



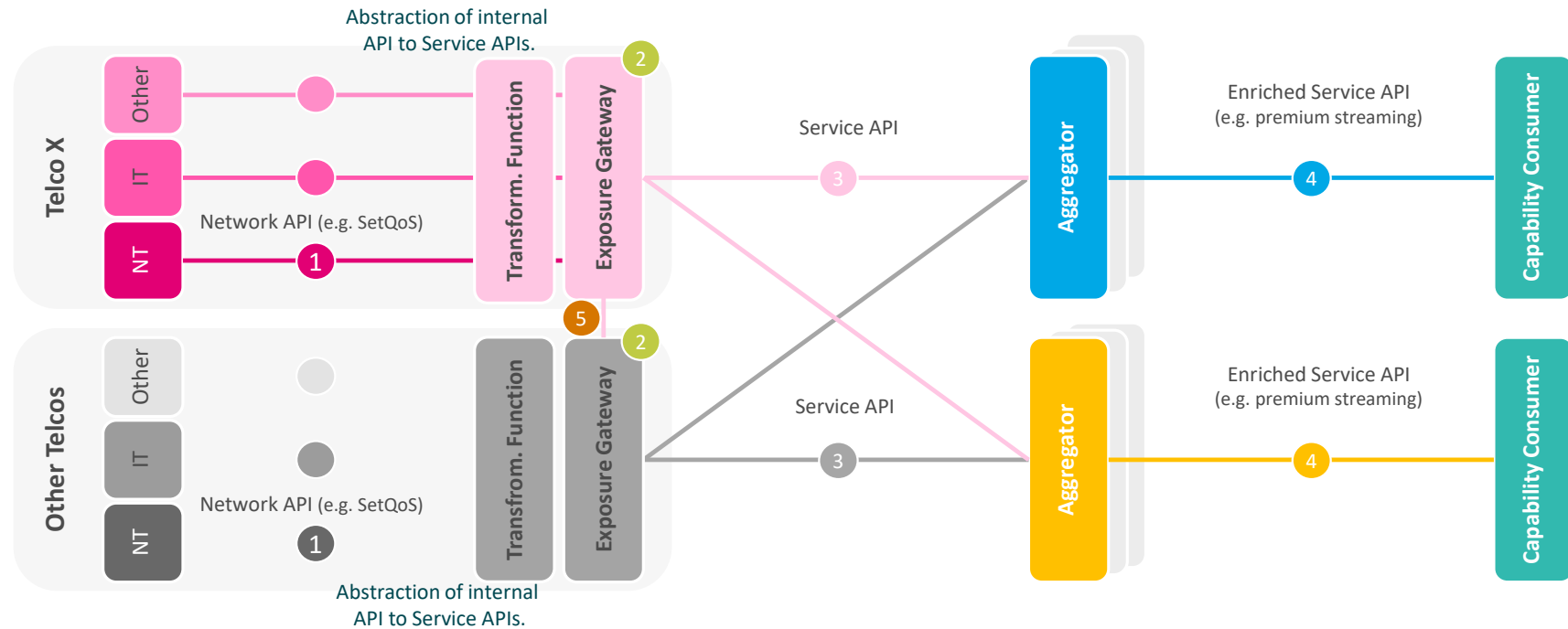
Quality on Demand

12. November 2021



LIFE IS FOR SHARING.

Blueprint technical architecture: Service APIs



- 1 Capabilities**
Exposable via Network APIs
e.g. slicing, positioning, managed QoS, IDM etc.
- 2 Exposure**
Abstraction of internal API to Service APIs. Common means of access across all operators
- 3 Service APIs**
Service APIs incl. also access control, billing, cross-operator federation etc.
- 4 Technical Aggregation (optional)**
Enrichment of Service APIs
e.g. cloud or platform providers etc.
- 5 Interoperability**
e.g. API roaming, etc.

Service APIs

Old
version

QoS sessions ^

POST

/sessions Reserve resources for QoS session



PATCH

/sessions/{sessionId} Modify resources related to QoS session



DELETE

/sessions/{sessionId} Free resources related to QoS session



QoS session callbacks ^

POST

/qos-changed Session QoS changed notification callback



Service APIs

QoS sessions

POST	/sessions	Reserve resources for QoS session	✓
GET	/sessions/{sessionId}	Get session information	✓
DELETE	/sessions/{sessionId}	Free resources related to QoS session	✓

QoS session callbacks

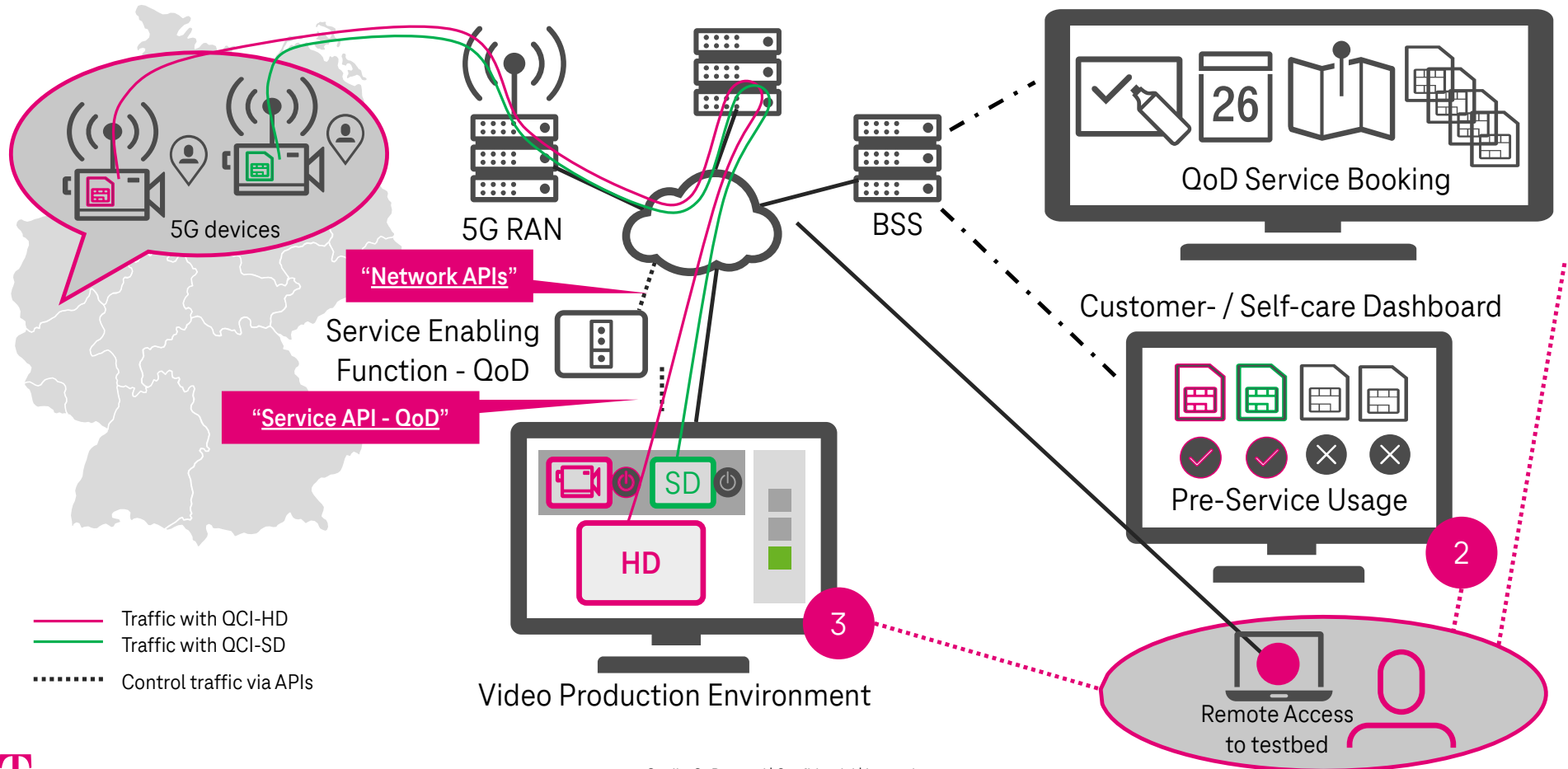
POST	/qos-changed	Session QoS changed notification callback	✓
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Example value

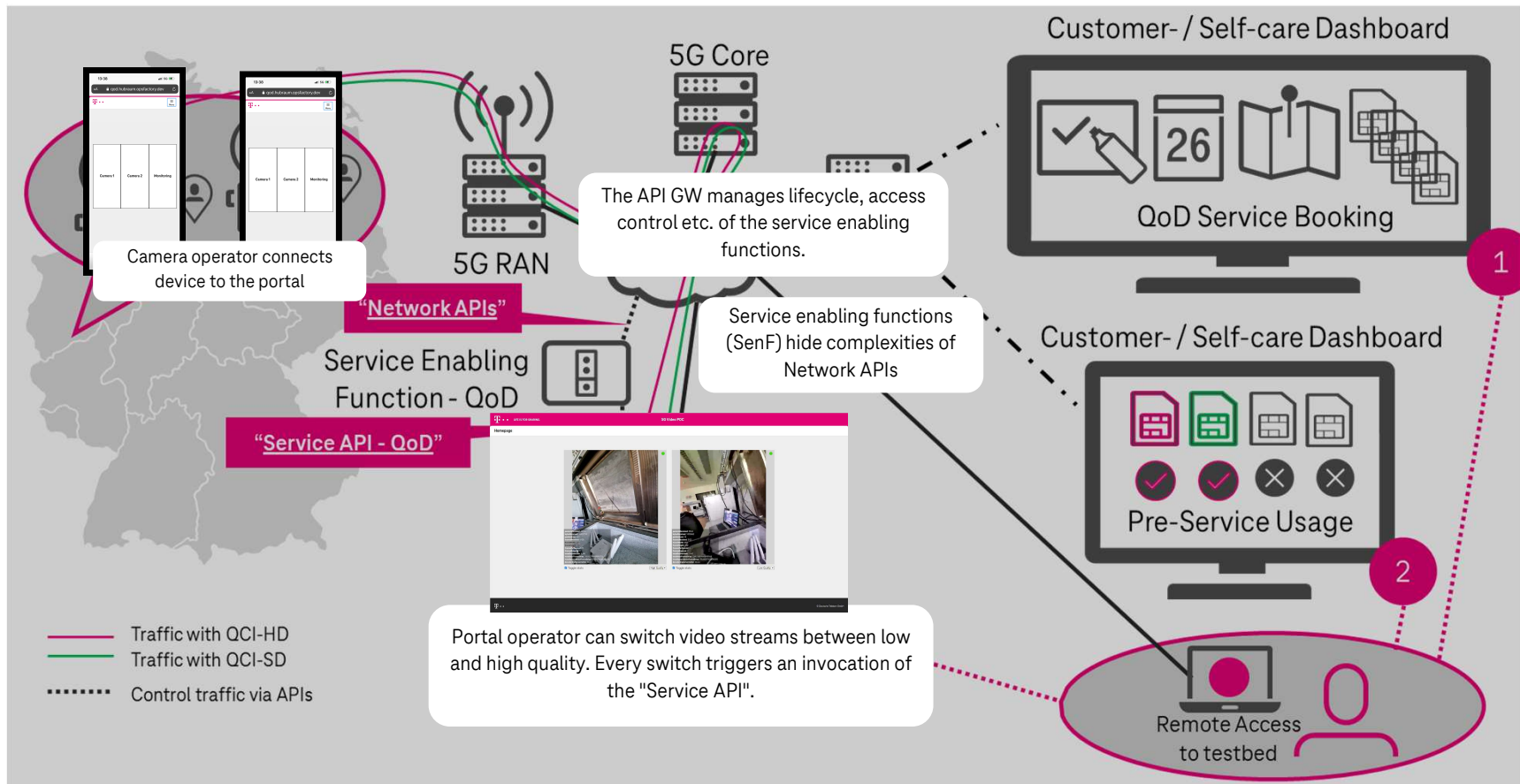
```
"ueAddr": "192.168.0.1",  
"asAddr": "192.168.0.1",  
"uePort": 65535,  
"asPort": 65535,  
"protocolIn": "TCP",  
"protocolOut": "TCP",  
"qos": "THROUGHPUT_S",  
"notificationUrl": "https://application-server.com/notifications"
```



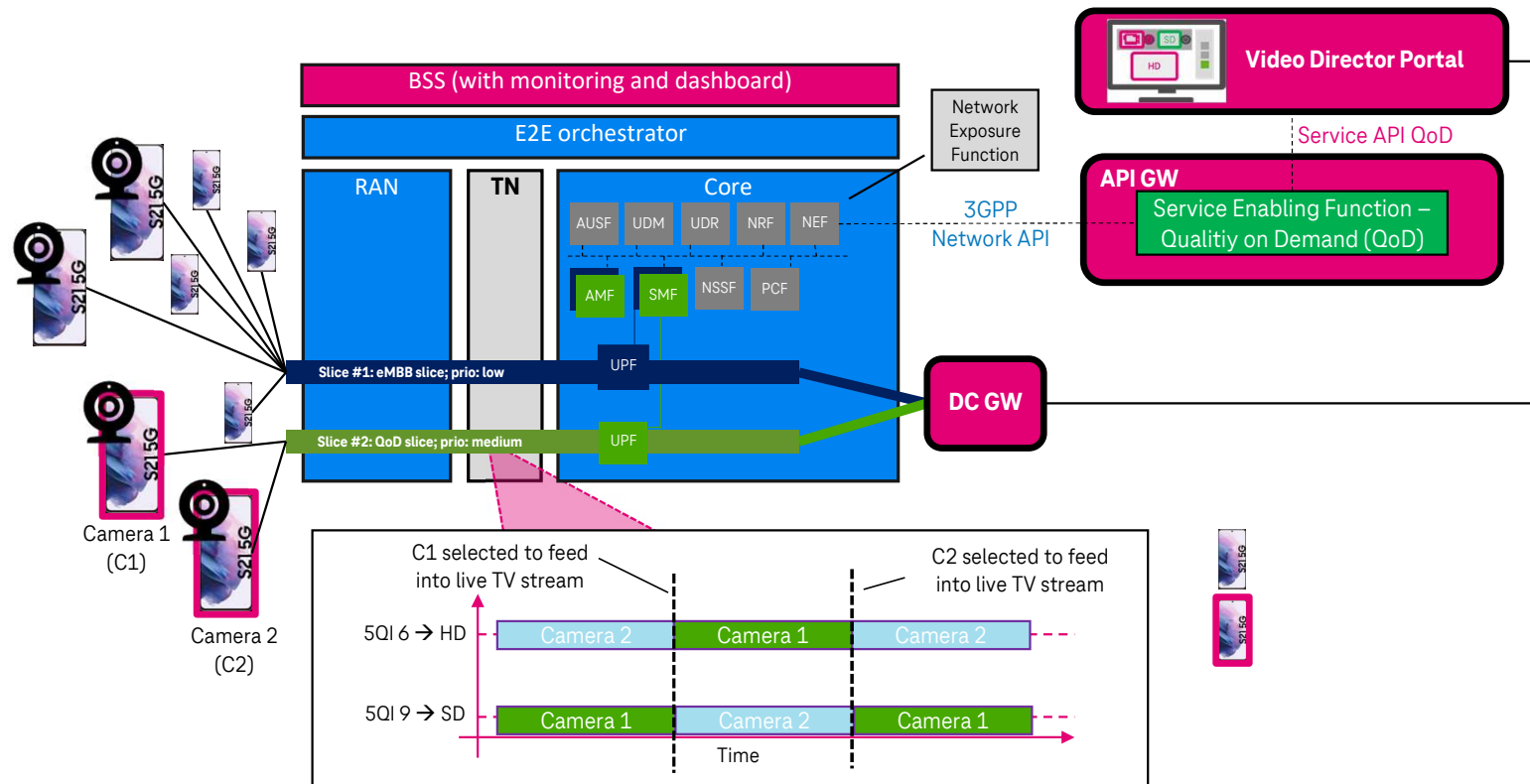
Quality on Demand – Target Picture



Quality on Demand – Target Picture

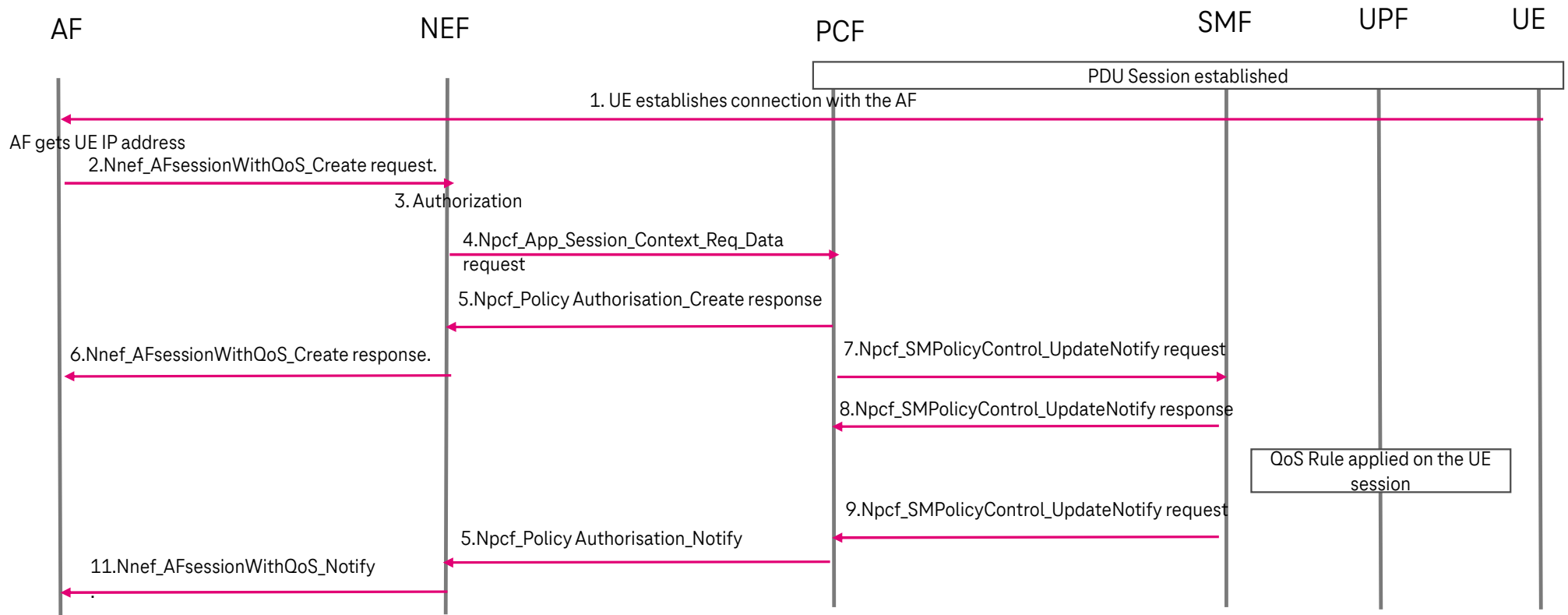


Video production PoC architecture.



Call Flow - AF Session with Required QoS

Reference:
3GPP 23.502
3GPP 29.122
3GPP 29.214
3GPP 29.521



Quality on Demand – Result (Trace at the UPF)

before switching: 5QI = 9 (priority level 80)

QoD_U_Plane_Trace.pcapng

gtp_ext_hdr.pdu_ses_con.qos_flow_id == 9 && ip.addr == 10.47.0.156

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.47.0.156	172.24.8.130	GTP <U>	1200	13134 → 43458 Len=1110
2	0.000166	10.47.0.156	172.24.8.130	GTP <U>	1200	13134 → 43458 Len=1110
3	0.000441	10.47.0.156	172.24.8.130	GTP <U>	1200	13134 → 43458 Len=1110
4	0.000473	10.47.0.156	172.24.8.130	GTP <U>	1200	13134 → 43458 Len=1110
5	0.000920	10.47.0.156	172.24.8.130	GTP <U>	1200	13134 → 43458 Len=1110
6	0.003829	10.47.0.156	172.24.8.130	GTP <U>	1225	13006 → 41425 Len=1135
7	0.003960	10.47.0.156	172.24.8.130	GTP <U>	1225	13006 → 41425 Len=1135
8	0.004129	10.47.0.156	172.24.8.130	GTP <U>	1225	13006 → 41425 Len=1135
9	0.004131	10.47.0.156	172.24.8.130	GTP <U>	1225	13006 → 41425 Len=1135

802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 232

Internet Protocol Version 4, Src: 172.24.5.241, Dst: 172.24.5.174

User Datagram Protocol, Src Port: 64163, Dst Port: 2152

GPUS Tunneling Protocol

Flags: 0x36

Message Type: T-PDU (0xff)

Length: 1171

TEID: 0x407370dd (1081307357)

Sequence number: 0x613e (24894)

Next extension header type: PDU Session container (0x85)

Extension header (PDU Session container)

Extension Header Length: 1

PDU Session Container

0000 = PDU Type: DL PDU SESSION INFORMATION (0)

.... 0000 = Spare: 0x0

0... = Paging Policy Presence (PPP): Not Present

0... = Reflective QoS Indicator (RQI): Not Present

00 1001 = QoS Flow Identifier (QFI): 9

Next extension header type: No more extension headers (0x00)

Internet Protocol Version 4, Src: 10.47.0.156, Dst: 172.24.8.130

User Datagram Protocol, Src Port: 13006, Dst Port: 41425

0030 04 93 40 73 70 dd 61 3e 00 85 01 00 00 45 b8 ..@sp a> E

QoS Flow Identifier (QFI) (gtp_ext_hdr.pdu_ses_con.qos_flow_id), 1 Byte Pakete: 51179 · Angezeigt: 44057 (86.1%) · Kommentare: 51179 · Profil: AWS_AMF

after switching: 5QI = 6 (priority level 60)

QoD_U_Plane_Trace.pcapng

gtp_ext_hdr.pdu_ses_con.qos_flow_id == 6 && ip.addr == 10.47.0.156

No.	Time	Source	Destination	Protocol	Length	Info
41095	124.305667	172.24.8.130	10.47.0.156	GTP <U>	115	56618 → 13290 Len=25
41096	124.308094	172.24.8.130	10.47.0.156	GTP <U>	188	33209 → 13330 Len=98
41097	124.310617	172.24.8.130	10.47.0.156	GTP <U>	160	33209 → 13330 Len=70
41098	124.315663	172.24.8.130	10.47.0.156	GTP <U>	472	33209 → 13330 Len=382
41099	124.323150	172.24.8.130	10.47.0.156	GTP <U>	115	56618 → 13290 Len=25
41100	124.335595	172.24.8.130	10.47.0.156	GTP <U>	349	33209 → 13330 Len=259
41213	124.481670	10.47.0.156	172.24.8.130	GTP <U>	1130	13330 → 33209 Len=1040
41214	124.481699	10.47.0.156	172.24.8.130	GTP <U>	1131	13330 → 33209 Len=1041
41215	124.486500	10.47.0.156	172.24.8.130	GTP <U>	1131	13330 → 33209 Len=1041

Frame 41214: 1131 bytes on wire (9048 bits), 1131 bytes captured (9048 bits) on interface cpu27, id 0 (outbound)

Ethernet II, Src: fa:7a:bc:b6:e4:bd (fa:7a:bc:b6:e4:bd), Dst: JuniperN_4d:78:2a (b4:8a:5f:4d:78:2a)

802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 232

Internet Protocol Version 4, Src: 172.24.5.241, Dst: 172.24.5.174

User Datagram Protocol, Src Port: 62634, Dst Port: 2152

GPUS Tunneling Protocol

Flags: 0x36

Message Type: T-PDU (0xff)

Length: 1077

TEID: 0x407370dd (1081307357)

Sequence number: 0xeb3c (60220)

Next extension header type: PDU Session container (0x85)

Extension header (PDU Session container)

Extension Header Length: 1

PDU Session Container

0000 = PDU Type: DL PDU SESSION INFORMATION (0)

.... 0000 = Spare: 0x0

0... = Paging Policy Presence (PPP): Not Present

0... = Reflective QoS Indicator (RQI): Not Present

00 0110 = QoS Flow Identifier (QFI): 6

Next extension header type: No more extension headers (0x00)

0030 04 93 40 73 70 dd eb 3c 00 85 01 00 00 45 b8 ..@sp a> E

QoS Flow Identifier (QFI) (gtp_ext_hdr.pdu_ses_con.qos_flow_id), 1 Byte Pakete: 51179 · Angezeigt: 6469 (12.6%) · Kommentare: 51179 · Profil: AWS_AMF

Stable Latency API

Story	Prio
As a Developer I want an API which offers me a stable latency then the best effort or other QoD-APIs, so i can optimize my dataflow for perfect interaction time	1
As a Developer i want to prioritize an App-Flow, so i can optimize the latency critical flows and can save money by using it only if it is necessary (is in)	1
As a Developer i want to switch between a bandwidth limit and an unlimited function, so i can decide if it is necessary to spend more money for bandwidth.	2
As a Developer i want to book the API for a defined time frame, so i can decide by myself how long i need the QoD. (On/Off Switch)	1
As a Product Manager i want to measure data, so i can decide later which package are ideally for billing. (Used Bandwidth, Calls, Time)	1
As a Product Manager i want to measure customer data, so i can decide later which package are ideally for billing. (Appname, User-IP, Customername, Customer ID more insights)	3
As a Developer i want to get insight about the use QoD-Quality in comparison to Bes-Effort afterwards, to see the results of my spending.	3



Stable Bandwidth/Throughput API

Story	Prio
As a developer i want an API which offers me a stable throughput, so i can fulfill the needs of my customers with a stable connection to my Service	1
As a Developer i want to decide if I prioritize an App-Flow or the whole App, so i can decide if I want all Flows in my App or only the ways which are important for the customer satisfaction.	1
As a developer i want to choose between different Package of throughput classes, so i can decide what class is fitting my needs and i can save money by using a smaller class. (S,M,L,XL)	1
As a Developer i want to book the API for a defined time frame, so i can decide by myself how long i need the QoD. (On/Off Switch)	1
As a Product Manager i want to measure data, so i can decide later which package are ideally for billing. (Used Bandwidth, Calls, Time)	1
As a Product Manager i want to measure customer data, so i can decide later which package are ideally for billing. (Appname, User-IP, Customername, Customer ID more insights)	3
As a Developer i want to get insight about the use QoD-Quality in comparison to Best-Effort afterwards, to see the results of my spending.	3



Thank you

