

The Mobile WEB QoE

Michal Ries, Jiří Hošek, Pavel Vajsar, Luboš Nagy

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Personal Data

Name: [Dr. Techn. Michal Ries](#)

Position: Vice – director for research and science

Contact:

- ❑ Research Centre SIX, Technická 12, Brno
- ❑ Tel.: +420 54114 6529
- ❑ E-mail: ries@feec.vutbr.cz
- ❑ Web: <http://www.six.feec.vutbr.cz/>
- ❑ Skype: mri_iw



Education

❑ **2004 – 2008**

Vienna University of Technology, Institute of Communications and Radio-Frequency Engineering, graduation as Doctor of Technical Sciences (Dr. techn).

Doctoral thesis: Video Quality Estimation for Mobile Video Streaming

Advisor: Prof. Dr. Markus Rupp (TU Wien)

Second examiner: Doc. Dr. Yevgeni Koucheryavy (TU Tampere, Finland)

❑ **1998 – 2004**

Slovak University of Technology in Bratislava, Faculty of Electrical Engineering and Information Technology, Department of Radio-electronics, graduation as an Ingenieur (Ing.)

❑ **1994 – 1998**

Gymnázium Jura Hronca.

Discussion

- ❑ What is **Quality of Experience**?
- ❑ What is **State of the Art**?
- ❑ What is **Novelty**?
- ❑ What is **Applied Research**?
- ❑ Difference between **Development and Research**?

Introduction

- ❑ The mobile broadband IP traffic generated by wireless devices present 45% actually.

This is a challenge for mobile operators and service providers, because it forces new investment for increasing network quality at all levels and on other hand to keep this investment on profitable basis.

... broadband Internet accounts presents HTTP traffic.

- ❑ In this domain, the most prominent application scenarios analysed are web browsing, file downloads and file uploads.

Outline

- ❑ The impact of following variables were investigated:
 - ❑ End-user device
 - ❑ Scenario
 - ❑ Web page
 - ❑ File download (DL)
 - ❑ File upload (UL)
 - ❑ Network parameters
 - ❑ Bit rates (BR)
 - ❑ Delay of established connection between client and server (delay)
- ❑ In total were 187 test condition for each user device on 194 test participants.

Test setup

- ❑ Test Methods: (rec. ITU-T P.800)

1. Absolute Category Rating (ACR):

Scaling: 5 grade MOS scale.

1: Bad

5: Excellent

2. Acceptability rating:

Question: Were you satisfied with tested quality?

Binary answer: YES or NO

- ❑ Test participants: 193

Test setup

□ Used Terminals:

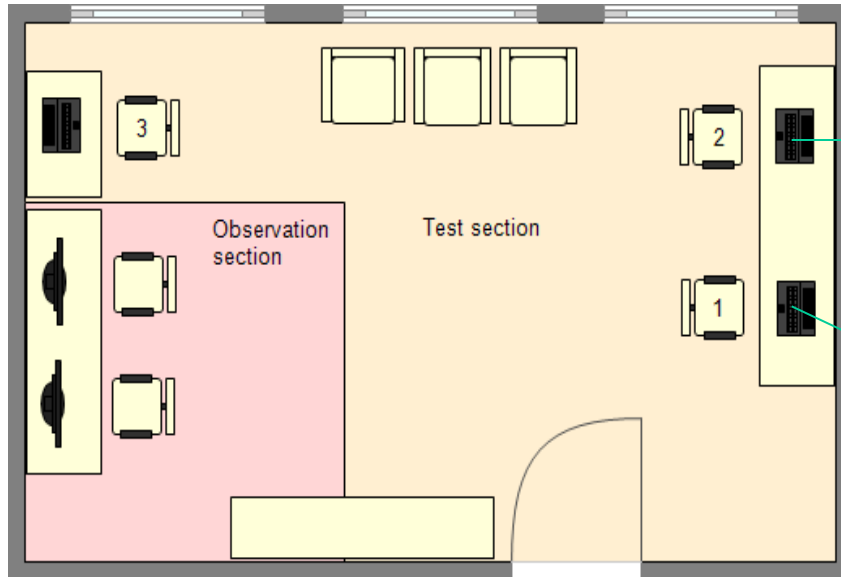
1. standard notebook (Lenovo X201i)
 - Processor: Intel Core i3 i3-330M/2.13 GHz,
 - RAM: 2.0 GB,
 - Display: 12.1 in TFT active matrix,
 - Resolution: 1280x800 (WXGA),
 - OS: Microsoft Windows 7.

2. Android smartphone (Samsung Galaxy Nexus)
 - Processor: Dual-core 1.2 GHz Cortex-A9,
 - Display: 4.65 inch,
 - Resolution: 720x1280 pixels,
 - OS: Android v 4.0.



Test setup

❑ Laboratory environment:



Ratio of luminance of inactive screen to peak luminance:	≤ 0.02
Peak luminance:	$> 200 \text{ cd/m}^2$
Environmental illuminance on the screen (Incident light from the environment falling on the screen, should be measured perpendicularly to the screen):	$< 200 \text{ lux}$

Test scenarios

□ WEB:

- 3 contexts: idnes.cz, Facebook registration, aukro.cz
- Connection setup:
 - BR [kbps]: 32, 64, 128, 256, 512, 1000, N, Er
 - Initial delay [s]: 0, 1, 3, 5, 7, 11

□ DL:

- 4 context: picture (picasa.google.com), music (ulozto.cz), video (Facebook.com), PDF (ulozto.cz)
- Connection setup:
 - BR [kbps]: 32, 64, 128, 256, 512, 1024, 2048, 4M, 8M, 16M, N, Er
 - Initial delay [s]: 0, 2, 5, 7, 11

□ UL:

- 4 context: picture (picasa.google.com), video (Facebook.com),
- Connection setup:
 - BR [kbps]: 32, 64, 128, 256, 512, 1024, 2048, 4M, N, Er
 - Initial delay [s]: 0, 3, 7

Assessment system

□ User interface:

Introduction:

Rozhraní pro hodnocení kvality zážitku QoE (Quality of experience)

Vítejte.
Hodnocení kvality zážitku mobilní datové služby v reprezentativních scénářích přinese komplexní náhled na vztah mezi subjektivním vnímáním datové služby a zvolenými klíčovými ukazateli (KPI). Získané výsledky budou analyzovány na statistickou spolehlivost a prezentovány podle metodiky Drive test E2E customer centric KPIs.

Úvod

Zahájit hodnocení kvality zážitku

Demographic data:

Pohlaví:

Muž
 Žena

Věk:

Vzdělání:

Středoškolské
 Vysokoškolské
 Doktorské

Typ zařízení:

Klasický mobil
 Smartphone

Operátor:

O2 - paušál
 O2 - kredit
 Vodafone - paušál
 Vodafone - kredit
 T-Mobile - paušál
 T-Mobile - kredit
 Něco jiného

Uložit dotazník a pokračovat

Questionnaire:

Zadání scénáře:

Ohodnoťte prosím celkovou kvalitu mobilní datové služby pro nahrání souboru. Kliknutím na tlačítko „Zahájit test“ se v nové záložce spustí testovaná úloha. Kliknutím na jednu ze zobrazených ikon se spustí automatické nahrávání souboru. Po skončení anebo opuštění úlohy se překliknutím na předchozí záložku vraťte zpět a proveďte hodnocení celkové kvality služby do hodnotícího formuláře.

Prosím ohodnoťte celkovou kvalitu služby v průběhu zadané úlohy:

5 - Vyborná
 4 - Chvilitebná
 3 - Dobrá
 2 - Dostatečná
 1 - Nedostatečná

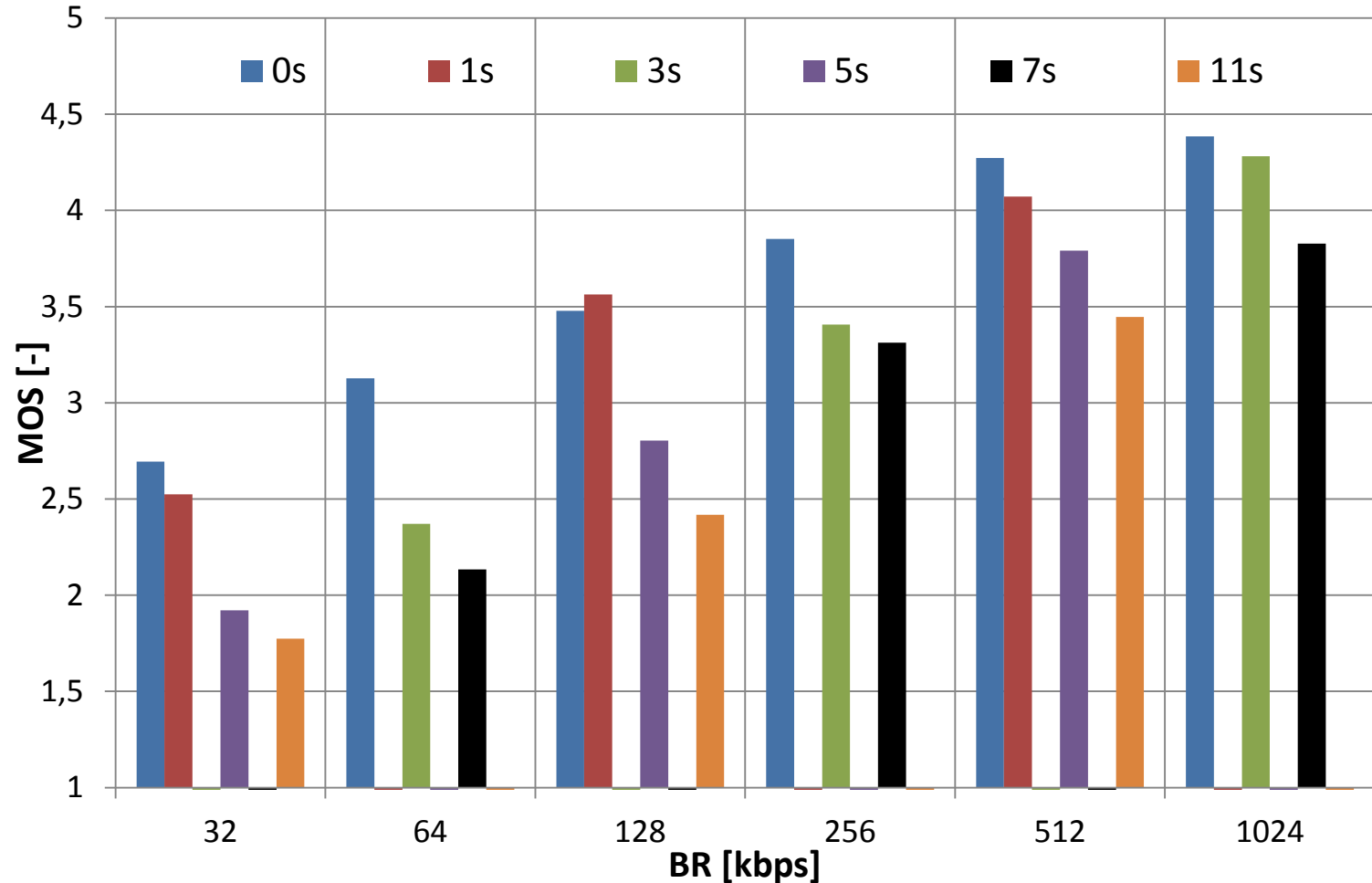
Představte si, že používáte placenou mobilní službu. Byli jste s její kvalitou spokojeni?

Ano
 Ne

Zahájit test

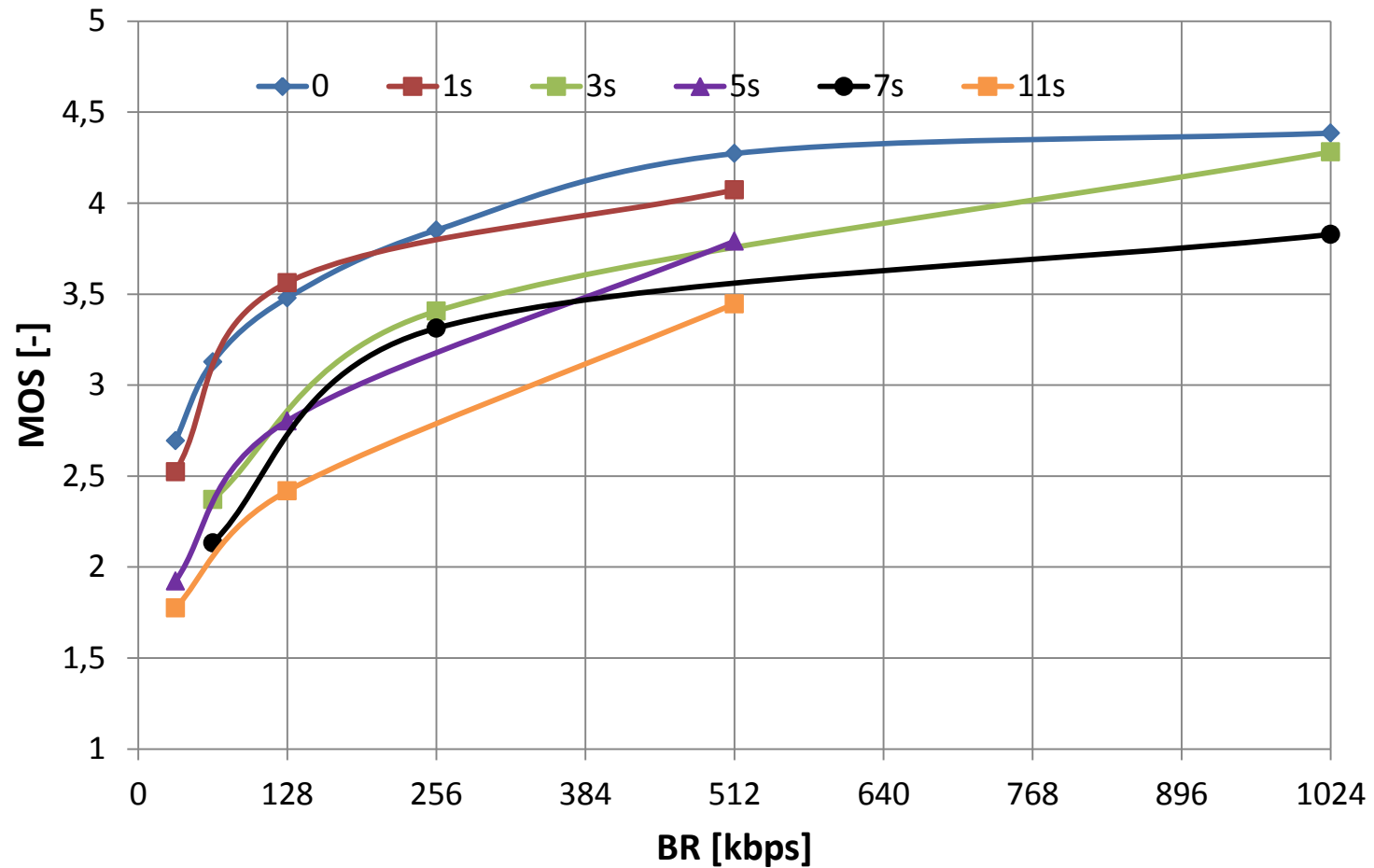
Subjective assessment

☐ Quality rating, web page scenario, notebook



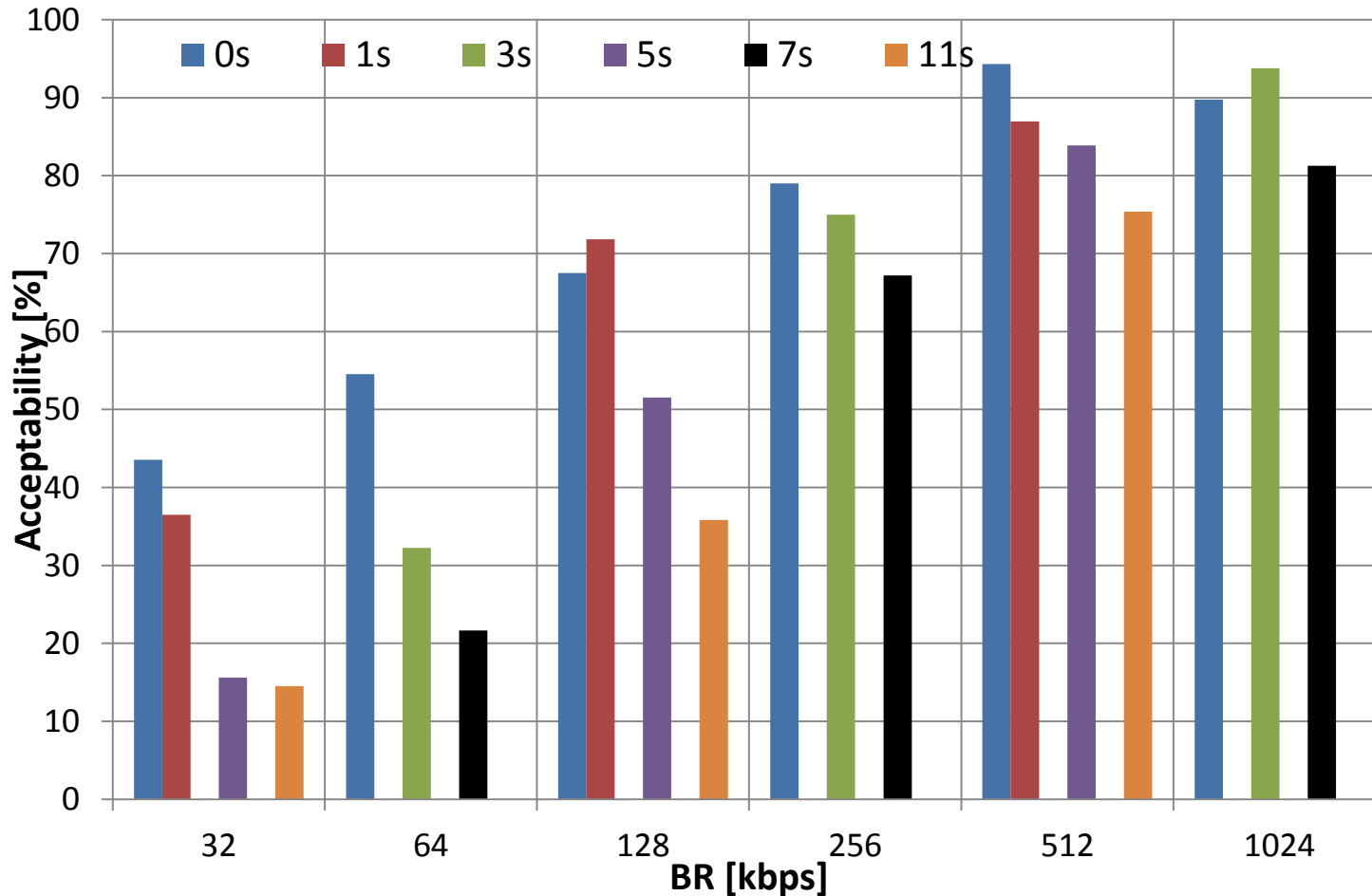
Subjective assessment

□ Quality rating, web page scenario, notebook



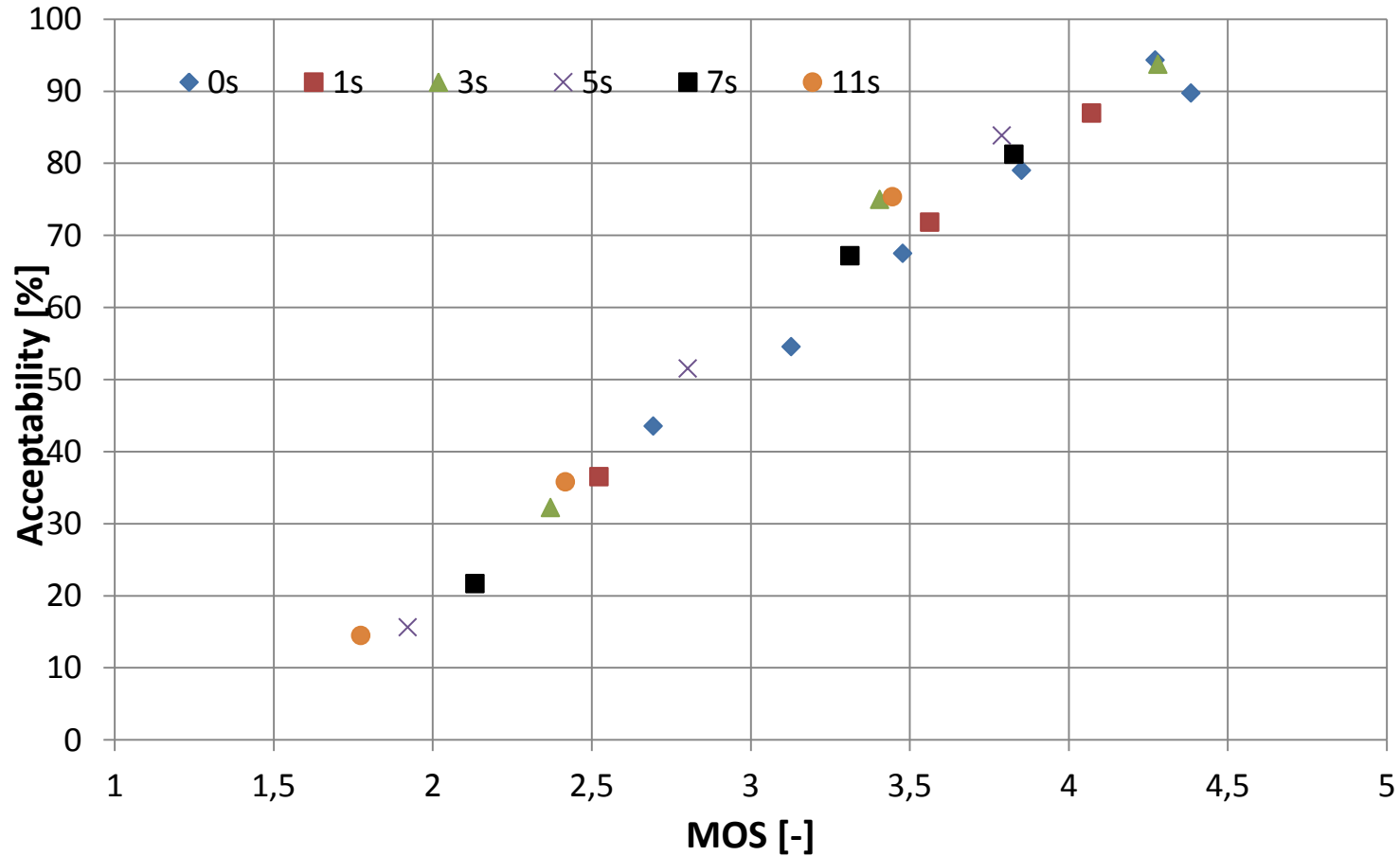
Subjective assessment

□ Acceptability rating, web page scenario, notebook



Subjective assessment

□ Acceptability vs. quality ratings, web page scenario, notebook



Quality Threshold and Quality Saturation

- TiMo we specify 3,7 MOS as a quality threshold for “premium quality” service.

Scenario	Notebook	Smartphone
Web Page	256 kbps	256 kbps
File DL	4 Mbps	4 Mbps
File UL	1 Mbps	1 Mbps

- The saturation threshold refers to BR with zero delay of established connection between client and server and where quality rating is not more increasing or achieve maximum quality rating or 4,5 MOS at five grade scale.

Scenario	Notebook	Smartphone
Web Page	512 kbps	256 kbps
File DL	4 Mbps	8 Mbps
File UL	4 Mbps	1 Mbps

- This is very practical output in order to avoid quality overprovisioning.

Conclusions

- ❑ The results allow us to identify “premium quality” and quality saturation thresholds for all investigated cases.
- ❑ The both rating show clear trend of increasing quality or acceptability with increasing BR and decreasing quality or acceptability with increasing delay.

Conclusions

❑ The QoE results for notebook:

- The results indicated strong web content dependence.
- The test subjects were very critical for new content.
- The test users are very sensitive for delay.

❑ The QoE results for smartphone:

- The results indicated significantly lower web content dependence and lower delay sensitivity in compare to the results obtained at notebook.
- Moreover, the statistical analyses show that BR is dominating QoE influencing parameter.

Discussion

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Acknowledgement

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