Cost efficient services testing, monitoring and benchmarking

ITU-T QSDG Workshop

Brazil, 27th-29th November

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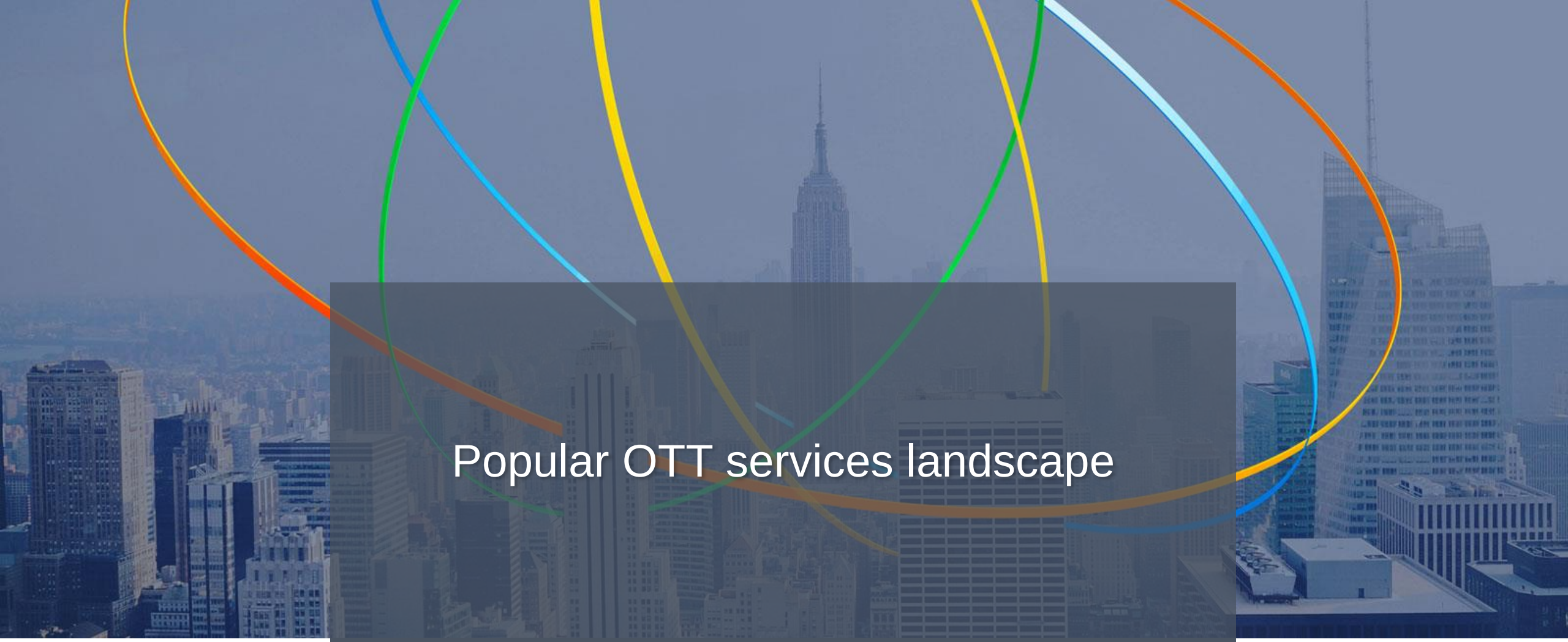
Agenda

- Popular OTT services landscape
- Requirements for cost efficient testing, monitoring and benchmarking solutions
- Smart testing techniques
- Take aways



Popular OTT services landscape

Popular OTT services landscape

SOCIAL MEDIA

VIDEO

The New TV: HD to 4K and 3D (5G for VR/AR)

The New Video
LTE Broadcast

The New
Conversational

OTTs – Few sample QoE/QoS/KPIs

facebook	Facebook Logon and Logoff Success Ratio (%) and Duration Facebook Operation Success Ratio (%) and Duration: (Load Feeds, Upload Photo, Upload Status, Load Friends List)
Instagram	Instagram Logon and Logoff Success Ratio (%) and Duration Instagram Operation Success Ratio (%) and Duration: (Load Feeds, Search b Hashtags)
twitter	Twitter Logon and Logoff Success Ratio (%) and Duration Twitter Operation Success Ratio (%): (Load Feeds, Twitter Posts)
YouTube	Streaming Completion Rate, Streaming Setup Success Rate, Streaming Video Play Start Success Ratio, Streaming Video Session Success Ratio, Streaming Service Access Time, Streaming Session Video Interruption Duration, Streaming Video Play Start Time, Streaming Video Session Time MOS-QoE; number of resolution switches and distribution, resolutions, Interruption/buffering, throughput …
skype	Session set up time, session accessibility Average audio MOS for VoIP

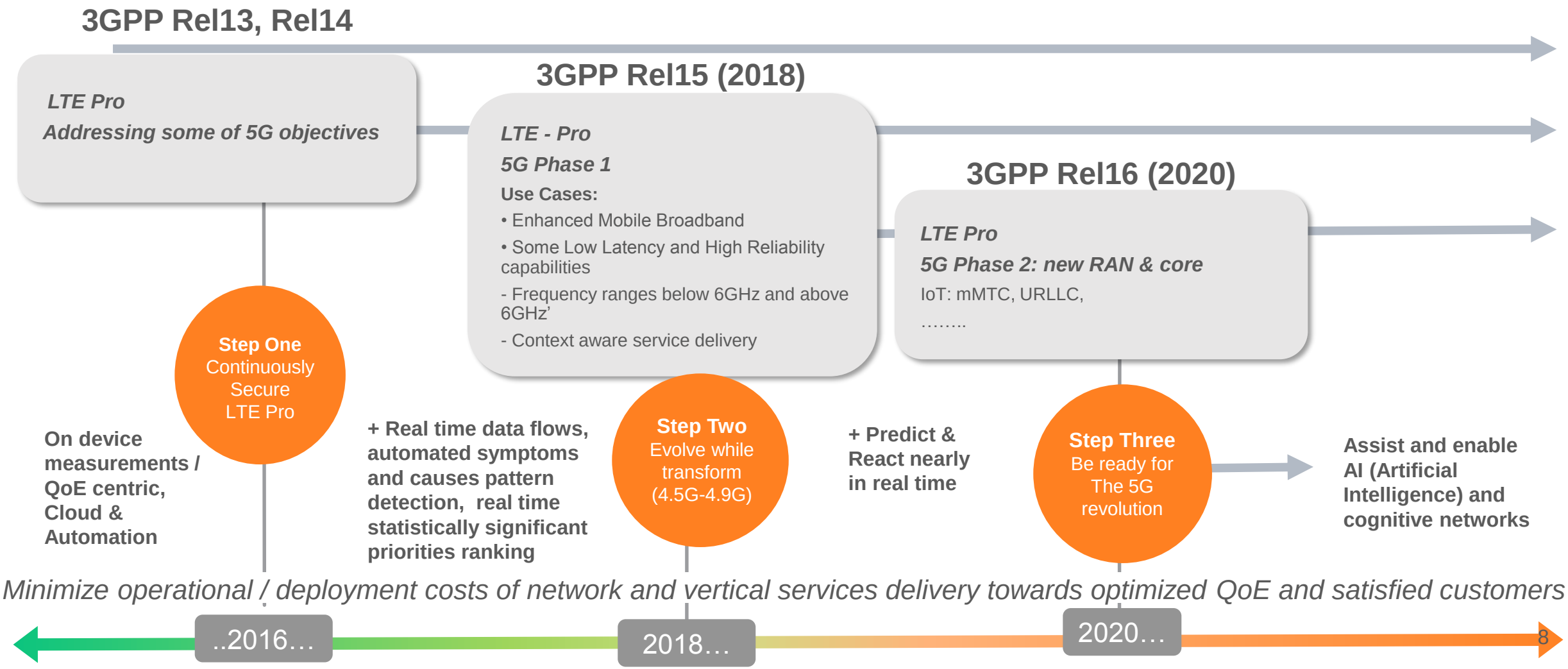
- All KPIs have same importance?
- Which one affects end user more than the rest?
- How to qualify and quantify performance differences from a user perspective?
- How to react and/or preempt problems?
- How to optimize bandwidth for sustaining happy customers at with optimal CAPEX/OPEX?

- Align with technology evolution
- Embed intelligence
- Simplify and automate

Requirements for cost efficient testing, monitoring and benchmarking solutions

Testing strategy aligned with technology evolution

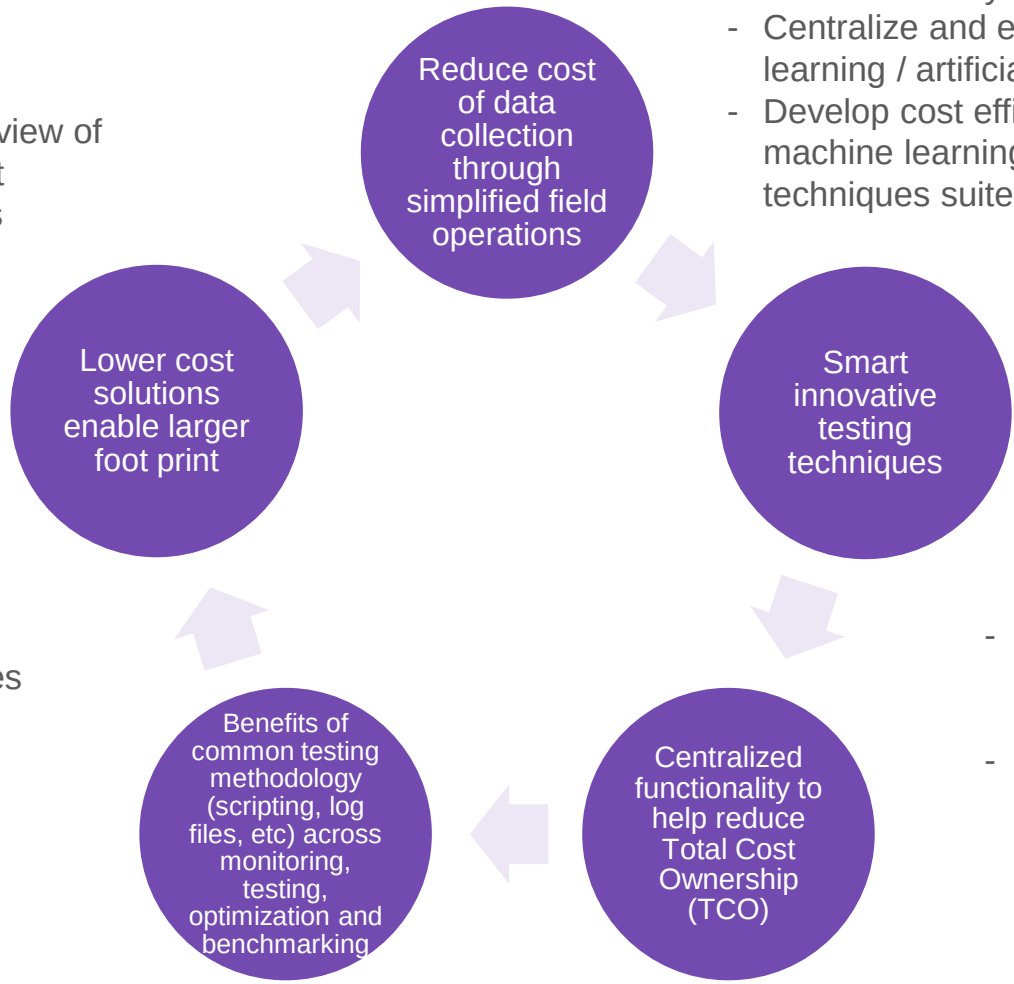
Virtualization, distributed cloudification, slicing, edge computing



Minimum requirements to follow the strategy

- Big data support
- Real time analytics and root cause analysis
- Centralize and embed Subject Matter Experts into machine learning / artificial intelligence algorithms
- Develop cost efficient benchmarking solutions, new machine learning based QoS/QoE evaluation / monitoring techniques suited for OTT services on the path to 5G

- Big data support
- Remote access for real-time view of network and test environment
- Cloud based testing solutions

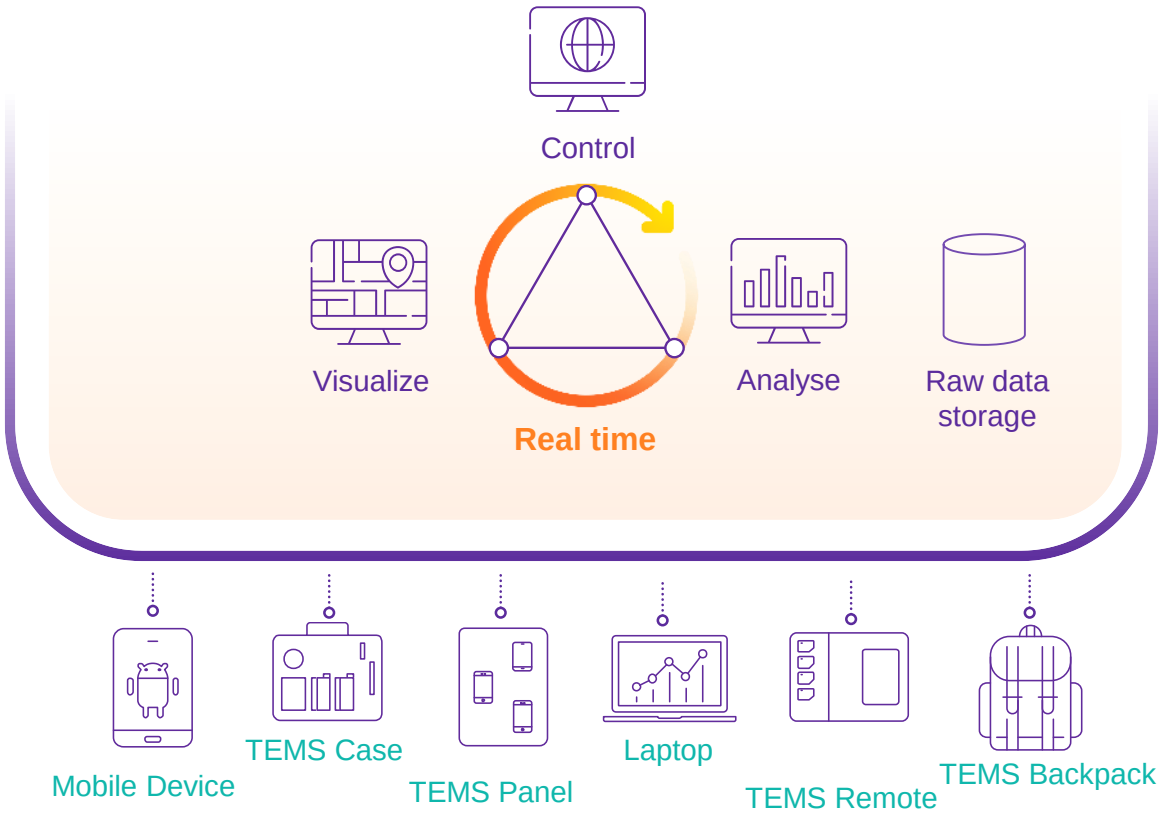


- Common KPIs
- Same script leveraged across stages
- Reduce post processing cost and conflicting information

- Common Management platform of data collection for all stages (monitoring, testing, benchmarking, etc)
- License management and sharing across users

TEMS testing approach – performance orchestration

Aligned with draft recommendation E.FINAD “Framework for Intelligent Network Analytics and Diagnostics”, TD 307 (TEMS contributors)



- Operations (FM, resources, licensing etc.)
- Storage of raw data,
- Real-time dashboards,
- Real-time analytics
- Monitoring statistics reports/views
- Alarms
- RCA on Real-time data

TEMS Discovery

Insightful Post Processing & Analysis of TEMS & 3rd party results

TEMS Post Processing Product
- Powerful off-line analytics
- Multi data format
- Desktop and Enterprise versions

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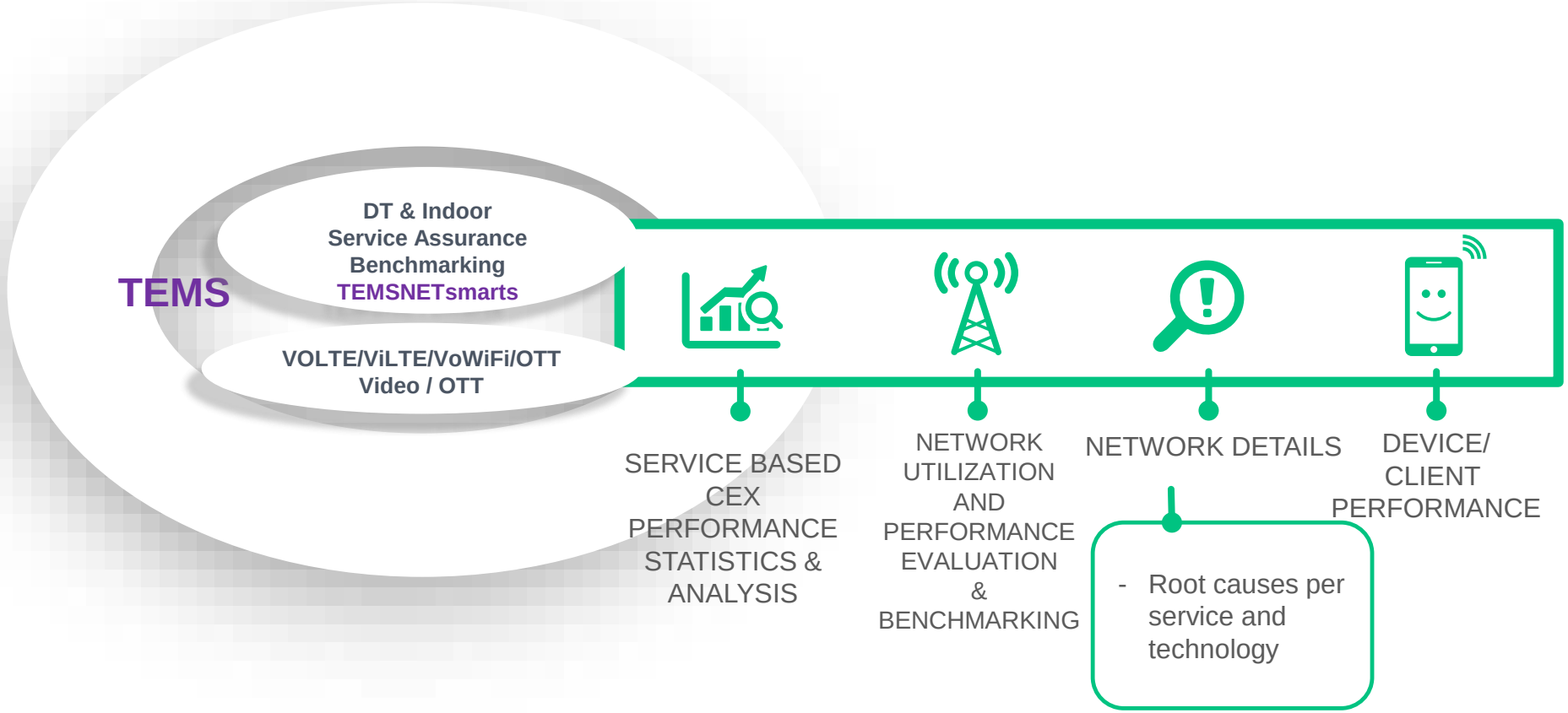
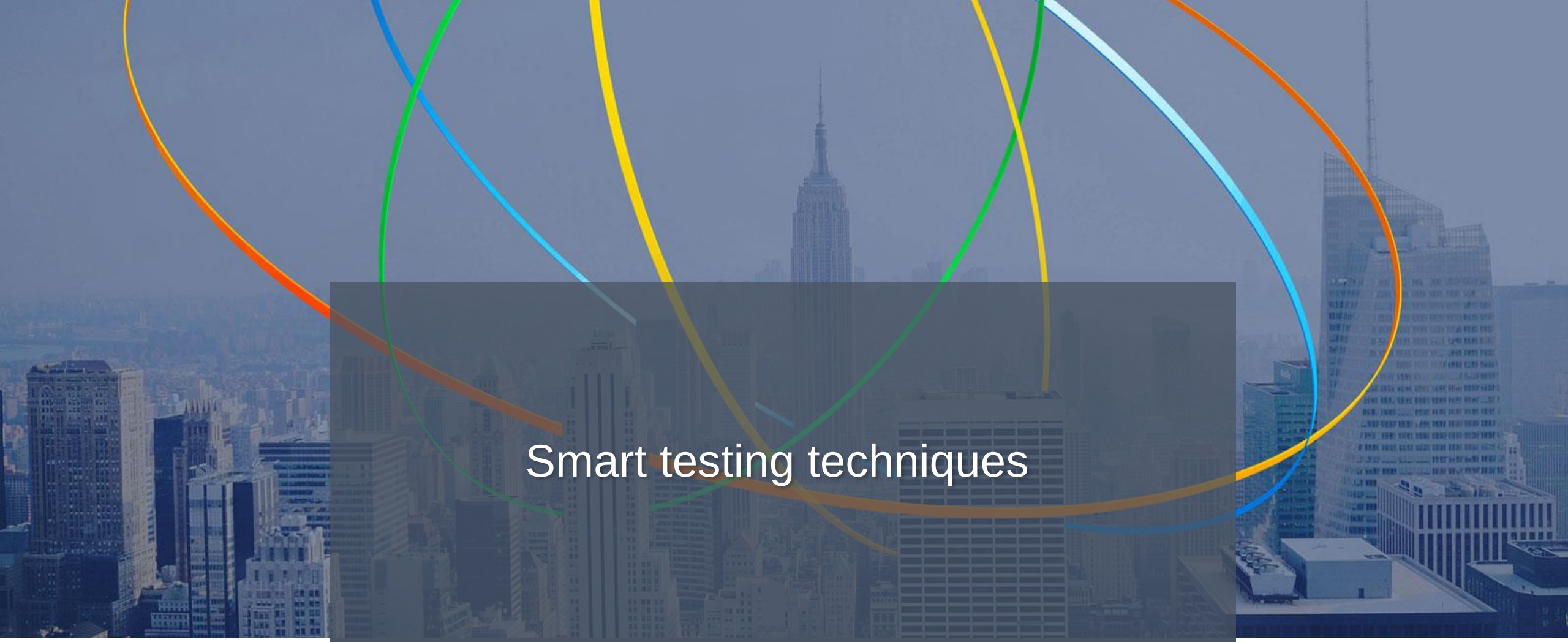
TEMS testing approach – smart testing

Aligned with draft recommendation E.FINAD “Framework for Intelligent Network Analytics and Diagnostics”, TD 307 (TEMS contributors)





Smart testing techniques

Benchmarking needs and TEMS solution

Architecture
- Web
- Workflow
- User Profiles (Use-cases)
- Cloud

System administration
- User configuration
- System configuration

Project administration
- Project configuration
- Resource scheduling

Remote configuration
- System and Software configuration
- TAG information- Company/ Team/ Project/ etc
- Workorder configuration, incl DoD/ DoF)
- SIM configuration
- Trigger conditions (Time/ Area/ Route/ Position)
- Pre-validation of Work orders*

Reporting- profiles
- KPI reports
- RCA reports
- Completion report
- etc

Remote access-*
- Trouble shooting
- Add-hoc testing

Alarm handing profiles
- Operational alarms-Event
- KPI threshold- CDF

Real Time monitoring profiles
- Map positioning- CDF

KPI reports

Trigger handling
Manual scheduling
Synchronization M2M
Device detection

Data Upload (OTA)
- Service information
- Event information
- CDF information*
- Log file *.trp
- Part of payload

Alerts (DoF)

Map with way-points
Turn-By-Turn instructions

Common Data repository- history aspect
- Workspaces
- Workorders (DoD/ DoF)
- Logfiles *.trp
- Reports
- Settings/ configurations
- Templates
- Profiles
- NO-SQL

Real Time monitoring profiles
- Performance counter monitor (KPIs/ Radio)
- Service monitor CDF
- Event monitor CDF
- Project monitoring- DoD/ DoF
- Post-validation of results

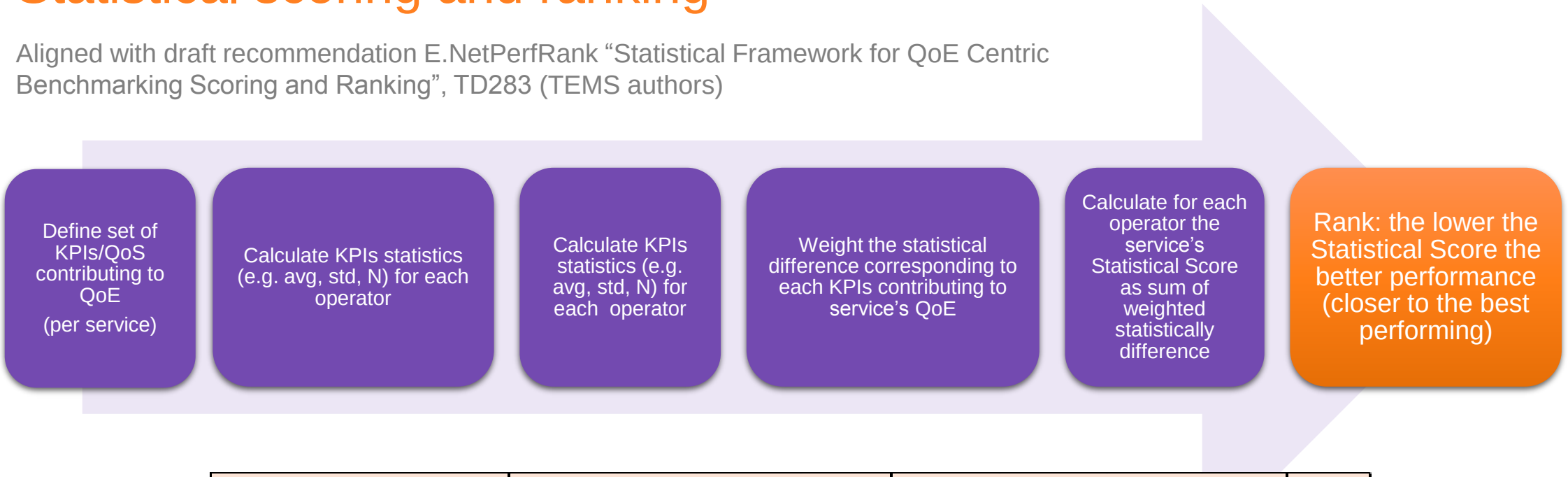
Hard case (x4NUCs)
- Inbuilt Router with WiFi/ hot-spot
- Power control logic
- Local display- sys. administration
- Ext. GPS, shared

Device mounting kit (up to 24 UEs)
- Inbuilt USB HUB
- Inbuilt charging

Real Time monitoring
- Service information
- Event information
- CDF information
- Progress information (DoD)

Statistical scoring and ranking

Aligned with draft recommendation E.NetPerfRank “Statistical Framework for QoE Centric Benchmarking Scoring and Ranking”, TD283 (TEMS authors)



	Network 1				Network 2				
	KPI	std	N	StatDiff	KPI	std	N	StatDiff	Weight
Call Retention Rate	0.95	0.218	87	0.046	0.97	0.170587	69	0	30%
Call Setup Success Rate	0.93	0.255	87	0	0.91	0.286182	69	0.2343	30%
Voice Quality (MOS)	3.89	0.5	2600	0	3.56	0.7	2070	17.154	30%
Mouth to Ear Delay	105	5	435	42.67	70	15	350	0	5%
Voice Call Setup Time	1200	300	87	0	1800	275	69	12.31	5%
StatScore				2.1473				5.8319	
Rank				1				2	

New QoE models: machine learning based

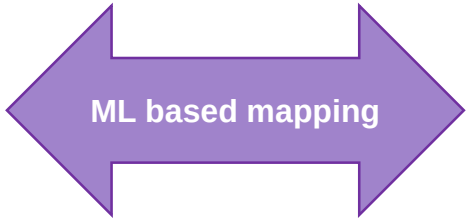
Aligned with draft recommendation P.VSQMTF "Voice service quality monitoring and troubleshooting framework for intrusive parametric voice QoE prediction", TD 312 (TEMS authors)

- A hybrid solution which aims to provide a QoE predictor (MOS) for EVS based VoLTE test scenarios
  - A feasible solution for VoLTE case because the knowledge of codec/client, jitter, delay and loss are sufficient to estimate voice quality
  - EVS codec profiles (bit rates, voice bandwidths, error concealment scheme) are standardized and they also replace the traditional device based VoLTE clients used with AMR codec
  - Hybrid: parameters and reference voice sample

Parameters set

Codec Rate, Voice Bandwidth, Jitter, Delay, Loss, DTX distribution

Reference voice sample (time analysis)

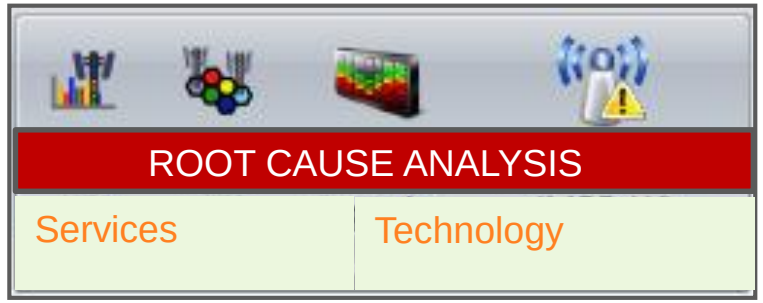


MOS scores

- Advantages:
  - No need for MOS calibration based on subjective scores (expensive and time consuming)
  - No need of speech signal recording and therefore simplified test set up
  - No need to perform tuning per device (expensive and time consuming)

TEMS approach for service and technology centric root cause analysis

Aligned with draft recommendation E.FINAD “Framework for Intelligent Network Analytics and Diagnostics”, TD 307 (TEMS contributors)



e.g. VoLTE / ViLTE

QoE/QoS/KPIs
(Negative) Events

List

Analysis Scripts
(diagnosis flowcharts

VoLTE/ViLTE QoE
VoLTE/ViLTE Session Performance

e.g. LTE /LTE-Pro

KPIs
(Negative)Events

List

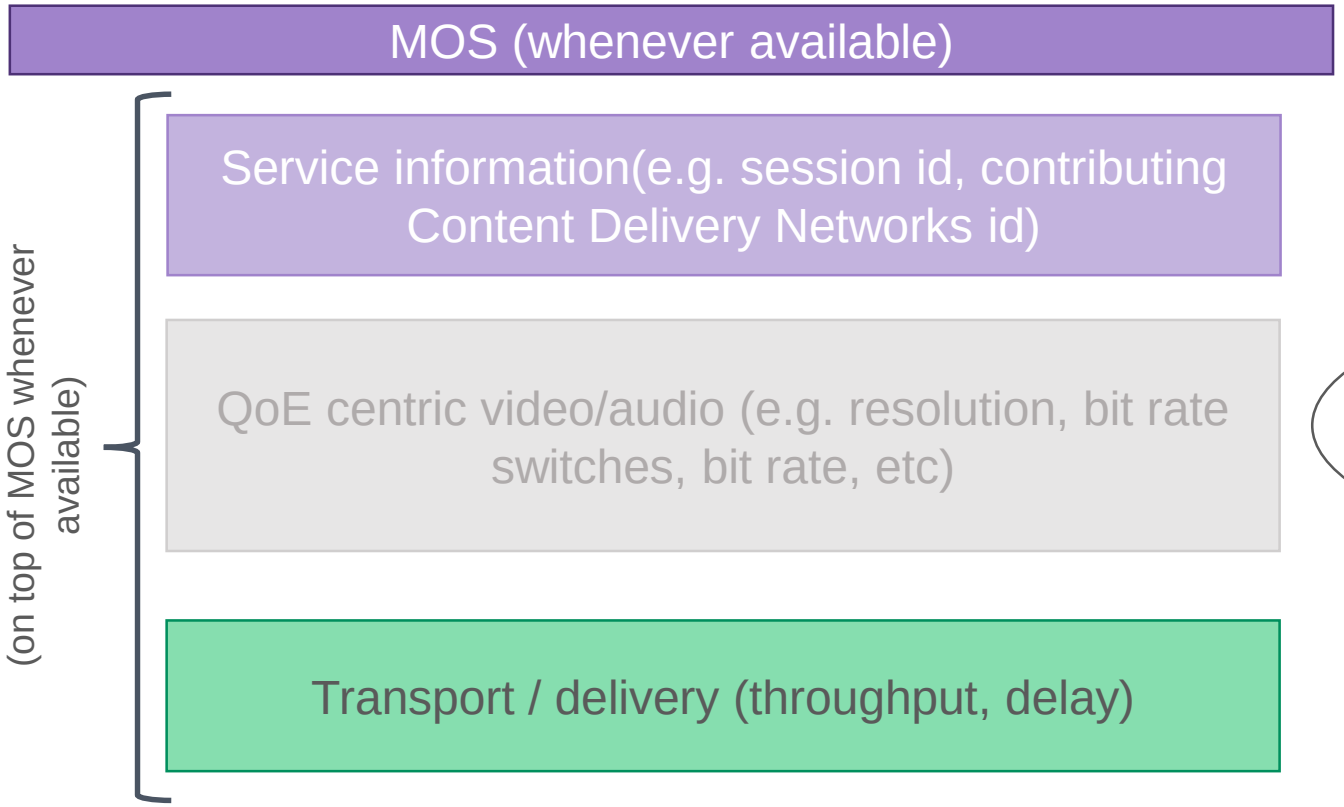
Analysis Scripts
(diagnosis flowcharts)

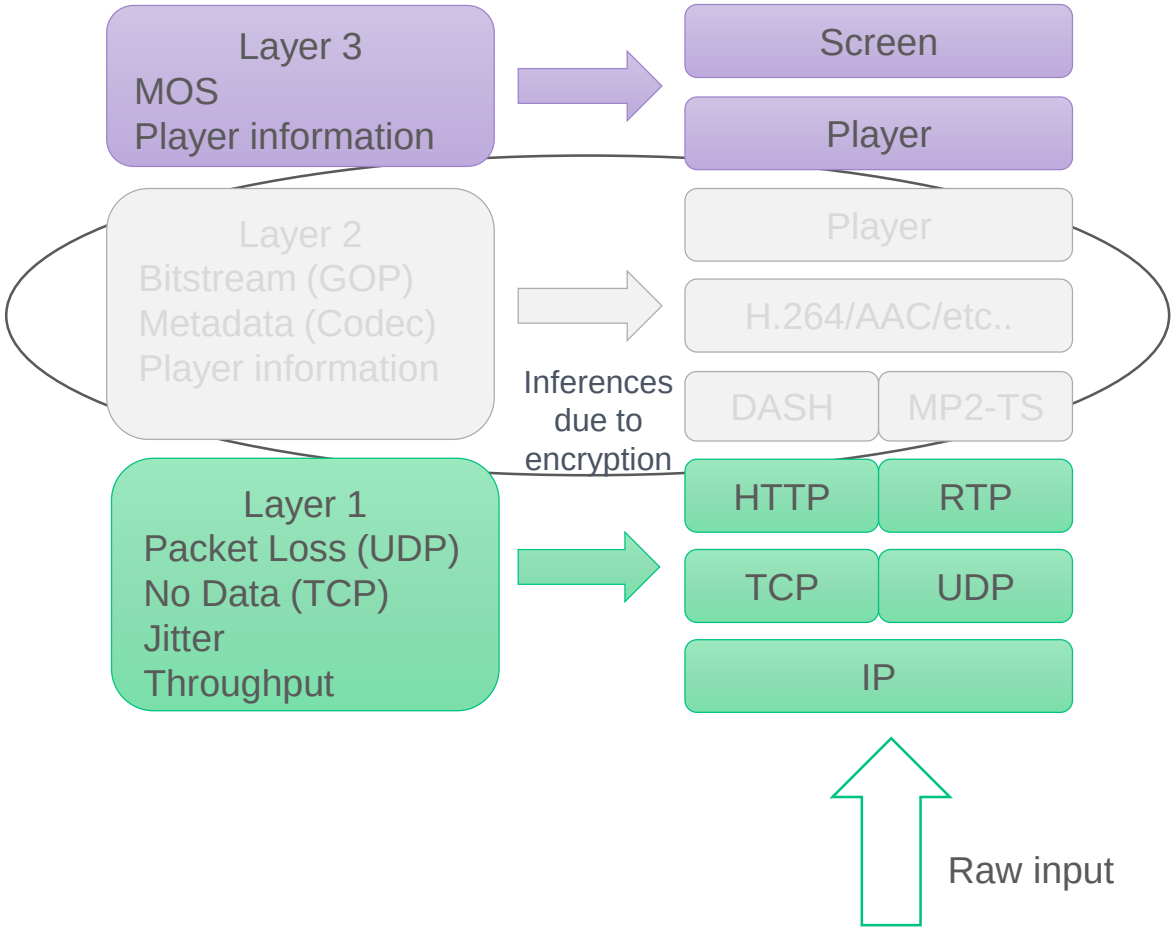
Coverage
Interference (eICIC, CoMP
(m)MIMO/beamforming performance
Mobility
CA performance

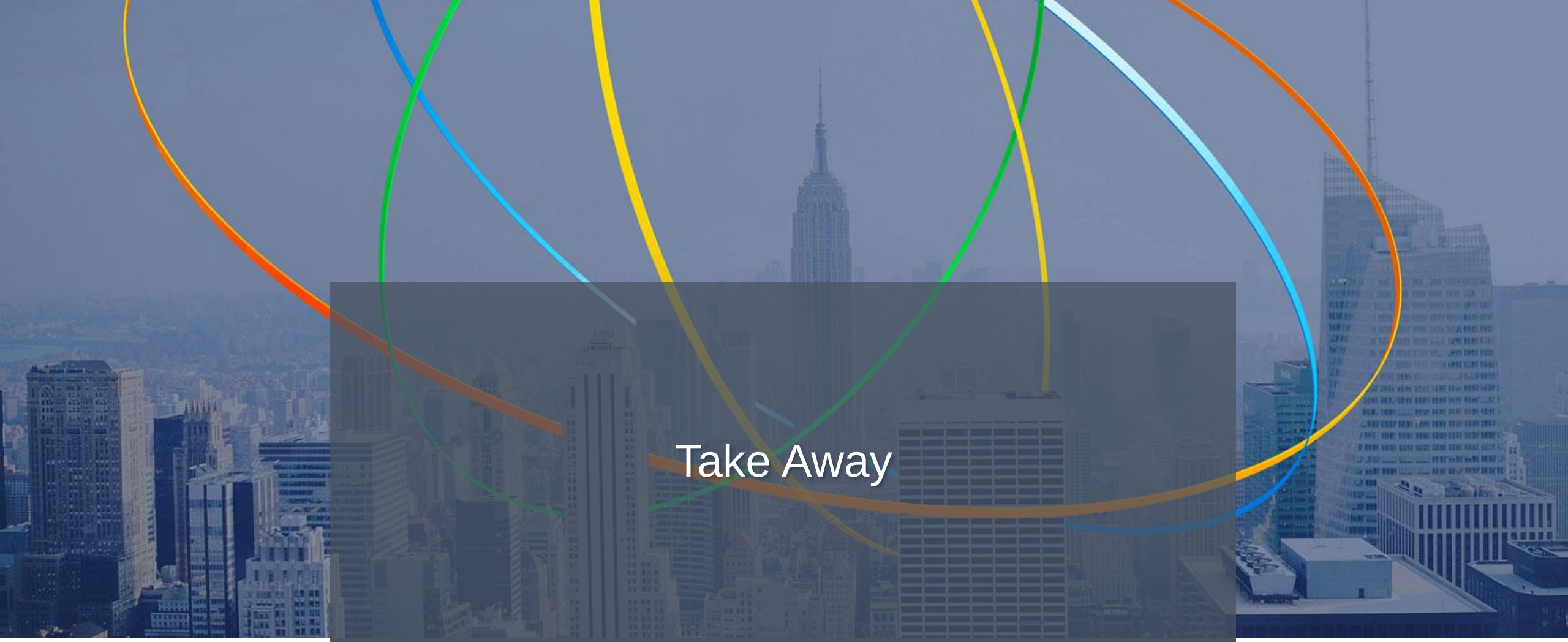
Performance Statistics on KPIs/events
Automated diagnosis reports; quality trends detection; localization of the problem (network and GPS)

Add on video QoE centric view to MOS scoring

Aligned with ETSI Work Item STQM 00215m (TEMS authors)







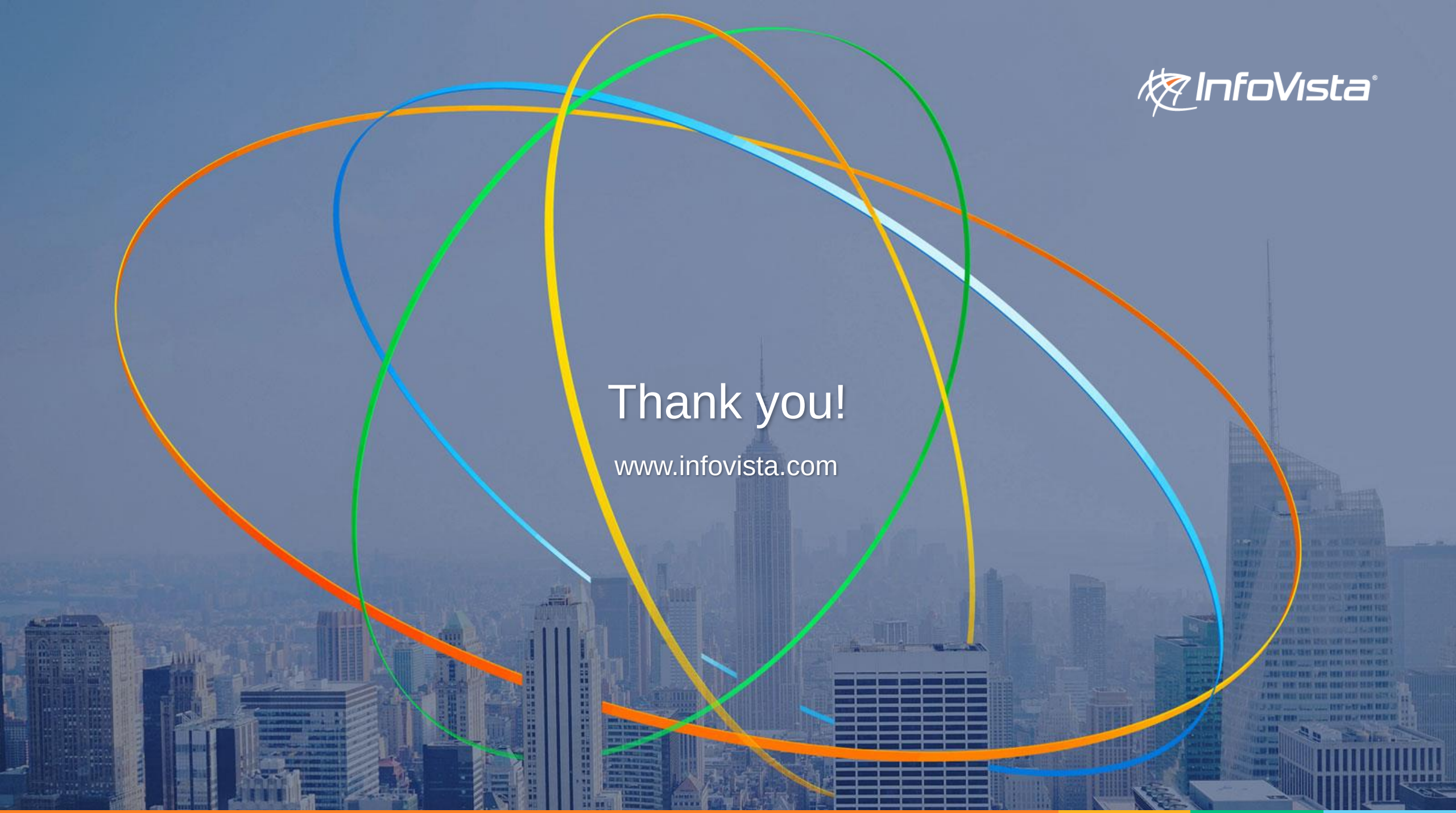
Take Away

Take away

1. Variety and complexity of OTT services (e.g. social media, video) require testing solutions which offer real time, remote cloud based big data collection, handling and processing; automated intelligent root cause analysis – TEMS ITU-T aligned solution

2. TEMS offers solutions for cost efficient statistical scoring and ranking of networks/services performance aligned with ITU-T recommendations

3. TEMS drives standardization efforts
   - For the introduction of machine learning techniques as a new technique for QoE prediction for OTT service
   - Evolving Video streaming quality evaluation beyond MOS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