3GPP Highlights

ISSUE 04 May 2022

3GPP - the Mobile Broadband Standard

Technical News

We have articles on UAS connectivity-identification-tracking (CT-wide), on RAN support for AI & machine learning, news about SA4's award winning work on media streaming protocols.

There are also articles on Energy Efficiency from SA5, a RAN4 briefing on the Rel-18 package, a CT4 perspective on 3GPP port assignments for protocols and a piece from the CT Chair about OpenAPIs... and there's more.

Partner Focus

Our Market Representation Partners (MRPs) have again contributed original content for Highlights.

We have a piece about Creating the Control Rooms of the Future (TCCA), another on the developing role of the NGMN Association. Also, our new MRP 'Open Generation' explain the 5G use cases for BVLOS.

We also have an Interview with NG Subramaniam, Chair of TSDSI.

A look inside

We have two articles that shine a light on how the 3GPP groups have managed the work during the Covid-19 pandemic.

Stephen Hayes, the 3GPP Working Procedures Group Chair explains recent changes to make our rules fit for purpose in the age of e-meetings.

Issam Toufik, Director of the 3GPP MCC, looks at the arrangements being made for the return to F2F Plenary meetings, in June 2022.

FORE - WORD

Looking forward to meeting again

Welcome to the fourth issue of 3GPP Highlights, a publication that aims to bring you news from the project and to provide an insight into how 3GPP is opening up to new challenges.

Although there is no single theme for this issue, a lot of the content is looking forward to our planned return to physical face-to-face meetings, from June. That won't be the end of e-meetings – Far from it. We now have our Working Procedures updated to allow for both physical and virtual meetings to contribute fully. We have an article on the topic of the Working Procedure updates for meetings and also a contribution from the MCC on the challenges for hosts and delegates alike, to get ready for the June TSG plenaries - our first face-to-face meetings since the end of 2019.

Issue 4 of HIGHLIGHTS has been re-designed to mirror the look of our new 3GPP website, scheduled for its launch around the same time. Despite the re-look, the newsletter content is divided into the customary sections on technical news, partner contributions and a catch-all news and events section - 'a look inside'.

As usual, the majority of the technical articles in Highlights are about the status of maturing features for the 3GPP system and the plans for new ones, as 5G develops into its advanced phase.

3GPP website this summer

A new 3GPP website is launched this summer, with a new look and an improved user experience for newcomers and oldies alike.
New site features include a beefed up 'browse our technologies' tool, to showcase use cases and technologies as they arrive in 3GPP.

All of the old website functionality has been preserved, behind this new shop window for 3GPP work.

Inside Issue 4

Georg Mayer (TSG SA Chair) takes a look at building consensus in 3GPP and how the race against the clock focuses our collective minds on a cooperative approach to building new releases. Wanshi Chen (TSG RAN Chair) has contributed a more detailed look at the progress made in the last RAN Plenary – in March. His article demonstrates the balance needed between administrative tasks, detailed meeting planning and on making progress on the latest releases. Lionel Morand (TSG CT Chair) has written on the subject of a specific technical achievement – covering the selection of OpenAPIs for the definition of APIs in the Service-Based Architecture and the use of the 3GPP Forge for their storage.

The diversity of the TSG Chair's articles demonstrates the potential we have in our regular newsletter to go beyond the usual headline story of release status and generational markers – vitally important though they are to our message.

The contributions by several expert delegates and officials in this issue are witness to the depth and breadth of the technology that 3GPP covers. The partners have again stepped up in this issue and we thank them for their market and standards expertise, reflected in their articles in the 'Partner Focus' section.

We hope that you enjoy this new look Issue 4 of 'Highlights'. If so, please tell a friend to subscribe. If not, please tell me and I will work to be better next time.

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AGREEING ON THE CONTENT OF 3GPP RELEASES

By Georg Mayer, 3GPP TSG SA Chair

The recently approved list of 3GPP Release 18 items is an impressive collection of the broad variety of topics that 3GPP will work on over the next one and a half to two years. More than 6 months of intensive discussions, negotiations and prioritizations were necessary prior to the list's approval by consensus amongst all of the companies taking part in the discussions.

A 3GPP Working Group usually has 15 to 18 months to work on a Release, to make sure that all of their relevant topics fit into a strict timeline. The Release-mechanism, intentionally makes time a scarce resource – allowing 3GPP specifications to be developed "close to the market need", i.e. many of the issues that are discussed today will be deployed in real products within one or two years after the Release has been frozen (completed). Additionally, experience has shown us that the major benefit of short releases is that they act as an assurance that only the most relevant topics make it onto the release list.

The Magic of Consensus

But as there is no objective mechanism to predict the success of certain features in the market, how can these relevant topics be identified? Here the requirement of consensus comes into play. What does consensus mean within a standards developing body like 3GPP? Simply put it means that in the end nobody will say "no" or put forward an objection to the items on the list.

For anybody who was part of the early discussions on Release 18 content this might seem like magic, as the long lists of topics initially proposed to be part of the Release were heavily disputed. It is also hard to believe that an organization which has over 750 Individual Members, many of them fierce competitors in the related markets, some of them in customer-client relationships, all from a broad variety of industry backgrounds, can find a common view on a list of items.

We are not talking about only mobile network operators, network equipment vendors, mobile phone and chipset manufacturers here but also about companies from the so-called vertical industries such as railways, car manufacturers, public safety organizations, satellite operators and automated factory planners, to name just a few.

What makes them all agree?

The basic driving force for cooperating towards a common set of features is the benefit that a common global standard provides to all stakeholders and their customers. This is a simple truth that the public has learned to take for granted over the last 30 years, during which the efforts in telecommunication standards have made global mobility possible and are now working towards a global mobile enabler platform for industrial services.

Customers assume it to be natural that they can get a connection with their mobile phone in whichever country they travel to. In the same way, the underlying technologies for self-driving cars, factories of the future and next generation health services will all soon be available everywhere.

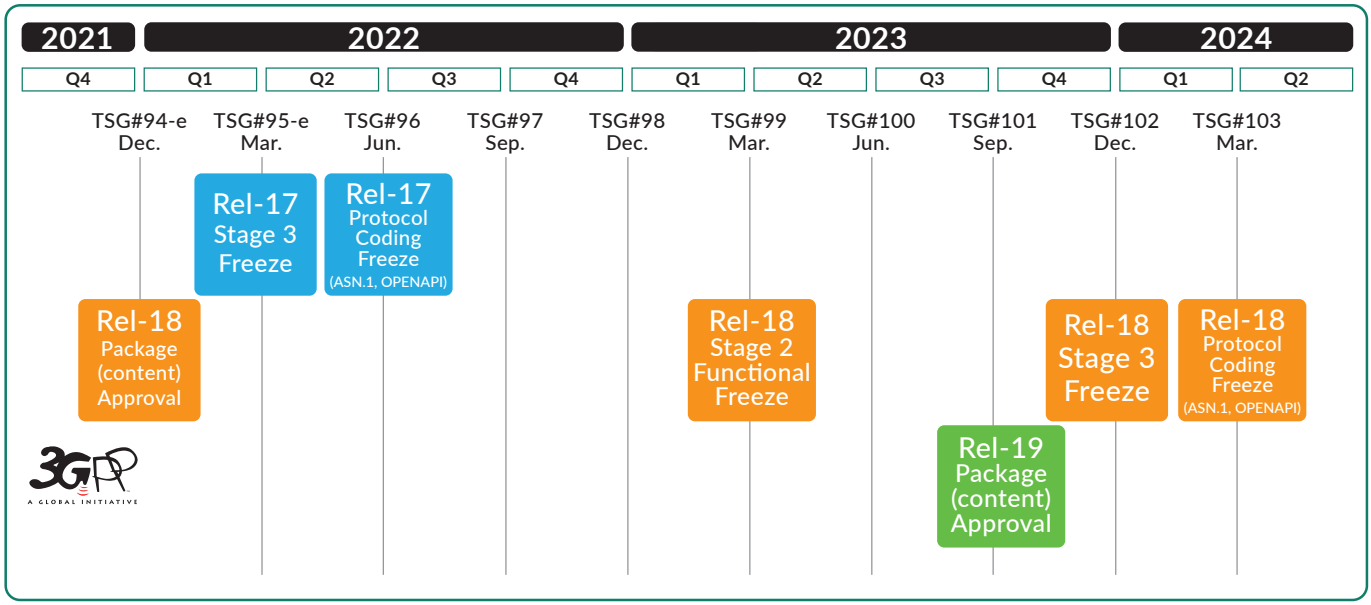
The continual development of 3GPP systems not only enables new businesses, it also is key to the future development of whole societies and more generally for technology not being a barrier but an enabler for worldwide communication and collaboration, be it for business, private reasons or research.

This is the "magic" that makes it possible for companies to find consensus on which topics to take forward within a 3GPP release. Obviously, the views on what is necessary to be done still differ a lot in the beginning of such discussions, as all companies come from different backgrounds. Coming to such conclusions therefore usually takes more than half a year of moderated discussions in the different 3GPP Working Groups (WGs) and Technical Specification Groups (TSGs).

Focus on Iteration and Flexibility

Whilst 3GPP is technically working now on Release 18, in parallel we already see new topics coming in for Release 19.

Subjects like Artificial Intelligence, the Metaverse and ambient sensing are currently studied on a requirements level.



At this point the initial ideas put forward are often too big to be technically realized within a single release. The discussions over the next months on Release 19 topics will force the contributing companies to focus on their main goals they pursue with their proposed items, in order for them to have a realistic chance to be approved into the new Release.

"There is always a next Release" is a common saying in 3GPP and it not only means that if a company cannot get their favored item into a specific release that they can always bring it back for the next. The next release is also the chance to broaden the scope of an item that starts in this release – to build on the technical solutions which are created today. As 3GPP specifications resolve so many different issues it is beneficial for all players to take a step-by-step approach when enabling complex features, this avoids monolithic approaches and enables flexibility.

Broad Enablers Instead of Functional Silos

Looking in detail at the recently approved Release 18 Study and Work Items it becomes visible that many of them have support from stakeholders from very different industries. This shows that most of the technologies that 3GPP develops today are not created as functional silos, which could only be used by specialized industries, but rather enable services for multiple purposes.

The limited time available within a release forces companies to look for common ground, in order to achieve their most important goals. This means that delegates from very different areas need to put their heads together and work out solutions that not only fit their individual requirements but can be used for other industries and purposes. This leads to more and more improvements to generic enablers such as Network Slicing, Edge Computing or Proximity Services, which all are essential for services of a very diverse nature.

The whole process of agreeing on the release content is often painful and sometimes it seems as if there are too many obstacles. That is where 3GPP's most valuable resource, its delegates, have shown again and again that they are capable of finding satisfying compromises to create working solutions for all.

Cooperation is Key

The pandemic forced all meetings to be held in electronic mode, often causing floods of e-mails and asking a lot of patience and commitment from the delegates. Also, some global political developments have made the cooperation between the members more complicated.

Nevertheless, in March 2022 - 3GPP declared the functional freeze of Release 17, whilst work on Release 18 was already at full speed. We are now also seeing the early shape of Release 19 through its initial studies. All this is testament to the saying 'where there's a will, there's a way'!

Since the beginning of 3GPP, delegates from countries all over the world, different companies and multiple industries have worked together to create the specifications which make the global mobile network, which we all take for granted, possible.

Cooperation is not always easy, it asks for patience, it includes criticism and often quarrels, but in the end it is the only possibility we have to create something that empowers people, businesses and science all over the world.

RAN3 COMPLETES AI & ML SUPPORT STUDY

By Angelo Centonza,
3GPP Working Group RAN3 Vice-Chair

In September 2020, RAN plenary approved a new study to investigate support for Artificial Intelligence and Machine Learning (AI/ML) in 5G RAN architectures. It explored a functional framework for RAN intelligence and identified use cases, based on the current 5G RAN architecture, where the application of AI/ML techniques could bring substantial benefits.

The RAN3 study, concluded at plenary (RAN#95-e) in March 2022, was motivated by the strong interest shown by the 3GPP community in pushing RAN automation towards new targets, with the aim of achieving network optimisation decisions in multi-variable scenarios for which classic, "rule-based" techniques would not be equally effective.

The approval of **TR 37.817 - Study on enhancement for data collection for NR and ENDC** marked a symbolic point in the history of 3GPP: standardisation moved from measurement-fuelled processes to methods that make use of predictions. Not only that, but such methods would also be able to predict events within an identified event class, that were seldom - or perhaps never - recorded before.

This study was the first of its kind and its outcomes are influencing work in similar activities of other 3GPP WGs, such as RAN1, SA5, and SA3.

3 main use cases investigated

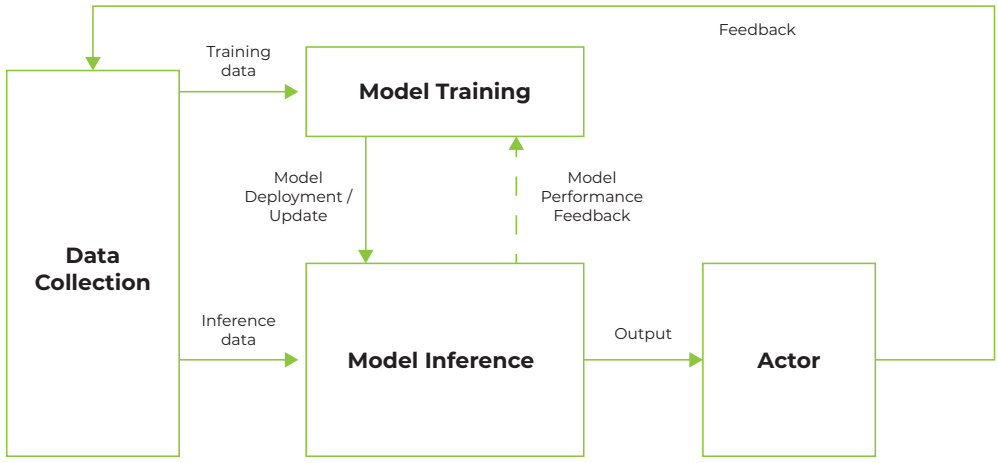
In order to focus the effort on tangible solutions and to ensure convergence to well-defined guidelines for normative work, RAN3 identified three main use cases for which AI/ML based solutions would be investigated:

- **Network Energy Saving:** where the energy consumption improvements for the whole radio access network may be achieved by actions such as traffic offloading, coverage modification and cell deactivation.
- **Load Balancing:** where the objective is to distribute load effectively among cells or areas of cells in a multi-frequency/multi-RAT deployment to improve network performance based on load predictions.
- **Mobility Optimization:** where satisfactory network performance during mobility events is preserved while optimal mobility targets are selected based on predictions of how UEs may be served.

One of the first steps taken by RAN3 was to identify key principles on the basis of which technical solutions for each use case could be developed. The following are some of the most relevant principles agreed:

AI/ML ALGORITHMS AND MODELS ARE IMPLEMENTATION SPECIFIC AND OUT OF STANDARDISATION SCOPE	>>>	This principle ensures free model selection and the establishment of a framework that fosters competition
SOLUTIONS DEVELOPMENT SHOULD FOCUS ON THE ENABLED AI/ML FUNCTIONALITY AND THE DEFINITION OF THE CORRESPONDING TYPES OF INPUTS/OUTPUTS	>>>	Namely, the main scope of the study includes the definition of the corresponding types of inputs/outputs and on determining how to transfer needed information among AI/ML functions, so to enable the desired AI/ML functionality.
LOCATION OF AI/ML FUNCTIONALITIES WITHIN THE CURRENT RAN ARCHITECTURE DEPENDS ON DEPLOYMENT AND ON THE SPECIFIC USE CASES.	>>>	Namely, there would be flexibility on where AI/ML functionalities reside, depending on the use case and the solution selected.
MODEL TRAINING AND MODEL INFERENCE FUNCTIONS SHOULD BE ABLE TO REQUEST DATA NEEDED FOR AI/ML PURPOSES, IF NEEDED.	>>>	Namely, information needed to run an AI/ML based process may be provided on a subscription basis.
USER DATA PRIVACY AND ANONYMISATION SHOULD BE RESPECTED DURING AI/ML OPERATION.	>>>	It remains to be analysed whether specific solutions are needed.

Introducing AI and ML while maintaining the current 5G architecture was a challenge that RAN3 addressed very effectively. In order to facilitate such a task, RAN3 defined a functional framework aiming at providing guidance on how different AI/ML functions interwork, as shown:



Functional Framework for RAN Intelligence
TR 37.817, fig. 4.2-1

Deployment options

On the basis of the principles and framework above, RAN3 developed different deployment options for the AI/ML functions:

- AI/ML Model Training is located in the OAM and AI/ML Model Inference is located in the gNB (gNB-CU for split RAN).
- AI/ML Model Training and AI/ML Model Inference are both located in the gNB (gNB-CU for split RAN).

For every use case, RAN3 identified sets of AI/ML inputs, outputs and feedback information that were considered most relevant to carry out and evaluate AI/ML based processes.

A variety of input information was described. Inputs may be generated by different entities such as UEs, neighbouring RAN nodes, and RAN nodes hosting the AI/ML inference process. Examples of input information are UE location information, RAN energy efficiency metrics and RAN resource status measurements.

The identified AI/ML outputs consist of a variety of predicted metrics and actions. Examples could be predicted energy efficiency levels, predicted RAN resource status metrics and mobility decisions for the purpose of energy efficiency improvements or load balancing optimisation.

For each use case a set of feedback information was identified. This information indicates how the system performance is affected by the AI/ML based operations and it can be used, for example, to trigger model retraining. Feedback information is case-based and measured after AI/ML based decisions are taken. It may include, but it is not limited to, indications on QoS and UE performance, energy efficiency measurements, RAN resource status metrics.

See full details of the study in **TR 37.817 –** 'Study on enhancement for data collection for NR and ENDC'.

What's next?

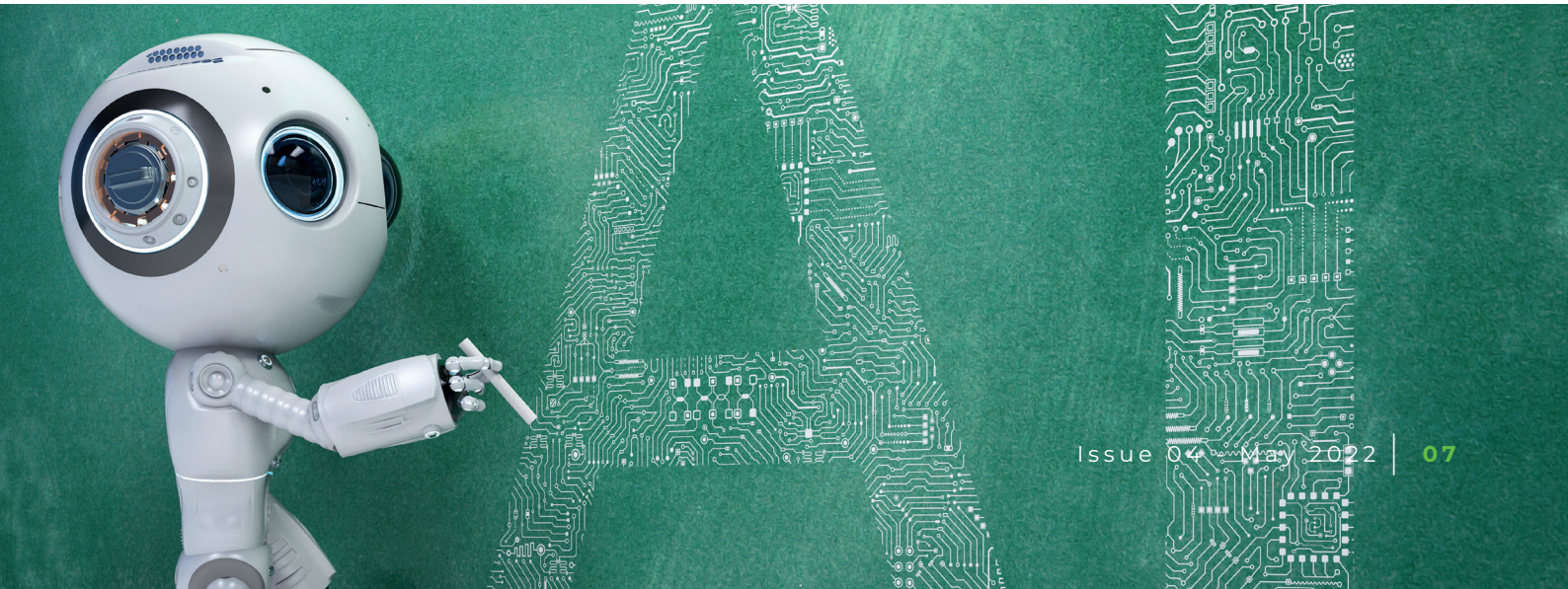
The study on AI/ML support in 5G RAN concluded that, during normative phase:

- The working principles agreed during the study shall remain valid
- The functional framework should be used as a guideline
- The identified use cases should be the focus of the work and the solutions developed during the study should be taken as baseline

A Work Item based on the above conclusions was approved in March 2022 during RAN#95-e and is available in **RP-220635.**

Look out for progress on the new Work Item on **Artificial Intelligence (AI)/Machine Learning (ML) for NG-RAN** and consider joining us in our journey into the "uncharted" territory of AI/ML in NG-RAN.

https://www.3gpp.org/specifications-groups (select RAN3)



TSG CT WORK ON UAS CONNECTIVITY,IDENTIFICATION AND TRACKING

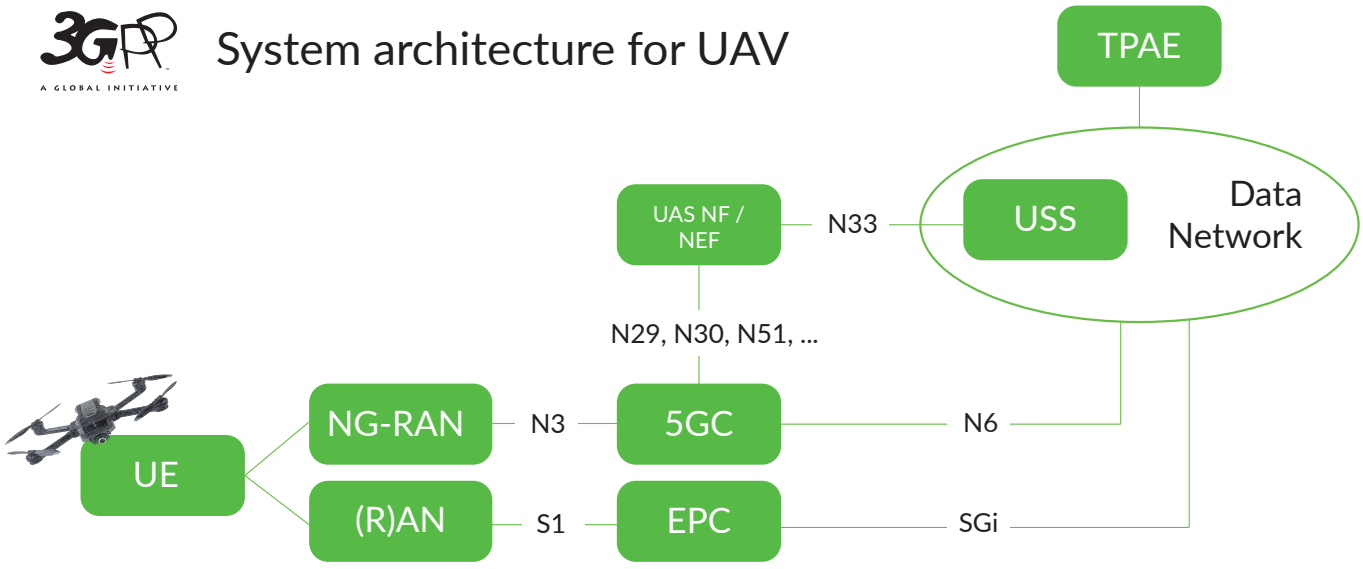
By Lena Chaponniere, 3GPP Working Group CT1 Vice-Chair

One of the defining drivers of 5G is the expansion beyond traditional mobile broadband to provide solutions meeting the needs of vertical industries.

A very good example of 3GPP rising up to this challenge is the work done in Release 17 to use cellular connectivity to support Uncrewed Aerial Systems (UAS), thereby enabling this vertical to benefit from the ubiquitous coverage, high reliability, QoS, robust security, and seamless mobility provided by the 3GPP system.

A key component of this work took place in CT Working Groups, which under the leadership of Sunghoon Kim (CT Work Item rapporteur) and Waqar Zia (rapporteur of new specifications TS 29.255 and TS 29.256) developed the necessary protocols and APIs to meet the service requirements specified in 3GPP SA1 and the architectural enhancements specified in 3GPP SA2, as part of the Release 17 Work Item on 'ID_UAS'.

The key functions of the 3GPP architecture for ID_UAS are depicted in the following figure:



UAS NF: UAS Network Function. The UAS NF is a new 3GPP network function which is used for external exposure of services to the USS, including UAV authentication/ authorization, UAV flight authorization, UAV-UAVC (UAV Controller) pairing authorization, UAV tracking and control of QoS/traffic filtering for C2 communication.

USS: UAS Service Supplier. The USS is an entity that supports the safe and efficient use of airspace by providing services to the operator/pilot of a UAS to meet the UTM (Uncrewed Aerial System Traffic Management) operational requirements.

TPAE: Third Party Authorized Entity (e.g. ground control tower).

The work in CT Working Groups focused on specifying support for the following features:

UAV remote identification:

The CAA (Civil Aviation Administration)-Level UAV ID was introduced in the 3GPP system. It is a globally unique, electronically and physically readable, and tamper resistant identification which allows the receiving entity to address the correct USS for retrieval of UAV information and can be assigned solely by the USS, via means outside the scope of 3GPP, or assigned by the USS with assistance from 3GPP system, whereby the USS delegates the role of "resolver" of the CAA-Level UAV ID to the UAS NF.

UAV USS authentication and authorization (UUAA):

The first step for the owner of the UAV is to register the UAV with the USS, via a procedure outside the scope of 3GPP, which can take place offline or using internet connectivity. During this procedure, the CAA-level UAV ID is configured in the UAV and the aviation-level information (e.g. UAV serial number, pilot information, UAS operator, etc.) is provided to the USS.

The UE at the UAV then registers with the 3GPP system by using existing procedures for 3GPP primary authentication, with the MNO credentials stored in the USIM.

After successful authentication of the UE, the UUAA procedure is performed, to enable the 3GPP Core Network to verify that the UAV has successfully registered with the USS. In 5GS, this procedure can take place during the 3GPP registration, or during the establishment of a PDU session for UAS services.

For the former, CT1 extended the registration procedure in **TS 24.501** to enable the UE to indicate its CAA-Level UAV ID into a new container (Service-level-AA container) included in the Registration Request message, which triggers the AMF to initiate UUAA with the USS by invoking the Nnef_Authentication service toward the UAS NF, as specified by CT4 in new specification **TS 29.256,** and the UAS NF to invoke the Naf_Authentication service toward the USS, as specified by CT3 in new specification **TS 29.255.**

For the latter, CT1 extended the PDU session establishment procedure in **TS 24.501** to enable the UE to indicate its CAA-Level UAV ID via the Service-level-AA container included in the PDU Session Establishment Request message, which triggers the SMF to initiate UUAA with the USS via the UAS NF by invoking the services mentioned above. In order to enable exchanging the authentication messages between the UE and the USS, CT1 specified a new Session Management procedure in **TS 24.501,** in which the SMF sends a Service-level Authentication Command to the UE in a Downlink NAS Transport message. The UE replies to this command with a Service-level Authentication Complete carried in an Uplink NAS Transport message. In EPS, the UUAA procedure takes place during PDN connection establishment, and the information exchanged to that end between the UAV and the PGW is carried in the Service-level-AA container included in the ePCO.

C2 communication over cellular connectivity:

C2 communication over cellular connectivity consists of the UAV establishing a user plane connection to receive C2 messages from a UAVC, or to report telemetry data to a UAVC. Authorization for C2 communication by the USS is required and includes authorization for pairing of the UAV with a UAVC, as well as flight authorization for the UAV.

C2 communication authorization may be performed:

- during the UUAA procedure (if UUAA is carried out at PDU session/PDN connection establishment) when the UAV requests establishment of a PDU Session/PDN connection for both UAS services and C2 communication
- during PDU session modification/UE requested bearer resource modification when the UAV requests to use an existing PDU session/PDN connection for C2 communication
- during a new PDU session/PDN connection establishment, if the UAV requests to use a separate PDU Session/PDN connection for C2 communication

To support this, CT1 extended the PDU session establishment and modification procedures in **TS 24.501** to enable inclusion of the CAA-level UAV ID and an application layer payload containing information for UAVC pairing and for UAV flight authorization in the Service-level-AA container carried in the PDU Session Establishment Request and PDU Session Modification Request messages. The ePCO Information Element in **TS 24.008** was also extended to enable it to include the above-mentioned information.

UAV location reporting and tracking

UAV location reporting and tracking was specified by CT3 and CT4 by re-using the existing Nnef_EventExposure service specified in **TS 29.522** with the UAS NF acting as NEF/SCEF and interacting with other network functions (e.g. GMLC and AMF/MME) to support UAV tracking. The following tracking modes were specified:

- **UAV location reporting mode:** the USS subscribes to the UAS NF UAV to be notified of the location of the UAV, and can indicate the required location accuracy and whether the request is for immediate reporting or deferred reporting (e.g. periodic reporting)
- **UAV presence monitoring mode:** the USS subscribes for the event report of UAV moving in or out of a given geographic area
- **List of Aerial UEs in a geographic area:** the USS requests the UAS NF for reporting a list of the UAVs in given geographic area and served by the PLMN.

OPEN APIs FOR THE SERVICE-BASED ARCHITECTURE

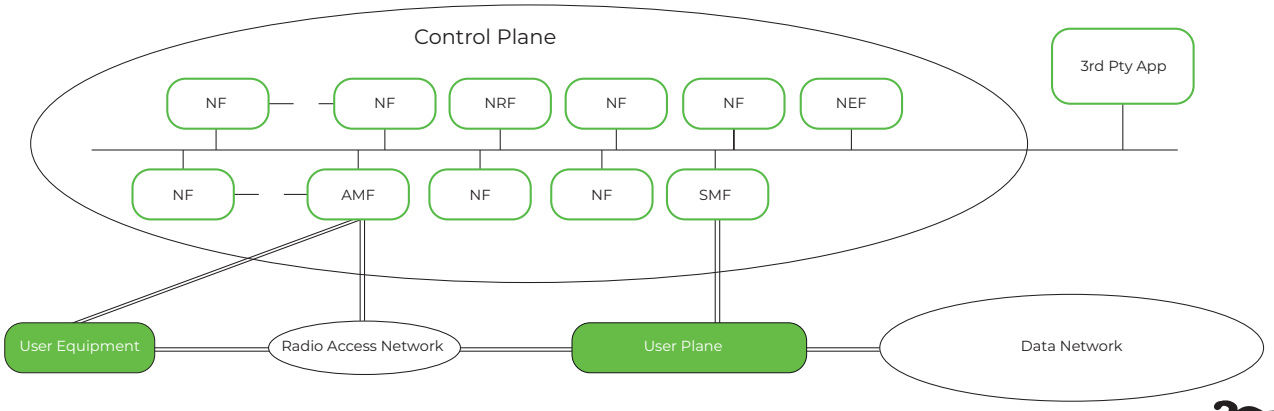
By Lionel Morand, 3GPP TSG CT Chair

Core network as a Service

The fifth generation of mobile networks defined by 3GPP, has not only introduced 5G NR (New Radio), but has also brought in a new core network relying on an open and modular service platform: the Service-Based Architecture (SBA).

SBA provides a cloud-native service framework in which mobile core network functionalities (authentication, mobility management, etc.) are supported by Network Functions (NFs), self-contained software applications that can be run on commercial off-the-shelf hardware hosted by cloud infrastructure.

Interconnected on a logically shared infrastructure or service bus, NFs offer services accessible to any other authorized NF through APIs (Application Programming Interfaces) named service-based interfaces (SBI). Services exposed by an NF (service producer) to another NF (service consumer) are described using API specifications that identify the set of accessible service data and indicate the authorized operations on these service data.



AMF Access and Mobility management Function
NEF Network Exposure Function
NF Network Function
NRF NF Repository Function

In this service platform, every NF can expose services and consume services provided by other NF. Since NFs are loosely coupled and interfaced with APIs, they can be easily deployed anywhere, on demand, without impact on the existing ones. New services or service instances are published in a centralized repository – the Network Repository Function (NRF) – accessible to all the NFs to discover the services available in the network and retrieve required routing information to interact with the NFs supporting the services.

These services can also be made open to third-party applications through a dedicated NF, the Network Exposure Function (NEF). The NEF exposes secured APIs to external or internal applications for a robust but easy access to the core network services and capabilities supported by the NFs.

The adoption of the SBA with APIs exposing services has contributed to migrate the mobile core network, traditionally conceived as a walled garden relying on telco-specific point-to-point protocols (e.g., Diameter), to a scalable, resilient and extensible service-oriented environment, more open to third-party developers and vertical industries for the creation of on-demand tailored services.

Design principles and documentation guidelines for 3GPPRESTful APIs

In order to speed up and ease the development of new APIs while ensuring reusability and interworking with existing ones, 3GPP has specified in 3GPP TS 29.501 a set of design principles and documentation guidelines for the specifications of the APIs used over SBIs. This set of recommendations is not restricted to SBIs but is also pertinent for any API defined by 3GPP, including northbound APIs, APIs used for 3rd party exposure, management/orchestration, charging or media streaming. The aim of 3GPP TS 29.501 is to provide an overall consistency at the 3GPP level for the design and description of the different APIs.

The main principle for the design of 3GPP API can be simply summarized as follows: API should be designed as RESTful API whenever possible.

REST (REpresentational State Transfer) is an architectural style that imposes certain guiding principles (or constraints) to be satisfied by an API to be referred to as RESTful API. In short, the underlying server implementation is hidden by a layer of abstraction: service data are defined as "resource" uniquely identified by URI (Uniform Resource Identifier) and service consumers use HTTP methods to access to only a representation of resources. The representation can be delivered over HTTP using different file formats, JSON being the most popular one.

For basic Create, Read, Update, and Delete (CRUD) operations on resource/service data, standard HTTP/2 methods (e.g. GET, POST, PUT, DELETE) are used to operate on resources uniquely identified by URIs.

The recommendation for the design of RESTful API is not blindly enforced as a dogma. When the REST model is not applicable (e.g. for non-CRUD operations), service operations can be however implemented as custom operations. Instead of operating on a resource, a POST operation can be used to call a specific function to execute in the NF service provider and the result of the function is provided to the NF service consumer in the response. And of course, depending on the service requirements, it is possible to mix REST-style operations and custom operations in the same API.

Along the recommendation for the design of RESTful API, 3GPP TS 29.501 also documents recommended best practices for API designers on (non-exhaustive list):

- Use of the HTTP methods (e.g. standards compliance, adherence to industry best-practices, homogeneity across different APIs, etc.)
- Error handling and use of HTTP response codes
- API versioning and version control
- Resource URI structure
- Resource representation (e.g. using the JavaScript Object Notation (JSON) format) and content format negotiation
- Naming conventions

For further information, please refer to 3GPP TS 29.501.

API description exposure through OpenAPI specification

3GPP selected OpenAPI version 3 (formerly known as Swagger) as the formal language to be used for the definition of APIs in the Service-Based Architecture.

As indicated in 3GPP TS 29.501, each API is documented in a 3GPP technical specification (TS) that describes in natural language the API, and this specification also includes a normative Annex containing an OpenAPI description of the API.

An OpenAPI description defines a standard, programming language-agnostic interface specification for HTTP APIs, which allows both humans and computers to discover and understand how an API works without requiring access to source code, additional documentation, or inspection of network traffic. When properly defined via OpenAPI, a consumer can understand and interact with the remote service with a minimal amount of implementation logic.

The OpenAPI document provides an easy description of the API, including: Available resources and authorized operations on each resource, Operation parameters Input and output for each operation, Authentication methods and Contact information, license, terms-of-use and other information.

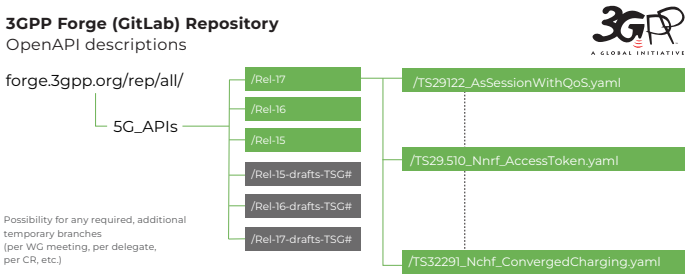
While OpenAPI descriptions can also be written in JSON, YAML is the preferred format recommended by 3GPP TS 29.501. Using a single format provides uniformity and allow reusability of OpenAPI specifications. Reusability is an important aspect to speed up the development of new APIs. Components of an OpenAPI specifications (parameters, response, data type, etc.) can be simply imported into another specification by simply referencing the OpenAPI description defining these components.

Storage of OpenAPI specification files in 3GPP Forge

OpenAPI descriptions are extracted from the annex of the 3GPP Technical Specifications and made available as stand-alone YAML files, identified by a file name composed of the API name prefixed by the TS number of the specification containing the OpenAPI description. All these files are then stored in a common repository managed by Gitlab on the 3GPP Forge, a web-based collaborative software platform managed by 3GPP for both developing and sharing applications.

This common repository allows: A centralized and unified handling of all the OpenAPI descriptions developed by 3GPP, A validation process based on tools common to all the working groups, easier cross-referencing and provides external users with a unique location for all the OpenAPI descriptions produced by 3GPP for testing and implementation purposes.

With GitLab, the syntax of OpenAPI specifications is automatically checked, using built-in and specific testing tools developed by 3GPP experts. The version control mechanism tracks the history of changes. Multiple branches are managed in parallel, each branch having different access control permissions (the OpenAPI specifications approved by TSG for the release, one temporary branch per release for specs. sent for approval at TSG and additional branches for proposed changes to OpenAPI descriptions).



Today, over 200 OpenAPI specifications are stored in the 3GPP Forge. And many more are still to come with the development of new services in the forthcoming releases.

If the use of the 3GPP Forge has significantly simplified the development of API specifications, 3GPP does not yet make the most of the Gitlab environment provided by 3GPP Forge for the handling of OpenAPI descriptions. While possible in open collaborative projects, it is still not possible to submit the proposed changes directly in 3GPP Forge and incorporate these changes into the OpenAPI specifications.

Modifications can only be done through approved Change Request (CR) against the technical specification containing the OpenAPI description. To make it possible, the 3GPP working methods would have to be first updated in order to become more agile and embrace more modern and open development practices (CI/CD, DevOps, etc.).

The GitLab repository containing OpenAPI descriptions is available at the following location: https://forge.3gpp.org/rep/all/5G_APIs.

The author wishes to acknowledge the amazing work of Jesus De Gregorio on OpenAPIs and his guidance in the production of this article.

TSG RAN#95-E PROGRESS TO REPORT

By Wanshi Chen, 3GPP TSG RAN Chair

TSG RAN#95-e was a hectic and critical meeting, held electronically from March 17th to March 23rd, with 5 working days spread across two weeks and a 48-hour quiet period imposed during the weekend.

Besides the usual Plenary business of RAN WG issues, ITU related issues, meeting planning, etc., RAN#95-e notched up some major achievements:

- The successful functional freeze for RAN Rel-17,
- Approval of RAN4-led Rel-18 package,
- Note: RAN1/2/3-led Rel-18 package was approved in December during RAN#94-e.
- Successful completion of the 5Gi merger (from RAN perspective), and
- Endorsed RAN meeting planning for 2022

What follows is a detailed RAN#95-e summary of the key areas covered by the meeting.

Administrative Aspects

RAN#95-e addressed the following administrative aspects:

Inclusive language: In 3GPP, using inclusive language for specifications is taken seriously. A large amount of effort was spent in previous RAN plenary meetings. Such effort continued in RAN#95-e, resulting in the approval of a set of Rel-17 CRs, including RP-220313 on the removal of the "black List" term and those derived from that term (CR to TS 44.318), RP-220314 to change "white list" to 'allowed list' (CR to TS 45.008), RP-220238 to take out "master, slave" (CRs for NR from RAN3), RP-220239 to change "black cells" to "excluded cells" (CR for E-UTRAN from RAN3), and RP-220506 for a variety of those terms (CRs for E-UTRAN and NR from RAN2). The detailed email discussion summary can be found in RP-220878.

WID names and acronyms: In response to ETSI MCC contribution RP-220065 titled "Guidelines on WIDs names and acronyms", RAN#95-e discussed and endorsed feedback as summarized in RP-220882. RAN plans to work with the guidelines, taking into account several aspects summarized in Section 5 of RP-220882.

UTRAN Specs in Rel-17: One involved discussion in RAN#95-e was whether and how to automatically upgrade UTRAN specs (25 and some 34 specification series) from Rel-16 to Rel-17. After lengthy discussion, RAN#95-e concluded the following (see more details in RP-220906):

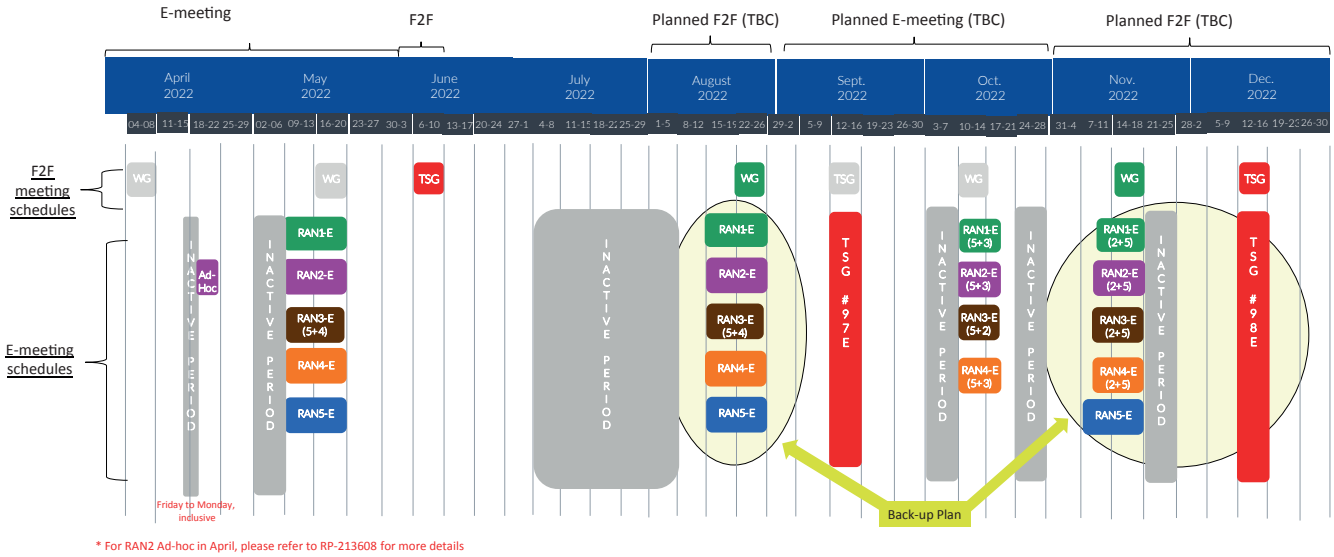
- **25 series :** Do not upgrade any 25-series specifications to Rel-17.
- **34 series :** Do not upgrade RAN4 specs TS 34.124 & 34.926, and RAN2 spec TS 34.109.

However, since such an issue requires coordination across TSGs, a Liaison Statement (LS) was sent to TSG SA and TSG CT (see RP-221015). The LS was carefully discussed in a subsequent joint TSG session, which resulted in the following conclusion:

- All 25 and 34 series specs should be upgraded to Rel-17 and that until the end of Rel-18 there should be a cross-TSG effort to find out if and how the related functionality could not be upgraded to Rel-18. This discussion should also be on whether to update the 2G specifications.

Proposed RAN meeting plan (2022)

RP-220857



* For RAN2 Ad-hoc in April, please refer to RP-213608 for more details

RAN Meeting Planning

Recently, the 3GPP's specially convened meeting hosting study group (MHSG) cleared the way for us to host TSG#96 as a face-to-face (F2F) meeting, in June. Decisions for other potential F2F meetings in 2022 are still pending.

For TSG RAN planning for both plenary and WG meetings are looking to further output from the MHSG, while having a back-up plan in place, in case of changes.

The figure below reflects the target plan and the back-up plan, and also the need for a series of inactive periods during the meeting schedule, to attempt to ensure a better work/life balance for everyone.

RAN Rel-17 Project Update

RAN#95-e brought about the planned Rel-17 functional freeze. All RAN Rel-17 projects have been under close scrutiny, checking the respective completion level and required exception sheets, if any. Dedicated email threads were allocated to numerous Rel-17 projects, such as: sidelink enhancement, support of reduced capability NR devices, extending current NR operation to 71GHz, further enhancements on MIMO for NR, NR NTN, IoT NTN, UE power saving enhancements for NR, enhancements to IAB for NR, enhancement of RAN slicing for NR, RF requirements enhancement for NR FR1, Further enhancements of NR RF requirements for FR2, etc.

Conference call sessions were also organized to address the more controversial issues.

In particular, one working agreement (#44), as declared by RAN2 (which was challenged), was resolved in a very smooth and constructive manner (see the compromise in RP-221003). This is a demonstration of the hard-working and constructive spirit among all the delegates involved.

Through the intensive discussion via emails and conference calls, RAN#95-e successfully declared that **RAN Rel-17 is functionally frozen.** There are some RAN Rel-17 projects with the approved exception sheets. These will be an important focus for the upcoming RAN WG meetings in 2Q'2022.

The RAN ASN.1 freeze is planned for RAN#96, in June 2022.

5Gi Merger Update

In RAN#94-e, a way forward on merging 5Gi into 5G was approved in RP-213532, with specific milestones set for both 3GPP and the Standards body in India - TSDSI.

In RAN#95-e, an LS (in RP-220028) from TSDSI was received, in which TSDSI confirms their commitment not to further maintain 5Gi as a separate standard for its evolution, as also communicated to PCG, TEC and ITU-R. TSDSI requests RAN#95-e to approve the technically endorsed CRs, as per the agreed way forward.

In response, RAN#95-e approved the 2 pending CRs (RP-220920 and RP-220921), along with a reply liaison to TSDSI (in RP-220950), informing them of the RAN#95-e outcome. With that, **the 5Gi merger is completed from RAN perspective.**

RAN Rel-18 Project Update

Release 18 is an important release, marking the start of 5G-Advanced. Discussion on potential RAN Rel-18 projects has been carefully planned and managed, starting from the first RAN Rel-18 workshop in June 2021.

In RAN#94-e, after multiple rounds of email discussion and conference calls, RAN1/2/3-led Rel-18 package was approved (as detailed in RP-213469). In the same package, there was also one RAN4-led Rel-18 WI and the corresponding RAN4 impact analysis for the approved RAN1/2/3-led Rel-18 items. The high-level overview of the corresponding TU budget was endorsed in RP-213697. All the corresponding SIDs/WIDs were also approved in RAN#94-e.

The primary focus in RAN#95-e for RAN Rel-18 were RAN4-led projects. Based on the fruitful email discussion in February 2022 focusing on potential RAN4-led R18 projects, RAN#95-e approved RAN4-led Rel-18 package in RP-220068 in a very smooth manner.

The corresponding TU budget was endorsed in RP-220980 and later consolidated in RP-221019. All the corresponding RAN4-led Rel-18 SIDs/WIDs were approved in RAN#95-e as well.

Consequently, combining RAN#94-e and RAN#95-e, the package approval process for RAN Rel-18 is now completed.

ITU Matters

As usual, RAN#95-e dedicated some time to handling matters related to ITU. In particular, the following liaisons were agreed by TSG RAN and sent to TSG SA:

- RP-220048: DRAFT reply letter to ITU-R WP5D/TEMP/353-E = RP-211636 on the schedule for updating Recommendation ITU-R M.2150 to Revision 'After Year 2021'
- RP-220908: DRAFT reply letter to ITU-R WP5D/TEMP/356 = RP-211634 on the schedule for updating Recommendation ITU-R M.2012 to Revision 6
- RP-220911: Draft reply LS to ITU-R WP5D/TEMP/482rev1 = RP-212699 (update to RP-213642) on work towards two new recommendations "Generic unwanted emission characteristics of base / mobile stations using the terrestrial radio interfaces of IMT-2020"

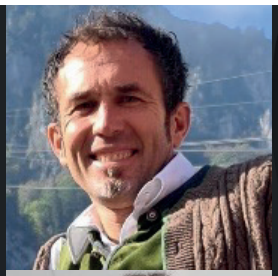
In addition, the following LS was approved by RAN and sent to SA:

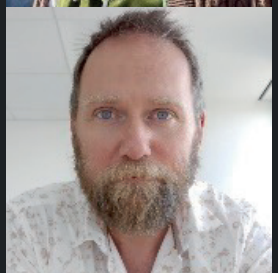
- RP-220912: LS related to 5GAA_WG4_S-220014 = RP-220044 on "online ITS communication standards database from ITU"

Concluding Remarks

Despite the extreme challenges due to COVID-19 and the inevitable cancellations of all 3GPP physical meetings since the start of 2020, TSG RAN has successfully managed to deliver RAN Rel-17 (in terms of functional freeze) and approve RAN Rel-18 projects in a completely electronic manner (emails and conference calls). A deep appreciation goes to all delegates who have been extremely hard-working, patient, and constructive during this difficult time.

TSG#96 is upcoming very soon, as a first face-to-face meeting after a long two-and-a-half year break. I am eagerly looking forwarding to the happy re-union!





MPEG AND 3GPP PICK UP AN EMMY® FOR WORK ON DASH

By Thomas Stockhammer, 3GPP WGSA4 Rapporteur of 3GPP DASH specification & Frédéric Gabin, 3GPP SA4 Chair

The Tech Emmy® is awarded for the development of technologies that either represent so extensive an improvement on existing methods or are so innovative in nature that they have materially affected television production. On January 26, 2022, The National Academy of Television Arts & Sciences (NATAS) announced the 73rd Annual Technology & Engineering Emmy® Award winners and for the first time 3GPP is a recipient.

For the work on "Standardization of HTTP Encapsulated Protocols", 3GPP proudly shares the honors with colleagues from the Moving Picture Experts Group (MPEG), for specifications on Dynamic Adaptive Streaming over HTTP (DASH) and with colleagues from Apple and MLB Advanced Media for HTTP Live Streaming (HLS) work.

A predecessor of the DASH specification was originally developed in 3GPP Rel-9 in 2009 under the acronym 3GPP Adaptive HTTP Streaming (AHS). In July 2010, 3GPP members responded to MPEGs Call for Proposals on HTTP Streaming and 3GPP AHS was selected as the baseline for MPEG DASH specifications.

In tremendous efforts, MPEG and 3GPP jointly developed DASH and published dual specifications in 3GPP TS 26.247 and ISO/IEC 23009-1. The beauty of the technology results from its simplicity to permit seamless media streaming experiences over the Internet and mobile connections to any device without complex QoS provisioning. Since then, the DASH technology has been widely adopted in the industry and as of today is one of only two protocols besides HLS to provide stunning TV services in operator, television as well as third-party services to smartphones, tablets, TV sets and any new devices that are connected to the Internet.

What is HTTP Streaming all about?

Here is the flash tutorial: Until just 15 years ago, TV distribution and video streaming was built on top of dedicated networks such as terrestrial, satellite, or cable systems, and IPTV was just starting – all using dedicated managed and expensive multicast systems. However, several smart people started to investigate the use of HTTP as the delivery protocol for streaming media. The basic idea was to:

(1) Create many small files, each representing something like 2 seconds of a video.
(2) Create multiple bitrate versions of the files.
(3) Put audio and video in separate track files
(4) Document the location of the files into a manifest.
(5) Provide the manifest to a device.
(6) Let the device create a session, download the pieces using a plain simple HTTP protocol, add it to playback buffers.
(7) Play the content and continue filling the buffers with real-time media for continuous playback

The stunning consequence was that suddenly media distribution over the open Internet was possible, independent of dedicated and typically expensive network systems. General purpose Content Delivery Networks (CDNs) could be used for media distribution and any device could access the media as HTTP/1.1 is very firewall friendly. It was also perfectly suited to mobile delivery, as the adaptive nature permitted to accommodate bitrate variations on the access link and overcome possible losses or delays due to the use if TCP/IP in combination with HTTP.

The technology has evolved over the last decade, MPEG meanwhile published the 5th edition of DASH and 3GPP has adopted DASH as the core protocol for its 5G Media Streaming specifications in TS 26.512.

And the winner is...

In recognition of the 3GPP specification work on Adaptive HTTP Streaming and its evolution into 3GPP DASH, in cooperation with MPEG, the National Academy of Television Arts & Sciences (NATAS) presented the Emmy® awards at the 73rd Annual Technology & Engineering Emmy® ceremony - in partnership with the National Association of Broadcasters (NAB) as part of their media and technology convention in Las Vegas on April 25, 2022.

Gilles Teniou, SA4 Vice-chair and Thomas Stockhammer (3GP-DASH Rapporteur) formally represented 3GPP at the ceremony – together with other 3GPP colleagues. Duplicates of the statue will be given to the most active contributing 3GPP member companies and 5 Innovator statues are to be presented to individuals that were instrumental to the completion of the work in 3GPP.

The Emmy® statue will be carried to 3GPP SA#96 F2F meeting for presentation by the SA4 leadership. The award will then be proudly on display within the 3GPP MCC, based at ETSI.

PORT ALLOCATION FOR NEW 3GPP INTERFACES

By Giorgi Gulbani, CT4 Rapporteur for the PortAI Work Item

Since 2015, The Internet Assigned Numbers Authority (IANA) has encouraged 3GPP to find and implement a solution for the port assignments for protocols only used in 3GPP networks, as an alternative to IANA assigned port numbers. In the meantime, IANA and the Internet Engineering Steering Group (IESG) have continued processing applications for new port allocations and do grant numbers, so long as their recommendations given in IETF RFC 7605 are followed.

A friendly parting of the ways

Now, from Release 17 onwards a 3GPP CT4 Working Group study has identified possible options for scenarios when a new default port number allocation is required, but for certain technical reasons requesting the number from IANA is not seen as the best way forward.

The study produced eight solution proposals and respective guidelines, which are documented in 3GPP **TR 29.941.** Any 3GPP working group can now rely on these guidelines and select the solution that is the most suitable for achieving their objectives.

It is still strongly recommended that 3GPP groups should apply to IANA for assigned service name and port number for any protocol potentially supported by roaming and inter-domain interfaces, when no other service port discovery is applicable (e.g. DNS-based solutions).

> “Any 3GPP working group can now rely on these guidelines and select the solution that is the most suitable for achieving their objectives.”

When the IANA assignment request cannot be justified, one of the alternative solutions described in clause 4 of **TR 29.941** should be adopted. This is especially true for 3GPP interfaces that would be used only in intra-domain scenarios.

In scenarios, when IANA allocated default port numbers cannot be used, while a new 3GPP interface application may require a pre-defined specific server port number, 3GPP becomes responsible for allocating a server port number (solution#6 in 3GPP **TR 29.941**).

The 3GPP registry for Service Names and Port Numbers

Port numbers should be assigned from a sub-range of the Dynamic/Private Port range [49152 - 65535]. Working Group CT4 decided to set aside further sub-range of 101 ports from 65400 to 65500. 3GPP allocated port numbers are documented in 3GPP **TS 29.641.**

From Release 17, when a new application requires a pre-defined server port number, during the application initialization the operating system will tell the new application if the port is already in use or not. If the port is in use by another, legacy application, the new application or operating system shall ensure that the legacy application stops using the port.

It is up to the implementation to decide if the legacy application will be forced to stop using the port immediately, or if the legacy application will be granted some period of time for gracious removal of the port from use.

For more information, please check WG CT4’s Technical Report and Specification on this topic:

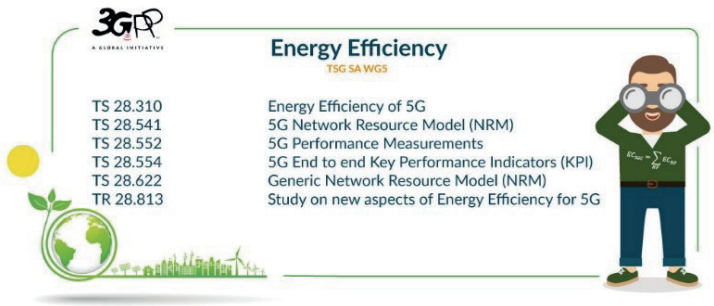
- **3GPP TR 29.941 -** Guidelines on Port Allocation for New 3GPP Interfaces
- **3GPP TS 29.641 -** 3GPP registry for Service Names and Port Numbers

ENERGY EFFICIENCY (EE) SA5 WORK AND RESULTS

By Jean-Michel Cornily, 3GPP WG SA5 Rapporteur for EE work items

Pursuing its work on Energy Efficiency (EE) and Energy saving (ES) of mobile networks, 3GPP SA5 has, in Release 17, extended its scope from RAN only to the whole 5G system. EE Key Performance Indicators (KPI) have been defined for the 5G core network and network slices.

As for RAN, their Energy Efficiency is defined by their performance divided by their Energy Consumption (EC), where the definition of the performance depends on the type of network entity it applies to. From this, SA5 work aimed at defining the best metrics for each of them, and their measurement method.



Performance of network slices has been defined per type of network slice, namely for enhanced Mobile Broadband (eMBB), Ultra-Reliable and Low Latency Communication (URLLC) and massive Internet of Things (MIoT), whereas user plane traffic volumes have been considered to define the performance of the 5GC.

To measure energy consumption, a bottom-up approach has been adopted, starting from assessing the EC of Network Functions up to 5GC and network slices. Whereas how to measure the EC of Physical Network Functions (PNF) has been defined by ETSI EE a long time ago, the page is still blank regarding how to measure the EC of Virtualized Network Functions (VNF). SA5 has defined a method to estimate it, based on the estimated energy consumption of the underlying virtual compute resource instance(s), i.e. Virtual Machine(s) (VM). In Release 17, only the virtual CPU usage of VMs, obtained by the Operator's OSS from ETSI NFV MANO, has been considered in their EC estimation.

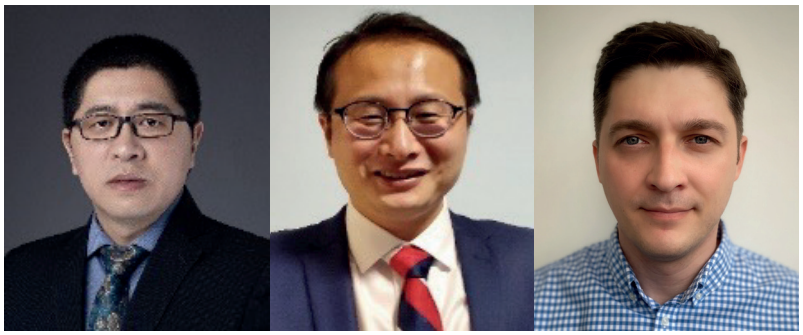
3GPP SA5 has defined mechanisms to collect, via OA&M standardized APIs, measurements from the 5G Network Functions, whatever the type of measurements, including performance and Energy Consumption related measurements, via a common OA&M channel.

SA5 has also introduced, in its Network Resource Model, attributes enabling Network Slice Customers (NSC) to express their requirements with regard to the energy efficiency of the network slice they order, based on GSMA NG.116 (Generic Network Slice Template), and be periodically informed of the actual energy efficiency of the network slice they obtained.

All this work has been done with constant communication with ITU-T, GSMA, NGMN, ETSI EE, ETSI NFV, 3GPP SA2 and RAN working groups.

During Rel-18, WG SA5 will pursue its efforts in various directions, including:

- Work with ETSI NFV to obtain more accurate virtual CPU usage measurements from ETSI NFV MANO, as currently defined measurements lack accuracy,
- Introduce additional metrics when estimating the Energy Consumption of Virtual Machines, e.g. their virtual disk or link usage,
- Extend our existing solution to Container-based Network Functions (CNF), in addition to VM-based Virtualized Network Functions,
- Investigate new use cases for Energy Saving, applied to NG-RAN, 5GC and network slicing. AI/ML assisted energy saving scenarios will be studied, including those based on analytics provided by the Management Data Analytics Function (MDAF) or NWDAF,
- Introduce first considerations on digital sobriety in SA5. Considering that the amount of energy consumed by Network Functions has dependency on data, signaling and OA&M traffic volumes to be processed / transported / stored by Network Functions, we'll introduce such considerations when designing future OA&M solutions.



RF AND RECEIVER PERFORMANCE TOWARDS 5G-ADVANCED

By Xizeng Dai, 3GPP WG RAN4 Chair, Haijie Qiu, RAN4 Vice-Chair, Andrey Chervyakov RAN4 Vice-Chair

The recent TSG RAN#95-e Plenary meeting, in March 2022, finalized the RAN4 core RF and RRM requirements for most of Release-17 non-spectrum work items and approved the new Release-18 package of RAN4-led work items and study items.

3GPP TSG RAN4 is responsible for standardization of spectrum, RF (radio frequency), and receiver performance, among which the receiver performance includes requirements of RRM (radio resource management), demodulation performance and CSI (channel state information) reporting. RAN4 is playing an important role in 3GPP to identify the implementation limits to help physical layer and high layer designs and to specify the requirements to verify devices in order to guarantee that the performance in the field can meet the goal of design.

86 RAN4 led items in Rel-17

For Release 17, we have worked on 86 RAN4-led work or study items and also on the requirements for 15 work items led by RAN1 and RAN2. Among the RAN4-led items, we enhanced RF requirements for Tx switching, high power UE, transmit diversity, 1024QAM and Pi/2 BPSK for sub-6GHz bands, and uplink and downlink Carrier Aggregation on millimeter wave bands. RAN4 also enhanced the RRM and demodulation requirements. Besides, new scenarios like high speed train on millimeter wave bands were enabled.

Regarding RAN1 and RAN2-led work items, RAN4 completed or is soon going to complete RF and RRM requirements for non-terrestrial networks, UE power savings, NR sidelink enhancement, NR coverage enhancement, NR extension up to 71GHz, enhancements of IAB, reduced capability NR devices, etc.

The focus shifts to Release 18

The Release 18 package of RAN4 work and study items were approved after extensive discussions in the group and at TSG RAN level in June, September, December of 2021 and February 2022. During the discussions, the 3GPP leadership focused on keeping the RAN4 workload within reasonable limits, focusing on the most important and urgent demands in the industry – a task that called for control of the number of items and care in the scoping clear objectives. We now have a good balance between RAN4-led items and impacts of items led by other working groups, as well as a balance between long term evolutions and urgent deployment requests.

Release 18 RAN4-led items were approved to continue the performance enhancements of UE RF in FR1 (below 7 GHz), UE RF in FR2 (below 71 GHz), RRM, measurement gaps and demodulation, as shown below:

UE FR1 RF enhancements

- 4Tx for CPE/FWA/ vehicle/industrial devices
- 8Rx for CPE/FWA/ vehicle/industrial devices
- Lower MSD

UE FR2 RF enhancements

- Requirement for FR2 multi-Rx chain DL reception
- UL 256QAM
- Beam correspondence requirements for RRC_ INACTIVE and initial access

RRM enhancements

- SCell activation enhancements in FR2 (i.e., reduction of SCellactivation delays)
- FR1-FR1 NR-DC RRM requirements

Measurement gap enh

- Joint requirements for pre-configured MG, concurrent MG and NCSG
- NeedForGap requirements
- Inter-RAT NR and [LTE] measurement without gaps

Demodulation performance requirement enhancements

- Advanced receiver to cancel inter-user interference for MU-MIMO
- ATP (Absolute ThroughPut)

In addition, more targeted work and study items were also approved for the following areas:

- Simplification of band combination specification • Enhancement for 700/800/900MHz band combinations
- Base Station (BS) RF requirement evolution for millimeter wave multi-band BS • FR2 high-speed train enhancement
- Over-the-air (OTA) testing enhancement, for FR2-1 OTA testing for UEs with multi-panel reception and 4DL layer
- EMC enhancements • Support of intra-band non-collocated E-UTRA, NR Dual Connectivity - EN-DC/NR-CA deployment
- NB-IoT (Narrowband IoT)/eMTC (enhanced Machine Type Communication) core & performance requirements for Non-Terrestrial Networks • Air-to-ground (BS on the ground, CPE in the air)
- NR support for dedicated spectrum less than 5MHz for FR1 (which was approved in RAN#94-e December 2021)

One quarter after 3GPP RAN1, RAN2 and RAN3 working groups started their 5G-Advanced work, RAN4 is also on the exciting path for 5G evolution.

REDUCING COMPLEXITY & COST IN FUTURE CONTROL ROOM IMPLEMENTATIONS

By Harald Ludwig, Chair of TCCA's Technical Forum

The ecosystem that first responders rely on to support them pivots around the control room and the operators carrying out their critical operations in front of their working positions (also called dispatchers or consoles). Control rooms provide essential communications, linking users in the field to a centralised command centre. Control rooms play a vital role as the bridge between the general public and the end users who utilise mission critical communications to protect people, property and communities.

For many years, narrowband LMR standards such as TETRA, Tetrapol, DMR, and P25 have successfully served these public safety agencies with voice and limited data communications applications.

However, as time moves forward, so too does technology, and broadband cellular 4G LTE, 5G and beyond represent the next level of integration within the control room. While some agencies may already use these cellular connections in the event of a network failure or for special events, Mission Critical Services (Mission Critical Push-To-Talk - MCPTT, Mission Critical Data - MCData and Mission Critical Video - MCVideo, collectively known as MC or MCX services) represent a fundamental paradigm shift in capabilities. These MCX services have all been standardised in 3GPP.

> "Broadband cellular 4G LTE, 5G and beyond represent the next level of integration within the control room"

While MCPTT field operation is relatively simple to understand, control room operations represent a more complex environment requiring interconnections to different management and support systems and various communication networks. Depending on the implementation approach, a significant amount of infrastructure may be owned and directly controlled by a commercial carrier. In order to increase understanding for public safety agencies, TCCA, in collaboration with other organisations and vendors, has created a Control Room Implementers' Guide.

However, while the standards have been written, the route to actual implementation can be confusing. Control rooms are not explicitly mentioned in the 3GPP MCX standards and it may be difficult to find the relevant parts in the standards. The aim of TCCA's Guide is to help control room vendors identify these parts and the best way to connect their systems to a 4G LTE and/or 5G MCX environment. The goal is to promote a common approach that will reduce both the number of variants and the level of proprietary interfaces.

Mission Critical standards development within 3GPP started in 2015 in 3GPP Release-13, following a major initiative from the public safety industry to create global standards with the collaboration of various government organisations, vendors and users from around the world.

3GPP Release-13 was the first to define a standard for MCX, and subsequent Releases evolved the features and capabilities, maturing the standards specifications based on industry feedback. 3GPP Release-17 is the latest set of fully ratified specifications, and work is ongoing to enhance these both for 4G LTE and 5G.

3GPP Standards define the reference architecture for MCPTT, MCData and MCVideo separately, while utilising a set of common core services that are applicable to all three. The available interfaces will depend upon the MCX service provider being used, the policies in place, and the required functionality.

3GPP Mission Critical standards include specifications to interwork with legacy LMR networks via an Interworking Gateway Architecture (called IWF) to enable the continued working of mission critical systems during the transition period from legacy LMR to 3GPP-based MCX systems. It may take several years for such transitions to fully complete.

Traditionally, cellular operators have operated the entirety of their cellular network. With the flexibility contained within the 3GPP standards, public safety agencies have the opportunity to develop alternative approaches. This allows the agency itself or the designated service provider to operate some parts of the network equipment. This ensures control and security remains with the agency.

TCCA's Control Room Implementers' Guide provides the foundation for creating a cohesive evolution from LMR to broadband-based control rooms. By following this Guide in developing procurement requirements, it is hoped that vendors will not be given enough opportunity to design and build proprietary offerings, but rather will focus on standards-based solutions to reduce both complexity and cost.

For a copy of the Guide, please contact admin@tcca.info.

MEETINGS CALENDAR

The Face-to-Face Decision Meeting (F2F_DM) sub-group met on May 10, 2022. This sub-group consists of the technical leadership and the Organizational Partners, involving the regional hosts by invitation. F2F_DM meets regularly to decide whether the TSGs and their WGs can meet F2F.

At their 3rd meeting (F2F_DM#3), it was decided that only one F2F Working Group meeting will take place in August 2022. WG RAN1 will go ahead – to be held in Europe – with the provision of two-way remote access for delegates who cannot travel. The process for the remote access to the meeting will be trialed at the June TSG RAN Plenary in Budapest (RAN#96), on one of the meeting days.

All other Working Group meetings in the period up to November 2022 will be e-meetings. The September TSG Plenary meetings are also to be held as e-meetings – as previously planned.

There will be a further review of the planning for the return to F2F meetings on June 13, 2022 (F2F_DM#3bis).

TITLE	TYPE	DATES (2022)	LOCATION	CTRY
CT#96	TSG	June 6 – June 7	Budapest	HU
RAN#96	TSG	June 6 – June 9	Budapest	HU
SA#96	TSG	June 7 – June 10	Budapest	HU
Newcomer Session		June 7 (08:00)	Budapest	HU
CT#97-e	TSG	Sept. 11 – Sept. 14	Online	
RAN#97-e	TSG	Sept. 12 – Sept. 16	Online	
SA#97-e	TSG	Sept. 13 – Sept. 19	Online	
CT#98	TSG	Dec. 12 – Dec. 13	Sevilla (TBC)	ES
RAN#98	TSG	Dec. 12 – Dec. 15	Sevilla (TBC)	ES
SA#98	TSG	Dec. 14 – Dec. 16	Sevilla (TBC)	ES

Physical meetings and e-Meetings may be changed, depending on the state of restrictions on delegates travel and precautions necessary to hold a safe – post Pandemic – meeting.

https://www.3gpp.org/3gpp-calendar

NEW MEMBERSHIPS

3GPP has welcomed the following organisations* into the project during 2022 so far. We currently have over 770 participating companies and organizations in 3GPP.

New 3GPP IM 2022	OP	Country
Apple AB NUF	ETSI	NO
Apple Marketing Iberia	ETSI	ES
BSI	ETSI	DE
Bytedance Technology	CCSA	CN
Chinatelecom Cloud	CCSA	CN
Chongqing Angying	CCSA	CN
Cobham Satcom	ETSI	DK
Comba	CCSA	CN
CTSI	CCSA	CN
Cygnusemi	CCSA	CN
DBL	CCSA	CN
Denso Automotive	ETSI	DE
Effort	ETSI	FR
Erik Sunell Consulting	ETSI	FR
E-surfing Digital	CCSA	CN
Esurfing IoT	CCSA	CN
Facebook Japan K.K.	ARIB	JP
Group 2000	ETSI	NL

New 3GPP IM 2022	OP	Country
Hangzhou Douku	CCSA	CN
Hangzhou Mengyuxiang	CCSA	CN
IMDA	ETSI	SG
JSI	ETSI	DE
Neustar, Inc.	ATIS	US
NTPU	ETSI	TW
NTT Advanced Technology Corporation	TTC	KR
Nvidia US	ATIS	US
ORS	ETSI	AT
SEU - Southeast University	CCSA	CN
SKY Perfect JSAT Corporation	ARIB	JP
Skylo Technologies	ATIS	US
Unisoc	CCSA	CN
US Cellular Corporation	ATIS	US
ViaSat Satellite Holdings Ltd	ETSI	UK
vivo Japan KK	ARIB	JP
Wiliot Ltd.	ETSI	IL

*NB. The list above may represent an evolution of an existing membership, or a change of company name, in addition to being a list of new members.

Source: 3gppmembership@etsi.org

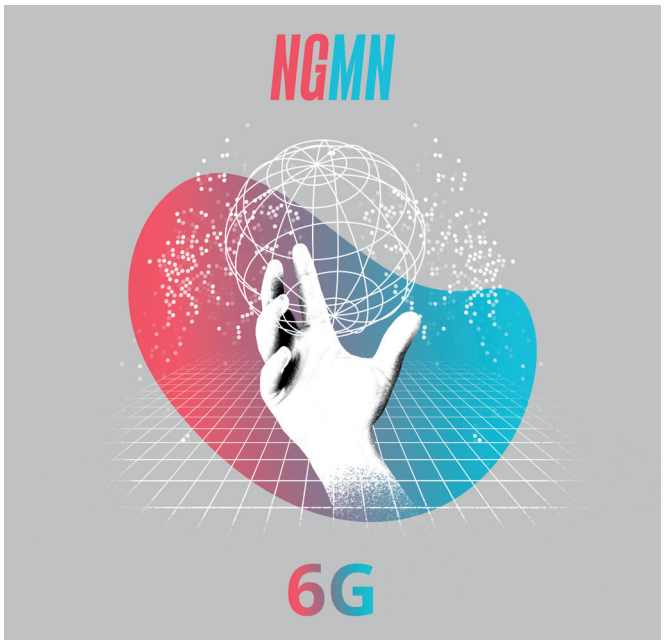
NGMN 6G VISION, OPERATING DISAGGREGATED NETWORKS AND GREEN FUTURE NETWORKS

By Anita Döhler, Chief Executive Officer NGMN Alliance

With a new positioning in 2021, the NGMN Alliance put the focus on the most burning topics of mobile telecommunications today and in the future – thus addressing and embracing the entire industry: Mastering the Route to Disaggregation with a focus on the End-to-End Operation of Disaggregated Networks, Green Future Networks, and 6G, as well as the continuous support of 5G's full implementation. NGMN continues to grow with new Partners joining the alliance, which clearly indicates that the organisation's strategic focus topics are highly relevant for the industry. This article provides an update on NGMN's growth momentum and strategic focus topics.

6G Drivers, Vision and Use Cases

NGMN has a track record in substantially impacting the success of 4G's and 5G's development and is best positioned to provide relevant and timely guidance to the whole ecosystem throughout the 6G development cycle. As a global organisation representing the entire value chain, NGMN is set to take the lead in providing impactful guidance for global 6G activities to respond to the needs of end users, societies, mobile network operators and the ecosystem as a whole.



NGMN believes that the continuing evolution of the mobile industry, and the underlying technologies, must be guided by the imperative to safeguard the three fundamental needs facing the society at large, and the telecoms industry specifically, namely:

- **SOCIETAL GOALS:** Future technologies should contribute further to the success of the United Nations Sustainable Development Goals.
- **OPERATIONAL NECESSITIES:** There is a strong need to make the planning, deployment, operations, management, and performance of the mobile operators' networks more efficient.
- **MARKET EXPECTATIONS:** Customer requirements need to be satisfied by offering new services and capabilities, supported by evolving technologies in a cost-effective manner.

> "In addition, the way future wireless standards and technologies are developed will be crucial. NGMN identifies some fundamental aspects which 3GPP needs to consider before starting the development of the next generation of standards and technologies:"

- **NEED FOR INCREASED SCOPE:** To drive full ecosystem automation, enhance visibility, and improve efficiency, the scope of activities should be expanded to include new aspects which are not yet (or fully) part of the current standards development requirements to take a holistic end-to-end view of the entire ecosystem, and not only its parts.
- **NEED FOR NEW STANDARDS EVOLUTION PARADIGM:** It is important to reconsider the traditional notion of a "generational" change driven solely by advancement in radio and core technologies. Instead, standards development should become broader in scope, but also more incremental and agile in detail, building on the existing 5G system.
- **NEED FOR DIFFERENTIATED TECHNOLOGY EVOLUTION:** Any new technological development should be assessed with respect to its differentiation from 5G, and any improvements should be benchmarked, including pragmatic deployment scenarios, with the law of diminishing returns in mind.

The identification of 6G use cases is key to determining the requirements for future generational change. Therefore, operators, technology suppliers and academic advisors in NGMN joined forces and contributed their views on which 6G use cases they predict will emerge in the future decade. The use cases are categorised into four classes:

- **ENHANCED HUMAN COMMUNICATION –** including use cases that have the potential to enrich human communications, such as immersive experience, telepresence & multi-modal interaction.
- **ENHANCED MACHINE COMMUNICATION –** including use cases reflecting the growth in collaborative robotics, and autonomous machines, the requirement for sensing the surrounding environment and the need for robots to communicate among themselves and with humans.
- **ENABLING SERVICES –** including use cases that require additional features, such as high accuracy location, mapping, environmental, or body sensing data.
- **NETWORK EVOLUTION –** describing aspects related to the evolution of core technologies including AI as a service, energy efficiency, and delivering ubiquitous coverage.

NGMN expects new use cases to emerge, in support of digitalisation and innovation beyond today's imagination. NGMN is now working on 6G E2E requirements which will feed into the ITU-R IMT Vision for 2030 and beyond and later into 3GPP and other Organizations who develop and standardise appropriate technologies.

Disaggregation Challenge

As networks become more complex – with increased separation between software and hardware and with an increasing number of interfaces and functions – the challenge of how to efficiently deploy and operate networks to meet customers' needs becomes increasingly relevant.

In late 2021, NGMN released a first White Paper on ODiN – Operating Disaggregated Networks, which explored the opportunities and challenges of disaggregated mobile networks. Whilst disaggregation provides many opportunities - a more resilient ecosystem and supply chain, increased innovation, agility and flexibility; deploying and operating a disaggregated network presents challenges such as increasing complexities in interoperability, system integration, efficient and resilient operation. All these aspects lead to the need for a significant End-to-End operating model transformation.

NGMN operators and vendors collaborate in generating End-to-End operating model blueprints, identifying potential gaps and providing requirements to the industry and to other organisations.

The current Phase 2 of the activity focuses on:

- Industry status and roadmap, including foreseen technical and tool evolutions
- Target picture provided by Network Disaggregation
- Relationship with specific industry verticals
- Operating Model(s) options, their pros/cons, main decision criteria and blueprints
- Role and impact of Disaggregated Network Testing

Journey Towards Green Telco

In its Green Future Networks Project Phase 1, NGMN released publications on four main items:

"Sustainability Challenges and Initiatives in Mobile Networks", "Network Equipment Eco-Design

and E2E Service Footprint", "Network Energy Efficiency" and "Metering for Sustainable Networks".

The "Network Energy Efficiency" publication focuses on best possible ways of reducing the energy consumption of mobile networks, a key concern of operators and an important step towards greener networks. In its publication, NGMN studies the different existing and future energy saving features and processes, and their potential when rolled out in the networks – among others, the usage of automatic and AI-driven wake-up/sleep modes as standardized by 3GPP, virtualisation technology, and the usage of efficient power amplifiers combined with massive Multiple Input Multiple Output (MIMO).

NGMN emphasises the importance for all vendors and operators to continue the implementation and activation of advanced energy saving features supported by the 5G standard.

The second phase of Green Future Networks focuses now on four main topics: supply chain circular economy criteria, reducing environmental impact, network energy efficiency phase 2 and defining an industry standard for a global green networks benchmark.

NGMN continues the valuable collaboration with its cooperation partners on all mentioned strategic focus topics and invites interested parties to join this endeavour for the benefit of the industry and the entire ecosystem.

www.ngmn.org

New Partner joins 3GPP

SatCom Industry Association (SIA-India) is now a Market Representation Partner (MRP) in 3GPP.

SIA-India represents the interests of the satellite communication ecosystem in India, with a membership drawn from satellite operators, manufacturers and solutions providers.

The body works alongside Government bodies, Regulators, Policymakers and domestic and international standards bodies to ensure that satellite effectively provides broadband access to end-users in India, with a particular focus on serving remote and rural areas.

SIA-India recently compiled the report "A Balanced Approach for Spectrum Allocation - Support for a Thriving 5G/IMT & Satellite Sector in India"

3GPP now has 26 MRPs – representing their community's interests in our groups & promoting standards participation to a growing variety of industry experts.

https://www.sia-india.com

WHAT IS OPEN GENERATION & WHY 5G?

By Adrian Buckley and Leila Ribeiro

Someday drones will be ubiquitous, but network limitations, safety, and security concerns make imagining a world where drones are delivering packages to our doorsteps almost impossible. MITRE Engenuity's Open Generation 5G Consortium was created to get to this future faster by accelerating use cases enabled by the unique characteristics of 5G such as cloud-based solutions, device-to-device communications, network slicing, and native edge computing.

Open Generation includes leaders from established private sector companies, start-ups, and academia, working together to develop 5G innovation to solve real life challenges. Joining 3GPP as a Marketing Representation Partner (MRP) allows Open Generation to play a leadership role in shaping the future of the telecommunications industry, permitting both those inside the consortium and members of 3GPP not in the consortium to benefit from its work.

UAS Ecosystem

The initial focus of Open Generation is on Uncrewed Aerial Systems (UAS) that uniquely benefit from the low latency and high reliability of 5G technology. UAS is a complex use case that operationalizes real-time knowledge collection and delivery services in indoor and outdoor environments. The large-scale infrastructure needed and hard technical solutions associated with UAS over 5G require end-to-end development and collaborative interworking between industrial partners from across the ecosystem.

Initial Use Cases

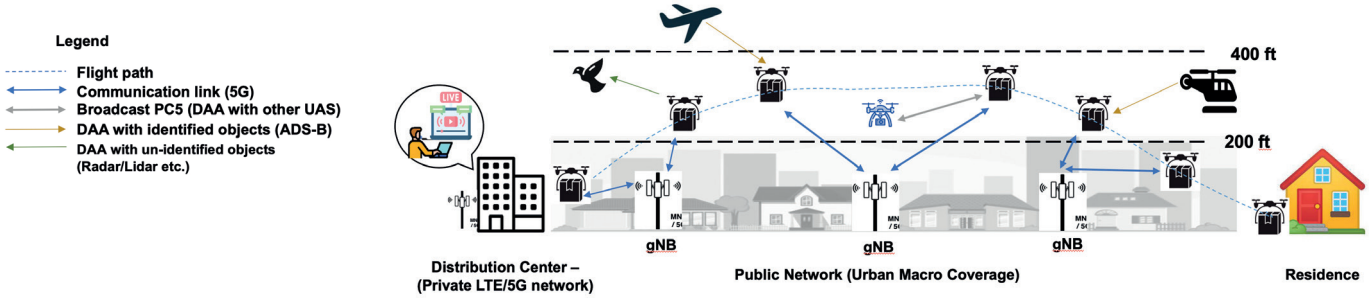
Drones today are being deployed for photography/videography, inspection, mapping, and logistics. However, to unlock emerging applications of UAS, the industry must develop and agree on the solutions required for safe and reliable Beyond Visual Line-of-Sight (BVLOS) operations and secure regulatory approval of BVLOS flights.

5G wireless networks have the potential to revolutionize safety and reliability of BVLOS use cases. Open Generation has selected four use cases to demonstrate that Command and Control (C2) communications and Detect and Avoid (DAA) systems used by UAS satisfy minimum levels of acceptable risk.

USE CASE 1 - COMMERCIAL PACKAGE DELIVERY

Many companies are interested in using UAS to increase product distribution, reduce delivery times, and achieve cost savings. This use case is focused on the last mile delivery of a package to its destination from a distribution center and will heavily rely on cellular networks for communication.

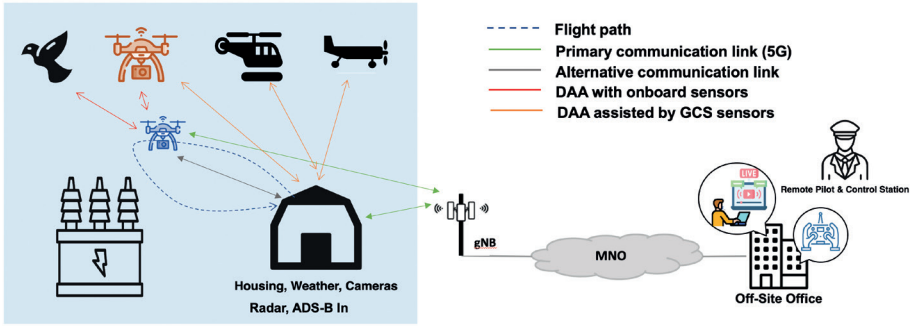
These delivery locations may be in urban, suburban, or rural areas—each presents unique challenges for the UAS operation as well as for the communication technology. Therefore, coexisting with current users and utilizing existing infrastructure are key considerations for our evaluation and identification of innovation opportunities.



USE CASE 2 - STATIC INFRASTRUCTURE INSPECTION

There are 60,000 energy distribution substations in the United States. Efficient maintenance of many, often remote, substations is a key industry challenge. Drone-in-a-box solutions provide potential remedies for costly inspections.

An electrical distribution substation has a fixed geographic footprint, which is likely serviceable by a single communication network cell. Access to the substation is controlled; therefore, ground risk is more easily mitigated, making the safety case for remote BVLOS operations easier.

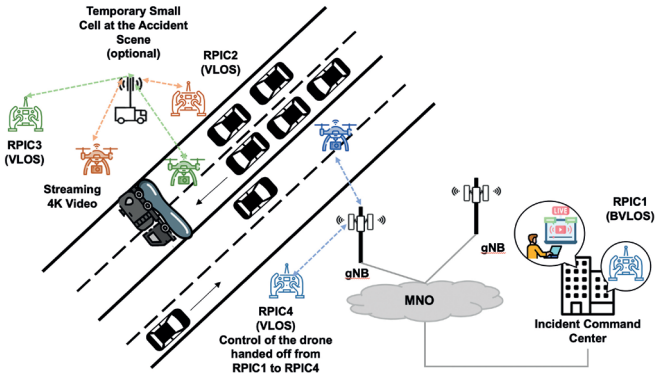


For this use case, we assume that there is a UAS stationed onsite for regular inspection dispatch. Only one drone is flown within the substation perimeter. The drone can fly pre-programmed flight routes, but network connectivity is required onsite at the substation for the pilot to intervene as required.

USE CASE 3 - EMERGENCY RESPONSE

Drones can play an important role in providing first responders with aerial views from an incident, from traffic collisions to hazmat scenarios. In such situations, drones could transmit high quality video as well as data from other sensors to first responders. Access to such data would help first responders assess the incident severity and optimize resources to be dispatched to the scene. Drones could also be deployed quickly and arrive at the incident scene much faster than ground vehicles.

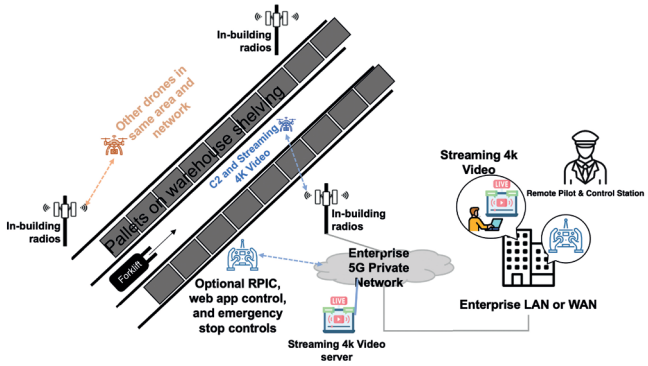
The drones participating in this use case are 5G-enabled and must maintain connectivity with the remote pilot in command (RPIC) so that the pilot can fly the drone at any time during the operation or for the entire operation. Initially, a scenario with up to three drones simultaneously operating within the area is under consideration.



USE CASE 4 - INDOOR INSPECTION AND SECURITY

Drones are used indoors to fly programmatically defined missions over pre-determined routes, visit waypoints to collect images in real-time, and stream video for indoor inspections, warehouse inventory management, or indoor security. A drone's ability to follow a path and provide real-time video uplink is central to the application.

Missions may be started by schedule or on-demand. The drone is equipped with cellular modems and uses an indoor private 5G network throughout the mission. The drone is equipped with a collision avoidance system to avoid hitting walls, equipment, furniture, people, or other installations in the building (e.g., sprinkler systems).



MITRE ENGENUITY | Open Generation

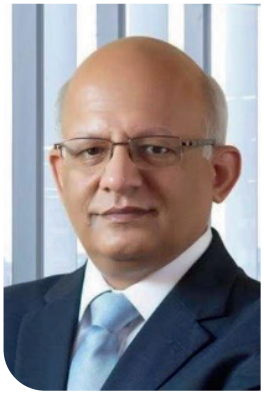
Open Generation Working Groups

These four use cases have been identified as key examples of drone operations that can be enabled with the help of 5G innovation. With an initial description and identification of key challenges and requirements of each use case, Open Generation working groups propose architectures based on 5G functionality as well as experiments to assess and validate performance.

The Implementation, Testbeds, & Experimentation Working Group plans and executes experiments for the specific use cases identified by our Advanced Use Cases & Devices Working Group, using solutions proposed by our Architecture & Solutions Working Group. Some of these are taking 3GPP Rel-18 items and prototyping them to determine if they are suitable solutions to the challenges presented.

Collaborating members perform experiments and simulations, publish results and performance metrics, and note improvement areas. Through this approach, Open Generation demonstrates the feasibility of commercial 5G drone operations to alleviate concerns for operational risks, including operation beyond visual line of sight (BVLOS). Data will be provided to 3GPP to help guide future 3GPP functionality as well as identify any potential areas of concern with existing functionality.

https://opengeneration.mitre-engenuity.org/



AN INTERVIEW WITH NG SUBERAMANIAM

TSDSI Chair and the current 3GPP PCG Chair.

Highlights: Since January 2014 TSDSI has developed India-specific requirements and brought them into 3GPP. However, TSDSI does a lot more than that. Could you give the 3GPP readership a sketch of TSDSI's main priorities and interests in 2022?

NGS: TSDSI was set up in 2014 as part of a Governmental National Telecom Policy resolution (2012), to be the country's Telecommunications Standard Development Organisation. We are an autonomous body with effective participation of the government, industry, R&D centres, service providers, and academia – Providing a platform to drive consensus on standards to meet national requirements, including security needs.

TSDSI gives those stakeholders a place in leading International Standards Development Organisations, including 3GPP of course. We also act as an advisory body for preparation of national contributions for incorporation of Indian requirements, IPRs and standards in to international standards.

Technical activities in TSDSI are driven by topics of members' interest. A technical activity can be triggered by TSDSI's standardization roadmap, direct member driven proposals or requests from policy makers.

The current focus areas include:

- **NETWORKS:** 6G, 5G Enhancements, Open Systems, Rural Broadband, Spectrum Studies, Backhaul, Convergence, Non-terrestrial Networks.
- **SERVICES & SOLUTIONS:** AI-ML, Applications & Service Layer Standards, IoT, Cloud, Security, Critical Communications, Drones, Quantum.

Our Roadmap has topics grouped in 9 clusters covering emerging and futuristic technologies. These are in various stages of deliberations as formal technical activities.

TSDSI made some key contributions to 3GPP Rel-16 (NaVIC) and 17 (technologies for LMLC) and we actively engaged in various forums at the ITU and in the standards project oneM2M.

TSDSI - an advisory body for preparation of national contributions for incorporation of Indian requirements, IPRs and standards into international standards

TSDSI has developed Technical Reports and Specifications in the areas of IoT/M2M, PPDR, ICN, Broadcast offload, Dual SIM, Backhaul, Drones, Security & Privacy, Support for Indian Languages in devices, Open RAN, Cloud Interoperability and Portability, Network Resource Utilization et al.

Apart from the technical activities, TSDSI is laying a strong emphasis on steering standards driven research and fostering an environment for stronger participation by Indian start-ups in global standards development activities.

Highlights: TSDSI works very closely with the Government of India Ministry of Communications (DoT) and the Telecommunication Engineering Centre, to ensure that India's invention is recognised in standards, but also to bring the 3GPP specifications into India. Could you describe the importance of the relationship with the Ministry and TEC to your role in 3GPP?

NGS: TSDSI is recognised by the Government of India as India's Telecom SDO. As the OP for India, TSDSI transposes 3GPP Specifications into TSDSI standards and publishes them for consumption in India. Guidelines for adopting TSDSI Standards as National Standards by the Telecom Engineering Centre (TEC) have been notified and are in practice. We work closely with TEC for adoption of these as national standards, as TEC goes through a public consultation process with the wider stakeholders in the marketplace.

Senior Leadership from Department of Telecommunications and TEC are nominated members of TSDSI's Governing Council. Like all our members, DoT nominees are keen and supportive of TSDSI initiatives that enhances our participation in Global SDOs, driving Standards driven Research, engagement of start-ups in contributing to standards development at the national and global levels.

DoT-TEC is also an Individual Member (IM) to 3GPP through TSDSI. Therefore, expectations and requirements of DoT-TEC from telecom standards flow into 3GPP as TEC contributions or through other IMs from TSDSI. And, specifications developed at 3GPP and transposed by TSDSI, eventually get adopted by TEC as the national standards.

We are also working closely with DoT in the Government's 6G initiative as the standards partner.

3GPP Highlights: In March 2022, TSDSI and 3GPP completed the steps to merge the 5Gi requirements into 3GPP specifications, to ensure that we proceed with a single standard for 5G. What are the implications to India companies and users of this move?

NGS: 5Gi addressed a critical requirement of India's rural coverage needs. We are pleased that the proponents and our members have been able to collaborate with global technology players to ensure that the requirements are taken on board for mainstream 5G and the merger process is ongoing.

This is significant as this requirement will now be part of the global standards and the full features of the ecosystem will be available to India companies. This will accelerate the adoption of 5G in India and help bridge the digital divide by making the services affordable, timely and sustainable.

3GPP Highlights: The disruption caused by the COVID Pandemic has been felt everywhere. From June, we will have Face-to-face 3GPP meetings again. How do you see this development and how soon will we see India's experts back at physical meetings?

NGS: Technology has been a great leveller during the pandemic. It has helped organizations to conduct their business operations to near normal levels and to find new ways of working along the way. With virtual meetings, TSDSI saw a surge in participation by our members in forums across the board. The barriers to participation were considerably lowered and made 3GPP more accessible to a broader spectrum of our members, resulting in a 175% increase in registration of IMs (20 to 55).

We certainly support, promote, and encourage this trend of using technology for 3GPP meetings that will make it more accessible for people from all regions. The increase in diverse participation will enrich the quality and quantity of contributions to 3GPP.

Having said that, we also recognise the need to have face to face meetings, as they promote better understanding, build relationships, and facilitate quicker, reasoned decision making.

Therefore, we look forward to discussing the opportunities for hybrid meetings. We look forward to increased participation in the 3GPP meetings of all types physical, virtual or hybrid, while we would welcome virtual or hybrid model, which is fast evolving as the future way of working across industries and markets.

3GPP Highlights: In the specification groups, we are at the mid-point of 5G work, so it is early days for the 6G debate. That said, do TSDSI already have some projects in place for what future evolution looks like – in 2030 and beyond?

NGS: TSDSI has adopted a multi-pronged strategy for its "6G" journey:

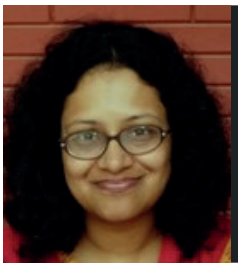
- To promote open research with industry, start-ups, and academia for steering research & innovation in India.
- To engage with global standard bodies including 3GPP and ITU for collation of use cases & requirements.
- To look for joint projects and information sharing on regional and global 6G initiatives. The intent is to harmonize efforts, towards technologies & applications and advance the 6G agenda.

TSDSI submitted initial contributions to ITU-R for IMT2030 Vision in 2021 and further contributions are in progress.

A study on "Use cases, requirements and technologies towards 6G" is in progress within TSDSI and we organise regular public stakeholder workshops on 6G and related futuristic topics like VLC, IRS, to name a few.

I am also chairing the task force on "International Standards Contribution" under the 6G Technology Innovation Group (6G-TIG) set up by DoT.

Our thanks to N G Subramaniam, Chair TSDSI and current Chair - 3GPP PCG.



Thanks also to Bindoo Srivastava, Director TSDSI Marketing & communications for making this possible.

TSDSI is one of the seven 3GPP Organizational Partners - from Asia, Europe and North America – that determine the general policy and strategy of 3GPP and also transpose the approved 3GPP Technical Specifications into national and regional standards.

tsdsi India's Telecom SDO **https://tsdsi.in/**

PROCEDURES FOR THE NEW AGE

By Stephen Hayes, 3GPP Working Procedures Group Chair

The 3GPP Working Procedures is the key foundational document of 3GPP. They describe the roles of key groups such as the Project Coordination Group, the Technical Specification Groups and their Working Groups. They also describe the responsibilities of the 3GPP partners, chairs, vice-chairs, individual members, delegates, and the supporting staff in the 3GPP Mobile Competence Centre.

There is a lot in the Working Procedures, right down to the description of processes for voting, elections, project management, dispute resolution, etc. They do no less than codify the principles of fairness, openness, and compromise that have made 3GPP so effective as a standards body.

But the Working Procedures are not a static document and as the standardization environment changes, so do the Working Procedures. To ensure that they are well maintained, the PCG has established a permanent subgroup "The Working Procedures Group" tasked with keeping them fit for use.

Covid-19 has provided the sternest test so far

When 3GPP was initially established it was based entirely on periodic face to face meetings. And although there were occasionally e-meetings held, all the formal processes defined in the Working Procedures assumed physical attendance. So essentially, the COVID-19 pandemic broke the Working Procedures.

The required fixes to the Working Procedures have been placed in a special annex (Annex I - Special procedures for exceptional situations restricting travel). It is expected that many of these changes will be migrated into the body of the Working Procedures, but the timeline for such a migration is not set.

> "With e-meetings, commitment was harder to quantify"

One of the reasons for placing the changes into an annex is because these are fundamental changes to the way 3GPP has worked for the last 20 years and it is desirable to trial these changes before making anything permanent.

One of the first items that needed to be fixed was the decision making power of the e-meeting. 3GPP has two types of meetings: ordinary and ad-hoc. Ordinary meetings have decision power and are the primary types of meetings. Ad-hocs are special meetings called with a limited scope and have limited decision power. Any decisions they take are ratified at a subsequent face-to-face (f2f) meeting. All e-meetings were originally considered ad-hocs. So, the first step was to give e-meetings the ability to take decisions on their own. Within the Working Procedures, e-meetings can now be ordinary meetings in their own right.

Getting the vote

Another item that required fixing was voting. Previously, voting was always done at f2f meetings. You could vote by proxy, but the vote had to be cast in person by the person carrying the proxy. The introduction of electronic voting made voting easier, but it still required attendance at a f2f meeting. The Working Procedures were changed to allow voting during e-meetings. However, due to time zone issues, the time window for voting was extended to 18 hours. Proxy voting existed as a concept for f2f meetings since sometimes it was not possible to attend a f2f meetings. For voting at e-meetings, proxies are not allowed.

Making a commitment

A final significant fix was voting rights. The ability to vote was based entirely on participation in f2f meetings. However, fixing the Working Procedures was not as simple as saying that an e-meeting equals a physical meeting because one of the 3GPP foundational principles was commitment. To gain voting rights in a group you have to show commitment to a group.

With face-to-face meetings, Individual Members (IM) showed commitment by sending a delegate to participate in the group. With e-meetings, commitment was harder to quantify. Eventually a solution was developed that allowed voting rights to be obtained by participating in e-meetings. It was slightly harder to gain rights via e-meeting only participation and voting rights could be lost if an IM skipped all the f2f meetings and only attended e-meetings. Those changes were put into effect at the March 2022 Technical Specification Group meetings (TSGs#95-e).

In addition, a pause on formal votes was initiated starting with the March 2022 meetings. This pause extends for the first 2 meetings of each group (after the adoption of the new rules) and is intended to allow those companies that were not able to gain voting rights during the pandemic to gain rights and participate in any formal decision making. An additional concept of voting rights hardship exemptions was established to encourage f2f meetings whereby under certain circumstances IMs that cannot attend a f2f meeting are not penalized for missing the meeting.

3GPP came into existence in an environment where unrestricted travel was the norm and developed a culture which maximized the ability of delegates from around the world to work together. The f2f way of working and building consensus is enormously productive and has directly translated to the success of 3GPP. But as travel becomes more restricted and technological alternatives to f2f meetings develop, 3GPP must adapt. The 3GPP Working Procedures Group is there to ensure that the principles of fairness, openness, and compromise persist in a changing environment.

The 3GPP Working Procedures are online at **https://www.3gpp.org/ftp/Information/Working_Procedures**

JUNE PLENARIES GO F2F

By Issam Toufik, Director of the 3GPP Mobile Competence Centre

When the COVID-19 pandemic surged in 2020, it had a considerable disruptive effect on the organization of 3GPP meetings. All physical meetings were cancelled and replaced by “virtual meetings” with views expressed by a combination of email list exchanges and on-line conference sessions.

In the early days, as hopes of quickly controlling or eradicating the pandemic were high, it was expected that this virtual mode would be a short-term measure and that face-to-face meetings would resume shortly. However, with the many challenges caused by the pandemic and the emergence of new variants, it quickly became clear that the return to “normal” would not be as soon as hoped. It has now been more than two years that all 3GPP meetings have been held as e-meetings.

While 3GPP adapted well to the new working environment – notably completing the whole of Release 17, from start to finish, during the pandemic - the desire and need to go back to face-to-face meetings as soon as possible is growing.

In response, the 3GPP Organisational Partners (OPs) tasked their Meeting Hosting Study Group (MHSG) to quantify the necessary conditions to restart 3GPP face-to-face meetings in a safe, fair and well-coordinated way.

The Partner’s meeting in October 2021 (OP#46-e) approved a set of conditions, based on the study groups findings, for physical meetings to be resumed in 3GPP. The OPs then created a new group chaired by the MHSG Convenor, with OPs representatives, the TSG leadership (SA, RAN and CT) and the regional meeting hosts - to ensure that the necessary progress was made. This new group meets on a regular basis to assess, based on the Organisational Partners’ input, the feasibility of hosting physical meetings in the next quarter. In their March meeting, the committee decided that the first 3GPP face-to-face meeting, since the Covid-19 outbreak, will be the June 2022 TSG meetings in Budapest-Hungary.

To ensure that this meeting is a success, the European Friends of 3GPP (EF3) - the host of TSGs#96 - is putting the necessary measures in place to ensure a safe meeting. Those include:

- **MEETING ROOMS SETUP RESPECTING SOCIAL DISTANCING BETWEEN THE DELEGATES.**
- **MICROPHONES REGULARLY SANITISED.**
- **STAGGERED GROUP COFFEE BREAKS & SEPARATE AREAS, TO AVOID CROWDING.**
- **PROVISION OF HAND-SANITIZERS IN PUBLIC AREAS & MEETING ROOMS.**
- **MCC WILL PROVIDE SUPERIOR FFP2 MASKS FOR DELEGATES.**
- **ALTHOUGH EF3 RECOMMENDS THAT ALL DELEGATES BRING COVID-19 SELF TESTING KITS, KITS WILL BE AVAILABLE TO PURCHASE.**
- **ACCESS TO TESTING ONSITE.**
- **HOTEL WILL HOLD SOME ROOMS FOR EXTEND STAY DUE TO A POSITIVE TEST.**

In order to simplify access to testing for delegates returning home after the meeting, EF3 has contracted medical staff to take care of the required Antigen or PCR testing (Certified by a medical doctor) to meet the requirements of airlines and border forces. A poll will be sent to all registered delegates a couple of weeks before the meeting checking for the need of COVID-19 testing before their return home. EF3 will prepare sufficient capacity and efficient scheduling according to poll’s results.

When we meet in Budapest in June, we will savour the moment, meet old friends and remember colleagues who have moved on or cannot join us, as we start our travels back to normal.

3GPP Excellence Awards

The 2021 awards are out, with four winners announced during the appropriate Working Group meetings at the beginning of 2022. This year's outstanding contributors to the work of 3GPP are:

For contributions to multiple areas – Including control channel design, MIMO, carrier aggregation, coverage enhancement, UE features.

Peter Gaal
TSG RAN WG1

For a commitment across multiple releases in 2021, producing high quality 3GPP specifications for Railways.

Martin Öttl
TSG SA WG6

For contributions to improvements in the area of Energy Efficiency, with focus on EE KPIs and how to measure them in the network, that have become extremely important for 3GPP.

Jean-Michel Cornily
TSG SA WG5

For demonstrating superior dedication and attitude while driving multiple features for UE Power Consumption, 5G System Architecture and Non-Public Networks.

Peter Hedman
TSG SA WG2

Ensuring interop for industrial use cases

In April, 3GPP Partners - Global Certification Forum (GCF) and the 5G Alliance for Connected Industries and Automation (5G-ACIA) have announced the signing of a cooperation agreement to jointly investigate industrial 5G certification needs.

This brings together operational technology & ICT companies from industry with the experts from the GCF – to develop testing and certification programs for Industrial IoT products' conformance to standards from 3GPP.

And the winner is...

In February, 3GPP SA4 colleagues picked up a Tech Emmy® for the development of media streaming protocol specifications that represent an extensive improvement in television production. **See the full story on Page 14.**

3GPP's MRPs:

Thanks to the 3GPP Market Representation Partners in 3GPP, for their continued support and generous inputs to each edition of 3GPP Highlights.

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