

Recommended 5G SIM: Unlocking the benefits and opportunities of 3GPP Release 17

About Trusted Connectivity Alliance



Trusted Connectivity Alliance (TCA) is a global, non-profit industry association, working to enable trust in a connected future.

VISION: To drive the sustained growth of a connected society through trusted connectivity which protects assets, end user privacy and networks.



Market Monitoring

Specifications and Interoperability

Industry Engagement and Strategy

Education

Our Membership



Founding:

Giesecke+Devrient
Creating Confidence

IDEMIA

ST
life.augmented

THALES

Valid

Executive:

Kigen

NXP

Full:

CARD CENTRIC SOLUTIONS LTD.
CARD CENTRIC

东信和平
EASTCOMPEACE

Linxens
crafting the future of connections

OASIS
smart sim
Embed. Connect. Activate

Qualcomm

TANYU

WORKZ

Ordinary:

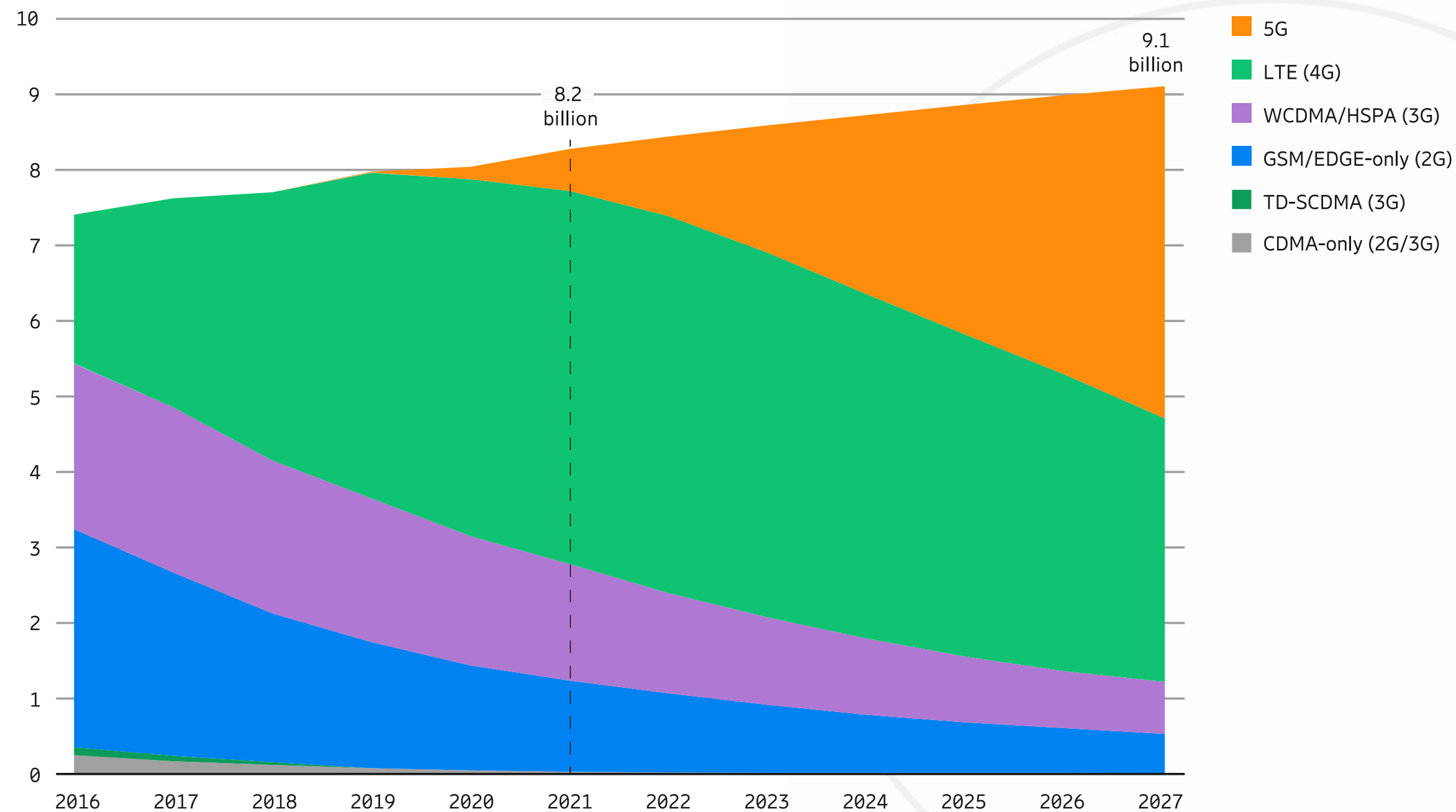
COMPRION



The Recommended 5G SIM



5G Rollout is Advancing



Source: Ericsson Mobility Report, Q1 2022

Expectation by 2025

- 5G networks to cover one-third of the world's population(*)
- Significant uptake, despite LTE remaining the leading technology

5G deployed in 54 countries with 121 active networks(+)

Many new markets and services:

- URLLC & MTC to provide significant expansion in automotive and IoT markets
- Enabling XR services to enjoy contents anywhere anytime
- To become leading technology in 5G Cellular Private Networks

(*) Feb.2022, GSMA
(+) May. 2022, Ericsson

Introduces new, significant challenges for security & privacy

What is the Recommended 5G SIM?



The SIM / eSIM is the only platform which can be used to secure 5G network access according to 3GPP – the 5G standardisation body.

The TCA's 'Recommended 5G SIM' document helps MNOs maximise investments in their 5G network infrastructure and promote the highest levels of trust and functionality.

- TCA first defined the Recommended 5G SIM in December 2018 to outline which technical features of SIM technology address the challenges MNOs face, beyond network access, when migrating to 5G.
- In 2021, the TCA enhanced the Recommended 5G SIM to align with new use cases introduced by 3GPP's Release 16 for phase 2 5G deployments.
- The Recommended 5G SIM has now been updated to align with new features defined in 3GPP Release 17.



**2021 showed
continuous
increase of
5G SIM
deployments**

5G USIM:
A key component
within the 5G security
architecture





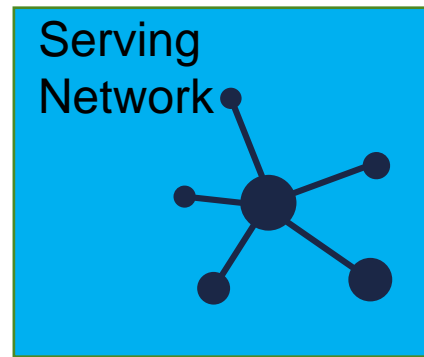
5G: Highly Flexible Architecture

Entails a complex security challenge



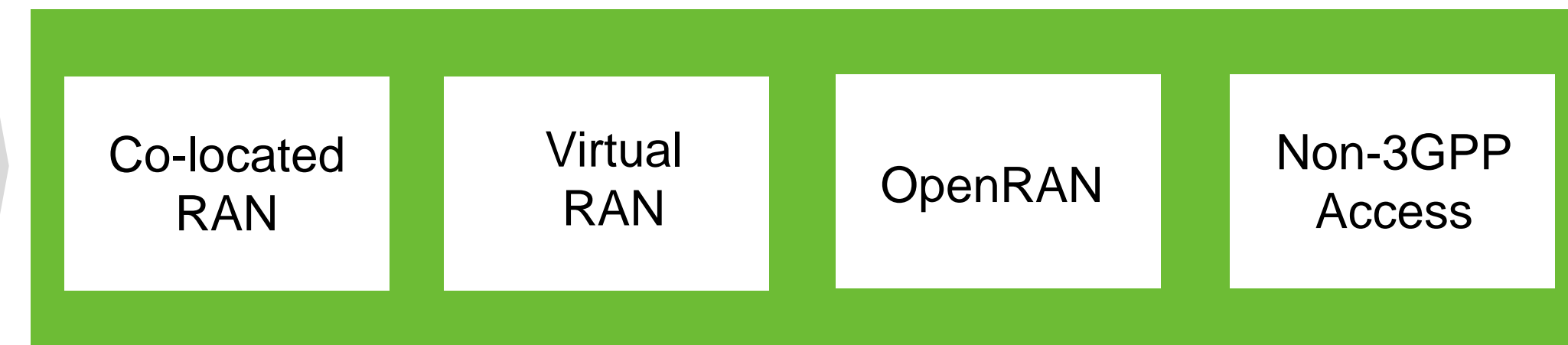
Home Network (HPLMN):

- Dedicated function for Credential Storage & Processing
- Dedicated function for Unified User Data Management
- Dedicated function for Subscriber Identifier (SUCI deconcealment)
- Policy control function to delegation



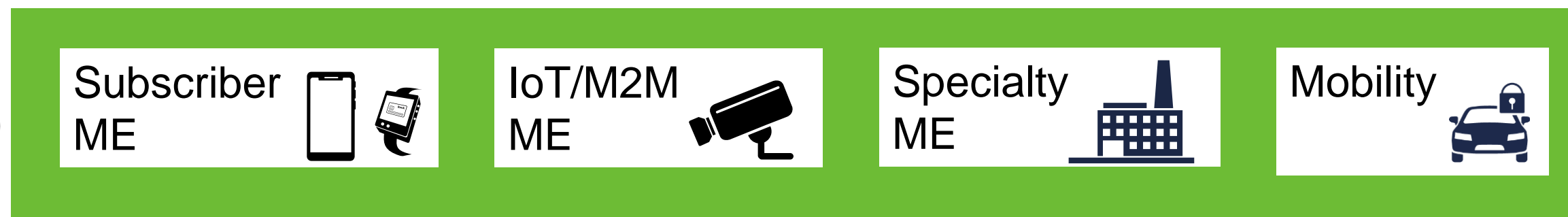
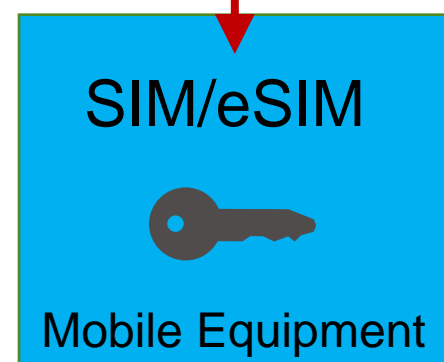
Serving Network(s)

- Multiple business models
- Dedicated Anchor Key (K_{SEAF}) for improved service level (K_{SEAF} provided by Home Network)
- Secondary authentication for service specific purpose



RAN Options

- Different radio technologies
- Trusted / un-Trusted
- 5G-NR and non-3GPP



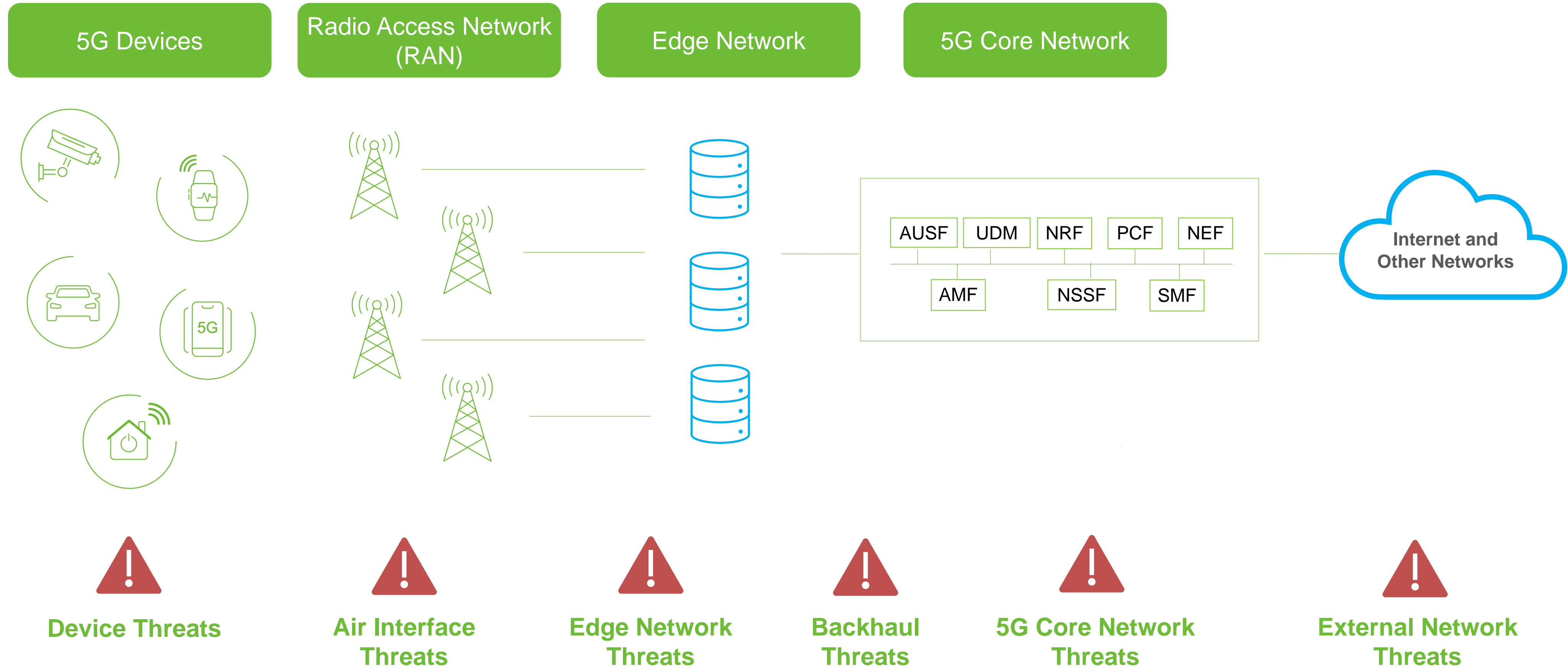
Large Variety of Mobile Equipment (ME):

- Personal device, multi-device
- IoT/M2M
- Automotive/transportation



5G Threats

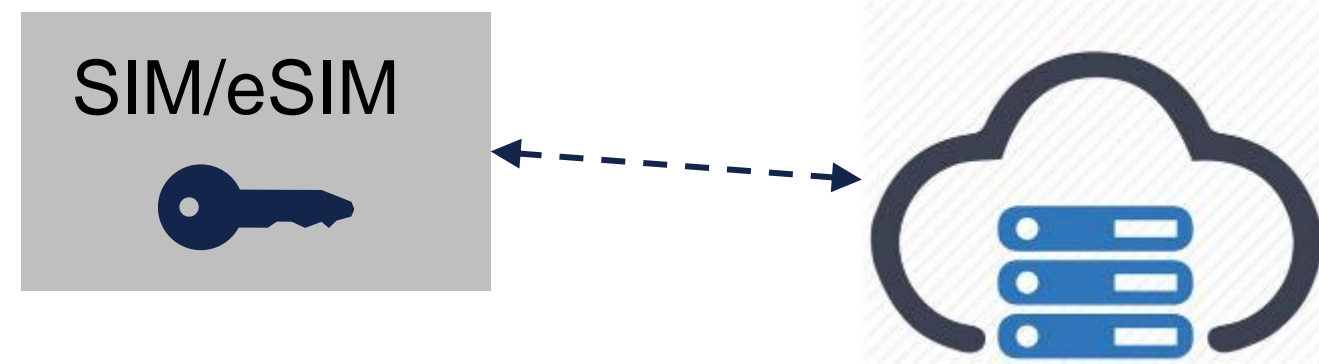
A wide range of threats across the whole system





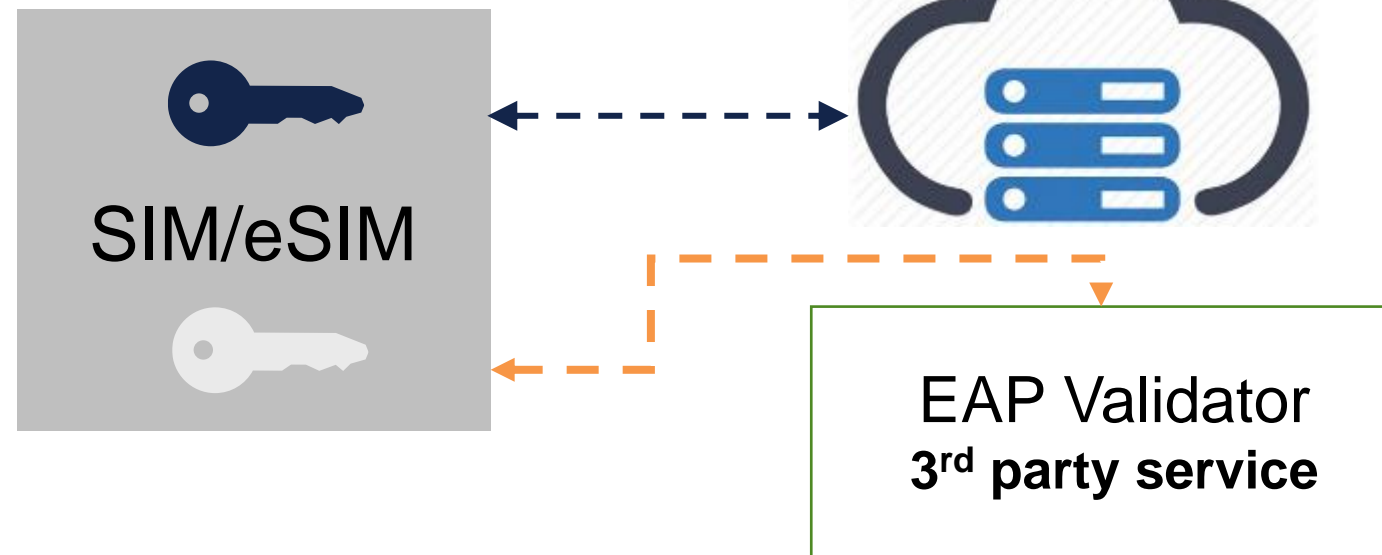
5G Authentication Flexibility

For different network configurations and services



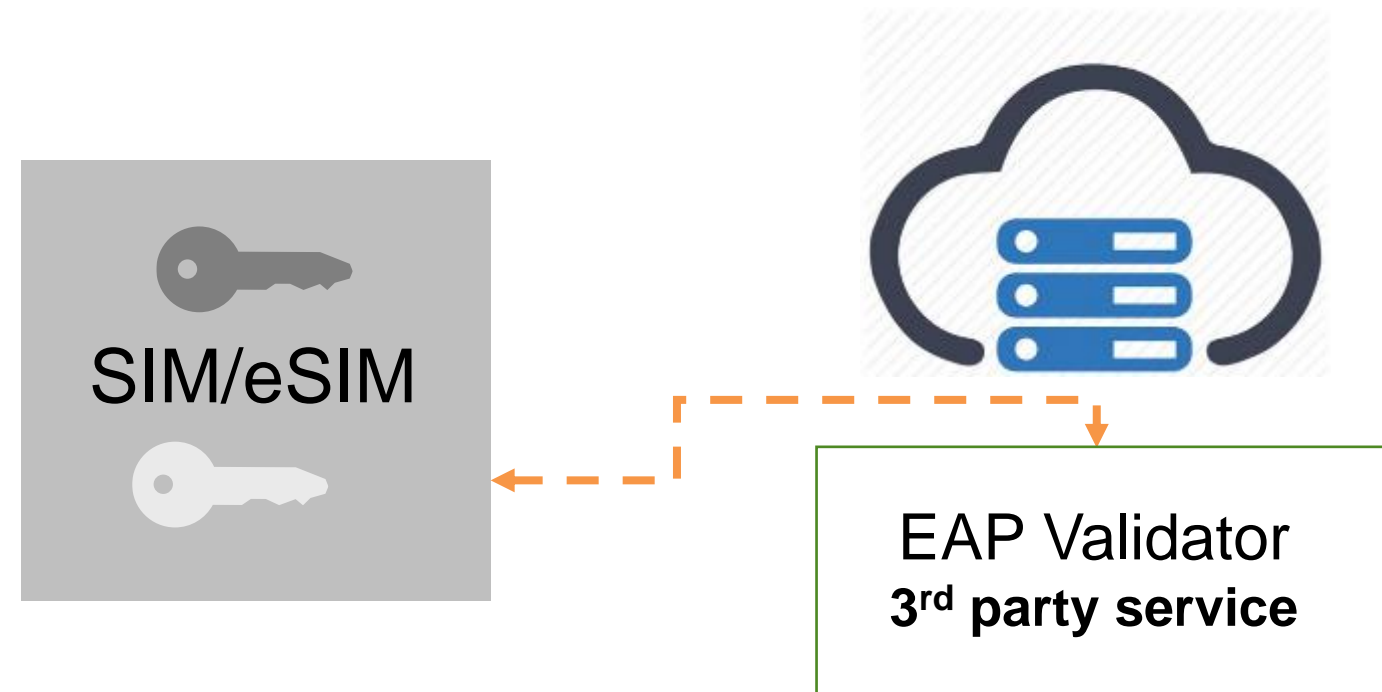
5G-AKA

- Primary authentication based on USIM stored credentials to authenticate to 5G Public Network.
- User authentication not delegated when accessing from visiting network to reduce security risks.



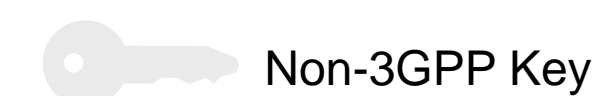
EAP-AKA

- Enablement of 3rd party services with comparable security level to 5G-AKA.
- Authentication for devices that are not “identified by IMSI”.



EAP-TLS

- Allows secure access to non-3GPP networks (private networks, IoT).
- Provides useful security facilities including certificate storage and validation, and session key establishment.



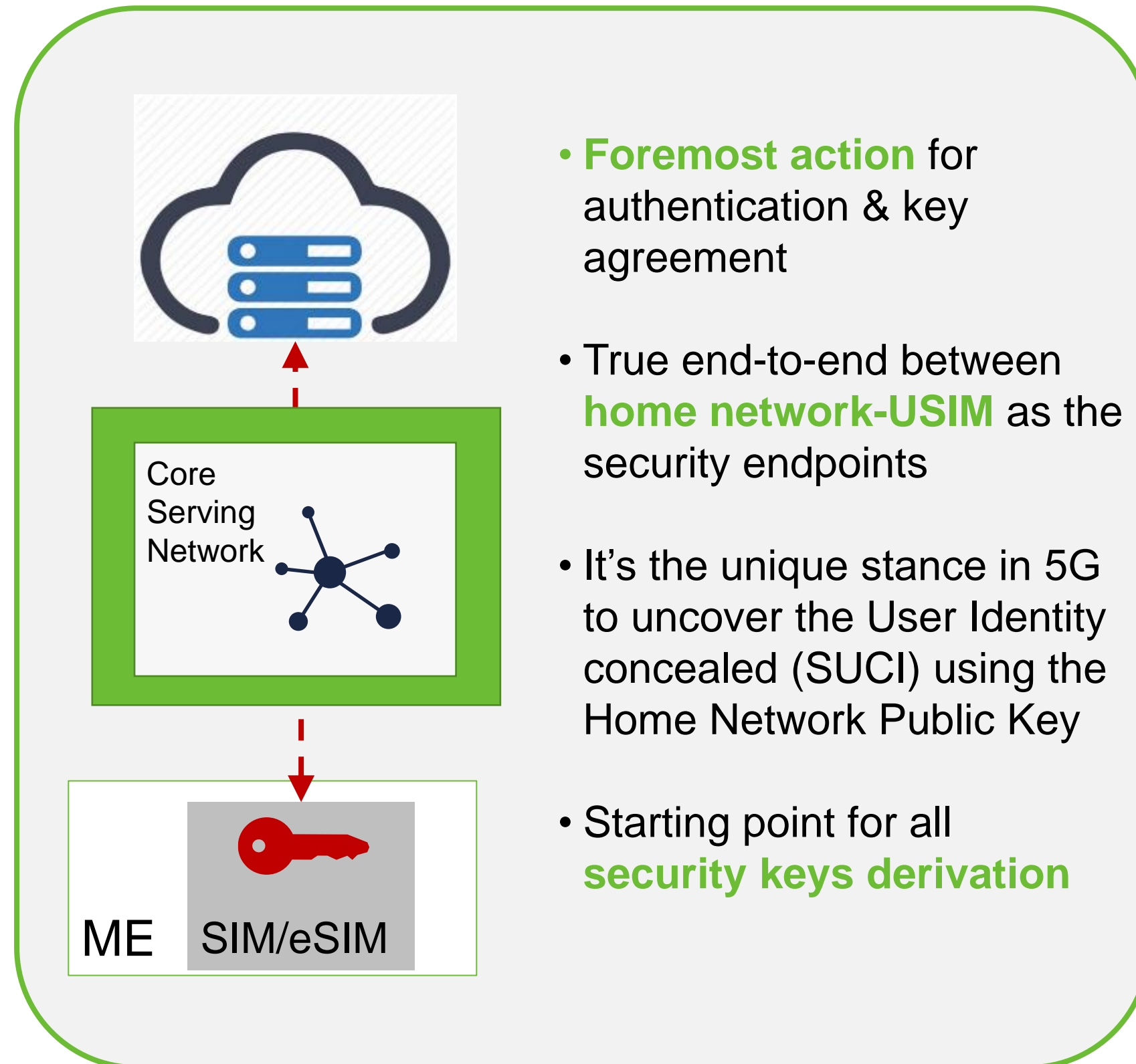


5G Authentication for Network Access

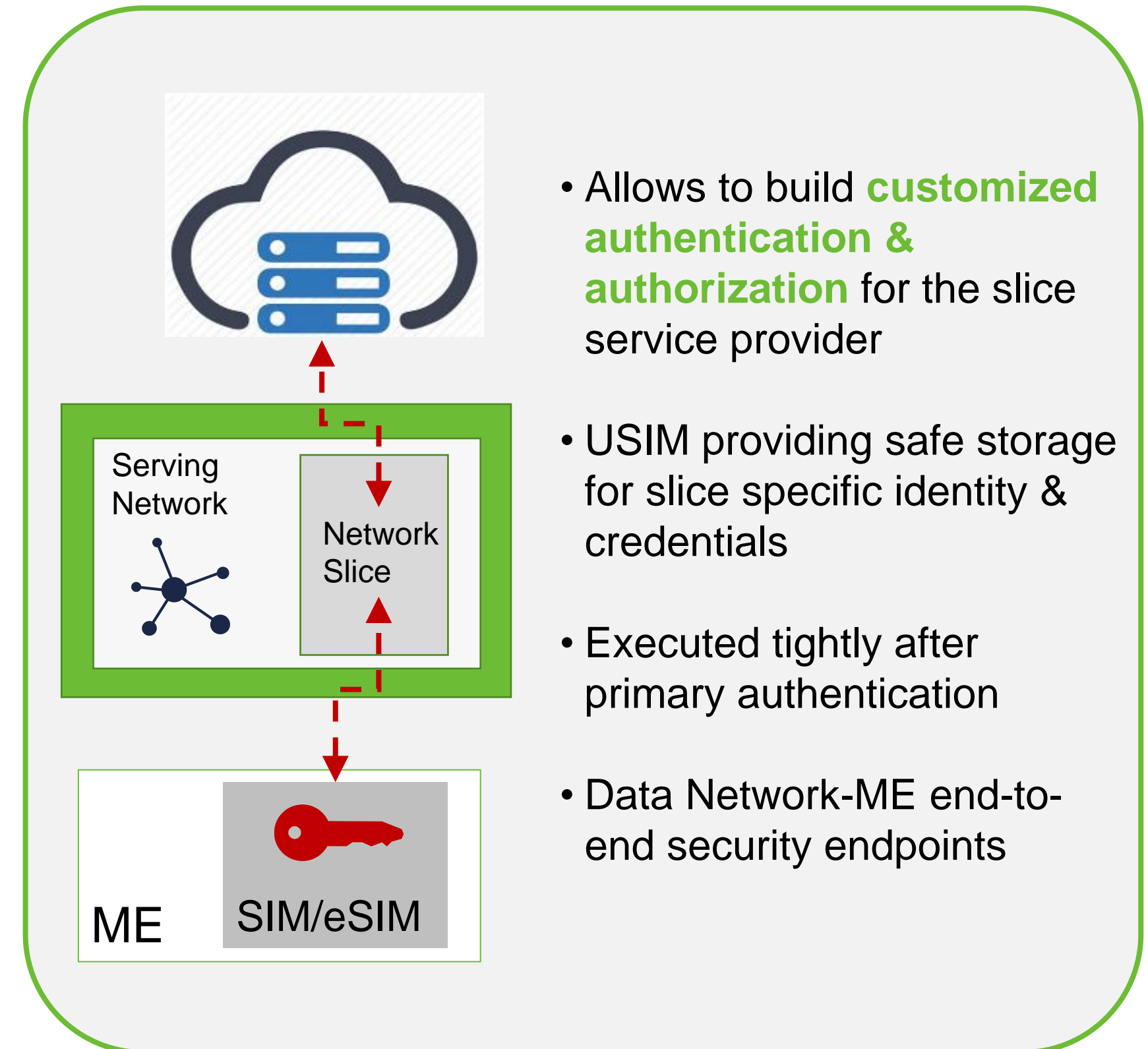
With targeted approach



Primary Authentication



Network Slice Authentication



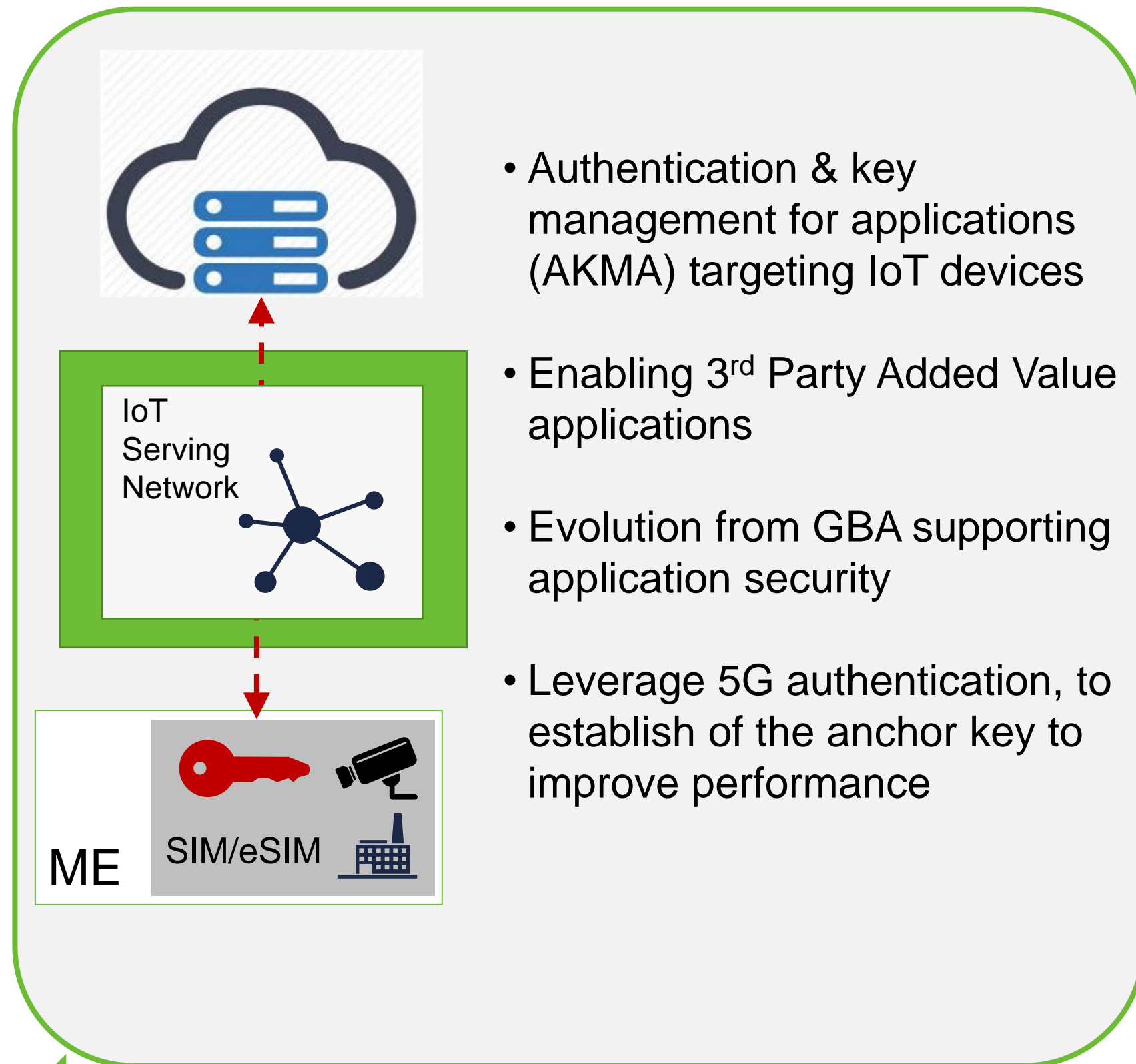


5G Authentication for Value Added Services

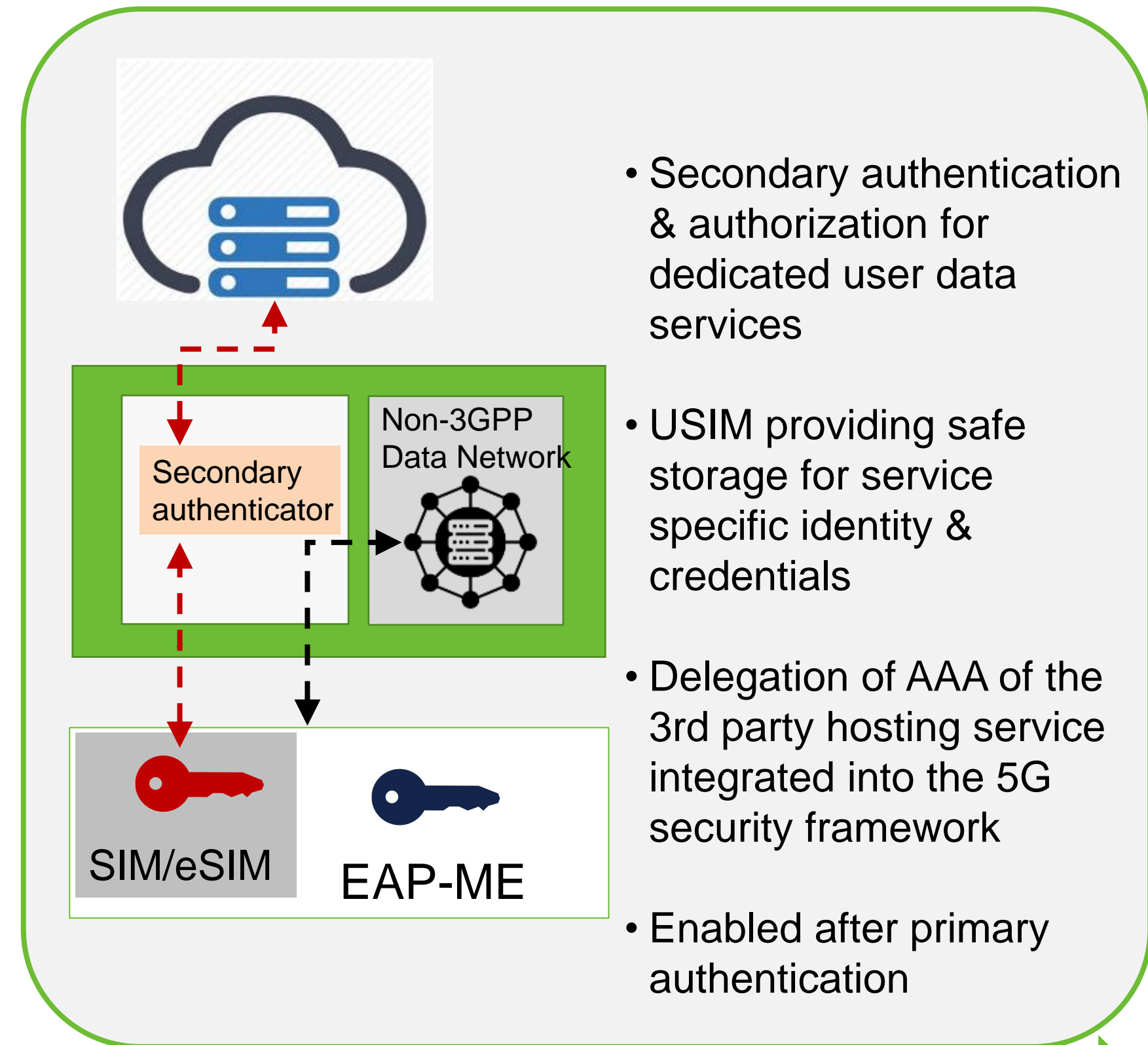
Providing higher security level to 3rd party applications



Application Specific Authentication



Secondary Authentication



USIM providing safe storage of security context



Recommended 5G SIM: Evolving with Network Architecture



Release 15 (R15)

R15 5G SIM

- Baseline NR to support Enhanced Mobile Broadband (eMBB) and Ultra-Reliable Low Latency Communication (URLLC) for vertical use cases.
- Guidance provided in the [TCA technical document](#) - 3GPP Prel.15 5G SIM Card: A Definition, November 2018



Release 16 (R16)

R16 5G SIM

- Enhanced the support for eMBB and URLLC broadband & vertical use cases
- Update to features introduced by 3GPP Rel.16 for 5G Phase 2: [TCA Recommended 5G SIM: A Definition, February 2021](#)
- Backwards compatible with 5G Phase 1 (3GPP Rel.15)



Release 17 (R17)

R17 5G SIM

- Expanded market reach for 5G: satellite, IoT services, public safety & mission critical services, UAV enhancements, cyber-physical industrial control, asset tracking, enhanced roaming and energy efficiency, network controlled interactive services, support multiple USIM per UE.
- Updated to respond to powerful features introduced by 3GPP Release 17 for 5G.



5G Advanced Opportunities and Challenges



Great potential for wide range of service models

- High performance network access for consumer smartphones/wearables
- Enhanced Broadband Fixed-Wireless-Access (FWA)
- Ultra-low latency/ultra-reliable connection for critical industrial, automotive and health
- Capability to serve large number and type of network endpoints for differentiating services
- Network Slicing and dedicated Private Networks for customized network access

Scalable framework

- Service Based Architecture (SBA)
- Single-purpose Network Functions (NF)
- Virtualization of NF ingrained in scalable Cloud infrastructure

New security challenges

- SBA 'exposes' the 5G Core to major new vulnerabilities
- Zero Trust Architecture needed to comply with Cloud infrastructure
- Multiple RAN options, deployed with multiple business models (Open-RAN, co-location, virtualization)

Higher security level needed to reach full 5G potential

- Separation of provider applications ("control plane") from user applications ("user plane") to help segregate security functions
- Interconnection of NF via REST APIs based on HTTP/TLS, and Open Authorization (OAuth)

Unified Authentication (UA) across different network types

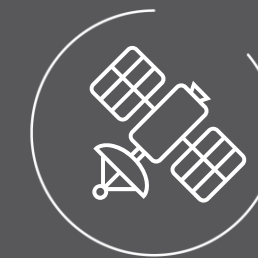
- Diversified security procedures to adapt to different configurations
- Protection of end-point Identity (user, IoT objects)
- UA suited for Public 5G, Private 5G (non-standalone/standalone), and non-3GPP networks

Recommended 5G SIM for Release 17: Features and benefits

Release 17: What is new?

The latest updates to the Recommended 5G SIM align with new features and enhancements introduced by 3GPP Release 17:

- An expanded New-Radio SideLink for growing IoT-use cases in the automotive industry.
- Ultra-reliable low latency services and RedCap (NR-Lite) for growing IoT, eHealth, public safety and mission-critical use cases.
- Improved roaming services for a financially effective, better subscriber experience.
- Unlocking mobile broadband and private 5G networks for homes and businesses.
- Supporting satellite telecoms for non-terrestrial connectivity.



Release 17 for 5G was published in September 2022 by 3GPP - the 5G standardization body.

[Click here to download the specification.](#)

5G SIM Features Available since Rel.16



[Recommended 5G SIM for Release 16 available to download here.](#)

Feature	Advantage	Recommended 5G SIM benefit
Improved Mobile Experience		
Networks slicing support	<ul style="list-style-type: none"> Easily build dedicated network offer thanks to 5G Network Slicing with tailored services. 	<ul style="list-style-type: none"> A standardized, cost-effective solution for network settings, ensuring proper configuration end-devices.
Multi-Device & Multi-Identity	<ul style="list-style-type: none"> Help users owning multiple devices to better organise & synchronize applications, data and events. Manage multiple identities on a single device, allowing different subscribers to call and message. 	<ul style="list-style-type: none"> 5G USIM supports Multi-Identity and Multi-Device capability.
Cellular V2X Communication		
	<ul style="list-style-type: none"> Improved Cellular V2X (C-V2X) technology through lower latency, greater responsiveness, higher reliability, and wider bandwidths 	<ul style="list-style-type: none"> 5G USIM supports V2X communication configuration, avoiding market fragmentation to ensure consistent V2X functionality.
Enhanced Subscriber Privacy		
	<ul style="list-style-type: none"> Subscription Permanent Identifier (SUPI) concealment protects the most prominent personal/device data Avoids sending in clear IMSI or NAI (Network Access Identifier) as for non-3GPP Radio Access Technologies 	<ul style="list-style-type: none"> SUCI concealment ensures true end-to-end security between home network and user USIM
Private Network Access		
	<ul style="list-style-type: none"> 5G is driving rapid growth in private network deployments dedicated to campuses and industrial districts, as well as industry 4.0 and factory automation. 	<ul style="list-style-type: none"> Delivers the same connectivity and privacy experience as for public networks. Ensures support across the different options for installing private 5G networks.

Secure Network Access

Improvements in Rel.17

Opportunity

- Non-Seamless WLAN Offload, supporting EAP-AKA with Concealed Identity (SUCI) calculation improvement

- AKA security enhancements

- Non-Access-Stratum configuration separating authentication counters for different PLMN

- 5GS eDRX procedure improvement with additional parameters stored in the USIM

Benefit from 5G SIM

- Allows MNO to securely offload traffic to WLAN avoiding user manual involvement, with better privacy

- Getting the network ready with higher resistance against future attacks

- Better security handling by having dedicated authentication context for each PLMN

- Significant improvement of handling of low power features, important for satellite networks, benefitting IoT devices

Roaming Services

Steering of Roaming (SoR) improvements in Rel.17

Opportunity

Optimization of roaming fees that remain an important revenue generator for MNOs

Improve network search / selection in roaming situation while being in Connected Mode. Research period optimized per services, separated for 5G VoNR and any applicative data connections.

It brings greater efficiency and improved roaming expenses for the MNO.

Introducing SoR for Satellite Networks to comply with their specificity:

- large area coverage, spanning multiple-countries
 - non-fixed location (except for geostationary constellation)
-

Disaster roaming thanks to the allocation of new, specific parameters.

Benefit from 5G SIM

Avoid full delegation of roaming authentication to Visiting network, reducing risk of billing frauds

Introduced new features in SoR for Connected Mode Control:

- Managing data application interruption (if, when)
- Re-start improvement

Business roaming policy can be stored in the USIM and updated by control plane layer.

Managing policy changes, via SIM card refresh command triggered by OTA or local applet.

The adaptation of SoR to the satellite roaming specifically makes the service ready usable

A much better definition network services in disaster area.

Opportunity

The GBA to support for 3rd party authentication is fully integrated as 5G Service Function, requiring no additional actions from the MNOs.

The fully-integrated GBA is being extended to support :

- Public safety
 - Edge Computing
-

5G Release 17 introduced support for access to non-3GPP networks:

- enabling "trusted" access to the non-3GPP Network
- providing tighter integration of 5G with industrial and corporate communication infrastructures.

Benefit from 5G SIM

The 5G SIM can act as an immediate enabler for the GBA services that are now integrated into the 5G architecture.

Support for 3rd party authentication is fully integrated as 5G Service Function, requiring no additional actions from the MNOs.

- Flexible authentication schemes allow to cope with a variety of use case
 - EAP-AKA Authentication can offer SIM-based high quality security services to non-3GPP network
 - EAP-TLS Authentication provides flexibility to integrated into existing infrastructure with possibility to enable a highly secure support by SIM.

Proximity Services (ProSe)

Improvements in Rel.17

Opportunity

Improvements of Proximity Services (ProSe) allow:

- Better scalability
- Better manageability
- Privacy
- Improved Battery efficiency

Public safety & Critical Communication will benefit from direct communication without infrastructure.

Additional positive impact on sectors:

- Advertising
- Traffic relaying for wearables
- Social and gaming

5G SIM enables the UE to use "operator-managed" radio resources.

Benefit from 5G SIM

5G SIM provides a secure and reliable storage of ProSe configuration parameters, managed by the Network Policy Control Function. 5G SIM offers also Secure Parameter provision.

Main parameters involved are:

- List of available ProSe Services
- Authorization policy, discovery and radio parameters for D2D communication in Home and public safety networks
- Authorization policy for network relay

Facilitates network testing and performance monitoring that are key requirements for IoT.

RedCap a.k.a. NR-Lite^(*)

New Radio for Reduced Capability Devices

Opportunity

Expansion of 5G to Low Tier UE

- Industrial wireless sensors networks
- Video monitoring
- Low-end Wearables
- Simple IoT Devices, usually power constrained

Same carrier for URLLC/NR-Lite, even in FR2

Addressed Verticals:

- Healthcare,
 - Smart Cities,
 - Transport & logistics,
 - Process automation,
 - Electrical distribution,
 - Building automation
-

Alternative to LTE LPWA mMTC (NB-IoT/Cat-M)

- Avoid the need to support multiple networks
- Brings all applications under the 5G umbrella
- Extended coverage, as it may use all 5G frequency bands, improving on the LTE frequency limitations

Benefit from 5G SIM

Power efficient 5G SIM is an ideal fit, in particular eSIM has a very small form factor and Bill of Material (BOM) saving iSIM. They bring a significant advantage for addressed applications.

Compatible with major NR-RedCap requirements:

- Low-power
 - Reliability 10^{-3} / 10^{-4} / 10^{-5}
 - Low latency 10ms-30ms
-

- A better integration and benefits from 5G core architecture enabling for slicing, QoS data flow control, VA applications, and privacy of objects for critical infrastructures

(*) This feature was initially known as as NR-Lite, then changed to NR-Light. It has been formalized in the standard as New Radio Reduced Capability **RedCap**

Opportunity

Rel.17 has improved the network support of Standalone Non-Public Networks (SNPN) for IoT user cases:

- SNPN Introduced support for credentials owned by 3rd party (credential holder) enhancement facilitating SNPN deployment.

Emergency services are supported

Benefit from 5G SIM

The 5G SIM is an enabler for SNPN deployment as it can act as Repository for Credential Holder.

- Rely on field proven 5G Public Network credential storage and authentication procedure as per 3GPP definition.
- Recommend the eSIM/iSIM remote profile provisioning as per definition of GSMA specification for better interoperability, security and service SLA.
- UICC is an enabler for Standalone Non Public Network switch: IMSI switch.

Enhanced Support of Industrial IoT

requiring Time Synchronous Communication Networks (TSC)

Opportunity

Rel.17 introduces uplink Time Sensitive Network

- Enabling UE-to-UE Time Sensitive Communication in Industrial application that have high security and safety requirements
-

Enablement of critical control application

- QoS and other parameters defined by the user application profile

Benefit from 5G SIM

Only 5G USIM performing a full 5G authentication can full-fill the security a safety needs of selected Industrial IoT applications, thanks to its highly secure access to 5G application profile

5G USIM offers crypto-box features for reliable and highly secure UE-endpoint application, able to fulfill specific needs:

- Device identity
- Root of Trust
- Application specific configuration

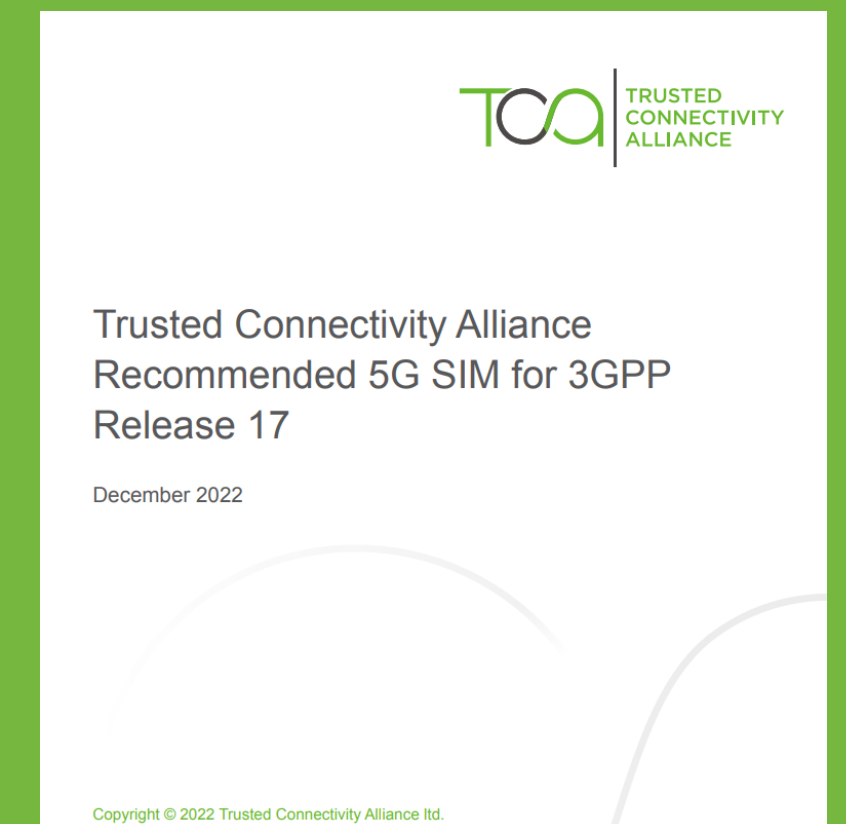
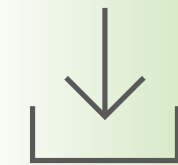
Key Conclusions

The 3GPP Release 17 brings to market many 5G features that can unlock significant opportunities for MNOs and service providers. **The Recommended 5G SIM definition fully endorses these updates.**

Yet the Release 17 features require a more sophisticated and higher level of security. **Only the 5G SIM can fulfill the challenges and complexities faced by MNOs as they enable new service opportunities provided by 5G Release 17-compliant networks.**

TCA strongly advocates for the adoption of the enhanced 5G SIM as it will enable MNOs to **unlock the full potential of 5G networks.**

[Click here to download the updated Recommended 5G SIM for Release 17](#)



For more information, please contact:
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