

# Creating 5G-Ready Networks: A 5-Step Network Transformation

## HIGHLIGHTS

- Understand why seizing new revenue opportunities from 5G services requires a fundamental rethink and redesign of mobile operator networks
- Create a 5G-ready network with the holistic automation, end-to-end visibility and control, and proactive intelligence required to efficiently and cost-effectively offer highly tailored services to customers
- Learn why strategic planning is vital to achieving first-to-market advantage and differentiated services in a marketplace marked by ongoing upheaval
- Use the Brocade 5-Step Network Innovation Model to understand how mobile operators can evolve their networks to be 5G-ready fast, while reducing risk and maximizing efficiency

## Fast Approach of 5G Demands Action Now

5G is predicted to revolutionize the mobile industry in unprecedented ways. The promise of ultra-low latency, increased performance, and virtualized network architecture is motivating mobile operators to start preparing now in anticipation of the 5G standards. In fact, 5G trials are already underway by some mobile operators seeking to understand the capabilities that 5G will enable.

New use cases, such as smart cities, smart transportation, and more efficient supply chain logistics, mean 5G offers significant new revenue opportunities. However, delivering 5G will necessitate a greater evolution in the underlying network system than what was required with the upgrade to 4G services. Fundamental new network architecture designs are required to enable the broadband-like speeds, massive scale, improved signaling, reduced latency, and low energy consumption targets being set.

Such significant changes can be complex and costly, and the use of previously unreferenced architectures may make progress seem slow. At the same time, attempts to adapt quickly to fast-changing circumstances and gain competitive advantage may demand adoption of very

new innovations and their deployment in new environments.

Mobile operators need to take advantage of the next few years to redesign their network architectures as part of a structured, phased, approach. Even in such intensive and fast-paced sectors as mobile services, a pre-planned series of roll-outs is advisable to allow for robust design, test, trial, and deployment. In the long term, this will accelerate adoption of 5G-ready infrastructures, rather than delay them, by reducing risk and ensuring investments are interoperable and future-proofed. To this end, Brocade has developed a step-by-step path to network transformation—the Brocade 5-Step Network Innovation Model—to help operators scope and plan their 5G-ready network architectures.

## A 5-Step Network Innovation Model for a 5G-Ready Infrastructure

The Brocade 5-Step Network Innovation Model helps mobile operators visualize the network transformation they require and identify the benefits that can be secured at each stage. It provides a framework for building a strategic plan for a transition from today's hardware-based, complex, and rigid mobile networks to the software-enabled, simplified, and flexible mobile network infrastructures that 5G will require (see Figure 1).

### Step One: Accept the Challenge

Deployment and utilization of 5G standards and solutions will create unprecedented demands on operators' networks. Imperatives to support these demands include:

- An ability to control virtual functions as they traverse across private and public cloud environments for fast, cost-effective scale and services deployment
- Mobile edge computing as that "edge" expands and evolves beyond current parameters

- Big machine learning so systems can intelligently manage themselves, and the vast volumes of data that will be generated

Operators' networks must continue to become more virtualized to make such transitions viable. This in turn makes the adoption of Software-Defined Network (SDN) solutions critical, since SDN is needed to enable orchestration and management across multiple diverse, adaptive, interconnected, and virtualized environments.

In addition, there are a number of key considerations that must also be analyzed and addressed. There must be minimal to no impact on current core operations during testing or full deployment, and integration and interoperability must be prioritized at every stage—along with security. And the accelerated rate of change, and challenges in predicting future developments, means vendor lock-in should be avoided to protect operators' ability to choose and change solutions according to their features and benefits, not their provider.

Ensuring all of these elements are covered—given the potential complexity and scale of the transformation required—demands a strategic plan; a staged process of test, trial, invest, and deploy; and a clear understanding of how legacy technologies can be leveraged.

At this stage, mobile operators should use the model to:

- Understand where legacy investments can best be leveraged
- Consider and agree on which use cases represent the best revenue opportunities, and what the technical requirements will be
- Create a plan and act on it

### Step Two: Adopt Holistic Automation for Operational Efficiency

Most operators have already established virtual network environments in some network silos. Understanding how to extend and optimize these virtual islands without increasing complexity or cost, or creating bottlenecks or weaknesses, will

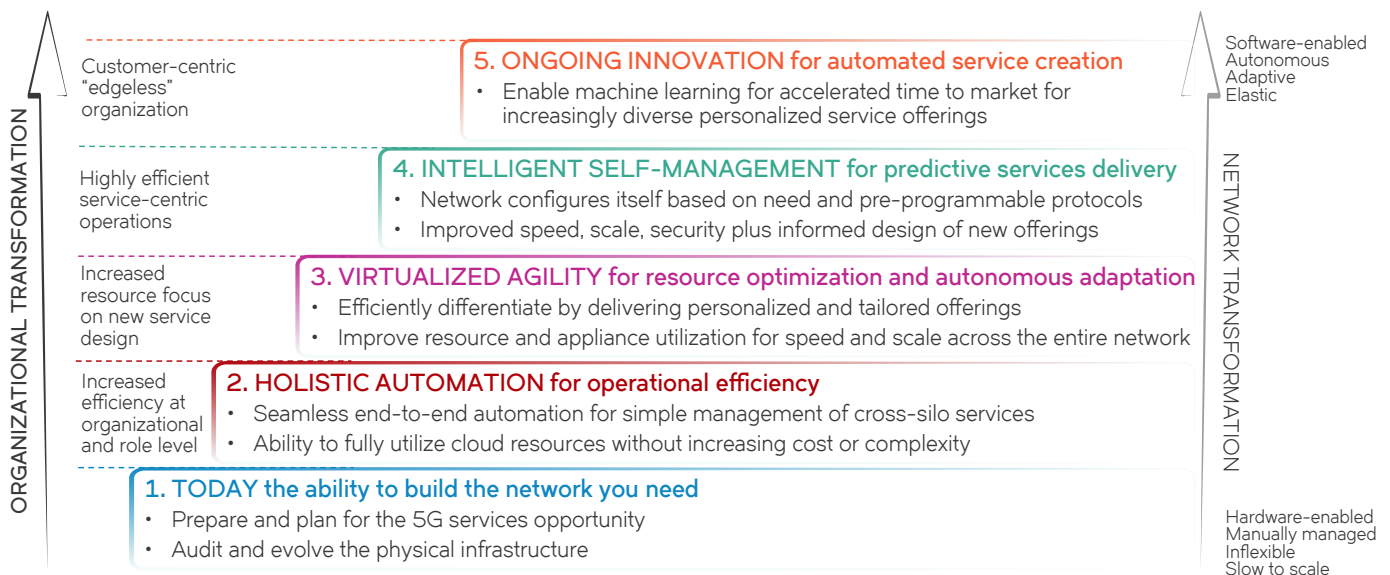


Figure 1: Brocade 5-Step Network Innovation Model for service providers.

enable operators to successfully take the next step in creating a 5G-ready network.

With mobile networks managed by multiple teams, specific domains such as RAN, mobile backhaul, or mobile core are kept in silos. This operational approach, and the legacy design of the environment, has led to SDN and Network Functions Virtualization (NFV) being adopted by individual teams in specific and limited deployments. To create the new operational architectures required to support 5G-enabled business models, operators need to encourage cross-domain deployments of virtual and software-enabled solutions.

To do this, operators must adopt the seamless, end-to-end, holistic automation of functions and tasks. This substantially improves efficiency, optimization, and utilization of devices and resources. And it will facilitate cross-team collaboration that new business models—and services such as Narrowband Internet of Things (NB-IoT) and network slicing—will demand.

A holistic approach to automation eliminates many of the boundaries and restrictions that can limit virtual functionality and appliance use, while accelerating their adoption and simplifying their management. As the network parameters become less defined and more abstract, the process of functional aggregation enables Virtual Network Functions (VNFs) to be fully optimized across all environments. With this in place, operators have the foundational pieces they require and can turn their attention to increasing agility and providing more personalized services.

### Step Three: Virtual Disaggregation for Agility and Resource Optimization

As operational barriers are removed through the adoption of holistic automation, operators can re-examine how they use and deploy resources to accelerate change. In a 5G-ready infrastructure, demands for agility require a further breakdown of the vertical operation silos. This can be achieved by disaggregation of the VNF control and data planes, and deployment of SDNs that extend from cell site to data center.

This will enable operators to gain agility in three ways:

- **Ability to personalize service offerings:** Operators can offer optional network functions, such as optimization and security, to create service-specific features and targeted pricing models for customers. SDN fabrics provide the end-to-end overlay and intelligence to support required end-to-end services, such as network slicing.
- **Optimized cross-domain traffic routing:** By disaggregating the VNF control and data planes, operators can scale and control the data plane independently. This supports autonomous, simple, end-to-end traffic routing regardless of a function's location or environment.
- **Optimized cross-environment workload processing:** The separation of data and control planes also supports adoption of new programmable ASICs that use extensible programming languages to enable workloads to be placed on whatever platform offers the

most efficient option, while still meeting Service Level Agreements (SLAs). The platform can be selected regardless of its network location, increasing agility while improving overall efficiency.

End-to-end adoption of SDN and disaggregation of VNFs require operators to review and redesign not only their networks, but also their processes and resources. New procedures and skill sets will be required to manage such a different environment, and take it to the next level.

### Step Four: Increase Intelligence for Self-Managing, Autonomous Networks

In step three, VNF disaggregation and SDN fabric adoption across all environments help operators create new service packages and add-on features. Building on this, operators can then increase the degree of tailoring available, with users or applications able to make specific requirements of the network based on a task or process. This intent-based networking sees the network configuring itself as required, on-demand. Network functions can be self-managed by the network, extracting meta data to support increasing optimization of resources and predictive adaptation. New services that combine 5G connectivity with new mobile devices and IoT offerings will open up markets and business models.

This is made possible by leveraging the programming and autonomous intelligence in SDN fabrics to incorporate contextual transfer capabilities. These leverage the data in the network service headers to extract information

about performance, usage, subscriber profiles, and flow alongside the traffic itself. Programming information can be incorporated directly into the service path using the SDN controller, while eliminating the need to explicitly classify traffic. The network functions become decision-makers, able to identify irregular data while passing complex decisions to core network management systems for improved security and efficiency.

### Step Five: Continuous Innovation to Keep Competitive Advantage

By following steps one through four, IT organizations can leverage automation to create a self-managing network. Decision-making and logic, however, remain highly manual up to this point. As 5G becomes ubiquitous, operators need to be able to accelerate time to market for deployment of services, and ensure profitability from increasingly diverse personalized service offerings as they seek to differentiate their offerings.

Introducing machine learning enables the automation of service creation and customization. Algorithms can invoke or deny optional features and services based on specified criteria, while pushing control policies and responding to anomalies that may present threats. This also supports predictive modeling, to understand and preempt network capacity and availability requirements.

The risks involved with offering new services can be mitigated, and services spun up or down in advance. Improved efficiency combined with predictive personalization of services will enable operators to optimize the monetization of their networks.

### A Tailored Plan for Network Transformation

By breaking mobile network transformation down into five logical steps, in which each builds on the preceding step, operators can prioritize what investments they should make from

a business and technical perspective. This also helps those involved directly in the planning process to easily articulate the immediate and longer-term network transformation to internal stakeholders.

Moreover, by structuring how organizations approach and plan network transformation systematically, the model helps highlight gaps, issues, or assumptions early, so they can be addressed. This reduces any risk involved, while helping to realize ways of reducing the cost, complexity, and timescales involved.

### Take the First Step

Whether to undergo a network transformation is not the question. But rather, how? Brocade is uniquely qualified to help organizations take the first step toward a network transformation and the beginning of a business evolution.

For more information on the Brocade 5-Step Network Innovation Model, visit [www.brocade.com](http://www.brocade.com) or contact a Brocade representative.

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