ASOCS' CYRUS 2.0 Delivers Flexible 4G/5G Indoor and Macro vRAN

Radio access networks are evolving to support an open, virtualized model for network agility and lower costs. ASOCS' CYRUS 2.0 leverages virtual RAN technology for a 4G/5G solution that is robust enough for macrocells and cost-effective for small cell and indoor networks.

Introduction

Mobile network operators (MNOs) around the world are evolving their radio access networks (RAN) to be built on a foundation of virtual network functions (VNFs), white box hardware, and standardized interfaces that embrace open standards. These new virtual RANs are replacing legacy RANs in existing macrocells in addition to enabling new small cells for outdoor and indoor networks. Multivendor, interoperable, and autonomous virtual RAN networks are becoming a reality thanks to new standards from the 3GPP and the O-RAN Alliance.

Intel® Network Builders ecosystem partner ASOCS has built its fully virtualized CYRUS 2.0 5G vRAN solution that utilizes the open fronthaul interface defined by O-RAN and can support diversified use cases, offering flexible business models for operators, businesses, enterprises, and neutral host providers that need micro, metro, and macro scale networks.

Virtual and Open RAN Impact on 5G Networks

MNOs are embracing virtual and open RAN solutions for their macrocells because they want a solution that is open and makes the possibility of being locked into a single vendor's technology a thing of the past, allowing them to better mix and match technology from different vendors for a solution that facilitates network service innovation combined with low total cost of ownership.

But the higher frequencies used in 5G networks require more, smaller base stations to fill in coverage gaps caused by signal attenuation. vRANs offer deployment flexibility in which multiple small cells can access one vRAN server or cloud instance, ultimately reducing cost and complexity.
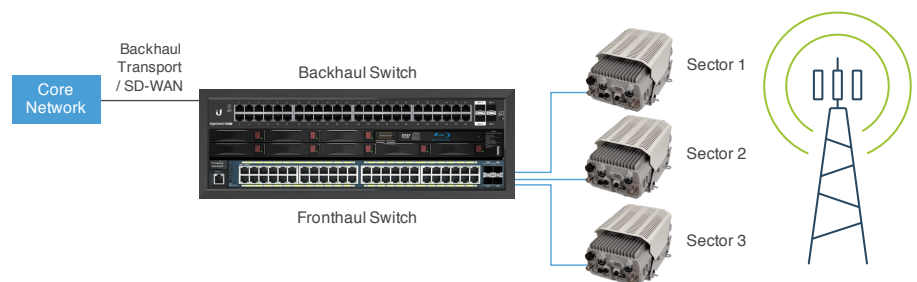

Figure 1. Architecture of CYRUS 2.0 for WAN applications.[1]

Enterprise and Business 5G Coverage and Services

Getting good service from a cellular network is challenged by building walls that can weaken cellular signals, resulting in bad coverage. The problem has the potential to get worse as emerging IoT applications add to network congestion and many times rely on 5G networks, which depend on higher frequency signals and have a shorter transmission distance that exacerbates the impact of walls and other obstructions.

Due to the high cost and complexity of indoor cellular networks equipment, installation, and maintenance, only large-to-mega-scale enterprises have deployed neutral-host (multi-operator), active or digital Distributed Antenna Systems (DAS) solutions. Smaller businesses have either had to pay for their own solutions or utilize low capacity, coverage-only networks such as passive DAS, small cells, or bi-directional antenna/repeaters (BDA).

vRAN can significantly reduce the complexity and cost of in-building and enterprise 4G and 5G networks by leveraging standard servers, switches, and Ethernet cabling and utilizing Power over Ethernet (PoE) for the radios.

CYRUS 2.0 Delivers Flexible 4G/5G RAN Services

CYRUS 2.0 is a single software stack for 4G and 5G cellular processing. CYRUS 2.0 is fully virtualized across all layers and can run on any standard server or universal CPE. It can connect to any radio using the O-RAN - FH 7.2 interface, enabling multiple enterprise and mobile network operators (MNO) use cases.

An end-to-end solution based on CYRUS 2.0 eliminates the need for expensive DAS deployments by leveraging the following technologies:

- Standard Ethernet switches and low-cost power over Ethernet (PoE)-connected radios. The switches utilize already installed networks for connectivity between the compute platform and the radios.

- Having vRAN running on a server and being disaggregated from the radio units supports radios from different manufacturers and that can be seamlessly upgraded to 5G radios without a new RAN.

CYRUS 2.0 for LAN

The CYRUS 2.0 architecture can scale for cost-effective deployments in a wide range of MNOs, enterprises, and small-to-medium-sized businesses. A key part of this scalability is the ability to utilize servers that are cost effective for these applications. For example, servers using Intel® Xeon® D processors provide the compute power for an implementation in an indoor, private network setting, or to connect up to two floors in an office building. A server based on the Intel Xeon Scalable processors can be used in a macrocell deployment or an indoor vRAN that serves an entire building.

Intel Xeon D processors deliver the transformative and ground-breaking of the Intel Xeon Scalable processors' architecture to applications that have space and power constraints, including intelligent edge applications. Intel Xeon D processors are system-on-a-chip processors that support high-density, single-socket network, storage, and

cloud edge computing solutions with a range of integrated security, network and acceleration capabilities.

Intel Xeon Scalable processors are designed for cloud-optimized, virtualized networks. The platform features an open architecture that scales and adapts with ease to handle the demands of emerging applications. These CPUs are designed to enable enterprises and MNOs to transition to virtualized, software-defined infrastructure to enable cloud capabilities for agile service delivery throughout the network.

Connectivity options for CYRUS 2.0 include an S1 interface to backhaul data traffic to the MNO's core network. The platform also supports an Ethernet switch for fronthaul connectivity to radios.

The CYRUS 2.0 system also provides complete enterprise networking by supporting VNFs for routing, WAN services, and data security. In these applications, the fronthaul switch is used to connect Wi-Fi access points or end users. The switch can be configured with fiber optic data ports to connect to edge switches to connect additional RRHs, access points, or user equipment. ASOCS provides these switches and servers as part of its solution, or enterprises can purchase and install this hardware separately.
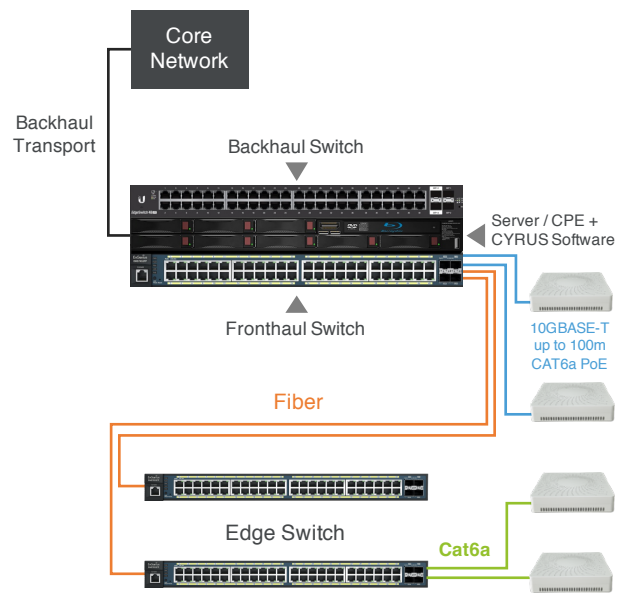
Figure 2. CYRUS 2.0 for LAN platform including connectivity to core network and to radios.

CYRUS 2.0 RAN Architecture

The RAN functionality is based on Open RAN (O-RAN) 7.6, the latest version of an open standard that decomposes the RAN. CYRUS 2.0 connects to radios, subsystems, and software sourced from multiple suppliers and connected over open interfaces.

The CYRUS 2.0 software runs on any server powered by an Intel® architecture-based CPU and comprises a complete OpenStack-based virtualization foundation, supporting 5G virtual distributed units and virtual central units (vDUs and vCUs). All software layers (L1, L2, L3) are running in the virtual machine, which is part of the virtualization layer. The CYRUS vDU supports multiple cells, processing the radio signals and
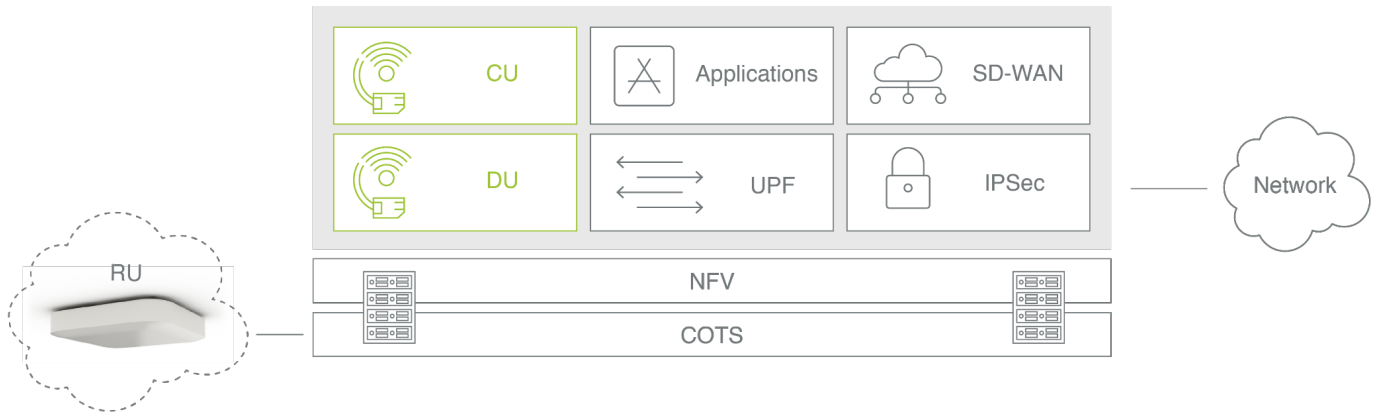
Figure 3. CYRUS 2.0 vRAN architecture.

then sending them to the vCU via the fronthaul network to terminate the connection and pass the data to the MNO's core network for further data processing and forwarding to the internet.

The 3GPP standards body for 5G has defined eight "functional splits," or ways that CU, DU, and radio unit (RU) functionality can be deployed. As can be seen in Figure 3, CYRUS 2.0 can be deployed flexibly with multiple remote RUs per vDU and multiple remote vDUs per vCU while both vDU and vCU can reside on the same server as needed. Support for the Option 2.0 interface means the vCU can also be placed at the cell site with local breakout capabilities.

On top of this functionality resides the CYRUS vManager for management of the local and remote components

of the network. CYRUS Rainbow is the local site management component of CYRUS vManager. It provides site configuration, performance monitoring, and fault management. CYRUS Rainbow can also provide separation for networks that support multiple MNOs.

The other element is CYRUSNet, which provides network-level management. This includes aggregation of management data from multiple sites or subnetworks. The software also provides a northbound interface for network wide configuration and operations. CYRUSNet also provides a hierarchical view of the network. The management software allows multiple carriers to be supported within a CYRUS 2.0 implementation by isolating compute and networking resources. A firewall feature also provides a more secure interface to the system.
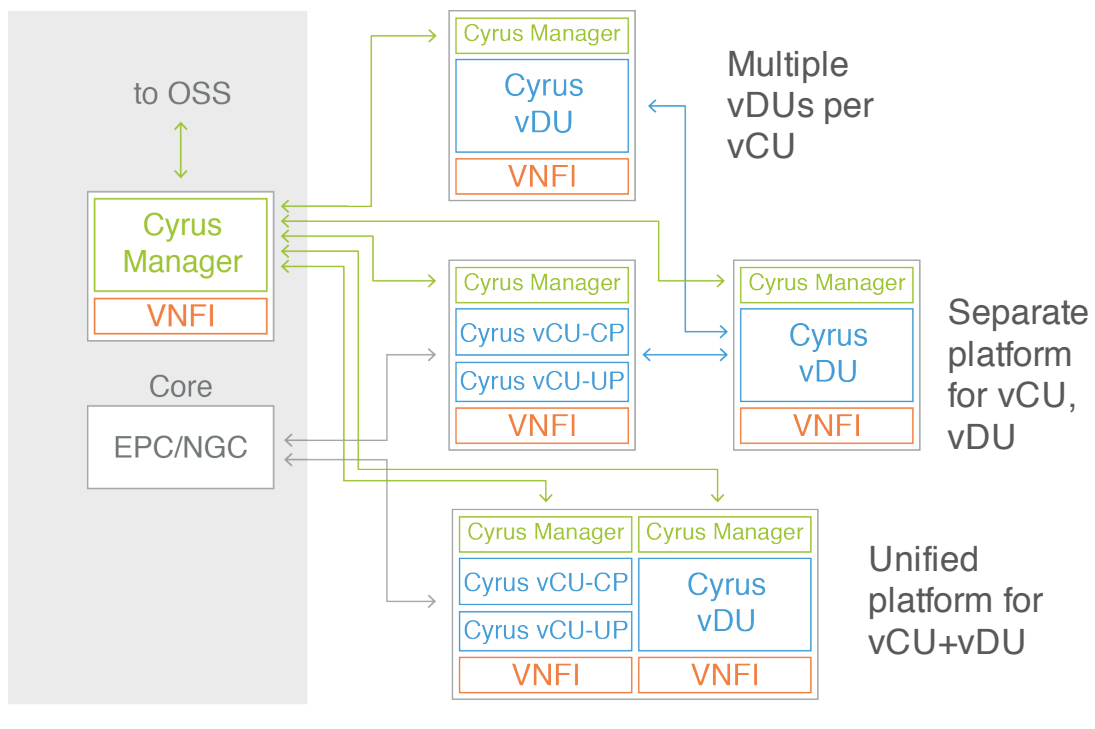

Figure 4. CYRUS 2.0 supports flexible vCU/vDU deployment options.
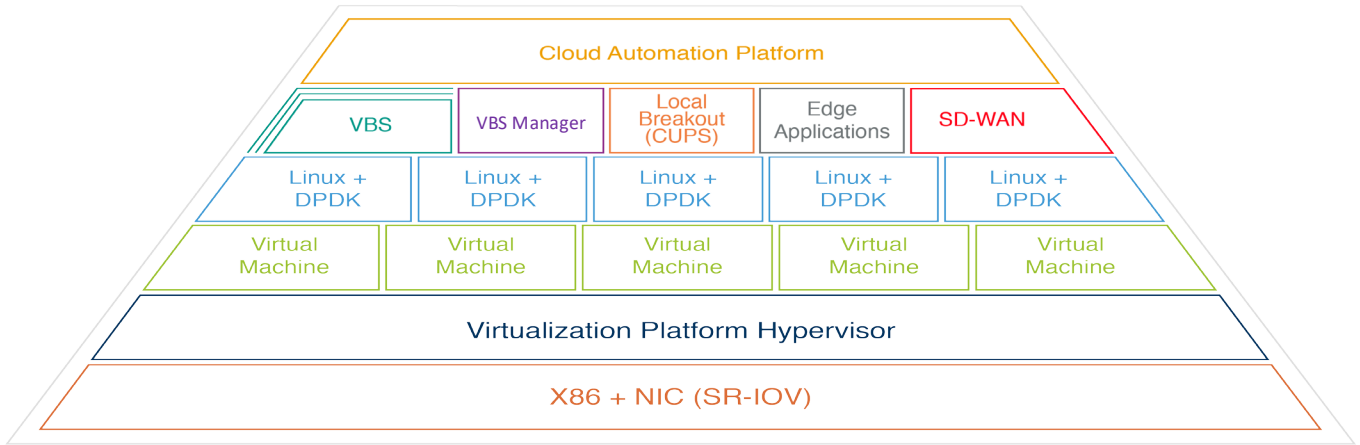
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Figure 5. Cyrus 2.0 complete solution stack.

Conclusion

Virtual RAN is becoming more important as 5G opens up new applications that require high performance and low latency. The CYRUS 2.0 vRAN platform delivers virtualized RAN functionality in a form factor that is flexible and scalable, allowing ASOCS to provide a complete solution for both macrocell and small cell networks.

About ASOCS

ASOCS is a pioneer in virtual Radio Access Networks (vRAN) and a provider of fully virtualized, NFV-compatible base station solutions for in-building wireless and macro-networks. The company's on-premise mobile edge cloud, CYRUS, transforms the traditional base station into a software-centric solution, providing full virtualization of all base station layers and functions. It delivers on the promise of openness and scale at a lower TCO and it's being deployed by operators around the world. ASOCS is working with leading carriers to support the move to 5G with full network virtualization, while implementing open interfaces such as xRAN, TIP and ONAP. Privately held ASOCS serves carriers and enterprises in the retail, real estate, corporate offices, hospitality, hospitals and sports and entertainment markets, and has offices in Israel and the United States. Visit www.asocscloud.com and follow us on LinkedIn.

About Intel® Network Builders

Intel® Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at http://networkbuilders.intel.com.