MOBILE TEST SUMMIT 2024

NETWORK BENCHMARKING TECHNIQUES – BEHIND THE SCENES

Mr. Simon Allemann
Product Manager
Rohde & Schwarz SwissQual AG

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Best network claims
First touch point to benchmarking campaigns

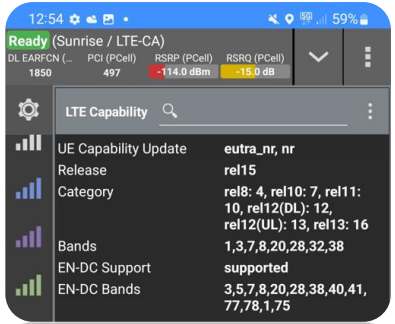
Why Benchmarking?

Mobile network operators and regulators have an interest in getting deeper insights into network quality and competition in specific markets. This interest is driven by three key requirements:

1. Benchmarking – provides a view of the relative performance of different mobile networks
2. Operations optimization – improves operational efficiency for the network operator (including customer service, service assurance and network engineering)
3. Marketing/customer experience management (CEM) – assesses end-user experience of network quality

► Based on Benchmarking data, Mobile Network Operators
  – can check that they are the best
  – prove that they are the best
  – know what the other competitors are doing
  – assess a new service

Reliable data collection – State-of-the-art devices



- Smartphones are the best suitable devices to measure and reflect QoE from the real end user perspective
- Select a smartphone type that is very common / popular and widely used in the operator's network
- Device / smartphone capabilities need to be same and aligned with the network

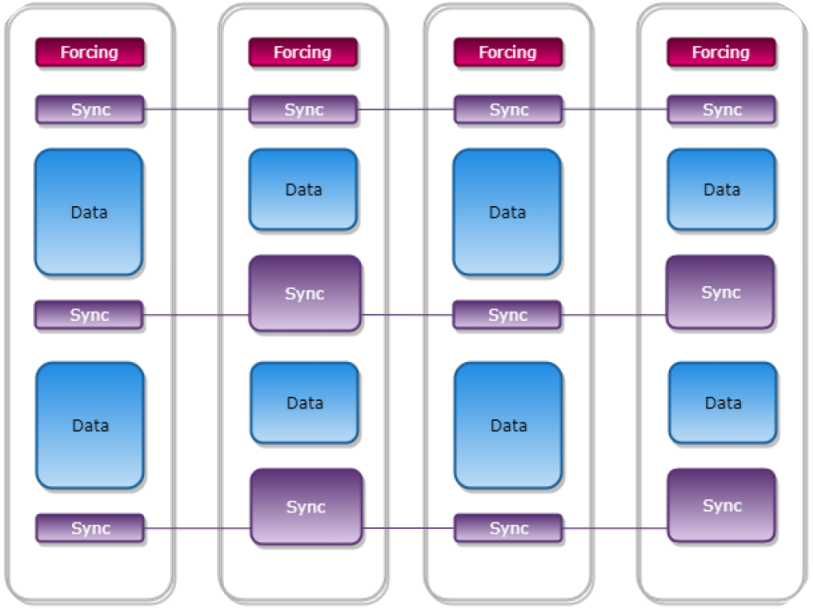
Reliable data collection – Accurate and reproducible data collection

Keep smartphone within normal operating temperature

- ► If smartphone gets too hot, it throttles down the CPU
- ► direct impact on performance of the device and data collection
- → collecting junk
- → useless data for reports & analysis later on

Sophisticated synchronization among the involved devices

- ► Same conditions for everyone



Reliable data collection – Accurate and reproducible data collection

In-car solution

Benchmarker 3 – Smart Mounting Wall

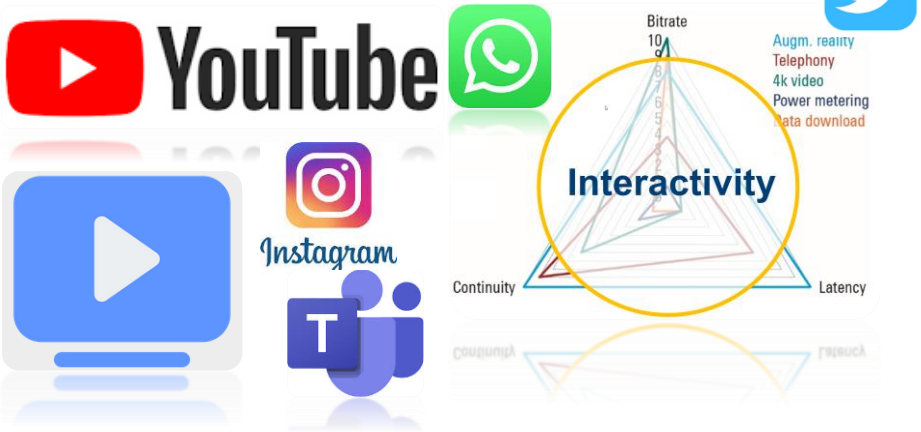
- Devices are surrounded by a forced air flow keeping them within allowed temperature range

Car roof top solution

Benchmarker 3 - TCM and VRB

- Devices are mounted in TCMs in a vehicle roof box.
- Within TCM, temperature is kept stable at 25°C guaranteeing reliable and accurate data collection

Reliable data collection – User perceived QoE



- Measure the quality of experience from the real end user perspective
- Measure the prominent services offered to end customers
- Adapt / introduce new tests along with technology evolution

VoIP App Tests for Benchmarking
Universal approach

- **Same principle for all VoIP OTT Apps**
  - Voice Call: End-to-End Call Setup Time
  - Voice Call: Digitally grabbed voice signal on phone
  - Voice Call: Full POLQA and P.863.2 voice quality analysis
  - Messaging: Send and delivery time for text, photo and data messages

- Using the ‘original’ VoIP OTT App ensuring the use of the service suppliers server infrastructure
  - → Each VoIP OTT supplier maintains an own backend
  - → True end-to-end performance only to be measured by using the supplier’s full eco-system
  - → Direct comparable results

VoIP App Tests for Benchmarking
MS Teams App service test - OTT VoIP / messaging + video

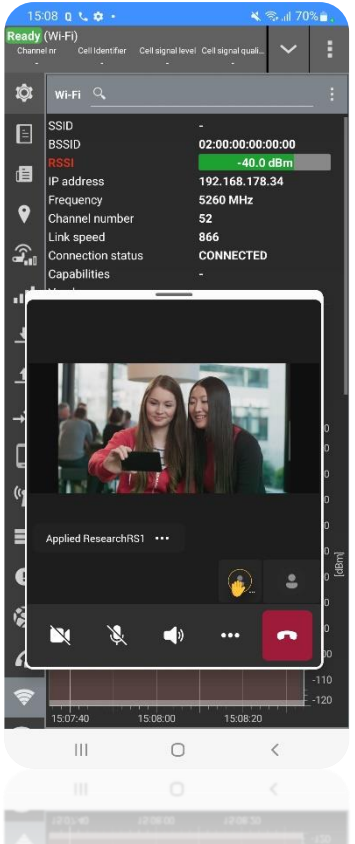
MS Teams voice call A-B (same as WhatsApp, Signal,…)

MS Teams messaging / file sharing (same as WhatsApp, Signal,…)

MS Teams video (video screen sharing)

- ► On B-side a video is displayed on screen and shared with A
- ► On A-side the received shared ‘video’ is analyzed
- ► Freezing, Sharpness

- ► Proves video channel availability and reliability



Video App Tests for Benchmarking
Universal approach for video access

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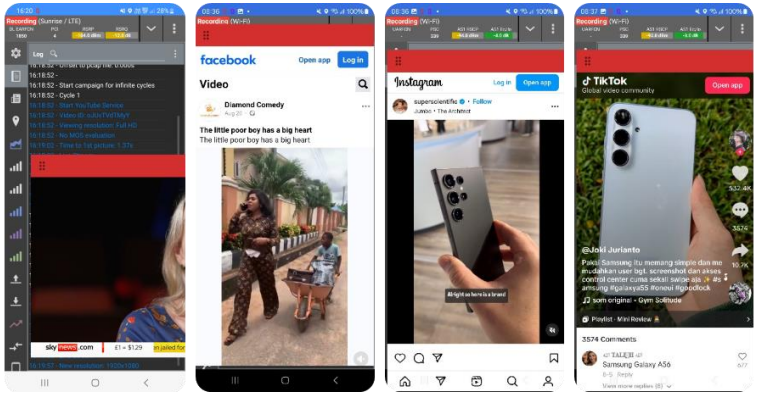
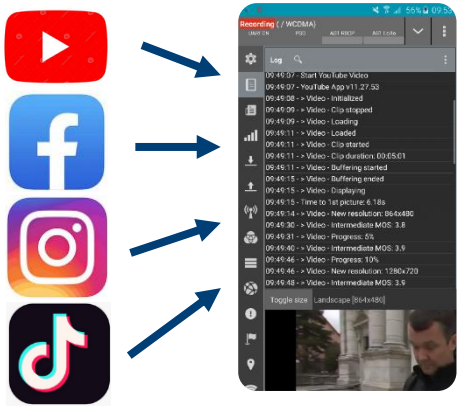
Individual Apps on smartphone



- Individual Apps on smartphone
- Different interfaces and control options
- Individual video scaling on screen
- Unknown side traffic (ad's, HTML content)

Android native video player component

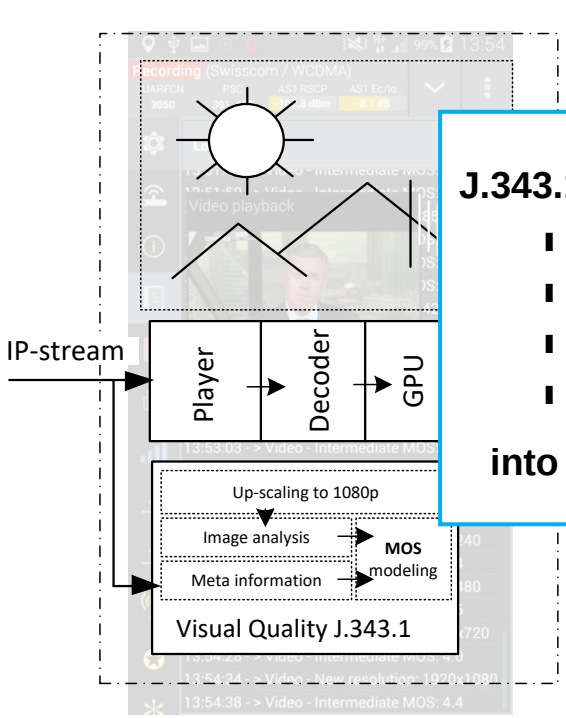


→ **Video frames**

- Service suppliers streaming server approached
- On phone: same player component same interface, same scaling
- No unwanted side traffic, no ad's

→ Focus on video streaming under same playing conditions

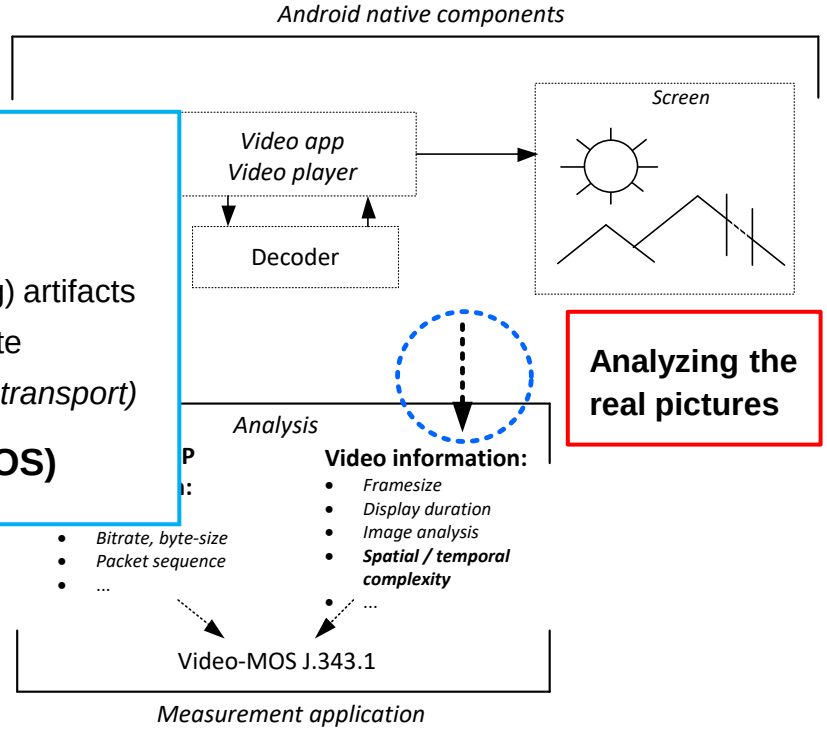
Real time testing of Video Streaming
Measuring Visual Quality with J.343.1 on a smartphone



J.343.1 integrates

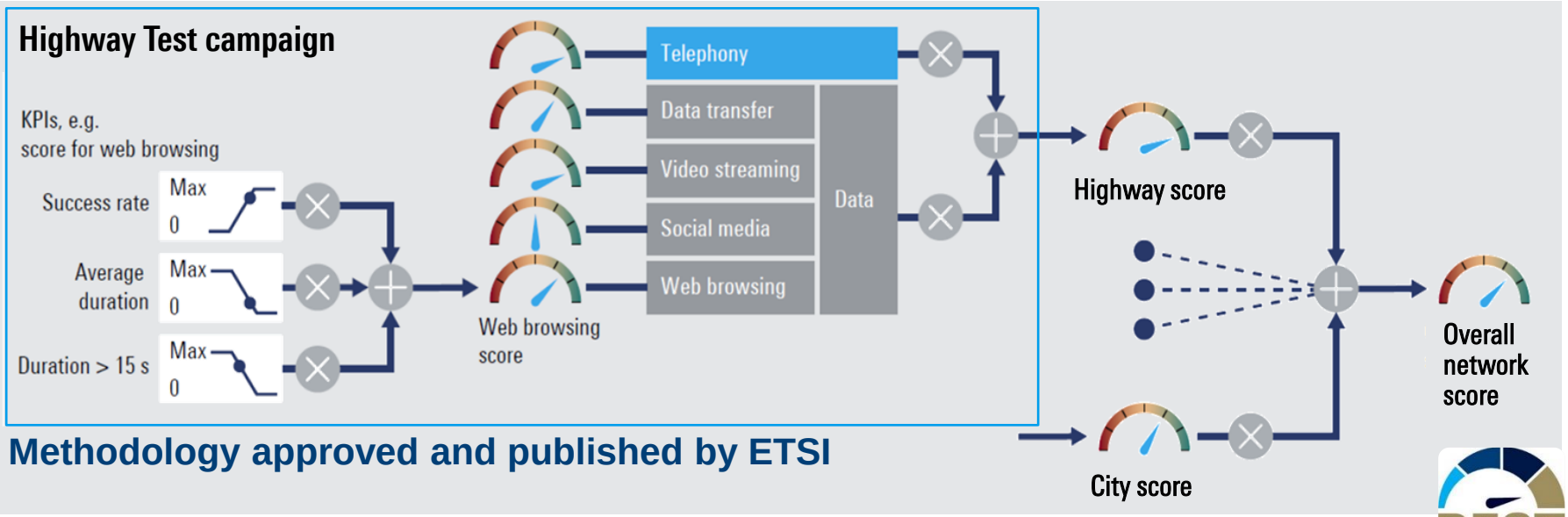
- Coding and compression effects
- Re-scaling (down- and upscaling) artifacts
- Perceived freezing and frame rate
- *Erroneous pictures (if unreliable transport)*

into one single score (Video-MOS)



Analyzing the real pictures

Reliable data collection – User Perceived QoE
Network Performance Score acc. to ETSI TR 103 559



Methodology approved and published by ETSI

- **Network Performance Score is technology-agnostic and transparent**
- **Network Performance Scores of different networks/countries/regions are comparable**

BEST NETWORK PERFORMANCE SCORE

Crowdsourcing data
Could it do the same job? → No!

Pros:

- Data is collected continuously and autonomously without a dedicated campaign
- Massive amount of data provides very high-resolution analysis (data from wherever people are)
- Mobile network coverage and quality statistics are available across a country or region.
- Identification of sites, locations and operators with highest data traffic can offer insights for new site planning or capacity expansion.

Cons:

- Conditions of crowdsourcing data collection are unpredictable and mostly unknown: e.g., temperature, radiation pattern, etc.
- Measurements are not reproducible (crowdsourcing analysis can be repeated or done on a newer data set, but it cannot be reproduced). If there is a dispute on a reported event, it cannot be reproduced for validation.
- Only a fraction of the data provided compared to real network measurements
- Data cannot be used for network optimization. Limited or no information on root causes

Conclusion

- Benchmarking → **same conditions** for everyone (☞ comparing “apples with apples”)
- Smartphones are very suitable to represent and reflecting the **real end user QoE**
- Benchmarking means **repeatable and reproducible** tests
- Harmonized method and scoring providing **transparency** and allowing international comparison
- Benchmarking data provide a **full set of KPI’s, Quality of Service and Quality of Experience** according to recommendations from standardization bodies
- Benchmarking data can be used for **network optimization**!

- Crowdsourcing can be a good complement to (**but not replace!**) drive tests
  - Identify areas with low coverage or network problems to trigger drive test teams
  - Help justifying national benchmarking campaigns (NPS) as well as helping to define campaign and route planning (relevant parts of the country covered)

► Rohde & Schwarz MNT – the experts in network testing and benchmarking

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Test. Measure. Innovate

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