(intel®)

Platform Consolidation Increases Agility and Lowers Cost for Service Providers and TEMs

Crystal Forest is designed expressly for communications infrastructure applications and complementary cryptographic and data compression workloads.

One of the greatest technological challenges of our time is building out the global wireless and wireline infrastructure to handle rapidly growing IP traffic – which increased eightfold over the past five years and is forecasted to increase fourfold over the next five years.[1] This exponential boom in IP traffic is due, in part, to the escalating demand for rich content by consumers using increasingly powerful mobile devices. Service providers must keep up with demand while delivering high-quality, value-added services at a competitive price. Telecom equipment manufacturers (TEMs) face similar challenges that require them to develop faster, more energy-efficient equipment capable of supporting higher traffic throughput at the network core, access and edge.

With substantial infrastructure investments on the horizon, service providers are looking for networking and telecom equipment that provides greater agility, more resilient security and better economics. These requirements will drive TEMs to retool their offerings to speed up new services deployment, better protect users and their data, and support much more throughput and network intelligence at lower cost. However, equipment platform complexity is hindering manufacturers' from making significant progress in these areas.

Network elements are rather complicated, particularly since many employ an assortment of processors to perform different workloads, such as application,

control plane, data plane and signal processing. Getting various computing systems to efficiently work together is typically difficult and time consuming. Then consider the entire network and its wide range of elements, each using various architectures for different workloads; this complicated status quo hinders service providers seeking to deploy services quickly, reduce costs, scale new services and contain infrastructure support costs. Similarly, TEMs fail to gain economies of scale due to the need to maintain expertise across multiple architectures, complex system integration and expensive tool chains to support different architectures.

Now imagine the benefits of being able to design the majority of network elements on a single architecture – one code base, one set of development tools and a massive ecosystem – enabling TEMs and service providers to bring flexible solutions to market faster and more economically. Making the transformation possible, Intel laid the groundwork with its 4:1 workload consolidation strategy, depicted in Figure 1, that enables the industry to switch to a more scalable, flexible, power-efficient and cost-effective infrastructure. Along these lines, this paper discusses the advantages derived from moving to general purpose computing for network and telecom infrastructure. This software-based approach can be realized using a next generation communications platform from Intel, codename Crystal Forest, capable of exceptional forwarding and security throughput.

Intel QuickAssist Technology is a set of software and hardware modules that accelerate bulk encryption, data compression and other workloads.
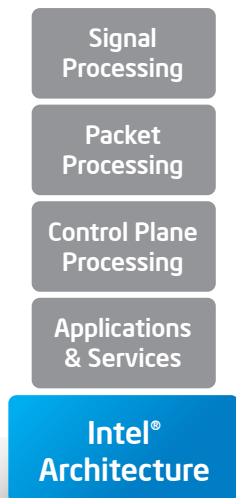

Figure 1. Intel's 4:1 Workload Consolidation Strategy

Why Workload Consolidation

Greater efficiency is the primary reason for considering a transition from hardware-focused equipment platforms to a single, software-focused architecture that executes many of the required workloads. The efficiency improvements associated with software-based network elements are far reaching for both service providers and TEMs, including:

Service provider benefits:

- **Solution footprint:** Decrease the number of physical assets by consolidating their functions using network virtualization.

- **Scalability:** Increase performance of any function just by adding more platforms. Optimize performance across workloads by dynamically reallocating computing resources.

- **Efficiency:** Avoid underutilized hardware caused by mismatched subsystem capacities.

- **New services deployment:** Create network-aware services more easily, since applications and networking functions run on the same platform. Add applications to the system as simply as to a server. Implement services software closer to the packet to minimize latency.

- **Operating expenses:** Simplify the deployment, maintenance and inventory of industry standard server architectures. Have a broad choice of performance and form factor options.

- **Power consumption:** Conserve energy by using power-optimized Intel platforms and removing all other computing systems (and their dedicated memory and I/O subsystems) associated with other processor architectures from the box.

TEM benefits

- **Platform development:** Use a common platform that makes it easier to deploy different services and is easier to control.

- **Engineering resources:** Reduce development effort with one platform architecture to know,

one code base to write and one development team to manage.

- **Product cost:** Take advantage of more manufacturing options, such as using commercial off-the-shelf (COTS) solutions that are refreshed yearly.

- **In-field support:** Minimize system support cost with just one type of hardware platform to learn, deploy and maintain.

Notwithstanding this impressive list of benefits, a critical precursor to transitioning to a single architecture is evidence that it delivers enough performance to meet tomorrow's throughput requirements.

Next Generation Platform Overview

Specifically designed for communications workload consolidation, Intel's next generation communications platform, codename Crystal Forest, will be a particularly cost-effective solution for equipment configured for low-end elements, such as wireless access and branch routers, as well as high-end equipment, including LTE core network elements and enterprise security appliances. Crystal Forest is designed expressly for communications infrastructure applications and complementary cryptographic and data compression workloads.

The Crystal Forest platform is based on the Intel® microarchitecture code named Sandy Bridge and includes Intel® QuickAssist Technology, and typical network and backplane interfaces. Network element designers can combine the Crystal Forest platform components in a multitude of ways to achieve their desired functionality and performance. The variety of Crystal Forest platform components that will be offered will provide the scalability to design a low-end router all the way up to a high-end router that could deliver up to 160 million packets per second Layer 3 packet forwarding performance.[2]

The Crystal Forest platform will have the flexibility to deliver three different

workloads on a single architecture. Developers will be able to assign cores to perform application, control plane and data plane processing as they see fit. They can also use the Intel® Data Plane Development Kit (Intel® DPDK), which includes performance-optimized libraries that enable fast packet movement in the data plane using multi-core Intel® architecture processors.

Intel QuickAssist Technology is a set of software and hardware modules that accelerate bulk encryption, data compression and other workloads. The acceleration features are accessed via a unified set of industry-standard application programming interfaces (APIs), which provides consistent conventions and semantics across multiple accelerator implementations and future-proofs software investments. The Crystal Forest platform with integrated Intel QuickAssist

Technology is expected to deliver up to 80 Gbps crypto acceleration,[2] which is comparable to today's solutions that typically employ multiple architectures to achieve this rate.

Scale and Scalability

For decades, the Intel processor roadmap has confirmed Moore's Law, the result of 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.

Intel's communications workload consolidation strategy takes full advantage of the company's ability to introduce new processors at a yearly rate. Whereas other communications processor vendors typically require two to four years to launch new products, Intel

refreshes its platforms at a faster clip. This allows equipment manufacturers to scale their performance at the same pace as industry-leading computing technology. Further shortening time to market, software backward-compatible Intel architecture processors greatly minimize the effort to transition to new platforms.

The scalability of the Crystal Forest platform enables system engineers to develop a cost-competitive family of products based on a common code base. This ability significantly reduces software development cost, while the opportunity to use COTS boards greatly minimizes hardware development cost. This platform will be supported by a broad ecosystem of hardware and software platform providers, enabling equipment manufacturers to bring systems to market more easily.

Wireless Consolidation Example

3G and emerging 4G/LTE networks have been built with specific hardware and software elements, each designed for the required workloads and capabilities. For example, the traditional design methodology for radio network controller (RNC) and base station elements is a multi-architecture platform with application-specific silicon components that are dedicated and optimized for particular

workloads. This design method produces an exceptionally complicated hardware design and an even more complex software development. With evolving networking standards (e.g., 3G to 4G), network nodes are becoming more expensive to design and support, which is adding to the overall complexity of the network.

Moving forward, the Crystal Forest platform will be able to perform these network functions in software, enabling

the same capability to be delivered using off-the-shelf hardware platforms. This provides a streamlined hardware and software development environment that reduces design costs and project timelines. Consolidation onto common hardware platforms allows greater network provisioning flexibility and network infrastructure with lower overall OpEx.
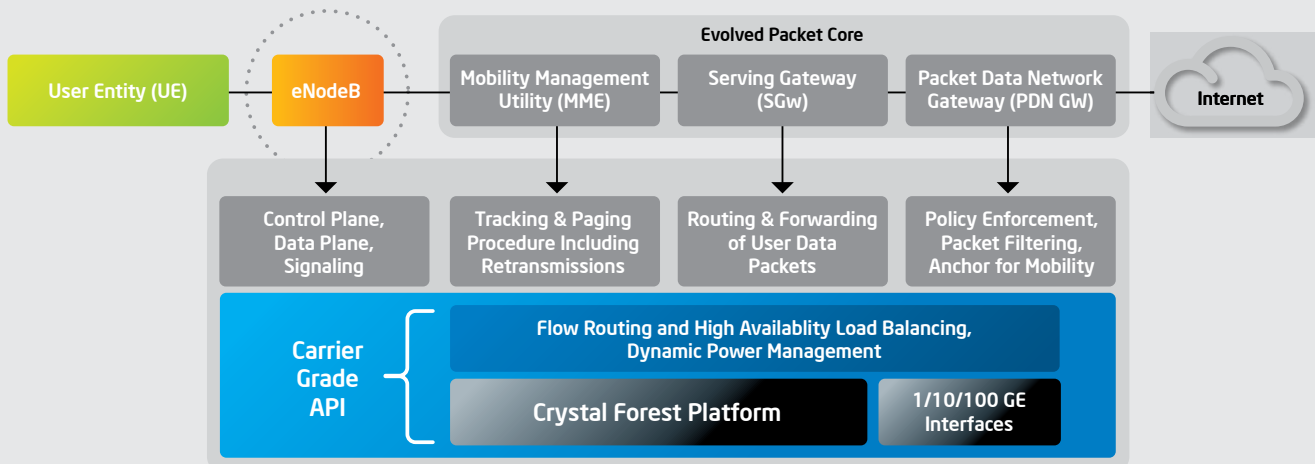

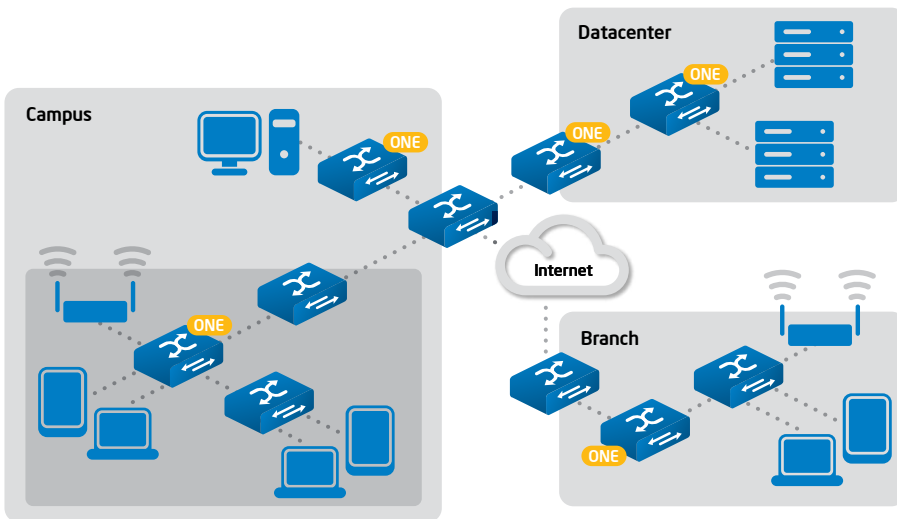Figure 2. From Many Equipment Platforms to One

Figure 3. Security Appliances Based on a Single Processor Architecture

Security Appliance Example

Network security encompasses a number of features, including the following. VPNs allow for private networks to be established over the public internet by providing confidentiality, integrity and authentication using cryptography. Traditional firewalls use policies to allow or deny traffic into the protected network. Anti-virus and anti-spam filters inspect email, web traffic and other known application payloads to filter out malware. Intrusion prevention systems monitor network traffic and prevent attacks from entering the protected network.

Traditionally, each of these security functions was carried out in a separate device, resulting in administrative complexity. Now it is common for security vendors to combine multiple security functions into a single unified threat management (UTM) appliance. One of the main drivers for this is the reduction in the total cost of ownership of the appliance, compared to having to install, configure and manage multiple network elements, potentially from different vendors.

Analogous to the way a single UTM appliance reduces the effort of IT professionals, a UTM appliance based on a single architecture, Intel® architecture, simplifies the system design task for developers. This will be possible with the Crystal Forest platform and its integrated Intel® QuickAssist Technology which is expected to deliver up to 80 Gbps crypto acceleration.

For more information about Intel platform providers, visit http://www.intel.com/design/network/ica

To learn more about Intel solutions for communications, please visit
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