |
| 7 | Distributed NAS |  Key Work Tasks： • WT-4: End-to-end security between UE and NF without AMF involvement |
| MediaTek Inc. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | •Security aspects |
| InterDigital Canada | 1 | Access and Mobility Management | Study and identify what AMF functionalities should be distributed to new/other NFs e.g., Access Control, Registration Management, Security Anchor point, reachability |
| KPN N.V. | 4 | Cloud-native architecture and support for XaaS | -Architecture support for “everything as a service” exposure with compute, data, network, AI and security as a service. |
| Intel | 3 | Unified data framework  | •Unified security and privacy protection mechanisms, addressing varying sensitivity levels (e.g., anonymization for user data, encryption for ML models). |
| Qualcomm | #1 | Common framework for operator services over the user-plane | •authentication, authorization and security establishment; |
| ETRI, SK Telecom, KT, LG Uplus | 6 | Unified Data Management Framework with User Consent | 4.Data traceability and privacy mechanisms to ensure transparency, security, and trustworthiness in data operations. |
| NOKIA, Spark NZ Ltd  | 19 | System aspects of security | Architectural and system procedure impact due to security |
| NEC Corporation | 1 | Basic network architecture | •Support for Multi NAS/Modular NAS/Distributed NAS and related security issues. |
| CATT  | 2 | 6G New NAS | -Study NAS termination and routing in core network for security, connectivity services and beyond connectivity services; and high-level procedures. |
| LG Electronics | 1 | General Architecture | The following objective can be considered regarding General Architecture of 6G:10)  Security framework, e.g. whether to keep 5G security framework or enhance 5G security framework |

# Network Exposure (17)

Network exposure has been mentioned in the following company inputs:

SK TELECOM, Rakuten Mobile, Google, MEDIATEK INC., NTT DOCOMO, KDDI, US Cellular, Verizon, ETRI, SK Telecom, KT, LG Uplus, NOKIA, Spark NZ Ltd , CATT , Charter Communications, KPN

The following aspects are mentioned:

* Simplifying the 3GPP-wide exposure framework to foster an API economy of scal
* Use of CAPIF for core exposure and functional split between NEF & CAPIF, Enabling authorization framework also for in-band and on-path exposure
* How to expose resources to authorized 3rd parties
* Unified network capability exposure in 5G/6G
* A unified network exposure framework across 6G core and 6G RAN to foster API economies of scale

**Moderator proposal:** This topic can be studied in SA6 first. No need for NWM discussion.

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| SK TELECOM | 9 | NF API exposures | 1. How to provide the 3GPP-wide API exposure framework2. How to expose NF information/resources to authorized 3rd parties3. How NF related resource exposure capability can be enabled. 4. How to support monitoring, usages/charging and resource reports8. Analysis of new or existing Plane enhancements, capabilities, and benefits |
| Rakuten Mobile | 1 | Resource as a Service | How to expose resources to authorized 3rd partiesHow network-aware resource exposure capability can be enabled by the 6G system's centralized policy framework. |
| Google | *9* | Network Capability  | - Unified network capability exposure in 5G/6G |
| MEDIATEK INC. | *Phase 1(Single Track)* | WT-1: Preliminary Pilot Study | •Network capability exposure framework |
| NTT DOCOMO | 11 | Network exposure framework  | -Study potential enhancement of overall framework to expose network capability and to allow operation from the outside.-Study potential enhancement of mechanisms for obtaining necessary authorization and user consent.-Study overall framework to expose network big data and to synchronize it with the external situation.-Study mechanisms for low latency notification for real-time synchronization. |
| KDDI, US Cellular, Verizon |  | Network exposure | A unified network exposure framework across 6G core and 6G RAN to foster API economies of scale |
| ETRI, SK Telecom, KT, LG Uplus | 8 | Unified Network Exposure Framework  | Simplifying the 3GPP-wide exposure framework to foster an API economy of scale |
| NOKIA, Spark NZ Ltd  | 16 | Exposure framework | Use of CAPIF for core exposure and functional split between NEF & CAPIF, Enabling authorization framework also for in-band and on-path exposure |
| CATT  | *1* | System Architecture | -Network exposure. |
| Charter Communications | 5 | Network Exposure | •(in)direct network information exposure via APIs to (un)trusted parties.•Network information/data related to a particular service. |
| KPN | 4 | Cloud-native architecture and support for XaaS | -Architecture support for “everything as a service” exposure with compute, data, network, AI and security as a service. |

# Other aspects (single company proposal)

The following aspects are proposed by single company.

**Moderator proposal:** Not 6G work area and no need for NWM discussion.

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| SK TELECOM | 6 | Background  | Potential objectives/WTs related to,1. Explore mechanisms for the UE to indicate whether a session is background or foreground in a standardized or harmonized manner.2. Investigate how this information could be considered in access control decisions, URSP selection, slicing preferences, and other traffic-handling policies.3. Examine benefits for UE OS, including improved power efficiency, user experience control. |
| SK TELECOM | 5 | Observability / Visibility | Potential objectives/WTs related to, 1. How to provide observability of NFs. How to bring inter/intra NF monitoring for accurate real-time diagnosis.2. How to improve the accuracy of analysis based on internal and external NF/system information.3. How to refine the control and execute (closed-loop) based on analytical results.4. How to measure, monitor and/or gather different NF status including state-transition, changes of normal/abnormal behaviours efficiently |
| Qualcomm | #3 | Harmonized UE tracking and paging solution | WT#1: Study a harmonized UE tracking, paging and data buffering solution for RRC states other than RRC\_CONNECTED. |
| NTT DOCOMO | 8 | Access integrations | -Indoor coverage support |
| LG ELECTRONICS  | 4 | Support of Mobile RAN(e.g. Advanced Air Mobility (AAM), Vehicle Mounted RAN (vmRAN)) | The following objective can be considered to support Mobile RAN (e.g. Advanced Air Mobility (AAM), Vehicle Mounted RAN (vmRAN)):1)  Configuration of Mobile RAN2)  Authorization of Mobile RAN3)  Location service procedures for accurate UE location estimation when it is served by Mobile RAN4)  Control of UEs’ access to Mobile RAN5)  Support of the mobility for UEs moving together with Mobile RAN6)  Support of UE's emergency services when connected via a Mobile RAN |
| ETRI, SK Telecom, KT, LG Uplus | 7 | 6G Architecture for Deep Semantic Communication (DSC) | Providing a framework for 6G DSC(Deep Semantic Communication)Key Work Tasks include defining – 1.AI Model Repository Function for AI model as Semantic Knowledge2.QoS Profile Influence on Source Coding |
| InterDigital Canada | 5 | Identity Layer | Study to support the ability to Identity, authenticate, and authorize applications and human users of the UE. |