

# A balanced diet of **PUBLIC AND PRIVATE CLOUD**



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## A balanced diet of public and private cloud

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We hope you enjoy the report and, most importantly, will find ways to use the ideas, concepts and recommendations detailed within. You can send your feedback to the editorial team at TM Forum via [editor@tmforum.org](mailto:editor@tmforum.org)

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# The big picture

Communications service providers (CSPs) are moving their IT workloads to the cloud in the ongoing drive to decrease operational costs, expedite deployment and vastly increase flexibility. They are still in the early stages of migration, but now that the benefits of cloud native operations are becoming more tangible, many operators are focusing on a more wide-reaching strategy for telco cloud. How they execute these strategies will heavily impact their competitive abilities for at least the next decade. This report looks at the emerging best practices and key considerations of CSPs at the cutting edge, and what this technological paradigm shift means for telco transformation.

The way different CSPs deploy their cloud strategies is a unique affair based on the specific operational and business requirements of the operator or line of business. In the past, this type of statement may have struck fear into the hearts of CTOs as it could translate to “heavy customization is required” to get them where they need to be.

However, one of the fundamental principles of cloud native technology is that it should be possible to build a bespoke, mission-focused IT ecosystem using existing modular assets and run microservice applications over it without constraint. This means that unique operational configurations can be constructed without custom proprietary code and the associated time and expense.

Based on this concept of extreme flexibility, the relationship between CSPs, IT vendors, systems integrators and cloud providers has become more complex and is no longer a clear-cut supplier/customer exchange. In some situations, the players in the ecosystem are partners, and in others they are competitors.

A key, emerging theme from our conversations with CSPs is that they do not want to lock into any fixed relationships with their cloud providers. They want to be able to dynamically manage configurations, moving IT assets from one environment to another as and when it suits their changing business and operational needs. As a mode of working, this is somewhat uncharted territory, as one operator in western Europe told us:

“As we move our company to the cloud, we cannot be trapped in any single way of working, and that must be reflected in our operational and business IT architectures and in the nature of the partnerships we build. Everything must be easily reconfigurable to stand a chance of getting a return on our investment.”

#### **Why utilize the cloud?**

We will discuss the details of new, dynamic cloud ecosystems throughout this report, but first it is important to understand the motivations for using the cloud in telecoms in the first instance. We can then use this understanding to map technology configurations to business motivations. Based on our research, the five most frequent drivers of cloud adoption include:



**Business agility & time-to-market** – CSPs' core business revenues are under pressure. Global connectivity revenues are not plummeting as some industry commentators report, but neither are they looking healthy. Therefore, every network operator around the world is executing business diversification strategies. Current operational structures mean that CSPs are not agile enough to be genuinely competitive in markets where their rivals are modern IT-centric companies.



**Innovation** – CSPs are not known for innovation but for providing connectivity services that enable over-the-top players to innovate. Yet as an industry we are obsessed with talking about the ways telcos can innovate. One thing is for certain: The current shape of CSPs' inner machinery isn't conducive to fostering a start-up-like environment. If CSPs can break this pattern and change their culture, there is a chance that a wave of innovation will follow. This prospect is attractive enough for many operators.



**Cost** – core consumer revenues are under pressure from macro trends like landline shutdown. While this doesn't represent a catastrophic downturn in earnings, it is sufficient for CSPs worldwide to usually report slowly declining service revenues in their annual reports. The solution has always been to cut costs accordingly and look to the profit margins for a positive number to report to shareholders. CSPs around the world are now reporting large cost savings as a result of their move to the cloud.



**Customers are different and so is their world** – many of the new opportunities for CSPs will be on the B2B side, especially once 5G reaches **the standalone phase**. Cloud paradigms are inherent in lining up to realize those future opportunities. Enterprise customers come to CSPs primarily for connectivity solutions, and they have a set of expectations about how the interaction will be. The digital age has shifted this paradigm and there is no going back. So, CSPs are striving to become more like the hyperscalers at the customer interface and provide an Amazon-like experience. Partnering brings them closer to this.



**Competitive advantage** – it is easy to believe that the new main competitor for a large digital Tier 1 telco could be Google or Amazon, but the competitive landscape amongst CSPs is still intense. The only way to stay on top of the situation is to constantly evolve technologically.

Read this report to understand:

- The benefits of hybrid or multi-cloud over just public or private cloud
- How the management and orchestration of the cloud ecosystem is key to future business success
- How CSPs are using the migration to cloud to solve age-old telecoms issues like interoperability
- Why CSPs are fostering partnerships to access new vertical markets
- Techniques CSPs are employing to migrate IT workloads to the cloud

Section 1

# Moving telecoms to the cloud

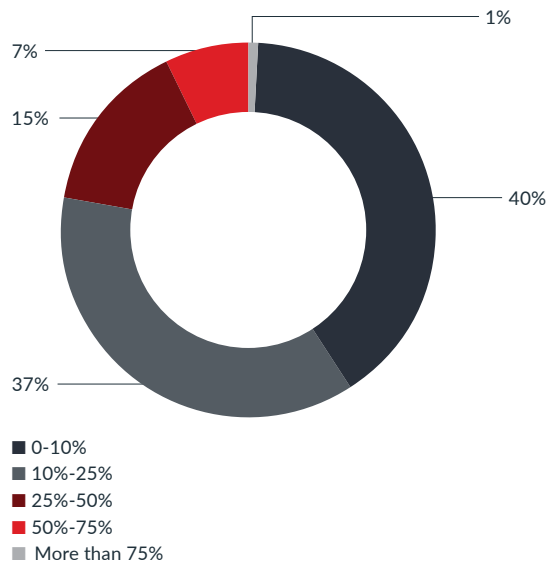
A contact at a leading supplier of operational and business support systems (OSS/BSS) told us that when they saw the move to the cloud happening several years ago, they entered a short phase of disillusionment and held disaster talks internally as they realized that their whole portfolio would have to be rebuilt from the ground up. But as they began to put a plan together, they realized that this could be the biggest opportunity of the company's history – a genuine interruption of the ongoing status quo and a chance to drive their intellectual property deeper into telco organizations and build a new way of working. They also realized that they needed to learn an entirely new language and way of thinking, and they would need to invent a way to educate their partners.

TM Forum's *Digital Transformation Tracker 5 (DTT 5) survey* shows that about 15% of communications service providers' (CSPs) IT workloads have moved to the cloud. That may sound like a low number, but the first few years of this exercise were slightly experimental.

Now the drive to accelerate cloud adoption is firmly supported by telco management and is underway. Larger migration stories are appearing with more regularity.

Verizon's 5G rollout strategy, for example, relied heavily on cloud infrastructure from the start, according to Lynn Cox, the company's Senior Vice President and Network CIO, who has the overall responsibility for OSS. "If we had done it the old way, which was with in-house servers, the cost to do it would have been astronomical, but also the time," she says. "That's where we turned to our partnership with AWS to maximize the speed with which we could make decisions and run these scenarios to come up with the best plan for our 5G network."

Percentage of IT workloads CSPs have migrated to public cloud



TM Forum, 2021

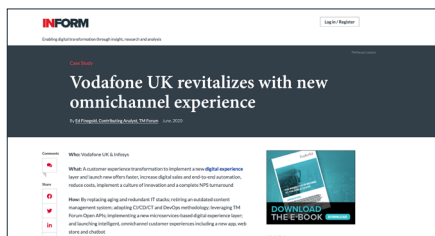
So, the cloud model is already the de facto way to run planning schemas for new operational configurations when trying to get the first-mover advantage. But it has to be done with a solid, scalable model for the future.

The cloud architectures that CSPs are building today are a springboard for new operational paradigms for the next 20 years. But they also must interoperate with systems from the previous 20 years. The balance of old and new IT infrastructure has always been an uneasy dilemma for CSPs, but it appears that telco cloud configurations are helping to manage this more effectively than ever.

In traditional business support systems (BSS), front-ends and back-ends are tightly coupled, making it extremely difficult to make changes that aren't costly and time consuming. To address this, some CSPs are using cloud native technology to build a layer that sits in between, effectively decoupling them.

Vodafone Group refers to this as the Digital Experience Layer (DXL) which it has built using a microservices architecture. The DXL sits in the AWS cloud and uses abstraction via **TM Forum Open APIs** to isolate legacy, downstream systems of record from changes occurring in the digital layer.

Read this case study to learn more about Vodafone's DXL:



### Private cloud first

In the move to cloud-based operational IT architectures, CSPs have gravitated towards using different cloud configurations for different use cases. The configurations are based on the characteristics dictated both internally by telco IT teams and externally by enterprise customers.

For example, an SD-WAN deployment may require some data to be stored on-premises or in a private cloud to meet regulatory or in-house rules, but the customer may want the connectivity operations piece to be handled over third-party public clouds. Tailoring these architectures has led to the realization that subtle changes to the configuration, management and orchestration of telco clouds can result in vast gains or losses in key metrics such as operational efficiency, cost structure, customer satisfaction and service lead times.



CSPs and their suppliers understandably began their cloud journeys with private clouds. Early on, telcos had concerns about public cloud security. They felt as though a private cloud was the most similar to their own data center-based server environments and therefore the logical starting point for rehosting applications. When it became apparent that cloud native is more than just rehosting and that public clouds have robust carrier-grade security, configurations could begin to change.

At first, private clouds dedicated to the specific needs of a single CSP were on premises within the CSP's own firewall. Now, they are increasingly located off premises in a cloud provider's domain. Private telco clouds can be optimized for operations workloads, incorporating specific requirements such as performance acceleration and security. TM Forum's *DTT 5* survey found that about a third of CSP respondents still prefer a private cloud-only approach for their IT workloads.

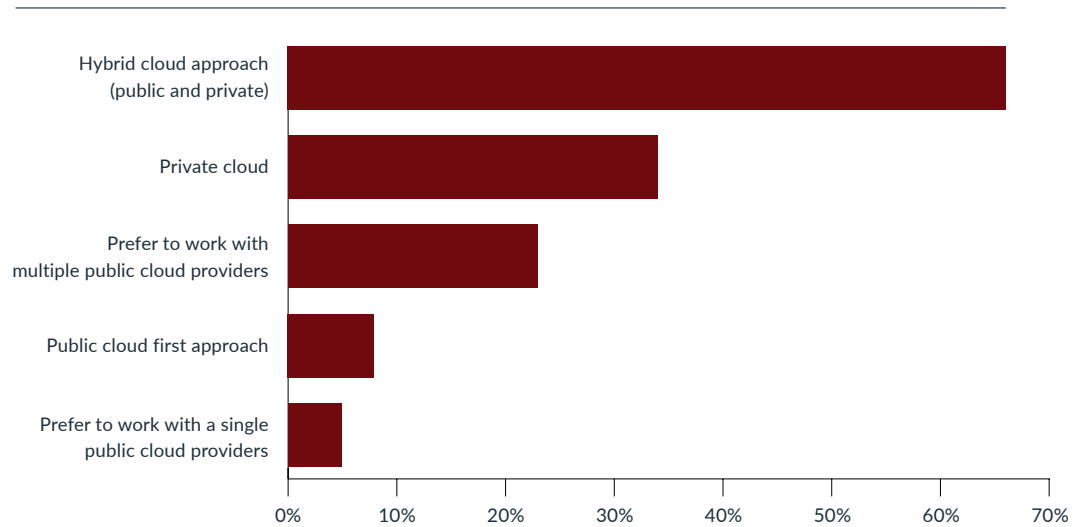
It is not uncommon for CSPs to build private clouds on third-party or vendor-owned data centers located off premises. Indeed, a number of private cloud subtypes, including managed private clouds and dedicated clouds have emerged.

CSPs are also at the early stages of building private edge clouds to enable local compute functionality for new use cases that are possible with 5G, such as video optimization or gaming that relies on virtual or augmented reality.

### The importance of virtualization

One of the primary drivers for telco cloud is that virtualized workloads can be deployed alongside cloud-ready applications under a common management platform, without making changes to existing hardware. In line with this concept, CSPs' use of private clouds started during the drive to virtualize various computing archetypes using IT assets. Understanding this virtualization technology is central to understanding how private clouds work.

### CSPs' preferred approaches to cloud migration



TM Forum, 2021

Private clouds use virtualization to create shared pools of resources sourced from physical hardware. The cloud is then able to utilize these resources quickly and easily without having to create environments one at a time from physical systems. Operational processes can then rapidly access all the pooled resources from a single source for building new services and scaling infrastructure, or indeed perform any of the tasks which may have been time consuming and expensive in a legacy IT environment.

The management layer provides control over the infrastructure, platforms, applications and data in the private cloud by empowering operations to monitor and optimize usage, oversee interfaces, and move data around as required. On top of the management layer, orchestration replaces human interaction with repeatable workflows and processes, making intelligent, dynamic decisions through the addition of AI and machine learning.

CSPs typically opt to use private clouds for a variety of reasons:

- Placing systems of record that hold sensitive data in a private cloud is common because security is important.
- Regulatory code may state that storing certain types of data in a public cloud is not permitted, depending on the specific country's laws.
- CSPs may be leveraging an existing investment in IT infrastructure by deploying a sole-use private cloud on top.

In the next section, we'll look at why a hybrid or multi-cloud approach can be beneficial.

Read *Digital Transformation Tracker 5*:



## Section 2

The multi-cloud is greater  
than the sum of its parts

Enterprise IT departments and hyperscale cloud providers have demonstrated the benefits of public cloud, and they have shown that the cutting edge of cloud usage lies in using hybrid or multi-cloud configurations to meet the exact business and operational requirements of individual scenarios. So, why is the telecoms industry reticent to follow suit? The concept of the telco cloud itself means that a multi-cloud balanced diet of public cloud and private cloud is the healthy option for communications service providers (CSPs).

Public cloud services provide access to software, computing platforms, or compute and storage infrastructure hosted on servers in a data center typically accessed via the public internet. All clouds become public clouds when the environments are partitioned and redistributed to multiple tenants. The total pool of cloud compute load is shared by numerous customers in a dynamic fashion based on demand. An online, self-service portal is often the sole human interface with the cloud service provider, which typically prices based on usage in a software-as-a-service (SaaS) model.

As such, public cloud services are often chosen by small- and medium-sized businesses and IT startups that need to control costs and have the flexibility to scale up or fail fast if required. CSPs are using this approach as well for their operational and business support systems (OSS/BSS) and **increasingly for network workloads**.

The bare-metal IT infrastructure used by public cloud providers can also be abstracted and sold as infrastructure-as-a service (IaaS), or it can be developed into a cloud platform that is sold as platform-as-a-service (PaaS). As CSPs are building trust in public cloud providers, they will move more applications to the public cloud, reducing the need to build and run data centers.

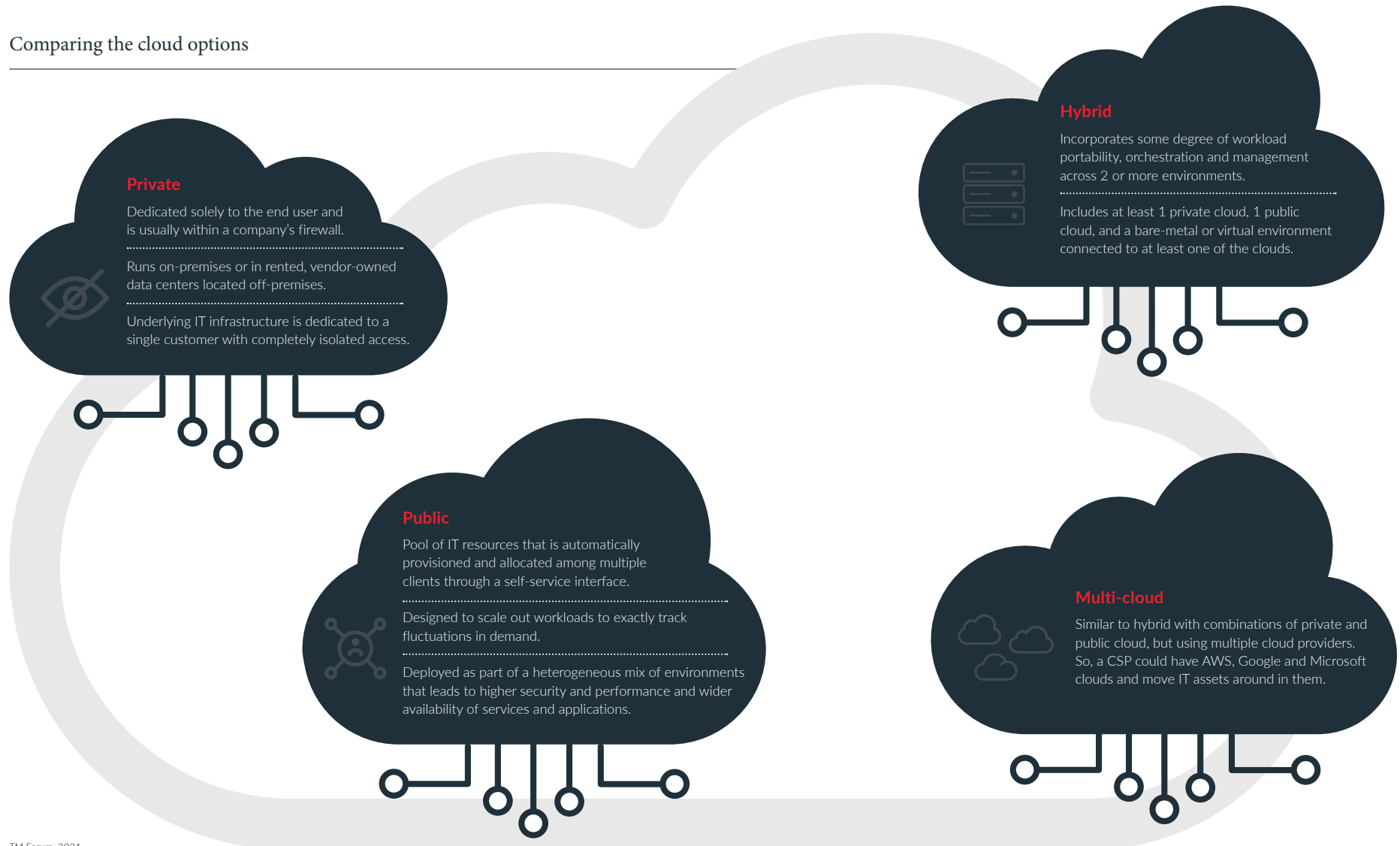
The obvious benefits are that public cloud is much less expensive, more scalable and easier to manage. This is why the majority of CSPs' cloud migration strategies now include public cloud.

#### **Hybrid clouds provide more options**

As 5G rollout continues, CSPs are essentially transforming their networks into agile platforms. As part of that trend, operators are in agreement that they must virtualize their entire networks across edge locations using a hybrid cloud configuration.

Hybrid cloud services can be significantly more complex than public cloud services and are generally seen as being more "carrier-grade" with a proprietary architecture. The use of hybrid cloud means that more options are available, leveraging the best characteristics of both private and public cloud.

Comparing the cloud options



CSPs often choose a hybrid cloud to meet business imperatives such as regulatory rules or data sovereignty requirements. For instance, the hybrid cloud is evolving to include edge workloads, bringing the compute power of the cloud to IoT devices and closer to where data is stored.

As illustrated in the graphic on [page 9](#), hybrid cloud is the preferred cloud migration approach among CSPs to deploy operational and business support systems (OSS/BSS), with two thirds choosing the approach. This makes practical sense as it reduces operators' reliance on more expensive and labor-intensive private cloud deployments.

#### **Managing the multi-cloud**

Pushing the “more options, more flexibility” concept further means that most CSPs will need to use a multi-cloud setup. Multi-cloud is the presence of more than one cloud deployment of the same type which could be either public or private, but critically they are sourced from different cloud service providers or vendors.

Many CSPs are already running multiple clouds in many configurations to address a variety of requirements. An example of this is the way CSPs such as AT&T and Telefónica are using multi-cloud architectures for 5G mobile edge compute services and applications. As their enterprise customers want to run workloads in several different clouds, the CSPs are putting multiple cloud partnerships in place.

In a multi-cloud solution, an operator can move assets around from Amazon Web Services, Microsoft Azure, Google Cloud Platform, or other platforms. As such the management of the multi-cloud scenario is rapidly becoming a focus for CSPs as it allows them to remain cloud agnostic and avoid any sort of lock-in as part of their new partnerships.

**“ Pushing the ‘more options, more flexibility’ concept further means that most CSPs will need to use a multi-cloud setup. ”**

## Standardizing the cloud with the Open Digital Architecture

TM Forum members **have been collaborating** to develop the Open Digital Architecture (ODA), a reference architecture to help CSPs evolve to a cloud native approach for their IT operations and networks. In mid-July, a team that has been working to accelerate development of component specifications and prototype test kits for validating the interoperability of commercial software products unveiled the first component specs.

Orange and Vodafone are among the TM Forum members piloting the validation and interoperability testing to ensure that their software systems can help with creating new partnerships and revenue streams across 5G and IoT ecosystems. The CSPs and others involved in **TM Forum's ODA Component Accelerator project** discussed the business value of the ODA in a **recent TM Forum webinar**.

"With 5G and IoT and platform ecosystems we see lots of innovations and technologies coming to market and opportunities for new services...and revenue," says Lester Thomas, Chief IT Systems Architect at Vodafone Group. "The question is: How will we manage when we move from having four core services to having many hundreds – or even thousands – of services?"

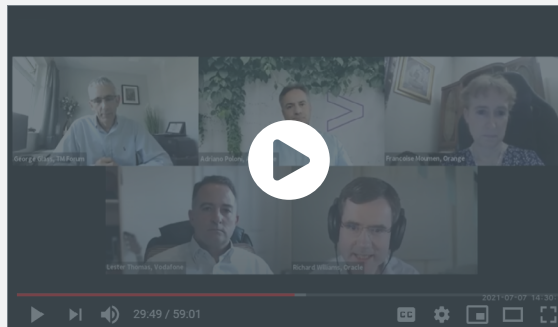
This is especially important because, as Thomas notes, future services are expected to be lower margin, meaning they will only be commercially viable if CSPs can greatly improve their operational efficiency.

By having access to modular, standardized and machine-readable software components, CSPs believe they will be able to create differentiated products and services much more quickly.

The Component Accelerator aims to make it possible for operators to buy a product that is specified to a particular component and know what environment it is going to run in, and **how it will be operated and what it will do**. Thomas compares the components to Lego blocks, which conform to underlying design guidelines but can be used in a variety of creative ways.

Watch the webinar to learn more, and **contact Ian Turkington** to find out how you can get involved in this collaborative work.

In the next section, we'll look at how CSPs are beginning to manage and orchestrate applications in hybrid cloud environments.



### Section 3

# Managing & orchestrating multiple clouds



For communications service providers (CSPs), achieving digital transformation goals may depend on the ability to manage and orchestrate IT assets across multiple cloud environments and leverage the benefits of cloud native software in the most effective way. The key phase of learning for CSPs that are moving operations to the cloud may still be on the horizon as migration almost always starts with the low-hanging fruit and ends with the most difficult IT systems. As such, CSPs and their suppliers are partnering to develop best practices for the management and orchestration of data in hybrid environments, while assessing how far they can go with a cloud native approach.

Several CSPs are reporting benefits in the early stages of cloud migration:



UK mobile operator Three is in the process of moving IT workloads to Microsoft Azure, which will reduce IT costs by one third over the next couple of years.



Orange Egypt built a horizontal cloud for its virtual network functions and virtual evolved packet core, which has improved time-to-market by 10 times.



In the US, Dish's new 5G network, which was built specifically for public and hybrid cloud, will have a cost that is just 25% of Verizon's equivalent 5G network per unit.



Vodafone Group is running many of its OSS/BSS functions in the cloud processing terabytes of data every day for optimization, with the cost of running some systems falling by up to 40%.



Deutsche Telekom's next-generation IMS initiative, NIMS, is a fixed-line voice service (covering 20 million customers in Germany) based on DevOps automation methodologies and cloud native technology, showing the scale at which telco cloud implementations are already running.



Rakuten Mobile's network in Japan has been a prime example of cloud native operations, and the company is driving forwards with vendor partners to make every commercial-off-the-shelf component totally cloud native.

“ The key phase of learning for CSPs that are moving operations to the cloud may still be on the horizon as migration almost always starts with the low-hanging fruit.”

### The importance of containerization within telco clouds

Managing and orchestrating the telco cloud relies heavily on the underlying technology in containers. **Linux containers** allow CSPs to package and isolate applications with all the necessary files within their runtime environments. Containers provide a more flexible choice when it comes to partnering with public cloud vendors, because of the way they package and isolate applications. CSPs can move the contained app between clouds without altering any functionality. This enables a multi-cloud model based on standards, meaning the choice of cloud provider is down to business decisions rather than technical support considerations.

Running microservices in containers is the fundamental building block of cloud native IT solutions, but the management and orchestration of these components is the key to success for CSPs in the service level.



#### Why Kubernetes?

**Kubernetes** is an open source container orchestration platform that automates container operations and reduces manual processes for deploying and scaling cloud native applications in a telco cloud, or indeed in any cloud. Automation within a Kubernetes platform helps achieve operational simplicity for scaled-up and scaled-out operations across private, public and hybrid environments.

### Portability & coupled applications in the cloud

Hybrid clouds are more than just public and private clouds arranged together; they are architected differently. It is beneficial to focus less on the ideas centered around connecting the various environments together, looking instead at the portability of the applications that run in the environments.

In a hybrid cloud setting, IT teams can develop and deploy applications as groups of independent but coupled services. If they ensure that they are running the same operating system in every IT environment and managing everything through a platform model, the applications universality is applicable across all the cloud environments below it.

This concept is at the core of the “agility” conversations CSPs have regarding cloud. Not only are operators in a post-silo reality, but they also are moving into a realm where it should not matter where applications and data reside. Both should be able to move around if that is beneficial.

Using a single operating system means that the hardware requirements are essentially abstracted and less important. The orchestration layer then abstracts application requirements. This creates a coupled and consistent computing environment, in which development and operations teams can work together using a DevOps model.

### Decommissioning strategies

A cloud strategy specialist at a European mobile operator that is rolling out a multi-cloud strategy told us that one of the most important parts of the process has been deciding when to start decommissioning legacy systems, once that function had been instantiated in the cloud. This is as much a part of the telco cloud story as creating new environments and applications.

Early cloud deployments for OSS did not have the same capabilities as legacy versions, so many CSPs chose to run them alongside each other while quickly driving functionality into the cloud versions.

In the interests of cost saving and operational efficiency, the mobile operator we interviewed is now in the process analyzing the legacy code and databases using bots. Then the company moves everything it needs to the new cloud versions and runs a series of checks before carefully decommissioning the old versions. This is a classic pain point for CSPs and an essential step that must be taken in cooperation with their cloud and technology providers.

In the next section, we'll look at some of the challenges CSPs and their suppliers face in moving support applications to the cloud.

“ Running microservices in containers is the fundamental building block of cloud native IT solutions, but the management and orchestration of these components is the key to success for CSPs in the service level. ”

## Section 4

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# Cloud migration challenges & opportunities

Moving applications to the cloud is not a simple step for communications service providers (CSPs) – it is part of larger transformation programs that have been underway for many years. The blueprint for the transition, however, is becoming clearer as the rate of migration increases and CSPs realize the benefits of live telco clouds. This section looks at some of the most frequently mentioned challenges in cloud migration and the opportunities for companies that can overcome them.

### People – retraining & rehiring

**Telstra recently announced** that by 2025 it will retrain 4,000 employees in cloud-related topics relevant to their jobs, and outlined how their jobs are changing because of the cloud. This training will be conducted in partnership with AWS. The framework agreement focuses on developing Telstra's multi-access edge computing capabilities using AWS edge compute solutions, ultimately boosting Telstra's 5G offering. Bundling an extensive program to train, accredit and certify employees reinforces the tight partner relationship that both organizations are aiming to cultivate in the deal.

Other CSPs are doing this as well, with new accreditations appearing monthly. These training relationships are a good source of fresh ideas, bringing new personnel into the telecom industry, primarily from an IT/cloud background.

The flipside of this is that there are inevitably CSPs shedding staff and rehiring IT people with a full-career focus on cloud development. With the shift to DevOps methodologies, **Agile** ways of working, cloud fluency and other changes, many IT staff are accepting voluntary redundancy, while graduates with software experience are getting hired at a rate not seen before.

This is an opportunity for CSPs to change their culture within the organization, which cannot be achieved through edicts. Smart operators are developing a roadmap of cultural change, and they will include those requirements in hiring plans.

### Understanding the human factor

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TM Forum members are collaborating **in several projects** to help the telecoms industry attract and retain the employees needed to succeed in the digital economy.

One current initiative is to create an Inclusion & Diversity Council made up of industry CEOs and other executives. The new council lists Amdocs, BT, Colt, Deutsche Telekom, Nokia and Verizon among its founding members and will be chaired by Keri Gilder, CEO of Colt.

The team is also working with Bain & Company to create an Inclusion & Diversity Score. This will give companies the metrics they need to benchmark their performance against that of leaders in the industry. To learn more about this work, please contact **Vicky Sleight**.

### **Maintaining user experience during the shift**

As many CSPs are moving existing workloads into Linux or similar operating systems, the act of shifting them to a cloud platform must remain essentially unnoticeable to internal groups and critically, to customers. To make this possible, technology partners are developing migration toolkits that act as templates for applications that are heading to the cloud. Such migrations are often likened to switching the jet engine on a plane in flight, with no room for errors that could result in major outages or service disruption.

The opportunity for CSPs' partners is to prove the validity of the relationship by putting in place a well-defined and proven methodology, based on industry standards and replicable processes. Users and customers should only find out that their CSP is moving to the cloud because of the availability of new capabilities, not in a letter apologizing for an outage.

### **Analyzing & cleansing data during the shift**

CSPs typically analyze applications, directories and databases to establish whether they are fit for migration into the cloud. This is an opportune moment to analyze data quality as it is rehosted.

One IT operations director at a Tier 1 US telco says that their strategy for an inbuilt data quality audit was to not implement corrections during the migration process, but to make notes on what work could be done in the near future. This way the working system gets transferred to the cloud in its current operational state. Then corrections can be made in the cloud, where they can be rolled back in a systematic way should the change have an adverse effect on operational processes.

The migration team's end goal for the rehosting stage is to make the smallest number of changes possible. Once an application is successfully running in the cloud, the next step may be to modernize some aspects with microservice code natively designed for a cloud environment. During the redesign, unnecessary dependencies and libraries will be disaggregated to a cloud location outside the application.

A close relationship between the CSP and the support system supplier is an important consideration, because not all IT vendors have re-designed their software to be cloud native and delving into proprietary systems code may not be permitted in the software license. The opportunity here is huge for CSPs in driving out age-old problems such as process automation faults and interoperability issues while embracing new technology. Many of the OSS/BSS vendors that are building cloud native portfolios are doing so in conjunction with their major CSP partners, informed by lessons learned over many DevOps cycles.

**“ Users and customers should only find out that their CSP is moving to the cloud because of the availability of new capabilities, not in a letter apologizing for an outage. ”**

### **Developer productivity & innovation**

Providing a feedback loop to all IT developers and innovators involved in the move to the cloud is in the interest of CSPs. Because of the open source nature of much of the software, at first telcos did not drive analytical data back into these communities. The use of open source-based platforms and communities is of course becoming more commonplace for CSP IT teams, and with platforms like Red Hat OpenStack Platform, the opportunity to partner with many certified participants is very attractive.

Co-creation and partnering within newly formed cloud ecosystems is still a challenge for the majority of CSPs as it has been uncharted territory until relatively recently. But it is a move that has benefits for the entire community. The opportunity is trading the line between being a member of a new technology-led community but also looking towards competitive advantage. The latter inevitably feeds the former if the right feedback loops are in place.

For example, partnership programs should form a community for evolving common aims within the industry, but also act as a marketplace for the distribution of assets. In a telco cloud context this may mean drawing together certified hardware and software as well as certified cloud and service providers in a carrier-grade or enterprise-grade hub. The participants may be partners, competitors, suppliers or customers, but if there are commonalities that can be shared beyond the concerns of competitive advantage, it makes a great deal of sense to form these communities.

In the next section, we offer some advice for CSPs and their suppliers as telcos adopt cloud technology.

**“ Co-creation and partnering within newly formed cloud ecosystems is a challenge for CSPs, but it is a move that has benefits for the entire community. ”**

## Section 5

# Make it happen – Strategies for telco cloud success



Although communications service providers (CSPs) are still in the early stages of migrating workloads to clouds of all types, the benefits of cloud native operations are becoming clearer. The move includes vast opportunities to increase agility, reduce costs and improve the experience for customers, but operators could also face potentially expensive stumbling blocks. Following are steps they and their suppliers can take to be successful:



### **Adopt public & private cloud**

No one size fits all. The path forward for telco cloud almost certainly lies in shifting combinations to closely track business needs, so CSPs need to master the art of manipulating configurations to suit their needs, rather than altering business goals to suit operational dictates. The shift from single private cloud deployments to multi-cloud is being driven by CSPs' evolving business requirements, but also by familiarity with the technology and its capabilities, limitations, security and reliability.

Consider the **Cloud City** group of software vendors exhibiting together at Mobile World Congress 2021. All the companies are focusing on the use of public cloud for the delivery of telecoms software solutions. This public cloud will more than likely end up part of a hybrid or multi-cloud environment for running a full operational stack.



### **Form strategic partnerships**

CSPs cannot go it alone into the cloud age. They should seek out new partnerships, and they also should re-engage with existing partners. Cloud service providers, cloud management platforms, support systems vendors, systems integrators, open source communities, other CSPs and enterprises all have a role to play in new operational chains.



### **Strive for flexibility**

There is little point in replicating the old way of running a telecom company in the cloud. CSPs must ensure that decision making at all stages gives them options and the maximum amount of flexibility to change. The operational principles of the multi-cloud arrangement mirror the business agility desired by the company.



### **Re-engage with customers**

The classic way to design telecoms products is to look at what the network and the company's assets can do and build a service offering from those building blocks. With the paradigm shifting, the cloud era attitude should be less about, "What can we provide to the customers?" and more about asking customers, "What do you need to achieve your goals?"



### **Don't be afraid of technology**

Many conversations with vendors during this research revealed that they believe CSPs are uneducated or even scared about the ways of cloud IT. "It is like they think if they ignore cloud, it will go away," says one supplier. The move to cloud is huge for many CSPs, but it is inevitable so they must be onboard.

**Focus on management & orchestration**

The underlying technology of cloud in its various forms is well understood. CSPs are trying to optimize the benefits they can derive from the technology, so the focus has shifted to the management and orchestration layers of hybrid and multi-cloud environments. CSPs are eager to maximize the flexibility and control of telco clouds without being locked into relationships with public cloud providers that could inhibit telcos' options for operations in the future.

**Remember that connectivity is still core**

For all the talk about new services, around 80% of CSPs' revenues worldwide comes from connectivity services. Operators' key, unique asset is their network. As the network slowly changes its stripes there will be new services to investigate, but using the shift to cloud to drive excellence in connectivity should be a top consideration.

“ The move to cloud is huge for many CSPs, but it is inevitable so they must be onboard. ”

## 5 Ways CSPs Can Capitalize on Multicloud

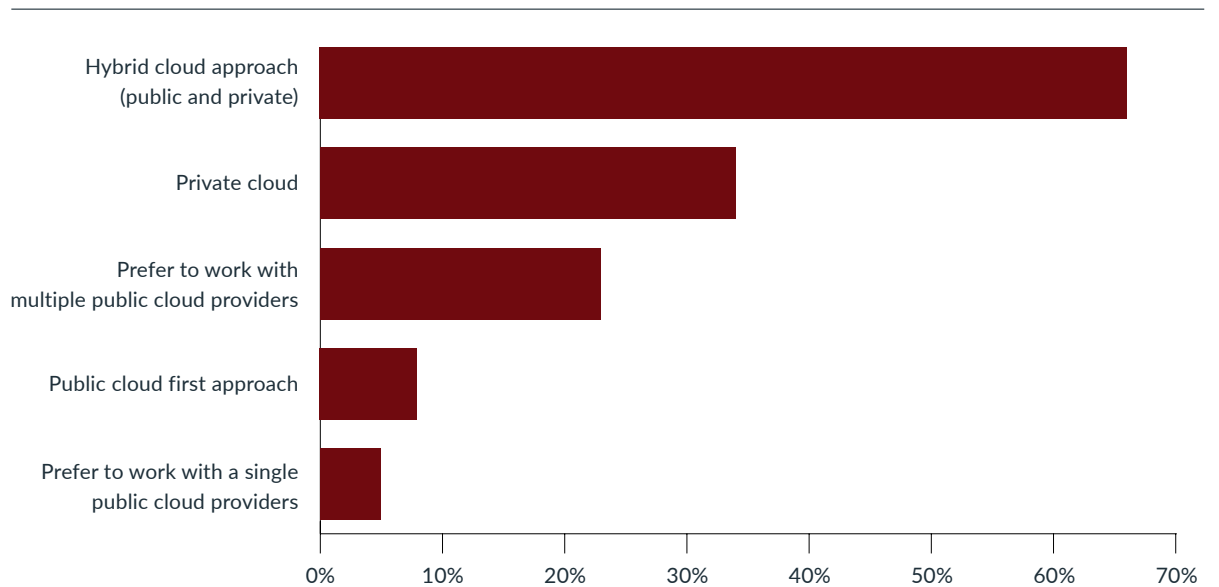


For most communications service providers (CSPs), a single-cloud approach is not an option. Leading CSPs have gone beyond back-office workloads to deliver services and networks using multiple hyperscale cloud providers. **TM Forum's Digital Transformation Tracker 5 survey** found that 66% of CSPs plan to take a hybrid private-public approach as they migrate operations, services, and networks to clouds, with 23% already reporting they prefer to work with multiple public cloud providers. In contrast, only 5% say they will choose to rely on a single public cloud.

CSPs understand they can leverage the hyperscale cloud providers' robust ecosystems to reap benefits in everything from scale and leading-edge capabilities to access to new channels and markets. But moving to the cloud also brings business risks CSPs want to avoid, like over dependence on a single supplier; intertwining processes with a suppliers' proprietary systems; or services that result in new infrastructure silos after a rush to market.

A CSP's ability to address these risks while managing many clouds as a single, and potentially fluid, infrastructure supports key goals and competitive differentiators like a faster pace of innovation, better customer journeys and experiences, and more cost efficient operations. Operators are competing in a multicloud world. The victors will excel not only at gaining the most cost efficiency, but also by leveraging potentially dozens of cloud partners to deliver a range of services including Edge, Core, WAN, vRAN and other networks as well as the entire panoply of business and consumer applications.

CSPs' preferred approaches to cloud migration



Source: TM Forum Digital Transformation Tracker 5

## 5 Ways CSPs Can Capitalize on Multicloud



### Addressing multicloud risks

Some large CSPs have already begun to use multiple hyperscale clouds to underpin **core, edge, RAN** and other services. Using different clouds to deliver a new range of services can give CSPs innovation, scale, and cost advantages. It benefits CSPs to approach the cloud market as a competitive ecosystem from which to choose the right cloud at the best cost for the purpose, and to avoid over-dependence on any single cloud provider.

CSPs have learned lessons from a lack of supplier diversity in the RAN market and may be wary of business risks, like:



**Supplier lock-in:** CSPs must avoid critical dependencies in their infrastructure. In markets where CSPs have relied on too few vendors with proprietary systems, they have suffered cost, complexity, and pace of innovation penalties.



**Dependence on proprietary controls:** CSPs may use many different clouds but managing each separately as an application platform via its proprietary controls will be unwieldy. It may be difficult to meet sophisticated FCAPS requirements for networks and services. New control silos may also replicate the product and operations silos CSPs have worked diligently to deconstruct.



**Lack of business agility:** The agility to onboard, launch, manage, and decommission cloud partners and resources quickly will impact a CSP's time to market, cost efficiency, and scalability as it competes against others aiming to launch new services fast on the same hyperscale clouds.



**Availability and Resiliency:** With clouds supporting network services, matters like resiliency-by-design and SLA-guarantees for availability enter focus. A multicloud strategy can result in a collection of disconnected silos or a resilient architecture. To meet classic carrier-grade network requirements and both network and service SLAs, orchestration across the multicloud environment becomes a requirement.

### Capitalizing on multicloud

In response to these risks, CSPs want to turn the multicloud challenge into a strategic opportunity. It is important to be able to choose from multiple hyperscalers and to align their best capabilities and costs with different parts of the CSP's business. CSPs need the agility to change underlying cloud providers – for reasons ranging from business dynamics to cost advantage – and minimize disruption.

Here are five elements of a good multicloud approach that can help a CSP gain time to market and innovation advantages while addressing business risks head on:

- 1. Stay agile.** Do not become overly dependent on or too tightly coupled to any one hyperscale cloud for a given purpose. Different public and private clouds – potentially hundreds of them – will be used to deliver different types of services or run various business and operations workloads. How agile and able a CSP is at harnessing these clouds as resources will be a difference maker. Each organization should, through a single pane of glass, have visibility into its resources in each cloud, as well as a consolidated view of its collective cloud resources.
- 2. Follow a plan.** As with any technical discipline, it takes a well-defined plan to manage cloud resources efficiently in a service provider-scale environment and user population. CSPs need to define, expand, and update best practices and controls relating to which workloads run in different clouds. This alignment and control is crucial to optimize service performance, meet quality and resiliency standards, comply with regulations and privacy laws, contain costs, and give employees clear procedures and governance.
- 3. Deliver the network.** Public clouds deliver scale and cost advantages, but delivering telecom network services with them raises the bar on performance, reliability, and trust. The challenge in the network is having the right performance, capacity, latency, resiliency, and service level agreement (SLA)-defined characteristics. Delivering networks from multiple clouds requires the right cloud build and architecture to deliver telco-grade availability.

## 5 Ways CSPs Can Capitalize on Multicloud



**4. Always improve.** Workload placement is a continuous practice that aims to achieve greater scalability across multicloud environments while optimizing cost. When large organizations run millions or billions of containers per day, even small optimizations translate into substantial costs or savings. CSPs need the ability to move workloads across different clouds without business or operational disruption not only to optimize workloads, but also to address issues like resiliency and disaster recovery.

**5. Waste no effort.** Enable teams to focus their energies on activities that deliver high value to the business. Disparate supplier portals and controls, a lack of visibility and communication across resources and organizations, and swivel chair integrations waste time for valuable people with scarce technical resources. Organizations across a CSP's enterprise will use cloud resources and need familiar tools that let them focus on delivering business value rather than tinkering with disconnected systems.

### With Red Hat, CSPs can build a winning multicloud strategy

As CSPs create multicloud environments to underpin operations, services, and networks, they may incidentally adopt an increasing variety of proprietary management and orchestration platforms from their suppliers. Allowing this to expand organically leads to supplier lock-in. While CSPs want to use different clouds for their distinct advantages, they also need a simple and efficient foundation for kubernetes, pipeline automation, container security and microservices architecture that lets them choose the right cloud for any job.

Red Hat enables a common, consistent experience for developers, architects, software partners, and operations teams, so that resources are all available in the same way, no matter which cloud they are using. CSPs gain access to:

- Open-source innovation through a leading commercial application platform with robust enterprise support and life cycle management.

- Deployment on any choice of technology – in-house, private, and public cloud.
- On-demand tools that provide a full view of all resources and deployments across clouds
- Comparison of cloud experiences to leverage the best cloud for any workload, service, or network.

These capabilities and more can give a CSP the command over cloud resources they need to innovate, scale fast, remain agile, and turn the multicloud ecosystem to their advantage.

Please [visit us for more information](#) on how Red Hat helps CSPs execute digital transformation, adopt cloud-native technologies, and operate multicloud environments.

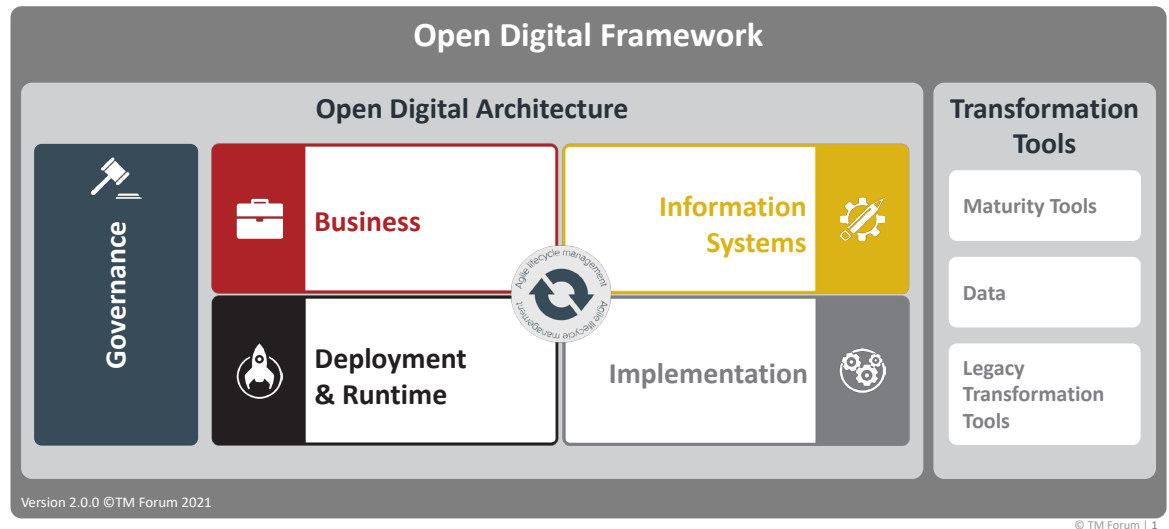
# TM Forum Open Digital Framework

## A blueprint for intelligent operations fit for the 5G era

The TM Forum **Open Digital Framework** provides a migration path from legacy IT systems and processes to modular, cloud native software orchestrated using AI. The framework comprises tools, code, knowledge and standards (machine-readable assets, not just documents). It is delivering business value for TM Forum members today, accelerating concept-to-cash, eliminating IT and network costs, and enhancing digital customer experience. Developed by TM Forum members through our **Collaboration Community** and **Catalyst proofs of concept** and building on TM Forum's established standards, the Open Digital Framework is being used by leading service providers and software companies worldwide.

### Core elements of the Open Digital Framework

The framework comprises TM Forum's **Open Digital Architecture** (ODA), together with tools, models and data that guide the transformation to ODA from legacy IT systems and operations.



### Open Digital Architecture

- Architecture framework, common language and design principles
- **Open APIs** exposing business services
- Standardized software components
- Reference implementation and test environment

### Transformation tools

- Guides to navigate digital transformation
- Tools to support the migration from legacy architecture to ODA

### Maturity tools & data

- Maturity models and readiness checks to baseline digital capabilities
- Data for benchmarking progress and training AI

### Goals of the Open Digital Framework

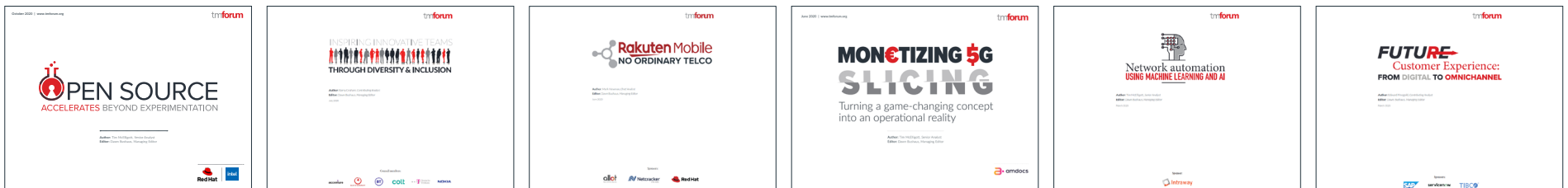
The Open Digital Framework aims to transform business agility (accelerating concept-to-cash from **18 months to 18 days**), enable simpler IT solutions that are easier and cheaper to deploy, integrate and upgrade, and to establish a standardized software model and market which benefits all parties (service providers, vendors and systems integrators).

### Learn more about collaboration

If you would like to learn more about the project or how to get involved in the TM Forum Collaboration Community, please contact **George Glass**.

# TM Forum Research Reports





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