

International

5G core network as a service

Leveraging cloud thinking
to enable affordable 5G for all



Wholesale



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Introduction

Deploying a 5G standalone (SA) core network is a complex and expensive undertaking that is out of reach for many telecom operators. It requires significant CAPEX and human resources to do, and only so many operators around the world have the capabilities.

And make no mistake, 5G is set to change the world. Research has found that 80% of global operator-billed service revenues will be attributable to 5G services by 2027, and that mobile operators around the world will generate \$625 billion from 5G services by 2027, up from \$310 billion in 2023¹.

But deploying a 5G SA network is hard to do and beyond most companies. So, could a different approach work? Could a tried and tested technology mindset previously applied to a different digital discipline transform access to and availability of 5G networks to smaller operators? Could cloud thinking applied to wholesale telecoms business models revolutionize the industry?

Orange Wholesale recently surveyed CEOs, COOs, CTOs, marketing directors and core network managers worldwide to establish their views about 5G core network as a service (5GCNaaS). The results were interesting.

We found that some views were consistent, others varied on geography. 5G SA is vital to the future was a unanimous opinion across all four regions surveyed - Africa, Europe, Asia and Latin America. Other findings included that mobile network operators (MNO) around the world are putting performance at the heart of strategy and counting on 5G performance to drive customer experience (CX). We also found that cost is a major barrier: migrating to 5G standalone is a long and complex project that requires significant investments. As a result, all operators are attracted by the idea of a shared 5G network core.

So, while there is market demand for 5G SA, there are still relatively few 5G SA services live. This paper will outline how a 5G Core Network as a Service solution (5GCNaaS) could be the new approach that can change that situation. We hope you find our new paper insightful!

Best regards,

Franck Morales, VP Marketing Orange Wholesale International

What is driving demand for 5G?

The industry has discussed the use cases that 5G could potentially enable for some time. These include the **industrial Internet of Things (IIoT)**, **autonomous vehicles (AVs)**, **smart cities**, and **connected healthcare**.

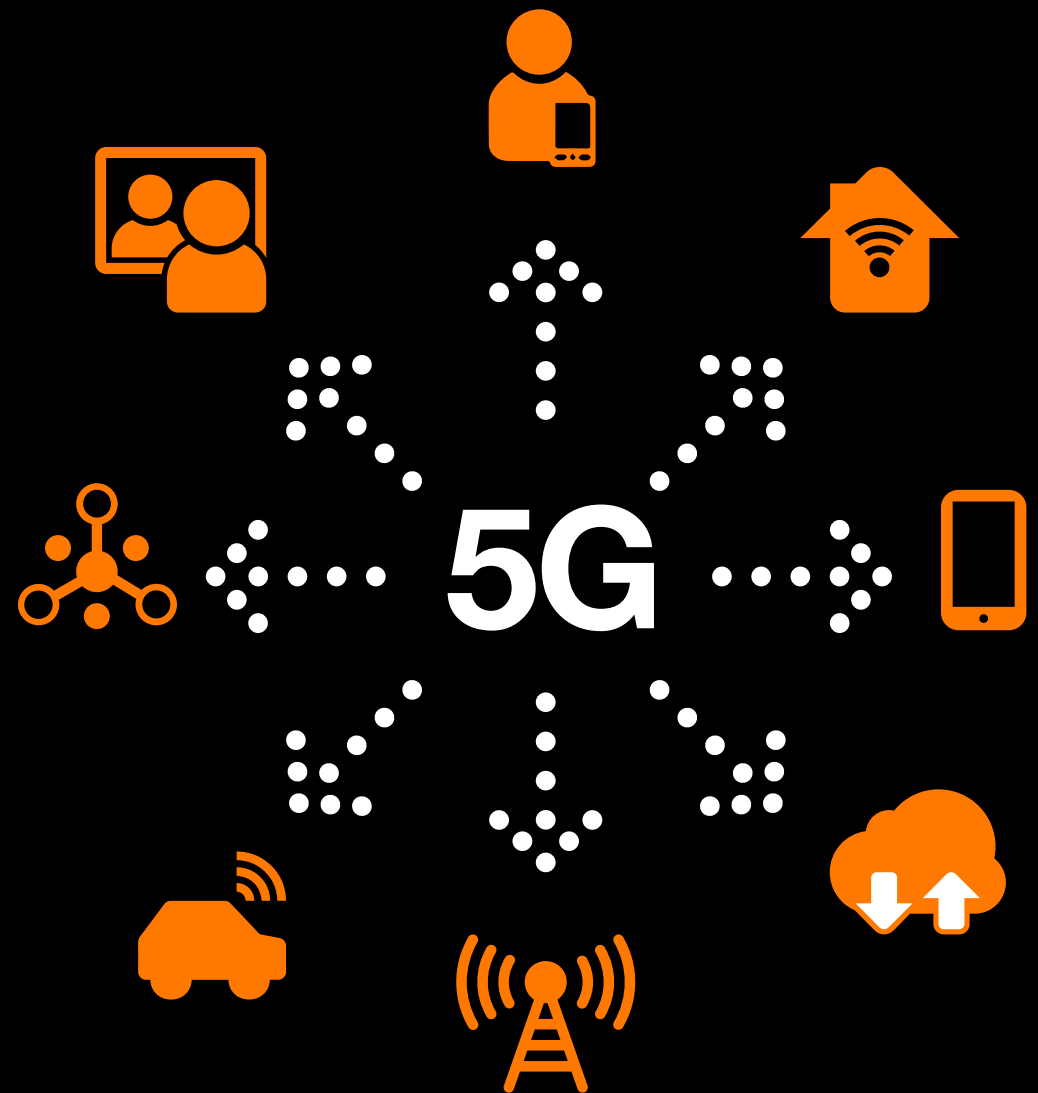
5G can provide the ultra-high speeds required for these data-heavy applications and cloud-based solutions. 5G SA can also enable ultra-low latency and higher bit and data rates, which are necessary for cloud gaming, immersive media, and vehicle or cobot control. It can also offer end-to-end network slicing with higher scalability and enhanced service management quality, making new business models and use cases possible across all kinds of verticals and creating new revenue opportunities for communications service providers (CSPs).

But it is 5G SA that's required to reach these new frontiers. When 5G connectivity first came to market in 2019, most deployments were non-standalone (NSA), which meant deploying 5G radios on top of existing 4G/LTE core network infrastructure. And while 5G NSA improved upon LTE, and offered the benefit of being quick to roll out, it doesn't enable all the capabilities that 5G SA does. And for now, the majority of 5G around the world remains NSA.

The need for improved network capabilities

5G SA and the new 5G core network architecture will make mobile networks more efficient and simpler to operate. It will also help reduce time to market for new services and make it easier to manage services with shorter lifespans. With 5G core infrastructure, operators and service providers can provide better network slicing and offer customers end-to-end service level agreements (SLA).

\$1.3 trillion - estimated economic potential of 5G ecosystem by 2030²



Orange Wholesale expert view:

Frédéric Freschel, VP Voice & Mobility Solutions, Orange Wholesale International:



To truly enable 5G's most compelling features and use cases, a full migration to SA networks with 5G radios running on top of a 5G core network infrastructure is essential. It enables:

- uRLLC, or ultra-reliable low latency communication, a technology that promises to deliver extremely fast and reliable communication with very low latency. This technology is particularly useful in applications that require real-time communication, such as autonomous vehicles, remote surgery, and industrial automation.
- mMTC, or massive machine-type communication, a technology that enables the connection of a large number of devices to the network. This technology is particularly useful in applications that require the connection of a large number of sensors and devices, such as smart cities, smart homes, and industrial IoT.
- Network slicing, a technology that enables the creation of virtual networks within a single physical network. This technology will enable new use cases that require different levels of service quality, such as private enterprise networks.

Overall, the introduction of uRLLC, mMTC, and network slicing with 5G standalone networks promises to bring a host of benefits to users and businesses alike. These technologies will enable faster, more reliable, and more efficient communication, leading to improved safety, efficiency, and user experience.”

22% of telcos worldwide are currently investing in building standalone 5G core networks³





An industry expert view:

Sofrecom Group CEO Guillaume Boudin on 5G SA use cases



Early use cases are mainly in the industrial field for **smart industries**. They relate to production, maintenance or logistics activities in big factories, harbors, or mines, and generally relate to mobility, production machines or digital sensors.

Smart cities will require massive IoT for traffic management, energy/water management, video surveillance and security.

The ultra-low latency of 5G SA will be needed for the deployment of **autonomous transport** with connected cars, buses, trams, and so on, and will enable additional information or entertainment services for passengers.

Most of the time, these B2B and B2B2C services will be implemented through private mobile networks, or hybrid private/public networks.

For the consumer market, 5G SA use cases are coming mainly from **online gaming** and applications based on **Virtual/Augmented Reality (VA/AR)**. They will be implemented on the public network.

The arrival of more competitive VR/AR devices will accelerate development of such consumer applications but will also boost **remote business applications** such as remote maintenance or telemedicine.

“We believe that the first truly viable application will be IOT. If you are doing IOT, the response is so short that it enables devices to operate efficiently”

Technical director, Asia

5G SA deployment barriers

What is holding up 5G SA rollouts? As with so many things, it is a simple question of time and money, particularly for smaller operators. Because overall, building and deploying a 5G SA core network is a complex and expensive project.

Orange experts have estimated that investment required in a 5G core network starts with a minimum total cost of ownership (TCO) of €50 million over 5 years. That includes €10 million to €20 million for hardware, software and license purchases plus other internal expenses required, plus also the cost of other information systems for billing and other areas.

According to the Global mobile Suppliers Association (GSA), as of early 2023, 239 operators in 94 countries and territories had launched or soft-launched 5G mobile services. GSMA Intelligence reports that “momentum for 5G SA rollouts is accelerating after a slow start”⁴, and also that 5G will account for as many as 1.2 billion connections by 2025⁵.

The spectrum auction issue

There are several reasons behind the relatively slow rollout of 5G SA. One is that spectrum auctions are still ongoing in many countries to grant new ranges, with some operators feeling that high prices they had to pay for first spectrum ranges could prove a barrier to 5G development and profitability.

In France, proceeds from the 5G 310 MHz spectrum auction came to €2.8 billion. In Germany, the auction encompassing all spectrum ranges amounted to €6.55 billion in total. This led to the GSMA to distribute recommendations for regulators, which include a clear message about spectrum auctions: “Governments and regulators should avoid inflating 5G spectrum prices as this is linked to slower broadband speeds and worse coverage.”⁶

It's a challenge operators must overcome: they need to carefully plan how they use different types of spectrum to optimize coverage in urban and rural areas, while also meeting the speed and latency requirements for IoT and Industry 4.0 use cases. While also keeping one eye on optimizing deployment costs of new sites and antennas. It's a lot to manage.

The RAN factor

The radio access network (RAN) must support 5G SA. This too means addressing a couple of challenges. First is that using a high-range spectrum to deliver the high speeds promised requires deploying more antennas. Those antennas need to have a fiber connection, which can mean heavy civil engineering work. Which, naturally, incurs more costs.

Second, that there are still communities and populations who express concerns or even outright resistance to 5G infrastructure. So, operators will need to address communications to these consumers to reassure them and compromise if and when necessary.

“The equipment comes with a high price. We have estimated that if we wanted to deploy a 5G network, we could require as many as two or three times the number of base stations to appropriately cover the necessary geographical region”



5G New Radio deployments worldwide

5G New Radio (NR) deployments around the world are at varying stages of maturity. There are estimated to be 297 commercial 5G NR networks in operation in 123 countries around the globe, utilizing assorted frequency bands⁷.

An industry expert view: Sofrecom Group CEO Guillaume Boudin on 5G SA deployment barriers



Deploying SA networks implies a deep evolution of a telcos' network architecture, requiring close coordination and integration between technological, operational, and organizational domains.

5G SA involves migrating core networks and network core, from hardware-centric infrastructure to modular, virtualized and cloud-based architectures. To achieve this, existing networks - including highly complex orchestration, operations, and business support systems, as well as network functions - must be decomposed, recast, and rewritten into software capable of running in various cloud environments with carrier-grade performance. In addition, these new core systems should integrate fully with other end-to-end network elements, including peripheral radio access networks, which are undergoing their own transformation.

These upgrades involve many crucial strategic decisions that can have a significant impact on future operating and investment costs, on business, operating and organizational models, as well as on potential revenue growth and profitability.

The challenges of deploying 5G SA are many, but its benefits are undeniable: a fully mature 5G capability that unlocks the full potential of 5G for operational efficiency, innovation and value creation!

The skills issue

Another major obstacle to 5G SA development is the lack of resources and skills related to new technologies like virtualization and cloud computing, plus also things like operating models, business strategies and service innovation. It will be essential to identify the skills available in-house and those that are missing, and define a strategy to acquire the missing skills, either via upskilling, external recruitments or outsourcing of operations in specific areas.

A new kind of core network is needed

There is a need for a new core network. That network will incorporate new technologies like software-defined networking (SDN), network function virtualization (NFV), network slicing, HTTPS proxies, regional P-Gateways, and more. Signaling will be based on service communication proxy (SCP), binding support function (BSF), and security edge protection proxy (SEPP) functions. The appropriate 5G network will also require HTTPS as the transport protocol.

Smaller operators, big concerns

As such, a massive financial investment is required. These financial requirements make it cost-prohibitive for smaller operators to deploy a 5G core network. It's proportionally more expensive, per user or per megabit, which will likely see smaller operators priced out. In a recent survey conducted by Orange, a core network manager in Latin America commented, "Deployment of 5G is being hindered by the cost of equipment". Larger operators, with more potential B2B and B2C customers, are less impacted. Research has shown that ecosystem availability, cost, and complexity are key concerns for operators wanting to evolve to 5G.

Operating model: breaking down silos

5G SA changes the traditional operating model and worker roles and responsibilities for telcos. Historically, telco operations teams tend to work in silos according to their function: user plan, signalization, customer databases, and so on.

"A key question is what kind of equipment should we deploy? And what technology transfer is needed? Also, there is a training factor - we will need to train our existing technical staff so that they are capable of maintaining this equipment effectively"

Telco Director, Latin America

Business case uncertainty remains

Despite all operators agreeing that 5G is the way forward, some are still unsure of just when the right time will be. This is especially true in countries where 4G is only now really becoming mainstream. Uncertainties can make it difficult to justify investing in a 5G SA core network immediately, and as of now, with 5G still not being fully defined, it also makes return on investment (ROI) harder to predict. 5G use cases are highly-anticipated, but, again in some geographies more than others, are still not mature and totally proven – so, can telcos be sure they'll be able to monetize them at a premium? Customers will still expect value, however exciting the new possibilities. Also, standards continue to evolve, which makes planning complicated. So overall, it is fair to say telcos are being asked to make huge investments for a future which cannot be 100% confidently predicted.

“Do we have a high or low demand for this fast-switching internet? Will the average mobile client make the difference?”

COO, Africa



Orange Wholesale expert view:

“With 5G SA, all functions run on the same infrastructure, simplifying the architecture but requiring a new operational organization, a matrix-based set-up that is based on breaking down silos and increasing collaboration to help deliver complex and high value-added services. Making these organizational changes, from back-office functions all the way through to field operations, may take an operator several years to implement and run smoothly”

Mohammed El Hafiani, 5GCNaaS Project manager at Orange Wholesale



“It’s a long process, and we are still really in the preparation stage. We have not started any implementations as yet, and we are still studying the market before making our initial move. We must make a convincing business case that can demonstrate our ability to get clients on board with the offer and generate ROI in the shortest time possible”

CTO, Africa CTO, Africa

The question of buy or make

Purchasing the 5G SA core network from recognized and trusted hardware and software providers can be perceived as the simplest way forward, despite the aforementioned financial and technical challenges. But it isn't that simple.

The buy option

It's a scenario as old as the enterprise technology industry itself: buy off-the-shelf, reduce risk. In the case of 5G SA, it can appear to telcos that if they rely on an off-the-shelf 'boxed' solution based on proven and tested equipment from a known provider, they will benefit from supplier support and faster delivery.

However, this also means purchasing an infrastructure that is appropriate for all use cases from day one, and also paying for it from day one too, when revenues might not have kicked in. Plus, there are other outgoings too, including things like license fees for active users, software subscriptions to ensure you get the latest updates, plus any maintenance costs – and all of this when you might not yet have the traffic or business coming in that you anticipate.

The make option

So, an alternative path to consider is the "make" option. Telcos may see a way forward in using open source and open API-based components, and then developing the 5G SA infrastructure themselves.

This can appear attractive as it offers potentially "lean development" whereby operators need only develop the infrastructure and features required for the specific use cases it wants to launch or that its customers demand. It presents the possibility to start small and grow the network as the business grows to fund and enable it. So, there is no need to pay for capacity or licenses if you don't have the revenues and business to support them.

On the downside, this approach requires a solid software provider partner to do so. As Guillaume Boudin says, "Using multiple vendors creates challenges in ensuring that all components integrate and work well together, requiring careful vendor selection and robust integration, testing, and validation methods."

It also requires specific skills and expertise to develop and maintain the solution, which can mean teams made up of several dozen developers. It's also essential to involve internal developers in order to transfer competencies successfully.

Orange Wholesale expert view:

"For consumer services, the 5G SA solution must be able to support millions of users. As things stand today, open-source solutions are not tested for such high volumes of users. They may be sufficient for private B2B use cases, but they must still be tested extensively to support consumer services"

Mohammed El Hafiani, 5GCNaaS Project manager at Orange Wholesale

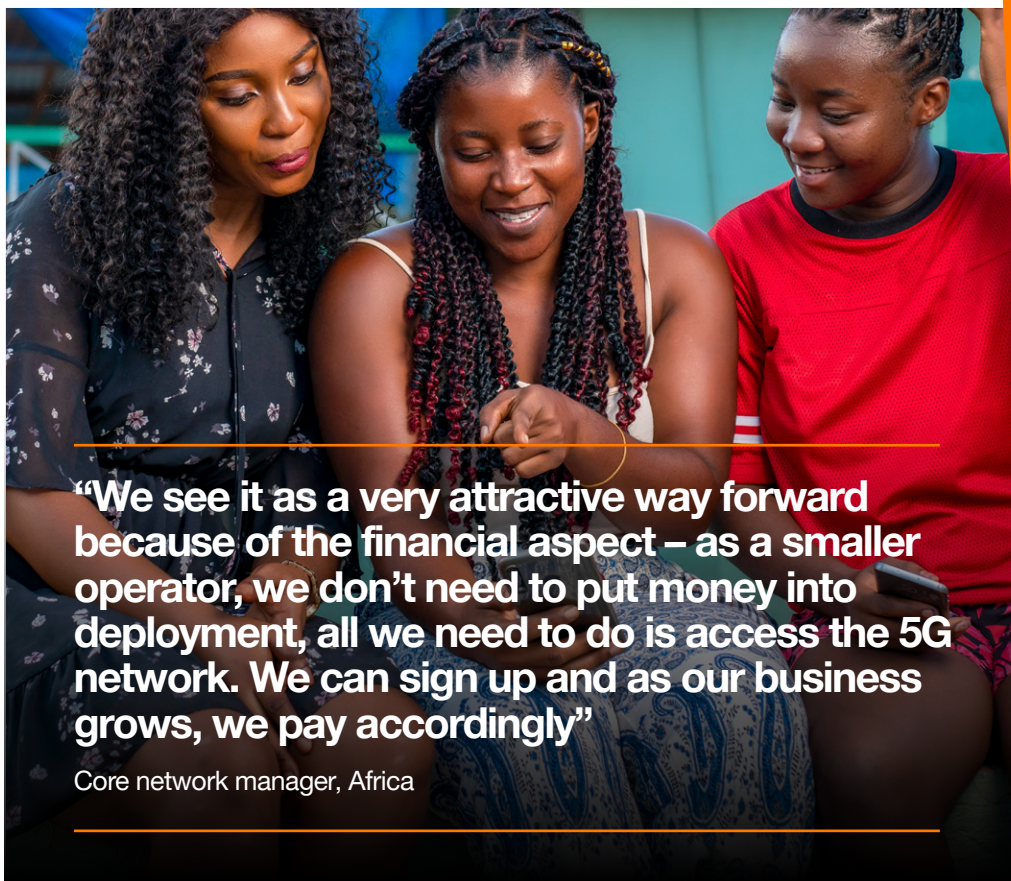


And finally, open source solutions must be carrier-grade. This extremely high-level of service availability is the foundation of Telco services and something that both consumers and enterprises have come to expect in most countries. In many countries, regulators also impose a level of QoS that telecom operators must achieve.



But what if there were a different way?

There can be an alternative way forward and a path to 5G SA for smaller operators. One that lets you replace existing plans and investments with a variable model, a “pay as you grow” approach that brings cloud thinking to the table and relies on leading wholesale operators to operate your core network-as-a-service. It’s called 5G core network as a service (5GCNaaS).



“We see it as a very attractive way forward because of the financial aspect – as a smaller operator, we don’t need to put money into deployment, all we need to do is access the 5G network. We can sign up and as our business grows, we pay accordingly”

Core network manager, Africa

Benefits and opportunities

5GCNaaS offers a way forward for operators of all sizes, conceivably giving them viable business models that leverage 5G and enable them to provide the services their customers want. There is scope for specification, implementation, operation, and development of a 5G core network based on a mutual model of splitting the investments between several operators.

The concept of mutualization would cover equipment, hosting, plus technical and human resources, shared out across multiple operators, and in theory, could make the required CAPEX more justifiable and return on investment (ROI) swifter. Not to mention that the approach would remove concerns about managing complexity or support costs or licenses that can be costly in the short term.

According to Frédéric Freschel, VP Voice & Mobility Solutions at Orange Wholesale, “Overall, it 5GCNaaS could position smaller operators where they can retain all the flexibility of customizing services for customers while giving them an edge over competitors.”

Embracing cloud thinking in 5G

- The as-a-service (XaaS) model could present a way forward to 5G SA that can give even smaller operators access to benefits denied to them under traditional models
- 5GCNaaS would mean operators don’t need to invest in their own 5G core networks and removes the CAPEX barrier
- The new model would see operators of all sizes presented with the chance to buy a comprehensive service from a third-party provider, just as companies already do with public cloud – and reap the financial and business benefits
- Model would be as cloud works now: 5G core network provider hosts the service and charges operators for usage
- The new, cloud-style model can make 5G more accessible for all

Key success factors for 5GCNaaS

Selecting then integrating a CNaaS solution into an existing IT system is no small task, but in fact is not that different from any other cloud solution integration. Here are some recommendations and key steps prior to designing architecture and moving forward with migration and integration.

1 Define clear objectives and needs: Clearly identify the services you want to use from the CNaaS solution, and what services you want to provide to your end-users. Sofrecom Group network services & OSS senior consultant Mustapha Cherifi specifies: “In case of service migration from legacy to new implemented solution, you will need to compare current service data and end-user experience to what you will provide through the new service. How different will they be? And if there is an impact for customers, how acceptable will that be?”

Furthermore, the SLAs you propose to your end-users will impact the final architecture. Finally, plan out how you will operate and monitor the service - you may need to integrate new APIs, e.g., to give your business customers more control to design their service.

2 Assess legacy IT infrastructure and resources: Carry out a comprehensive assessment of your existing legacy IT infrastructure. Understand its strengths, weaknesses, and dependencies.

You will need to assess the compatibility of your existing applications with the cloud environment. Some legacy applications may require modifications to work with the new cloud-based core network.

3 Assess availability of in-house expertise and resources: Also assess your in-house expertise for design, migration, acceptance and operations. As mentioned earlier in this whitepaper, expertise may be limited at first and require support from external experts.

4 Consider compliance requirements: Depending on your country, regulations may impose specific rules, such as data privacy rules on how to handle or store end-user data, or also specific radio frequency plans. Understanding these rules is a critical step as it will impact the final architecture and selection of features taken from the CNaaS solution.

“The first barrier to overcome is really the government, because we have to obtain spectrum from the regulatory body, and that requires that all equipment as well as customer information is stored within the country”

CTO, Latin America

5 Carefully define security measures and architecture: “This is a critical success factor says Mohammed El Hafiani. You will need to ensure that the operator’s network and the cloud solution are secured and isolated to guarantee data security”.

“Security is essential when it comes to our data, and it is obviously a question that must be addressed when discussing an outsourced solution such as a 5G network. We must have all the necessary legal framework in place to correctly serve our subscribers”

CEO, Europe



“In practice, a comprehensive feasibility study will include assessing all these important criteria that impact the project’s viability, including economic, technical, operational, legal, and market factors.”

Mustafa Cherifi, Network services & OSS senior consultant at Sofrecom Group

6 It also requires a shift in mindset: telcos are not used to relinquishing control of something that has always been a strategic asset, the core network.

Attitudes are already shifting to this new thinking, as evidenced in shared mobile towers and antennas, or in the separation of telecom infrastructure vs services in some countries. For example, that could be where one provider provides the infrastructure in the whole country or a region to other telcos who then focus on delivering B2C or B2B services.

“To make 5GCNaaS work as effectively as possible, telcos must accept that the core network infrastructure can be considered less of a strategic imperative, and that differentiation will come from the services, QoS, and customer experience the telco is then able to deliver.”

Mohammed El Hafiani, 5GCNaaS project manager at Orange Wholesale

The potential democratization of 5G SA

5G SA will be an enabler of innovation and greater prosperity worldwide, and telcos that can't offer it risk being left behind by competitors. Not all telcos will have the financial means, in-house skills, and expertise to develop their own 5G core networks and then wait several years for ROI.

In this scenario, 5GCNaaS could offer a viable path forward to 5G for operators of all sizes. Firstly, the pay-as-you-go (PAYG) model ensures no CAPEX is required, putting 5G SA within reach of smaller operators, with reduced risk.

5GCNaaS can put operators in a position where they don't need to entirely reinvent their business, or spend time and money hunting new technical expertise: the third-party 5GCNaaS provider would provide these. It can also enable network on demand, whereby operators have instant access to core network services whenever needed.

The business benefits seem clear too. Operators can bring new services to market faster, speeding up time to revenue. Smaller operators can also benefit from scalability, as they can scale up offerings if they are in high demand and spin them back down as demand drops. Overall, the 5GCNaaS model, being built on OPEX, simplifies costing and expenditure for operators, reduces risk, and makes 5G SA more financially viable in both the short and long term.





How Orange Wholesale International can help

Orange Wholesale International has embarked on an ambitious roadmap to develop strategic solution offerings to support customers with their transformation towards 5G deployments and next generation mobile networks.

Our roadmap comprises four elements:

- 5G SA Roaming Signaling
- Open Roaming Hub, which extends roaming coverage and manages security certificates and partnerships
- IPX Regional Breakout, designed to locally manage termination of international data roaming and ensure low latency
- 5G Core Network as a Service

The 5GCNaaS offering leverages our roaming contracts with many partners around the world, many of whom are already transforming their mobile ecosystems. Orange Wholesale International can help them to simplify and digitalize their customer journey, using a cloud-ready core network supported by a wide range of solutions.

Thanks to 5G SA technology, Orange Wholesale International will be in a position to deliver tailored solutions characterized by the concept of 5G network “slicing” and tailored specifically to operators’ needs. The implementation consists of sharing the same physical 5G SA network and splitting it into several virtual networks designed for specific use cases.

For Cédric Gonin, VP Global Business Support at Orange Wholesale International, “The value proposition of our 5GCNaaS is at the heart of operators’ 5G promise. We can offer our partners a cloud-ready, secure core network that allows them to unlock slicing capabilities and very low latency. The 5G Standalone adventure is just beginning and will take us on unexpected paths.”

About Orange Wholesale

Orange Wholesale is a responsible telecommunication services wholesaler offering operators and content providers around the world the expertise and experience of a world class team in the field of global connectivity.

Orange Wholesale leverages the knowhow and product portfolios of the acclaimed Orange roster of businesses to provide complete wholesale telecommunication solutions for the French market, leading global connectivity services, as well as advanced network infrastructure for voice, data and mobile, on the land, under the seas and in space.

In this ever-changing, ever-challenging landscape, we empower our customers and partners using the Orange promise to “lead the future” - together.”

Get in touch

If you would like to talk further about your plans to migrate to 5G standalone, or how a 5G Core Network as a Service solution could help you, please contact your Orange Wholesale account manager or get in touch:

wholesale.international@orange.com

Sources:

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