REPORT

Operator Strategies for Disaggregation in 5G Transport Networks

infinera

In partnership with

MOBILE WORLD LIVE

Executive Summary

5G introduces new network architectures that will have a profound impact on radio, core and transport network design. As communication service providers (CSPs) begin to roll out 5G, *Mobile World Live* conducted an online survey of mobile and fixed-line network operators and mobile virtual network operators (MVNOs) to understand current strategies for the 5G transport network, and, specifically, the role that disaggregated architectures play in transport network planning. The survey confirmed the significance of the transport network for supporting 5G strategies as well as revealed CSP aspirations for disaggregation of switching and routing resources in 5G transport networks and the operational considerations that need more attention.

Key Findings

Transport network factors highly in early 5G plans. Even though most 5G deployments are expected after 2020, CSPs are thinking about transport evolution strategies now.

Disaggregation in 5G transport is in its infancy. Most CSPs surveyed (66%) are likely to include disaggregated architectures in 5G transport networks, but the survey reveals a lack of knowledge about the technology and cautious deployment plans over the next three years. Some CSPs (16%) plan to deploy disaggregated architectures within the next 12 months, while 18% have plans for within the next two years and 14% within the next three years.

Cost savings and deployment flexibility are the top benefits of disaggregated architectures, but managing the evolution and complexity are the biggest concerns. CSPs view the biggest advantage of disaggregation to be CAPEX reduction, followed by OPEX savings and deployment flexibility. The most important concerns are how to manage the migration from legacy equipment to disaggregated networks as well as dealing with additional complexity.

Survey Methodology

This report is based on responses from an online survey of 71 communication service providers (CSPs) conducted by *Mobile World Live* on behalf of Infinera. Nearly 30% of respondents were from mobile network operators with annual revenues of less than US$10 billion, 27% were from mobile network operators with annual revenues of more than US$10 billion, 21% were from fixed-line network operators with annual revenues of more than US$10 billion, 13% were from fixed-line operators with revenues of less than US$10 billion, while 10% were from mobile virtual network operators (MVNOs).

Geographically, the largest group of respondents (just over 50%) were from companies with headquarters in Europe, while 23% had headquarters in Asia, 13% in North America, 7% in South America, 4% in Africa and 3% in the Middle East.

Introduction

The evolution to next generation 5G networks introduces architectural changes in the radio access network (RAN) and core network that will have significant implications for how operators design and provision transport capacity and services. The mobile transport network will need to meet the higher capacity and lower latency demands of 5G as well as flexibly adapt to diverse traffic flows to support a growing variety of use cases, from augmented reality to factory automation. A key concept that will enable next generation transport networks is disaggregation, whereby networking software is separated from the switching or routing hardware and broken down into functional components that can be more efficiently operated.

Some operators have already started to launch 5G networks in North America and Asia, and other early commercial launches are expected in 2019. The earliest deployments will focus on enhanced mobile broadband services and fixed wireless access, making the first 5G services and networks much like existing 4G, albeit with faster broadband speeds. After 2020, 5G deployments are expected to implement more of the specified architectural changes to support a broader range of services, some that require extremely low latency and high availability.

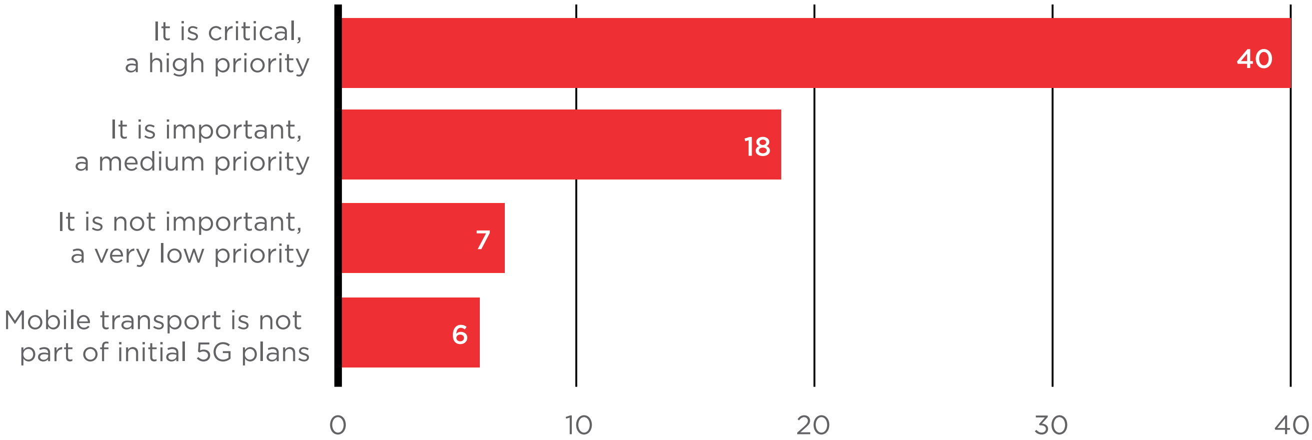
By 2025, GSMA Intelligence expects there will be 1.4 billion 5G connections, accounting for 15% of global mobile connections. Most of those 5G connections will predominantly be in China, Japan and the U.S.

This report assesses CSP strategies for disaggregated architectures in 5G transport, including the perceived challenges and benefits, as well as anticipated timelines for deployment.

5G Transport Challenges

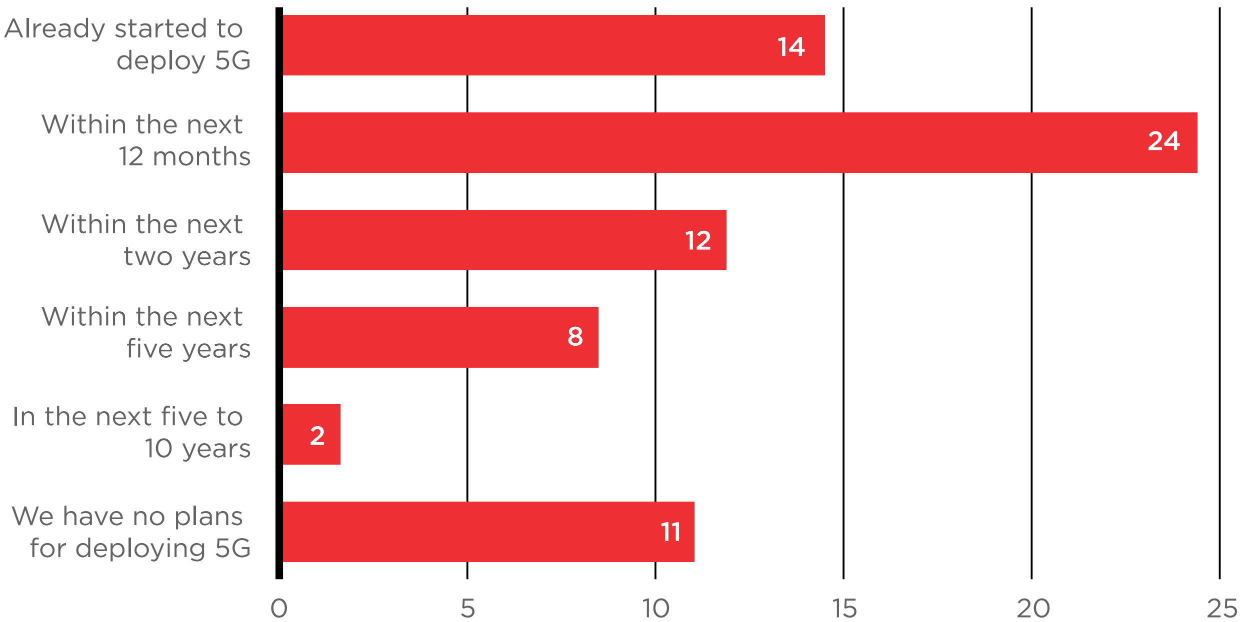
In the current early stages of 5G rollouts, CSPs are already thinking about how to evolve their transport networks to meet new requirements for capacity, latency and an extraordinarily diverse set of service use cases. An overwhelming majority of survey respondents said that mobile transport was either critical and a high priority in their 5G network plans (56%) or important and a medium priority (25%) in 5G planning. Only 8% said that mobile transport was not part of their initial 5G plans.

Figure 1: How does mobile transport factor into your 5G network plans?



More than half of the CSPs surveyed are in the early stages of rolling out 5G, as 20% of respondents said they have already started to deploy 5G and 34% said they plan to deploy within the next 12 months. Meanwhile, 17% said they plan to deploy within the next two years, 11% within the next five years, and 15% said they have no plans for deploying 5G.

Figure 2: When do you plan to start deploying 5G?



Respondents were asked to rank the most important challenges for mobile transport in 5G networks and the three top concerns were meeting high capacity requirements, supporting low-latency applications and aggregating traffic flows from diverse sources. These are the most important issues that respondents will need solutions for in next generation transport networks.

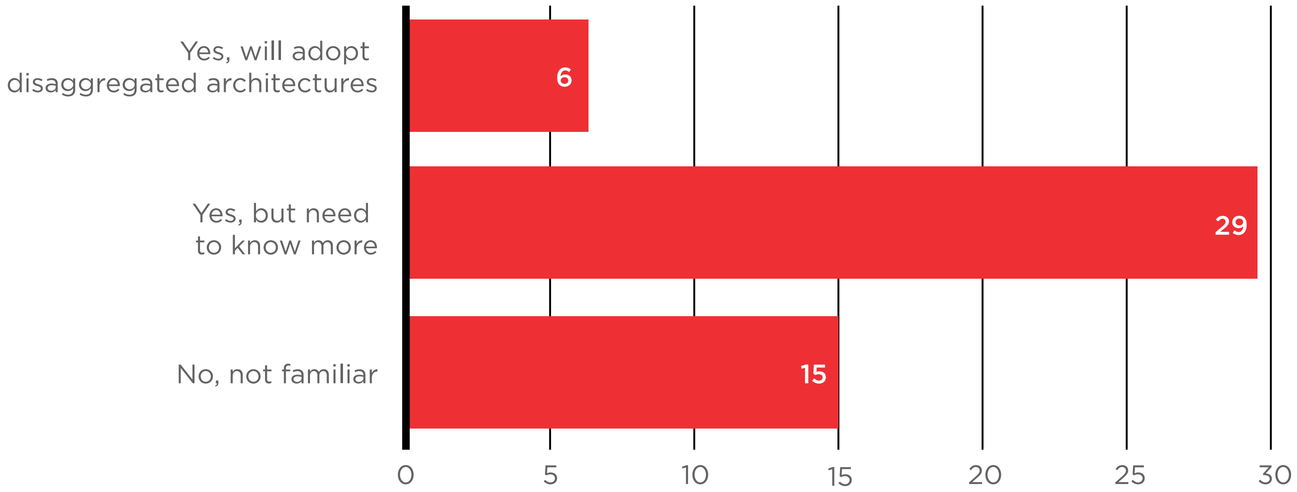
Other challenges that were rated as slightly less important than the top three included supporting distributed data centres and ensuring accurate timing and synchronization. Interestingly, enabling more advanced 5G features, such as network slicing, was rated as a lower priority issue, which perhaps reflects that most respondents are in the early phases of 5G deployment.

Drivers for Disaggregation

Disaggregation can mean different things to people in different parts of networking and IT sectors. For the purposes of this survey, disaggregation was defined in two categories: disaggregated switching and routing, whereby networking software is separated from the switching and forwarding hardware (i.e., white boxes), and disaggregated optical transport, where individual functions are separated into discrete devices, such as open transponders or open line systems.

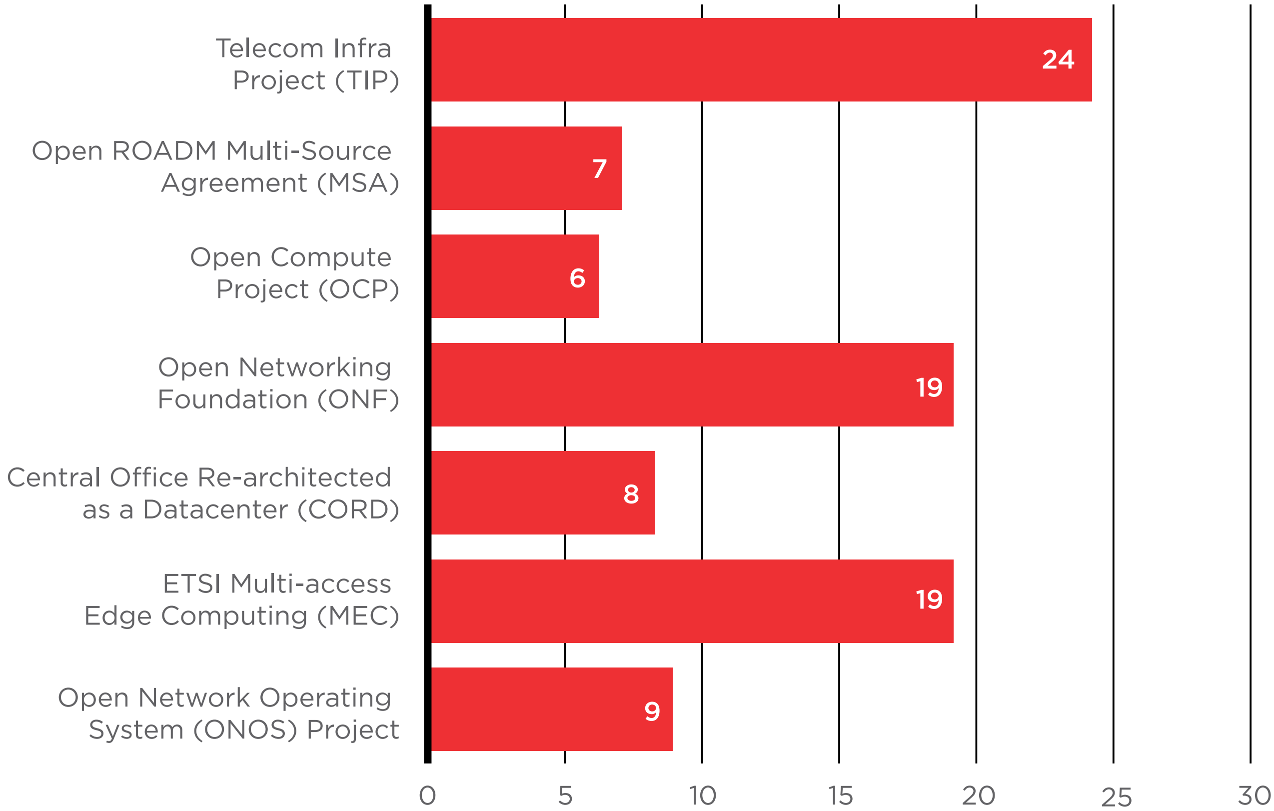
The survey revealed that while there is awareness, as well as some acceptance, of disaggregated architectures, there is also big demand to learn more about the technologies. Most respondents (58%) said that they were familiar with disaggregated architectures but needed to know more about them. A minority are already convinced, as 12% said that they were not only familiar but also will adopt such architectures. But one third of respondents said that they were not familiar. Clearly, there is a need among CSPs for information about the implications of disaggregation in their networks.

Figure 3: Are you familiar with disaggregated architectures?



Another indication of awareness is the type of industry initiatives that respondents are taking part in. Among the initiatives that respondents said they participated in or tracked closely, the top three groups were the Telecom Infra Project (TIP), Open Networking Foundation (ONF) and ETSI's Multi-Access Edge Compute (MEC).

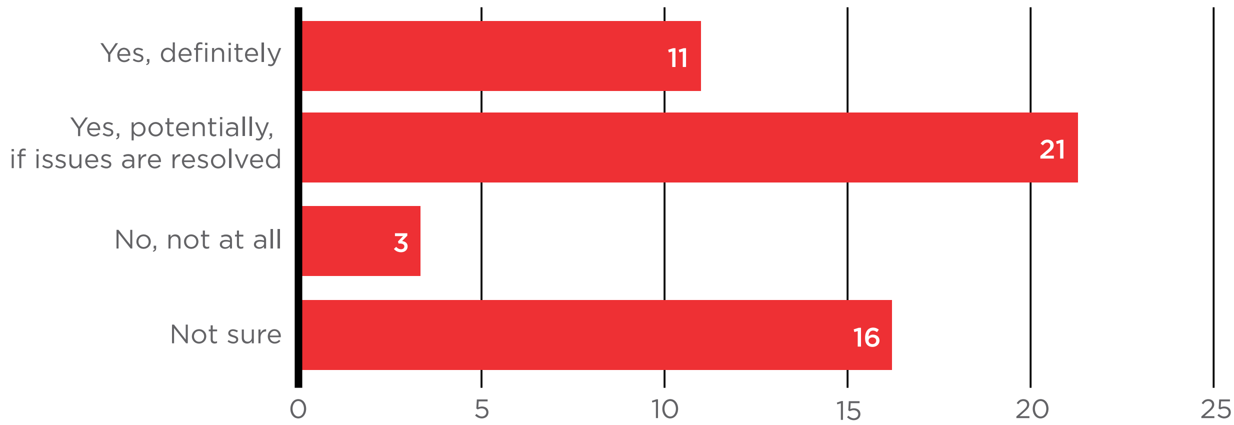
Figure 4: What industry groups/initiatives does your company participate in or track closely?



Disaggregation Benefits and Challenges

The survey suggests there is uncertainty among CSPs about the perceived value of disaggregation in transport networks. Of those surveyed, 42% said that there potentially is value in disaggregating networking software from white box hardware in transport networks, but only if issues are resolved. While 22% said that they were certain of the value in disaggregation, one third said that they were not sure if there was value. Only 6% said that there was no value at all.

Figure 5: Is there value in disaggregating networking software from the switching and forwarding hardware (white boxes) in transport networks?



When it comes to the advantages that CSPs expect from disaggregation in transport networks, the top three benefits are CAPEX savings, OPEX savings and deployment flexibility, according to the survey. Considering the top challenges that respondents identified for 5G transport in general – that is, meeting high capacity, low latency requirements and supporting diverse traffic flows – the results from this question suggest that CSPs are looking to disaggregation to achieve those goals in the most cost effective and flexible way possible.

Other important benefits for respondents were open application programming interfaces (APIs) for greater innovation, cost-efficient scalability, as well as support for new revenue-generating services, which suggests CSPs are focused not only on the cost savings potential of disaggregation but also on the capabilities that will drive new revenues.

When it comes to the challenges of operationalising disaggregation, respondents were most concerned about managing the migration from existing legacy devices to disaggregated networks. Their next biggest challenge was dealing with additional complexity in monitoring, configuration and management of disaggregated network elements. Disaggregation has significant implications for management and operations, as respondents recognised. And finally, the third biggest challenge was added complexity in monitoring, configuration and management of networks with a wider variety of vendors.

Other important challenges included the orchestration of both physical and virtual network devices as well as DevOps models that require different skills for operational personnel.

Disaggregated Architecture Deployment Scenarios

Most survey respondents said that they are very likely (30%) or somewhat likely (36%) to adopt disaggregated architectures in their 5G transport networks, but nearly one third said that they did not know if they would or not. The timelines for deployment are likely to be distributed over the next 10 years, according to the survey results. And 36% of respondents said that they do not know when they will deploy. These results suggest that disaggregation in transport networks is in its infancy, which mirrors the immaturity of 5G networks in general.

Figure 6: How likely are you to include disaggregated architectures in 5G transport networks?

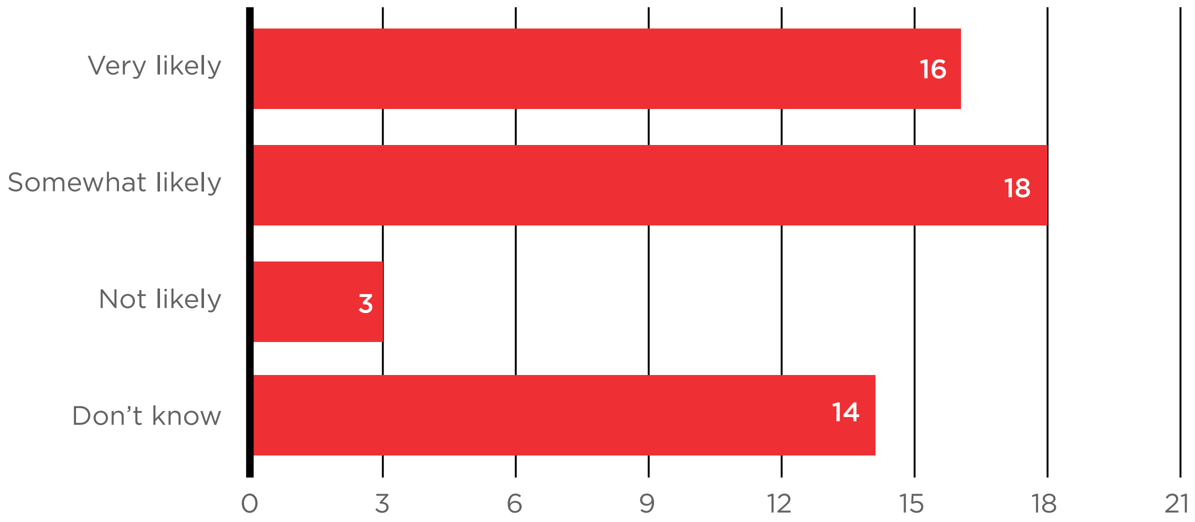
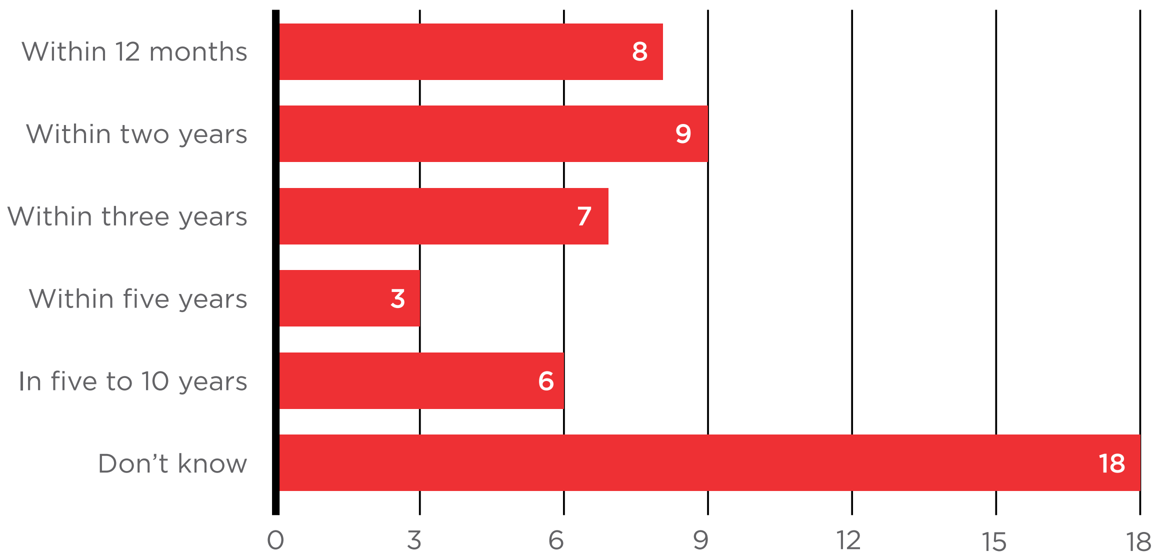
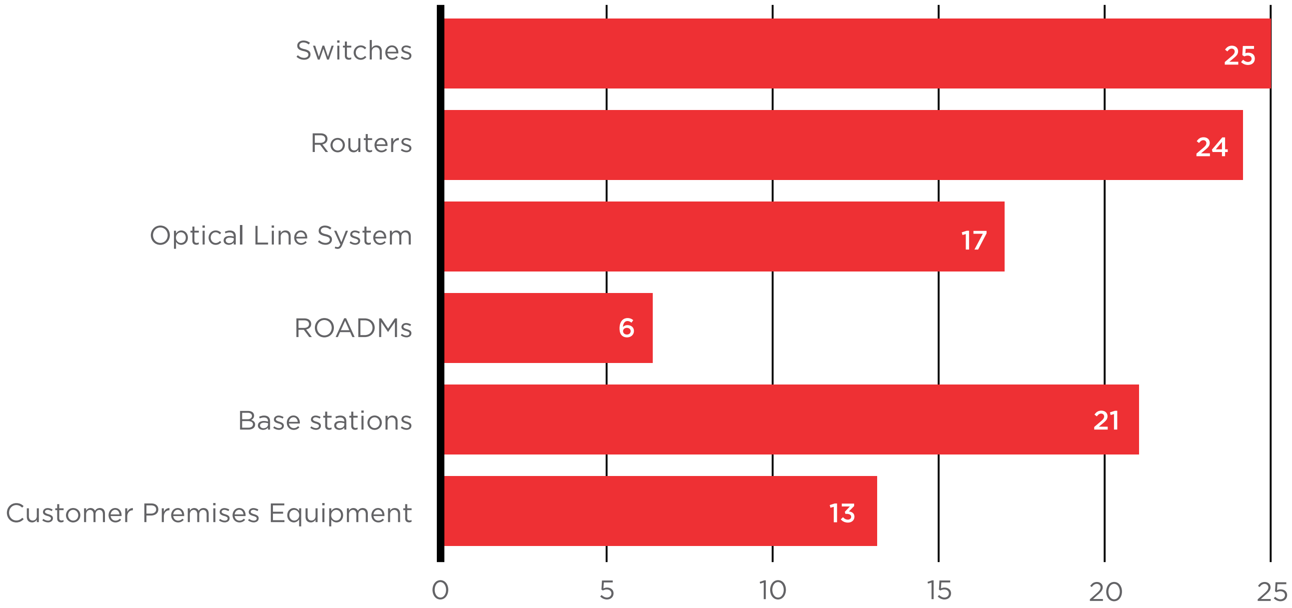


Figure 7: When do you plan to implement disaggregated architecture in 5G transport networks?



There are many different network functions and network locations that are viable candidates for disaggregation. The network functions that are the most likely candidates for disaggregation, according to the CSPs surveyed, are switches, routers, base stations and optical line systems.

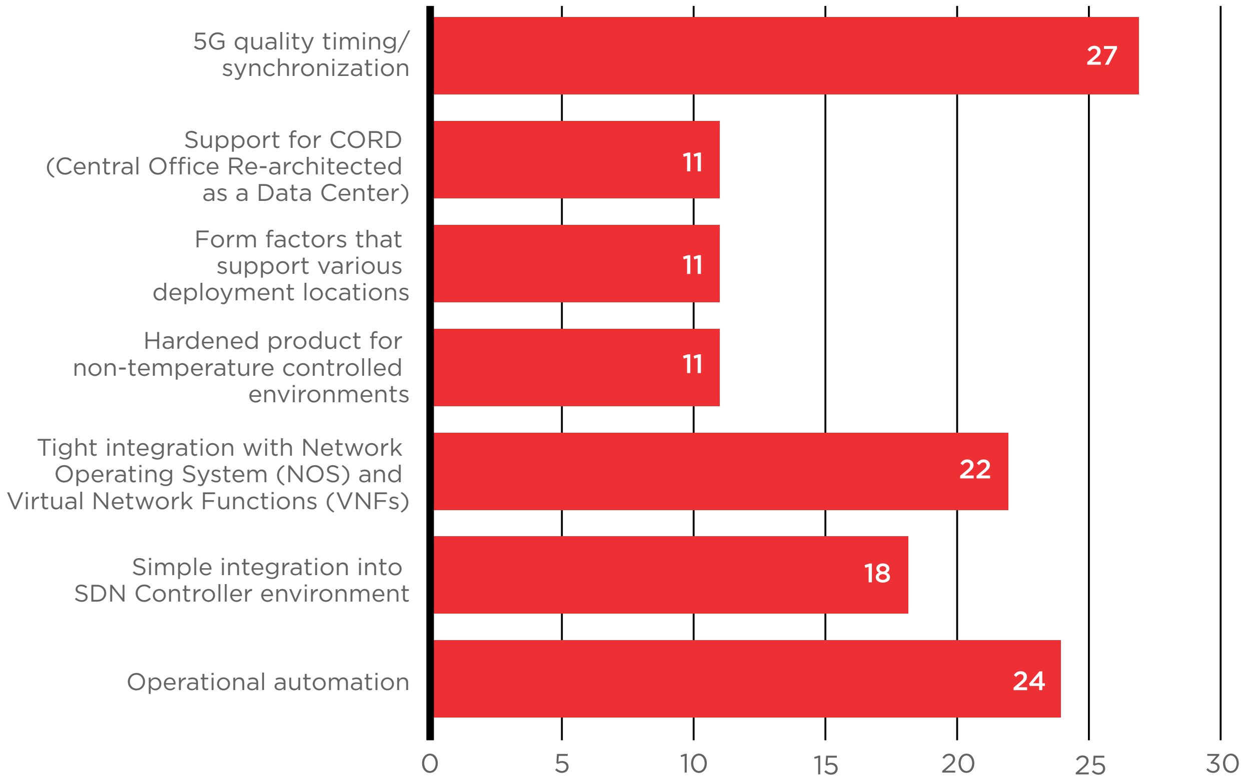
Figure 8: Which network functions are likely candidates for disaggregation in your network?



Disaggregated white box routers are expected to be key enablers for supporting new 5G services. When it comes to how to deploy white box routers, CSPs have a number of location options. Respondents were asked to rank the locations that would be the best fit for disaggregated white box routers. According to respondents, the top location is the cell site, followed by aggregation nodes, core network, data centre and lastly edge data centre (such as in a MEC deployment).

Respondents were also asked what their requirements are for white box router hardware. The most important requirement was 5G quality timing and synchronization. Also high on the list of requirements were operational automation, low cost, tight integration with Network Operating System (NOS) and Virtual Network Functions (VNFs) as well as simple integration into Software Defined Networking (SDN) Controller environments.

Figure 9: What are your requirements for white box router hardware?



Given that disaggregation breaks down physical hardware appliances into white box routers, NOS and VNFs, CSPs will have new ways to purchase solutions. They will have more choice, the ability to select best of breed elements as well as avoid supplier lock-in with single-vendor, aggregated solutions, which is most common today.

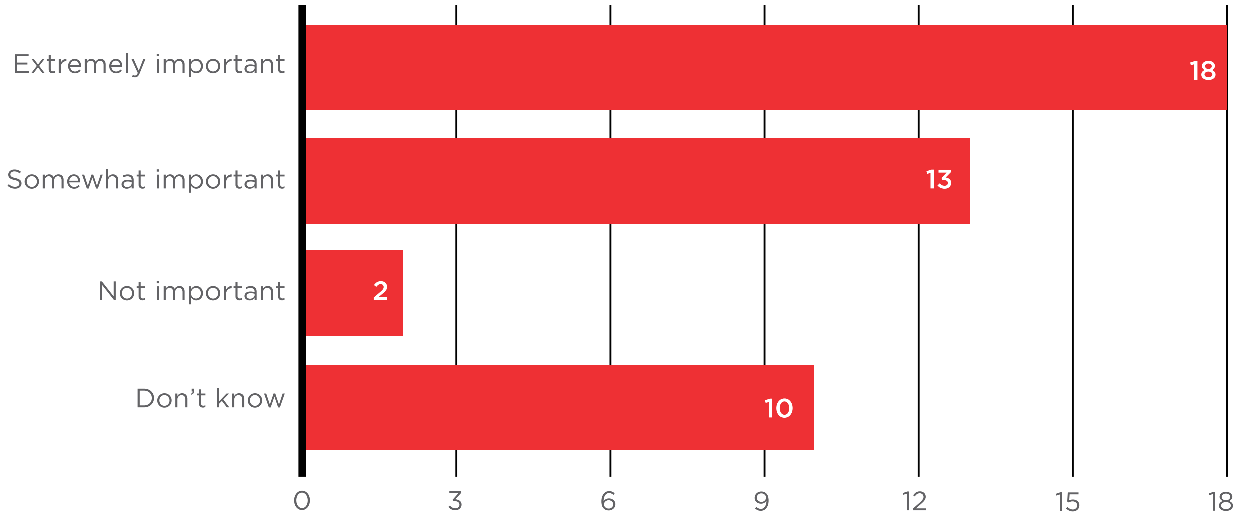
Supporting 5G Use Cases

Transport network architecture strategies must coalesce with CSPs' broader 5G plans. Any decisions around disaggregated architectures will have implications for RAN deployment plans, core networks, edge cloud deployments (i.e., MEC) as well as SDN – just as decisions in any of these parts of the network will affect the transport network. As noted earlier in this report, most respondents said that the transport network was a priority in their 5G network plans, even in this early phase of network deployments, which suggests CSPs may be taking an end-to-end approach to 5G planning.

When considering disaggregated architectures for transport, CSPs are laying the foundation to support future 5G services. CSPs that deploy disaggregated solutions initially for 5G mobile backhaul can also support a variety of other services. The CSPs surveyed said that they were likely to support other services, in addition to mobile backhaul, with a disaggregated transport solution, including residential broadband, business services, fixed/mobile convergence, wholesale services to other service providers and IoT applications. The lowest ranked option among respondents was that the disaggregated transport solution would only support mobile backhaul.

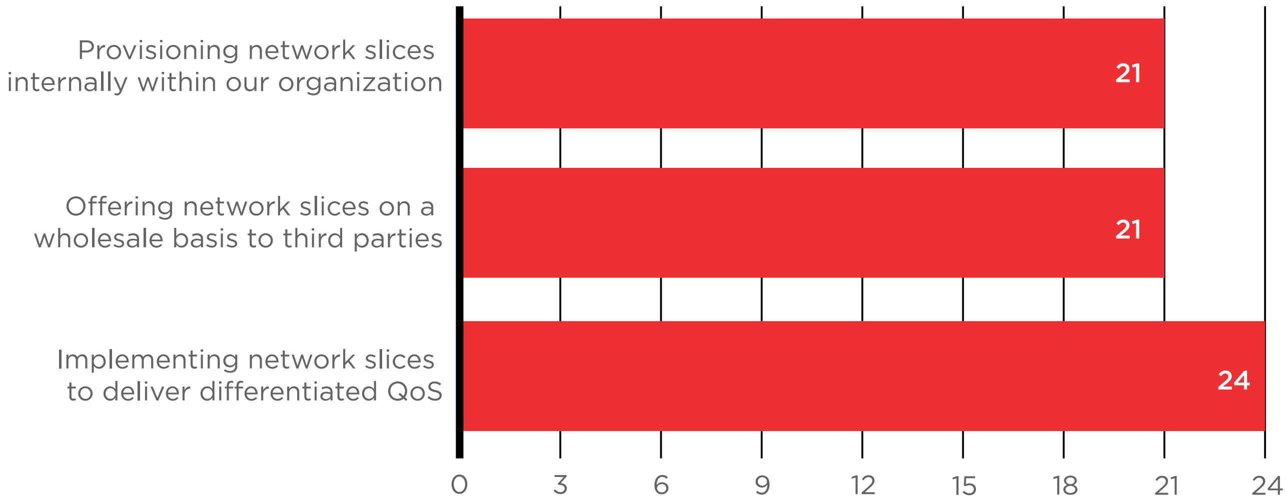
Most respondents (71%) said that interworking with SDN Controllers was extremely important or somewhat important when it comes to disaggregation considerations.

Figure 10: When considering disaggregation in 5G transport networks, how important is interworking with SDN Controllers?



Network slicing is an important feature of 5G that allows CSPs to dedicate parts of their networks to specific services or use cases. The transport network is key to facilitating CSP business plans for network slicing. Respondents indicated that they are considering a range of network slicing business models, from provisioning network slices internally within their organisations to offering network slices on a wholesale basis to third parties to implementing network slices to deliver differentiated quality of service. Given the range of business models, it's clear that the transport network needs to be flexible to support a variety of scenarios.

Figure 11: When considering network slicing in 5G networks, what business models are you likely to support?



Conclusion

The transport network is top of mind in 5G network planning for most respondents, and many are interested in disaggregated architectures in 5G transport for achieving cost savings in CAPEX and operations as well as greater deployment flexibility.

To help CSPs include disaggregation as part of their 5G transport strategy, there are several operational challenges that need to be addressed. CSPs are concerned about managing the evolution from current networks with legacy appliances to disaggregated networks; they also anticipate additional complexity from working with a variety of disaggregated network elements and more vendors.

Disaggregated transport networks offer a foundation for cost-efficiently supporting new revenue-generating 5G services.

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