MCMC MTSFB TC GXXX:2026

TECHNICAL CODE

IMT-2020 (FIFTH GENERATION) - SYSTEM AND SPECIFICATIONS FOR NON-PUBLIC NETWORKS

Developed by

Malaysian Technical Standards Forum Bhd

Registered by

MCMC

Registered date:

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Foreword

This technical code for IMT-2020 (Fifth Generation) - System and Specification for Non-Public Network ('this Technical Code') was developed pursuant to Section 95 and Section 184 of the Act 588 by the Malaysian Technical Standards Forum Bhd ('MTSFB') via its International Mobile Telecommunications and Future Networks Working Group.

This Technical Code shall continue to be valid and effective from the date of its registration until it is replaced or revoked.

IMT-2020 (FIFTH GENERATION) - SYSTEM AND SPECIFICATION FOR NON-PUBLIC NETWORKS

Introduction

This Technical Code refers to the IMT-2020 system and specification for Non-Public Network (NPN), also known as Fifth Generation (5G) private networks. A NPN is a network designed for exclusive, non-public use, capable of utilising both virtual and physical elements. It encompasses private networks, which are isolated and do not interact with public networks. According to 3GPP, there are 2 types of NPNs, Standalone Non-Public Networks (SNPNs) and Public Network Integrated NPNs (PNI-NPNs). SNPNs are fully independent of Public Land Mobile Networks (PLMNs), or mobile network operators, aligning with the concept of private networks and requiring significant investment and commitment from the owner. In contrast, PNI-NPNs operate with PLMN support, either as dedicated private slices or through shared deployments between the PLMN and the private network owner.

The types of NPN configurations are as follows:

a) SNPN; and

b) PNI-NPN consisting of;

   i) Shared Radio Access Network (RAN);

   ii) Shared RAN and control plane; and

   iii) End-to-End (E2E) network slicing.

1. Scope

This Technical Code specifies the system requirements and technical specifications for the deployment of 5G NPN across various industry sectors. In particular, the Technical Code covers the following aspects:

a) Network configuration, architecture and technical specifications of the IMT-2020 network, excluding User Equipment (UE), to support deployment as an IMT-2020 or 5G NPN.

b) Guidance on optimal spectrum usage for IMT-2020 NPN deployment, taking into consideration international best practices.

c) Network performance and Quality of Service (QoS) requirements to support vertical industry use cases, including but not limited to manufacturing and transportation.

d) Reference documentation of selected 5G NPN deployments in Malaysia to guide implementation and support the adoption of relevant 3GPP specifications.

2. Normative references

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies.

Refer to Annex A.

3. Abbreviations

For the purpose of this Technical Code, the following abbreviations apply.

Refer to Annex B.

4. Terms and definitions

4.1 End-to-end Latency

The total time in milliseconds for data to travel between two endpoints across multiple domains, e.g. radio access network domain, transport network domain, core network domain and application service domain.

4.2 Latency

The time taken in milliseconds to transfer a packet from a source to a destination contributed by the radio network.

4.3 IMT-2020

A set of requirements and specifications developed by the International Telecommunication Union (ITU) for the 5G of mobile networks.

4.4 Reliability

Reliability over the air interface relates to the capability of transmitting successfully a predefined amount of data within a predetermined time duration with a given probability.

4.5 Standalone Non-Public Network Identifier (SNPN ID)

A Public Land Mobile Networks Identifier (PLMN ID) and Network Identifier (NID) identifying an SNPN.

4.6 Public Network Integrated-Non Public Network (PNI-NPN)

PNI-NPNs operate with PLMN support, either as dedicated private slices or through shared deployments between the PLMN and the private network owner.

5. System architecture and specifications

Two types of NPNs can be distinguished, SNPN and PNI-NPN as described in ITU-T Y.3128, 3GPP TS 23.501 and 3GPP TS 22.261 as well as GSMA. The 5G service-based architecture shown in Figure 1 defined in 3GPP TS 23.501 is essential to support the 2 types of NPNs. Details for abbreviations can be referred to MCMC MTSFB TC G027.

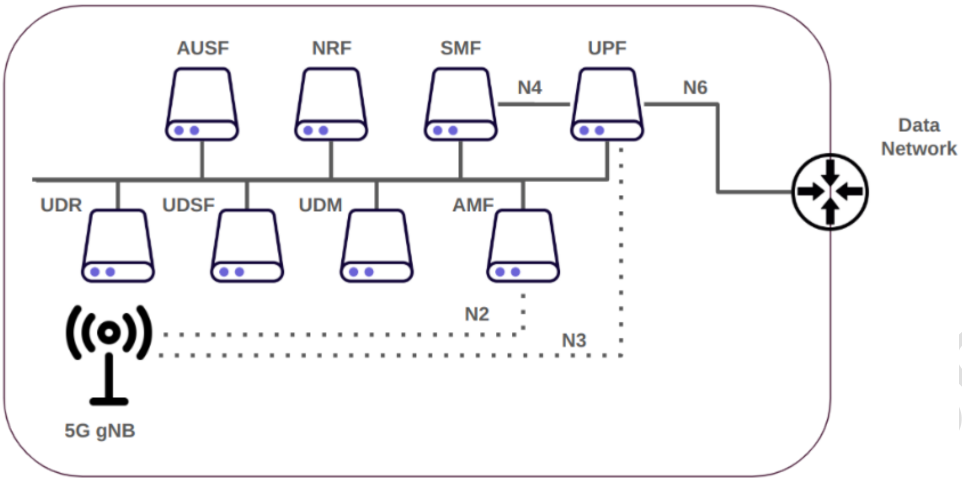

Figure 1. 5G service-based architecture

5.1 Standalone Non-Public Network (SNPN)

A SNPN is a 5G network designed for independent operation, separate from PLMNs, without relying on network functions provided by PLMNs. Deployed within a defined perimeter like a factory, an SNPN houses all necessary network functions internally, communicating with the public network only through a firewall. The operating technology is based on service requirements defined in 3GPP TS 22.261, and the SNPN has its own dedicated identifier, known as Standalone Non-Public Network Identifier (SNPN ID) containing PLMN ID and NID that identify a SNPN.

While entirely independent, a NPN device, containing dual subscription, can optionally connect to the public network via the firewall for access to services such as voice. This connection can also enable access to SNPN services from the public network and facilitate roaming agreements with public network operators. The operation and all service attributes up to the firewall are the sole responsibility of the organisation deploying the SNPN. The architecture is further illustrated in Figure 2(a) and 2(b).

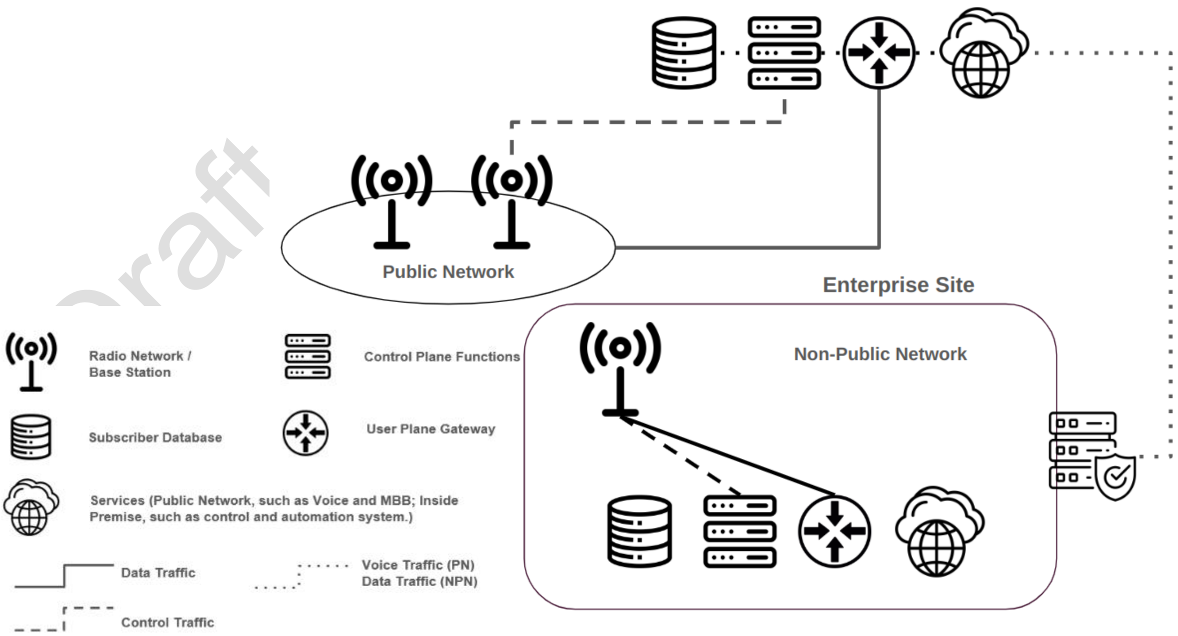

Figure 2. SNPN architecture

ITU has assigned a PLMN ID with Mobile Country Code (MCC) value 999 which can be used by a SNPN operator. 3GPP has introduced NID as an extension to the PLMN ID so that a SNPN can be uniquely identified even if it shares the same PLMN ID value. It is not assumed to be globally unique e.g. a PLMN ID can also be regionally shared. For example, the national regulator can assign a Mobile Network Code (MNC) value which is shared by multiple networks in a single country - this is the case in Germany. However, Malaysia has decided not to permanently assign MNC values to be shared by multiple networks. Table 1 shows the assignment of MCC and MNC values for SNPNs in Germany and Malaysia.

Table 1. Global assignment of PLMN ID for SNPN

Country	MCC	MNC	Type of network
Germany (DE)	262	98	Private network
Malaysia (MY) / Mobile Network Operator (MNO) A	502	110, 112, 113	Private network
Malaysia (MY) / MNO B	502	155	Private network
ITU Global assignment	999	99 / 999	Private network

5.2 Public Network Integrated Non-Public Network (PNI-NPN)

A PNI-NPN is supported by PLMNs, e.g. by means of dedicated data network names or by one (or more) network slice instance allocated for the NPN. ITU-T Y.3128 further defines the requirements for network function communication between public networks and PNI-NPN in IMT-2020.

5.2.1 PNI-NPN using Radio Access Network (RAN) sharing

In RAN sharing, a NPN and a public network share a portion of the RAN, typically base stations, while keeping other network functions separate. NPN traffic remains within the enterprise perimeter, while public network traffic is routed accordingly through a firewall. The RAN sharing is mentioned in 3GPP TS 23.251. Figure 3 illustrates a single shared base station over an enterprise site. However, dedicated base stations for NPN users are also possible. The NPN can retain its own dedicated NID while operating under a RAN sharing agreement with a public network operator. An optional connection to the public network via a firewall, similar to the SNPN case, can also be implemented.

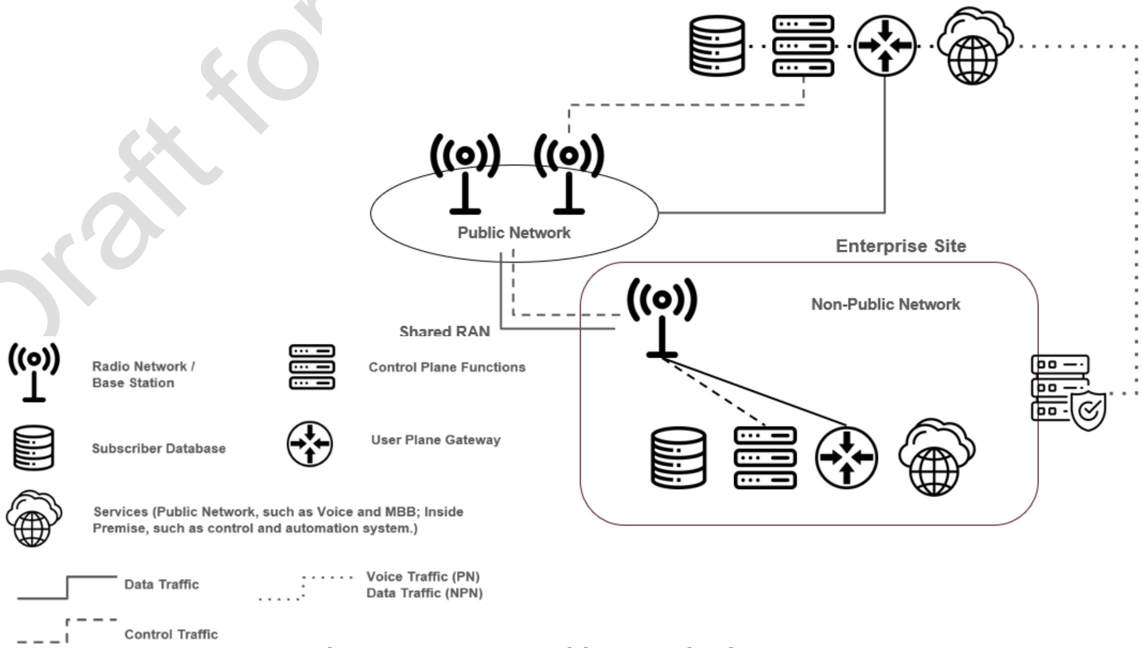

Figure 3. PNI-NPN with RAN sharing

5.2.2 Public Network Integrated Non-Public Network (PNI-NPN) using Radio Access Network (RAN) and control plane sharing

The NPN and public network share the RAN, with the public network handling all control plane functions. NPN traffic stays within the enterprise perimeter, while public network traffic is routed accordingly via a firewall. This segregation can be achieved through network slicing, using different slice identifiers, or via Access Point Names (APNs) to differentiate traffic.

Figure 4 illustrates a single shared base station over an enterprise site. However, dedicated base stations for NPN users are also possible. In this scenario, the NPN is hosted by the public network, and NPN devices are public network subscribers, simplifying the contractual relationship. NPN devices can directly connect to the public network and its services, including roaming. An optional connection between private and public network services can be used to access NPN services via the public network when devices are outside NPN coverage but within public network coverage.

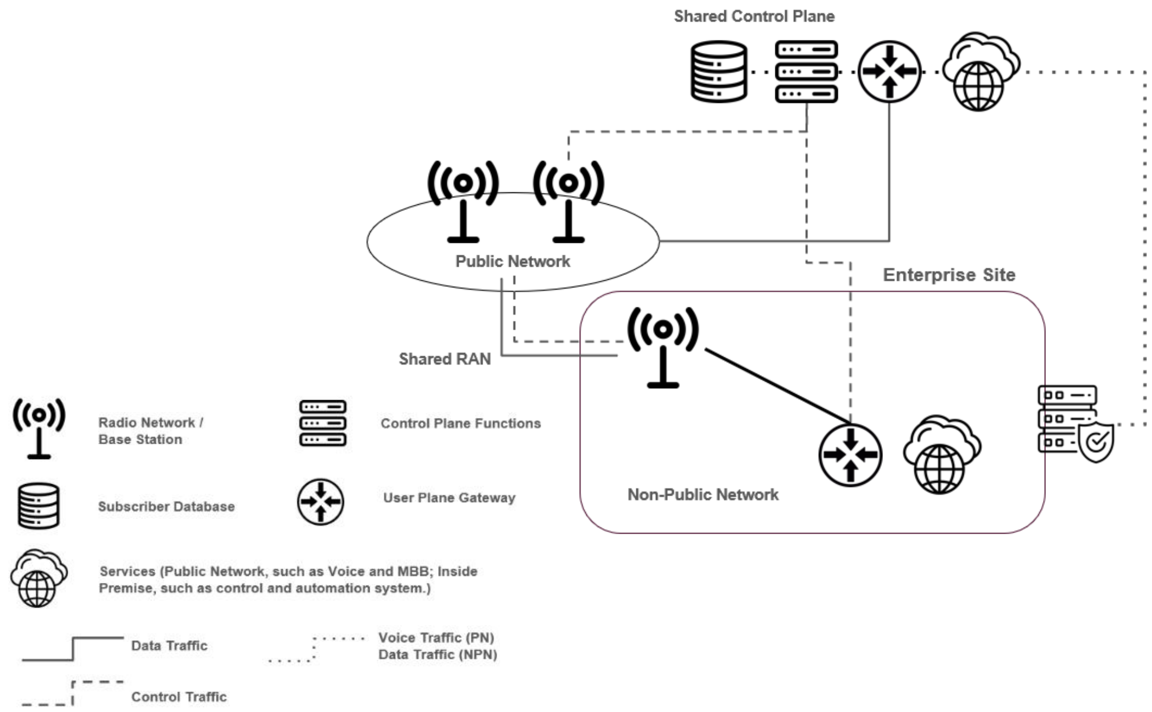

Figure 4. PNI-NPN with shared RAN and control plane

5.2.3 Public Network Integrated Non-Public Network (PNI-NPN) using End-to-End (E2E) network slicing

In this scenario, both the public network traffic portion and the NPN traffic portions are external to the defined enterprise but treated as if they were parts of completely different networks, as illustrated in Figure 5. This is achieved through virtualisation of network functions in a cloud environment. These functions can then be used for both public and for private network purposes.

This scenario can be implemented by means of network slicing or APN functionality. In this scenario NPN subscribers are, by definition, also public network subscribers. Since all data is routed via the public network, access to public network services and the ability to roam can be implemented easily in accordance with the agreement between the NPN and the public network operator.

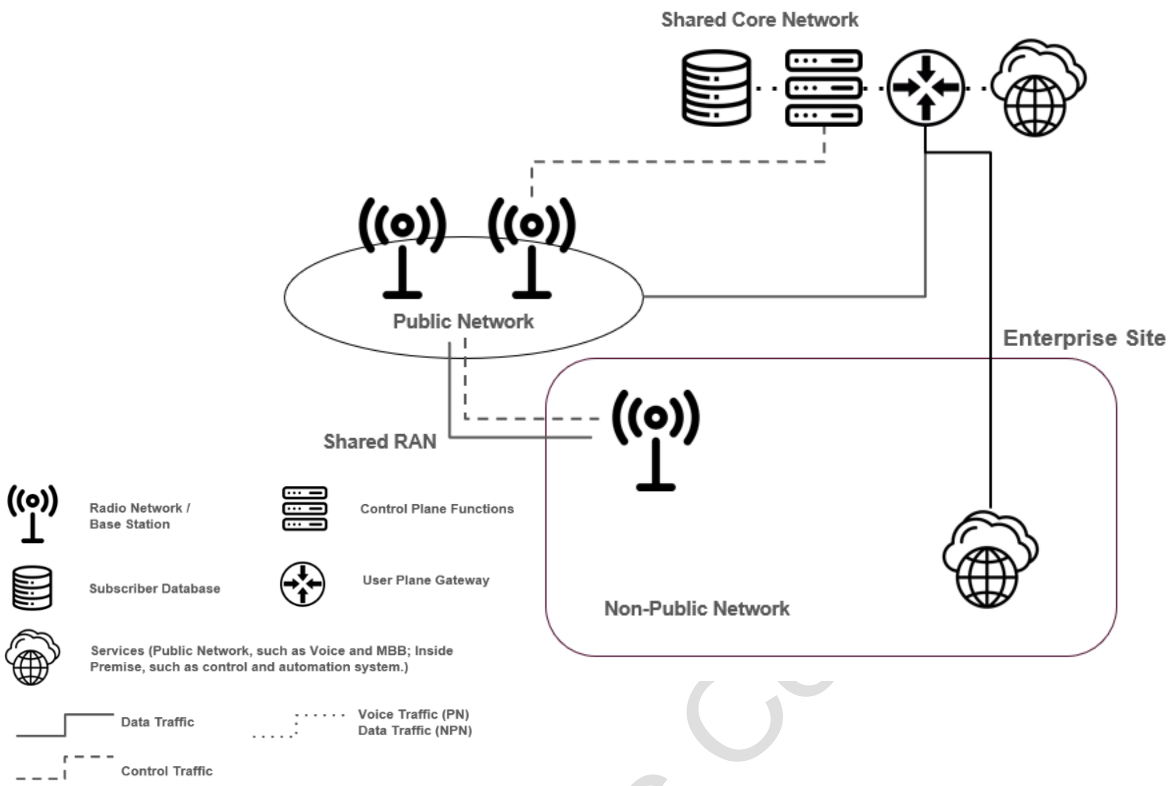

Figure 5. PNI-NPN with E2E network slicing

5.3 Supported spectrum for Fifth Generation (5G) Non-Public Networks (NPN)

5G NPNs may operate using a variety of spectrum bands, depending on the deployment model, regulatory approvals and the nature of the use case. The choice of spectrum affects performance characteristics such as coverage, capacity, latency and coexistence with existing public networks, in line with national licencing requirements and spectrum outlined for 5G by the ITU-R (ITU-R M.1036) and 3GPP (3GPP TS 38.101).

The key bands are summarised as shown in Table 2.

Table 2. Spectrum bands and their potential applications

Frequency range	Usage model	Potential applications
600 MHz - 900 MHz	Licenced or shared	Wide-area Internet of Things (IoT), smart agriculture
3.4 GHz - 3.8 GHz	Licenced or shared	Industrial automation, smart cities
3.7 GHz - 4.2 GHz	Licenced	High-capacity enterprise networks
26 GHz, 28 GHz	Licenced	Ultra-low latency, factory automation
5 925 MHz - 7 125 MHz	Unlicensed	Indoor NPNs, campus networks

A number of different usage models may be deployed, utilising licensed or unlicensed spectrum.

5.3.1 Licensed spectrum

Licensed spectrum may be deployed under different usage models depending on the spectrum access and operational arrangement. The following subclauses describe the applicable models.

a) Dedicated spectrum

Spectrum is obtained directly from the regulator and the network operates as a SNPN. This has the advantage of offering security, high reliability and the ability to manage QoS independently. However, this requires a considerable investment in infrastructure.

b) Shared spectrum

Spectrum is licenced under and shared with an incumbent operator. It can be provided by network slicing, spectrum leasing (generally in a given geographical location) or a hybrid model. Dynamic Spectrum Sharing (DSS) may also be deployed. An alternative is where spectrum is shared amongst a number of NPN providers. This has the advantage of maximising the usage of spectrum.

c) Unlicensed spectrum

Licence-exempt bands such as 5 GHz or 6 GHz are utilised. This is suitable for deployments that wish to reduce costs, are small in scale or are operating in geographically isolated areas, however they may be subject to interference issues.

5.3.2 Spectrum usage

Global best practices highlight creating diverse and flexible spectrum access for 5G NPNs to lower entry costs while maximising the efficiency of spectrum usage and deployment. Many countries follow a dedicated spectrum allocation, with mid-bands (band n78) and mmWave bands (band n257) being the most commonly allocated.

Countries including Japan (band n79, band n257), South Korea (part of band n79), UK (band n77, band n258), France (band n41) and Germany (part of band n77) have allowed enterprise providers to obtain local licences for operation of NPNs. This is also the case in the United States with its usage of the Citizens Broadband Radio Service (CBRS) band n48 for deployment of NPNs.

With reference to Malaysia, MCMC has allocated band n79 (MCMC SRSP MS 4700 2 July 2025) for private network usage under Apparatus Assignment (AA) licensing condition.

Regulators are providing transparent guidelines for NPN spectrum availability, application processes, technical requirements such as power limits and interference mitigation, as well as rules for coexistence.

The following bands are those currently applicable in Malaysia for the deployment of NPN in IMT-2020:

Table 3. Spectrum bands for NPN in Malaysia

Frequency range	Spectrum type	NPN Type
703 - 743 MHz/ 758 - 798 MHz	Shared spectrum	PNI-NPN/SNPN
3.4 GHz - 3.6 GHz	Shared spectrum	PNI-NPN/SNPN
4.7 GHz - 4.8 GHz	Dedicated spectrum	SNPN

Frequency range 703 MHz - 743 MHz, 758 MHz - 798 MHz and 3.4 GHz - 3.6 GHz are currently allocated to IMT-2020 network providers for the deployment of 5G IMT-2020 networks. Any consideration for NPN shall be based on agreement between the NPN service and the respective licenced IMT-2020 network providers, under approval from MCMC.

In the case of frequency range 4.7 GHz - 4.8 GHz, a service provider can directly apply to MCMC for an AA to operate the NPN service.

Any use of spectrum shall comply with the relevant MCMC Standard Radio System Plan (SRSP), in addition to MCMC Spectrum Plan and the Communication and Multimedia (Spectrum) Regulations 2000.

5.4 Quality-of-Service (QoS) of vertical use case

5G NPNs may achieve isolation from public networks through different implementation methods depending on the network architecture and deployment model. The following methods describe the approaches used to establish such isolation.

a) Logical network resource isolation

Resource allocation mechanisms prevent direct communication between the NPN and public network functions, even when both operate on the same physical infrastructure.

b) Physical network resource isolation

Separate physical network resources are dedicated exclusively to the NPN, establishing complete separation from the public network.

The level of compliance for the critical service attributes of E2E latency and reliability relative to the system architecture and specifications is described in Table 3.

Table 3. Level of compliance for service attributes of QoS based on types of 5G NPN

Architecture and specification	Compliance	Service attribute of QoS	
		E2E Latency	Reliability
SNPN	High	Physical network resource isolation	
PNI-NPN using RAN sharing	High/medium	a) Logical network resource isolation in the shared RAN with efficient resource allocation b) Physical network resource isolation other than shared RAN	
PNI-NPN using RAN and control plane sharing		a) Logical network resource isolation in the shared RAN with efficient resource allocation b) Physical network resource isolation other than shared RAN and control plane	
PNI-NPN using E2E network slicing	Medium/low	a) Logical network resource isolation b) Distance between enterprise premise and public network facilities	a) Logical network resource isolation b) Depending on service requirement level
Note: High, Medium, Low for E2E latency and reliability criteria will be subject to network configuration and design.			

QoS can be further used to ensure reliable and optimised connectivity for various enterprise applications and services. 5G QoS is managed using 5G QoS Identifiers (5QI), which define traffic handling characteristics such as latency, priority and packet loss. Standardised 5QI values are specified for services that are assumed to be frequently used and thus benefit from optimised signalling by using standardised QoS characteristics. In summary, 5QI values can be either Guaranteed Bit Rate (GBR) or Non-GBR.

The network allocates dedicated bandwidth for GBR bearers to guarantee the minimum data rate for specific applications, such as industrial control and real-time video. Meanwhile, non-GBR bearers do not have a guaranteed minimum bandwidth and share resources with other traffic for applications such as internet browsing, file downloads and email. Further description of 5G QoS can be found at MCMC MTSFB TC G027.

5G NPNs are driven by the need for improved service reliability and reduced latency. Table 4 shows standardised 5QI values that are relevant to 5G NPN to achieve the application requirement.

Table 4. 5QI for IMT-2020 (Release 18) NPN service usages

5QI	5QI service type	Priority	Delay budget (ms)	Packet error rate
1	Real-time voice	20	100	10^{-2}
2	Real-time video	40	150	10^{-3}
3	Process automation monitoring	30	50	10^{-3}
5	Internet Protocol Multimedia Subsystem (IMS) signalling	10	100	10^{-6}
6	Video streaming	60	300	10^{-6}
9	Internet (e.g. File Transfer Protocol (FTP), HyperText Transfer Protocol (HTTP))	90	300	10^{-6}
65	Mission Critical user plane Push-To-Talk voice	7	75	10^{-2}
75	Automotive Vehicle to Everything (V2X)	25	50	10^{-2}
80	Augmented Reality (AR)	68	10	10^{-6}
82	Delay critical discrete automation	19	10	10^{-4}

Application requirements based on 5QI require the E2E architecture of the 5G NPN, such as transport, core, and edge computing, to be designed according to the NPN types outlined in Clause 5. QoS may be applied to prioritise applications or services in standalone operation or within a 5G network slice.

5.5 Security

Industrial deployments necessitate strong privacy and security to meet critical requirements such as data confidentiality, data integrity (through authentication and access authorisation), dependability, and overall trustworthiness. Privacy in this setting refers to the ability to determine data dissemination, and security provides assurance that these determinations are upheld.

Given the diverse policies across industries and deployment scenarios, the extent of privacy is primarily shaped by the level of data, control, and management isolation for both physical and logical aspects of the network. The security features not related to the system architecture and specification deployment can be found in MCMC MTSFB TC G028. Table 5 describes the data privacy and security types across the various NPN system architectures and specifications.

Table 5. Type of privacy and security based on 5G NPN architectures and specifications

Architecture and specification	Privacy and security
SNPN	a) Data fully resides at the campus or enterprise production domain b) Spectrum, device authentication and assets are the sole responsibility of the enterprise
PNI-NPN using RAN Sharing	a) Data fully resides at the campus or enterprise production domain b) Spectrum and radio assets are the responsibility of the network operator c) Device authentication and core network assets are the responsibility of the enterprise
PNI-NPN using RAN and control plane sharing	a) Data fully resides at the campus or enterprise production domain, except subscriber information. b) Spectrum, radio with partial core assets and device authentication are the responsibility of the network operator c) User plane core network assets are the responsibility of the enterprise
PNI-NPN using E2E network slicing	a) Data at enterprise is accessible via firewall b) Spectrum, device authentication and assets are the sole responsibility of the network operator

6. Reference deployment

5G NPN deployments have been implemented in Malaysia across several industries to enhance operational efficiency, safety, and innovation. This clause presents two (2) case studies of implemented 5G NPN deployments in Malaysia and describes the respective architectures used. The case studies are as follows:

a) energy sector; and

b) manufacturing sector.

6.1 Energy sector innovations

An established oil and gas company has been at the forefront of adopting 5G NPN to modernise its operations at several sites within Malaysia. A 5G NPN is a transformative technology for the oil and gas industry, offering secure, high-speed, and low-latency connectivity to support mission-critical operations. The case study information and benefits are tailored for the industry’s unique challenges as discussed below and summarised in Tables 6 and 7.

Table 6. Energy sector 5G NPN solution description

Case study topics	5G NPN Description
Network	5G NPN
Focus	Support mission-critical operations
Purpose	Streamline workflows, automate data collection, and enhance safety measures across the energy plant.
Background	Partnering with local 5G operators, the company established Malaysia's first 5G NPN and has provided coverage at one of the world's largest liquefied natural gas facilities.
Problem	Operational efficiency and safety challenges
Solution	5G SNPN supporting Mission Critical Data (IoT)
Architecture type	SNPN
Description	A SNPN was implemented to connect IoT sensors, autonomous drones, and worker wearables while maintaining local edge computing for real-time analytics. The same network could extend to monitor pipelines leading to onshore facilities, ensuring integrated and seamless operations.
Devices	IoT sensors, autonomous drones, and worker wearables
Subscriber Identity Module (SIM) card	Special SIM card designed to access a 5G SNPN that: a) works within the confines of the energy company's premise; and b) cannot connect to the PLMN

In conclusion through strategic deployments and collaborations, the energy industry is leveraging private 5G networks to drive digital transformation, enhance operational efficiency, and improve safety standards within the oil and gas industry. These initiatives not only position Malaysian industry as a leader in technological adoption but also set a benchmark for the energy sector's evolution in the digital age.

6.2 Smart manufacturing

The integration of private 5G networks into smart manufacturing in Malaysia is demonstrated through a collaboration between a mobile operator and a leading automotive infotainment manufacturer. This deployment represents the country's first implementation of a private 5G network in the manufacturing sector. The implementation approach and associated benefits addressing the industry's operational requirements are summarised in Table 8 and Table 9.

This case study underscores the transformative impact of private 5G networks in the manufacturing industry, highlighting how strategic collaborations and advanced technologies can lead to significant improvements in operational performance.

Table 7. Manufacturing industry 5G NPN solution description

Case study topics	5G NPN Description
Network	5G NPN
Focus	Smart manufacturing, IR 4.0 for optimum productivity
Purpose	To enhance production efficiency and agility through the digitisation of the manufacturer’s production line
Background	Establishment of Malaysia’s first smart manufacturing solution using private 5G network
Problem	Operational efficiency and technological integration
Solution	5G standalone NPN, technological integration
Architecture type	SNPN
Description	The deployment involved the installation of a SNPN, facilitating seamless integration of smart manufacturing technologies with the manufacturer’s existing ERP systems. This setup enabled real-time data transmission and analysis, leading to improved decision-making and operational efficiency.
Devices	IoT sensors, Autonomous Mobile Robots (AMRs)
SIM card	Special SIM card or embedded Subscriber Identity Module (eSIM) designed to access a dedicated 5G NPN

The successful deployment of private 5G networks in collaboration with industry partners sets a precedent for the adoption of advanced technologies across various sectors in Malaysia. These initiatives not only enhance operational efficiency but also position Malaysia as a leader in industrial digitisation within the Southeast Asian region.

6.3 Observation of 5G NPN architecture

Private 5G networks enable enterprises to support automation, real-time data processing, and improved operational efficiency. There are four (4) types of 5G NPN architecture that may be implemented as described in Clause 5. The two (2) case studies presented in this clause utilise the first 5G NPN architecture, namely SNPN.

Both deployments are based on the SNPN architecture and are implemented using a solution commonly referred to by the industry as 5G-in-a-box. This solution refers to a compact and integrated deployment that provides the core infrastructure required for a private 5G network in a simplified and modular form.

Key features of the 5G-in-a-box SNPN architecture include the following:

a) Simplified deployment

The 5G-in-a-box solution integrates core network functions, base stations, and software into a compact and portable system. This integration reduces deployment complexity and enables faster network implementation.

b) Enterprise-grade scalability

The solution supports scalability to accommodate larger industrial deployments. Additional modules may be deployed to support increased network capacity or operational requirements.

The 5G-in-a-box solution provides the following benefits:

a) Cost efficiency

The solution reduces initial deployment costs compared to conventional 5G network infrastructure.

b) Rapid deployment

The modular and integrated design enables faster network deployment with reduced infrastructure requirements.

c) Customisation

The solution may be configured to meet specific enterprise requirements such as coverage area, device density, and bandwidth.

Annex A
(normative)

Normative references

MCMC MTSFB TC G027:2023, *IMT-2020 (Fifth Generation) - System Architecture and Specifications (First Revision)*

Recommendation ITU-R M.2083-0, *IMT Vision - Framework and overall objectives of the future development of IMT for 2020 and beyond*

Recommendation ITU-R M.2160-0, *Framework and overall objectives of the future development of IMT for 2030 and beyond*

Recommendation ITU-T X.1813, *Security and monitoring requirements for operation of vertical services supporting ultra-reliability and low-latency communication (URLLC) in IMT-2020 private networks.*

Recommendation ITU-T Y.3100, *Terms and definitions for IMT-2020 network*

Recommendation ITU-T Y.3128, *Requirements for network function communication between public networks and public network integrated non-public networks in IMT-2020*

3GPP Release 19: TS 22.104, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Service requirements for cyber-physical control applications in vertical domains; Stage 1*

3GPP Release 18: TS 22.261, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Service requirements for the 5G system; Stage 1*

3GPP Release 18: TS 23.251, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Network Sharing; Architecture and functional description*

3GPP Release 18: TS 23.501, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; System architecture for the 5G System (5GS); Stage 2*

3GPP Release 18: TS 28.557, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Management and orchestration; Management of Non-Public Networks (NPN); Stage 1 and stage 2*

3GPP Release 17: TR 23.700-07, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on enhanced support of Non-Public Networks (NPN)*

3GPP Release 17: TR 26.805, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on Media Production over 5G NPN Systems*

3GPP Release 18: TR 28.828, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on charging aspects for enhanced support of non-public networks*

3GPP Release 18: TR 33.858, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on security aspects of enhanced support of Non-Public Networks (NPN) phase 2*

3GPP Release 18: TR 23.700-08, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on enhanced support of Non-Public Networks; Phase 2*

GSMA, "Private 5G Industrial Networks: An Analysis of Use Cases and Deployment", June 2023

Annex B
(informative)

Abbreviations

5G	Fifth Generation
5QI	5G Quality of Service Identifiers
AMF	Access and Mobility Management Function
AMR	Autonomous Mobile Robots
APN	Access Point Names
AR	Augmented Reality
AUSF	Authentication Server Function
CBRS	Citizens Broadband Radio Service
DSS	Dynamic Spectrum Sharing
E2E	End-to-End
eSIM	embedded Subscriber Identity Module
FTP	File Transfer Protocol
GBR	Guaranteed Bit Rate
gNB	Next Generation Node B
HTTP	HyperText Transfer Protocol
IMS	Internet Protocol Multimedia Subsystem
IoT	Internet of Things
MCC	Mobile Country Code
MNC	Mobile Network Code
MNO	Mobile Network Operator
NID	Network Identifier
NPN	Non-Public Network
NRF	Network Repository Function
PLMN	Public Land Mobile Network
PLMN ID	Public Land Mobile Networks Identifier
PN	Public Network
PNI-NPN	Public Network Integrated Non-Public Network
QoS	Quality of Service
RAN	Radio Access Network
SIM	Subscriber Identity Module
SMF	Session Management Function
SNPN	Standalone Non-Public Network
SNPN	Standalone Non-Public Network Identifier
UDM	Unified Data Management
UDR	Unified Data Repository
UDSF	Unstructured Data Storage Function
UE	User Equipment
UPF	User Plane Function
V2X	Vehicle-to-Everything

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