Security Level:

Bridging QoE and QoS for Mobile Broadband Networks

Dr. David Soldani
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Capacity Sharing Workshop, 13th Oct 2011

Institute of Communication Networks and Computer Engineering (IKR) – University of Stuttgart, Germany

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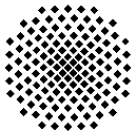
http://www.ikr.uni-stuttgart.de/Content/CapacitySharingWS/program.html



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Curriculum Vitae – Dr. David Soldani

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Areas of Expertise (not exhaustive)

- Solutions for Traffic Management in Mobile Broadband Networks
- Mobile Broadband Networks (TETRA, GSM, EDGE, WCDMA, HSPA, LTE/SAE and WiMAX)
- E2E QoS, QoE and Policy Based Management Solutions
- E2E Service and Network Performance, Network Planning, Optimization and Automation
- Transport Network Layer Technologies (IP/MPLS/Ethernet)
- Fixed Broadband Networks (xDSL, xPON)

Professional Background

- **16 years in ICT industry**
- **2009 – present: Huawei Technology Düsseldorf**
  - VP European Research Centre
  - Head of European Network Solutions R&D
- **2007 – 2009: Nokia Siemens Networks (NSN)**
  - Head of Solutions & Services Innovation (SSI)
  - Head of Customer Networks & Solutions (CTO office)
- **1997 – 2007: Nokia (Finland and Italy)**
  - Various technical & research management positions
- **1995 – 1997: Military Navy, Sirti SpA, Rohde & Schwarz**
  - Various technical positions

Relevant Experience (not exhaustive)

- Lead R&D and Customer Services organizational units
- Unit/area strategy formulation and implementation
- Technology and Innovation Management for ICT industry
- Conduct lectures at Universities, Military Academy and ICT Companies
- Perform advanced research in the fields of own expertise
- Provide consulting functions to profit and nonprofit organizations
- Supervise any type of R&D deliverables
- Published/presented many international papers
- Editor in chief and one of the main contributors to several books
- Holder of several international patents

Outline

- Definitions
- Industry trends
- Key technology issues
- User aware Customer Service Assurance
- Case study
- Bridging QoE and QoS

Customer Experience Management
- The four pillars

Brand Image

Customer Facing E2E Processes

Customer Experience

Pre-Service Marketing

Service Quality Management

Customer Service Assurance

Source TM Forum

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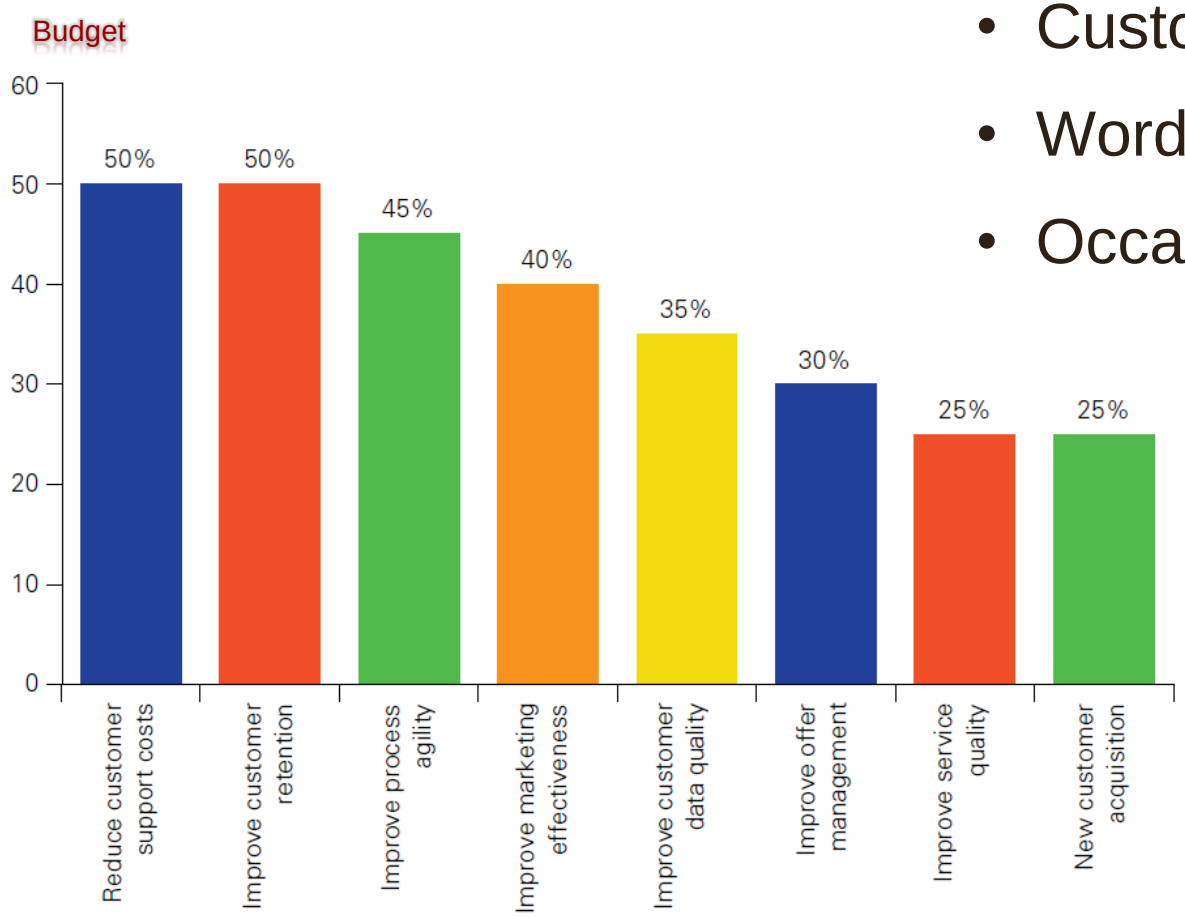
Managing customer experience becomes operator core business

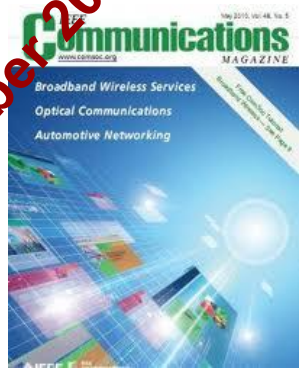


- Customer retention
- Word of mouth
- Occasional buys

Source: TMF – Exploiting Analytics, 2010

IEEE Special Issues

October 2011



GUEST EDITORIAL

TRAFFIC MANAGEMENT FOR MOBILE BROADBAND NETWORKS

David Soldani Sajal K. Das Mahbub Hassan Jahan A. Hassan Giridhar D. Mandyam

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March 2010

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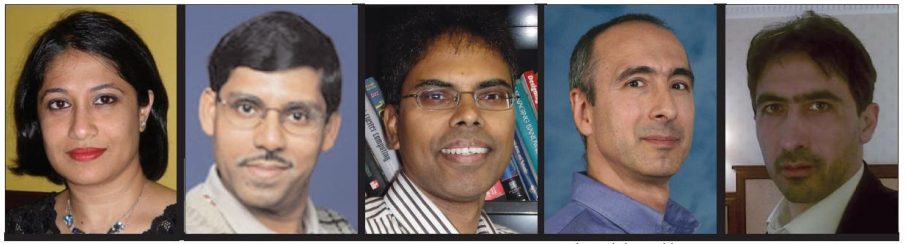
Improving Quality of Experience for Network Services



Jahan A. Hassan Sajal K. Das Mahbub Hassan Chatschik Bisdikian David Soldani

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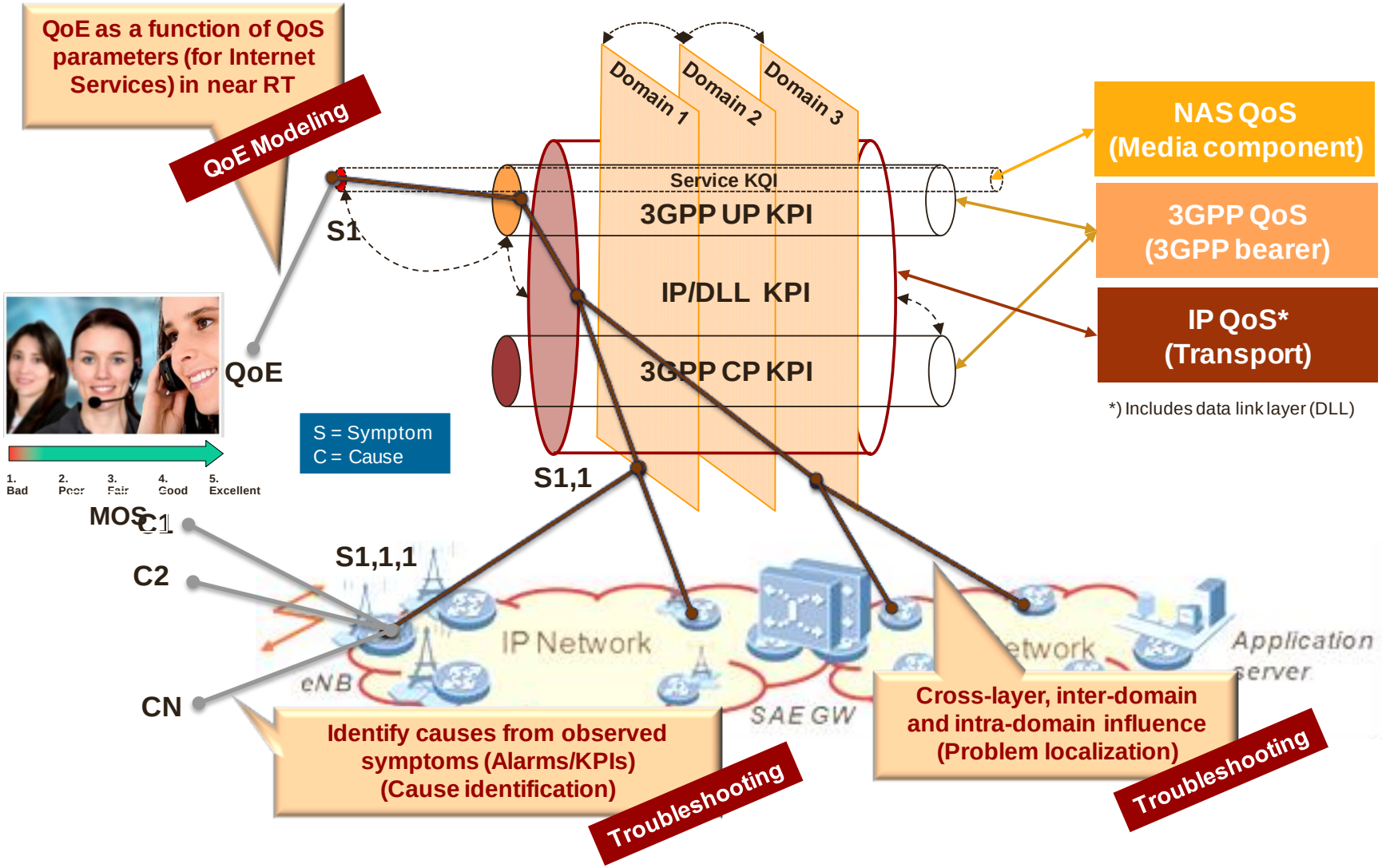
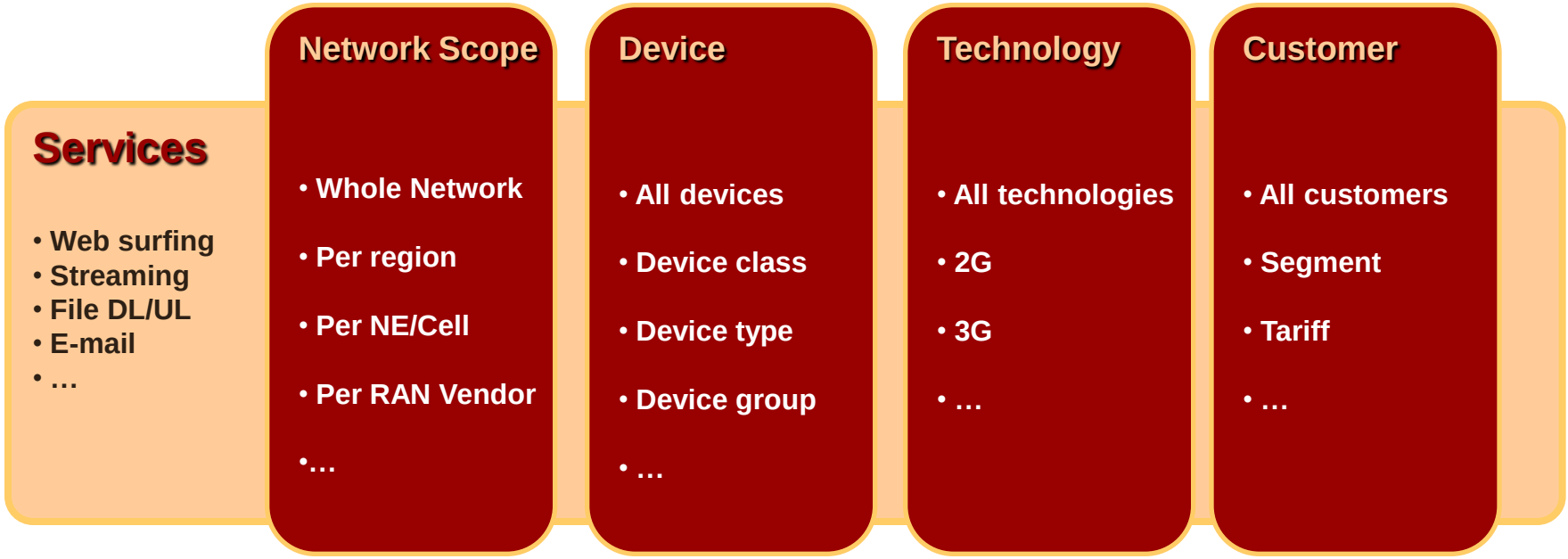
QoE challenges

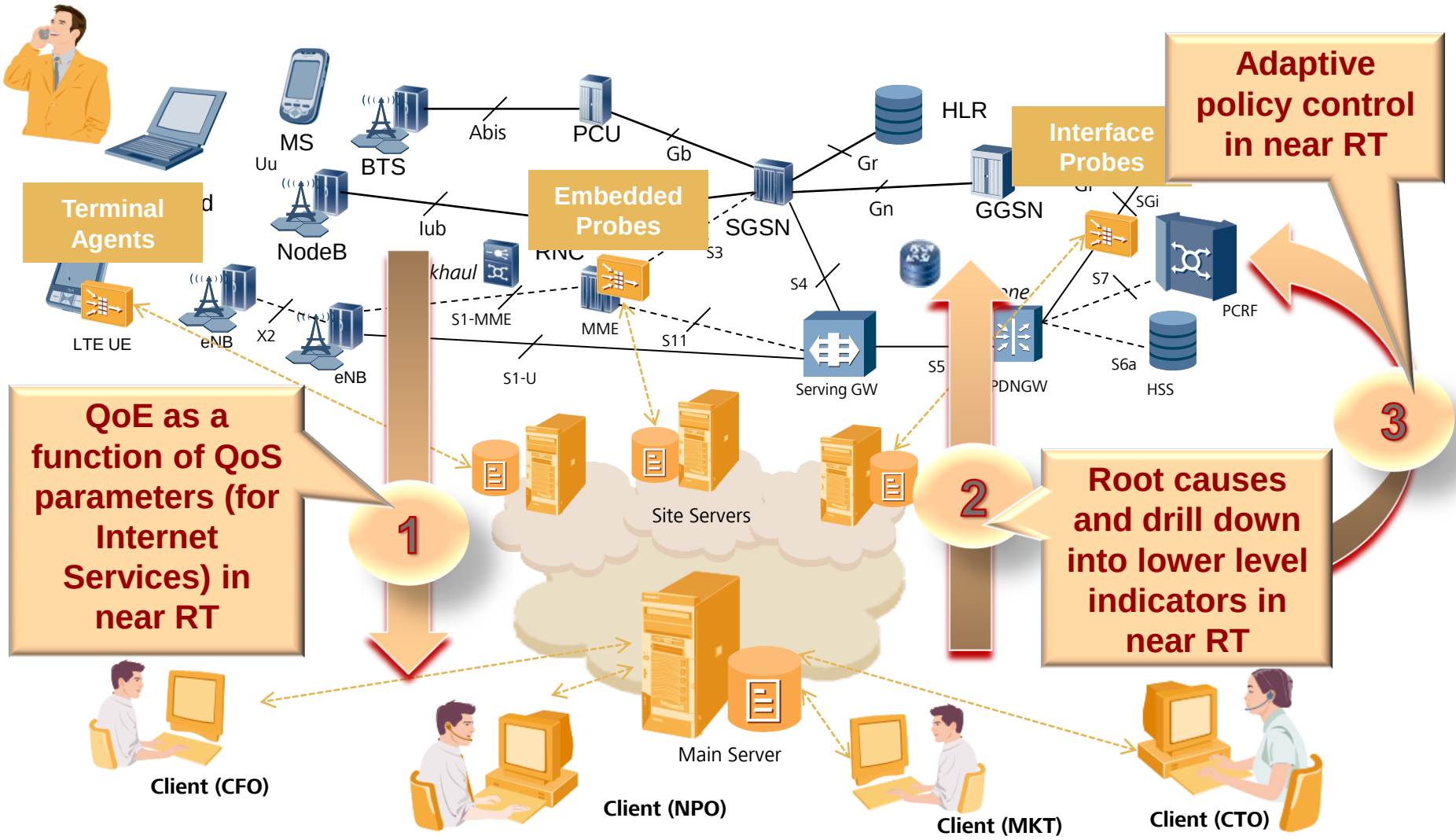


Solution segmentation

- **Filtering and enforcement based on all possible combinations**



Intelligent Traffic Management



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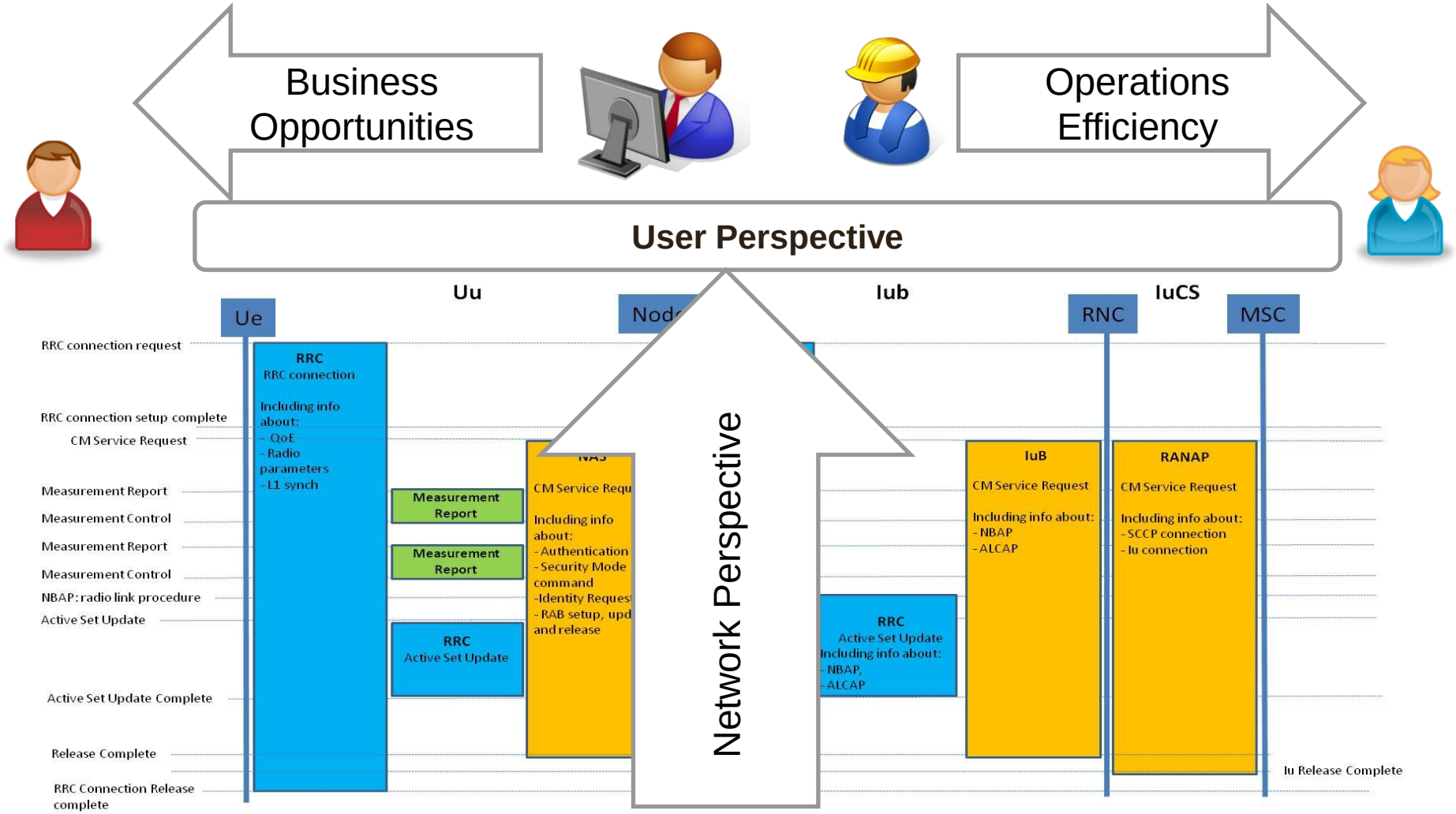
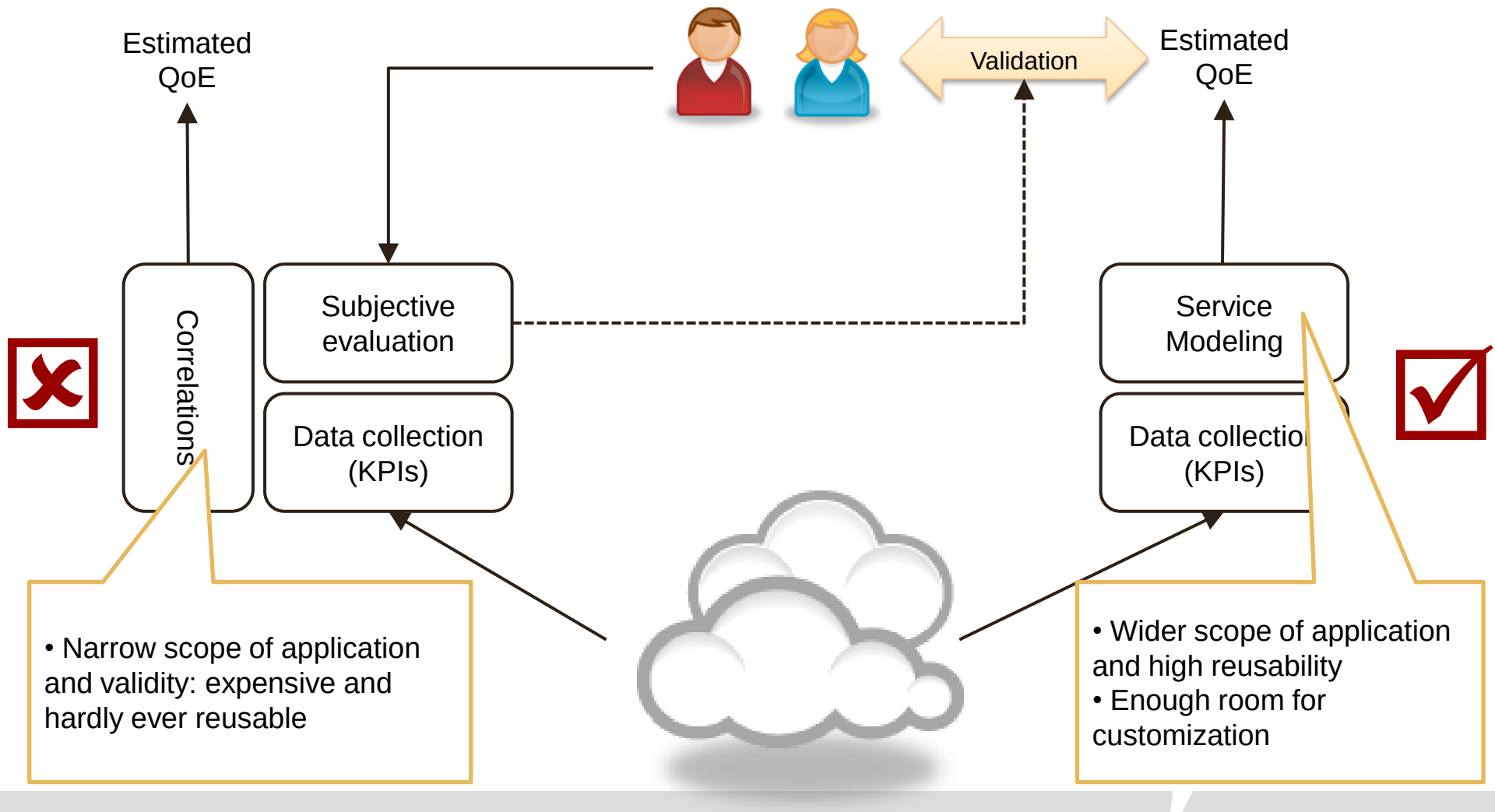
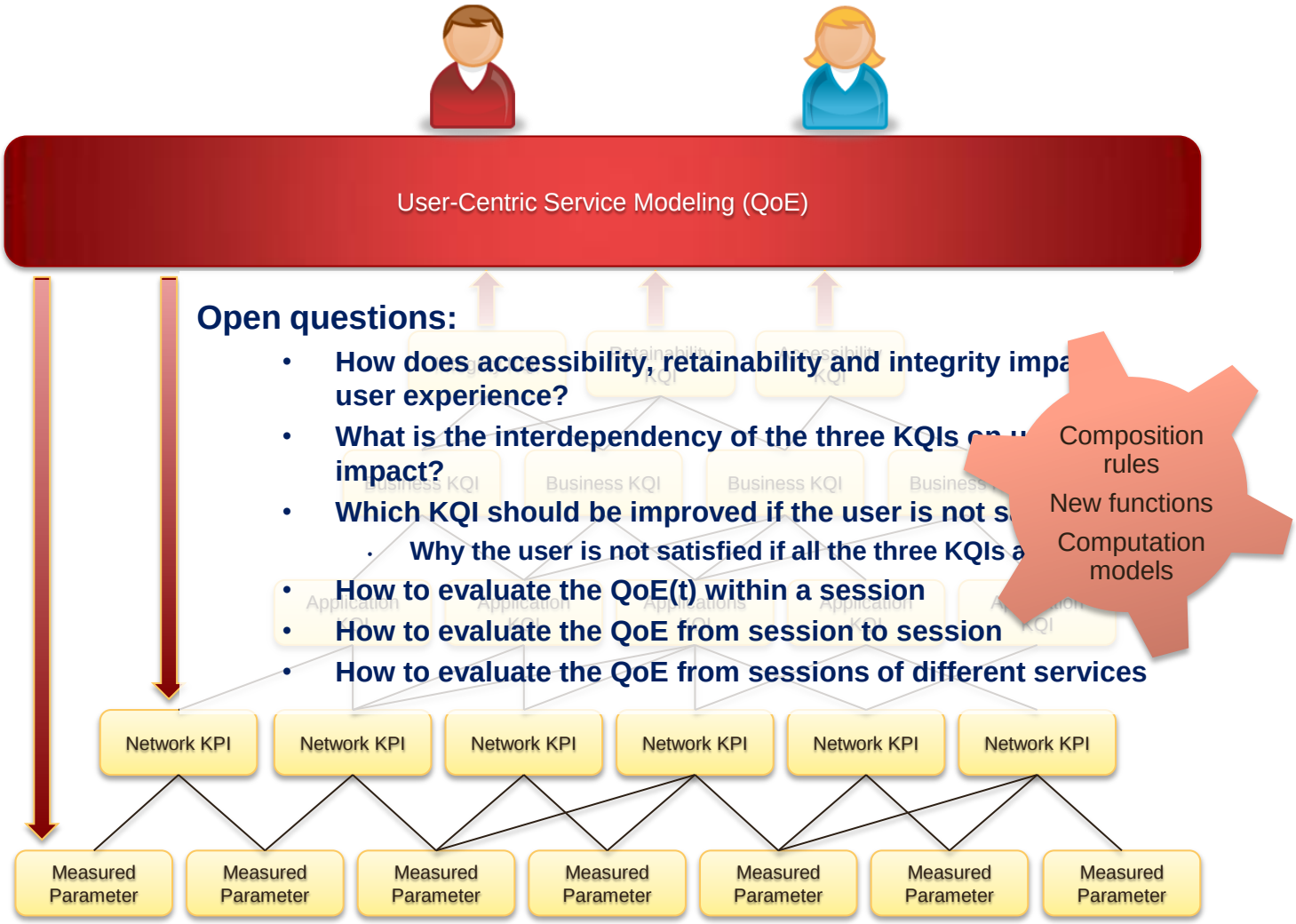
End-to-end view



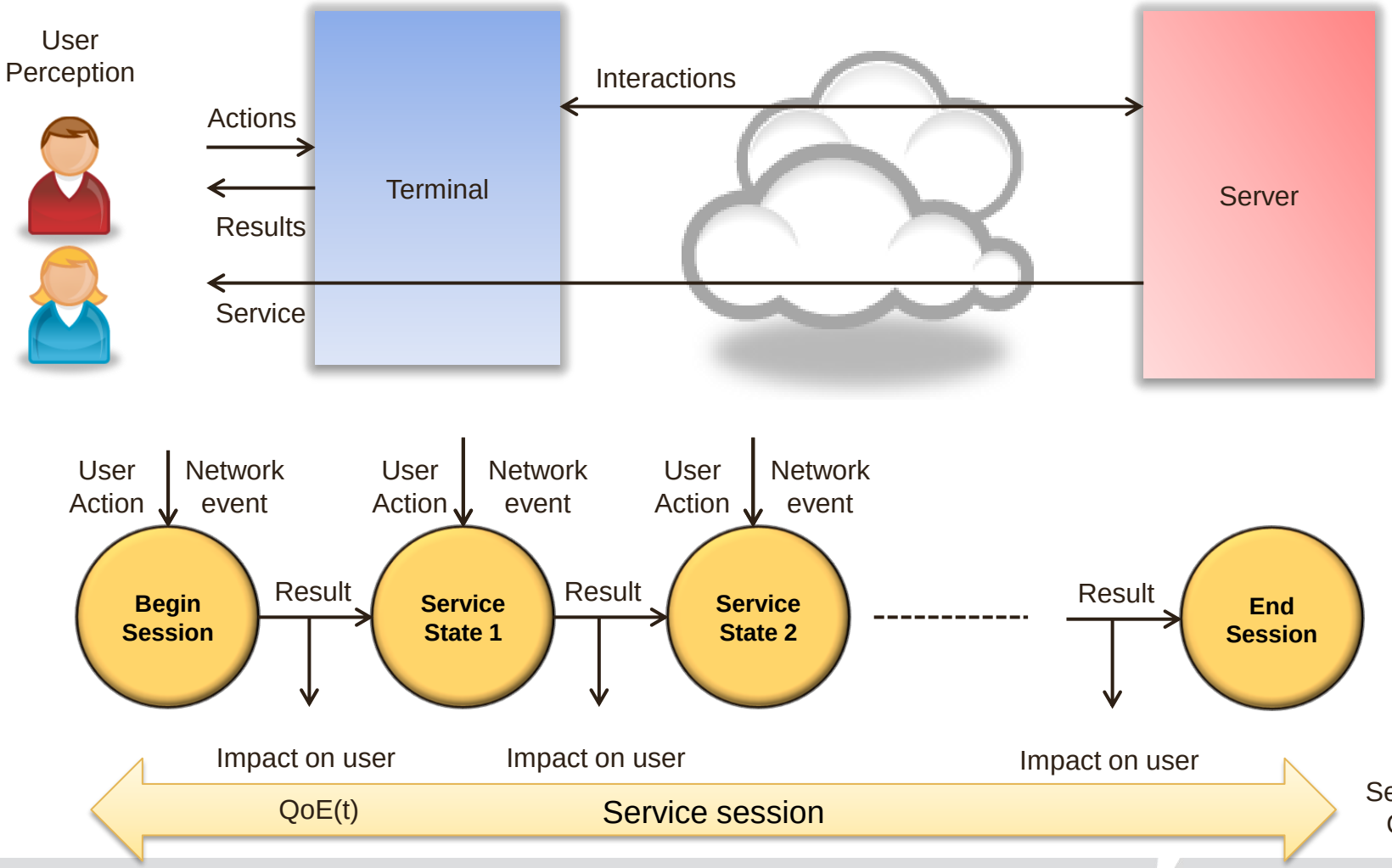
How to assess user's perception?



User-Centric Service Modelling



User-centric Service Model (USM)



USM: Examples

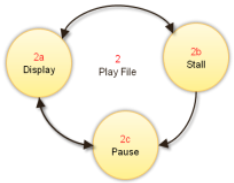
One user Over many sessions

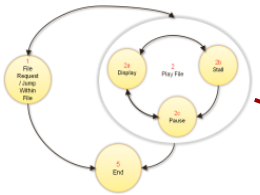
• 1 session • context known	• 1 session • context known	• idle period • user active	• 1 session • context known
Web	**YouTube**		**Download**
Session =KPI1…..KPIz	Session =KPI1…..KPIy		Session =KPI1…..KPIx

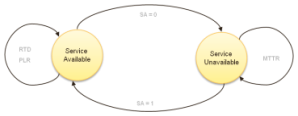
Legacy quality assessment

- KQI_availability, KQI_retainability, KQI_accessibility
- KQI_availability, KQI_retainability, KQI_accessibility
- KQI_availability, KQI_retainability, KQI_accessibility

User-Centric Service Model

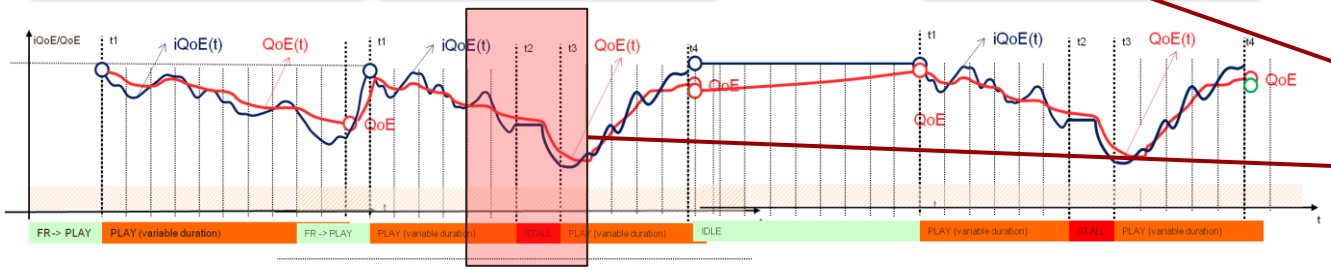






QoE(t)=f(KPI1,.....,KPIz)	QoE(t)=f(KPI1,.....,KPIy)	QoE(t)=f(KPI1,.....,KPIx)

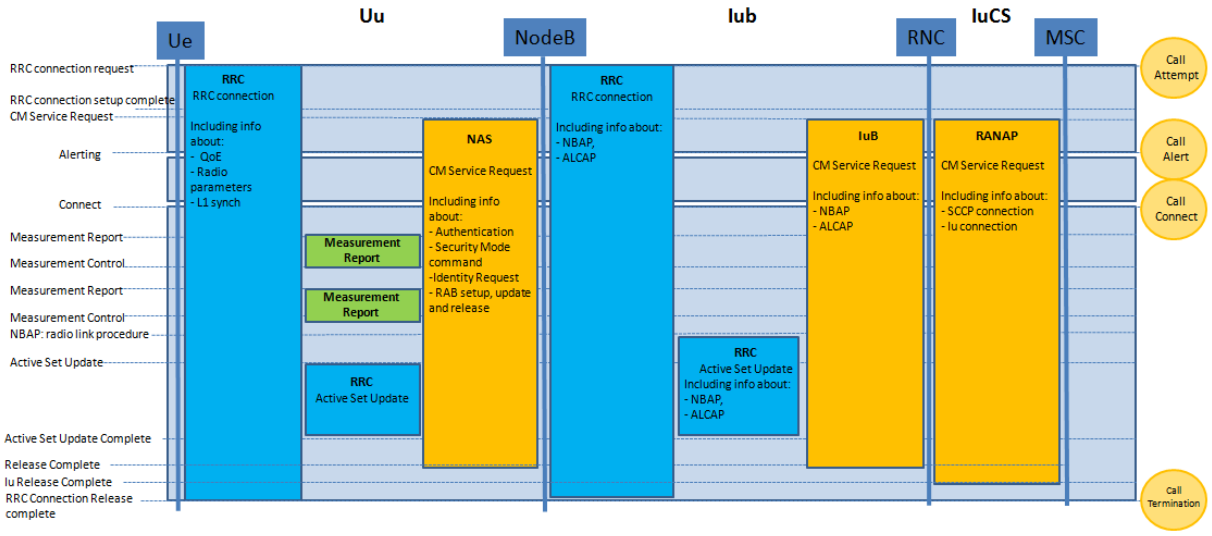
Anomaly Detection



Trouble-shooting

On target troubleshooting

User centric Troubleshooting (UTS)



User perception

SDR
SDR
SDR
SDR
SDR
SDR
SDR
SDR

KQIs
Segment x

Statistical **measurement of QoE** per **segment of users**

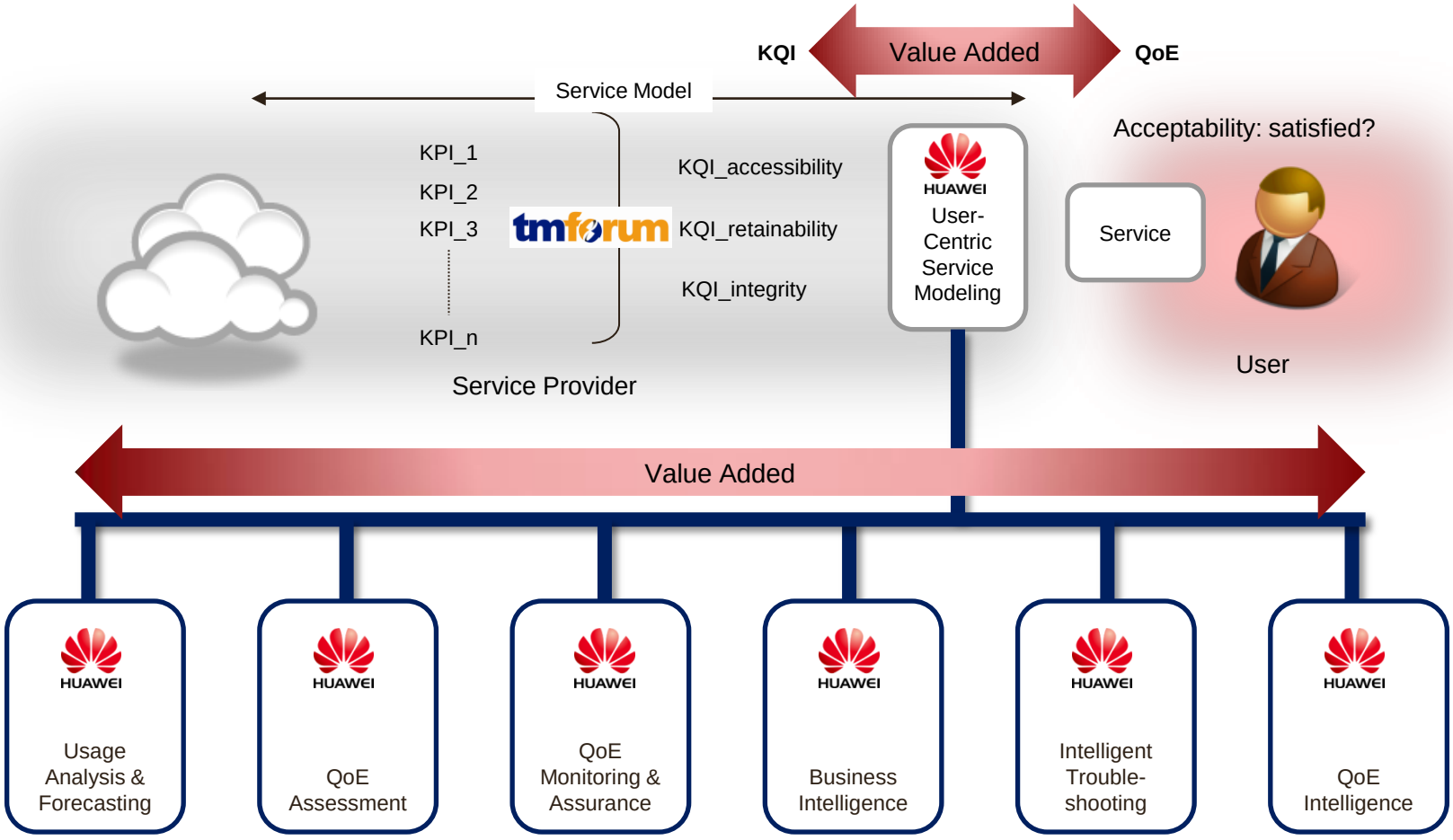
TDR TDR TDR TDR TDR TDR TDR
TDR TDR TDR TDR TDR TDR TDR
TDR TDR TDR TDR TDR TDR TDR

KPIs Interface 1 Protocol 1
KPIs Interface 1 Protocol 2
KPIs Interface 1 Protocol 3
KPIs Interface 2 Protocol 1
KPIs Interface 2 Protocol 2
KPIs Interface 3 Protocol 1
KPIs Interface 3 Protocol 2

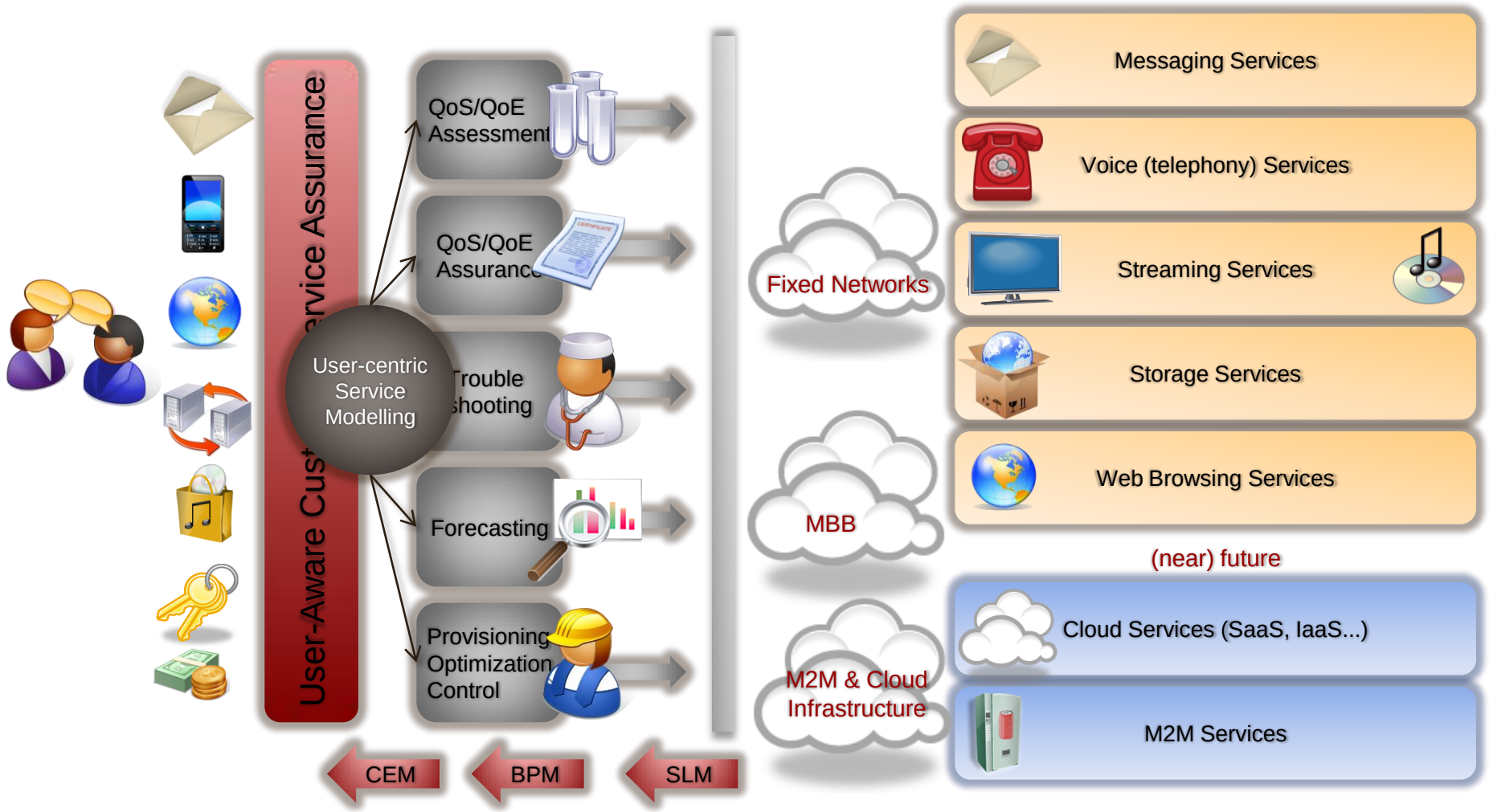
CORRELATION

TDR = Transaction Data Record
SDR = Session Data Record

uCSA: USM value added to CSA



Network and technology agnostic approach



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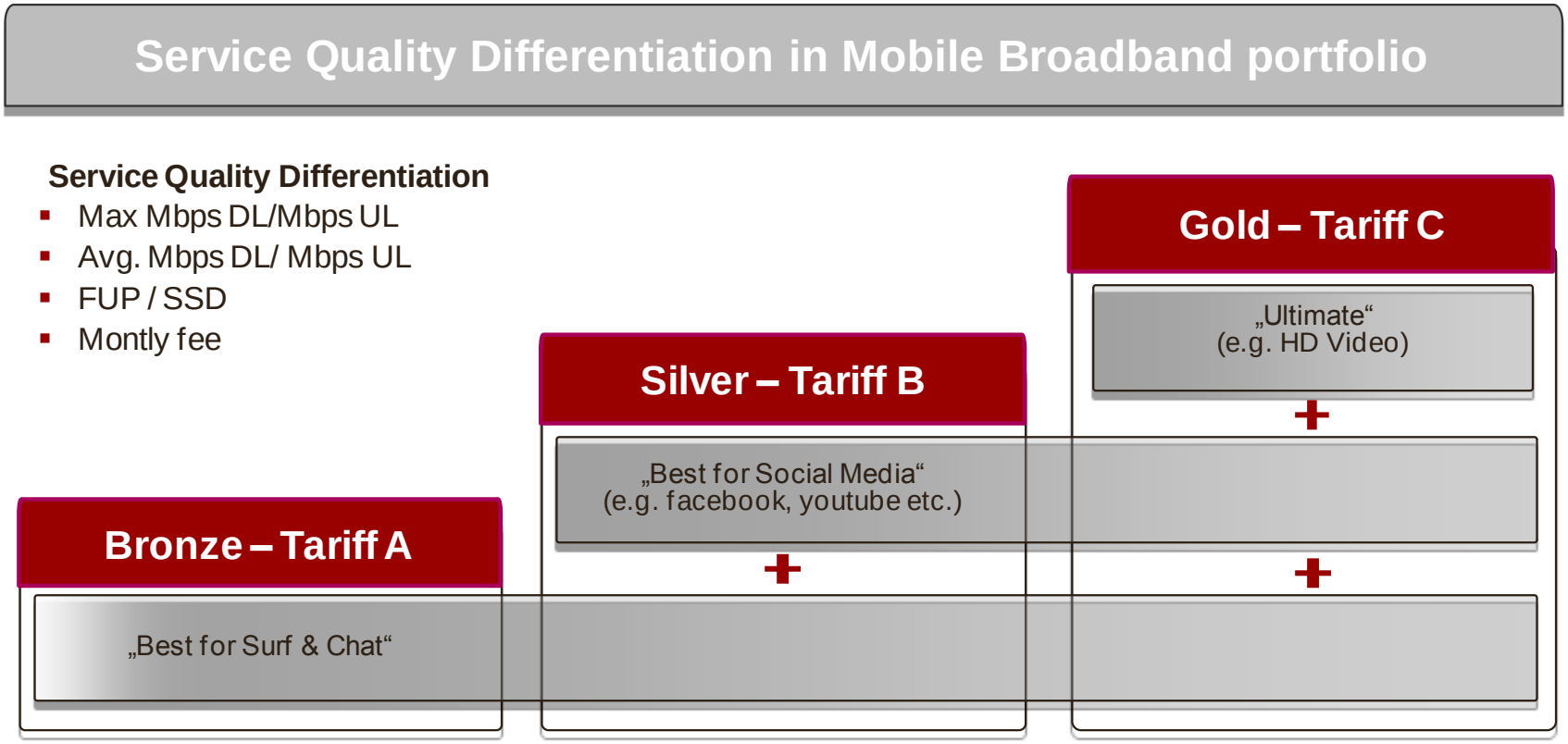
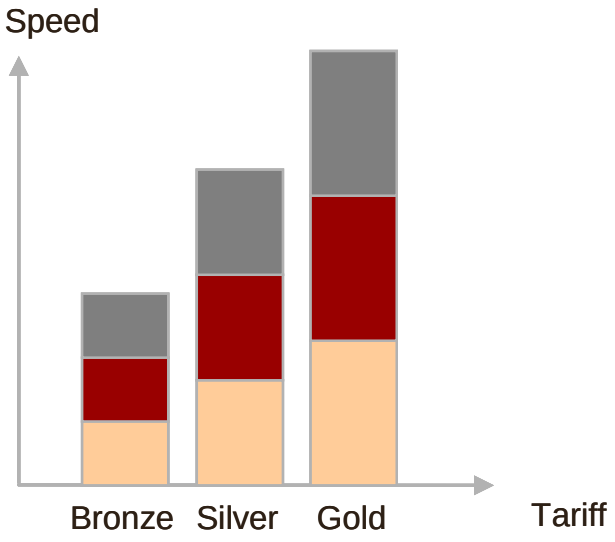
Service quality differentiated G/S/B portfolio

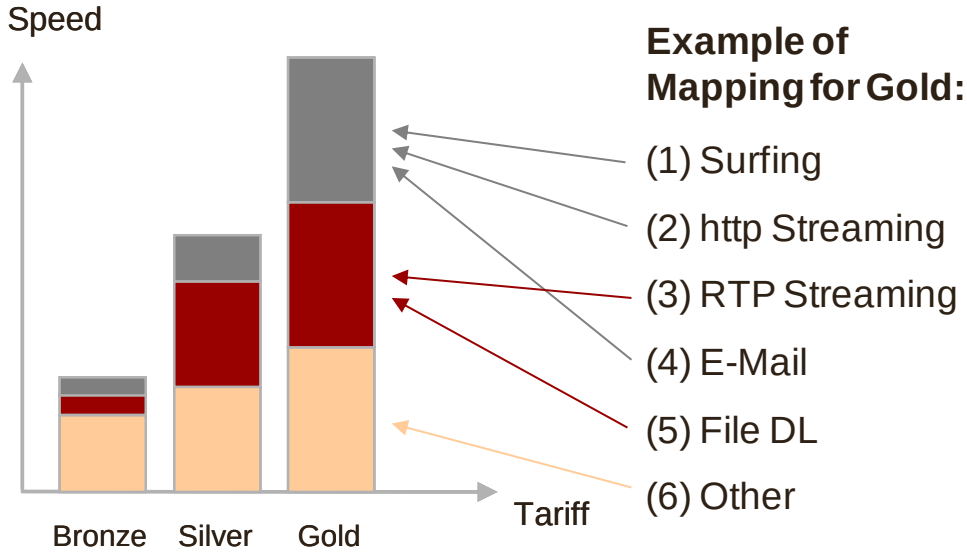


Bandwidth levels

Empty network



Loaded network



Allocated capacity: HD video Streaming Surfing

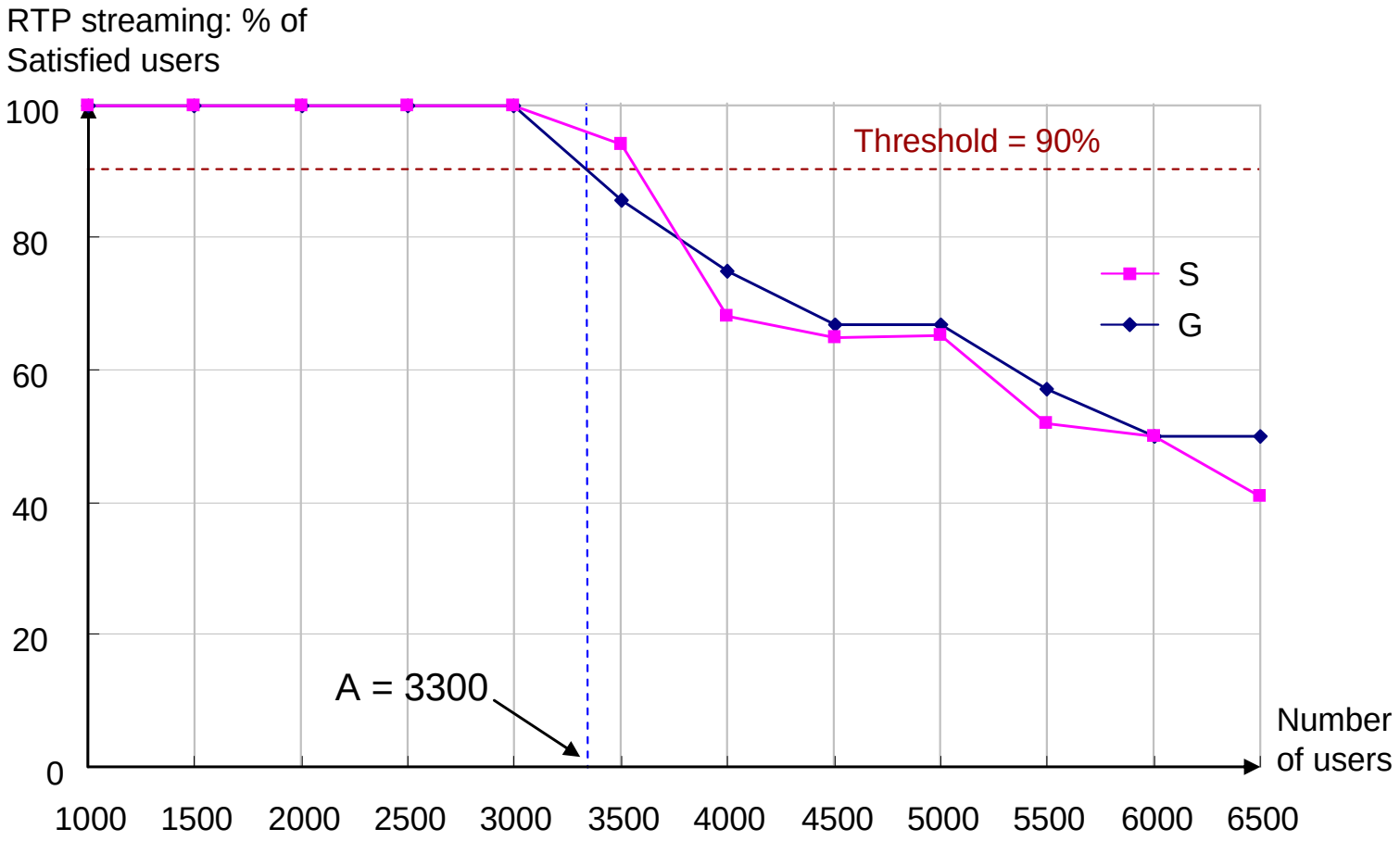
(In loaded networks, e.g., throttling of Streaming and/or HD Video services for Bronze will make it possible to allocate the freed capacity to Gold, or Silver, so that a higher priority will enable a better user experience.)

User satisfaction criteria for HSPA

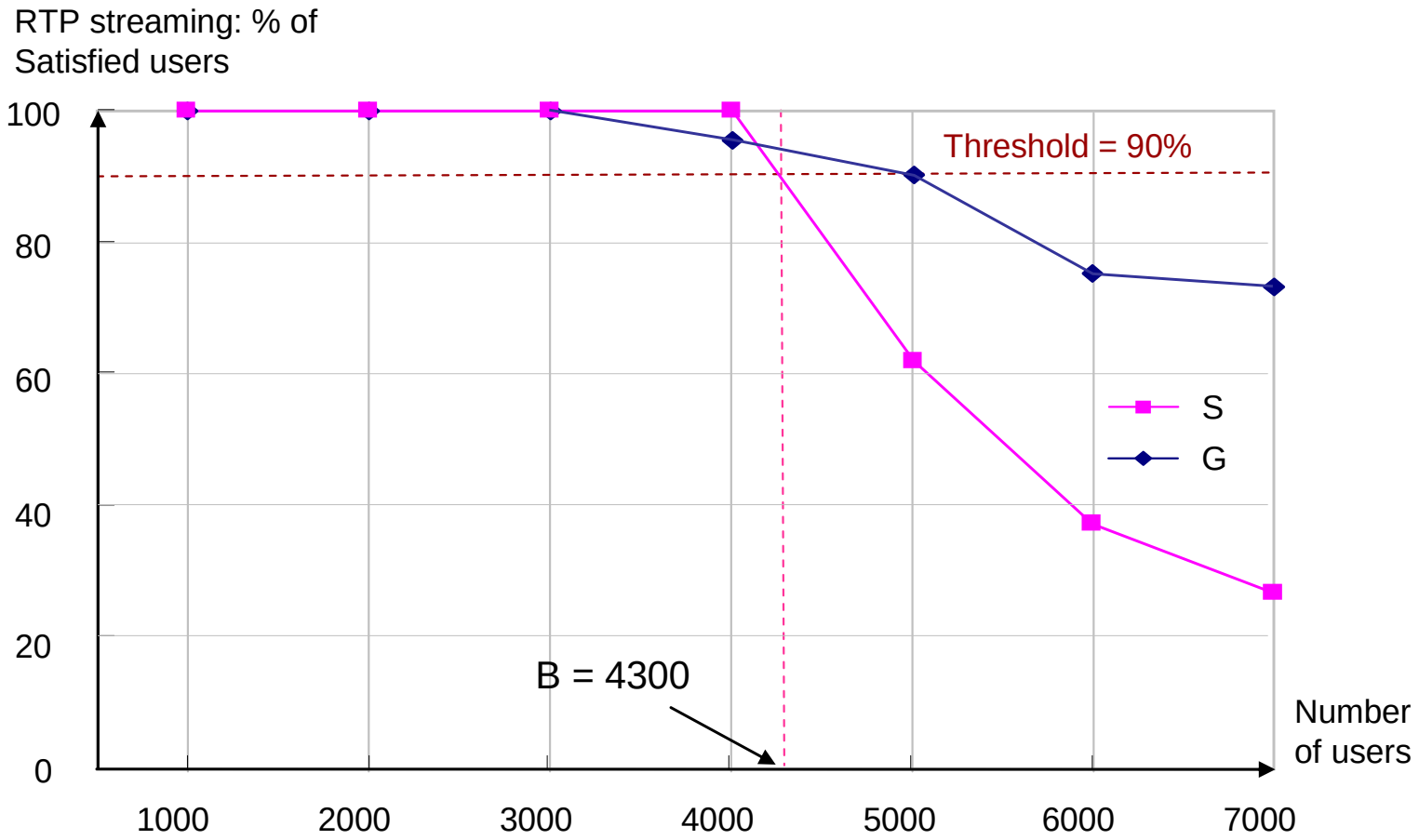
User Type	Av. Speed (GBR*)	Web Surfing	http streaming	RTP streaming	File downloads
Gold	512 kb/s	Web page delay < 4s	Throughput ≥ 384 kb/s	Throughput ≥ 90 kb/s PDL < 300 ms PERL < 10^{-6}	Throughput ≥ GBR
Silver	256 kb/s	Web page delay < 8s	Throughput ≥ 192 kb/s	Throughput ≥ 90 kb/s PDL < 300 ms PERL < 10^{-3}	Throughput ≥ GBR
Bronze	128 kb/s	Web page delay < 10s	NA	NA	NA

*) Minimum target rate

Without QoS - RTP Streaming



With QoS - RTP Streaming



G = (B-A)/A = 30% or equivalently 22% of site savings!

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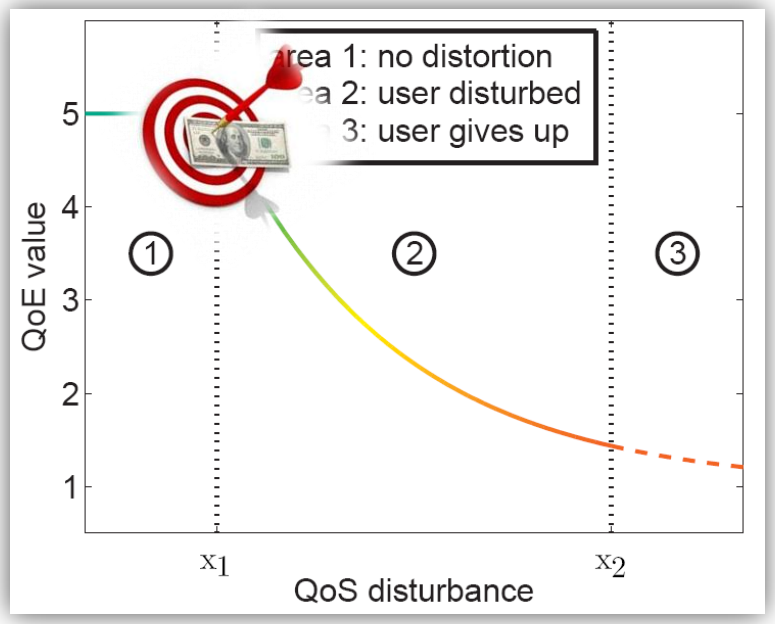
Bridging QoE and QoS: possible approaches

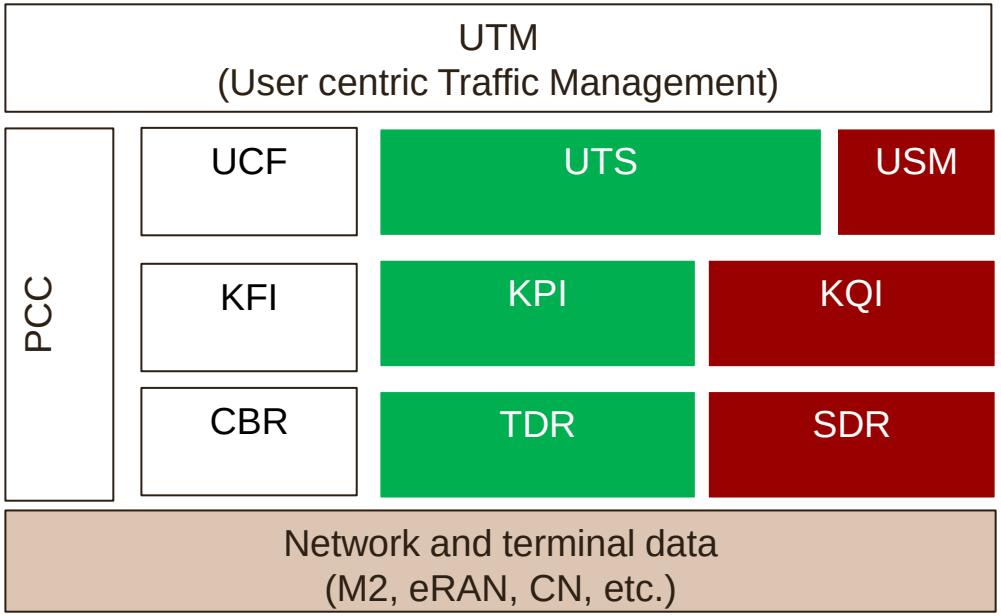
Targets

- QoE at optimal QoS
- ARPU / Market Share

Solutions

- User Classification Fairness (UCF)
- Control of Flow Mobility





KFI = Key Financial Indicators

References

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Thank you

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