WHITE PAPER

BROADCOM

A Broadcom Point of View

Emerging Market Demands, and How to Respond

How Communication Service Providers Can Adapt to New Threats and Opportunities

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Executive Summary

For today's communication service providers (CSPs), including cable operators and telecommunications firms, the technology and business landscape continues to evolve, and the changes show no signs of slowing down. This paper examines how the obstacles and objectives for CSPs have been evolving, and it examines the technologies and approaches that will be required for organizations looking to adapt and thrive amidst these new realities.

Trends Shaping an Increasingly Challenging Market

In recent years, the pressures on CSPs have continued to mount. Following are just a few of the top trends adding to the pressure:

- **Pace of change**. Driven by the accelerated rate of technological and market change, teams must continue to adapt at an ever-increasing pace. Competitive threats and opportunities keep arising more rapidly. Not only does fast technological innovation become increasingly critical, it also keeps getting more expensive. The evolving nature of communication lines paints a vivid example. While early advancements like ISDN and ADSL required investments, they leveraged existing copper cables. Now, the move to fiber optic requires ripping up pavement, running entirely new lines, and so on—significantly boosting the up-front outlay required.

Not only does fast technological innovation become increasingly critical, it also keeps getting more expensive.

- **Silos**. Over time, the proliferation of siloed technologies, environments, and domains has continued. In the case of long-tenured incumbents, this proliferation has progressed unabated over the course of decades. Now, organizations may be contending with disparate sets of infrastructure that came through acquisitions, or that sprung from new initiatives that were developed in isolation. Over time, these silos represent significant obstacles to agility, cost efficiency, and competitiveness. Fundamentally, delivering excellent customer service requires going across silos.
- **Software-defined everything**. Where in the past, equipment was deployed via function-specific appliances, with dedicated hardware and embedded software, today, the landscape is dramatically different. Approaches like software-defined networking (SDN) and network function virtualization (NFV) enable CSPs to run services on commodity hardware, commercial or open-source software, and the like. This evolution is happening in all parts of the organization, including in such core areas as provisioning in network operations. This evolution presents a fundamental set of implications and challenges for ongoing operation, and it also lowers the barrier to entry for competitors.
- **New market entrants**. While stiff competition from existing players is nothing new, what's changed is that the number and type of different players has continued to increase. Threats from new players, such as satellite broadband providers, appear likely to eat away at the market share of established CSPs. Further, organizations like hyperscale technology providers are offering an expanding portfolio of services, such as network edge offerings, that encroach on the domains traditionally served by CSPs.

- **Sustainability**. As they chart their organization's directions, leaders are starting to take an increasingly holistic view of what success looks like. Often, CSPs are among some of a country's largest energy consumers, which means their operations can have a significant impact on communities and the environment. Consequently, leaders are increasingly being evaluated based not only on their bottom-line performance, but on their environmental and social impact.

Potential Growth Strategies

Across regions and organizations, leaders will be looking to pursue various strategies for business growth:

- **Content**. Many leaders have moved forward based on a recognition that content really is king. In many markets, those who own the digital content that attracts viewers will be the ones that are strongly positioned in their markets. Consequently, in the recent past, there have been several examples of CSPs merging with entertainment firms.
- **Expansion**. Many other leaders are seeking to grow revenues and their customer base through acquisitions or building out an ecosystem through partnerships. This can include merging with other traditional CSPs, pursuing acquisitions of businesses in adjacent markets, or developing an application-centered platform.
- **Pure play**. A third approach is to stay focused on a core competency. By dedicating investments and expertise to a core area, businesses can be well positioned to establish a competitive edge in that domain. For CSPs, this may mean keeping a focus on core network services or potentially building on that platform to deliver a complete offering, such as an over-the-top service.

Fundamentally, CSPs can't succeed solely by making incremental cost improvements.

Key Business Priorities

No matter which top-level business strategy an operator pursues, teams will be required to address several key objectives:

- **Increase strategic value**. It will be increasingly vital to move up in the food chain, delivering higher-level, higher-value service offerings, and supporting entirely new business models. Operators can move to harness new ecosystems and services around 5G, IoT, blockchain, and, in the near future, quantum internet.
- **Strengthen and grow core business**. To combat price pressures and competitive threats, CSPs will need to achieve breakthrough improvements in their core business, strengthening existing services and customer relationships.
- **Cost reduction**. Fundamentally, CSPs can't succeed solely by making incremental cost improvements. To achieve breakthroughs in service innovation and profitability, CSPs must chart a transformative path to removing complexity from top to bottom, including business models, portfolios, IT, and networks.
- **Digital transformation**. Today, CSPs deliver the internet and mobile services that digital natives rely upon. While these services remain vital foundations for the digital age, the reality is that CSPs will nevertheless need to pursue their own digital transformation. This will include the development and delivery of a new suite of digital services, as well as establishing digital operations and, in the longer term, a truly digital organization.

Obstacles: Operational Complexity

Across the organization, operational complexity is stifling CSPs' ability to meet all their key objectives. This complexity is increasing due to a number of factors:

Software-Defined Everything

As outlined earlier, approaches like SDN represent a fundamentally different paradigm, a significant departure from the network operations of the past. In software-defined environments, virtualized services run on standard hardware, with different components linked together to deliver digital services. In moving to these approaches, the number of technology layers and distributed systems goes up, introducing new layers of operational complexity.

Granularity of Software

The use of microservices and function-as-a-service-based approaches continues to grow, introducing a highly complex, dynamic, and ephemeral environment in which resources are constantly started and stopped to accommodate fluctuating workloads. While these modern approaches offer a range of advantages, they also introduce an entirely new degree of complexity for operations teams.

5G and Network Slicing

Beyond the more broadly understood implications of 5G for users, namely big improvements in bandwidth and speed, 5G will introduce significant disruption in the business-to-business sector. 5G enables CSPs to pursue end-to-end network slicing approaches and ultimately business-to-business-to-consumer (B2B2C) models. Through these models, CSPs partition network services and deliver them as dedicated slices to business clients, who can then provide packaged offerings to their customers. The end result is that, in the 5G era, instead of running a few networks, the CSP will operate tens of thousands.

Legacy Technologies

While adoption and support of emerging technologies is an imperative, these efforts need to happen in parallel with the rationalization of legacy technologies. The faster CSPs can move away from legacy technologies, the sooner such benefits as cost reduction and agility gains can be realized. However, CSPs have to contend with a number of factors that impede or even block this modernization.

While the reduction of legacy technologies can provide benefits in terms of cost savings and agility, these benefits need to be weighed against such factors as regulatory requirements that may restrict the abandonment of legacy systems, as well as ethical and social responsibilities that may be tied to older operational approaches. For example, ending support for an older network technology may be beneficial financially and operationally, but it may result in customers with older devices being forced to purchase new systems.

Data Center Proliferation

In the past, an operator may have been running a handful of data centers to manage the global or national core. While those data centers remain, small data centers are increasingly being established away from the core, often with hundreds at the metro core level and even more at the edge.

Across these proliferating data centers, software-defined everything and cloud adoption continue to blur the traditional boundaries that existed between what's been considered IT and operational technology (OT), and between the network and the cloud.

In the following sections, we examine the three key areas CSPs will need to focus on in order to address their complexity challenges and business objectives.

Maximizing Customer Value Through Value Stream Management

Some CSPs have fared better through the pandemic than others, but, across the board, margins continue to be tight. For business leaders, choosing investments wisely, and ensuring teams get the biggest returns from those investments, is absolutely critical.

Obstacles

As outlined above, the pace of change, both in terms of technological innovation and market dynamics, continues to accelerate. In planning, decision makers must constantly weigh not only complex factors and criteria, but they must also choose among shorter and longer-term investments in the midst of all this change. In making these decisions, far too many leaders lack real insight into the value of their investments, leaving them ill equipped to plan and manage with intelligence.

Many leaders are lacking insights for tracking and maximizing the return on investments (ROI) being made and the projects underway. Was the ROI promised in the initial business case ultimately delivered? Are projects still on schedule and on track with plans? If not, where are efforts diverging? Too often, objective, accurate answers to these basic questions are hard to come by.

Some executives are still relying on non-integrated spreadsheets and manual reporting from different teams. These tactics make it virtually impossible to manage value streams with any efficacy. The result is suboptimal plans, and potential ROI isn't fully realized.

Investments and projects can be particularly difficult to track in dynamic organizational environments. A manager may leave or be reassigned, or organizational structures may change, before their project is wrapped up, so no stakeholder remains to assess and be accountable for ROI. Alternatively, investments and budgets may be reallocated midstream, meaning the project doesn't get completed, let alone tracked. Fundamentally, these scenarios result in massive waste, which CSPs can ill afford.

Some executives are still relying on non-integrated spreadsheets and manual reporting from different teams. These tactics make it virtually impossible to manage value streams with any efficacy.

Requirements

To most intelligently manage and optimize these decisions, teams need to establish value stream management approaches and leverage project and portfolio management. Leaders need the following capabilities:

- **Intelligent project and portfolio management**. Leaders must have portfolio management capabilities that help track projects and investments in real-time. For example, a solution needs to transparently transfer ownership in the event of a change in leadership.
- **Standardized, cross-silo visibility**. It is vital to establish a unified, standardized way to track investments across silos, across the organization. If leaders don't have cross-silo insights, and a standardized framework for analysis, they won't truly be able to tell what is successful and what isn't.
- **Complete lifecycle visibility**. Executives must have unified visibility across the lifecycle, including spending, tracking, and deriving value.

- **Timely profit and loss insights**. It's vital to be able to track what's profitable and what's losing money, so leaders can make course corrections early and mitigate losses. Otherwise, the longer the delay, the more money that will be wasted.

Maximizing Quality Assurance Through DevOps and Continuous Testing

Like virtually all other enterprises, CSPs are increasingly moving to adopt agile approaches. Within many CSPs, however, these agile transitions are happening in a siloed fashion, rather than across the organization.

In part, this is the result of a culture clash that often arises between the "fail-never" approach traditionally taken by network operations teams, and the "fail-fast" mindset espoused by agile proponents. While agile approaches promise to improve quality, these and site reliability engineering (SRE) strategies tend to be employed in arenas in which there's some level of tolerance for failure. However, for CSPs, the reality is sometimes, failure isn't an option.

While it's one thing to have a movie streaming user encounter a performance hiccup, it's another thing for a phone user to be unable to make a call to an emergency "911" service. Particularly with voice services, it's not an overstatement to say lives can be at stake, which means failure isn't an option—not fast, not slow, not ever.

Requirements

To meet their agility objectives, and support increasingly software-driven environments, the widespread move to agile will be an imperative. In the coming months, while they navigate this transition, most CSPs will need to manage a mix of waterfall and agile approaches, with teams striving to boost agility, while maximizing quality assurance. To achieve these objectives, teams will require advanced testing capabilities.

Traditionally, testing was often perceived as overhead, something like an expensive insurance policy. That's in part because it can be hard to quantify the potential cost savings associated with catching bugs before they get to market. This can make it hard to define the actual return on testing investments.

However, catching bugs early, before they have a negative impact on the customer experience, is critical, which makes establishing rigorous testing a must. Moving forward, testing will represent a core of effective software-defined networking services. Teams need to establish a central testing function that:

- Spans traditional operator silos, enabling testing teams to track the entire customer journey.
- Addresses privacy regulations and security policies, promoting efficient, compliant management of test data.
- Spans the DevOps lifecycle, powering testing throughout the development process, before digital services are rolled into production, and up to and after these services are deployed into production.

Optimizing Operations Through AIOps and Automation

Beyond all the complexity that has been introduced by trends like software-defined everything, another shift has been occurring. In the past there was a wide gap between the largely generalized systems used by IT teams, and the specialized OT equipment used for operator networks. Now, it's all effectively become IT. For CSPs, environments need to be managed in a similar fashion to IT or cloud infrastructure stacks.

In contending with these evolving demands, many teams are encountering challenges. In the past, when delivering traditional wireline voice services, meeting 99.999% availability metrics was the norm. Now, complex, application-driven environments are making it far more difficult to manage service level assurance. Further, when issues arise, staff from all teams get involved, invariably with everyone saying their domain is functioning properly.

Fundamentally, today's realities are requiring that CSPs take a new approach:

- **Manual analysis is not sufficient**. Teams need AI and machine learning to manage the massive data volumes that environments now generate. They must gain the actionable insights needed to respond quickly when issues arise, and to preempt issues from occurring in the first place.
- **Manual efforts are not sufficient**. To effectively manage service levels in today's dynamic, ephemeral, and complex environments, teams need automation to keep pace.

"Through 2025, the number of CSPs investing in artificial intelligence (AI) technologies for improving their infrastructure planning, operation and products will rise from 30% in 2020 to 70%."[1]

AIOps

Within today's CSPs, the objective needs to be establishing "self-driving" IT and network monitoring. Networks need to be self-healing, self-provisioning, and self-configuring and enable self-service.

Within most organizations, teams are running distinct tools for each different silo. To start, it's essential to reduce the number of vendors and tools in the environment and to monitor everything in a unified fashion. While a number of tools will still be required, it's critical to establish a unified approach and to aggregate the intelligence from different tools.

Teams need maximum flexibility from their platform, so they can integrate with everything employed today, and the technologies that will be implemented tomorrow. They need to establish multi-layered operational intelligence, leveraging data from across the environment. This intelligence needs to encompass data on monitoring, faults, performance, location, topology, flow, and more.

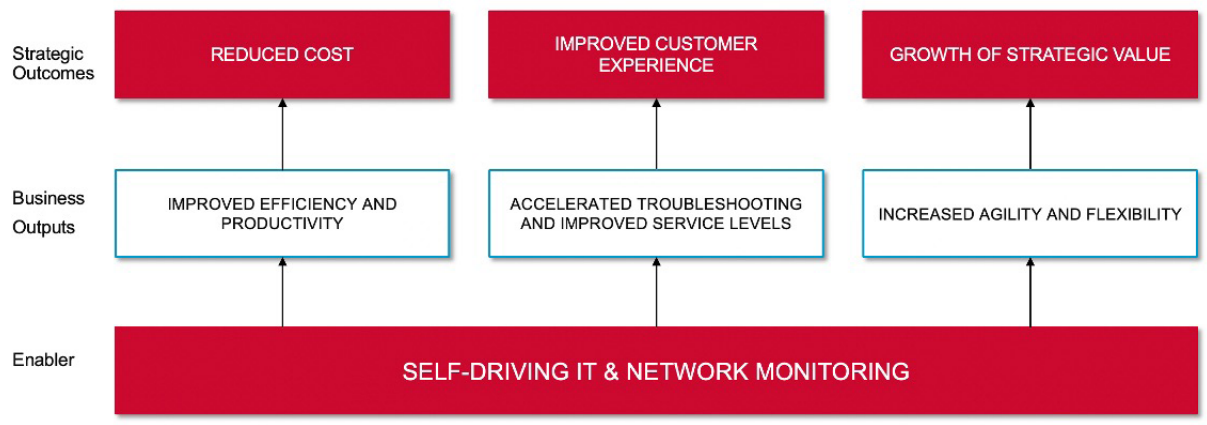


Figure A. To be successful, CSPs will need to establish self-driving IT and network monitoring.

Once this unified operational intelligence has been established, teams can begin to make significant advancements. For example, they can use this intelligence to flag potential issues and generate automated steps to implement the changes needed to preempt the issue.

Automation and Orchestration

Automation is another area in which silos exist within CSPs. For example, when CSPs buy network equipment, it will include management software that is specifically designed for that equipment. Many teams have implemented automation within these specific platforms, and will now have a number of automation technologies employed.

It's vital that teams establish a way to manage each apps' and vendors' automation in a centralized fashion. They need to employ orchestration capabilities to efficiently manage different automation engines. Teams need to employ cross-domain, cross-technology orchestration, so, for example, they can handle automated hand-offs between cells in different domains and from different vendors.

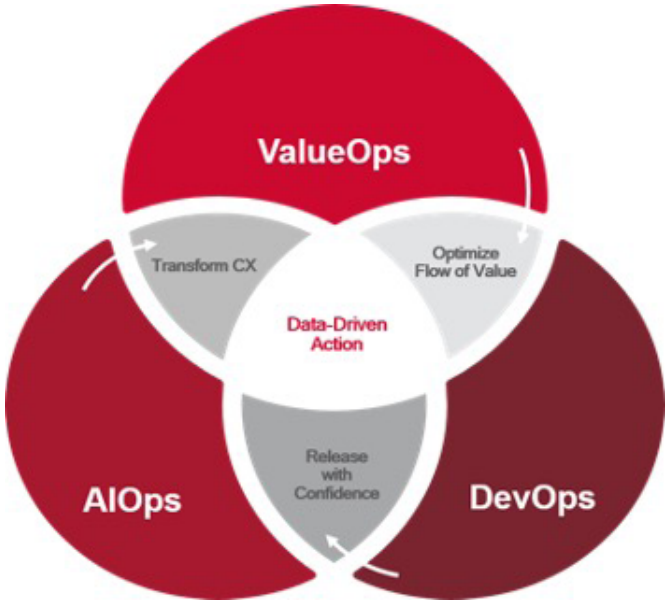
How Broadcom Enterprise Software Can Help

Broadcom offers intelligent software solutions that help fuel the digital transformation of the world's leading CSPs. Our enterprise software breaks down silos, fostering improved collaboration, alignment, and decision making across business operations and technology functions.

Broadcom solutions are optimally aligned to help CSPs address their key business and technology imperatives, including increasing strategic value, strengthening and growing their core businesses, and reducing costs. Broadcom delivers solutions in three key areas:

- **ValueOps**. The company's industry-leading ValueOps platform enables business leaders to gain increased visibility across their organization and break down the silos that have historically separated business and IT. With these solutions, teams can gain the transparency, efficiency, and accountability required to optimize the flow of strategic value across the organization.
- **DevOps**. Broadcom solutions combine agile planning, continuous testing, CI/CD automation, and powerful AI-driven quality insights. These easy-to-adopt, industry-leading DevOps solutions streamline release cycles, eliminate barriers to speed, and optimize quality. With these advanced capabilities, DevOps teams can dramatically accelerate innovation, while reducing business risk.

Figure B. Broadcom delivers software solutions that fuel digital transformation.



- **AIOps**. With AIOps from Broadcom, operations teams can gain a new level of observability. By leveraging these solutions' advanced analytics and automation, teams can eliminate manual efforts, streamline workflows, and enhance collaboration. With AIOps, teams can solve complex IT problems—before they have an impact on customers.

Conclusion

For today's CSPs, the challenges can be massive, but so can the opportunities. It will only be by taming complexity and eliminating silos that CSPs will be able to strengthen their competitive position and thrive in their dynamic markets. With enterprise software from Broadcom, CSPs can harness the comprehensive, advanced solutions they need to address their technological and business imperatives today, and in the long term.

Endnotes

1 Gartner, "Predicts 2021: CSP Technology and Operations Strategy," December 1, 2020, ID: G00735935, Analysts: Amresh Nandan, Mentor Cana, Kosei Takiishi, Peter Liu, and Ted Chamberlin. GARTNER is a registered trademark and service mark of Gartner, Inc. and/or its affiliates in the U.S. and internationally, and is used herein with permission. All rights reserved.

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