Odysseus-2001

MediaPEP

An *ActiveUMTS* QoS Management Server,
An Internet Protocol Booster and
An Adaptive Media Transcoder Switch for
E2E-IP Integration of Mobile Wireless
Interactive Telepresence Applications

Project Overview – Update 1.12.2000

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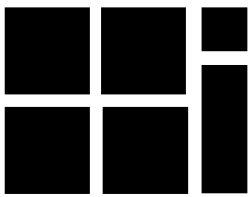
ICM N CTO FutureLab

What are we going to talk about ?

- Wireless Radio Communication (UMTS and beyond)
- Mobile Internet
- Interactive Multimedia (MPEG-4, Real-Time Video)
- Integrated Solutions
- Mobile Communication Devices
- Quality of Service and Performance Enhancements

Project Partners & Roles



Heinrich Hertz Institute

MPEG-4
Error Robustness;
Adaptive Bit Rate Transcoding;
Access Network Support

Technology University of Berlin

Wireless Access
Protocol Design;
Active Networking;
Mobile Videoconferencing

Technology University of Ilmenau

UMTS Conform IP QoS Methodology;
Interval-based Runtime Data Transport
Dynamic Bandwidth Allocation;
Telematics Services

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Project Leader& Chief Architect

Northeastern University (Boston)
Network Computing Lab / SCADS

Scaleable and Dependable
Server Architecture

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Communication on Air

Wireless Video Car Promotion Service

The Quadriga-2000 Project

http://www.quadriga-2000.com

The History

A Vertical Mobile Enterprise Solution for the Automotive Industry (Prototype)

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Communication on Air

Wireless Video Car Promotion Service *Video Streaming*

Car Community Service

Vendor

Live video capturing

Buyer

Video playout MPEG-4

GSN

Wireless video gateway

GSM/GPRS/UMTS

LAN/WAN/Internet

Video clip database

Video server

Customer profil database

Application server:

- Wireless car promotion
- Wireless movie promotion
- N.N.

Background/ CeBIT Show Case: "Houses for Sale on Air" (*HiCell*) m-Commerce
A Real Life Application Scenario to Save Time and Money via Remote Home Visit

Husband @ Office

Content/Video & Application Server (Home Database Preview)

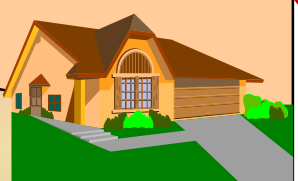
1) *Video Streaming*

UMTS

2) *Video Conferencing*

E2E-All-IP Network

1. New Home
2. New Holiday Resort

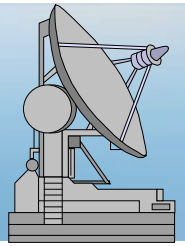


Wife @ Home

Advisor on the go

Vendor@NewHome

Why do we do that (Internet over wireless) ?



- Question: The idea of Internet has been: a single approach over whatever kind of technologies. So, why does it not work with wireless?
- Answer: Wireless kills TCP/UDP performance, because
  - TCP cannot distinguish between error and congestion based losses; thus, it must always activate Congestion Control.
  - UDP applications suffer from packet losses (a single loss of a high compression video may result in unacceptable video quality).
  - Handover ?

Multimedia in a Mobile Environment

Consequences:

When communication conditions get worse and error rate increases in a wireless link, transmission jitter increases, because error packets are retransmitted based on the Radio Link Control protocol located in the data link layer.

The Project's Challenge:
Aplication-aware QoS Management for UMTS and Beyond

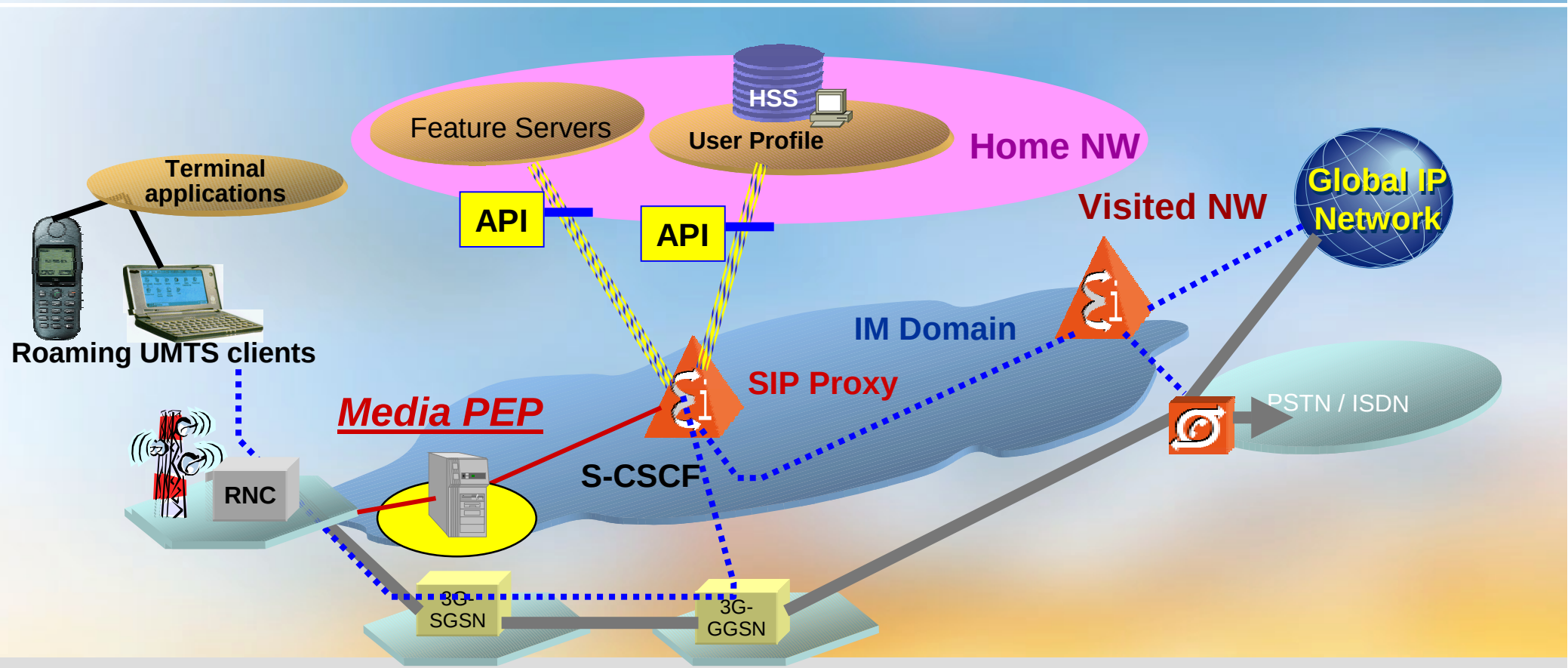
Application's Premise: „ALL-IP", but NOT „IP alone" !

- **IP** was initially designed as a „dump" pipeline to transport packets between the terminals **of a *wired network*.**
- **Yet**, IP does work only in tuples with other control & management protocols ***on top of IP***:
- Thus, **TCP and UDP** were designed to support the two basic Internet services: reliable/connection-oriented and unreliable/connectionless to handle latency and packet loss.
- **Later**, even these mechanisms were not sufficient enough to support *new media, services and applications*. This is how protocols such as **XTP, RTP, RTSP, RTCP, RSVP, MPLS, etc.** emerged.

However, there are no control mechanisms for packet loss due to access fluctuations in mobile wireless networks.

Therefore, we have to shift the packet control & management paradigm to the layers *under IP* and truly „embrace" - [ ] - IP within the application and the media access.

The Idea: *MediaPEP*
Adaptable QoS Management for Mobile Multimedia Services in UMTS



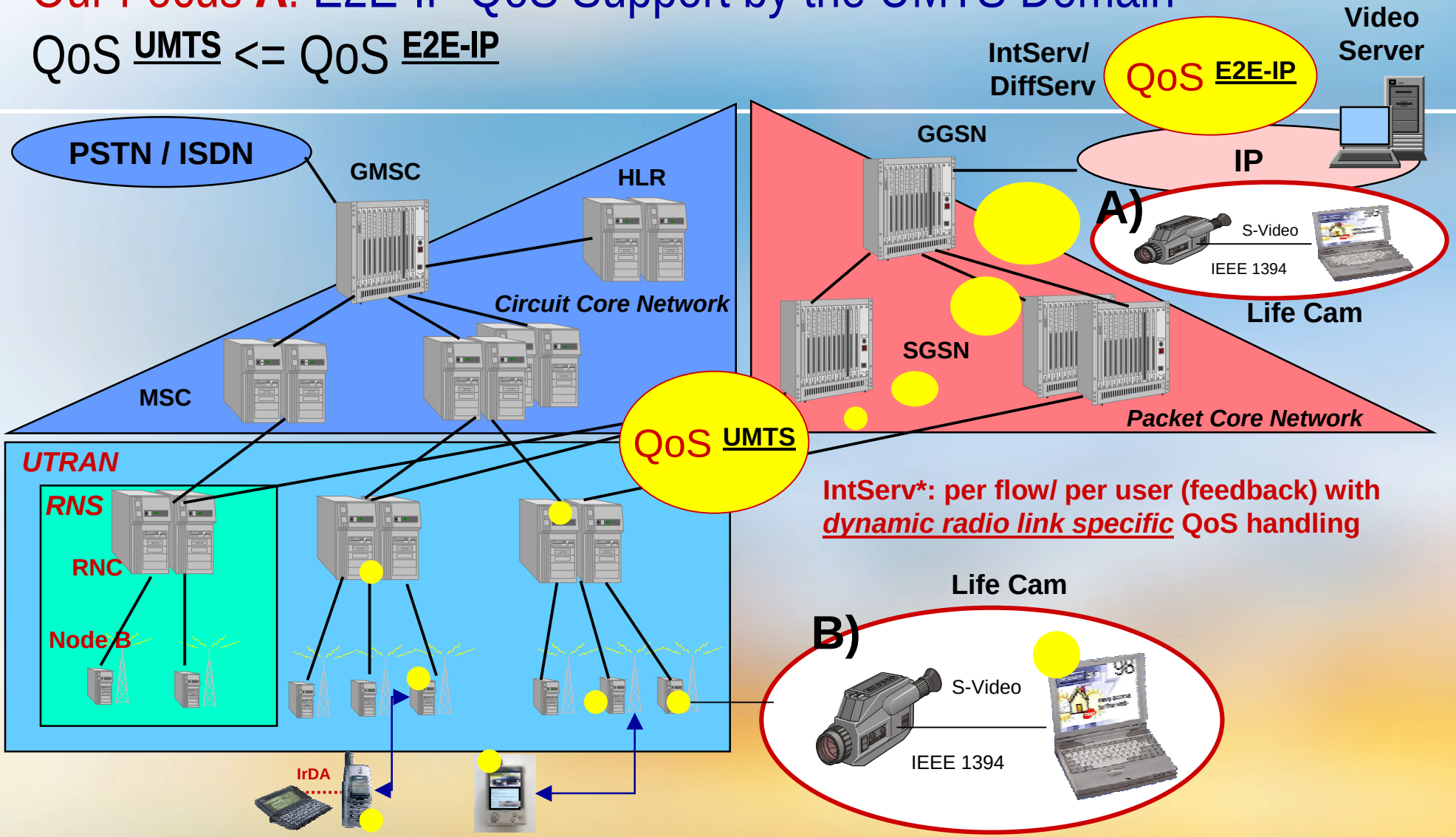
MediaPEP = Media Performance Enhanced Proxy = QoS Management Server, Internet Protocol Booster & Media Transcoder Switch

What are we expecting ?

1. **Media Performance Enhanced Proxy**
   - ***ActiveUMTS* QoS Management Server: Prototype**
   - **MPEG-4 MAC-IP Booster: Prototype**
   - ***Adaptive* MPEG-4 Transcoder Switch: Prototype**
2. **Error-robust Mobile MPEG-4 Video Conferencing System MINT: Prototype**
3. **UMTS Conform E2E-IP QoS Methodology and Algorithms: Implementations**
4. **Source Code**
5. **Documentation: FSpec (level 1 & 2)**
6. **Test Reports**
7. **IETF RFCs**
8. **Patents**

Our Focus **A**: E2E-IP QoS Support by the UMTS Domain

QoS **UMTS** <= QoS **E2E-IP**



Our Focus **B**: Selection Criteria for QoS Management Functions

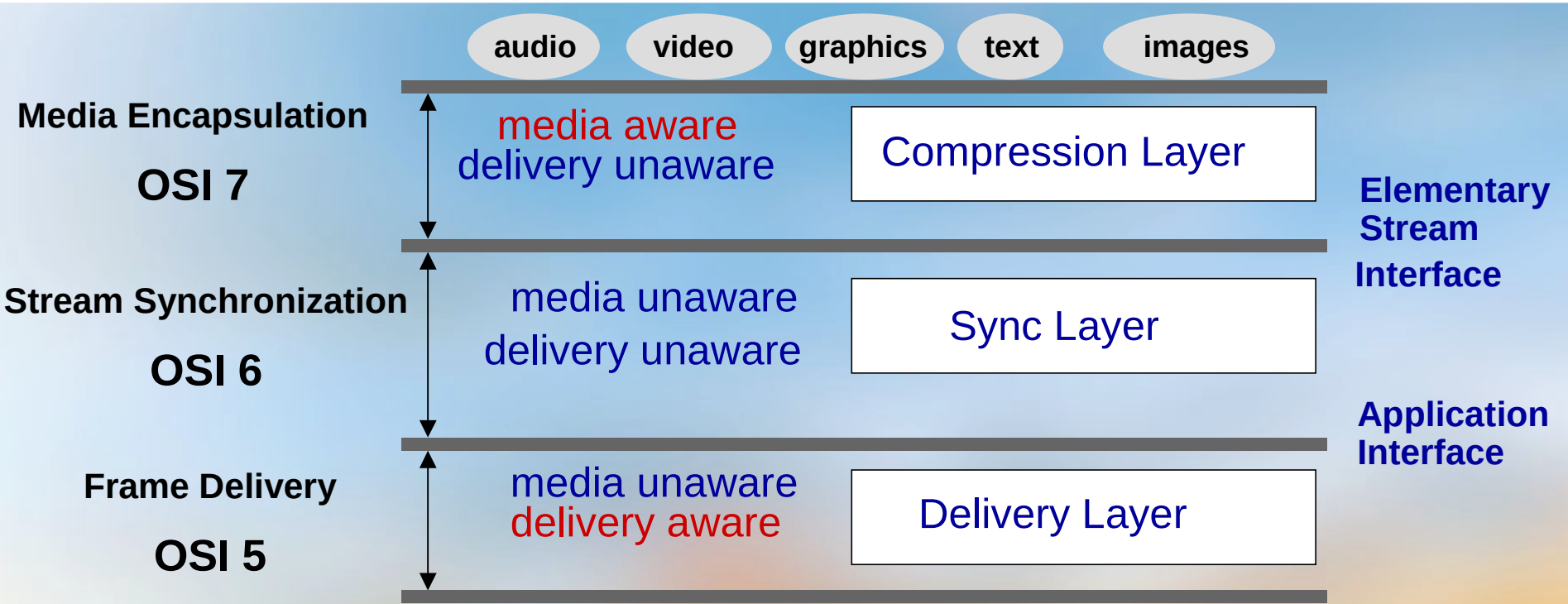
Objective: Configurable On-Demand QoS Method System

QoS Selection Criteria

1. ***UMTS & ETSI standardization***
2. ***QoS principles***
3. ***QoS specification***
4. ***QoS architecture***
5. ***QoS mechanisms***

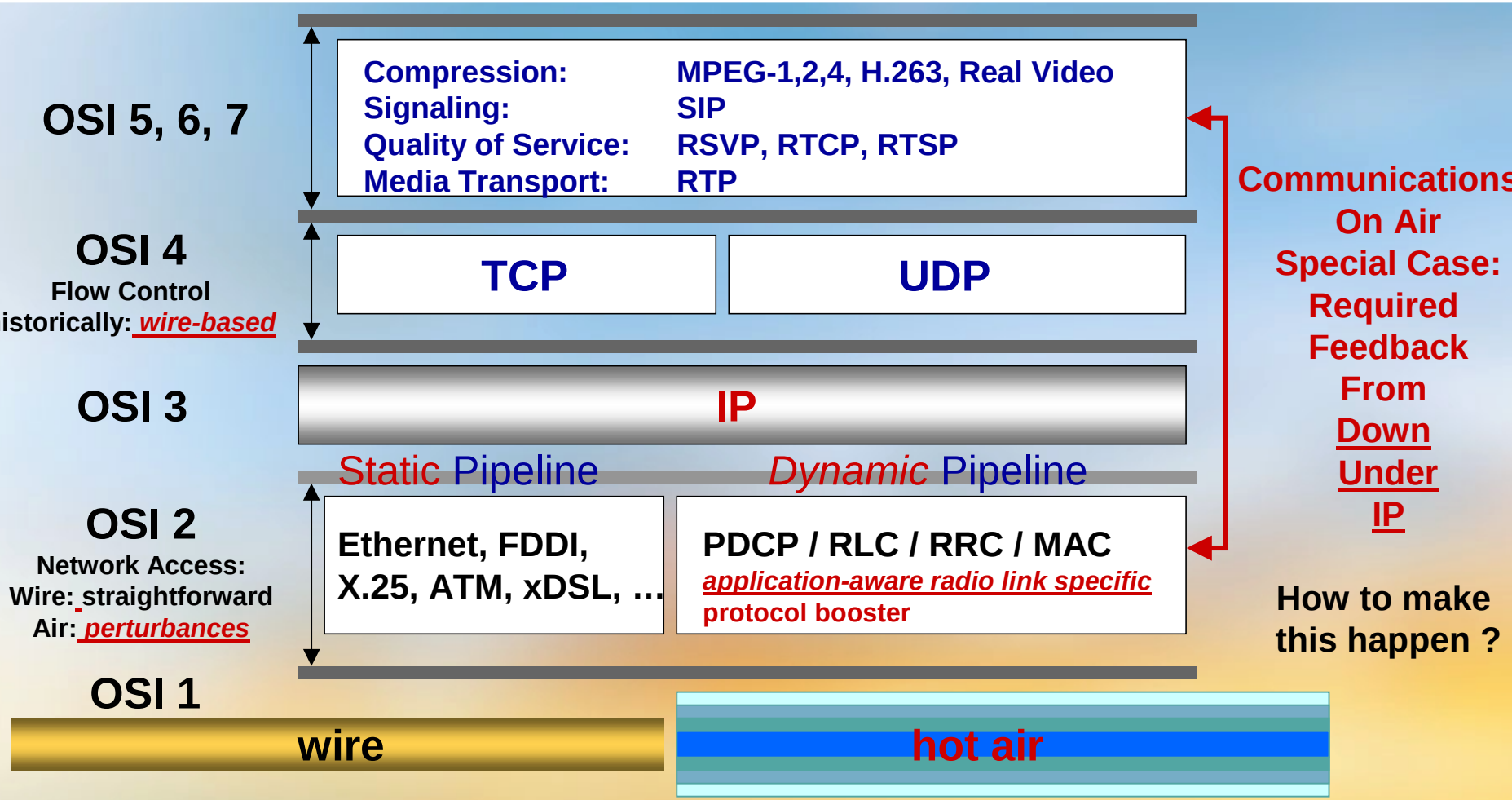
1. ***QoS provision (mapping, admission, reservation)***
2. ***QoS management (monitoring, availability, degradation, maintenance, scalability)***
3. ***QoS control mechanisms (scheduling, shaping, policing, flow control, flow* synchronization)**

Our Focus **C**: Mobile Multimedia Applications → Horizontal Integration or E2E Optimized Synchronous Delivery of Different Media Types

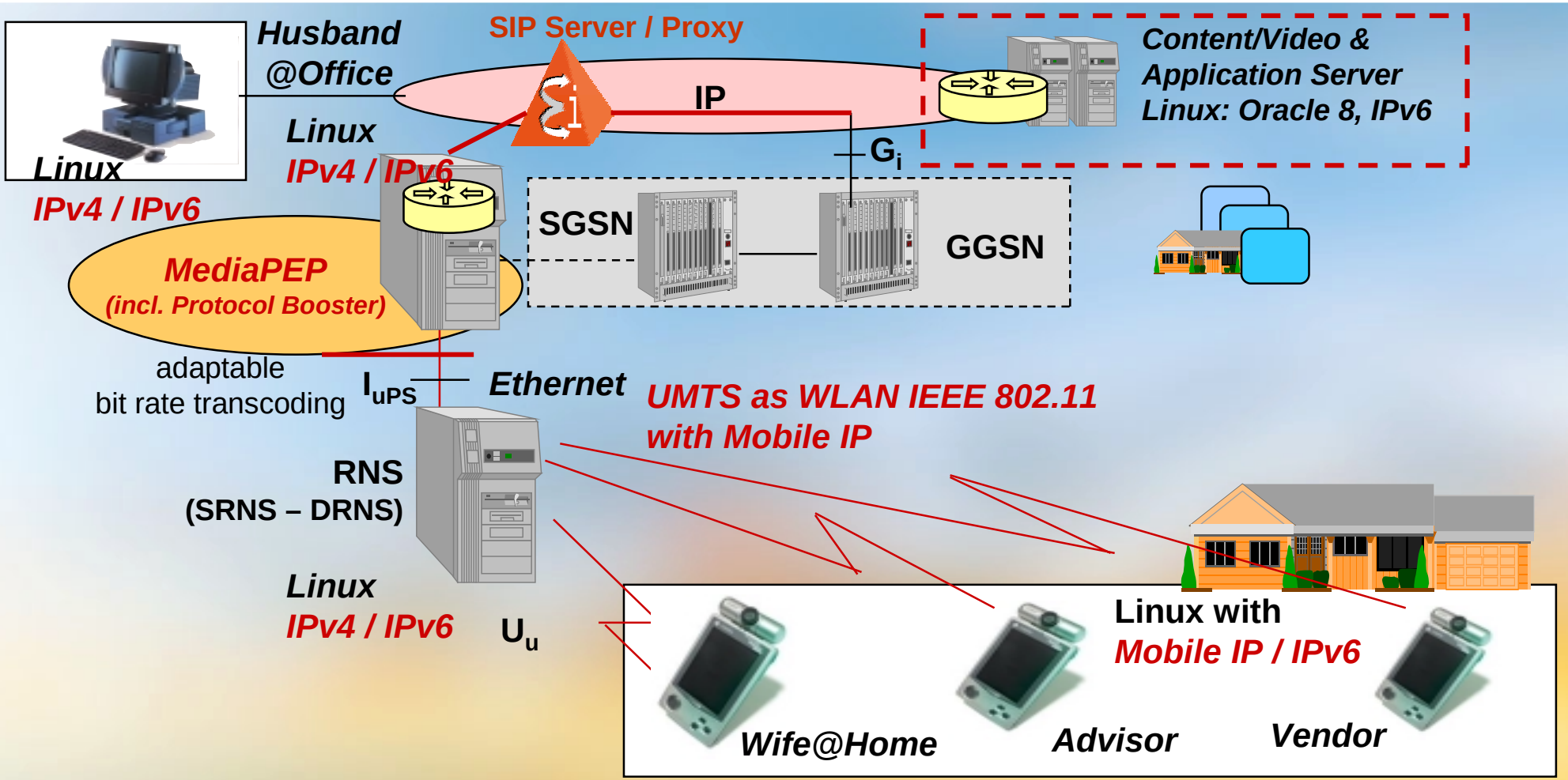


- ***Compression* Layer (OSI 7, Application)** performs media encoding and decoding of Elementary Streams
- ***Sync* Layer (OSI 6, Presentation)** manages Elementary Streams, their synchronisation & hierarchical relations
- ***Delivery* Layer (OSI 5, Session)** ensures **transparent access to content** irrespective of delivery technology
- The boundary between the Compression Layer and the Sync Layer is named **Elementary Stream Interface**
- The boundary between the Sync Layer and the Delivery Layer is named **Application Interface**

The Requirement: Embracing IP or Vertical Integration of Mobile Multimedia **within [IP]**



The Solution: An *ActiveUMTS* QoS Management Architecture for a Real Time Joint Viewing Telepresence Service in m-Commerce: Trial Configuration



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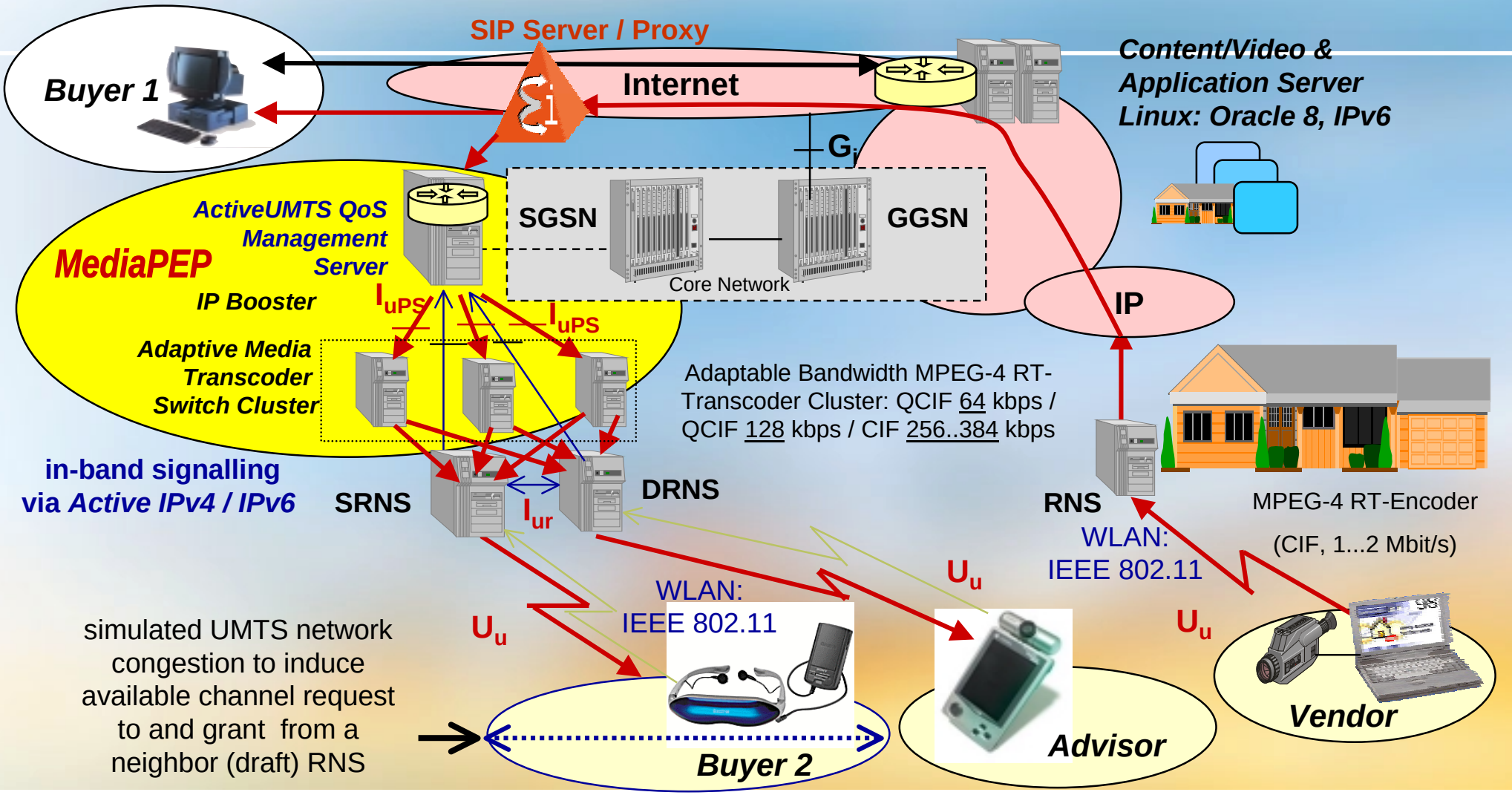
MediaPEP, an *ActiveUMTS* QoS Management Architecture for a Real Time Joint Viewing Telepresence Service in m-Commerce: FutureLab Implementation Details



Information and Communications