Linking QoE and QoS on data services

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Content

• QoS – QoE framework for data services

• Case studies:
  • WWW browsing
  • Network performance vs YouTube experience
  • Optimisation
our company

PIONEERING  founded in 1988 to design and rollout world’s first GSM network, 1000+ projects in 80+ countries since then

INDEPENDENT  owned by Finnish telecom investors, independent of all operator groups and equipment vendors

CONSULTING  consulting and professional services for telecom service providers and regulators

consulting for mobile industry since 1988
our services

Technology Strategy → Design and Optimisation → Audit and Benchmark → Performance Management

maximised customer experience
minimised network cost
what are QoS and QoE?

QOE DEPENDS ON...
- expectations
- branding
- socio-economic background
- price
- customer care
- provisioning
- **end-user QoS**
QoE, QoS and network performance quantified

**QUALITY OF EXPERIENCE**
how well service quality meets expectations?

**QUALITY OF SERVICE**
measured application/service KPIs

**NETWORK PERFORMANCE**
capacity, coverage, functionality, efficiency...

- call setup time
- call completion rate
- sms send time
- sms completion rate
- file transfer time
- www page waiting time
- video buffering time
- video setup success rate
Common challenge: “How is the quality?”

“network is excellent…”

“...customers not satisfied”

need to find right targets for acceptable QoE!
OPERATOR CASE: CEM FOR WWW BROWSING

Let’s take a dive into WWW browsing Quality of Experience...
Objective | sufficient web browsing experience for high value customers

1. QoE targets: define the desired WWW QoE level

2. QoS targets: measure QoE & QoS and cross-correlate to define the relation

3. CTO Targets: Link QoS with NW performance to find right network performance KPI targets
1. QOE TARGET | define the desired WWW QoE

- QoE defined in MOS scale
- Captured with end-user queries: “On 1-5 scale, what is your WWW browsing experience?”

<table>
<thead>
<tr>
<th>MOS</th>
<th>QoE</th>
<th>Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Excellent</td>
<td>Imperceptible</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>Perceptible but not annoying</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
<td>Slightly Annoying</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
<td>Annoying</td>
</tr>
<tr>
<td>1</td>
<td>Bad</td>
<td>Very Annoying</td>
</tr>
</tbody>
</table>

**SUFFICIENT QoE TARGET**

90% of high value customers MOS $\geq 4$
2. QoS TARGET | correlate QoS with QoE

Web Browsing QoS and QoE

QoS: WWW page waiting time [s]

QoE [MOS]

unsatisfactory region
(MOS < 4)

QoS target: WWW download time < 3s
3. CTO TARGETS | find required NW performance

1000KB WWW Page Waiting Time vs. Bitrate

- Unsatisfactory region: (www download time > 3s)
- Accepted region: (www download time < 3s)

CTO TARGET
- 90% of subs get >3.5 Mbit/s in 4G
- >4.5 Mbit/s in 3G

QoS: WWW page waiting time [s]

NW Performance: Bitrate [Mbit/s]
1. **QoE targets**: define the desired WWW QoE level

   MOS ≥ 4

2. **QoS targets**: measure QoE & QoS and cross-correlate to define the relation

   WWW DL time < 3 s

3. **CTO Targets**: Link QoS with NW performance to find right network performance KPI targets

   NW performance
   - >3.5 Mbit/s in 4G
   - >4.5 Mbit/s in 3G
OPERATOR CASE: CUSTOMER EXPERIENCE BENCHMARK

competitive positioning of YouTube experience
big difference in NW performance...

Vodafone higher bitrate, but KPN faster YouTube

...thin margins in customer experience
OPERATOR CASE: CUSTOMER EXPERIENCE OPTIMISATION

improving QoE for Kuwaiti operator
objective: customer experience improvement

1. Measure end-user QoS of smartphone voice and data
2. Measure network performance
3. End-to-end troubleshooting & improvement recommendations
customer centric optimisation area prioritisation

- number porters
- tickets
- coverage plots
- landmarks
- population
- planned sites
- churn
- complaints
improved **customer experience** with zero CapEx

- **15%-25% faster browsing** in optimised areas
- **10% of sites optimised**, zero capital expenditures
- **end-user QoS and network performance** connected
recap & takeaway messages

1. common challenge: CTO team & CMO team targets often not fully aligned

2. linking network performance to customer experience challenging but not impossible

3. proper CEM framework results in maximised customer experience & minimised network cost