

Enabling Policy-Based Mobility Management in SAE*

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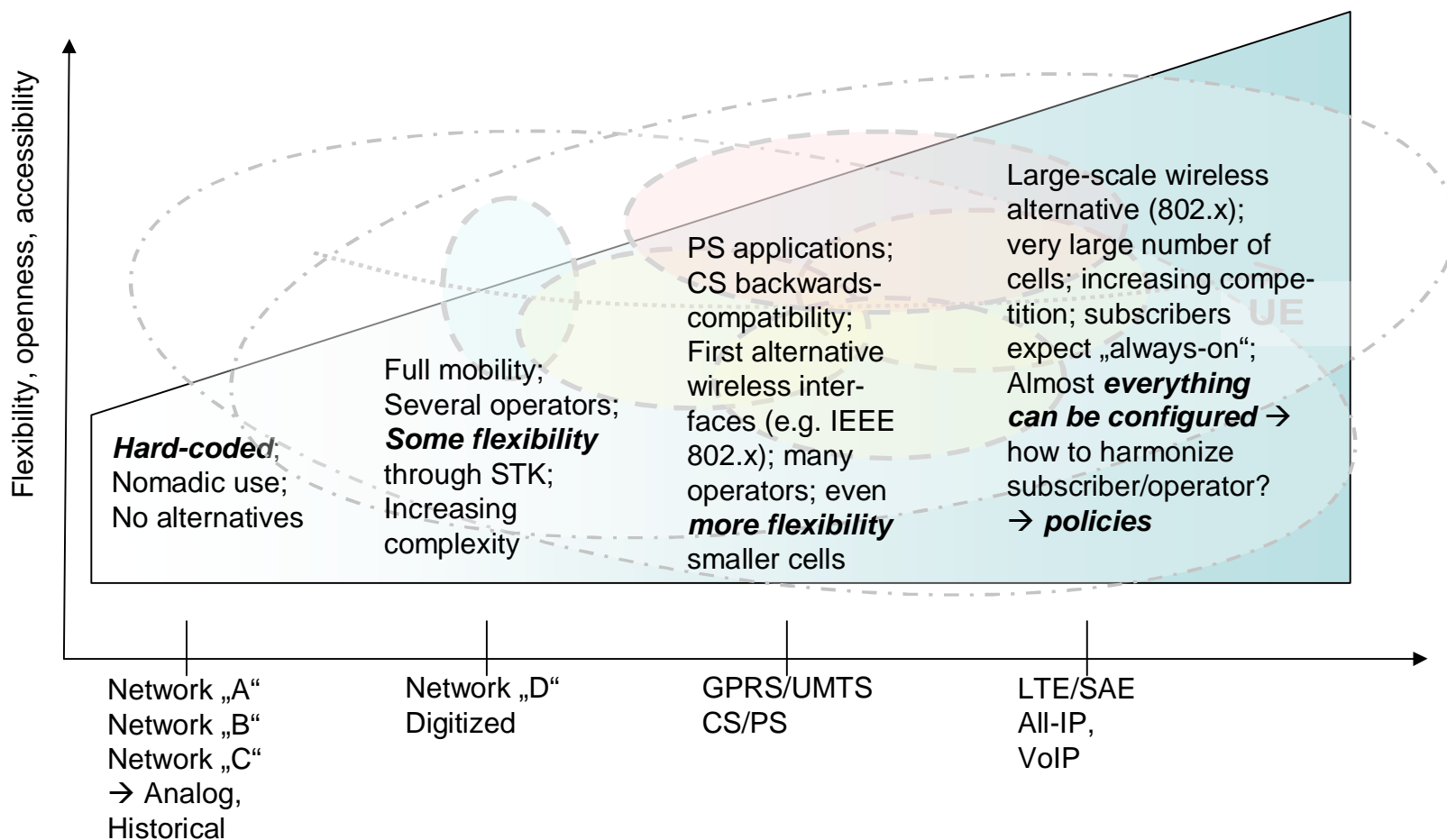
* 3GPP ↔ non 3GPP mobility



Overview

- Interpretation of PBMM
- Requirements for PBMM
 - SAE Architecture
- Prior and Ongoing PBMM activities

Increased Complexity and Flexibility → Increased need for Policies?



The Policy Continuum (J. Strassner)





Interpretation of PBMM and relation with PbQoS

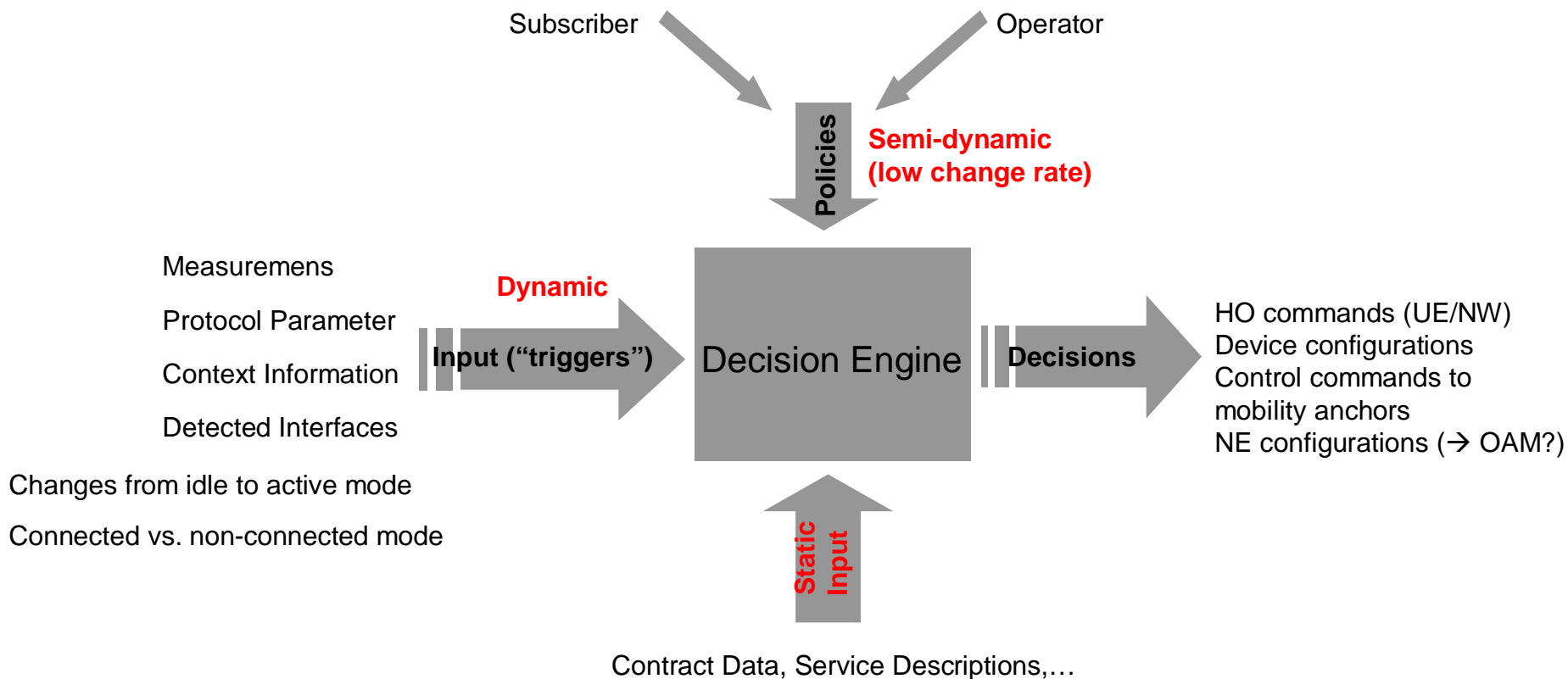
- Policy based management has been adopted for several domains such as QoS, security and VPN (simplified service creation and network mgmt.)
 - Standardized or being standardized in DMTF or IETF
 - But: no standards for mobility policies yet (?)
- How can Policy Based MM be interpreted?
 - Based on triggers and rules, configure and enforce mobility-related NE
 - → Similarity with classical PbQoS (Policy DB, Triggers, Decision Engine, Enforcement, ...)
 - Cyclic operation
 - Additional function: „Mobility Decision Point“
 - Needs to interact with mobility anchors and UE



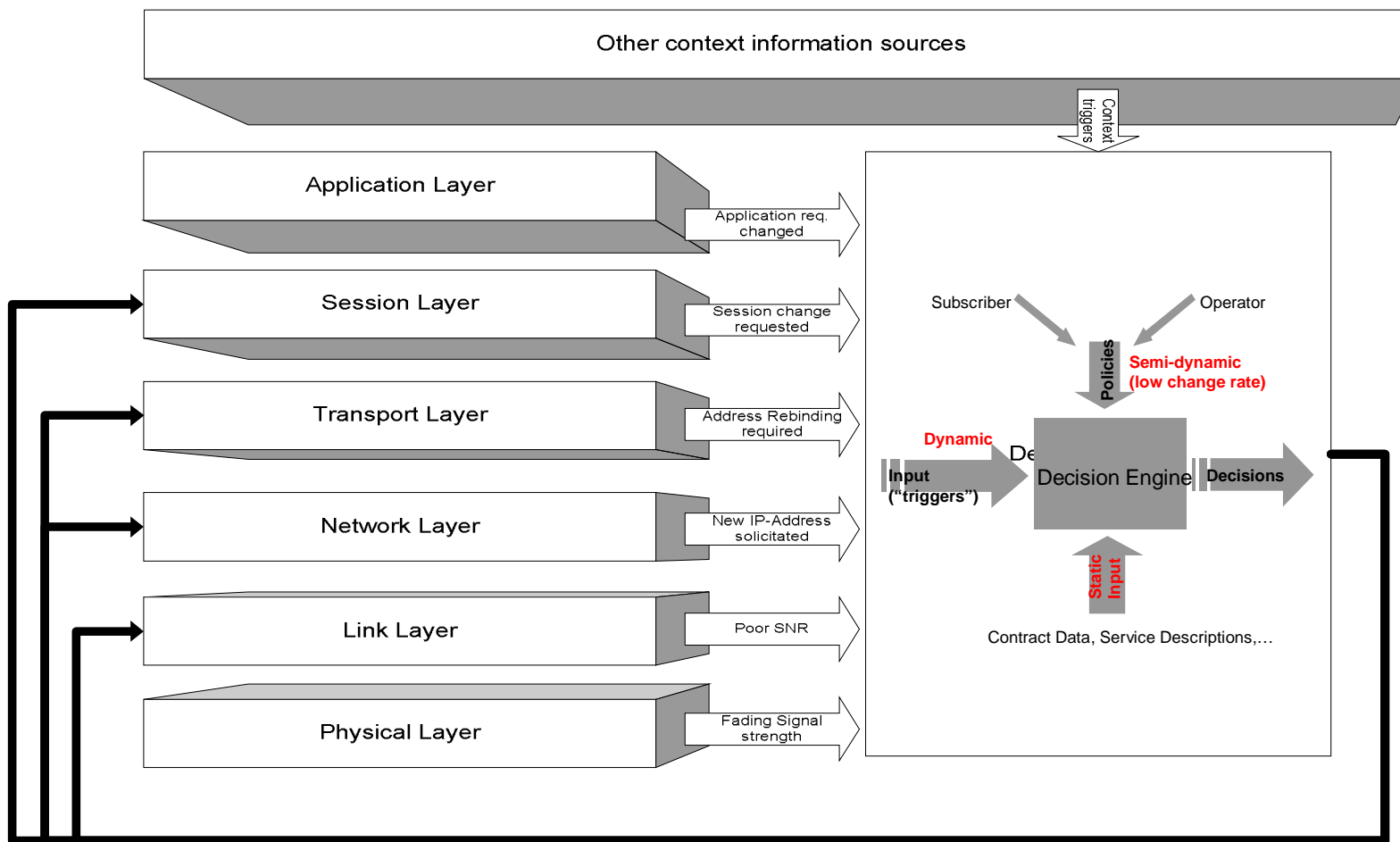
Interpretation of PBMM and relation with PbQoS

- PBMM policy rules specify how to conduct a handover
 - When and how to switch
 - Consideration of user preferences
 - Application QoS requirements
 - Characteristics of UE
 - Access network(s) availability
- The advantage of policy based mobility management over static approaches:
 - Mobility behavior can be changed (for the entire system) by changing some of the rules, or more radically, by introducing or activating a new set of rules in the network and / or UE.

The classical PBMM cycle, adapted to Mobility



Layers & Mobility





Specific input for PBMM decisions

- Radio measurements
 - Network based
 - How to access them (forward data from eNB via aGW to anchor functions and even further?) → currently, the S2 IF is discussed for this purpose.
 - UE based
 - UE sends measurement reports of its received channel quality of 3GPP and Non 3GPP access networks to the PBMM in the core network. UE contacts PBMM entity to request a vertical handover decision.
 - Transfer via which channels?
- Link/Access type information
 - IP does not provide a means for detecting the type of link layer
 - Use segmented IP address space?
 - Lookups in Radius/Diameter DB?
 - Multi-operator / ISP issues / NAT



HO-decision types

- Classical
 - Network-based (e.g. GSM)
 - Device-assisted (measurements)
- More recent
 - Device-based
 - Network-assisted (measurements) as described in <https://www.ist-winner.org/DeliverableDocuments/D4.3.pdf>
- „Extended“ HO decision:
 - **Mobility management includes selection of access technologies even if the user/end-system is not moving!**
(QoS, costs, operator selection, application prefs,)



PBMM as enabler for ABC / ABM

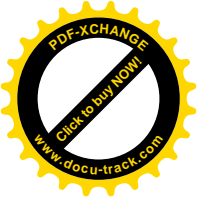
- Motivation: Anticipation of NGMN and new devices to support heterogeneous, overlapping access technologies
- Decide when, whether (at all), where (to) and when to conduct a handover
- HO are:
 - Required:
 - When the currently used technology is no longer available
 - When a new access system type) is available and more suitable (e.g. cheaper, better QoS)
 - Additionally possible:
 - If policies (user, network) apply (even if there is no movement!)
- HO decision depends on optimization goals and available access technologies, etc.
- For subscribers, it is important to be “always best connected” (ABC).
- For operators, it is important to have UEs “always best managed” (ABM).
- Criteria are numerous and sometimes conflicting
- Policy rules specify when and how to conduct a handover by considering the factors such as user preferences, application QoS requirements, mobile terminal characteristics and available access networks.



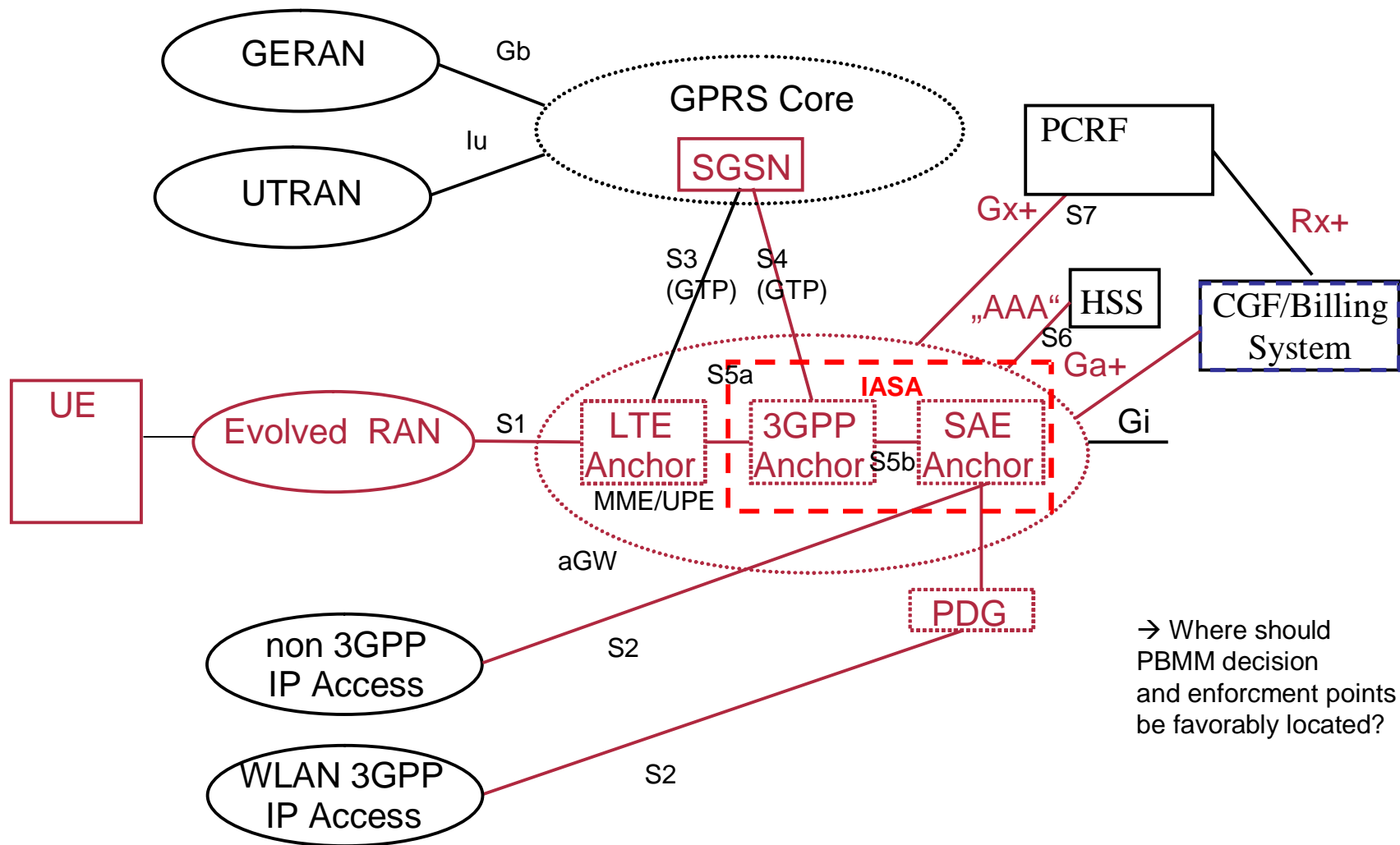
PBMM as enabler for ABC / ABM (II)

- Several potential positions exist for the decision engines which make the mobility decisions according to the policy rules.
 - UE-centric decision
 - NW-centric decision
- Coordination of the decisions (reasonable and dynamic compromise between user autonomy and network control)
 - Operator-centric: UE decisions limited by a set of options controlled by the network:
 - If NAMM* has decided to use just one access, then the UE has to use this single access. If NAMM has recommended the use of a set of accesses, then the UE has the freedom to choose one of them. The only exception is when the UE has physically not been able to use any of them, then the UE is allowed to initiate/maintain a basic connectivity through an access of its choice. Such a basic connectivity is necessary in order to contact NAMM at all.
 - Flexibility of the UE:
 - at the initialization phase
 - as long as NAMM has not given any decisions or has given the decision that the UE can decide
 - Within the set of options by NAMM such as the free choice from a set of accesses

* NAMM: Network Assisted Mobility Management



SAE Architecture – Mapping of Mobility between 3GPP and non 3GPP Systems



→ Where should PBMM decision and enforcement points be favorably located?

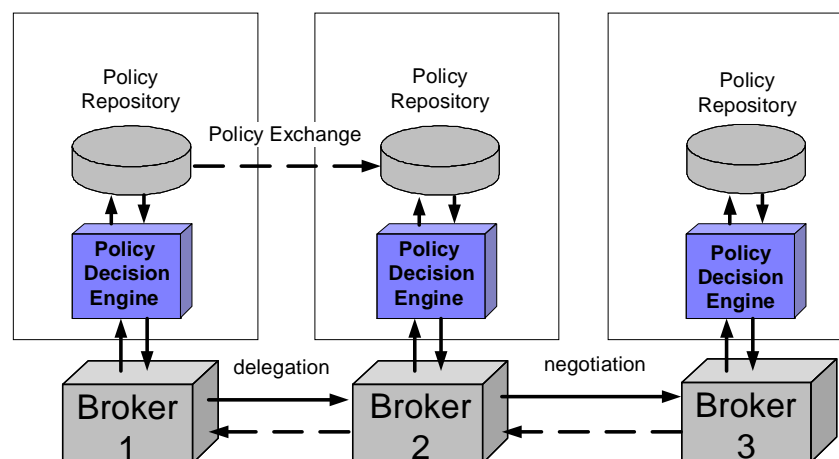


ScaleNet (BMBF) Relevant Features related to Mobility between 3GPP and non-3GPP

- Policy-based Mobility Management (NAMM)
 - Two modes: Terminal and network centric
 - Support of *User Classes* like GOLD and Standard
 - Definition of *Service Classes* like Best Network and Best Service
 - Business Policies → Mapping (via GUI) of *User Classes* to *Service Classes*
 - Definition of triggers for policy-based decision making
 - Mapping of Network Policies to *Service Classes*
 - Definition of proprietary policy description format

Other options

- Broker Architecture (e.g. MASA N - Mobility and Service Adaptation in Heterogeneous Mobile Networks, 2002-2005, Dr. Fan et al.)



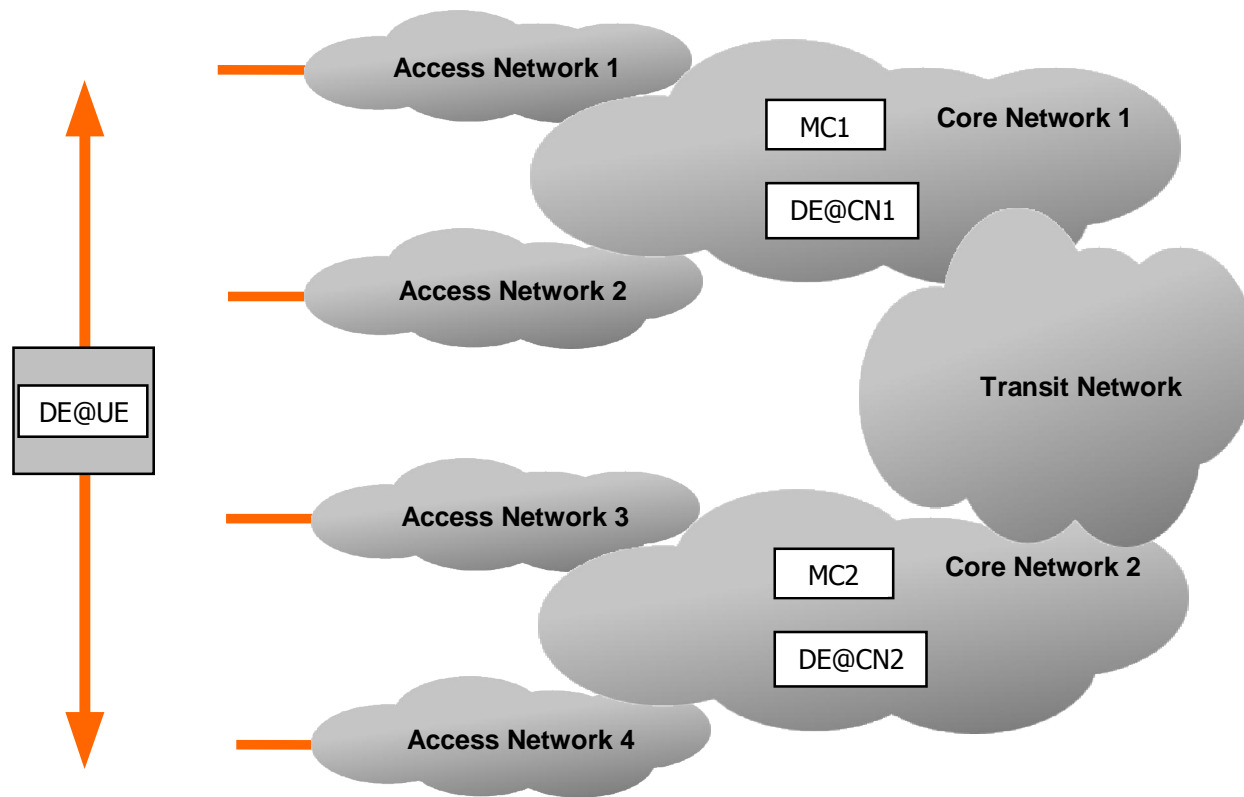


Rationale for Broker-Based Resource Management

- Admission control conducted at the edge of the network (domain) only
 - is done based on the local view of each node; generally uncoordinated;
 - can only be conducted based on the static arrangements among the nodes;
 - can not react to the current situation in the middle of the network;
 - must be based on a more pessimistic estimation of the resource usage.
- Admission control and resource management based on broker's global view of network (domain)
 - can coordinate the admission control of the edge nodes;
 - the coordination can be dynamic and take the current situation in the network into consideration;
 - can thus provide more reliable QoS;
 - more efficient usage of the resources possible, or reversely, needs possibly orders of magnitude fewer resources.

Overall view of PBMM

Meta-control in the case of multiple operators (e.g. roaming): MC1 connects to MC2 with a set of preferences which are then negotiated.



Legend:
MCx – Meta-Control Function at Network x
DE@UE – Decision Engine at User Equipment
DE@ANy – Decision Engine at Access Network y
DE@CNz – Decision Engine at Core Network z



Wrap-up

- Described PBMM
- Discussed enabling mechanisms