

Reference Measurement Points for Validation end-to-end QoS in Heterogeneous Multiple Domain Network

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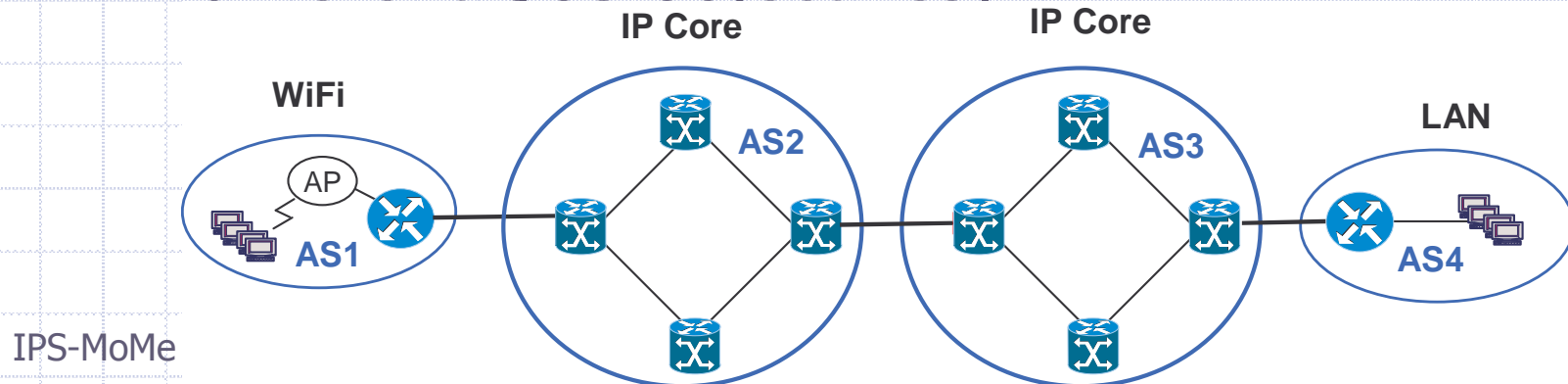
Outline

- ◆ Introduction
- ◆ Reference Locations of Measurement Points
- ◆ Management of measurements
- ◆ Summary

Introduction (1)

◆ Modern IP networks:

- n usually consist of multiple domains built based on different technologies, like IP DiffServ, xDSL, WLAN, LAN, etc.
- n should provide QoS guaranties (by offering a set of network services with different OoS objectives)



Introduction (2)

- ◆ The role of Monitoring and Measurement System (MMS) is essential to:
 - n Validate the actual QoS level offered to users
 - n Support traffic control, like admission control, traffic engineering

- ◆ The key elements of MMS we deal with are:
 - n proper location of measurement points (MP) inside a network
 - n effective management of measurements

Reference Locations of MPs (1)

◆ Goal: define places in a network that allow to collect required measurements, related with offered QoS, carried traffic...

◆ Constraints:

n different technologies,

n different network services offered:

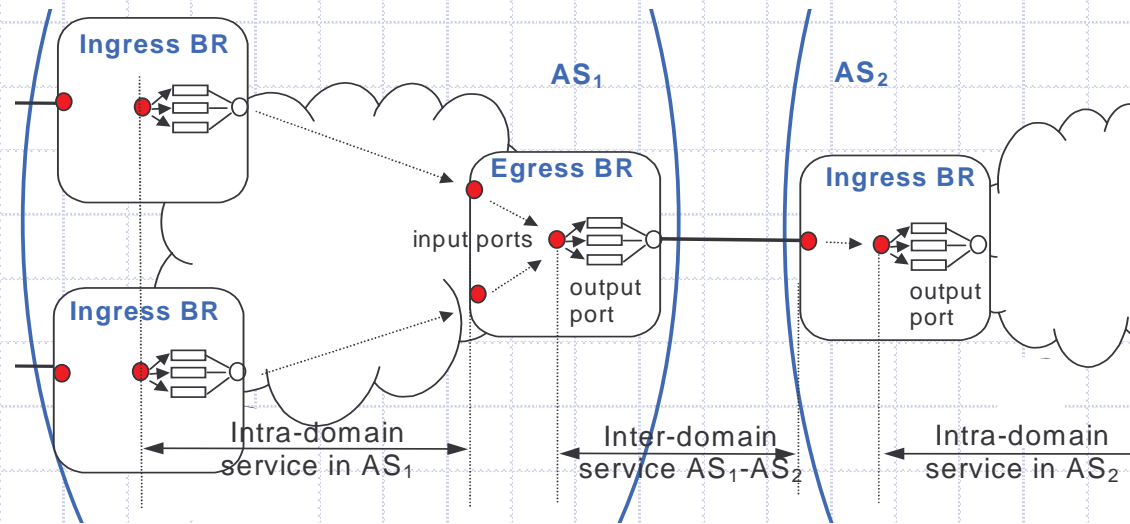
w by particular network technologies

w inside particular domains and on inter-domain links

Reference Locations of MPs (2)

◆ Solution:

- n to perform measurements on IP layer
- n to place MPs in the points where particular service begins or ends to operate



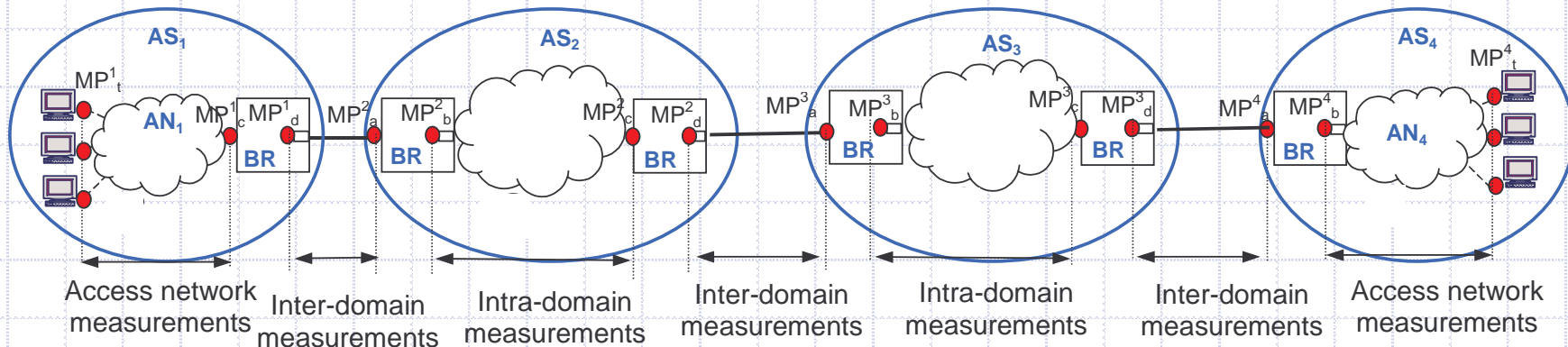
Reference Locations of MPs (3)

◆ For core network:

- n MP_a^X – at input interface of the ingress border router
- n MP_b^X – at entrance to the queue of output interface of the ingress border router.
- n MP_c^X – at input interface of the egress border router.
- n MP_d^X – at entrance to the queue on the output interface of the egress border router.

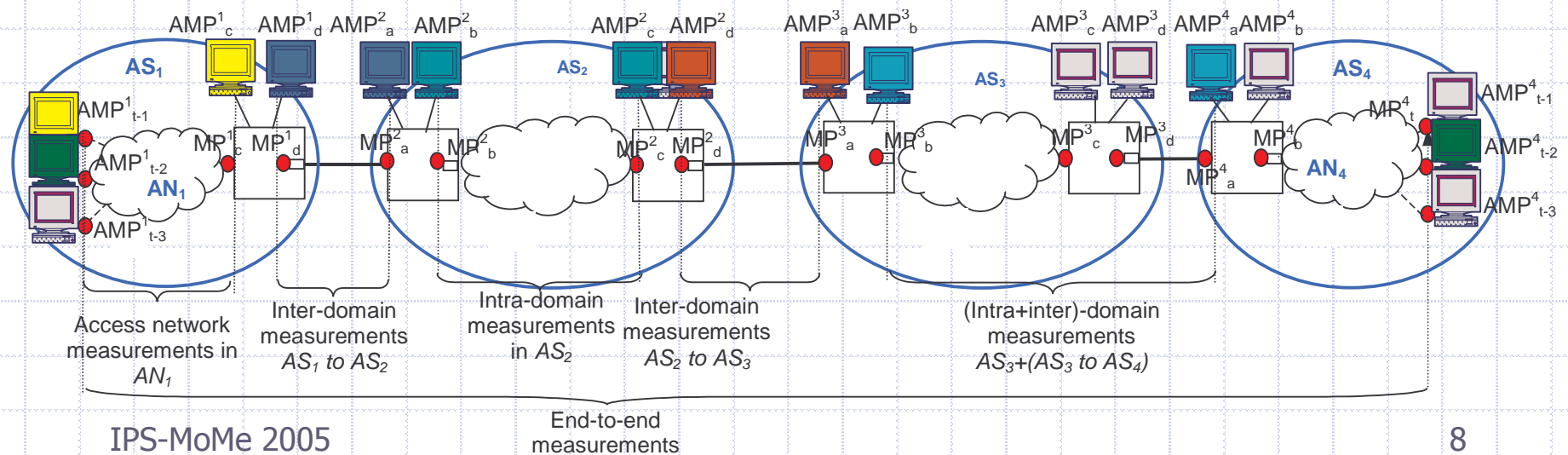
◆ For access network:

- n MP_t^X – at IP interface of the user terminal



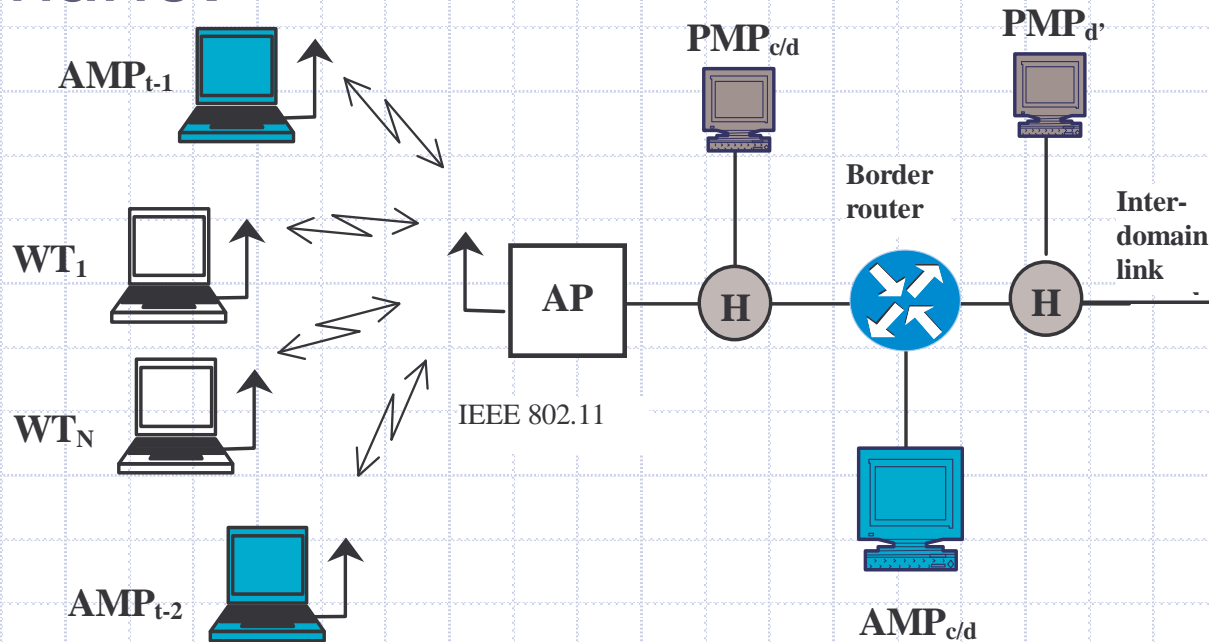
Deployment of measurement equipment (1)

- ◆ Deployment of MPs require to:
 - n overcome limited access to the routers
 - n consider different types of measurements (active and passive)
 - n take into account internal architecture of access network



Deployment of measurement equipment (2)

◆ Exemplary WLAN access network scenario:



WT_i : Wireless Terminal $i=1,..N$
 AMP: Active Measurement Point
 PMP: Passive Measurement Point

AP: Wireless Access Point
 H: Passive hub

Management of measurements (1)

- ◆ management with a central controller
- ◆ management with domain controllers and with measurement control protocol
- ◆ management with domain controllers without measurement control protocol

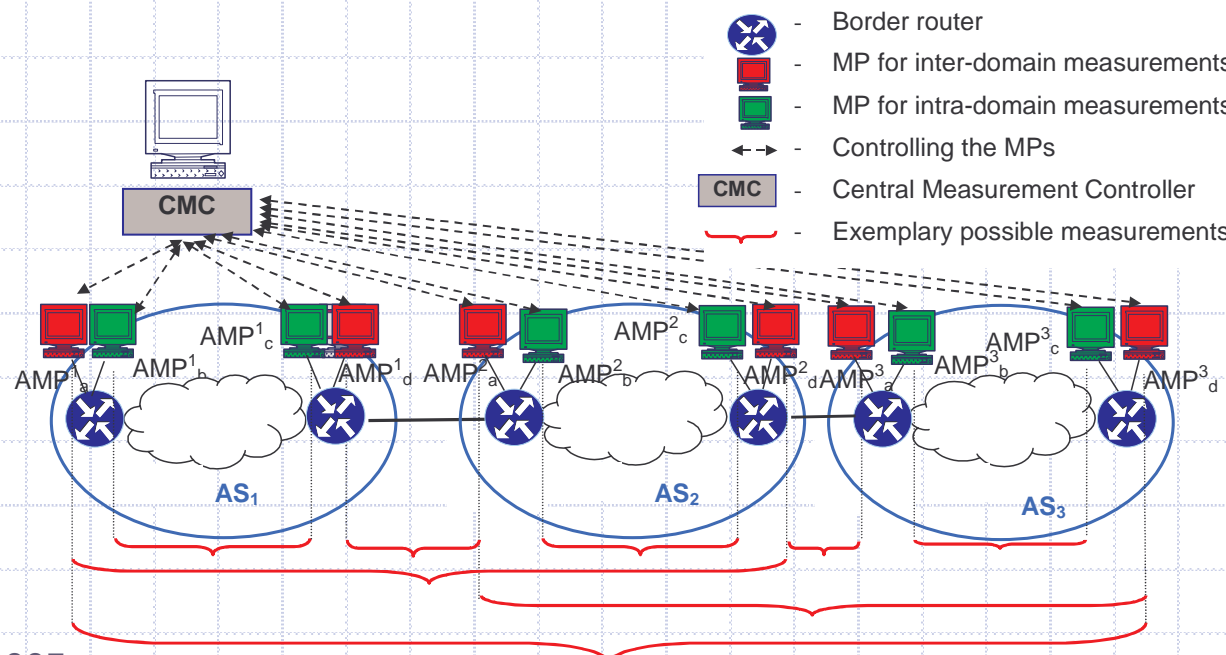
Management with a central controller

◆ Strengths:

- n simplicity
- n straightforward implementation

◆ Drawbacks

- n not scalable!
- n hard to deploy in multi-provider network



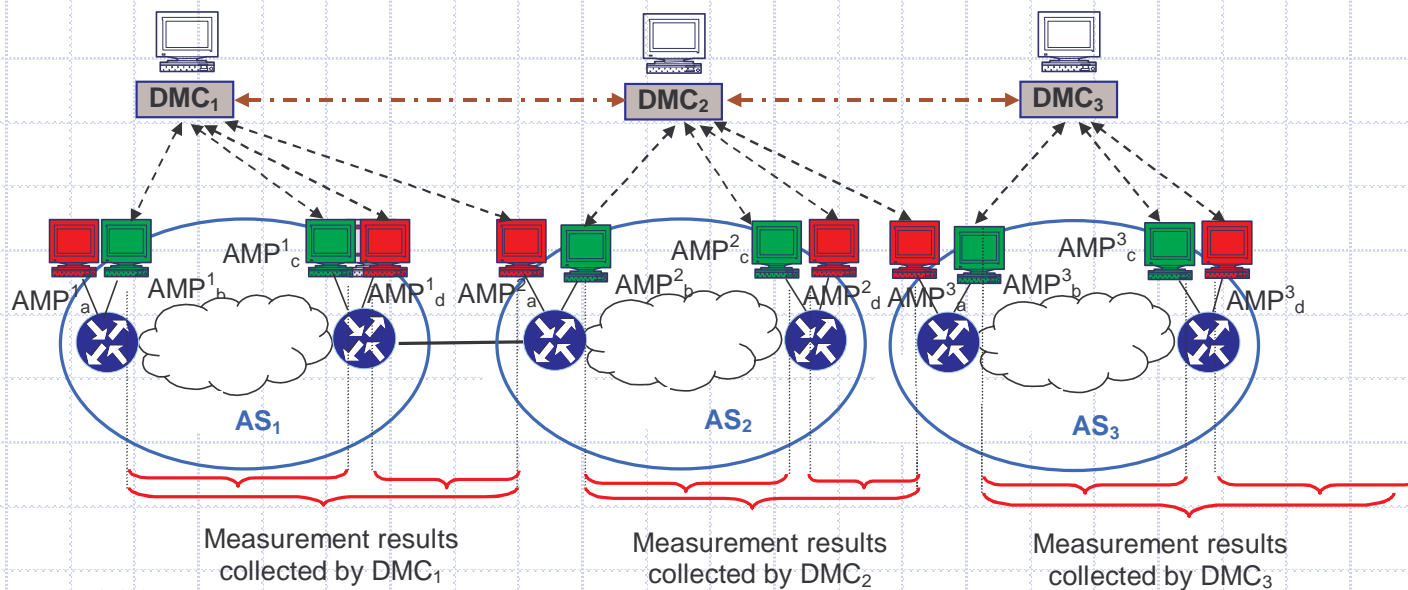
Management with domain controllers and control protocol

◆ Strengths:

- n scalability
- n independency in measurements

◆ Drawbacks

- n complexity
- n accuracy of results



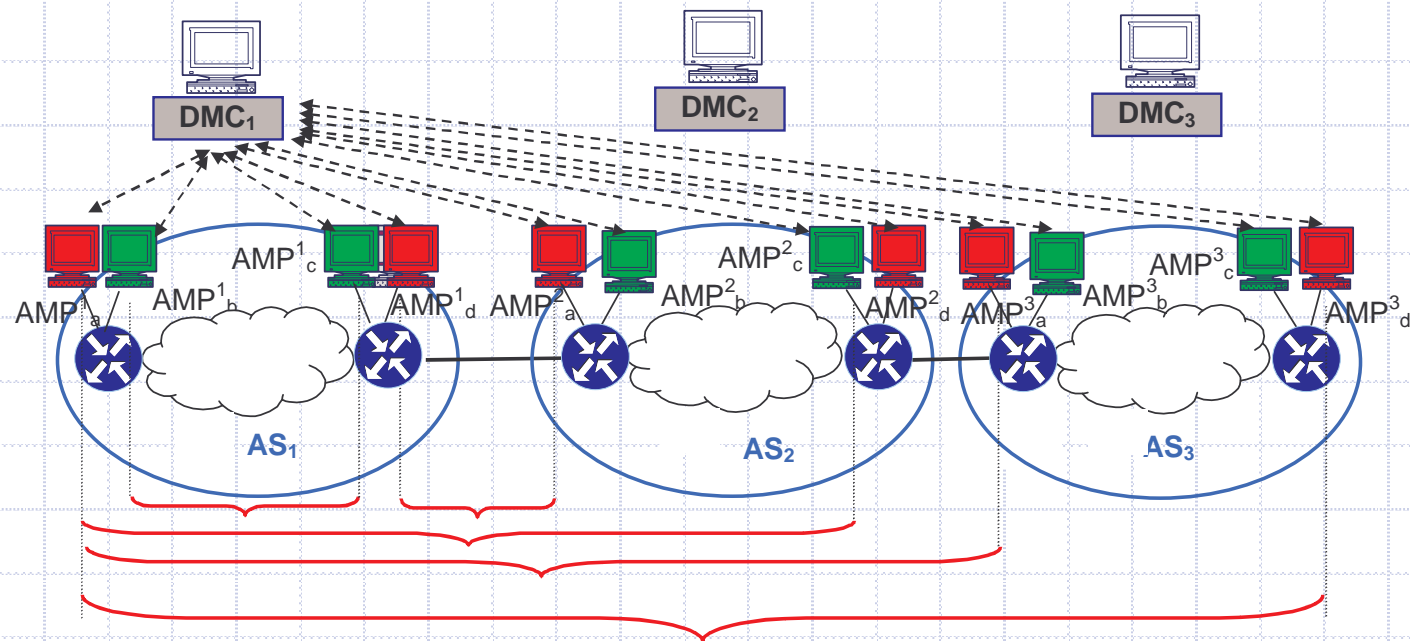
Management with domain controllers but without control protocol

◆ Strengths:

- n scalability
- n independency in measurements

◆ Drawbacks

- n complexity
- n accuracy of results



Summary

- ◆ The reference MPs for validation of QoS in multiple domain, heterogeneous network were proposed
- ◆ The exemplary deployment of MPs was proposed
- ◆ Three schemes for managing measurements were discussed