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ANALYSYS MASON QUARTERLY

Consulting and research specialists in telecoms, media and technology

ISSUE 2 APR-JUN 2020

Featured in this issue

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Ireland provides a leading example of a national broadband plan that others are likely to follow

Patrick Kidney, Partner, Consulting

"Governments and other stakeholders need to address digital divides sooner rather than later."

The National Broadband Plan (NBP) is a landmark project in Ireland and has been described as the most important piece of infrastructure since Irish rural electrification. It has the potential to significantly change the lives of many people and will ensure that 100% of the Irish population has access to high-speed broadband; an achievement that few countries have been able to accomplish. The COVID-19 crisis had yet to emerge when the Irish government signed the contract with National Broadband Ireland and claimed that access to high-speed broadband opens up "... opportunities in flexible and remote working, smart health with online GP and nursing services and medical monitoring, cloud-based services and connected devices, smart farming opportunities, digital learning, reliable electronic payments and booking". Ireland and much of the world has since gone through a crash course in e-commerce, e-education, e-health, video communications, digital payments and remote working, thereby demonstrating the need for high-quality broadband services.

The Irish government awarded the 25-year contract to National Broadband Ireland to build the new rural network covering 540 000 premises in November 2019, after an extensive tender process. The network will provide fibre to the premises (FTTP) connectivity in the vast majority of cases, with provision for wireless alternatives for up to 2% of the hardest-to-reach premises. Nearly 300 broadband connection points (BCPs) will be provided in the first year of the project in order to support free Wi-Fi in local communities and digital work hubs in every county. The provision of the fibre network will take place alongside the roll out of these BCPs; 115 000 premises will be covered by the second year of the project and an additional 70 000–100 000 premises will be covered each year thereafter.

The Irish government had the foresight and courage to mandate universal coverage, thereby guaranteeing that rural communities would not be left behind and would instead have the same high-speed-broadband-enabled opportunities as those in urban areas. It was possible to forecast many of the benefits of the NBP, but the impact of the COVID-19 crisis is demonstrating just how tangible and immediate these are. Indeed, any doubts about governments using public funds to meet the significant costs of enhancing high-speed broadband coverage in their countries can now be more easily dispelled.

High-speed broadband access is proving to be an important utility that is necessary for the social and economic well-being of the world. This is highlighted by the current COVID-19 crisis: many businesses have worked remotely for the first time and have experimented with video calls, and thousands of teachers have delivered classes over broadband. 100% broadband coverage using robust networks will help to deliver universal services and further drive the adoption of new ways of working.

The design of the Irish NBP was complex

The Irish NBP was conceived in 2012, with a vision to permanently address the growing 'digital divide' in Ireland. The development of the plan was complex and challenging, but other governments and stakeholders can learn from it and carry out their own strategies more quickly.

Analysys Mason was a key advisor to the Irish government as the scheme was designed and developed. We worked with industry, the government, regulators and other stakeholders to develop the technical strategy and approach. This included evaluating and costing alternative

technology solutions, specifying products (and how they would be futureproofed and evolve with market needs), determining the intervention area (see Figure 1) and defining deployment milestones and the mechanisms for benchmarking, product pricing, testing and verification and technical change control.

Major parts of the project included:

- defining the technical strategy (including the minimum technical requirements, the approach to deployment, operations requirements and how the NBP will evolve and continue to meet the high-speed broadband needs of rural Ireland over the 25-year contract duration)
- documenting procurement requirements
- extensively engaging with bidders
- supporting the bidder selection process
- defining the intervention area, taking account of market developments
- engaging with national and EU stakeholders to ensure compliance with national guidelines, policies and rules.

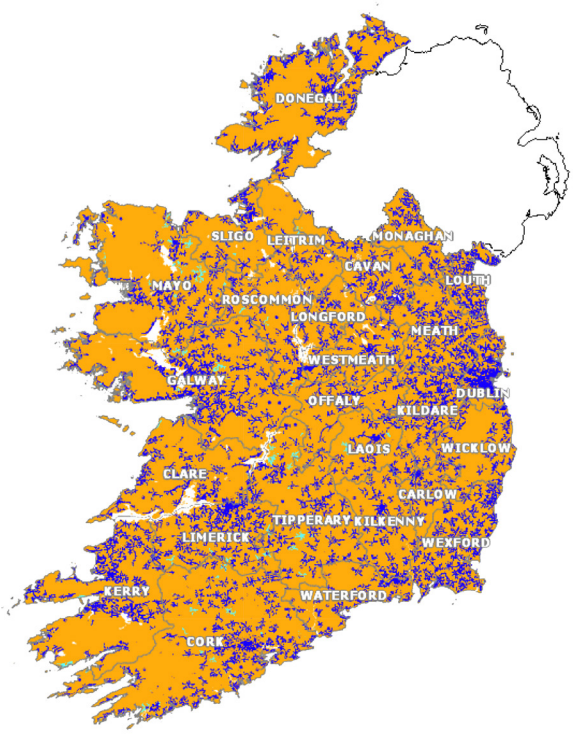


FIGURE 1: MAP OF THE INTERVENTION AREA (AMBER) FOR THE NBP [SOURCE: DCCAE, 2019]

Future broadband interventions should be easier

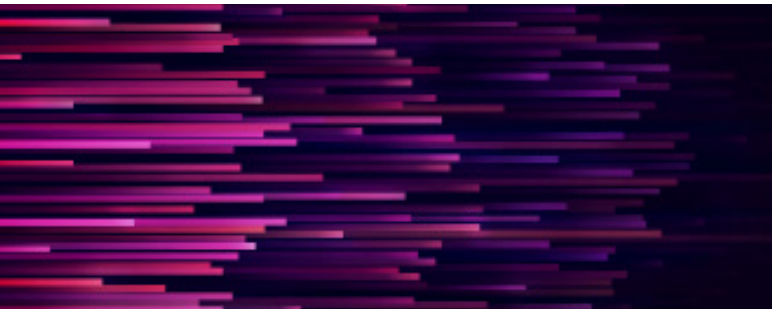
Projects such as the NBP need champions and the political will to look to the long term. Governments in some countries (including several that have implemented highly successful state interventions) have not pursued ubiquitous high-speed broadband in the past due to the considerable challenges involved in covering rural areas. The Irish government has not shied away from these challenges and will now see the benefits of its conviction. Others can learn from Ireland, and we expect that they should now be able do things more quickly, especially as the environment post-COVID-19 will be more supportive.

We expect to see more initiatives like the Irish NBP in the future given the current global crisis and the renewed appreciation of the benefits of high-speed broadband. We expect that policy makers will put more focus and resources into ubiquitous, robust networks in order to underpin their economy in normal times and be much better prepared in times of crisis, which could return. However, there are still difficult issues to address and Analysys Mason is well-placed to assist with these. We all share the objective of making access to broadband central to the future of economies, thereby making them more resilient and robust. However, it makes sense to start now and get all countries (and their economies) ready for the next challenge given that these network deployments are major engineering projects that require complex co-ordination.

Questions?
Please feel free to contact Patrick Kidney, Partner, Consulting at patrick.kidney@analysysmason.com

COVID-19: the telecoms industry will suffer less than many others, and can thus help to support the economy

Johann Adjovi, Partner, Consulting



"Under normal circumstances a surge in the use of telecoms services could present an opportunity for increased revenue, but in these difficult times, the response from the industry has been quite different."

The telecoms industry has an important role to play in the COVID-19 pandemic

Most countries in the world have implemented physical distancing and stay-at-home/confinement policies to try to limit the rate of hospitalisation during the COVID-19 pandemic and economic activity, social interactions and entertainment have become increasingly dependent on telecommunications as a result. This has led to an overall surge in the use of ICT services and in the amount of associated traffic (Figure 1). Telecoms operators worldwide are reporting traffic increases of 20–70% during the daytime, driven by increased use of videoconferencing, video and cloud-based ICT services.

Streaming platforms such as Netflix and YouTube have temporarily reduced the quality of their multimedia content in Europe to ease the pressure on the network, but additional capacity may be required in the long term. This will generate some additional costs, but regulatory responses may assist. For example, the regulator in the USA has granted T-Mobile access to additional spectrum on a temporary basis to enable greater capacity to be delivered rapidly.

The telecoms industry is suffering, but much less so than many others

A surge in telecoms service usage could provide operators with an opportunity for increased revenue under normal

Work-related platforms	Teams	Number of daily active users has grown by 38% (from 32 million to 44 million in March 2020)
	Zoom	26.9 million new mobile app downloads in March 2020
	Slack	The growth rate for the net new paid customer based double from 1 February 2020 to 18 March 2020
	Cisco Webex	22-times increase in traffic to/from Japan, Singapore and South Korea
	Nord VPN	Global use increases by 165%
Entertainment	Facebook	Total messaging traffic has increased by 50% and also video calling traffic has double in some markets
	Netflix	Subscriber base increase by 9.6% in one quarter (1Q 2020)
	TV	TV viewing could increase by 60% during the COVID-19 lockdown
	WhatsApp	76% increase in time spend on WhatsApp in Spain
	Online gaming	The average number of Counter Strike players increased by more than 20% during March 2020
Telecom operators	AT&T USA	The number of Wi-Fi calling minutes increased by 82% during weekends
	BT UK	Traffic on fixed network climbed by as much as 60% compared to normal weekdays
	Vodafone	Mobile data traffic increased by 50% in some markets
	Telecom Italia	Internet traffic increased by over 70% since Italy went into lockdown

FIGURE 1: INCREASE IN DEMAND INCREASE FOR SELECTED SERVICES AND APPLICATIONS DURING THE COVID-19 PANDEMIC [SOURCE: ANALYSYS MASON AND PUBLIC SOURCES, 2020]

circumstances, but the response from the industry has been quite different in these difficult times. Indeed, some telecoms operators are providing additional free services/data.

COVID-19 will cause problems for the industry. Analysys Mason Research is forecasting a 3.4% decline in revenue for operators in high income countries in 2020.[3] There is likely to be a number of specific impacts as the global economy deteriorates and many industries are badly hit.

- **Working capital and bad debt.** The working capital and bad debt ratios for telecoms operators are expected to increase because customers and small and medium-sized enterprises (SMEs) may need more-favourable payment terms or may even be unable to pay their telecoms bills, especially as time goes on. Operators and governments have implemented initiatives meaning that telecoms services will not be terminated in the case of payment delay, for instance.
- **Loss of roaming net revenue.** Severe travel restrictions and border closures will drastically reduce the international roaming net revenue (that is, the roaming revenue net of roaming costs). This will affect some markets and operators particularly badly.
- **Reduction in customer numbers.** A reduction in travel may affect the overall mobile penetration due to the loss of migrant workers who would otherwise be mobile customers in a particular country, as was seen in China in early 2020.
- **Reduction in the volume of mobile top-ups.** Unbanked, prepaid subscribers in developing markets may struggle to buy airtime vouchers or physical top-ups due to their high dependency on indirect physical channels, which may be closed during lockdowns. This in turn could lead to slump in mobile recharge volumes (by as much as 35%, as reported in India[4]).
- **Disruption of network operations and maintenance.** Operations and maintenance (O&M) processes will be put to the test as measures are taken to protect the spread of the virus among operators' employees.
- **Discretionary investments may be reduced.** Operators are likely to try to preserve cash due to the global financial uncertainty. This will affect their investment levels and discretionary spending, particularly for network upgrades, including those to 5G (unless these upgrades have the direct effect of increasing the network capacity). Additional factors that are likely to slow down investments in specific locations or for specific vendors include the following.
  - Major global sporting, tourism and trade events have been delayed. For example, global events such as the Tokyo Olympic Games and Expo 2020 Dubai have been, or are being, delayed. These events were themselves drivers for the early roll-out of 5G technologies and services.
  - The supply chains for electronics and ICT hardware have been disrupted because China was one of the early epicentres of the epidemic. This greatly affects the logistics of acquiring and deploying new telecoms equipment, even though telecoms vendors are trying to mitigate this impact. For example, Huawei re-opened its Chinese factories (that it closed down in December 2019 due to COVID-19) in February 2020 because of its intention to meet the demand for 5G equipment.

There is a lot to play for in the post-COVID-19 era

Many organisations have accelerated their digital transformations thanks to travel restrictions and the increase in home working. These forced digital transformations, combined with a behavioural shift in favour of online services, may have a lasting effect on trade and collaboration. This in turn will create an overall increase in the demand for telecoms services in the post-COVID-19 era, which may develop into a real longer-term opportunity for telecoms operators.

Operators are stepping up to these unique circumstances. Operator executives should remain focused on the immediate day-to-day developments regarding the pandemic, but they should not lose sight of the opportunities that may be available in the 'new normal' that will emerge post-COVID-19.

Analysys Mason has helped many operators and investors to identify and assess strategic opportunities in the TMT sector. We can assist telecoms operators, vendors and financial institutions to navigate the challenges that COVID-19 continues to present. All related articles and insights can be found at https://www.analysysmason.com/covid19.

[1] Nielsen (2020), The impact of COVID-19 on media consumption across North Asia. Available at: https://www.nielsen.com/apac/en/insights/report/2020/the-impact-of-covid-19-on-media-consumption-across-north-asia/.

[2] Kantar (2020), COVID-19 Barometer: Consumer attitudes, media habits and expectations. Available at: https://www.kantar.com/Inspiration/Coronavirus/COVID-19-Barometer-Consumer-attitudes-media-habits-and-expectations.

[3] Analysys Mason Research: COVID-19 will lead telecoms revenue to decline by 3.4% in developed markets in 2020 -https://www.analysysmason.com/Research/Content/Short-reports/covid-19-operator-revenue-impact/

[4] The Economic Times (2020), Lockdown triggers 35% slump in mobile recharge volumes. Available at: https://economictimes.indiatimes.com/industry/telecom/telecom-news/lockdown-triggers-35-slump-in-mobile-recharge-volumes/articleshow/74998587.cms?from=mdr.

Questions?
Please feel free to contact Johann Adjovi, Partner, Consulting at johann.adjovi@analysysmason.com

Compute at the edge: hyperscale cloud providers are courting both operators and their enterprise customers

Caroline Chappell, Research Director, Research

"Operators and public cloud providers have complementary strengths that are leading them to collaborate in the short term in order to build a public edge cloud proposition for enterprise customers."

The demand for edge computing is high among enterprises

Analysys Mason's recent survey of large enterprises in four developed countries and six vertical markets confirmed that the enterprise demand for edge computing is strong. The six vertical industries included in our survey were manufacturing, transport and logistics, healthcare, finance, retail and the public sector. Enterprises indicated that they plan to use edge computing for new digital use cases where the proximity to data sources is important, and where the cost of shipping massive datasets from their premises back to a central cloud is prohibitive. Large companies across all the sectors expressed a preference for 'public edge computing', delivered by a third-party owner and operator of multi-tenant edge cloud infrastructure over edge clouds that a third-party or the enterprise itself manages on-premises. Analysys Mason expected that the public edge cloud computing services market would grow to USD33.7 billion in 2025, at a CAGR of 62% from 2020, prior to the COVID-19 outbreak (Figure 1).

The public edge computing opportunity is attractive to operators because it coincides with their ambitions to generate substantial revenue from enterprises' use of their 5G networks. New digital use cases including autonomous vehicles and factory automation will require a combination of edge computing and 5G capabilities including ultra-low latency and network slicing. Operators own metro data centres, central offices and cell sites in areas with high population densities and/or near industrial facilities, which would be prime locations for edge computing infrastructure (depending on the mix of requirements). By building capacity

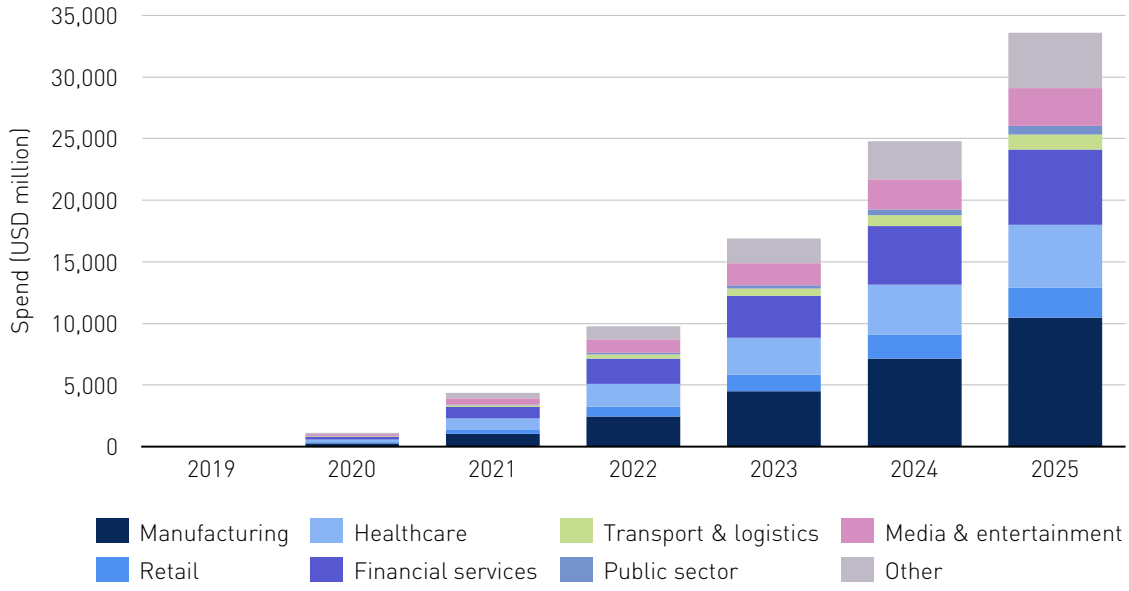


FIGURE 1: ENTERPRISE SPEND ON PUBLIC EDGE CLOUD, BY SECTOR, WORLDWIDE, 2019–2025 [SOURCE: ANALYSYS MASON, 2020]

beyond their own 5G networking needs in these locations, operators hope to capture a share of the emerging public edge computing market; this is the premise of the ETSI Multi Access Edge Computing (MEC) initiative.

Public cloud providers have also recognised the growing enthusiasm for edge computing in enterprise verticals, particularly in those that they are keen to target, such as manufacturing and healthcare. These players also possess key edge computing ingredients, including versions of their cloud technology stacks that can be delivered on enterprise premises and platform services that are of high relevance to new edge applications and around which they have built developer ecosystems. Such platform services include IoT device management, AI/analytics, digital twins (virtual replicas of physical systems, such as wind turbines or seaports), blockchain and gaming.

Operators and public cloud providers are collaborating to address the edge cloud market opportunity

Many public cloud providers have collaborated with operators in the past 9 months as they pool their respective strengths to address the public edge computing market. AWS, Google, IBM and Microsoft Azure have all announced edge computing partnerships with multiple Tier-1 operators, through which they will place their cloud stacks in operators' premises, starting with metro data centres. In these locations, public cloud providers' stacks are typically co-located with operators' network edge clouds running virtualised network functions, such as components of the mobile packet core and eventually the 5G core, thereby supporting converged fixed and mobile access.

Operators are pursuing a dual strategy regarding public edge computing. They are working with public cloud providers to get to market quickly, but they are also setting up industry alliances with fellow operators to create interoperability between their own edge clouds. These alliances are fragmented at present: for example, Verizon, América Móvil, KT, Rogers, Telstra and Vodafone formed the 5G Future Forum at the beginning of the year, while a different mix of operators from Europe and Asia–Pacific announced the GSMA Operator Platform Project in February 2020. Nonetheless, these alliances signal operators' intentions to own as much of the edge value chain as possible, from edge locations and connectivity to the platform services that will underpin a 5G-enabled edge computing developer ecosystem.

Public cloud providers will continue to seek edge location partners beyond operators and appear to have plans to colonise the private, on-premises edge, including the 'far edge' of 55 billion connected devices that IBM is predicting for 2022. Public cloud providers could take advantage of 5G spectrum licensing changes (regulators in various countries are opening up mid-band spectrum for private/shared usage) to offer private networks-as-a-service running on their clouds. Microsoft's March 2020 deal to acquire 4G/5G mobile core vendor, Affirmed Networks, is a step in this direction. Microsoft underlined the link between Affirmed and its Azure Edge Zone strategy, which could see Affirmed running in Microsoft's 200 edge zones as well as in on-premises Azure private edge zones.

The long-term balance of power in the edge cloud market is uncertain

Edge computing represents a nascent but attractive new market opportunity. Edge clouds will enable completely new use cases across industry sectors; they will also address the demands of a post-COVID-19 landscape, in which the delivery of experience is likely to be more-digital. The promise of this market is drawing operators and public cloud providers together for now, but the balance of power between these players is uncertain in the longer term. Analysys Mason is tracking the evolution of the edge computing market in its research publications and through custom research studies. A report on operator opportunities and threats in the public edge computing market will be published shortly.

Questions?
Please feel free to contact Caroline Chappell, Research Director, Research at caroline.chappell@analysysmason.com

FTTH/FTTB in the EU: why and how local monopolies may get regulated

James Allen, Partner, Consulting

"It is possible that small local FTTH monopolies in some EU countries may in future be subject to ex-ante regulation; similar to the historic treatment of local copper networks in Finland."

Some ancient (pre-internet) history: in the past, the fixed telecoms industry was highly fragmented in Finland and different regions of the country had copper telephone networks provided by different companies. Today, many of these companies have merged, but the Finnish regulator Traficom continues to regulate 27 different companies as having significant market power (SMP) in the wholesale local access market in different regions of Finland. Many of these operators are tiny. For example, two companies cover different parts of the Åland islands, a region that represents less than 1% of the population of Finland – and each has SMP. Therefore, rather than saying 'Balkanised', in the telecoms industry we should perhaps refer to the historic Finnish model, with local monopolies of small size, each requiring regulatory supervision.

Fast forward to today. A recent market review by the Swedish regulator PTS concluded that there is a national market for wholesale local access to fibre networks (FTTH and FTTB) in Sweden that is distinct from other technologies, and found the former incumbent operator Telia to have SMP. However, after this was examined, the European Commission has issued a "serious doubts" letter, pointing out that the actual situation is not at all homogenous.[1] In 139 of Sweden's 290 municipalities, there is indeed a network owner with over 80% of the number of local fibre connections (which would usually indicate SMP).

However, this 80% market share operator is Telia in only 60 of those municipalities and is another local operator in 79 municipalities. In 77 of those 79 areas, this is a municipal network. Using national averages obscures these critical differences.

The European Commission also notes that, where the municipal networks are present, *"Telia typically provides retail services as an access seeker to the municipal network based on central access[2] or acts as the communications operator, rather than self-providing the FTTH/B connectivity."*

From these facts, the Commission concludes the following.

"While at national level the market conditions appear to be very heterogeneous, the situation appears different when looking at municipal areas (or aggregated areas with similar conditions). In many cases, the conditions of competition within municipalities appear to be sufficiently homogeneous and are often clearly distinguishable from neighbouring areas."

If the analysis that concluded that Telia has SMP nationally were to be repeated by PTS using similar criteria, but looking at the sub-national areas implied by the Commission, this would imply that it is the various local operators holding 80% local market share which have SMP in the various fibre local access markets. In Sweden, these local operators are mostly municipally operated, but in other countries they may be commercial deployments.

The Swedish case, although yet to be revised by PTS following the European Commission's concerns, has three important features.

- It shows that a separate relevant market for fibre wholesale local access can be defined.
- It shows that very high local market shares can demonstrate that very different competitive conditions may exist in different local areas even if pricing appears to be relatively homogenous nationally.
- It implies that if the SMP analysis were repeated on appropriately defined geographical markets (municipal areas, in this case) then it is very likely that FTTH operators other than Telia would have SMP in 79 Swedish municipalities.

Operators found to have SMP will be subject to one or more regulatory remedies that could be relatively light touch (e.g. mandated wholesale access, transparency, non-discrimination obligations) or could if necessary be more intrusive (e.g. price control, obligation not to unreasonably bundle).

The historic Finnish regulatory model with many local SMP players may therefore re-emerge in FTTH in some EU countries. However, at the same time, other countries including the UK are pursuing a model where, as network coverage develops, there may be overlaps between FTTH networks in urban and suburban areas, which may represent a very different outcome and, potentially, different types of risks to consumers such as non-collusive oligopolies.

We are therefore seeing a variety of different models of competition in FTTH which will result in turn in different, tailored, responses from EU regulators (even within a common EU regulatory code). For further details, contact James Allen (Head of Regulation, Cambridge) or your local Analysys Mason office.

[1] Case SE/2019/2216: Wholesale local access to fibre networks provided at a fixed location in Sweden.

[2] While this is called "central access" by the Commission, it may be similar to a local access product in some ways due to the small scale of these networks.

Questions?
Please feel free to contact James Allen, Partner, Consulting
at james.allen@analysysmason.com

New-generation mobile cost models: addressing broader issues beyond termination rates

Loïc Tchoukriel-Thébaud, Manager, Consulting

"Mobile cost models should not be overlooked because the insights that they offer contribute to providing better regulation thereby stimulating investments into high-quality networks."

Over the past 20 years, national regulators have developed mobile cost models with one specific objective in mind: to set cost-oriented mobile termination rates (MTRs). However, Analysys Mason's new mobile cost model, developed for the French regulator Autorité de régulation des communications électroniques, des postes et de la distribution de la presse (Arcep), demonstrates that such models have the potential to offer regulators worldwide a more-detailed understanding of the mobile networks that are active in their country.

Arcep commissioned the development of its new mobile cost model despite the imminent introduction of Eurorates[1] (EU-wide fixed and mobile voice call termination rates) and the less-contentious regulatory debates about MTRs in the EU now that the 'Pure LRIC' MTRs are sufficiently low that they do not significantly constrain retail offers such as unlimited voice.

Talking to operators on an equal footing when it comes to the knowledge of network costs

This new generation of mobile cost models chiefly aims to understand the total cost of specific commercial or societal aims rather than to calculate the unit cost of a regulated service. In particular, Arcep wanted to understand the cost of:

- extending the coverage of a mobile operator
- upgrading radio sites' backhaul technology to fibre
- offering a given throughput per site on all 4G sites with current spectrum allocations (with or without refarming from 3G)
- maintaining operators' networks in their current state of deployment.

Arcep has used the model so far for the first (4G and/or 5G coverage) and fourth activities described above.

This new cost model complements the 'regulation from data' approach[2] that Arcep has adopted since 2016, which offers end users of telecommunications services detailed information about the availability and quality of networks (both mobile and fixed) to inform their choices. The information provided partly relies on data collected from these same end users. Both approaches combine to provide better regulation, which helps to create an environment for, and stimulates investments in, high-quality networks. This, in turn, will have positive socio-economic externalities.

The new-generation cost model was produced with the co-operation of the French telecoms industry

French operators agreed to participate in the development of Analysys Mason's mobile cost model by contributing detailed comments during several consultations. This means that the model more accurately reflects their current networks and is better placed to help Arcep to evaluate the cost implications of their evolution over time. The model also relies on extensive databases that store information about operators' radio sites (these databases are, to a large extent, publicly available[3]) and databases about microwave backhaul links (which are held by Arcep, but bring together data submitted to it by the operators).

This bottom-up model was developed to calculate network costs in the following three modes.

- Analysys Mason used operators' databases that hold information about radio sites and microwave backhaul links to replicate actual deployments. Cost results were calibrated against the regulatory accounts of each of the metropolitan[4] operators.

- The hypothetical extension of an actual network was evaluated through the addition of new sites deployed in specific locations (which may have been determined via a radio-planning exercise), as shown in Figure 1.
- A testbed mode simulated the impact of new technologies that have yet to be deployed (for example, 5G, virtualised core and cloud RAN).

The first two modes apply to all existing operators in metropolitan France and the French départements d'outre-mer (DOM, grouped into those located in the Caribbean and those located in the Indian ocean). The third mode applies to all existing operators as well as to one hypothetical, generic operator in each area.

Mobile cost modelling can provide better regulation

This new generation of mobile cost model can give regulators worldwide a detailed knowledge of the cost implications of future deployments to be borne by the mobile operators in their country. Analysys Mason has conducted almost 200 cost modelling projects over the past 10 years and, as a result, has acquired unrivalled experience in developing and updating cost models, often including consultation with various industry stakeholders.

[1] European Commission (11 December 2019), Summary report on the public consultation on voice call termination rates. Available at https://ec.europa.eu/digital-single-market/en/news/summary-report-public-consultation-voice-call-termination-rates.

[2] Arcep (16 January 2020). Available at https://www.arcep.fr/la-regulation/grands-dossiers-thematiques-transverses/la-regulation-par-la-data.html.

[3] Agence Nationale des Fréquences (ANFR), L'observatoire en carte. Available at https://www.anfr.fr/gestion-des-frequences-sites/lobservatoire/lobservatoire-en-carte2/.

[4] This includes operators in mainland France but excludes those in the départements d'outre-mer (DOM) and territoires d'outre-mer (TOM, such as French Polynesia, New Caledonia, and various other small French islands around the world with little or no population).

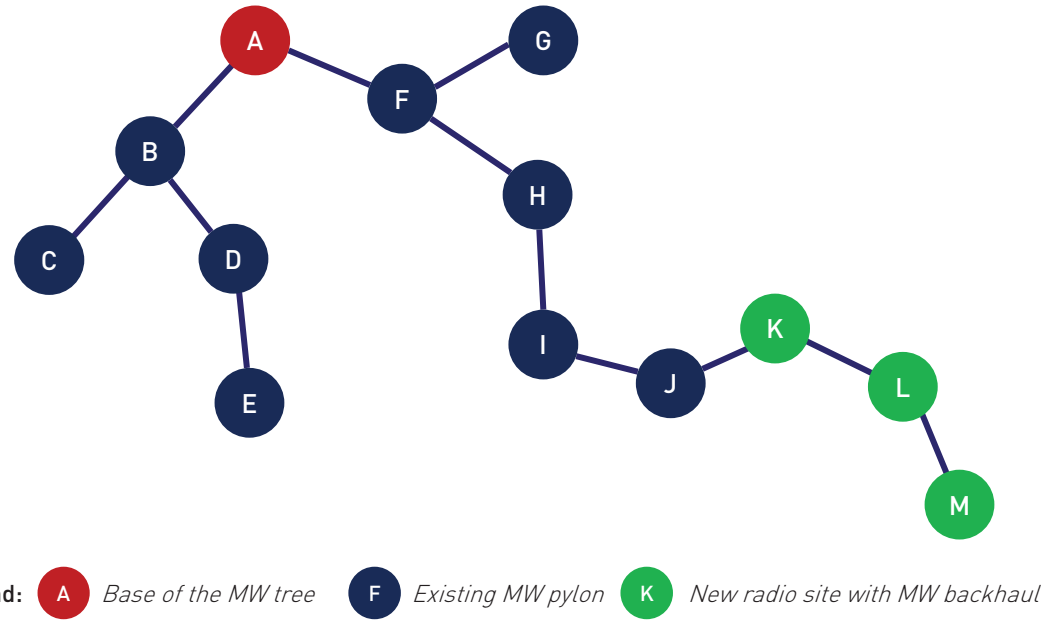


FIGURE 1: ANALYSYS MASON'S MOBILE COST MODEL EXTENDS THE NETWORK BY ADDING NEW SITES AND CONNECTING THEM TO THE EXISTING BACKHAUL NETWORK (MICROWAVE (MW) LINKS ARE SHOWN IN THIS EXAMPLE) [SOURCE: ANALYSYS MASON, 2020]

Questions?

Please feel free to contact Loïc Tchoukriel-Thébaud, Manager, Consulting at loic.tchoukriel-thebaud@analysysmason.com

The use of COVID-19 contact tracing apps implies a potential trade-off between public health interests and privacy/data protection

Fabio Fradella, Principal, Consulting

During the COVID-19 pandemic telecoms networks are already playing a strong role in protecting society and keeping certain parts of the economy functioning.[1] This article discusses the opportunity to use smartphone technologies to track people for public health applications, and the obvious privacy implications associated with this.

Location tracking generates potentially useful information that could help to reduce onward spread of the disease. For example, it can be used to:

- Measure the approximate locations of citizens / number of movements (footfall) per day in specific areas, to indicate whether lockdown controls are being observed in a consistent way over time
- Reveal detailed movement patterns to assist in modelling the interconnectedness of society (e.g. to understand which lockdown measures are more likely to reduce the number of new cases per infected person, and so stem the growth rate of the disease and hasten its decline)
- Identify people who need to be warned to self-isolate because they have been in close proximity to known cases during the period when those people may have been infectious.

Each of these applications has different requirements in terms of location accuracy, synchronisation of data collection (timestamps), and the required level of take-up of the tracking mechanism. They can also be implemented in a variety of ways, with the data that is gathered being subject to different degrees of aggregation, anonymisation and storage. These results can be partly achieved with different levels of privacy protection:

- The first (footfall) application is, with certain limits, readily achievable with entirely anonymised data
- The second (detailed movement patterns) is by its nature very difficult to anonymise (since it involves tracking where individuals live, work and shop)
- The third can potentially be achieved without knowing the actual location of the device, by using short-range device-to-device communications (e.g. Bluetooth Low Energy (BLE)); Apple and Google recently announced a BLE-based system aimed at establishing a contact-tracing network on a voluntary basis, by using smartphones to store data about other phones that have been in close proximity.

The short-range device-to-device option could possibly enable tracking of likely contacts without allowing the state to know everyone's detailed movements all the time, but the concept – at least as it has been described to date – does pose several challenges:

- It will only work well enough to prevent new clusters of infection if a high proportion of the population always carries a suitable device
- Even such chains of contacts represent data that would be highly valuable to certain state actors outside the health arena (e.g. for detection of crime, espionage, suppression of investigative journalism)
- If it relies on self-reporting of symptoms there is a risk of misuse; and mechanisms to minimise abuse would have to avoid deterring genuine reporting of mild symptoms
- Characteristics of the device/operating system (OS) may limit the ability to support specific technical solutions (e.g. access to location data when the app is not active; battery life).

According to media reports,[2] some countries have started using phone data to track people's movements in various ways, and with different levels of intrusiveness – including the USA, South Korea, Iran, Israel,[3] Singapore, Taiwan, Austria, Poland, Belgium, Germany and Italy.

These developments raise some questions:

- Should governments be entitled to track people to support these kinds of apps during pandemics? What about seasonal flu? Will such practices become permanent?
- How is this related to citizens' personal data protection rights (especially in the EU)?

These questions highlight a trade-off between the protection of a general interest (i.e. in the present case, public health) and the rights of an individual (privacy).

Contact tracing of the kind outlined above:

- has the potential to prove useful in the current circumstances, but great care would be required in its implementation, including the need for societal consent (e.g. support from domestic parliaments)
- requires individual consent: people must agree to be traced by the state or by someone on its behalf (assuming this is not to be secret surveillance)
- should only be allowed under very tight safeguards: in the EU, the General Data Protection Regulation (GDPR) framework does provide scope for processing personal data (including location) for public interest purposes;[4] however, GDPR also gives the data subject several rights (e.g. access, rectification, erasure)[5] from which derogation is only possible if there are specific legal provisions in the relevant Member State.[6]

The Italian case

As an example of work underway in individual countries, the Italian government has selected an app for contact tracing and physical parameter recording, based on a combination of GPS and BLE. App download and usage will be on a voluntary basis, but people who do not install and use it may be subject to mobility restrictions.

Current efforts in Italy are focused on identifying key elements of the GDPR framework relevant to use of the proposed app, including data controller and processor, data storage locations (e.g. GDPR includes specific prescriptions regarding cross-border and/or cloud-based storage solutions).[7] Italy's Parliament, privacy authority and secret service committee are each required to provide input on the app's compliance with national law (and GDPR) before it can be used.

Thus, while an app of this kind is clearly aimed at protecting public health, its impact on individuals' interests (i.e. privacy rights) needs to be assessed and minimised by relevant stakeholders (such as the privacy authority and the OS provider) – but ideally without significantly delaying the development and deployment of the app.

[1] Analysys Mason Consulting: COVID-19: the telecoms industry will suffer less than many others, and can thus help to support the economy

[2] See Business Insider, "The US is tracking people's movements with phone data, and it's part of a massive increase in global surveillance", available at https://www.businessinsider.com/countries-tracking-citizens-phones-coronavirus-2020-3?IR=T#taiwan-can-tell-when-quarantined-people-have-left-the-house-6

[3] A move which has subsequently been suspended over privacy concerns; see https://www.bbc.com/news/technology-52395886

[4] See EU Regulation 2016/679, Article 6, point 1e.

[5] Ibid, Chapter III.

[6] Ibid, Article 89.

Questions?
Please feel free to contact Fabio Fradella, Principal, Consulting at fabio.fradella@analysysmason.com

Businesses should consider infrastructure-based strategic partnerships with cloud service providers

Jia Yee Lim, Manager, Consulting

"Infrastructure-based strategic partnerships could help cloud service providers to facilitate global expansion, and could also allow local businesses to take a more inclusive role in the cloud value chain."

Businesses typically rely on channel or technical partnerships with large cloud service providers (CSPs) to address the burgeoning cloud opportunity. However, businesses could also consider an infrastructure-based strategic partnership, especially in markets where CSPs' presence is lacking, thereby allowing them to take a greater share of the business venture.

In an infrastructure-based strategic partnership, the business partner typically invests in all or part of the cloud computing hardware (for example, servers and networking equipment), as well as in other third-party services (such as data centre capacity and network connectivity), while adhering to the technical specifications from the CSP. The strategic partner may also take on various responsibilities in the management of commercial and technical operations (for example, leading the sales effort, providing basic customer support and navigating local regulations), depending on their expertise.

The CSP is in turn responsible for the cloud technology, R&D, orchestration and operation, capitalising on its international scale and breadth of services developed over years of R&D and operations. The revenue from the joint operations can then be shared between the strategic infrastructure partner and the CSP at a pre-determined rate that balances the potential return on investment to each party.

An infrastructure-based strategic partnership is potentially beneficial for both parties

The public cloud market is growing, and more and more businesses are outsourcing their IT workloads to the cloud. Large CSPs are often well-funded, but will probably have to carefully balance investment requirements to support the increasing demand. CSPs' finite resources will be stretched further as more countries impose data localisation requirements; CSPs will have to build more regions and availability zones on top of their existing networks (see Figure 1) to support customers in the countries affected.

An infrastructure partnership with a local business can enable a CSP to share the investment risk with a third party, while at the same time dealing with the complex local regulatory requirements (such as foreign ownership and import restrictions) for launching availability zones in a new market. Tencent Cloud is an example of a CSP that has taken advantage of infrastructure-based partnerships in its global expansion: it has partnered with at least six local partners across the Americas, Australia, Europe and India to date in order to deliver its cloud computing platform (see Figure 1).

The strategic infrastructure partner can, in turn, make use of the CSP's scale, breath of offerings and brand name to enter the public cloud infrastructure market, thereby unlocking an opportunity to expand into other parts of the cloud value chain (such as managed services).

An infrastructure partnership comes with higher returns than a channel or technical partnership, but these returns are commensurate with the larger risk that the business partner must take to invest in cloud infrastructure. Indeed, the upfront investment required may be substantial because cloud infrastructure provision derives most of its strategic advantage from the scale of its operations. As such, a long-term exclusive commitment may be needed to make the business case viable for the strategic partner.

Infrastructure and network providers are the obvious targets for strategic partnerships, but the opportunity is also interesting for online service providers

Infrastructure and network providers already control the key inputs for cloud service operation and can use strategic partnership opportunities to move from being a third-party

supplier to having a more-inclusive role within the value chain. An example is SB Cloud, a joint venture between SoftBank and Alibaba Cloud in Japan, that was launched in 2016. SB Cloud provides cloud services, including data storage and compute, from data centres in Tokyo, and allows SoftBank to diversify into providing cloud services to its extensive business customer base in Japan.

Infrastructure and network providers are the obvious targets for a strategic partnership with a CSP, but this opportunity may also be interesting to online service providers (OSPs) that have a large internal demand. These players are looking to manage costs while continuing to benefit from the operational and cost efficiencies that cloud computing can provide. A strategic partnership with a CSP can bring the advantages of lower latency to the OSP's daily operations. More importantly, it can facilitate the transformation of the OSP's computing requirements from being an operating cost, into being a revenue-generating function, further contributing to the diversification strategies of OSPs today.

Analysys Mason has extensive experience in the cloud and data centre markets worldwide, and is familiar with the unique opportunities and challenges that these markets present. We work with companies to evaluate cloud business opportunities, develop business plans and identify synergies in potential partnerships.

[1] The actual figure may be higher because 10 of the regions have an undisclosed number of availability zones.

[2] Six of which are in the form of 'overseas co-operative infrastructure', that is, they are delivered in partnership with a local player.

Cloud service provider	Number of regions (planned)	Number of availability zones
Alibaba Cloud	21	61
Amazon Web Services	22 (5)	69
Google Cloud Platform	22 (3)	67
IBM Cloud	29	Approximately 45
Microsoft Azure	52 (4)	62 (4)[1]
Oracle Cloud	22	66
Tencent Cloud	26[2]	53

FIGURE 1: NUMBER OF REGIONS AND AVAILABILITY ZONES FOR VARIOUS CLOUD SERVICE PROVIDERS [SOURCE: COMPANY WEBSITES, MARCH 2020]

Questions?
Please feel free to contact Jia Yee Lim, Manager, Consulting at jia.yee.lim@analysysmason.com

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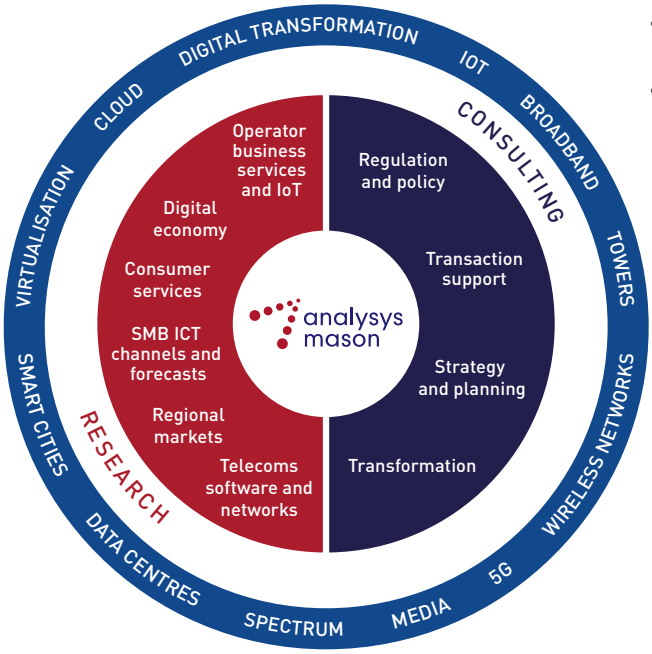

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