White Paper

Mobile Network as a Service

A New Solution Architecture for Mobile Network Operators

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Introduction

Cloud consumption models are gaining traction across all company sizes and industries. Whether software as a service (SaaS), infrastructure as a service (IaaS), or platform as a service (PaaS), the value propositions of virtualization are being sought by IT decision makers. According to Forrester Research,[1] more than 35 percent of large global enterprises either have already deployed – or are planning to deploy – one of these cloud models. Moreover, they are voting with their wallets. Based on recent market analysis by the Cisco® Internet Business Solutions Group (IBSG), the consensus estimate across five leading research firms shows that the global cloud market will surpass $50 billion by 2015, representing a robust 30 percent compound annual growth rate (CAGR).

The move to the cloud is being driven by the overall value proposition of anything as a service (XaaS), which includes the following benefits:

- Speed of deployment
- Fewer skill requirements
- Business agility
- Ability to support mobile and remote workers
- On-demand capacity and scalability
- Improved IT infrastructure manageability and flexibility
- Better disaster recovery
- More flexibility for testing and special projects

As organizations continue down the path of virtualization and cloud-based solutions, they will increasingly demand these benefits from their vendors. Cisco IBSG believes it is just a matter of time before mobile network service providers are asked to deliver a similar experience. This creates the opportunity for a next generation of communications – a new solution architecture for service providers that we call mobile *network as a service (NaaS).* Mobile NaaS delivers many of the value proposition components, business-model levers, and web-based distribution benefits of existing virtualization services such as SaaS and IaaS, enabling mobile network operators to provide similarly flexible solutions.

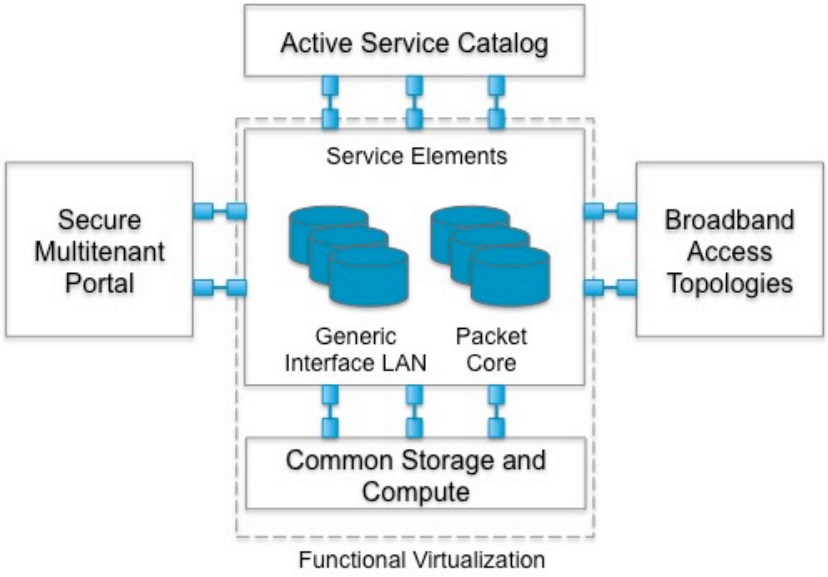
This paper will outline the core concepts of mobile NaaS; how it applies to two key market segments; its impact on service provider (SP) business models; its operational benefits and implications; and finally, the economic impact of NaaS on mobile network operators. We will show that service providers can enjoy compelling commercial and operational benefits from virtualizing the packet core, independent of any hardware cost savings they may expect.

A Simple Mobile NaaS Architecture Delivers Broad Benefits

The basic premise of mobile NaaS is to enable businesses to have more flexibility and control of their mobile services. Companies want to be able to customize their networks to meet specific needs, while having the ability either to accelerate or bypass traditional service provider processes that may prevent them from being more responsive to their own customers' needs. Consider, for example, a retail bank that is trying to open a new branch over a weekend and cannot wait for the traditional weekday installation window from the service provider.

Today, the various provisioning, engineering, and operational functions required to enable new customers, new services, and repairs are buried behind monolithic and independent network elements. In addition, the ability to access and customize these functions varies across SP regions and support teams. The goal of mobile NaaS is to simplify the architecture through virtualization, bringing disparate software solutions onto common hardware to create more efficient processes.

Figure 1. Mobile NaaS Is Anchored in a Flexible and Extensible Set of Service Elements.



Source: Cisco IBSG, 2013

As seen in Figure 1, at the heart of mobile NaaS is an intelligent core with the service elements needed to deploy mobile data services. Traditionally, each software element runs on dedicated hardware, but under NaaS, these elements are separated so the software can run on shared virtual machines. The intelligent core includes mobile network elements, security functions, signaling, and other required service elements. Below these service elements is a common storage and compute infrastructure that can be delivered to the intelligent core as needed through a virtual machine approach. To the right, we see that the intelligent core should work across a variety of licensed and unlicensed access technologies. At the top is the active service catalog, representing the service provider's ability to create unique service environments by combining service elements in an

automated and simplified way. Finally, on the left is the secure portal that enables consumers and business customers to access and manage their own network instances.

With the multitenant portal and the active service catalog, each customer has its own unique instance of the network, which can be logically separated from other traffic and resource contention. As we will see, this is truly transformative when compared to today's more homogeneous, one-size-fits-all networks.

A NaaS solution offers *business customers* five broad benefits:

1. **Independence:** Each customer has the potential to have a logically segregated network.
2. **Bursting:** Customers who typically have lower network requirements can pay for more capacity only when needed.
3. **Resilience:** For highly critical applications, a variety of reliability treatments can be applied.
4. **Analytics:** SPs can provide customers with detailed reports and insights into how the service is performing.
5. **Security:** For highly sensitive applications, a variety of data protection solutions can be applied.

NaaS provides additional benefits for *mobile service providers:*

1. **Ease of adding new service elements:** New service elements can be integrated with just a few clicks, reducing cost of support while encouraging experimentation.
2. **More open and streamlined support models:** Business customers can self-support in many areas, which transfers costs away from operations.
3. **Isolation of customer traffic:** SPs can minimize the impact of a software glitch, radio misbehavior, or faulty sensor by logically partitioning traffic by customer and application.
4. **Common service intelligence across access types and owners:** Separation of access and intelligence by cooperating operators can enable a consistent service environment outside the core footprint.

Proof Points: Applying Mobile NaaS to Two High-Growth Segments

To validate the need for the mobile NaaS model, we identified two market segments where service providers are currently looking for new revenue: the machine-to-machine (M2M) market and upstart mobile virtual network operators (MVNOs). These are not the only two mobility service segments that mobile NaaS can deliver; however, we are using them to illustrate the possible benefits that NaaS can bring to the mobile network.

Machine-to-Machine

The "Internet of Things" (M2M) represents a growing industry with tremendous opportunity for service providers. Strategy Analytics predicts there will be more than 1 billion connected cellular modules by 2018,[2] and the market is already crowded, with third-party players taking the lion's share of the value. Instead of being content with simply selling a mobile

network connection, service providers are beginning to realize that they need to move up the value stack and take control of their customer relationships as this market continues to grow.

The M2M space is not particularly complex from a segmentation perspective. Most customers fall into one of three categories, and the mobile NaaS proposition is a good fit for each:

1. **Customers that need just a simple sensor at a low cost** will be drawn to the lower initial investment of the NaaS model and the flexibility to pay as they grow. They may even be interested in taking on some of the burden of provisioning and troubleshooting their own devices in exchange for a lower monthly charge.
2. **Customers that have a fair amount of operational activity requiring immediate attention** will be drawn to the individualized reporting capabilities of mobile NaaS and the ability to test various configurations more quickly.
3. **Customers with fairly advanced networking solutions requiring significant customization** may also like the idea of keeping their traffic segregated from that of others and managing a consistent solution across several service providers. The ease of adding and configuring new service elements, as well as integrating elements through APIs, will be attractive to those looking for solution flexibility.

When we map these scenarios to the dozens of M2M use cases now in motion, several industries stand out as prime prospects for mobile NaaS: transportation, manufacturing, energy, and public safety.

Mobile Virtual Network Operators

The MVNO space is heating up again, this time driven by a new wave of entrants focused on mobile data solutions. By 2015, there will be 186 million global connections from MVNOs[3] – 15 percent higher than today's level. Just how will this growth take place? Today we are seeing a new breed of MVNO, one that is less focused on "me-too" voice services and more focused on data, with the emergence of 4G LTE. Companies such as Ting, Republic, Jasper, and Wyless are moving into this space and beginning to experiment with new, data-centric offerings, but the real market makers may turn out to be the big brands that are looking to transform their customer experience through mobility.

For example, we may see a new voice-over-IP entrant such as Skype build an MVNO business for which it can create differentiation through innovative voice and video services. Also, look for the media industry and players such as Netflix and Hulu to take control of their streaming offers across the increasingly attractive "third screen," and for nontraditional retailers such as Ford and Amazon to extend their customer relationships through mobility. Finally, expect consumer electronics manufacturers such as Sony, Nintendo, and Apple to throw their muscle behind mobile to ensure their devices work as well as they demand.

So, what will these future MVNOs require from mobile operators, and how can mobile NaaS help? For the traditional voice-based MVNO, as well as web-based entrants, creating service differentiation will be key. They will need to begin experimenting with various combinations of voice and messaging solutions before they find the right mix. Here, NaaS can reduce the cost of failure, while giving operators more flexibility to add service elements where required. For the up-and-coming data MVNO, whether consumer electronics-based or entertainment (content)-oriented, tighter operational control will be required to ensure that their unique customer experience is being delivered. MVNOs will be keenly interested in extracting customer insights through reporting and analytics, and will likely want to segregate their traffic. The greatest interest, however, will come from the unique service environment they can create by adding service elements to enable quality of service, redundancy, parental controls, and video optimization to give customers that "wow" experience.

While we have focused on just two market segments, there are many other examples where the mobile NaaS concept could be transformative. One can imagine enterprises that want more self-service, consumers who want more innovative features, and small businesses that want tighter integration. Each of these and more become increasingly possible as the cost of experimentation and deployment decrease in a mobile NaaS environment. With mobile NaaS, service providers can address the unique service and application requirements that previously were costly and challenging in a traditional architecture.

Mobile NaaS Can Spur Business-Model and Distribution Innovations

Two of the most exciting potential areas of innovation enabled by mobile NaaS are the service provider's business model and distribution capabilities. Mobile operators can take advantage of their flexible virtual environment to create new pricing plans and channels that can greatly accelerate adoption and growth.

Business customers are becoming increasingly comfortable with the SaaS and IaaS models — not only from an operational and service-creation perspective, but also because of the procurement advantage these models enable. A closer look at these cloud provider pricing models reveals some of the key levers used to attract customers while extracting maximum value. We have gathered insights from 16 SaaS providers to help illustrate and further define the latitude of pricing possibilities for mobile NaaS offerings. Based on this analysis, we have identified five trends service providers should consider when developing mobile NaaS pricing strategies:

1. **Per-seat pricing:** Due to the need for more flexibility in using services, pricing may not be tied to a single active phone number, but to a license for using services if and when required.
2. **Simplified pricing bundles:** Providers need to reduce billing complexity while doing a better job of matching cost to capability. The more complex the service and the more intelligent the service provider systems need to be, the more the solution will cost. Gold, Silver, and Bronze packages are typical for SaaS providers.

3. **Monthly recurring charges, with incentives:** Many SaaS operators offer discounts for extended time periods or use a "freemium" model to lure customers, then upsell them to a higher-value plan.
4. **Complex solutions funded through professional services:** Keep the pricing simple for simple solutions, but be prepared to charge handsomely for integration and customization if customers are unable to do these on their own.
5. **Alignment of cost and use:** When customers pay only for what they use, they have less risk of overinvestment and are able to pay as they grow.

Through mobile NaaS, the SP business model can be deconstructed into radio access and network intelligence. Increasingly, business customers will want to make separate choices for their access and intelligence services, rather than having these capabilities bundled together. Consider an example where an MVNO has a unique service configured for a customized mobile NaaS environment. Now, suppose an MVNO customer needs to roam onto another network that does not support this environment. With a separation of access and intelligence, the roamed-on network can simply route the traffic back to the NaaS environment and let it provide the required intelligence.

This separation of access and intelligence also shows up in M2M scenarios, where customers may have modules that are attached to the network but send data only sporadically. In this case, the service provider needs to keep the network configuration waiting and available, so the module owner has to pay for access each month, whether the module sends data or not. By separating access and intelligence, SPs can charge the customer for the intelligence needed to keep the connection alive and configured in the system, and then charge separately for the radio access network (RAN) component when the module finally sends some data. The flexibility, innovation, and margin created through the separation of access and intelligence will be transformative.

NaaS also enables mobile network operators to participate in more profitable distribution models that meet the needs of their customers while minimizing the cost of adding subscribers. Today, service providers typically use three models to reach a business customer. For some solutions, such as M2M, a "sell-with" model is used. Here, the mobile network service provider simply attaches its network service to an M2M solution provider's application and the customer pays two bills: one to the M2M solution provider and one to the network service provider. Alternatively, in the "sell-through" model, the M2M solution partner bundles the mobile connection into a one-stop-shop solution and maintains the customer relationship. Finally, in the "sell-as" model, the mobile service provider assumes the responsibility of the solution partner and provides the one-stop shop to the customer under the service provider's bill.

Through NaaS, the mobile operator can move away from the current default of "sell-through" to the more profitable "sell-as" and "sell-with" models. By providing a robust web interface for customer self-service, the service provider can simplify the onboarding process and make the "sell-with" model an attractive alternative to the partner's "sell-though" offering. In addition, the "sell-as" model becomes more attractive as the service

provider integrates a few key vertical solutions into its network service and makes them easier to manage through its web portal. In both of these scenarios, the web portal becomes the preferred onboarding method for new customers and greatly simplifies the operations of the service provider, thereby speeding time to market and decreasing acquisition costs.

We have seen that mobile NaaS offers many of the value proposition components, business-model levers, and web-based distribution benefits that have been demonstrated in the virtualization worlds of SaaS and IaaS. We have also seen that these newfound capabilities offer significant benefits to customers and market opportunities to service providers. We will now look turn to the operational benefits and implications of mobile network as a service.

Mobile NaaS Operational Benefits

Based on our experience in working with various large wireless operators in the United States, we believe that mobile NaaS can bring substantial benefits. The operational efficiencies and business agility offered by mobile NaaS derive from three key components:

1. **Virtualization of functional elements:** Critical functional elements, which today are typically stand-alone applications on dedicated hardware, are virtualized under mobile NaaS and hosted on a standardized blade-server farm. This step enables a uniform operational approach across multiple elements, affording better consistency and repeatability, and promoting integration simplicity.
2. **Creation of an active service catalog:** An active service catalog represents all of the functional elements that have been virtualized and identifies how they map to both the services that rely on those elements, and the customers who consume those services. The catalog also defines the policies by which they can interact. This drives down service creation cycles and streamlines both sales and configuration of complex orders.
3. **Process automation:** The active service catalog, in tandem with the virtualized elements, enables automation of operational processes. This is a powerful combination that ultimately benefits OpEx, increases business agility, and drives customer satisfaction.

To analyze the benefits of mobile NaaS, we turned to the enhanced telecommunications operations map (eTOM) process framework from the TeleManagement Forum[4] to identify the operations and infrastructure processes impacted. eTOM is a time-tested and trusted industry framework that provides a meaningful vocabulary for discussing operational benefits. By comparing the future-state processes under mobile NaaS to current-state processes, and identifying the differences in time and resources consumed under each scenario, we can determine the implied benefits. Mobile NaaS significantly impacts two process categories: resource-centric and service-centric processes.

Impact on Resource-Centric Processes

We expect mobile NaaS to deliver significant benefits across three resource-centric processes: 1) provisioning, 2) trouble management, and 3) management support and readiness. Throughout this discussion, "resource" refers to the hardware and software elements of the solution.

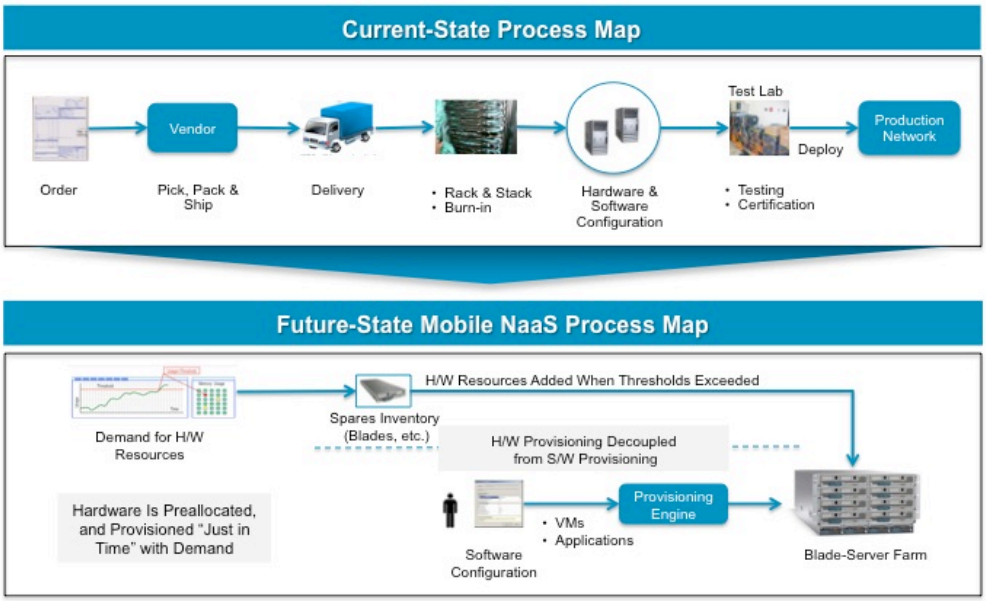
Provisioning

In this context, "provisioning" refers to the allocation, physical delivery, installation, configuration, testing, and activation of a resource. Today, to deploy a given element or function, the mobile network service provider's Operations group first orders a stand-alone machine from the vendor, and then racks and stacks the machine. This process alone can take several weeks. The physical hardware then experiences a burn-in period, typically lasting a day or so. Finally, the application is configured, tested, and activated onto the live network environment. From beginning to end, the entire process can take anywhere from several weeks to a few months, and require one to two full-time employees.

In a mobile NaaS environment, this process is greatly simplified and the timeline significantly compressed (see Figure 2). First, the Operations group doesn't need to wait for delivery of the new hardware or to engage in testing. Instead, it simply either provisions a new application instance onto a virtual machine or expands the license terms of an existing application instance to increase its capacity. In the latter case, software typically scales linearly with service load, eliminating the need for new hardware or testing. In either case, the application is precertified by the vendor to operate virtually on the standardized blade-server hardware as long as certain engineering rules (relating to CPU, memory, and I/O allocation) are met.

Thus, standardized configurations are used and deployed according to simple business rules. Furthermore, the entire process can be automated and managed from a central location. This massive simplification of current processes stems directly from decoupling applications and hardware. Our analysis shows that by eliminating hardware delivery cycles, burn-in, configuration, testing, and certification, and by automating application configuration and activation, efficiency in the provisioning process can be improved by 40 to 80 percent.

Figure 2. Mobile NaaS Simplifies and Accelerates the Provisioning Process.



Source: Cisco IBSG 2013

Trouble Management

"Trouble management" involves surveying and analyzing problems on element resources, localizing the source, and then correcting and resolving the trouble. Today, analysts in the mobile network provider's Network Operations Center (NOC) monitor physical machines housing each network element, using both general network management tools and dedicated element managers. They investigate alarms and other events from stand-alone hardware and the applications themselves, and if they cannot resolve these quickly, they escalate to higher tiers of support. Higher support tiers, in turn, localize the trouble by performing specialized tests using a variety ad-hoc tools. Finally, the NOC analysts correct and resolve the issue by addressing the root cause — in some cases by reconfiguring applications, and in other cases by replacing stand-alone hardware. This is a highly manual and sometimes complex process today that requires deep subject-matter expertise in the NOC.

The mobile NaaS environment, on the other hand, streamlines the trouble-management process significantly. From a hardware perspective, rather than monitoring individual stand-alone physical machines, the NOC instead monitors a single blade-server farm. Blades are configured according to a set of standards, meaning that, on average, they are more reliable. For the same reason, it's simpler to localize troubles by using better and more standardized tools. Correcting and resolving troubles is also easier because of the standardized hardware and configurations. In fact, many common events or troubles can be resolved automatically with simple scripts, avoiding the need for human interaction altogether. For example, if a blade is found to be faulty, a workflow can be triggered to replace and reprovision the blade quickly, while the virtual machines requiring that blade are automatically reassigned. In this way, NOC staff at multiple tiers can be redeployed as

more events and outage resolutions are automated. By standardizing hardware, simplifying troubleshooting, automating outage resolution, and increasing the percentage of trouble resolutions at Tier 1, efficiency in the trouble management process can be improved by 30 to 50 percent.

Management Support and Readiness

"Management support and readiness" refers to proactive monitoring of network and IT resources, such as packet gateway servers and IP services, to ensure optimum performance, while also maintaining the resource infrastructure. Typically, the Network Operations group regularly monitors stand-alone applications on dedicated hardware to ensure that they are performing to specification. For example, Network Operations monitors the CPU and memory, and maintains workloads according to preset engineering guidelines. It also applies vendor-issued software patches and updates regularly.

In a mobile NaaS environment, the effort required by these processes is reduced, primarily because hardware health and performance tuning can be standardized and automated — a benefit of being in a virtual environment. For example, as a given element requires more CPU or memory, it can simply be allocated additional capacity "on the fly" from the blade-server farm (see Figure 2). Cisco IBSG estimates that by enabling centralized management, and by automating performance management and general maintenance, efficiency can be improved by 25 to 40 percent.

Impact on Service-Centric Processes

Mobile NaaS will also positively impact three service-centric processes: 1) selling, 2) service configuration and activation, and 3) service development and management.

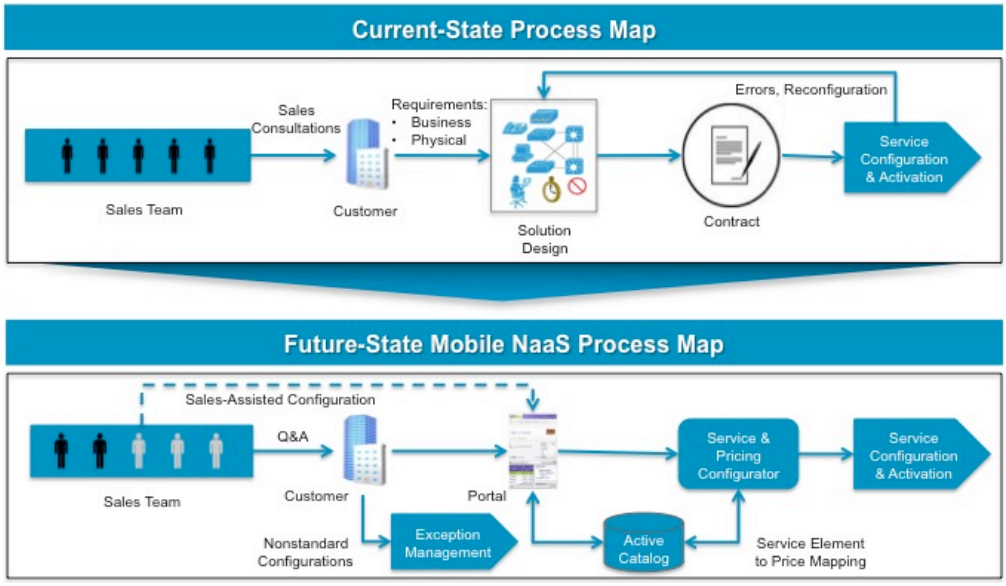
Selling

"Selling" refers to the typical consultative sales process whereby an account team, including a sales engineer, engages the customer with the ultimate goal of securing a customer order. Depending on the service, this often follows a complex sales cycle and involves multiple sales calls to perform site surveys, collect customer requirements, socialize potential solution designs, agree on pricing, and, ultimately, ink a contract that incorporates the final solution. For complex sales, this process is highly manual, requires a skilled salesforce, and is prone to errors. For example, solution designs are often misconfigured in the service order, and eventually the correction costs both the customer and the service provider both time and effort.

In a NaaS environment, the sales process is more streamlined, requiring much less intervention from the sales department, and resulting in fewer errors (see Figure 3). Some customer segments — small to midsize companies, for example — could access the active service catalog through a customer portal and use it to design and configure their own solution directly. The service catalog would be rules-based to produce only practical solutions, and it would have a built-in price configuration tool, thus eliminating solution and pricing configuration errors. Alternatively, the sales organization could access the active service catalog through a dedicated interface, producing the same advantages. Once the

user arrives at a given solution design, the same design would drive the service order engine, eliminating another potential source of errors. Our analysis shows that by minimizing sales involvement through customer self-service and by providing rules-based pricing and solution design, efficiency could be improved by 25 to 80 percent in the selling process. Customer satisfaction would also improve as a result of shortening the sales cycle and reducing errors.

Figure 3. By Standardizing Service Elements, Mobile NaaS Streamlines the Selling Process and Reduces Errors.



Source: Cisco IBSG, 2013

Service Configuration and Activation

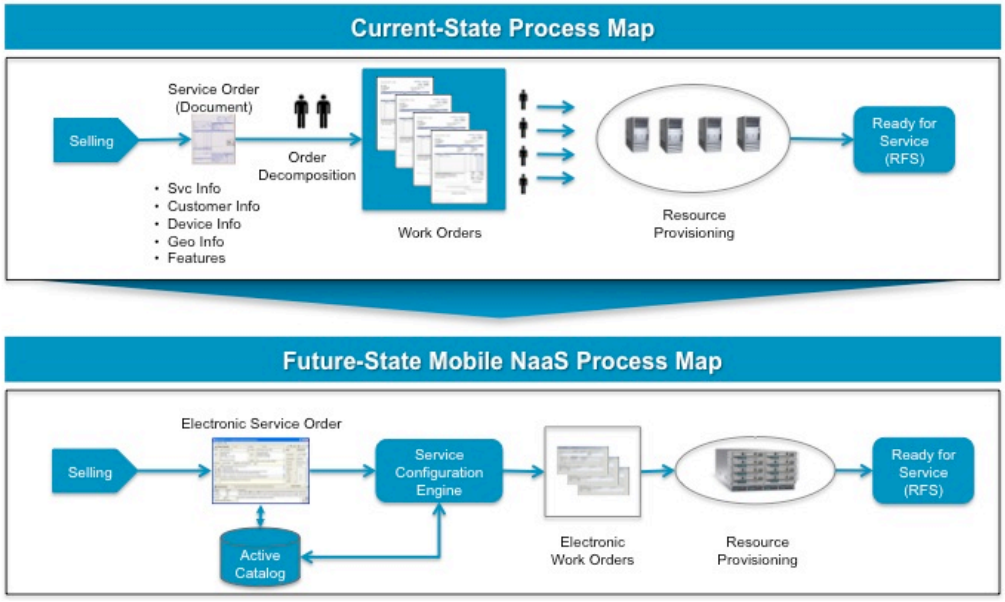
"Service configuration and activation" refers to the process by which a customer order — generated by the selling process — is turned into a service order and eventually provisioned onto the underlying network and application resources upon which the service relies. Today, service configuration and activation is typically a manual process with little automation. After a customer has signed a service agreement, a service order is created, and individual work orders are developed for each network element or resource to be provisioned. Typically, this process is managed by a manual workflow tool. Because of unique customer requirements, the service order usually involves a "special project," which is difficult to standardize or automate. The result is an unduly complex and prolonged service configuration and activation timeline, requiring dedicated and skilled resources.

In a mobile NaaS environment, however, a higher level of efficiency can be achieved. First, a service order emerges as an output of the selling process. This service order is created using only standard configurations generated by an active service catalog. Therefore, the configuration process is automatic. Customer orders requiring nonstandard configurations generate exceptions and are still handled manually. However, these new configurations

are then incorporated into the active service catalog so that, in time, only a small percentage of customer orders require a special project.

The active service catalog contains rules for how the service configuration maps to underlying resources (network and IT elements and features), so service activation is achieved automatically via flow-through provisioning of those resources. To a large degree, the manual workflow associated with individual work orders is eliminated; instead, the process is driven by an activation engine, fed by the electronic service order, and guided by policies in the active service catalog. By eliminating manual workflows, slashing service configuration rework, and automating service configuration, efficiency can be improved by 50 to 100 percent in the service configuration and activation process.

Figure 4. Service Configuration and Activation in a Mobile NaaS Environment: the End-to-End Process Is Automated.



Source: Cisco IBSG, 2013

Service Development and Management

"Service development and management" refers to the strategy, planning, and delivery of new and/or enhanced customer-facing services. This process involves developing a strategic vision and multiyear services roadmap, and then mapping demand forecasts for these services to the resources and capabilities required to deliver them. Delivering new or enhanced services includes implementing new processes and systems; developing new capabilities to deliver new functionality; and testing and rolling out the new service. New service creation is, by nature, cross-functional and requires significant interaction.

That would not differ greatly under a mobile NaaS environment. What would be different, however, is how a newly defined service would interact with existing shared resources, and the manner by which any new required resources would be developed.

Under NaaS, existing virtualized components reside in an active service catalog, so assigning them to a new service follows a standardized process, with well-defined templates and interactions that do not impact other services. Furthermore, any required new service components are simple to add to the active service catalog, according to a standardized set of procedures that define the relationship with other components in the catalog, and how they are orchestrated by the new service. This decoupling of services and resource components makes it simpler to build and orchestrate new end-to-end services. It also ensures maximum reuse of shared resources while limiting disruptions.

For example, product managers need not heavily engage Engineering, Operations, and IT organizations in endless product implementation meetings and workshops, which is typical today. Instead, product managers simply select a subset of the features already in the active service catalog and then determine how to integrate any additional functions not already contained in the catalog. By freeing up product managers to focus on strategic roles, enabling customer-driven innovation, and developing standardized flexible and re-usable configurations, efficiency could be improved by 25 to 75 percent in the service development and management process, according to Cisco IBSG's analysis.

Additional Infrastructure-Based Benefits

In addition to the process-based benefits outlined above, significant infrastructure benefits can be captured from virtualization of the service elements. Namely, SPs can expect a decrease in power and cooling OpEx, as well as a reduction in data center floor space. These benefits are well documented in industry literature.[5] With mobile NaaS, the SP can expect to see a reduction in OpEx of 25 to 50 percent related to server power consumption, as well as a comparable reduction in cooling power for data center air conditioners, pumps, and humidifiers. SPs can also expect a reduction in floor space of up to 66 percent[6] – a significant savings when a data center with a power density of 500 watts per square foot costs $5,000 per square foot to build.[7] We have not included these savings in our analysis.

Operational Implications

While the value proposition for mobile NaaS holds great promise, it is also important to keep in mind several implications and critical success factors along the transformation journey.

First, NaaS implies a significant transfer of ownership and control from Network Operations to IT Operations. This is an important concern that needs to be managed carefully. Network Operations typically demands full control of the physical hardware underpinning the services it is accountable for delivering. Ceding that control to IT Operations would need to be coupled with training and strict operational-level agreements (OLAs) to provide the level of comfort the Network Operations organization will demand.

Second, IT Operations must develop a robust "just-in-time" capacity management and optimization capability to ensure machine hardware and virtual machine availability. To achieve this, it will need to work closely with the planning organization to accommodate an

aggregated forecast for hardware resources. IT Operations will also need to make sure that the performance requirements of each virtual resource are accommodated by the underlying hardware (CPU, memory, I/O, and network capacity), possibly by specifying and assigning different blade-server "classes," which could be optimized for different types of workloads.

Finally, a service orchestration process that is decoupled from the underlying resource processes will be needed. This is a subtle but critical point. Many operators today have tightly coupled processes, systems, and network resources, which result in service stovepipes and limited business agility. A mobile NaaS environment creates an opportunity for new business agility by making semiautonomous hardware and application resources available as modular and shared services, which can then be assembled into end-to-end processes by an overarching service orchestration layer. Although NaaS is not a necessary requirement, it is certainly an enabler.

Mobile NaaS Offers Significant Economic Benefits

As we can see from the above sections on commercial and operational benefits, NaaS creates significant value. However, we should also expect that there is some "cost of change" to move to a more virtualized environment, and a cost of adding incremental OpEx and CapEx to capture any added revenue.

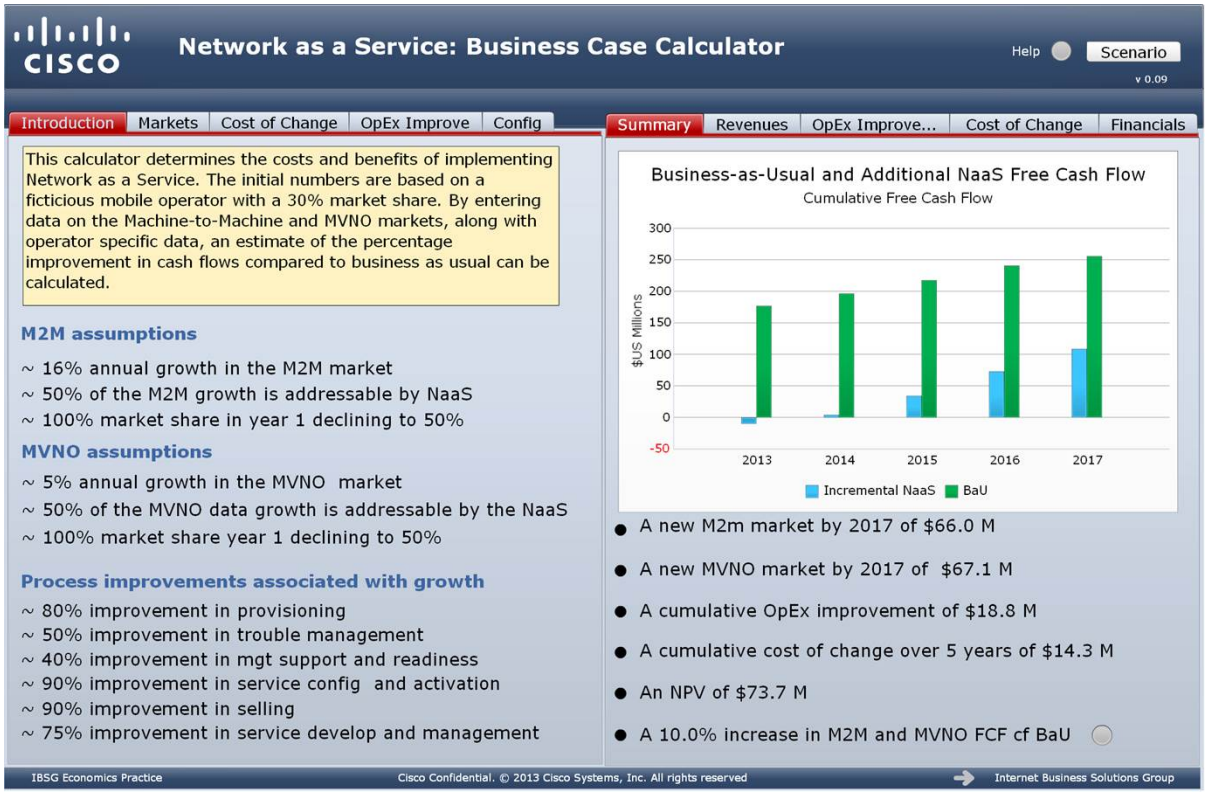
To that end, Cisco IBSG has developed a simple but effective business case modeling tool that calculates financial metrics, such as the cumulative cash flow and the net present value (NPV) of moving to the NaaS model. In this case, the model is focused on improvements to the M2M and MVNO segments, but the solution could be extended to a variety of other SP offers in both the consumer and business segments.

The model uses a set of assumptions around market growth and market share, along with the cost of change and expected operational improvements. In the particular example shown in Figure 5, the model uses the following assumptions:

- An operator with a 30 percent market share
- An M2M annual market of $300 million, growing at 16 percent each year, of which 50 percent of the growth is addressable by NaaS
- An MVNO annual market of $4.7 billion, growing by 5 percent each year; 50 percent of the data-centric component is assumed to be addressable
- The operator taking a higher market share in the early years, reducing to 50 percent in 2017
- Cumulative change costs of around $14.3 million
- An 83 percent improvement in the operational costs of the growth component of the markets obtained by NaaS

Figure 5 below shows the main screen of the model, which indicates a net increase in cash flow of 10 percent and an additional revenue stream of $133 million, based on the above parameters.

Figure 5. Cisco IBSG's Interactive Tool Enables Mobile Operators To Estimate the Potential Financial Impact of Moving to a NaaS Model.



Source: Cisco IBSG, 2013

Summary

Mobile network as a service represents a promising new technology innovation that creates both commercial and operational benefits. When deployed solely in the context of M2M and MVNO segments, the results are significant – in the range of a 15 to 20 percent gain in cash flow. However, this analysis also implies that there could and should be greater benefits that stretch well beyond these two particular segments into the broader consumer and business suites of services. Although it is not likely to be a linear extrapolation from the M2M and MVNO analysis, even an improvement of a few percentage points in revenue or operational cost would have significant implications for a company's future.

We have also seen that the commercial and operational benefits of virtualization create real and significant value for mobile service providers. Thus, apart from any hardware cost savings that may come from this migration, mobile NaaS represents an attractive proposition for mobile operators and their customers.

Next Steps

NaaS represents an exciting, new, and disruptive technology for mobile network operators, and SPs should be asking what they can do now to prepare for its arrival. Although the technology is still in its infancy, below are eight short-term actions that can give forward-thinking operators a tremendous head start:

1. **Determine which services would benefit most from the NaaS value proposition.** Where is the best place to start?
2. **Consider the potential of decoupling access from intelligence in the current business model.** Which new doors will this open?
3. **Estimate the cost of change.** Is there a data center already in place? Are skills developed? How many servers are required?
4. **Run a high-level business case.** Will it make financial sense to move to NaaS with one, two, three, or more services migrating?
5. **Stage a lab environment.** Are the tools and skills in place to manage a NaaS-based architecture?
6. **Reengineer broader processes.** Which operations and business support systems, key performance indicators, and application programming interfaces will need to change? How large is this effort?
7. **Extrapolate findings to develop a holistic virtualization strategy.** Which other services and service elements should move to NaaS over time?
8. **Redefine marketing approach.** How does NaaS change the channel mix and market positioning?

By executing against these eight imperatives, operators will be much further down the path toward virtualization and a true NaaS environment. The process will not be easy, but the findings along the journey will begin to shape the DNA of the organizations and employees involved. This maturation process will become a cornerstone of future success.

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