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Adtran Simplifies Deployment of Scalable, Resilient Cloud at Edge

With growing demand for user applications at customer premises, Adtran's Ensemble Cloudlet, optimized for Intel® Xeon® Scalable and Intel Atom® processors, offers an edge cloud with localized control and zero-touch provisioning

As cloud computing applications continue to expand, enterprises are finding that traditional centralized cloud data centers aren't enough. Increasingly, enterprises are seeking to utilize cloud computing at the edge, putting workloads closer to where data is generated and processed. According to STL Partners, the on-premises edge computing market will increase by 35 times between 2022 and 2030.[1]

There are numerous drivers for the demand for cloud computing at the edge. These include:

- **Low latency:** Some applications, such as private 4G and 5G, virtual or augmented reality, and smart manufacturing, require low-latency access to computing resources.

- **Reduced backhaul:** Applications such as video surveillance produce tremendous volumes of data, with only a small portion of it containing useful information. By processing data locally, the required uplink can be drastically reduced because only alerts or aggregated data are sent upstream.

- **Data sovereignty:** Some organizations and jurisdictions have requirements or laws that require keeping data local. A centralized cloud requires transporting data out of the specified area and so may not be a viable option in those cases.

- **Standalone resiliency:** Some applications must continue to operate even if network connectivity fails. That means local hosting.

- **Lower costs:** Centralized cloud can be very expensive for applications that must run 24/7. In many cases, local edge environments can be operated for far less cost.

Edge cloud computing presents unique implementation challenges

Edge cloud computing intrinsically differs from hyperscale data center clouds, resulting in unique implementation challenges.

To start, edge cloud requires managing tens of thousands of clouds at different sites. This requires centralized management and orchestration (MANO) capabilities that can handle this scale.

Edge clouds also vary widely in their operating environments. When built at aggregation sites or customer locations, they may range from a few racks to many. When built on premises, they may be much smaller - from one server to a few dozen. They may also be deployed in outdoor cabinets that expose the systems to a wide range of power availability and weather-related operating conditions. As locations may be difficult to access, edge clouds must have remote management capability. Remote management must be secure and able to operate over multiple types of fiber and wireless networks. And it must be resilient against hardware failures to minimize the need for site visits.

Further, technical skills levels at edge sites may vary widely. Edge clouds must have the capability to launch remotely using zero-touch provisioning that can be handled by non-technical users. And cloud cabling must be simplified to prevent cabling errors.

While end-users can add multiple universal customer premises equipment (uCPE) devices at one site, this approach requires that each added node is its own cloud. There is no single orchestration tool for services at the site, so node interconnections are built outside of the cloud, and workloads can't be migrated across uCPEs. This means high availability applications must be launched twice, requiring more server cores and additional license costs. This configuration also has no shared local network storage, which means images or databases cannot be locally shared.

Scalable, resilient edge cloud from Adtran's Ensemble Cloudlet

Intel® Network Builders ecosystem member Adtran has enhanced its Ensemble Cloudlet solution, making it easy to deploy a scalable, resilient cloud at the edge. Powered by Intel® architecture processors, Ensemble Cloudlet provides a scalable edge cloud with localized cloud control.

Ensemble Cloudlet is designed to deploy and manage tens of thousands of edge clouds. It uses automated, zero-touch provisioning to launch nodes and create clouds. Figure 1 illustrates that Ensemble Cloudlet clusters multiple connector nodes into a single cloud. It is architected for easy installation and management by fewer and less-technical human resources through management automation tools.

To provide resiliency, Ensemble Cloudlet features redundant local cloud controllers, redundant management access to each node, and shared local storage. Policies also migrate workloads between servers.

Ensemble Cloudlet is optimized to work on all Intel® architecture CPUs, including high-power, high-performance Intel® Xeon® Scalable processors and smaller footprint Intel Atom® processors.

3rd Gen Intel® Xeon® Scalable processors offer a balanced architecture with built-in acceleration and advanced security capabilities, designed over decades of innovation for the most demanding workload requirements. For edge networks, the CPUs handle real-time analytics, AI, and other demanding workloads providing a powerful, scalable foundation for edge computing. The processors are cost effective, durable, and flexible for network infrastructure, network security, and storage appliances.

Intel Atom® processors deliver the right balance of performance and cost and low power for remote site servers and uCPE. These processors offer the power, durability, and scalability needed for network edge infrastructure, including network security acceleration, and storage appliances.

Furthermore, Ensemble Cloudlet can utilize advanced Intel® QuickAssist Technology (Intel® QAT), which offers accelerated data encryption and compression. The Data Plane Development Kit (DPDK), an Intel-developed open-source application to accelerate packet processing and packet forwarder creation without custom routers and switches, comes built into Ensemble Cloudlet.

Ensemble Cloudlet provides failover migration policies for applications. In many cases high availability can be achieved without the need to run and license two separate instances of an application. This cuts costs by reducing the need for dual application licensing and reduces the total number of cores consumed.
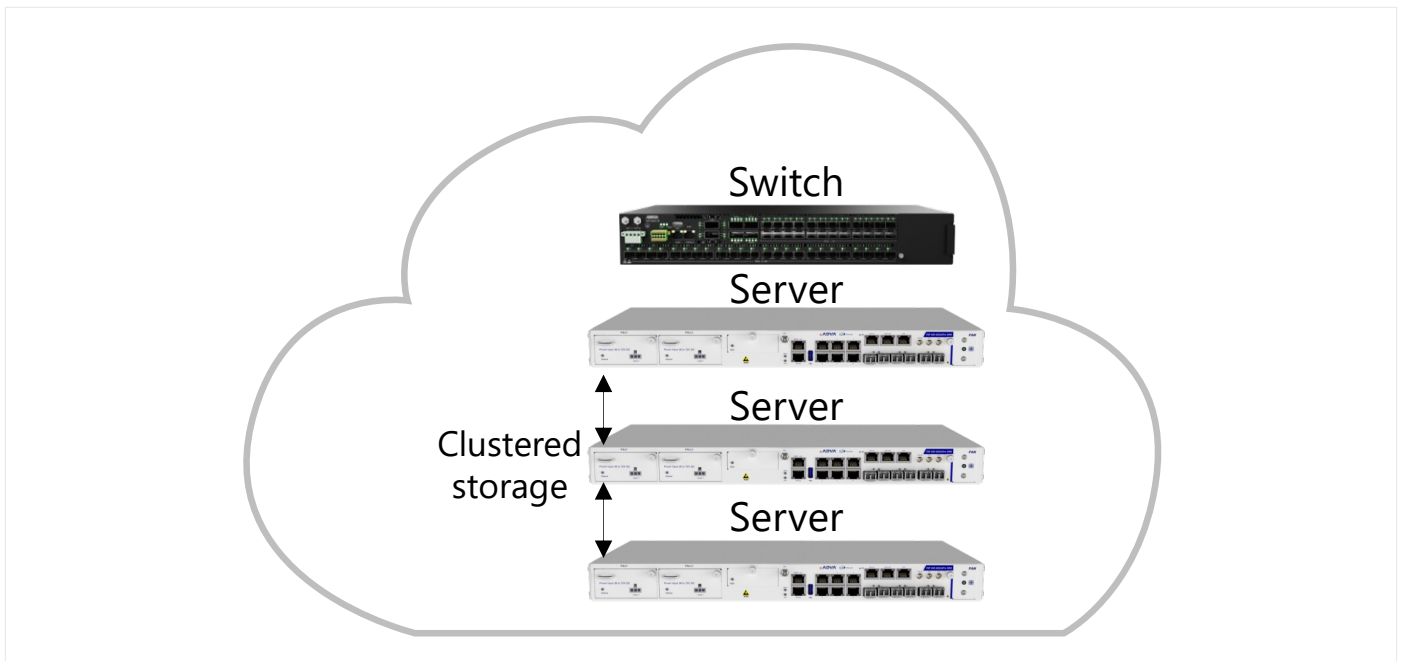
Figure 1. Ensemble Cloudlet clusters multiple connector nodes into a single cloud.
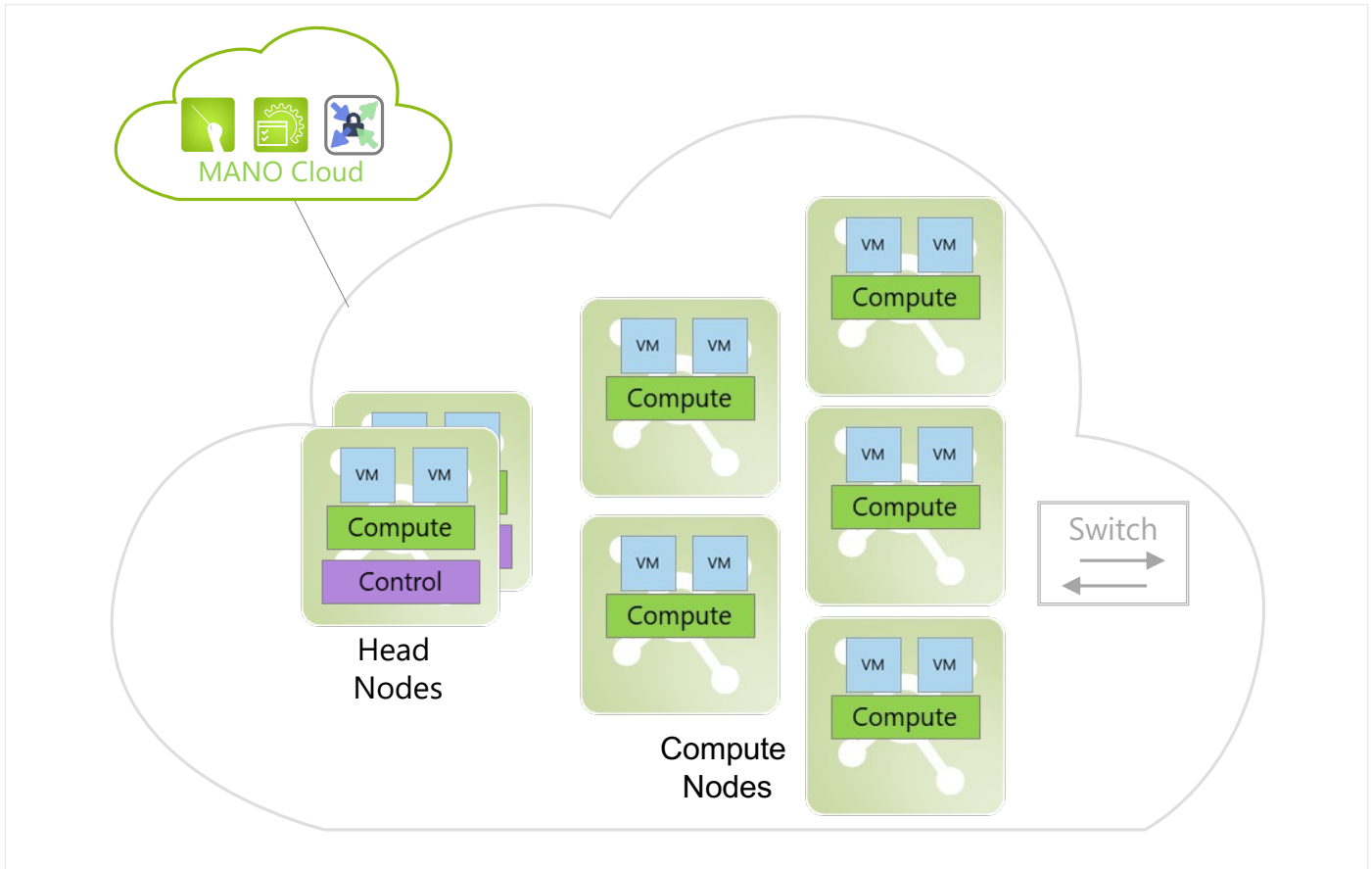
Figure 2. Major components of Ensemble Cloudlet

Cloudlet's ZTP turnup and simple administration is provided by Ensemble MANO, a standard application that can run on private or public clouds hosted on any Intel-powered server. With Cloudlet, orchestrated services can span multiple nodes. High-availability and inter-node connections are orchestrated and do not need to be manually configured outside of the cloud.

Ensemble Cloudlet components

The major components of Ensemble Cloudlet are shown in Figure 2. The head node provides local cloud controller, compute resources, and management WAN access. The compute nodes provide compute resources for the cloud. Storage is distributed across all nodes.

The cloud switch provides local connectivity within the edge cloud. The Cloudlet architecture includes pre-configured Adtran switches that can support redundant switch options

Ensemble Cloudlet supports infrastructure as a service (IaaS) and self-deployment

Sometimes end users want to manage their own cloud infrastructure. More often they want to host their workloads on the service provider's edge cloud in an IaaS model. Ensemble Cloudlet supports both models.

In the IaaS model, a telecommunications service provider deploys and operates Ensemble Cloudlet on behalf of the end user. Ensemble Cloudlet hosts both virtualized communications functions (e.g., SD-WAN or firewall) as well as end-user applications running in their own segregated sandbox, with no impact on the operator's applications.

A benefit of this approach for the end user is that they do not need to purchase or manage onsite computing hardware. Rather than having to own and manage cloud servers, customers – ranging from retail locations to branch offices – might have all their communications and application needs hosted on Ensemble Cloudlet and managed by the service provider. This simplified deployment model eliminates the need for hardware maintenance and is especially beneficial for customers that do not have local IT staff to run local clouds.

In a self-deployment model, enterprise IT staff might have the desire and capability to deploy and manage their own edge clouds. In this case, Ensemble Cloudlet takes care of the details of operation, allowing the IT team to focus on other work.

Ensemble Cloudlet customer use cases

Here are two use cases demonstrating the benefits of Ensemble Cloudlet:

- A managed service provider based in Asia-Pacific offers a smart factory solution that includes Ensemble Cloudlet. The offering features a managed networking service, network high availability, and managed machine learning services for the factory customer. The service provider earns added revenue for hosting a large and recurring smart factory workload. Ensemble Cloudlet's software-as-a-service MANO simplifies the go-to-market model and time-to-revenue.

- A North American service provider to global manufacturers offers a platform-as-a-service (PaaS) to handle IT workloads, including Ensemble Cloudlet. The package features a managed networking service, network high availability, and PaaS hosting of IT workloads with redundancy. The service provider earns added revenue for hosting a large and recurring IT workload. And the added cost for more cores is small and one-time.

Conclusion

Adtran's Ensemble Cloudlet makes it easy to deploy a scalable, resilient, cost-effective cloud at the edge. Optimized to work with both Intel® Xeon® Scalable and Intel Atom® processors, it can utilize advanced Intel features such as Intel® QAT and DPDK. Ensemble Cloudlet is designed to deploy and manage tens of thousands of edge clouds, using automated, zero-touch provisioning. Its MANO deploys from the same platform as a customer's uCPE device. Ensemble Cloudlet supports both managed service and self-deployment options, making it ideal for a wide range of edge cloud applications.

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Ensemble Cloudlet Solution Brief

Intel® Xeon® processors

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Data Plane Development Kit

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