

Next Generation Central Office (NGCO) – Data Center at the Edge

Harness state of the art technologies to build efficient Edge infrastructure today, while preparing for the 5G Services explosion.

This executive brief describes Intel's Data Center at the Edge solution, the NGCO and how it brings together:

- **Market trends and industry standardization efforts**
- **Proven telecommunication technologies**
- **Opportunities for Service deployment at the Edge**

To deliver a flexible, secure and high performance platform for fixed mobile convergence (FMC) and service delivery at the Edge

Executive Summary

Software defined networking (SDN), network functions virtualization (NFV) and the imminent arrival of early 5G architectures are driving change in communications Service Provider (CoSP) networks. New technologies and techniques being embraced by the industry are driving fundamental change in the way carriers plan, deploy and manage their infrastructure. Intel believes this transformation will occur at the Edge of the network, which Intel calls the Next Generation Central Office (NGCO).



Figure 1. Network Diagram Illustrating the Central Office and Edge Location within the Network

There are a number of key technologies and initiatives helping to define the opportunity for CO transformation and associated service deployment. We cover these briefly here, however for a more expansive discussion please refer to <https://builders.intel.com/docs/networkbuilders/creating-the-nextgeneration-central-ofce-with-intel-architecture-cpus.pdf>.

1. Control and User Plane Separation (CUPS)

CUPS is a set of standards that allow CoSPs to architecturally separate control and user plane functions. This allows for greater choice in the supply chain where CoSPs may select control and user plane vendors to integrate the control plane function with emerging network controllers.

2. Open Compute Project* (OCP)

Open Compute Project* has made great progress over the last few years in terms of specification and approval of switch and server designs which can be leveraged for deployment at the network edge.

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OCP has been active in specifying disaggregated input/output (I/O) shelves which certify gigabit-capable passive optical networks (GPON), next generation PON (NGPON), digital subscriber line (DSL) and G.fast technologies. This allows CoSPs to separate these layer 1 and 2 technologies from their transport forwarding architectures and reduce overall cost and make network upgrades simpler.

3. CORD* (Central Office Re-architected as a Datacenter)

CORD* has emerged as a key industry initiative that builds upon the work in OCP. CORD leverages OCP servers, I/O shelves and switch designs, but adds some key components such as open source virtual network functions (VNFs) and orchestration tools in order to deliver end-to-end implementations.

4. 5G Edge Deployments

3GPP* Release 15 was frozen in September 2018 – this is the first deployable end-to-end 5G release and is the beginning of what is likely to be a decade-long standardization and deployment track.

There is no appetite amongst CoSPs (whether an early 5G adopter or not) to deploy any edge infrastructure that cannot be subsequently leveraged or re-used for 5G. This dynamic promotes a VNF-agnostic edge location such as the NGCO, which can be leveraged today for residential,

enterprise and LTE services but will also be used to deploy 5G edge gateway functions when and where it makes sense for a given CoSP.

5. NFV and the Path to Cloud Native

While the industry is embracing NFV, there is also a push to go further. The CoSP wish to embrace the similar cloud like CD/CI (Continuous Delivery/Continuous Integration) open source frameworks the OTT (Over The Top) providers have embraced (e.g. Kubernetes*) to enable them to rapidly roll out and update their differentiated services. These cloud frameworks provide services in containers, or micro-services often referred to as the “bare metal” approach. The NGCO edge platform will comprehend the transition from NFV to containers and also address the hybrid approach to hosting/deploying both types of enabling vehicle.

6. Fixed Mobile Convergence

Fixed-Mobile Convergence has been a goal for CoSPs for many years. As new network technologies, such as new 3GPP generations, new access technologies and services are offered by operators, inevitably they begin to face an operational and commercial disadvantage to new entrants or niche SPs that concentrate perhaps on just one technology or one access (e.g. LTE entrants).

While functional software specifications will take time, the ability to run both the broadband network gateway (BNG)

NGCO Edge Platform



Screen shot of Intel NGCO Demonstration

Figure 2. Intel is building a fully functional NGCO Edge Platform to showcase the advantages of locating Network Functions and Services at the Edge

and evolved packet core (EPC) workloads on commercial off the shelf (COTS) server(s) today is appealing to CoSPs from an investment protection point of view. NGCO addresses this directly.

7. New Services

The dawning of 5G networks and the continuing expansion of the service portfolio by the OTTs have led many to envision a distribution of service locations within the CoSP network and an integration between CoSPs and OTT players in order to automate OTT service delivery from within their networks. Many potential applications have been identified that benefit from proximity to customers, lower latency and contextual awareness. Some of these include augmented reality, mixed reality, virtual reality, autonomous driving or V2N (vehicle to network), industrial control and immersive video.

Summary

The goal is to address the transformative trends listed above in a Next Generation Central Office (NGCO) single rack solution for all use cases (Gateways, telco service and OTT service) rather than per function NFV use case approach being adopted by many today. The NGCO rack delivers:

- Provider Edge (PE) router for enterprise traffic
- Broadband Network Gateway (BNG) for residential traffic
- Evolved Packet Core (EPC) for LTE traffic
- 5G Core Network (5GCN) in 2H 2018 for 5G traffic
- Cable Modem Termination Service (CMTS) for cable modem termination
- Associated service delivery – API-driven content delivery network (CDN) in the first instance

All delivered in a secure rack infrastructure which provides the requisite telemetry and platform analytics to enable management layers to address and correct issues in real time through emerging AI enabled automation.



Figure 3. Image of Intel's fully functional NGCO Data Center Edge Platform

For more information, please see “Creating the Next Generation Central Office with Intel® Architecture CPUs” which can be found at <https://builders.intel.com/docs/networkbuilders/creating-the-next-generation-central-office-with-intel-architecture-cpus.pdf>.

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