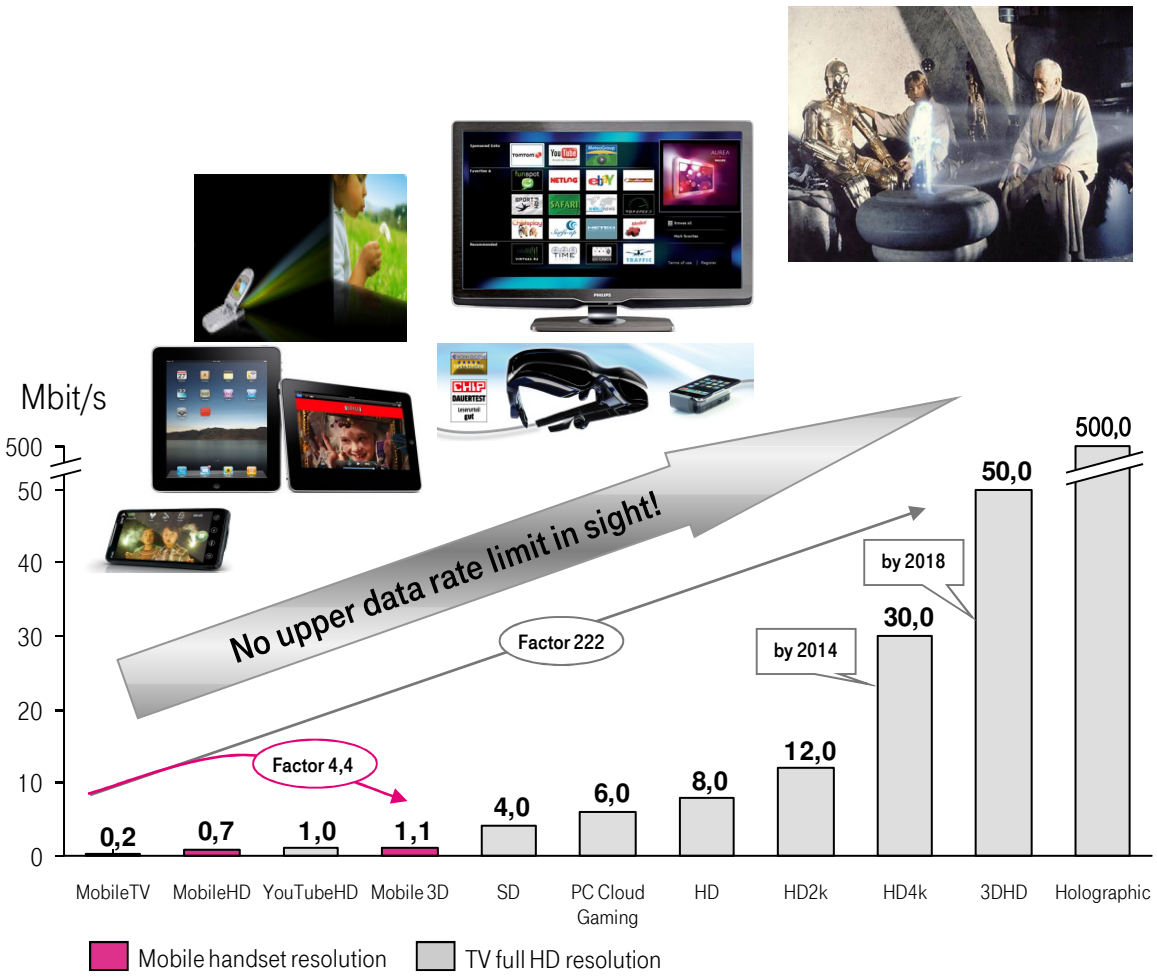
Münchener Kreis – Netzneutralität.

Netzmanagement/Best-Effort/QoS.

Beitrag zur Diskussion

Life's for Sharing

Innovation in video streaming is just one example to show that any static definition or regulation of QoS is soon overtaken by reality.



Innovation impacts QoS

Trends in Video Streaming (Example)

- Video on mobile devices become daily life service, supporting also HD and 3D TV.
- Further dimensions like 3D and holography, new applications like FreeViewpointTV.
- Hi-Resolution screen already in the market (e.g. iPhone 4G), Micro projectors to appear soon.
- New technologies: Flexible, head mounted, inorganic and sensing displays.

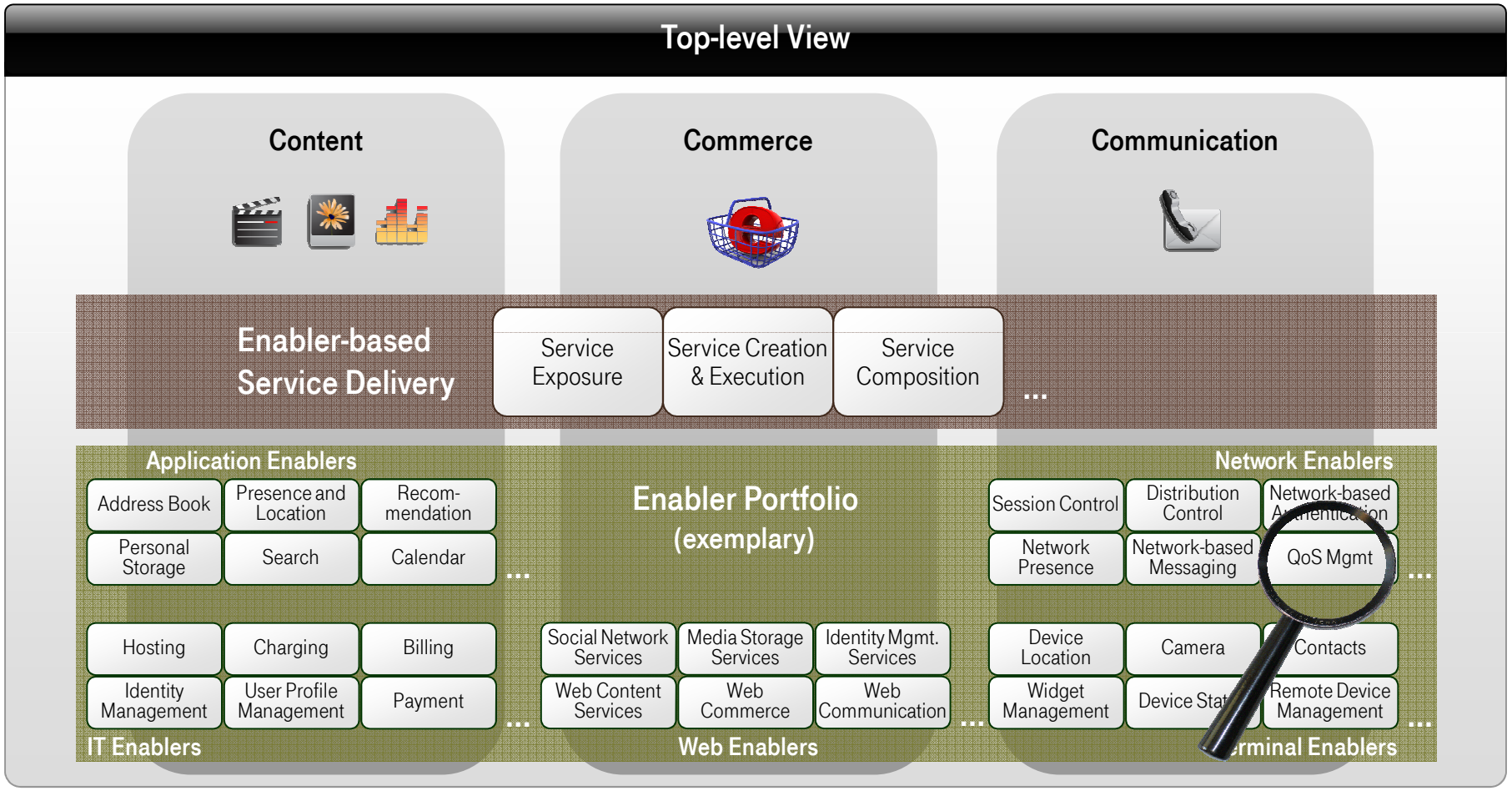
Key Message

- **Innovations in infrastructure** and radio networks, along with ongoing **digitization**, give rise to range of new technologies and applications, whose QoS **demands cannot be forecasted accurately**
- QoS parameters like bandwidth, delay, jitter and packet loss can only be **predicted at cluster levels with imprecision**

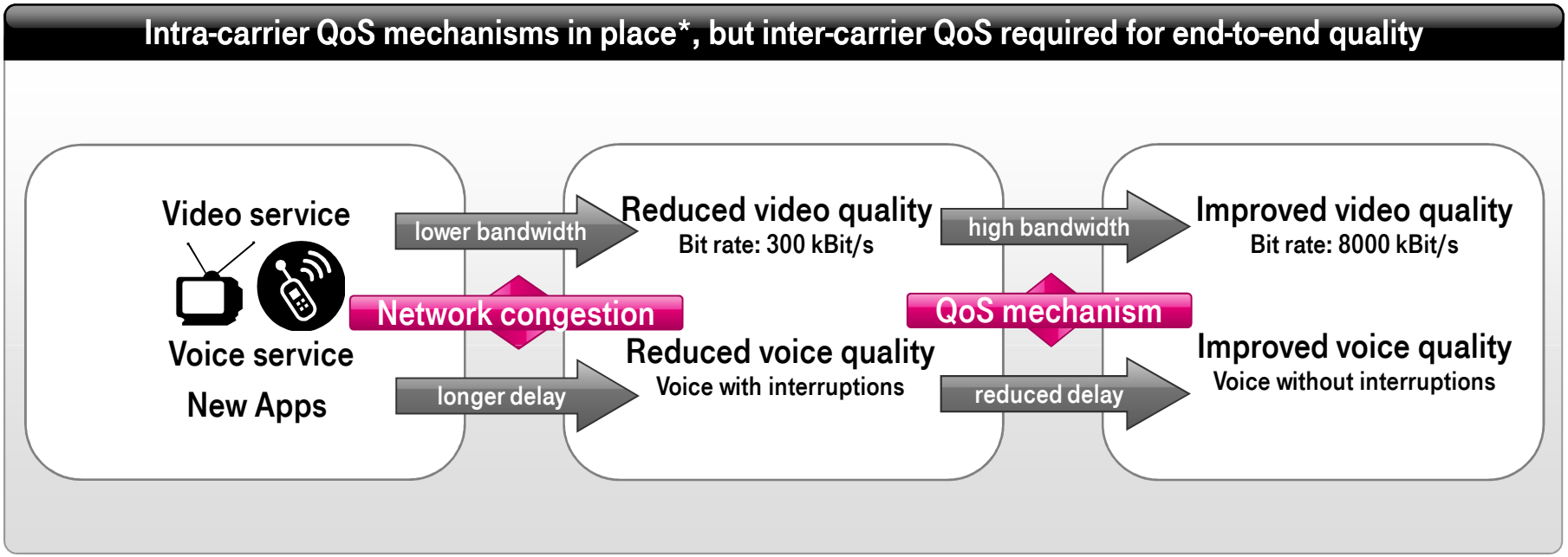
QoS Enablers can guarantee network performance for inelastic real-time IP services, which in turn **improves QoE** for customers

Source: Telekom – "Long term traffic forecast of P&D with P&I inputs"

From a large variety of Telco's Internet-related assets, Quality of Service (QoS) can be a significant one.



What is QoS good for and why?
Telcos are in a unique position to offer improved and assured QoS to customers.

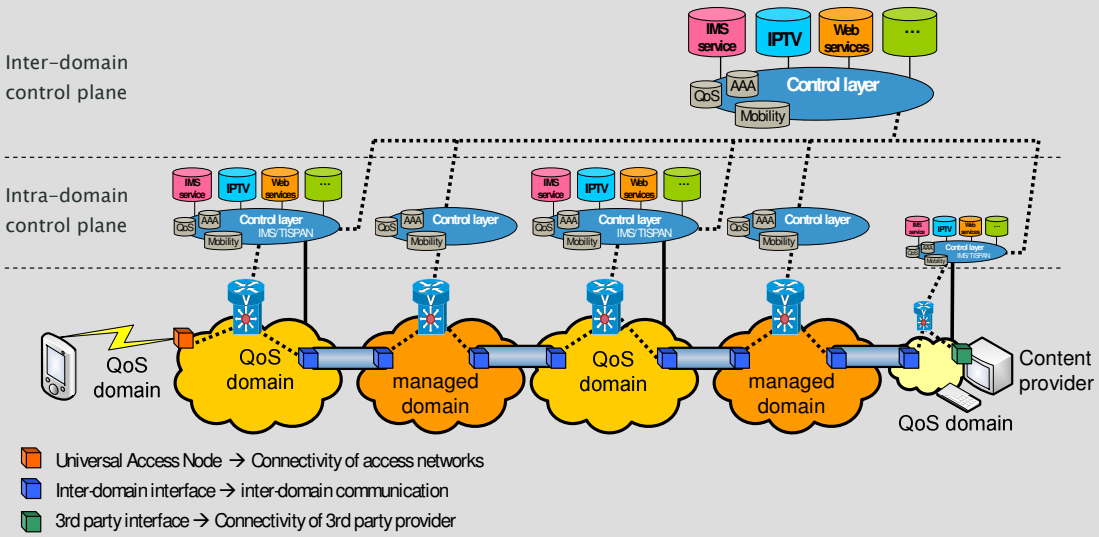


Telekom is actively researching mechanisms to provide guaranteed end-to-end QoS to customers in cross-carrier environments.

* e.g., DiffServ

Illustration: end-to-end QoS.
The Enabler QoS is an important aspect in the enabler eco-system.

e2e QoS architecture consists of QoS controlled and managed domains.



Description

- Multi-operator architecture: Multiple ISPs can define a common service offer covering network access and Internet services
- End-to-end QoS provisioning through different QoS domains; QoS domains with different QoS mechanisms (e.g. QoS control through IMS, managed domain, etc.)
- Over the top control plane/process for co-ordination of end-to-end QoS provisioning – no direct control of the QoS domains hence control based on request and confirmation and willingness of the operator to support the QoS request

Basics

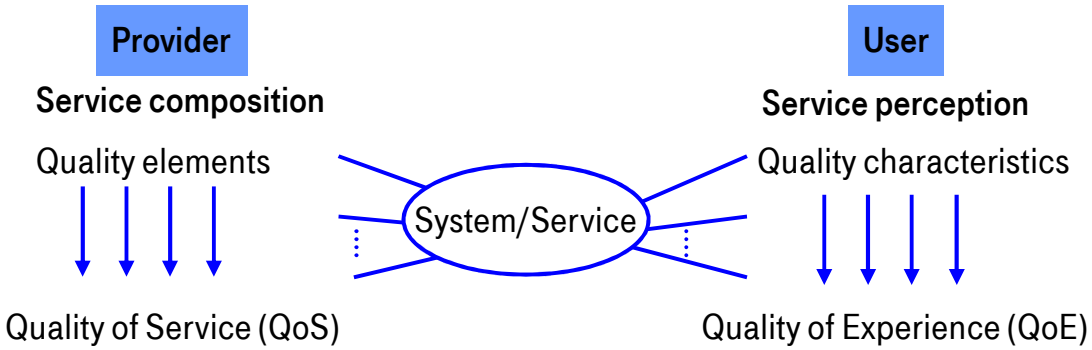
Current Status	▪ Bandwidth increases ▪ Service differentiation/QoS is needed to support different services and applications
Strategic Development	▪ Services and applications request different QoS
Market Influence	▪ Offer service differentiation to customers with willingness to pay
Stakeholders' Impact	▪ Monetize investments ▪ Support innovation lead ▪ Differentiation from competitors
DT impact on regulation	▪ Service differentiation/QoS drives regulation

Short Assessment

- Service differentiation/QoS necessary with raising traffic
- Monetization chance because service differentiation means different pricing
- Regulatory restrictions critical

QoS Enablers provide QoE to customers.

Innovation creates new services whose network demands cannot be forecasted precisely. Telcos can offer QoS enablers to guarantee QoE to customers in such a scenario.

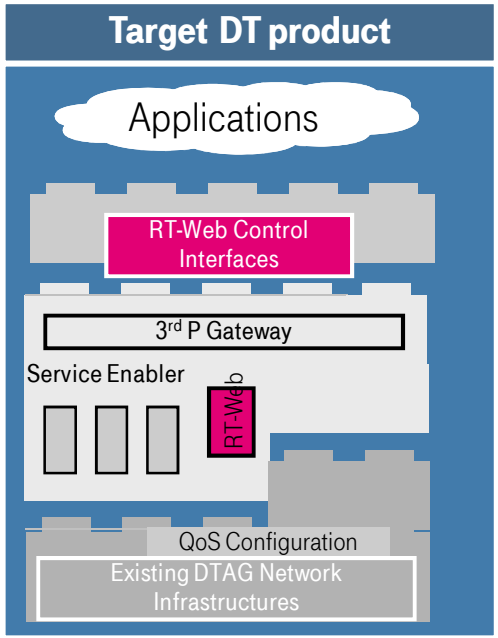


QoE Definition

Quality of Experience: Degree of delight of the user of a service. In the context of communication services, it is influenced by content, network, device, application, user expectations and goals, and context of use.”

Innovation impacts QoS

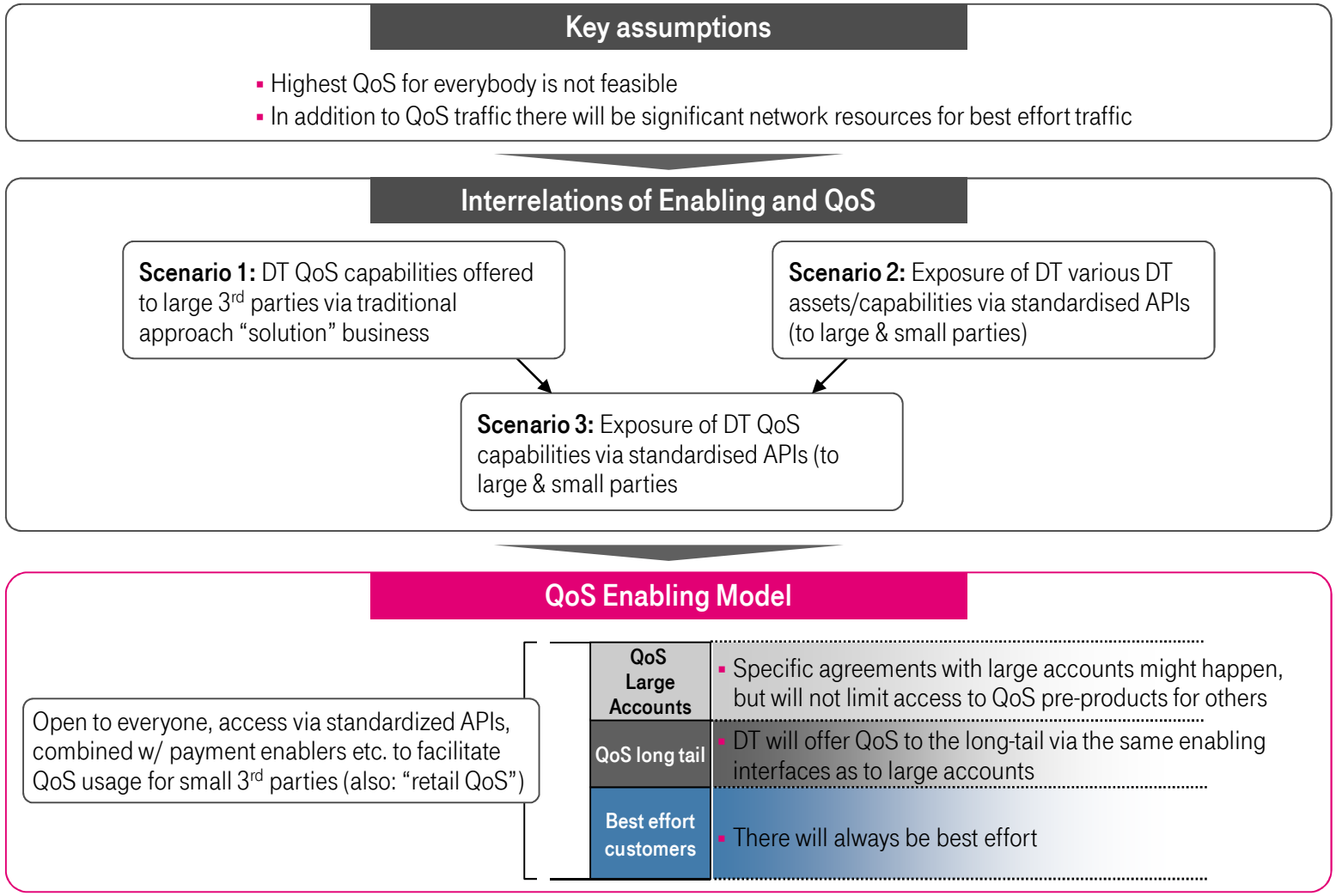
- Innovations in infrastructure and radio networks, along with ongoing digitization, give rise to range of new technologies (eg. LTE Advanced) and applications (eg. FreeViewpointTV), whose capacity demands cannot be forecasted accurately
- QoS parameters like bandwidth, delay, jitter and packet loss can only be predicted at cluster levels with imprecision
- QoS enablers can guarantee network performance for inelastic real-time IP services, which in turn improves QoE for customers



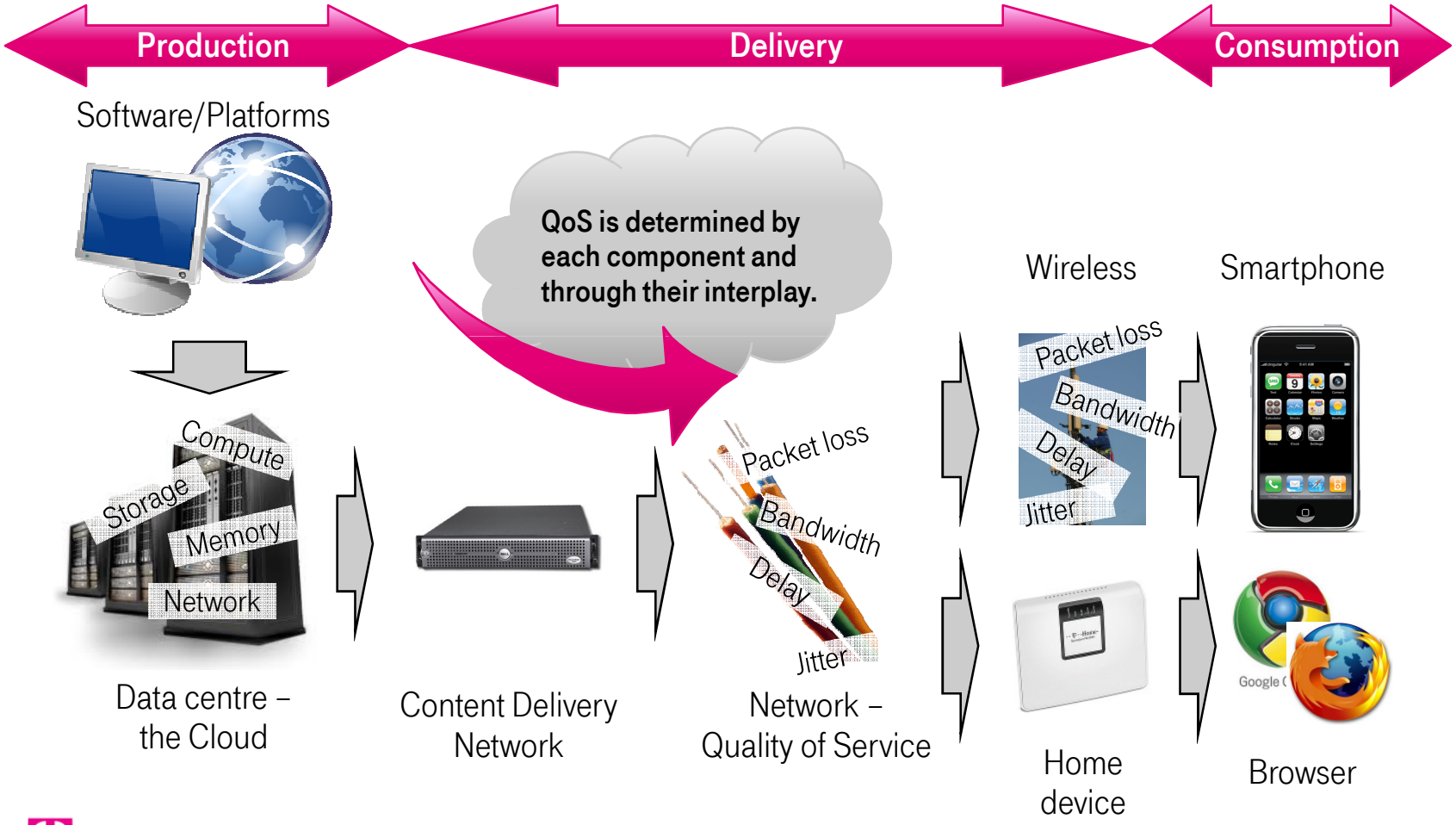
The Telco Response

- Example – Real time Web enabler: a Net enabler for QoS-aware applications, a building block for QoS Enablers
- Enabler realizes two mechanisms: 1) Utilize QoS (reduced delay, packet loss, jitter) in access network via policy group shift; 2) Accelerate communication between clients via lightweight message protocol and respective proxy.

QoS will be the most valuable enabler – a non-discriminatory offering will play a key role.

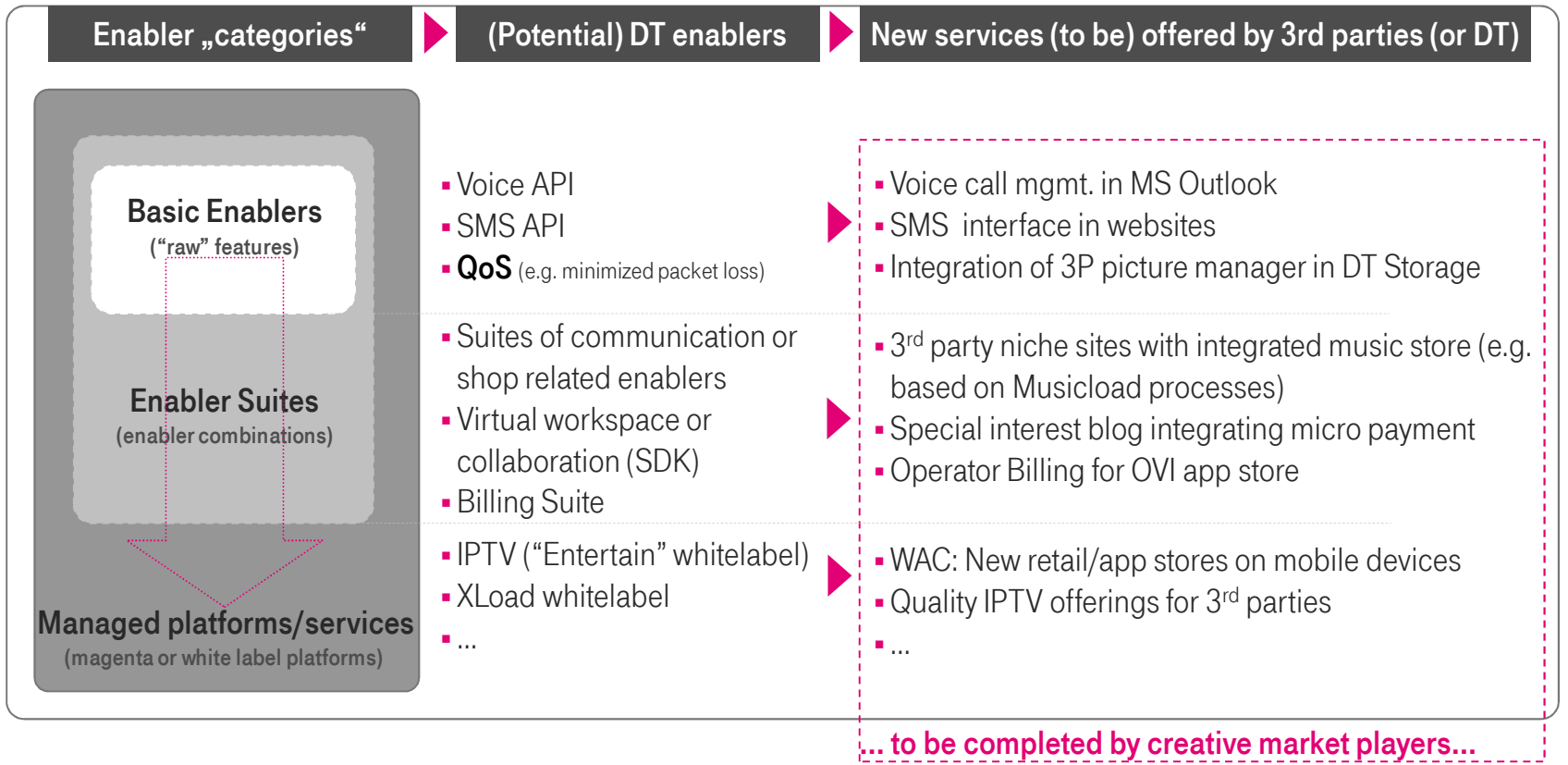


Even cloud services require cross-carrier QoS to span production, delivery and consumption domains.



Backup.

DT offers its network/IT assets and capabilities for own and 3rd party services.



The term “Cloud Computing” comprises SaaS, PaaS and IaaS offerings.

Software-as-a-Service

- Customer Web Applications

musicload

IMMOBILIEN SCOUT 24

softwareload

- Enterprise Web Applications

Microsoft Office Live

brainloop

SUGARCRM

Platform-as-a-Service

- Functional services

developer garden

ClickandBuy™

- Industry-specific

Salesforce

- Application hosting

Google App Engine

Infrastructure-as-a-Service

- Virtual machines

zimory

amazon web services™

the rackspace cloud

- Database abstraction

edgecast

amazon web services™

Dropbox

- Computation services

amazon web services™

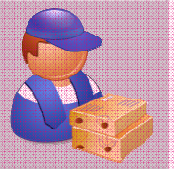
“Cloud Computing” term is used for various offerings. Common denominator: price depends on usage (utility computing); all services delivered from a central location via the Internet/intranet.

Potential for Cloud QoS management exists across production, delivery and consumption domains. However, Telcos can significantly impact delivery domain through QoS management.

Production

- Optimize the **software architecture** for delivery from the cloud, enabling global distribution and thereby faster delivery.
- Set up **data centers** so that computing resources can be provisioned and combined in a flexible way. Thereby, resources are available to web applications as needed, reducing bottlenecks.

Delivery



- Create content/application **delivery networks** adapted to Cloud offerings.
- Offer interface for web applications to set **network QoS** parameters. This specifically involves QoS handover at peering points, QoS management for the last mile and QoS management in radio cells.
- **Transcode content** for mobile consumption, e.g. video transcoding for YouTube.

Consumption

- Optimize smart phone **operating systems** for business requirements, enable them to manage network QoS.
- Speed up **web browsers** (not Telco business).

Research example: Wireless LAN.
Telcos can improve the VoIP quality for end-users in wireless LANs through packet aggregation mechanism.

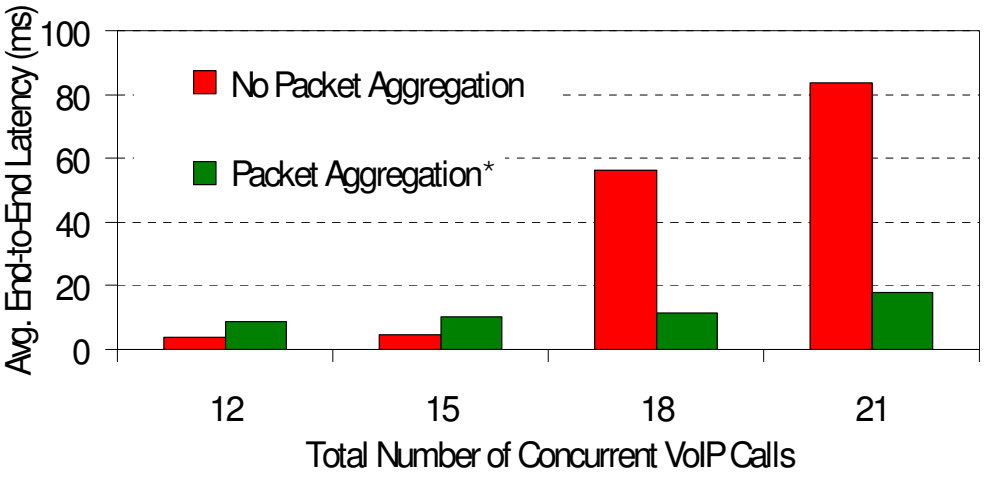
Problem statement

- Wireless LANs (IEEE 802.11) currently support only a limited number of concurrent VoIP-calls
- This leads to reduced service quality for the users in case of parallel usage

Proposed Telco solution

- Aggregating small packets to larger ones in wireless network leads to better service quality
- Does not require any change on the user side
- Reduces end-to-end latency (for users) and improves network efficienty (for Telcos)
- Mechanism tested successfully in T-Labs

Packet Aggregation reduces end-to-end latency for concurrent VoIP calls.



* FUZPAG: Fuzzy Controlled Packet Aggregation; 3 hops with 54 Mbit/s (physical layer)

Packet Aggregation is a technical solution from Telcos leading to a better service quality for the user