3RD GENERATION PARTNERSHIP PROJECT 2 "3GPP2"

Inter-Technology Handoffs – Architecture and Basic Call Flow

SOURCE:

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ABSTRACT:

This contribution presents the architecture recommended for adoption in X32-20050926-xxx DOto1X-BasicHandoff-Arch-Decision-NT-LU-QC.doc. The basic handoff call flow for this scenario from X32-20060718-019 has been replicated for completeness.

RECOMMENDATION:

1. Review and adopt Section 1 as the Inter-Technology Handoff architecture. Send a liaison to TSG-X ERA regarding the recommended architecture.
2. Review and adopt Section 2. Place call flow in the appropriate section of the baseline document.

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1. Architecture for Handoff from HRPD to 1X

1.1 New Functional Entities

Two new functional entities are added to the MMD network to support handoff:

Call Control Continuity Function (CCCF)

Network Domain Selection (NeDS)

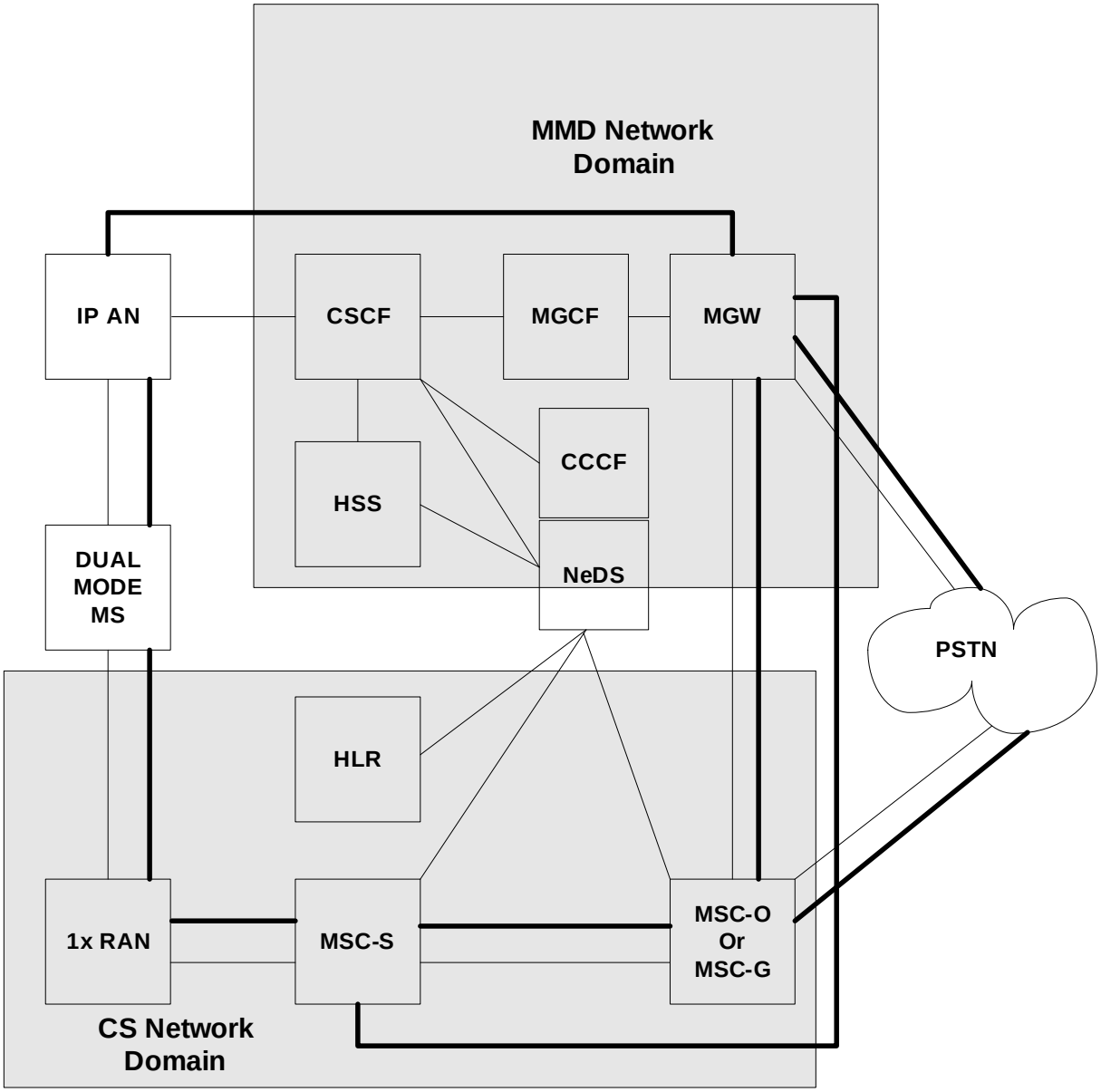


Figure 1: Inter-Technology Handoff Architecture

The Call Continuity Control Function (CCCF) is a new functional node added to the MMD network as an Application Service. The CCCF is included in the call signaling path of all calls originated from or terminated to a MMH that are identified as potential handoff candidate calls. A CCCF instance is associated with each MMH that places or receives a call that is determined to be a potential handoff candidate.

CCCF is responsible for:

- Tracking call sessions and associated bearer paths for potential handoff candidate calls.
- Receiving and processing handoff requests for inter-technology handoff from MMH users.
- Filtering handoff requests based on the number of and status of calls the MMH user is involved in.
- Releasing any resources freed as a result of inter-technology handoff.

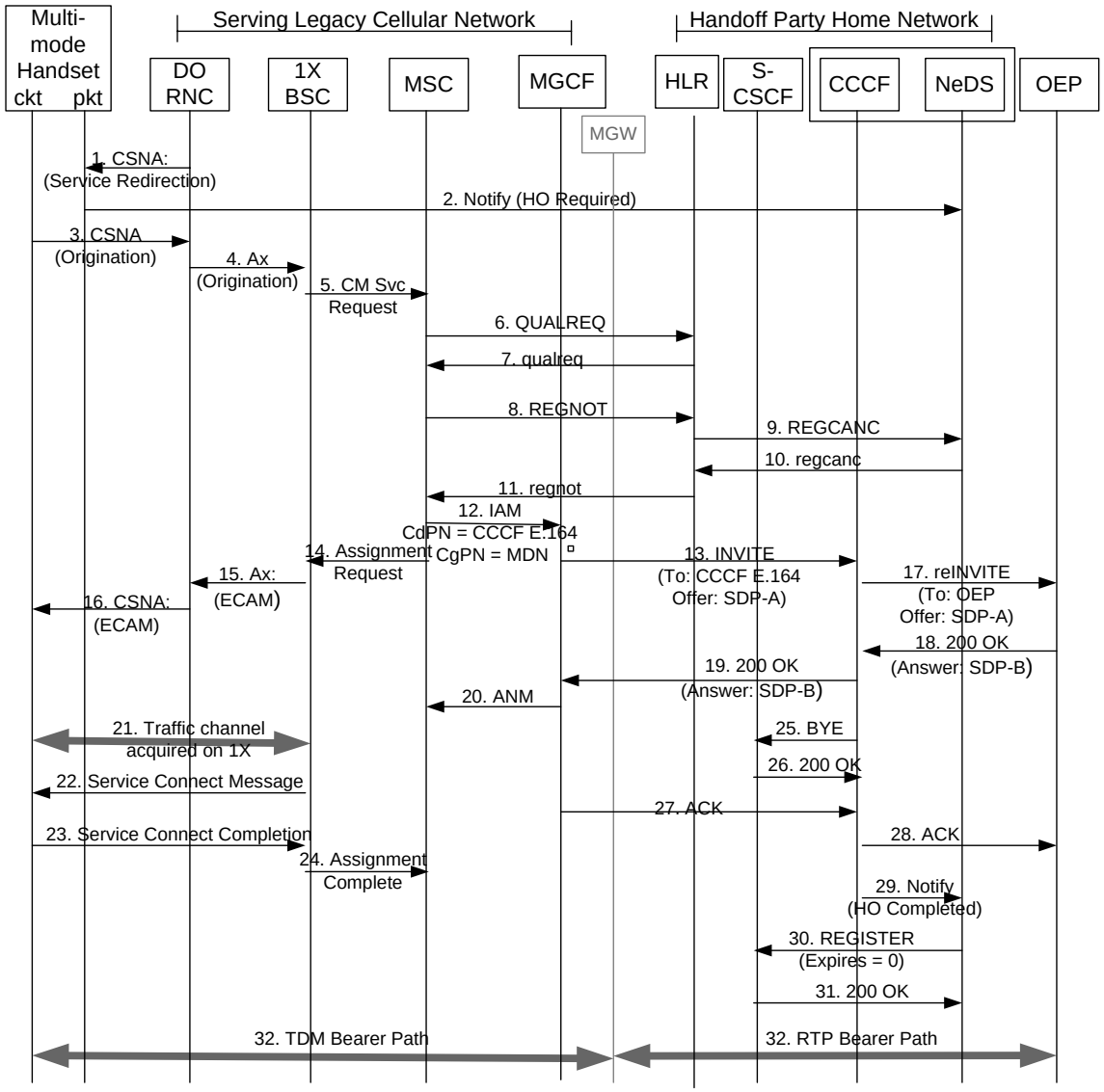
The Network Domain Selection (NeDS) is a new functional node in the MMD network that contains multiple functions. The primary NeDS responsibilities are defined below.

- The NeDS provides basic registration management between the MMD and Legacy CS networks.
- For calls routing from the legacy cellular ISUP domain to the MMD domain, the NeDS provides a MSC/VLR interface into the MMD network to the legacy cellular network:
    1. The NeDS receives ROUTREQ request, performs TLDN management (by virtue of coordinated provisioning with the appropriate MGCFs), and responds to the legacy cellular network request on behalf of the MMD network to direct the calls into the MMD network.
    2. The NeDS also receives REGCANC messages from the cellular HLR and performs registration processing in the MMD network. Once an incoming call is in the MMD network, normal MMD call routing takes place.
- For calls routing from the MMD domain to the legacy cellular ISUP domain:
    1. The NeDS performs LOCREQ processing to acquire the proper TLDN routing numbers from the cellular network and then the call is routed normally into the legacy cellular ISUP domain.
    2. The NeDS is also responsible for generating REGNOT/MSINACT messages to the cellular HLR when a MMH registers or powers-down in the MMD network.

2. Handoff Call Flows PS to CS

The following section address packet switched to circuit switched handoff.

Detailed call flow



<u>Call Flow Details:</u>

1. The DO RNC informs the MMH that it is reaching the edge of its DO coverage by tunneling a 1X Service Redirection message to it via the CSNA protocol.
2. The MMD network function NeDS is notified that the MMH is initiating a PS to CS handoff. The NeDS uses this notification information to delay the processing of the RECANC message received from the cellular HLR, see step 8, (that is triggered when the MMH registers with the cellular HLR).

3-4. MMH creates a 3G1X Origination message by populating the “Called

Party ASCII Number' parameter of the "CM Service Request" by attaching a "SERVICE CODE" value (e.g., 617) in front of the CCCF E.164 number. Note it is assumed that the MMH had previous received the CCCF E.164 number will in the MMD environment. This message is tunneled using the using the CSNA protocol to the DO RNC. The DO RNC forwards the message along to the 3G1X BSC across the Ax interface.

5-7. Upon receiving the "CM Service Request" the MSC-S initiates a "Registration Procedure" The MSC-S performs QUALREQ processing to authenticate the user prior to allowing registration and prior to allocating a traffic channel to the user.

8. The MSC-S sends REGNOT to the cellular HLR.
9. The HLR sends a REGCANC to the NeDS (which, because of being notified of handoff in step 1, records the request and responds with a positive acknowledgement to the HLR)
10. The NeDS responds with positive acknowledgement of regcanc to MSC-S
11. HLR responds with positive acknowledgement of regnot to MSC-S
12. After receiving the "CM Service Request" and in parallel to steps 6-11 the MSC-S performs a translation on the "Called Party ASCII Number' parameter of the "CM Service Request". Using the "SERVICE CODE" value (e.g., 617) the translation of the MSC-S results in the IAM being routed to a MGCF in the serving network.

    Note: For now we are assuming a 1-1 relationship between the MGCF (which could actually be in any network) and the MSC-S. This relationship can be based on geographical location of MSC-S and MGCF.

    The MSC-S forms the IAM by using the CCCF E.164 number for the "Called Party Number" and the E.164 number of the MMH for the "Calling Party Number". The MSC-S strips away the "SERVICE CODE" value (e.g., 617).
13. The MGCF (acting as a SIP-ISUP Signaling Node) converts the IAM message to a SIP INVITE using procedures defined in ITU-T Q1912.5. The MGCF contacts the MGW to establish two terminations. The first termination is a TDM connection between the MGW and the MSC-S. The second termination is an IP termination. The SIP INVITE contains an SDP Offer (referenced as SDP-A in the call flow). Using SIP Routing (RFC3261) the SIP INVITE is sent to the CCCF.
14. On receiving the CM Service Request, the MSC sends out an Assignment Request to the mobile.
15. The Enhanced Channel Assignment Message (ECAM), generated by the 3G1X BSC is tunneled across the Ax interface to the DO RNC.
16. The DO RNC further delivers this message to the MMH via the CSNA tunnel.
17. Upon receiving the SIP INVITE from the MGCF, the CCCF examines the "SIP From" header to determine which subscriber is performing a PS-CS handoff. Using the cached session information (received during the MMD session(s) setup) for the subscriber, the CCCF performs state and service filtering. The CCCF initiates a reINVITE to the OEP (Other End Point) of the VoIP session. The SIP reINVITE contains an SDP offer. The SDP Offer is the same as that received in Step 13.
18. The OEP accepts the reINVITE and responses with a 200OK. The 200OK

(INVITE) contains the SDP answer (referenced as SDP-B in the call flow).

19. The CCCF response to the INVITE (see Step 13) by sending a 200OK message. The 200OK (INVITE) contains an SDP answer. The SDP answer is the same as that received in Step 18 (referenced as SDP-B in the call flow).
20. Upon receiving the 200 OK (Step 19), the MGCF sets up the IP connection. The MGCF sends an “ANM” to the MSC-S.
21. After receiving the 3G1X ECAM message, the MMH acquires the radio traffic channel on the 3G1X system.
22. The 3G1X BSC sends a Service Connect message to the MMH specifying the service configuration for the call. The MMH begins to process traffic in the 3G1X system in accordance with the specified system configuration.
23. On receipt of the Service Connect message, the MMH responds with a Service Connect Complete message.
24. After the radio traffic channel and circuit have been established and fully interconnected, the 3G1X BSC sends an Assignment Complete message to the MSC and considers the call to be in the Conversation state.
25. At any time after step 19, the CCCF initiates release of the VoIP session by sending a SIP BYE to the S-CSCF
26. Since the MMH is already on the 3G1X traffic channel, it does not respond to the BYE message (if sent out by the S-CSCF). The S-CSCF returns a 200 OK after failing to receive a response from the MMH and timing out.
27. The 200 OK (Step 19) is acknowledged.
28. The 200 OK (Step 17) is acknowledged.
29. The CCCF sends a SIP Notify to the NeDS that all sessions for the subscriber have been taken care of and the HO is complete.
30. The NeDS deregisters the subscriber from the MMD domain.
31. The SIP deregistration is acknowledged.
32. Packet-switched bearer traffic (RTP/UDP/IP) is exchanged between the OEP and the MGW. A TDM bearer path provides continuity for the session between the MGW and the 3G1X BSC.