HOW TO SEIZE THE 5G OPPORTUNITY

A WHITE PAPER

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5G NETWORKS—NEW TECHNOLOGIES AND STANDARDS

5G is fast becoming a reality, with widespread deployments already underway. 5G will deliver speeds up to 1,000 times faster than 4G, as well as much lower latency and the ability to support huge numbers of devices connecting to the network simultaneously. Not only will 5G deliver benefits to the consumer in terms of increased speed, but it will unlock the full potential of the Internet of Things (IoT) and support the vast array of connected devices that will be prevalent.

In order to deliver on these ambitious goals, 5G networks and charging systems will be fundamentally different from their predecessors in several ways, and will be underpinned by a number of key technologies.

→ **Virtualization**—5G networks and charging systems will run in virtualized cloud environments, following NFV principles and standards to deliver auto-scaling and fault tolerance

→ **Network Slicing**—5G will enable network operators to provide portions of their networks for specific customer use cases such as mobile broadband, smart energy grid, connected vehicles or smart cities. Each use case receives a unique set of optimized resources and network topology with SLA-specified properties such as connectivity, speed, and capacity that suit the needs of that use case. Network slicing allows the creation of multiple virtual networks on top of a shared physical infrastructure, unlike 4G, in which all services and use cases share the same infrastructure

→ **Microservices**—In order to deliver the ultra-low latency and self-healing required to support 5G, network and charging components that were previously centralized will be moved closer to the network edge in a distributed fashion. There will be a move away from a small number of large central monolithic application instances to multiple smaller, streamlined components optimized for carrying out specific tasks where they are required

In order to effectively monetize 5G networks, offline and online charging systems will have to be aligned with these technologies and support the same operating modes. A number of the key 3GPP standards surrounding offline and online charging have been modified for 5G, and this will be discussed later.

MONETIZING 5G—WHAT ARE THE TOP USE CASES?

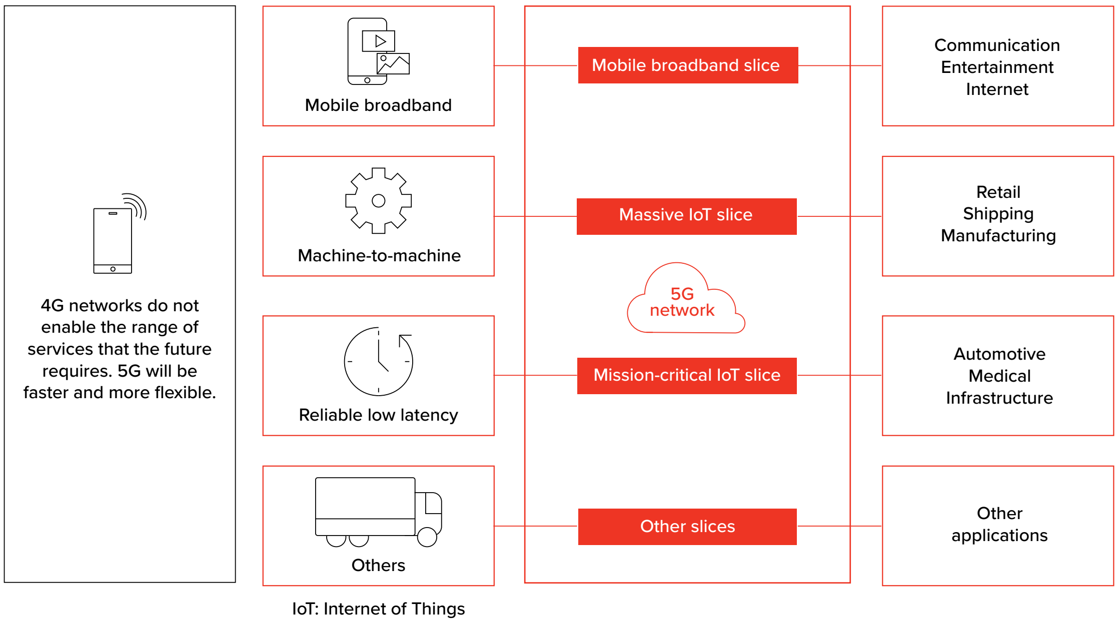
As 5G becomes a commercial reality, the most compelling use cases for 5G are becoming clearer.

→ **Fixed Wireless Access**—The first widespread commercially deployed 5G use case was fixed wireless access (e.g., Verizon's 5G Home Launch in 2019). This is where 5G is used to provide internet connectivity to a home or enterprise using wireless connectivity instead of fixed/cable infrastructure. 5G offers consumers and enterprises much faster and more reliable mobile broadband that provides a viable alternative to fixed/cable broadband services

→ **Enhanced Mobile Broadband**—While full mobile 5G deployments are still ongoing, 5G will eventually deliver significantly faster, more

5G NETWORK SLICING

5G NETWORK SLICING ENABLES SERVICE PROVIDERS TO BUILD VIRTUAL END-TO-END NETWORKS TAILORED TO APPLICATION REQUIREMENTS

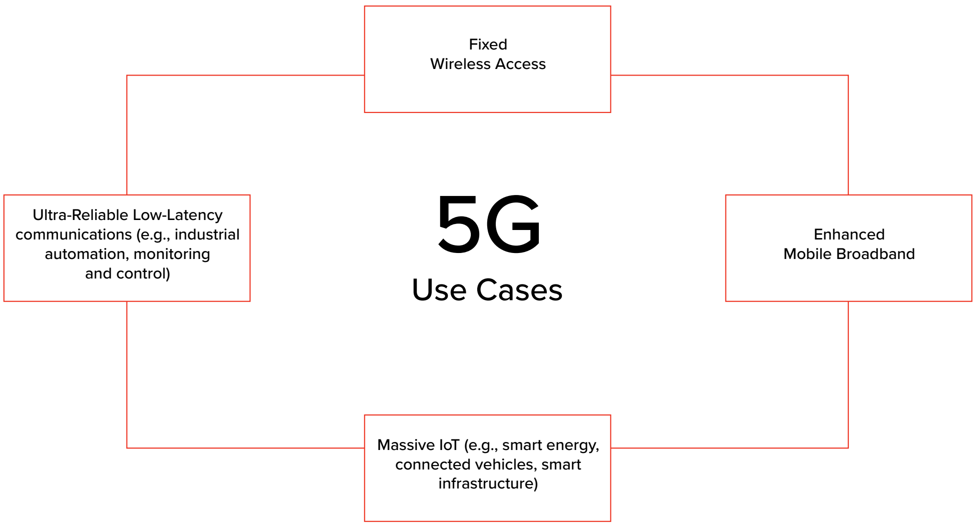


Source: ITUNews

uniform data rates at much lower latency than its predecessors, and better performance whilst on the move. The increased performance will make it feasible to access and consume services such as 4K/8K video streaming and virtual/augmented reality on mobile devices. 5G will also allow a far higher number of devices to simultaneously connect to the network, thereby alleviating bottlenecks often seen in 4G where data services become slow or even inaccessible in crowded locations

- **Massive IoT**—Sometimes referred to as Massive Machine-Type Communications, the vision of this use case is to enable seamless connectivity for the predicted 24 billion IoT devices that will be in service by 2025, per the GSMA. Massive IoT will support across a broad spectrum of applications including connected vehicles, smart energy and smart cities/infrastructure to name but a few

- **Ultra-Reliable Low-Latency Communications**—This use case enables the launch of new services that will revolutionize industries with ultra-reliable, low latency communications. Examples of where this type of communication will be required would include remote monitoring and control of critical infrastructure (e.g., smart grid), self-driving vehicles and industrial robotics, as well as commercial and military drone control



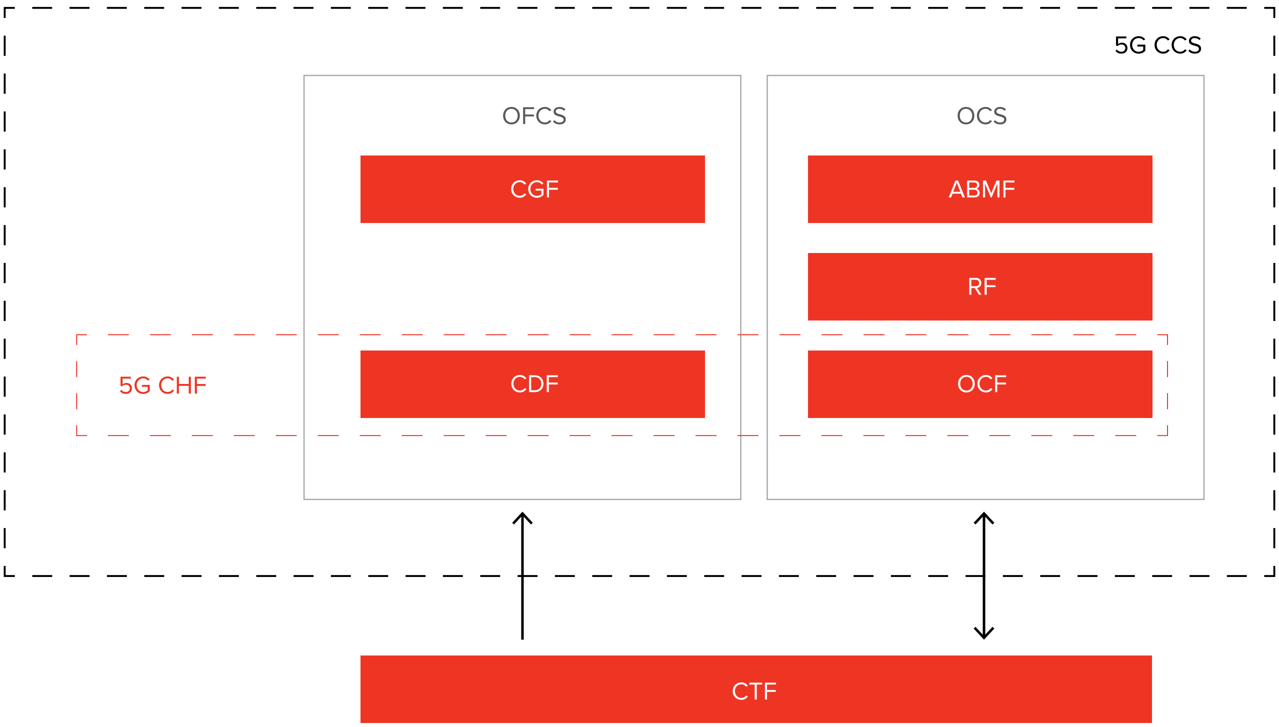
IMPACTS OF 5G ON CHARGING REQUIREMENTS & INFRASTRUCTURE

The 3GPP standards for offline and online charging in 5G differ from previous iterations in a number of ways:

- The 4G Offline Charging System (OFCS) and Online Charging System (OCS) are consolidated into a single logical entity called the Convergent Charging System (CCS)
- The offline CDR generation capabilities provided by the Charging Data Function (CDF) and online charging event management provided by the Online Charging Function (OCF) are consolidated into a single logical entity called the Charging Function (CHF)
- The 4G Diameter interfaces between the Charging Trigger Function (CTF) and the CHF are implemented using a new Service Based Interface for 5G, based on JSON/HTTP2

Network Slicing in 5G will provide options for charging to be located “in-slice” or “across-slice.” The decision as to which option is used will depend on the requirements of the operator and the specific use case. For example, in cases where network slices are being used to segregate different virtual operators (MVNOs), it will be possible to deploy the CHF/CCS in each slice to enable segregation of data and multi-tenancy.

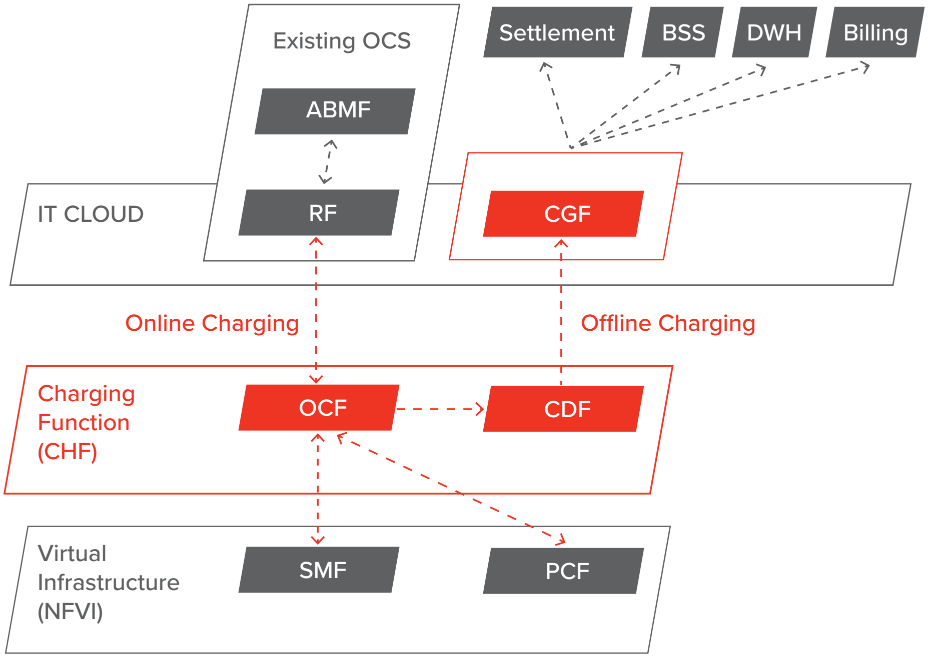
In other scenarios, it may be desirable to have the CHF/CCS deployed across multiple slices: providing a shared charging infrastructure and revenue assurance across all services.



CCS Convergent Charging System	OCF Online Charging Function
CHF Charging Function	RF Rating Function
CTF Charging Trigger Function	ABMF Account Balance Management Function
CDF Charging Data Function	OFCS Offline Charging System
CGF Charging Gateway Function	OCS Onlline Charging System

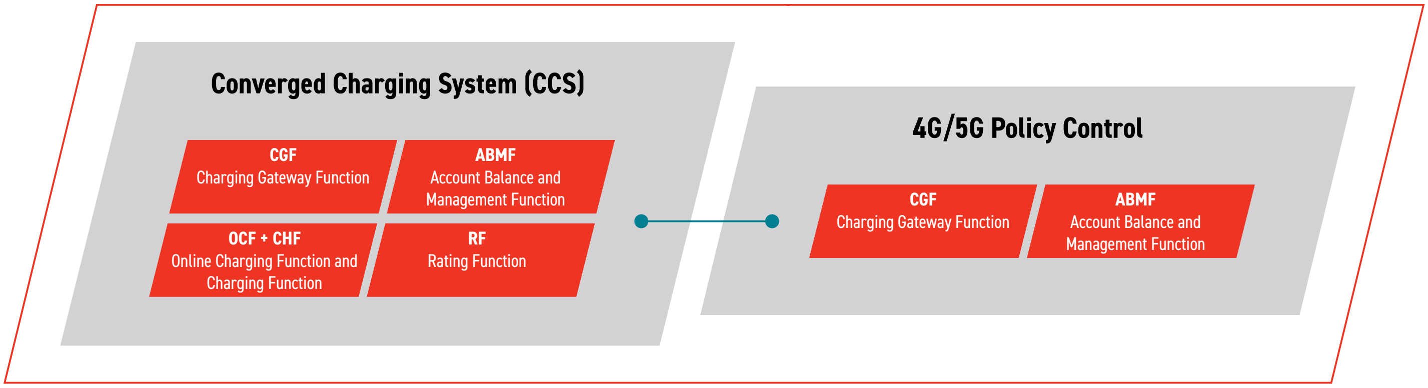
THE NEXT STEPS

At a minimum, 5G will require a new or upgraded CHF capability as the interface to the network components which was previously Diameter is now based on JSON/HTTP2. In cases where the existing Online Charging System (OCS) is being preserved and reused for 5G, operators should look at 5G monetization solutions that front-end the existing OCS and handle the new JSON/HTTP2 interfaces to the 5G network components and the Charging Gateway Function as shown in Option 1 on the next page.



Option 1—Front-end existing OCS

Another option is a fully integrated 5G converged charging and policy solution to capture the commercial opportunity of 5G and support 4G and 5G subscribers on one platform, as shown in Option 2.



Option 2—Converged 5G charging and policy solution

Each CSP will have a different deployment model, so they should look for 5G monetization solutions that can either fulfill the role of the 5G CHF standalone and/or the overall 5G CCS. They should also consider a solution that deploy the CHF and CCS in virtualized components.

ABOUT CSG

CSG is a leader in innovative customer engagement, revenue management and payments solutions that make ordinary customer experiences extraordinary. Our cloud-first architecture and customer-obsessed mindset help companies around the world launch new digital services, expand into new markets, and create dynamic experiences that capture new customers and build brand loyalty. For nearly 40 years, CSG's technologies and people have helped some of the world's most recognizable brands solve their toughest business challenges and evolve to meet the demands of today's digital economy with future-ready solutions that drive exceptional customer experiences. With 5,000 employees in over 20 countries, CSG is the trusted technology provider for leading global brands in telecommunications, retail, financial services and healthcare. Our solutions deliver real-world outcomes to more than 900 customers in over 120 countries.

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