Wireless Connectivity for Seaport Operations
February 22, 2017
Agenda

- Application Overview
  - Seaport, Harbor, and Dockyard Operational Networking
  - Backhaul options for critical equipment and operations
- Proxim Wireless Overview
- Proxim Wireless Technologies
- Seaport and Dockyard Deployment Considerations
- Proper Solution Design for Seaport and Industrial Applications
- Combining the Right Products for the Best Solution
- Port and Terminal Case Studies
- Related Industry Solutions
- Summary and Questions
Seaports, Harbors, and Dockyard operations represent some of the most difficult wireless networking challenges in a single solution.

- Harsh outdoor elements combined with heavy industrial operations
- A wide variety of large equipment, complex logistics and site obstacles
- An operation with a continuously changing scale and requirements
- A push towards automation, increased security, and mobile connections

Today the backbone to meet these requirements and support this complex operation is built on the modern wireless data network.

Proxim Wireless provides a set of core technologies which are designed to provide port operators with this backbone.

- Combining PtoP and MP products, Access Points, and Network Management, Proxim delivers reliable, robust, and scalable solutions to the support the most complex Seaport operations.
Proxim Wireless & Technologies
Who are we

30+ YEARS IN WIRELESS SPACE

2+ MILLION UNITS IN THE FIELD

90+ COUNTRIES

250,000+ CUSTOMER WORLDWIDE

Tsunami®

ORINOCO®
Markets We Serve

MOBILITY & INTELLIGENT TRANSPORTATION SOLUTIONS

SECURITY & SURVEILLANCE

CARRIER BACKHAUL

WIRELESS ISPs & LAST MILE ACCESS

WIRELESS LAN
Innovation at the Heart of Proxim
More Net Bandwidth
Solves the hidden node problem, protects the system from packet collisions and transmits the data in an optimal way.
Over 75% efficient means more $$ bits.

More Concurrent Subscribers
Connects over 100 remote nodes without adverse effects on total usable bandwidth.

Quality of Service
Ensures that the most important data arrives with priority. Prioritize and allocate bandwidth based on the type of traffic. Built in support for VoIP, IPTV, streaming video and more.

Smart Scheduling
Controls network bandwidth, protect the network from excessive bandwidth use by any one station.

WORP® is a proprietary wireless MAC protocol which optimizes connectivity in PMP networks.
Proxim ClearConnect™ ensures your wireless network efficiency even in harsh environment
Proxim FastConnect™

Features
- Guarantees seamless mobility
- Unparalleled handoff times < 40msec
- Supports delay-sensitive multimedia applications at speeds of 185 mph (295 km/h)

Applications
- Onboard Internet Connectivity
- HD CCTV inside vehicles
- Passenger Announcement (PA) Systems
- Onboard display advertising
- Digital Signage to provide route information

FastConnect™
High Speed Mobility for Buses, Trains, Metros and Ferries
Proxim Product Portfolio

**Point-to-MultiPoint**
- **Tsunami® MP-820/830 Series**
- **Tsunami® MP-826/8160 Series**
- **Tsunami® MP-10100 CPE/CPA Series**
- **Tsunami® MP-10100/L Series**
- **Tsunami® XP-10100 Series**

**Indoor WiFi**
- **ORiNOCO® AP-9100**
- **ORiNOCO® USB-9100**

**Outdoor WiFi**
- **ORiNOCO® AP-9100R**
- **ORiNOCO® QB-9100**

**Point-to-Point**
- **Tsunami® QB-825/835 Series**
- **Tsunami® QB-10100 Series**
- **Tsunami® QB-10100L Series**
- **Tsunami® GX-810/824 (FCC only)**
Tsunami® QB/MP-10100 for Backhaul and Mobility
Tsunami® MP Portfolio Overview

Tsunami Multipoint Positioning

Throughput in Mbps

XP-10100-SU

XP-10100-BS

MP-10100-SU

MP-10100-BS

MP-10100L-SU

MP-10100L-BS

MP-10100-CPA

MP-10150-CPE

MP-825-CPE

MP-835-CPE

MP-820-BS

MP-830-CPE

List Price in USD

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000
Tsunami® QB/MP-10100 Series

**Very High Performance**
With up to 633 Mbps UDP Throughput and 29 dBm transmit power, Tsunami® 10100 delivers very high throughput over very long ranges.

**Interference Robustness**
Proxim ClearConnect™ is a suite of over 13 different techniques all working together ensures robust and reliable radio communications in noisy deployments.

**Flexible Channel Planning Worldwide**
Operates in unlicensed bands from 5.150 to 5.925 GHz with 20, 40 and 80 MHz possible channel bandwidths.

**Water Proof**
IP67 rated and tested to operate under 1 meter of water for up to 30 minutes

**Advanced Gigabit Ethernet Ports**
Dual Gigabit Ethernet ports with controllable PoE in/out, capable of powering 802.3af compliant devices. Includes support for Jumbo Frame (9k bytes) and Ethernet Synchronisation pass-through (IEEE 1588v2).

**Extra Secure**
Tsunami® 10100 implements AES 128 encryption and Radius authentication. It also features highly-secure remote management via SSL, SSH and SNMPv3.

**Cost Effective and Ease of Use**
The most cost-effective, very high performance solution from Proxim, enabling any deployment to enjoy a quick return on investment.

**Controlled and Managed Effortlessly**
ProximVision™ Advanced unifies management of the entire Proxim infrastructure, within a few clicks. From monitoring network performance to remote device configuration and management PV Advanced provides total control.
**Compact Form Factor**
Smaller footprint and choice of integrated or external antenna helps WISP or video surveillance deployments in urban environments.

**Very High Performance**
With up to 866 Mbps data rate and 29 dBm transmit power, Tsunami® 10100-CPE/CPA delivers from 50 to 200 Mbps throughput over very long ranges.

**Interference Robustness**
Proxim ClearConnect™ is a suite of over 13 different techniques all working together ensures robust and reliable radio communications in noisy deployments.

**Flexible Channel Planning Worldwide**
Operates in unlicensed bands from 4.900 to 5.925 GHz with 20, 40 and 80 MHz possible channel bandwidths.

**Extra Secure**
Tsunami® 10100-CPE/CPA Implements AES 128 encryption and Radius authentication. It also features highly-secure remote management via SSL, SSH and SNMPv3.

**Water Proof**
IP67 rated and tested to operate under 1 meter of water for up to 30 minutes

**Cost Effective and Ease of Use**
The most cost-effective, very high performance solution from Proxim, enabling any deployment to enjoy a quick return on investment.

**Controlled and Managed Effortlessly**
ProximVision™ Advanced unifies management of the entire Proxim infrastructure, within a few clicks. From monitoring network performance to remote device configuration and management PV Advanced provides total control.
**High Performance**

With up to 400 Mbps UDP Throughput and 29 dBm transmit power, Tsunami® 10100 delivers high throughput over very long ranges.

**Interference Robustness**

Proxim ClearConnect™ is a suite of over 13 different techniques all working together ensures robust and reliable radio communications in noisy deployments.

**Flexible Channel Planning Worldwide**

Operates in unlicensed bands from 5.150 to 5.925 GHz with 20 and 40 MHz possible channel bandwidths.

**Water Proof**

IP67 rated and tested to operate under 1 meter of water for up to 30 minutes

---

**Advanced Gigabit Ethernet Ports**

Dual Gigabit Ethernet ports with controllable PoE in/out, capable of powering 802.3af compliant devices. Includes support for Jumbo Frame (9k bytes) and Ethernet Synchronisation pass-through (IEEE 1588v2).

**Extra Secure**

Tsunami® 10100 implements AES 128 encryption and Radius authentication. It also features highly-secure remote management via SSL, SSH and SNMPv3.

**Cost Effective and Ease of Use**

The most cost-effective, very high performance solution from Proxim, enabling any deployment to enjoy a quick return on investment.

**Controlled and Managed Effortlessly**

ProximVision™ Advanced unifies management of the entire Proxim infrastructure, within a few clicks. From monitoring network performance to remote device configuration and management PV Advanced provides total control.
Dual radios
Tsunami CrossPoint (XP) includes two radios:
- one 5 GHz WORP multipoint radio
- one 2.4 GHz Wi-Fi access point in a single device

Advanced Gigabit Ethernet Ports
Dual Gigabit Ethernet ports with controllable PoE in/out, to power 802.3af compliant devices. Includes support for Jumbo Frame (9k bytes).

Extra Secure
Implements AES 128 encryption and Radius authentication. Also features highly-secure remote management via SSL/TLS, SSH and SNMPv3.

Cost Effective and Ease of Use
The most cost-effective, very high performance access point with backhaul solution from Proxim, enabling any deployment to enjoy a quick return on investment.

Controlled and Managed Effortlessly
ProximVision™ Advanced unifies management of the entire Proxim infrastructure, within a few clicks. From monitoring network performance to remote device configuration and management PV Advanced provides total control.

Very High Performance
With up to 633 Mbps UDP Throughput and 29 dBm transmit power, Tsunami® XP-10100 delivers very high throughput over very long range.

Interference Immune
Proxim ClearConnect™ suite of over 13 different techniques all working together ensures robust and reliable radio communications in noisy deployments.

Part of Tsunami® Family
Tsunami® XP-10100 is fully interoperable with Tsunami® MP-10100 series. Moreover it is as robust and feature-rich as any other Tsunami® 10100 device.

Dual protocols

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PTMP WiFi Backhaul

- Each XP (Cross Point) unit has two radios
  - one for WORP communication to MP-10100 BSU
  - one for standard WiFi access
- XP also supports the PoE out for applications such as video cameras.
- This allows rapid deployment of a WiFi access network as well as security coverage on one network
Tsunami® 10100 Simplified GUI

- Tsunami 10100 introduces a simplified Web based Graphical User Interface
  - Setup Wizard helps quickly configure the link based on the Application Type
  - New Summary page provide a quick view of the link and highlight important facts
- Three login levels are available
  - Monitor
    - Read only
  - Admin
    - Simplified Web GUI
  - Advanced
    - Full feature Interface
ORiNOCO AP-9100R
Ruggedized for Outdoor Industrial & Enterprise Applications
ORiNOCO® Ruggedized AP-9100R

**Dual radios**
Access Point
5 GHz 802.11ac and 2.4 GHz 802.11n outdoor Access Point with built-in Spectrum Analyzer to ensure optimum performance even in harsh environment.

**Increased Performance**
ORiNOCO® AP-9100R dual radio delivers Gigabit performance with 1166 Mbps aggregate data rate, greater flexibility and interference avoidance.

**Advanced Gigabit Ethernet Ports**
Dual Gigabit Ethernet ports with controllable PoE in/out, to power 802.3af compliant devices. Includes support for Jumbo Frame (9k bytes).

**Extra Secure**
ORiNOCO® AP-9100R implements AES 128 encryption and Radius authentication. It also features highly-secure remote management via SSL, SSH and SNMPv3.

**Multimedia support**
Enables quadruple-play applications - video, voice, data and mobility with low latency and IEEE 802.11e QoS.

**Cost Effective and Ease of Use**
The most cost-effective, very high performance outdoor access point solution from Proxim, enabling any deployment to enjoy a quick return on investment.

**Water Proof**
IP67 rated and tested to operate under 1 meter of water for up to 30 minutes.

**Controlled and Managed Effortlessly**
ProximVision™ Advanced unifies management of the entire Proxim infrastructure, within a few clicks. From monitoring network performance to remote device configuration and management PV Advanced provides total control.

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ORiNOCO® Ruggedized AP-9100R

AP-9100R outdoor
- Dual radio: 2.4 and 5.15-5.85 GHz

Features

<table>
<thead>
<tr>
<th></th>
<th>2.4 GHz</th>
<th>5 GHz</th>
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<tbody>
<tr>
<td>Standard</td>
<td>802.11b/g/n</td>
<td>802.11a/n/ac</td>
</tr>
<tr>
<td>MIMO</td>
<td>2x2:2</td>
<td>2x2:2</td>
</tr>
<tr>
<td>TX power (dual chain)</td>
<td>Up to 26 dBm</td>
<td>Up to 28 dBm</td>
</tr>
<tr>
<td>Data Rate</td>
<td>300 Mbps</td>
<td>866 Mbps</td>
</tr>
</tbody>
</table>

- Connectorized for flexible antenna selection
- IP67 weather proofed enclosure
- Dual Gigabit Ethernet port with PoE in/out (25w output)
- Jumbo Frame support (9k Bytes)
- Public HotSpot
  - HomePage ReDirect & Walled Garden
- HotSpot 2.0
ORiNOCO® AP-9100R Simplified GUI

- ORiNOCO AP-9100R introduces the simplified Web Graphical User Interface
  - Setup Wizard helps quickly configure radios
  - New Summary page provide a quick view of the link and highlight important facts
- Three login levels are available
  - Monitor
    - read only
  - Admin
    - Simplified Web GUI
  - Advanced
    - Full feature Interface
ProximVision Advanced

Hybrid Controller
ProximVision™ Advanced

Designed for Large Networks
PV Advanced includes redundancy and NorthBound Interface to efficiently manage up to 10,000 nodes networks.

Heterogeneous Networks
PV Advanced unifies management of the entire Proxim infrastructure, including basic supervision of SNMP capable switches and routers.

Control and Manage Effortlessly
From monitoring network performance to remote device configuration and management, PV Advanced provides total control in a few clicks.

Multiple Remote Access
Gives network managers a flexibility to define access policy from the office or through the cloud for up to fifty concurrent session.

Geographical View and Dashboard
Provides a map overlay of your entire network with real-time, visual network status indicators.

Great Ease of Use and Supportability
Allows you to manage your entire network from a single console and wherever you are located.

Fault Management
Monitors your network and informs you of operational events or alarms.

FREE Copy
Download a full features, 100 nodes, FREE version of PV Advanced for 30 days.

PV Advanced includes basic controller features
- Auto discovery
- Network overview
- Firmware management
- Easy configuration
- RF parameters manual settings
PV Advanced merges a Cloud Based Carrier Management System and WLAN Controller features into a single software platform

- Modern Port networks are becoming more complex to address the operating requirement for high capacity and mobility.
  - This involves multiple Wireless technologies such as Wi-Fi, Proxim’s Tsunami WORP® and PtP / PtMP backhaul.
- Running and monitoring this complex network with multiple frequencies, power levels, and operations demands a solution which until today was a mixture of several disparate systems such as NMS and WLAN controllers.
- PV Advanced allows Proxim network elements to be managed under a single system ensuring seamless integration and control.

"With ProximVision Advanced, Proxim redefines the NMS/WLAN controller landscape with a hybrid solution today to deliver what our customers need for tomorrow. ProximVision Advanced has been architected to lead the way in simplifying, cost reducing, and easing operational challenges for the highly complex Heterogeneous Networks being deployed."

Greg Marzullo, President and CEO, Proxim Wireless
PV Advanced server is designed to be installed wherever you want:

- **Dedicated Server**
  - You have a dedicated server for networks management!
    Simply install PV Advanced server software on a Windows Server sitting in your IT room or control center.

- **Virtual Server**
  - You don’t want to allocate one physical server to PV Advanced!
    Start a Virtual Machine on your server and run PV Advanced server software on it.

- **Cloud Based**
  - You don’t want to worry about the hardware!
    Lease a Windows Server instance from Amazon Web Services (or any other cloud services) and run PV Advanced server in the Cloud.

Whatever the solution, securely access PV Advanced from any location via your Web browser.

- Requires NPAPI enabled browsers with Java plugin.
PV Advanced uses SNMP v1, v2c, v3 device discover and management

- Directly access devices via Web interface for easy configuration
  - Device profile can be created then pushed to other device at the least disruptive time via the task scheduler
- Provides a full view of the network:
  - Tree Architecture with easy device access
  - Static or Dynamic view of RF link quality, channel use, and operational activity
  - Fault and Alarms notification
  - Dashboard with detailed information
- Provides comprehensive fault management which allows you to be the first to know what is happening in your network
  - Events severity level and action (forward to IP, email, audio tone) configuration
  - Threshold Alarms definition
  - Device Trap receiver
 IPv4 and IPv6 stack
- Client/Server access
- Devices/Server communication

 Radio Link Test
- Perform performance test between two devices at a specific modulation
  - Once the test is run, the units revert back to operational mode

 Multiple View
- Control which sections of the network topology tree are visible for each user profile.
  - Admin always view all devices
Seaports and Harbors
The Proxim Wireless Solution
Networking Ports & Terminals

- Port Infrastructure & Environment
  - Backhaul connections
  - Mounting assets
  - Mobile equipment
  - Automated operations

- Network Traffic Requirements
  - Flows from various traffic sources and operations
    - Ship to shore, command center, and connections to agencies
  - Security required on all flows
    - Sensitive data – video surveillance and radiation detection

- Video Surveillance for Site Safety and Security
  - Securing the assets at the facility
  - Monitoring operations for safety

- Ensuring efficient and effective operations
  - Intermodal container management
  - Tracking equipment in operation
  - Scaling operations as industry scales
Port & Terminal Challenges

- Port Infrastructure – Connectivity
  - Large structures, equipment and continuous movement
  - Scale is always increasing
  - Mounting assets are not always strategically placed
  - Connections to mobile equipment for tracking and control
  - Automated container operations

- Harsh Environment for Wireless Infrastructure
  - Seaports are large outdoor ocean front industrial operations
  - Operating 24/7 Day and Night in all weather conditions

- Network Traffic Requirements
  - Various traffic flows require VLAN separation and QoS
  - Secure data flows required for mission critical traffic
  - Sensitive data – video surveillance, radiation detection, and agency data

- Site Safety and Security
  - Properly locating cameras for robust coverage requires the flexibility of wireless
Fixed QB & MP Backhaul Solutions

✓ Tsunami QB/MP-10100/820 series features simplify Port infrastructure
  ➢ Built in Gateway with NAT, DHCP server, and Proxy DNS
  ➢ Service flow based QoS with different profile creation

✓ Tsunami clients are compact and robust
  ➢ Ideal for installation in Ports and other industrial environments

✓ Tsunami series offer support for mobility
  ➢ Roaming between BSU connections for mobile terminal equipment

✓ Tsunami series offer built-in support HD Video traffic
  ➢ Ideal for site safety and security solutions

✓ Tsunami clients easy to deploy and install
  ➢ Deployment is faster and less prone to error
  ➢ Large antenna beam width provides faster Base Station discovery
    ➢ Optional antenna provide extra range
  ➢ RSSI LED simplifies antenna alignment
  ➢ Radius based provisioning automates remote device configuration

✓ Tsunami MP-835-CPE price/performance ratio
  ➢ Creates a cost effective solution for large seaport operators
Tsunami 10100/820 series support robust and secure links
- Metal enclosure with secure management and OTA AES data encryption
- Optimized RF link thanks to Dynamic Frequency Selection, Dynamic Data Rate, and Base station redundancy

Tsunami 10100/820 series support advanced video streaming
- Multicast transmission at high modulation and IGMP snooping
- QoS with latency and jitter control
- Packet burst and built-in advance retransmission mechanism

Tsunami 10100/820 series are designed for HD cameras
- 50 to 600+ Mbps throughput
- Tsunami 10100/820 clients compactness is ideal for industrial deployment
ORiNOCO® AP-9100R for Port infrastructure
- Supports any 802.11a/b/g/n/ac equipment vendor client
- Dual radio for 2.4 and 5 GHz operation
- Built in Gateway with NAT, DHCP server, and Proxy DNS
- Service flow based on VLAN with QoS prioritization
- Radius/Server based authentication and provisioning
  - Automates and secures client connectivity
- ORiNOCO® AP-9100R is Ruggedized
  - IP-67 rated for dust, salt air, moisture, and humidity
  - Ideal for installation in Ports and other industrial environments
- ORiNOCO® AP-9100R is connectorized for flexible antenna selection
  - Providing focused coverage and better range
  - Continuous connections for automated terminal equipment
- Tsunami MP-835-CPE price-performance ratio
  - Creates a very attractive cost effective solution for large Ports
Terminal Mobile Networking

- Tsunami 10100/820 series high speed mobility enables seamless communication between mobile equipment and fixed base stations
  - FastConnect supports high speed connections up to 295 km/h (185 mph)
  - Clients roam between Tsunami 820 and 10100 base stations
- Tsunami 10100/820 series offers built in mobility at no extra cost
  - Mobility feature is in every Tsunami MP device
- Tsunami MP-10100-CPE/CPA are compact and ideal for vehicle installation
  - Compact footprint and robust enclosure
  - Choice of built in or external antenna
  - 12 VDC powering
- Ideal for mobile equipment control and video offload
Proxim Case Study: Seaport and Harbor
Port Automation Design and Solution

✔ Challenge

- Existing WiFi Network not providing proper Container Field coverage
- Project Requirements
  - Increase coverage to include entire container field
  - Increase connection reliability for Gantry Crane automated operation (ARTGC)
  - Provide mobility solution for portable port equipment such as Reach Stackers

✔ Solution

- ORiNOCO® AP-9100R ruggedized with external antenna
- Use 5GHz 802.11ac with improved channel management
- Tsunami® MP-10100 with compact 10100-CPE

✔ Why Proxim?

- Secure traffic with QoS
- IP-67 rated outdoor wireless equipment
- Mobile roaming solution
Port Mobility Design

Tsunami® MP-10100
CPE/CPA
Port Automated RTGC Design
Port Command Center Backhaul
Hutchison Ports, Port of Felixstowe – UK
Mobility Solution

Challenge
• Provide wireless connectivity to moving vehicles for the largest container terminal in the UK:
• Proxim solution to this request is two-fold:
  • On RTG Cranes (Rubber Tire Gantry)
  • On Quai Cranes
• To provide wireless backbone for on-crane data equipment while cranes are in motion

Solution
• Proxim Tsunami MP-8200 / 820 Series
  • Tsunami MP-8200 BSU’s covering the container yard with their sector antennas facing the sea
  • MP-825 CPE’s mounted on the RTG and Quai Cranes with their integrated antenna

Why Proxim?
• Hutchison Ports evaluated and tried solutions from multiple vendors and only Proxim complied with the testing criteria
• Superior functionality provided by WORP allows roaming in a harsh radio environment
• IP67 hardware with compact CPE
Challenge

- The primary requirement for the port management was to ensure seamless network connectivity across all its shipping assets.

Solution

- Tsunami® Base Stations are installed on central weighing station to ensure clear line of sight.
- Tsunami® Subscriber Units are installed on top of towers and cranes.

Result

- The network performs seamlessly despite the distance over water and changing weather patterns.
Port surveillance La Rochelle France (Phase 1)

Challenge
- On of the largest commercial ports in Europe
- Requirement to increase surveillance capacity in an awkward environment
  - 3000 visitors per day
  - 10,000 badge holders

Solution
- Tsunami QB11 5054
- Video surveillance

Why Proxim?
- Quick deployment compared to fiber solution
- Secure wireless using WORP
- Outdoor wireless products

« Nous sommes très impressionnés par la solution sans fil déployée qui fonctionne sans interruption dans des conditions climatiques parfois extrêmes. La solution est déjà amortie puisque nous avions au départ envisagé une solution par fibre optique, » explique M. Dominique Colson, Officier de Sécurité du Port.
Challenge
• More capacity required
  > Installation of high capacity cameras
• Extension of existing network

Solution
• Tsunami QB 8200
  > Data rate 300 Mbps
  > MiMO Technology
• Sony Cameras

Why Proxim?
• No issues with previous solution
• Upgrade to latest technology
• Secure wireless solution
Related Industries
Offshore / Onshore Oil and Gas

✓ Offshore Oil and Gas Operations
  ➤ Offshore platform connectivity to onshore operations
  ➤ Localized platform Access connectivity
  ➤ Video surveillance

✓ Refinery Operations
  ➤ SCADA Pump Station and Storage Tank connectivity
  ➤ Mobile Equipment connectivity
  ➤ Video surveillance for safety and security
Thank You

Tell Us Your Roughest Story In Pictures
And Get A Chance To WIN USD 500

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+proxim

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Backup
Tsunami® QB/MP-10100 Products

- QB-10100-LNK: 2xN-Type
- QB-10150-LNK: 22 dBi integrated antenna
- QB-10150-LKL: 28 dBi integrated antenna
- MP-10100-BSU, MP-10100-SUA and MP-10100-CPA: Two N-Type connectors
- MP-10150-BS1 & MP-10150-SUR: 22 dBi, panel antenna
- MP-10150-BS9: 16 dBi, 90° sector antenna
- MP-10150-SUL: 28 dBi, 2 foot panel antenna
- MP-10150-CPE: 16dBi, panel antenna
### Tsunami® QB/MP-10100 Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Dual Gigabit Ethernet port with PoE in and out</td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>Jumbo Frame support (9k Bytes)</td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>Precision Time Protocol (IEEE 1588v2) pass-trough</td>
<td>- Protocol used by Carrier to deliver a precise time over the network and thus estimate the round trip delay between network devices</td>
</tr>
<tr>
<td>Controller communication</td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>Tsunami 8200/820 backward compatibility (MP only)</td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>High Speed Mobility (MP only)</td>
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#### Protocol Specifications

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<tr>
<th>Protocol</th>
<th>WORP</th>
</tr>
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<tbody>
<tr>
<td>MIMO</td>
<td>2x2:2</td>
</tr>
</tbody>
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<th>TX power (dual chain)</th>
<th>Up to 29 dBm</th>
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<tr>
<th>Data Rate</th>
<th>866 Mbps</th>
</tr>
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<table>
<thead>
<tr>
<th>Throughput</th>
<th>Up to 600 Mbps @ 80 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Up to 305 Mbps @ 40 MHz</td>
</tr>
<tr>
<td></td>
<td>Up to 130 Mbps @ 20 MHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>5.150 – 5.925 GHz</th>
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<tr>
<td>Protocol WORP</td>
<td></td>
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<tr>
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<td>600 Mbps @ 80 MHz</td>
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<td>305 Mbps @ 40 MHz</td>
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</tr>
<tr>
<td>130 Mbps @ 20 MHz</td>
<td></td>
</tr>
</tbody>
</table>
Product Variants

- MP-10150-CPE-50/100/150/200
  - 4.900 – 5.925 GHz, 15 dBi panel antenna
- MP-10150-CPA-50/100/150/200
  - 4.900 – 5.925 GHz, N-Type connectors

Features

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<td>Data Rate</td>
<td>866 Mbps</td>
</tr>
<tr>
<td>Throughput</td>
<td>50 to 200 Mbps License upgradable</td>
</tr>
</tbody>
</table>

- Jumbo Frame support (9k Bytes)
- Precision Time Protocol (IEEE 1588v2) pass-through
- Controller communication
- High Speed Mobility
Tsunami® 10100L Product Variants

- QB-10100L-LNK: 2xN-Type
- QB-10150L-LNK: 22 dBi integrated antenna
- MP-10100L-BSU & MP-10100-SUA: Two N-Type connectors
- MP-10150L-BS1 & MP-10150-SUR: 22 dBi, panel antenna
- MP-10150L-BS9: 16 dBi, 90° sector antenna

- Tsunami 10100L only support 20 and 40 MHz channels
  - Maximum Data Rate of 400 Mbps
  - 80 MHz channel can be enabled by license upgrade
  - All features are identical to Tsunami 10100 features
Product Variants

- XP-10100-SUA (for use in a multipoint network)
  - Two 5 GHz N-Type connectors plus Two 2.4 GHz N-Type connectors
- XP-10100-BS1/SUR
  - 5 GHz, 22 dBi pannel antenna plus Two 2.4 GHz N-Type connectors

Features

<table>
<thead>
<tr>
<th></th>
<th>2.4 GHz</th>
<th>5 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>WiFi</td>
<td>WORP</td>
</tr>
<tr>
<td>MIMO</td>
<td>2x2:2</td>
<td>2x2:2</td>
</tr>
<tr>
<td>TX power (dual chain)</td>
<td>Up to 26dBm</td>
<td>Up to 29 dBm</td>
</tr>
<tr>
<td>Data Rate</td>
<td>300 Mbps</td>
<td>866 Mbps</td>
</tr>
<tr>
<td>Throughput</td>
<td>Up to 150 Mbps</td>
<td>Up to 600 Mbps</td>
</tr>
</tbody>
</table>

- Dual Gigabit ethernet port with PoE in and out for camera
- Jumbo Frame support (9k Bytes)
- Perfect for supporting Controller communication
- Perfect for providing a HotSpot
PV Advanced is designed to support large networks
- Up to 10,000 nodes
- Up to 50 concurrent management sessions
  - Auto log out after pre-defined inactivity time

PV Advanced is ready for heterogeneous networks
- Support for all Proxim Tsunami® and ORiNOCO® devices
  - Includes 10 years old “Legacy” product
- Basic Support for any SNMP MIB-2 capable product
  - Product status and real time performance information

PV Advanced software works on Windows 2003, 2008 or 2012 Server
- It can run on local hardware, virtual machine or in the cloud
- Server performance depend on the network size

<table>
<thead>
<tr>
<th>Network Elements</th>
<th>CPU</th>
<th>MEMORY</th>
<th>Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1,000</td>
<td>Intel® Xeon® E3-1220 v3</td>
<td>4 to 8 GB</td>
<td>500 to 1000 GB single partition</td>
</tr>
<tr>
<td>&lt;5,000</td>
<td>Intel® Xeon® E5-2430 v2</td>
<td>8 GB</td>
<td>1000 GB single partition</td>
</tr>
<tr>
<td>&lt;10,000</td>
<td>Intel® Xeon® E5-2660 v3 or E5-2680 V3</td>
<td>16 GB</td>
<td>2000 GB single partition</td>
</tr>
</tbody>
</table>
PV Advanced includes basic controller features

- **Overview Page**
  - PV Advanced status in one view

- **Discovery and Provisioning**
  - Automatically discover, configure and update device

- **Client Statistics**
  - Collect, store, and display clients information

- **Channel View**
  - Display all devices channel usage

- **Supported by:**
  - ORiNOCO AP-9100R
  - Tsunami® QB/MP-10100, 10100 CPE/CPA, and 820/830 series
PV Advanced directly access’ the device web interface

- No need to learn a new management interface to use PV Advanced
- No synchronization issue between PV Advanced and device firmware version
  - Firmware upgrades directly reflected in PV Advanced
PV Advanced allows users to centrally change SSID/Link Profile settings for multiple devices simultaneously

- Just select all devices to manage and the VAP to change

- Then set the new SSID parameters
PV Advanced includes the ability to forward alarms to OSS (operations support systems) and BSS (business support systems).

Network Manager can also query PV Advanced via its REST (Representational State Transfer) API Support.

Get Sub Topology

<table>
<thead>
<tr>
<th>Command</th>
<th>/topology/subnet/&lt;parentKey&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
<tr>
<td>Purpose</td>
<td>Returns the topology under a specified parent</td>
</tr>
<tr>
<td>Parameters</td>
<td>parentKey – A key of a network element to returns the sub-topology for</td>
</tr>
<tr>
<td>Result</td>
<td>An array of JSON objects.</td>
</tr>
</tbody>
</table>

```json
"data":{
  "topologyList": [
    {
      "parentKey": "563651494",
      "status": "0",
      "name": "Fremont BSU",
      "serialNumber": "14US32895437",
      "longitude": "-121.926390",
      "latitude": "37.478821",
      "type": "TMP",
      "key": "00:20:a6:19:29:39",
      "ethernetMac": "00:20:a6:19:29:39",
      "ipAddress": "10.0.0.1",
      "icon": ""}
  ]
}```

collections are provided for easy integration
PV Advanced allows users to centrally change security settings for multiple devices simultaneously.

- Just select all devices to manage and the security profile to change.

- Then set the new security parameters.
Why Tsunami®

- Tsunami is: Trusted, Experienced, Reliable
  - 20+ years in wireless broadband business
  - First PTP Tsunami released in 1997
  - First Tsunami MP released in 2004

- Tsunami is: Secure
  - AES 128 encryption
  - Secure management (SSL/SSH/SNMPv3)
  - Robust, weatherproof metal enclosure

- Tsunami is: Fully Manageable
  - Radius authentication and provisioning
  - Full SNMP MIB
  - SNTP and Syslog
  - sFlow agent
  - Completely integrated with PV advanced

- Tsunami is: Flexible
  - WORP or WORP sync protocol
  - Bridging or Routing mode
  - IPv4 or IPv6 stack
  - Point to Point (Quickbridge®) or Point to Multipoint
  - Unlicensed 5GHz or Licensed 6.4 GHz

- Tsunami is: Feature Rich
  - High Speed Mobility
  - Full VLAN support (Trunk, Access, QinQ)
  - Spectrum Analyzer and Radio Link Test
  - NAT and PPPoE client
  - IP over IP Tunneling
  - IGMP snooping

Tsunami®
Performance Matters, Proxim Delivers™

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Why ORiNOCO®

ORiNOCO is: Trusted, Experienced, Reliable
- 20+ years in wireless LAN business
- First WLAN client/AP released in 1994
- ORiNOCO Carrier/Enterprise AP introduced in 2003

ORiNOCO is: Secure
- AES 128 encryption
- Secure management (SSL/SSH/SNMPv3)
- Rogue Scan – search for all devices transmitting near the AP

ORiNOCO is: Fully Manageable
- Radius authentication and accounting
- Full SNMP MIB
- SNTP and Syslog
- Completely integrated with PV advanced

ORiNOCO is: Flexible
- WDS Support including interworking with legacy Orinoco APs
- Up to 8 SSIDs per radio
- Dual radio 2.4 and 5GHz
- Packet Forwarding
- VLAN mapping to SSID plus Ethernet Trunk/Access

ORiNOCO is: Feature Rich
- WMM QoS
- Adaptive cell size
- Link Integrity
- Public Hot Spot and Hot Spot 2.0

ORiNOCO®
Performance Matters, Proxim Delivers™
Secure Corporate Networks

- ORiNOCO® Access Point ensures corporate network data privacy
  - 802.11i security using AES 128 encryption
  - 802.1x Radius based authentication
- ORiNOCO® Access Point secure management prevents hacker from tampering with the device configuration and thus bypass security
  - https/SSL web GUI
  - telnet/SSH CLI
  - SNMPv3 with full MIB
- Proxim Vision Advanced
  - Hybrid Controller provides rapid network deployment and mobile configuration
WORP Sync is the synchronous variant of WORP®

- It is designed to mitigate interference found in dense networks and simplify channel planning tasks
- Based on a Time Division Multiplexing architecture, it defines a fixed transmit/receive pattern to be used by all units across the wireless network

WORP Sync must be loaded on all devices that are part of the network. It is compatible with the following devices:

- Tsunami 8200-G and 820 Base Station and Quickbridge.
  - Requires one pulse per second external source
  - QB825 and QB826
- Tsunami 8100, **8200** and 820 clients (SU / CPE)
  - No specific hardware required

WORP Sync is also capable of matching other vendors transmit/receive pattern

- Current release includes Cambium mode allowing to co-exist with ePMP and PMP 100, 430, 450 networks
WORP® vs WiFi

- WORP® developed over a ten year period with 250,000 man hours of development
- Operates on standard 802.11 hw platforms
- Polled MAC eliminates Hidden Node issues

WORP® Key Features
- Efficiency – super packing, selective retransmission and more, yield IP packet throughputs of 65% to 90%
- Service flow based QoS for traffic prioritization
- Security – MAC authentication, AES 128, fully encrypted
- Multicast direct support without performance loss

Wi-Fi
- Scalability is poor, more users degrades performance
- Efficiency is typically 50%
- QoS support is limited and not effective under load
- Multicast are either transmit in low modulation or split into multiple unicast

Wi-Fi Mesh
- Bandwidth limited
- QoS difficult to enforce