

# Lowering Network TCO with a Virtualized Core

## Mavenir vEPC

Mobile operators are competing to add capacity and services quickly, yet are finding that their traditional hardware-based architectures make this endeavor too expensive and time-consuming. By moving to a virtualized Evolved Packet Core (vEPC), operators can quickly react to market changes, reduce backhaul costs, and reduce services time to market by simplifying deployment, interoperability, and optimization.

A recent IDC study shows that virtualizing the entire set of EPC functions enables the mobile network infrastructure to operate at a higher utilization rate of up to 87%, resulting in opex cost efficiencies of up to 25%. The study also shows that factors such as the extent of network virtualization and control/user plane separation–driven architectures can result in potential opex cost savings in the range of 20 to 40% over a five-year period (Figure 1).

### KEY BENEFITS

- Opex savings up to 40% over 5 years compared to traditional EPC deployment
- On-demand scalability optimizes resource usage and increases business agility
- Natively 5G ready with an integrated 4G/5G core
- Low-latency use cases by placing user plane at the network edge
- Rich application integration using built-in data correlation and streaming capabilities

### Virtualized Assets' Cost Efficiency, 2016-2020

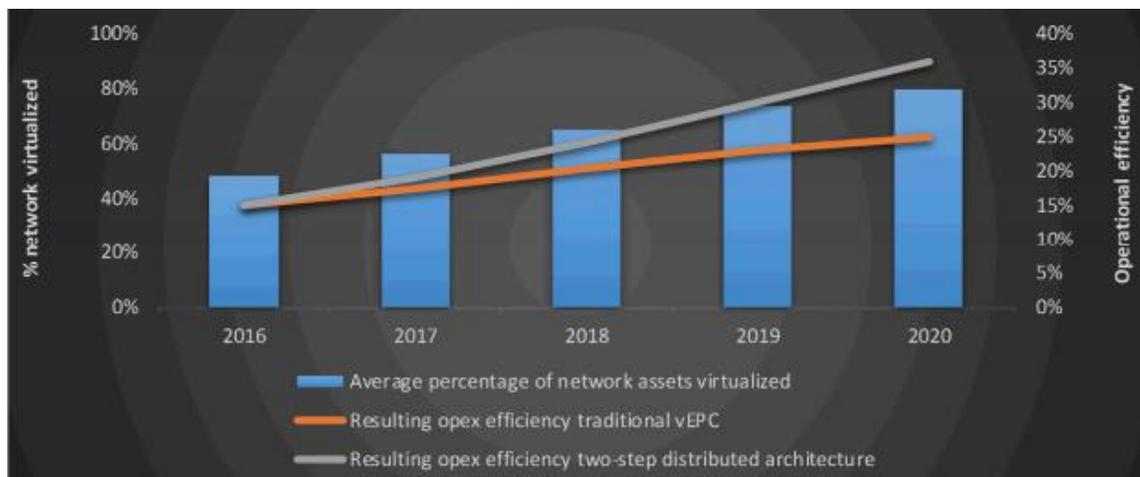


Figure 1: vEPC Network Cost Efficiency. Source: IDC, 2016

## Mavenir vEPC: The Industry’s First and Most Scalable and Agile Evolved Packet Core

Mavenir vEPC cloud-based core network architecture transforms mobile networks through a highly scalable and nimble virtualized EPC that can adapt to a range of emerging 4G LTE deployment use cases. Its visionary nature allows it to be natively extensible to emerging 5G architectural standards. This approach eliminates the expensive hardware, long upgrade cycles, overprovisioning, and years-in-advance budgeting that traditionally characterize mobile service provider networks. Now operators can offer services to both 4G and 5G subscribers, and then scale to support Multi-Access Edge Computing (MEC) use cases on small form factor and white box solutions with zero touch orchestration.

### Solution Description: Mavenir vEPC

Mavenir vEPC is an innovative Evolved Packet Core (EPC) specifically designed from the ground up for virtualized environments. It utilizes a service-based, horizontal architecture consisting of independent interface, service logic, database, and management modules (Figure 2). This holistic approach to functional virtualization optimizes performance and efficiency—compared to the traditional approach of replicating existing physical nodes as a software asset—and is the fundamental difference between Mavenir vEPC and other virtualized products. Mavenir has built on next gen virtualization with the use of containers, addressing the webscale network requirements of MNOs. By leveraging this innovative architecture, the vEPC provides a robust, high-performance, scalable, and fault-tolerant solution capable of supporting diverse use cases.

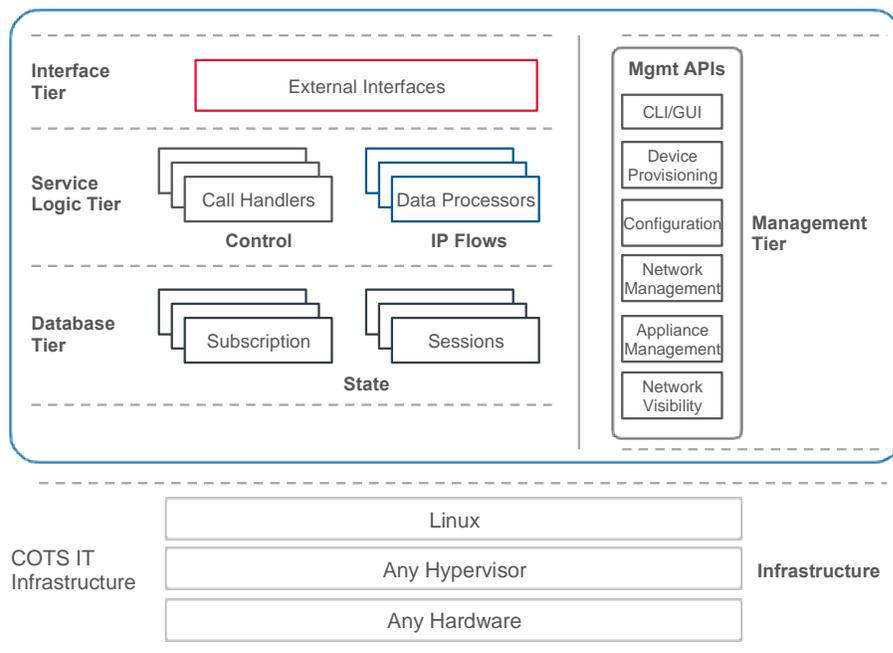


Figure 2: vEPC Logical Architecture. Source: Mavenir

### Optimized for Processing, Transactions and Sessions

Another unique capability of the Mavenir vEPC framework is that it provides control plane and user plane separation, with each plane functioning and scaling independently and elastically according to the respective load factor. With this framework, Mavenir vEPC is optimized for processing control plane transactions and user plane session data.

### On-Demand, Granular Scalability

The Mavenir vEPC can be deployed as one complete virtual EPC, yet has the flexibility for multiple product offerings on the same platform by the selective enablement of interfaces, as required by the operator (Figure 3).

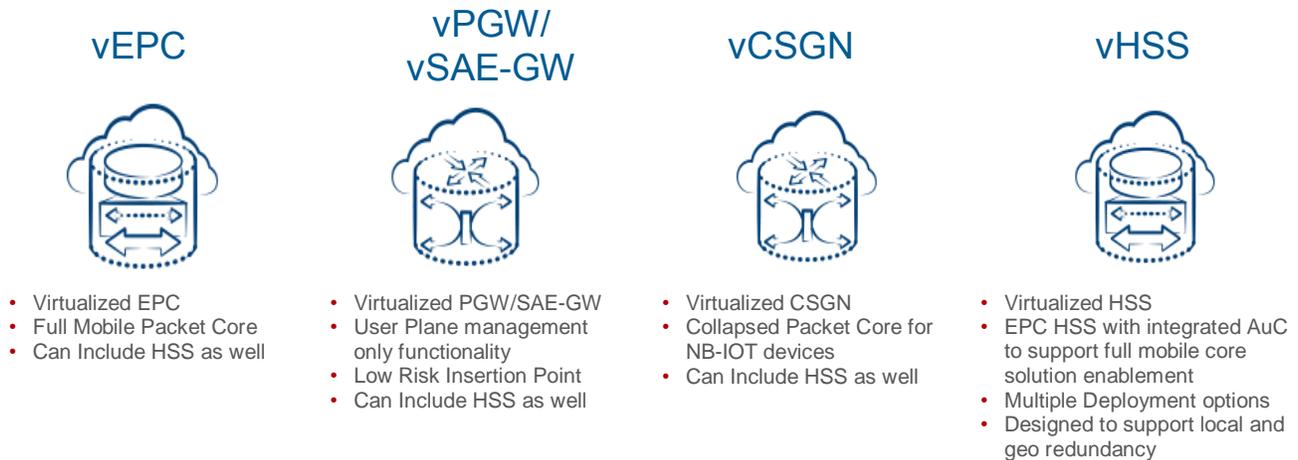


Figure 3: Selective Enablement of Interfaces for Different Product Personalities. Source: Mavenir

Mavenir vEPC components are fully distributed and tiered by function, such as signaling, interface, service logic, and data management. This modular design allows for greater flexibility in designing solutions for a range of industry use cases. Moreover, no barriers exist in terms of subscriber, throughput, or virtual resource minimums that must be deployed. Such on-demand, granular scalability eliminates the need for long-range advance budget planning and expensive overprovisioning.

## Optimized User Plane Performance

Mavenir vEPC has been optimized to enable packet core user plane functions on general-purpose Intel x86-based servers. With its unique architecture, Mavenir vEPC provides best-in-class performance and has been benchmarked for full duplex 10 GbE line-rate data processing and minimal data plane latencies.

Mavenir vEPC utilizes data plane acceleration technologies, such as Intel DPDK in PCI passthrough or SR-IOV mode, to guarantee high performance in a virtualized environment. Key aspects of delivering user plane services over a virtualized platform include overcoming the non-real-time nature of the x86 hardware processing pipeline and providing alternative solutions to traditional interrupt-driven packet processing approaches. By using batch-based packet processing models and poll-mode-based drivers, Mavenir vEPC achieves faster memory access and packet processing. This allows operators to service a user plane that provides deterministic packet forwarding using a combination of synchronous run-to-completion and inline asynchronous threads, thereby maximizing throughput levels.

## Higher Service Velocity

As an open, highly adaptable solution, Mavenir vEPC can provide higher service velocity than traditional, physical node-based architectures, which are far more rigid and complex. Its service-based, modular design, combined with open API support, enables operators to quickly create and implement new features for maximum business agility. Operators can add infrastructure to support new users or new services in just days, instead of months. The fully virtualized deployment allows operators to grow their mobile networks at market speed.

## Form-Factor Miniaturization

The scale-in capabilities of the Mavenir vEPC allow the same Mavenir vEPC software used in larger networks to be miniaturized and used for small form-factor applications. This means that a Mavenir vEPC-based network-in-a-box type of solution inherits the same fully qualified and interoperability-tested software that is available for larger, carrier-grade networks. In its miniaturized version, Mavenir vEPC can scale down to operate on as few as two Intel x86 compute cores while servicing up to a hundred subscribers.

## Use Cases

The hardware-centric approach of traditional EPC infrastructure has forced service providers to create expensive, large-capacity nodes that are cost-prohibitive to deploy in a flexible manner. Mavenir vEPC decouples network functions from hardware to provide a service-based, modular design that can also provide control plane and user plane separation. As a result, a wide range of industry use cases can be addressed using the same platform software.

### 5GC (5G Core)

Mavenir has built the vEPC based on webscale architectural principles that are only now being adopted as part of 5G Core standards discussions. That means operators can deploy a Mavenir vEPC today, in their 4G network, and organically grow it into a 5G Core. Mavenir’s 5G Core network is designed for mobile communications systems with the functional capabilities to support high bandwidth, massive IoT connectivity, and ultra-low latency applications.

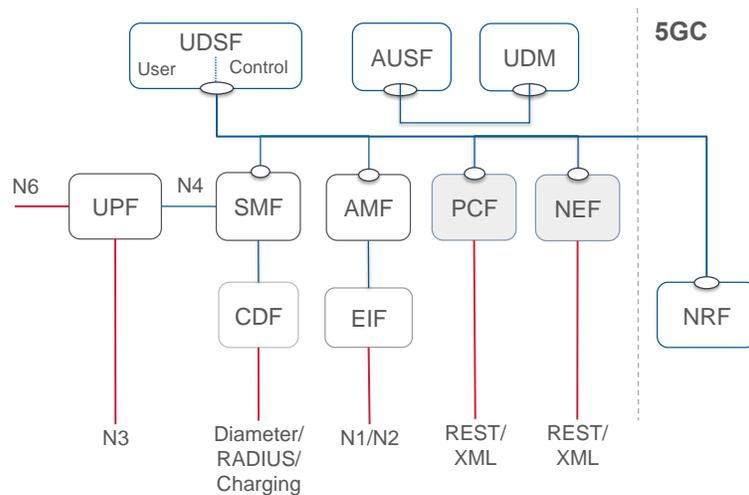


Figure 4: Mavenir 5GC Architecture

### IoT

The Mavenir vEPC software has the versatility and scalability to be custom-scaled to meet the requirements of high-throughput Cat-1 devices, or low-throughput narrow band Cat-M1 and NB-IoT devices. While NB-IOT chipsets are still coming to market, Mavenir has taken the lead by building NB-IoT capabilities (such as eDRX, PSM, CP/UP optimization) into the vEPC, and is ready when the technology sees mass adoption.

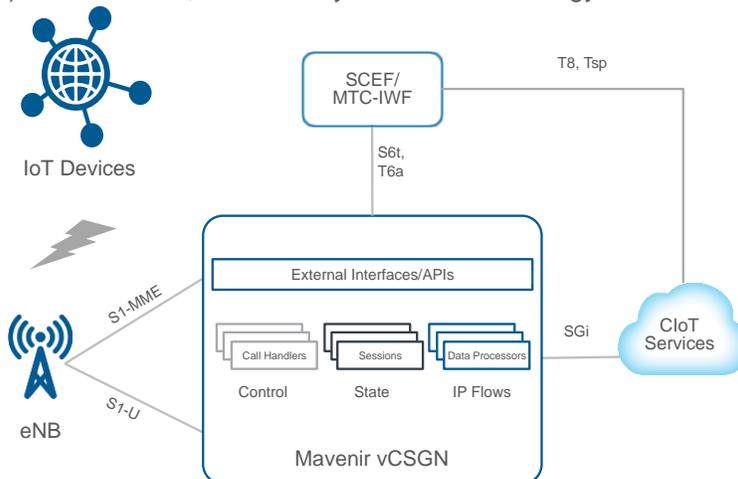


Figure 5: Mavenir vCSGN

## MEC (Multi-Access Edge Computing)

Mavenir’s unique scaling capabilities allow a vBBU (Virtual Base Band Unit), a vEPC, and a MEC application to be deployed at the edge of the network. This enables latency reduction, higher bandwidth utilization, and the expanded ability to rapidly process content very close to the end users. MEC creates a new ecosystem and value chain, enabling CSPs to securely open their Radio Access Network (RAN) edge to authorized third parties while allowing them the flexibility to deploy innovative applications and services. This widens the addressable market for CSPs beyond the traditional consumer-centric business model to varied vertical markets such as automotive, health, energy, education, manufacturing, and many others.

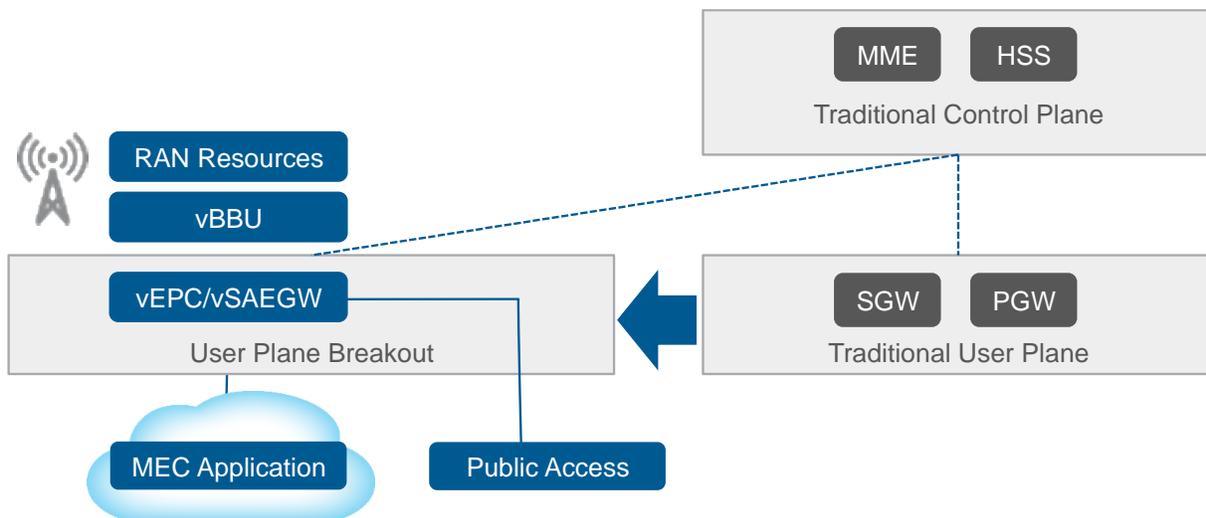


Figure 6: Mavenir vSAEGW or vEPC Edge Deployment

## Enterprise LTE

Mavenir’s vEPC is the first industry solution to scale NFV for the enterprise marketplace, providing mobile operators the opportunity to offer enterprise customers a secure wireless LTE network, all running from an off-the-shelf (COTS) on-premises compute device. For the enterprise, it’s a turnkey solution: zero touch provisioning, no inventory, and no time to revenue. The mobile network operator generates recurring revenue from managing the solution and renting spectrum to the enterprise. The network is very simple to deploy and maintain, and is designed for fast updates and upgrades. The enterprise can generate revenue from roaming fees negotiated with the operator, as well as wireless services offerings for building tenants. It’s a win-win for both the operator and the enterprise.

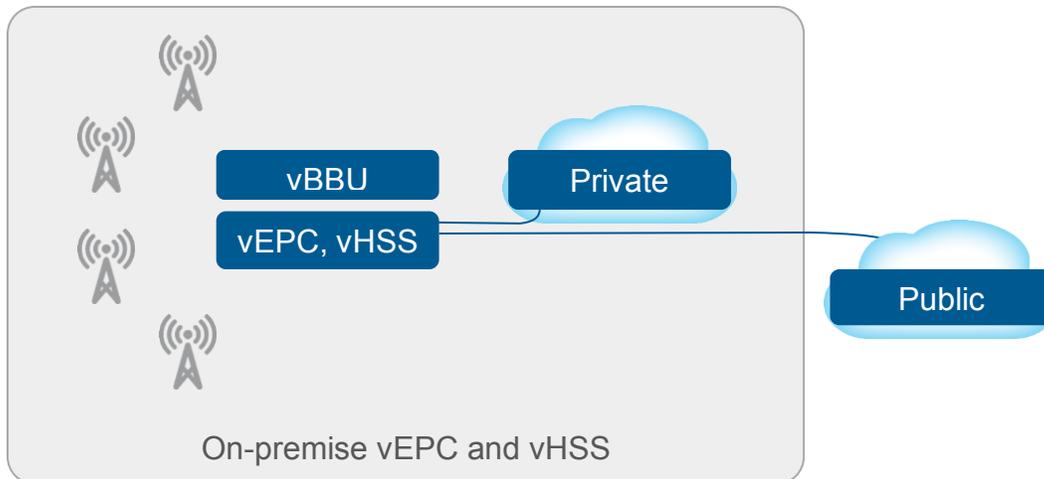


Figure 7: Mavenir vEPC with vHSS

## Summary

Mavenir vEPC is an innovative, NFV-ready, cloud-based virtualized EPC that can scale independently in the dimensions of throughput, transaction rate, and session capacity. This flexibility enables operators to quickly offer new revenue-generating services and significantly lower capex and opex. The Mavenir vEPC uniquely utilizes a holistic approach to functional virtualization that optimizes performance and efficiency. Another industry differentiator is the fact that the Mavenir vEPC can be deployed as a complete virtual EPC, combined with an HSS, or deployed selectively as a standalone vPGW/vSAEGW, vCSGN, or vHSS. The Mavenir vEPC can adapt to a range of emerging 4G LTE deployment use cases, and its visionary nature allows it to be natively extensible to emerging 5G architectural standards, and it is ahead of the market for 5GC.