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Applications at the edge

- Hannu Flinck
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Since end of 2014 close to 70 companies have joined the ETSI Industry Specification Group for Mobile Edge Computing (MEC)

Standardization

Co-founded by Nokia in October 2014, the ETSI Industry Specification Group for Mobile Edge Computing grow from an initial 6 to over 50 members in less than a year.

Wide ecosystem support

The group is composed of leading telecom operators, network infrastructure vendors, IT/middleware vendors, independent software vendors, and OTTs.

Use case proliferation

Members of the group (as well as other companies) continuously deliver new use cases that exploit the benefits of edge computing.

MEC members

Allot
ASTRI
AT&T
Ceragon
Cisco
ETRI
Eurecom
Fujitsu
HP
Huawei
IBM
Intel
ISMB
InterDigital
ITRI
Juniper
NEC
Nokia
NTT Docomo
Orange
PeerApp
PT
Quortus
Red Hat
Saguna
Samsung
Sony
Spidercloud
Telecom Italia
Telefonica
Telekom Austria
Vasona
Viavi
Vodafone
Xilinx
YAANA
ZTE

MEC participants

Accelleran
ACS
AMD
Adva
Akamai
Altera
Artesyn
Athonet
Brocade
Cavium
China Mobile
Core Analysis
Druid
EdgeCom
EE
IDT
Informa
Gallery
KDDI
Layer123
Nextworks
Quortus
SCILD
SK Telecom
Univ. de Madrid

MEC applications could be deployed at hotspots, city-wide, or across the entire network

Zone applications

E.g. special services in stadiums, exhibitions, malls, enterprise campuses

Deployed in combination with Small Cell and Macro BTS (RRH, DAS)

City-wide applications

E.g. IoT applications deployed as part of Smart City initiatives, or services for city residents and visitors

Deployed at metro aggregation sites and baseband hotels

Network-wide applications

Network-wide applications

E.g. essential network functions, and ubiquitous services that require a consistent experience / performance

Deployment in combination with Radio Cloud, or specific deployment patterns (e.g. Car2X along roads)

Which applications at the mobile edge?

Real time

Lowest application latency end-to-end, for a real time user experience or critical communications

Interactive

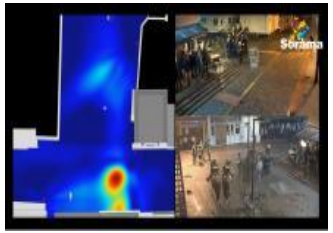
Maximum transaction rate between device and cloud for an interactive user experience

Private

Local communications for robust performance, privacy, and security

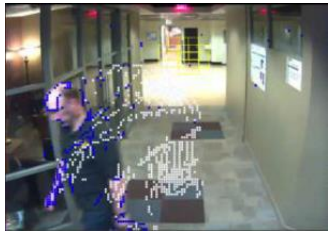
IoT

Real time insights from data exploited at the point of capture, minimum cloud ingress bandwidth



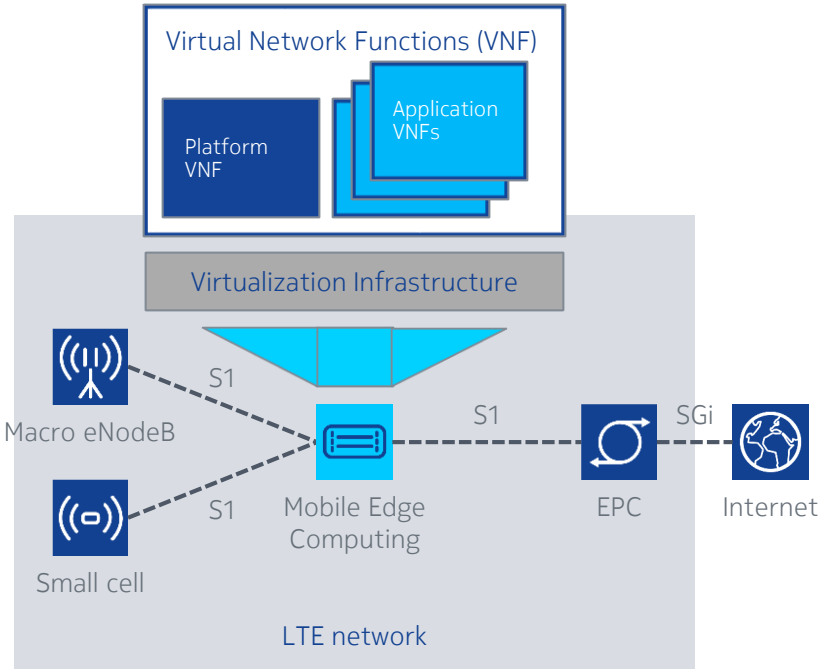
Data and compute heavy

Local compute and storage for most demanding workloads to go mobile

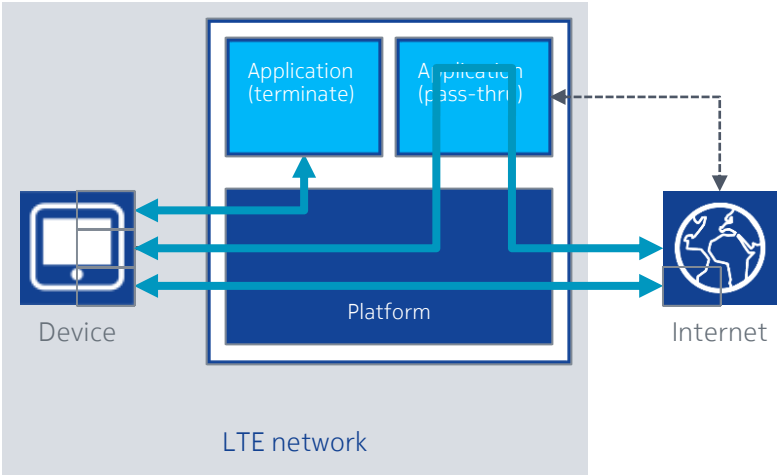


Mobile Edge Computing: how it works (LTE view)

Deployment anywhere through virtualization



Traffic Offload Function



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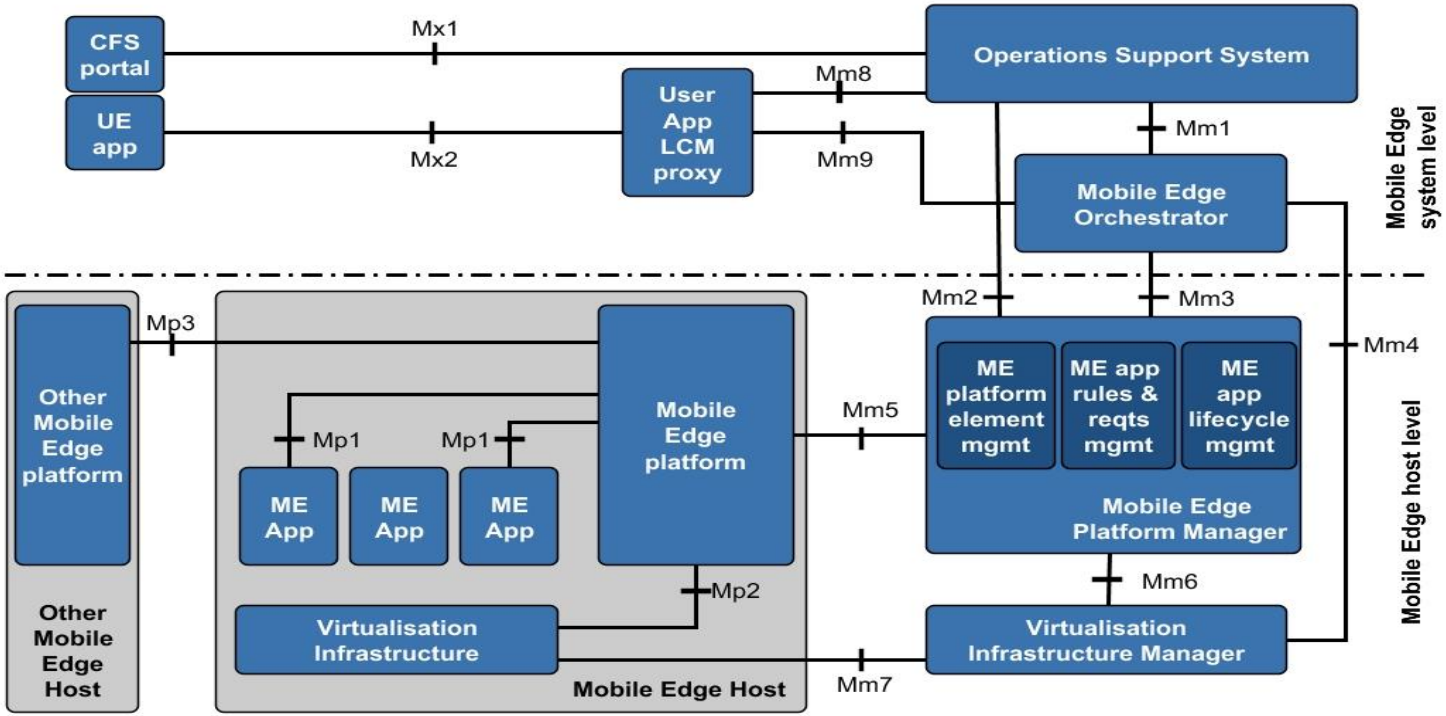
Mobile Edge Computing reference architecture from ETSI



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MEC applications

Subscribers

Better and more mobile broadband, and exciting new services

Throughput guidance (video optimization)

User and network analytics

LTE coverage extender

Edge video orchestration

Augmented reality

User engagement

Indoor navigation

Enterprises and corporates

Extends traditional footprint

Local breakout to enterprise network

Private LTE (local EPC, HSS, IMS)

Footfall analysis

Mission critical group communications

Video surveillance

Object tracking

Local content

Internet-of-Things and Verticals

New frontiers for network-based service innovation

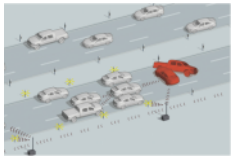
Edge video analytics

Edge audio analytics

IoT gateway*

Deployable LTE system (network-in-a-box)

Mission critical group communications



Car-to-car and car-to-roadside communications

CopCar2.0*

* Concept and prototypes

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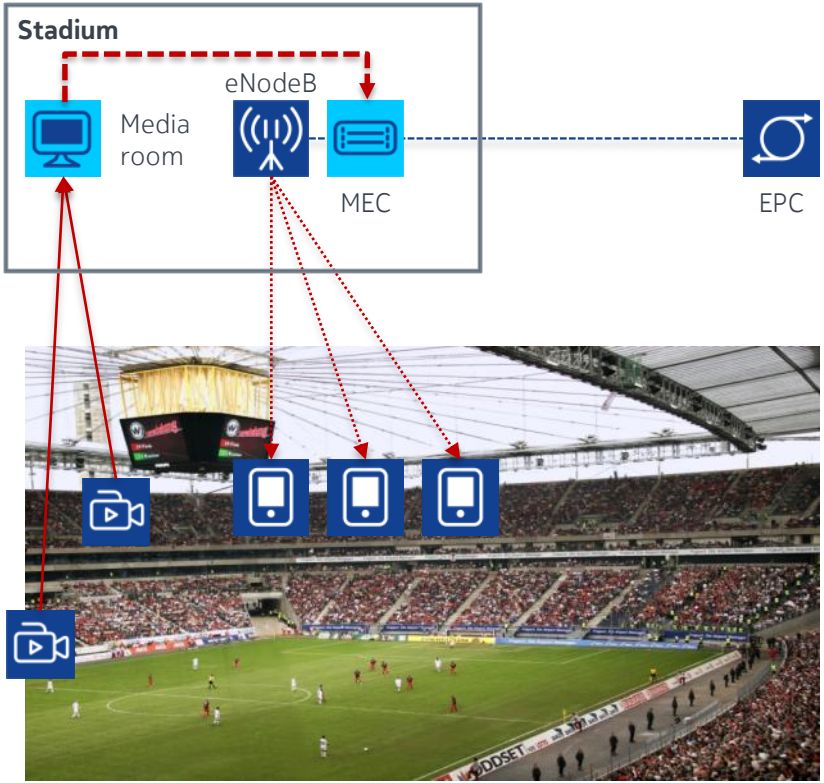
Edge video orchestration

Create exciting live views for stadium visitors



Use case

- Live camera signals are locally ingested and played out to visitors in real time
- Visitors can select between different cameras, which are presented in HD and SD quality levels
- Distribution over unicast and broadcast (based on local eMBMS gateway)

Benefits

- Exciting service for event visitors, providing an immersive real time experience: <<1s from camera to device, including encoding, play-out, decoding
- Video traffic does not put any strain on venue backhaul
- eMBMS (multimedia broadcast multicast service) can be deployed as a local SW function, without impact to the core network

China Mobile and Nokia deliver extreme mobile broadband and real time video

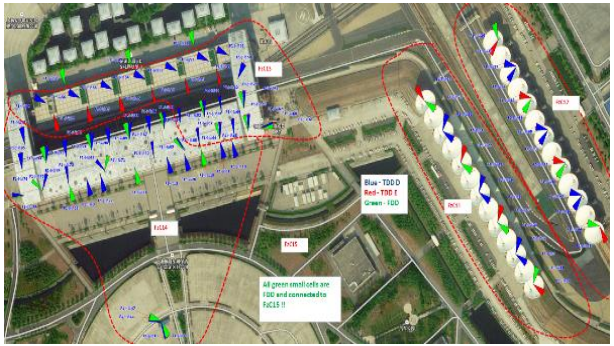
Deployed at F1 Shanghai, powered by small cells and Mobile Edge Computing

Mobile Edge Computing to deliver live video to spectators inside the venue with <<1s of end-to-end latency, versus 30s and more when watching over the Internet

Real time experience

Close to 100 LTE small cells deployed, 228GB of LTE data delivered during the peak hour, 1.27TB delivered during the entire event

Extreme capacity



Combination of LTE small cells and Mobile Edge Computing deployed at one of the busiest network locations, during one of the most prestigious events

Latest technology

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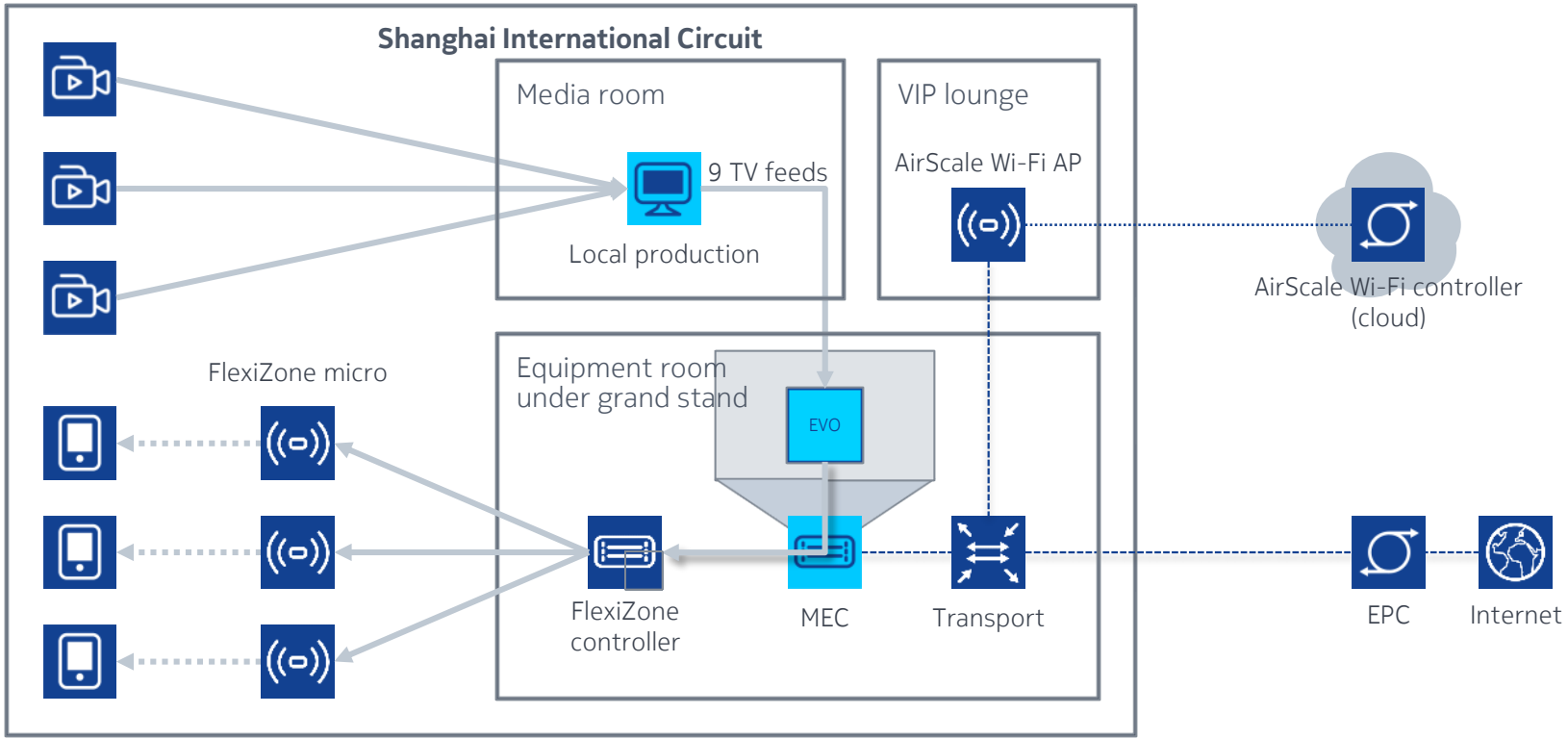
High level network architecture



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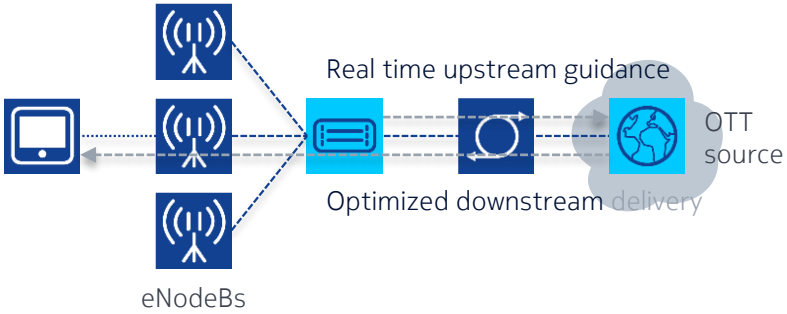
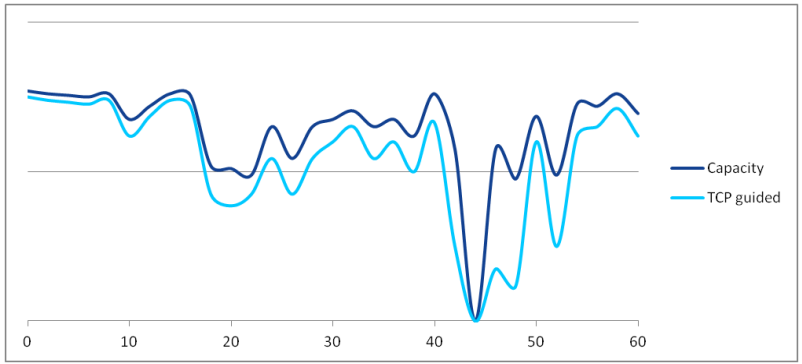
Throughput guidance for an optimal video experience

Developed and tested with Google, proposed for standardization to IETF





Use case

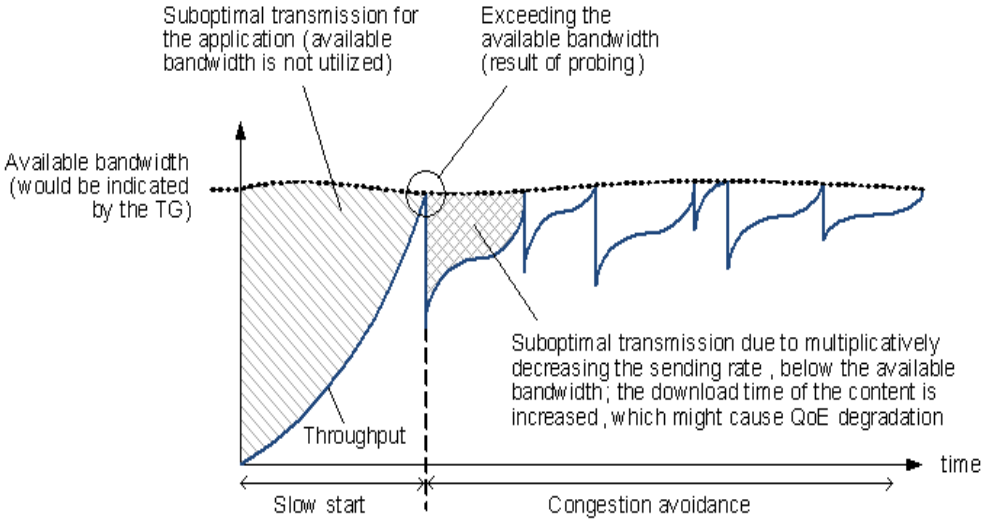
- Computes real time throughput guidance for individual user connections
- Guidance is sent within upstream user packets, no extra signaling is required
- Largely eliminates the inefficiencies in mobile delivery today, which are caused by sources being unable to gauge network capacity

Benefits

- Best video experience as a differentiator
- Network resources freed up along the entire delivery chain, including the air interface
- Simple and completely non-intrusive optimization, also for encrypted content
- Cooperate technique to replace obsolete Gi LAN optimizers (e.g. Citrix decided to shut down Bytemobile)

High-level solution

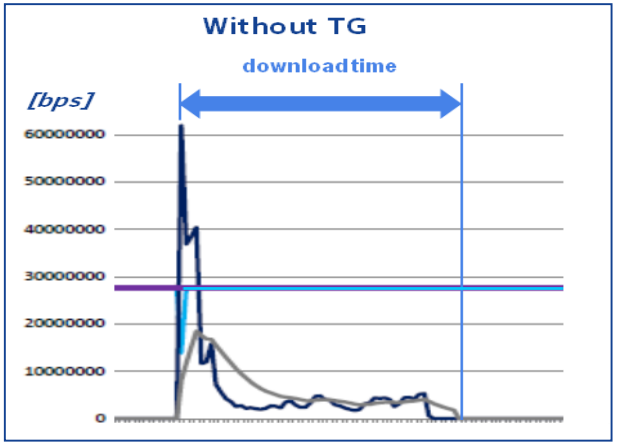
Throughput guidance

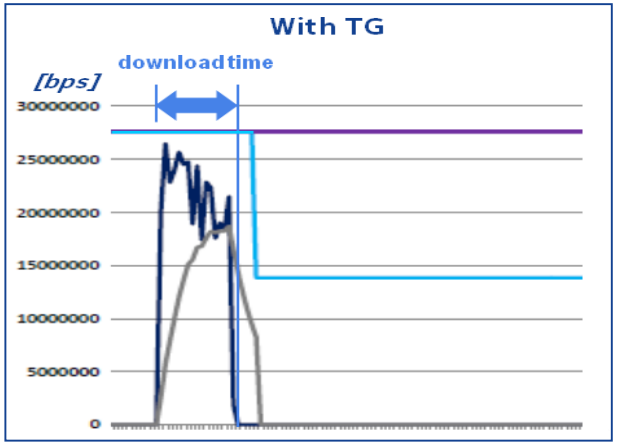


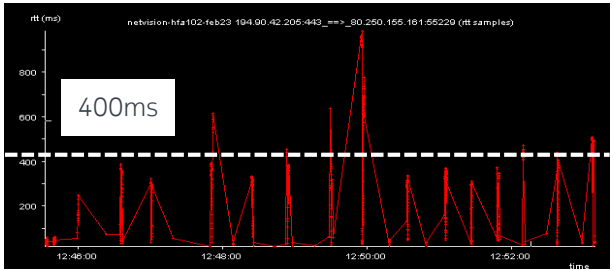
- The LA Analytics Agent calculates real time throughput guidance based on user plane and control plane analytics.
- TG is provided for each individual bearer.
- TG is exposed through enriching upstream TCP options, that is, within the user plane, to avoid additional out-of-band signaling.
- Therewith, TG works for both encrypted and unencrypted content. Throughout the year of 2015 Google have encrypted most of their content, which makes most traditional optimizers in the Gi LAN useless.
- TG is exposed to configurable domains only and signed by the application, in order to maintain authenticity and integrity of the information.
- Operators deploying TG need to ensure that upstream TCP options are not dropped by firewalls etc.

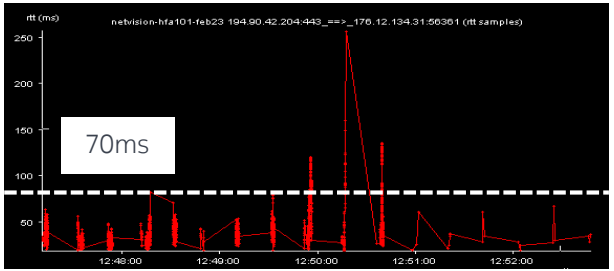
A field trial with Google has exceeded the expectations from the previous lab results

- Video resolution is consistently higher, and the number of resolution changes is reduced
- Huge improvement in mean throughput shortens download time and thus releases network resources earlier, and saves battery life
- Significant improvements in TCP round trip time and retransmissions









TG — Measured Throughput — Exponential Averaged Throughput — Cell Capacity

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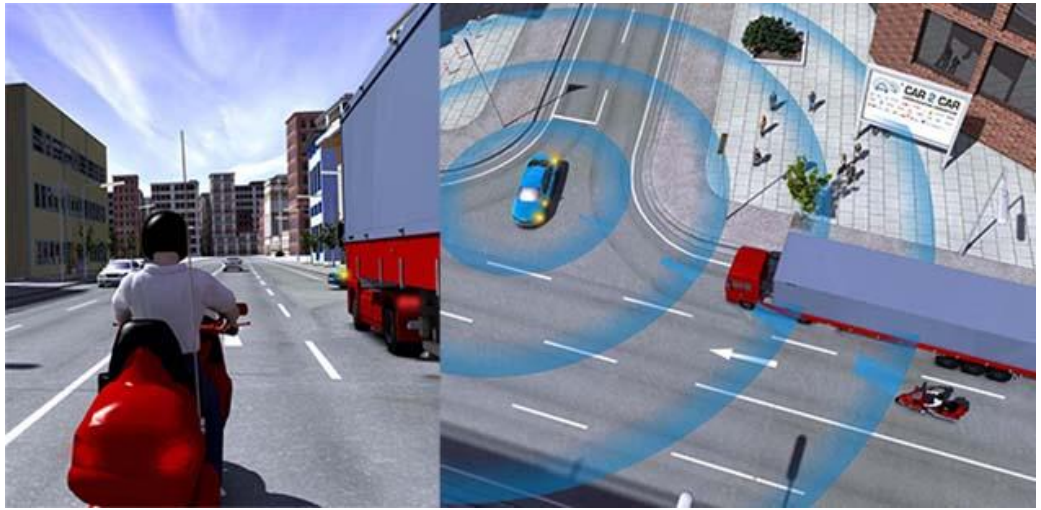
Connected car: Digital A9 Motorway Test Bed

Nokia, Deutsche Telekom, Continental and Fraunhofer ESK

- Combined expertise from an automotive supplier, an operator and a network vendor
- Many cars are already equipped with a large number of cameras and sensors providing valuable information and improving safety
- But they can only look a certain distance ahead – they cannot “see through” a truck or sense a traffic jam
- Vehicles assisted by MEC can receive information from other vehicles, which is something an in-car sensor cannot provide, e.g. can receive warnings in less than 20 ms.



Source: 360.HERE.com

See more: https://www.youtube.com/watch?v=rbPH3OGO2F4&feature=youtu.be

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