Reliable Industrial WLAN?
A g e n d a

► Industrial Challenges

► Technologies for Reliable Links

► Application Examples
Agenda

- Industrial Challenges
- Technologies for Reliable Links
- Application Examples
## Basic Industrial Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Relevant Mounting Kits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation &amp; mounting</td>
<td>- Relevance Mounting Kits</td>
</tr>
<tr>
<td>Power supply</td>
<td>- Redundant 12-48 VDC</td>
</tr>
<tr>
<td>Oil, dust, acid, water, ...</td>
<td>- IP30 to IP68</td>
</tr>
<tr>
<td>Connectivity</td>
<td>- Terminal blocks, M12, ...</td>
</tr>
<tr>
<td>Temperature</td>
<td>- 0° – 60°C or -40° – 75°C</td>
</tr>
</tbody>
</table>

- Swivel pole mounting
- Wall mounting
- DIN-rail mounting

- A-PK-DC2DOF
- A-WK-55
- DK-DC50131
Advanced Challenges

- Electromagnetical fields
- Vibration & shock
- Maintenance
- MTBF
- Availability & performance

- Metal housing, EMC tested
- Mech. design, tests
- Easy plug & play, simple interfaces
- >10 years
- High availability and stable link performance
Example Pictures

- IP 68
- -40° to 75°C
- Metal housing
- Water and vibration proof connectors
- Redundant 12-48VDC
Agenda

- Industrial Challenges
- Technologies for Reliable Links
- Application Examples
Technologies ...

- Which standard to choose?
- Roaming solutions for moving vehicles
- Redundant RF cards against interference
- MIMO technology against reflections
- How to secure your network
- Advanced networking features
Which Standard to Choose?

- **Channel co-existence and interferences on 2.4GHz!**
  - Factories are overloaded with 2.4GHz WLAN
  - Bluetooth, microwaves etc interfere on 2.4GHz

- **5GHz provides more channels and less interference!**
  - Choose 802.11a or 11a/n

<table>
<thead>
<tr>
<th>Standard</th>
<th>IEEE 802.11b</th>
<th>IEEE 802.11a</th>
<th>IEEE 802.11g</th>
<th>IEEE 802.11n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatibility</td>
<td>IEEE 802.11b</td>
<td>IEEE 802.11a</td>
<td>IEEE 802.11b/ g</td>
<td>IEEE 802.11a/ b/ g</td>
</tr>
<tr>
<td>Frequency Band</td>
<td>2.4 GHz</td>
<td>5 GHz</td>
<td>2.4 GHz</td>
<td>2.4/ 5 GHz</td>
</tr>
<tr>
<td>Max. Data Rates</td>
<td>11 Mbps</td>
<td>54 Mbps</td>
<td>54 Mbps</td>
<td>300 Mbps</td>
</tr>
</tbody>
</table>

- **Professional site survey for channel selection and best installation location**
Fit for Purpose Roaming Solutions

- Roaming Time Parameters: # Channels & Security mode
  - Controller based roaming
    - High end solution
    - Flexible network design
    - <50ms incl WPA2
  - Client Roaming
    - Easy installation
    - Interoperability
    - <500ms incl WPA2

- Client re-associate and re-authenticate to the new AP

- Wireless Access Controller
- Controller for key handling and roaming commands
Don’t Worry about Interference!

- **Redundant RF Cards**
  - Redundant RF’s in 2.4 and/or 5 GHz send packets redundant
  - No packet loss in case of interference
MIMO against Reflections I

Nulling of electromagnetical waves

Control Room

Multipath

AWK-3131 Wireless AP

AWK-3131 Wireless Client

AWK-3131 Wireless Client

AWK-3131 Wireless Client
MIMO against Reflections II

- **802.11 a/b/g**
  - Diversity chooses best signal only

- **802.11 n**
  - MIMO adds all incoming signals up
Network Security

- Multiple security features available
- Industrial WLAN copies Enterprise features

**Authentication**
- Wireless (802.11)
- Wired (802.3)

**Encryption**
- Requires 802.11 authentication
- Can be encrypted with different protocols

**Filtering**
- Special Band for Loss Interference
- 2.4 GHz to 2.4 GHz Band (Europe ETSI)
- 4.9 GHz to 5.1 GHz Band (Public Safety Band)
- 5.825 GHz to 5.9 GHz Band (Special Application Band)

**Network**
- AP

**MOXA**
Advanced Networking I

- Wireless Bridge Mode
  - Node independent throughput
  - Clients can attach to any node along the bridge
Advanced Networking II

- **STP / RSTP**
  - Ring structures provide redundancy in case node fails
  - Loops must be avoided!

Recovery time depends on # nodes and device performance
Agenda

- Industrial Challenges
- Available Technologies
- Application Examples
Real Case 1: Wireless Ladle Transfer Crane in Steel
Real Case 2: Fully Automated Staker/Reclaimer in Mine
Real Case 3: Reliable Mobile WLAN in Underground Mine
Thank You

Lars Jaeger
Business Development IW
Lars.Jaeger@moxa.com