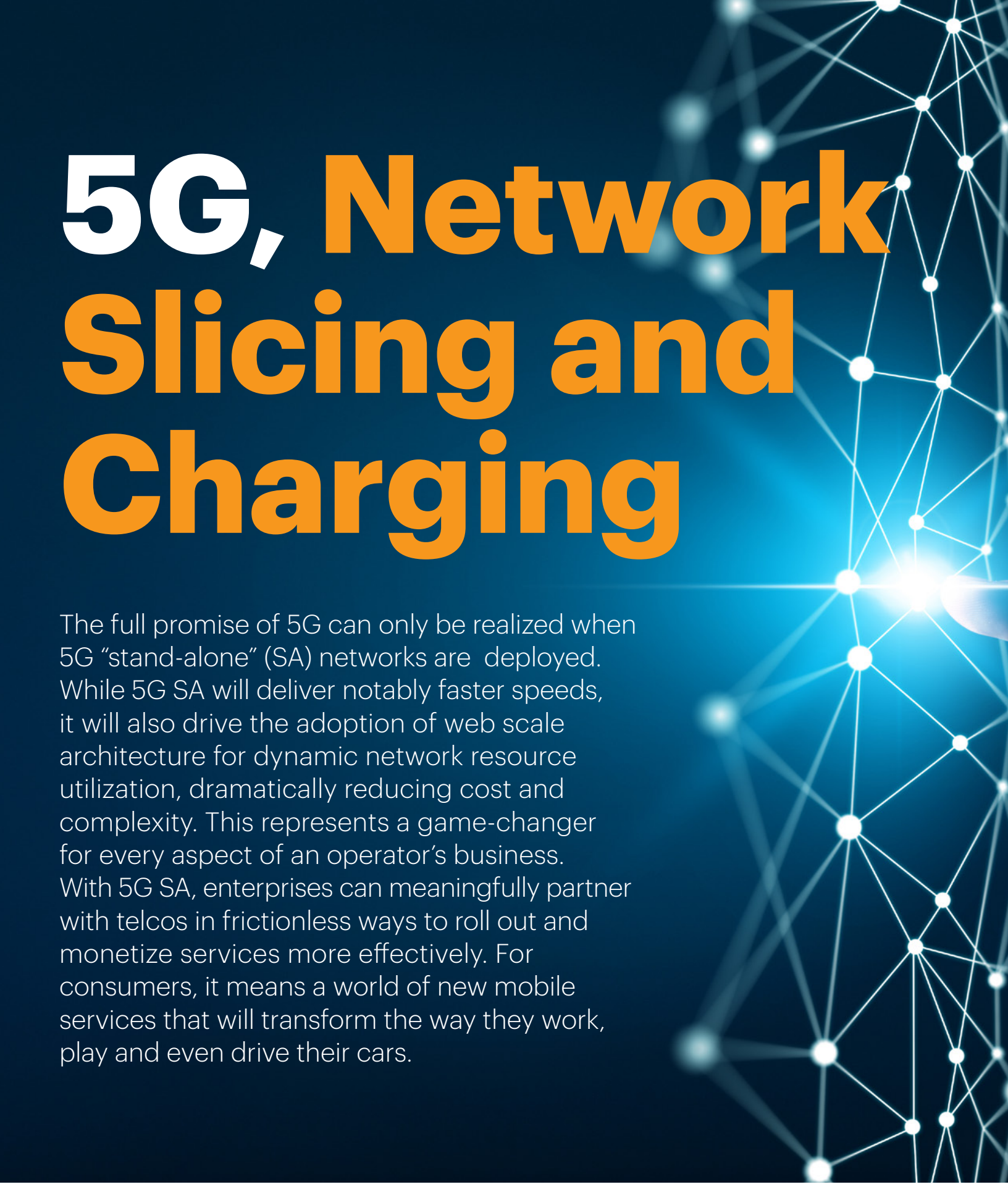
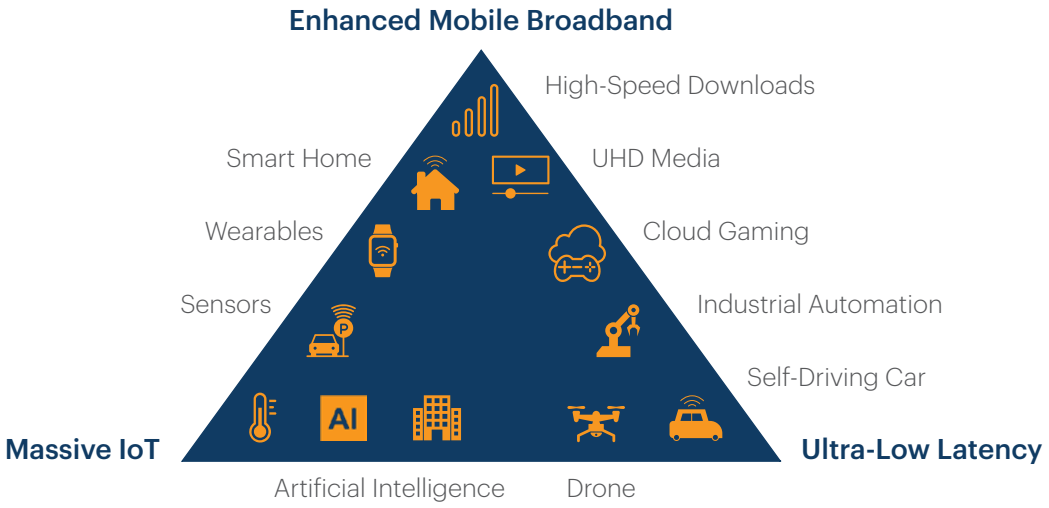
5G, Network Slicing and Charging



The full promise of 5G can only be realized when 5G "stand-alone" (SA) networks are deployed. While 5G SA will deliver notably faster speeds, it will also drive the adoption of web scale architecture for dynamic network resource utilization, dramatically reducing cost and complexity. This represents a game-changer for every aspect of an operator's business. With 5G SA, enterprises can meaningfully partner with telcos in frictionless ways to roll out and monetize services more effectively. For consumers, it means a world of new mobile services that will transform the way they work, play and even drive their cars.



Design Considerations for 5G Networks

One of the biggest differences between 5G and previous generations is how network services will be delivered. In the past, telco operators built their networks to provide best effort to every subscriber, which often meant overbuilding the network. Operators cannot afford to do the same for 5G.

Instead of attempting a one-size-fits-all network, operators need to strategically and selectively deliver network services by leveraging new technologies such as cloud-based architectures and network slicing. For the first time with 5G, the network is designed to rapidly and cost-effectively harness dynamic resources when and where they are needed, from enhanced mobile broadband (eMBB) to massive machine type communications (mMTC) to ultra-low latency (ULL).

Distributed Architecture
By decoupling the user and control planes, for example, telco operators will have the ability to selectively scale network capacity to take advantage of new network paradigms such as multi-access edge computing (MEC). A distributed architecture also presents new challenges, however, such as the need to provide session and charging continuity as sessions move across different networks and network elements.

Network Slicing
Enables operators to deliver a variety of different network services and experiences without changing the underlying network. Operators can expect to have hundreds or even thousands of different slices in their network as 5G evolves. There may be one slice for consumer eMBB that features exceptional speed and high bandwidths, another slice for IoT devices in the home with low bandwidth requirements, a third for IoT devices on the manufacturing floor that may require much more bandwidth, a fourth with ultra-low latency for autonomous vehicles, a fifth with low latency and high bandwidth for virtual reality gaming, ad infinitum.

Edge Computing
Instead of setting up individual points of presence with their own radio and core components, operators can now separate those components and place only what they need at the near or far edge of the network while centralizing control in the core. This is important for applications such as content delivery networks, which are much more efficient to operate closer to the media consumer, and private LTE networks that can reduce network congestion by intelligently routing local traffic at the edge rather than backhauling it through the entire network.

A World Where Everything Talks to Everything Else

For years, enterprises have implemented web scale technology in their own networks to reduce costs, increase agility and embrace innovation through open-source platforms. With 5G, telco operators are now doing the same, though on a much larger and admittedly more complex scale. With a web scale architecture, telco operators can realize a host of benefits, including:

- Flexibility to deploy software and services on common-off-the-shelf (COTS) servers;
- Ability to scale network functions up or down quickly using a microservices-based architecture;
- Rapid deployment of new services and streamlined lifecycle management as services are updated, scaled up, scaled down or retired;
- Standards-based APIs that support network automation.

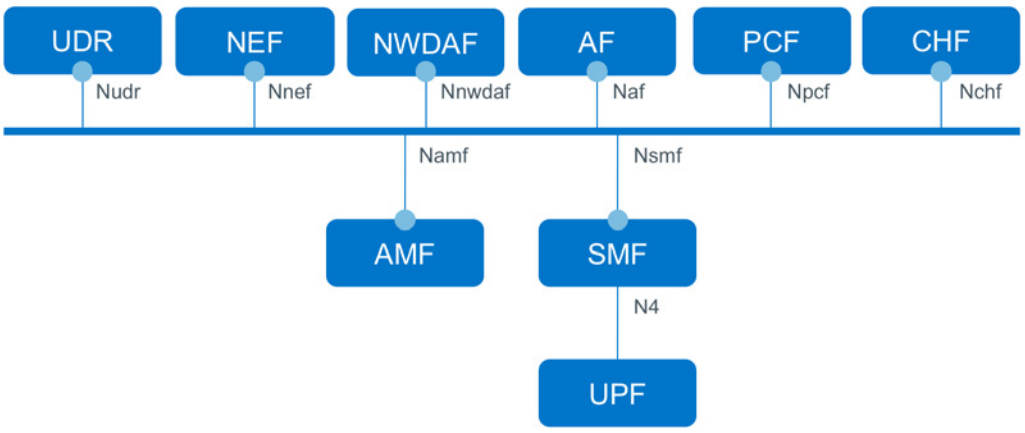
One important distinction between 5G and earlier-G networks is in the way that network elements communicate with each other.

Historically, telco networks have used point-to-point communications between purpose-built hardware. The result? If an element wanted to share information with another element, a dedicated connection between the two was required. This had the unfortunate effect of making most networks look like a spaghetti dinner with an alphabet soup of signaling protocols sprinkled on top.

5G resolves this problem by utilizing a service-based architecture that allows elements to simply publish and subscribe to any other element without requiring a dedicated point to point interaction. This opens up exciting new possibilities for network charging, as elements like the network exposure function (NEF) and network data analytics function (NWDAF) can unlock information that couldn't be easily shared before, creating new scenarios for revenue-generating services.

Policy and Charging Control... **Before**

... and **After**: 5G Service Based Architecture



3GPP Introduces New Charging Paradigms for 5G

As with past network transformations, the Third Generation Partnership Project (3GPP) has been an important industry voice in mapping out 5G architectural requirements and standards. 3GPP Release 15 (R15), for example, introduced two new network elements — the Session Management Function (SMF) and Policy Control Function (PCF) — that introduced new charging possibilities. The SMF, for example, established a means by which telco operators could enforce seamless session charging even as those sessions moved between devices (e.g., a user who starts watching a movie on their tablet but finishes watching it on their smartphone).

3GPP R16 is even more bold in its expansion of the 5G charging ecosystem, defining five new aspects for unique and previously unavailable charging functions:

- The Access & Mobility Management Function (AMF) allows critical charging information such as device registration and location to be collected before session charging is set;
- The Network Exposure Function (NEF) shares session information between the telco operator and enterprises in order to charge based on the type of service consumed (e.g., high-definition video, online gaming, etc.);
- The Network Data Analytics Function (NWDAF) allows telco operators to charge based on SLAs and other session analytics;
- The Network Slice Management Function (NSMF) enables telco operators to perform "per slice" charging;
- The Access Traffic Steering, Switching and Splitting (ATSSS) function seamlessly enables Wi-Fi and wireline access alongside cellular in a single session, and permits flexible charges in these scenarios.

Use Cases for Network Slicing and Charging

It's one thing to talk about new technologies and charging functions, but how does all this translate into dollars and euros for telco operators? By leveraging the new 5G charging ecosystem, combined with new capabilities around network slicing, 5G unlocks new revenue-generating services for both enterprises and consumers.

Enterprise Pricing: Consider a Pizza Parlor

Today, a telco operator would most-likely serve the pizza parlor an all-you-can-eat data plan. With 5G, that same operator could now serve-up three different slices with different performance characteristics and prices:

Enterprise

One slice for employees of the business (in-store as well as delivery drivers and more)

Consumer

A second slice for customers using the pizza parlor's network (which could be offered for free or with a small hourly charge for high-bandwidth users)

IoT

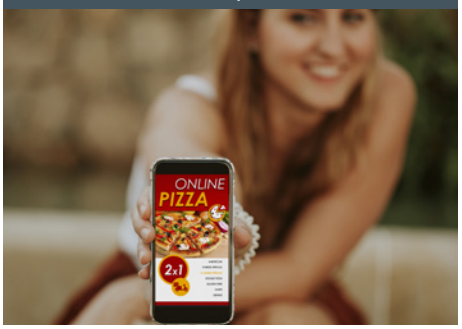
A third slice for IoT devices (cameras, refrigerators, pizza oven temperature sensors, and more)

All of these various users and devices will have differing needs, some of which depend on dynamic conditions, and for any of which the price may vary in a competitive business market. Telco operators will be able to ensure service level agreements (SLAs) and price accordingly, for each slice of the network. More importantly, they will gain the ability to dynamically scale pricing, making it specific to different devices, conditions, and needs.

Consumer Pricing: Consider Retail Subscribers

Mobile usage patterns for consumers differ widely, as they do for connected devices. Today, most of those devices share the same bandwidth and service levels, regardless. With 5G, retail users will be able to manage those connections in a myriad of ways, creating all-new pricing opportunities:

Enterprise

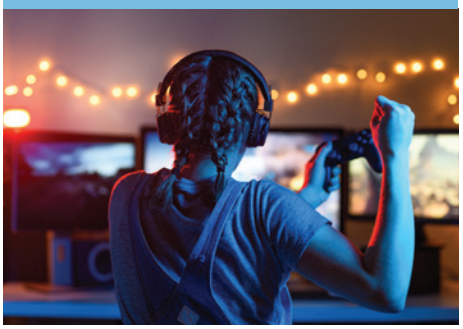


A prioritized slice for business communications services

Consumer

A high-bandwidth slice for online gaming and video streaming

Consumer



A lower cost slice for usage between 10:00 PM and 6:00 AM, or perhaps when network congestion is low

Whether dynamically charging against usage, SLAs or any other metric that a telco operator wants, network slicing will make it possible to quickly and efficiently configure, deploy and manage consumer services in entirely new ways.

The Possibilities are Endless

Imagine any communications scenario — a smart parking meter charging a credit card, a wireless UPC scanner in a warehouse, a Netflix subscriber watching a movie on their phone in another country — and you can imagine a slice (and a price) for it.

Unlock the Potential of Endless Possibilities

Network slicing and charging are really two sides of the same coin. Telco operators need slicing to create new revenue-generating services and they need flexible charging models to monetize those slices. At MATRIXX, we're advancing towards the 5G future, with a converged charging system that features a cloud native architecture, a unique web scale database and native support for network slicing.

Telco operators must take charge of their 5G success. The right charging system can help you prepare for a more profitable future.

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