Quality of Service in Ultrabroadband models

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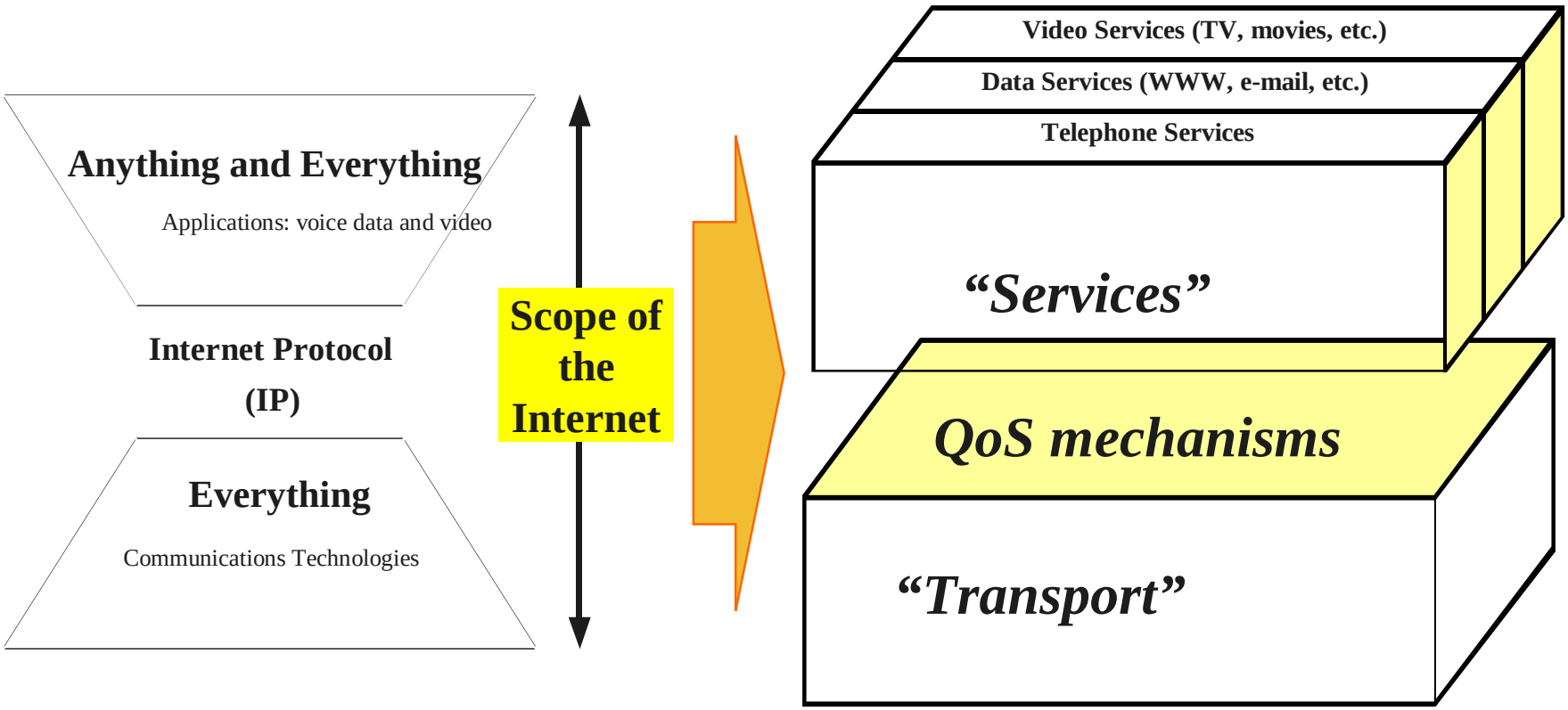
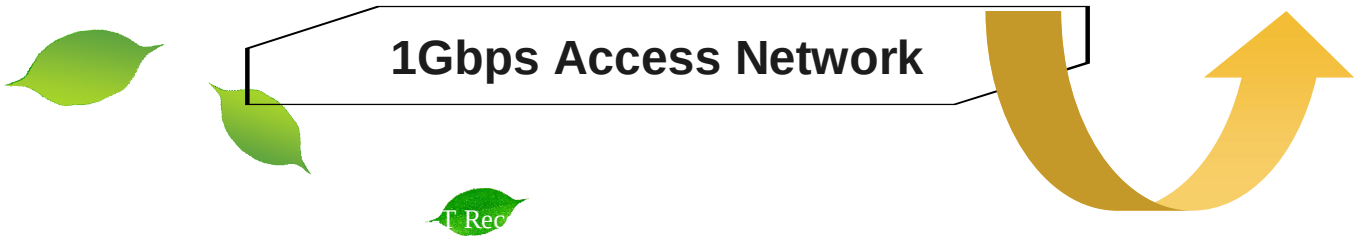
Ultrabroadband Networks (UBB)

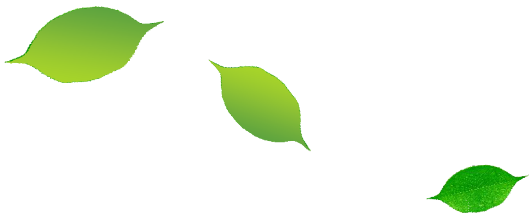




Introduction

- **QoS: a set of quality requirements and a number of ways these requirements can be configured to interoperate in a stable and consistent fashion**

  - In the engineering terms, refers to the probability of the telecommunication network meeting a given traffic contract, or the probability of a packet succeeding in passing between two points in the network.



With other words..

- **Subjective and qualitative**

“high”, “medium”, “low”, “worse”, “better”, “good”, “fair”, “poor”

- **In a word:**

Better, faster, cheaper!

Observations

- UBB defined as over 1Gbps (CITI)
- QoS depends on QoE
- Efficient subscribers management
- ISPs restrict or block access in some cases due to bandwidth scarcity
- Need for end-to-end QoS
- High premium services delivery

QoE

User-Experience-Oriented Quality

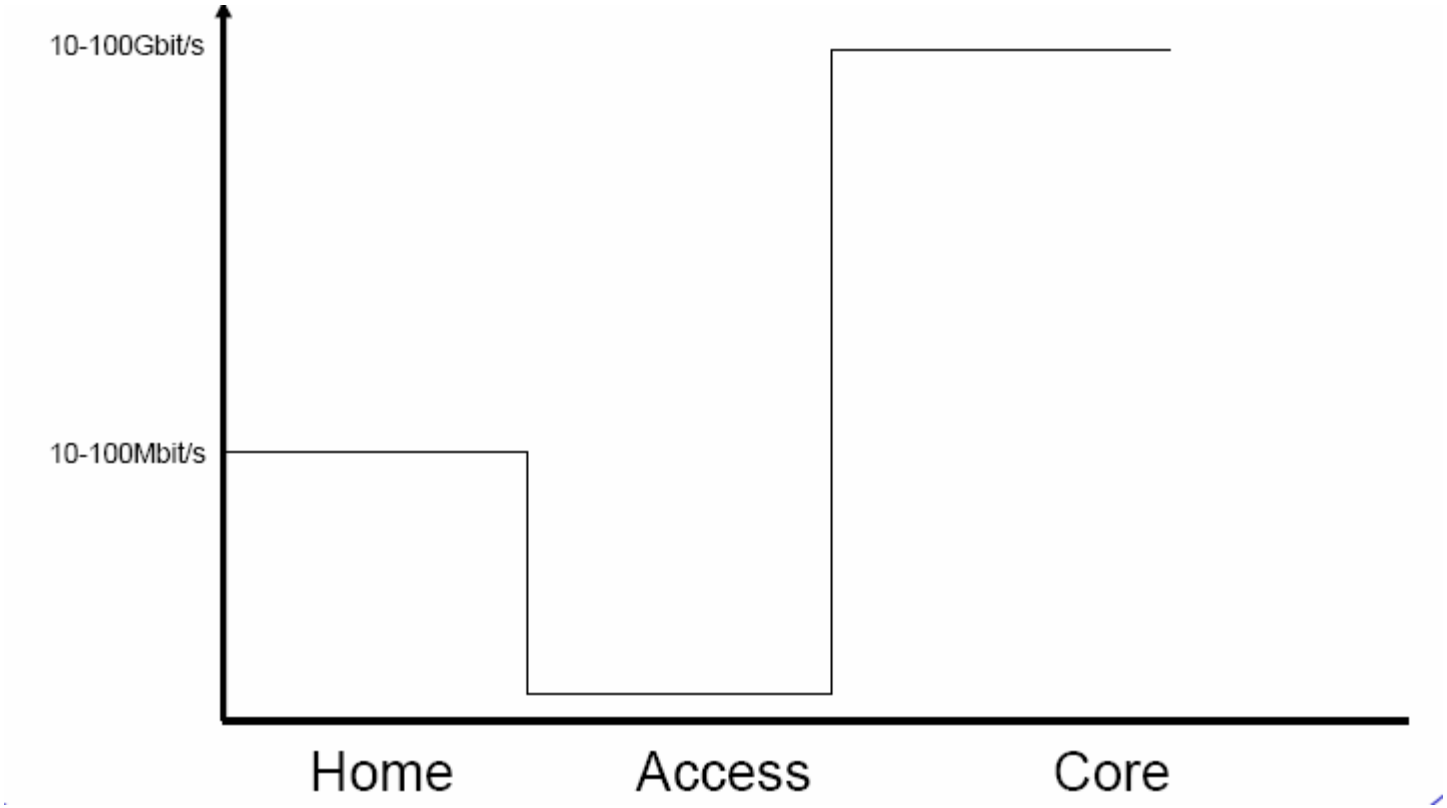
The overall acceptability of an application or service, as perceived subjectively by the end-user.

"…the totality of the Quality of Service mechanisms, provided to ensure smooth transmission of audio and video over IP networks"

Factors increasing the Home Network bitrate

- Streaming video on the Internet
- Video on Demand
- Video telephony and conferencing
- Digital cameras and camcorders
  - Increasing need for exchanging pictures and videos
- Enhanced data security
- UBB connections required for tolerable service

Where do we need QoS?

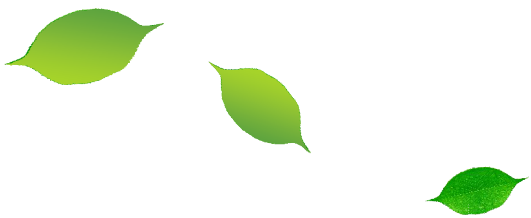


Why do we need QoS

- Consumer driven experience

(i.e. Video 2.0)

- Complexity and anarchy to manage
- Congestion
- Guarantee and secure service



Research questions

- **UBB QoS in the core network or in the access point? Invest where?**
- **Can QoE drive the QoS and its pricing?**
- **UBB QoS, how and why? OPEX?**

Current issues

Delay	it gets held up in long queues, or takes a less direct route to avoid congestion
Jitter	packets from source will reach the destination with different delays
Dropped packets	the routers might fail to deliver (drop) some packets if they arrive when their buffers are already full.

Type A: Real-time Services

- E. g. voice and video telephony, IPTV
- Strict latency requirements

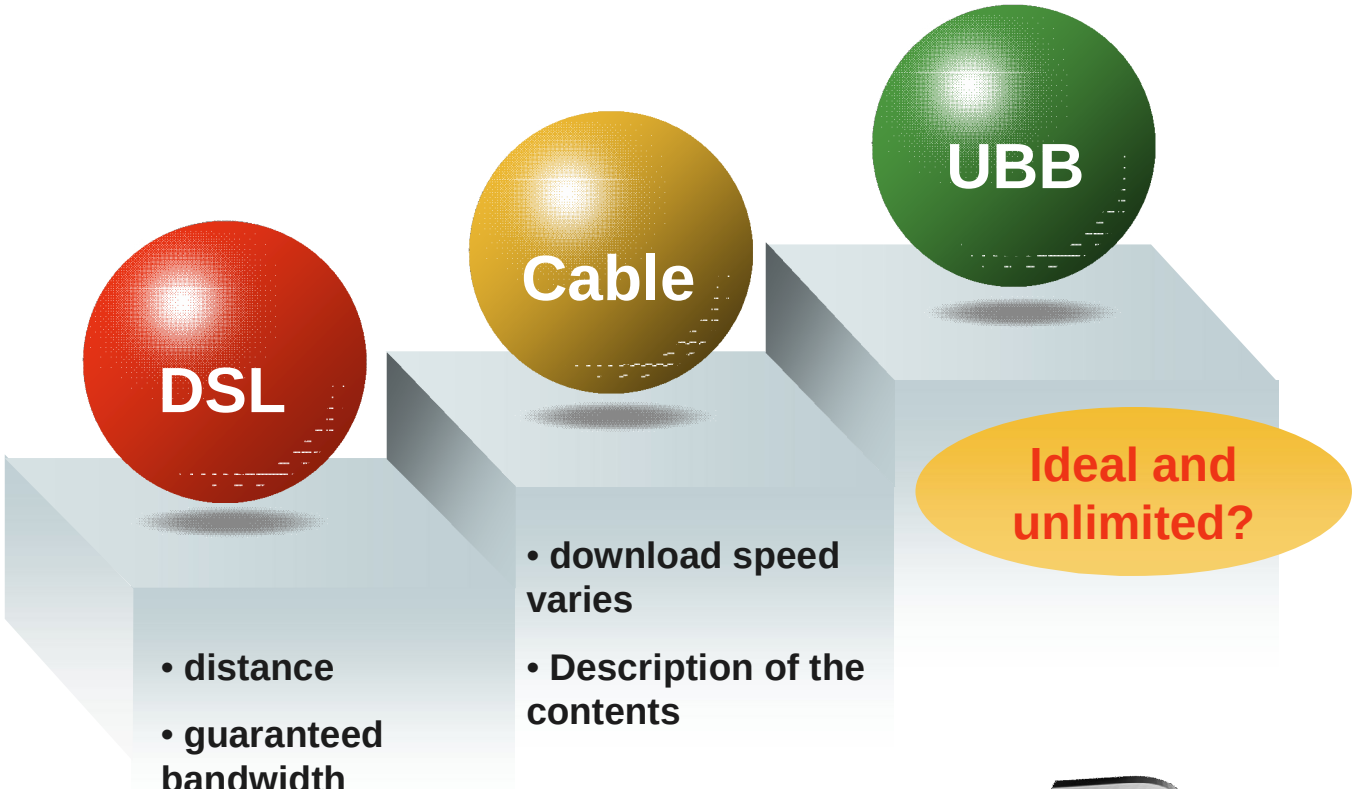
Type B: Interactive Data and Streaming Services

- E. g. web browsing and downloading
- Can tolerate limited amount of delay
- Transmission speed is still a key user requirement

Type C: Delay-Tolerant Services

- E.g. e-mail, file transfer
- Can tolerate more significant delays, without materially affecting the Quality of Service (QoS) perceived by the customer

OoS evolution



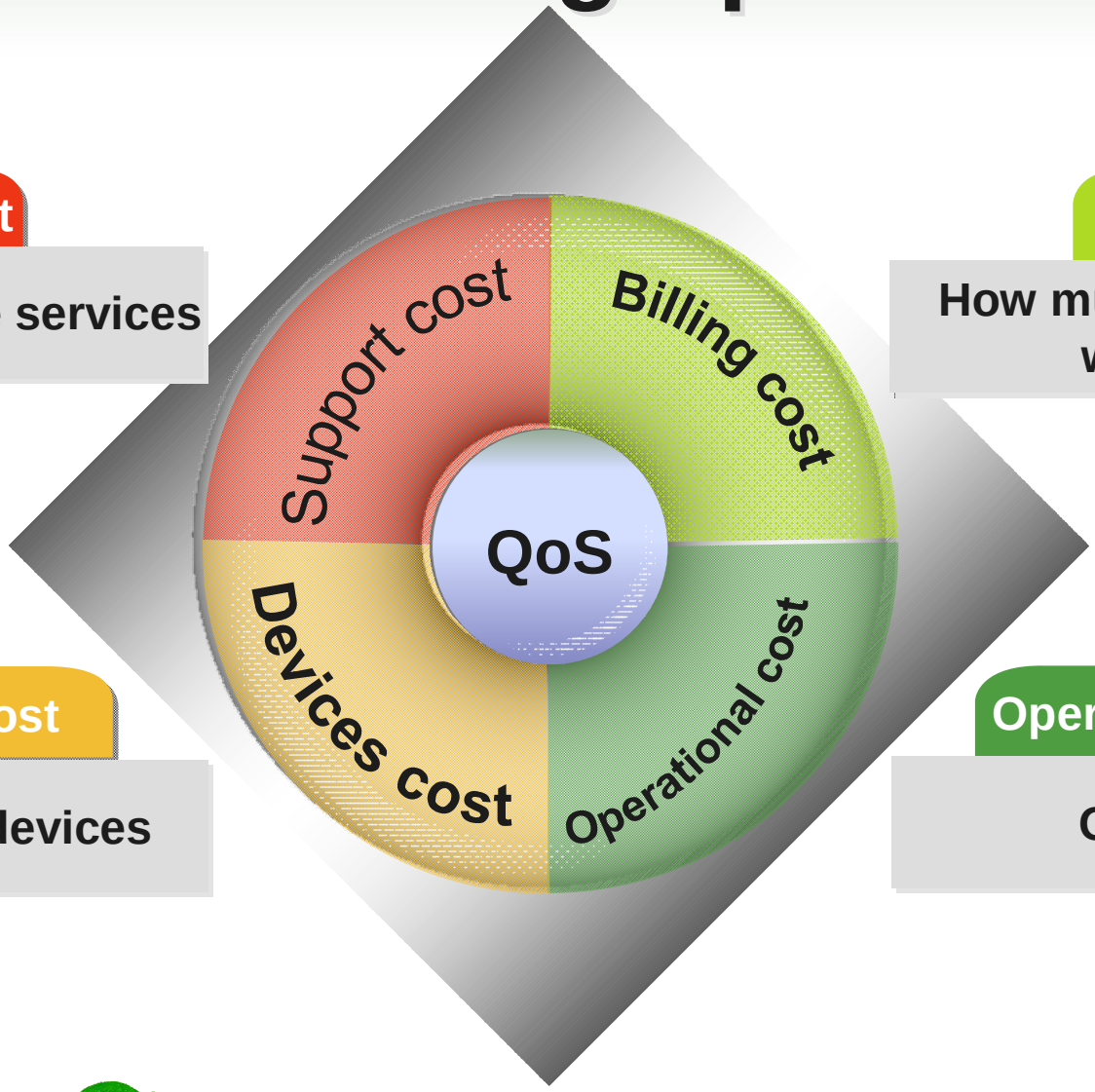
What are the QoS costs? Adding up..

Support cost

Guarantee the services

Billing cost

How much and for what?



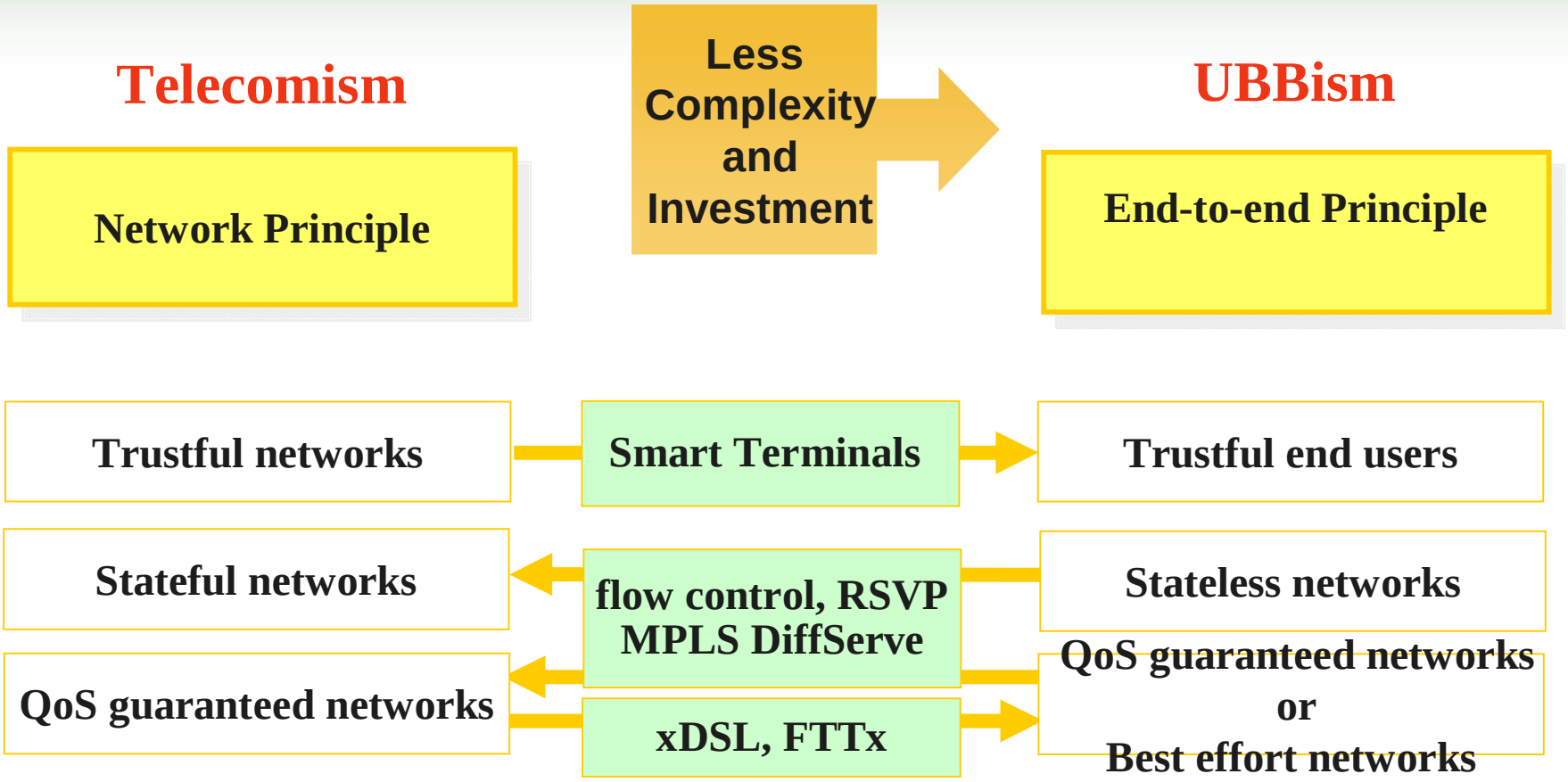
Devices cost

Intelligent devices

Operational cost

OPEX

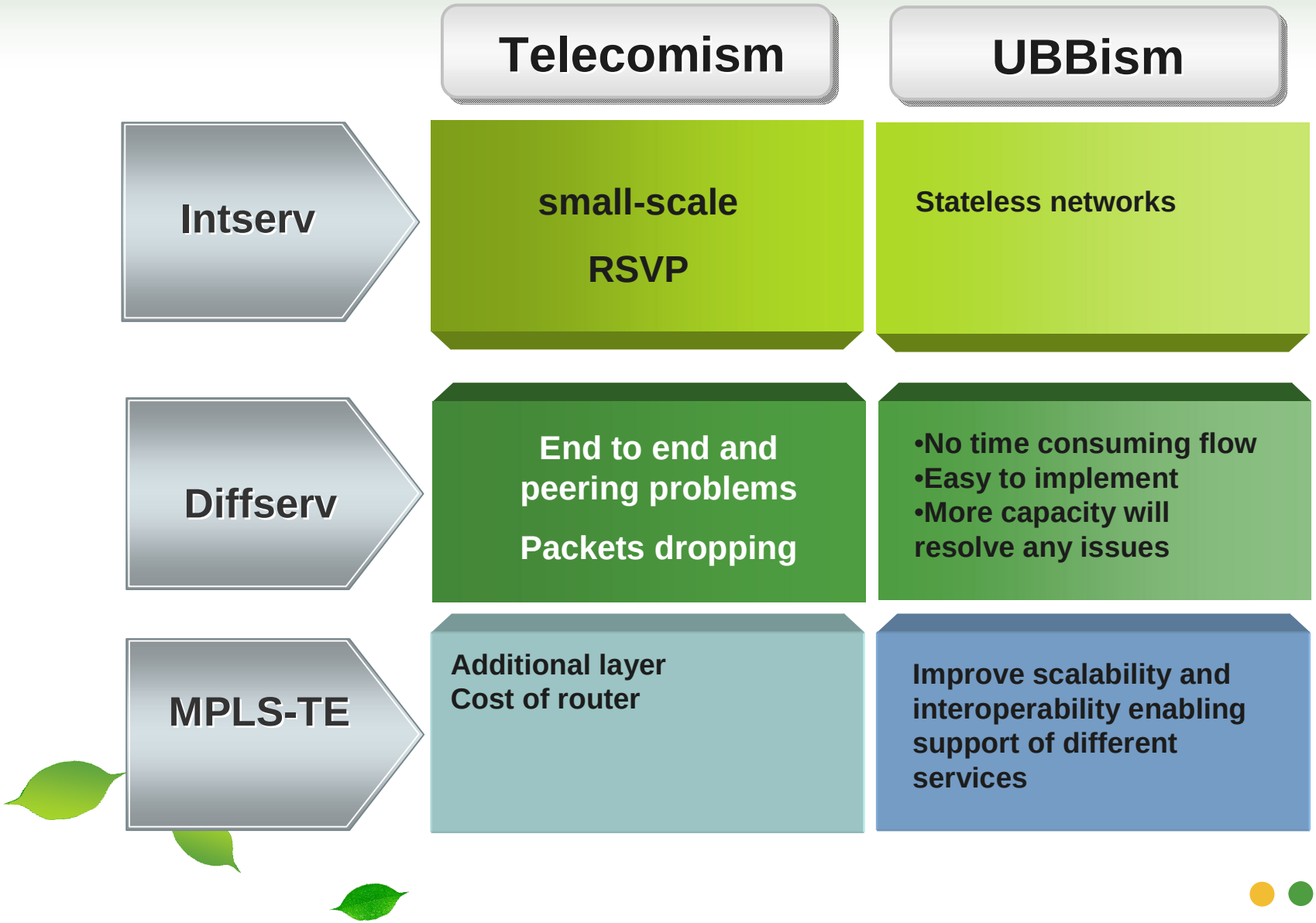
From Telecomism To UBBism



Current QoS mechanisms

- **Integrated Services: an architecture that specifies the elements to guarantee QoS on networks**
- **Differentiated services: which packets to delay or drop at the expense of others in a situation where there is not enough network capacity**
- **Multi Protocol Label Switching (MPLS) Traffic Engineering: efficient use of available bandwidth between a pair of routers**
- **Over-provisioning: Having more bandwidth than allocated traffic.**

Effective management of resource contention

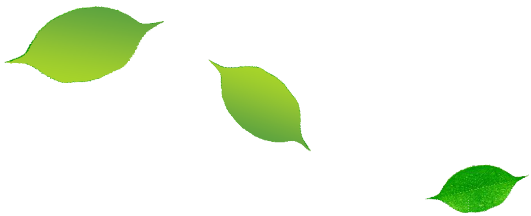


UBB QoS drivers

- QoE
- Content
- Convergence
- Pricing
- Users/Producers bandwidth needs based on services

Do we need QoS at the UBB access point?

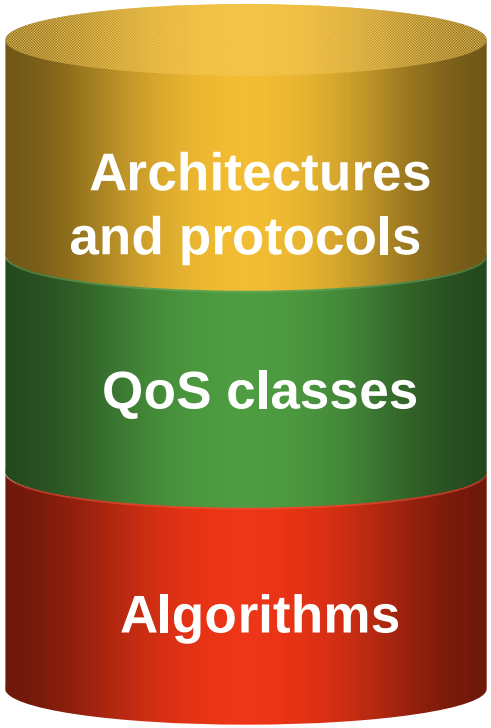
- **Yes..because:**
  - **Congestion will still exist**
  - **QoS mechanism guarantees service delivery and organizes the massive traffic**
  - **Secure sensitive applications:**
    - **VoD**
    - **VoIP**
    - **Video Telephony**



Some Alternatives to QoS

- **Smart provisioning?**
  - How and how much? Consumer oriented
- **Pricing**
  - Congestion pricing
    - Nice theoretic properties
    - But not practical
  - Usage-based pricing
    - Would help a lot
    - Business access is increasingly metered
    - Could provide differentiated services (*e.g.* Paris Metro Pricing)

Need for QoS standards



- QoS priority
- Traffic signaling

- Mapping and advancing different platforms

- smart provisioning perhaps via QoE
- End user implementation

Final remarks & Conclusions

- Need for smart network devices and intelligent operating systems
- New QoS standards should emerge
- Efficient but less complicated QoS solutions, combination of MPLS and DiffServ
- QoE should drive QoS
- Sell QoS as a new source of revenue

Thank You for your attention

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