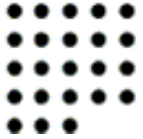


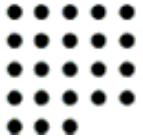
Monitoring and Performance
Evaluation of RCSe (joyn)
Video Communication Service

Forschungsprojekt AVQoX
Andreas Grebe, Stephan Küffner, Oliver Portugall



Was ist Joyn?

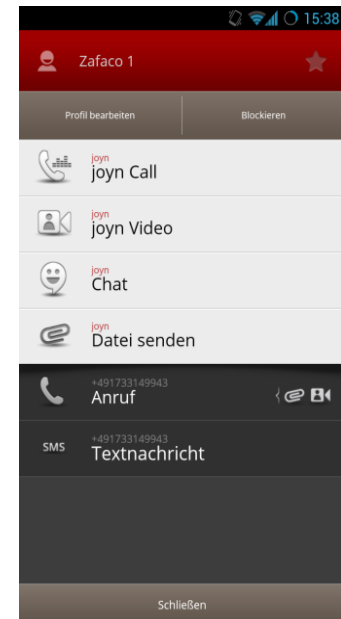
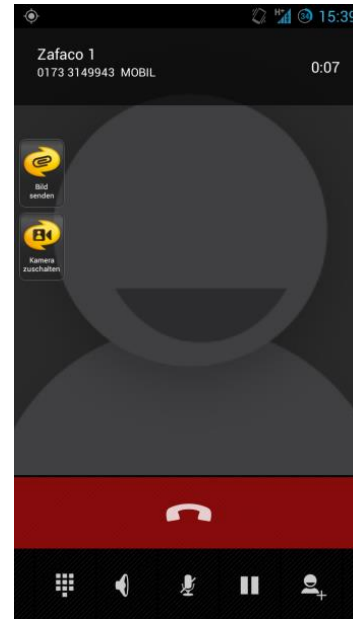
- **Spezifikation von der GSMA - RCS**
 - **Gemeinsamer Standard für Nachrichten-, Sprach und Videodienste**
- **Providerübergreifende Funktionalität**
- **Version 5.1**
 - **Video Call**
 - **Voice Call**
 - **Chat**
 - **Dateien Senden**
 - **Video Share**



Native Joyn Applikationen

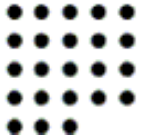
■ Deutsche Telekom

- Native App nur Chat Funktion
- Zuschalten von Video Share während eines Gesprächs durch Overlay Buttons



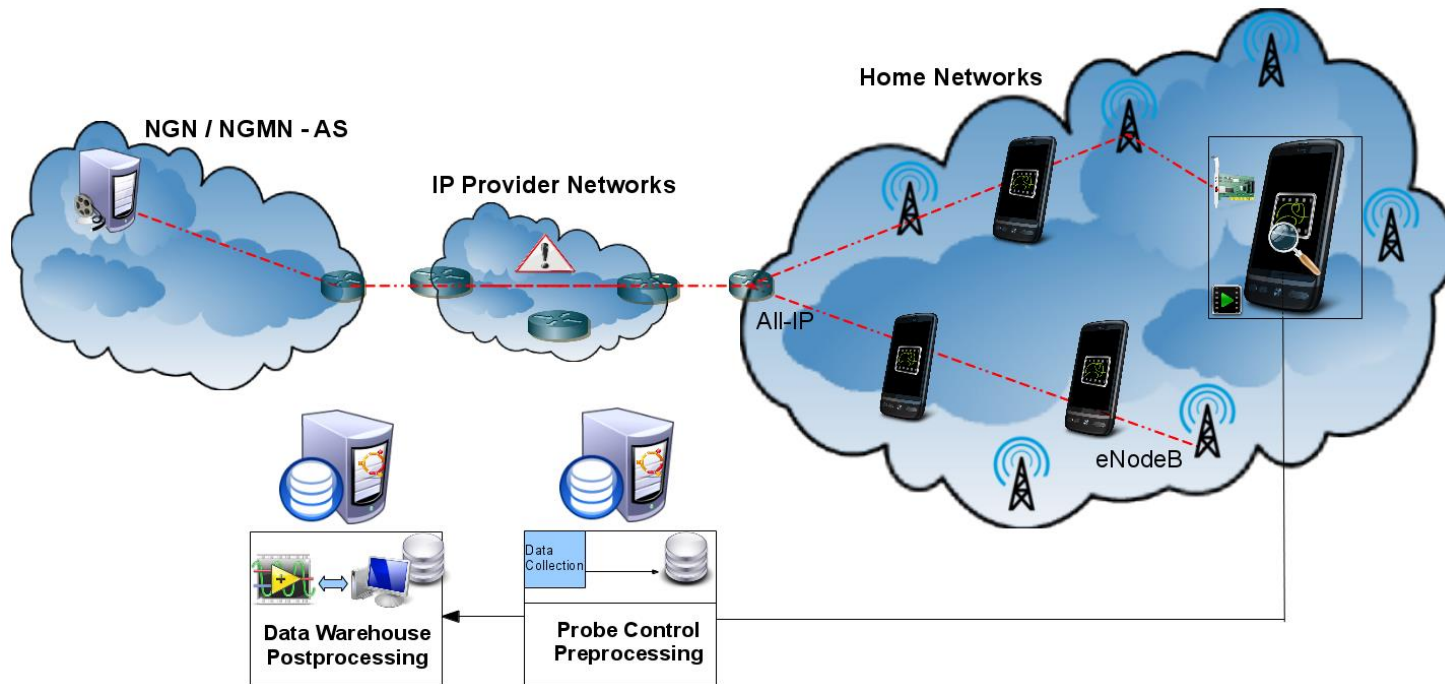
■ Vodafone

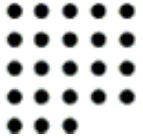
- App mit Voice und Video Funktion nach RCSe 5.1
 - Voice-over-IP und Video-over-IP
 - Video Call “+g.gsma.rcs.bevoicevideo”
- Standalone App (Video Call) & Overlay Buttons (Video Share)



AV QoX Probe - Netzwerkansicht

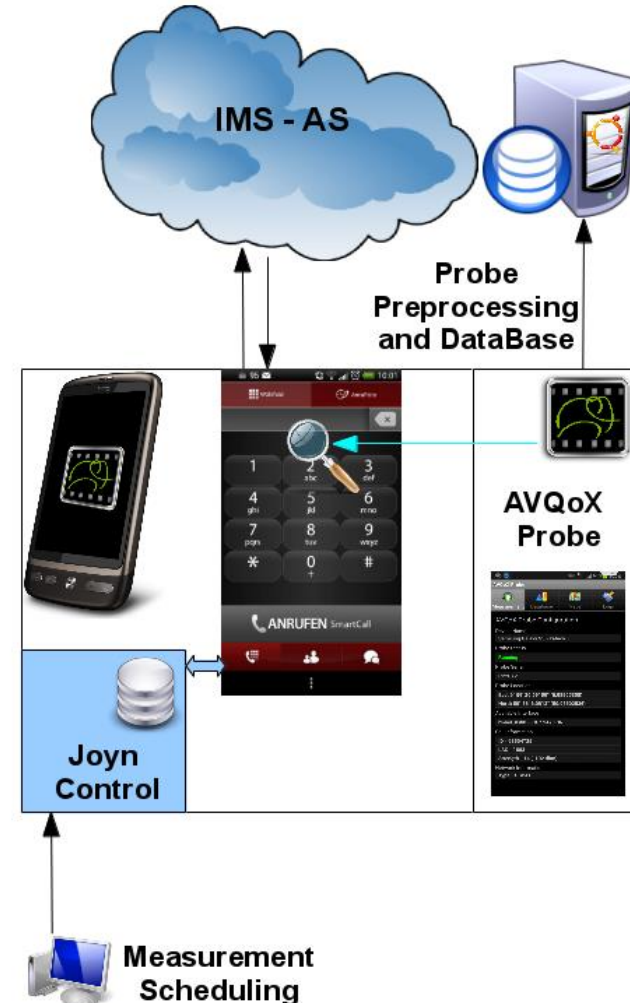
- Endgeräte unabhängig
 - Messungen auf Android SmartPhones ab Android 2.2 (API 8)
- Providerübergreifende Messungen möglich

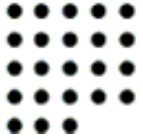




AV QoX Probe - Detailansicht

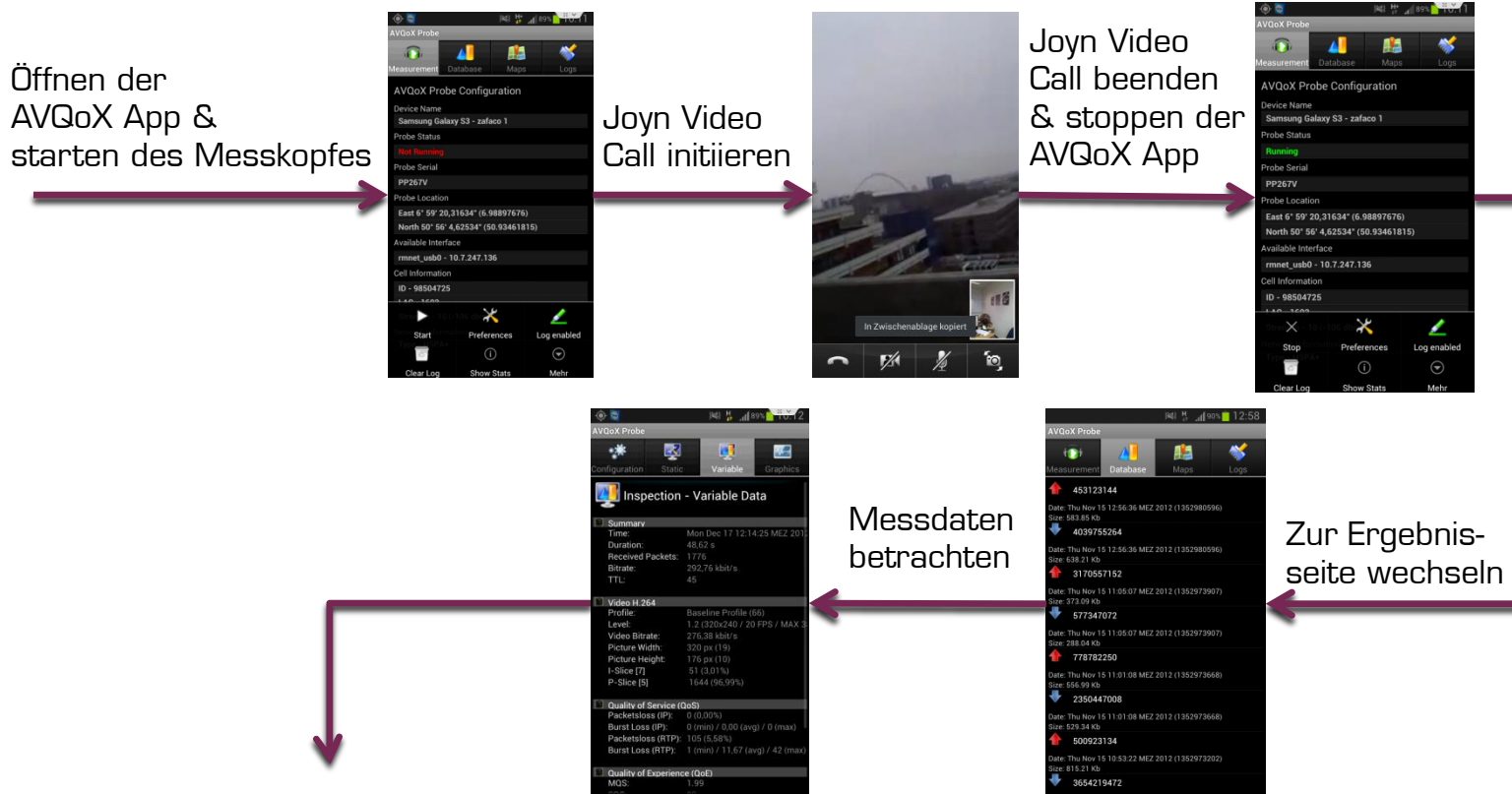
- Zeitgesteuerte Messungen über USB
- Volle Kontrolle über die Native Joyn Applikation
 - Video Calls initiieren
 - Video Calls beenden
 - Kamera wechseln
- Passiver AVQoX Messkopf
- Joyn Applikation kommuniziert mit Provider IMS
- Berechnung und Speicherung der Messdaten auf externen Servern



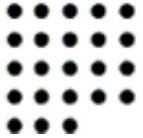


Messablauf - Manuell

- "Standalone App" mit GUI zum Starten/Stoppen des Messkopfes

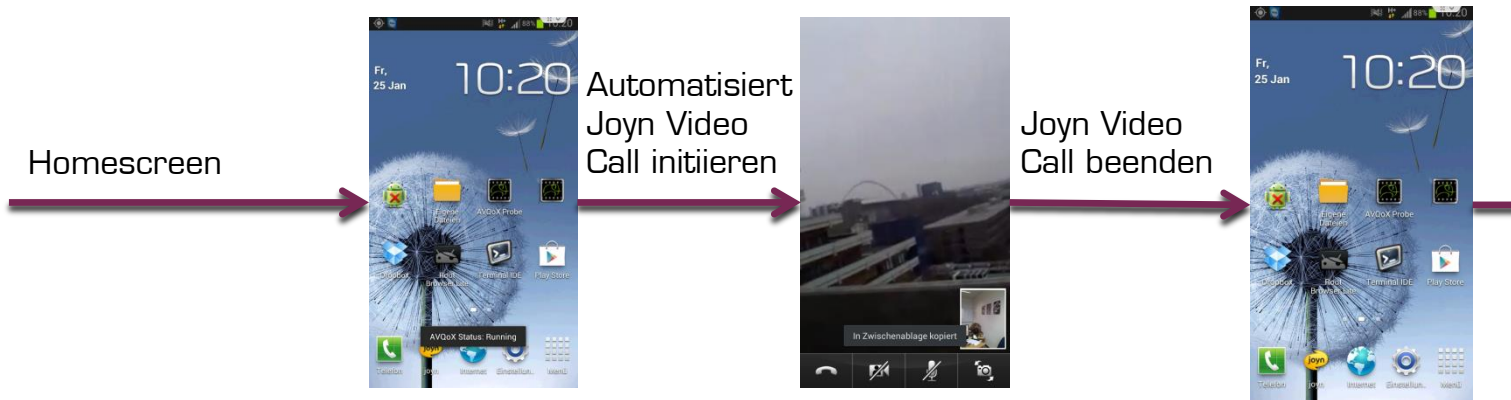


Messdaten im Webfrontent auswerten



Messablauf - Automatisch

- "Background Service" für automatisierte Messungen in Android



AV QoX Research Project AVQoX - Joyn Monitoring

Welcome to our Monitoringsystem for Joyn

Filter - Data [2013-04-09@10:43 - 2013-04-15@16:13]

| Date: | 2013-04-09 | @ 10:00 | 2013-04-15 | @ 17:00 |
|---------|----------------------------|--------------------------|-------------------------------------|-------------------------------------|
| Device: | Device 1 - 262021004272593 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| | Device 3 - 262021615473505 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| | Device 3 - 262011900258741 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

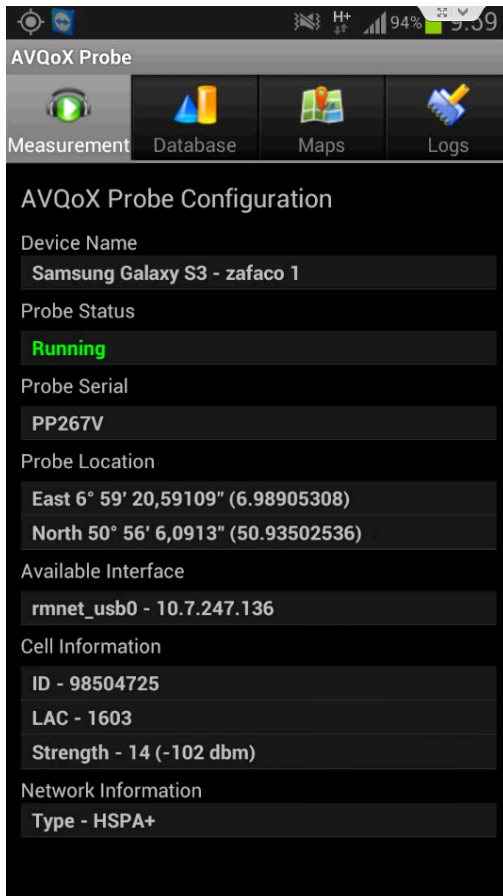
Provider: Deutsche Telekom, Vodafone

Measurements - Mobile Probe - Joyn

| Number of Measurements: | 1898 | Error Failure: | 0 % (0) |
|-------------------------|-----------|-----------------------|---------|
| Duration (Mean): | 16.3285 s | System Error Failure: | 0 % (0) |
| MQS-V (Mean): | 3.906 | | |

Messdaten im Webfrontend auswerten

AV QoX Probe



AVQoX Probe

Measurement Database Maps Logs

AVQoX Probe Configuration

Device Name
Samsung Galaxy S3 - zafaco 1

Probe Status
Running

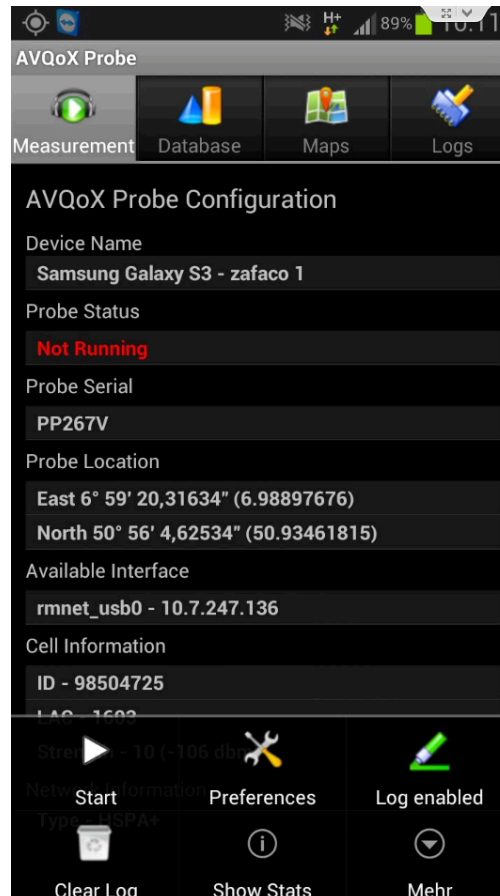
Probe Serial
PP267V

Probe Location
East 6° 59' 20,59109" (6.98905308)
North 50° 56' 6,0913" (50.93502536)

Available Interface
rmnet_usb0 - 10.7.247.136

Cell Information
ID - 98504725
LAC - 1603
Strength - 14 (-102 dbm)

Network Information
Type - HSPA+



AVQoX Probe

Measurement Database Maps Logs

AVQoX Probe Configuration

Device Name
Samsung Galaxy S3 - zafaco 1

Probe Status
Not Running

Probe Serial
PP267V

Probe Location
East 6° 59' 20,31634" (6.98897676)
North 50° 56' 4,62534" (50.93461815)

Available Interface
rmnet_usb0 - 10.7.247.136

Cell Information
ID - 98504725
LAC - 1603

Start Preferences Log enabled

Clear Log Show Stats Mehr



AVQoX Probe

Measurement Database Maps Logs

3170557152
Date: Thu Nov 15 11:05:07 MEZ 2012 (1352973907)
Size: 373.09 Kb

577347072
Date: Thu Nov 15 11:05:07 MEZ 2012 (1352973907)
Size: 288.04 Kb

778782250
Date: Thu Nov 15 11:01:08 MEZ 2012 (1352973668)
Size: 556.99 Kb

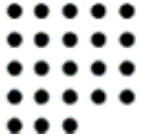
2350447008
Date: Thu Nov 15 11:01:08 MEZ 2012 (1352973668)
Size: 529.34 Kb

500923134
Date: Thu Nov 15 10:53:22 MEZ 2012 (1352973202)
Size: 815.21 Kb

3654219472
Date: Thu Nov 15 10:53:22 MEZ 2012 (1352973202)
Size: 441.95 Kb

553445280
Date: Thu Nov 15 10:48:56 MEZ 2012 (1352972936)
Size: 913.96 Kb

3307443602



Messergebnisse

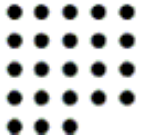
- Messzeitpunkt
- Richtung des Netzwerkverkehrs
- GPS Position
- Zellen Informationen
 - ID/LAC/Signalstärke/Provider
- Ethernet
- IP
- UDP/TCP
- RTP

AVQoX Probe

Configuration Static Variable Graphics

Inspection - Static Data

| | |
|--------------------|-------------------|
| Layer 2 - Ethernet | |
| MAC-Source: | 0e:40:ff:ff:ff:ff |
| MAC-Destination: | 00:00:02:12:00:00 |
| Layer 3 - IP | |
| IP-Version: | 4 |
| IP-Source: | 139.7.154.36 |
| IP-Destination: | 109.41.2.86 |
| IP-Protocol: | 17 |
| Next Protocol: | UDP (17) |
| IP-TOS: | 0 |
| Layer 4 - UDP/TCP | |
| TCP Src. Port: | 0 |
| TCP Dest. Port: | 0 |
| UDP Src. Port: | 21172 |
| UDP Dest. Port: | 63216 |
| Layer 5 - RTP | |
| SSRC: | 4255060777 |
| Payload-Type: | 116 |



Messergebnisse - Variabel

- Call Duration
- Bitrate
- Profile / Level
- Picture size
- Slices
- Loss
- Media Quality Score
- Subjective Quality Score

AVQoX Probe

Configuration Static Variable Graphics

Inspection - Variable Data

Summary

| | |
|-------------------|------------------------------|
| Time: | Thu Nov 15 12:57:24 MEZ 2012 |
| Duration: | 39,11 s |
| Received Packets: | 1393 |
| Bitrate: | 260,87 kbit/s |
| TTL: | 50 |

Video H.264

| | |
|-----------------|--------------------------------|
| Profile: | Baseline Profile (66) |
| Level: | 1.2 (320x240 / 20 FPS / MAX 3) |
| Video Bitrate: | 244,91 kbit/s |
| Picture Width: | 320 px (19) |
| Picture Height: | 176 px (10) |
| I-Slice [7] | 18 (1,32%) |
| P-Slice [5] | 1348 (98,68%) |

Quality of Service (QoS)

| | |
|--------------------|----------------------------------|
| Packetsloss (IP): | 0 (0,00%) |
| Burst Loss (IP): | 0 (min) / 0,00 (avg) / 0 (max) |
| Packetsloss (RTP): | 64 (4,39%) |
| Burst Loss (RTP): | 1 (min) / 16,00 (avg) / 56 (max) |

Quality of Experience (QoE)

| | |
|------------------|-----|
| MQS (Predicted): | 2.1 |
|------------------|-----|

AVQoX Probe

Configuration Static Variable Graphics

Received Packets: 1393
Bitrate: 260,87 kbit/s
TTL: 50

Video H.264

| | |
|-----------------|--------------------------------|
| Profile: | Baseline Profile (66) |
| Level: | 1.2 (320x240 / 20 FPS / MAX 3) |
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| Burst Loss (IP): | 0 (min) / 0,00 (avg) / 0 (max) |
| Packetsloss (RTP): | 64 (4,39%) |
| Burst Loss (RTP): | 1 (min) / 16,00 (avg) / 56 (max) |

Quality of Experience (QoE)

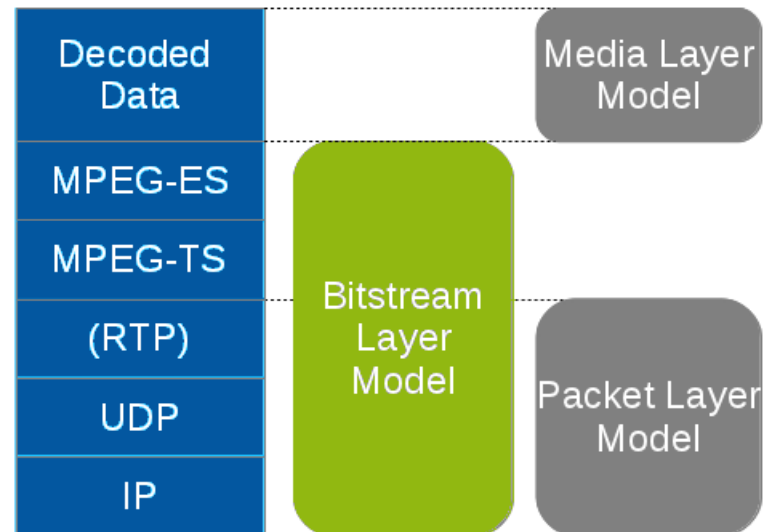
| | |
|------------------|-----|
| MQS (Predicted): | 2.1 |
|------------------|-----|

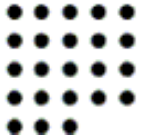
System

| | |
|-----------------------|---|
| System-Availability: | 1 |
| Service-Availability: | 1 |
| Error-Code: | 0 |
| Error-Description: | - |

Video QoX Model

- Video QoE basiert auf Bitstream Layer Model
- Keine Beeinflussung (non-intrusive)
- Keine Referenz (non-reference)
- Live Analyse (in-service)





Messergebnisse - Joyn Streams

- **Joyn Video Codec:** H.264 / Baseline / Level 1.1-1.3
- **Resolution:** 320 x 176
- **Datenrate Video Stream:** ~300kBit/s
- **Anzahl I-Slices:** ~4%
- **Anzahl P-Slices :** ~96%

- **Example**
 - **Netzwerk Typ:** HSPA
 - **MQS:** 4.233
 - **Paketverlust :** ~0.678%

Messergebnisse - Joyn Streams Details

- **Signalisiertes H.264 Profil und Level**

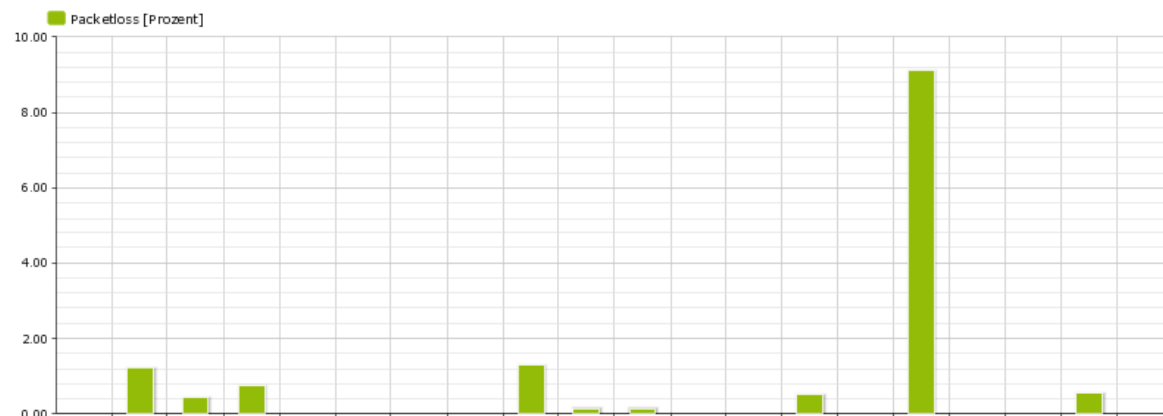
| H.264 Baseline Profile | | | |
|------------------------|--------------------------------|----------|---------|
| Level | Parameters | Vodafone | Telekom |
| 1.1 | 320x240 / 10FPS / max 192 kbps | 6.9% | 100% |
| 1.2 | 320x240 / 20FPS / max 384 kbps | 89.3% | 0% |
| 1.3 | 320x240 / 30FPS / max 768 kbps | 3.8% | 0% |

- **Verwendete H.264 Parameter**

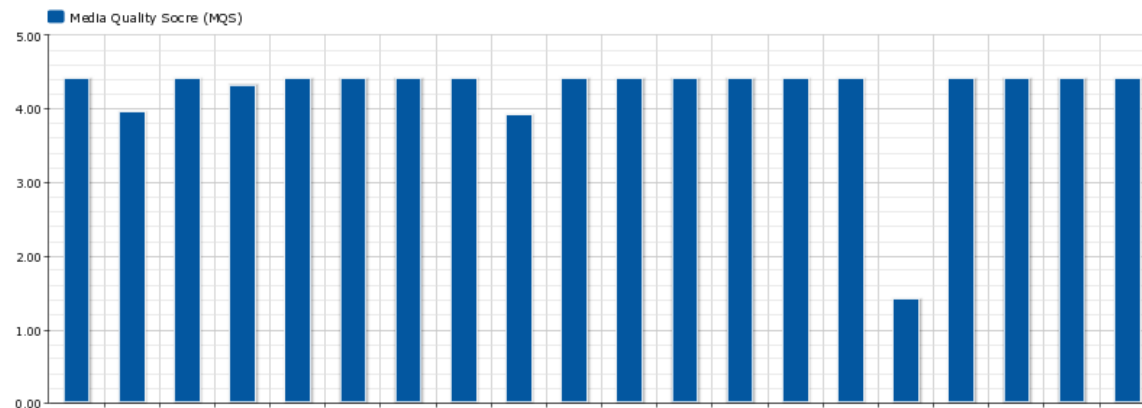
| Level | Provider | Video bitrate | Resolution |
|-------|----------|---------------|-------------------|
| 1.1 | Telekom | 55 - 161 kbps | 320x176 / 176x144 |
| 1.1 | Vodafone | 26 - 130 kbps | 320x176 |
| 1.2 | Vodafone | 22 - 341 kbps | 320x176 |
| 1.3 | Vodafone | 17 - 659 kbps | 320x176 |

Messergebnisse - Joyn Streams Details

■ Paketverlust in % - Telekom

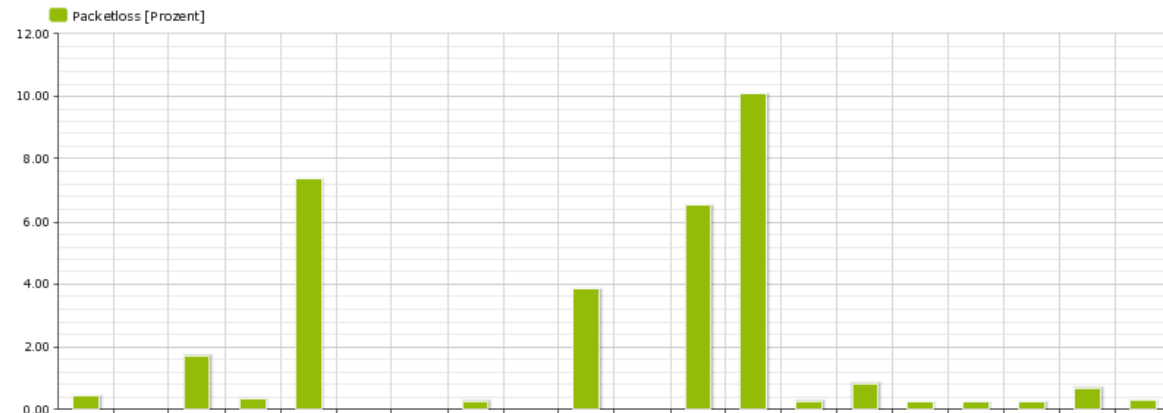


■ Media Quality Score - Telekom

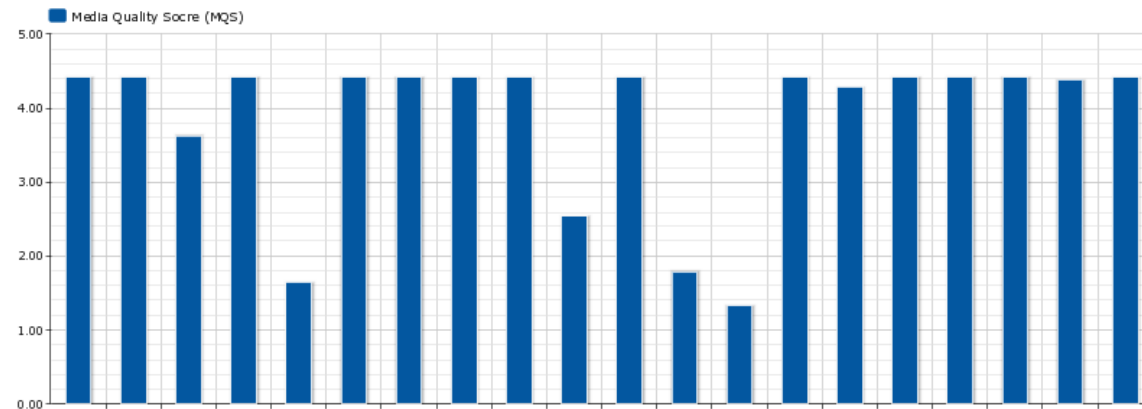


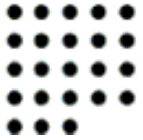
Messergebnisse - Joyn Streams Details

- **Paketverlust in % - Vodafone**



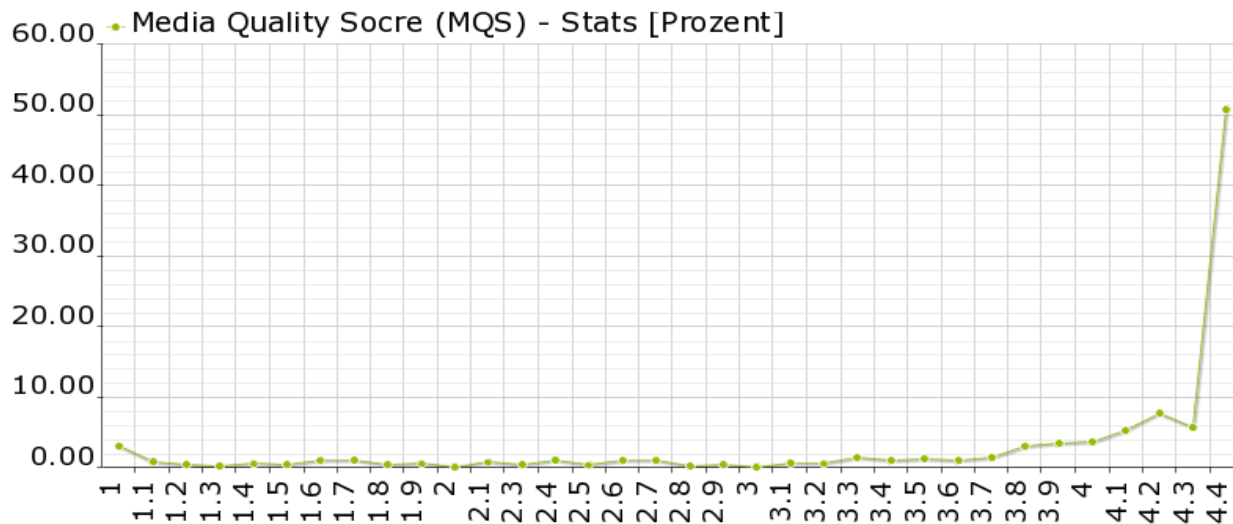
- **Media Quality Score - Vodafone**

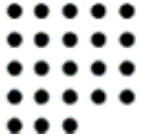




Messergebnisse - Joyn Streams Details

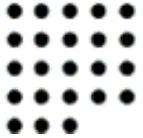
- **Statistische Verteilung Media Quality Score**
 - **1800 Messungen - Messintervall 15 Sekunden**
 - **> 50 % - MQS von 4.4**
 - **73 % - MQS > 4.0**
 - **19 % - MQS < 3.7**





Ausblick

- **Benchmarking**
 - **Automatisiert**
 - **Vergleichende Messungen mit Video Share**
 - **Messungen zwischen den Providern**
- **O2 veröffentlicht Joyn App Mitte 2013**



Vielen Dank für Ihre Aufmerksamkeit

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▪ Webseite

- www.avqox.de

