

# Performance Solution for NFV Reduces Cost-per-bit and Simplifies Service Deployment

**Designed to run consolidated, virtualized network functions, Radisys\* ATCA compute modules are versatile building blocks for network infrastructure.**

## Introduction

Consumer adoption of smart phones and tablets is off the charts, resulting in an exponential growth in network traffic. The challenge for network operators is how to augment capacity in a cost-effective manner to meet rising demand. At the same time, operators need to monetize this traffic expansion by adding more intelligence to the network and segmenting the market, which allows them to generate higher average revenue per user (ARPU) through tiered service level agreements (SLAs), differentiated pricing plans, content-based services, etc.

These objectives are more easily achieved by moving from 40G to 100G-capable equipment and by adopting the principles outlined by network functions virtualization (NFV).<sup>1</sup> Both can reduce infrastructure expenditures (CapEx/OpEx) and accelerate the deployment of new services.

This solution brief describes how the challenges facing network operators can be addressed by the Radisys\* T-100 family, which enables the telecom industry to achieve its NFV design objectives for processor-intensive data plane applications. Examples include Radisys ATCA compute modules based on Intel® Xeon® processors, which deliver the performance, reliability, and availability critical to address network infrastructure requirements of NFV in telecoms. The solutions support various networking functions, such as security, policy enforcement, deep packet inspection (DPI), load balancing, and media optimization, among others.



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## Operator Challenges

With the move from 3G to 4G/LTE, network operators will need to support higher traffic throughput and, at the same time, overcome several challenges:

- **Lower service delivery cost** by increasing the efficiency of networking equipment.
- **Expand the capabilities of the core network** to handle all of the new services consumers are demanding.
- **Focus on developing new services**, not Platforms.

## Radisys\* T-100 Solutions

The industry is very focused on finding solutions that aggressively reduce the cost-per-bit and ultimately lower service delivery cost. Along these lines, the Radisys T-100 Platform family is an



Figure 1. Radisys\* A4700 Compute Blade

ATCA-based 100G Platform that provides up to a 50 percent cost-per-bit reduction over its 40G predecessor systems<sup>2</sup> in a comparable form factor. The T-100 Ultra Platform features a 14U, 14-slot, NEBS-ready chassis with over 2 terabits aggregate throughput, while the T-100 Pro features a 6U, 6-slot chassis with 640 Gbps throughput. All T-100 Platforms can be configured with full redundancy, exceeding the industry's "five nines" availability targets.

The T-100 also improves traffic throughput of 40G assets, enabling network operators to expand the capabilities of the core network, as needed, to meet emerging customer demands. It also delivers flexibility and performance critical for keeping up with increasing high-speed mobile data traffic, ensuring the core network does not become the next choke point in the network. This solution demonstrates how Radisys employed the open architecture made available by ATCA to deliver true 100G over the back plane inside the chassis, thus satisfying the capacity requirements that 4G radio access networks will be placing on the network core.

Since operators do not want to be burdened by low-level hardware and software design, the T-100 is pre-integrated with virtualization, operating system, and security software, as well as a host of tools developed to accelerate application development. Lastly, the T-100 Platform provides telecom equipment

manufacturers (TEMs) with a new R&D paradigm in the form of an Infrastructure as a Service (IaaS) model that allows them to focus solely on building their application.

## Why NFV Matters to Network Operators

At the heart of NFV is the decoupling of network functions from hardware through abstraction and virtualization. The end result is software workloads can be run on a common pool of hardware resources, allowing them to be deployed dynamically throughout the network as needed. For network operators, this translates into migrating from expensive, rather inflexible proprietary Platforms to high-volume, proven server technology with dramatically lower acquisition and operating costs.

In the case of the Radisys T-100 Platform, the servers are Radisys A4700 blades based on dual, 12-core Intel Xeon processors from the E5-2600 v3 product family. Operators can deploy or update services in minutes, as easily as a software load, compared to the weeks or months typically needed to install a piece of proprietary equipment. When monetizing network traffic is a key requirement, NFV greatly simplifies services deployment.

Moreover, while the Radisys A4700 compute blade is designed for high throughput data plane applications, the server can also support application plane and control plane requirements. This

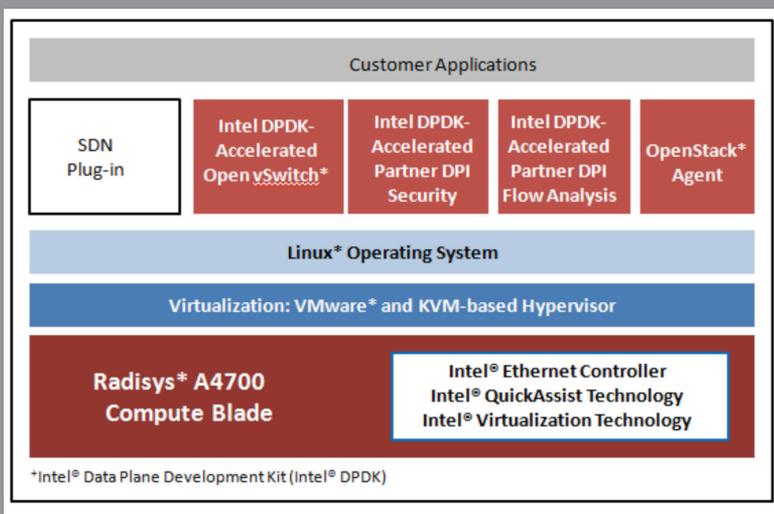


Figure 2. Software Stack Support for the Radisys\* A4700 Compute Blade

but finds it requires a software change that only the OEM can make because the equipment is essentially a closed system.

One reason traditional network elements are rather complex is the use of different hardware architectures to run diverse workloads, like packet processing on network processors (NPUs) and Application Specific ICs (ASICs), and control and application processing on general-purpose CPUs. As a significant step towards changing this paradigm, the latest Intel Xeon processors combined with the Intel® Data Plane Development Kit (Intel® DPDK) can provide a significant boost to networking/packet processing workload performance. This is possible because multi-core architecture with integrated memory controllers is delivering exceptional performance gains and significantly lower memory latencies (as much as a 40-50 percent reduction), allowing all these workloads to run on a single architecture. Layer 3 forwarding throughput, for example, has sharply improved and is now on par with many NPUs.

### Simplifying Service Deployment

The Radisys A4700 Compute Module is supported by a rich set of middleware and security software that greatly reduces the effort to develop new services. Networks operators can choose from a wide assortment of pre-validated virtualization software and operating systems, as shown in Figure 2. The pre-integration of virtualization, OS, and security software on the A4700 enables

flexibility enables operators to reach a very high level of workload consolidation and equipment utilization, which are key for maximizing equipment efficiency.

The benefits of flexible workload management and market velocity offered by NFV are easier to attain if the hardware resource pool has homogenous technology attributes, as in the case of standard Intel x86 CPU-based servers. As demonstrated in web and enterprise data center deployments, the consolidation of network functions using a homogenous resource pool can reduce time-to-market and infrastructure costs by orders of magnitude.

### Packet Processing on Intel® Processors

The growing complexity of today's infrastructure is driving widespread interest in NFV among network operators and service providers. A major factor is the increasing variety of proprietary, fixed-function appliances that are unable to deliver the agility and economics needed to address constantly changing market requirements. This is because optimization for performance has mandated the use of specialized technologies, limiting flexibility, and the development and deployment of new services. The impact can be seen when an operator wants to create a new service,



equipment providers to design high-performance, high-value products that can accelerate, analyze, and secure network traffic and applications.

The Radisys software stack integrates essential DPI-enabling technologies that can host content classification, security, and flow analysis. In doing so, Radisys helps streamline the design of network equipment by bringing everything together in an SDN/NFVI-enabled Platform.

In addition to integrating DPI enabling technologies, the Platform provides Linux\*-based packet processing acceleration, application acceleration engine (network stack), and management plane, all running concurrently on a single, Intel Xeon processor-based Platform. All these components are accessible via a common application programming interface (API), greatly simplifying application development.

## Enhancing Open Source

Telecom network operators have stringent timing constraints for their mission-critical applications and services, such as voice, video, and charging. In many cases, open-source software components must be enhanced in order to satisfy the associated real-time requirements. Consequently, Intel and Radisys have been working to improve the performance of network functions running in NFV environments.

An example is the Intel DPDK Accelerated Open vSwitch\* – a fork of the open source Open vSwitch multilayer virtual switch found at <http://openvswitch.org/>. This software-based function re-created the kernel forwarding module (data plane) by building the switching logic on top of the Intel DPDK library to significantly boost packet switching throughput. The forwarding module runs in Linux User Space with BSD license rights. This software, along with many other types of virtualized network functions, runs on Radisys T-100 Series Platforms in support of NFV-based infrastructure.

## Benefits from Consolidation

For many low to mid-density nodes in particular, consolidating multiple workloads onto Intel® architecture may allow NPUs to be removed from the design. This approach can lower development costs by creating more software reuse opportunities and simplifying the tool chain, which boosts efficiency, reduces training time, decreases license fees, and enables programmers to work on any system function. Moreover, moving to a single architecture eliminates many integration and validation issues, saving time and effort.

If network equipment providers want to avoid hardware development altogether, they can use commercial, off-the-shelf (COTS) boards, like the Radisys A4700

Compute Module, with carrier grade capabilities and long life support. These products take advantage of the Intel processor roadmap, which continues to confirm Moore's Law through continuous investment in technology and manufacturing. On roughly an annual basis, Intel launches higher performance computing Platforms used by equipment manufacturers to develop more capable products. Operators can benefit from lower operating expenses (OpEx), because Intel® processors optimize power consumption and lower the maintenance costs associated with managing complex multi-architecture systems.

## Packet Processing Software Enhancements

Complementing its microarchitecture advancements, Intel has made packet processing software enhancements provided by the Intel DPDK. The development kit reduces a significant amount of overhead when using an out-of-the-box, standard Linux operating system to host user plane stacks. Significant processing time is saved by using core affinity, disabling interrupts generated by packet I/O, enforcing cache alignment, implementing huge pages to reduce cache misses, prefetching, and many other concepts. The Intel DPDK runs in user space, thus removing the high overhead associated with kernel operations, and with copying data between kernel and user memory space.



## Extensive Technical Support from Radisys\*

With in-house technical resources and a global footprint, Radisys maintains the resources that enable developers to remain focused on meeting their customers' needs. Radisys offers remote diagnostics, which allow its technical support professionals to directly link into the live environment, and identify and resolve problems quickly, thus minimizing costly downtime. When configuring ATCA systems, OEMs and network operators can get guidance from Radisys technical experts about ways to maximize performance. Even if the hardware architecture includes products from multiple vendors, Radisys technical support can help ensure all hardware and software, across all Platforms, is functioning properly.

## Intel® Data Plane Development Kit (Intel® DPDK) Support

Radisys provides training, advice for performance optimization, and issue resolution for the Intel DPDK running with Radisys hardware and software, so developers need not go to multiple ecosystem entities for help or questions. Radisys is the single front - with 24 x 7 technical support - for x86 data plane requirements: rackmount and bladed hardware, Intel DPDK software, support, consulting, and professional services.

## Workload Acceleration

In combination with data plane processing, equipment developers can accelerate bulk encryption, data compression, and other workloads using Intel® QuickAssist Technology: a set of software and hardware modules accessible via a unified set of industry-standard application programming interfaces (APIs) that provide consistent conventions and semantics across multiple accelerator implementations. For instance, the Intel® Platform for Communications Infrastructure with integrated Intel QuickAssist Technology is expected to deliver up to 100 Gbps crypto acceleration, which is comparable to today's solutions that typically employ multiple architectures to achieve this rate.

Intel promotes standard, open interfaces (i.e., APIs) through open source projects, such as OpenSSL\* and Openswan\*, that are also supported by Intel QuickAssist Technology. This capability enables developers to use built-in Platform acceleration or add-in acceleration cards, with minimal software modification, to achieve different cost-performance objectives.

## Solutions for NFV

The tremendous growth in network traffic is driving network operators to adopt new infrastructure solutions that reduce cost-per-bit, expand the capabilities of the core network, and simplify service

deployment. Fulfilling these needs, the 100G-capable Radisys T-100 family increases traffic throughput over the prior generation, thereby greatly increasing network capacity and efficiency, and is supported by a rich set of middleware and security applications, thus reducing the effort to develop new services. Moreover, operators can protect their software investments because their code will run on next-generation Intel® processors.

With the Radisys T-100, network equipment developers can build solutions using a single architecture to consolidate all their workloads, thus simplifying development and lowering hardware cost. The scalability and virtualization capabilities of Intel processor-based Platforms enable system engineers to develop a cost-competitive family of products based on a common code base. Radisys systems, supported by a broad ecosystem of independent software vendors (ISVs), reduce the effort and time needed to bring NFV-based solutions to market.

For more information about Radisys T-100 Series Platforms,  
visit [www.radisys.com/products/t-series-platforms](http://www.radisys.com/products/t-series-platforms).

Solution Provided By:



radisys.

For more information about Intel® solutions for communications infrastructure, visit [www.intel.com/go/commsinfrastructure](http://www.intel.com/go/commsinfrastructure).

<sup>1</sup> Source: "Network Functions Virtualisation – Introductory White Paper," published at the October 22-24, 2012 at the "SDN and OpenFlow World Congress", Darmstadt-Germany, pg. 3, 4, 9, <http://portal.etsi.org/portal/server.pt/community/NFV/367>.

<sup>2</sup> Source: Radisys

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