ERICSSON

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

Lauri Mikkola

S-38.310 Thesis seminar on Networking Technology

Helsinki University of Technology

1.2.2005

Basic Information

- Thesis written at Oy L M Ericsson Ab
- Supervisor: Professor (Pro tem) Jouni Karvo
- Instructor: M.Sc. Juha Eloranta, M.Sc. Raul Söderström

Contents

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

Background (3/3)

- 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

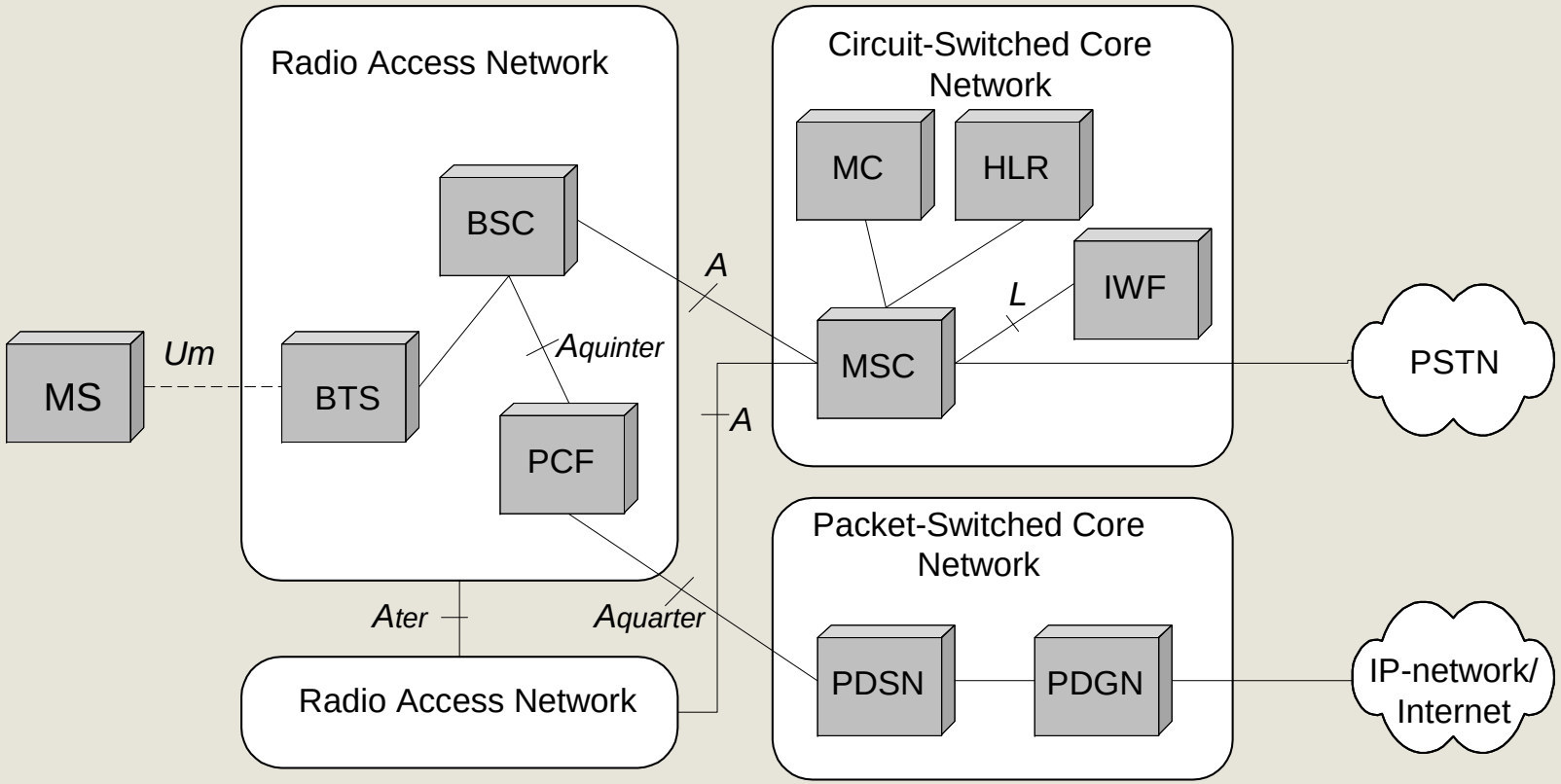
Objectives and Research Method

- Study the CDMA2000 core network and how it is effected by the layered architecture
  - Literature study
- Find a 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)



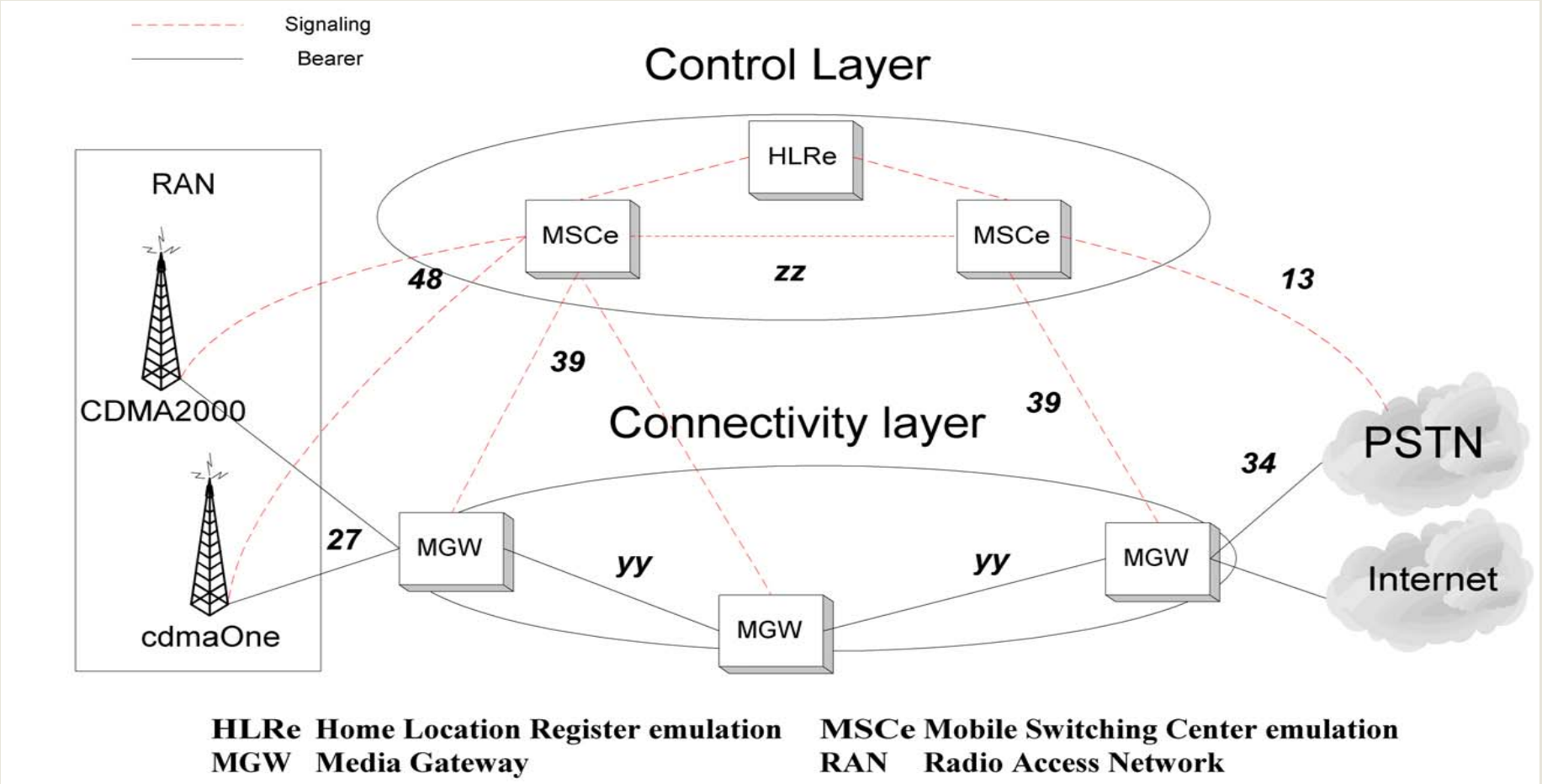
BSC	**Base Station Controller**	**MC**	**Message Center**	**PDGN**	**Packet Data Gateway Node**
BTS	**Base Transceiver Station**	**MS**	**Mobile Station**	**PDSN**	**Packet Data Support Node**
HLR	**Home Location Register**	**MSC**	**Mobile Switching Center**	**PSTN**	**Packet Switched Telephone Network**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

ERICSSON

Layered Architecture Based LMSD (1/2)

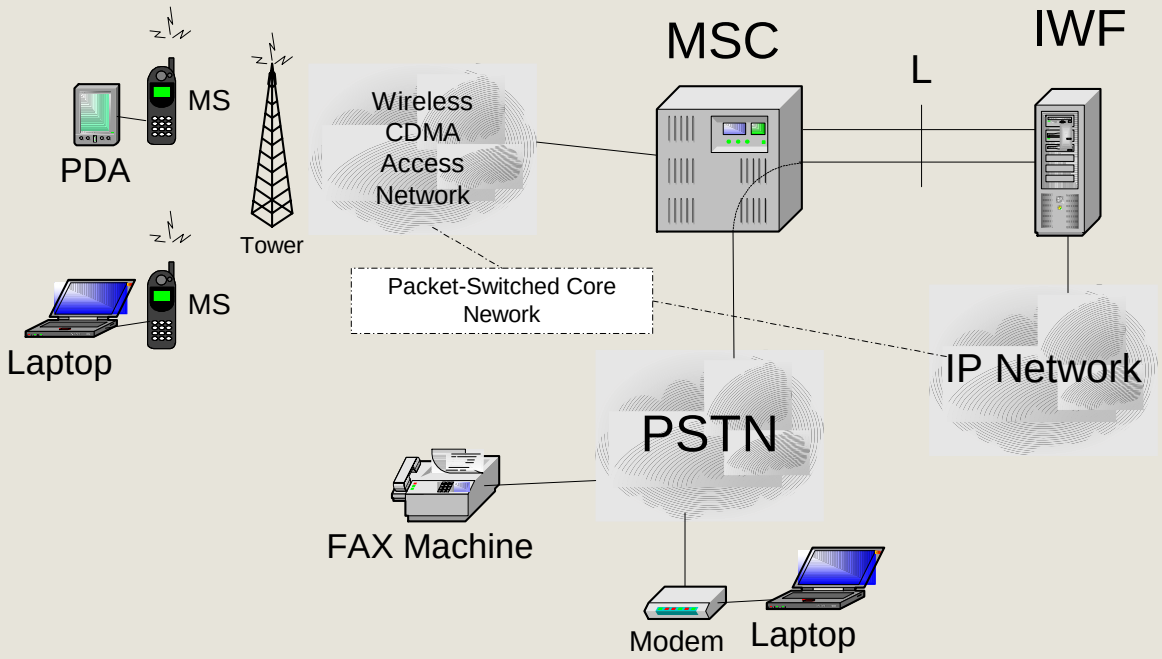
- Supports legacy mobile phones in the ALL-IP network
- The control and connectivity layer of the core network are separated
- The tasks of the legacy MSC is split between the Media Gateway (MGW) and Media Switching Center Emulation (MSCe)
- MGW
  - Provides the bearer aspect and switching fabric of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

Layered Architecture Based LMSD (2/2)



The Interworking Function (IWF)

- The IWF in the non-layered Core network



MS **Mobile Station**
PDA **Personal Digital Assistant**

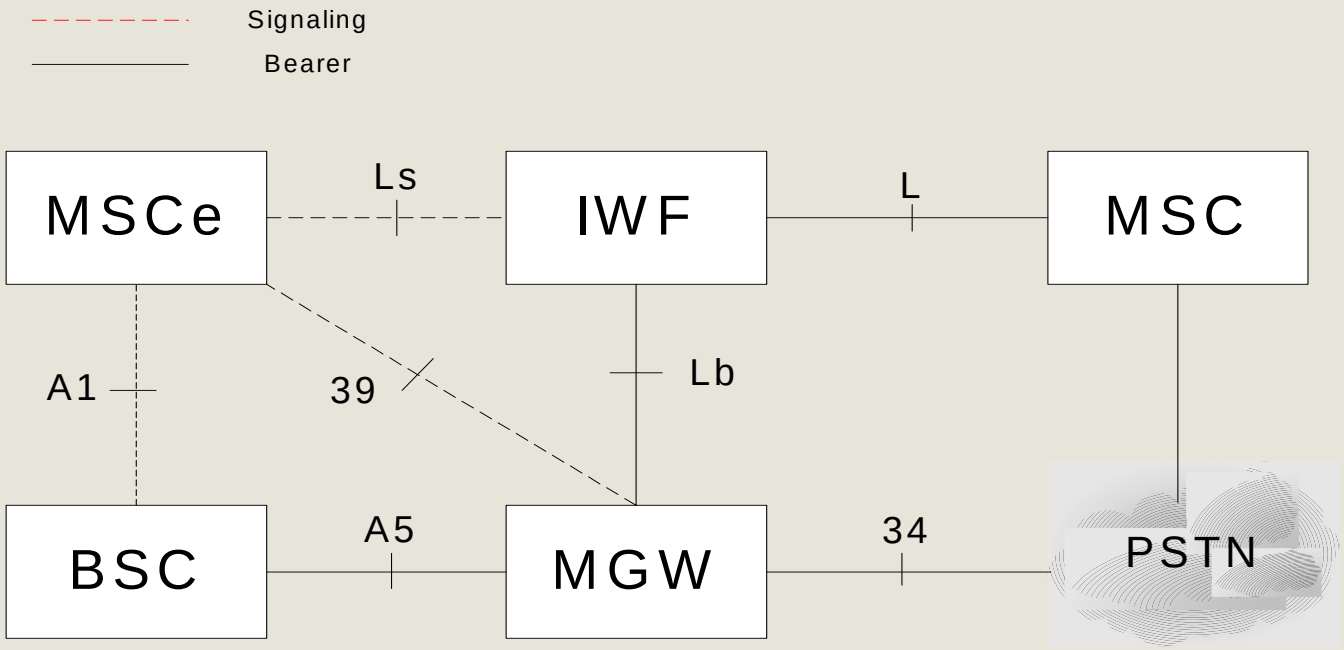
ERICSSON

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

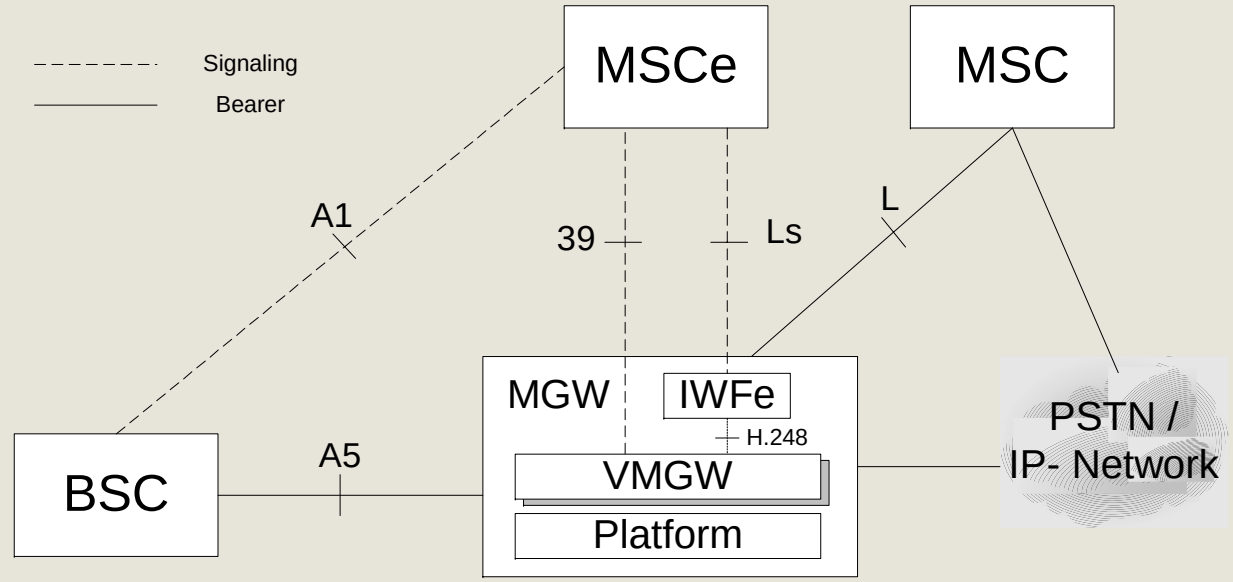
Realization Proposals (1/4)

- IWF as a separate physical node



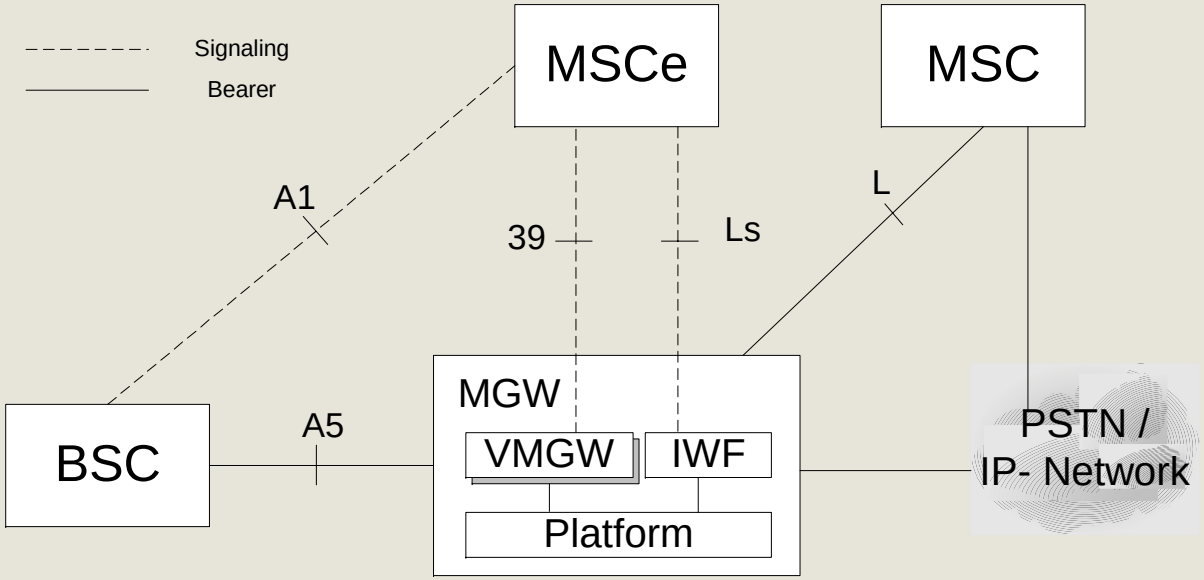
Realization Proposals (2/4)

- IWF as a functional part of the MGW



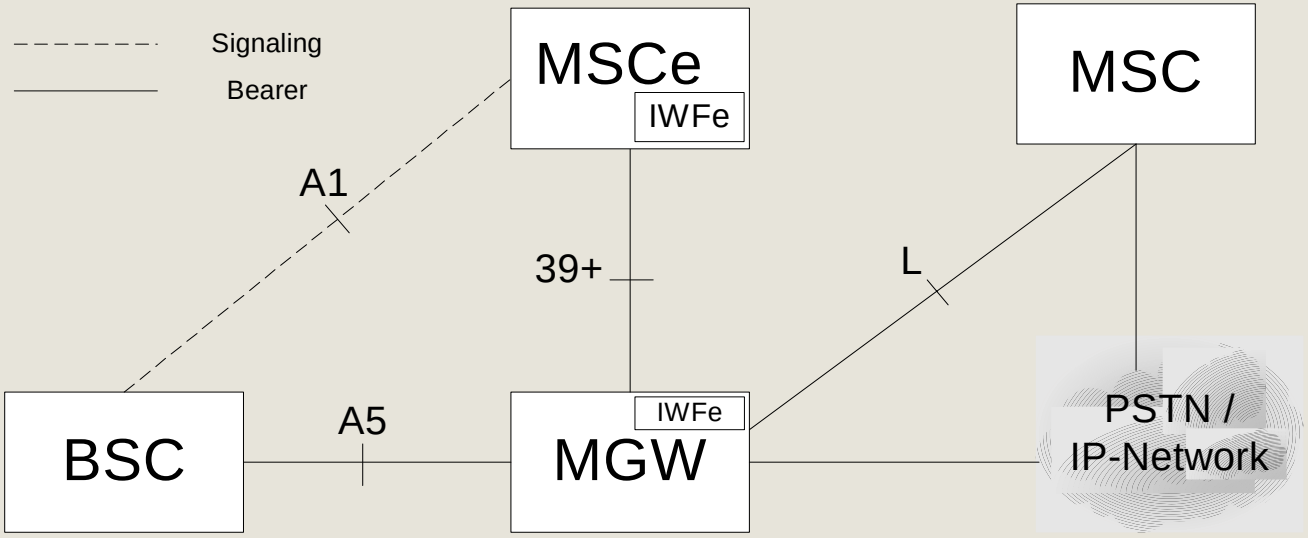
Realization Proposals (3/4)

- 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

ERICSSON

Questions and comments?

Thank You!