



QUICK START GUIDE FOR THE TRANZEO WIRELESS TR-CPQ

REVISION 1.3
FIRMWARE BUILD 89
DECEMBER 12, 2005

QUICK START GUIDE – TR-CPQ

FCC Information

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a Residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communication.

Operation of this equipment in residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

The user should not modify or change this equipment without written approval from Tranzeo Wireless. Modification could void authority to use this equipment.

For the safety reasons, people should not work in a situation which RF Exposure limits be exceeded. To prevent the situation happening, people who work with the antenna should be aware of the following rules

1. Install the antenna in a location where a distance of 40 cm from the antenna may be maintained.
2. While installing the antenna, do not turn on power to the unit.
3. Do not connect the antenna while the device is in operation.
4. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Safety Notices

Safety Precautions:

YOU MUST READ AND UNDERSTAND THE FOLLOWING SAFETY INSTRUCTIONS BEFORE INSTALLING THE DEVICE:

- This antenna's grounding system must be installed according to Article 810-15, 810-20, 810-21 of the National Electric Code, ANSI/NFPA No. 70-1993. If you have any questions or doubts about your antenna grounding system, contact a local licensed electrician.
- Never attach the Grounding Wire while the device is powered.
- If the ground is to be attached to an existing electrical circuit, turn off the circuit before attaching the wire.
- Use the Tranzeo POE only with approved Tranzeo models.
- Never install Radio Equipment, surge suppressors, or lightning protection during a storm.

A BRIEF WORD ON LIGHTNING PROTECTION

The key to a Lightning Protection is providing a harmless route for lightning to reach ground. The system should not be designed to attract lightning, nor can it repel lightning. National, State and local codes are designed to protect life, limb and property, and must always be obeyed.

When in doubt, consult local and national electrical codes or contact an electrician or professional trained in the design of grounding systems.



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Introduction

This next-generation wireless LAN device – the TRANZEO TR-CPQ, brings Ethernet-like performance to the wireless realm. Fully compliant with the IEEE802.11b standard, the TRANZEO TR-CPQ also provides powerful features such as the Internet-based configuration utility as well as WEP and WPA security. Maximize network efficiency while minimizing your network investment and maintenance costs.

Hardware Installation

Product Kit

Before installation, make sure that you have the following items:

- The TR-CPQ x 1
- DC Power Adapter x 1
- Power over Ethernet Adapter x 1
- Ethernet Boot x 1
- Mounting Bracket x 1
- Kep Nuts (With Washer Attached) x 8
- U-Bolt w/ 2 Nuts x 1
- Ethernet Boot Gasket x 1
- Ethernet Cable Lock x 1

If any of the above items is not included or damaged, please contact your local dealer for support.



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Mechanical Description

LED panel of the Wireless LAN Smart Access Point:

The following table provides an overview of each LED activity:

Label	Color	Indicators
POWER	Red	On: Powered On Off: No Power
LAN	Red	On: Ethernet Link Flashing : Ethernet Traffic Off: No Ethernet Link
Radio	Red	On: Radio Link Flashing Radio Activity Off: No Radio Link
Signal	Amber	Light up in sequence to indicate signal strength

Power Supply

ONLY use the power adapter supplied with the TR-CPQ. Otherwise, the product may be damaged.

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Hardware Installation

Take the following steps to set up your TR-CPQ.

Site Selection: Before installation, determine the TR-CPQ unit's location. Proper placement of the unit is critical to ensure optimum radio range and performance. You should perform a Site Survey to determine the optimal location. Ensure the CPE is within line-of-sight of the Access Point. Obstructions may impede performance of the unit.

Tools Required to Install

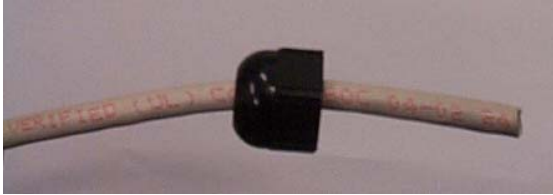
- One 3/8 wrench
- One 3/4 wrench
- One RJ-45 Crimper
- A suitable length of Cat 5 Cable to bring the signal from the unit to the Power over Ethernet Adaptor
- 2 RJ-45 Jacks

Before installing, you must determine if the unit will be in the horizontal or vertical orientation. The TR-CPQ model can be mounted in either orientation. The Ethernet boot should always be placed so that the cable runs toward the ground for maximum environmental protection.

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Connecting the Ethernet Cable

Step 1



Place the Ethernet Boot Cover over the end of your Cat 5 Cable. Attach the sticky side of the gasket to the underside of the Ethernet Boot.

Step 2



Attach Ethernet Cable Lock on side of the Ethernet Boot. This is easiest to do before you attach the RJ-45 Jack.

Step 3



Tighten using a $\frac{3}{4}$ " wrench or socket. Tighten until the Cable Lock touches the Boot as shown in Step 3.

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Step 4



Repeat steps 2 & 3 to attach the second Ethernet Cable lock if you purchased the optional dual port boot.

Step 5



Place Gasket over screws.

Step 6



Remove gasket backing and place boot cover on radio.

Step 7



Insert the Cat 5 Cable and tighten the Boot Cover. Be sure to pull enough cable through to reach the RJ-45 connector with an RJ-45 jack attached. The Gasket must be attached to the Boot so that it sits between the radio and the boot.

Hand tighten only. **DO NOT OVERTIGHTEN** as you may damage the environment seal.

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Step 8



Place the Ethernet boot over the 4 Screw Posts. The screws should just barely clear the tightening bracket. Apply 4 Keep nuts to the screw posts and tighten until the gasket makes full contact with the Ethernet boot. Do not over tighten.

Attaching the Mounting Bracket



As shown below, the U-Bolt is designed to mount around a pole. Tighten bolts sufficiently to prevent any movement.



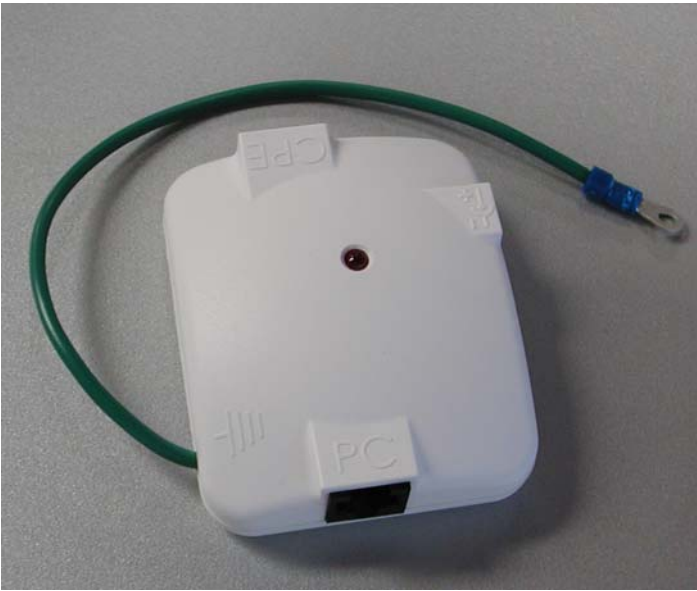
Down or up tilt can be adjusted by swinging the unit before tightening the U-Bolt.

Grounding the Antenna

Using a #6 Green grounding wire, connect the Grounding Lug on the radio to a proper ground. See APPENDIX A Lighting Information for more information.

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Connect the Power Cable



Connect the power adapter to the power socket on the Power over Ethernet Adaptor, and plug the other end of the power into an electrical outlet. Plug the RJ-45 Cable from the unit into the POE. The Station Adaptor will be powered on and the power indicator on the top panel will turn on.

NOTE: ONLY use the power adapter supplied with the Access Point. Otherwise, the product may be damaged.

This unit must be grounded. Connect the green Grounding cable to a known good earth ground, as outlined in the National Electrical Code.

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HTML Interface

NOTE: The default IP address is **192.168.1.100**
The default User Name is **admin**
The default Password is **default**

Passwords

Password Set/Reset

Use this screen to set or reset the passwords to your device if they've been lost or inadvertently changed. For security reasons, you must set both the normal administration password and the recovery passwords before accessing the administration interface.

The recovery password is available for 5 minutes after powering the device on. After 5 minutes the device must be power-cycled to reactivate the recovery password; this helps prevent abuse of the recovery password by users without physical access to the device.

Note: You must set both the normal administration and recovery passwords before using the administration interface.

Administration Password


Username: This is the normal account used to administer the device.
Password:
Confirm: This password is currently set to the factory default. You must set this password before using the administration interface.

Recovery Password

Username: This is a special account used to recover the administration password if it has been lost or inadvertently changed.
Password:
Confirm: This password is currently set to the factory default. You must set this password before using the administration interface.

When you first enter the Web Interface, you will be required to enter a new recovery password. This password is intended to allow the ISP to change the password of the device if they forget it. This password must be different than the operator password. Neither password can be left at Default. These passwords must be changed to access the device. If you do not enter new passwords, you will return to this webpage.

Information



802.11b (2.4GHz)
Tr-CPQ Router
with Integrated
15 dB Antenna

[CPE Setup Menu](#)
[Wireless Settings](#)
[Administrative Settings](#)

[Security](#)
 Basic
 Advanced

[Status](#)
[AP List](#)

[Network Configuration](#)

[Log Off](#)

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Information Page

Wireless Settings
DFS/TPC Enabled No
Link Status No Link
SSID TrCPQ
Device Name TrCPQ

Network Settings
IP Address 192.168.1.99
Subnet Mask 255.255.255.0
Gateway 192.168.1.1
Accessed From 192.168.1.10

Security
Encryption Off
Authentication None

Radio
Country / Regulatory US: United States (FCC1_FCCA)
MAC Address 0060B3DD2B38
Channel 1

Board
OS 6.3.34P (1019)
Software 1.10 (TrCPQ-84R)

Event Log
Hardware Events (none)

In the frame on the left, select the option you wish to configure.

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Wireless Settings

Wireless Settings

TrCPQ	SSID
Best (automatic) ▼	Tx Rate
3200	RTS Threshold (0-3000)
2346	Fragmentation Threshold (256-2346)
110.7 km ▼	Link Distance
0	ACK Timeout Tuning (µs)
30.0	Power Cap (dBm)
US: United States ▼	Select Country

Apply Back to Information Page

SSID

The SSID is a unique ID given to an Access Point.

Wireless clients associating to the Access Point must have the same SSID. The SSID can have up to 32 characters.

TX Rate

The rate at which the radio will communicate with the clients. **NOTE:** Setting this rate below the maximum possible does not limit bandwidth, and often has a negative impact on the operation of your network.

RTS Threshold (0-3000)

Select RTS that works best in your location. A general rule of thumb is the more clients you have, the lower the value should be set.

Fragmentation Threshold

Select Fragmentation that works best in your location. The lower the Fragmentation, the smaller the packets.

Link Distance

Sets the distance of the link for correct ACK timing.

ACK Timeout Tuning (µs)

For fine tuning the ACK timing if required.

Power Cap (dBm)

Sets the output power of the radio.

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Administrative Settings

The screenshot shows the 'Administrative Settings' page. At the top, it says 'Please type path to targeting Image File Name or click "Browse" button.' Below this is a text input field for 'Image File Name' with a 'Browse...' button to its right and an 'Upgrade Software' button below it. A horizontal line separates this from the next section. Below the line, it says 'To restore all settings to the factory defaults, please click "Defaults" button. To reboot system without resetting, click "Reboot" button. To get back to "Information Page", click "Back to Information Page" button.' There are 'Defaults' and 'Reboot' buttons. Below these are several input fields: 'Device Name' (containing 'TR6Rt'), 'User Name' (containing 'admin'), 'Password' (masked with dots), and 'Confirm Password' (masked with dots). To the right of these fields are labels: 'Device Name', 'User Name', 'Password', and 'Confirm Password'. Below the password fields are two checked checkboxes: 'Extended Wireless Information' and 'Signal/Status LEDs'. At the bottom are 'Apply' and 'Back to Information Page' buttons.

Image File Name

Enter the location of the Bios update file, or use Browse to locate the file in your PC, and then press 'Upgrade Software'

Defaults

Returns all settings to factory defaults.

Device Name

The network name of the device.

User Name

The access user name.

Password/Confirm Password

Enter the password for accessing the device

Ext. Info Enabled

Enable extended information. Extended information is only displayed with Tranzeo Wireless Technologies Access Points.

Signal / Status LEDs

Un-select to turn off the LEDs on the unit.

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Security Basic

The screenshot shows the 'Basic Security Settings' page. Under the 'WEP' section, there is an 'Enabled' checkbox which is unchecked. The 'Authentication' dropdown is set to 'Open'. The 'Key Length' dropdown is set to '64 bit'. The 'Default Key' dropdown is set to 'WEP Key 1'. Below this, there is an 'Activate Keys' section with four input fields, each containing the hexadecimal string '1234567890'. At the bottom of the WEP section are 'Apply' and 'Back to Information Page' buttons.

Enabled

Turn On WEP

Authentication

Select Open or Shared Key Authentication

Key Length

Level of Encryption. **NOTE:** 64 bit is referred to as 40 bit on some systems

Default Key

Choose the default WEP key

Activate Keys

Enter your WEP keys. **NOTE:** Keys must be entered in HEX only.

Security Advanced

The screenshot shows the 'Advanced Security Settings' page. Under the 'WPA' section, there is an 'Enabled' checkbox which is unchecked. The 'Cipher Type' dropdown is set to 'AES'. The 'PSK' input field contains 'password99'. The 'Update Interval (s)' input field contains '3600'. Below this, there is an 'Authentication' section. The 'RADIUS Server IP Address' input field contains '0.0.0.0'. The 'Timeout (min)' input field contains '60'. The 'RADIUS Server Shared Secret' input field contains 'radius_shared'. The 'Server Port' input field contains '1812'. There is also a 'MAC Address' checkbox which is checked. At the bottom of the WPA section are 'Apply' and 'Back to Information Page' buttons.

Enabled

Turn On WPA

Cipher Type

Select the Level of Encryption. TKIP or AES

PSK

Enter your password

Update Interval

Enter the update interval

Enabled Turn on 802.1x RADIUS Server Authentication

RADIUS Server IP Address

Enter the server IP

Timeout (min)

Enter the timeout period

RADIUS Server Shared Secret

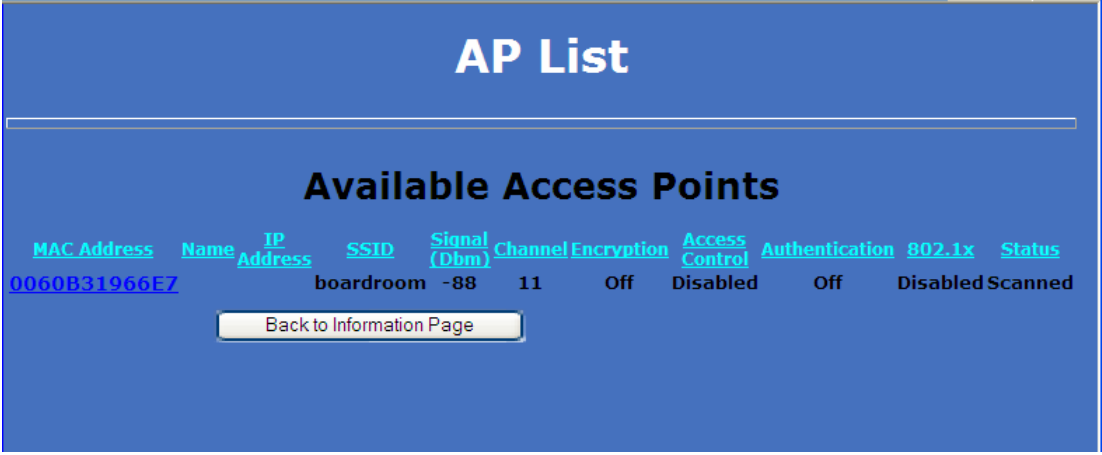
Enter the name of the server

Server Port

Enter the port of the server

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AP List



The screenshot displays a web interface titled "AP List" with a sub-section "Available Access Points". It features a table with the following columns: MAC Address, Name, IP Address, SSID, Signal (Dbm), Channel, Encryption, Access Control, Authentication, 802.1x, and Status. A single row of data is visible, and a "Back to Information Page" button is located below the table.

MAC Address	Name	IP Address	SSID	Signal (Dbm)	Channel	Encryption	Access Control	Authentication	802.1x	Status
0060B31966E7			boardroom	-88	11	Off	Disabled	Off	Disabled	Scanned

[Back to Information Page](#)

Shows list of available APs in the area

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Network Configuration

Network Configuration

Bridge Router

MTU(Kb) Default or 1.5

Allow Pinging

Access to Web Server Port 80 Timeout 60

WAN Static DHCP Client IP Mode

Copy DHCP parameters Release Probe

status

192.168.1.100 0.0.0.0 IP Address 192.168.1.1

255.255.255.0 0.0.0.0 Subnet Mask 255.255.255.0

192.168.1.1 0.0.0.0 gateway

0.0.0.0 0.0.0.0 DNS1

0.0.0.0 0.0.0.0 DNS2

Domain Name

Routing

NAT QoS [Static Routes](#)

Ethernet (wired) Port A Speed (Mbs), Duplex AUTO

B AUTO

Apply Back to Information Page

This page allows you to control the network configuration of the device.

You can also choose Static or DHCP Client IP configuration for both the device and any associated IP clients.

Enable the Router option to change the IP configuration for the LAN.

DHCP Server

In router mode you can configure the DHCP server settings.

NAT

Enable or disable NAT routing. On by default when in router mode.

Ethernet (wired) Port

Allows the setting of the Ethernet ports on the radio.

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DHCP Configuration

DHCP Configuration

IP Parameters

Subnet Mask: 255.255.255.0

Address Range

Starting Address: 192.168.100.100

Number of Addresses: 100

Gateway

This Unit Other: 192.168.100.1

Lease Time: 24 minutes

DNS

Server IP Address(s)

WAN-Assigned Static: Primary 0.0.0.0 Secondary 0.0.0.0

Domain Name

WAN-Assigned Static: localdomain

WINS

WAN-Assigned Static: Primary 0.0.0.0 Secondary 0.0.0.0

DHCP Clients

Apply Back to Information Page

Subnet Mask

Subnet mask for the DHCP pool.

Address Range

Starting Address

The starting address of the DHCP pool.

Number of Addresses

The number of addresses you want to have in the DHCP pool.

Gateway

Select *This Unit* to use the gateway on the radio or select *Other* to set a different gateway address.

DNS

WAN-Assigned

Select to use the DNS server addresses from the WAN side.

Static

Select to set DNS servers different than those on the WAN side.

Domain Name

WAN-Assigned

Select to use the Domain from the WAN side.

Static

Select to set a Domain different than on the WAN side.

WINS

WAN-Assigned

Select to use the WINS server addresses from the WAN side.

Static

Select to set WINS servers different than those on the WAN side.

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Static Routing Setup Screen

IP Routing

System Routes

Interface	IP Address	Subnet Mask	Gateway	Metric
WAN	192.168.1.255	255.255.255.255	0.0.0.0	1
WAN	192.168.1.100	255.255.255.255	0.0.0.0	1
WAN	192.168.1.0	255.255.255.0	0.0.0.0	1

User Routes

Interface	IP Address	Subnet Mask	Gateway	Metric
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0
Off	0.0.0.0	0.0.0.0	0.0.0.0	0

Default Route

Select Interface Gateway

System WAN 192.168.1.1

User WAN 0.0.0.0

Apply Back to Information Page

Static Routes

Adds a new route to the IP routing table.

System Routes

This section shows the current routing table entries.

Interface Specifies whether the entry will be enabled or disabled, and what interface it should use to transmit the packet.

IP Address The IP address or network that the packets will be attempting to access
Subnet Mask - Used to specify which portion of the Destination IP signifies the network trying to be accessed and which part signifies the host that the packets will be routed to.

Note: 255.255.255.255 is used to signify only the host that was entered in the Destination IP field.

Gateway Specifies the next hop to be taken if this route is used. A gateway of 0.0.0.0 implies there is no next hop, and the IP address matched is directly connected to the router on the interface specified:

Metric - The number of hops it will take to reach the Destination IP or network. A hop is considered to be traffic passing through a router from one network to another. If there is only one router between your network and the Destination network, then the Metric value would be 1.

Default Route

Allows the user to change the default route of the radio. **This option should be used with extreme caution.**

Tranzeo QoS Setup Screen

Quality of Service Configuration

Uplink Speed (Mbps): 4 Mbps

Dynamic Fragmentation: Automatic Classification:

Rules

#	enabled	Name	Protocol	Source		Port		Destination		Port	
				To	Range	To	Range	To	Range		
0	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
1	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
2	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
3	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
4	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
5	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
6	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
7	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
8	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
9	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
10	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
11	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
12	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
13	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
14	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
15	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
16	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
17	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0
18	<input type="checkbox"/>	0	0	0.0.0.0	0.0.0.0	0	0	0.0.0.0	0.0.0.0	0	0

Menu Options

Uplink Speed (Mbps)

Sets the maximum total pipe size for this client.

Dynamic

Fragmentation Reduce delay for high-priority traffic and adaptive fragmentation where the fragmentation is determined by the uplink speed. This feature greatly improves the gaming and VOIP experience.

Automatic Classification

In vast majority of cases, this is all you need to select. Applications such as VOIP, Gaming, etc are given priority.

For further QoS information refer to Appendix B.



QOS RULES

If you chose to add you own rules, here are the various options:

- Enabled** You must select enabled to turn the rule on
- Priority** The lower the number, the higher it priority. 0 is the highest priority and 255 in lowest.
- Name** The name here is for your reference only.
- Protocol** Enter the IP **Protocol Number** Common options are: 0 for ANY, 1 for ICMP, 6 for TCP, and 17 for UDP. See Appendix A – IP Protocol numbers.
- Source IP Range** Enter the range of the IP Addresses on the LAN side that the rule should apply to Enter 0.0.0.0 to apply the rule to all LAN IPs, otherwise enter the highest and lowest IP. For a single IP enter the same IP in both boxes
- Source Port Range** Enter the range of the Ports on the LAN side that the rule should apply to. Enter 0 to apply the rule to all Ports. For a single port enter the same port in both boxes
- Dest. IP Range** Enter the range of the IP Addresses on the WAN side that the rule should apply to.
- Dest. Port Range** Enter the range of the Ports that on the WAN side the rule should apply

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System Performance

System Performance

Select Refresh Rate (s) 0.5 1 3 5 10

Associated Access Point

Name	IP Address	SSID	Channel	Status
AProuter	192.168.0.61	R&DTestAP	4	Associated
Encryption	Authentication	Access Control	802.1x	MAC Address
Off	Off	Disabled	Disabled	0060B3B5FAAI

Link

Signal (Dbm)

-53

Tx Rate (Mb/s)

11

Select Refresh Rate

Each radio button represents a Refresh Rate. Many browsers do not allow infinite refreshes of a page through scripts, so this page may stop updating. If it does, simply change the Refresh rate to another value to restart the process.

Associated Access Point

Information about the access point is displayed here. Some items will only be displayed if the Access Point is a Tranzeo TR-CPQ series AP



NOTE ABOUT TX RATE: This field shows the value that the signal is capable of. If you have locked the data rate to a lower rate, this number may exceed that value.

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APPENDIX A: Lightning Information

What is a proper Ground?

This antenna must be grounded to a proper Earth Ground.

According to the National Electrical Code Sections 810-15s and 810-21, the grounding conductor shall be connected to the NEAREST accessible locations of the following:

- a) The building / structure grounding electrode
- b) The grounded interior metal water piping system
- c) the power service accessible means external to enclosure
- d) the metallic power service raceway
- e) the service equipment enclosure
- f) the grounding electrode conductor

The important thing is to connect to ground at the nearest point.

Why is coiling the LMR or CAT5 bad?

The myth is that lightning follows the path of least resistance. It actually follows the path of least impedance. Coiling cables creates an air-wound transformer, which lowers the impedance. This means you are in fact making your radios a more appealing target for surges.

What standard does Tranzeo Wireless equipment meet?

This radio exceeds International Standard IEC 61000-4-5 when properly grounded. For a copy of the full testing report, see *Report Number TRL090904 - Tranzeo Surge Protection board* located on the Tranzeo website.

Is lightning damaged covered by the Warranty?

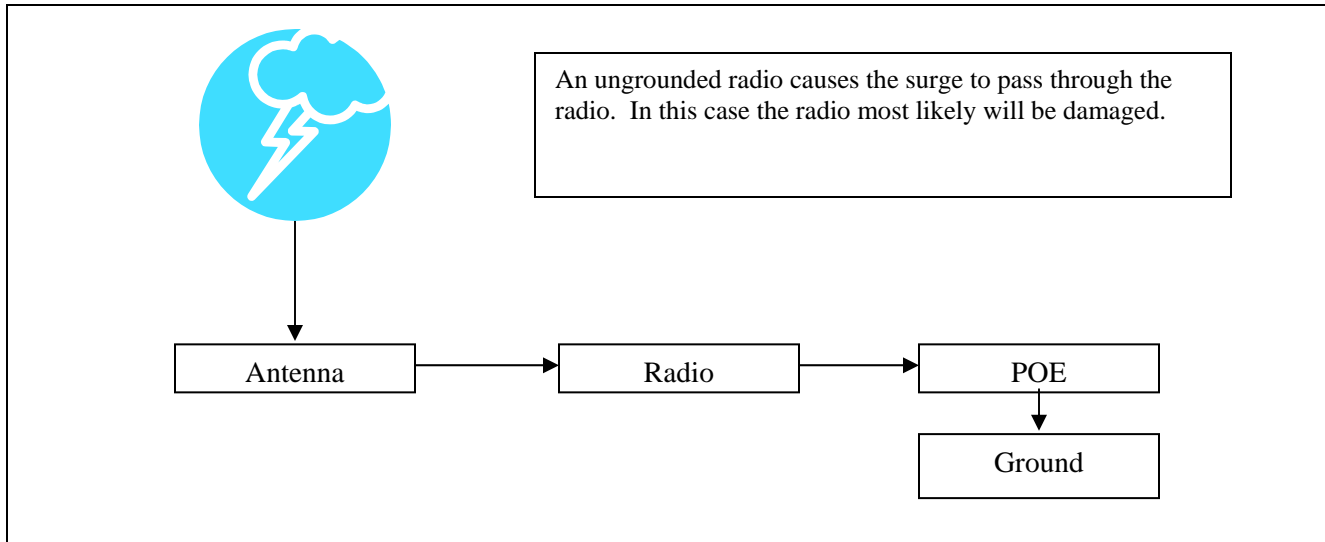
No. Lightning is not covered by the warranty. If you follow the instructions, your chances of lightning damage are greatly reduced, but nothing can protect a radio from a direct lightning strike.

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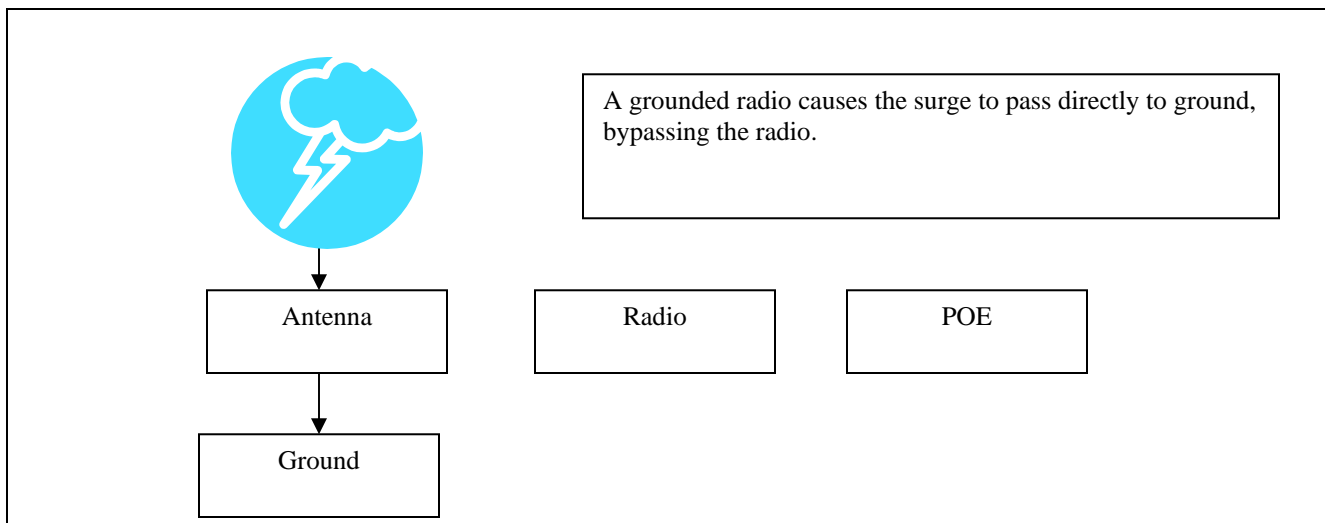
Where to Ground the device

This radio must be grounded at the Pole **AND** at the POE. This is because the radio is between the Exterior Antenna and the POE ground. See the examples below

Ungrounded Radio

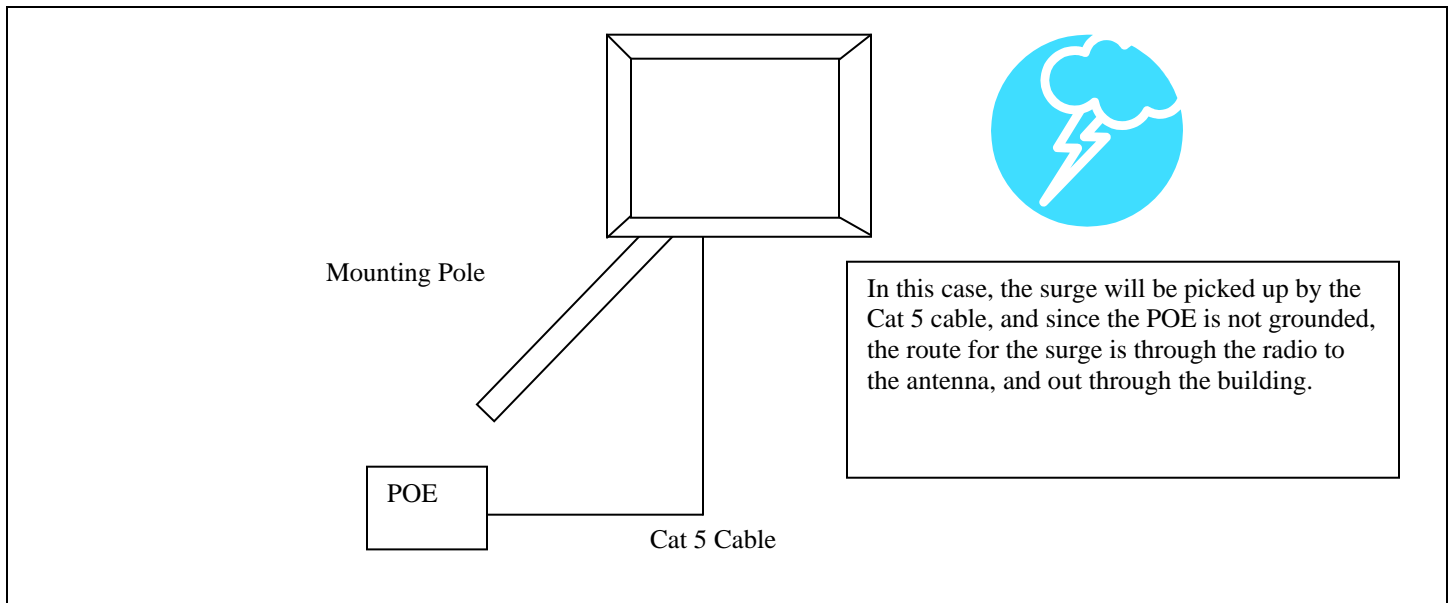


Grounded Radio

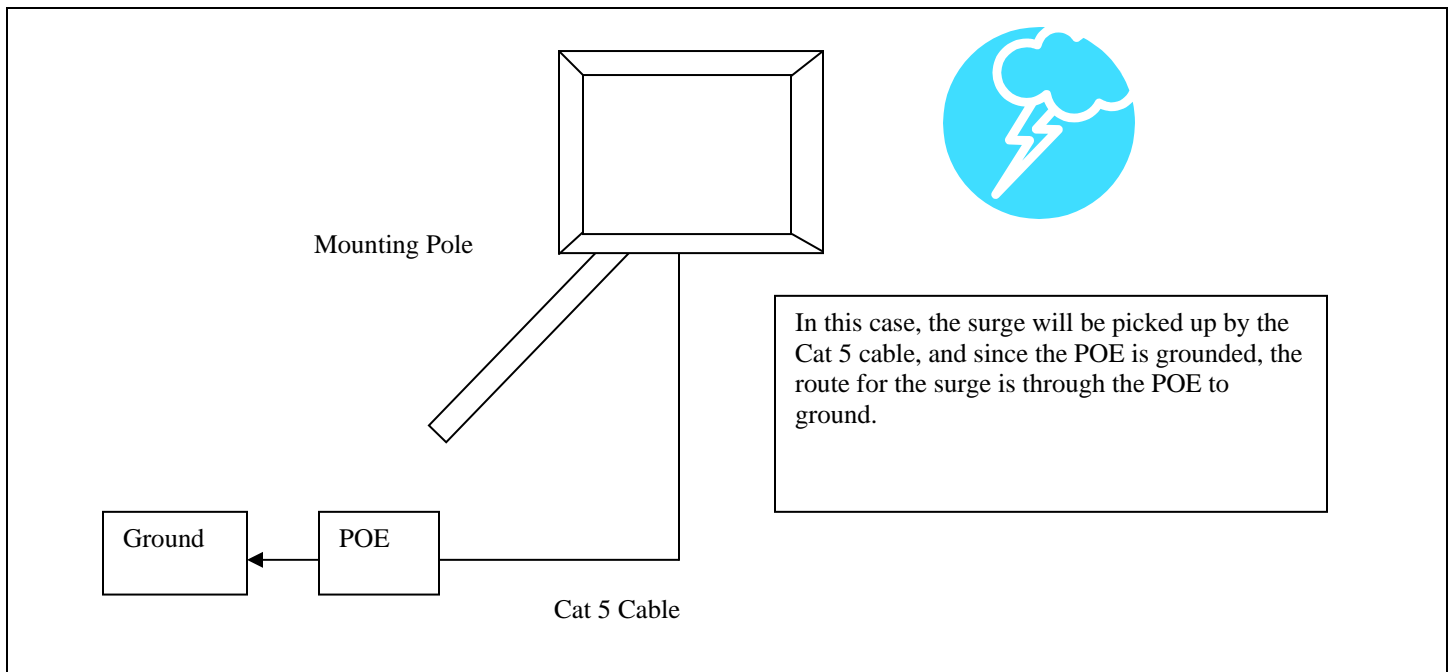


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Ungrounded POE



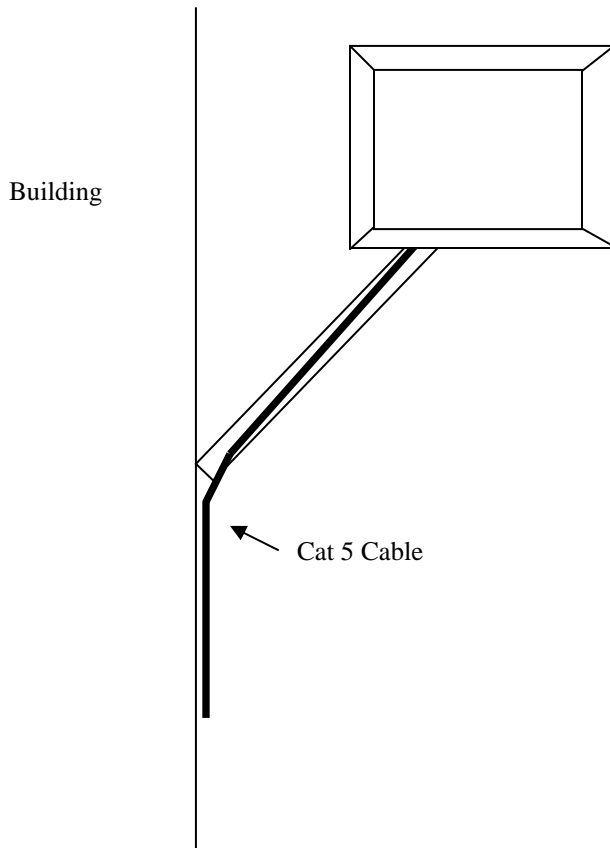
Grounded POE



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Best Practices

- 1) Always try to run the Cat5 and LMR inside of the mounting pole wherever possible. This helps to insulate the cable from any air surges.



- 2) Keep all runs as straight as possible. Never put a loop into the cables.
- 3) Test all grounds to ensure that you are using a proper Ground. If using an electrical socket for Ground, use a socket tester, such as Radio Shack 22-141
- 4) Buy a copy of the National Electrical Code Guide and follow it.
- 5) If you are in doubt about the grounding at the location, drive your own rod and bond it to the house ground. At least you will know that one Rod is correct in the system.

APPENDIX B: QoS

QoS

Tranzeo Wireless Technologies' software takes full advantage of technology to ensure a consistently high quality on-line experience through the use of powerful Quality of Service (QoS) mechanisms. The key to making this applicable in a WISP environment is the Intelligent Stream Handling, a patent-pending algorithm which autonomously manages the flow of traffic going to the Internet, without the need for user configuration. As a result, real-time, interactive traffic, such as gaming, VoIP and video teleconferencing, are automatically given the appropriate priority when other users and applications use the connection. In addition, Intelligent Stream Handling minimizes the impact of large packet, lower priority traffic on latency-sensitive traffic and eliminates delays. Tranzeo Wireless Technologies' software effectively eliminates the lag and breakup problem in online gaming and other voice/video applications.

In today's broadband environment the impact of just one data stream running in parallel with a real-time application can be quite dramatic. Using NetIQ's Chariot VoIP test measurement over a connection, it can be demonstrated that introducing a single FTP transfer in the upstream direction will reduce the Mean Opinion Score (MOS) for a G.729 VoIP codec from a very good 4.4 to a completely unacceptable level of 1 immediately. Using the same scenario with Tranzeo Wireless Technologies' QoS enabled, the voice quality remains consistently high with an MOS of 4.4, and maintains that level even with multiple FTP streams.

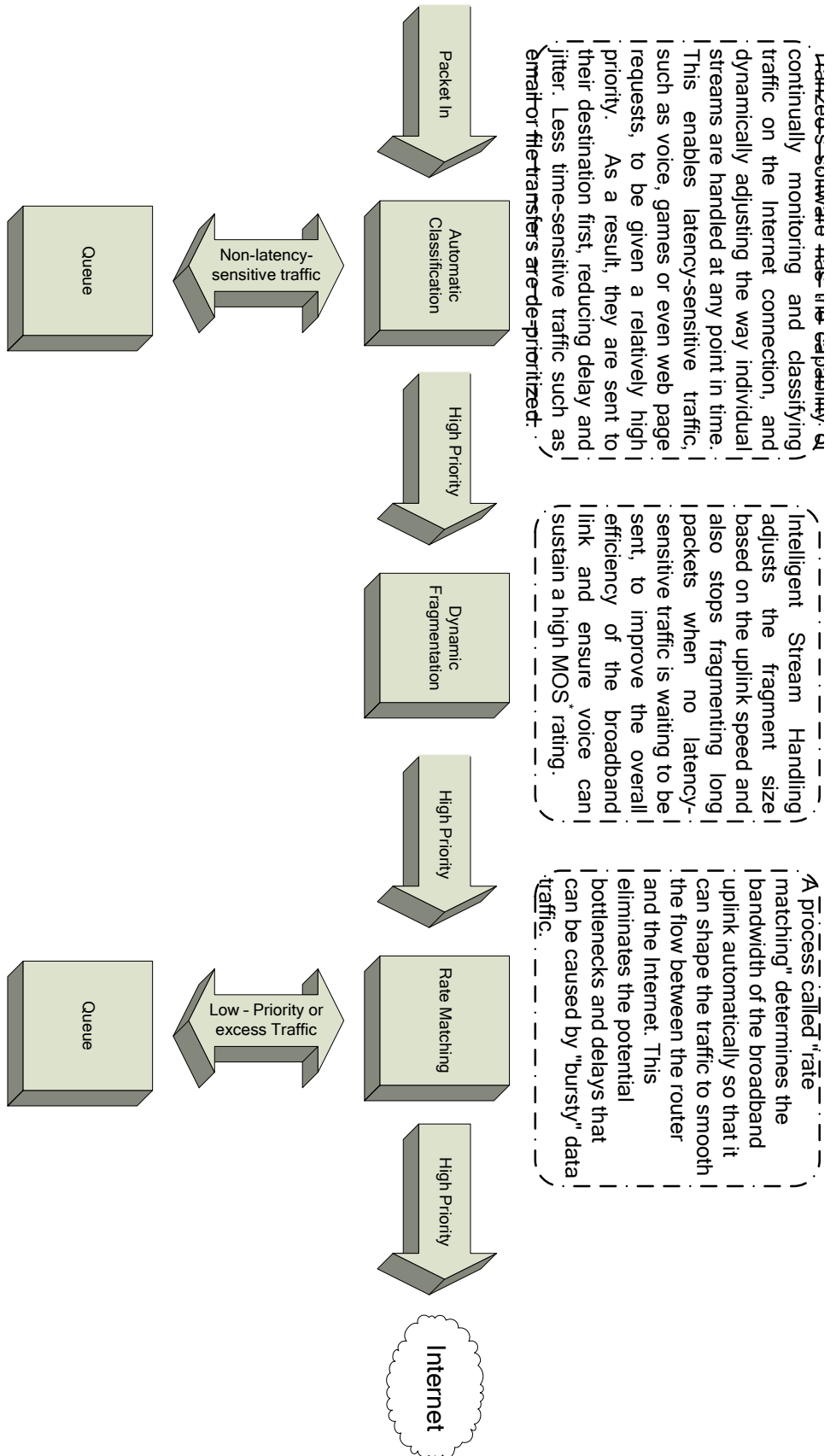
· **Automatic Traffic Classification:** Tranzeo Wireless Technologies' software has the capability of continually monitoring and classifying traffic on the Internet connection, and dynamically adjusting the way individual streams are handled at any point in time. This enables latency-sensitive traffic, such as voice, games or even web page requests, to be given a relatively high priority. As a result, these packets are sent to their destination first, reducing delay and jitter. Less time-sensitive traffic such as email or file transfers are sent at lower priority. Since Intelligent Stream Handling operates automatically without the need for user configuration, it is able to effectively make use of 255 priority levels for fine-grained control of the packet streams.

· **Rate Matching:** A process called "rate matching" determines the bandwidth of the broadband uplink automatically so that it can shape the traffic to smooth the flow between the router and the Internet. This eliminates the potential bottlenecks and delays that can be caused by "bursty" data traffic.

· **Dynamic and Adaptive Link Fragmentation:** Low priority traffic is also fragmented to reduce the latency and jitter that can be introduced by long packets. Intelligent Stream Handling adjusts the fragment size based on the uplink speed and also stops fragmenting long packets when no latency-sensitive traffic is waiting to be sent, to improve the overall efficiency of the broadband link and ensure voice can sustain a high MOS rating.

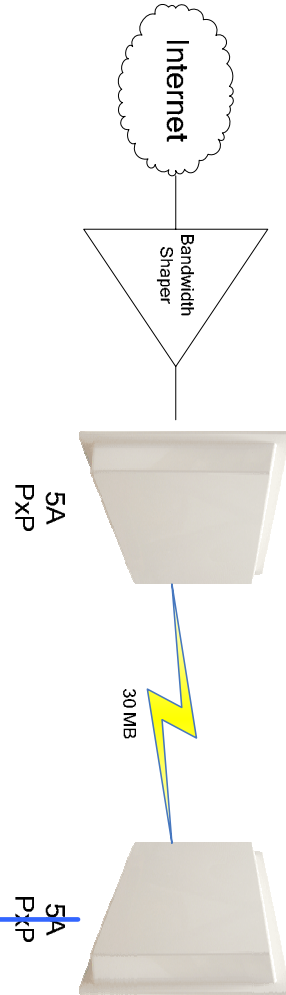
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Examples:

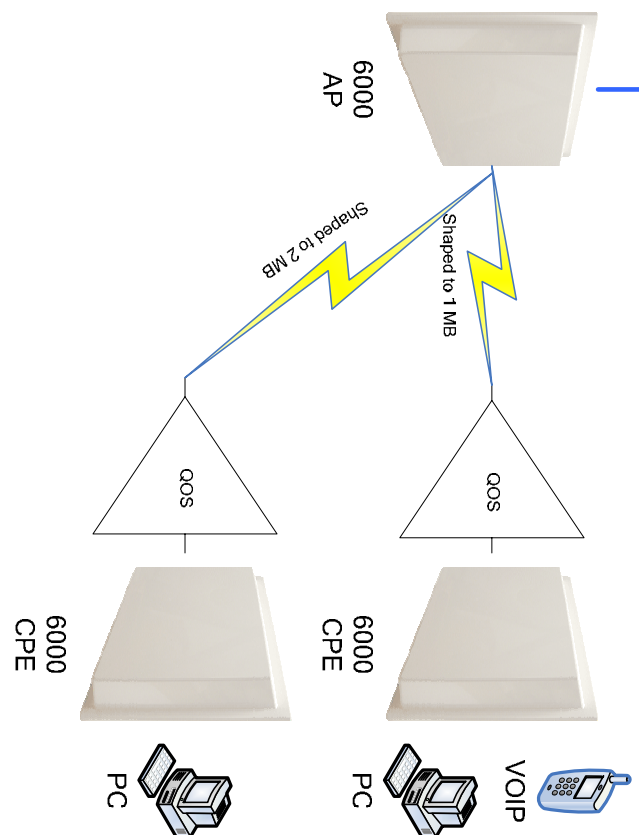


*Mean Opinion Score (MOS)

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In this case, the head end shaper is limiting the incoming demand based on the end user to ensure no one user is taking the entire downstream.



In this case, no one user is ever able to draw more than their fair share of the available up stream bandwidth, even if the communication is between two stations on the same AP.

Tranzeo Wireless Technologies	
Network QoS Example	10/5/2005

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Simple Testing for QoS Issues

It is actually extremely easy to disturb any real time delay sensitive traffic to show the effects of Bandwidth Loading.

Measuring the effect on RTT and showing jitter

A simple test can be performed using e-mail and the ping utility.

1. From a Command Windows type: `ping <IP_ADDRESS OR DOMIAN> -t` . In our example, we are pinging Yahoo.com
2. Using an e-mail application send an e-mail containing 1 or 2 high resolution photographs.
3. Observe what happens to the ping time. You should see something similar to the results below. Notice how the ping time goes from 10's of milliseconds to 1000's of milliseconds with a large amount of variation.

Pinging `www.yahoo.akadns.net [66.94.230.45]` with 32 bytes of data:

```
Reply from 66.94.230.45: bytes=32 time=23ms TTL=50
Reply from 66.94.230.45: bytes=32 time=450ms TTL=50
Reply from 66.94.230.45: bytes=32 time=426ms TTL=50
Reply from 66.94.230.45: bytes=32 time=549ms TTL=50
Reply from 66.94.230.45: bytes=32 time=396ms TTL=50
Reply from 66.94.230.45: bytes=32 time=640ms TTL=50
Reply from 66.94.230.45: bytes=32 time=406ms TTL=50
Reply from 66.94.230.45: bytes=32 time=488ms TTL=50
Reply from 66.94.230.45: bytes=32 time=642ms TTL=50
```

4. When the background traffic stops the response time reverts to a normal and consistent time illustrating how the local network traffic has the greatest impact on the internet delay and jitter. Notice how the ping time only varies within the single digit milliseconds in the absence of background traffic.

```
Reply from 66.94.230.45: bytes=32 time=118ms TTL=50
Reply from 66.94.230.45: bytes=32 time=20ms TTL=50
Reply from 66.94.230.45: bytes=32 time=22ms TTL=50
Reply from 66.94.230.45: bytes=32 time=22ms TTL=50
Reply from 66.94.230.45: bytes=32 time=20ms TTL=50
Reply from 66.94.230.45: bytes=32 time=16ms TTL=50
Reply from 66.94.230.45: bytes=32 time=21ms TTL=50
Reply from 66.94.230.45: bytes=32 time=21ms TTL=50
```

RTT on a Tranzeo Wireless Technologies QOS enabled router

Repeating the same "ping" test with background traffic on a Tranzeo Wireless Technologies router



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produces markedly different results, shown below:

```
Pinging www.yahoo.akadns.net [66.94.230.37] with 32 bytes of data:  
Reply from 66.94.230.37: bytes=32 time=44ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=31ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=29ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=22ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=51ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=39ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=22ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=26ms TTL=50  
Reply from 66.94.230.37: bytes=32 time=34ms TTL=50
```

Note: These results were obtained on a system with a quoted 256Kbps upstream capacity. The Tranzeo Wireless Technologies router was configured to use the Dynamic Fragmentation setting with Automatic Classification.

FAQ:

q. Can I use QOS in bridge mode?

a. Sorry, no. This is a feature of our router module.

q. Can create my own rules?

a. Yes, you can add up to 31 rules of your own.

q. Does this mean I no longer need to shape at the head end?

a. No. Shaping at the head end controls the flow into the network from the outside. QOS on the CPE controls flow into the network from within the network.

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APPENDIX C – IP Protocol numbers.

This is a list of currently assigned IP protocol numbers as of time this document was written as defined in RFC 1700.

Decimal	Keyword	Protocol	Decimal	Keyword	Protocol
0	HOPOPT	IPv6 Hop-by-Hop Option	46	RSVP	Reservation Protocol
1	ICMP	Internet Control Message	47	GRE	General Routing Encapsulation
2	IGMP	Internet Group Management	62	MHRP	Mobile Host Routing Protocol
3	GGP	Gateway-to-Gateway	49	BNA	BNA
4	IP	IP in IP (encapsulation)	50	ESP	Encap Security Payload for IPv6
5	ST	Stream	51	AH	Authentication Header for IPv6
6	TCP	Transmission Control	52	I-NLSP	Integrated Net Layer Security TUBA
7	CBT	CBT	53	SWIPE	IP with Encryption
8	EGP	Exterior Gateway Protocol	54	NARP	NBMA Address Resolution
9	IGP	private interior gateway	55	MOBILE	IP Mobility
10	BBN-RCC-MON	BBN RCC Monitoring	56	TLSP	Transport Layer Security using Krypton key management
11	NVP-II	Network Voice Protocol	57	SKIP	SKIP
12	PUP	PUP	58	IPv6-ICMP	ICMP for IPv6
13	ARGUS	ARGUS	59	IPv6-NoNxt	No Next Header for IPv6
14	EMCON	EMCON	60	IPv6-Opts	Destination Options for IPv6
15	XNET	Cross Net Debugger	61		any host internal protocol
16	CHAOS	Chaos	62	CFTP	CFTP
17	UDP	User Datagram	63		any local network
18	MUX	Multiplexing	64	SAT-EXPAK	SATNET and Backroom EXPAK
19	DCN-MEAS	DCN Measurement	65	KRYPTOLAN	Kryptolan
20	HMP	Host Monitoring	66	RVD	MIT Remote Virtual Disk
21	PRM	Packet Radio Measurement	67	IPPC	Internet Pluribus Packet Core
22	XNS-IDP	XEROX NS IDP	68		any distributed file system
23	TRUNK-1	Trunk-1	69	SAT-MON	SATNET Monitoring
24	TRUNK-2	Trunk-2	70	VISA	VISA Protocol
25	LEAF-1	Leaf-1	71	IPCV	Internet Packet Core Utility
26	LEAF-2	Leaf-2	72	CPNX	Computer Protocol Network Executive
27	RDP	Reliable Data Protocol	73	CPHB	Computer Protocol Heart Beat
28	IRTP	Internet Reliable Transaction Routing Protocol	74	WSN	Wang Span Network
29	ISO-TP4	ISO Transport Class 4	75	PVP	Packet Video Protocol
30	NETBLT	Bulk Data Transfer	76	BR-SAT-MON	Backroom SATNET Monitoring
31	MFE-NSP	MFE Network Services	77	SUN-ND	SUN ND PROTOCOL-Temporary
32	MERIT-INP	MERIT Internodal Protocol	78	WB-MON	WIDEBAND Monitoring
33	SEP	Sequential Exchange	79	WB-EXPAK	WIDEBAND EXPAK
34	3PC	Third Party Connect	80	ISO-IP	ISO Internet Protocol
35	IDPR	Inter-Domain Policy Routing Protocol	81	VMTP	VMTP
36	XTP	XTP	82	SECURE-VMTP	SECURE-VMTP
37	DDP	Datagram Delivery	83	VINES	VINES
38	IDPR-CMTP	IDPR Control Message Transport Proto	84	TTP	TTP
39	TP++	TP++ Transport Protocol			
40	IL	IL Transport Protocol			
41	IPv6	Ipv6			
42	SDRP	Source Demand Routing			
43	IPv6-Route	Routing Header for IPv6			
62	IPv6-Frag	Fragment Header for IPv6			
45	IDRP	Inter-Domain Routing			

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Decimal Keyword Protocol

Decimal	Keyword	Protocol
85	NSFNET-IGP	NSFNET-IGP
86	DGP	Dissimilar Gateway Protocol
87	TCF	TCF
88	EIGRP	EIGRP
89	OSPF-IGP	OSPF-IGP
90	Sprite-RPC	Sprite RPC Protocol
91	LARP	Locus Address Resolution
92	MTP	Multicast Transport Protocol
93	AX.25	AX.25 Frames
94	IPIP	IP-within-IP Encapsulation
95	MICP	Mobile Internetworking Control Pro.
96	SCC-SP	Semaphore Communications Sec. Pro.
97	ETHERIP	Ethernet-within-IP Encapsulation
98	ENCAP	Encapsulation Header
99		any private encryption scheme
100	GMTP	GMTP
101	IFMP	Ipsilon Flow Management
102	PNNI	PNNI over IP
103	PIM	Protocol Independent Multicast
104	ARIS	ARIS
105	SCPS	SCPS
106	QNX	QNX
107	A/N	Active Networks
108	IPComp	IP Payload Compression
109	SNP	Sitara Networks Protocol
110	Compaq-Peer	Compaq Peer Protocol

Decimal Keyword Protocol

Decimal	Keyword	Protocol
112	VRRP	Virtual Router Redundancy
113	PGM	PGM Reliable Transport
114		any 0-hop protocol
115	L2TP	Layer Two Tunneling Protocol
116	DDX	D-II Data Exchange (DDX)
117	IATP	Interactive Agent Transfer
118	STP	Schedule Transfer Protocol
119	SRP	SpectraLink Radio Protocol
120	UTI	UTI
121	SMP	Simple Message Protocol
122	SM	SM
123	PTP	Performance Transparency
124	ISIS over IPv4	
125	FIRE	
126	CRTP	Combat Radio Transport
127	CRUDP	Combat Radio User Datagram
128	SSCOPMCE	
129	IPLT	
130	SPS	Secure Packet Shield
131	PIPE	Private IP Encapsulation within IP
132	SCTP	Stream Control Transmission
133	FC	Fibre Channel
134-254		Unassigned
255		Reserved

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APPENDIX D – Common TCP Ports

See <http://www.iana.org/assignments/port-numbers> for a full list of Well Known Port Numbers.

Keyword =====	Port =====	Description =====
ECHO	7	Echo
SYSTAT	11	Active Users
QOTD	17	Quote of the day
MSP	18	Message Send Protocol
FTP-DATA	20	File Transfer (Data Channel)
FTP	21	File Transfer (Control)
TELNET	23	Telnet
SMTP	25	Simple Mail Transfer
NAME	42	TCP Nameserver
BOOTPS	67	Bootstrap Protocol Server
BOOTPC	68	Bootstrap Protocol Client
TFTP	69	Trivial File Transfer
WWW	80	World Wide Web
KERBEROS	88	Kerberos
POP3	110	TCP post office
NNTP	119	USENET
NFS	2049	Network File System
SIP	5060	SIP