



# Building momentum around VoLTE Roaming

Published by

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# Introduction

Mobile data traffic continues to grow at an explosive pace, with the average monthly usage per smartphone expected to jump from the low single digits today to around 25GB in 2025<sup>1</sup>. However, voice remains a staple of communication for mobile users across the globe, a fact highlighted by a 20-70 per cent jump in usage worldwide<sup>2</sup> in 2020 sparked by the Covid-19 health crisis. Operators therefore need to continue offering high quality voice services even as they push ahead with 5G deployments to meet rising mobile data demand in a rapidly digitising world.

But this presents a problem: in order to recycle spectrum for 5G, operators must shut down legacy circuit-switched 2G and 3G networks used to carry voice traffic. Enter Voice over LTE (VoLTE), an IP-based voice transport mechanism that lets operators deliver high-quality voice services while eliminating the need for traditional circuit-switched systems.

Over 200 operators around the world have deployed VoLTE services<sup>3</sup> in their networks, and nearly 2,000 devices support VoLTE features today with many more being launched every month. However, roaming with VoLTE remains a gaping hole in this plan. While over 100 networks were planning to launch VoLTE Roaming services in 2019<sup>4</sup>, very few actually did so. This means that as operators plan for 2G and 3G network shutdowns to re-farm existing low-band spectrum for 5G services, their customers may be left without a vital service when traveling abroad. This will result in below-par customer experience for roaming users, and the loss of potentially lucrative revenue opportunities for operators.

This whitepaper looks at the hurdles operators are up against in pursuing VoLTE Roaming agreements, the risks they face if they put off striking deals for too long and the tools that are available to help them move forward on a journey that is certain to be rewarding.

<sup>1</sup> Ericsson Mobility Report, June 2020.

<sup>2</sup> Ibid.

<sup>3</sup> <https://www.gsma.com/futurenetworks/all-ip/statistics/>

<sup>4</sup> <https://www.volteroaming.com/the-first-volte-roaming-taskforce-meeting-held/>

# VoLTE Landscape

VoLTE technology has been around for quite some time. South Korean operator SK Telecom and US player MetroPCS<sup>5</sup> became the first to launch commercial VoLTE service in August 2012. Just three years later, SK Telecom teamed up with domestic rivals KT and LG Uplus to roll out the world's first interconnected VoLTE service<sup>6</sup>, allowing consumers to take advantage of the technology when calling across networks.

The advantages of VoLTE over traditional circuit-switched 2G and 3G systems are clear: according to GSMA, the technology enables faster call initiation, with VoLTE setup occurring in about one-third

of the time needed for a circuit-switched call; offers better voice quality; uses fewer radio resources; and supports multimedia communications such as messaging.<sup>7</sup>

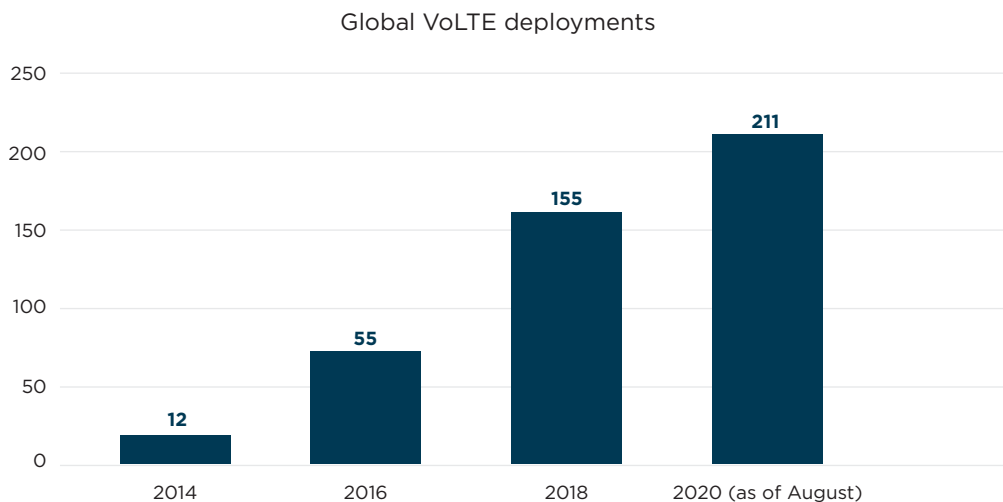
VoLTE also sets operators on the path to 5G: as Ericsson noted in its June 2020 Mobility Report, circuit-switched fall-back will soon no longer be an option since the IP Multimedia Subsystem (IMS) used in VoLTE is the only standardised voice protocol for 5G.<sup>8</sup>

Indeed, it seems operators have widely recognised these benefits, as evidenced by the stream of deployments which followed MetroPCS and SK Telecom's initial launches. Data from Ericsson's

Mobility Report series showed global VoLTE deployments grew from 12 as of November 2014, to more than 155 four years later<sup>9</sup>.

The latest statistics from both GSMA Intelligence and Global mobile Suppliers Association (GSA) indicate 211 operators in approximately 100 countries around the globe have now deployed the technology.<sup>10</sup> GSA found at least 30 additional operators are in the process of deploying VoLTE, with another 31 operators either planning deployments or conducting trials.

**Figure 1: Number of Global VoLTE Deployments**



Data from Ericsson Mobility Report November 2014, 2016, 2018; GSMA Intelligence, August 2020

<sup>5</sup> Mobile World Live, "MetroPCS silences SKs LTE voice launch". 8 August, 2012. <https://www.mobileworldlive.com/latest-stories/metropcs-silences-sks-lte-voice-launch>

<sup>6</sup> GSMA press release, "GSMA welcomes launch of world's first commercial interconnected VoLTE service in South Korea". 18 June, 2015. <https://www.gsma.com/newsroom/press-release/gsma-welcomes-launch-of-worlds-first-commercial-interconnected-volte-service-in-south-korea/>

<sup>7</sup> GSMA reference document, "VoLTE Implementation Guide". July 2020. <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

<sup>8</sup> Ericsson Mobility Report, June 2020.

<sup>9</sup> <https://www.ericsson.com/en/mobility-report/reports>

<sup>10</sup> <https://gsacom.com/paper/volte-status-march-2020/>

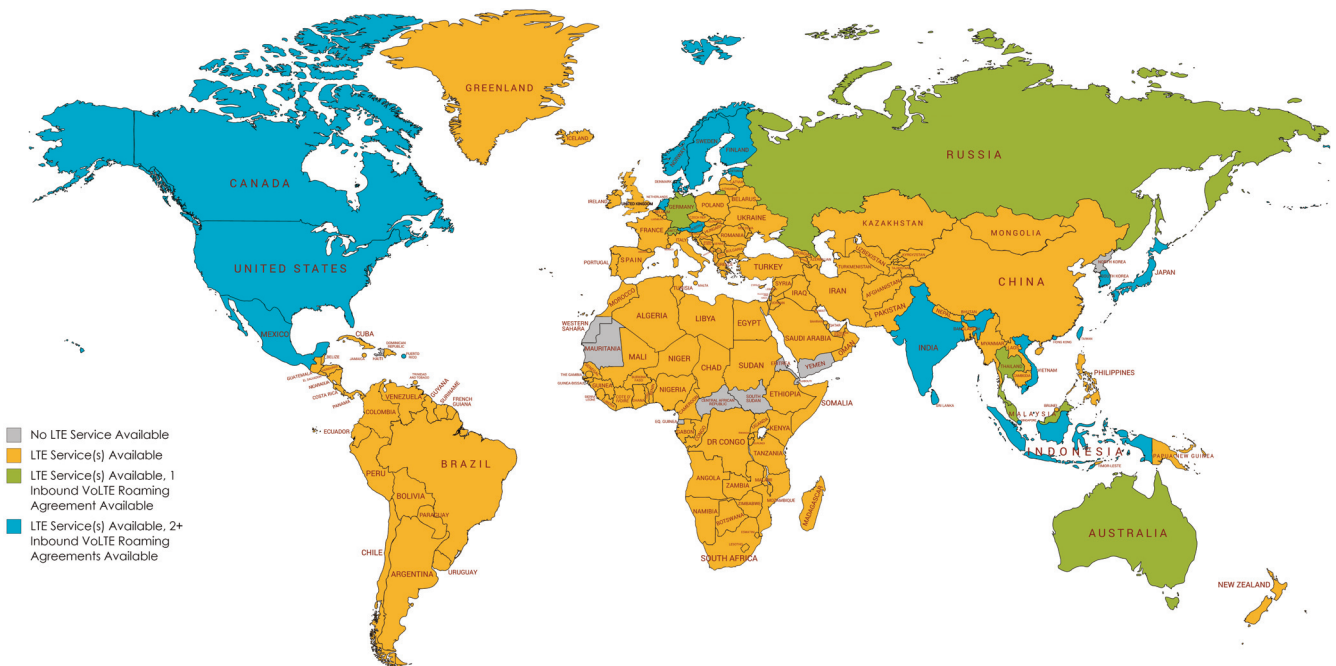


LG Uplus staked a claim as the first operator to offer VoLTE roaming alongside Japanese operator KDDI in April 2015<sup>11</sup>. But to date, only a fraction of operators which offer VoLTE service at home offer VoLTE Roaming.

Operators which have released public information about their VoLTE Roaming launches include AT&T, Bell Canada, China Mobile Hong Kong, Chunghwa, CSL, Dialog Axiata, Far EasTone, JT Global, KDDI, KT, LG Uplus, NTT

Docomo, Reliance Jio, SmarTone, Telenor, Truemove, Rogers Communications and Verizon.

**Figure 2: VoLTE Deployment Status – Source: GSMA**



<sup>11</sup> Mobile World Live, "LG Uplus claims first commercial VoLTE roaming". 13 April, 2015. <https://www.mobileworldlive.com/asia/asia-news/lg-uplus-claims-first-commercial-volte-roaming>

# Why VoLTE Roaming

VoLTE Roaming builds on standalone deployments by extending all of the aforementioned advantages to more customers, while also improving coverage by allowing users to tap into the networks of new 4G-only operators and offering operators a competitive advantage by making them a preferred network for inbound roamers.

Grand View Research noted in a May 2020 report voice roaming still accounts for more than 25 per cent of roaming revenue, and forecast revenue from the overall roaming market (including data and SMS) to reach \$88.9 billion by 2027, up from \$65.1 billion in 2020<sup>12</sup>.

As 2G and 3G network shutdowns continue, VoLTE Roaming will also ensure operators maintain access to key markets for their customers.

Take the US for example: Verizon is preparing to turn off its 2G and 3G CDMA networks at the end of 2020<sup>13</sup>, and reports indicate T-Mobile US will require all devices connecting to its network to be VoLTE capable from January 2021<sup>14</sup>. Meanwhile, AT&T shut down its 2G network in January 2017, and plans to phase out 3G in February 2022<sup>15</sup>. Thus, both 2G and 3G will likely be completely inaccessible within two years, meaning VoLTE Roaming will be a requirement for continued service for inbound roamers traveling in the US.

Additionally, as mentioned above, VoLTE and by extension VoLTE Roaming agreements will be a prerequisite for 5G roaming. Standalone 5G standards currently only include support for IMS-based voice service, meaning there is no standardised way for a 3G network to interface with a standalone 5G network in a roaming environment.



<sup>12</sup> Grand View Research, "Roaming Tariff Market Size, Share & Trends Analysis Report By Roaming Type (National, International), By Distribution Channel, By Service (Voice, SMS, Data), By Region, And Segment Forecasts, 2020 - 2027". May 2020. <https://www.grandviewresearch.com/industry-analysis/global-roaming-tariff-market>

<sup>13</sup> <https://www.verizon.com/support/knowledge-base-218813/>

<sup>14</sup> Android Police, "If your T-Mobile phone doesn't have VoLTE, you could get kicked off the network soon". 23 July, 2020.

<sup>15</sup> <https://www.androidpolice.com/2020/07/25/t-mobile-will-soon-require-volte-on-all-phones-incompatible-devices-kicked-off-january/>

<sup>15</sup> <https://www.att.com/support/article/wireless/KM1324171/>



## Roadblocks for VoLTE Roaming

There are a few good reasons why operators have been slow to pursue VoLTE Roaming agreements despite their home network deployments. While such arrangements are key for the future, setting up VoLTE Roaming is highly resource intensive and time consuming.

Historically, operators only needed to ship SIM cards to one another to conduct partner testing for 2G and 3G. But VoLTE requires the exchange of actual devices, meaning operators have to spend the time and money to ship and test multiple devices.

A typical operator may have to send as many as 15 or more devices to each roaming partner. In some cases, operators prefer to test all of their major handsets with partners before moving forward, increasing the amount of time and money that has to be dedicated to testing.

As GSMA noted in its July 2020 VoLTE Implementation Guide: “There are over 1800 hundred VoLTE capable devices and currently circa 200 VoLTE launches, with variations between the MNOs regarding their TS.32[19] parameter preferences. VoLTE Roaming enables any device to appear in any network. The need to test ‘everything everywhere’ is overwhelming. There is a need to have a methodology and testing strategy to break down the problem into a manageable task.”<sup>16</sup>

Operators also have to compare network configurations to ensure interoperability, resolving architectural differences and routing misconfigurations to come to a finalised setup for roaming. All of this, of course, takes up more time and resources.

But some initial barriers to VoLTE Roaming have already been removed.

Take for example lawful intercept, which refers to the legal ability of government authorities to access private communications. Regulations on whether or not operators must support lawful intercept vary by country, which posed a problem for roaming partners using encryption.

However, this issue was addressed by 3GPP in its Release 14 specifications, which require Internet Protocol Security (IPSEC) to be used on IMS signalling but permit encryption to be either enabled or disabled to meet local requirements.

A similar stumbling block related to emergency calling support was also resolved by 3GPP.

<sup>16</sup> GSMA reference document, “VoLTE Implementation Guide”. July 2020. <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

## Operator perspective

In a September 2020 interview, an executive from a major North American operator explained VoLTE Roaming opens the door for operators to capitalise on B2B opportunities that utilise VoLTE technology, including automotive connectivity, security systems, IoT applications and even IP messaging services which use the same IMS core as VoLTE.

Most importantly, though, the North American operator executive stressed VoLTE Roaming agreements will ensure MNOs continue to have a viable voice service in a post-2G and 3G world.

“There are operators, probably lower tier-3, tier-4 operators in some parts of the world who have made statements that they just want to provide a data service to their customers, and they expect their customers to use over-the-top applications for voice.

What that does is it degrades their position as a service provider to their customers, and with 3GPP specified devices, your 3GPP mobile device cannot attach to a mobile network if a voice service is not available in circuit switch or VoLTE.”

The executive continued: “So you have all these billions of handsets that are floating out there: they will not attach to our network once we turn down 3G service...unless that subscriber has a VoLTE-capable device and has VoLTE Roaming launched [with us].”

Despite any challenges, the executive urged other operators to press ahead with VoLTE Roaming implementations, warning they may get caught in a backlog if they wait too long.

“It’s going to create a huge funnel situation. The more operators globally wait or delay or plan on doing their own VoLTE

Roaming implementations closer to the time that operators are doing their 2G, 3G decommission, the more that funnel is going to get tight.”

The executive noted a crush of operators seeking VoLTE Roaming agreements will strain the resources required to implement such arrangements, including both staff and network resources. The smaller the operator is, the greater the burden will be, the executive added.

“The bottleneck is with everything that encompasses implementation...There’s going to be too many operators who need it sooner than later, and we’re forecasting that there will be operational difficulties and probably timing difficulties. That’s when prioritisation will take place.”



# Accelerating Progress

Thankfully, there are a number of solutions to help operators accelerate testing today, efficiently manage VoLTE Roaming systems once they are in place, and bridge the gap to legacy 2G and 3G circuit-switched systems as they work toward implementation.

## Roaming Support Node

While it can take time to deploy VoLTE Roaming agreements with partners, there are interworking solutions available which can help operators accommodate in-bound VoLTE roamers before roaming arrangements are settled. As defined by GSMA's Network Group, interworking refers to a functionality which allows two networks to talk to one another to enable services to be delivered across those networks.

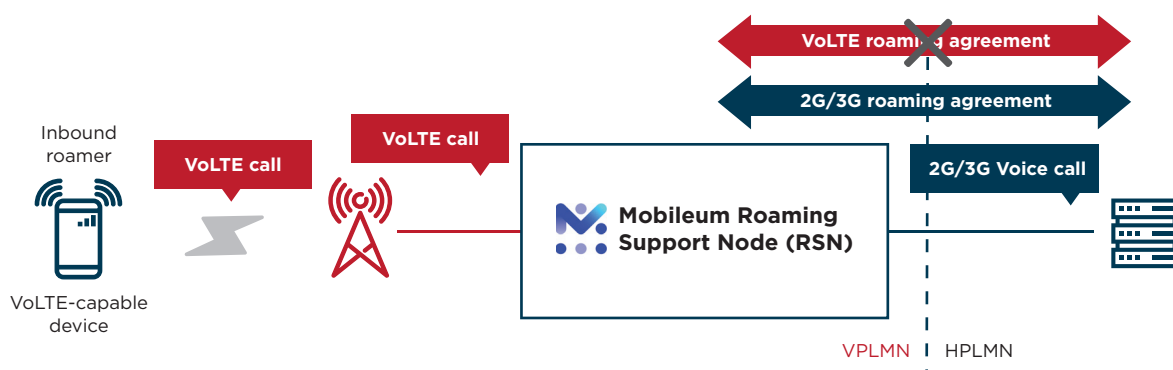
One interworking product aimed at addressing VoLTE Roaming challenges is Mobileum's Roaming Support Node (RSN), which enables VoLTE for subscribers even when there is no VoLTE Roaming agreement in place by acting as a translator between VoLTE and circuit-switched systems (see Figure 3).

So, for example, say there is no VoLTE Roaming agreement between a UK operator and a US operator, but a customer from the UK operator roams in the US. Mobileum's RSN can enable VoLTE services for that roamer by acting as a sort of go-between, interfacing with the US operator's VoLTE system on one side and the UK operator's circuit-switched system on the other to convert the call to VoLTE.

The RSN interworking system will work for any subscriber with a VoLTE-capable handset.

Such a capability is key in a world where 2G and 3G sunsets are accelerating, and not just for operators looking to support outbound VoLTE Roaming. Interworking functionality such as that offered by the RSN can help operators, without a 2G or 3G network, increase their inbound traffic and revenue, and also indirectly boost their leverage in negotiations for wholesale rates for outbound traffic.

**Figure 3: Roaming Support Node(RSN) enables inbound roamers with a VoLTE capable device to make VoLTE calls also in the absence of a VoLTE roaming**





## Test acceleration

Mobileum also offers different options to help operators accelerate and automate the otherwise lengthy and burdensome testing required for VoLTE Roaming arrangements.

For instance, its Remote Radio Testing solution enables a home operator to create a virtual copy of a foreign operator's network in a shielded environment within its own. This allows the home operator to test any device at any time, eliminating the complex logistics of shipping devices to a foreign network for in-person evaluation and significantly speeding up the testing process.

Operators can also cut down on the manpower needed for testing using Mobileum's GlobalRoamer worldwide network of VoLTE Robots, which enable automation of a wide range of test functions (e.g. VoLTE, SMSoIP, SSoIMS, RCS). SIM cards are managed centrally and can be used for testing in any location where VoLTE robots are deployed, using the SIM multiplexing capabilities. In addition to conducting testing ahead of the VoLTE Roaming launch, the robots can also be programmed to conduct periodic testing after commercial launch, to proactively spot service issues and ensure the best customer experience.

GlobalRoamer VoLTE services are available in more than 75 countries thus far, with a roadmap in place for rollouts in over 120 countries.

Moreover, Mobileum also offers the possibility to test with the most popular iOS and Android devices, also ensuring device compliance for VoLTE. Covering both device and network is essential for establishing a consistent testing scheme for VoLTE roaming.

## Roaming management

Operators can also turn to Mobileum for a number of tools to help manage their VoLTE Roaming quality once partner agreements have been implemented. Three key offerings include Mobileum's Intelligent Steering, Call Correction and Roam Policy products.

In its VoLTE Implementation Guide, GSMA noted VoLTE Roaming exacerbates conditions which can impact the ability of devices to achieve and maintain an optimised roaming experience, recommending operators adopt a device-based steering solution to ensure user devices register only on compatible networks.

Mobileum's Intelligent Steering product is one such solution, which assesses an outbound roamer's device capabilities, VoLTE subscription profile and visited network capabilities, and connects them with the network best suited to serve them. So, for instance, a traveling customer with a VoLTE-capable device will be steered toward a VoLTE network in the country they're visiting, while customers carrying handsets without VoLTE

compatibility will be pushed to a network which still offers 2G and 3G service. This helps prevent customers with non-VoLTE handsets from losing service and ensures the best quality of experience for all roamers.

The company's Call Correction offering similarly works to anticipate a roamer's needs, identifying what country they are in and automatically supplying the correct country code to ensure all of their local calls are completed. It also helps ensure call completion when roaming customers dial short codes, which vary by country and can cause a roamer's call to be dropped when not handled properly.

Finally, RoamPolicy is Mobileum's real-time management platform, which offers operators a one-stop shop to enforce fair usage and prevent fraud and revenue leakage.

In the context of VoLTE, the platform allows operators to block or limit user calls to high-cost numbers, and send usage notification alerts to users to prevent bill shock. These functions can help avoid fraudulent roaming usage as well as subscriber non-payment in response to bill shock.

Taken together, these solutions represent a comprehensive integrated portfolio which helps alleviate complexity and accelerate VoLTE Roaming implementation.

<sup>17</sup> GSMA reference document, "VoLTE Implementation Guide". July 2020. <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

# Conclusion

Momentum behind VoLTE is strong and only getting stronger with each passing year. But despite more than 200 operator launches of the technology, VoLTE Roaming remains an issue – one that it is becoming increasingly urgent to solve.

Advances in technology, particularly a need among operators to recycle spectrum from legacy networks for 5G, mean 2G and 3G fall-back for voice services won't be an option much longer. Though implementing VoLTE Roaming is a daunting task, it is one operators must undertake and there are several solutions on the market to help smooth their path.

Mobileum's suite of products is up to the task, standing ready to help operators serve users before their VoLTE Roaming implementations are complete; accelerate and automate testing with partners; and manage their new VoLTE Roaming policies once rollouts are complete.



Mobileum is a leading provider of Telecom analytics for roaming, security and risk management and end-to-end domestic and roaming testing solutions. More than 900 operators rely on its Active Intelligence platform to increase roaming revenues, to improve network security, to minimize risk and to ensure active testing and monitoring. With a strong record of innovation, Mobileum is recognized for its ability to extract network and customer insights and to convert them into real-time actions that increase revenue, improve customer experience and reduce costs. Headquartered in Silicon Valley, Mobileum has global offices in Belgium, Dubai, Germany, India, Portugal, Singapore and UK.

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