

How to **lead** in the
**OPEN AP
ECONOMY**



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Contents

03

The big picture

07

Section 1: Why are companies adopting the Open APIs?

11

Section 2: The status of Open API adoption

18

Section 3: Using Open APIs to reduce costs and complexity

25

Section 4: Using Open APIs to partner

33

Section 5: Where are the roadblocks for Open API adoption?

37

Section 6: Can Open APIs become the de facto standard?

40

Additional features & resources

The big picture

Application program interfaces (APIs) are vital in every digital business, and for communications service providers (CSPs) they could mean the difference between realizing and squandering the opportunity to monetize innovative 5G services. APIs are simple coding instructions that allow disparate software systems to communicate without the need for costly, time-consuming integration, and they are essential to enabling companies to interconnect with external partners in platform business models.

By now, the story of how Jeff Bezos used APIs to turn Amazon Web Services into a half-trillion dollar business seems trite, but there are still lessons to be learned, particularly in the telecommunications industry. As a whole, communications service providers (CSPs) have not yet figured out how to turn APIs into platform gold. Or perhaps it is more accurate to say they know how but are only beginning to execute on the plan.

They must move more quickly. As Stéphane Richard, Chairman and CEO of Orange, explained during his keynote address at TM Forum's Digital Transformation World Series in October, the way telcos operate IT is too complex, rigid and costly. He believes that monolithic core IT systems and legacy processes and technologies are "a systemic part of the problem," and he suggests that CSPs are not transforming fast enough.

Watch Richard's keynote:



“

Progress in addressing these challenges is so slow that some studies predict that by 2025 technical debt will consume more than 40% of operators' current IT budgets,” Richard said.

Adoption grows

Orange is one of the pioneers of the TM Forum Open APIs, along with BT and Vodafone Group (see page 4). Since the formal launch of the Open API program in 2016, they have been joined by dozens more CSPs and suppliers pushing for the Open APIs to become the de facto standard in the telecoms industry.

It has not been an easy sell with every company. Most CSPs and suppliers have invested heavily in developing their own APIs, and the value of adopting an industry standard is not always readily apparent to everyone working inside a company.

But as understanding grows about how industry fragmentation impedes innovation and the ability to compete (see page 26), so does adoption of the Open APIs. Today, most of the world's largest CSPs and telecoms suppliers are pledging their support not only for the interfaces, but even more importantly the Open Digital Architecture (ODA).

A brief history of the Open APIs

In December 2013, 150 coders crowded into a conference room in San Francisco, the first-ever public users of [TM Forum's new REST-based Open APIs](#). There were only three at the time: the Product Catalog API, Product Ordering API and Trouble Ticket Management API. The idea was to demonstrate how standard interfaces could make operators more attractive to developers and easier to do business with.

The event offered \$6,000 in cash prizes and featured teams working feverishly into the night to create applications ranging from ecommerce and office-in-a-box to management of prison inmates' needs. The winners of the hackathon used the APIs to develop an app that allowed users to offer goods for trade with no money changing hands. The team used the Product Catalog API to show listings, the Product Ordering API to handle the exchange and the Trouble Ticket Management API to share offer status.

"When we ran that hackathon in San Francisco, it was a risky but important exercise," says Joann O'Brien, the Forum's VP of Digital Ecosystems. "We had really been trying to 'de-telcoize' the APIs and had been out there saying they could be used anywhere. The success of that event was groundbreaking."

The hackathon was the first of many to publicly demonstrate the power and versatility of the Open APIs, which have been developed by member companies to solve common challenges to IT integration and help operators participate in platform-based digital ecosystems. As Dr. Lester Thomas, Chief Systems Architect at Vodafone Group, explained when the Open API program was formally launched in 2016:

"We strongly believe that there's an ecosystem model we need to adopt. So, between operating models we need to have integration based on these Open APIs, and also, we build it in a way that we can expose these services even to external partners... In the [Vodafone operating companies] which have adopted this most strongly, we're seeing in excess of 60% of demand-driven re-use – more than 60% of the time, that market can meet new demand through existing APIs. That's huge agility, huge time-savings, and of course it's a huge cost savings as well."

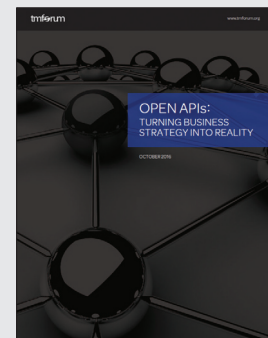
Thomas, Laurent Leboucher, VP of Digital IT, Customer Relations and Global Architecture at Orange, and George Glass, who was previously Chief Systems Architect at BT and is now the Forum's CTO, recorded the videos below in 2016 to explain why their companies were pioneering the Open API initiative.



The Open APIs are technology agnostic and can be used in any digital services scenario, from developing next-generation IT systems to enabling IoT services and smart cities, or onboarding virtual network functions. The interfaces are REST-based and can be used by almost any programming language.

They are developed using a crowdsourcing approach, and members are encouraged to contribute extensions and enhancements for the benefit of everyone who uses them. The Open APIs also are easy to test, and TM Forum offers [formal conformance certification](#) for many, with an aim to do so for all the interfaces (see [page 17](#) for more about certification).

Read these reports to learn more about the history of the Open APIs:



Today TM Forum provides more than 50 Open APIs that CSPs and others can use for IT transformation and end-to-end management of complex digital services. Over 22,000 people from 1,900 companies are using the interfaces. In 2020 alone, 886 companies have downloaded 106,300 API assets.

To date, 75 companies – 18 of the world’s leading CSPs and 57 of their suppliers and other partners – have signed the Open API Manifesto publicly demonstrating their endorsement of the Open APIs. In signing the manifesto, CSPs agree to position the Open APIs as a requirement in their IT requests for

proposal and other methods of procurement such as proofs of concept and hackathons. Their supplier partners commit to using Open APIs in relevant product applications and to provide feedback and extensions to the APIs.

A combined Open API and Open Digital Architecture Manifesto is supported by 44 companies, including 15 global service providers. The ODA is a framework under development which aims to create a software marketplace where CSPs can easily procure Lego-like IT components in order to speed innovation, improve customer experience and reduce costs.

The idea is to define standardized, interoperable and reusable software components that are organized loosely into coupled domains. The components expose business services through the Open APIs, which are built on a common data model. Importantly, ODA provides machine-readable assets and software code, including a reference implementation and test environment, which is the first step toward a viable marketplace. We’ll discuss the ODA and why it makes the Open APIs more powerful throughout this report.

Open APIs at a glance



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Companies that have signed the Open API Manifesto

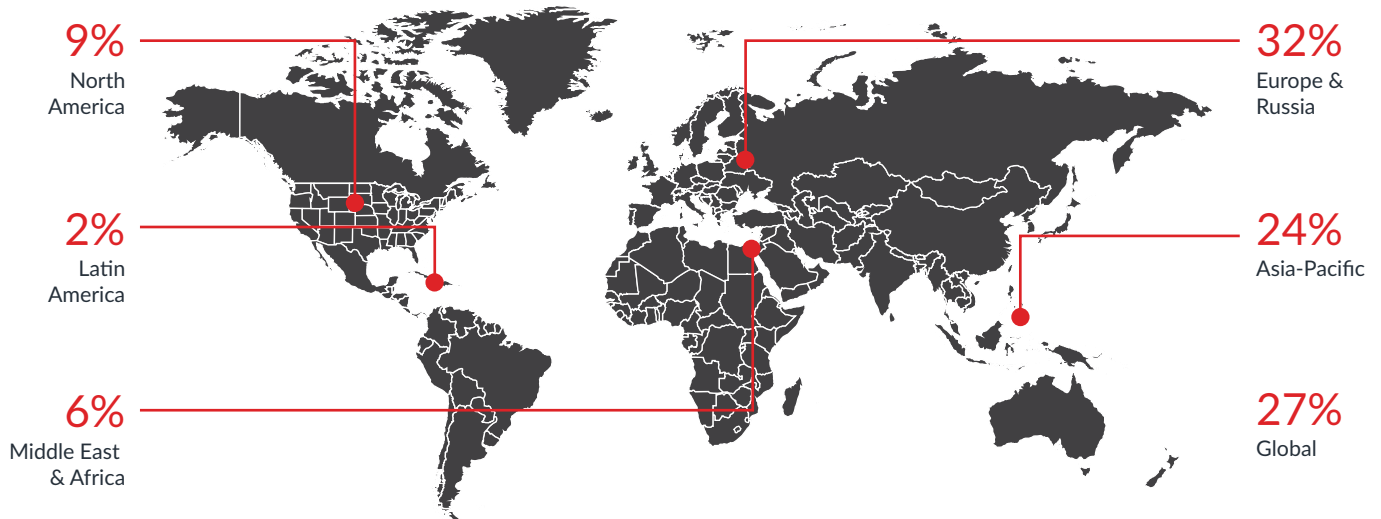


Companies that have signed the Open API & Open Digital Architecture Manifesto



Who are the survey respondents?

CSPs **81** respondents from 51 companies Suppliers **45** respondents from 34 companies



Research methodology

This report assesses where we are on the path to the Open API economy, looking at the status of adoption, drivers, how CSPs are using the interfaces and which suppliers are supporting them. It also looks at challenges to using the Open APIs that will need to be overcome to advance them as the standard.

The research for this report includes surveys of CSPs and their suppliers conducted in October and November. Questions were designed not only to gauge adoption, but also to understand sentiment about the interfaces. Our goal from the start has been to provide an evaluation of Open API adoption with frank discussion about challenges to using them.

We intentionally sought participation from companies adopting the Open APIs to find out about their experiences, but we also surveyed some companies that are not using them. In addition, we conducted in-depth interviews and analyzed many public presentations about API adoption at the Forum's recent Digital Transformation World Series (DTWS)

online event. The report also draws on data from TM Forum's ongoing Open API Adoption Assessments and interviews with TM Forum staff.

About three quarters of CSP respondents to the survey work for converged operators, with all sizes of companies well represented. More than half of CSP respondents are software architects or engineers, and others hold senior-level roles such as chief operating officer, chief systems architect and heads of IT and cloud. About three quarters of supplier respondents work for companies providing IT support systems and services, with the remainder split mostly among network companies and systems integrators.

Read the report to understand:

- What Open APIs are and why companies are using them
- Which Open APIs are most widely used and which companies are using them
- Why CSPs want more suppliers to implement Open APIs, and which companies are leaders in adopting Open APIs
- Why operators are focusing on transforming customer-facing systems first
- What the quantifiable benefits are of using Open APIs (and why some CSPs and suppliers say it is difficult to quantify them)
- How AT&T, Axiata, BT, Bharti Airtel, China Unicom, Deutsche Telekom, Globe Telecom, MyRepublic, Orange, Rakuten, stc, Telefónica, Telia, Three Ireland, Vidéotron, Vocus and Vodafone are using Open APIs to transform their IT organizations
- Why the Open APIs are more powerful when used in conjunction with the ODA, and how the combination can enable platform-based software marketplaces and new 5G business models
- Whether the Open APIs can become the de facto standard in the telecoms industry and how collaboration among standards-development organizations can help

Section 1

Why are companies adopting Open APIs?

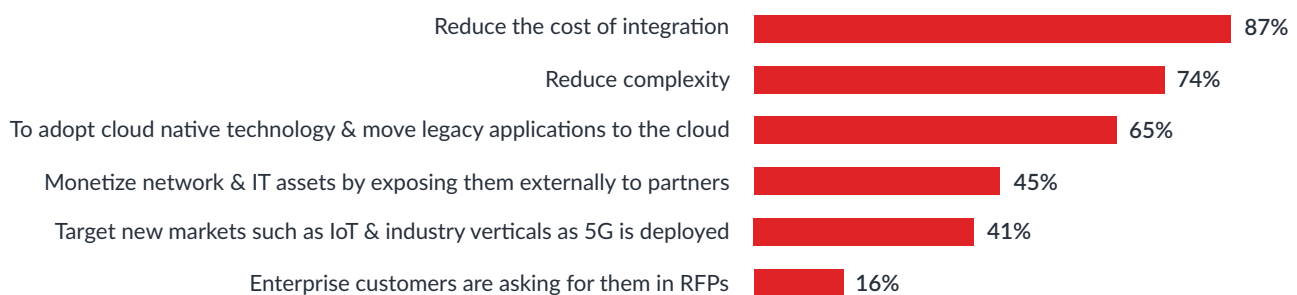
Communications service providers (CSPs) are adopting Open APIs because they enable plug-and-play interoperability of components within their IT systems and networks. As explained in the introduction, Open APIs dramatically reduce the cost of integration and time to market for new services. Importantly, they also allow operators to expose network and IT capabilities to partners using platform-enabled business models. All these changes are critical for enabling CSPs to experiment and deliver new 5G services to enterprises and consumers.

In the survey conducted for this report, we gave CSPs and suppliers lists of potential reasons for adopting the Open APIs and asked them to rate each on a scale from very important to not important at all. The graphics below show the percentage of respondents who rated the drivers as very or moderately important.

It is not surprising that the biggest drivers are reducing costs and complexity. Many operators report spending about 80% of their IT budgets on integration and customization, which leaves only 20% for innovation. They are turning to Open APIs and open architectures to flip this ratio.

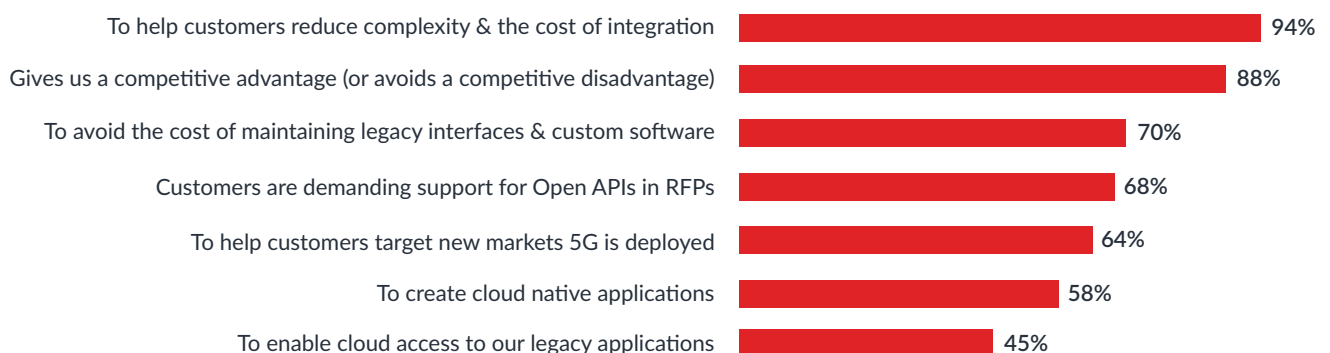
Many CSPs are “wrapping” legacy systems so that they can move them to a cloud environment. Only a few are using the Open APIs to create platform businesses with external partners, but many plan to as a second phase of digital transformation. We'll discuss these sets of drivers in more detail in the next two sections.

CSPs' reasons for adopting Open APIs



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Suppliers' reasons for adopting Open APIs



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A new architecture

The Open APIs are useful on their own, but they become much more powerful when used in conjunction with a modern, component-based architecture like the [Open Digital Architecture \(ODA\)](#), which is part of the Open Digital Framework (see [page 52](#)). A component-based approach gives CSPs the ability to evolve incrementally to a fully automated,

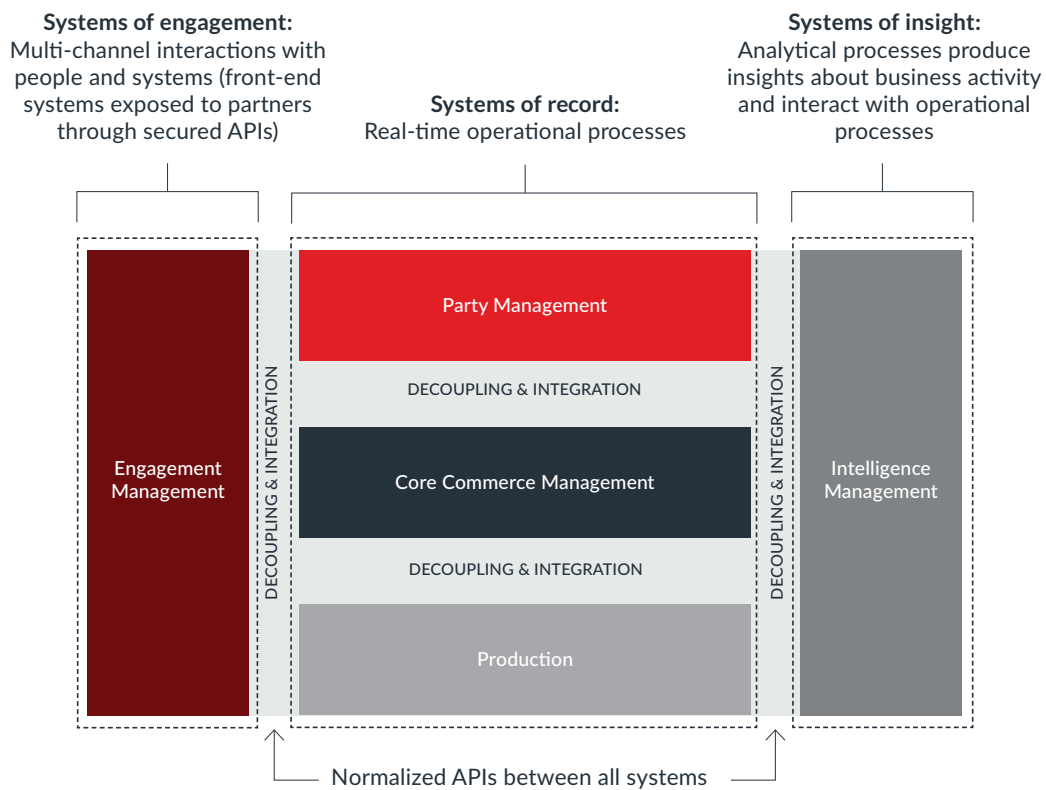
cloud native operations environment that relies on analytics and AI to deliver zero-touch services.

TM Forum launched the ODA Project in February 2018. Just as the Open APIs aim to be the de facto standard for telecoms interfaces, ODA aims to be the de facto standard for open digital platforms.

CSPs have led development of the architecture with a primary goal of

reducing the time it takes to go from concept to cash when creating new services. They want to be able to do this in days or even hours, as digital native service providers do. But today it often takes a year or more for a telco to develop and monetize a new service because of requirements to build connections many times over between customer management, service management, and ordering and billing systems across several lines of business.

ODA functional architecture



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Accelerating progress

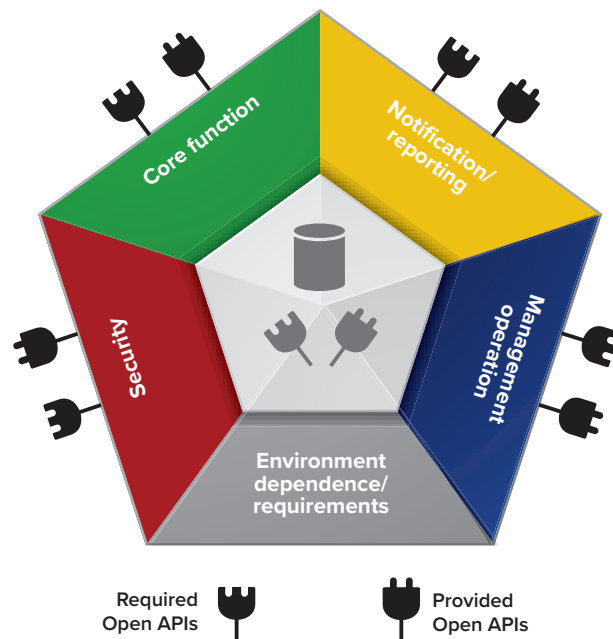
As noted, CSPs collaborated early on to standardize exposure of services through the Open APIs. Then TM Forum changed a bylaw so members could co-develop the Open APIs under standard open source licensing terms, that is, [Apache 2.0](#). Now Orange and Vodafone Group are leading the charge to [create softwareized standards](#) that CSPs can use to test ODA concepts.

Originally developed as a prototype of one part of ODA called [the Business Operating System \(BOS\)](#), the scope of this work has expanded to encompass development of a complete ODA Reference Implementation. During a Catalyst proof of concept, the team developed the ODA Canvas, which is a software-defined blueprint for a cloud native operating environment.

In December 2020, TM Forum launched the [ODA Component Accelerator](#) and a new legal entity called tmf.codes so that members can co-develop shared software code for the ODA Reference Implementation under Apache 2.0. The goal is to be able to test suppliers' software solutions for interoperability. We'll discuss the Component Accelerator more in [Section 6](#).

The graphic above illustrates an ODA component, which is an independently deployable piece of software, typically built out of one or more microservices. Components have an "envelope" that provides metadata to describe its core function and specify which Open APIs it exposes or depends upon.

"The point of the ODA Component Accelerator is to build a reference implementation with real components



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which can be used as a platform for testing commercial products," says Andy Tiller, TM Forum's Executive Vice President, Collaboration & Innovation. "So, whether you're participating in the project or not, you'll be able to come along as a commercial vendor with your component and plug it into the reference implementation in the Open Digital Lab or a CSPs' environment. Service providers will then be able to prove to their own satisfaction that their vendors are fully compliant with the ODA and Open APIs."

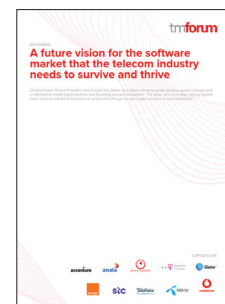
These changes pave the way for CSPs and their partners to participate in all kinds of software marketplaces, as buyers of IT solutions and sellers of products and services to partners and customers.

We'll discuss marketplaces more in [Section 4](#). In the next section, we'll look at the status of Open API adoption.

Learn more about the history of ODA in this report:



Learn more about the vision for marketplaces in this white paper:



From Pollock to Mondrian: ODA simplifies ‘spaghetti’ architecture

Many CSP executives discuss legacy IT operations in terms of “spaghetti” architecture – where network and operational domains are tightly coupled, and every network element must be manually integrated with every support system. This complexity is the reason it typically takes operators more than a year to develop and deliver new services.

Laurent Leboucher, VP of Digital IT, Customer Relations and Global Architecture, Orange, compares CSPs’ legacy architectures to a Jackson Pollock painting, whereas the goal is to move to an approach that favors artist Piet Mondrian. Leboucher shared the slide below during a presentation at Digital Transformation World Series to illustrate his point.

“IT legacy in telco environments very often looks like a Pollock painting,” he explains. “It’s hard to identify through hazy building blocks, and there is almost no loose coupling. Data records are very often duplicated several times, and everything seems to be tied to everything else. This is often the result of many years of silo fragmentations and various attempts to fix those fragmentations with technical projects, which created this entropic technical debt.”

By contrast, Mondrian’s art is much simpler with shapes that can be clearly identified. “ODA is similar,” Leboucher

says. “It is characterized by cohesion and loose coupling, with functional blocks in colors and Open APIs for the loose coupling in between.”

He adds that ODA is futureproof and designed with an outside-in perspective, in that it can support existing and new, digital services, while also addressing implementation of B2B2X digital ecosystems, which will be critical for operating and monetizing 5G and edge computing.

“Our architecture needs to be understood by our business colleagues,” Leboucher says. “Otherwise, it will stay an abstract piece of art.”

Leboucher gives the example of a customer who begins ordering a product on his mobile device and wants to continue the process at home on a PC but finds the shopping cart empty when he logs in using the new device. CSPs have no easy way to provide a consistent multi-channel experience because each channel is implemented with its own monolithic application. By using Open APIs and an open architecture like ODA, however, an order capture process can be implemented once and shared by several systems of engagement.

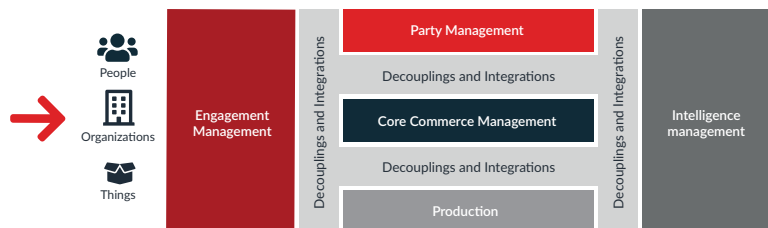
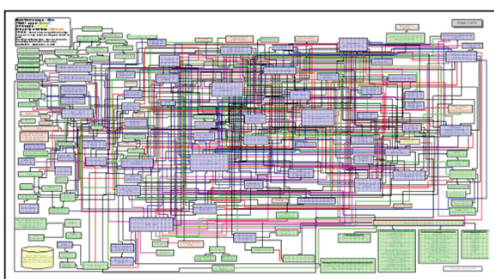
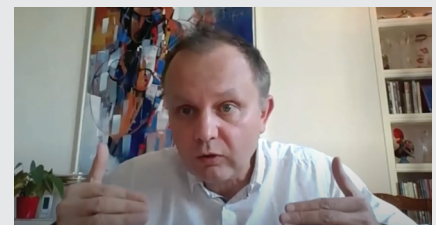
“In traditional IT we spend too much time doing horizontal integration between legacy systems

implemented many years ago and new systems – and even between new systems because they often don’t comply with standard Open APIs,” Leboucher says.

And there is vertical integration to consider as well. “Traditionally, IT solutions were not cloud native and they were not containerized, so there is an additional effort to deploy our components to a particular infrastructure target,” he says. “And think of all the environments that we need to put in place: test, integration, pre-production, and later the production environment. Sitting in all those environments is time and money.”

Leboucher says he sees an urgent need to reduce this burden by making IT applications cloud native by design so that they can be integrated as “software Lego blocks” using a well-designed architecture based on ODA. We’ll discuss this more throughout the report.

Watch Leboucher’s presentation and a panel discussion about ODA:



TM Forum, 2021 (courtesy of Laurent Leboucher)

Section 2

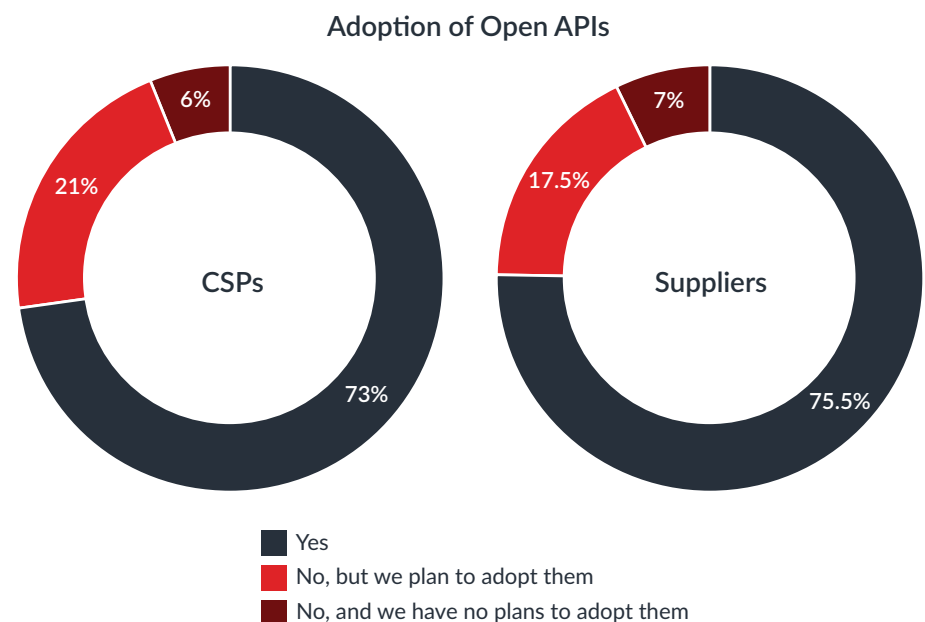
The status of Open API adoption

Adoption of the Open APIs has been increasing steadily since the first three REST-based interfaces were introduced in 2013 and the Open API Program was officially launched in 2016. As noted in the introduction, most communications service providers (CSPs) are using them to simplify IT environments and move applications to the cloud. Many operators also say they are planning to use the interfaces to expose their IT systems to external partners in platform business models, but only a small number are doing this today.

Most of the companies we surveyed are adopting the Open APIs, and this is not surprising given that many respondents are active TM Forum members. Only about a quarter of respondents said their companies are not adopting the Open APIs, but most of them plan to do so.

Encouragingly, over 93% of CSP respondents said Open API adoption is part of a broader corporate strategy. A transformation strategy that insists on use of the Open APIs throughout the business and across operating companies is key to widespread adoption and making Open APIs the de facto standard.

However, a few respondents said they are having difficulty getting buy-in company-wide. "Within the OSS department we have a strategy to focus on Open APIs, but in the whole company there is a lack of willingness to do so," writes one respondent from a small European CSP. A respondent from a large global operator gave a similar assessment.



TM Forum, 2021

Some people also noted that in practice it simply is difficult to get all operating companies and departments to adopt common technology including Open APIs, even when it is corporate strategy. At one large European CSP,

for example, the architects of a new 5G developer portal have not yet incorporated the Open APIs because they didn't know about them.

Who's using Open APIs?

The lists below rank CSPs, suppliers and systems integrators based on the number of Open APIs they downloaded in 2020. The top-ranked CSPs are downloading APIs thousands of times, and in most cases multiple operating companies and divisions are using them.

Top 25 CSP Open API users

- | | |
|---------------------------|-------------------------------------|
| 1. Deutsche Telekom | 14. AT&T |
| 2. Vodafone Group | 15. EWE TEL |
| 3. Orange | 16. SES Astra |
| 4. America Movil | 17. Verizon Communications |
| 5. TELUS | 18. Millicom International Cellular |
| 6. Telenor | 19. PCCW |
| 7. Bell Canada | 20. Vidéotron |
| 8. Telia | 21. Vocus |
| 9. NTT | 22. Advanced Info Service |
| 10. Telefónica | 23. Axiata Group |
| 11. BT | 24. TDC Group |
| 12. Rogers Communications | 25. Singtel Optus |
| 13. Telstra | |

Top 15 systems integrator Open API users

1. Infosys
2. Accenture
3. Capgemini
4. Deloitte
5. Atos
6. CGI Info Systems Management Consulting
7. Sopra Steria Group
8. Alepo Technologies
9. DXC Technology
10. Sysbiz Technologies
11. Hycom
12. Cognity
13. BearingPoint
14. Xynexis International
15. Applied BSS

Top 25 supplier Open API users

- | | |
|------------------------------|--|
| 1. Ericsson | 15. Nexign |
| 2. Amdocs Management | 16. Novabase |
| 3. IBM | 17. Sterlite Technologies |
| 4. NEC | 18. Salesforce |
| 5. Oracle | 19. Wipro Technologies |
| 6. Tata Consultancy Services | 20. Torry Harris Integration Solutions |
| 7. Tech Mahindra | 21. ERP Soluciones |
| 8. CSG | 22. Hansen Technologies |
| 9. Tecnotree | 23. i2i Systems |
| 10. Nokia | 24. Cognizant Technology Solutions |
| 11. Huawei Technologies | 25. Ciena |
| 12. Whale Cloud Technology | |
| 13. PIA Bilişim Hizmetleri | |
| 14. Comarch | |

Types of APIs

The graphic below compares CSP and supplier adoption of specific types of Open APIs. For the purposes of the survey, we grouped them logically as outlined here. The groupings are the same as those used in the Forum’s ongoing [Open API Adoption Assessments](#) (see [page 14](#)):

- **Customer** – APIs that CSPs use to interact with their customers (for example, customer management, shopping cart and bill management APIs)
- **Engaged Party** – APIs that CSPs use to interact with partners to deliver services (for example, privacy management, party interaction and partnership management APIs)
- **Customer Engaged Party** – APIs that are common to Customer and Engaged Party relationships (for example, product ordering, service

level agreement management and payment management APIs)

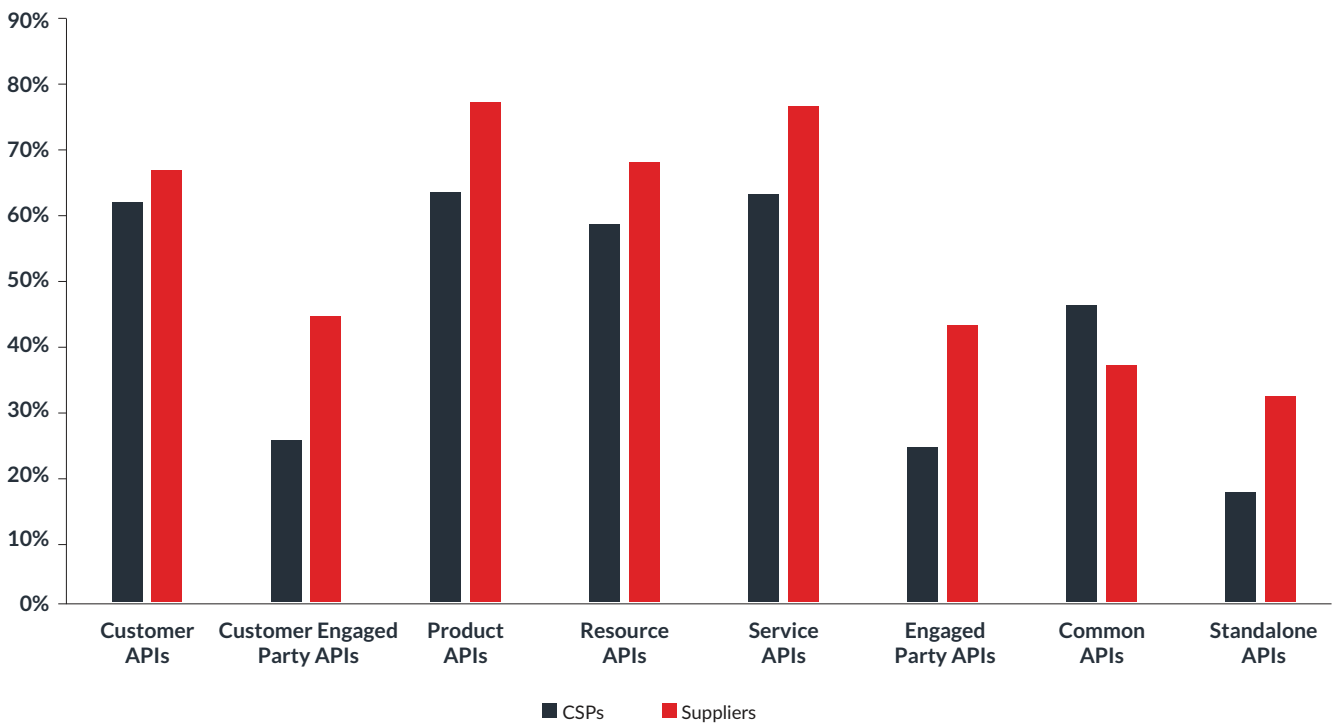
- **Product** – APIs that CSPs use to manage the products they offer (for example, product catalog management and product inventory management)
- **Resource** – APIs that CSPs use to manage their physical resources (for example, resource catalog management, resource inventory management and alarm APIs)
- **Service** – APIs that CSPs use to manage their logical services (for example, service catalog management, service inventory management, and service activation and configuration APIs)
- **Common** – APIs that fit into all the groups described above (for example, trouble ticket, usage management, performance management and geographic location management APIs)

- **Stand-alone** – APIs that do not fit into any of the groups outlined above (for example, IoT device management and distributed ledger management APIs)

It is not at all surprising that customer and product APIs are among the most widely adopted Open APIs as most CSPs begin digital transformation with customer-facing systems, which are critical to running the business. We’ll explore this more in the next section.

We were a bit surprised at the popularity of the resource and service APIs because most CSPs are just beginning to experiment with approaches such as network-as-a-service (NaaS – see [page 21](#)). But resource APIs are also used for physical inventory like handsets, which likely explains the high rate of adoption.

Which Open APIs are companies using?



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Helping CSPs evaluate suppliers and their peers

The goal of TM Forum's ongoing [Open API Adoption Assessments](#) is to help companies conduct an independent and fair self-analysis of their usage of and compliance with TM Forum Open APIs in product portfolios and internal IT systems. Doing so can help CSPs compare vendors' implementations of TM Forum Open APIs and show them how their own deployments stack up against other CSPs.

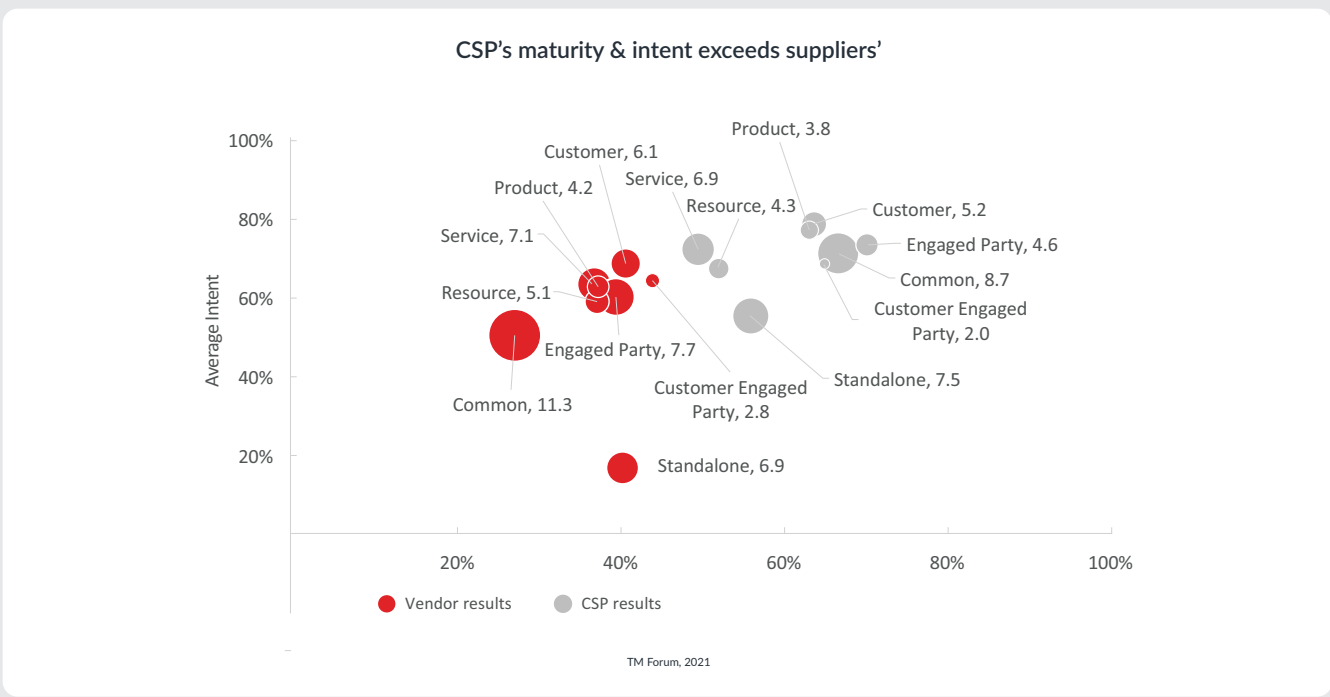
TM Forum has been conducting voluntary API adoption assessments with CSPs and their suppliers since early in 2019. [Pilot results](#) were published in July 2019, with follow-up results published [in November](#) the same year and again [in June 2020](#). The most recent assessment was published in December 2020.

The assessment tool evaluates maturity of Open API adoption, ranging from presence on a product roadmap to deployment in a CSP's environment. It also evaluates the company's intent or ambition to adopt the Open APIs. Based on these scores, the company's adoption is rated:

- **Experimenting** – respondent has completed some testing of Open APIs but has not fully incorporated them into products and services; they may have experimented with Open APIs in a sandbox environment, in TM Forum's Open Digital Lab or as part of a [TM Forum Catalyst proof of concept](#) (low level of commitment and low level of maturity)
- **Broad ambition** – respondent has an ambitious commitment to support Open APIs across the whole scope of their products or systems but is early in the process of deploying them (high level of commitment but low level of maturity)
- **Focused, targeted deployment** – respondent has implemented a small number of Open APIs; maturity is advanced, but the number of APIs used only covers a small area of their product portfolio
- **Widespread, mature deployment** – respondent has implemented several Open APIs in a significant percentage of their product portfolio, and products are widely deployed in CSPs' environments

The latest assessment shows that CSPs' intent and maturity in deploying APIs exceed suppliers', and this has been the case since the reporting began. CSPs' maturity is on average 28 points higher than suppliers', although this number is skewed by leading CSPs' adoption. Since November 2019, there has been a 57% increase in survey participation with 20 new vendors, and average industry intent increased by 12 percentage points to 60%.

The graphic below shows the intent and maturity for specific groups of Open APIs. The label and size of circle indicate the average number of relevant APIs. We'll discuss adoption assessment more in [Section 6](#).



Component suites

Only a small percentage of CSP and supplier respondents said they are adopting Open API component suites, but more plan to do so. Component suites are groupings of APIs that support end-to-end scenarios or execution flows across resources.

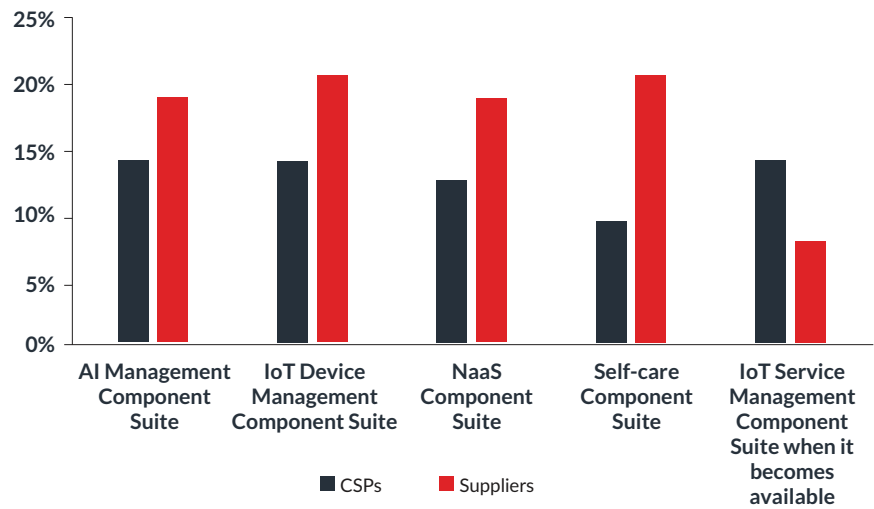
“The capability of binding APIs as being part of a logical component providing a highly cohesive set of capabilities is a major step in creating the building blocks for the next generation of BSS/OSS architectures,” says Pierre Gauthier, Chief API Architect, TM Forum.

The Customer Self-care Component Suite, which defines the set of operations that CSPs should offer to enable a self-care app, was the first suite offered, followed by the NaaS Component Suite, which automates the end-to-end lifecycle of network services.

The IoT Device Management API Suite aims to simplify end-to-end IoT device management with a goal of speeding up prototyping and commercial IoT deployments so that CSPs can expand quickly into vertical markets. A companion IoT Service Management Component Suite is under development.

The newest suite, the AI Management Component Suite, defines the set of operations that should be offered for a CSP to govern deployment of AI systems at scale. Some operators said they believe this is how most companies will adopt the Open APIs going forward – as groups of relevant interfaces that can be combined to address specific business challenges, rather than individual APIs.

Planned support for Open API component suites



TM Forum, 2021

Differences explained

An easy explanation for different rates of adoption is that all companies want to protect their own approaches and investments. But it's more complicated than that. Large, incumbent suppliers have relied on locking in their CSP customers, but this is not necessarily nefarious. Vendors need to protect their investments in research and development. And while CSPs say they want to avoid vendor lock-in, they don't want to do so at the cost of jeopardizing innovation.

In the middle are startups and niche software suppliers that take one of two positions: go all in on Open APIs and other standards to prove their value in the ecosystem; or stand behind their product's unique capabilities and homegrown APIs and wait for direction from CSP customers on when and how to change.

Each position is valid – or has been – until now. But so many disruptive changes are now underway, such as the seismic shift in the competitive landscape underpinned by hyperscale cloud providers, growing network and application expertise within enterprises themselves, 5G deployment, virtualization, automation, and the need to manage exponentially larger volumes of data. Meeting these challenges requires collaboration as an industry on common pieces of the puzzle.

Demanding support

While 65% of CSP respondents said their requests for information and proposal (RFIs and RFPs) require support for Open APIs, supplier respondents reported even higher demand. We asked for a simple yes or no from CSPs, but we asked the question bit differently of suppliers as shown in the graphic on [page 16](#).

Suppliers report that it is rare to receive an RFP that does not request support for Open APIs, and we believe these requests are persuading vendors to increase support for Open APIs in their products and services. CSPs would like for the commitment to be stronger, however, with only 7% saying that their suppliers are very committed to Open APIs and nearly 43% believing vendors are mostly paying lip service to Open APIs.

But vendors say there is a difference between requesting support and making it mandatory, and some suppliers wish all CSPs would make Open API compliance mandatory in all RFPs. Full compliance would make integration easier for everyone and would drive the Open APIs as the de facto standard.

For example, although software supplier Matrixx is planning to adopt Open APIs, the company sees little incentive for incorporating them. While some CSPs are asking for support for two Open APIs that Matrixx could use in its solutions (the Usage Management API and Prepay Balance Management API), the company says operators have not made them mandatory.

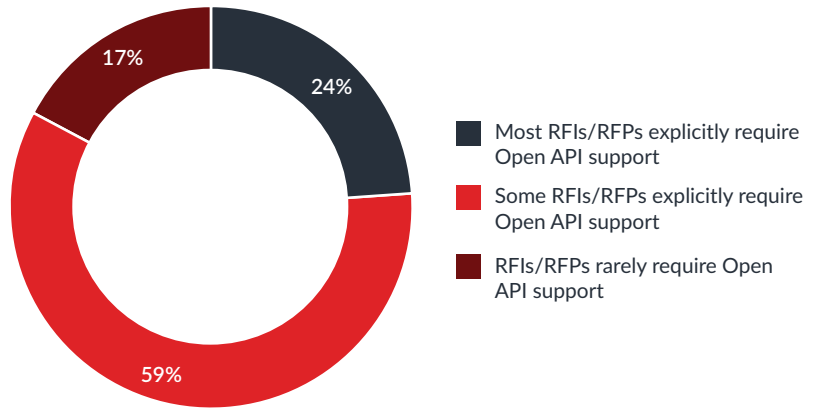
Competitive advantage

Suppliers who do comply with Open APIs see it as a competitive advantage. Says Mounir Ladki, President and CTO of MYCOM-OSI:

“

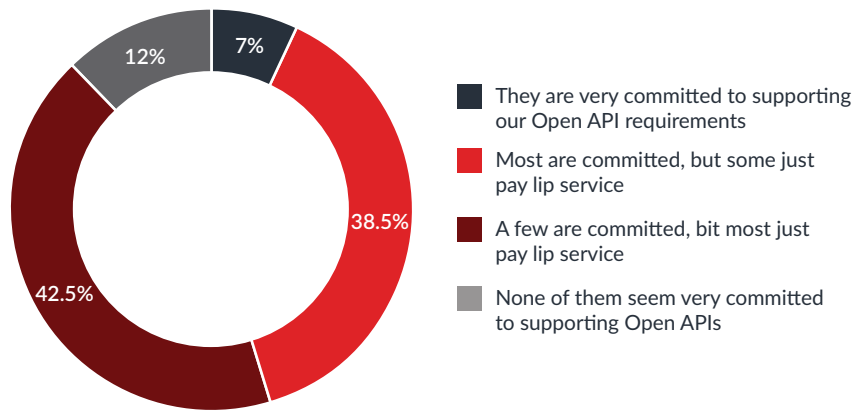
“We would like them to be requested more and even made mandatory. Integration projects are overly complex, risky, time-consuming and costly. Open APIs are really an answer to reducing the risk and cost and time to market. They increase the chance of success for these projects.”

Do CSPs' RFPs require support for Open APIs?



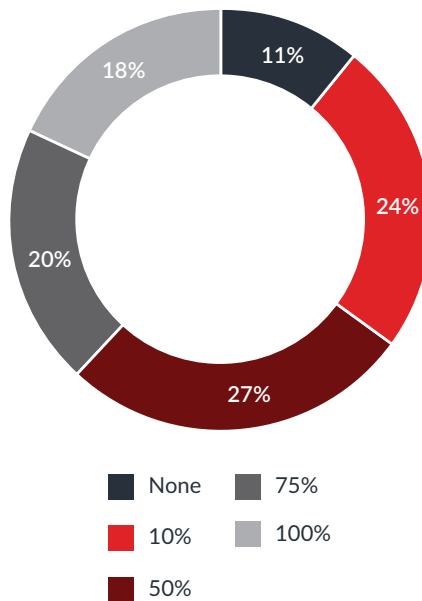
TM Forum, 2021

CSPs' view of how committed suppliers are to Open APIs



TM Forum, 2021

Percentage of suppliers' portfolios that support Open APIs



TM Forum, 2021

Vance Shipley, Founder and CEO of SigScale, agrees.

“

“You can't expect the big vendors to wake up tomorrow and decide to be altruistic,” he says. “But when the group of operators who can afford to flex their position start to really drive requirements, the vendors will have to come on board.”

Indeed, this is already happening as large CSPs such as Vodafone and Orange are making Open APIs mandatory in their RFPs.

Certification counts

To encourage adoption of the Open APIs, TM Forum recently began a formal certification program that awards badges to suppliers that demonstrate conformance with Open APIs in their software products and services through testing. Bronze level certification means the supplier has certified adoption of up to three Open APIs; silver, four to nine; gold, 10-19; and platinum, more than 20.

The graphic below shows the top 5 suppliers based on certifications at the end of November 2020. A full list can be found [on the TM Forum website](#).



Tecnotree was the first company to achieve gold certification for Open API conformance. The company is a good example of a smaller supplier that sees value in standards.

“

One of the reasons we picked up on the Open APIs was that we do not know which way digital transformation is going to take us,” says Deva Sharma, Chairman of Technology Board at Tecnotree. “We wanted to keep that openness in our architecture.”

By contrast, Oracle is a very large, incumbent supplier that is demonstrating strong commitment to the Open APIs, and the company is doing so in part to avoid accusations of vendor lock-in. The company uses application APIs that are increasingly REST-based Open APIs from TM Forum and 3GPP APIs for southbound communication to the network.

“If what we are trying to do is something the TM Forum is trying to address, then we look first and foremost to leverage the Open API,” says Leonard Sheehan, Senior Director of Product Marketing, Oracle Communications. “It has become our default approach over the last year.”

Oracle is a founder of the Open Digital Architecture Component Accelerator (see [page 39](#)), and the company signed the Open API & ODA Manifesto in June, along with Amdocs, Netcracker and Nokia. In October, Ericsson, Huawei and Salesforce signed the combined manifesto.

Ericsson is going so far as to create a “BSS Exposure Layer” to help CSPs implement Open APIs. In a white paper, the company explains that the aim is to “develop and productize a telco-grade framework to accelerate the implementation of Open APIs on top of its BSS products, while enforcing best practices, reusing proven and mature design and code, and guaranteeing that key non-functional requirements are in place for every developed API.”

In the next section, we’ll look more closely at how CSPs are using the Open APIs for internal IT transformation.

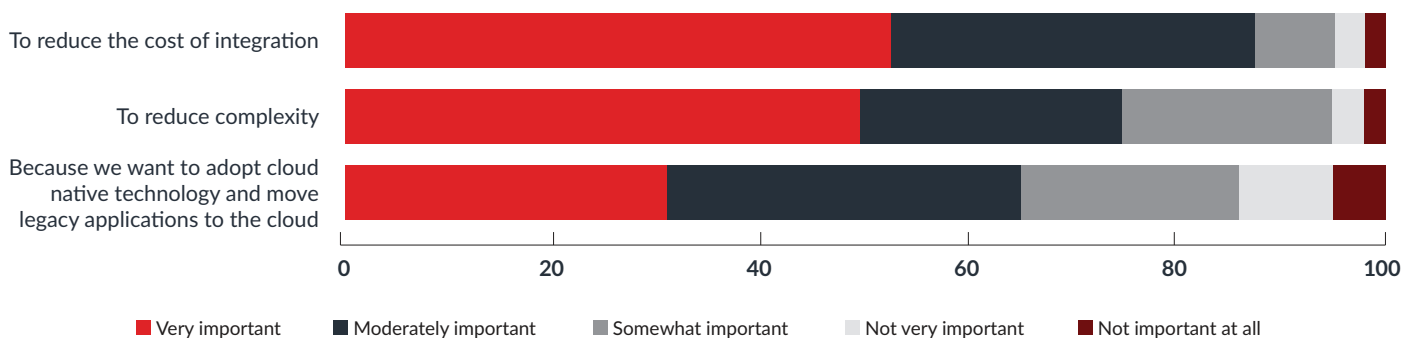
Section 3

Using Open APIs to reduce costs and complexity

The journey to transform IT systems with goals of significantly reducing costs and complexity typically starts with digitizing customer-facing systems because they are critical to running the business. These systems also help communications service providers (CSPs) deliver personalized services.

The graphic below provides a more detailed look at the three drivers for using Open APIs that ranked highest in the survey conducted for this report. About half of all CSP respondents said reducing costs and complexity are “very important” drivers.

Internal drivers for Open API adoption



TM Forum, 2021

Reducing customization

In the past, systems that handle product, order, revenue and customer management collectively have been called business support systems (BSS). Now, many CSPs refer to them using terms such as “engagement management” and “core commerce management”. This is the terminology TM Forum uses in describing [the Open Digital Architecture \(ODA\)](#) (see [page 8](#)).

No matter what they are called, simplifying customer-facing systems is paramount because CSPs’ subscriber and revenue growth is stagnant. To compete they must focus on improving loyalty and upselling customers by

delivering personalized experiences on par with those delivered by digital natives. At the same time, operators must lower their operating costs through automation.

CSPs’ current IT environments consist of many different commercial software applications that have been modified over decades. These often either have overlapping functionality or present gaps in the end-to-end customer journey, which operators must address through customization.

As a result, operators spend millions of dollars and huge amounts of time on complex integration and further customization whenever changes are needed. In addition, CSPs face

integration headaches when they acquire other companies and must merge completely disparate systems.

As explained in [Section 2](#), many suppliers are now selling customer-facing systems that include support for Open APIs, and CSPs often request Open API compliance in any new systems they procure. But many implementations of Open APIs so far have consisted of “wrapping” suppliers’ legacy APIs with Open APIs. Often this is because CSPs are building digital experience layers across markets, but they are modernizing back-end systems of record (also known as operational support systems – OSS) more slowly.

Make it simple

Simplification is a chief goal in wrapping systems. As noted in [Section 1](#), CSPs are hoping to reverse the 80:20 rule when it comes to IT spending so that they can allocate much more to innovation rather than integration and customization.

Deutsche Telekom is using the Open APIs in this way. The company is the top downloader of Open APIs and an active collaborator in the ODA project. The company's European division has used Open APIs to introduce a single self-care mobile application for consumers called OneApp across Europe (see below). The German division is also using Open APIs for customer-facing systems.

"There are thousands of initiatives looking at the TM Forum Open APIs within Deutsche Telekom, varying from just one system architect using a single API to very big projects," says Alexis de Peuffeilhoux, Senior Enterprise Architect, who works in the company's German operating company. "Even so, we have one effort to provide Open APIs at the enterprise level, and this is where we are currently concentrating on developing the APIs we need for the commercial front-ends on customer care, such as online shopping and the call center."

The goal of the enterprise Open APIs is to wrap still monolithic business support systems (BSS) with a decoupling layer to increase agility and improve customer experience. De Peuffeilhoux explains:

“

Standardizing on the Open APIs reduces complexity. They bring a common neutral language that everybody can speak to the others within the company. And so, if I use a Customer API, most of my colleagues now already have an idea what that is because they are currently adopting the TM Forum vocabulary and data model.”

Flipping IT

Vodafone Group, the No. 2 downloader of Open APIs and an ODA leader, is guiding transformation of operating companies in 24 markets globally as part of a strategy called "Flip IT", which got underway in 2015. A chief goal has been creating digital experience layers in the operating companies.

"We are undergoing a two-phased transformation," says Dr. Lester Thomas, Chief Systems Architect, Vodafone Group. "The first stage is creating a digital version of our own business, and the second phase is developing digital ecosystems... If you do the first phase right, all the investment helps you become more agile."

Doing it right means investing in people who understand the value of APIs and will be devoted to developing the API strategy. Thomas says that in the Vodafone companies where Open APIs were adopted first, the common success factor was that the local team had API evangelists.

The operating companies are transforming digitally in strategic phases, driven by local challenges. For example, one of them needed to integrate several acquired fixed-line companies, so they wrapped legacy systems using Open APIs so that they could sell quad services quickly and effectively. Two others were greenfield operations, so they started with an Open API strategy.

Vodafone UK is an Open API success story in terms of quantifiable benefits (see [page 20](#)), and Vodafone Group is also beginning to deliver platform-based services using Open APIs and ODA (see [page 30](#)).

Deutsche Telekom saves time with Open APIs

In 2017, Deutsche Telekom's European division deployed 17 Open APIs in five markets – Poland, Czech Republic, Slovakia, Hungary and Croatia – as part of an effort to develop its OneApp mobile application. Previously, each country had its own app, and all were based on differing architectural approaches.

Deutsche Telekom developed what it calls the Harmonized API Layer (HAL) to be used for future front-end solutions such as customer self-care and e-commerce. Company executives

say they were able to save "a hell of a lot of time" by using APIs that already exist rather than creating them from scratch. They were able to cut the time in half, and expect similar results for future projects.

"If you want to introduce one mobile application with one single code, the only way to do this is if you have a middle layer with the same APIs in all those countries," says Dominik Periškić, who served as Project Director of HAL. "This is the only way you can actually hide the complexity of the whole

OSS/BSS landscape in all those countries. Standardization makes it easier on the front end because you don't have to build the specific code for each of those countries."

Read the full case study:



Open APIs power Vodafone UK's Digital Experience Layer

Vodafone UK's Digital Experience Layer (DXL) is a good example of how to use Open APIs to transform customer-facing systems.

Several years ago, the mobile operator introduced a first-generation mobile app, but it was a stand-alone solution with each customer-facing channel still operating in an IT silo using unsynchronized data. New product introductions required significant

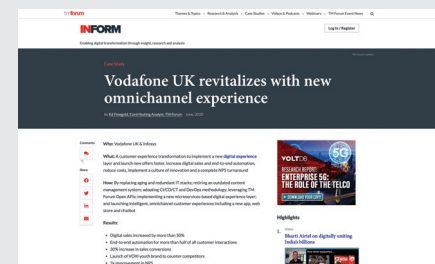
changes to systems of record, and business units could not roll out new offers fast enough.

In 2016 Vodafone UK wanted to introduce a new digital omnichannel experience that rivaled companies like Netflix. The operator turned to Infosys which advocated a single, common digital experience layer built on microservice components in the Amazon Web Services cloud. The idea

was to enable common customer journeys across all channels.

Vodafone UK's is using three Open APIs in DXL: Customer Bill Management API, Party Management API and Product Inventory Management API. The company's overall goal is to enable a modular platform architecture that provides interoperability, scalability and well-defined interfaces between omnichannel solutions and downstream systems. The graphic below shows significant benefits including a 13-point increase in Net Promotor Score (NPS) and measurable improvement in subscriber growth and revenue.

Read the full case study:



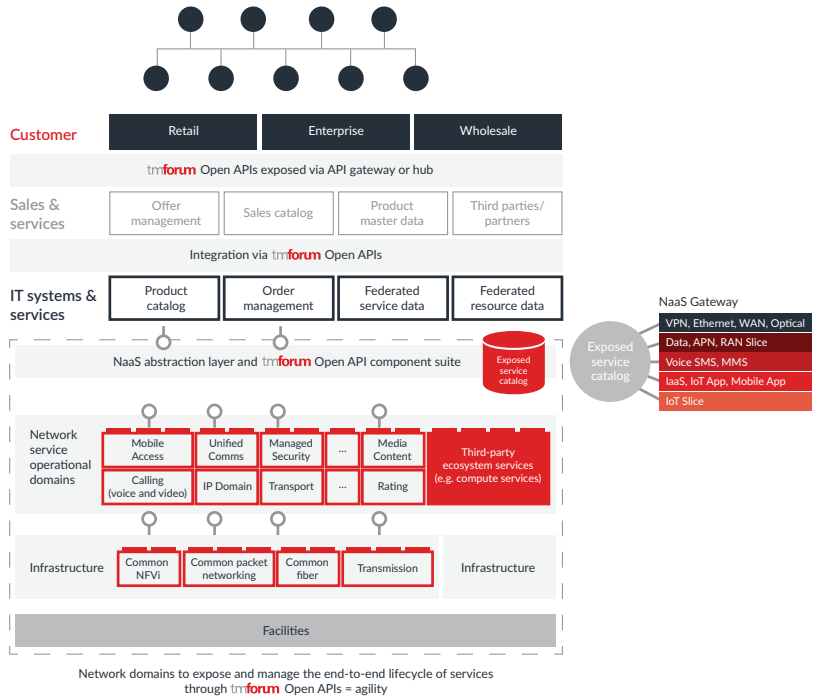
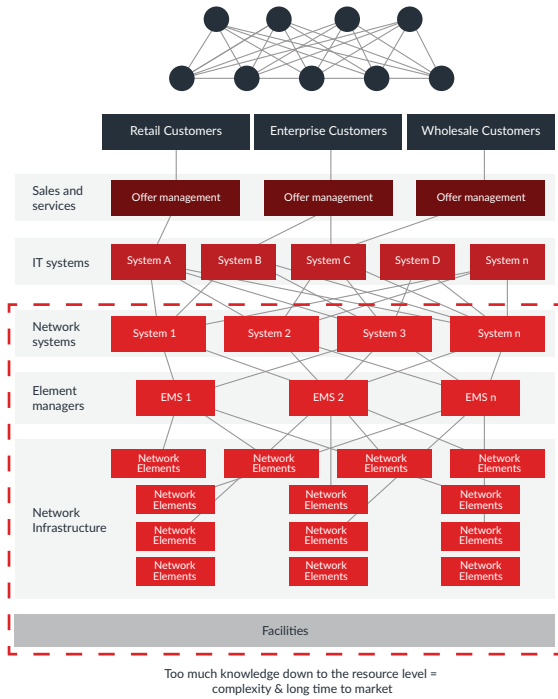
Beyond BSS

The move toward a true platform-based architecture requires using Open APIs not only in customer-facing systems, but also in the production layer where systems such as orchestration and service assurance interface with network components. CSPs can then open these systems to partners and customers using Open APIs. This can include adopting network-as-a-service (NaaS).

NaaS is a flavor of software-as-a-service that enables CSPs to provide network experiences that are similar to cloud computing, in that customers can use self-service portals to make changes, with service activation executed on demand. NaaS can be viewed narrowly as a way for CSPs to deliver enterprise connectivity services like SD-WAN over fixed networks.

But increasingly, some operators are adopting NaaS as a transformative architecture that builds on network functions virtualization and software-defined networking. As CSPs deploy software-defined 5G core networks, it will be possible to deliver NaaS as a mobile service using network slicing. The graphic below shows the simplification that is possible when CSPs adopt a layered NaaS architecture.

CSPs need to simplify



TM Forum, 2021

Using intent & AI

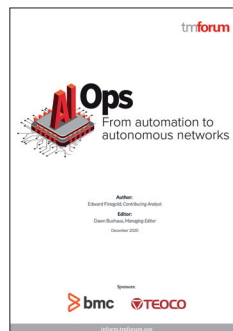
In this approach, CSPs can use intent-based management, where operational domains abstract the complexity of the network at a high level and expose network services (service function chains made up of interconnected virtual and/or physical network functions) through an Open API like the [TM Forum Service Configuration and Activation API](#) to an orchestration system.

The goal then is to manage the lifecycles of these network services autonomously using the customer's intent, policy, closed control loops, data analytics and AI. Importantly, the network services exposed and used for products sold to customers can be reused without having each product defined and associated with the complete resource definition for each

network service. Instead, products are linked to network services through Open APIs, and it is the responsibility of the operational domain to decide how that network service will be delivered.

TM Forum's [ODA](#), [Autonomous Networks](#) and [AI, Data & Analytics](#) collaboration projects are all working to advance automation and AI in operations (AIOps).

Read [this report](#) to learn more:



Telstra successfully used Open APIs to [implement NaaS](#) as part of a major transformation in 2018, and AT&T used them recently to deliver optical wavelength services with impressive results in a Catalyst proof of concept (see [page 22](#)).

AT&T quantifies significant NaaS business impacts

AT&T was the first North American CSP to sign the Open API Manifesto in May 2019, with a goal of speeding the company’s operational transformation programs.

“We went the TM Forum route because it has probably the biggest portfolio of open APIs that are available to the marketplace,” says Ernie Bayha, a Lead NaaS Consultant for AT&T.

“Approximately 11 of these TM Forum Open APIs have been implemented within AT&T, as we kick the tires and evaluate the ones that are most important to us.”

One area AT&T is focusing on is inventory management, and Bayha notes the challenges the company faces are shared among CSPs.

“It is AT&T’s goal to have a common inventory model,” Bayha says. “We hope to provide a ‘single pane of glass’ so that we can evolve and use federation and Open APIs to provide that single view of the inventory... We

want to do something in the inventory space that can save us a lot of money going down the road and provide better support to our operational clients.”

A recent TM Forum Catalyst project championed by AT&T demonstrated that it may be possible to achieve a 50% reduction in time to revenue and a 50% reduction in provisioning time for optical wavelength services using Open APIs and NaaS. The team used five of the Open APIs to automate ordering and provisioning of optical wavelength services.

In this case, a customer was able to order a 100 Gigabit wavelength service between Houston and Atlanta using a self-service portal. NaaS was used to define and expose reusable services by decomposing the wavelength service into reconfigurable optical add/drop multiplexer (ROADM) or Open ROADM connections, tail service connections for each customer end point, and a logical link aggregation (LAG) service.

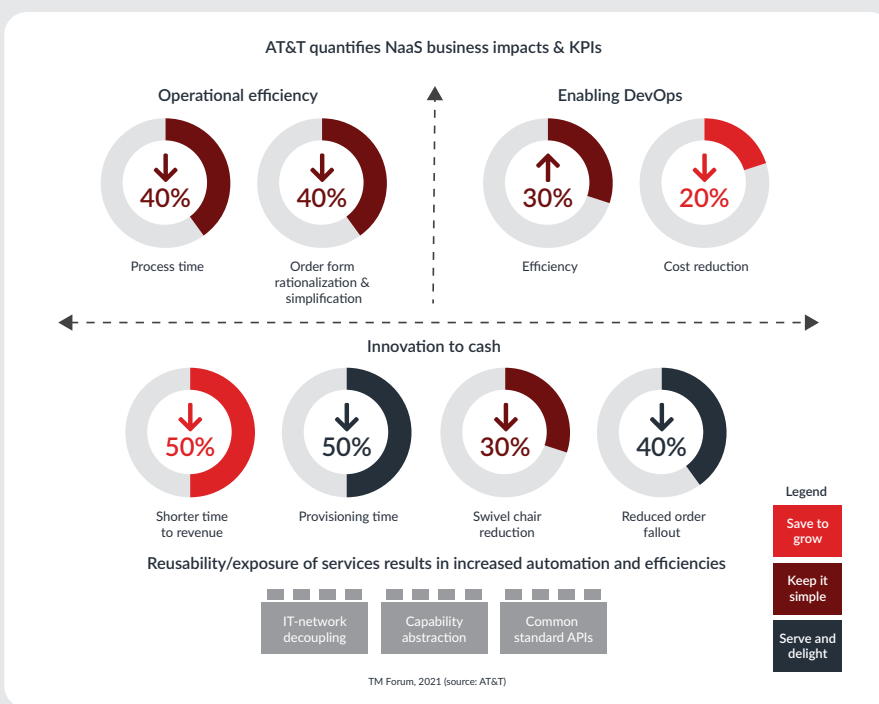
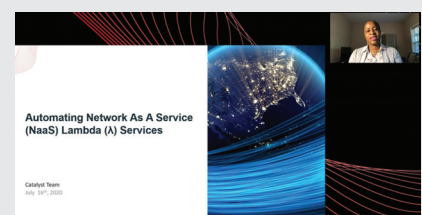
AT&T and participants in the project used Open APIs to set up a product catalog consisting of a composite wavelength service product for the enterprise market and wholesale ROADM service product for the wholesale market. Importantly, the interfaces did not include specific information about the network resources used to deliver the wavelength service.

As Allison Whittaker, Area Manager, AT&T, noted during the team’s live demonstration this summer, ordering and other IT systems need to know what to deliver based on the customer’s intent, but they do not need to know how the services are implemented in the network. This abstraction of the network details from the IT domain/ordering system is the key to NaaS and reducing complexity.

The graphic below shows the potential automation and efficiencies that are possible from abstracting network capabilities and decoupling IT systems from the network.

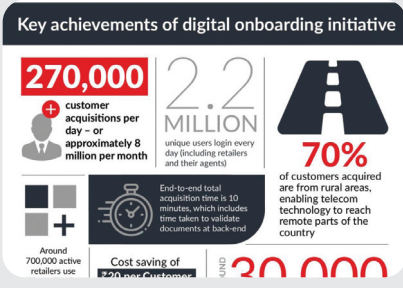
Based on its experience, AT&T has collaborated with other TM Forum members on a user guide for service fulfillment that provides best practices and lessons learned during the Catalyst implementation. The company hopes that participation in the Catalyst Program will lead to deployment of NaaS in a production environment.

Watch the Catalyst demonstration to learn more:

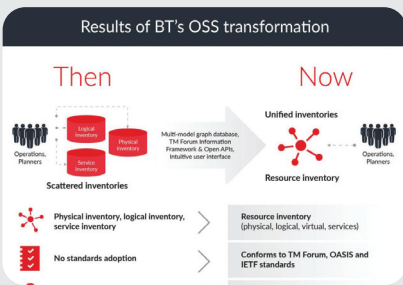


Additional case studies

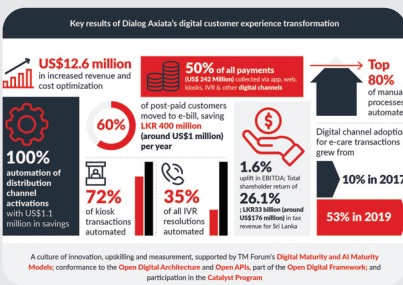
The final pages of this section include brief summaries and links to many more case studies highlighting the quantifiable benefits of using the Open APIs for internal transformation. The list is not exhaustive; more case studies and summaries of dozens of TM Forum Catalyst proofs of concept using Open APIs can be found on [TM Forum Inform](#). In the next section, we'll look at how CSPs are using Open APIs to partner.



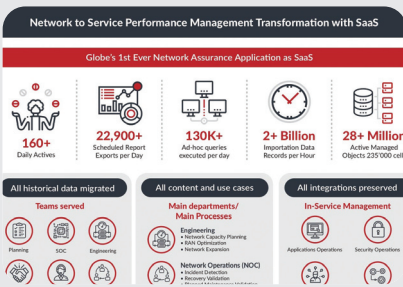
Bharti Airtel onboards 270,000 new customers every day. Doing this manually, including verifying people's identity, was so labor intensive that within just four months of implementing a new digital customer onboarding process supported by Open APIs, the company was able to save \$9 million in operating costs.



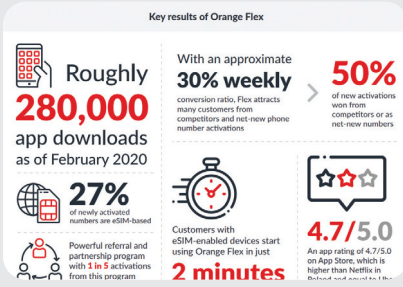
BT collaborated in a TM Forum Catalyst project that led to a transformation program consolidating network inventory systems using ODA, Open APIs, open source technology and NetSecOps. The company has saved millions in capital and operating costs and reduced time to onboard new network capabilities from 18 months to less than a week.



Dialog Axiata used ODA and Open APIs to transform customer experience in order to implement personalization and automation across app, web, retail, kiosk, contact center and social media channels. The results were significant: \$12.6 million in increased revenue and cost optimization and automation of the top 80% of manual processes.



Globe Telecom had more than 10 systems supporting network performance management alone. Using ODA and Open APIs, the company implemented a cloud-native service assurance suite and migrated the mission-critical capability to the public cloud – a first in Southeast Asia.

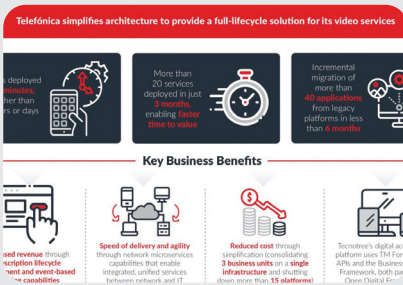


Orange Poland, the third largest operator in the Orange group after France and Spain, is a good example of using Open APIs to transform locally is. The telco is handling two major transformations in parallel: building an integrated, omnichannel fixed, mobile and convergent front-end for sales and care; and developing a dedicated digital offer called “Flex” which aims to capture a new customer segment through simplification.

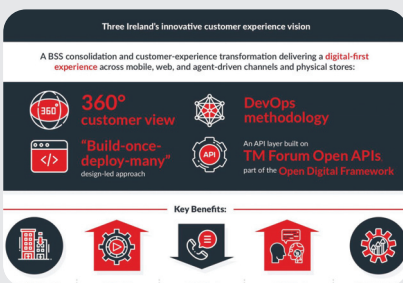
[Watch this episode](#) of TM Forum’s Hard Talk to learn more about Flex.



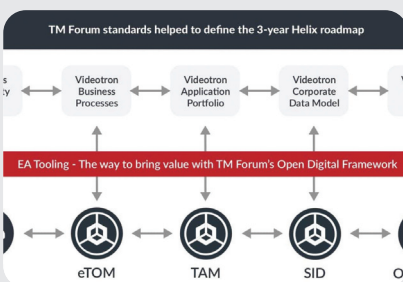
STC’s hodgepodge of legacy BSS made it impossible to get a 360-degree view of each customer’s experience when they subscribed to multiple services. It took six to eight months to launch new services, bundles couldn’t be supported and there was limited adoption of digital channels. The company used Open APIs and other TM Forum assets to transform, resulting in significant improvements to customer experience.



Telefónica used Open APIs to expand its Movistar Play video service to its entire customer base. As part of the project, the company migrated over 40 business and service processes to a new, unified platform that also enables faster activation for new customers and faster rollout of new video services.



After acquiring O2 Ireland, **Three Ireland’s** BSS landscape was sprawling, consisting of more than 300 different systems, 16 catalogs and more than 50 third-party partners spanning both business and consumer markets. Three implemented a Digital Experience API layer based on Open APIs, with a focus on digital customer commerce and care.



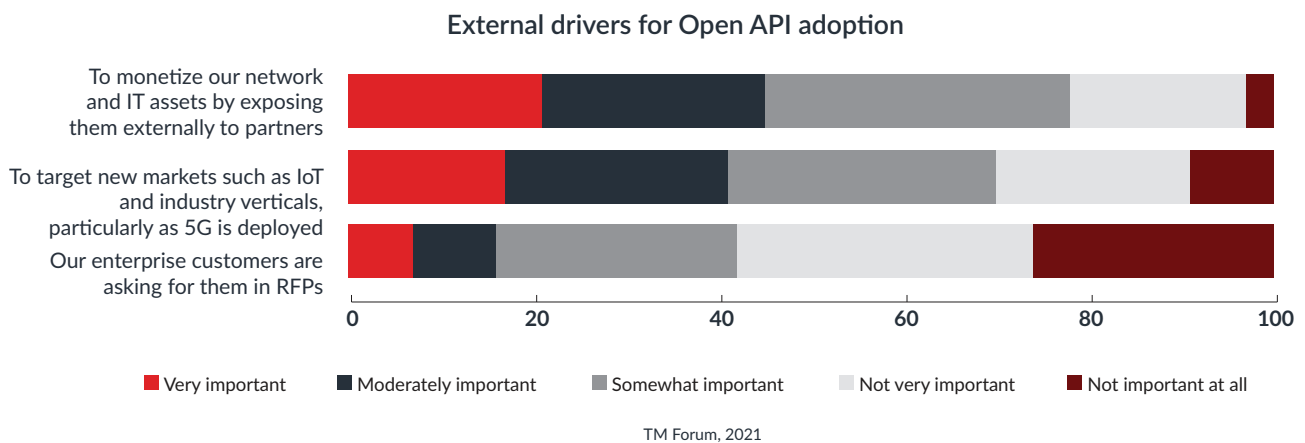
In 2018, **Vidéotron** began an ambitious plan to transform to an agile, open, standards-based architecture. The first milestone of that plan was Fizz, an independent all-digital mobile brand. One of the key elements powering Fizz is its hybrid cloud environment, in which it uses Amazon Web services as the operational platform for its business support systems and part of its core network, and a private cloud for the mobile and fixed Videotron networks. This model proved so successful that Videotron used it as an inspiration for another new TV service called Helix.

Section 4

Using Open APIs for partnering

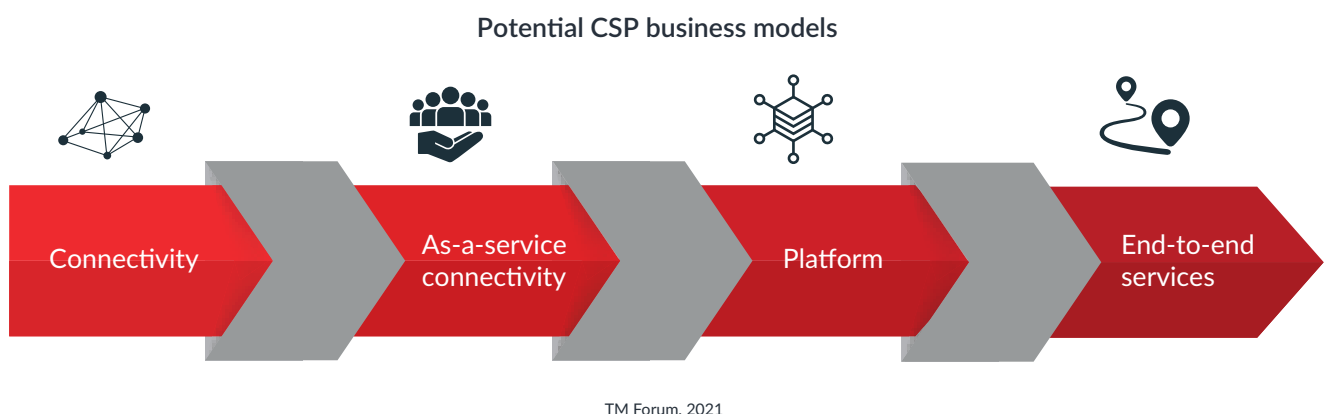
After they have transformed their IT environments, communications service providers (CSPs) can leverage Open APIs as part of a platform strategy to expose systems externally to enterprise customers and partners. This is still largely a goal rather than reality, but some operators are beginning to deliver platform-based services.

The graphic below provides a more detailed look at the three drivers for using Open APIs that ranked lowest in our survey: monetizing network and IT assets, targeting new markets as 5G is deployed, and satisfying enterprise customers' demands for standard APIs. Clearly CSPs do not yet find these drivers as important as reducing costs and complexity, with only a small percentage rating them as "very important".



Slow progress

Much of our research in the past two years has focused on potential business models for CSPs. Our 2019 report [5G future: Business models for monetization](#) proposed a continuum of models, ranging from being a best-in-class connectivity provider to providing full end-to-end services to enterprises. The graphic below from that report shows the progression of offers that are possible.



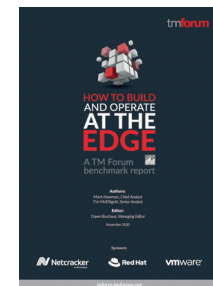
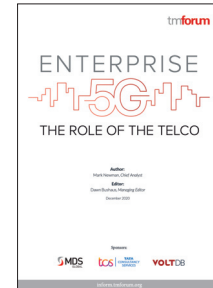
A year ago, we noted that CSPs' progress toward the right side of the continuum was slow-going. Our research for this report indicates that this is still the case. Indeed, several of the operators we spoke to said that their companies are aspiring to use Open APIs to expose IT assets to partners, but they admitted they still have a lot of work to do before this can happen. Only a small number of companies are beginning to deliver true platform-based services, and most are in the early stages. We'll look at a couple of them later in this section.

TM Forum CEO Nik Willetts believes CSPs must evolve beyond selling only core connectivity products or risk disintermediation by competitors. During a session at Digital Transformation World Series (DTWS) [he explained](#):

"You've got to remember, the same customer who's buying your connectivity product is very happily buying a hyperscale cloud product. And the difference in experience, ease of access and elastic pricing of the whole offering makes telco offerings feel like the Dark Ages."

Indeed, with APIs sitting between CSPs and enterprise customers, telcos can become much more like hyperscale cloud providers in terms of agility and ability to respond to customers' and partners' needs quickly (see panel). This is a significant motivation for developing industry-agreed Open APIs and ODA. This approach fundamentally changes the role of IT, turning it into a kind of wholesale provider of all kinds of services to internal and external customers.

Read these reports to learn more about monetizing 5G business models and CSPs' plans for edge computing:



Open APIs level the playing field

In 2016 when Twilio was listed on the New York Stock Exchange in an initial public offering (IPO), the company was valued at \$1 billion. By the end of the first day of trading, it was worth \$2.4 billion. As TM Forum's VP of Digital Ecosystems Joann O'Brien [noted at the time](#), Twilio made a whole new market possible by enabling things to work together through APIs that previously were discrete and incompatible. Had the communications industry consolidated around open APIs way back when for SMS systems, network operators could have captured that multi-billion-dollar market for themselves.

At the time of Twilio's IPO, [The Guardian](#) newspaper did a good job explaining the company's literal overnight success: "Twilio provides a messaging platform for developers, which means that

companies can use its tools and services to create their own messaging apps and features. It has stayed focused on helping software developers do things that were previously considered really hard. Huge barriers prevented developers from working with the different telecoms providers and their complicated SMS gateways, their many standards and protocols, and their unmanageable pricing structures. Twilio successfully broke down all the things that stopped developers from creating messaging features into a few simple pieces that made a whole new market possible."

O'Brien puts it even more succinctly. "Twilio, Apigee and others have been able to recognize and exploit fragmentation in our industry," she says, noting Google's 2016 purchase of Apigee, an API management platform, for \$625

million. "The Open APIs are a way of leveling the playing field."

Indeed, Apigee [discusses](#) telco fragmentation in a publication about the Apigee API Exchange: "The market for services is global. Companies are no longer competing exclusively in their 'home' markets. To be competitive, companies in all industries need to think about regional or global markets. This means releasing services not necessarily tied to your geography or network (in the case of telcos) and finding ways to interoperate with other API providers..."

CSPs are starting to realize the benefits of industry standard Open APIs to expose their assets not only to developers inside their own companies, but also to developers working for partners and customers. The result is much faster innovation.

Centralized data platform

A handful of CSPs are offering platform-based services today. One excellent example is China Unicom Group, which used blockchain technology and APIs to develop a centralized data-sharing platform across 31 subsidiaries. The platform is based on the ODA and uses 25 Open APIs along with other TM Forum assets. It relies on using mobile numbers to verify users and allows data to be referenced between systems, rather than replicated.

China Unicom is using the platform to share data with over 1,000 enterprise customers in more than 20 industries, such as banking, insurance, technology, ecommerce, aviation, real estate, consulting, handset vendors, government, education, media, manufacturing and tourism. This includes 74 automotive companies responsible for around 15 million connected cars.

China Unicom uses a layered architecture which includes an API enablement platform. It is made up of 771 APIs and contains all the company's big data and AI capabilities. The platform exposes them to front-end applications and sees an average of 200 million API calls per day. China Unicom estimates it has saved \$22 million in IT costs related to data storage and management using this approach. Read the full case study [here](#).

China Unicom's centralized data-sharing platform

Powered by **Blockchain**

Unifies data across



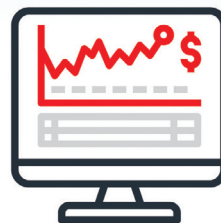
and enables the operator to share and trade data with enterprise customers to allow them to develop and augment services

This includes



responsible for around **15 million connected cars**

The platform uses **mobile numbers** to verify users and **allows data to be referenced between systems**, rather than replicated,



resulting in savings of around **\$22 million in IT investment costs** related to data storage and management.

China Unicom shares data with



over 1,000 enterprise customers from over **20 industries**

China Unicom and Whale Cloud built the data-sharing platform based on TM Forum's best practices and standards,



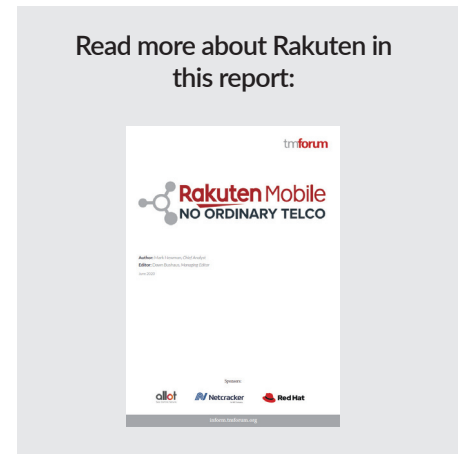
including the **Business Process Framework and Information Frameworks, Open Digital Architecture** and over 25 **Open APIs**.

TM Forum, 2020 (source: China Unicom)

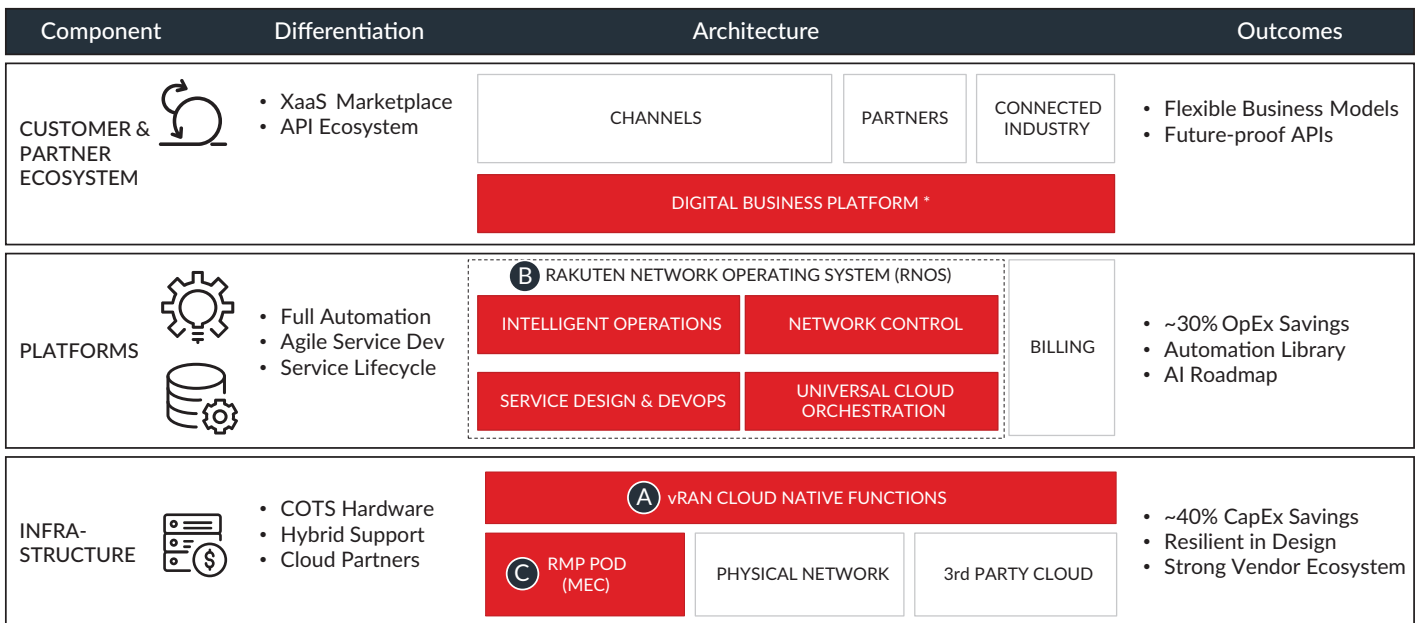
Rakuten's platform

Developing platform business models is easier for greenfield operators like mobile startup Rakuten because they are building cloud-based networks and IT environments from the start. Rakuten is using Open API-enabled IT systems as part of its Rakuten Communications Platform (RCP), which the company describes as a platform to enable other telecoms operators to rapidly deploy low-cost virtualized networks.

The graphic below illustrates the platform, which aims to bring together all the necessary components for mobile operators to support their own digital ecosystems of partners. [In a blog about RCP](#), Rakuten explains that platform customers will be able to visit an online marketplace where they can click, purchase and deploy everything needed to run their private, cloud-native, virtualized 5G mobile network, wherever they may be located in the world. The company says it will start testing RCP early in 2021.



Rakuten Communications Platform



TM Forum, 2020 (source: Rakuten)

Telia's Division X

Another way to embrace platforms is to create an entirely separate business unit. Sweden's Telia went this route when it created Division X to develop IoT services with partners. The company's digital ecosystem enablement platform is built on Open APIs.

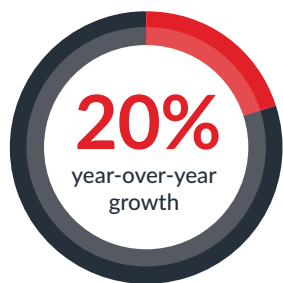
Importantly, the platform allows Telia to experiment with new business and charging models, and develop, fulfill and monetize joint offerings with partners. A single platform across local operating companies gives Division X the advantage of developing and managing offers centrally, while allowing tailored solutions for specific markets – using

local partners, languages, currencies and tax codes, for example. This platform is now a hub for more than 600 enterprise customers. Read the full case study [here](#).

Telia's Division X accelerates IoT revenue growth using Infonova Digital Business Platform

A New Avenue for Revenue Growth

In 2019 Division X was driving



Becoming the Hub for Enterprise Customers

More than 600 enterprise customers

+600

across...



Leveraging Economies of Scales

With the platform, Division X **develops** offerings **centrally** & sells them **locally**



Reducing Time to Market & Accelerating Innovation



Experimenting, Monetizing and Growth with New Business Models

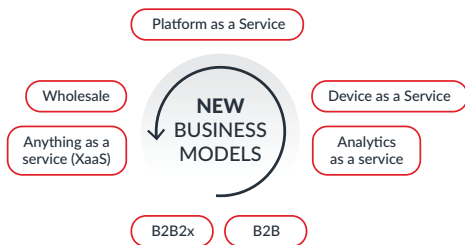
+70

Leveraging business flexibility and advanced charging to introduce new business models

launched on the platform in **2019**



IoT Solutions



Driving Sustainable Development Goals



Division X is using the platform to launch solutions, supporting Telia's overall ambition in driving the European Sustainable Agenda

Using TM Forum assets to enable these achievements

TM Forum Information Framework principles are adopted by the Infonova Digital Business Platform and support Division X's B2B2X digital services innovation activities. By using TM Forum Open APIs, the platform allows Telia to move to a more efficient single platform configuration and enables simple and fast onboarding of new IoT services.

BearingPoint.//Beyond

TM Forum, 2020

IT is strategic

Among incumbent operators with a lot of legacy systems, becoming a platform provider requires completely rethinking IT. As Orange CEO Stéphane Richard explained in his keynote at DTWS, “IT is no longer simply the concern of the CIO. It is now a strategic capability that is highly visible in the boardroom. But I think we as an industry have to take an honest look at the way we operate our IT, where we stand versus the competition, as well as how we are perceived by our customers.”

Orange and Vodafone are both delivering some platform-based services today. Together the companies have been instrumental in creation of the ODA Reference Implementation, which is being developed as part of the *Business Operating System (BOS) Catalyst Project*, the goal of which is to allow rapid innovation through modular software components that run in a standard microservices operating environment. Both companies are also embracing the concept of software marketplaces laid out in TM Forum’s recent ODA white paper (see panel on [page 32](#)).

Platforms at Orange

Orange was one of the first companies to sign the ODA Manifesto. It has been adopting Open APIs for several years as part of its digital transformation strategy and is a huge advocate of using standards and open source technology.

Richard explained that embracing a component-based architecture is key. “I am fully convinced that the industry needs a rapid shift to an open, modern software-based technology architecture that enables new operating and business models, one which is loosely coupled, cloud native and AI-driven, made up of components which can be easily procured and deployed without the need for customization,” he said. “In

other words, the telco industry must evolve from the closed IT architecture, where it is only delivering its own services to its own customers, to an open platform architecture that is accessed through openly available APIs. This is the purpose of ODA.”

Orange operates as a federation of national operating companies with local IT teams in every country. These teams operate autonomously with corporate labs to support them, so technical and IT governance must be clear. Orange Group identifies what should be local and global. For example, front ends and customer management platforms are local solutions, while services and offer and product platforms are shared across operating companies.

The company’s API program has two primary goals: transformation through APIs and improving developer channels. API transformation aims to change the mindset and culture within each Orange operating company and to help projects expose and consume APIs. The company views both internal and external developers as customers, and to make it easier for all developers, Orange offers easy-to-use tools such as a web portal for internal use and external use (developer.orange.com).

The company is adopting Open APIs to develop new business opportunities with partners. For example, Orange’s wholesale division, Orange International Carriers, is providing a set of standardized TM Forum and MEF APIs to sell its Ethernet Now offering to international service provider partners (for more about MEF APIs, see [page 34](#)). This set of APIs is used to orchestrate a business flow, from site retrieval, to eligibility check, to pricing quote and then to ordering and manage product inventory accordingly.

Orange also is implementing innovative IoT services to address the connected car market, which is expected to grow rapidly with the rise of 5G networks.

“The TM Forum Open APIs offer a particularly well-suited framework for the creation of such services,” says Laurent Leboucher, VP of Customer Relations Solutions and Global Architecture at Orange.

One service called “Internet on the Move” could allow car manufacturers to manage Orange eSIM cards in the cars of their customers. “This successful service uses the full set of TMF APIs involving the API product suite (catalog, inventory, ordering), service activation, resource inventory and usage consumption,” Leboucher explains. “Several famous car manufacturers are already leveraging Internet on the Move, and the list of new use cases and customers is rapidly expanding.”

Vodafone’s revolution

In Vodafone’s case, self-assessment of IT revealed an uncomfortable truth: IT was part of the problem, according to Carlos Valero, the company’s Director of IT Strategy and Architecture, who spoke with his colleague Dr. Lester Thomas, Chief Systems Architect, at DTWS.

“We were stuck in a world where we were acting as an order taker – it was a customer-provider relationship,” Valero said. “We were stuck with very large outsourcing contracts, and we were having no control in many cases about the future that we wanted to drive... This customer-provider relationship was always putting us at the low end of the value chain and not really bringing any value to the business.”

Watch the conversation between Valero and Thomas:



Revolutionary cultural change was the first step in fixing this. In Vodafone, as in most CSPs, IT represents about 5% of the business' overall expenses, yet the team was continuously expected to cut costs. The company had to shift instead to thinking about the impact IT might be able to make on the other 95% of costs, and on what role software could play in improving agility and increasing innovation.

This led to focusing on IT not as a cost center, but as a key enabler for the business. To do this, the company is taking four important steps:

- 1 Identify the digital capabilities IT can provide to internal and external customers
- 2 Build a modern digital architecture that is API-driven and component-based; the company calls this V-ODA (Vodafone ODA)
- 3 Adopt Agile and DevSecOps practices to find new ways of delivering IT
- 4 Leverage employees and partners with an aggressive insourcing plan to acquire skills

While Vodafone Group is not executing a single transformation program across all operating companies, the group sets guidelines for the companies to follow and tracks every local replacement of systems in a federated way through what Valero calls a "strategy monitoring framework". This includes measuring progress and taking action when expectations aren't met.

For example, after the first two years of the Flip IT strategy, Valero's team discovered that targets for acquiring software skills through insourcing were not being met and needed to move faster. "We created much more aggressive targets for the insourcing and made very, very clear where we

wanted to insource [certain] profiles," he explains. "And then we involved the whole company from HR to finance and all the different actors to make that a reality."

These profiles included software engineers, architects and API specialists in Vodafone's Engagement Management layer, according to Thomas, and the company expects to continue insourcing such roles for its Network as a Platform layer. So far, the initiative has been successful, with the company insourcing thousands of roles and consistently delivering on its targets year after year. Vodafone Group now aims for 50% of its technology workforce to be software engineers by 2025.

Targeting IoT

As part of its Technology 2025 strategy, Vodafone Group is using Open APIs and ODA to push into new markets as a platform provider, with IoT as the first.

Vodafone is selling platform-based IoT services to enterprises in verticals such as manufacturing and automotive. The company is collaborating with Ford Motor Company and TM Forum in an important 5G IoT project called [5GEM \(5G Enabled Manufacture\)](#). It is a 22-month project supported by a £3.9 million (\$5.1 million) investment from the UK government. Other participants include ATS, HSSMI, Lancaster University, TWI and Vacuum Furnace Engineering.

The goal is to use 5G and AI in manufacturing to connect machines, allowing real-time feedback, control, analysis and remote expert support. TM Forum will contribute [Open APIs](#) for key purposes including IoT devices, ensuring portability and scalability of the solution across the globe, and management of connectivity through network as a service (NaaS).

“

We want to create a platform ecosystem to enable adjacent businesses to our more traditional one," Valero says. "We strongly believe that everything will be software in the next few years... And we believe that to be successful in the world of platforms and ecosystems, we need to move away from traditional RFX processes and towards rapid proofs of concept and software marketplaces. We are already moving in that direction."

The vision for modern telecoms marketplaces

In May 2020, 11 companies, seven of them CSPs, collaborated on a [TM Forum white paper](#) that sets out a clear, industry-agreed vision for marketplaces in the telecoms industry. The vision is two-pronged:



Development of a new procurement model for CSPs and their suppliers, in which purchase and assembly of interoperable solutions is easier and cheaper because of the adoption of industry-standard, self-describing ODA components



Creation of marketplaces that allow CSPs to expose their capabilities to developers, customers and partners

The way CSPs and suppliers currently do business is extraordinarily expensive. Our 2019 report [Time to kill the RFP?](#) found that procurement today costs the industry \$1 billion a year, and these are only the direct costs. The true cost of running lengthy RFP processes in terms of risk and impact on agility is much higher.

This is beginning to change, however. In the survey for this report, 40% of suppliers said their CSP customers are soliciting bids in ways other than RFPs – for example, hosting hackathons that require vendors to demonstrate how their technology works and how well their Open APIs work in practice.

One large European operator ran a hackathon recently to evaluate Open API adoption in customer-facing IT systems and was surprised at the results. The company started the process using a traditional RFP process to shortlist suppliers and then ran hackathons to evaluate potential solutions. The goal was to find out not only whether the products' Open API implementations worked, but also how well each supplier's team worked with the CSP's IT team.

The supplier that was the lead contender going into the hackathon – a large, well-established vendor that the CSP expected to win the bid – did not perform well during the evaluation. The unexpected winner delivered a more conformant solution, and the opportunity to work together revealed that the winning vendor's team fit better with the CSPs IT team.

“Software marketplaces are a very fascinating vision,” says Alexis de Peufelhous, Senior Enterprise Architect at Deutsche Telekom. “To achieve this, we need more collaboration between operators to engage and create a bed of Open APIs that everybody exposes. The room for interpretation in the Open APIs today makes it quite challenging to say, ‘Okay, I’m going to deploy something that works on Orange Open APIs or on Vodafone Open APIs without any change. That needs to be demonstrated.”

Several groundbreaking [TM Forum Catalyst proofs of concept](#) have been exploring the concept, looking at potential B2B and B2B2X business models that offer a variety of roles for CSPs: a customer in a software marketplace; a partner for developers; and sellers of platform-enabled services to industry verticals.

The [Business Operating System Catalyst](#), for example, which is creating the ODA Reference Implementation, is aiming toward development of a marketplace for software components. As noted, this project has led to creation of the ODA Component Accelerator, which we'll discuss in more detail in [Section 6](#).

The [Developer is king!](#) project seeks to help CSPs monetize 5G and edge by looking at two of the potential roles: selling to enterprises or other organizations in verticals like

education, automotive, healthcare and manufacturing; and partnering with developers. A multi-phased, award-winning project called [Digital Business Marketplace](#) has been developing a telecoms marketplace similar to the Apple or AWS marketplaces (AWS is a participant in the project), where CSPs and partners can share products and services and repackage them with their own services for customers. And the [App Trading Marketplace](#) project, championed by Axiata, has also developed a marketplace where CSPs can publish their own applications for use by other operators in non-competitive geographies.

Click on the screen shots below to watch the Catalyst demonstrations.

BOS Catalyst:

Today's Application Architecture

- A typical Market has ~180 BSS/OSS applications.
- Each application has its own operations approach.
- The TM Forum TAM (Telecoms Application Map) is a human readable classification model for all applications required to run a CSP. This is only loosely followed by Software vendors and CSPs.
- Open APIs provide standard approach for integrating applications, but don't address challenge of deploying and operating a complex application landscape.

Cloud-native Component Architecture

- Software Components running on an open standard cloud-native 'Canvas'.
- Each component has a self-describing 'Envelope' with all the meta-data required to fully automate the management and operations. The implementation of the component can be proprietary ('black-box') or open-source ('Glass-Box').
- Components can be made available in a Component Marketplace.
- An open-source style collaboration for building the ODA Component standards.
- Component CTAs and certification to enforce inter-

Developer is king!:

Example Use Case Flow for Remote Learning - D2C biz model

Device arrival at customer site → Local installation → Configuration → Host 2 platform → Device subscription → Registration

Enables: Faculty engagement, Learning by Gamification, Self-paced learning, Personalized content, and Independent events.

Digital business marketplace:

Digital Business Marketplace - Phase 1

Multi-partner ecosystem

Device arrival at customer site, Local installation, Configuration, Host 2 platform, Device subscription, Registration

App trading marketplace:

Unique Value Proposition - Multicloud Edge Platform

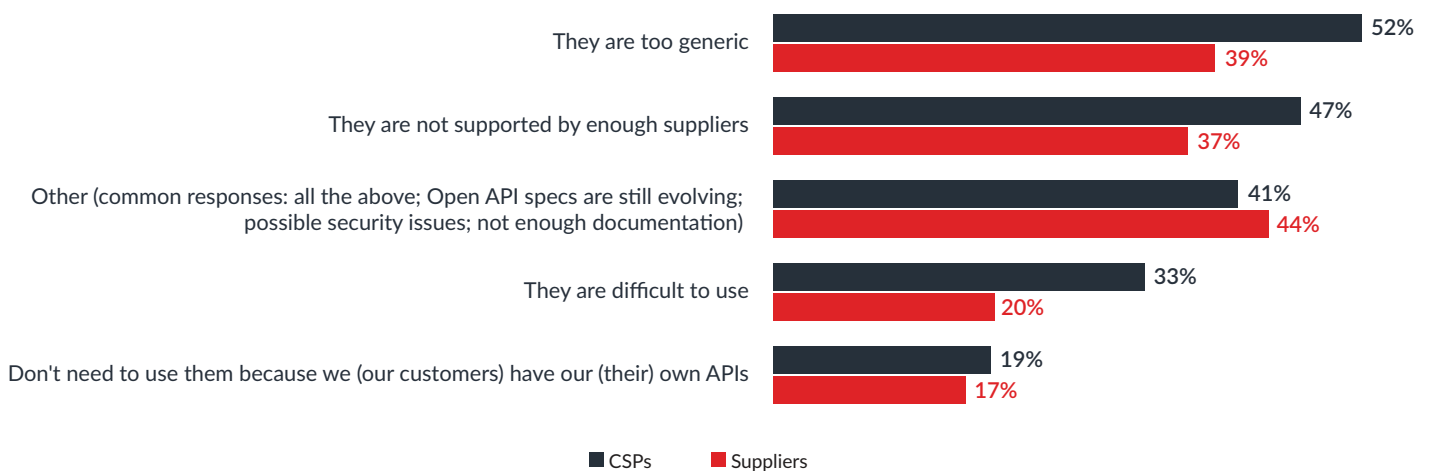
- Lower time to market of innovative 5G IoT use cases, on The Edge
 - Consolidation of all relevant use cases
 - Edge
 - Network
- Lower operation costs, on The Edge
 - Virtualized edge services
 - Automation and
 - Edge resource management (2)
- Cloud native elasticity and reliability, on The Edge
 - Virtualized edge services
 - Automation and
 - Edge resource management (2)
- New sources of revenue, from The Edge
 - New and emerging IoT services
 - Edge to be licensed related to new parameters (e.g. location of IoT devices)

Section 5

Where are the roadblocks for Open API adoption?

Although many communications service providers (CSPs) and their suppliers are benefitting from using TM Forum Open APIs, there are some hurdles to clear if the interfaces are to become the de facto standard for the telecommunications industry. Some of these obstacles may be a matter of perception rather than a serious problem inhibiting adoption, but all will need to be addressed.

Challenges to using Open APIs



TM Forum, 2021

As noted, an early challenge some CSPs have faced in adopting Open APIs is getting buy-in across the organization, when most companies have already developed their own APIs. It is costly to replace them, so a strong business case is usually necessary.

We asked about this challenge and others in our survey, and it was viewed as the least problematic, with only 18% of CSPs citing it as a drawback to using the Open APIs. This represents progress, which we'll discuss more in the next section.

Are the APIs too generic?

The biggest challenge, according to CSP and supplier respondents, is that the Open APIs are too generic, meaning users must do additional programming to get the functionality they need. More than half of CSPs cited this as a drawback to using the APIs.

The idea that they are too generic has long been a common criticism. But the Open APIs are, in fact, designed to be generic; it is what makes them open, standard and reusable. Take the [Product Ordering API](#), for example. This API can be used to order any type

of product because the product information is passed via reference, not value. The product details are contained in a product catalog, and that definition explains which attributes are mandatory and which are optional. Software code must be written on either side of the API to make this flexibility understandable.

"If we don't give you the flexibility to configure and modify payloads in the APIs, they are not going to be valuable or reusable," says TM Forum CTO George Glass. "But it does mean that there is an extra degree of training that you've got to do with your organization."

The problem is that over the years, many CSPs have reduced the number of software engineers they employ by relying on suppliers and systems integrators to manage network and support system integration. But now they need to retrain employees with software skills or hire such talent, Glass argues.

“

You’re going to have to get those people back into your organization because that’s where IT has gone and where the network is going,” he says. “If you don’t have those skills, you are going to get left miles behind.”

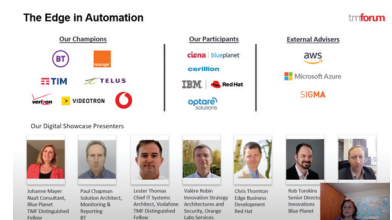
Dr. Lester Thomas, Chief Systems Architect at Vodafone Group, shares this view, noting that the Open APIs are becoming even more generic. “Effectively, the standard itself is the minimum standard to have something laid down so that you can build on top of it,” he says. “It is designed to be almost like a metamodel for how you build standard APIs – you still have to do work on top. Because they are generic, they can work for new services that we hadn’t even imagined when we designed the APIs.”

Thomas points to edge computing as an example. Vodafone is one of eight CSPs that participated in a TM Forum Catalyst proof of concept called *The edge in automation*, which demonstrated how to deliver edge computing as just one service that fits into a catalog of services delivered using network-as-a-service (NaaS). To accomplish this, the team adopted the ETSI data model describing the services available to the edge and made them available as NaaS API.

“The API is extensible and is extended even by other standards bodies to make it less generic and more specific to certain use cases,” he explains. “We’re effectively making the APIs a kernel of the absolute minimum you need for a standard, and then you add extensions to that kernel. So, the MEF and TM Forum can have effectively the same APIs, and both publish to say this is how you interoperate.”

See the panel below for details about how MEF’s divergence from the Open API standard led to an improvement to make them more useful.

Watch the video to learn more about the *Edge in automation* Catalyst:



TM Forum & MEF align APIs

Some of MEF’s APIs are examples of TM Forum Open APIs that were extended for use in Ethernet and SD-WAN applications, but the extensions caused them to diverge slightly from the standard. Companies working in both organizations raised concerns, which led to a [joint announcement](#) in October of alignment of TM Forum and MEF APIs.

The groups have agreed on measures that enable MEF LSO Sonata inter-provider APIs to conform to TM Forum Open API standards. These collaborative APIs automate business-to-business transactions between service providers for address validation, site queries, product offering qualification,

product inventory, quoting, ordering, trouble ticketing, etc.

Part of the solution includes a change to the Open APIs called “domain context specialization”, which allows TM Forum Open APIs to accommodate services like Ethernet and SD-WAN. “We always wanted to keep the payload completely flexible, and that probably wasn’t the best way to implement the API,” says TM Forum CTO George Glass. “So, we came up with this concept of domain context specialization.”

The point is to help CSPs find a better way to deliver end-to-end services, according to MEF CTO Pascal Menezes. “Services are not static

anymore, and everyone wants that cloud-like experience to go to a portal and turn up a service instantly,” he says. “We’ve come together, and it’s been great for both member [companies] that we all got in the same boat and we row the same way.”

Listen to Glass and Menezes discuss the alignment efforts in this TM Forum Quick Talk Podcast:



Suppliers' support

Another concern for survey respondents is lack of supplier support for the APIs. More than 40% of CSP respondents said the Open APIs are not supported by enough suppliers, and interestingly nearly a third of supplier respondents share their concern. This finding is consistent with the results of TM Forum's ongoing [Open API Adoption Assessment surveys](#).

Andy Tiller, TM Forum's Executive Vice President, Collaboration & Innovation, has been analyzing the adoption assessments since their inception. He is not surprised that many CSPs and vendors feel adoption is progressing too slowly. "In our latest vendor assessment survey, you can see a collection of suppliers that are very committed, but the average score is being dragged down by the group that rate much lower in terms of maturity," he says, adding that the trend is similar with CSPs.

“

You can see this in your survey results as well,” Tiller says, referring to the survey conducted for this report. **“There are some vendors that are saying, ‘It’s not happening fast enough for us – we’re fully on board and want to go faster.’ But others are holding back.”**

We'll discuss this more in the next section.

Difficult to use

Another challenge is ease of use. Nearly a third of CSP respondents and about 20% of supplier respondents said this is a problem. Comments from survey respondents and follow-up interviews uncovered two primary concerns:



The fact that the Open APIs are tied to a catalog-driven architecture and a specific information model, [the TM Forum Information Framework \(SID\)](#)



Lack of documentation and support for developers outside TM Forum

“To change to the Open APIs sometimes requires architectural changes, which incurs cost,” writes one respondent. “It also requires a consistent design approach, so that the interpretation on how they are implemented is consistent. In a large corporation that is very difficult to achieve, i.e. for all to align to the SID when it wasn't necessary in the past.”

Other respondents expressed similar concerns: “There is definite learning curve to use them, and the internal data models need to be refactored to adapt.” And, “They are attached to a framework and set of concepts that our portfolio architects are slowly ramping up on (e.g. domain-driven design).”

Alexis de Peuffeilhoux, Senior Enterprise Architect at Deutsche Telekom who is active in the Open API collaboration community, shares these concerns: “I must say that even being one of the experts about the Open APIs within my company, there are still a lot of things about which I don't know 100% of the answers.

“

“We cannot assume that all the people looking at the Open APIs have an experience of TM Forum knowledge,” De Peuffeilhoux adds. **“In our company they are developers, and some have never heard about the SID model, for instance.”**

Vodafone's Thomas agrees. “I think we probably need to have more resources for new people, for new developers who aren't part of the creation of the standards. Where do they go to find tutorials, use cases, sandboxes?” he asks. “If you look at the hyperscale internet companies, they all have their own developer conferences. So, I think there's probably more we need to do, focusing on that end developer experience for how they learn and then adopt these APIs.”

Documentation is lacking

Related to resources for developers is the suggestion from several survey respondents and people we interviewed that better documentation is needed for the Open APIs, specifically examples of how to implement them to support various use cases.

“To be made more usable, they need more examples on how to leverage them in concrete solutions,” de Peufeilhoux says. “We need to engage business and IT to publish use cases. It’s work that every operator has to do to take the use case and decide, ‘Okay, what are the needed APIs to realize this use case?’ We have started to do this in the context of the Open Digital Architecture [IG1128] with Orange – we are describing some API call flows – but it needs much more.”

Johanne Mayer, an independent consultant who has held positions within CSP and supplier companies and is an active participant in the TM Forum Collaboration Community, believes documented examples of JSON payloads used in the Open APIs are necessary as well. “That would make it so much easier, because then you are not starting from scratch.”

She adds: “When I was at Telstra and we were implementing our API gateway, we were looking for any sample that our guys working in the network domains could look at for the TMF641 or TMF640 [service activation and ordering APIs] and understand what’s in there.”

Toward this end, AT&T is contributing a network-as-a-service (NaaS) use case from its TM Forum Catalyst proof of concept (see [page 22](#)) to a new

NaaS service fulfillment “playbook” (IG1224), which is being developed in TM Forum’s Collaboration Community with Mayer leading the effort. This includes a sample payload for a NaaS wavelength service.

“The AT&T NaaS Catalyst project contributed TMF641 payloads, and these payloads have been accepted by the TM Forum,” says Ernie Bayha, Lead NaaS Architect, AT&T. “It’s intended to be a best practice, and we are trying to get the views of other CSPs in particular to find out how we can improve upon what we did in the Catalyst for end-to-end service fulfillment. Hopefully, this will inspire creation of more playbooks.”

In the next section, we’ll continue the discussion about what has to happen for the Open APIs to become the de facto standard.

Section 6

Can the Open APIs become the de facto standard?

Large majorities of communications service providers (CSPs) and suppliers want the Open APIs to become the de facto standard for the telecommunications industry, but many do not think this is happening quickly enough, especially CSPs. Each group tends to blame the other for slow progress, but evidence shows that despite this, momentum is gaining not only for Open API adoption but also the Open Digital Architecture (ODA).

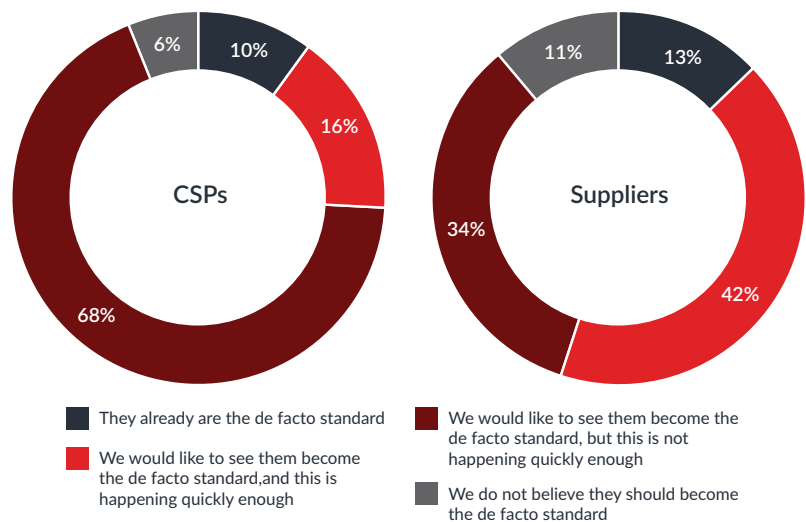
While nearly 70% of CSP respondents to the survey conducted for this report said that Open API adoption is not happening quickly enough, more than half of supplier respondents said the Open APIs are either already the de facto standard or will be soon enough. Only a small percentage of CSPs and suppliers said they do not want to see the Open APIs become the de facto standard.

We also asked about ODA adoption. As explained throughout the report, the ODA is a framework CSPs can use to develop a modular, componentized and cloud-based architecture. These components expose business services through Open APIs. Our survey found that most CSPs and suppliers are already adopting or intend to adopt ODA along with the Open APIs, which is encouraging.

Similar results

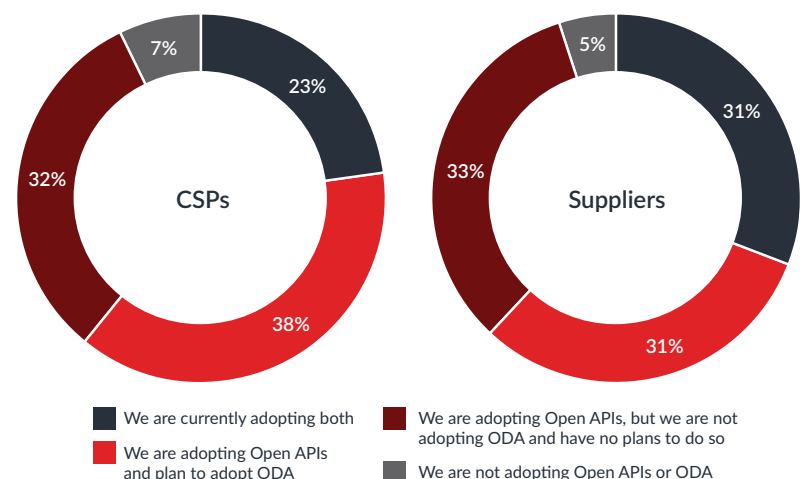
TM Forum's own ongoing Open API Adoption Assessment reports show that CSPs' intent and maturity in adopting the interfaces has always been and continues to be stronger than suppliers', but both are increasing. The graphic on [page 38](#) from the latest assessment survey reported in December 2020 shows overall adoption trends since the first survey in 2019.

Can Open APIs become the de facto standard?



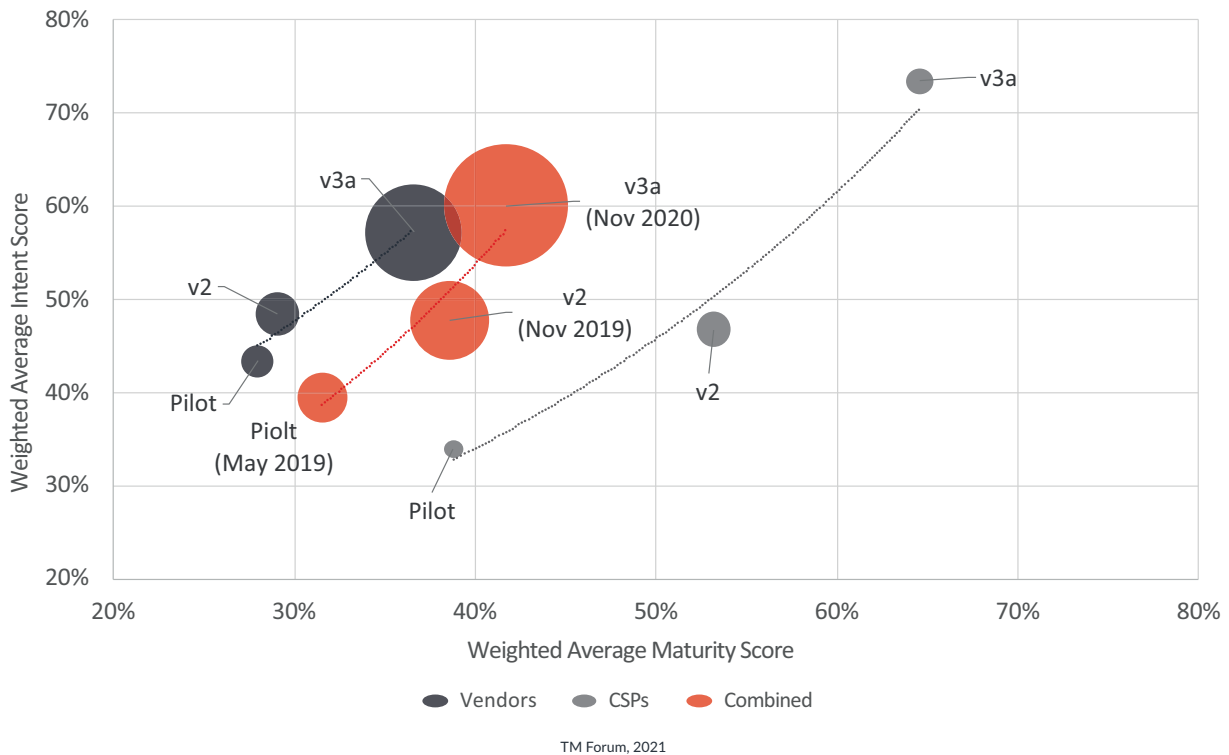
TM Forum, 2021

Adoption of Open APIs and ODA



TM Forum, 2021

Industry progress toward Open API adoption



As explained in previous sections, both sides play the blame game when it comes to the rate of Open API adoption, but this isn't particularly useful when CSPs desperately need to speed up transformation not only to remain competitive, but also to realize the promises of enterprise 5G.

Speaking during a Hard Talk panel discussion about ODA and Open API adoption this summer, Brendan O'Rourke, Expert Partner at Bain & Company, explained that the telecoms industry's adoption of microservices architectures and APIs is lagging well behind that of enterprises in retail and other verticals. While he noted some exceptions (several of which we've profiled in this report), he said most telcos are about three to five years behind "in really strong thinking about how we move to that kind of architecture in a standard way across the industry. ODA has been doing great things in the last 12 months to accelerate that thinking and drive it into the industry. I think that's really good."

Watch the Hard Talk discussion:



Indeed, with 75 companies now pledging support for the Open API Manifesto and 44 signing the combined Open API and ODA manifesto, there is momentum. Dr. Lester Thomas, Chief Systems Architect, Vodafone Group and a leader in the push to get the telecoms industry to adopt the Open APIs and the ODA as de facto standards, points to this support as significant progress. He says that while 18 months ago he may have been a bit worried about suppliers' commitments to adopting the Open APIs in their products and services, he is no longer concerned.

“

There was a lag between us adopting Open APIs in Vodafone and suppliers incorporating them,” Thomas says. “Even with our strategic vendors we’ve had partnerships with for a long time, it took a while before the Open APIs percolated in their product versions. But I’d say that today all of our strategic vendors have adopted these Open APIs, and they’re on the list of conformant vendors in the space. They’re not companies that pay lip service; they’re companies that are heavily engaged in contributing because they want to bring the standard forward.”

Component accelerator

Thomas and other TM Forum members are hoping that the new ODA Component Accelerator Project [announced in December](#) will speed up standardization even more. Founders of the initiative include Accenture, Axiata Digital Labs, Global Wavenet, Globetom, Oracle Communications, Orange, SigScale, Sysbiz Technologies, Vodafone and Whale Cloud.

The aim of the ODA Component Accelerator is to:

- Develop and validate specifications for ODA components (as explained in [Section 1](#), a component is an independently deployable piece of software, typically built out of one or more microservices; they have an “envelope” that provides metadata to describe its core function and specify which Open APIs it exposes or depends upon)
- Foster collaborative development of an ODA Canvas and other non-commercial software code using an open source approach (importantly, the purpose is not to build open source IT systems, but rather to create a platform for ODA component validation and interoperability testing of commercial software products).
- Establish the ODA Reference Implementation (or potentially multiple reference implementations)
- Test and validate the ODA Reference Implementation(s) using black box commercial components
- Prepare for ODA component interoperability testing

The initiative includes two new sister projects: ODA-Component Accelerator {Dev} and ODA-Component Accelerator {Run}. While {Run} is a TM Forum project, {Dev} is the first project under a new tmf.codes legal entity which supports code-sharing collaboration with Apache 2.0 licensing. The projects will work in TM Forum’s Open Digital Lab.

This is a significant development for TM Forum. It is a big step in the organization’s own digital transformation – that is, moving away from standards that are available only on paper in the form of technical reports and information guides to machine-readable assets that companies can download and use immediately. Eventually, the vision is that the ODA Component Accelerator will pave the way for a software marketplace where CSPs can procure components without the need for lengthy RFP processes.

Beyond telecoms

Joann O’Brien, VP of Digital Ecosystems at TM Forum and one of the early developers of the Open API Program, sees the Component Accelerator as a way for TM Forum Open APIs to be used widely in a variety of products and consumed behind the scenes.

“

“It’s the ‘Intel inside’ idea,” O’Brien says, referring to the chip maker’s very successful ad campaign to position Intel as intrinsic to computing. “But in this case, it’s ‘TM Forum inside.’”

To do this, O’Brien is pushing for the Open APIs to be endorsed by the International Telecommunication Union, which could be a game-changer. This process will be lengthy, however.

Ultimately, the goal is to see Open APIs used anywhere and everywhere – not only by CSPs and suppliers within the telecoms industry, but also in other industries and by all kinds of organizations. They are already used in many smart cities, for example.

Marc Hayden, Director of the Industry Technology Ecosystem Program at

ServiceNow, sees this as an important opportunity. “We are in 46% of the global 2000 companies, and other suppliers also have a desire to extend to other industries,” he says. “The other industries may know RESTful, but they may not have looked at TM Forum Open APIs because the majority of their use cases and integration have been outside our vertical.”

For more information about TM Forum’s Collaboration Community, Open APIs and the ODA Component Accelerator, please contact [George Glass](#).

Additional features & resources

42 | [Tecnotree - The future we waited for is here](#)

44 | [TM Forum Open Digital Framework](#)

45 | [TM Forum research reports](#)

46 | [Meet the Research & Media team](#)

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The future we waited for is here

How to design enterprise architecture in the digital open economy

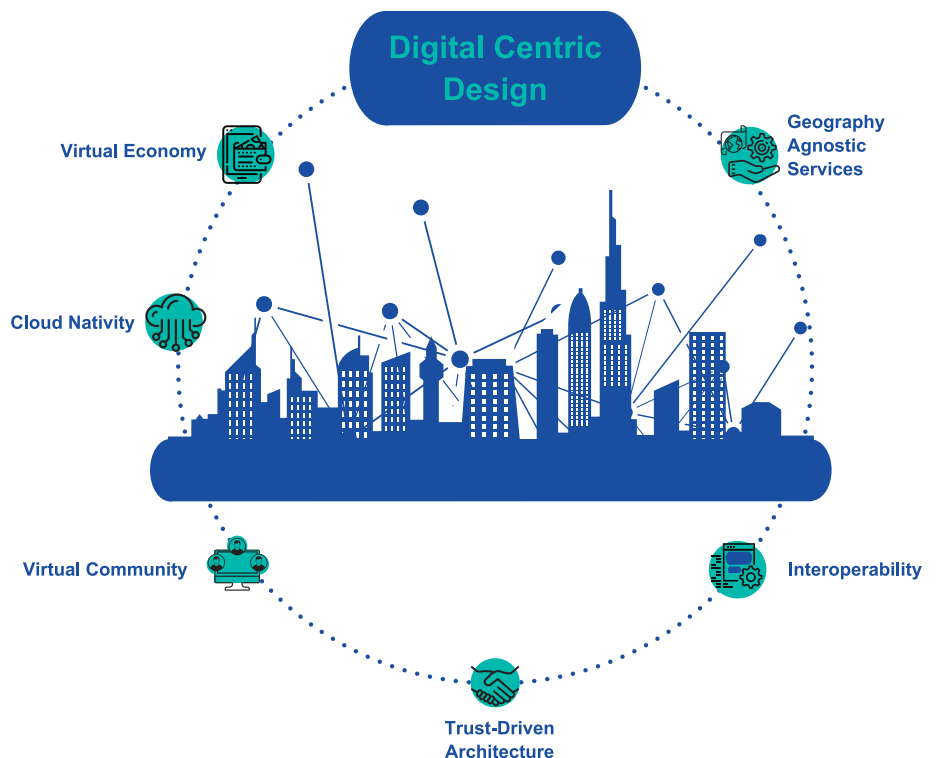
Connecting the world is more necessary now than ever before. However, the boon of an always-on, digitally connected world also comes with a challenge: to rapidly evolve to meet the needs of the business. In this article, we explore the key areas of architectural consideration while designing an enterprise architecture.

In pondering the future, we must consider the past. Just one year ago, most would say that the industry was undergoing a slow-paced transition to the digital world that might take 3 to 5 years. Today, we already see a world that has changed so much. Vivid imaginings from a year ago are already a reality.

Covid-19, one of the largest pandemics in human history, has devastating effects across nations and has also showcased how quickly humankind can adapt and invent. Nothing around us seems the same anymore. Children are schooling remotely, some of the largest organizations have announced the possibility of permanent work from home, and even world leaders had to resort to running their governments remotely.

The challenge in front of us is unprecedented, as is the opportunity. For the first time in history, a child in a remote village in the emerging world potentially has access to the same educational content as some of the most developed nations in the world. It is now possible for doctors in some of the finest medical institutes around the world to provide medical assistance to the remotest parts of the world.

These changes have taught us another important aspect of development and growth - future calls for a multi-pronged approach over unilateral. Now, the big question is - what are those pillars and key considerations that can reshape the transformation architecture of tomorrow:



Virtual Economy

It is becoming more evident that human connections are moving into the world of internet. People are increasingly more comfortable sharing their life in the digital world. These digitally connected communities need services to be redesigned at the speed of their rising needs. Such service design calls for faster innovation, and the **catalog-driven approach** has been

a unique innovation in driving customer experience and fulfillment processes, resulting into the ability to cater to complex business needs with a simplified low-code approach.

Enterprises must consider **multi-experience** as one of the key themes while designing a channel strategy. Applications must move beyond the web and mobile presence to a world of being omnipresent.

Trust-driven Architecture

“

To be trusted is a greater compliment than being loved.”

George MacDonald

With human-to-human interactions and services moving to the digital world, trust cannot be an afterthought. Developers of the digital-world applications are considering **data privacy by design** being built into every layer of the architecture. An enterprise architect should consider the following as implicit themes:

- **Transparent & consent-based data collection** – Get the consent of the users on what information may be collected, personalize the application behavior to the gradient of the permissions.
- **Geography specific data** – Ensure regulatory compliance and the law of the land are followed for information stored on the cloud. Design architectures with geography awareness to preserve information and replication only at the intended location.
- **Built-in security** – E2E encryption is a crucial requirement, applications must be capable of encrypting information across the chain of data handling.

Geography Agnostic Services

The Covid-19 pandemic has taught us how much connectivity has changed the way people interact with businesses. Services are no longer bound by geographic limitations. Almost any provider can now offer services around the world.

Applications and services must solve the gap in the ability to digitally map supply from any part of the world to meet the demands through **marketplaces**.

Cloud Nativity

Accelerating needs of the businesses have been rapidly changing the expectations from the business applications platforms. Traditional capital investments, which break even over a long period of time, do not seem viable. Moreover, cloud providers have been increasingly focused on resolving central impediments to cloud adoptions, such as regulatory compliance. These efforts are transitioning from a capital-based investment to a more adaptive opex-based investment. Enterprises must plan on transitioning their strategy to a cloud-native strategy to ensure the adaptations to the evolution of business needs.

Interoperability

Owing to the ever-evolving needs of the businesses, enterprise environments will continue to be multi-vendor and multi-platform – due to the democratization of application development. Enterprises now have access to applications of all shapes and sizes. Interoperability is now a necessity, not an option. By using standards such as Open APIs and eTOM from TM Forum, enterprises can ensure applications can communicate with each other using a common language.

Open APIs enable enterprises to create their own micro-ecosystems around the Open APIs – leveraging the gig economy where innovations can be created much faster than before, without geographic boundaries.

Conclusion

As we embrace the new reality of the world, it is important to re-think our ways of working and focus on some of the core design elements of enterprise architecture, which help businesses accelerate their transition into serving digitally connected communities globally. Tecnotree, an early adopter of Open APIs and microservices, follows the design principles which can meet the needs of not just today but also make the IT architecture to be ready for tomorrow.

Contact us at marketing@tecnotree.com to know how you can make your IT architecture future-ready.

TM Forum Open Digital Framework

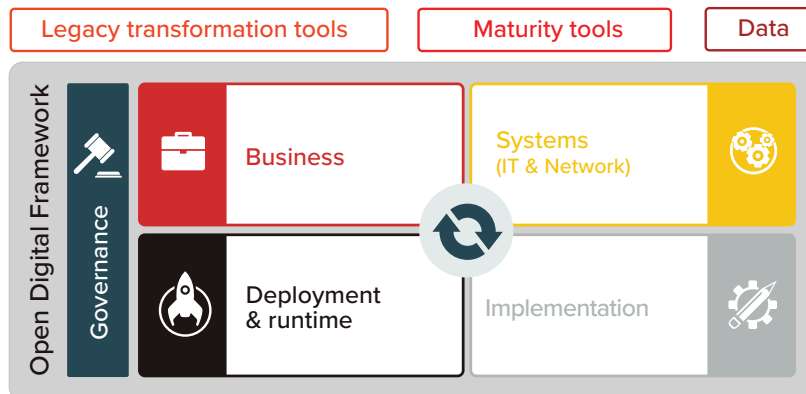
A blueprint for intelligent operations fit for the 5G era

The [TM Forum Open Digital Framework \(ODF\)](#) 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 & network costs, and enhancing digital customer experience.

Developed by TM Forum member organizations through our [Collaboration Community](#) and [Catalyst proofs of concept](#), 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 aim is 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, their suppliers and systems integrators).

Learn more about member collaboration

If you would like to learn more about the Open Digital Framework, or how to get involved in the TM Forum Collaboration Community, please contact [George Glass](#).

TM Forum research reports



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For more about TM Forum's Open APIs and Open Digital
Architecture, please contact [George Glass](#)