MultimEDia transport for mobIlE Video AppLications

ITG 5.2.4 Workshop on Traffic Management for Mobile Networks

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DOCOMO Euro-labs

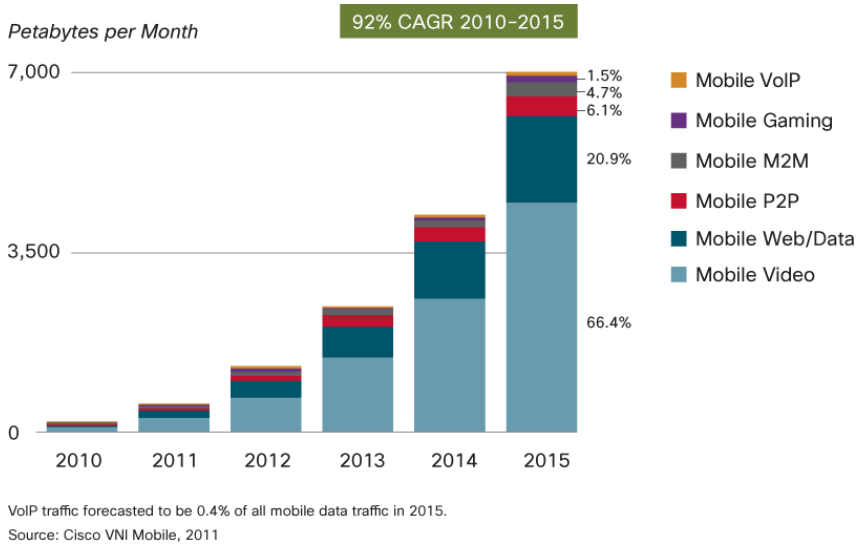
Outline

- The MEDIEVAL project
- DOCOMO focus
  - Traffic optimization for mobile networks
  - Demo scenarios

The MEDIEVAL project

Motivation

- **Video** is a major **challenge** for the future mobile networks



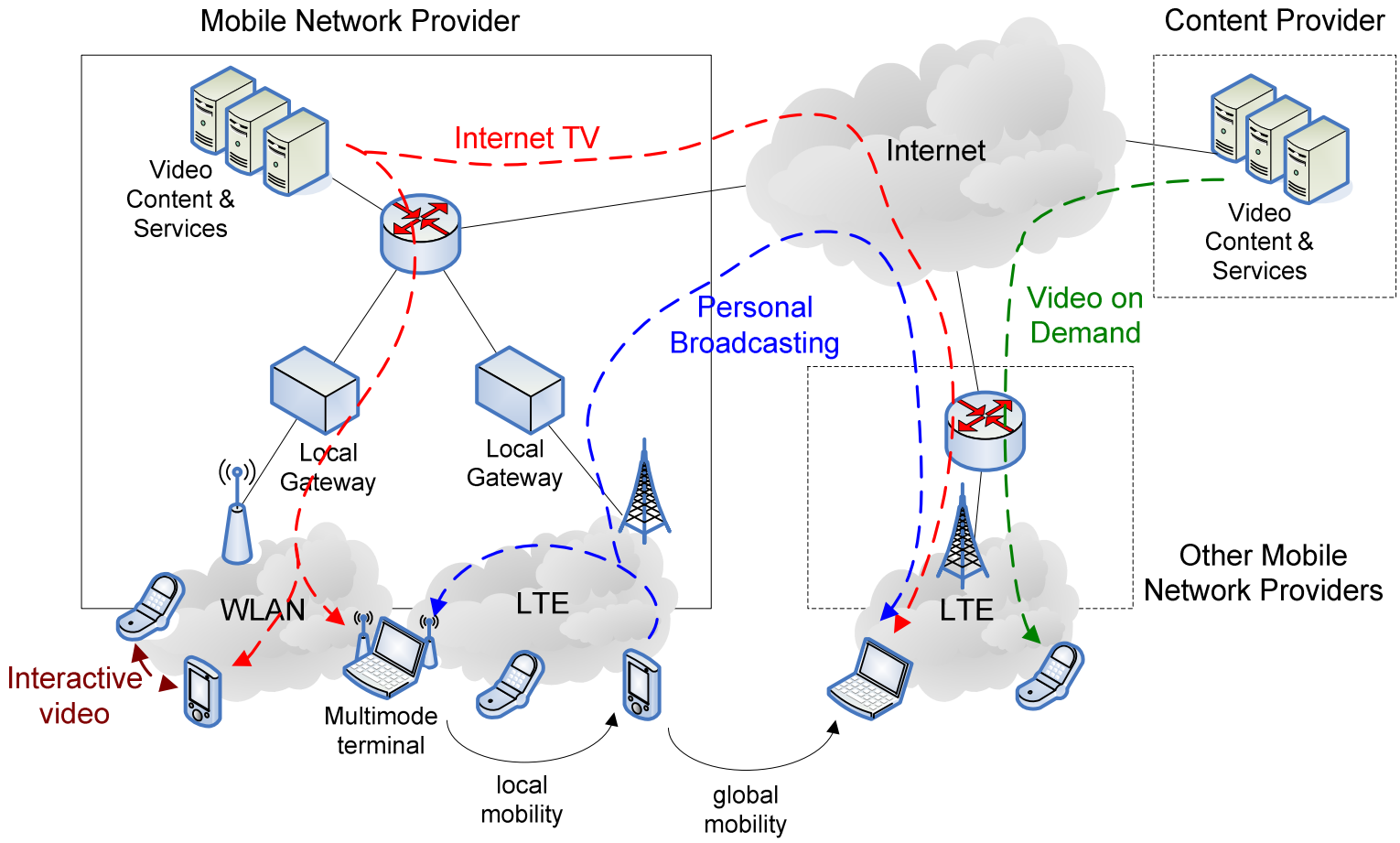
VoIP traffic forecasted to be 0.4% of all mobile data traffic in 2015.
Source: Cisco VNI Mobile, 2011

- Current mobile network **IS NOT** designed for **video**
  - Today's architectures are very inefficient when handling video
  - Future network architecture should be tailored to efficiently support the requirements of this type of traffic
  - Specific **enhancements for video** should be introduced **at all layers** of the protocol stack where needed

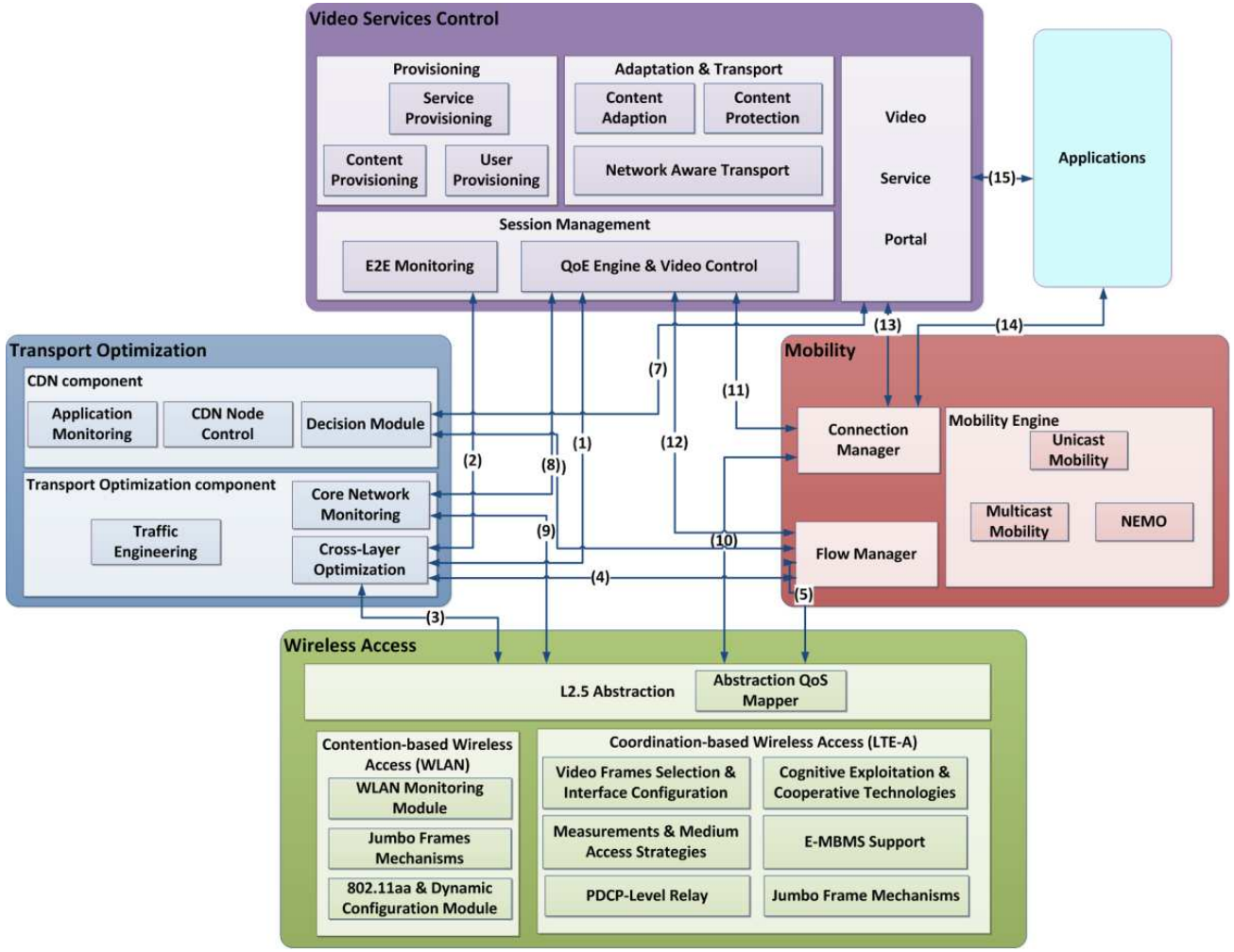
The MEDIEVAL project

- MEDIEVAL is an **operator-driven** project specifying and demonstrating a **mobile video** architecture with **cross-layer** mechanisms to provide high quality of experience to users

Vision


Mobile Network Provider
Content Provider
Video
Content &
Services
Internet TV
Internet
Video
Content &
Services
Personal
Broadcasting
Video on
Demand
Local
Gateway
Local
Gateway
WLAN
LTE
LTE
Other Mobile
Network Providers
Interactive
video
Multimode
terminal
local
mobility
global
mobility

Functional Architecture of MEDIEVAL

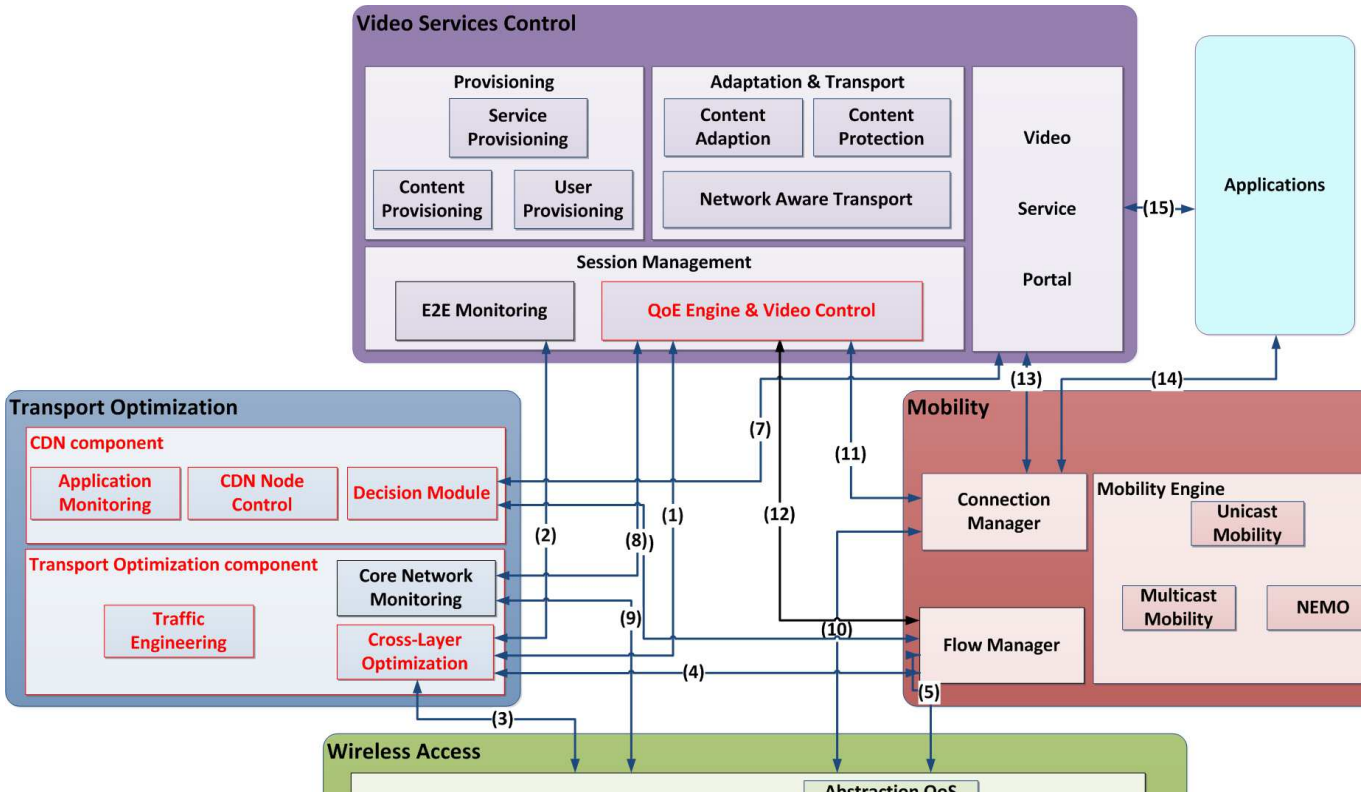


4 subsystems

- Video Services Control
- Transport Optimization
- Wireless Access
- Mobility

Functional Architecture of MEDIEVAL

- DOCOMO focus: transport optimization solutions
  - QoE-based cross-layer optimization
  - Mobile CDN



Traffic optimization for mobile networks

Video sensitivity

- QoS is not enough for video delivery
- Objective video quality assessment
  - PSNR, SSIM, etc.
  - Mapped to Mean Opinion Score (MOS)

- Data rates vs. perceived quality
  - Different “sensitivities”
  - Understanding the impact of resource allocation

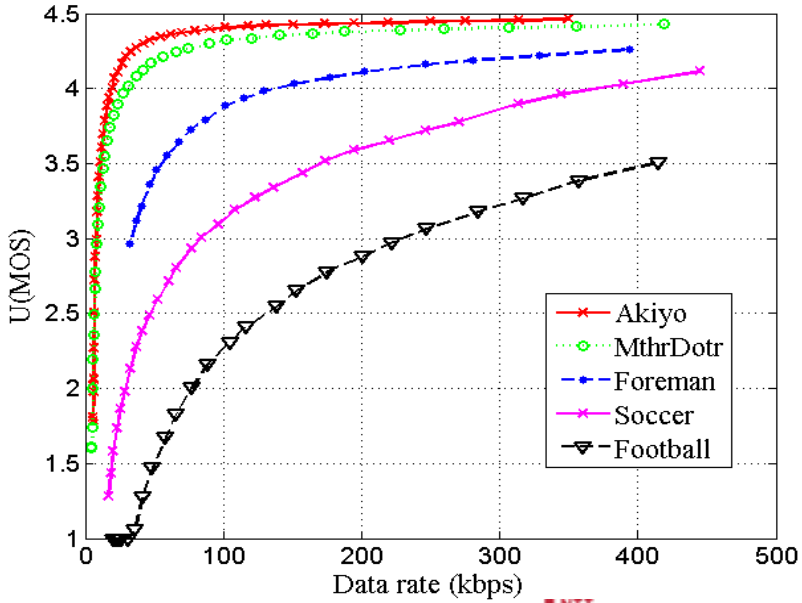
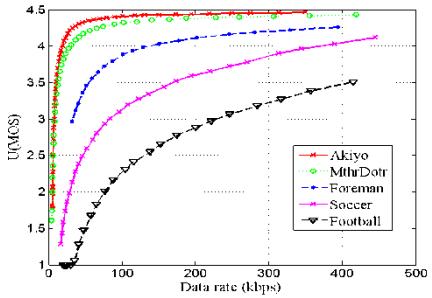
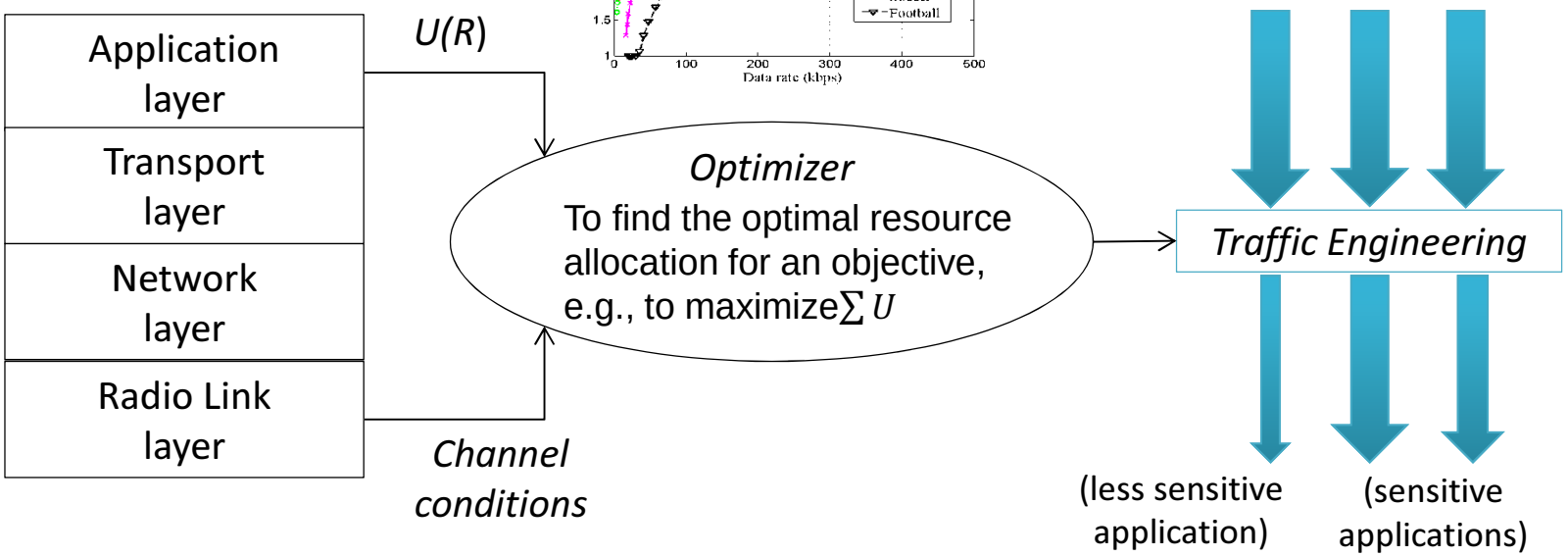


Fig. source: Thakolsri. S, et al. QoE-based cross-layer optimization of wireless video with unperceivable temporal video quality fluctuation

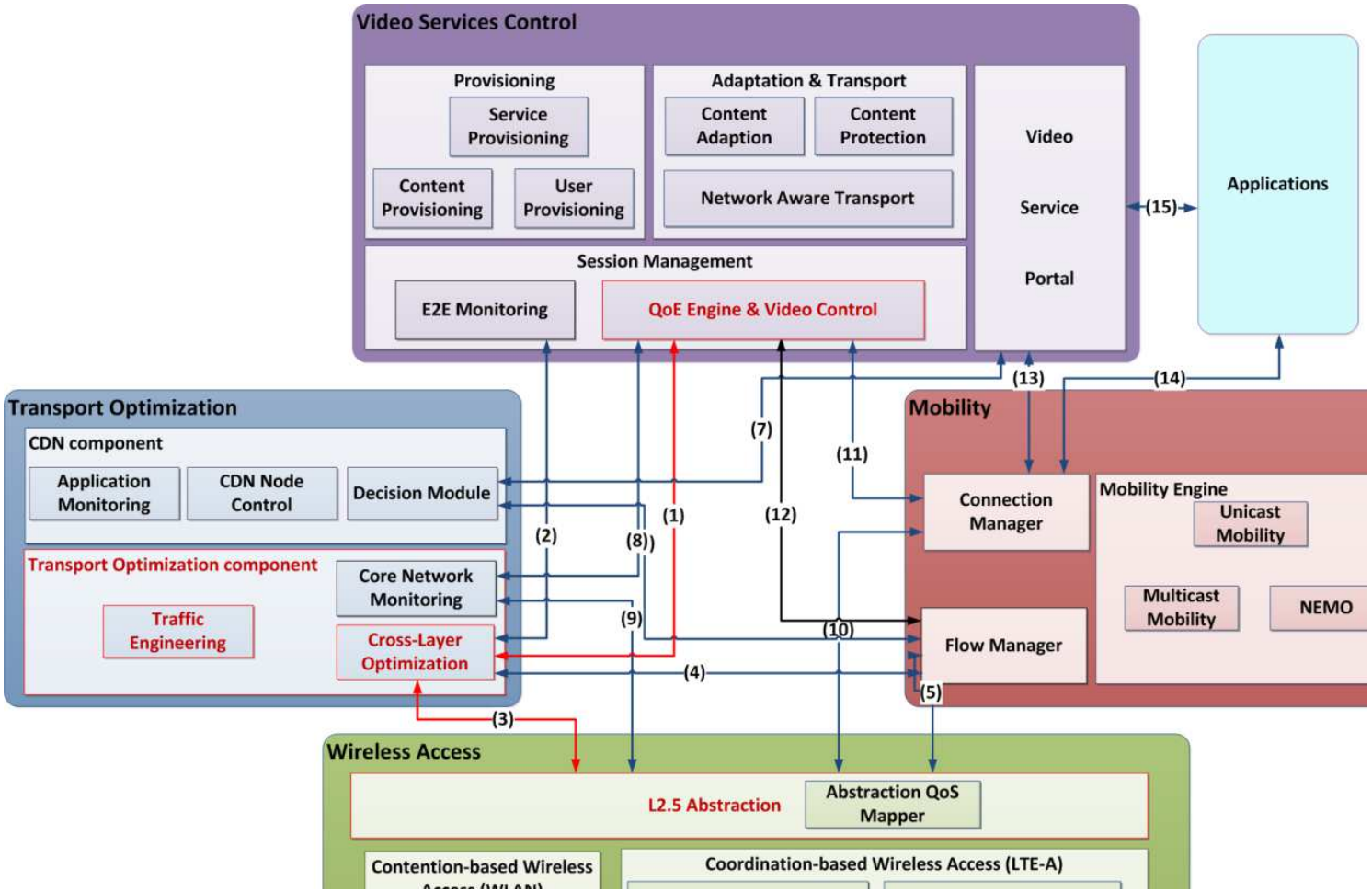
QoE-based traffic management

- QoE-based cross-layer optimization
  - The resource allocation aims to maximize overall QoE of multiple users
  - The overall QoE is optimal in network congestion scenarios



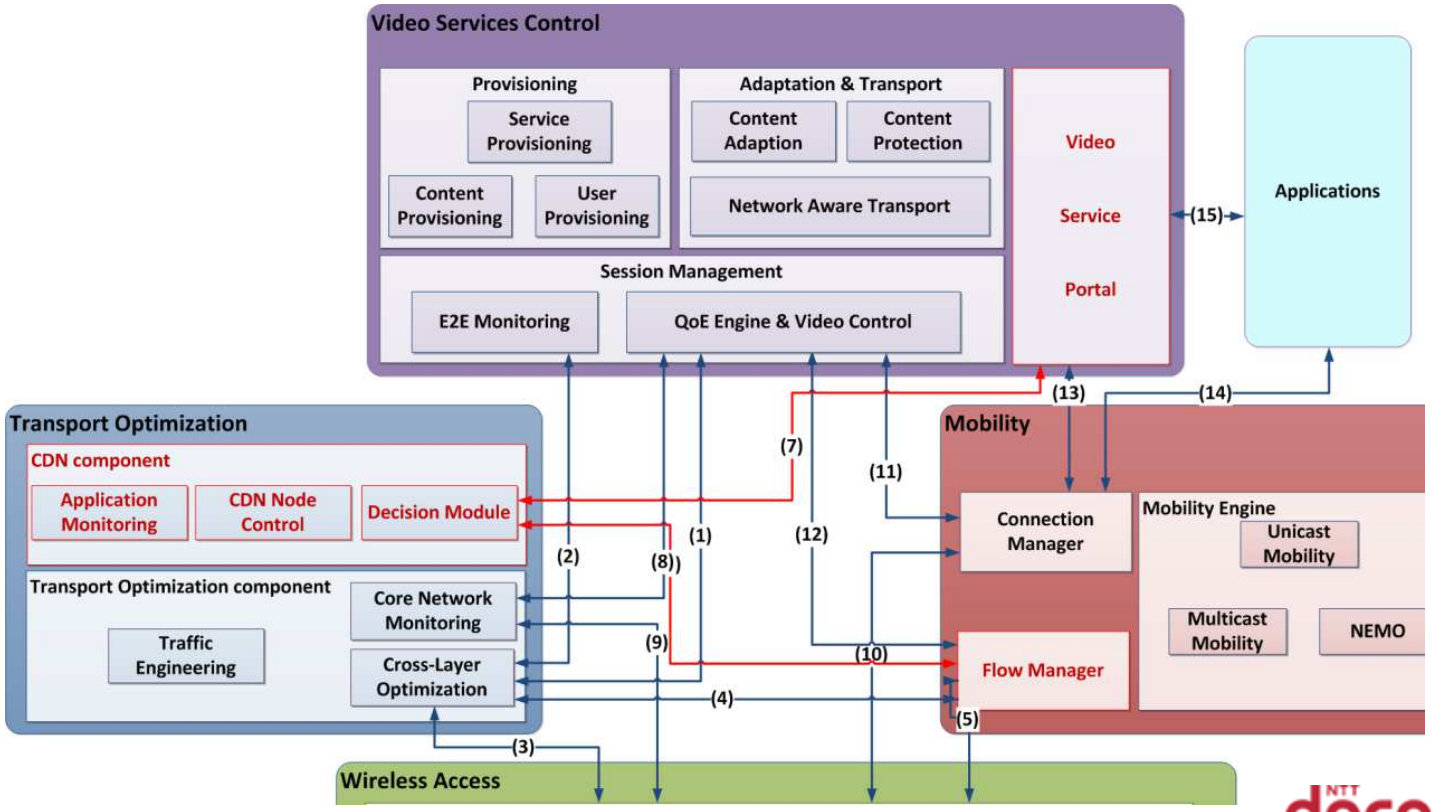


QoE-based Traffic Management in MEDIEVAL



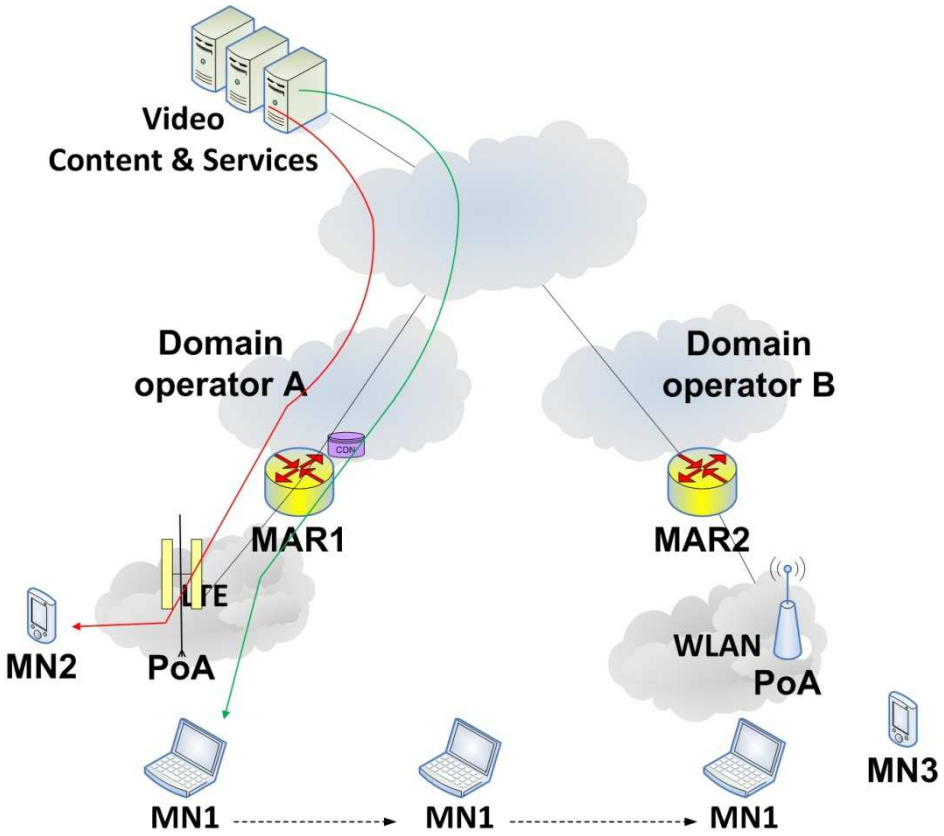
Mobile CDN

- Optimal placement and management of CDN nodes and optimal selection of content locations
- Performing load-balancing among the cached video sources and network elements, as well as relaying connections for mobility, caching, or confidentiality reasons



Demo scenarios

Demo A: Inter-operator scenario

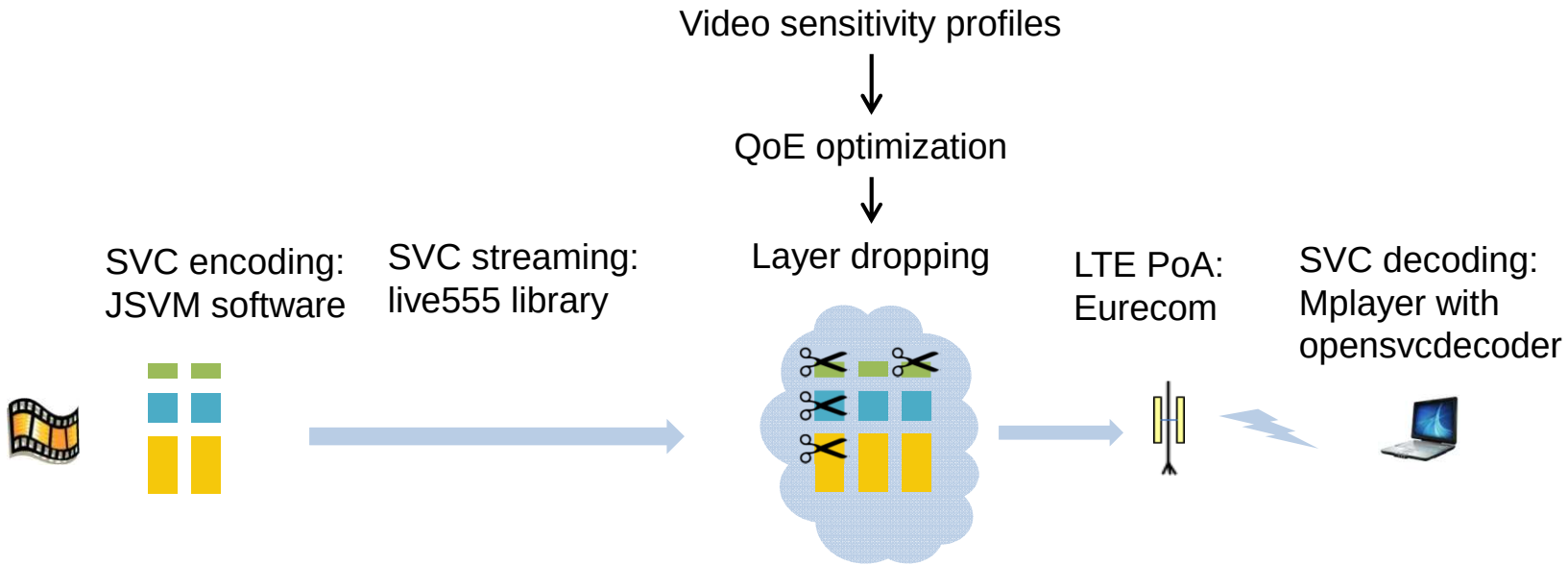


MAR: Mobility Access Router
MN: Mobile Node

- The scenario
  - Video services use SVC streaming
  - A terminal moves from MEDIEVAL-enabled domain to non-MEDIEVAL domain
  - In both domains congestion occurs
- To show the advantage of QoE-based traffic management in congestion scenario

Demo A: Inter-operator scenario

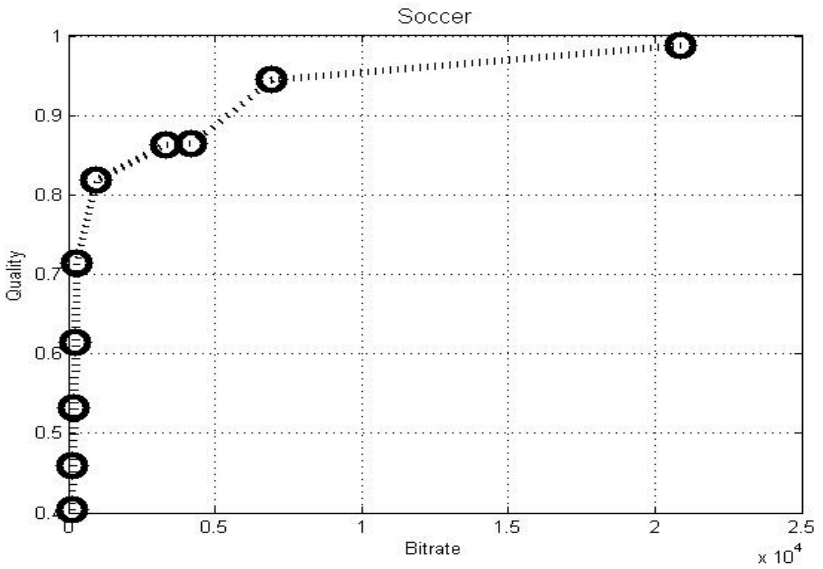
- The prototype for congestion handling in MEDIEVAL-enabled domain
  - resource allocation of all users based on sensitivities of different videos
  - SVC layer dropping for fine quality degradation
  - packet marking enables fast dropping in core and LTE access



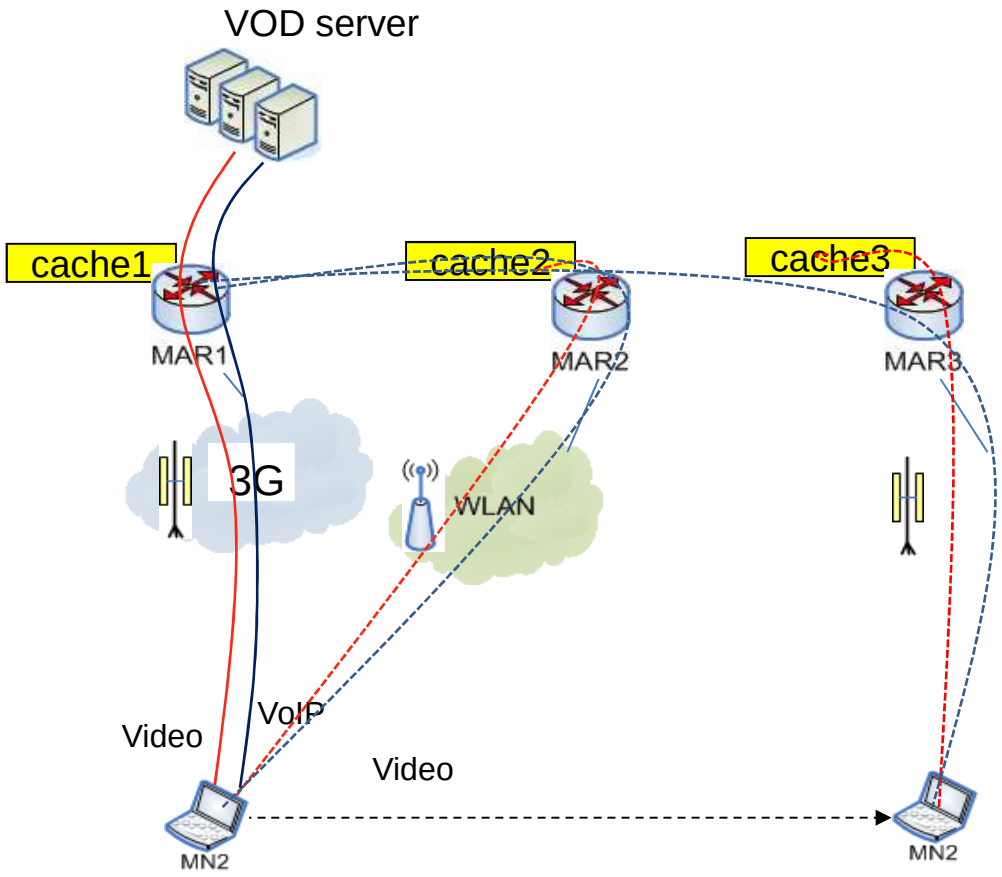
Demo A: Inter-operator scenario

- Example of SVC-encoded video sensitivity
  - Soccer video in 4CIF, 30fps is encoded in 30 Layers
    (2 spatial layers) x (5 temporal layers) x (3 quantization layers)
  - The quality envelop tells the dropping order
    each point tells 3-dimension information (layers, bitrate, quality)

Layer	Bitrate	Quality
(1,4,2)	20880.0	0.988494
(1,4,1)	6922.0	0.945055
(1,4,0)	4202.0	0.864700
(0,4,2)	3300.0	0.863223
(0,4,1)	963.1	0.819280
(0,4,0)	276.8	0.714704
(0,3,0)	231.0	0.614261
(0,2,0)	188.4	0.532213
(0,1,0)	150.1	0.459336
(0,0,0)	118.5	0.404121



Demo B: VoD reference scenario



MAR: Mobility Access Router
MN: Mobile Node

- The scenario
  - The video is available in the VoD server and the caches
  - A terminal is using VoD and VoIP services
  - While it is moving around, the best cache is selected to serve the terminal
- To show the capability of mobile CDN in mobility scenario
- Demonstrated MEDIEVAL features
  - CDN & Mobility integrated solutions
  - DMM based intra-domain handover (both between homogeneous and heterogeneous PoAs)
  - WiFi Offload support

Summary

- MEDIEVAL targets to evolve the future mobile networks for video delivery
- DOCOMO focus on transport optimization solutions. In particular, to cope with network congestions, QoE-based traffic management improves the overall QoE of multiple users, mobile CDN alleviates the load of networks
- Demo scenarios are designed to demonstrate multiple MEDIEVAL features

Thank you for your attention

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