Multiple Care-of Address Registration + IEEE802.21 with NEMO Basic Support

Keio University/WIDE Project
Kyocera Corporation
Introduction

- **Background**
  - Multiple Care-of Address Registration (MCoA)
    - It is proposed to support multihomed mobile nodes in Monami6 WG
    - WIDE had several experiments/demonstrations using MCoA
  - 802.21
    - L2 information is used for efficient handovers but it is often maintained for each network access devices in different manner
    - We thus have interesting to use IEEE802.21

- **Purpose**
  - Study how we can use IEEE802.21 on MCoA enabled MIP/NEMO
  - **NEMO + MCoA + 802.21**
  - Confirmed how it works!
**Experiment Testbsd**

- VoIP clients are communicating via a MR
- the MR is equipped with iBurst and EvDO Rev.0
- the MR will switches from iBurst to EVDO

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**Network Diagram**

- IPv6 Internet
- IPv4 Internet
- iBurst Network
- KDDI/AU Network
- DTCP server
- Keio HA

**In-vehicle**

- Mobile Network
- SIP server
- HUB
- VoIP Client

**HUB**

- Log Analyzer
  - traffic dump
  - L2 info trace

**iBurst UT**

- G729 (20 bytes per 20ms)

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Kyocera

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68th IETF
iBurst

- A metropolitan-wide wireless broadband system developed by Kyocera and ArrayComm
- TDMA/TDD based wireless broadband system
  - adaptive-array antenna, SDMA, Link Adaptation
- 1Mbps downlink per user
  - maintains stable high-speed communications even while multiple users are concurrently connected
- Excellent range (approx. 12 km radius)
- Reliable mobile handover between coverage areas
- all IP-based network

http://global.kyocera.com/prdct/telecom/office/iburst/technology.html
Test Scenarios

- Case 1: NEMO + MCoA + two types of link triggers
  - MCoA with 802.21 L2 triggers
  - We define two thresholds to notify the status changes:
    - L2-Prepare (GOOD to FAIR) for MCoA path establishment
    - L2-GoingDown (FAIR to BAD) for switching active interfaces
- Case 2: NEMO + two indications
  - Use the two thresholds by 802.21 trigger as well
  - Without MCoA
- Case 3: NEMO + one indication
  - Use only the switching threshold
- Case 4: NEMO only
  - No interaction with L2
System Flow (Case 1)

- Every 500ms:
  - MIH_Get_Status.request
  - MIH_Get_Status.confirm

- When a CoA assigned on EVDO, MR binds the CoA by using MCoA

- Change default path and send de-registration about the CoA of iBurst

- MIH_Switch
  - MIH_Commit.request
  - MIH_HandoverComplete.Request
  - MIH_HandoverComplete.Response
  - Link_Teardown.request
  - Link_Teardown.response

- Link_UP.Request
  - Link_UP.indication

- The MIH_Get_Status/Link_Get_Parameters loop again

- Threshold 1
  - MIH_Handover_Prepare.request
  - MIH_Handover_Prepare.confirm

- Threshold 2
  - MIH_Get_Status.request
  - MIH_Get_Status.confirm

- Start ppp for EVDO

- MIH_Commit.request
  - MIH_HandoverComplete.Request
  - MIH_HandoverComplete.Response

- Link_Teardown.request
  - Link_Teardown.response
Changes of L2 RSSI (Case 1)

① the RSSI of iBurst goes below Threshold 1 (-93dBm).
② the NEMO path via EVDO is established
③ the RSSI of iBurst goes below Threshold 2 (-98dBm).

We defined the thresholds according to ITU-T G.107
The VoIP trace on MNN (Case 1)

handover from iBurst to EVDO

no packet loss at the VoIP traffic

The jitter became bigger because of the bad link quality
Comparison with other Scenarios

<table>
<thead>
<tr>
<th>case</th>
<th>packet loss</th>
<th>delay(ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) NEMO + MCoA + 2 trigger</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(2) NEMO + 2 trigger</td>
<td>33</td>
<td>350</td>
</tr>
<tr>
<td>(3) NEMO + GoingDown trigger</td>
<td>847</td>
<td>16900</td>
</tr>
<tr>
<td>(4) NEMO + no L2 interaction</td>
<td>7338</td>
<td>142000</td>
</tr>
</tbody>
</table>

(1) See the previous two slides. **0 packet loss!**
(2) The case without MCoA support. **The delay is caused by RTT of BU/BA.**
(3) The case only with LinkDown event. **The delay is about RTT of BU/BA+ Link Preparation.**
(4) The simple NEMO case: Neither L2 indication nor MCoA. **The MR didn’t aware of the link down before the PPP session timeout.**
Consideration

- System must be flexible to support several handover scenarios
  - Setting L2 association (e.g. PPP, 1x) required certain period. Thus LinkGoingDown is not always useful.
  - Some trigger to kick the L2 association/preparation before LinkGoingDown is necessary.

- A common API to send/receive IEEE802.21 message inside a node would help
- An algorithm against misleading indications is needed
Summary

- Keio/WIDE and Kyocera have designed and implemented a MR which is capable of
  
  **NEMO + MCoA + 802.21**

- The MR performs the make-before-break handover with MCoA and triggers the handover by 802.21

- We confirmed the MR works well with iBurst and CDMA2000 1x EvDo Rev.0
  - VoIP clients are communicating via the MR without any packet loss during the handover
Any Question?

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