LTE - CDMA Interworking

eHRPD - Use of a Common Core and a Stepping Stone to LTE

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Overview

eHRPD (evolved High Rate Packet Data*)

- eHRPD involves changes needed to attach the 3GPP2 HRPD access network to the 3GPP Evolved Packet Core (EPC) IP environment via Proxy Mobile IP (PMIP).

LTE Interworking

- LTE to eHRPD – optimized and non-optimized handover
- LTE to cdma2000® 1x Circuit-Switched Fall Back (1xCSFB)
- LTE to cdma2000 1x Single Radio Voice Call Continuity (1xSRVCC)

Future work

* HRPD is the standards name for what is commercially known as EV-DO.

cdma2000® is the trademark for the technical nomenclature for certain specifications and standards of the Organizational Partners (OPs) of 3GPP2. Geographically (and as of the date of publication), cdma2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA) in the United States.
eHRPD Connectivity to EPC Architecture

Legend

3GPP EPC entity

3GPP2 entity

Signaling

Bearer

HSGW: HRPD Serving Gateway

ePCF: evolved Packet Control Function

eAN: evolved Access Network

(Not all interfaces are shown in this figure.)
eHRPD Interworking with LTE

Legend

- **LTE-specific entity**
- **3GPP EPC entity**
- **3GPP2 entity**

Signaling

Bearer

(Not all interfaces are shown in this figure.)
LTE → eHRPD Handover

Optimized Handover

- Involves the use of S101 and S103 interfaces to minimize the gap in packet flow to reach the goal of < 300 ms.
- Signaling changes on the air interface to support S101 based tunneling.
- The UE establishes context on the eHRPD access network by signaling over the S101 tunnel.
- The eNodeB (via the MME) and eAN coordinate the handover.

Non-Optimized Handover

- The UE leaves LTE coverage, attaches to the eHRPD access network, builds context, and resumes packet flow.
- Support in LTE to direct the handover and provide eHRPD parameters.
- Latency (gap in packet flow) can be several seconds.
eHRPD/1x → LTE Idle Hand-Up

LTE neighbor information is broadcast by the eHRPD/1x network.

- Reduce search time for LTE pilots.
- Minimize the device battery power consumption.

Uses reselection (idle handover) parameters and procedures.

Similar parameters and procedures are used for idle hand-up from 1x to LTE.
eHRPD - Project Description

Before eHRPD:
- Single core network for LTE and HRPD
- Inter-working with seamless mobility
- Incompatible security mechanisms
- Separate policy frameworks

Potential SW upgrade on existing equipment:
- Single core network for LTE and HRPD
- Inter-working with seamless mobility
- Common security mechanism
- Single policy framework
LTE - cdma2000 1x CSFB/SRVCC Architecture

Legend

- **LTE-specific entity**
- **3GPP EPC entity**
- **3GPP2 entity**

Signaling

Bearer

Internet
IMS
Operator Appl.s., Etc.

HSS/AAA
PCRF
PDN GW

MME
SGW

eNB
UE

S102

IWS
BS

MSC
MGW
HLR

3GPP EPC entity
3GPP2 entity

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3GPP EPC entity
3GPP2 entity
LTE - cdma2000 1x CSFB

LTE can provide Data services, while Voice services are provided on cdma2000 1x.

Voice and Data services are not simultaneous. The mobile device camps on LTE for Data services, and “falls back” to the circuit switched 1x system to make/receive voice calls.

LTE uses the S102 interface to transparently pass cdma2000 1x signaling between the mobile device and the cdma2000 1x system.

1xCSFB includes support for:

- Registration
- Paging for cdma2000 1x Mobile Terminated Calls
- SMS

Mobile originated calls are made directly on cdma2000 1x.
LTE - 1x SRVCC

- Single Radio Voice Call Continuity anchors a voice call in IMS.
- Call is transferred from the packet environment to the MSC-based circuit environment.
- Control is maintained in IMS.
- May reduce latency in voice call handoff from packet to circuit.
- May not be implemented immediately or completely.
- Some signaling elements of SRVCC may be used to reduce the call setup time for 1x CSFB.
Future Work

3GPP2 will continue to support operators that choose to deploy LTE technologies.

3GPP2 will continue to cooperate with 3GPP to enhance:

- LTE - eHRPD interworking
- LTE - cdma2000 1x CSFB / SRVCC interworking
- Features made possible by LTE interworking.
- Features made possible by attachment to the EPC.
# List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>Authentication/Authorization/Accounting</td>
</tr>
<tr>
<td>BTS</td>
<td>Base Transceiver Station</td>
</tr>
<tr>
<td>CSFB</td>
<td>Circuit-Switched Fall Back</td>
</tr>
<tr>
<td>eAN/ePCF</td>
<td>evolved Access Network/evolved Packet Control Function</td>
</tr>
<tr>
<td>eHRPD</td>
<td>evolved High Rate Packet Data</td>
</tr>
<tr>
<td>eNB</td>
<td>eNodeB - evolved NodeB</td>
</tr>
<tr>
<td>EPC</td>
<td>Evolved Packet Core</td>
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<tr>
<td>HLR</td>
<td>Home Location Register</td>
</tr>
<tr>
<td>HRPD</td>
<td>High Rate Packet Data</td>
</tr>
<tr>
<td>HSGW</td>
<td>HRPD Serving Gateway</td>
</tr>
<tr>
<td>HSS</td>
<td>Home Subscriber Server</td>
</tr>
<tr>
<td>IMS</td>
<td>IP Multimedia Subsystem</td>
</tr>
<tr>
<td>IWS</td>
<td>Interworking Server</td>
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<tr>
<td>LTE</td>
<td>Long Term Evolution</td>
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<tr>
<td>MME</td>
<td>Mobility Management Entity</td>
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<tr>
<td>MGW</td>
<td>Media Gateway</td>
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<tr>
<td>MSC</td>
<td>Mobile Switching Center</td>
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<tr>
<td>PCRF</td>
<td>Policy Control Rules Function</td>
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<tr>
<td>PDN GW</td>
<td>Packet Data Network Gateway</td>
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<td>PMIP</td>
<td>Proxy Mobile IP</td>
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<tr>
<td>S-GW</td>
<td>Serving Gateway</td>
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<tr>
<td>SMS</td>
<td>Short Message Service</td>
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<td>SRVCC</td>
<td>Single Radio Voice Call Continuity</td>
</tr>
<tr>
<td>UE</td>
<td>User Equipment</td>
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</table>

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Thank You!

For more information, please visit

http://www.3gpp.org and

http://www.3gpp2.org