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MEASURING THE POPULAR OTT IS EQUIVALENT AS MEASURING CUSTOMER EXPERIENCE IN MOBILE NETWORKS?

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WHAT IS OTT?

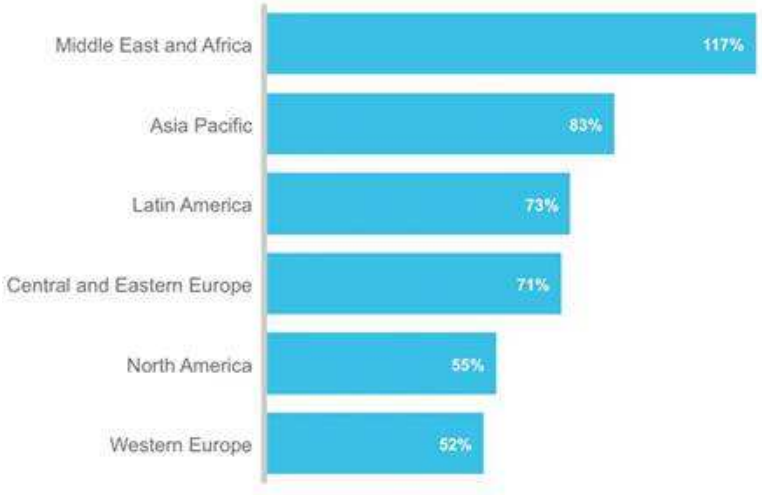
"In broadcasting, over-the-top content (OTT) refers to delivery of audio, video, and other media over the Internet without the involvement of a multiple-system operator in the control or distribution of the content."

Source WikiPedia

- **OTT services are mainly video and streaming content such as Netflix and Youtube**
- **OTT Messaging services are also part of OTT family**
  - **Skype, WhatsApp and many others**
  - **Even Facebook can be considered as a OTT messaging service**
- **OTT services in mobile networks are applications running on top of the data connection**

NETWORK DATA USAGE

- **Global mobile data traffic grew 74 % in 2015**
- **More than half a billion (563 million) mobile devices and connections were added in 2015**
  - Smartphones accounted for most of that growth. Global mobile devices and connections in 2015 grew to 7.9 billion, up from 7.3 billion in 2014
- **Mobile video traffic accounted for 55 percent of total mobile data traffic in 2015**
  - Three-fourths (75 percent) of the world's mobile data traffic will be video by 2020



Mobile Data Growth in 2016

Source Cisco VNI report

APPLICATION USE IN MOBILE NETWORKS

- **Interestingly browsing is the biggest data traffic generator**
- **Youtube second and growing**

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	Facebook	17.93%	HTTP	17.65%	HTTP	16.92%
2	HTTP	13.45%	YouTube	16.54%	YouTube	15.15%
3	SSL	8.63%	Facebook	12.85%	Facebook	13.72%
4	YouTube	8.25%	SSL	5.68%	SSL	6.17%
5	BitTorrent	5.00%	MPEG	4.23%	MPEG	3.85%
6	Skype	4.60%	Netflix	3.89%	Netflix	3.53%
7	iTunes	3.01%	iTunes	3.48%	iTunes	3.40%
8	Instagram	2.07%	Google Market	2.66%	BitTorrent	3.02%
9	MPEG	2.05%	BitTorrent	2.60%	Google Market	2.43%
10	Snapchat	1.86%	Instagram	1.92%	Skype	1.93%
		64.99%		69.59%		70.13%

sandvine

Table 8 - Top 10 Peak Period Applications - Europe, Mobile Access

WHAT IS CUSTOMER EXPERIENCE IN MOBILE NETWORKS

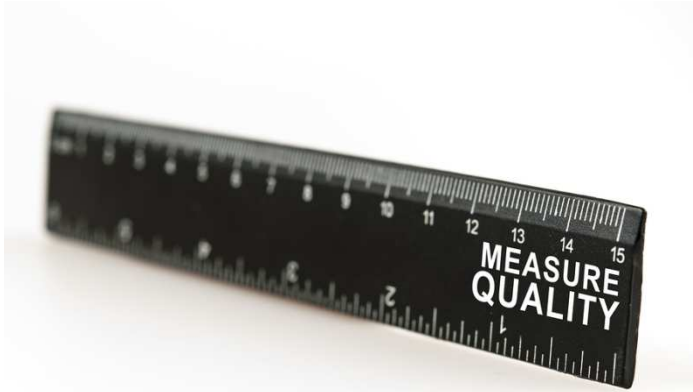
- Customer experience is a wide concept
  - Customer care and billing
  - Cost for subscriber
  - Network quality
  - Devices

- Network quality
  - How customers are perceiving the quality that they expect from the mobile network
  - For mobile users the fixed line application experience is a solid comparison
  - Devices are also a key enabler for good customer experience

- We need to have KPIs and measurement methods to compare the perceived quality vs expected quality

HOW QUALITY IS MEASURED TODAY?

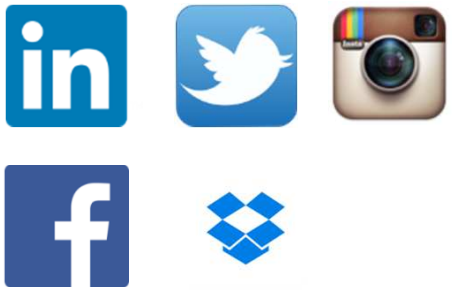
- Voice
  - PESQ
  - POLQA
- Video
  - PEVQ-S
- Messaging
  - SMS
  - MMS
- Data
  - Throughput(s)
  - Ping
  - HTTP(S)
  - Many others…



- We need methods to measure application quality
- We are still missing a standardised way to measure most of the popular applications

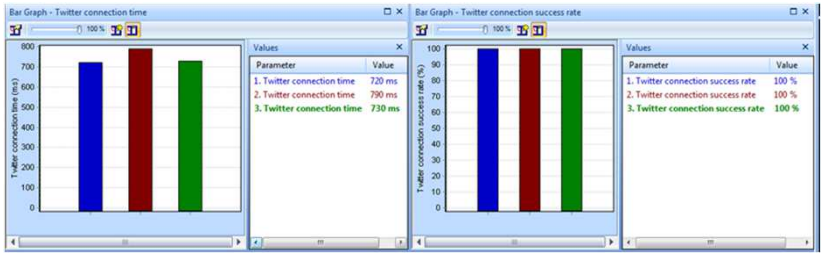
HOW SHOULD WE MEASURE CUSTOMER EXPERIENCE IN THE FUTURE?

- What to measure and capture from the point of view of the **end-user QoS**?
- The first one, corresponding to the **service accessibility** category, should measure whether the access to service account and access token is successful or not after the user request
- Another important quality aspect is that the operations do not get stuck at some point. The **service retainability** category should, therefore, contain a KPI that measures the ability of the different operations to complete
- Finally, under **service integrity**, the KPIs should contemplate quality aspects. Therefore, these KPIs should evaluate the delayed time experienced. Application data throughput is also recorded but due to quite low data rates used by social media applications it is not as an important KPI as service accessibility, service retainability, and times experienced



Statistics- Facebook

Parameter	1. Nokia 500	2. Nokia 500
Network operator	TeliaSonera Finl...	Elisa Oyj
Facebook connection attempt success rate	100	100
Facebook connection attempts	181	202
Facebook connection failures	n/a	n/a
Facebook connection success	180	202
Facebook connection success rate	100	98
Facebook connection time	663	1000
Facebook disconnects (dropped)	n/a	4
Facebook disconnects (normal)	180	198
Facebook transfer attempts	179	202
Facebook transfer failures	n/a	4
Facebook transfer success	179	198
Facebook transfer success rate	100	98
Facebook transfer time	688	1410
Application throughput downlink measurement average	93335.0703	67466.1484



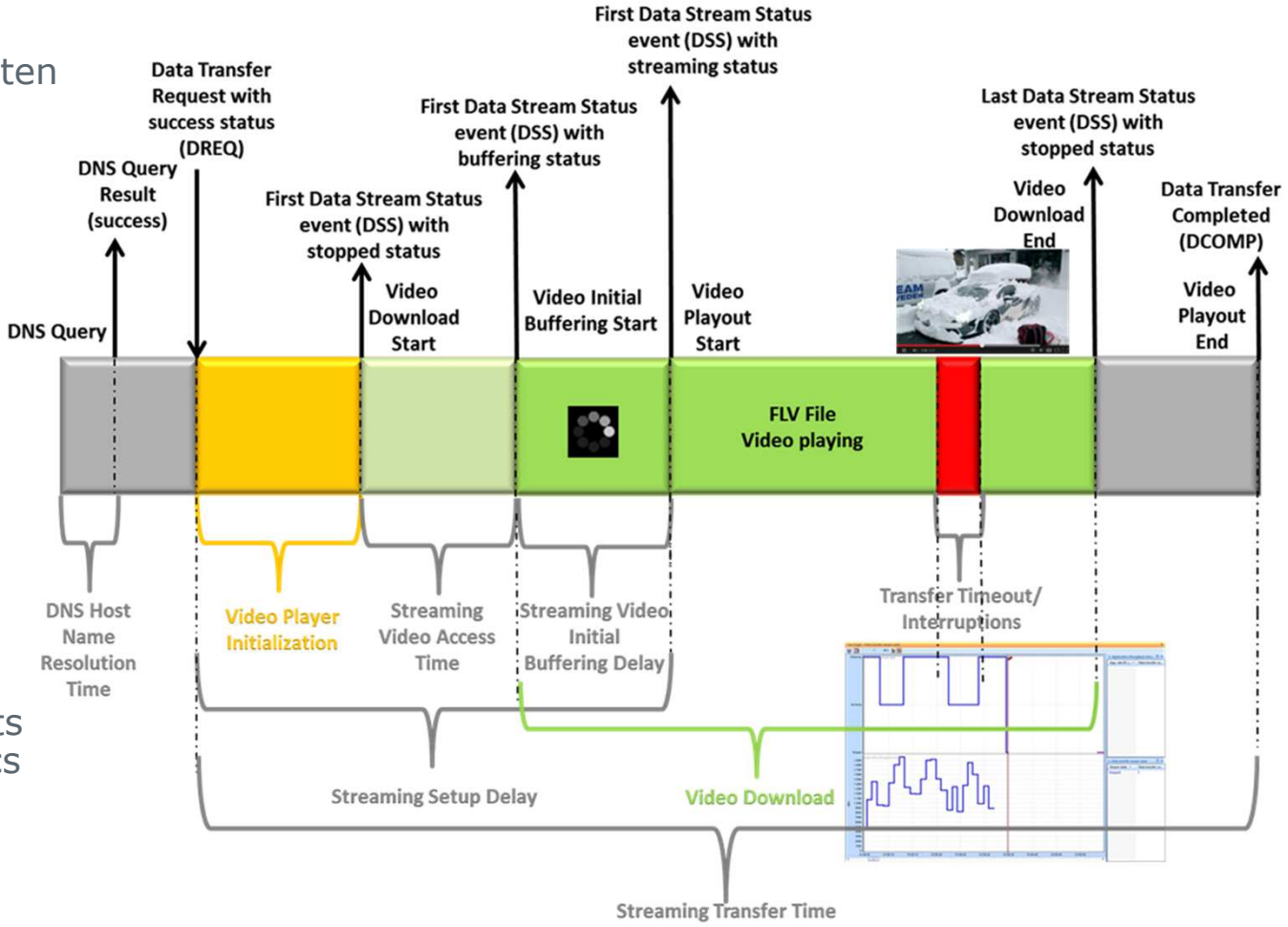
YOUTUBE TESTING

- **What to measure?**
  - The down-stream scenario, the probability to access and see a video and the quality of the video are the key KPIs
  - HTTP streaming is used by all Android and iOS based handsets. KPIs seen with the RTSP/UDP transport mechanism, such as video quality jitter and video quality jerkiness, are obsolete -> PVI streaming (RTSP) not suitable anymore
- **If the video content is compressed during the transfer by a proxy hence the content arriving at the subscriber is not identical**
- **Only way to measure and verify the QoE is the competitive side by side benchmarking**
- **Two options to perform YouTube testing:**
  - **Proprietary Youtube Testing (Anite has one) (PC based or UE based; NMR)**
  - **Opticom PEVQ-S Video Streaming Analysis (PC based or UE based; NMR)**

YOUTUBE TESTING-
VIDEO MEASUREMENT FLOW

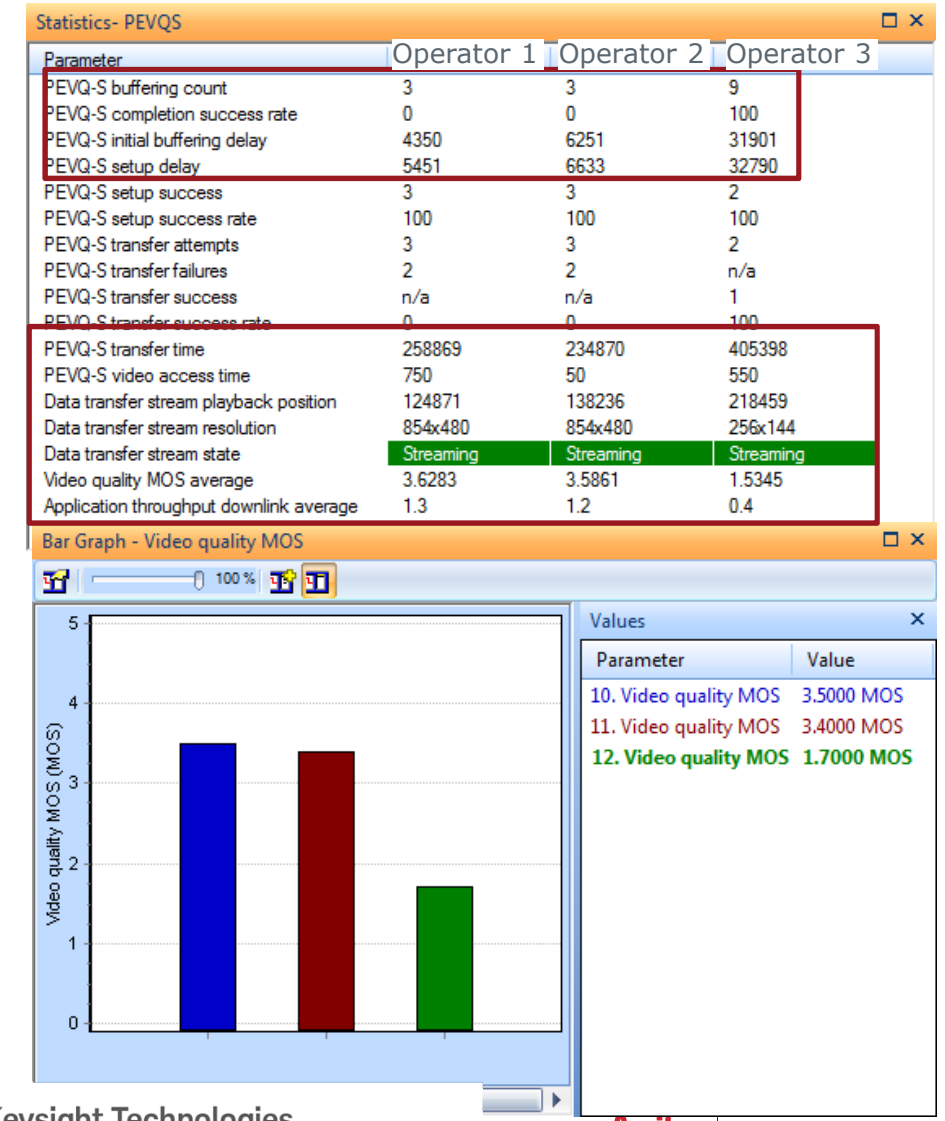
What is written in the Log

Trigger Points and Statistics



PEVQ-S VIDEO STREAMING ANALYSIS

- Benefits
  - Truly measure and competitively benchmark picture quality in a long-term context as perceived by subscribers
  - Standards-based video quality measurement, fully backward compatible to ITU-T J.247 and P.910 subjective tests
  - Benchmark and optimize video streaming characteristics of mobile networks
  - Differentiate your OTT service offering from the competition



OPERATOR BENCHMARKING REPORTS

LinkedIN

	Op1	Op2	Op3	Op4	Op5
Load self feed success rate	--	--	--	--	--
Load profile from contact list success rate	--	--	--	--	--
Load profile using public URL success rate	--	--			
Share text and URL success rate	86.66667				
Load my info success rate	100				
Load self feed - delay (ms)	0				
Load profile from contact list - delay (ms)	0				
Load profile using public URL -delay (ms)	0				
Share text and URL - delay (ms)	2126.23	3437			
Load my info - delay (ms)	2225.47	200			
Connection Drop Rate (%)	6.666667				
Throughput (Kbps)	0				
Score	77				

Facebook

	Op1	Op2	Op3	Op4	Op5
Wall Feed Loading Success Rate	100	100	100	100	100
Friends List Loading Success Rate	100	100	100	100	100
Wall Feed loading delay (ms)	2352.86	939.87	980	3319.8	1132.2
Friends List loading delay (ms)	5447.79	3210.9	4112.8	3274.6	5998.33
Wall Posting Success Rate	100	100	100	100	100
Photo Posting Success Rate	--	--	--	--	--
Wall Posting Delay (ms)	1821.38	1918.8	959.37	1446.5	1154
Photo Posting Delay (ms)	0	0	0	0	0
Connection Drop Rate (%)	0	0	0	0	0
Throughput (Kbps)	12.74	6.13	6.64	3.94	3.21
Score	**100**	**90**	**90**	**88**	**88**

Instagram

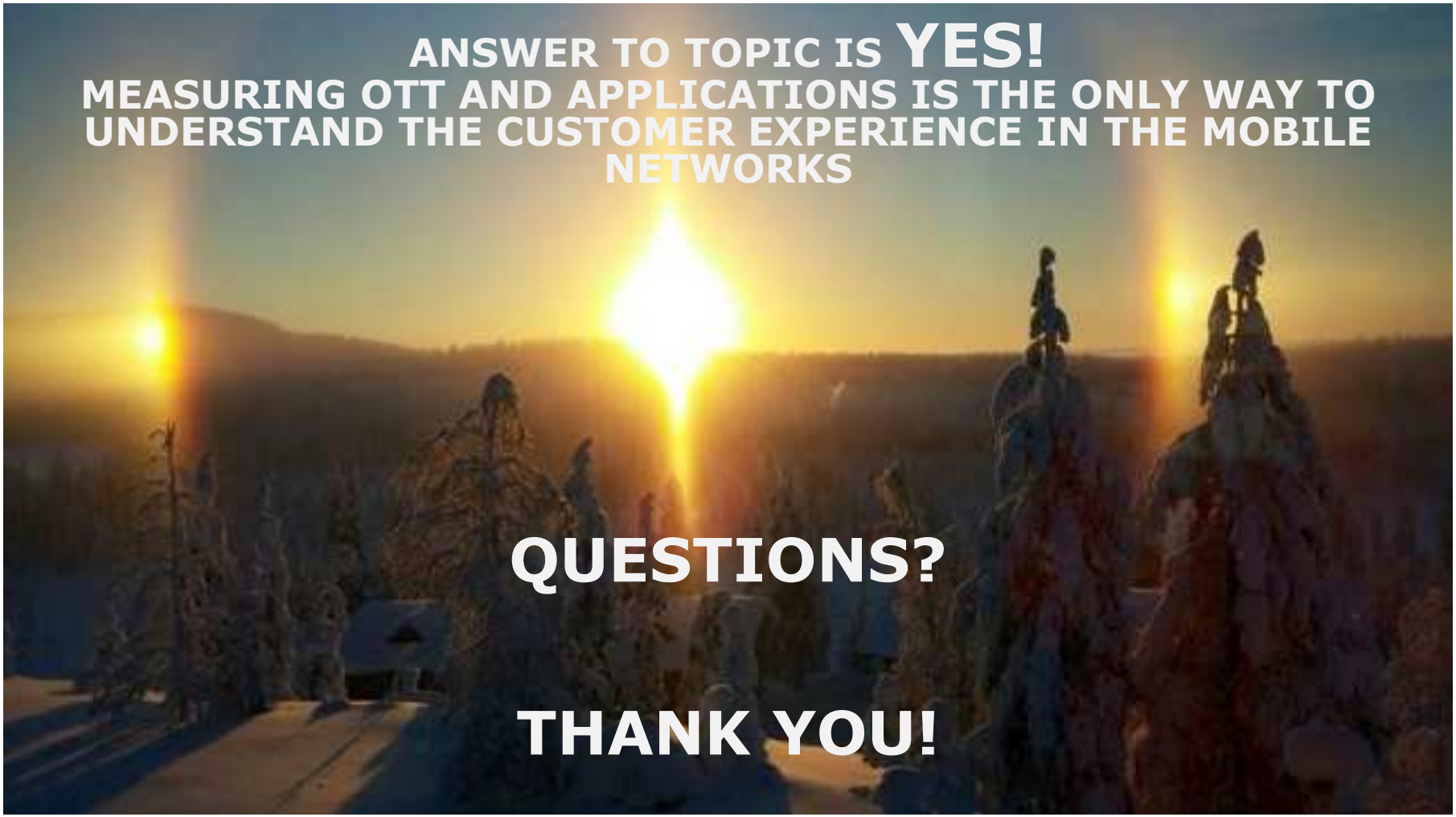
	Op1	Op2
Load User feed - success rate	--	--
Load self feed success rate	--	--
Load popular feed - success rate	--	--
Search media with a tag - success rate	--	--
Load User feed - delay (ms)	0	
Load self feed delay (ms)	0	
Load popular feed - delay (ms)	0	
Search media with a tag - delay (ms)	0	
Connection Drop Rate (%)	--	--
Throughput (Kbps)	0	
Score	0	

Youtube

	Op1	Op2	Op3	Op4	Op5
Page Loading Success Rate	95.83333	100	95.83333	73.33333	85.18519
Service access time (ms)	1637.78	1434.54	1789.96	1435.36	1507.48
Service Initial Buffering Delay (ms)	805.35	739	586.39	542.32	573.43
Video start delay (ms)	2450	2177.08	2381.17	1985	2087.78
Buffering Count	0	0	0	0	0
Video MOS	0	0	0	0	0
Connection Drop Rate (%)	4.166667	0	4.166667	26.66667	14.81481
Application Throughput (Kbps)	445.81	574.45	450.86	393.65	457.36
Score	**20**	**80**	**45**	**60**	**75**

WHY REGULATORS SHOULD CARE ABOUT OTT MEASUREMENTS?

- OTT and application services are the main use of the mobile networks TODAY and will continue to increase in the future
- Coverage and signal measurements are not enough to determine the network quality and subscriber based experience
- Regulators have already raised the interest to measure and publish OTT as well as application quality (Greece)
- Still more information is needed for subscribers to decide the right network operator based on their preferred usage
- Regulators can and should proactively measure the services and publish the information



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