Telco-Grade Wireless Links
The Cure for the Common Radio

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Airmux Global Deployments

Over 500,000 radios deployed in over 150 countries
The Airmux Solution

• **Sub-6GHz PtP and PtMP broadband wireless**
  – We do sub-6GHz better than anyone else!

• **Fixed, Nomadic and Mobile modes of operation**
  – Self-healing rings, 1+1 redundancy, Hot-spare base stations, etc.

• **Typical Applications:**
  – Elimination of leased lines (T1, analog and others)
  – Connectivity to hard to reach locations
  – Efficient cellular backhaul
  – Utility substation connectivity
  – Real-time video surveillance including on moving vehicles traveling at speeds over 150 Mph
Key Points about Airmux

• Airmux provides real “carrier class” radios for the lowest prices in the industry in PtP and PtMP configurations

• Airmux-5000 provides PtP performance in a PtMP system, enabling WISPs and ESPs to offer Service Level Agreements (SLAs) to their customers

...and...

• Airmux mobility is a unique game-changer for mobile security applications offering up to 30 Mbps, asymmetrical throughput, to a vehicle traveling 150 Mph
Airmux family:
Airmux-400 PtP
Airmux-5000 PtMP
Airmux provides Telco Grade Wireless Links

**Point to Point**
- 6- 200 Mbps Net Ethernet
- 1- 16 Native T1/E1s
- Multi Band Radios 2-6GHz
- Long range to 50+ miles

**Point to Multi-Point**
- Base Station with 200Mbps Aggregate
- 32 Sub Units 5/10/20/50Mbps
- Secure SLA capacity to 25miles
- 4.9/5.3/5.4/5.8GHz, 3.65GHz
Point-to-Point
Airmux-400
Product Offering
AIRMUX PtP Advantages

• Robust & Reliable
  – Operates in all environments & terrains
  – Industry-leading MIMO, OFDM & Diversity technologies, enabling nLOS / NLOS
  – Field-proven air interface for optimal performance under congested spectrum
  – Monitored Hot Standby 1+1 and RING topology, ensuring high availability
  – Inter/Intra TDD synchronization, maximizing capacity while reducing tower space

• Flexible
  – Multi-band radio – one platform, multiple frequency bands
  – Native TDM & Ethernet in one solution
  – Seamless migration from TDM to IP
  – Can be deployed in various topologies & configurations (PtP & Multiple Point-to-Point—hub and spoke, self-healing ring, & daisy chain)
# Airmux PtP Wireless Links @ 2.4-5.8GHz

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>KEY PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airmux-400</td>
<td>- 200 Mbps net aggregate capacity @40MHz &amp; 1-16 T1s</td>
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<tr>
<td></td>
<td>- 2.4/4.9/5.3/5.4/5.8 GHz</td>
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<tr>
<td></td>
<td>- 100 Mbps Net aggregate @20MHz &amp; 1-16 T1s</td>
</tr>
<tr>
<td></td>
<td>- 2.4 / 2.5GHz / 3.65 GHz</td>
</tr>
<tr>
<td>Airmux-400L</td>
<td>- 50 Mbps net aggregate capacity &amp; 1-8 Native T1s</td>
</tr>
<tr>
<td></td>
<td>- 2.4 / 2.5 &amp; 4.9/5.3/5.4/5.8 GHz</td>
</tr>
<tr>
<td>Airmux-400LC</td>
<td>- 25/10 Mbps net aggregate capacity &amp; 1-4 T1s (for 25Mbps)</td>
</tr>
<tr>
<td></td>
<td>- 2.4 / 2.5 / 3.65 &amp; 4.9/5.3/5.4/5.8 GHz</td>
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<tr>
<td></td>
<td>- 10 Mbps unit upgradeable via s/w key</td>
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</tbody>
</table>
Airmux-400 High Capacity IP & TDM Backhaul

- **200 Mbps** net aggregate throughput at 40MHz
- Asymmetric Automatic up to 184/16Mbps
- Multi Band Radios **4.9/5.3/5.4/5.8, 3.65GHz**
- 5/10/20/40 MHz channel bandwidth
- QoS 4 queues 802.1p & Diffserv
- 10/100/1000 Ethernet interface
- High Processing Power for Triple Play Support – 148,000 VOIP PPS
- Native TDM 1-16 T1/E1s + Ethernet
- Web based NMS – for easy access and control
- Optimized for high capacity IP backhaul applications
Airmux-400L
Medium Capacity & Great Price

- **50 Mbps** net aggregate throughput
  Asymmetric Automatic to 5/45Mbps
- Multi Band Radios 4.9/5.3/5.4/5.8 GHz
- 5/10/20 MHz channel bandwidth
- 15 dBi embedded antenna for use up to 5km and connectorized in the same ODU
- QoS 4 queues 802.1p & Diffserv
- 10/100 Ethernet interface
- High Processing Power for Triple Play Support – 100,000 VOIP PPS
- Native TDM 1-8 T1/E1s + Ethernet
- Web based NMS – for easy access and control
- Optimized for Medium capacity IP backhaul / Triple play / Private networks
Airmux-400LC MiMO Solution for the Last Mile

- The best PtP solution in the market for access applications:
  - MiMO / Diversity – double capacity per given channel, better nLOS performance
  - Rich feature set of well known Airmux-400
  - Full asymmetric, QoS, Spectrum viewer
  - Very competitive price
- Two models, both supporting 4.9/5.3/5.4/5.8GHz
  - Up to 25 Mbps+ 4T1
  - Up to 10 Mbps net aggregate
- Small form factor unit case
  - Integrated antenna (15.5 dBi)
  - Connectorized unit
- Ideal successor to the Airmux-200 family
Airmux-400 features

- Robust Telco Grade Airmux designed MIMO OFDM Radios
- Multiband ODUs
- HSS and GPS ODU Sync to prevent cross interference
- Long range operation to 50+ miles
- Low and Stable latency of 2-3msec
- Spectrum Viewer
- 128 AES bit encryption in hardware
- Support 1+1 for Ethernet or T1/E1s
- Support Ring Topology
- Low Power consumption 13-35 watts
Features (continued)

- Diversity mode for nLOS and highly interfered area
- Adaptive Modulation with 8 Levels BPSK to 64 QAM
- Max Tx Power 25dbi
- Small footprint and low weight (ODU Radio 1.8Kg / 19x27cm)
- Immunity to Interference
- Optimized TCP algorithm
- Comply to IP67 for extreme weather
- Non-interrupted Transmission
- Quick and simple Installation via Intuitive GUI
Improving Competitiveness in the Last Mile and Video Surveillance Market

**PtP**

- **Airmux-400 (200Mbps)**
- **Airmux-400L (50Mbps)**

**High-End Market**

**Backhaul**

- **Airmux-400LC (25Mbps)**
- MiMO/ Diversity, Asymmetric QoS, Spectrum viewer
- Greater capacity vs. Range

**Low-Capacity Market**

**Access / Video Surveillance (VS)**
• Telco Grade Indoor Unit 19” 1U
• Dual Power Supply with redundancy
• 2 GB Ethernet Ports / Native TDM T1/E1s / SFP Port
• Independent clock per TDM port
• VLAN/QinQ,
• 1+1 Ethernet redundancy
• Ring topology
• -20 to -60V DC or 220V AC
• Dry contacts for Alarms

4 Models
- Ethernet Gigabit bit Only
- Ethernet + 4 T1/E1
- Ethernet + 8 T1/E1
- Ethernet + 16 T1/E1
IDU

- 2 Ethernet Ports / 2 T1/E1 Ports
- 9.5 inch / 24cm
- 1+1 Ethernet redundancy
- Ring topology
- VLAN/QinQ
- Single power supply
- Independent clock per TDM port

2 Models
- Ethernet Only
- Ethernet + 2 T1/E1
New Aggregation Unit - IDUH

- Aggregation for multiple Airmux links and HBSs at hub location
- Supports entire Airmux ODU portfolio
- Up to 6 PoE Interfaces (IEEE 802.3af / IEEE 802.3at/ Airmux PoE)
- Up to 25W per port
- 2 LAN Interfaces 10/100/1000 Mbps; auto-negotiation
- SFP Interfaces : 2 x SFP ports of 10/100/1000 Mbps (standard MSA)
- Dimensions : 1U x Half 19” width
- Power Feeding : 44VDC - 56VDC, Dual redundant inputs.
Airmux-400 PtP Applications

Cellular Backhaul

IP & Access

Private Networks
Point-to-Multipoint
Airmux-5000
Product Offering
Airmux-5000  High Capacity PtMP

- **HBS-200 MIMO Base Station**
  - **250Mbps** Net Capacity @ 40MHz
  - **112Mbps** Net Capacity @ 20MHz
  - **4.9/5.3/5.4/5.8 GHz** (5/10/20/40MHz)
  - Also 2.5 & 3.65 GHz models

- **HBS-50 MIMO Base Station**
  - **50Mbps** Net Capacity @ 10MHz
  - **4.9/5.3/5.4/5.8 GHz** (5/10/20/40MHz)
  - Integrated 90° FP Antenna option

- **HBS-25 MIMO Base Station**
  - **25Mbps** Net Capacity @ 10MHz
  - **4.9/5.3/5.4/5.8 GHz** (5/10/20/40MHz)
  - Integrated 90° FP Antenna option
Airmux-5000 High Capacity PtMP

- Dedicated bandwidth per SU ensuring SLA
- 32 Subscriber Units per Base Station
- Smart Bandwidth Manager to dynamically allocate unused bandwidth to subscriber units
- Asymmetric traffic to 90/10% in each direction
- Designed for long range up to 18 miles
- Networking features – VLAN, QinQ, QoS per SU
- Low latency, min < 3msec, typical 4 to 10msec
- Channel BW – 5, 10, 20, 40 MHz
## Airmux-5000 High Capacity Subscriber Units

<table>
<thead>
<tr>
<th>Family</th>
<th>Max. Capacity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSU-50</td>
<td>50 Mbps</td>
<td>Integrated Antenna &amp; Connectorized models</td>
</tr>
<tr>
<td>HSU-25</td>
<td>25 Mbps</td>
<td>Integrated Antenna &amp; Connectorized models</td>
</tr>
<tr>
<td>HSU-10</td>
<td>10 Mbps</td>
<td>Integrated Antenna &amp; Connectorized models, upgradeable to 25Mbps capacity with s/w key. Also Integrated model with PoE feed for video camera</td>
</tr>
<tr>
<td>HSU-5</td>
<td>5 Mbps</td>
<td>Integrated Antenna &amp; Connectorized models, upgradeable to 5 or 10Mbps capacity with s/w key</td>
</tr>
</tbody>
</table>
MIMO Capacity per sector

**SUs range 2km @20MHz Channel BW**

- Sector Capacity - 92Mbps
  - 7 clients @ 6Mbps
  - 3 clients @ 10Mbps
  - 1 client @ 20Mbps

**SUs range 6km @20MHz Channel BW**

- Sector Capacity - 75Mbps
  - 7 clients @ 5Mbps
  - 2 clients @ 10Mbps
  - 1 client @ 20Mbps

**Double capacity at 40MHz Channel BW**
Airmux Mobility
Key Mobility Applications

• Border security
  – Real-time video feed to command post

• Transportation security
  – Real-time video streaming from trains, subways
  – Real-time video feeds of RR crossings to train engineer
  – WiFi and maintenance connectivity

• Oil & Gas
  – Ship to platform
  – Pipeline patrols

• Mines
  – Video feeds to/from mobile equipment

• Public Safety
  – Maritime ship to shore video feeds
<table>
<thead>
<tr>
<th>Mobility Requirement</th>
<th>Cellular</th>
<th>Satellite</th>
<th>Wi-Fi Mesh</th>
<th>WiMAX</th>
<th>Airmux</th>
<th>Customer Advantage using Airmux</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi-directional high Capacity</td>
<td>Low UL Capacity</td>
<td>Low UL &amp; DL Capacity</td>
<td>Supported</td>
<td>1:4 UL/DL capacity ratio</td>
<td>30Mbps net throughput – Full Asymmetric</td>
<td>High resolution video transmission for both UL and DL</td>
</tr>
<tr>
<td>Long range coverage</td>
<td>Inconsistent 3G coverage</td>
<td>Unlimited in open space</td>
<td>300m</td>
<td>10Km</td>
<td>10Km</td>
<td>Low number of base stations</td>
</tr>
<tr>
<td>Work in nLOS/NLOS &amp; harsh environments</td>
<td>Excellent</td>
<td>No coverage in underground and northern countries</td>
<td>Poor performance</td>
<td>Good</td>
<td>Good</td>
<td>Proven performance in multipath environment</td>
</tr>
<tr>
<td>Wide range of Frequencies</td>
<td>N/A</td>
<td>N/A</td>
<td>Unlicensed 2.4 &amp; 5GHz</td>
<td>2.3, 2.5 &amp; 3.5GHz</td>
<td>Unlicensed 2.1 to 6GHz</td>
<td>Complete flexibility</td>
</tr>
<tr>
<td>Low latency</td>
<td>High Latency 20-200msec</td>
<td>High Latency &gt;300msec</td>
<td>High Latency 20-200msec</td>
<td>High Latency 20-100msec</td>
<td>Low and Constant Latency 10-20msec</td>
<td>High Performance in delay sensitive applications (Video, Voice)</td>
</tr>
<tr>
<td>QoS</td>
<td>Not Supported</td>
<td>Not Supported</td>
<td>Partial Support</td>
<td>Supported</td>
<td>Supported</td>
<td>Different levels of data service priority</td>
</tr>
<tr>
<td>OPEX</td>
<td>Medium</td>
<td>High</td>
<td>None</td>
<td>Medium</td>
<td>None</td>
<td>Unlicensed bands</td>
</tr>
<tr>
<td>CAPEX</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>
Airmux – Summary

Reliable & Robust  |  High Capacity  |  Long Ranges  |  Flexible & Scalable  |  Cost Effective  |  Simple

- Working at n/NLOS (near/Non-Line-Of-Sight) scenarios
- OFDM based technology
Airmux – Summary

- Reliable & Robust
- **High Capacity**
- Long Ranges
- Flexible & Scalable
- Cost Effective
- Simple

- High capacity per Sector - 200 Mbps aggregate throughput
- Up to 16 SUs per sector using Airmux-5000
Airmux – Summary

Reliable & Robust  |  High Capacity  |  **Long Ranges**  |  Flexible & Scalable  |  Cost Effective  |  Simple

- Long Range – up to 50+ miles @ 40Mhz
Airmux – Summary

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<th>Cost Effective</th>
<th>Simple</th>
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- High capacity end user equipment
- Wide range of frequency bands
- Aggregation up to 200Mbps
Airmux – Summary

Reliable & Robust  High Capacity  Long Ranges  Flexible & Scalable  Cost Effective  Simple

- Competitive cost structure
- Reduced CAPEX and Opex
Airmux – Summary

- Simple radio planning, training, installation & maintenance
- Reduced OPEX