Bounded Latency Applications over Service Provider Networks

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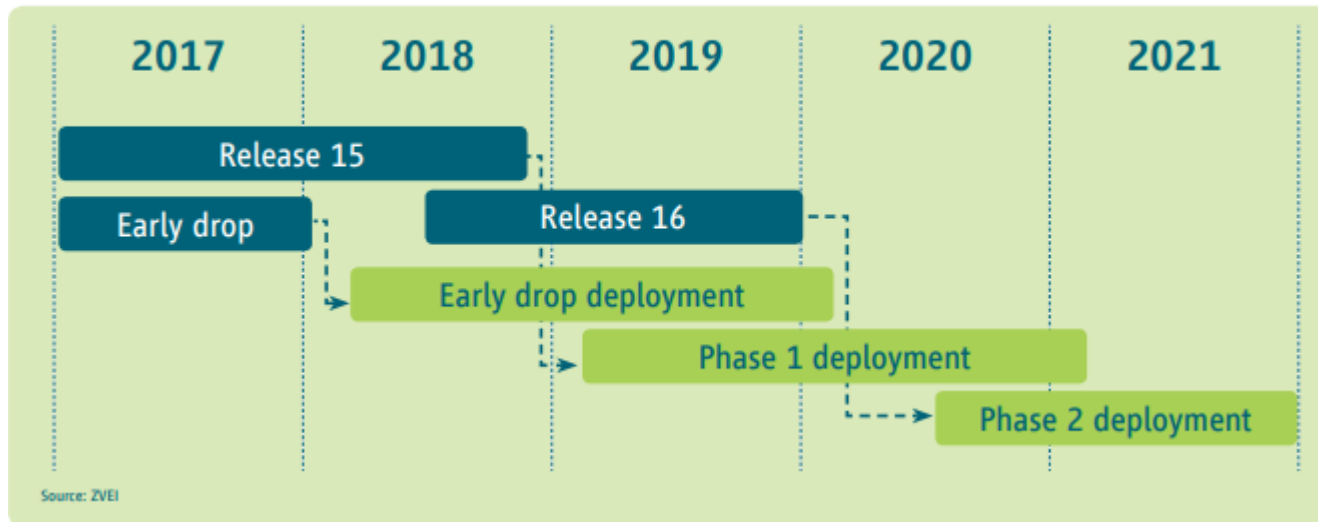
IEEE 802.1 TSN, 2019 Jan Hiroshima

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Low latency and deterministic networking drives revenue

- On-Demand 4K video will increase network load and latency requirements;
- Cloud VR/AR services come with stringent latency expectations;
- IoT connects billions of devices with their own latency requirements;
- 5G applications further add to density of networks and rigorous latency specifications;
- Web-scale networking are global in nature and low latency by design;

There are multiple transport techniques that can provide these kind of service, What TSN Ethernet can help?

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5G uRLLC Progress

Figure 8: Timeline of 5G standardization (blue) and deployments (green)

	2017	2018	2019	2020	2021

Release 15

Early drop

Early drop deployment

Phase 1 deployment

Phase 2 deployment

Release 16

Source: ZVEI

What TSN Ethernet can help?

During R-16 period (delayed 3 months), specific interests of industrial domain will be addressed more thoroughly.

- Connected factories;
- Electricity monitor and control;
- V2X with 5G NR;

China/US/Japan/Europe start to invest on V2X market

https://www.5g-acia.org/fileadmin/5G-ACIA/Publikationen/Whitepaper_5G_for_Connected_Industries_and_Automation/WP_5G_for_Connected_Industries_and_Automation_Korrektur_Download.pdf

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Bounded Low Latency Private Lines

Tata Communications provide global low latency Ethernet, connecting the most important economic centers in the world.
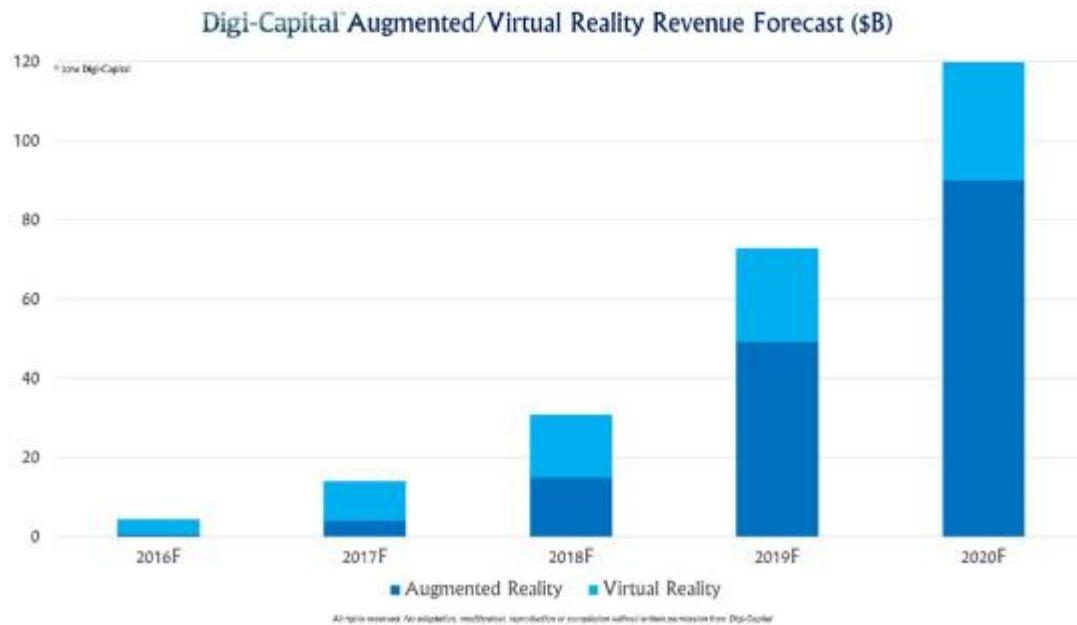

China Telecom in Shanghai provides a bounded low latency network, which is highly praised by low latency applications users;
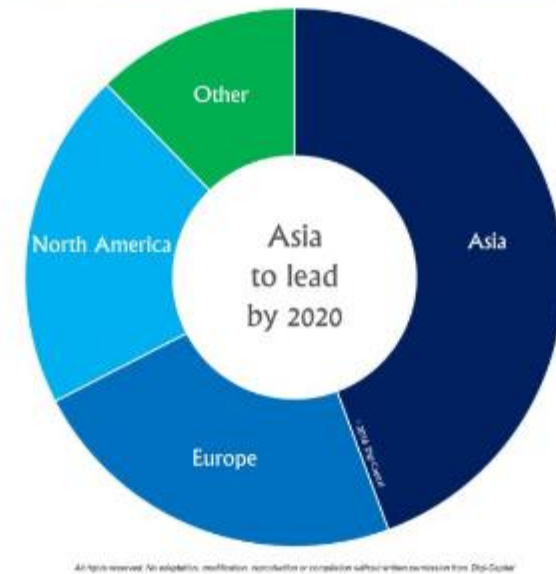Shorter bounded delay in center circles;

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VR Could Be Big Soon

Cloud VR market is growing and early deployment may be in Asia.

Timing is everything

Digi-Capital Augmented/Virtual Reality Revenue Forecast ($B)

■ Augmented Reality   ■ Virtual Reality

Go east, young man

Digi-Capital Augmented/Virtual Reality Regional Revenue 2020F

Other
North America
Asia to lead by 2020
Asia
Europe

https://www.digi-capital.com/news/2016/01/augmentedvirtual-reality-revenue-forecast-revised-to-hit-120-billion-by-2020/

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Cloud VR Demonstrations

China Mobile and Huawei release worlds first operator cloud VR in 2018

Other vendors and operators are also making similar demos in 2018/2019;

© Flickr/cc-licence/makeuseof

No.1 올레 tv
세계최초 IPTV
360° GiGA VR 출시
kt

[KT's demonstration, the world's first VR on IPTV, through Olleh tv]

| Cloud VR Operators |
|---|
| China Mobile; |
| China Telecom; |
| China Unicom; |
| LG U+; |
| KT; |
| Others |

https://www.telecomtv.com/content/vr-ar/huawei-helps-china-mobile-fujian-release-worlds-first-operator-cloud-vr-31764/

https://www.lightreading.com/mobile/5g/lg-u-to-launch-vr-only-app-in-line-with-5g-services/d/d-id/748584

https://www.netmanias.com/en/post/korea_ict_news/10892/iptv-kt-video-streaming/kt-presented-the-world-s-first-iptv-vr-service

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5G Remote Surgery

China Unicom and Huawei made first 5G remote surgery demonstration in Fujian, China.   (Jan 2019)

https://www.youtube.com/watch?v=yFR61jjL1vo
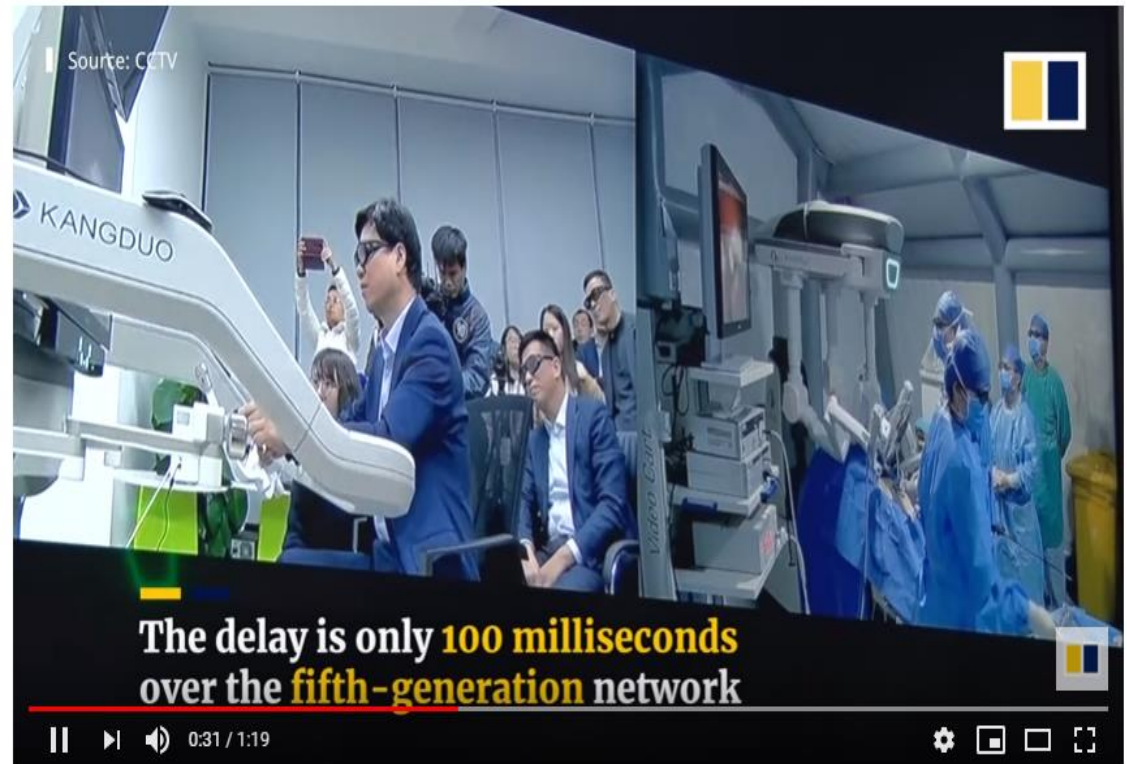
100ms delay over 50km distance.

MEF Use Cases

QCI	Resource Type	Priority	Packet Delay Budget (PDB) (See NOTE 1)	Packet Error Loss Rate (PELR) (See NOTE 2)	Example Services
1	GBR	2	100 ms	10^{-2}	Conversational Voice
2	GBR	4	150 ms	10^{-3}	Conversational Video (Live Streaming)
3	GBR	3	50 ms	10^{-3}	Real Time Gaming
4	GBR	5	300 ms	10^{-6}	Non-Conversational Video (Buffered Streaming)
5	Non-GBR	1	100 ms	10^{-6}	IMS Signalling
6	Non-GBR	6	300 ms	10^{-6}	Video (Buffered Streaming) TCP-based (e.g., www, e-mail, chat, ftp, p2p file sharing, progressive video, etc.)
7	Non-GBR	7	100 ms	10^{-3}	Voice, Video (Live Streaming) Interactive Gaming
8	Non-GBR	8	300 ms	10^{-6}	Video (Buffered Streaming) TCP-based (e.g., www, e-mail, chat, ftp, p2p file sharing, progressive video, etc.)
9	Non-GBR	9	300 ms	10^{-6}	Video (Buffered Streaming) TCP-based (e.g., www, e-mail, chat, ftp, p2p file sharing, progressive video, etc.)

Smart grid, Online game, Cloud AR/VR are also possible applications over SP networks.

Use case description from MEF 22.3, informative.

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Consideration in TSN for Service Provider Networks

• We (the Task Group) need to select a set of representative use cases that cover most of the market.

• We need to select one or a few techniques that will satisfy these use cases.

• The document needs to supply the tools necessary for a prospective SP user to determine what TSN tools are needed for a particular network.

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Thank you.

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