

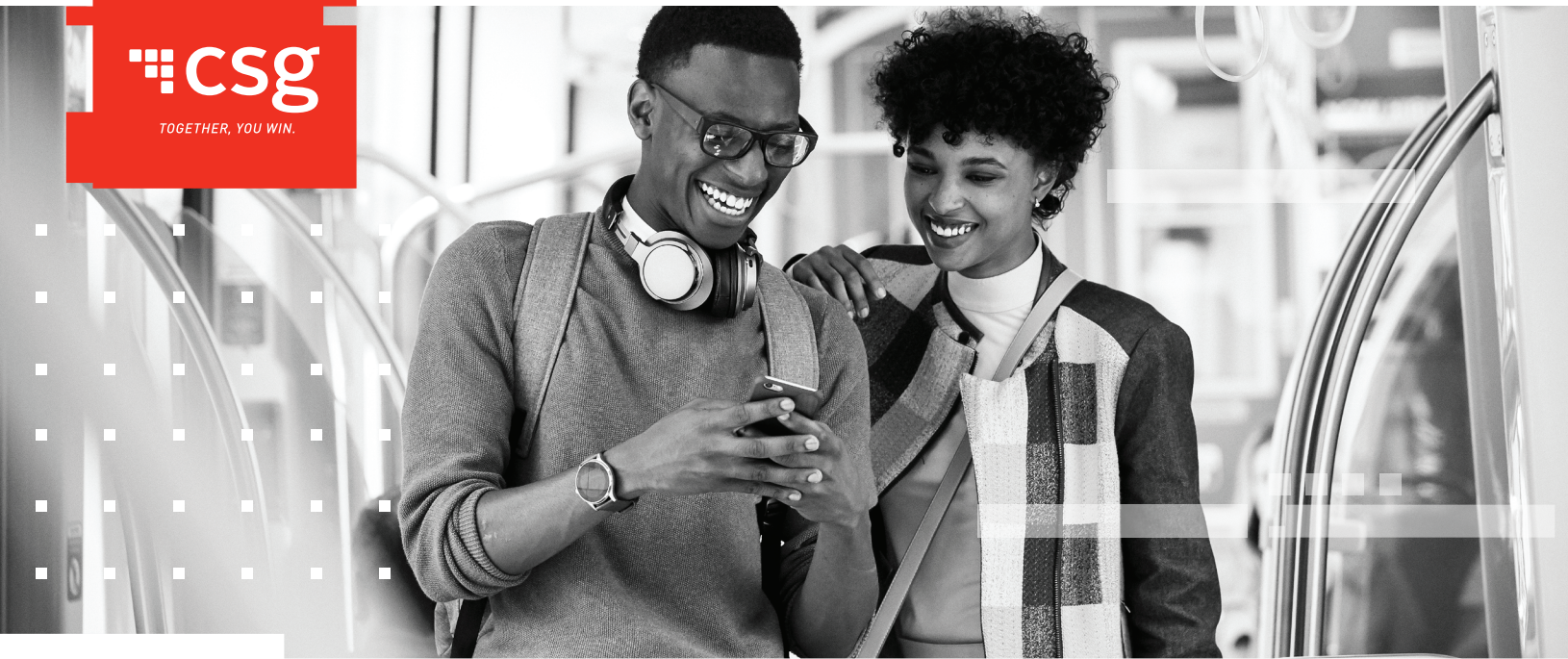


CSG 5G MONETIZATION SOLUTIONS

SEIZE THE NETWORK OPPORTUNITY



TOGETHER, YOU WIN.



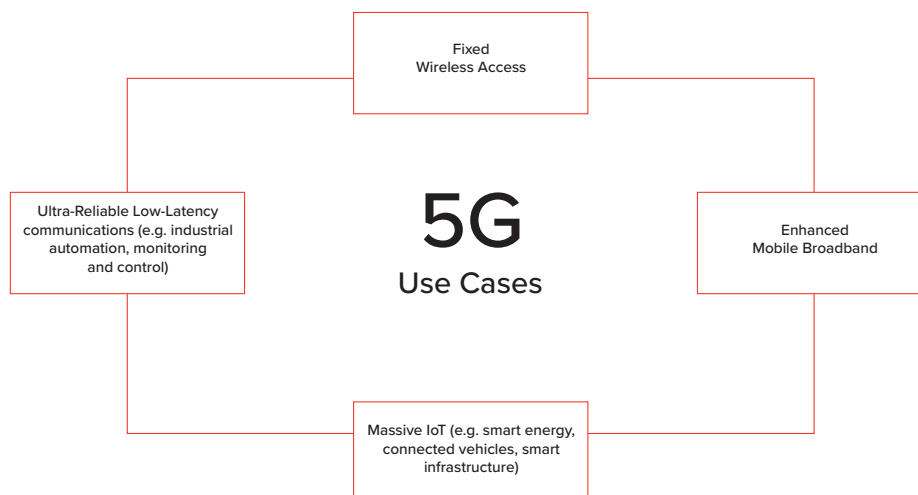
5G is fast becoming a reality, with widespread deployments expected by 2020. 5G will deliver speeds up to 1000 times faster than 4G, as well as much lower latency and the ability to support huge numbers of devices connecting to the network simultaneously. Not only will 5G deliver benefits to the consumer 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.

New concepts such as network slicing in 5G provide the ability to set up multiple virtual networks using shared physical infrastructure. Network functions, as well as charging systems, will run in virtualized

environments in a distributed configuration, and the trend will be to have multiple smaller instances rather than one or two large centralized monolithic instances. 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.

MONETIZING 5G—WHAT ARE THE TOP USE CASES?

As we move closer to 5G becoming a commercial reality, and with advanced trials underway, the most compelling use cases for 5G are becoming clearer.





- **Fixed Wireless Access**—The first widespread commercially deployed 5G use case will be fixed wireless access. This is where 5G is used to provide internet connectivity to a home or enterprise using wireless connectivity instead of fixed/cable infrastructure. 5G will offer 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 may be some way off, it will eventually deliver significantly faster, more uniform data rates at much lower latency than its predecessors, and better performance while on the move. The increased performance will make it feasible to access and consume services such as HD/4K 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 widely predicted tens of billions of IoT devices and sensors that will be in service by 2020 across a broad spectrum of applications including connected vehicles, smart energy and smart cities/infrastructure to name 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 links. Examples of where this type of communication will be required would include remote monitoring and control of critical infrastructure, automation of industrial robotics as well as commercial and military drone control.

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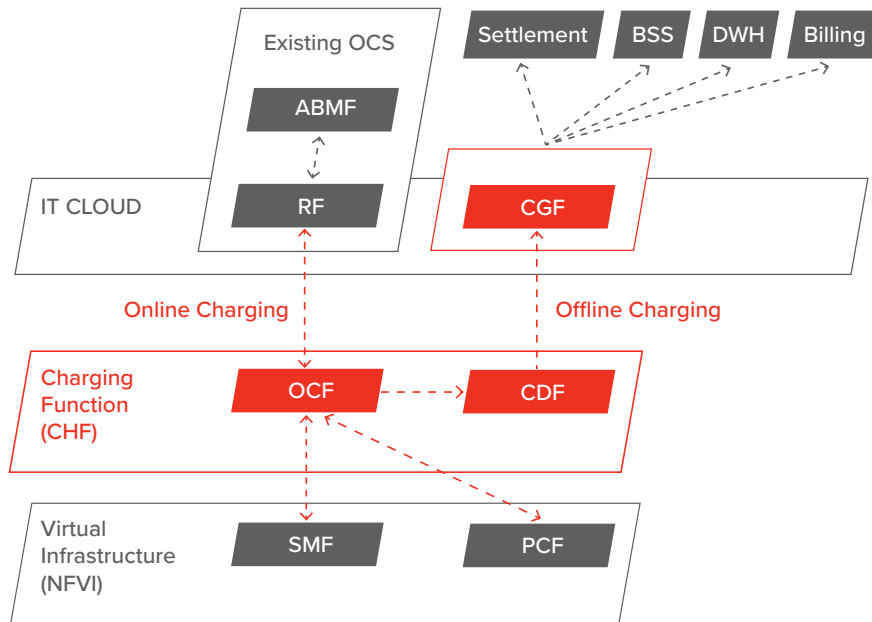
5G standards specify two new charging and mediation components: the Charging Function (CHF) and the Convergent Charging System (CCS). The CHF provides offline and online mediation capabilities, while the CCS provides the CHF functionality, as well as online charging (rating and balance management) as an integrated solution. CSG provides solutions for both the 5G CHF and CCS.

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, CSG's CHF solution provides a fast time to market for 5G services by front-ending the existing OCS and handling the new JSON/HTTP2 interfaces to the 5G network components and the Charging Gateway Function as shown in the first diagram on the next page.



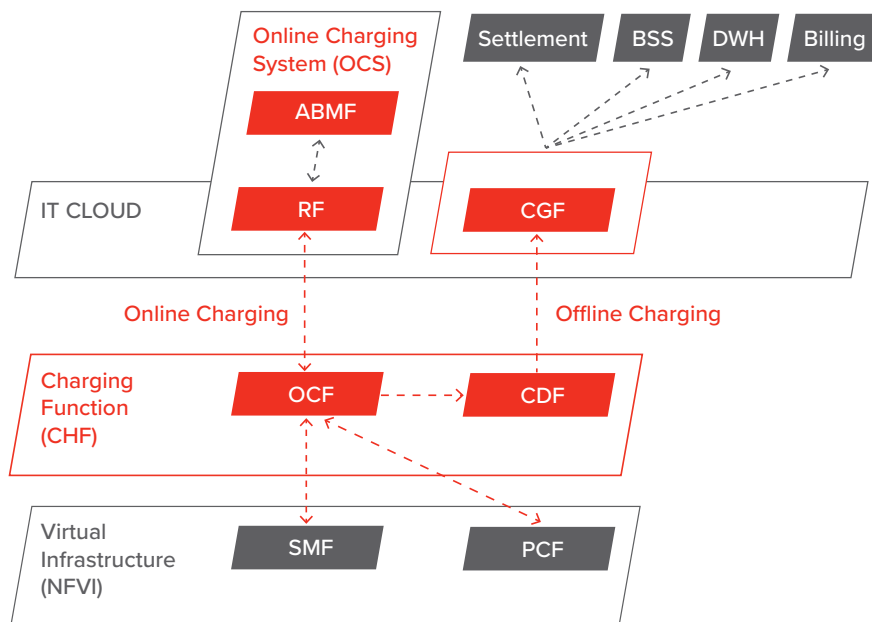
BSS FUNCTIONS



CSG can also provide a fully integrated 5G CCS solution to fulfill all 5G mediation and charging

requirements including rating and balance management, as shown in the following diagram.

BSS FUNCTIONS





CSG 5G MONETIZATION SOLUTIONS

- Based on proven and market-leading technology
- Standalone adjunct CHF solution that can be used to extend the lifetime of the existing OCS
- Integrated CCS solution for offline and online charging from a single vendor
- Proven scalability handling billions of events per day at ultra-low latency
- Deployed and certified in virtualized (NFV) environments
- Fast time to market for 5G services

ABOUT CSG

CSG tackles the complexity of business evolution in the digital age for the most respected communications, media and entertainment service providers worldwide. With over 35 years of experience, CSG delivers revenue management, customer experience and digital monetization solutions for every stage of the customer lifecycle. The company is the trusted partner driving digital transformation for leading global brands, including Arrow, AT&T, Bharti Airtel, Charter Communications, Comcast, DISH, Eastlink, iFlix, MTN, TalkTalk, Telefonica, Telstra and Verizon.

At CSG, we have one vision: flexible, seamless, limitless communications, information and content services for everyone. For more information, visit our website at csgi.com and follow us on [LinkedIn](#), [Twitter](#) and [Facebook](#).