



Look Inside.

Enterprise Radio Access Network (E-RAN) Enables New NFV-Based Services at the Edge

SpiderCloud Wireless* offers a breakthrough platform that enables mobile operators to deliver excellent 3G/4G coverage, capacity, and NFV hosted services in medium to large enterprise buildings.

Introduction

Before the creation of the enterprise radio access network (E-RAN), there was not a cost effective method to deliver cellular service into medium to large buildings. Equally problematic, if mobile operators needed to host a cloud at the edge, they had to provision a separate server at the site and manage it throughout its lifecycle.

Overcoming these challenges, the E-RAN small cell system from SpiderCloud Wireless* provides cellular service to indoor areas spanning upwards of 50,000 square feet to 1.5 million square feet of space, and supports over 10,000 voice and data subscribers. The E-RAN's unique architecture features a Services Module with a quad-core Intel® Xeon® processor, whose costs can be amortized across up to 100 small cell radios, thus providing an economical edge cloud hosting location that also supports network functions virtualization (NFV). Since the E-RAN enables access to the Internet, mobile core, enterprise DMZ, and 3G/LTE radio access networks, this edge cloud hosting location enables independent software vendors (ISVs) to build unique innovative applications: enterprise-facing, standalone, enterprise cloud helper, and telecom analytics/operations.

This solution brief describes this E-RAN system, which has been in commercial service for several years on three continents in the world's largest mobile operators. The system meets their stringent service quality per 3G/LTE performance indicators (KPIs) that are critical to mobile operators and enterprises. Due to its unique architectural location, the SpiderCloud Services Module gives rise to new opportunities in edge cloud enterprise services and telecom operations applications. The pent-up demand for an economical edge cloud hosting location has resulted in various types of applications developed by a number of solution providers, including some that are featured in the following.

SpiderCloud
Wireless





Solving Enterprise Communications Challenges

Poor cellular coverage and the lack of data capacity in-building are major problems for the enterprise sector in its broadest sense - that is, not just in offices, but in retail establishments, transport hubs, industrial premises, hotels, and more. The shortcomings are becoming more glaring as voice and data usage shifts away from landlines to mobile devices, and many companies support bring your own device (BYOD) policies. These factors are turning inadequate voice quality or data capacity from irritants into critical competitive issues for businesses, as well as for mobile operators, whose customers are increasingly willing to switch operators in order to get better service.

Small cells can address these problems by delivering improved coverage and capacity in a secure and managed fashion, while dramatically cutting CapEx and OpEx for mobile operators and lowering mobile service costs for enterprises. They can also help businesses address additional challenges such as integrating communications across the organization, and ensuring security and legal compliance.

Small Cell Challenge

In just the United States alone, buildings larger than 50,000 sq. ft. account for more than 50 percent of the commercial space, reports the U.S. Department

of Energy in its Building Report. With respect to mobile communications, many factors, such as building materials or outdoor tower network coverage, drive the need to provide services from inside the building. However, the traditional gap in the market has been a lack of small cell systems that support buildings over 50,000 square feet and meet the KPIs of mobile operators. Furthermore, the alternatives to small cell technology are typically very expensive and hand crafted.

SpiderCloud took on the challenge to build a scalable small cell system, incorporating enterprise technology, such as Cat 5/6 cabling, Power-over-Ethernet, and TCP/IP, that functions as a harmonious member of the overall cellular network. The system also supports:

- Hardware features access: trusted platform module (TPM) and IPsec
- Transport access: mobile core, Internet, enterprise DMZ, and 3G/LTE RANs
- API access to platform events and traffic flows

The solution is also an edge cloud, featuring an Intel Xeon processor-based Services Module capable of sharing an NFV hosting environment across a cloud of small cells and delivering services evenly to every small cell in its domain. Intel championed the business case justification and technology on different standalone small cells, demonstrating how Intel® processors could be integrated in an E-RAN. Still, it was SpiderCloud that overcame a major challenge confronting

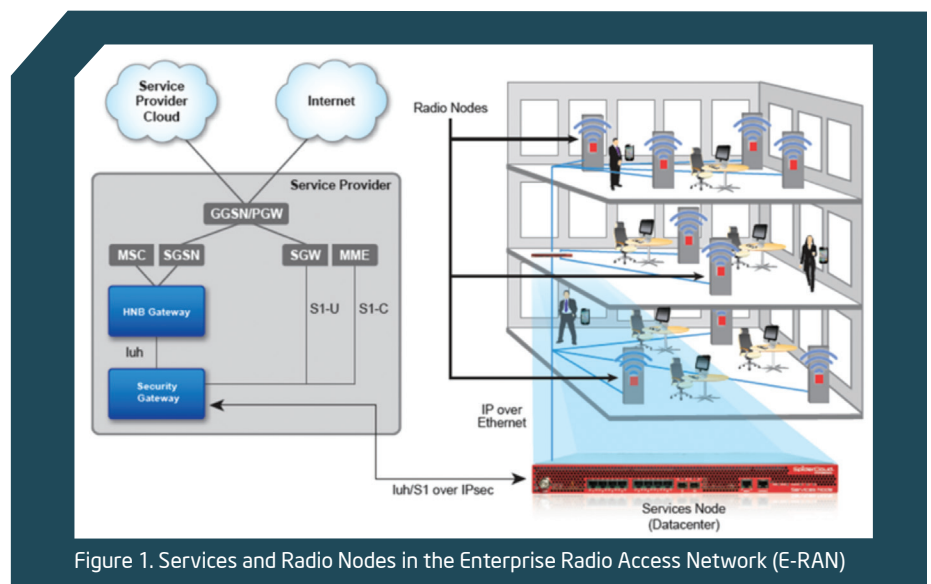


Figure 1. Services and Radio Nodes in the Enterprise Radio Access Network (E-RAN)



both Intel and small cell manufacturers, which is enabling the subsystem cost to be amortized across multiple small cells.

Small Cell System Overview

SpiderCloud offers a scalable, in-building 3G/4G small-cell system called the E-RAN, which can provide cellular coverage and data capacity from upwards of 50,000 square feet to 1.5 million square feet of space, and support over 10,000 voice and data subscribers. A single system comprises up to 100 Radio Nodes connected over an Ethernet-based network to an on-premises SpiderCloud Services Node (SCSN), as shown in Figure 1. The SCSN, which is the central configuration and services enabler, acts both as a controller of Radio Nodes and an aggregator.

The SCSN securely connects to the mobile operator's core network with just a single backhaul connection. This enables the operator to deliver managed mobility services to its enterprise customers. Without the presence of a local control point on an enterprise customer's Ethernet network, a mobile operator cannot effectively coordinate small cells or support inter-small cell signaling. In addition, a local controller avoids having hundreds and thousands of small cells connecting back to the mobile operator's gateways, which otherwise would slow down handovers and connections, and increase the rate of interference coordination inside buildings for 3G and LTE small cells.

The SpiderCloud Services Platform offers NFV-hosted applications secure access to 3G/4G traffic - a single point of inspection for all traffic coming into and leaving an enterprise or venue. Such multi-technology traffic inspection enables intelligent data filtering and caching applications at the edge. The Services Node platform can host virtual network functions (VNFs) from any source at the edge of the network.

Some of the benefits from NFV Edge Cloud capabilities in the network are:

- Operations applications for instrumentation and analytics are enabled by NFV hosting of a collector/aggregator at the network edge.

- Operators avoid having to send massive amounts of raw data over the backhaul to a collector/aggregator in the mobile core.
- Time-sensitive enterprise and emerging public safety applications can be processed quickly by event processing engines running at local indoor locations.

Small Cell System Details

The SCSN supports up to three modules: two Access Modules (AMs) and a Services Module (SM), as shown in Figure 2. The AM supports radio access technologies, including UMTS and LTE. The SM is designed to support third party VNFs, and is powered by an Intel Xeon processor with 8 GB of RAM that provides a

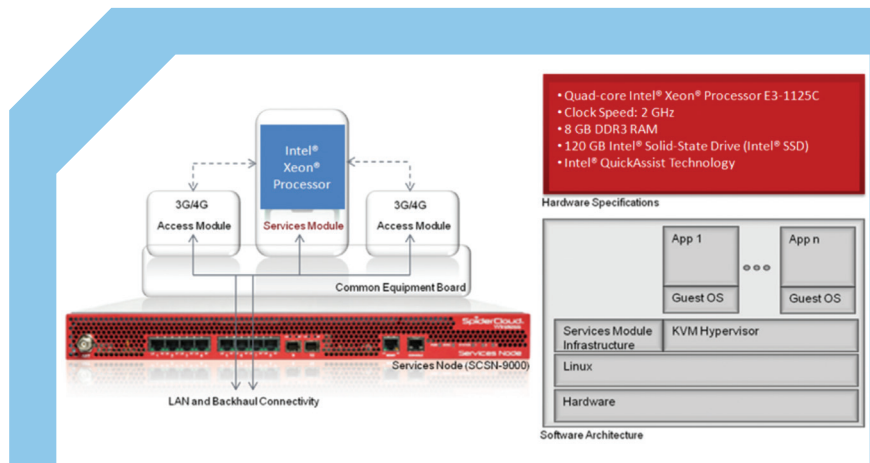


Figure 2. The SpiderCloud Services Node Supports up to Three Modules



virtualized environment for a wide range of applications. The SM offers a Kernel-based virtual machine (KVM) environment that enables hosting of multiple concurrent virtual appliances across different operating systems (Guest OSs) and programming languages. Applications hosted on the Services Module have access to a 120 GB Intel® Solid-State Drive (Intel® SSD).

Through the Services Module Infrastructure (SMI), the system enables management of VMs hosted on the SM. The SpiderNet Element Management System allows mobile operators to remotely access the services platform to install and/or upgrade VMs. SpiderNet also provides the ability to provision system resources (CPU, RAM, etc.) across VNFs as well as monitor operational status of each application. The SpiderCloud Fault and Performance Management entities monitor faults on Guest OSs and provide statistics on the VM environment.

SpiderCloud has been working with third party ISVs to bring to market VNFs associated with security, content filtering, and content delivery.

With the Services Module integrated into the SpiderCloud Services Node, mobile operators can host NFV applications at the edge by exploiting the E-RAN's unique on-premise, multiple technology controller-based architecture. The powerful services platform enables the migration of content delivery and core network functions to the edge, as well

as intelligent data filtering and caching applications, by establishing a single point of inspection for all traffic coming into and leaving an enterprise or venue. In addition, SpiderCloud's 3G/4G controller offers location and presence detection capabilities that enable context-aware VNFs, or Network as a Service (NaaS) opportunities.

Third Party Hardware, Operating Systems, ISV VNFs, and OSS Integration

A standard KVM virtualization environment on the Services Node enables hosting of multiple concurrent VNFs across different operating systems (Guest OSs). Along with its partners, SpiderCloud has successfully integrated and demonstrated VNFs ranging from content caching and analytics to security solutions. SpiderCloud developed well-defined 'application development guidelines' that provide any third party ISV a framework to evaluate, develop, demonstrate, and bring to market fully integrated VNF solutions. The SpiderNet Element Management System provides the ability to remotely access the Services Platform to install and/or upgrade any third party VNF.

Development Partnerships

SpiderCloud's Services Node (SCSN) enables secure services to any mobile device on the network by providing a trusted connection to the Radio Nodes

and a logical view into all devices on the E-RAN. It also allows mobile operators to manage cloud and application services, such as master data management (MDM), BYOD, location and context-awareness, security, and IP-PBX services. With Intel, SpiderCloud has established several services partners to showcase how the Services Node can host managed services, such as:

- **Security threat detection with McAfee* Virtualized Network Security Platform (VNSP)**
VNSP protects a device from malicious packets sent by a server on the Internet by identifying and preventing network security threats (e.g., malicious packets) at the edge of the mobile network before such threats can reach the core network.
- **Location aware Content Delivery at the edge by IBM***
IBM handset-to-location video and advertising "push" services use a VM hosted on a SpiderCloud Services Node at venues and shopping malls.
- **Caching at the edge (e.g., stadiums) with Saguna***
Centralized content caching on the SCSN reduces backhaul traffic and improves the user experience as part of a scalable small cell system for large campuses, venues, and shopping malls.

For more information on the preceding applications, [visit](#):



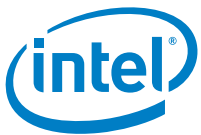
- **Context-aware applications**
SpiderCloud, HP*, and Vodafone* won a Small Cell Forum award in June 2014 for innovative work in this area. ([press release](#))
- **PBX Integration with Tango Networks***
This joint mobility solution enables mobile operators to provide enterprises with the ability to extend their mobile unified communications (UC) services and applications, and PBX functionality from their IP telephony network through their small cells as part of the trusted carrier macro-cellular network. ([press release](#))
- **Druid Software* PBX for Hospitals**
This integrated unified and mobile communications system is tailored for hospital environments, using the ecosystem of mobile devices to replace desk phones and paging systems. ([press release](#))
- **Managed Services Market Opportunity**
A recent survey by IGR indicates that 56 percent of IT managers at U.S. companies with 500 or more employees would be willing to pay an increase of between 15 percent to 30 percent per employee for improved indoor cellular coverage and capacity. ([press release](#))

New Era for In-Building Communications

The SpiderCloud E-RAN small cell system addresses the challenges of scaling indoor communications infrastructure within medium to large buildings while meeting the KPI goals of mobile operators and enterprises. With an onboard Intel Xeon processor, the SpiderCloud Services Module supports cost-effective edge cloud solutions over 3G/LTE, thus creating new opportunities for ISVs servicing the enterprise, cloud, and mobile operator markets.

For more information about solutions from SpiderCloud
Wireless, visit www.spidercloud.com.

Solution Provided By:



For more information about Intel® solutions for communications infrastructure, visit www.intel.com/go/commsinfrastructure.

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