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RE-VoLTE: Should we stop the shutdown of 2G/3G to save lives?? A lack of VoLTE standardisation breaks voice calling globally

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RE-VOLTE

Should we stop the shutdown of 2G/3G to save lives??


A lack of VoLTE standardisation breaks voice calling globally

Hendrik Rood

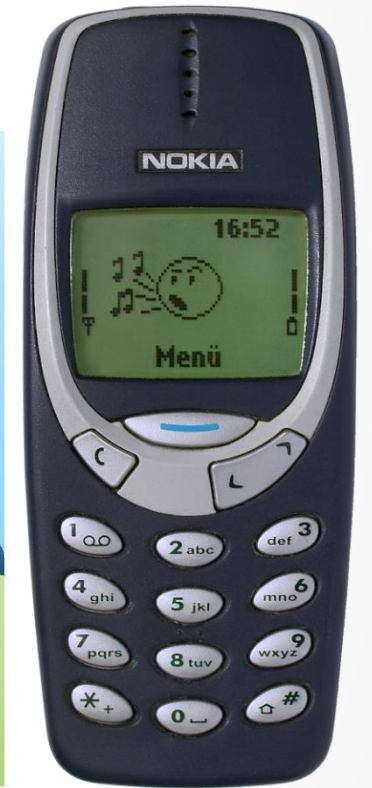
RE-VOLTE

Presentation MCH 2022

Call to MCH2022 participants!

- Do you work on VoLTE? Do you work for a telco, MVNO, MVNE, handset maker or IMS-platform builder?
- **Share what you know about this issue!**
 - Can be confidential and off the record
- Do you work with emergency services?
- Or work in the car-industry on eCall?  **Make them aware!**
- Do you want to help with the **RE-VOLTE**? Push this issue in your country too!
- Contact my colleague rudolf.vanderberg@stratix.nl / @internetthought on Twitter
 - Or myself hendrik.rood@stratix.nl / @HendrikRood on Twitter

2G, 3G, 112, roaming and eCall are European global success stories.
It works everywhere and for everyone



The end of 2G/3G changes everything. No incoming/outgoing telephony, SMS or 911 for many roamers!



Welcome, you are roaming on AT&T. Due to network technology compatibility, traditional voice calls will not work. Please use data, SMS, and app-based calling.

Now • SIM1



<https://assistance.free.fr/articles/preparer-sereinement-mon-sejour-aux-etats-unis-1231>
https://www.reddit.com/r/ATT/comments/t8x9fr/help_no_reception_on_swedish_sim_in_usa/

It is broken, for Dutch, Germans and British

Kan niet bellen in de VS, sms en internet werkt wel ✓

Mobiel

Bellen van en naar Nederland werkt niet in Amerika ✓

Mobiel

Kan in Amerika alleen bellen via T-Mobile netwerk ✓

Mobiel

Ik heb de Voordeel 100 bundel aangezet, maar kan niet bellen in USA ✓

Mobiel

Bundel 2000 werkt niet in de USA ✓

Mobiel

Operators expect 'blood on the highway' as US visitors lose 9-1-1 emergency access

Alan Burkitt-Gray June 16, 2022 11:29 AM



Roaming goes down the drain as AT&T disconnects European travellers

Alan Burkitt-Gray May 30, 2022 12:07 PM



Roaming in den USA: Vodafone-Kunden oft ohne Netz

Wir haben VoLTE-Roaming in den USA getestet. Vor allem Vodafone-Kunden haben derzeit ein echtes Problem und stehen oft ohne Netz da.

Von Markus Weidner

Probleme auch für Telekom-Kunden

Canadian Wireless Telecom Association warning

Device Type	Device capability and details
3G / HSPA Only	Voice (including emergency calls to 9-1-1) and data services will no longer be supported on AT&T and T-Mobile when they discontinue their 3G/HSPA network services.
4G LTE (without VoLTE roaming capability)	<p>Voice services (including emergency calls to 9-1-1) will no longer be supported on AT&T and T-Mobile when they discontinue their 3G/HSPA network services.</p> <p>Your data services (e.g. connecting to internet and using mobile apps) will continue to be supported when in 4G LTE network coverage on AT&T and T-Mobile. (Standard roaming charges apply)</p>
4G LTE (with VoLTE roaming capability)	No impact on data services or voice calling when in 4G LTE network coverage on AT&T and T-Mobile. (Standard roaming charges apply)

Consumers can't see what a 4G with VoLTE roaming (911!) phone is! Operators, chipset vendors and handset makers must all allow it!

Models listed here are not guaranteed to work on the AT&T network. AT&T cannot guarantee the capabilities or performance of any individual device that was not purchased directly from AT&T or an authorized retailer of AT&T.

There are many versions of the same phone, and each version has its own model number even when the marketing name is the same.

> **EXAMPLE:**

- Galaxy S20 models G981U and G981U1 will work on the AT&T network
- Galaxy S20 models G981F, G981N and G981O will NOT work

© 2022 AT&T Intellectual Property

Last updated: April 12, 2022



Apple iPhone



Galaxy S20 5G G981U

Galaxy S20



Galaxy S20 5G G981N

See a very long list at <https://www.att.com/idpassets/images/support/pdf/Devices-Working-on-ATT-Network.pdf>

Don't Travel! Consumer how-to for VoLTE 112 calling

Do	Don't
Use iPhone*	Use Android (handset/chipset makers and telcos may block VoLTE /emergency/roaming)
Use biggest mobile network	Use small network/MVNO (small MNOs get less support, MVNOs often excluded from VoLTE/roaming)
Buy new phone from mobile network (each year)	Buy phone cheaper in shop or online (MNOs may not enable VoLTE for phones bought elsewhere, support may stop)
Live in big country.	Live in small country (Sales volume determines VoLTE/112 support)
Stay at home	Travel (Lack of roaming support and fallback when out of coverage may make 112 unreachable)
Stay with network	Switch network (No guarantee that phone works with other network)
Use postpaid	Use prepaid (more MVNO, comes less with handset, less roaming support etc)

* No VoLTE support on many smaller networks and MVNOs for a list see [://support.apple.com/nl-nl/HT204039](http://support.apple.com/nl-nl/HT204039)

Operators may demand 2G/3G for 112 and block VoLTE emergency calls

forum.vodafone.de/t5/Störungsmeldungen-Mobilfunk/Notruf-mit-VoLTE/td-p/2825296



Mobilfunk

Internet & Festnetz

TV

Angebote für Kund:innen

Hilfe



Ink1 Moderatorin 10.01.2022 16:26

Re: Notruf mit VoLTE

Hi gnude,

generell ist das richtig, über VoLTE ist kein Anruf zu 110 oder 112 möglich.

Allerdings sollte in dem Moment bei den Notrufnummern Deine simkarte auf 2G wechseln und der Anruf kann erfolgen.

Sollte der Fall auftreten, dass dies nicht geschehen ist, würden wir eine technische Reklamation aufnehmen.

Viele Grüße

Inken

Roaming is not backwards compatible.

No backwards compatible roaming from 2G/3G (non-IMS Voice) to IMS Voice networks and limited support for VoLTE or VoLTE roaming globally! No guarantee that phone can or will initiate anonymous VoLTE 112 call when roaming

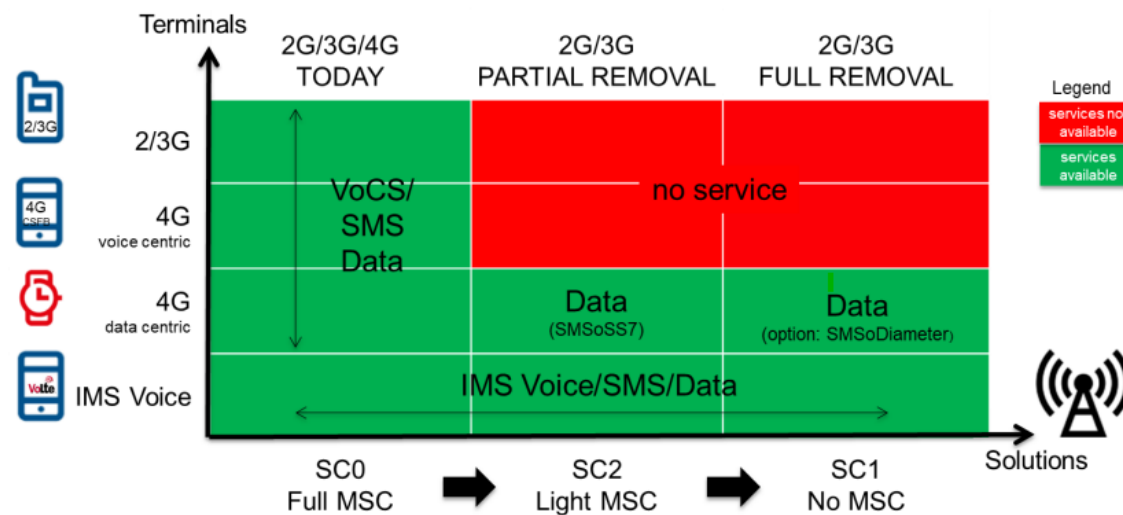
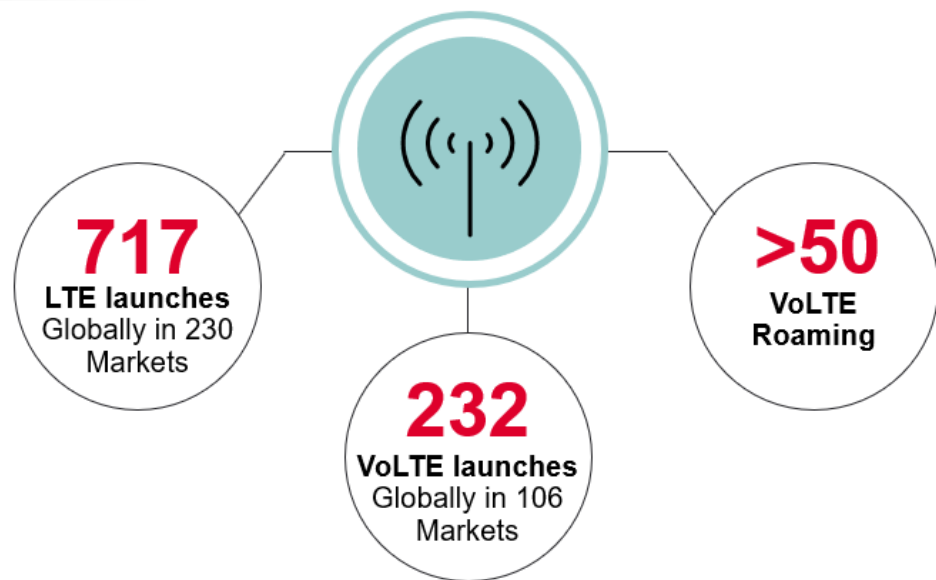


Figure 7 Service availability

<https://www.gsma.com/services/blog/guide-accelerating-volte-roaming/>

<https://www.gsma.com/newsroom/wp-content/uploads/NG.121-v1.0-2.pdf>

~50% of German SIM-cards cannot use VoLTE

Nutzung und Verteilung aktiver SIM-Karten

		2019		2020		Q2/2021	
		in Mio.	in %	in Mio.	in %	in Mio.	in %
insgesamt, ohne M2M-Karten ¹⁾		107,2		107,4		105,2	
Penetration (SIM-Karten / Einwohner)		-	129	-	129	-	127
Unternehmen:	Netzbetreiber	79,8	74	80,2	75	80,6	77
	Serviceprovider	27,3	26	27,2	25	24,6	23
Vertragsart:	Postpaid	70,9	66	72,4	67	69,4	66
	Prepaid	36,3	34	35,0	33	35,8	34
M2M-Karten		27,7	-	36,0	-	40,6	-
LTE-Teilnehmer (ohne M2M-Karten)		60,1	-	63,6	-	68,9	-
VoLTE-Nutzer		32,2	-	45,7	-	52,9	-
stationäre oder hybride Nutzung		1,2	-	1,2	-	1,1	-

Quelle Bundesnetzagentur

¹⁾ Der Rückgang aktiver SIM-Karten Ende Q2/2021 ist auf eine Bestandsbereinigung inaktiver Karten zurückzuführen.

Tabelle 5: Nutzung und Verteilung aktiver SIM-Karten

The standard for VoLTE emergency calling has mistakes. Industry discusses but doesn't take action (Implementation mistakes too!)



IMS Profile for Voice and SMS
Version 17.0
18 July 2022

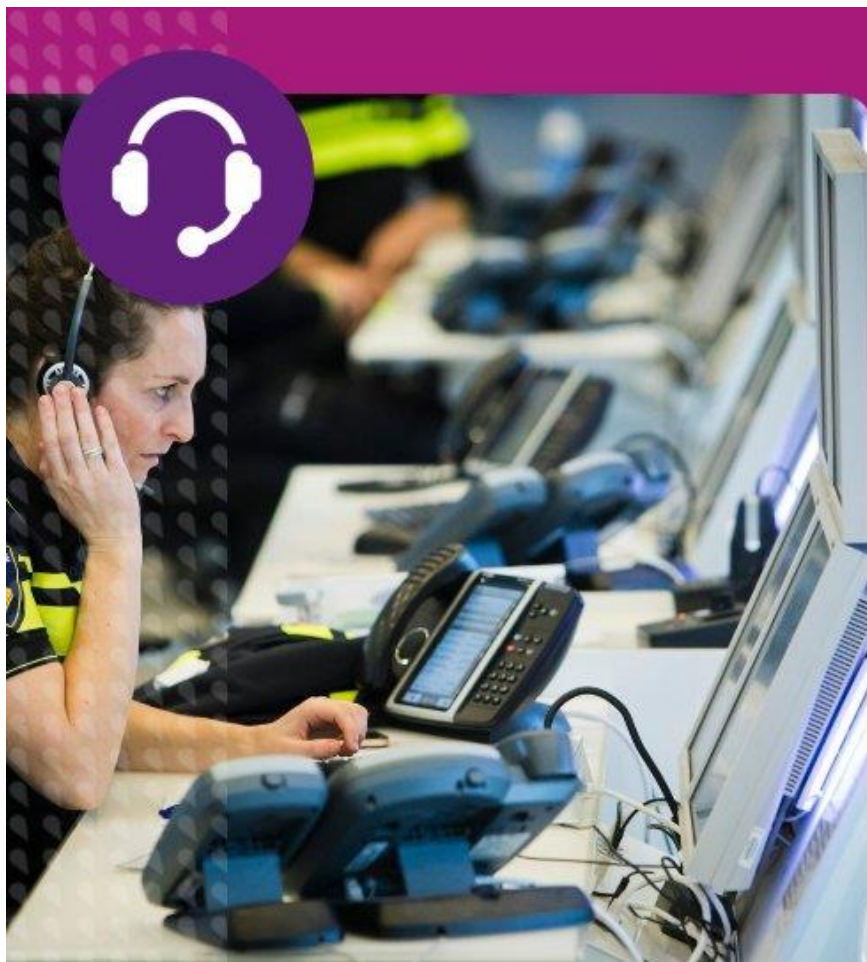
NOT FIXED YET !!

This is a Non-binding Permanent Reference Document of the GSMA

GSMA PRD IR.92 states that "The UE and the network must support both IPv4 and IPv6 for all protocols that are used: SIP, SDP, RTP, RTCP and XCAP/HTTP". There are discussions within the GSMA Networks Group about whether this should be changed to say "The UE **must** and the network **can** support both IPv4 and IPv6 for all protocols that are used: SIP, SDP, RTP, RTCP and XCAP/HTTP". The key thing is that the UE should support both versions. The problem scenario raised has been reported to the GSMA previously. So, UE supports only IPv4 and the network only supports IPv6 for emergency and thus PS emergency call is not possible - which is an issue.

GSMA Services Showcase Live #2 Getting VoLTE Rollout Right Wednesday 6 April 2022

**NED: Regulator had to force operators to support VoLTE/VoWiFi
(Only for supported phones and not yet for inbound roaming!)**



**Alarmnummer
112 is nu overal
bereikbaar via
wifi-bellen en 4G**

Shutdown is imminent – Europe to start 2025!

The major milestones for Full Circuit-Switched closure are 2021-2022 starting in North America and Asia, and 2025-2027 starting in **Europe**.

Note: Asia, Oceania and North America are first decommissioning 2G while Europe is starting first with 3G.

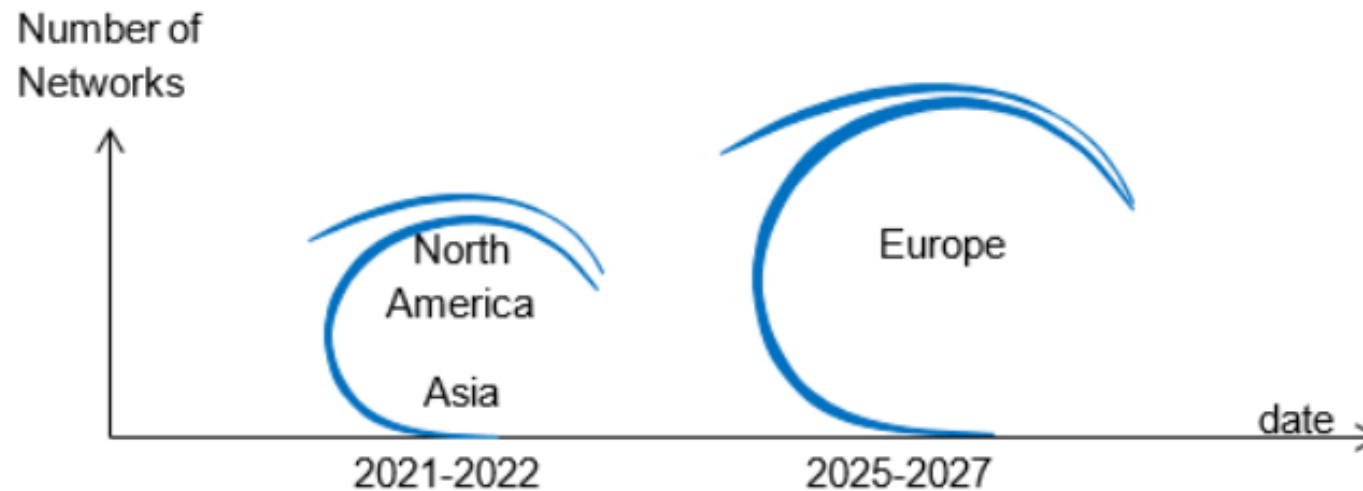


Figure 9: CS shutdown trends per continent

<https://www.gsma.com/newsroom/wp-content/uploads/NG.121-v1.0-2.pdf>

Who needs to act?

many will need testing aid

You!

- Raise alarm
- Contact MemParl.'s
- Talk to telcos
- Talk to manufacturers
- Talk to standardisation orgs

Government

- Stop 2G/3G Shutdown
- Start anti-trust against blocking of phones/MVNOs etc
- Demand interoperable VoLTE
- Demand global 112/911 access
- Verify and test

Telecom

- Make real standard
- Test, fix, test
- Chipset/handset work for all MNO/MVNO
- MNO should allow all phones
- Save shareholders money and evade compliance issues

Latest developments

- EENA was shocked when it heard about the situation in the US after AT&T shut down 2G/3G and Europeans said they couldn't call
 - Asked Rudolf to give this presentation at EENA 2022 in Marseille (see youtube)
<https://youtu.be/sHjyLmFt-eg>
- Dutch government took action
 - Parliamentary questions (Dekker (D66), Rajkowski (VVD))
 - Dutch gov sent paper to Radio Equipment Expert Group
 - Will hold meeting with sector in September 2022
- Several off-the-record calls confirming that situation is bad
 - MNOs saying that operating all over Scandinavia isn't big enough for VoLTE fixes
 - VoLTE tester saying emergency calls in USA have issues on both handset and MNO side
 - Handset maker confirming both MNOs and SoC manufacturers hard to work with
 - Dutch telco tech; VoLTE/VoWiFi 112 call not for inbound roaming, MVNO or grey import handset
- Presentation to Working Group 15 of CENELEC Technical Committee 278
 - eCall worked because GSM worked. Standardisation challenges were "car crash and car calls"
 - NG eCall assumes VoLTE works, that assumption is faulty
- Presentation to ETSI EMTEL at invitation of ETSI and Dutch gov.
 - ETSI INT will focus on test scenarios for emergency calls

RE-VOLTE

Annex explaining how bad the situation is.

Stop 2G/3G Shutdown until MNO's provide global 4G emergency calling

- Current 4G/5G Voice over LTE (VoLTE) standards do not ensure interoperability between networks and devices. 112/911 aren't guaranteed, particularly when roaming.
- GSM/3G (emergency) calls just worked. For VoLTE (emergency) calls consumers need the right phone, chipset, software, operator white listing, inter-operator roaming and luck
- Standardisation of VoLTE incl 112/911 failed. Mobile networks, chipset vendors, handset makers use blacklists against each other to stifle competition and hurt consumers
 - Also hurts NG Ecall in cars!
- To keep emergency services globally accessible governments, need to halt 2G/3G shutdown, until there is globally interoperable VoLTE with 911/112 access
- Telecom sector will deny, be angry over 5G investment, bargain for half baked measures, say it's impossible and then do it; Interoperable VoLTE will save them billions in testing, liability and anti-trust! (and save lives too!)

2G/3G shutdown shouldn't have been a problem

- Voice over LTE should deliver reliable voice communication.
- Voice over LTE failed because of fragmented standardisation. There are hundreds of options and combinations. Only the right combination of options works.
 - Standards require testing and as few options as possible.
- Many half-baked initiatives to get VoLTE working hurt by anti-competitive practices
 - (2008-2010) 3GPP Release 8 and 9 were deemed to complex
 - 2010 GSMA adopts One Voice to simplify 4G voice (with long lists of options)
 - 2012 – 2022 Every vendor and MNO chooses other parameters and engages in blacklisting
 - 2019 GSMA launches Network Settings Exchange where operators can upload their VoLTE parameters for use by handset manufacturers. Major handset manufacturers don't use it.
- April 2022, GSMA VoLTE Roll-Out meeting concludes VoLTE is hard, badly supported and requires proprietary fixes by MNO's, MVNO's, handset makers and chipset vendors
 - <https://www.gsma.com/services/resources/getting-volte-rollout-right-showcase-live-2/>

Who is responsible to fix this mess?

- Governments need to fix this mess. Strong enforcement of regulation combined with requiring full support of 2G/3G until VoLTE works as well/better than 2G/3G
- PSAPs should lobby for enforcement of VoLTE to emergency services and 4G eCall
- Anti-trust authorities should look at anti-competitive behaviour (blacklisting) to exclude handset makers, MNOs and MVNOs
- Consumer authorities should attend to deceptive and anti-consumer behaviour
- European Commission should call out sector for destroying the success of 112 and eCall and putting lives at risk.
- Boards should hold management accountable: VoLTE interoperability wastes resources in each firm and blocks 5G deployment, it opens up firms to liability lawsuits
- Sector should be ashamed: Putting lives at stake while wasting shareholder resources

VoLTE breaks everything we assumed

- Voice over LTE doesn't work out of the box, on any device, on any network, with any provider, any SIM-card, in any country, while roaming, regardless of manufacturer, chipset or operating system or where you bought the phone.
- There is no guarantee you can dial 112 / 911 with VoLTE
 - Will often revert back to 2G/3G!
 - Broken implementations
 - Badly configured networks
 - Broken firmware for chipsets
 - Roaming may break it
- Only active on 200 networks of 700 global networks
 - >50 offer roaming
 - Roaming only possible if home network has VoLTE, not backwards compatible!
 - Phones may be blacklisted

Will Your Phone Still Connect to 911?



What Is Happening?
Mobile carriers are shutting down current 3G networks to upgrade to 4G and 5G. Phones more than a few years old may not run on the new networks - not even for 911 calls.



What Do You Do?
Ask your mobile provider if your phone will be affected. You may need to upgrade your device. Check on your elderly relatives or vulnerable community members to make sure their phones can access the new networks!

mdcounties.org/3G



Cause: Lack of responsibility for standardisation and implementation

- VoLTE wasn't properly standardised and no oversight on implementation
 - Good standardisation needs rough consensus and running code
 - VoLTE wasn't needed when it was standardised. Nobody cared if the standard was good, because everybody used 2G/3G voice. Implementation took years and was fragmented
 - Operators, handset makers, IMS-platform suppliers, chipset vendors all have their own interpretation of VoLTE
- VoLTE implementation takes weeks to test for each device and network element.
 - Lots of patches and fixes needed from everyone in the supply chain!
 - 80 page test requirements, hundreds of people
 - There is no reference implementation
 - Change to MNO's IMS platform requires retesting of all devices, which doesn't happen
 - If you want roaming, you need to test everything again with the roaming partner!
 - Whole sector bleeds money because VoLTE isn't standardised
- Nobody takes responsibility; neither 3GPP, GSMA, MNO nor manufacturer! All publicly state VoLTE is broken and emergency calling may not work, blame others and take no action

Commercial departments got involved too!

- MNOs block use of externally bought VoLTE devices
 - Can't buy from retailers
 - Can't switch from other operator with device
- MNOs/Handset makers may block VoLTE when changing SIMs
- MNOs demand payment from handset makers for testing VoLTE on devices
- Handset makers demand purchase of X-thousand devices to enable VoLTE
- Handset makers disable VoLTE roaming in software (refuse to enable it)
- Handset/chipset vendors refuse to support old (>12months) devices
- MVNOs are ignored by handset makers and chipset vendors
- Handset makers complain chipset vendors don't care about fixing bugs
- Roaming revenues decreased, therefore no investment to enable VoLTE roaming

Creates massive barriers for consumers, competitors and MVNOs.

Known issues for VoLTE and emergency calling on 4G/5G only networks

- Some handsets only support fallback to 2G/3G circuit switched for emergency
- IPv4/IPv6 implementations cause errors for emergency calling
 - Some handsets only use IPv4 for emergency calling (some operators only IPv6)
 - Some handsets only use IPv6 (operator may require IPv4 and IPv6!)
 - Some handsets want both IPv4 and IPv6 (standard compliant), but operator only IPv6
- Blacklisting may affect ability to dial emergency number
 - Use of VoLTE/emergency on other networks/SIMs may be blacklisted by home operator
 - Handset may be blacklisted for VoLTE/emergency by home operator
 - Handset may be blacklisted for VoLTE/emergency by visited network
 - Handset manufacturer may blacklist home operator or visited network
 - Chipset manufacturer may blacklist home operator or visited network
- Home network may not support VoLTE or VoLTE roaming
- Assortment of other firmware/software/manufacturer/chipset/IMS-platform issues

It's impossible to know if a VoLTE phone can dial emergency services, double so when roaming

Solution: back to standardization

- A RE-VoLTE is needed.
 - A version without hundreds of options
- The same version(s) everywhere and on every phone
- Strong enforcement of 112/911 complicity

- Benefits:
 - Saves industry millions in implementation, operation and testing
 - Less anti-trust and liability concerns for boards
 - Saves lives in emergency situations!

RE-VOLTE

Saving millions while saving lives and reducing anti-trust and liability issues should have every boardroom's support!

RE-VOLTE

Some examples of VoLTE issues around the world

Issues with VoLTE implementation

- GSMA has a guide on VoLTE implementation. It lists many issues. Examples:

However, there are a number of practical problems in the testing of VoLTE/Roaming:

- OEM Blocking of VoLTE – open market devices deliberately disable their VoLTE/IMS capability on insertion of a SIM indicating a network (MCC/MNC) that has not been tested sufficiently. Such blocking is carried out by the OEM to prevent a bad user experience when connecting to an « untested » network and resulting reputational damage to the device. Such blocking also tends to impact to a greater extent on smaller MNOs.
- OEM Blocking of VoLTE Roaming – This issue is believed to be caused by historical reasons due to incorrect setting of the VOPS indicator.

5.10 IPv4/IPv6 Compatibility Issues

IP compatibility issues have been observed whereby:-

- Not all devices request IPv4/v6 - some only request IPv4 on all APNs.
 - Some UEs request IPv4 only for **emergency** calls.
- Not all operators support IPv6 – and in this case, if the device only requests IPv4, the request will fail.

GSMA PRD IR.92 section 5.1 states that both the UE and N/W must support both IP versions.

Challenges for manufacturers

- Low in-country support of SOC vendors for issue management
 - Majority of the SOC vendors cut the field force and expect ODMs to manage the field work
- Complex interaction between Field Force, R&D, SOC SW developers and operator labs
- Fragmented IMS network configuration even within the same operator family
 - First time roll out takes 3-4 weeks intense testing and trial
 - Even receiving the configuration details from MNO and MVNO does not match to underlying SW configuration of SOC
 - Major challenges to maintain the settings for different SOC SW architecture
 - Many test cases cannot be performed in live network
 - Root cause of many issues are related to times and interaction of mobile device and backend
- Switching off 2G or 3G networks in some countries/channels has major impact to consumer experience
 - In extreme case the user will not even have call service

Who am I?

- Hendrik Rood
- Senior Consultant at Stratix
- KPN Telecom '90-'95, Stratix since 1995
- First TCP/IP-backbone developed in 1993
- Extensive background in telecom, Internet and datacenter tech and infrastructure economics
- Standards, regulation & policy, investing & finance



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Who is Rudolf

- Rudolf van der Berg
- Senior Consultant at Stratix
- Previously Tele2, OECD, Logica, Ministry of Economic Affairs
- Work on 5G regulation, standardization, interconnection, IP-networks, M2M etc.

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How did Rudolf get involved?

- Last year he asked on LinkedIn why some new phones did support VoLTE and others didn't. I thought it was something simple as a software toggle
- Rudolf got a long list of serious issues. His background in regulation informed me that the effects would hurt consumers around the world. He wrote a blog: <https://rudolfvanderberg.medium.com/10-things-to-know-about-volte-and-vowifi-not-working-3d3a21e5b829>
- On Reddit people reacted with more issues https://www.reddit.com/r/Android/comments/p6r99j/why_voltevwifi_ofen_doesnt_work_on_your_android/
- Tweakers Netherlands wrote an article on the issue <https://tweakers.net/reviews/9422/het-probleem-met-volte-en-waarom-we-nog-niet-zonder-2g-en-3g-kunnen.html>
- Rudolf notified EENA of effects on emergency services and gave the first talk
- Nobody at Stratix has a commercial interests in VoLTE or emergency calling. We weren't asked by anyone or paid by anyone to say or propose one thnig or another thing.
- EENA paid for travel to Marseille conference
- WG-Naming and Numbering (CEPT) got interested too.

Thank you

Stratix

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