Realization of the Interworking Function in the Layered Architecture Based CDMA2000 Core Network

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Basic Information

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Background (1/3)

- CDMA2000 (Code Division Multiple Access 2000) is a third generation (3G) mobile network standard specified by the 3rd Generation Partnership Project 2 (3GPP2)

- Follows the global 3G standard IMT-2000, defined by the International Telecommunications Union (ITU)

- Backward compatible with the 2G cdmaOne air interfaces IS-95 A and IS-95 B
Background (2/3)

- CDMA2000 Radio interfaces
  - CDMA2000 1xEV-DV
    - Support both data and voice on the same carrier
    - Supports 1.25 MHz carriers
    - Peak data rate 3.1 Mbit/s
  - CDMA2000 3X
    - Up to three separate 1.25 MHz carriers (=3.75 Mhz)
    - Not currently under active development
3GPP2 has defined layered architecture for the evolution of the CDMA2000 core network and ALL-IP in the access, service and core network.

Old mobile phones will remain supported in the Legacy MS Domain (LMSD) of the IP based network, which provides the same service as legacy networks.

The LMSD is going to be based on layered architecture.
Problem Description

• The Interworking Function (IWF) provides protocol conversion and interworking required by legacy data services, such as circuit-switched data (CSD) and Fax

• The research problem is how to realize the IWF in the layered architecture based CDMA2000 core network
Objectives and Research Method

- Study the CDMA2000 core network and how it is affected by the layered architecture
  - Literature study

- Find an optimal placement for the IWF in the layered architecture based CDMA2000 core network
  - Compare four placement proposals based on functional and non-functional requirements
CDMA2000 Core Network (non-layered)  (1/2)

• Divided into a circuit-switched and packet-switched part
• Circuit-switched Core Network
  – Voice calls and circuit-switched data calls (64 kbit/s PCM)
  – The Mobile Switching Center (MSC) switches the traffic in the core network and provides the interface for user data and signaling between the wireless network and other public networks
• Packet-switched Core Network
  – Packet-switched data
  – Switches up to 3.1 Mbit/s using the CDMA2000 1xEV-DV air interface
CDMA2000 Core Network (non-layered) (2/2)

Radio Access Network
- BSC
- BTS
- PCF

Circuit-Switched Core Network
- MSC
- HLR
- IWF

Packet-Switched Core Network
- PDSN
- PDGN

PSTN
IP-network/Internet

Symbols:
- Um
- A
- Ater
- Aquinter

Abbreviations:
- MS: Mobile Station
- BTS: Base Transceiver Station
- HLR: Home Location Register
- IWF: Inter Working Function
- BSC: Base Station Controller
- MC: Message Center
- MSC: Mobile Switching Center
- PDGN: Packet Data Gateway Node
- PDSN: Packet Data Support Node
- PSTN: Packet Switched Telephone Network
- PCF: Packet Control Function

Legend:
- A: Interconnection point
- Ater: Interconnection point
- Aquinter: Interconnection point

Diagram notes:
- Connections between nodes indicate communication paths.

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Layered Architecture Based LMSD (1/2)

• Supports legacy mobile phones in the ALL-IP network
• The control and connectivity layer of the core network are separated
• The tasks of the legacy MSC is split between the Media Gateway (MGW) and Media Switching Center Emulation (MSCe)
  • MGW
    – Provides the bearer aspect and switching fabric of the MSC
  • MSCe
    – Has signaling and call control aspects of the MSC
Layered Architecture Based LMSD (2/2)

Control Layer

Connectivity Layer

HLRe Home Location Register emulation
MGW Media Gateway
MSCe Mobile Switching Center emulation
RAN Radio Access Network
PSTN Public Switched Telephone Network
Internet

Signaling
Bearer
The Interworking Function (IWF)

The IWF in the non-layered Core network
Realizing of the IWF in layered architecture

• Basic requirements:
  – 3GPP2 Standard:
    • Has to be between reference points 27 and 34 in the LMSD
  – Support for both the non-layered and layered architecture
    • Easier migration of networks
  – Support for the L-interface
    • Legacy MSC should not need any upgrading
  – Reuse of existing protocols as much as possible
Realization Proposals (1/4)

- IWF as a separate physical node
Realization Proposals (2/4)

• IWF as a functional part of the MGW
Realization Proposals (3/4)

- IWF integrated on the MGW platform
Realization Proposals (4/4)

- IWF control over H.248
Conclusion

• Proposal 4 (IWF control over H.248) was chosen as a recommendation
  – Offers the best conformity with existing protocols
    • H.248 between the MSCe - MGW
  – Integrates smoothly into the MGW
  – No impact on the legacy MSC
  – More future proof than the standalone solution
    • Easy retirement
Questions and comments?

Thank You!