iBASIS

8th Edition

VoLTE & 5G ROAMING ROUNDTABLE

April 12, 2022 | Virtual Session

BE THERE FIRST

ROUNDTABLE OBJECTIVES

iBASIS

Stimulate interaction and information sharing with Mobile operators on VoLTE Roaming and 5G Roaming, despite limitations of its virtual nature

A pragmatic and constructive discussion, allowing early adopters to find each other and share their experiences and the ecosystem they benefit

ON THE AGENDA

15:00 – 15:05   Welcome & Introduction   Patrick George,
                 Session Objective & Agenda   EVP Product & Business Development, iBASIS

15:05 – 15:15   VoLTE & 5G Roaming Outlook   Nitin Bhas, Strategy & Insight Lead, Kaleido Intelligence

15:15 – 15:25   Operator's perspective: KPN   Leendert Koning, Commercial Product Manager Roaming, KPN

15:25 – 15:35   Operator's perspective: Bouygues Telecom   Benoit Bertin, Head of International Wholesale, Bouygues Telecom

15:35 – 15:45   Operator's perspective: Telus   Tavis Freeman, Manager of Vendor Relations, Telus

15:45 – 15:55   IPX provider's perspective: iBASIS   Maïssa Jamli, Sr Product Manager, 5G Roaming & Innovation, iBASIS

15:55 – 16:00   Conclusions & Wrap-up   Edwin van Ierland, CEO Voice & Mobile Data, iBASIS

5G Roaming: MNO Opportunities & Requirements

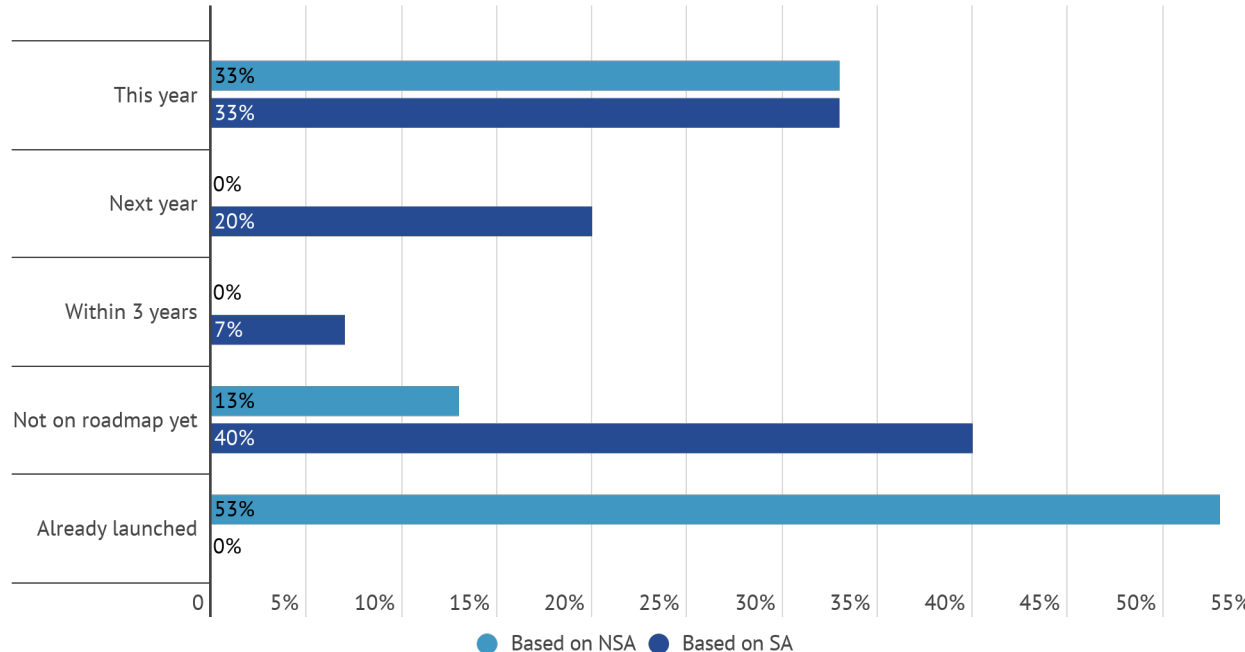iBASIS VoLTE & 5G Roundtable 2022

Presentation by Kaleido Intelligence

MNO 5G Roaming NSA & SA Launch Plans

5G Roaming Deployment Plans: When will you launch 5G roaming? (Based on NSA/SA architecture)

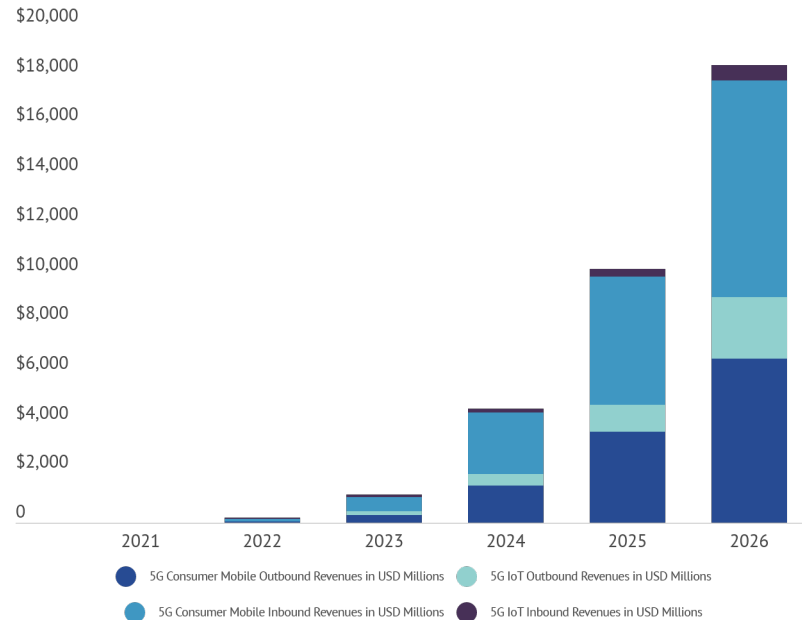|	Based on NSA	Based on SA
This year	33%	33%
Next year	0%	20%
Within 3 years	0%	7%
Not on roadmap yet	13%	40%
Already launched	53%	0%

● Based on NSA ● Based on SA

With several operators currently testing and trialling 5G SA roaming interoperability, around 34% of the respondents expect to launch 5G SA roaming in 2022.
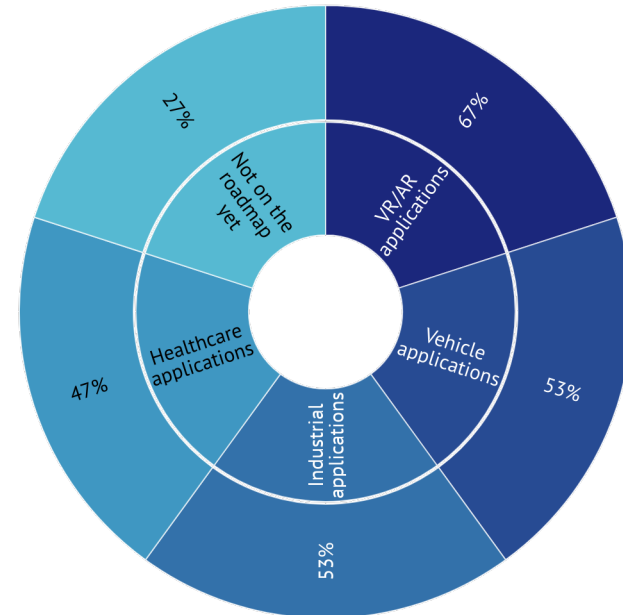
Source: Kaleido Intelligence

roaming.kaleidointelligence.com

The 5G Roaming Opportunity for MNOs

Roaming Revenues in 2026: Kaleido Forecasts $18 billion in Inbound & Outbound Revenues

Legend:
- 5G Consumer Mobile Outbound Revenues in USD Millions
- 5G Consumer Mobile Inbound Revenues in USD Millions
- 5G IoT Outbound Revenues in USD Millions
- 5G IoT Inbound Revenues in USD Millions

Source: Kaleido Intelligence

5G Roaming Use Cases: #1 VR/AR Applications Gains on Industrial & Automotive Use Cases

- VR/AR applications — 67%
- Vehicle applications — 53%
- Industrial applications — 53%
- Healthcare applications — 47%
- Not on the roadmap yet — 27%

Source: Kaleido Intelligence

roaming.kaleidointelligence.com

Kaleido Intelligence

5G SA Roaming: MNO Requirements

What do you perceive to be the most immediate requirements while launching 5G SA roaming?

Requirement	Value	Rank
Upgrading to service based architecture core network	40%	#1
Testing SA roaming functions	33%	#2
Secure interconnection model support	27%	#3
VoLTE and VoNR roaming support	20%	
Interworking with Diameter/SS7	20%	
Negotiate 5G SA roaming agreements	20%	
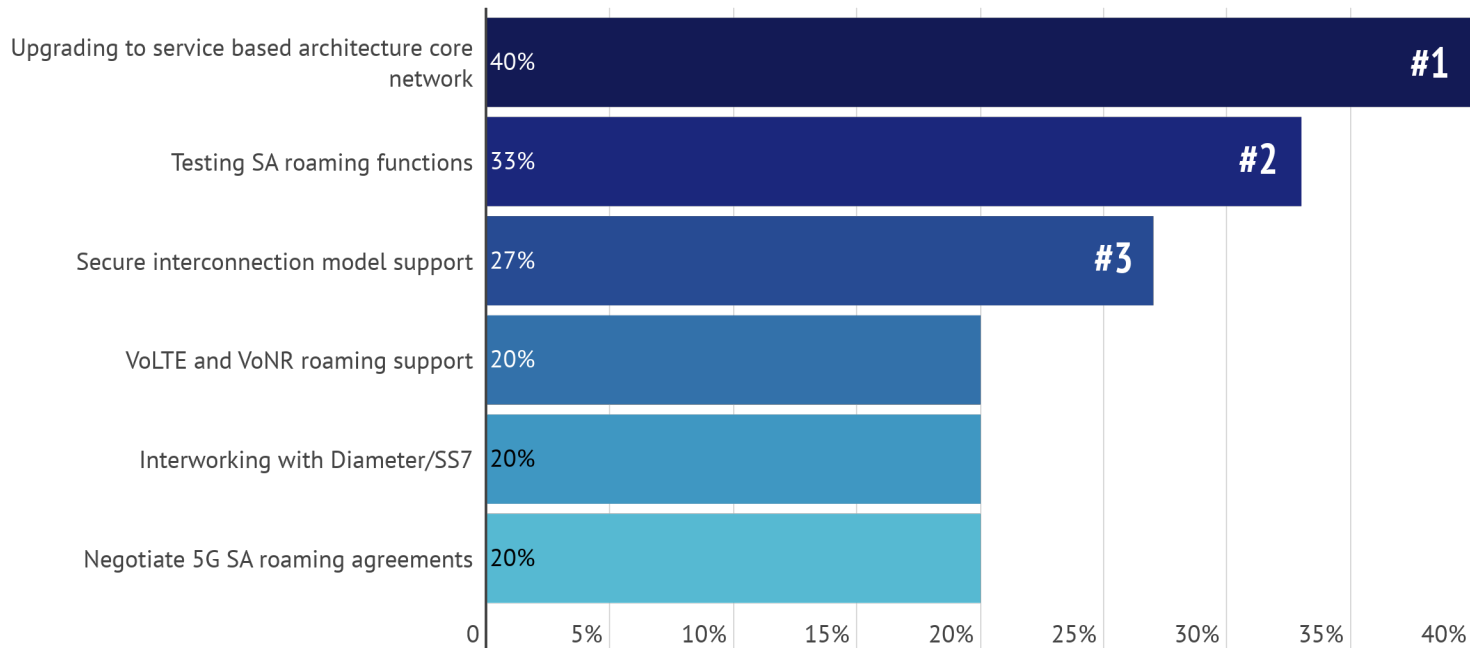
Source: Kaleido Intelligence

IPX Vendor Requirements & Innovation

Kaleido Intelligence

IPX Vendor Requirements for 5G SA Deployment

What are your top expectations from your IPX vendor while launching 5G SA roaming?

Requirement	%	Rank
Enable a wider range of 5G SA use cases	28%	#1
Support and monitoring of advanced network-slicing functions	25%	#2
5G SA roaming testing support	20%	#3
5G signalling support via HTTP/2	19%	#4
Security solutions for 5G SA (firewall, IDS, IPS)	12%	#5
Choosing the right interconnection model	11%	#6
Reliable and fast data network	10%	#7
Cloud based 5G VAS support	9%	#8
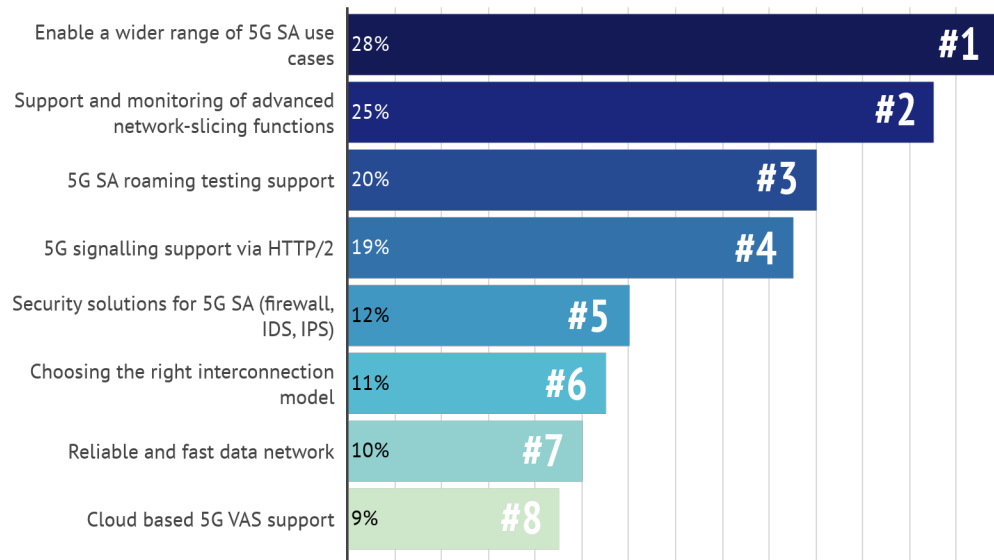
Source: Kaleido Intelligence

5G Service Innovation MNO Expectations: Top 5

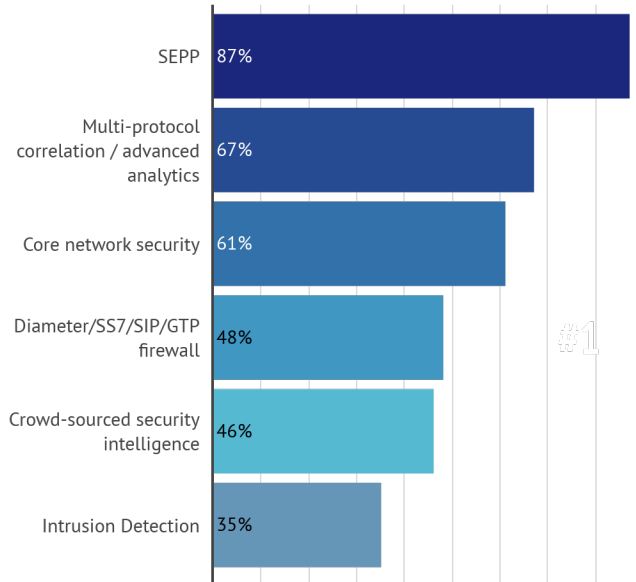*What kind of services or innovation you expect from your IPX provider?*

Service	%
Real-time intelligence	87%
VoLTE & non-VoLTE interworking	73%
Guaranteed QoS / QoE	67%
Signalling interworking	60%
Data transport	40%

Source: Kaleido Intelligence
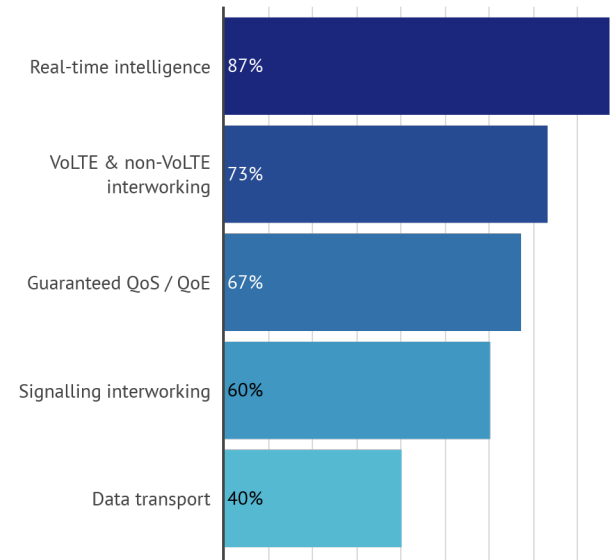
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Addressing A New Security Architecture & The IPX Role

Kaleido Intelligence

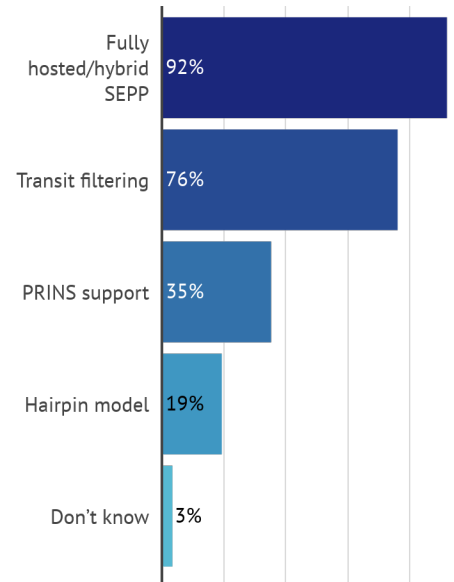### Security & 5G: Why 'Best-in-Class Security' is a 'Must Have'

What are your priorities for security investment plans in 2022?

Category	Percentage
SEPP	87%
Multi-protocol correlation / advanced analytics	67%
Core network security	61%
Diameter/SS7/SIP/GTP firewall	48%
Crowd-sourced security intelligence	46%
Intrusion Detection	35%

#1

Source: Kaleido Intelligence

Which security method(s) do you expect your IPX in 5G to use to provide you VAS services for 5G; how do you expect your IPX provider to address these?

Category	Percentage
Fully hosted/hybrid SEPP	92%
Transit filtering	76%
PRINS support	35%
Hairpin model	19%
Don't know	3%

Source: Kaleido Intelligence

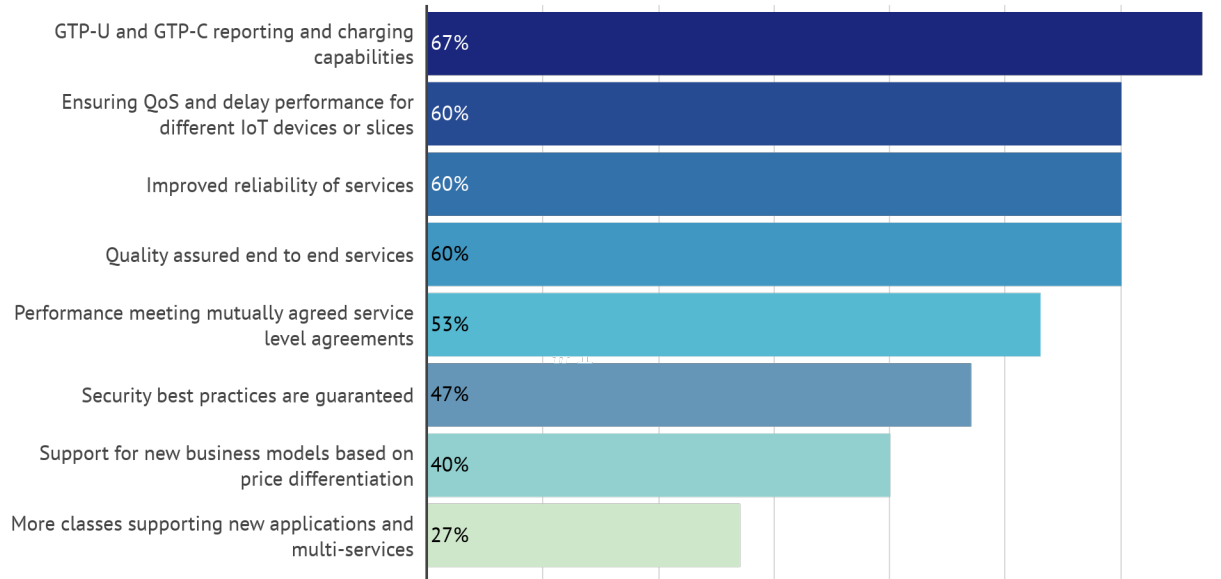87% of survey respondents view SEPP investment as the core priority for 2022, given that 5G roaming initiatives are accelerating.

roaming.kaleidointelligence.com

The Essential Actions For 5G Roaming Success

Kaleido Intelligence

QoS & QoE Expectation Intensifies

What are your QoS/QoE expectations from your IPX provider, compared with today?

Category	Value
GTP-U and GTP-C reporting and charging capabilities	67%
Ensuring QoS and delay performance for different IoT devices or slices	60%
Improved reliability of services	60%
Quality assured end to end services	60%
Performance meeting mutually agreed service level agreements	53%
Security best practices are guaranteed	47%
Support for new business models based on price differentiation	40%
More classes supporting new applications and multi-services	27%

GTP-U & GTP-C reporting and charging capabilities found to be the #1 QoS/QoE expectation by 67% of the MNO respondents.

Source: Kaleido Intelligence

> " "

Partnering with a reliable and innovative IPX provider to deliver an optimal 5G roaming experience, with a clear focus on capacity, security, QoS and analytics is fundamental.

www.ibasis.com   www.kaleidointelligence.com

5G ROAMING:
MNO OPPORTUNITIES & IPX REQUIREMENTS 2022

A Kaleido Intelligence Whitepaper for iBASIS

iBASIS   Kaleido Intelligence

About the White Paper

This latest edition of the 5G Roaming white paper from iBASIS and Kaleido Intelligence highlights the opportunities that 5G will bring for operators, alongside the associated MNO requirements and expectations from IPX vendors. Kaleido Intelligence surveyed nearly 100 respondents across tier-1 operators around the world on their 5G roaming plans during January-February 2022 to learn more about their commercial and technical requirements for implementing 5G roaming from an IPX, security and signalling perspective.
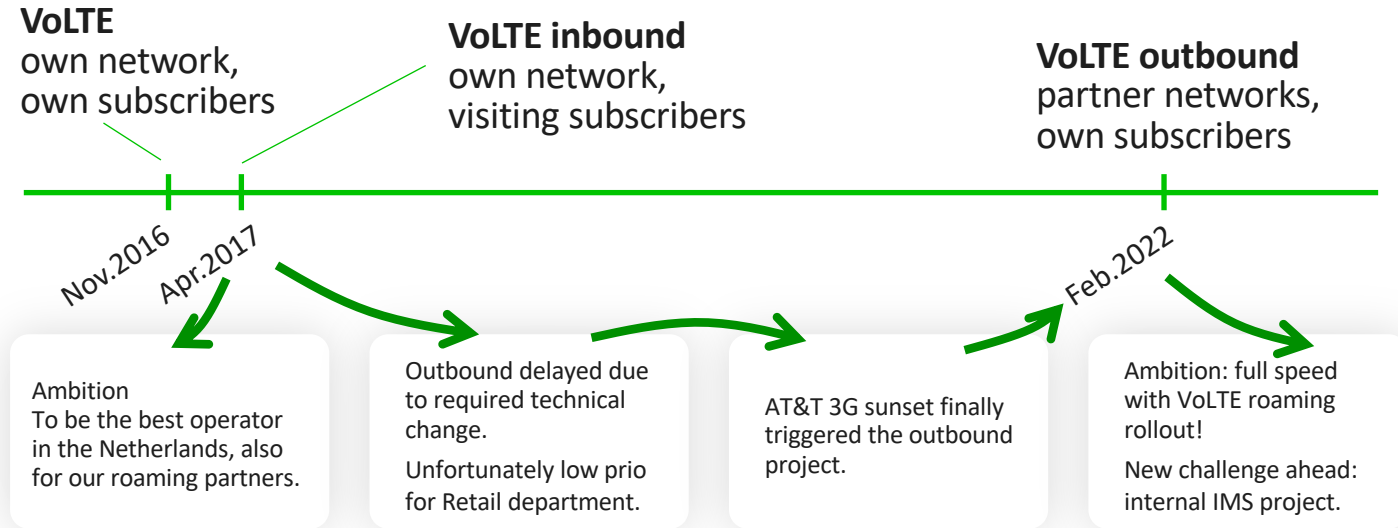
roaming.kaleidointelligence.com

VoLTE Roaming
An operator's perspective

Leendert Koning

12 April 2022

kpn. The network of the Netherlands

KPN's VoLTE timeline

VoLTE
own network,
own subscribers

VoLTE inbound
own network,
visiting subscribers

VoLTE outbound
partner networks,
own subscribers

Nov.2016

Apr.2017

Feb.2022

Ambition
To be the best operator
in the Netherlands, also
for our roaming partners.

Outbound delayed due
to required technical
change.

Unfortunately low prio
for Retail department.

AT&T 3G sunset finally
triggered the outbound
project.

Ambition: full speed
with VoLTE roaming
rollout!

New challenge ahead:
internal IMS project.

kpn

Business drivers

Best operator in the Netherlands

→

Better network experience
Higher voice quality

→

Prepare for future 5G/VoNR.
Roaming-SLA agreements needed with roaming partners and IPX-providers to ensure QCI/QoS values can be met.

2G/3G sunset:
abroad and own network

→

Prevent degradation of voice service while roaming for your subscribers.

→

Risk: loss of roaming footprint for the fundamental service: voice!

kpn

VoLTE & 5G Roaming

Bouygues Telecom

VoLTE Roaming

US EXPERIENCE

VoLTE launched in 2021 but still to learn about QoE

Device management complexity

Short and premium numbers not supported yet

LAWFUL INTERCEPT

Mandatory for inbound opening with complex requirements from French Authorities.

Complete new solutions from vendors – work in progress

TESTING CHALLENGE

Available ressources not aligned with upcoming launches

New approach for IREG testing to be defined

Looking for new testing solutions

5G Roaming

NSA

Opened with 15 operators (outbound) – 26 (Inbound)
Default launch on demand

Higher data speed … when 5G spectrum available

VoLTE as prerequisite for some operators

SA

In design phase for roaming architecture – open questions :
- Architecture per use cases: HR vs LBO.
- Signalling and user plan interconnection options.
- Management of slice ID between VPMN and HPMN.
- Voice handling

Billing system upgrade (BCE)

4G core virtualization – side effects on VoLTE roaming rollout

5G Roaming Update

TELUS Partner Solutions

April 2022

5G Roaming | Service evolution

Non-Standalone (NSA) **NOW**		Standalone (SA) **2023-24**

Next Evolution of Roaming	Customer Experience	Partner Relationship	In Development
Quick to stand up	Consistent Faster Speeds	Data Growth	Multi-year roll-out
Broad industry uptake	Improved coverage	Quality Differentiator	No Live Roaming

5G NSA and SA will evolve the customer experience

TELUS

5G Roaming | Standalone considerations

Internal Deliverables

- Implement network nodes (SEPPs)

- Billing system upgrade (BCE)

- Voice fallback development

- Interconnect / IPX peering strategy

- Steering solution development

- Device support enablement

External Drivers

- Industry standards

- Partner readiness

- Vendor enablement

- Wholesale agreement terms

TELUS

THE MOBILE INDUSTRY RESHAPED IN A POST-COVID ERA

iBASIS

Consumers

- Embraced a **digital lifestyle**
- Emphasized **data usage**

Industry

Significant boost in the **cellular M2M** market

- Accelerated **digitalization strategies** in all industry verticals
- Increased opportunities for **M2M initiatives** during pandemic

INTERNATIONAL MOBILE MARKET GROWTH WILL BE DRIVEN BY

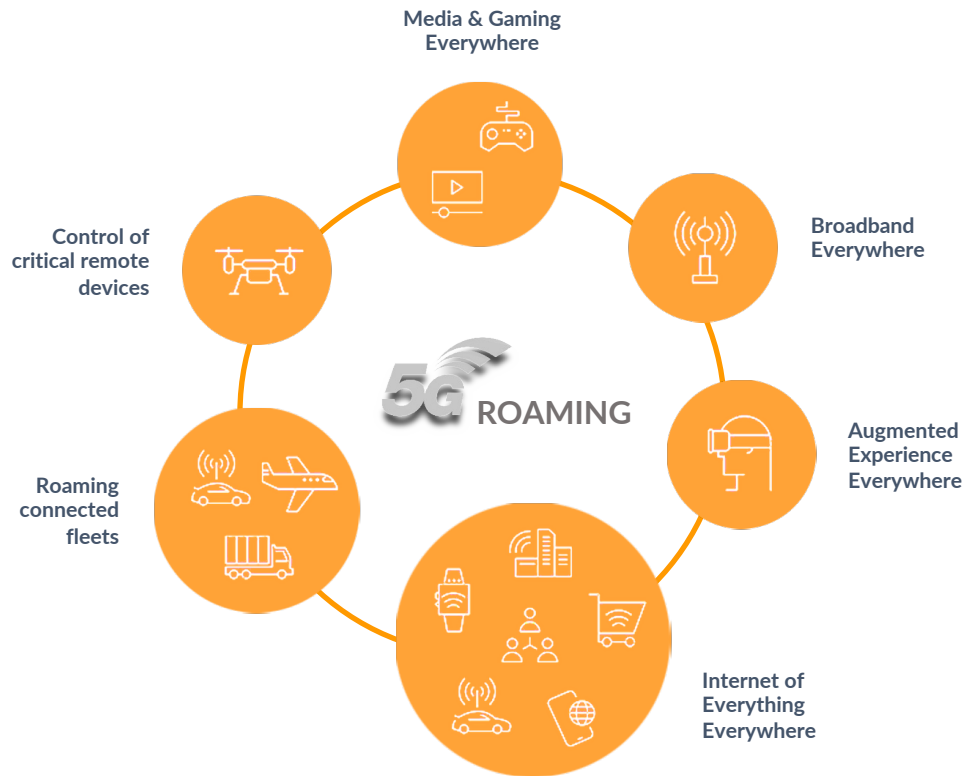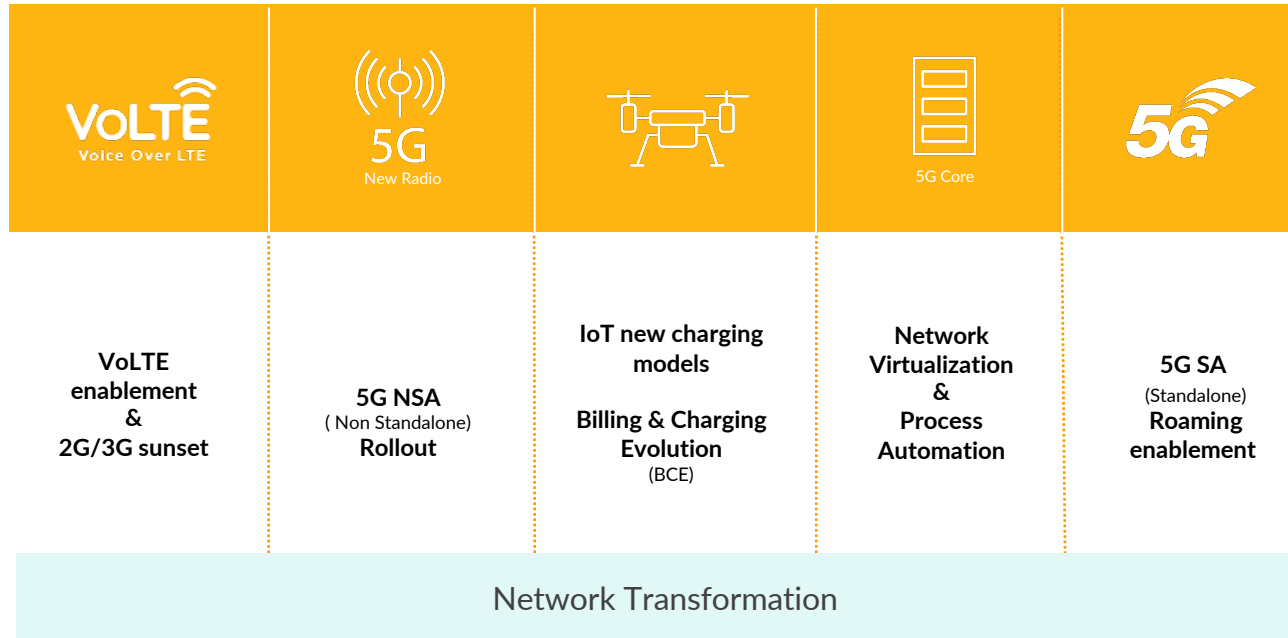| Post-pandemic traffic recovery | Consumers high demand on data | Cellular IoT driving new business cases and charging model | Industry's demand on global connectivity |

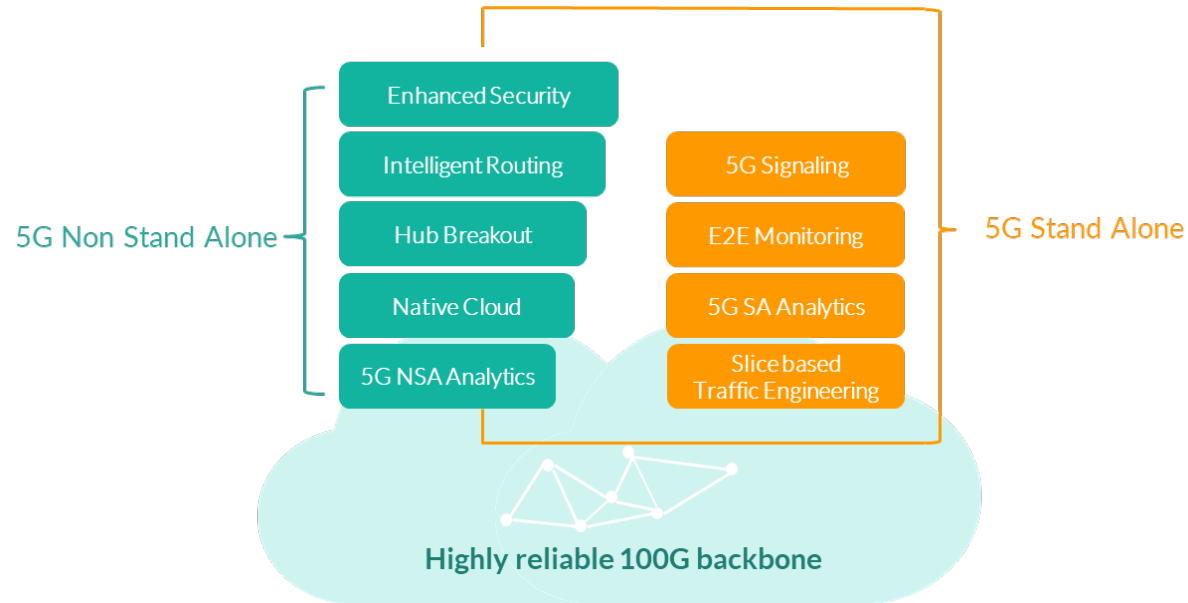# 5G TO LEVERAGE THE VALUE OF ROAMING BUSINESS

iBASIS

5G has the potential to unlock new revenue streams in roaming

- Take Data usage and Digital Relationship to the next level

- Enable & monetize differentiated services

- Massive roll-outs of connected objects become possible

- Unleash the full potential of network for industrial MVNOs and IoT players

Media & Gaming Everywhere

Broadband Everywhere

Control of critical remote devices

5G ROAMING

Augmented Experience Everywhere

Roaming connected fleets

Internet of Everything Everywhere

THE JOURNEY TO 5G STANDALONE ROAMING

iBASIS

VoLTE Voice Over LTE	5G New Radio		5G Core	5G

VoLTE enablement & 2G/3G sunset	**5G NSA** (Non Standalone) **Rollout**	**IoT new charging models** **Billing & Charging Evolution** (BCE)	**Network Virtualization & Process Automation**	**5G SA** (Standalone) **Roaming enablement**

Network Transformation

- Encrypted Signaling
- Technology interworking
- Capacity management
- End-to-end quality of service all the way to the visited network
- Local & regional break-out
- Slicing business requirements
- Value added services
- Security

iBASIS -5G READY- NETWORK EVOLUTION

iBASIS

5G Non Stand Alone

- Enhanced Security
- Intelligent Routing
- Hub Breakout
- Native Cloud
- 5G NSA Analytics

5G Stand Alone

- 5G Signaling
- E2E Monitoring
- 5G SA Analytics
- Slice based Traffic Engineering

Highly reliable 100G backbone

ENABLING 5G ROAMING

- 5G SA PRODUCTION ENVIRONMENT DESIGN
  - SEPP
  - SCP
  - IWF
  - IPUPS

- PKI INFRASTRUCTURE

- 5G SECURITY
  - http/2 firewall
  - GTP firewall
  - 5G attack detection & prevention

- 5G ANALYTICS & MONITORING
  - InVision NSA Module
  - InVision SA Module

- 5G ROAMING VAS
  - BCE for Clearing
  - SoR, WSMS etc.
  - Policy control

iBASIS

HTTP Proxy

Visitor Network — N32-f — **iBASIS 5G TESTING HUB** — N32-f — **Home Network**

GSMA & 3GPP Compliant

SINGLE GATEWAY
to 3G/LTE/5G Roaming

STRONG FOOTPRINT
via direct peers

COLLABORATION
with customers

BIG DATA ANALYTICS
with iBASIS InVision platform

Network Slicing Support | QoS and QoE Support | 100G Level Interfaces | Backward (3G/LTE) Compatible | 2B+ LTE Enabled Subscribers | 2,000 Fixed and Mobile Destinations | 700+ LTE Destinations

BUILDING EXPERTISE ON 5G SA USE CASES

- Signaling interconnection testing
- Hosted SEPP
- 3G-4G-5G Interworking
- 5G Peering testing
- Slicing

Trials: contact@ibasis.net

https://ibasis.com/innovation/

CONCLUSIONS & WRAP-UP

Key takeaways

Recommendations

Suggestions for next meeting

THANK YOU

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For more information,
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