WiMAX

Application scenarios, first experiences and evolution

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Exceeding Nomadic Customers’ expectations

W-LAN like access:
+ Anywhere
+ Anytime
+ Seamless
+ Simple
+ Friendly
+ Secure
Naturally complementing WiFi

The Internet

Corporate Hot-Spots

Nomadic Hot-Spots

Residential Hot-Spots

Public Hot-Spots

Providing cellular coverage of urban and rural areas alike

SIEMENS Communications
Operating in LOS and NLOS

WiMAX technology, solves or mitigates the problems resulting from NLOS conditions by using:
- OFDM technology.
- Sub-Channelization.
- Directional antennas.
- Transmit and receive diversity.
- Adaptive modulation.
- Error correction techniques.
- Power control.

Filling the gap between Fixed and Mobile

Mobile Networks (GSM, UMTS, HSPDA, …)

BB Wireless (WiMAX 802.16d, 802.16e, …)

Fixed Networks (xDSL, FITL, …)
**Easy to integrate with W-LAN access through WIP**

- The Wireless Integration Platform (WIP) is designed to support both Wireless LAN and WiMAX technologies.
- It performs the following functionalities:
  - Authentication – Authorization – Accounting
  - End user billing \ charging
  - Access Control
  - It provides an Interface to 2G - 3G networks (towards HLR and the Billing system)
- End User Authentication based on the Web portal page
- Billing \ Charging models
  - pre-paid (voucher)
  - post-paid (Credit Card)
  - SIM card ….

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**Easy to integrate into 2G/3G Mobile Networks**

- **UMTS / GPRS / EDGE**
- **WLAN Access**
- **Core Network**
- **Back-End**
- **Internet / Intranet**
- **Client Software**

**COMMENTS**

- **MSM (Mobile Session Manager) = AAA Server**
- **Charging@Vantage = Charging logic, rating, accounting**
- **MSP (Mobile Smart Proxy) = WAP/Web Gateway**
Fully supporting Internet Mobility standards underway

- NAP: Network Access Provider
- NSP: Network Service Provider
- UE: User Equipment
- BS: Base Station
- ASN: Access Service Network
- GW: (ASN) Gateway
- CSN: Connectivity Service Network
- ASP: Application Service Provider

Application scenarios and Standards evolution path

- WiMAX Profile#1 (IEEE 802.16-2004)
- WiMAX Profile#2 (IEEE 802.16e)
- WiMAX Profile#3 (IEEE 802.16e / 802.16g)

<table>
<thead>
<tr>
<th>2H2005</th>
<th>1H2006</th>
<th>1H2007</th>
<th>1H2008</th>
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<tr>
<td>Wireless DSL</td>
<td>Hot Zone</td>
<td>Mobile</td>
<td></td>
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<tr>
<td>Corporate Feeding</td>
<td>No Handover</td>
<td>Seamless Handover</td>
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<tr>
<td>WIFI Feeding</td>
<td>User authentication in different locations</td>
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<tr>
<td>Fixed</td>
<td>Nomadic</td>
<td>Portable</td>
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A worldwide Broadband Wireless Access standard

- Compliance to standard
- Standard frequency plan
- Harmonized licensing schemes

are all key to achieve:
- CPE cost reduction
- Service interoperability
- Worldwide roaming

License value as a function of intended usage

- License must fit actual technology potential to avoid overpricing
- Outdoor and indoor coverage must be guaranteed separately
- Unlicensed spectrum (5.8 GHz) best fit for private/local usage

License Value as a function of intended usage

<table>
<thead>
<tr>
<th>Frequency Band</th>
<th>Mobility</th>
<th>Nomadity</th>
<th>Ubiquity</th>
<th>Bandwidth</th>
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<td>&gt;10 GHz</td>
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<tr>
<td>&gt;3.5 GHz</td>
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<tr>
<td>&gt;2.5 GHz</td>
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<td>&gt;5 GHz</td>
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</tbody>
</table>

License value as a function of intended usage.
WiMAX: some first conclusions

- Leading BWA technology, addressing several different user needs
  - Users not adequately served by wired BB access at their home/office
  - Users requiring ubiquitous BB access
- Offering unprecedented opportunities to operators and governments
  - To reshuffle the TELCO market by fostering liberalization and competition
  - To provide customers and citizens with high quality affordable services
  - To effectively confront the risk of Digital Divide

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Long-term Digital Divide risk in Italy

Areas with inadequate (fiber/copper) wired access capacity
Population: 5,700,000

Source: Osservatorio Larga Banda 2005
Early WiMAX trials in Italy

Siemens’ WayMAX trial equipment

Indoor unit

Outdoor unit

Antenna

Residential Modem

Communications

Early WiMAX trials in Italy
Cassina de’ Pecchi trial architecture
Early WiMAX trials in Italy

Cassina de’ Pecchi – Bicocca NLOS connection

View from Bicocca towards Cassina

Cassina de’ Pecchi – Bicocca link data
Distance: **11.1Km. (NLOS, near LOS)**
Clutter: urban / suburban
BS Antenna (Cassina): 90deg sector, 15dBi; height 45m
TS Antenna (Bicocca): 18deg, 18dBi; installed at 6th floor (20-25m)
BS Tx Power: +35dBm
Rx level DL (TS): around -65dBm

Early WiMAX trials in Italy

**Combined DVB-T/WiMAX trial in Val d’Ayas**
Early WiMAX trials in Italy

All-Wireless CATV concept: broad area coverage

DVB-T + WiMAX

All-Wireless CATV concept: last mile/drop solutions

IP Network
WiMAX: further conclusions

- Best fit for
  - WLAN (and Hot-Spot) feeding in urban areas
  - SDSL alternative in urban and sub-urban areas
  - xDSL alternative in low density and/or geo-morphologically disadvantaged areas
  - xDSL alternative in areas with high seasonal changes in population
  - Direct broadband wireless access in large outdoor areas
  - DVB-T return channel

WayMAX: product availability roadmap

- Internal lab trials          until Sep ’05
- Public trials with customers since Oct ’05
- Commercial availability    from Dec ’05
- Manufacturing ramp-up      1st Half of ’06