POE PRODUCT TRAINING

Instructor Name

TRENDnet

Topics

- Introduction to PoE
- TRENDnet PoE Products
  - 802.3at or PoE+
  - 802.3af standard PoE
  - Splitters/Injectors
  - IP Cameras
  - Wireless Access Points
- Applications
- TRENDnet Advantage
- Questions

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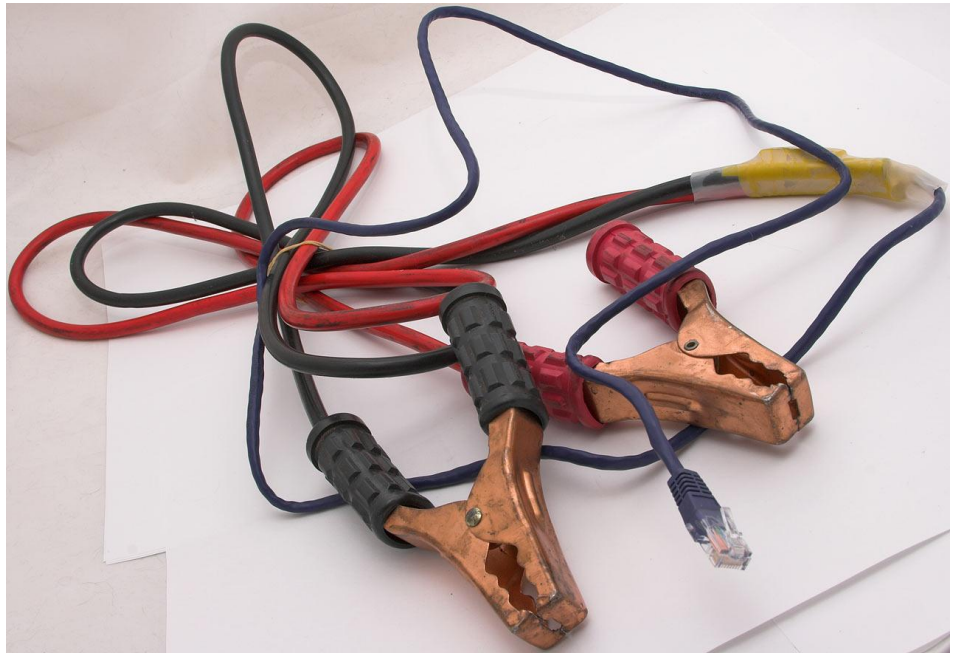
Introduction

What is Power over Ethernet (PoE)?

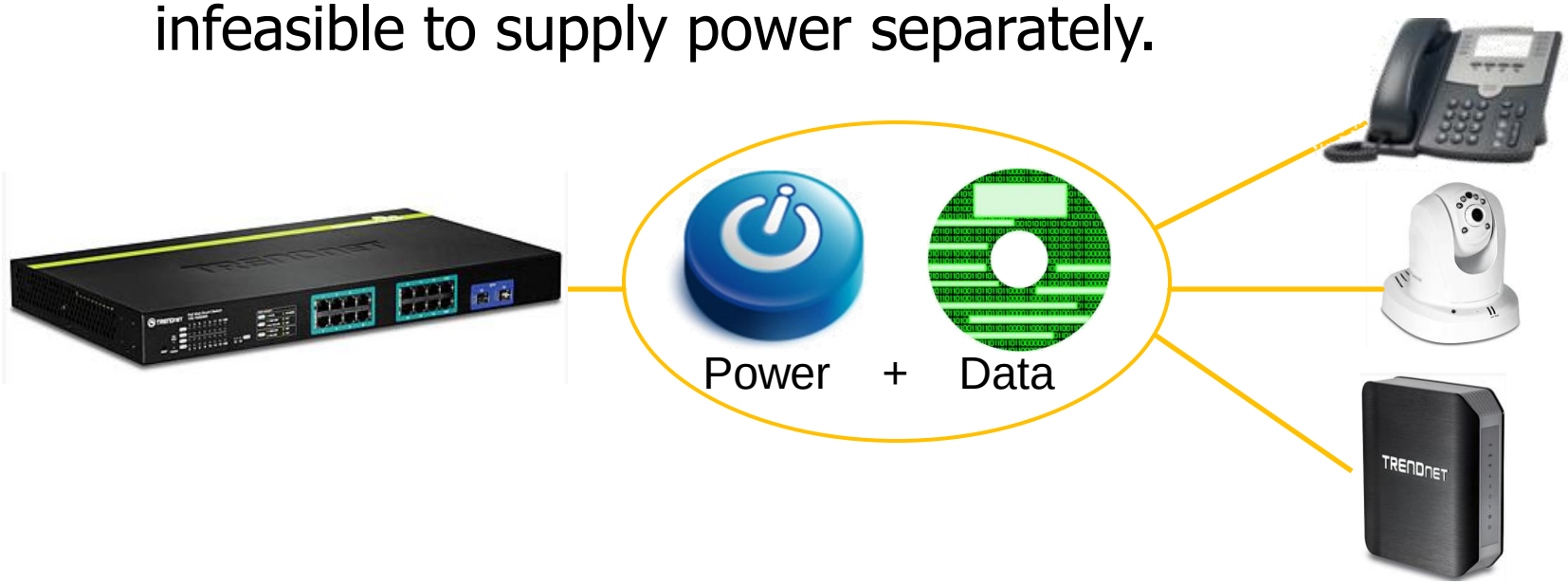
- PoE technology describes any system that transmits electrical power, in addition to data, to remote devices over standard twisted-pair wire in an Ethernet network.



Introduction

How is Power over Ethernet (PoE) used?

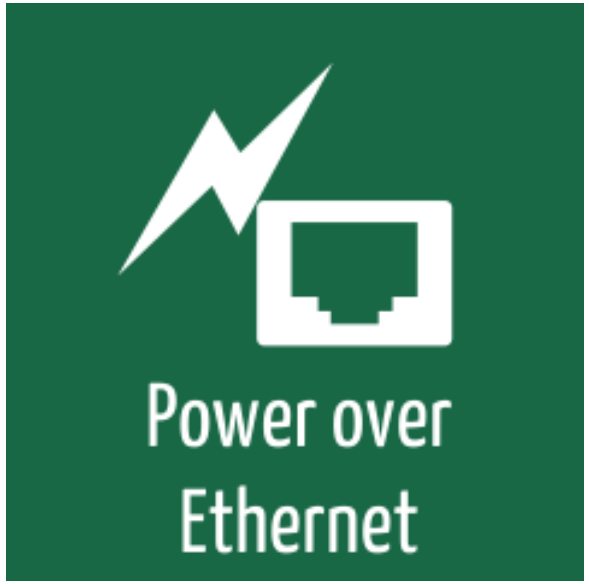
- PoE is useful for powering IP telephones, wireless LAN access points, IP cameras, and other low power network appliances where it would be inconvenient or infeasible to supply power separately.



Introduction

Features

- **Industry Standard**
  - IEEE 802.3at = 34.2 watts (PoE+)
  - IEEE 802.3af = 15.4 watts (PoE)
- **Cabling**
  - Cat 5,5e,or 6 Ethernet Cable
- **Common Applications**
  - Wireless Devices
  - Internet Cameras
  - VoIP Phones



Introduction

The Three Elements of PoE

- Power Sourcing Equipment (PSE)

TPE-115GI (Injector)

TPE-TG44G

TPE-T80H

TPE-TG160g

TPE-224WS

- Powered Device (PD)

TEW-753DAP

TPE-114GS (Splitter)

TPE-104GS (Splitter)

TV-IP302PI

TV-IP450PI

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Introduction

Power Sourcing Equipment (PSE)

- The PSE is connected to a device and at once detects whether the device falls into two categories. It's either a compliant device or it's non-compliant. If the device is compliant with the 802.3af or 802.3at standard then adequate power is supplied. If the device is non-compliant then power is not supplied.

- These devices are designed to detect the power needed by providing a range of voltage from 37 up to 57 Volts to supply the necessary power levels to each device automatically.

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Introduction

Powered Device (PD)

- This is your VoIP Phone, camera, Wi-Fi access point or other devices. This will provide the correct impedance to the PSE and ideally send a signal to the PSE indicating how much power it requires.

- Devices that are true 802.3af or 802.3at only need a single interface for power and data via the same network cabling.

- Non-Compliant PoE can use a splitter to achieve that same advantages as standardized devices.

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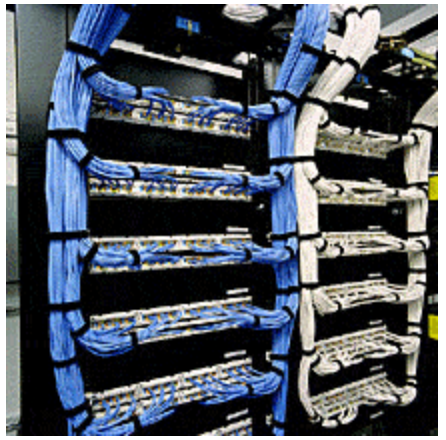
Introduction

Cabling

- CAT 5 cable or better is used to transmit the power. The advantage is that this commonly used Ethernet cables can be used to keep installation costs down. The maximum length of cable is 100m (328ft) and the delivered power is 30w for PoE+ and 15.4w for standard PoE.



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Introduction

Cabling – PoE+ Repeaters

Gigabit PoE+ Repeater/Amplifier

TPE-E110 (Version v1.0R)

- Extends 100 meters for a total distance of up to 200 meters (656 ft.)
- Daisy chain up to 7 units for a total PoE+ network extension of 800 m (2,600 ft.) *
- Plug and play installation
- No external power required
- Wall mountable
- Rugged metal housing

Gigabit PoE+ Repeater

TPE-E100 (Version v1.0R)

- Extends 100 meters for a total distance of up to 200 meters (656 ft.)
- Daisy chain two TPE-E100s for a total PoE+ network extension of 300 m (980 ft.)
- Plug and play installation
- No external power required
- Wall mountable
- LED indicators
- Rugged metal housing

Introduction

PoE Power Up Stages

Stage	Action	Volts specified [V]	
		802.3af	802.3at
Detection	PSE detects if the PD has the correct signature resistance of 19–26.5 kΩ	2.7–10.1	
Classification	PSE detects resistor indicating power range	14.5–20.5	
Mark 1	Signals PSE is 802.3at capable. PD presents a 0.25–4 mA load.	—	7–10
Class 2	PSE outputs classification voltage again to indicate 802.3at capability	—	14.5–20.5
Mark 2	Signals PSE is 802.3at capable. PD presents a 0.25–4 mA load.	—	7–10
Startup	Startup voltage	> 42	> 42
Normal operation	Supply power to device	37–57	42.5–57

Introduction

Benefits

- Cost Saving - reducing costs of new power outlets

- Mobility - allows you a variety of setups without being tied down to a power outlet

- Management – Ability to provide and control power output to specific devices.

PoE IP Cameras

Model	PoE Port	PoE Power Consumption	Features
 TV-IP572(P/PI)	(1x) 10/100Mbps (802.3af)	3.15W/4.95W	Megapixel/ H.264 572PI is IR
 TV-IP612P	(1x) 10/100Mbps (802.3af)	12W	Optical Zoom
 TV-IP672(P/PI)	(1x) 10/100Mbps (802.3af)	9W	PTZ/Megapixel 672PI is IR
 TV-IP252P	(1x) 10/100Mbps (802.3af)	8W	Fixed Dome
 TV-IP262PI	(1x) 10/100Mbps (802.3af)	7W	Megapixel/H.264

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PoE IP Cameras

Model	PoE Port	PoE Power Consumption	Features
 TV-IP311PI	(1x) 10/100Mbps (802.3af)	5W	3 Megapixel resolution ONVIF
 TV-IP302P1	(1x) 10/100Mbps (802.3af)	6.24W	Wide angle Megapixel/H.264
 TV-IP322P	(1x) 10/100Mbps (802.3af)	9.5W	Narrow field of vision Megapixel/H.264
 TV-IP310PI	(1x) 10/100Mbps (802.3af)	5W	3 Megapixel resolution ONVIF
 TV-IP430PI	(1x) 10/100Mbps PoE + (802.3at)	20W	2 Megapixel/H.264 ONVIF v2.2
 TV-IP450PI	(1x) 10/100Mbps PoE + (802.3at)	35W	Megapixel/H.264 ONVIF v2.2

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Splitters/Injectors

Model	Fast Ethernet	Gigabit	PoE Splitter Voltage/Wattage	PoE Injector Power Output
 TPE-103I	✓		N/A	802.3af (mode A) Pins: 1, 2, 3, 6
 TPE-104S	✓		5V, 7.5V, 9V, 12V	N/A
 TPE-113GI		✓	N/A	802.3af (mode A) Pins: 1, 2, 3, 6
 TPE-114GS		✓	5V, 7.5V, 9V, 12V	N/A
 TPE-115GI		✓	N/A	802.3at (mode A) Pins: 1, 2, 3, 6
 TPE-105I	✓		N/A	802.3at (mode A) Pins: 1, 2, 3, 6

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802.3at or PoE +

Model	Ports	IEEE PoE Standards	Total PoE Power Output	Unmanaged Plug & Play Design
 TPE-TG44G	4x (PoE/PoE+) 4x(Non-PoE) 10/100/1000Mbps	802.3af 802.3at	60 Watts (4x15w or 2x30w)	✓
 TPE-T80*	8x (PoE/PoE+) 10/100Mbps	802.3af 802.3at	240 Watts (8x30w)	✓
 TPE-TG80G	8x (PoE/PoE+) 10/100/1000Mbps	802.3af 802.3at	105 Watts (7x15w or 3x30w)	✓
 TPE-TG81G	8x (PoE/PoE+) 10/100/1000Mbps Rackmount	802.3af 802.3at	105 Watts (7x15w or 3x30w)	✓
 TPE-T88G	8x (PoE) 8x(Non-PoE) 10/100/1000Mbps	802.3af 802.3at	120W (8x 15w or 4x30w)	✓
 TPE-T160*	16x (PoE/PoE+) 10/100Mbps	802.3af 802.3at	480W (16 x 30w)	✓

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802.3af/at

Model	Ports	10/100/100Mbps Ports	Total PoE Power Output	Web GUI Management
 TPE-S44	4x (PoE/PoE+) 4x(Non-PoE) 10/100Mbps	NONE	30W (Aggregate on 4 PoE Ports)	
 TPE-S80	8x (PoE) 10/100Mbps	NONE	126W (8 x 15w)	
 TPE-S160	16x (PoE) 10/100Mbps	NONE	254W (16 x 15w)	
 TPE-1020WS	8x (PoE/PoE+) 2x(Non-PoE) 10/100/1000Mbps 2 SFP	10x	75W (Aggregate on 8 PoE Ports)	✓
 TPE-1620WS	16x (PoE/PoE+) 10/100/1000Mbps 2 SFP	16x	185W (Aggregate on 16 PoE Ports	✓
 TPE-224WS	24x (PoE) 4x (PoE+) 10/100Mbps 2 SFP 4x 1000Mbps	NONE	193W (Aggregate on 24 PoE Ports)	✓

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802.3af/at

Model	Ports	10/100/100Mbps Ports	Total PoE Power Output	Web GUI Management
 TPE-TG240g	24x (PoE/PoE+) Gigabit	NONE	370W	✓
 TPE-2840WS	4x (PoE+) 20x (PoE) Gigabit 4 SFP	NONE	185W	✓
 TPE-4840WS	12x (PoE+) 12x (PoE) Gigabit 4 SFP Shared	24x 1000Mbps	370W	✓

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802.3af/at

Model	PoE Port	Speed	PoE Power Consumption	Features
 TEW-638PAP	(1x) 10/100Mbps (802.3af)	N300	3.12w	2 2dBi detachable antennas
 TEW-753DAP	(1x) 10/100Mbps (802.3af)	N300 Per Band	12w	Dual band 4dBi antenna VLAN tag support
 TEW-735AP	(1x) 10/100Mbps (802.3af)	N300	6w	2 4dBi Antennas Plenum rated VLAN tag support
 TEW-653AP	(1x) 10/100Mbps (802.3af)	N300	6w	4dBi Antenna VLAN tag support

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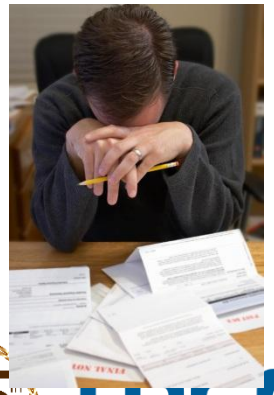
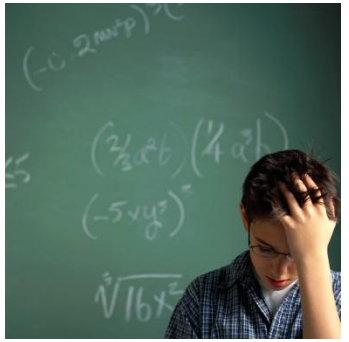
PoE Power Budget

- Total PoE power for entire switch
- Some or all ports support PoE
- Total power cannot exceeded budget



PoE Power Budget

- Example – TPE-224WS
  - 24 ports, 15.4W per port, 170W budget



- If all PoE devices use 15.4W
  - 170W / 15.4W = 11 PoE devices supported

- Lower PoE requirement = more devices

PoE Power Budget Calculator

Coming soon…

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Power over Ethernet Budget Calculator

Please select your PoE/PoE+ Switch

TPE-T80

Please select your TRENDnet PoE powered device

TV-IP302PI

Please select a quantity for your TRENDnet PoE powered device

10

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TPE-1620WS

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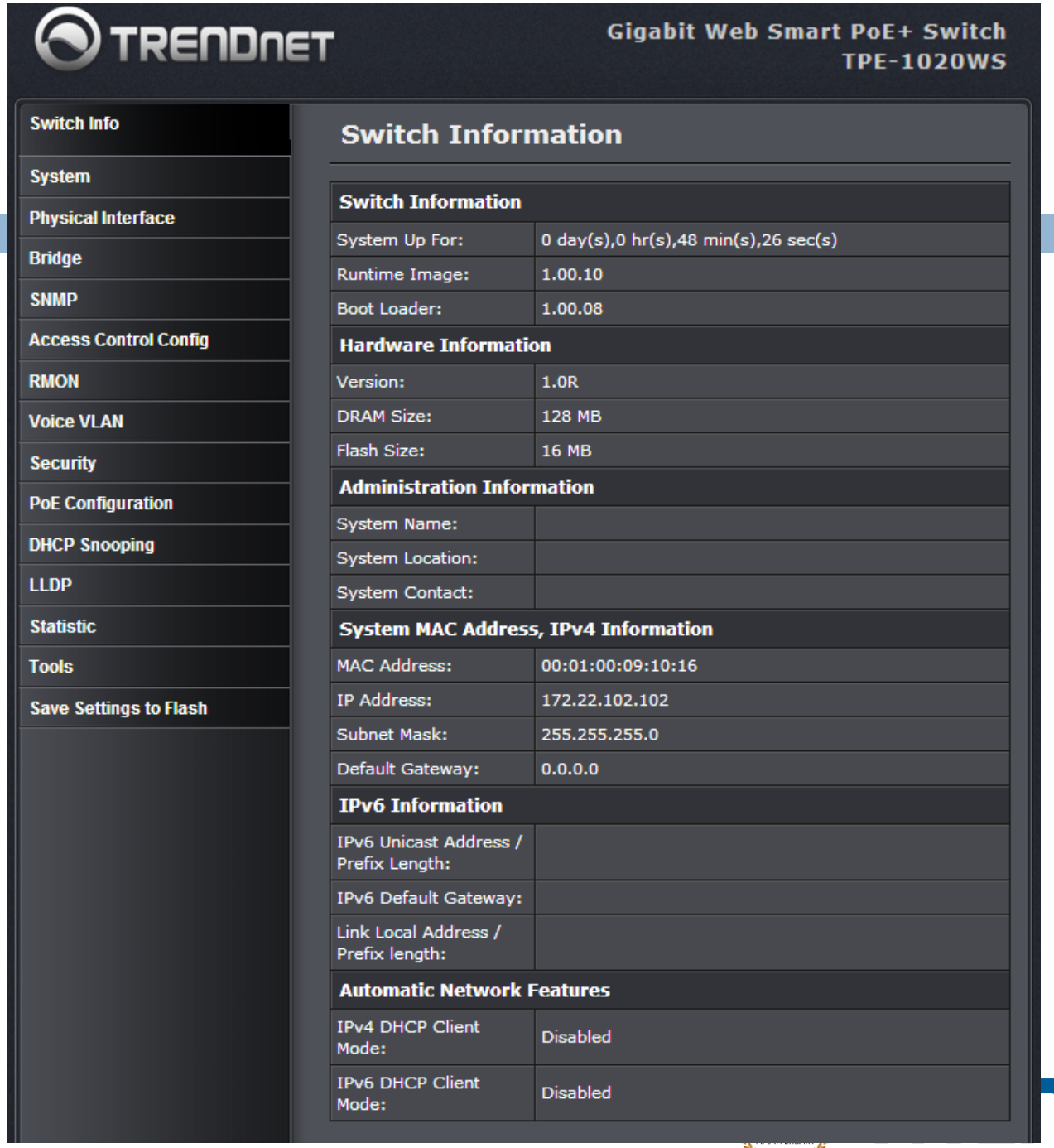
GUI


TRENDnet
Gigabit Web Smart PoE+ Switch
TPE-1020WS
Switch Info
System
Physical Interface
Bridge
SNMP
Access Control Config
RMON
Voice VLAN
Security
PoE Configuration
DHCP Snooping
LLDP
Statistic
Tools
Save Settings to Flash
Switch Information
Switch Information
System Up For: 0 day(s),0 hr(s),48 min(s),26 sec(s)
Runtime Image: 1.00.10
Boot Loader: 1.00.08
Hardware Information
Version: 1.0R
DRAM Size: 128 MB
Flash Size: 16 MB
Administration Information
System Name:
System Location:
System Contact:
System MAC Address, IPv4 Information
MAC Address: 00:01:00:09:10:16
IP Address: 172.22.102.102
Subnet Mask: 255.255.255.0
Default Gateway: 0.0.0.0
IPv6 Information
IPv6 Unicast Address / Prefix Length:
IPv6 Default Gateway:
Link Local Address / Prefix length:
Automatic Network Features
IPv4 DHCP Client Mode: Disabled
IPv6 DHCP Client Mode: Disabled

GUI

735 = 6W Max

672 = 9W Max

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Gigabit Web Smart PoE+ Switch
TPE-1020WS

- Switch Info
- System
- Physical Interface
- Bridge
- SNMP
- Access Control Config
- RMON
- Voice VLAN
- Security
- PoE Configuration
- DHCP Snooping
- LLDP
- Statistic
- Tools
- Save Settings to Flash

Power Over Ethernet Settings

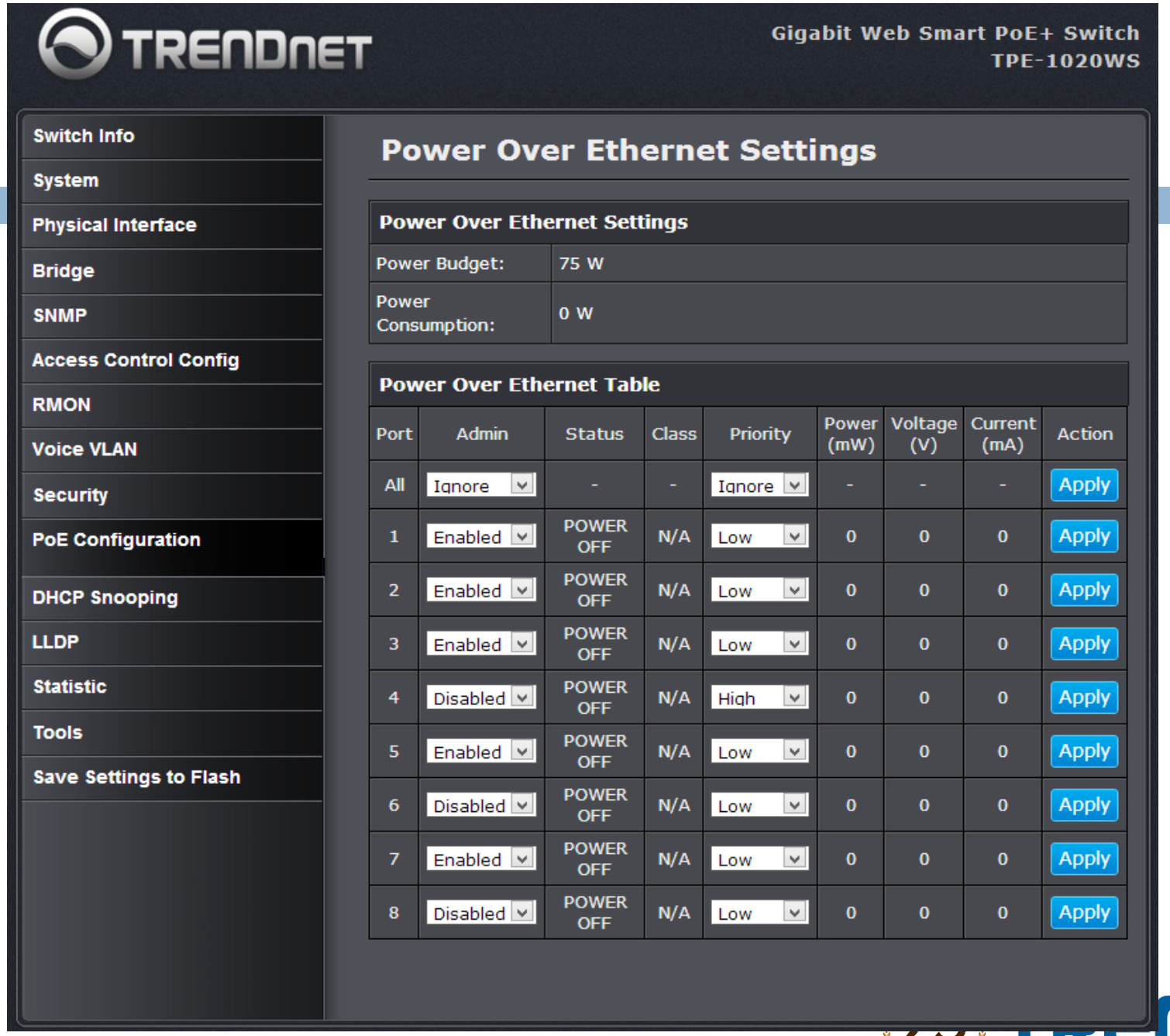
Power Over Ethernet Settings

Power Budget:	75 W
Power Consumption:	5 W

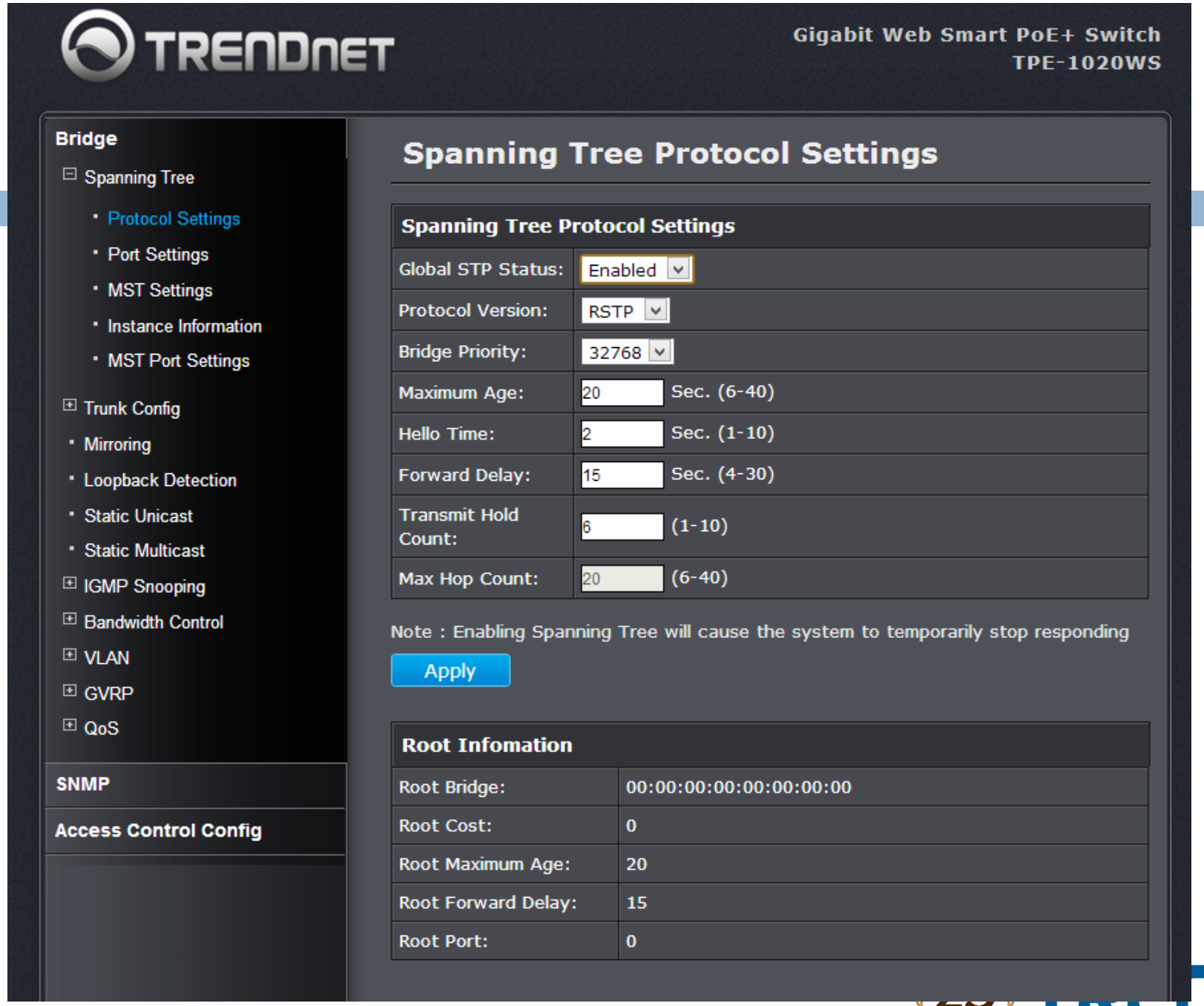
Power Over Ethernet Table

Port	Admin	Status	Class	Priority	Power (mW)	Voltage (V)	Current (mA)	Action
All	Ignore	-	-	Ignore	-	-	-	Apply
1	Enabled	POWER OFF	N/A	Low	0	0	0	Apply
2	Enabled	POWER OFF	N/A	Low	0	0	0	Apply
3	Enabled	POWER OFF	N/A	Low	0	0	0	Apply
4	Enabled	POWER ON	Class0	High	2400	54	44	Apply
5	Enabled	POWER OFF	N/A	Low	0	0	0	Apply
6	Enabled	POWER ON	Class0	Low	3300	54	63	Apply
7	Enabled	POWER OFF	N/A	Low	0	0	0	Apply
8	Disabled	POWER OFF	N/A	Low	0	0	0	Apply

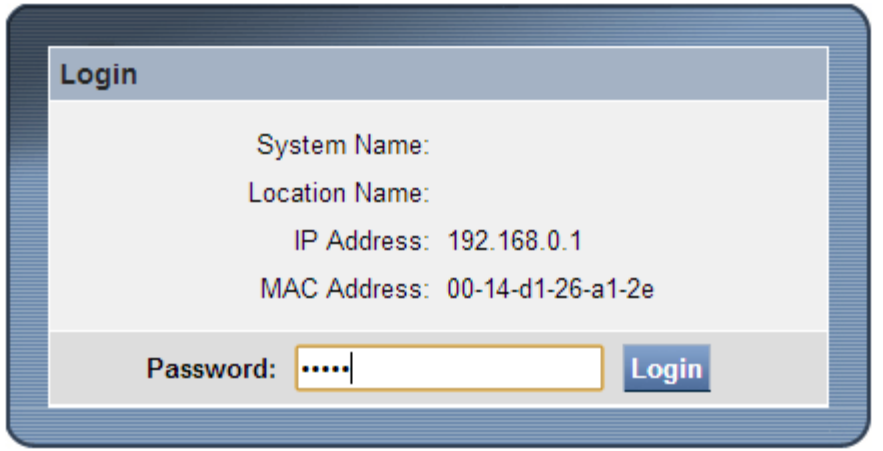
GUI


TRENDnet
Gigabit Web Smart PoE+ Switch
TPE-1020WS
Switch Info
System
Physical Interface
Bridge
SNMP
Access Control Config
RMON
Voice VLAN
Security
PoE Configuration
DHCP Snooping
LLDP
Statistic
Tools
Save Settings to Flash
Power Over Ethernet Settings
Power Over Ethernet Settings
Power Budget: 75 W
Power Consumption: 0 W
Power Over Ethernet Table
Port | Admin | Status | Class | Priority | Power (mW) | Voltage (V) | Current (mA) | Action
All | Ignore | - | - | Ignore | - | - | - | Apply
1 | Enabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply
2 | Enabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply
3 | Enabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply
4 | Disabled | POWER OFF | N/A | High | 0 | 0 | 0 | Apply
5 | Enabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply
6 | Disabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply
7 | Enabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply
8 | Disabled | POWER OFF | N/A | Low | 0 | 0 | 0 | Apply

GUI


TRENDnet
Gigabit Web Smart PoE+ Switch
TPE-1020WS
Bridge
Spanning Tree
Protocol Settings
Port Settings
MST Settings
Instance Information
MST Port Settings
Trunk Config
Mirroring
Loopback Detection
Static Unicast
Static Multicast
IGMP Snooping
Bandwidth Control
VLAN
GVRP
QoS
SNMP
Access Control Config
Spanning Tree Protocol Settings
Spanning Tree Protocol Settings
Global STP Status: Enabled
Protocol Version: RSTP
Bridge Priority: 32768
Maximum Age: 20 Sec. (6-40)
Hello Time: 2 Sec. (1-10)
Forward Delay: 15 Sec. (4-30)
Transmit Hold Count: 6 (1-10)
Max Hop Count: 20 (6-40)
Note : Enabling Spanning Tree will cause the system to temporarily stop responding
Apply
Root Infomation
Root Bridge: 00:00:00:00:00:00:00:00
Root Cost: 0
Root Maximum Age: 20
Root Forward Delay: 15
Root Port: 0

TPE-224WS



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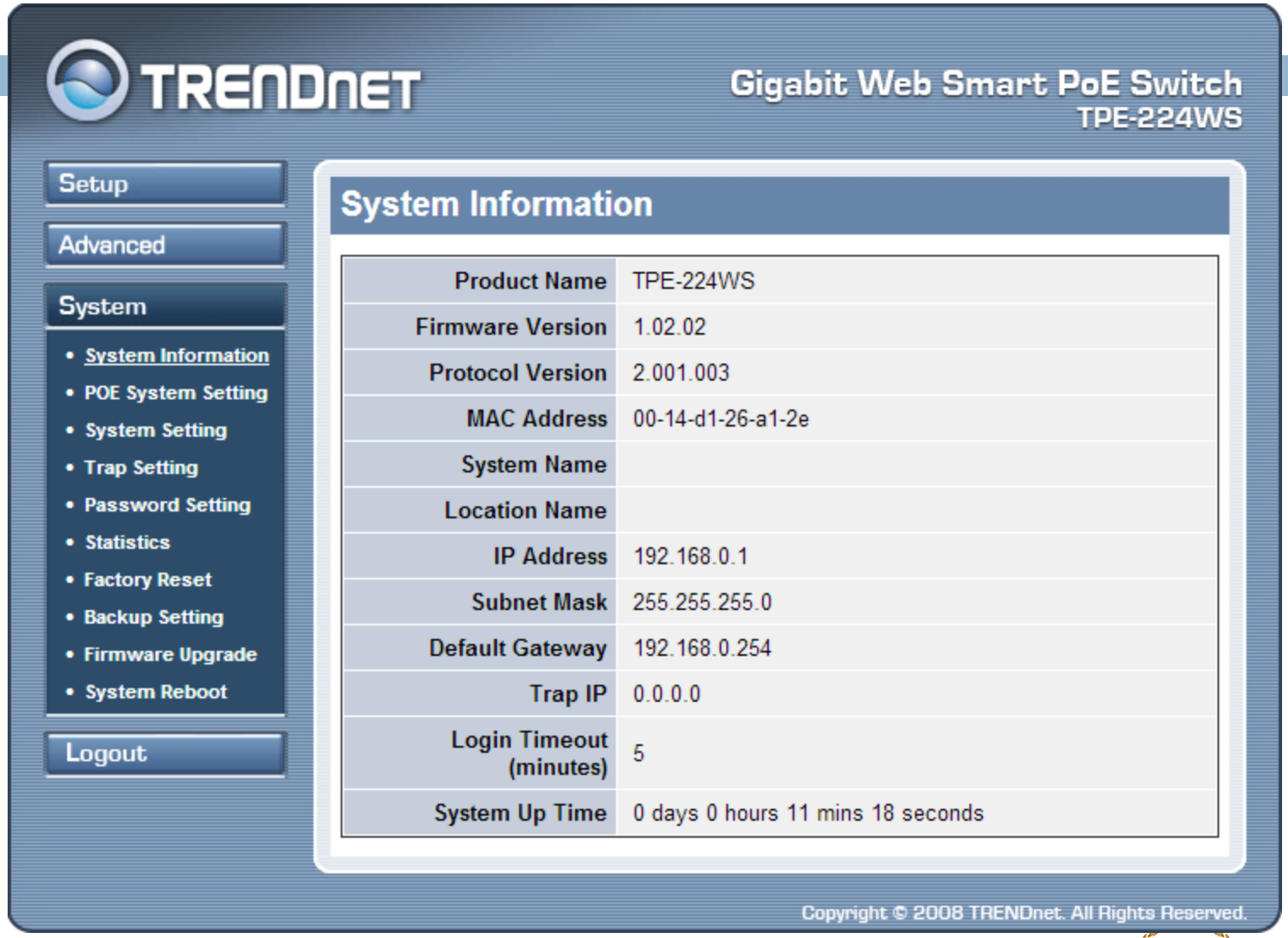
TPE-224WS GUI



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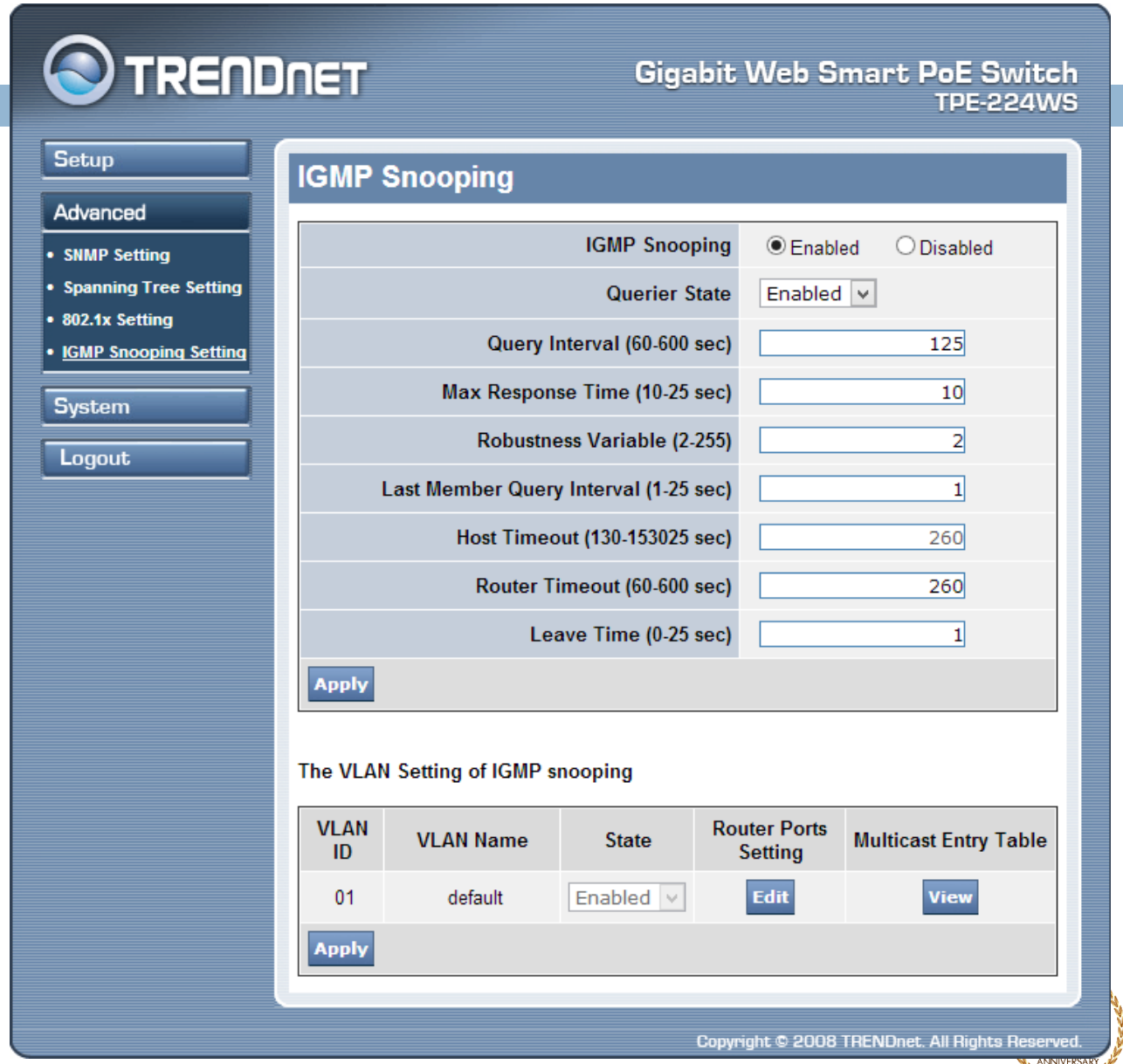
TPE-224WS GUI



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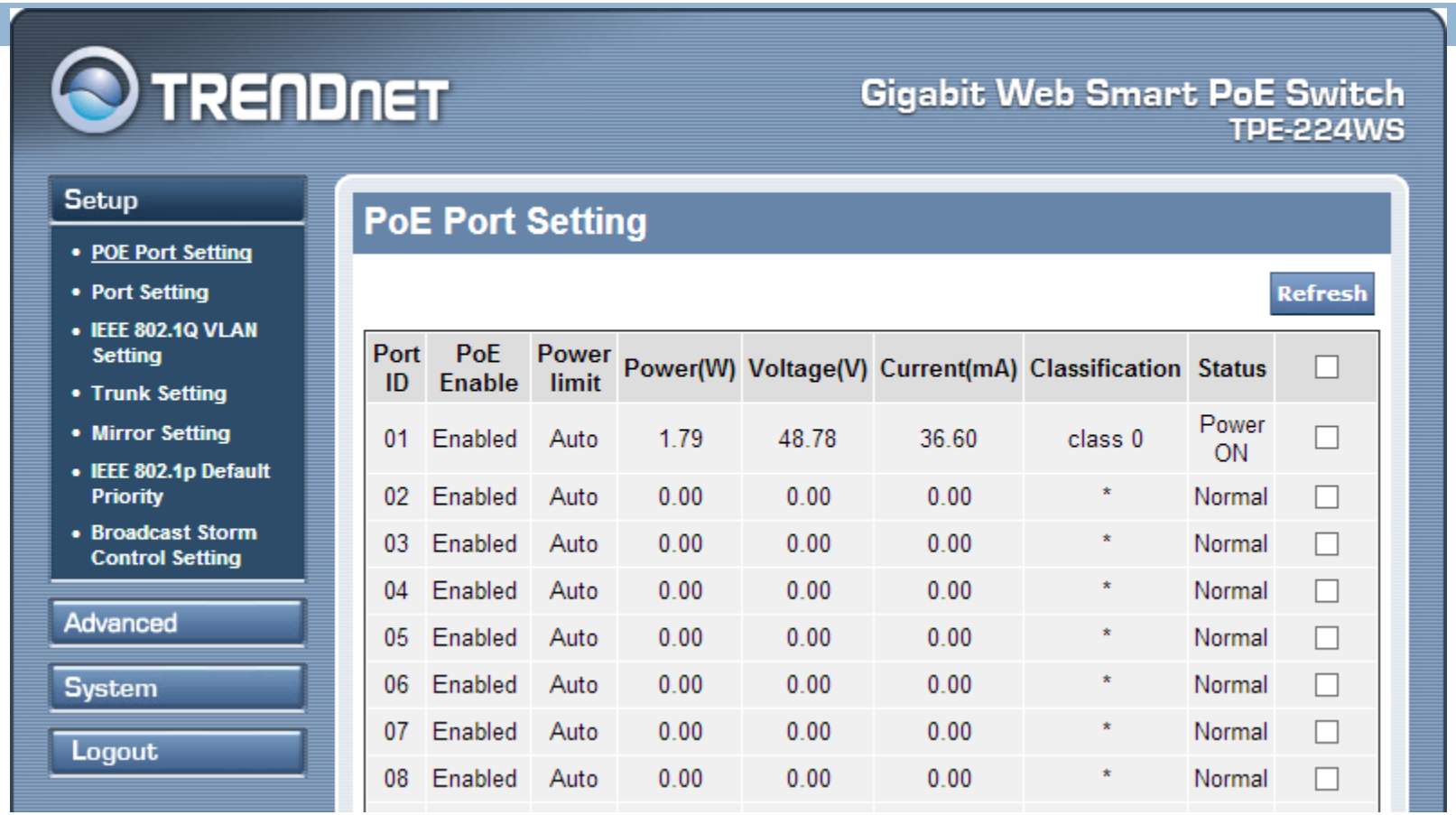
TPE-224WS GUI



Port ID	PoE Enable	Power limit	Power(W)	Voltage(V)	Current(mA)	Classification	Status	
01	Enabled	Auto	1.79	48.78	36.60	class 0	Power ON	
02	Enabled	Auto	0.00	0.00	0.00	*	Normal	
03	Enabled	Auto	0.00	0.00	0.00	*	Normal	
04	Enabled	Auto	0.00	0.00	0.00	*	Normal	
05	Enabled	Auto	0.00	0.00	0.00	*	Normal	
06	Enabled	Auto	0.00	0.00	0.00	*	Normal	
07	Enabled	Auto	0.00	0.00	0.00	*	Normal	
08	Enabled	Auto	0.00	0.00	0.00	*	Normal	

Applications

PoE Ethernet Switch

(TPE-224WS)

Wireless AP

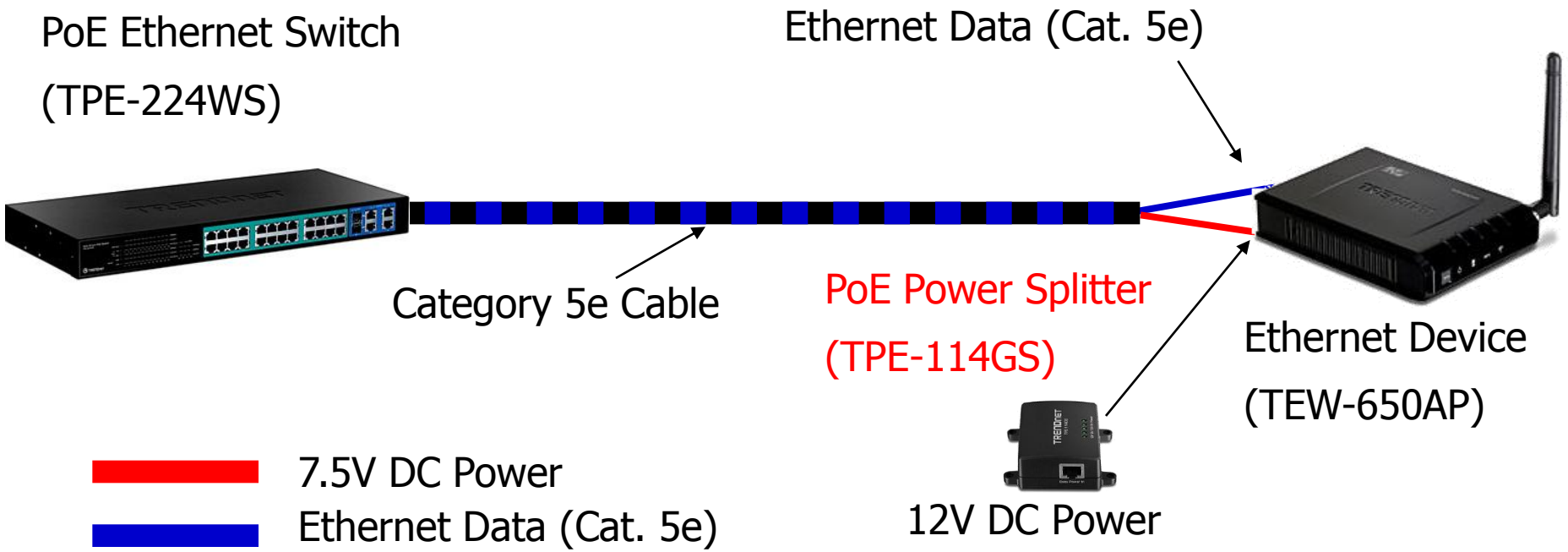
(TEW-653AP)

Category 5e Cable

48V DC Power + Ethernet Data

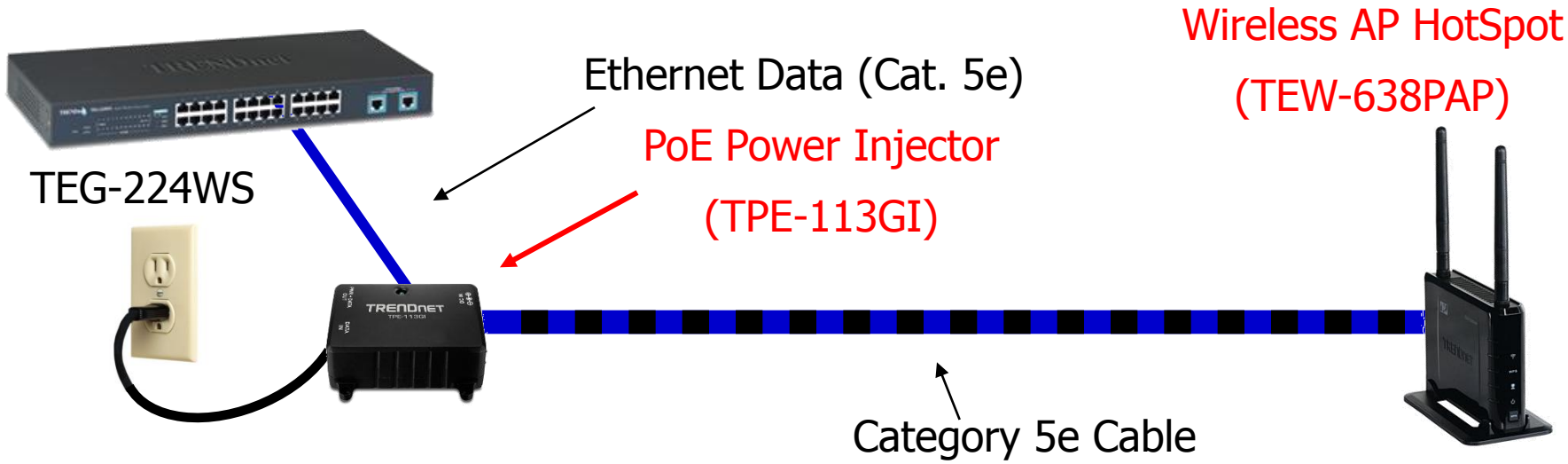
Applications

PoE Switch with Power Splitter



Applications

Power Injector and Powered Device



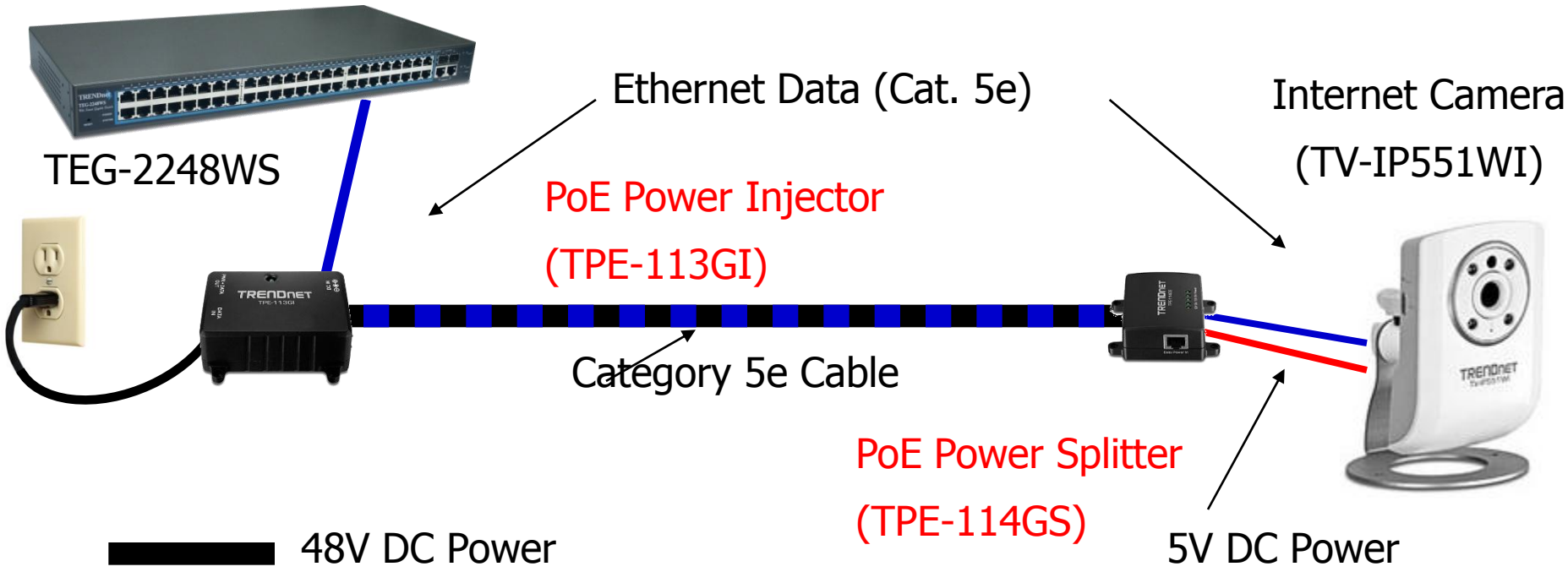
48V DC Power + Ethernet Data

48V DC Power

Ethernet Data (Cat. 5e)

Applications

Power Injector and Power Splitter



Advantage

Why TRENDnet?

- High quality products
- Award winning performance
- 20 years in the business
- Advanced product feature sets
- Price to performance leadership

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Q&A

Questions?

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TRENDnet®

Thank You

Networks People Trust™

IDnET

Agenda

01 Technology Overview

02 TRENDnet Product

03 TRENDnet Product

04 TRENDnet Product

05 TRENDnet Product

06 TRENDnet Product

07 Summary

Product Definition

- Describe the product or service being marketed

Competition

- The competitive landscape
  - Provide an overview of product competitors, and their strengths and weaknesses
  - Position each competitor’s product against the new product

Positioning

- Positioning of product or service
  - Statement that distinctly defines the product in its market and against its competition over time
- Consumer promise
  - Statement summarizing the benefit of the product or service to the consumer

Communication Strategies

- Messaging by audience
- Target consumer demographics

Packaging and Fulfillment

- Product packaging
  - Discuss form factor, pricing, look, and strategy
  - Discuss fulfillment issues for items not shipped directly with the product
- COGs
  - Summarize cost of goods and high-level bill of materials

Launch Strategies

- Launch plan
  - If product is being announced
- Promotion budget
- Supply backup material with detailed budget information for review

Public Relations

- Strategy and execution
  - PR strategies
  - PR plan highlights
  - Have backup PR plan including editorial calendars, speaking engagements, conference schedules, etc.

Advertising

- Strategy and execution
  - Overview of strategy
  - Overview of media and timing
  - Overview of ad spending

Other Promotion

- Direct marketing
  - Overview of strategy, vehicles, and timing
  - Overview of response targets, goals, and budget
- Third-party marketing
  - Co-marketing arrangements with other companies
- Marketing programs
  - Other promotional programs

Pricing

- Pricing
  - Summarize specific pricing or pricing strategies
  - Compare to similar products
- Policies
  - Summarize policy relevant to understanding key pricing issues

Distribution

- Distribution strategy
- Channels of distribution
  - Summarize channels of distribution
- Distribution by channel
- Show plan of what percent share of distribution will be contributed by each channel – a pie chart might be helpful

Vertical Markets/Segments

- Vertical market opportunities
  - Discuss specific market segment opportunities
  - Address distribution strategies for those markets or segments
  - Address use of third-party partner role in distribution to vertical markets

International

- International distribution
  - Address distribution strategies
  - Discuss issues specific to international distribution
- International pricing strategy
- Localization issues
  - Highlight requirements for local product variations

Success Metrics

- First year goals
- Additional year goals
- Measures of success/failure
- Requirements for success

Schedule

- 18-month schedule highlights
- Timing
  - Isolate timing dependencies critical to success