Корпоративная презентация

Вертикали и горизонтали промышленной автоматизации

«Новинки телекоммуникационного оборудования в продуктовой линейке ПЛКСистемы»
Часть 2: Korenix

Вебинар
Москва
31 марта 2016 года

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Ведущий специалист ОП и ТП

(495) 925-77-98
Содержание

- Кореникс и рынок industrial Ethernet
- JetNet Din Products
- JetNet Rack series Product
- JetWave Products
- Пример применения
Рынки

Ind. Ethernet

Heavy Ind. EMC
EN50155
EN50121-4/-3-2
IEC-61373

Heavy Ind. EMC
IEC 61850-3
IEEE 1613

Heavy Ind. EMC
NEMA TS1/2

Heavy Ind. EMC
C1D2, Zone 0,1,2

Heavy Ind. EMC
EN 60945 Marine

Heavy Ind. EMC
NEMA TS1/2

SURVEILLANCE
2016 DIN-Rail Gigabit Switch

Layer 3

JetNet 7014G
IPv6
EN50121-4
2016 Q2
IEEE 1588v2
JETNet 7020G
IPv6
EN50121-4
2016 Q4

JetNet 7310G-8P
IPv6
EN50121-4
2016 Q2
IEEE 1588v2
JetNet 7714G-M12
IEEE 1588v2 M12
2016 Q3

Layer 2

JetNet 5020G
SFP with DDM
NEMA TS2
EN50121-4
2016 Q3
Ready

JetNet 6910G-M12
IEEE 1588v2 Bypass
M12
2016 Q3

Bypass

EtherNet/IP
Modbus/TCP

CS CYBER SECURITY

CR CYBER REDUNDANCY
JetNet 5020G

- **16 FE/TX, 4 GbE/TX/SFP Combo**
  - 100Mbps, 1000Mbps Fiber

- **Fully Managed L2+ Switch**
  - IPv4/IPv6 SNMP, Web, Telnet
  - DHCP Server/Client, DHCP Relay w/Opt 82
  - USB Configure Backup/Firmware Upgrade
  - VLAN, QinQ, Private VLAN
  - 802.1p CoS/8 Queues/Port, IPv4 ToS/ Diffserv
  - Port Trunking, Mirroring
  - IGMP Snooping V1/V2c/V3, IGMP Query
  - Particular Unknown Multicast Forwarding
    - Drop, Flooding, Route port forwarding
  - IEEE 1588 v2 PTP- Transparent clock
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>GbE/TX</td>
<td>8</td>
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<td>PoE /PSE</td>
<td>8</td>
<td>4</td>
<td>4</td>
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<tr>
<td>PoE Budget</td>
<td>240W/ 54V</td>
<td>80W/ 24V</td>
<td>80W/ 24V</td>
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<tr>
<td>GbE SFP</td>
<td>2</td>
<td>2</td>
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<tr>
<td>FE Fiber</td>
<td>Yes, Auto</td>
<td>Yes, Auto</td>
<td>-</td>
<td>Yes, Auto</td>
<td>Yes, Auto</td>
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<tr>
<td>Console</td>
<td>RS232/RJ-45 8P8C</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>DO, DI</td>
<td>1 Alarm Relay Dry Out, 1 DI (Semi Digital: Hi [ 11<del>30V ], Lo [ 0</del>10V] )</td>
<td></td>
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<tr>
<td>Power</td>
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<td>Heavy Industrial</td>
<td>V</td>
<td>V</td>
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<td>Transport</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
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<tr>
<td>Power Station</td>
<td>V</td>
<td>V</td>
<td>V</td>
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</tr>
</tbody>
</table>
Full Gigabit & Power Sourcing

JetNet 7310G-8P

- Full Gigabit PoE Switch
  - 8x 10/100/1000Mbps
  - 2x 100M/1000Mbps, Fiber SFP, Digital Diagnostic Monitoring
  - Wire-speed forwarding
  - High Efficiency 1.5MB Buffer

- 240W PSE Power Budget
  - IEEE 802.3at, 30W per port
  - 240W Full Power Delivery
  - -40~75 Wide Temperature

240W @75°C
1.5M Bytes Packet Buffer

- Very bursty traffic behavior result from video encoding technology
- I-frame consist of a large group of packets in a short intervals
- The bandwidth requirement depends on video format, resolution, vendors
- 1.5M bytes packet buffer eliminates packet loss and ensures video surveillance quality

JetNet 6528G
JetNet 5020G/7310G

[H.264 Frame Burst]

Over 100Mbps, video fragment
Rugged & High Reliability Design

High Reliability

- Dual Power Input with Redundancy
  - Electrical Current sharing (High Volt/High Sharing)
- Voltage Variation Survive
  - Accept voltage change during operating – DC 9.6~60V
- Automatic Self Rescued w/Watch-dog timer
  - 210ms Seconds Reset Timer
  - Hardware Based, Prevent CPU go into Software Dead Lock Loop

Suitable Extreme Out-Door Application

- Wide Operating Temperature Range - -40°C ~ 75°C
  - Must Adopts with Wide Temperature SFP Transceiver for Fiber
  - Indeed Wide Temperature AC power Supply or Battery
Railway Track Side –
- EN50121-4 EMC (Level-3, Performance, Criteria-A)
  - Criteria A – during Noise Interfere, no traffic loss
- Factory Automation – Overhead - Heavy Industrial EMC up Level-3, 4
  - IEC61000-6-2 (EMI) / IEC 61000-6-4 (EMS)

<table>
<thead>
<tr>
<th>EN55022 Radiation</th>
<th>JetNet 5020G</th>
<th>Track Side EN50121-4</th>
<th>Heavy Industrial EMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>6k/8K, Criteria-A</td>
<td>6K/8K, Criteria-B</td>
<td>4K/6K, Criteria-B</td>
</tr>
<tr>
<td>IEC61000-4-2 ESD</td>
<td>6k/8K, Criteria-A</td>
<td>6K/8K, Criteria-B</td>
<td>4K/6K, Criteria-B</td>
</tr>
<tr>
<td>20V/m, Criteria-A</td>
<td>20V/m, Criteria-A</td>
<td>10V/m, Criteria-A</td>
<td>10V/m, Criteria-A</td>
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<tr>
<td>IEC61000-4-4 EFT</td>
<td>2KV, Criteria-A</td>
<td>2KV, Criteria-A</td>
<td>2KV, Criteria-B</td>
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<tr>
<td>IEC61000-4-5 Surge</td>
<td>2KV, Criteria-A</td>
<td>2KV,Criteria-B</td>
<td>1kV, Criteria-B</td>
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<tr>
<td>IEC61000-4-6 CS</td>
<td>10V/m, Criteria-A</td>
<td>10V/m, Criteria-A</td>
<td>10V/m, Criteria-A</td>
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<tr>
<td>IEC61000-4-8 PFMF</td>
<td>300A/m, Criteria-A</td>
<td>300A/m, Criteria-A</td>
<td>30A/m, Criteria-A</td>
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<tr>
<td>IEC61000-4-9 PMF</td>
<td>300A/m, Criteria-A</td>
<td>300A/m, Criteria-A</td>
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<td>Layer 3</td>
<td>Layer 2</td>
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<td><strong>10G</strong></td>
<td><strong>10G SFP+</strong></td>
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<td><strong>JetNet 7852-4XG</strong></td>
<td><strong>JetNet 6828G</strong></td>
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<td>Ready</td>
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<td>2016 Q2</td>
<td>2016 Q3</td>
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<td>IPv6</td>
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<td>IP40</td>
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<td>IEEE 1588v2 PTP</td>
<td>IEEE 1588v2 PTP</td>
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<td>IEEE1613</td>
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<td>IEC61850-3</td>
<td>IEC61850-3</td>
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<td>EN50121-4</td>
<td>EN50121-4</td>
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<td><strong>JetNet 5428G V2</strong></td>
<td><strong>JetNet 5728G V2</strong></td>
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<tr>
<td>EtherNet/IP</td>
<td>EtherNet/IP</td>
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<td>Modbus/TCP</td>
<td>Modbus/TCP</td>
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<tr>
<td><strong>IEEE 1588v2 PTP</strong></td>
<td><strong>IEEE 1588v2 PTP</strong></td>
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<td><strong>2016 Q3</strong></td>
<td><strong>2016 Q3</strong></td>
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<td>IPv6</td>
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<td>IP40</td>
<td>IP40</td>
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<td>Ethernet Security</td>
<td>Ethernet Security</td>
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<tr>
<td>Cyber Redundancy</td>
<td>Cyber Redundancy</td>
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<td></td>
</tr>
</tbody>
</table>
JetNet 7852G-4XG

Industrial 48GTX+ 4x10G L3 Routing Server Switch

- **High-Performance L2/L3 Deployments**
  - 48GTX + 4 1/10GbE dual speed SFP/SFP+ uplink ports
  - 176Gbps switching capacity and 131Mpps forwarding rate supported
  - 4k Vlans, 12K jumbo frame, 32k MAC
  - -10~55°C wide operating temperature

- **High Availability**
  - 1+1 hot-swappable power supplies
  - Out-of-band management supported
  - MSR, 802.1D, 802.1w, and 802.1s supported
  - Up to 8 ports per link aggregation group (LACP) and up to 64 groups
  - Up to 32 paths ECMP routing for load balancing and redundancy
  - Virtual Router Redundancy Protocol supported

- **Intelligence**
  - Comprehensive suite of Routing, Switching, HA, Security, QoS, and Management
  - Advanced IPv4 and IPv6 routing

- **Simplicity**
  - Korenix View & korenix NMS Management

Industrial layer 3
Managed Switch

MSR-24G+2 10G Ring,
RSTP/MSTP

L2/L3/L4 ACL
LLDP / NMS

Layer 3 Routing
Redundancy
Dimensions (Height x Weight x Depth):
1.69x17.13x15.5 in. (42.8x435x393.7 mm)

Weight: 15.87lbs (7.2kg)

48 Fixed 10BASE-T/100BASE-TX/1000BASE-T Ports

4 Fixed 1/10G SFP+ Ports

470 watts Power supply

VAC hot-swappable power supply
### JetNet 7852G-4XG

**Performance/Scalability**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Maxim Limit</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>MPC8541</td>
<td>800MHz</td>
</tr>
<tr>
<td>Switching Capacity</td>
<td>176Gbps</td>
<td>Line rate non-blocking for all packet size</td>
</tr>
<tr>
<td>Supported L3 Interfaces</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>IPv4 Unicast Route Table</td>
<td>Up to 6K</td>
<td>Pure IPv4; with IPv6 3K</td>
</tr>
<tr>
<td>IPv4 Host Table</td>
<td>4K</td>
<td>Arp entries</td>
</tr>
<tr>
<td>IP Multicast Routes</td>
<td>512</td>
<td>PIM</td>
</tr>
<tr>
<td>VRRP groups</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>MAC Table/IGMP snooping group</td>
<td>32K/256</td>
<td></td>
</tr>
<tr>
<td>EtherChannel</td>
<td>64 (8 members per group)</td>
<td></td>
</tr>
<tr>
<td>Active VLAN</td>
<td>4093</td>
<td></td>
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<tr>
<td>ECMP</td>
<td>32-way</td>
<td></td>
</tr>
</tbody>
</table>

*100 times routing table
8 times host routes*
### JetNet 7852G-4XG SW Key Features

#### Layer 2
- Port-based VLAN
- 802.1Q VLAN
- IGMP snooping
- LACP
- Storm Control
- STP/RSTP/MSTP
- DCB
- MLAG
- GRE
- Q-in-Q
- QoS/DiffServ
- L2/L3/L4 ACL
- Static & dynamic port security
- 802.1X
- DHCP snooping
- IP Source guard
- DAI
- LLDP/CDP

#### Layer 3
- Static route
- VLAN routing
- RIP v1/v2
- OSPF v2
- ECMP
- ARP, Proxy ARP
- IGMP
- DVMRP
- PIM-DM/-SM
- VRRP
- RIPng
- OSPF v3
- MLD v1/v2
- PIM-DM6, PIM-SM6
- DHCPv6 relay
- Policy-based Routing
- IS-IS
- BGP4

#### Mgmt.
- CLI/WEB/SNMP
- sFlow (RFC 3176)
- IPv6 management
- Auto-Installation

#### Data Center Application
- 802.1Qau (CN)
- 802.1Qaz (ETS)
- 802.1Qbb (PFC)
- DCBX (LLDP for DCB, VEPA, NIV)
- VM Tracer
- EVB/802.1Qbg
- OpenFlow v1.0/v1.2/v1.3
# Korenix 10G SFP+ Transceiver Solution

<table>
<thead>
<tr>
<th>Fiber Transceiver</th>
<th>Speed</th>
<th>Distance</th>
<th>Wave-length</th>
<th>Operating Temp.</th>
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</thead>
<tbody>
<tr>
<td>SFP10GLR10D</td>
<td>Single-mode 10GBase-LR/LW DDM</td>
<td>10km</td>
<td>TX1310nm, RX1310nm</td>
<td>-10~70C</td>
</tr>
<tr>
<td>SFP10GSRD</td>
<td>Multi-mode 10GBase-SR/SW DDM</td>
<td>300m(OM3)</td>
<td>TX 850nm, RX 850nm</td>
<td>-10~70C</td>
</tr>
</tbody>
</table>

![SFP10GLR10D](image1.png)  
![SFP10GSRD](image2.png)
JetNet 6828Gf/6528Gf

24GTX/8Gf+4 1GSFP L3/L2 full Gigabit Managed Switches

- 24GTX + 4 1GbE SFP ports
- 8 On Board 100/1000 RJ45/SFP combo ports
- EEE Energy Saving
- EN50121-4, IEEE1613, IEC61850-3 Compliance
- IEEE 1588v2 PTP with hardware time stamping for precise time synchronization of network (under 1 μs)
- USB FW upgrade
- Layer 3 Routing & Redundancy (6828Gf)
- Advanced IPv4/IPv6 Management/Routing (6828Gf)
- MSR <10ms@250 Recovery Speed
- Layer 2+ Software, Private VLAN, QinQ, 4k VLANs, 12K jumbo frame, 16k MAC
- EtherNet/IP, Modbus/TCP, korenix NMS management
- Fanless design, -40~75C
- All aluminum construction (JetNet 6828Gf)
- Redundant power supply with universal 110/220 VAC
- JetNet 6828Gf-1AC/-2AC/-1AC-1DC24/-2DC24 models
- JetNet 6528Gf-1AC/-2AC/-1AC-1DC24/-2DC24 models
## Time Sync.

<table>
<thead>
<tr>
<th>IEEE1588 PTPv2</th>
<th>Ruggedcom RSG2488 (HW-based)</th>
<th>MOXA ICS-G7828A (SW-based)</th>
<th>korenix JetNet6059G (SW-based)</th>
<th>korenix JetNet6528G (HW-based)</th>
<th>korenix JetNet6528G modular (HW-based)</th>
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<tbody>
<tr>
<td>Ordinary Clock</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Boundary Clock</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2E Transparent Clock (one-step)</td>
<td>✔</td>
<td>✔</td>
<td>Coming soon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2E Transparent Clock (two-step)</td>
<td>✔</td>
<td>✔</td>
<td>Coming soon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2P Transparent Clock (one-step)</td>
<td>✔</td>
<td>✔</td>
<td>Coming soon</td>
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<td></td>
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<tr>
<td>P2P Transparent Clock (two-step)</td>
<td>✔</td>
<td>✔</td>
<td>Coming soon</td>
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<tr>
<td>GPS time source</td>
<td>✔</td>
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<tr>
<td>Clock Accuracy</td>
<td>50ns</td>
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<td>-</td>
<td>100ns</td>
<td>50ns</td>
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</tbody>
</table>
### IEC 61850-3 & IEEE 1613 Test Summary (Full loading tests by IXIA)

<table>
<thead>
<tr>
<th>JetNet 6528Gf</th>
<th>Items Refer Std.</th>
<th>Severity / Level - Passed</th>
<th>Comments / Note</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Substation Std.</td>
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</tr>
<tr>
<td>EMI Radiation EN55022</td>
<td>IEC 61850-3</td>
<td>30Mhz ~1Ghz testing frequency range</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>EMI Conduct EN55022</td>
<td>IEC 61850-3</td>
<td>150Khz ~30Mhz testing frequency range</td>
<td>AC: Passed DC: Passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-2 ESD</td>
<td>IEEE 1613</td>
<td>Contact +/- 8KV, Air +/- 15KV</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-3 R.S.</td>
<td>IEEE 1613:2009</td>
<td>80~1G, 20V/m RMS, 35V/m peak less</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-4 EFT (Burst)</td>
<td>IEC 61000-6-5</td>
<td>Signal port: 4KV 100Khz</td>
<td>AC: Passed DC: Passed</td>
<td>B</td>
</tr>
<tr>
<td>IEC61000-4-5 Surge</td>
<td>IEC 61000-6-5</td>
<td>Signal/Signal port: 4KV CM/ 2KV DM; DC Pwr port: 4KV CM/ 2KV DM</td>
<td>AC: Passed DC: Passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-6 C.S.</td>
<td>IEC 61000-6-5</td>
<td>AC/DC Pwr: 10Vrms, Signal: 10V/m 150Khz~80Mhz, w/1Khz, 80% AM modulate. Performance Criteria B</td>
<td>AC: Passed DC: Passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-8 Pulse Field Magnetic Field</td>
<td>IEC 61000-6-5</td>
<td>100A/m Continuous, 1000A/m 1 Sec. to 3 Sec. refer to IEC 61000-6-5</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-10 Damp Oscillator Magnetic Field</td>
<td>IEC 61850-3</td>
<td>Refer to IEC 61000-4-10 30A/m</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-11 Voltage Dips (AC Pwr Sys)</td>
<td>IEC 61850-3</td>
<td>AC power: 100% for 5 S. periods, 100% for 50 sec. periods.</td>
<td>AC: passed</td>
<td>B</td>
</tr>
<tr>
<td>IEC61000-4-16 Conducted Common Disturbance</td>
<td>IEC 61000-6-5</td>
<td>Signal port: Level-4, 30V Cont., 300V / 1 second. DC port: level 4, 30V Cont., Criteria B at least.</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-17 Ripple on DC Power Supply</td>
<td>IEC 61850-3</td>
<td>10% Un (Normal, Typical Voltage)</td>
<td>DC: passed</td>
<td>A</td>
</tr>
<tr>
<td>IEC61000-4-18 Damped Oscillatory Wave</td>
<td>IEC 61000-6-5</td>
<td>2.5KV for Common mode, 1KV for Different Mode</td>
<td>AC: passed DC: passed</td>
<td>A</td>
</tr>
</tbody>
</table>
JetNet 6728G-24P/16P/8P

24GTX+4 1GSFP L2 full Gigabit Managed IEEE802.3at PoE Switch

- 24GTX + 4 1GbE SFP ports
- 24/16/8 Ports 802.3af/802.3at PoE+
- EEE Energy Saving
- EN50121-4 Compliance
- IEEE 1588v2 PTP with hardware time stamping for precise time synchronization of network (under 1 μs)
- USB FW upgrade
- Advanced IPv4/IPv6 Management
- MSR <10ms@250 Recovery Speed
- Layer 2+ Software, Private VLAN, QinQ, 4k VLANs, 12k jumbo frame, 16k MAC
- EtherNet/IP, Modbus/TCP, korenix NMS management
- Fanless design, -40~75C operating temperature
- All aluminum construction
- Redundant power supply with universal 110/220 VAC
- JetNet 6728G-24P/-16P/-8P models
JetNet 5728G-24P/16P v2

Industrial 24FE + 4G combo L2+ Managed IEEE802.3at PoE Switch

- 24FE + 4 1GbE SFP ports
- 24/16 Ports 802.3af/802.3at PoE+
- EEE Energy Saving
- USB Storage
- EN50121-4 Compliance
- Software-based IEEE 1588v2 PTP
- Advanced IPv6 Management
- MSR <10ms@250 Recovery Speed
- Layer 2+ Software, Private VLAN, QinQ, 4k VLANs, 9K jumbo frame, 16K MAC
- EtherNet/IP, Modbus/TCP, korenix NMS management
- Fanless design, -40~75C
- Redundant power supply with universal 110/220 VAC, 48VDC
- JetNet 5728G-24P/16P models
JetNet 5428G/Gf v2

Industrial 24FE + 4G combo L2+ Managed Switch / Industrial 16FX-8TX-4GTXSFP L2+ Managed Switch

- 24 100TX + 4 100/1000 RJ45/SFP combo ports (G)
- 16 100FX + 8TX + 4 100/1000 RJ45/SFP combo ports (Gf)
- EEE Energy Saving
- USB Storage
- EN50121-4 Compliance
- Software-based IEEE 1588v2 PTP
- Advanced IPv6 Management
- MSR <10ms@250 Recovery Speed, SuperChain, ERPS
- Layer 2+ Software, Private VLAN, QinQ, 4k VLANs, 9K jumbo frame, 16K MAC
- EtherNet/IP, Modbus/TCP, korenix NMS management
- Fanless design, -40~75C
- Redundant power supply with universal 110/220 VAC, 24/48VDC
- JetNet 5428G-1AC/-2DC24 models
- JetNet 5428Gf-1AC/-2AC/-1AC-1DC48 models
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interface</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber Ports</td>
<td>4x1000 SFP</td>
<td>2x100/1000 SFP</td>
<td>4x100/1000 SFP</td>
</tr>
<tr>
<td>DC power input</td>
<td>2x12-48V (DC)</td>
<td>2x1000 SFP</td>
<td>2x18-75V (DC)</td>
</tr>
<tr>
<td>DI/DO (Dry Relay)</td>
<td>NA</td>
<td>NA</td>
<td>1xDO (AC)</td>
</tr>
<tr>
<td>Dual Power/Ring status/Alarm LED</td>
<td>Power/RM LED</td>
<td>Power/RM LED</td>
<td>Yes</td>
</tr>
<tr>
<td>Console/USB</td>
<td>RS232</td>
<td>RS232</td>
<td>RS232/USB</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>125Mhz ARM7</td>
<td>125Mhz ARM7</td>
<td>600Mhz MIPS</td>
</tr>
<tr>
<td>System Memory</td>
<td>64Mbytes RAM</td>
<td>64Mbytes RAM</td>
<td>256Mbytes RAM</td>
</tr>
<tr>
<td></td>
<td>8Mbytes Flash</td>
<td>8Mbytes Flash</td>
<td>32Mbytes Flash</td>
</tr>
<tr>
<td>Packet Buffer</td>
<td>2Mbits</td>
<td>2Mbits</td>
<td>1.5Mbytes</td>
</tr>
<tr>
<td>EEE Energy Saving</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>Jumbo Frame/MAC address</td>
<td>9.2Kbytes/8K</td>
<td>9.2Kbytes/8K</td>
<td>9.2Kbytes/16K</td>
</tr>
<tr>
<td>Traffic Priority (QoS)</td>
<td>4 Queues/port</td>
<td>4 Queues/port</td>
<td>8 Queues/port</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModBus TCP</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>EtherNet/IP</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Cyber</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced RDH (256 Groups)</td>
<td>RDH</td>
<td>RDH</td>
<td>Yes</td>
</tr>
<tr>
<td>Super Chain; ITU-T G.8032 ERPS</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>RDH peer-protection (patented)</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## JetNet 5428Gv2 vs. JetNet 5428Gv1

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Cyber Security</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>802.1x MAB</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IPv6 ACL; Radius</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>DHCP Snooping</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>IP source guard (IPSG)</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>Dynamic ARP inspection (DAI)</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>Sticky port security</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>IPv6 RA Guard</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>Denial-of-Service Prevention (DOS)</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop / Broadcast storm protection</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>MLD snooping</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>DDM SFP</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>USB flash drive utility</td>
<td>NA</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-25~70°C, Fanless</td>
<td>-25~70°C, Fanless</td>
<td>-40~75°C, Fanless</td>
</tr>
<tr>
<td>MTBF</td>
<td>&gt;234,000 (5428G-DC)</td>
<td>&gt;219,000</td>
<td>&gt;234,000</td>
</tr>
<tr>
<td><strong>Certification</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE/FCC/UL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Vertical Market</td>
<td>NA</td>
<td>NA</td>
<td>EN50121-4/NEMA TS2</td>
</tr>
</tbody>
</table>

### Environment
- Operating Temperature: -25~70°C, Fanless
- MTBF: >234,000 (5428G-DC), >219,000 (5428G), >234,000
- Certification: CE/FCC/UL, Yes
- Vertical Market: NA, EN50121-4/NEMA TS2
Redundancy+ ERPS

- MSR (Multiple Super Ring) and flexible extended Designs, RDH, Super Chain
- Korenix Pattern Design
- Korenix Managed Switch Only
- Recovery time 5ms, Zero Restoration time

- ERPS (Ethernet Ring Protection Switching)
- ITU-T standard under G.8032
- Взаимодействие коммутаторов от разных производителей
- Recovery time < 50ms,
Восстанавливаются два и более линков в сети
Новые протоколы и технологии

**Application Layer 2**
- IEEE802.1x MAB
- RFC3621 PoE MIB
- PTPv2 (SW-based)
- Advanced Modbus/TCP

**Layer 3**
- IPv6 static routing
- SNMP IPv6
- IPv6 ACL

**Cyber Security**
- DHCP Snooping
- IP source guard (IPSG)
- Dynamic ARP inspection (DAI)
- Sticky port Security

**Cyber Redundancy**
- Advanced Super Chain
- 256 RDH group
- MLD Snooping
- USB Storage

- BGP4
- ECMP
- IPv6 RIPng/OSFPv3
- Multicast Routing: MLD v1/v2, PIM-DM6/-SM6

**Cyber Security**
- Automatic Denial-of-Service (DOS) to avoid DoS attack
- RA Guard (IPv6)

**Cyber Redundancy**
- G.8032 ERPSv2
- RDH peer protection
- MC LAG
- OPC UA

**Time Sync.**
- PTPv2 (HW-based)
- Sync-E
- GPS time source
- IEC 62439 HSR/PRP

Q1, 2015
Q2, 2015
Q3, 2015
Q4, 2015
New Cyber Security

- DHCP Snooping
- Dynamic ARP inspection (DAI)
- IP source guard (IPSG)
- Multi Level Authentication
- IPv6 RA Guard
- IPv6 ACL (L3/L4)
JetPort Product Line

JetPort 5801
JetPort 5804
JetPort 5804i
JetPort 5601 (V3)
JetPort 5604
JetPort 5604i

Wireless
Dual Ethernet
New Version (V3)

1 Port
4 Port
Serial Port

2KV isolation protection
2KV isolation protection

## JetPort 5601 V2 vs. JetPort 5601 V3

<table>
<thead>
<tr>
<th></th>
<th>JetPort 5601 V2</th>
<th>JetPort 5601 V3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Logo</strong></td>
<td>Korenix</td>
<td>No brand Design</td>
</tr>
<tr>
<td><strong>CPU speed</strong></td>
<td>250 MHz</td>
<td>750 MHz</td>
</tr>
<tr>
<td><strong>Linux Kernel</strong></td>
<td>2.4.27</td>
<td>2.6.31</td>
</tr>
<tr>
<td><strong>Window Driver</strong></td>
<td>Windows 7(32/64 bit)</td>
<td>Windows 10/8/7(32/64 bit)</td>
</tr>
<tr>
<td><strong>Terminal Block</strong></td>
<td>3-pin</td>
<td>3-pin screw</td>
</tr>
<tr>
<td><strong>Long Distance Termination</strong></td>
<td>HW DIP Switch</td>
<td>SW Control</td>
</tr>
<tr>
<td><strong>Dimension</strong></td>
<td>96.1(W) x 99(D) x 29.6(H)</td>
<td>110(W) x 114.8 (D) x 29.6 (H)</td>
</tr>
<tr>
<td><strong>Oper. Temp.</strong></td>
<td>-10~70°C</td>
<td>-20~70°C</td>
</tr>
</tbody>
</table>
JetPort 5601 V3
1 port RS232/422/485 Serial Device Server

- 3-in-1 RS232/422/485 Serial Port
- Dual 10/100BaseTX Ethernet Ports
- Dual Power Inputs (Terminal Block/Power Jack)
- Max. Serial Speed: 921.6 kbps
- Secured Management by HTTPS and SSH
- **JetPort Commander**, Korenix Windows Utility for Device Discovery, Multiple Device Setting and Monitoring.
- Versatile Serial Modes: Real/Virtual Com, Serial Tunnel, TCP Server, TCP Client, UDP
- Up to 5 Simultaneous Real/Virtual COM, TCP Server, TCP Client Connections
- Event Warning by Syslog, Email, SNMP trap
- Operating Temperature: -20~70°C
Несколько режимов работы:
- **Switch**: Stroe & Forward w/ CRC Check
- **Modify cut-through**: Forwarding after DA w/o CRC check
- **Pure Converter**: Simplify Signal Converts
- **Smart**: Pure Converter mode with RJ Speed Negotiation

Минимальные задержки
- 1.6 x 10^-6 S latency time
- совместимость с EtherCAT, PowerLink

Bi-directional Link Loss Forwarding
- Remote Link Down – Central Alarm
- Auto Fail-over Recovery

Условия работы:
- -40~75С, NEMA-TS1/TS2
- IEC 61000-6-2/-6-4 Heavy Ind. EMC, Track Side
# JetWave Products

<table>
<thead>
<tr>
<th>Industrial Outdoor AP</th>
<th>Industrial Din-Rail AP/GW</th>
<th>Cellular M2M Router/ Switch/ Serial</th>
</tr>
</thead>
<tbody>
<tr>
<td>JW2450 WIFI CPE, IP55, 802.11n, 1x1</td>
<td>JW3220/3220-M12 Dual 802.11n WIFI</td>
<td>JW2310-HSPA/LTE Cellular Router</td>
</tr>
<tr>
<td>JetWave 2810/20/30 1/2/3x 802.11n, 2x2</td>
<td>JW3320/3320-M12 3G+GPS+WIFI</td>
<td>JW2311-HSPA/LTE Cellular+WiFi Router</td>
</tr>
<tr>
<td>JetWave 4020, 9dbi 11n 2.4G+11ac 5G</td>
<td>JW3420/3420-M12 LTE +WIFI</td>
<td>JW2316-LTE Cellular +11n WiFi Router Switch</td>
</tr>
<tr>
<td>JetWave 4020E 11n 2.4G+11ac 5G</td>
<td>IWC 5630 IWLAN Controller</td>
<td>JetBox 5630/5633Gf VPN Server/Computer</td>
</tr>
<tr>
<td>Korenix NMS Includes JetWave</td>
<td>Korenix Mobile Manager</td>
<td>JetPort 5801v3/ JW5801 LTE Serial</td>
</tr>
</tbody>
</table>
JetWave 3320 GPS

- Antenna Type (Socket D): External Passive Antenna
- Firmware: V1.2
JetWave 3200 V1.2 firmware

- JetWave 3200 LTE-U model
  - LTE module: Cinterion PLS8-US
    - LTE-E: 800(20)/900(8)/1800(3)/2600(7)MHz
    - LTE-U: 700(17)/850(5)/AWS(4)/1900(2)MHz

- Korenix Mobile Manager support
- JetWave 3320 GPS support
- IPsec VPN
  - OpenVPN client + IPsec VPN
Cellular Router + Switch

- JetWave 2316 Industrial Cellular + 802.11n 2.4G IP Gateway, 4GT + 2G SFP Gigabit Switch, LTE-E/U

- LTE

- LTE + WLAN

- 2x Fiber
- 4x Gigabit L2 Switching
- Ring Redundant
- 802.1Q VLAN
- Serial/WAN

JetWave 2310/2311

JetWave 2316
JetWave 2316

- **Functionality**: 2.4G WIFI, 3G/LTE
- **Antenna**: (4.xdBi, -40~85°C)
- **Temperature Range**: -40~85°C
- **System LED**
- **USB**
- **Reset**
- **RS-232/422/485**
- **WAN (Gigabit Ethernet)**
- **Dual SIM Slot**
- **2x 100/1000M Fiber SFP**
- **SMA Antenna Socket** A(Front), B, C, D
- **LED Fiber**
- **4x Gigabit Copper**
- **2x DC Input, Digital Output**

### Antenna Installation

<table>
<thead>
<tr>
<th>Antenna</th>
<th>JetWave 2316-E</th>
<th>JetWave 2316-U</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>LTE-Aux</td>
<td>LTE-Aux</td>
</tr>
<tr>
<td>B</td>
<td>WIFI 1-1</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>LTE-Main</td>
<td>LTE-Main</td>
</tr>
<tr>
<td>D</td>
<td>WIFI 1-2</td>
<td>-</td>
</tr>
</tbody>
</table>

**Antenna installation**
JetWave 2316

- JetWave 2316 Industrial Cellular + 802.11n 2.4G IP Gateway, 4GT + 2G SFP Gigabit Switch, LTE
  - LTE, 2x2 DL-MIMO, max. 100MDL/50M UL
  - 802.11n 2.4G 2T2R, up to 300Mbps WLAN
  - 1GT WAN, 4GT + 2x 100/1000Base-X SFP ports, Wire-speed LAN Switching, LAN to WAN/LTE Routing
  - **Rapid Super Ring for Ring Redundancy**, integrated with Korenix Managed Switch
  - **Redundant Gateway**
  - **OPCuA** for Industrial M2M Communication
  - Dual SIM for Carrier Provider Redundancy
  - Support 256 VLAN tagging
  - WAN/Cellular Redundant, Auto-offload
  - NAT/Firewall/DMZ and Secure VPN Connectivity
  - Korenix View, Mobile Manager, SNMP, Korenix NMS
  - USB Configuration/Firmware restoring
  - 1xRS232/422/485 Dual DC 24V(12-48V), -40~70°C
<table>
<thead>
<tr>
<th>Communication Interface</th>
<th>Features</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LTE (Long Term Evolution)</strong>&lt;br&gt;2x2 DL-MIMO</td>
<td>WAN to LTE Redundant&lt;br&gt;Dual SIM Standby&lt;br&gt;OPCua&lt;br&gt;Mobile Manager Client</td>
<td>Max. 100Mbps DL, 50Mbps UL&lt;br&gt;÷ 30s WAN to LTE</td>
</tr>
<tr>
<td>Ethernet-WAN:&lt;br&gt;1x 10/100/1000Mbps RJ-45</td>
<td>NAT, Firewall, DMZ, Static Route, Dynamic RIP&lt;br&gt;Secured VPN Connectivity</td>
<td>High Speed 700MHz CPU&lt;br&gt;High Speed NAT Routing/VPN</td>
</tr>
<tr>
<td>Ethernet-LAN:&lt;br&gt;4x 10/100/1000Mbps RJ-45&lt;br&gt;2x 100/1000Mbps SFP Fiber</td>
<td>Korenix Rapid Super Ring&lt;br&gt;Ring Failed to LTE Redundant&lt;br&gt;RSR Redundant Gateway&lt;br&gt;IEEE 802.1Q&lt;br&gt;QoS / Class of Service&lt;br&gt;SNMP</td>
<td>12Gbps Wire Speed LAN Switching&lt;br&gt;Up to 5ms Recovery, 0ms Restoration&lt;br&gt;256VLANs&lt;br&gt;4 physical queues</td>
</tr>
<tr>
<td><strong>2.4G 802.11n 2T2R Wireless LAN</strong>&lt;br&gt;WLAN</td>
<td>AP, Client, WDS AP/Client&lt;br&gt;Link Fault Pass-Through&lt;br&gt;WIFI Auto-offload</td>
<td>Up to 300Mbps&lt;br&gt;÷ 10ms Auto-offload</td>
</tr>
<tr>
<td>RS232/422/485 COM</td>
<td>Serial 3-in-1 Communication</td>
<td>Up to 460.8Kbps</td>
</tr>
</tbody>
</table>
M2M Connectivity

- Multiple Clients to WAN/LTE Routing
- NAT, Firewall & DHCP for edge devices protection
- Secure Remote Connectivity: VPN
• Virtual Private Network

• Extend a private network across a public network
  – Replacement of expensive wire line
  – Using tunneling (Virtual Wire)
  – Data encryption
  – PPTP/L2TP/IPSEC/OpenVPN
• **WAN to LTE Redundant**
  - В то время как порт WAN соединен, это - основное соединение с провайдером поставщика услуг. Как только порт WAN перестал работать, LTE может быть резервным интерфейсом.

• **Dual SIM Redundancy**
  - В то время как основная связь SIM прерывается, восстанавливается через другого поставщика услуг и второй SIM карты.
• One Link Failed -> Rapid Super Ring
• Two Link Failed?
  – Redundant Gateway is activated
  – Redundant LTE(or WAN) Connection is activated
New Product Launch
Industrial Dual Band 802.11ac Wireless Access Point

JetWave 4020 series
Industrial Lead 802.11ac

- **Industrial Leading 802.11ac**
  - One Stream 150M -> 433Mbps
  - Two Streams 2T2R: 433Mx2 => 866Mbps
  - Three Streams 3T3R: 433Mx3 => 1,299Mbps
  - Beamforming technology

- **Dual Band Dual Radios:**
  - 2.4G 802.11n 2T2R: 300Mbps
  - 5.8G 802.11ac Wave 1 2T2R
  - Up to 1.16Gbps concurrent performance

- **Qualcomm QCA9890I**
  Industrial grade 802.11ac Wave 1 Solution
• **JetWave 12AB Series Korenix Design 802.11ac WIFI Module**
  - A: Frequency Band (2: Dual, 4: 2.4G only, 5: 5G only)
  - B: MIMO (2: 2T2R, 3: 3T3R)

• **JetWave 1253-ac1**
  - 5G 802.11a/n/ac, 3T3R MIMO, up to 1.3Gbps
  - 11ac Tx: 21dBm 1Tx, 25dBm 3Tx
  - Industrial QCA 9890I, -40~85°C
  - mPCIe, Linux

• **JetWave 1223-ac1**
  - 2.4G 802.11n + 5G 802.11ac, 3T3R MIMO, up to 450M/1.3Gbps
  - 11ac Tx: 15dBm 1Tx (TBD)
  - Industrial QCA 9890I, -40~85°C
  - mPCIe, Linux
JetWave 4020/4020E

- M12 USB + Console
- M12 Gigabit Ethernet
- M12 24V/110V Power Input
- Embedded 9dBi Dual Band Antenna
- N-Type External Antenna
**Anti-Vibration M12**

- **M12 Power**
  - 4-pin A-code
  - Dual 24V DC Input (≒15%)
  - Dual 110V DC Input (≒15%)

- **M12 USB + Console**
  - 8-pin A-code (Same as JetNet)
  - USB: Firmware Upgrade, Configuration Restore
  - Console CLI for configuration and Diagnostic

- **JetWave 4020/4020E:**
  - 1xGT WAN, 1xGT LAN
  - Routing & Switching

- **JetWave 4020/4020E-RSR (Phase 2):**
  - 2x GT LAN
  - Rapid Super Ring, RSR Redundant Gateway
  - 802.1Q VLAN, QoS
Dual M12 Ethernet Port

- One LAN One WAN for NAT Routing
- Two LAN for Ring / Wire speed Daisy Chain (Phase 2)

192.168.10.x
192.168.1.x

Dual Gigabit Ethernet Routing

Control Room

Gigabit Ethernet Ring/Daisy Chain
High Gain Embedded Antenna

- **Embedded Wall-mount 180° 2.4G 2T2R + 5G 2T2R bands antenna with a reflector plate.**
- **2.4GHz Band:**
  - 20dB EIRP for CE (ETSI 300 328)
- **Radio Pattern:**
  - 2400-2500MHz Frequency, 9dBi peak gain
- **5.8GHz Band:**
  - 27dB EIRP for ETSI 301 893 (Band 3)
- **Radio Pattern:**
  - 5150-5350MHz: 10dBi peak gain
  - 5475-5874MHz: 8dBi peak gain
JetWave 4020/4020E Major Spec

- **JetWave 4020/4020E Industrial Dual Band 802.11ac Wireless Access Point**
  - Rugged Outdoor and Industrial leading 802.11ac WIFI
  - **Dual Band Dual Radios**, 2.4G 802.11n and 5.8G 802.11ac Wave 1
  - **Up to 1.16Gbps** concurrent performance and Beamforming technology
  - **Internal Dual band 9dBi** 4T4R MIMO Antenna for Ceiling/Wall-mounting (4020)
  - **Dual M12 Gigabit Ethernet** ports Bridging or NAT Routing
  - **IP67** Water-proof, -40~70°C operating temperature, **EN50121-4** EMC protection
  - M12 24V/110VDC Power Input
  - M12 USB for configuration restoring
Industrial grade WLAN Controller

JetWave IWC 5630 series
Industrial-grade WLAN Controller
IWC 5630

- Korenix wireless management solution
  - Central-managed wireless network
    - Auto discovery/provision
  - Advanced wireless mobility
    - Server-based super roaming
  - Enhanced wireless security
    - Minimal secure deployment
Central-managed wireless network

• IWC 5630 monitors AP status for problem solving
  
  AP List
  This table shows the currently active access points.

<table>
<thead>
<tr>
<th>Index</th>
<th>MAC Address</th>
<th>Model</th>
<th>Name</th>
<th>Status</th>
<th>IP</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00:12:77:07:</td>
<td>JetWave320</td>
<td>korenix070307</td>
<td>Pending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>00:12:77:31:</td>
<td>JetWave320</td>
<td>korenix310084</td>
<td>Off-line</td>
<td>192.168.11.1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>00:12:77:31:</td>
<td>JetWave320</td>
<td>korenix310084</td>
<td>Connected</td>
<td>192.168.11.1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>00:12:77:31:</td>
<td>JetWave320</td>
<td>korenix310084</td>
<td>Connected</td>
<td>192.168.11.1</td>
<td></td>
</tr>
</tbody>
</table>

• IWC 5630 event/alarm for AP status in history

Event/alarm Log

<table>
<thead>
<tr>
<th>#</th>
<th>Date</th>
<th>Time</th>
<th>Level</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sep 4</td>
<td>17:29:01</td>
<td>Medium</td>
<td>AP [00:12:77:31:00:00:0c] joined WLAN controller.</td>
</tr>
<tr>
<td>2</td>
<td>Sep 4</td>
<td>17:32:19</td>
<td>Medium</td>
<td>AP [00:12:77:31:00:00:0c] disconnected.</td>
</tr>
<tr>
<td>3</td>
<td>Sep 4</td>
<td>17:47:03</td>
<td>Medium</td>
<td>AP [00:12:77:31:00:00:0c] rejoined WLAN controller.</td>
</tr>
<tr>
<td>4</td>
<td>Sep 4</td>
<td>17:48:20</td>
<td>Medium</td>
<td>AP [00:12:77:31:00:00:0c] disconnected.</td>
</tr>
</tbody>
</table>
Enhanced wireless security

- Minimal deployment: A secure gateway
  - Layer 2 MAC ACL
    - Allow & deny list
  - Layer 3 IP filtering
    - Source/destination IP addresses
    - Source/destination Ports
Advanced wireless mobility

Server-based super roaming
- 802.1x authenticator
- PRE-AUTH
- 100 ms roaming
  • Preparing test report

LAN

Radius server

AP1

AP2

AP3

Hundreds of ms to few seconds
Server-based super roaming

- 802.1x authenticator
- PRE-AUTH
- 100 ms roaming
  • Preparing test report
Redundancy++ with Cellular Communication

- Remote Monitoring with Ring (RSR) Integration
- **Product --> Solution**
  - IWC 5630/Mobile Manager/NMS on Central Room
  - Wire/Wireless Switch/Gateway for roadside Field BOX

Remote Monitoring

JetWave 2316 Series

Remote RING Monitoring

Rapid Super Ring
JetWave IWC 5630

- **JetWave Industrial-Grade WLAN Controller**
  - Integrated AP **auto discovery and auto provision** for fast installation and deployment
  - WPA2-personal/enterprise and IEEE 802.11i-compliant wireless security
  - **Layer2 MAC ACL and layer3 firewall** for traffic filtering
  - IEEE 802.1x/RADIUS supported and configurable **built-in RADIUS server** for plant wireless network
  - **100ms** server-based super roaming
  - Up to **25 managed APs and 1000 concurrent users**
  - Up to 8 WLAN profiles supported
  - IP30 grade sheet metal chassis
  - **-40~75°C** operating temp
  - **DC 9~36V** power input
Outdoor Industrial Wireless AP
JetWave 2450 11n, 8dBi

JetPort 5801 Slim LTE router

Industrial Mobile Cellular Router

Indoor Industrial Wireless AP
JetWave 4020E / 2820 11n/ac, IP67

JetWave 2316 router switch

Industrial Din-Rail Wireless AP/Gateway
JetWave 2316

Korenix NMS/Mobile Manager
IWC5630 IWLAN Controller

Industrial Wire & Wireless Integration
The Qinghai-Tibet Railway, China

The Qinghai-Tibet Railway the highest plateau railway in the world. To ensure a reliable operation in the extreme environment, the authority built a monitoring and control system on its power SCADA system, wireless stations along all the track line.

Korenix were successfully chosen as its main network system for JetNet are able to operate stably in extreme conditions. Strong winds, heavy sandstorms and more than a 30℃ temperature variation during one day. The IP31 aluminum housing offers great cooling effect, and protects the device from heavy sandstorms. The EN50121-4 EMC level protect the switches from the frequent thunderstorms.
### Radiated emissions immunity:
Twice the industrial level and 7 times the residential level

### Surge levels on signal:
4 times higher than industrial levels, 8 times higher than residential levels

### Surge levels on DC:
8 times higher than industrial and residential levels
114 pieces of JetNet 5428G and 96 pieces of JetNet 4510 were installed in 22 railway stations and the 96 field sites. **Two levels of rings** are designed for better scalability. Each field-level ring consists of several JetNet 4510 that run Korenix **MSR** for fast recovery. The JetNet 5428G at the station-level connect with the 3rd party core switches by **MSTP**.
JetNet 4510’s rugged design provides reliable connections to the PLCs, sensors and controllers at the field site
ITS on Train Network

Complete Wire Ring + Wireless Solution

Intelligent Transportation System is built on the train network. Easy installation and configuration benefit operators in less time spending. Korenix Ethernet and Wireless products form a complete ITS solution including MSR network redundancy and wireless communication with the centers of stations.

- Ethernet Connectivity
- PoE Power Delivery for Railway IP Cams
- Anti-Vibration M12 Connector
- Cellular
- Wireless
- Outdoor AP at Station
Intelligent Bus/Vehicle Network

- Station: Rugged Outdoor Wireless AP with Embedded Antenna
- Moving Vehicle:
  - 9~12V Booster PoE, 802.3at 30W for high power PD
  - Wireless CPE with Fast Roaming
  - Anti-Vibration M12 Connector
- LTE Connection on the way, switch to WIFI CPE on the Station
PoE for IP Surveillance/ITS

**JetNet 5310G-w**
- 8FE (PoE) + 2G combo
- IEEE 802.3at (30W)
- Cyber Redundancy/Security
- L2 manage
- -40~75°C

**JetNet 7310G-8P**
- 8GTX (PoE) + 2G SFP
- IEEE 802.3at (30W)
- Cyber Redundancy/Security+
- L3 Routing
- -40~75°C

**JetNet 3906G**
- 5GTX (4xPoE)
- 1G Optic Fiber for uplink
- IEEE 802.3at (30W)
- 12/24V Booster PoE
- -40~75°C

**JetNet 5428G V2**
- 24FE + 4G Combo
- L2+ manage/L3 Routing
- Isolated redundant power
- -40~75°C

**JetNet 6528Gf**
- 24GE + max. 12 SFP
- L2+ manage/L3 Routing
- Isolated redundant power
- -40~75°C

**JetNet 7852-4XG**
- 48GTX + 4 1/10G SFP
- 10G Bandwidth
- Advanced L3 Routing
- hot-swappable Power
Managed Switch IP Surveillance/ITS

**Road Side**

**JetNet 7014G**
- 10GTX + 4G SFP
- Dual DC Isolated power
- Redundancy, L3 Routing
- -40~75°C
- EN50121-4, IEEE 1613

**JetNet 5020G**
- 16FE + 4G Combo
- Dual DC Isolated Power
- Redundancy, L2+ Managed
- -40~75°C
- EN50121-4

**JetNet 5010G/4508**
- 7FE+3G Combo/ 8FE
- 3 Gigabit for Uplink
- FE for field connection
- Redundancy, L2 Managed
- -40~70°C

**Data Center**

**JetNet 6528Gf**
- 24GE + max. 12 SFP
- L2+ manage/L3 Routing
- Isolated redundant power
- -40~75°C

**JetNet 5428G V2**
- 24FE + 4G Combo
- L2+ manage
- Isolated redundant power
- -40~75°C

**JetNet 7852-4XG**
- 48GTX + 4 1/10G SFP
- 10G Bandwidth
- Advanced L3 Routing
- hot-swappable Power
СПАСИБО ЗА ВНИМАНИЕ !!!

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