Dynamic Control

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November 1998

Plasmolen

Overview

1. Structure & services of dynamic control
2. Dynamic generic control
3. Association agents
4. MVC-agents
5. Handover indicator (at MT)

Subentities

- Dyn. generic control Level of AP
- Association agent Level of Association
- MVC-agent Level of Connection
- Handover indicator (at MT)

Address mapping

- two address levels: for associations and connections

⇒ hierachical by ADG, AAA, and AMA

entity	main parameter	mapping		
ADG		ATM-MT-addr.	⟷	MAC-MT-addr.
AAA	MAC-MT-addr.	Conn. id	⟷	MVC_Id
AMA	MVC_Id		—	

Table 1: Address mapping in the AP

Dynamic generic agent

- general task: dynamic association management
- One instance per MAC-layer
- servicing control layer's association-related requests:
  - association request ⇒new association agent
  - deassociation request ⇒killing of association agent
  - relay of further signals to and from the right AA
- managing MAC-layer addresses for associations
- relay of special association-agent MPDUs (meta-signalling for association set-up)

Dynamic agent (cont’d)

- no peer-to-peer MPDU’s
- at AP
  - `MPDUMTAP_Association`
  - `AP_Deassociation_req/AP_Deassociate`
  - `MT_Deassociated`
  - `MT_Lost`
- at MT: even simpler:
  - initializing MHI & MAA
  - Relay of deassociation request

Association agent

General task: management of single associations

- static creation of control VCs
- dynamic creation of data VCs
- address mapping: Connection Ids ⟷ MVC_Ids.
- relay of certain signals (meta-signalling)
- important data
  - mapping of ATM-layer Connection Ids to MVC-instance
  - address of MT at ATM- and MAC-level
  - AP-address at MAC-level
  - other configuration data

Association set-up: 4-way handshake

- MT associated with an AP (at most one), means:
  - MT synchronized
  - 3 control MVC-agent peers running
  - common MT-MAC-layer address
- Association setup: MT-initiated 4 way handshake:

MPDU	effect	remark
1. *Association*	new AAA	via contention
2. *Addr_Allocate*	MTgets MAC-address	via broadcast
3. *Addr_Received*		
4. *Association_Ack*	“associated”	

- timeouts between the steps (2 at MT, 1 at AP)
- 3 types: Power-on, forward-HO, backward-HO

Deassociation

Deassociation: inverse to association

- confirmed deasociation service to the control layer, different at AP/MT
- part of the handover-manoeuvre ⇒three forms of control-layer requested deassociation:
  - forward handover
  - backward handover
  - closing of MAC
- besides that: also partially established associtions can be deassociated (see later)

Contol-layer deassociation at MT

- part of the larger scenario of backward handover
- situation: MT is associated[1]
- simple, non-acknowledged peer-to-peer protocol: just a notification to AAA
- effect:
  1. notify the AAA-peer
  2. kill the MMAs except the control instances
  3. confirm deassociation to control
- Note: control-layer requested deassociation for AP with different meaning (see next foil)

[1] more precisely: re-associated after radio scan

Terminating an AAA

- Kill-signal from ADG
- 3 reasons:
  - MAC-layer shut-down request from control-layer[2]
  - deassociation request from the control-layer[3]
  - loss of MT[4]
- effect: end of AAA, after
  1. notification of MAA-peer
  2. killing of all concerned MVC-agents[5]

[2] `Close_MAC_req/AP_Deassociate`

[3] `AP_Deassociation_req`

[4] from AIA

[5] Mascara's control AMA lives a tick longer. cf. also MT-deassociation

Aborting partially established associations

- Besides deassociation of a fully established association: aborting a partially established association possible
- partial association: somewhere between the 1st and the 4th handshake
- reasons:
  1. Control-layer request
  2. timeout or association-agent internal problems
  3. request from peer
- reaction: Undo all steps performed so far:
  - if an MVC-agent has been instantiated: kill it
  - if an address has been assigned: revoke it
  - if your peer already knows about the process of association: tell him that it fails (and he will also deassociate)

Handover

Controlling connections

- static creation of control MVC-agents
- dynamic creation of MVC-agents upon user-request
- relay of signals, i.e., address mapping

Connection opening & reopening

- 3 confirmed sub-services to the control-layer
  - (re)-opening: at MT
  - reservation: at AP
  - switching: at AP
- AP-initiated opening vs. MT-initiated opening (similar for reopening)
- Coordination at AA-level: MT-initiated 2-way handshake, no timeout[6]
- addressing: MT-generated-MVC_Id wins
- task of the association agent:
  - creation of the MVC-agents
  - AP: generation of MVC_Id

[6] But: see also AMA/MAA-behavior

Connection opening: AMA

- as at AA-level: 3 contributions: reservation, switching, and opending (activation-MPDU)

idle	no request yet
reserved	reserved, but not switched (Cf. timer `Timer_VC_Switch` at AP).
pending	"activated", but not yet reserved the connection. (Cf. timer `Timer_VC_ConnectionPending` at AP).
switched	switched (and reserved) but not activated it. (Cf. timer `Timer_VC_Activation` at MT).
active	all signals arrived

MVC-agents

- responsible for single connections
- distinguished by their MVC_Id,[7] unique per association
- 3 control MVC-agent pairs with reserved MVC_Ids
- no broadcast-MVC-agent

[7] MAA-generated. MVC_Ids are the MAC-layer analogues to ATM-layer connection indentifier.

Handover indicator

- MHI at MT only
- task: monitor the current association, initiate a handover,[8] if need be

⇒ – periodic collection of relevant information[9], and
  – reactive to alarm signals, i.e.,
    - ∗ frame-desynchronization: from MPX
    - ∗ failed return from incommunicado: from MTC

- attentive in MT's associated state, but pausing during incommunicado and handover[10]
- when handover has been initiated by MHI: association will happen; when completed, MHI-timer will start again

[8] backward in general, forward in case of alarm

[9] Timer `Timer_Update_HOParm`

[10] p. 104: Timer unset?

MT-target cell vs. handover indicator

- MT target cell: collects information about the radio environment = all APs
- interaction MHI ⟷ MTC:
  - MTC suspends and wakes-up MHI (normal behavior = incommunicado period)
  - MHI orders MTC to find a new AP[11] (in forward and backward handover)

[11] `Get_Target_AP`

MHI: backward handover

- periodically collect relevant data:[12]
  - radio-link quality + cell-errors + MPDU-errors
- decide about the
  - need of handover, but
  - not the AP-candidate[13]
- if handover is needed
  1. unset the timer
  2. instruct the MTC to find some AP; if this succeeds,[14]
  3. inform the control layer

[12] from the entities MEF, MPR, GDL respectively

[13] MTC will choose

[14] and if not??

MHI: forward handover

- role of MHI in forward handover:
  - accecpts signal AP_Lost (i.e. no decision by MHI)
  - stop the MHI-timer
  - inform concerned entities to take appropriate urgent measures
    1. control layer: indication[15]
    2. MAA: AP_Lost[16]
    3. MTC: instruct the MTC to find some AP

[15] MT_AssociationLost_ind

[16] MT will switch on broadcast