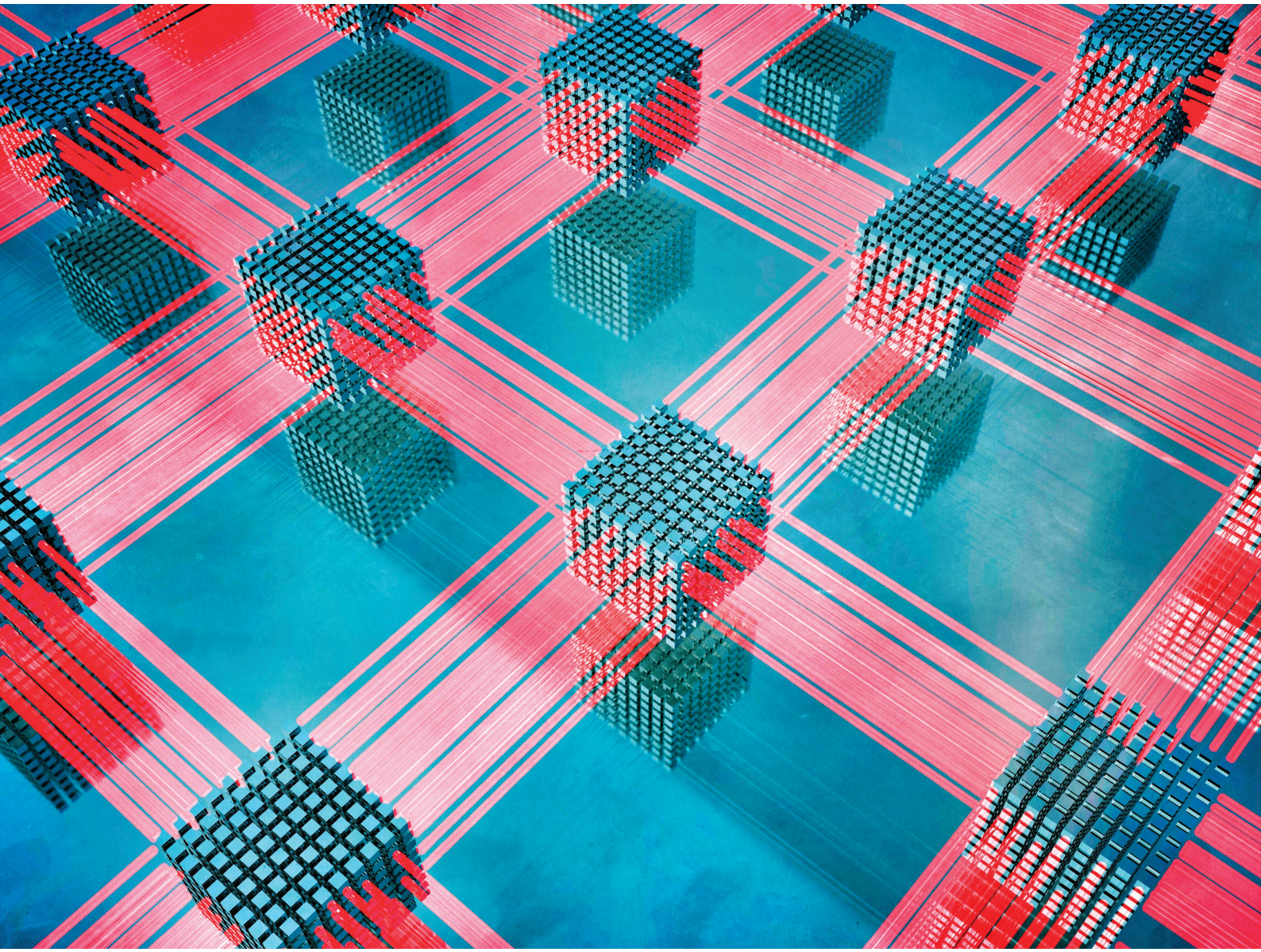
informa
telecoms & media

Mobile SDN: The future is virtual



Sponsored by JUNIPER NETWORKS

Contents

About

Principal Analyst
Dimitris Mavrakis

Area of expertise: IMS, mobile access network technologies, femtocells, backhaul, network APIs.

"As LTE is being deployed throughout the world, mobile operators are finding it hard to strike a balance between network investments, new pricing schemes and increasing traffic. Several initiatives are being deployed, including capacity upgrades, optimization, offload and policies to tackle all of these challenges."

Dimitris Mavrakis is a principal analyst with Informa Telecoms & Media. He is part of the Networks team where he covers a range of topics including Next Generation Networks, IMS, LTE, WiMAX, OFDM, core networks, network APIs and identifying emerging strategies for the mobile business.

Dimitris is also actively involved in Informa's consulting business and has led several projects on behalf of Tier-1 operators and key vendors.

Dimitris has over 12 years experience in the telecommunications market. He has a strong background in mobile and fixed networks and an in depth understanding of market dynamics in the telecoms business. In the past, Dimitris has worked as a project leader to perform challenging network measurements and has lead a team of researchers to produce pioneering research and acclaimed publications.

Dimitris holds a PhD in Mobile Communications and a MSc in Satellite Communications from the University of Surrey.

JUNIPER NETWORKS

Juniper Networks (NYSE:JNPR) is a global leader in providing high-performance networking and IP technology to the world's largest service providers. Juniper provides a full complement of LTE network infrastructure solutions for mobile providers including backhaul, security, and packet core.

The world's depending on the mobile network like never before. To win customer trust and loyalty you need to build the best to deliver the experiences your users expect, where and when they want them. Juniper's innovation in IP networks and security for leading service providers can help optimize a transition that has operators re-thinking everything from the RAN to backhaul.

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. Additional information can be found at Juniper Networks or connect with Juniper on Twitter and Facebook.

Executive summary

As data services continue to penetrate the mass market, mobile operators have found out that new, third parties have entered the market where they previously were the only service enabler. Operators are saying that they are being disintermediated from service delivery and being relegated to access-only providers.

However, LTE and Software Defined Networks (SDN) are two key technologies that can help operators reposition themselves to become service providers yet again and operate truly flexible, service-oriented data networks. After all, bandwidth is a precious commodity while capacity and coverage are becoming bargaining chips for the mobile operators while SDN is the next step.

Software Defined Networks is receiving a lot of interest in the telecoms market in 2013. SDN is already an established concept in the IT domain in the form of OpenFlow and OpenStack; although this is in a different context, it offers similar benefits to both IT and telecoms service providers. Increased scalability, flexibility, cost savings and less dependence on overprovisioning for network design are a few examples of short-term benefits SDN brings to both IT and telecoms. In the long term, the concept will allow for new service architectures, service exposure, new revenue opportunities and more efficient operations.

Telco SDN offers a multitude of new opportunities to mobile operators. Apart from the obvious cost savings and network agility, new services may be introduced without the need for new hardware while an operator can create new virtualized sub-networks for premium customers. Moreover, a shorter time to market and easier integration of third-party services may provide the necessary competitive advantage against OTT services. Telco SDN is expected to be a significant tool to ensure the future profitability of mobile operators. It also comes at the right time, after initial LTE networks are deployed. The data nature of LTE networks will create an ideal testbed for SDN while increasing revenue opportunities, although it is not a prerequisite for telco SDN.

As with all new emerging technologies and concepts, SDN is a challenge for operators to first comprehend and then fully understand how it should be implemented. Several similar concepts have emerged in the past with variable success, which makes operators somewhat hesitant to invest heavily in SDN without first making sure they will gain tangible benefits. However, contrary to previous successful – and even failed – concepts, telco SDN is fundamentally different due to its history, time of market entry and overall market status.

Informa's recent SDN survey illustrates that the technology is critical for the future of mobile networks: 47% of operator respondents believe that SDN is essential for the future of networks, while 26% believe it is critical for certain parts of the network. Flexibility, scalability and cost efficiency all rank high in terms of SDN drivers while cloud services and easier service introduction are expected to increase in importance.

Call to action

According to Informa's analysis and survey findings, SDN may introduce new types of services and breathe new life into operator business models. Although SDN/virtualization technologies are not yet standardized, the software nature of the concepts allows operators to deploy now and upgrade to standardized components via software when necessary. The service opportunities and integration with third parties via APIs are considered a major opportunity in the mobile market.

Informa suggests operators should implement SDN in the data center and the core network to begin with. Virtualization in the Enhanced Packet Core (EPC) will allow operators to maintain more efficient networks and address existing market segments with more granularity while introducing new types of services (e.g., SLA-governed virtual networks for premium customers and cloud services for SMEs).

According to their position, Informa recommends the following to the different types of operator:

Progressive operators

Informa would recommend that progressive operators act as early adopters of SDN and deploy virtualized architectures and service exposure as soon as possible. The software nature of these new concepts will allow early adopters to upgrade to new versions going forward. Tier-2 and Tier-3 operators should find a significant competitive advantage in SDN in order to provide new types of services.

Mainstream operators

Tier-1 operators are most likely to wait until the initial use cases of telco SDN are deployed. Informa recommends that Tier-1 operators participate in standardization activities while deploying SDN concepts on a smaller scale as part of the process of understanding the technical, business and cultural impacts. As with progressive operators, mainstream operators are advised to become familiar with the IT concepts as they are very likely to become the de facto standard in telecom networks.

Late adopters

Informa advises technology late adopters to assess the impact of SDN concepts in their infrastructure and understand which pain points may be removed by the application of OpenFlow or virtualization. These operators should also participate in the discussions about the application of SDN in the mobile business and embrace the key lessons from successful case studies.

Telco SDN and virtualization

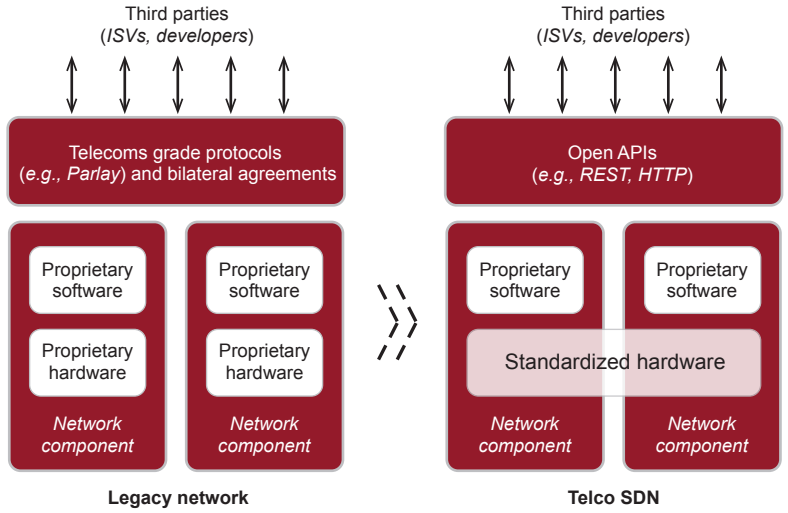
Definition

In the context of this analysis, telco SDN refers to specific technologies, which are generally considered as very promising for the evolution of the mobile network (see fig. 1):

- **Separation of the control and data planes**: Borrowed from IT SDN and OpenFlow, the separation of the control and data planes allows sophisticated traffic management to be driven by software, rather than purely by hardware routers. In the mobile environment, the control and data planes have also been separated in the EPC, making this concept familiar to network operator technology departments
- **Network virtualization**: The implementation of network components in software and the replacement of dedicated, proprietary hardware with commoditized IT platforms is also widely used in the IT and cloud domains. The migration from proprietary platforms to completely open architectures is not expected to happen overnight and Informa expects that proprietary hardware will remain in the short to medium term. Components that can be virtualized include the Enhanced Packet Core (EPC) and several other processing-hungry components.
- **Service exposure**: Although not strictly overlapping with SDN, service exposure seems to be integrated in current vendor strategies to help operators expose network functionality to third parties more effectively. An underlying SDN technology may enable or enhance API exposure for various services, but neither service exposure nor SDN require each other to function.

Arguably the biggest immediate benefit to mobile operators is virtualization of network components where legacy hardware is replaced by commoditized IT equipment and network elements are implemented in software. The separation of the control and data planes is also a benefit, although OpenFlow currently refers to data centres, which is not yet a critical piece of telecoms infrastructure. The same goes for service exposure, which offers significant revenue opportunities. However, operators are still undecided how to implement a more open business. As such, the focus of the operator and vendor community is on network virtualization and is now formalized in the Network Functions Virtualization (NFV) group.

Fig. 1: Legacy networks vs. SDNs



Source: Informa Telecoms & Media

Industry activities

Major operators have set up the Network Functions Virtualization (NFV) Forum. The forum says that its aim is to use "standard IT virtualization technology to consolidate many network-equipment types onto industry-standard high-volume servers, switches and storage, which could be located in data centers, network nodes and the end-user premises."

The NFV Forum says that network-functions virtualization applies to any data-plane-packet processing and control-plane function in fixed and mobile network infrastructures and is highly complementary to SDN, with the two being mutually beneficial but not dependent on each other. Network functions can be virtualized and deployed without requiring an SDN, and vice versa.

Key operators, including AT&T, Telefonica, Deutsche Telekom, Vodafone, France Telecom and Verizon Wireless, and several vendors, including Alcatel-Lucent, Cisco, Huawei, IBM, Juniper Networks and NSN, are founders of the forum. In an interesting departure from the standard membership model of telecoms bodies, IT vendors have joined, indicating that there is considerable potential in the telecoms environment for these new entrants.

Although the NFV forum is aiming to virtualize both control and data planes of the mobile network, Informa expects that the massive requirements on the data plane will make it more difficult to virtualize packet routing. As such, we expect that the control and services layers will be virtualized initially while data plane routing and forwarding will likely remain in dedicated, high speed equipment. Nevertheless, NFV can result in massive cost savings in the control and service layers while enabling functionality for new services.

There are also considerable differences in requirements between the networking (packet-processing heavy) and IT (storage, compute heavy) domains. Functionality of the latter usually resides in the data centre and is very likely to be virtualized but packet processing is distributed, high speed and volatile which is arguably more difficult to be virtualized. The IT domain of the mobile network (BSS, OSS, databases, analytics) is very likely to be virtualized first.

How is telco SDN different from previous technologies?

Telco SDN offers similar benefits to previous, somewhat unsuccessful initiatives, including IMS. In other words, both SDN and IMS allow – among other things – horizontalization of network infrastructure and easier service exposure to third parties that are without clear new business and revenue opportunities. However, there are several differences from previous attempts, especially when SDN is compared with IMS.

Telco SDN (and NFV) has serious advantages over IMS: SDN is already being implemented in the IT domain, and operators and vendors will have learned from their involvement in IMS. Also, SDN is attempting to enter the market by applying practices and technologies from the IT domain to the telecoms environment – this is in contrast with IMS, which was a completely new – and very optimistic – concept. Moreover, the vendors involved in SDN and virtualization also come from the IT domain and have experience of large-scale IP networks – which is the convergence of mobile networks.

Market status

The mobile market is currently an environment of conflicting activities: new networks are being launched that promise new growth and revenue opportunities, but, at the same time, there is increasing competition, profit erosion and the overall challenging economic environment. Network CTOs are currently bombarded by new technologies while having to answer for increased network efficiency, capacity for new subscribers and services. At the same time, the telecoms and IT domains are starting to align, bringing great synergies and benefits to the established mobile value chain.

Data awareness

Increased data awareness is putting a strain on mobile and fixed networks, while operators attempt to become more efficient in monetizing and operating their networks. Previous offers of unlimited bundles, competition and regulation are all challenges facing mobile operators in developing markets, while Web-based services have capitalized on the availability of data services to offer operator alternatives – in many cases free of charge. So, despite the increasing data awareness, which is generally considered a positive development for the mobile market, operators are at risk of simply becoming access providers – a profitable business model but it cannot, however, sustain nationwide deployments of carrier-grade networks.

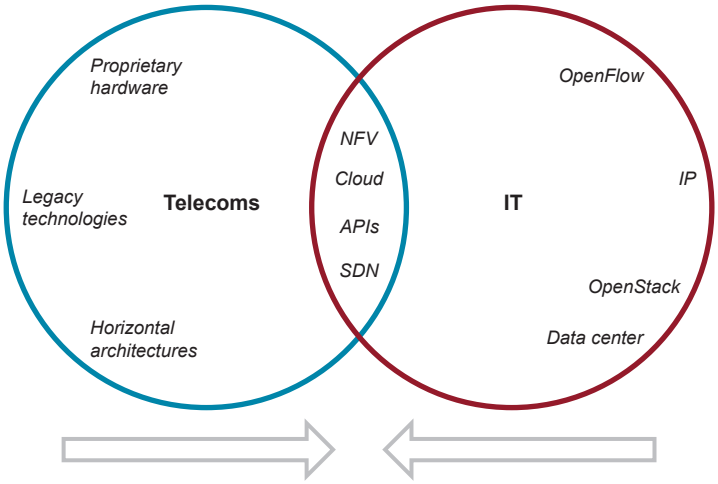
LTE network monetization

LTE networks are designed for data services and all the handsets available for these networks currently are smartphones. Although these networks are highly efficient for data-network monetization, initial feedback for operator services driven by LTE – namely VoLTE and RCS – illustrate that operators may not be able to charge a premium for voice or

messaging services. Furthermore, OTT services become significantly better on LTE due to its data-centric nature and they may compete directly with operator services.

Therefore, operators are scrambling to find new revenue opportunities for their new and expensive LTE networks. M2M, enterprise services, verticals (including healthcare, transport, utilities and energy) are targets for mobile operators, while integration with third-party services and flexibility in service provisioning are a critical priority. The design of current networks dampens the willingness of operators to launch these new initiatives, but SDN and virtualization are two key pillars for operating service-oriented networks.

Fig. 2: Alignment of telecoms and IT



Source: Informa Telecoms & Media

Alignment of telco and IT

The telecoms and IT infrastructures are starting to converge, with mobile operators using IT concepts to streamline or improve their infrastructure or using IT architectures for new opportunities, including cloud services. The large scale of IT infrastructure demands efficiency in many areas, including traffic handling, resource allocation and operations, while the centralized nature of data centers and cloud services requires higher operational efficiency. IT technologies have therefore evolved much faster than telecoms technologies, often through the work of single companies aiming to make their operations more efficient. OpenFlow and OpenStack are such concepts; they are designed to make the operation of data centers more manageable and traffic routing more flexible.

Tier-1 mobile operators have already deployed data centers for their enterprise and SME services and are exposed to such IT concepts. The proprietary and vertical nature of telecoms infrastructure is now giving way to more efficient platforms that borrow concepts from the IT domain (see fig. 2). SDN and virtualization are the first examples of this convergence.

Initial telco SDN implementations

Virtualization in the mobile network may manifest in several different locations, ranging from radio, to core network to data center. However, there are some specific areas of the network that are highly relevant and virtualization offers an answer to challenges that have been facing operators for many years. Different parts of the network may be subject to different benefits from virtualization, although most are highly desirable, they sometimes come at a cost (see fig. 3).

The benefits of virtualization increase towards the edge of the network and are maximized when they are facing the end user. For example, a virtualized CPE will not require continuous upgrades when a fixed operator upgrades to new technologies. However, the cost to virtualize the edge of the network – especially when considering radio networks – is prohibitively expensive. Furthermore, the LTE networks have just been deployed and operators will require some form of ROI from these existing networks before investing billions once again.

Cloud RAN is the first implementation of virtualization in the radio access layer, where baseband processing is pooled at a semi-centralized location to allow for

Fig. 3: Virtualization benefits for mobile networks

Network layer	Cost	Virtualization benefits
Radio	$$$$$	Less reliance on proprietary hardware More flexibility to launch new air interfaces Fluid and scalable baseband processing (Cloud RAN)
Core	$$$	Adaptive traffic management Ability to implement components in a data center Less reliance on overprovisioning Gradual introduction of new elements and services
BSS/OSS	$$	Service exposure Billing system flexibility and scalability (e.g., online charging) Easier introduction of MVNOs
Data center	$	New service opportunities Easier provisioning for SLA-bound services Services for vertical segments, including enterprise and SME

Source: Informa Telecoms & Media

more fluid resource allocation. This also requires high expenditure and is only likely to be deployed once small cells become widespread.

On the other hand, the Enhanced Packet Core (EPC) is a part of the network that is more likely to be virtualized in the short term, due to its flat (IP) nature and the need for its components to be flexible and scalable. The core network is far more centralized compared with the RAN and therefore easier to upgrade, maintain and virtualize. EPC components include the MME (mobility management) and gateways (PGW, SGW) which may be implemented in software and run from data centers in order to provide a more scalable and flexible architecture. Specific functionality of the network may be exposed to trusted third parties while operators will be able to create customized services for groups of customers, or even individual premium customers (SMEs or enterprises).

The BSS/OSS and data-center realms are subject to similar benefits but, due to their centralized nature, infrastructure supporting these elements may already be streamlined. Although these two realms are far easier to virtualize compared with other parts of the network, SDN does not solve their critical challenges and may not yield considerable cost savings.

Initial implementations of mobile network virtualization are expected either in the EPC or legacy components that are no longer manufactured or serviced. Older technology infrastructure, including PSTN and BRAS, are very likely to be virtualized so that operators do not need to maintain legacy hardware. The implementation of legacy components in software will result in cost savings but not in additional revenue streams.

On the other hand, virtualizing the EPC will not only result in cost savings but also generate opportunities for new revenue streams. Service exposure, easier introduction of new services, SLAs and cloud services are examples where virtualization may be a key element.

LTE and beyond

Although LTE networks are currently being deployed and 2013 is expected to be the biggest year in terms of actual launches, operators are looking ahead and attempting to establish a longer-term vision. There are already discussions about 5G, not necessarily about the adoption of new technologies, but how data and mobile can enrich and enhance living conditions and contribute to a better environment. In any case, operators will require new network architectures going forward in order to sustain current and future end-user demands.

New service architectures

An ongoing discussion about the future of mobile networks and 5G is focusing on power efficiency and how mobile can address vertical segments – for example, the connected city. In order to enable this, operators will need service architectures and infrastructure that will be able to adapt to demand instantaneously rather than relying on overprovisioning. Although these concepts are currently in the distant future, virtualization and SDN are the first steps towards operating flexible networks that can adapt to demand more efficiently.

Conclusions

SDN and virtualization are new concepts that have the opportunity to revolutionize mobile networks. Although similar concepts have appeared in the past with questionable success, the current market status, the evolution of both telecoms and IT technologies and the increasing requirement for network flexibility are expected to make virtualization and SDN a de facto standard in mobile networks, whether these are in developing or developed markets.

Although many parts of the network are being positioned as key candidates for virtualization, Informa believes that the packet core (EPC) will be among the first to be virtualized for reasons outlined above. Early-mover and greenfield operators will be able to create new service opportunities and operate more flexible and cost-effective networks which will give them a competitive advantage against established operators. Even though the standardization of virtualized components will arrive in the market either later this year or next, mobile operators may invest now and upgrade to these components when they are available. The software nature of the technology allows them to do so and enter the market before their competitors and introduce third-party services.

Leading Mobile Network Virtualization

Juniper is pursuing virtualization of the mobile packet core and surrounding network elements. Mobile networks are uniquely suited to benefit from virtualization due to the demands of high performance networking/packet processing combined with a broad range of network services including intelligence, subscriber awareness, and optimization, needed for efficient operation.

There are four layers within Juniper's mobile network virtualization architecture – networking, control, services and management.

In previous network models, networking, control and services were bundled together inside a single hardware appliance, making it difficult to scale without installing a new appliance. Abstracting the service, control and network/packet processing layers enables mobile service providers to scale services independent of the underlying network routing platforms providing more efficient capital investment and dramatically increased deployment flexibility.

Network functions become virtual machines that can leverage Juniper's industry-leading packet processing/routing platforms. As a result, installing, provisioning and managing a new appliance is no longer required to increase scale.

The JunosV App Engine is a KVM hypervisor which separates and abstracts the network routing function (the MX 3D Edge Services Router) from the services layer. With JunosV App Engine (JVAE), Juniper network services as well as services from third party developers can execute and scale on x86-based hardware.

The first network function abstracted with JVAE is Juniper's Mobile Control Gateway which provides the SGSN/MME function within a packet core. The SGSN/MME function executes efficiently on x86 hardware due to its memory/compute intensive function, making it ideal for virtualization.

Juniper will continue to deliver virtualized instances of its own network services, as well as work with third-party partners to bring a breadth and depth of capabilities the mobile core network.

Virtualization Brings Agility

Agility is the core benefit virtualization brings to service providers. Any network service or function that can be delivered as a hypervisor can run on the JunosV App Engine platform. Thus service providers are able to select best-of-breed technologies and network function to augment and complement the capabilities of the mobile core network.

These services can scale up, and down, rapidly and cost-effectively. Rather than the operational expense of adding a new hardware appliance, a new network function is introduced as a virtual machine, spinning up additional resources as needed on a low-cost x86 hardware platforms.

Adding additional MME capacity with legacy Mobile Control Gateway requires an additional hardware appliance to be installed and provisioned. The new MCG must then be configured to ensure other network elements are aware of this new MCG and can access its new capacity.

Compare this to the Juniper virtual MCG which only requires a new virtual machine to add network capacity. There is no new hardware to install and provision. But most importantly, the network continues to request capacity from the **same MME node** – but now that node has double the capacity (and half the load). There's no need to provision the network to become aware of new capacity in a different network element, the existing MME node can scale capacity indefinitely.

The Virtualized Mobile Network

As a leader in high-performance IP networking, Juniper provides a range of solutions in backhaul, security, packet core and value added services to smooth the migration to LTE (see fig.).

Backhaul/Access

Mobile backhaul networks are quickly evolving to layer 3 MPLS/IP transport, providing additional flexibility to efficiently support traditional circuit services along with packet services. Juniper's ACX Universal Access product functions as a cell site router with the industry's highest performance throughput along with integrated network timing to ensure synchronization over the

Juniper's SDN-ready LTE Infrastructure Solutions

Source: Juniper Networks

IP transport network. Combined with aggregation capabilities of the MX portfolio, mobile backhaul networks achieve the capacity and performance requirements for an IP-based access network.

Security

Smartphones, LTE and the mobile internet introduce a range of new security threats to the mobile core network. Juniper offers the industry's most comprehensive end-to-end security suite for protecting the mobile core network at each of the different interface points (S1, S8, Gi,...). With integrated support for mobile-specific protocols as well as zero downtime hardware and software upgrades, it's no surprise that Juniper has been the leading high-end security solution for service providers for three years running.

Packet Core

The industry's first open evolved packet core (EPC), Juniper's mobile core solution provides unmatched scalability, both up and down, to meet the widest range of deployment options. Scale up to meet the skyrocketing demands of consumer mobile internet services, scale down to push the EPC to remote and edge locations within the network, or leverage virtualization to meet the cost/performance targets of emerging M2M applications.

Value Added Services

The Value-Added Service complex is where service innovation occurs. But for many operators, this part of the network has become a costly, complex string of hardware appliances required to support IP routing and the mobile internet. Now with JunosV App Engine, new services can be introduced as virtual machines, freeing up capital and operating expense and dramatically increasing network agility.

Conclusion

Juniper is aggressively pursuing a virtualized mobile network environment. By separating the networking, control and services layers, mobile providers are able to achieve a level of service agility unmatched in traditional networking architectures. As Juniper drives its SDN principles throughout its access, security and packet core products, the mobile network will transform into a platform for new service innovation – giving savvy providers a competitive edge to profit from the mobile internet.

For additional information on Juniper mobile solutions, please visit **www.juniper.net/us/en/dm/mobile-lte**.

Appendix: Survey results

In order to gauge market perception and understand how the market is perceiving telco SDN and associated benefits, Informa undertook an industry survey which focused on the broader topic of SDN. Several answers from this survey are highly relevant in this study and are presented in this section.

In total, there were 287 respondents to the survey, 130 of the respondents are operators: 50% are mobile operators, 45% converged operators and 5% fixed operators. The largest proportion of respondents was from Western Europe, followed by Asia Pacific, Eastern Europe and North America.

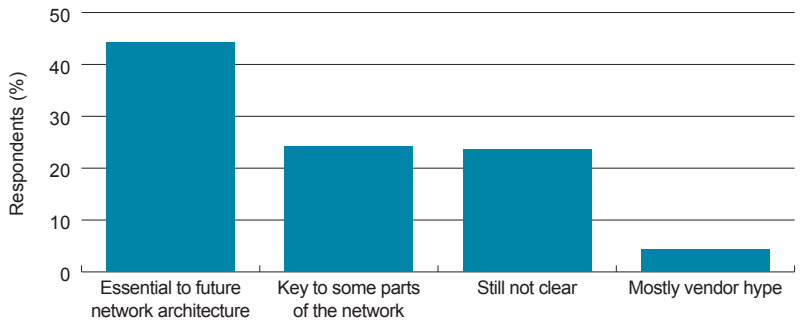
When asked to define telco SDN, 54% of respondents chose "implementation of network components in software" and 28.8% chose "separation of control and data planes". Other options included OpenFlow for data center and Cloud RAN while several respondents answered that telco SDN is more than one of these choices combined together.

The vast majority of survey respondents believe that telco SDN will be essential to the future of networks, but there are still some issues to be addressed before it becomes completely mainstream (see fig. 4).

Operational issues related to the network are top drivers for telco SDN according to the survey respondents (see fig. 5).

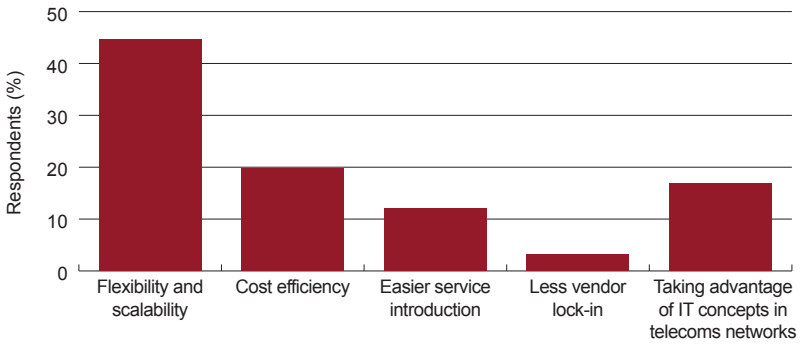
Service introduction is expected to become a bigger focus as telco SDN

Fig. 4: What is your perception of telco SDN?



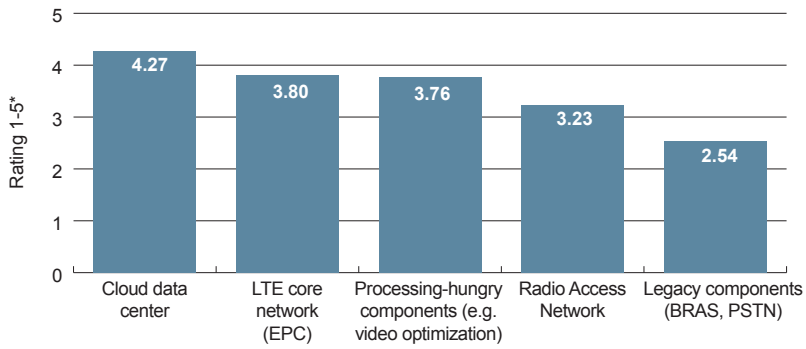
Source: Informa Telecoms & Media

Fig. 5: What is the primary benefit of SDN in telecoms?



Source: Informa Telecoms & Media

Fig. 6: Where do you expect SDN to be deployed initially in telecoms networks?



*Notes: Operator respondents only. *Scale runs from 1 (least likely to be initially deployed) to 5 (most likely to be initially deployed).*
Source: Informa Telecoms & Media

concepts evolve. A few operator respondents have also associated SDN service exposure (APIs) and value-added services in the survey.

When asked where SDN will be initially deployed, operator survey respondents answered that the Cloud data center was the most likely (see fig. 6). However, although the data centre is arguably the biggest opportunity for SDN whether in the telecoms market or in the IT domain, the LTE core network is generally considered as the initial modernization target for telco SDN.

When asked about the market drivers for SDN, network efficiency ranked the highest, followed by easier third-party service integration and vertical/enterprise services (see fig. 7), illustrating that there is definite potential in using SDN for revenue growth and new services.

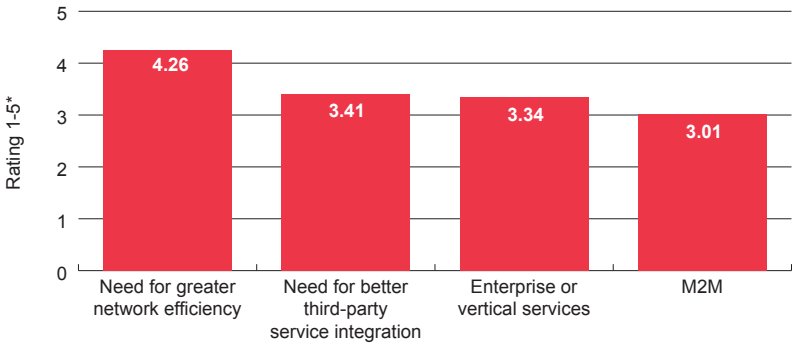
Regarding the timeline of telco SDN deployment, 40% of the operator respondents believe it will be deployed within 1-2 years while 40% expect it in the next 3-5 years; 10% expect to see SDN deployed during 2013. And 75% of operator respondents expect that either LTE or LTE-Advanced will be the access technology driving telco SDN adoption globally, while 17% expect fixed networks to be the priority.

Region-wise, 50% of the respondents expect North America to be the initial market for telco SDN deployments, followed by Asia Pacific with 26%. Western Europe and the developing regions follow with 15% and 10%, respectively. AT&T, NTT DoCoMo and Deutsche Telekom were the most popular operators in the survey results, followed by Verizon Wireless, Telstra and China Mobile.

In terms of barriers, vendor interoperability, a lack of standards and SDN's unclear role rank the highest while the operator respondents generally favor the emergence of the NFV Forum and expect it to accelerate technology evolution.

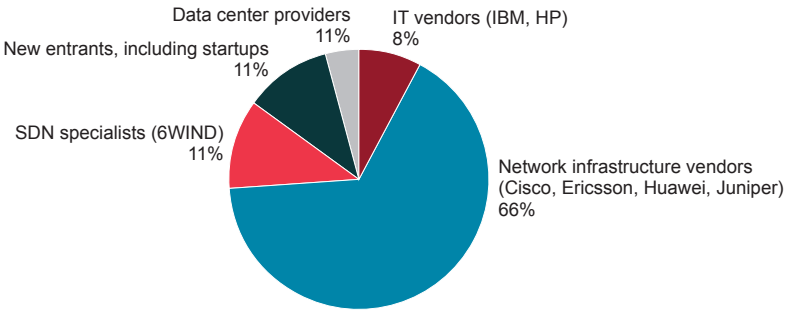
Despite SDN being developed for the IT domain, the vast majority of respondents expect that telecoms vendors will be the most relevant party for telco SDN (see fig. 8). Competitive differentiating factors for these vendors include strength in R&D and legacy in IT, followed by customer orientation.

Fig. 7: What will cause operators to start deploying SDN?



*Notes: Operator respondents only. *Scale runs from 1 (least likely to cause deployment) to 5 (most likely to cause deployment).*
Source: Informa Telecoms & Media

Fig. 8: Which vendors do you expect to be more relevant for telco SDN?



Note: Operator respondents only.
Source: Informa Telecoms & Media

informa
telecoms & media

YOUR GLOBAL RESEARCH PARTNER

Informa Telecoms & Media delivers strategic insight founded on global market data and primary research. We work in partnership with our clients, informing their decision-making with practical services supported by analysts.

Our aim is to be accessible, responsive and connected, both to the markets we serve and to your business goals.

- *Our global analyst teams have a deep understanding of the evolving telecoms and media value chain. Our research program combines local market insight with sector-based analysis for a complete, integrated view.*
- *Our research expertise is built on the in-house collection, validation and analysis of primary data. We track and forecast new and established datasets, using proven, robust methodologies.*
- *Our services drive decision-making. Our data, forecasting and analysis, supported by interaction with clients, provides real value.*

OUR OBJECTIVES:

– Message construction and validation
– Market education
– Go-to-market planning
– ROI justification
– Pricing and positioning
– Competitor tracking
– Customer segmentation and targeting
– Sales enablement
– Business opportunity analysis (sizing/prioritizing)
– 1-5 year planning
– Market entry planning (dynamics/demand)
– Competitor tracking (investment/activity)
– Information systems support
– Numerical and analytical tracking

OUR SERVICES:

– Benchmark reports
– Surveys
– Webinars
– White papers
– Country reports
– Company reports
– Forecasts
– Go-to-market reports
– Case studies
– Event facilitation
– Speaking engagements
– Workshops

For more details on Informa Telecoms & Media and how we can help your company identify future trends and opportunities, please contact: ***ITMConsulting@informa.com***