How to seize the 5G opportunity

by CSG

5G networks and charging systems have had to be fundamentally different from their predecessors in a variety of ways, and have been underpinned by a number of key technologies.

5G networks - new technologies and standards

5G is now very much a reality; widespread deployments took place throughout 2021. 5G delivers 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.

5G not only delivers benefits to the consumer in terms of increased speed but it unlocks the full potential of the Internet of Things (IoT) and supports the vast array of connected devices that have become commonplace over the last year.

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

Virtualisation

5G networks and charging systems now run in virtualised cloud environments, following NFV principles and standards to deliver auto-scaling and fault tolerance.

Network Slicing

5G now enables 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 optimised resources and network topology with SLA-specified properties such as connectivity, speed, and capacity that suit the needs of that use case.

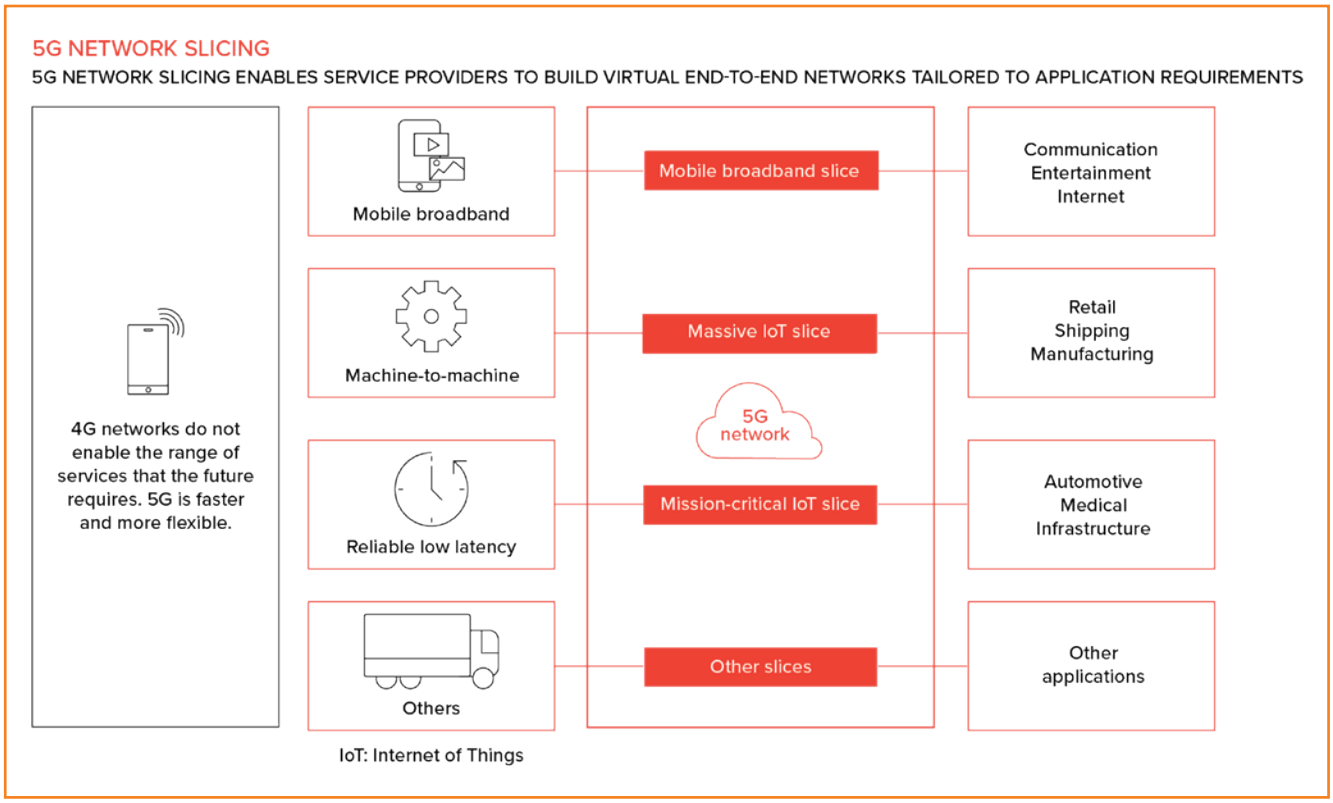
Network slicing allows the creation of multiple virtual networks on top of a shared physical infrastructure, unlike 4G, in which all services and use cases share the same infrastructure.

Microservices

In order to deliver the ultra-low latency and self-healing required to support 5G, network and charging components that were previously centralised have been moved closer to the network edge in a distributed fashion.

There has been a move away from a small number of large central monolithic application instances to multiple smaller, streamlined components optimised for carrying out specific tasks where they are required in order to effectively monetise 5G networks, offline and online charging systems are now aligned with these technologies and support the same operating modes.

A number of the key 3GPP standards surrounding offline and online charging have had to be modified for 5G, and this will be discussed later.



Monetising 5G - what are the top use cases?

5G is now a commercial reality and the most compelling cases for 5G are now clear.

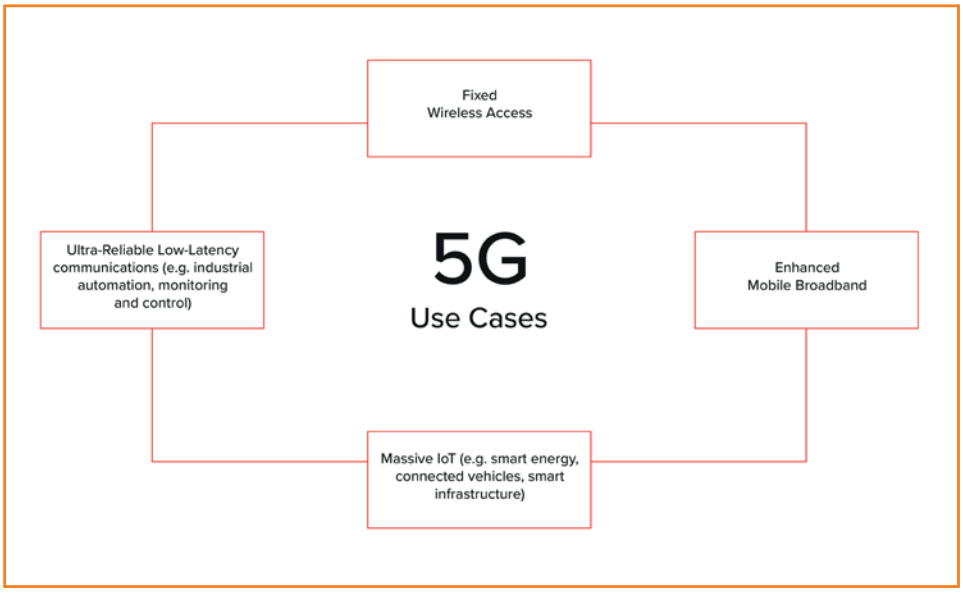
Fixed Wireless Access

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 was 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 5G mobile deployments are still ongoing, 5G will eventually deliver significantly faster, more uniform data rates at much lower latency than its predecessors, and better performance whilst on the move. The increased performance makes it feasible to access and consume services such as 4K/8K video streaming and virtual/augmented reality on mobile devices.

5G also allows 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

As we have seen, this use case has enabled the launch of serivces that are revolutionising industries with ultra-reliable, low latency communications. Examples of where this type of communication is coming into use 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.

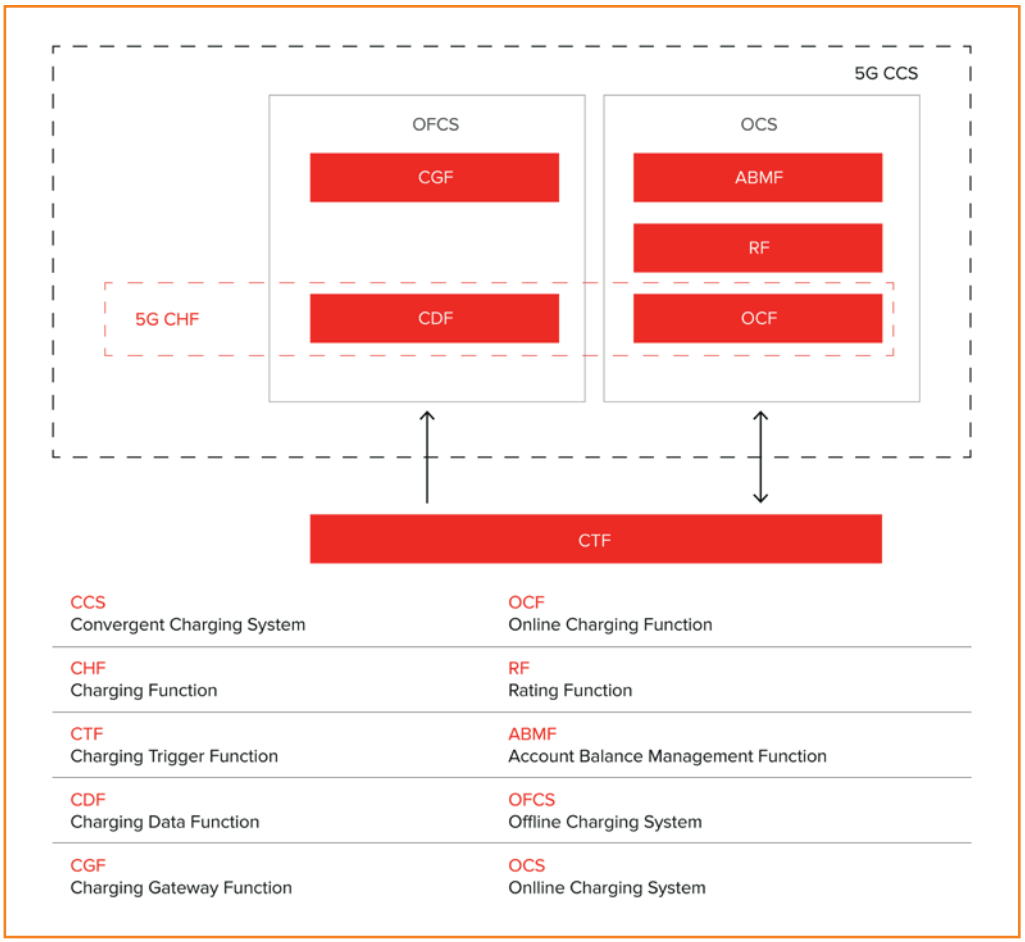
Impacts of 5G on charging requirements & infrastructure

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.

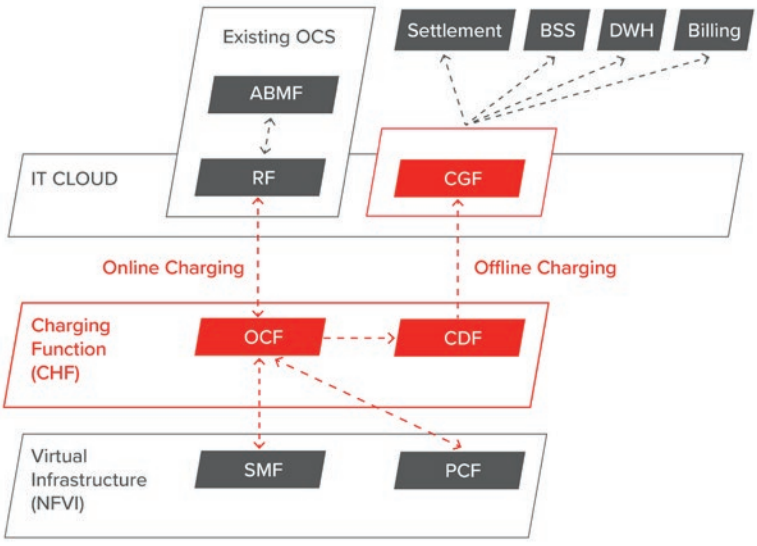
Network Slicing in 5G provides options for charging to be located “in-slice” or “across-slice.” The decision as to which option is used depends on the requirements of the operator and the specific use case.

For example, in cases where network slices are being used to segregate different virtual operators (MVNOs), it is possible to deploy the CHF/CCS in each slice to enable segregation of data and multi-tenancy.

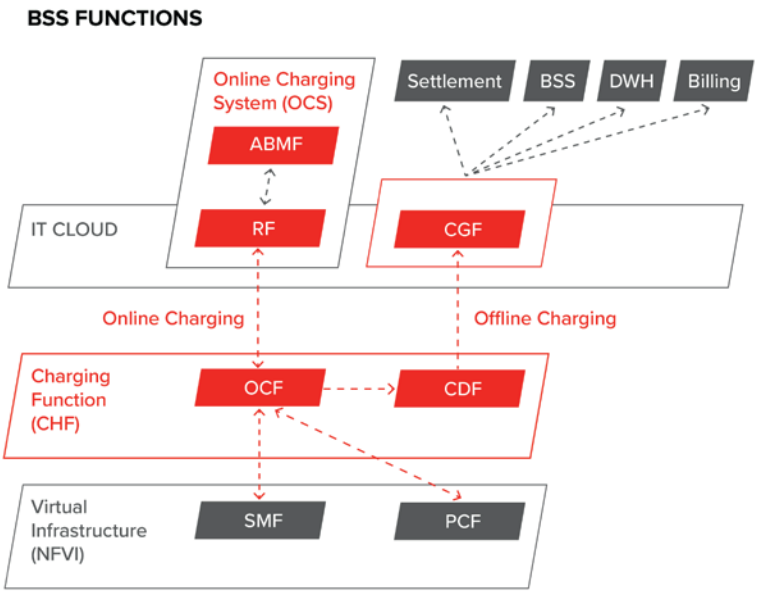


CCS Convergent Charging System	OCF Online Charging Function
CHF Charging Function	RF Rating Function
CTF Charging Trigger Function	ABMF Account Balance Management Function
CDF Charging Data Function	OFCS Offline Charging System
CGF Charging Gateway Function	OCS Onlline Charging System

Network Slicing in 5G provides options for charging to be located "in-slice" or "across-slice."



Option 1—Front-end existing OCS



Option 2—Converged 5G charging and policy solution

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

The next steps

At a minimum, 5G requires 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 now need to look at 5G monetisation 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 left.

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.

Each CSP will have a different deployment model, so they should look for 5G monetisation 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 virtualised components.

For more information, see www.csgi.com/capabilities/5g/