SOLUTION BRIEF

# Visual Cloud in 5G Era

Enabling cloud gaming and media analytic services with QCT infrastructure

## Key Highlights

- Building 5G end-to-end infrastructure with QCT comprehensive product portfolio.
- Providing a validated and optimized 5GDC solution for media services.
- Enabling media services with high bandwidth and low latency on QCT 5G infrastructure.

## Visual Cloud Use Cases

- Ultra-low latency cloud gaming for exceptional user experience.
- Intelligent ad insertion for improved advertising efficiency.
- Automated recognition for accelerated manual process.

## Executive Summary

As the era evolves from 4G to 5G, media service and digital data have been sharply increasing and dominating the global internet traffic consumption. End customers pursue relatively high-quality media service in terms of video resolution and data transmission, which results in the indispensability of high bandwidth. 5G technology is a breakthrough, allowing the infrastructure to carry a huge amount of data and perform high bandwidth and ultra-low latency to deliver good user experience.

Most computing-oriented tasks of visual services are processed in the cloud, where the media contents are delivered to end users by using video streaming technology. User experience is no longer limited by storage capacity or computing performance of client device but relies more on the computing and networking capabilities of cloud infrastructure. A flexible and scalable cloud infrastructure with optimized network functions is considered to be best suited for addressing the increasing demand of media services.

QCT provides optimized end-to-end 5G infrastructure from data center to edge for visual cloud service throughout the supply chain, including cloud service providers (CSP), business-to-business (B2B) solution providers, and telecommunication operators. With QCT's comprehensive product portfolio and robust ecosystem, visual cloud service providers can offer competitive services with high agility and enhanced user experience.

## Visual Cloud Introduction

Visual cloud services such as media processing and delivery, media analytics, immersive media, cloud graphic, and cloud gaming have been discussing for a decade. These services aim at providing good user experience with high resolution and rapid data transmission regardless of the capability of local device. To mitigate the workload on client device, visual cloud services enable remote consumption of contents and services from the cloud as well as efficient delivery of visual experience to end consumers. With a view to achieve real-time video streaming from cloud to end consumers, service providers require optimized hardware infrastructure with not only advanced networking technology but also high-compute capability from data center to edge.

To provide a carrier-grade and software-defined network function virtualization (NFV) infrastructure for visual cloud services, QCT 5G Data Center (5GDC) is a comprehensive x86-based NFV rack level solution for real-time applications such as cloud gaming, ad insertion, and recognition. Covering from data center to edge, 5GDC enables 5G infrastructure to implement video streaming with ultra-low latency through 5G network for diverse visual cloud use cases, as shown in Figure 1.

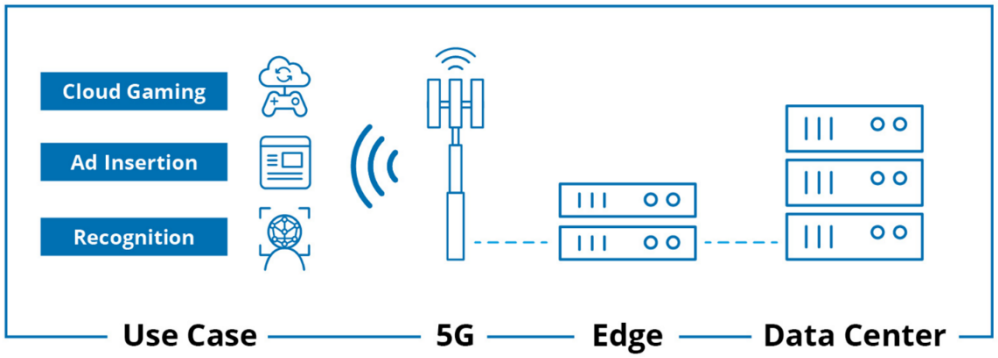


*Figure 1. Overview of visual cloud services.*

## Visual Cloud Architecture

**Hardware**

QCT provides comprehensive product portfolio which covers from datacenter to edge for visual cloud services. On the hardware layer, QCT GPU servers are powered by acceleration hardware ranging from CPU, GPU, VPU, to FPGA to fulfill the requirement of high-compute performance.

QCT's 2U/4U GPGPU servers with high density and high performance are best in class for building 5G infrastructure, as shown in Figure 2. QuantaGrid D52G-4U, QuantaGrid D52BV-2U, and QuantaGrid Q72D-2U compatible with Intel or Nvidia GPGPU product family are recommended for visual cloud workloads such as immersive media, cloud gaming, and media analytics in the data center and central office. Quanta Grid D52Y-2U with merely 400mm depth is the best suited for edge system, which can be closely located to end users and further reduce the latency of data transmission.

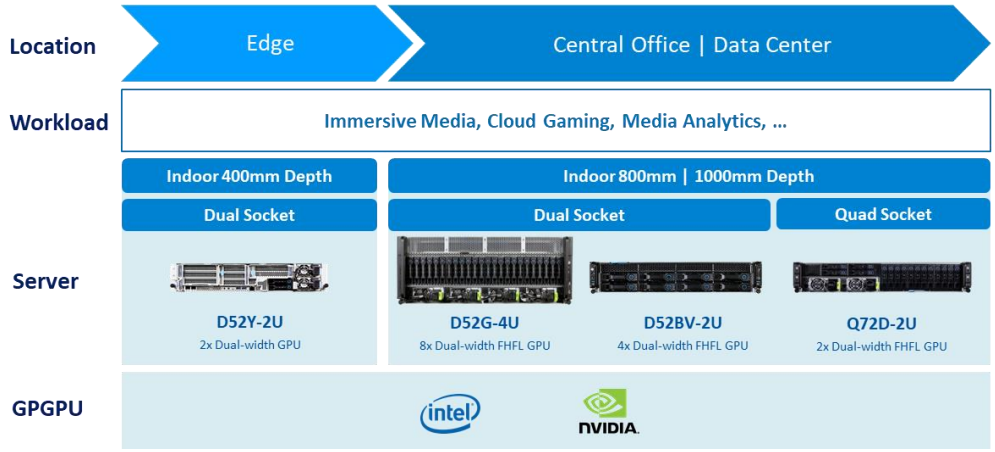


*Figure 2. QCT GPU product portfolio from data center to edge.*

**Software**

QCT provides optimized Network Function Virtualization Infrastructure (NFVI) and Cloud Native Service Infrastructure (CNSI), emphasizing network performance to realize a scalable cloud environment. To accelerate the packet processing for NFVI platform, QCT enables enhanced platform awareness (EPA) features which not only supports memory huge pages in the compute nodes but also provides both OVS-DPDK and SR-IOV data plane acceleration. To achieve superior network performance, QCT implements Container Network Interface (CNI) on CNSI to create multiple interfaces among pods and utilizes SR-IOV and DPDK on the same node, bringing the maximum efficiency to realize agility in daily operations.

On top of virtualization layer, software building blocks, which comprise data decoding, inferencing, rendering, encoding, streaming, transcoding, and capturing, are optimized by adopting open source framework and architecture for diverse visual cloud use cases, as shown in Figure 3. To implement the building blocks, the software which are commonly used for visual service optimization are FFMpeg, GStreammer, Intel SVT, OpenVINO, TensorFlow, and Gaming Anywhere.

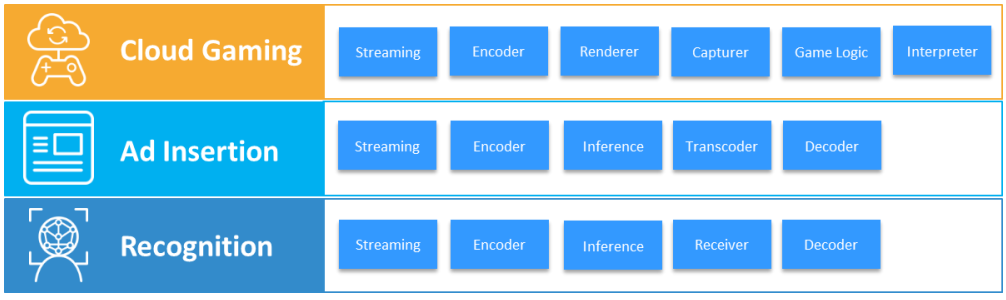


*Figure 3. Software building blocks of visual cloud services.*

## Visual Cloud Use Cases

**Cloud Gaming**

Cloud gaming services is a server-based gaming solution. Since all heavy-load services are executed in the cloud, gamers do not necessarily prepare high-configuration local device. Ultra-low latency is a critical feature equipped in 5G infrastructure to enable high-performance network and real-time streaming for good user experience. The gaming infrastructure provides exceptional network performance for cloud gaming service providers to gain sustainable competitive advantage and fulfill the ever-growing network demand. Moreover, the gaming platform with high scalability and high availability (HA) delivers stable gaming services as well.

**Ad Insertion**

Intelligent ad insertion transforms video services from passive media streaming to interactive video experiences for efficient advertising. With 5G network infrastructure, inferencing process in the cloud can detect target objects in source video and then insert relevant advertisement contents to end-user device in real time. End users perceive the advertisement is highly relevant to the video contents they are interested in. The ad insertion enables advertisers to accurately reach potential customers so as to improve advertising effectiveness.

**Recognition**

Recognition is a process implemented by automatically detecting, classifying, and identifying face or object. With ultra-low latency, this process can be realized in live media to accelerate manual process. For example, face recognition has been widely adopted in access control of private properties, security check in the public transport, and customized advertisement to customers in retail industry; object recognition can be adopted to automatically process quality control (QC) in smart factory through defect detection in production line.

## Conclusion

With a rapid growth of media traffic, image resolution and data transmission rate are crucial factors in delivering stable and reliable media contents and services. Cloud service providers are seeking flexible and scalable cloud environment to break through the bottleneck of the capability of end-user device and bandwidth. 5G is the technology evidenced to be a significant evolution to ensure compute and network performances. Driven by the need to expedite ubiquitous connectivity, QCT provides optimized infrastructure tailored for visual cloud uses cases such as cloud gaming, ad insertion, and recognition, and practically surmounts the capability of local device.

QCT 5GDC is a solution with hardware and software integration, which aims at providing the optimized 5G infrastructure from data center to edge. The solution provides optimized 5G network, enabling the realization of diverse 5G-related use cases. For visual cloud services, QCT offers GPU servers powered by acceleration hardware, ranging from CPU, GPU, VPU, to FPGA to further enhance computing capability. With QCT comprehensive product portfolio, visual cloud service providers are rest assured that building services on QCT 5G infrastructure can ensure fast data transmission with ultra-low latency and provide superior user experience.

## ABOUT QCT

Quanta Cloud Technology (QCT) is a global data center solution provider. We combine the efficiency of hyperscale hardware with infrastructure software from a diversity of industry leaders to solve next-generation data center design and operation challenges. QCT serves cloud service providers, telecoms, and enterprises running public, hybrid and private clouds. Product lines include hyperconverged and software-defined data center solutions as well as servers, storage, switches and integrated racks system. QCT designs, manufactures, integrates and services cutting-edge offerings via its own global network. The parent of QCT is Quanta Computer, Inc., a Fortune Global 500 corporation. For more information, visit the QCT website at http://www.QCT.io.

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