
Proxicast

Virtual Cable Switchboard Server

User Guide

Version 2.x



www.proxicast.com

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1. Introducing the Switchboard Server

Some Proxicast devices (such as the PocketPORT) offer a unique feature called “Virtual Cable Mode” (VCM) operation. VCM is Proxicast’s implementation of Ethernet over IP. In this mode, two or more gateways act as a very long virtual Ethernet cable. Any intervening networks, such as the Internet or firewalls, are completely transparent; the ends appear to be directly connected via a cable. Any application that works over a direct Ethernet cable also works over Virtual Cable Mode.

The Virtual Cable Switchboard Server is a Linux-based application which provides address resolution and packet relay services for Proxicast’s devices which support Virtual Cable Mode operation. All VCM devices must interact with a Switchboard Server in order to establish a connection with other devices.

The accompanying Virtual Cable Switchboard Server Monitor web-application provides real-time monitoring of the Virtual Cable network and devices.

2. System Requirements

- X86-based Linux Operating System (e.g. Ubuntu)
- 1 GB RAM
- 500 MB disk space
- Network interface card
- Internet connectivity with 1 UDP and optionally 1 TCP open inbound ports
- Web browser (optional)
- Root level OS privileges for installation
- Activation key purchased from Proxicast

All of the Switchboard Server components are statically linked. No external libraries are required or installed which may affect other applications on the Linux system.

3. Licensing

The Switchboard Server is licensed on a per-server basis and requires a license activation key purchased from Proxicast. Each Switchboard Server is also licensed for a maximum number of concurrent Gateway device (e.g. PocketPORTs) connections. An unlimited number of end devices may be connected behind each gateway. Each Switchboard Server can also support multiple Virtual Cable networks.

4. Installation

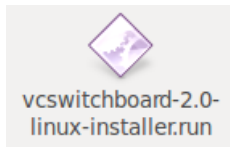
Installation of the Switchboard requires root level privileges. Log into Linux as root or use the sudo command to temporarily obtain root privileges.

4.1 Graphical Installer

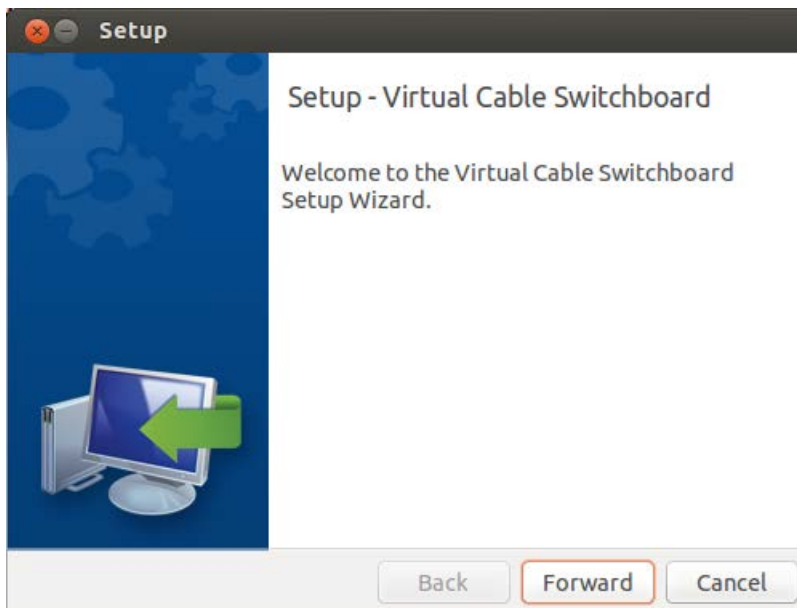
- Download the Switchboard installation package to a temporary directory.
- Make the package executable (run as a program), for example:
chmod +x vcswitchboard-2.0-linux-x32-installer.run

- Execute the installer from the command line:
`./vswitchboard-2.0-linux-x32-installer.run`

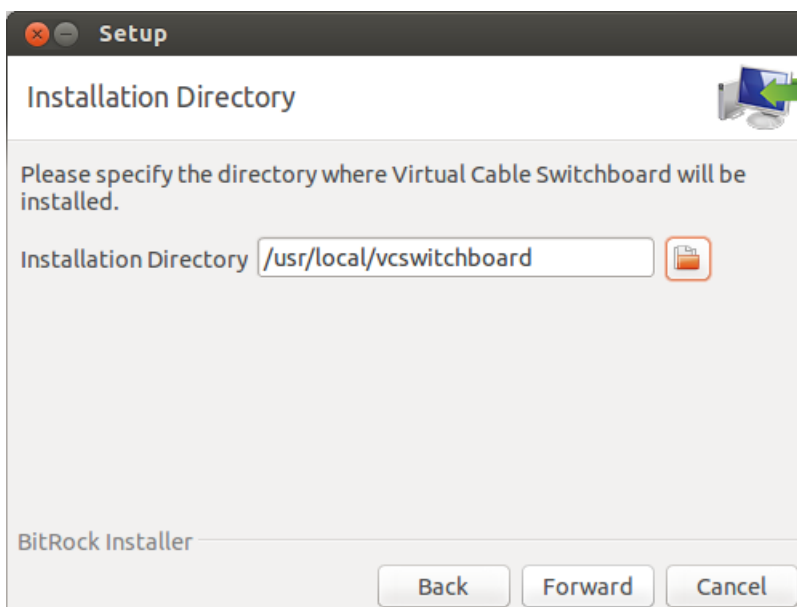
or if logged in as root, double-click on the icon:



- Follow the installation wizard prompts.

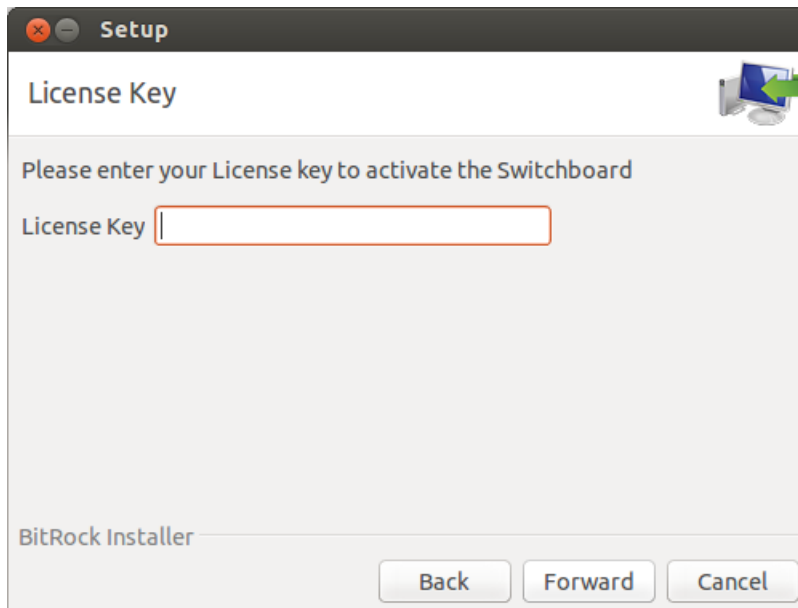


- Select the directory where the Switchboard Server components will be installed. The default is `/usr/local/vswitchboard`.



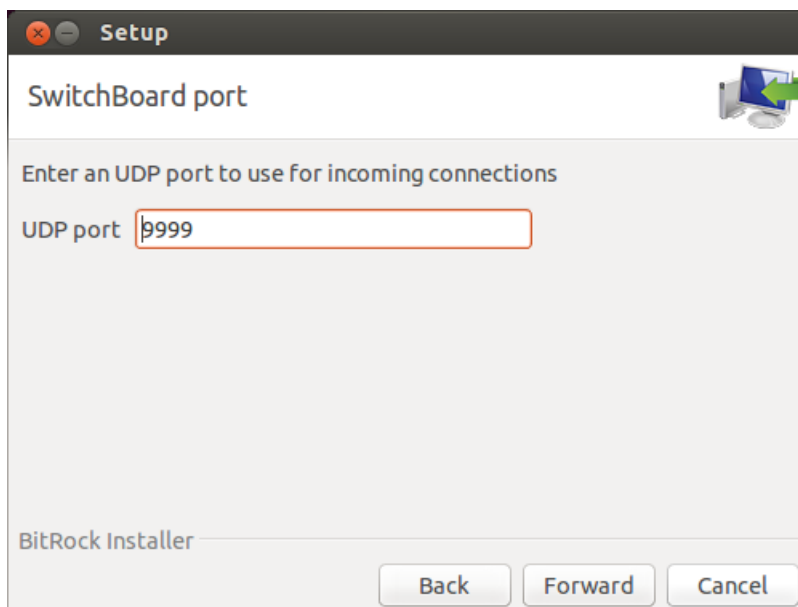
- Enter the license key required to activate the Switchboard Server.

NOTE: the Linux server must have Internet access at this point for the installer to contact Proxycast's Activation Server to validate your license key.



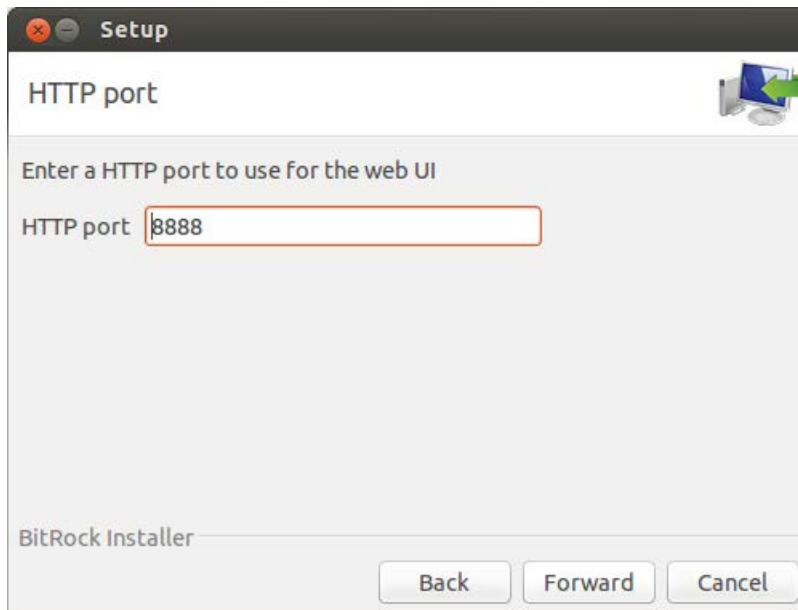
The screenshot shows a window titled "Setup" with a close, minimize, and maximize button. The main title is "License Key". Below the title is a small icon of a computer monitor with a green arrow pointing to it. The text reads: "Please enter your License key to activate the Switchboard". Below this is a text input field labeled "License Key" with a cursor inside. At the bottom left, it says "BitRock Installer". At the bottom right, there are three buttons: "Back", "Forward", and "Cancel".

- Enter the UDP port number that the Switchboard Server will use to communicate with Gateway nodes. The default port is 9999. This port must be open on any firewalls between the Switchboard Server and the Internet.

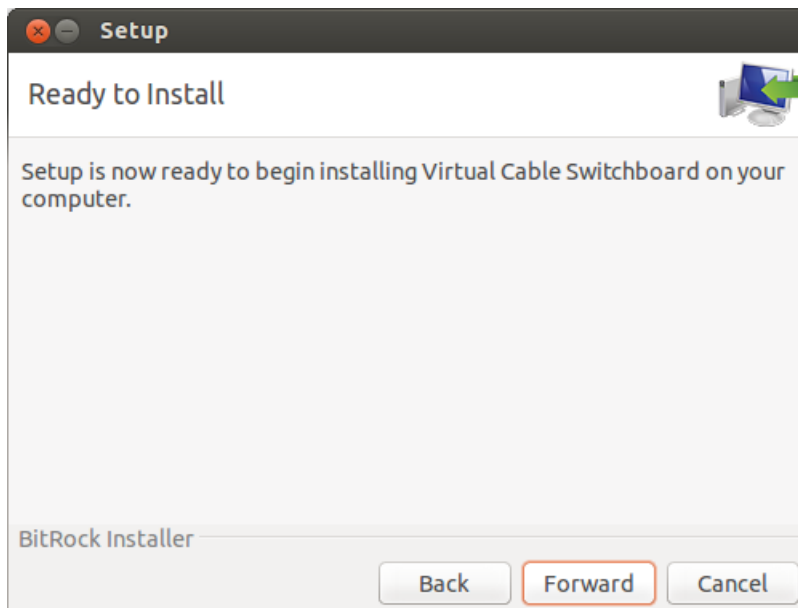


The screenshot shows a window titled "Setup" with a close, minimize, and maximize button. The main title is "SwitchBoard port". Below the title is a small icon of a computer monitor with a green arrow pointing to it. The text reads: "Enter an UDP port to use for incoming connections". Below this is a text input field labeled "UDP port" with the value "9999" entered. At the bottom left, it says "BitRock Installer". At the bottom right, there are three buttons: "Back", "Forward", and "Cancel".

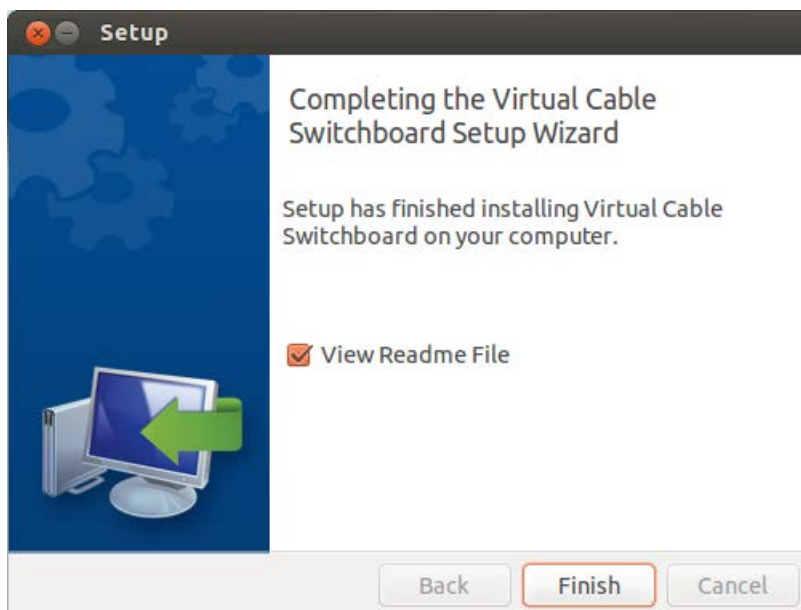
- Enter the port number that the Switchboard Server Monitor will use to listen for HTTP requests. The default port is 8888. To view the Monitor remotely, this port must be open on any firewalls between the Switchboard Server and the Internet.



- The Switchboard Server is now ready to be installed.



- After installation is complete, be sure to view the README file for the latest information about the Switchboard Server.



- Upon exiting the installer, you may optionally start the Switchboard Server application.



4.2 Command Line Installer

The Switchboard can also be installed from a terminal command line. For environments without a desktop GUI, use: `--mode text` to launch the installer.

- Download the Switchboard installation package to a temporary directory.
- Make the package executable, for example:
`chmod +x vcswitchboard-2.0-linux-x32-installer.run`
- The command line options are shown below. Execute the installer from the command line:
`./vcswitchboard-2.0-linux-x32-installer.run <options>`

Usage:

<code>--help</code>	Display the list of valid options
<code>--version</code>	Display product information
<code>--unattendedmodeui mode></code>	Unattended Mode UI Default: none Allowed: none minimal minimal WithDialogs
<code>--optionfile <optionfile></code>	Installation option file Default:

<code>--debuglevel <debuglevel></code>	Debug information level of verbosity Default: 2 Allowed: 0 1 2 3 4
<code>--mode <mode></code>	Installation mode Default: gtk Allowed: gtk xwindow text unattended
<code>--debugtrace <debugtrace></code>	Debug filename Default:
<code>--installer-language <Language></code>	Language selection Default: en Allowed: en ar bg ca da nl et fr fi de el es es_AR he hr hu it ja lt ko pl pt_BR pt ro ru no sl sk sq sv sr tr zh_TW zh_CN va cy cs
<code>--licensekey <licensekey></code>	License Key Default:
<code>--prefix <prefix></code>	Installation Directory Default: /usr/local/vcswitchboard/
<code>--port <port></code>	UDP port Default: 9999
<code>--httpport <httpport></code>	HTTP port Default: 8888

NOTE: the Linux server must have Internet access at this point for the installer to contact Proxicast's Activation Server to validate your license key.

4.3 Uninstalling the Switchboard Server

To uninstall the Switchboard Server, execute the following command as root in the installation directory:

```
./uninstall
```

or if logged in as root, double-click on the icon:



4.4 Moving to a Different Server

To move the Switchboard Server to a different Linux server, uninstall the software as described above while the original server is connected to the Internet. This will deactivate your license key. Then install the Switchboard Server on the new Linux server using your existing license key.

5. Operating the Switchboard Server

5.1 Starting the Switchboard Server

The Switchboard Server can be started after installation is complete. The installer also creates the script file *vcswitchboard* in the */etc/init.d* directory so that the Switchboard Server starts when the operating system is started.

To start the Switchboard Server manually, execute the following command as root in the installation directory:

```
. /switchboard-start.sh
```

NOTE: The Switchboard Server clears any previous activity log information when it starts.

5.2 Stopping the Switchboard Server

To stop the Switchboard Server manually, execute the following command as root in the installation directory:

```
. /switchboard-stop.sh
```

5.3 Routine Operations

The Switchboard Server runs as a background process performing its functions without user interaction. Switchboard and Virtual Cable Network activity can be viewed using the Virtual Cable Switchboard Server Monitor installed with the Switchboard Server (see page 10).

The Switchboard Server's log file can grow quickly, especially on large networks. While this does not negatively impact the Switchboard Server's performance, it can degrade the responsiveness of the Switchboard Monitor application.

Proxicast strongly recommends regularly purging or archiving the log or restarting the Switchboard Server to trim old log entries. For example, a daily cron job can run any of the utility scripts provided with the installation package:

switchboard-start.sh – stops and restarts the Switchboard server, erasing all old log entries

purge-log.sh – erases all old log entries without stopping the Switchboard server

archive-db.sh – copies the entire Switchboard.db file to a new file based on the current timestamp, erases all old log entries, but does not restart the Switchboard server

5.4 Changing the Listening Ports

To change either the Switchboard Server or Server Monitor listening ports, you must uninstall and re-install the software.

5.5 Upgrading to a New Switchboard Version

If an updated version of the Switchboard Server is released, you may install the upgraded version simply by obtaining the latest installer program from Proxicast and re-running the installer.

5.6 Purchasing Additional Gateway Licenses

To increase the number of allowed concurrent Gateways, contact Proxicast to purchase the necessary licenses, then re-run the installer to authorize the additional Gateways with our Activation Server.

6. Virtual Cable Switchboard Server Monitor

The Switchboard Server includes an embedded web server and application for monitoring the Switchboard and Virtual Cable Network activity. Launch the Virtual Cable Switchboard Server Monitor (VCSSM) by:

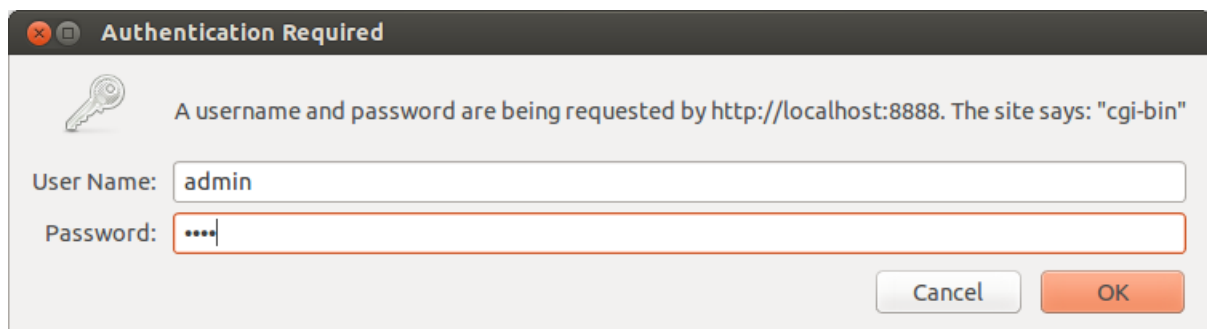
- Clicking on the icon in the installation directory:



- On the Linux server, opening a web browser to the address: <http://localhost:8888>
- From the Internet, opening a web browser to the address: <http://<your-servers-public-IP>:8888>

NOTE: if you selected a different HTTP listening port during installation, use that port number instead of 8888.

To access VCSSM, log in with the default username = **admin** and the default password = **1234**.



Authentication Required





A username and password are being requested by <http://localhost:8888>. The site says: "cgi-bin"

User Name:

Password:

Cancel OK

6.1 Virtual Cable Terminology

	Virtual Cable Network	Virtual Cable Networks consist of 2 or more Gateway nodes which are operating in Virtual Cable Mode and that have the same Account Name, Network Name and Password defined. Networks are created on an ad-hoc basis as Gateways contact the Switchboard Server.
	Gateway Node	Gateway Nodes are Proxicast devices (such as the PocketPORT) which are operating in Virtual Cable Mode. Gateways are responsible for periodically contacting the Switchboard Server and routing packets for the device nodes connected to them based on information from the Switchboard.
	Peer-to-Peer Node	Peer-to-Peer Nodes are devices connected to Gateway nodes that can exchange data with other device nodes via direct communication between their respective Gateways. Ethernet traffic <u>IS NOT</u> flowing through the Switchboard Server.
	Relayed Node	Relayed Nodes are devices which cannot reach other peer nodes because the destination device's Gateway cannot be accessed directly from the Internet. Ethernet traffic between relayed nodes <u>IS</u> flowing to the Switchboard Server to be relayed through a reverse tunnel to the destination node's Gateway.

Since a Virtual Cable Network requires at least 2 Gateway nodes, the maximum number of concurrent networks supported by the Switchboard Server is one-half the number of licensed Gateway nodes.

Each Network represents a separate Ethernet broadcast domain (subnet). Nodes which do not need to communicate with one another should be placed in separate Networks to minimize extraneous traffic sent to non-relevant nodes.

Gateways which have public IP addresses typically perform peer-to-peer communications (assuming no ports are blocked). Gateways which have private IP addresses and/or are behind firewalls typically must relay their traffic through the Switchboard. Public IP addresses on Gateway nodes are preferred to avoid the extra latency required for relayed packets and to minimize Switchboard Server load.

Active Gateway nodes are defined as Gateways which have registered or re-registered with the Switchboard Server within the previous 2 minutes. The Switchboard Server will allow additional Gateways to connect until the concurrent Gateway license limit is reached. The active Gateway count will be reduced 2 minutes after a Gateway fails to register.

Gateways and Device nodes are identified uniquely by their MAC addresses.

NOTE: All Switchboard Server events are logged using Coordinated Universal Time (UTC).

6.2 Status Screen

proxicast Virtual Cable Switchboard Server Monitor Server Time
2014-04-14 20:25:00 UTC

Status **Activity** **Log**

Server Status

Switchboard Server	Running
Server Started	2014-04-09 17:43:12 UTC
Up Time	5 days 2 hours 41 minutes 47 seconds
Licensed Gateway Nodes	25
Active Gateway Nodes	2
# Log Entries	34,712
Switchboard Port	9999
License Key	0813-6C90-3CA2-83A7
Switchboard Version	2.4
Monitor Password	Change

Recent Events

```

2014-04-14 20:24:10 UTC [switchboard.c: 151] Re-registered node [public_ip=172.16.1.1:28465][mac=00:1B:39:11:14:D6][network=john@acme.com-SensorNet]
2014-04-14 20:24:11 UTC [switchboard.c: 151] Re-registered node [public_ip=166.149.47.64:9999][mac=00:1B:39:11:16:5E][network=john@acme.com-SensorNet]
2014-04-14 20:24:12 UTC [switchboard.c: 193] Registered new peer [public_ip=172.16.1.1:28465][mac=00:1B:39:0F:50:7D][network=john@acme.com-SensorNet]
2014-04-14 20:24:12 UTC [switchboard.c: 193] Registered new peer [public_ip=172.16.1.1:28465][mac=00:21:5A:80:E5:7A][network=john@acme.com-SensorNet]
2014-04-14 20:24:13 UTC [switchboard.c: 193] Registered new peer [public_ip=172.16.1.1:28465][mac=30:05:5C:15:70:20][network=john@acme.com-SensorNet]
2014-04-14 20:24:40 UTC [switchboard.c: 151] Re-registered node [public_ip=172.16.1.1:28465][mac=00:1B:39:11:14:D6][network=john@acme.com-SensorNet]
2014-04-14 20:24:42 UTC [switchboard.c: 124] Re-registered peer [public_ip=172.16.1.1:28465][mac=D4:3D:7E:57:62:E5][network=john@acme.com-SensorNet]
2014-04-14 20:24:43 UTC [switchboard.c: 151] Re-registered node [public_ip=166.149.47.64:9999][mac=00:1B:39:11:16:5E][network=john@acme.com-SensorNet]
2014-04-14 20:24:48 UTC [switchboard.c: 124] Re-registered peer [public_ip=172.16.1.1:28465][mac=00:1E:90:99:B7:0B][network=john@acme.com-SensorNet]
2014-04-14 20:24:57 UTC [switchboard.c: 193] Registered new peer [public_ip=172.16.1.1:28465][mac=58:6D:8F:AD:32:41][network=john@acme.com-SensorNet]

```

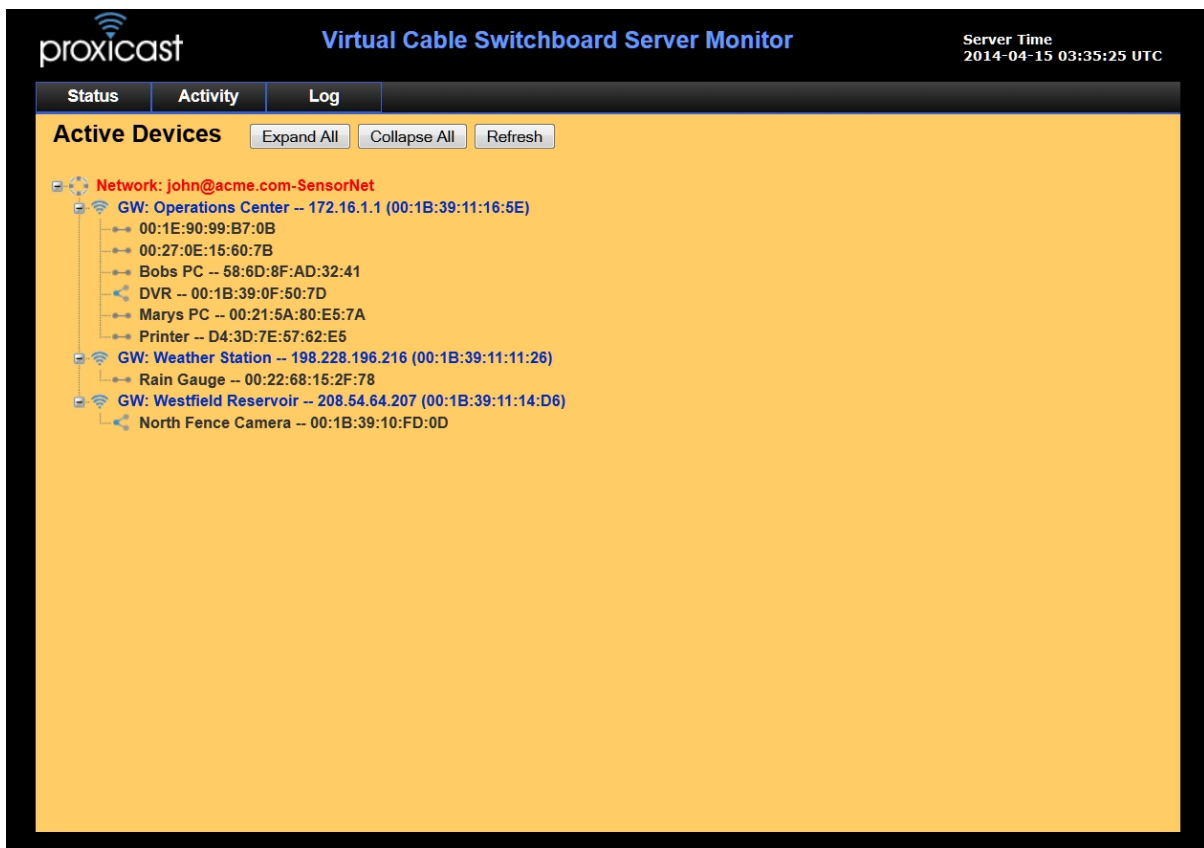
The Status screen provides a snapshot of the Switchboard Server's settings and current activity. The top section shows the server's running status, start time, up time, number of active Gateway nodes, and the size of the Switchboard Server's log. It also shows the server's UDP listening port along with the license key and software version.

Use the Change link to change the VCSSM login password (username is fixed as "admin").

The bottom portion of the Status screen displays Switchboard Server log entries which have occurred over the previous 2 minutes.

The Status screen refreshes automatically every 30 seconds.

6.3 Active Devices Screen

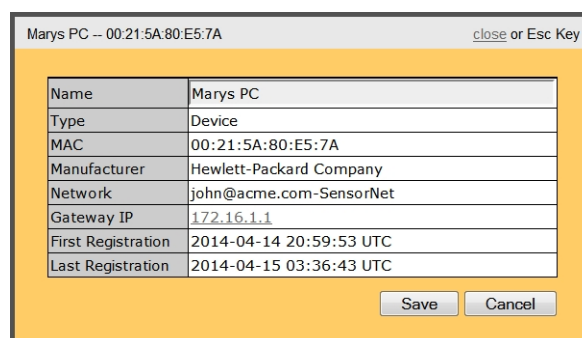


The Active Devices screen shows a tree view of the Networks, Gateways and Device nodes which have communicated with the Switchboard during the previous 2 minutes.

Networks show all of the Gateways which are communicating in the same virtual Ethernet domain. Gateways show the nodes connected to them and indicate whether they are able to send packets to other devices in peer-to-peer mode or via Switchboard relay (e.g. the DVR and the North Fence Camera).

The tree view may be expanded or collapsed via the action buttons. The Active Devices screen is only refreshed on demand via the Refresh button.

Clicking on any entry will display a device summary popup window that provides detailed information about the node.



You may assign a descriptive name to each node (up to 32 characters). This name will be pre-pended to the node's IP/MAC address in the Activity Devices tree view. The characters ' " \ | are not permitted in node names.

6.4 Packet Relays Screen

The screenshot shows the 'Packet Relay Activity' screen in the Virtual Cable Switchboard Server Monitor. At the top, there is a navigation bar with 'Status', 'Activity', and 'Log' tabs. The main header includes the 'proxicast' logo, the title 'Virtual Cable Switchboard Server Monitor', and the 'Server Time' '2014-04-15 03:39:31 UTC'. Below the header, there is a section for 'Packet Relay Activity' with a checkbox for 'Directed Packets Only', a 'Network Filter' dropdown menu, and a 'Refresh' button. The main content is a table with the following data:

Network	Source	Destination	Type	Time
john@acme.com-SensorNet	DVR	FF:FF:FF:FF:FF:FF	Broadcast	2014-04-15 03:38:54
john@acme.com-SensorNet	North Fence Camera	DVR	Directed	2014-04-15 03:38:51
john@acme.com-SensorNet	00:1E:90:99:B7:0B	FF:FF:FF:FF:FF:FF	Broadcast	2014-04-15 03:38:59
john@acme.com-SensorNet	Rain Gauge	FF:FF:FF:FF:FF:FF	Broadcast	2014-04-15 03:39:23
john@acme.com-SensorNet	00:27:0E:15:60:7B	FF:FF:FF:FF:FF:FF	Broadcast	2014-04-15 03:39:02
john@acme.com-SensorNet	Printer	FF:FF:FF:FF:FF:FF	Broadcast	2014-04-15 03:39:22

The Packet Relays screen displays a table showing the Switchboard Server's current packet relay activity. The names of the source and destination nodes are shown, along with the type of packet relay and the timestamp.

Broadcast and **Multicast** packets are always relayed because Gateway nodes do not know if all other devices on the network will be able to receive the packet.

Directed (unicast) packets are being relayed by the Switchboard Server between 2 specific network nodes. The check box above the table will suppress the display all packet relays except for directed packets. The Relay Table may also be filtered by Network Name if more than one Virtual Cable network is active on the Switchboard server.

Broadcast packets are common in an Ethernet network as devices continuously update their status. However, excessive broadcast traffic may indicate a network problem (e.g. broadcast storms) or that the Virtual Cable Network has too many devices connected.

Unless being used for an application on a Device node connected to a Gateway, multicast traffic should be minimized. Both broadcast and multicast packets are sent to all nodes of the network, thereby affecting network speed and data utilization limits.

Clicking on any name will display the device summary popup window for that node.

The Packet Relay screen can be manually refreshed via the Refresh button.

6.5 Log Screen

The screenshot displays the 'Switchboard Log' interface. The header includes the proxicast logo, the title 'Virtual Cable Switchboard Server Monitor', and the server time '2014-03-23 20:03:09 UTC'. The main content area is a scrollable list of log entries, each starting with a timestamp (e.g., '2014-03-23 19:48:23 UTC') and a network identifier (e.g., '[switchboard.c: 151]'). The log entries describe various network events such as 'Re-registered node' and 'Registered new peer', including details like public IP addresses, MAC addresses, and network names (e.g., 'mary@acme.com-Cameras', 'john@acme.com-SensorNet'). At the top of the log area, there are filter controls: 'History' (set to 15 min), 'MAC Filter', and 'Network Filter', along with a 'Refresh' button. A 'Purge Log' button is located at the bottom left of the log area.

The Log screen allows you to view the complete Switchboard Server log and to filter the log entries by time, MAC and Network Name. The filters are convenient for analyzing and troubleshooting specific devices.

Selecting values from the filter drop-down boxes will immediately apply the filter condition. Click the Refresh button view the latest log entries with the filter conditions applied. The Log screen does not refresh automatically.

The Purge Log button at the bottom of the Log screen will erase all Switchboard Server log entries. Allow approximately 2 minutes for the Switchboard Server to re-register its Gateways and Devices.

7. Troubleshooting & FAQ's

7.1 Troubleshooting

Cannot install Switchboard Server

- Installer file must be made executable.
- You must have root access privileges.
- You must install the correct architecture version (e.g. 32-bit or 64-bit) for your server.

Gateway does not show in Active Device List

- Check that the Gateway is connected to the Internet.
- Confirm that the Gateway's Virtual Cable settings have the correct IP address and port number for the Switchboard Server.
- One or more firewalls may be intervening and blocking the Switchboard's UDP listening port.

Device node does not appear in Active Device list

- Devices will not appear until they attempt to communicate with another node.
- Check the device's IP settings.

Gateway appears and disappears regularly

- Check network connectivity/reliability on the Gateway.
- Check the AutoPing settings on the Gateway.

Gateway with a public IP address is relayed

- One or more firewalls may be intervening and blocking certain ports.
- Check with your ISP regarding the type of IP address assigned to your Gateway.

7.2 Frequently Asked Questions

Q: Which Linux distributions are supported?

A: Any Linux version that runs on an X86 compatible CPU.

Q: Can the Switchboard Server run on a Linux Desktop installation?

A: Yes.

Q: Can the Switchboard Server run on a Linux Virtual Machine (VM) under Windows?

A: Yes. Be sure to configure the network to allow access to the UDP and HTTP listening ports.

Q: Can the Switchboard Server run on a Linux Virtual Private Server (VPS)?

A: Yes. If you do not have access to the VPS physical console, you may have to use the command line installation via an SSH terminal session.

Q: Can the Switchboard Server run on a hosted shared Linux server?

A: It depends on your hosting company. Most will not give you root access to a shared server. However if you provide them with the installer package and instructions, they may install the Switchboard Server for you.

Q: Can the Switchboard Server run behind a firewall?

A: Yes, as long as the firewall opens and forwards the UDP and HTTP listening ports to the Linux server. Use the firewall's public IP address as the Switchboard Server address in your Gateway nodes.

Q: If the Switchboard Server does down, does all Virtual Cable network traffic stop?

A: No. Peer-to-peer nodes will continue to communicate until one of them changes its public IP address or disconnects from the Internet. Relayed nodes will stop communicating when the Switchboard Server is down.

Q: Can I communicate from the Switchboard Server to the Gateways or Devices?

A: Not directly. The Switchboard Server cannot initiate communications with Gateway or Device nodes. If the Gateway has a public IP address with no ports blocked, you can connect to it or its connected Devices via a web browser using the Gateway's public IP address.

Q: Can the Switchboard Server capture and analyze Ethernet packet traffic?

A: The Switchboard Server has no packet analysis functionality. Packages such as Wireshark can capture Virtual Cable packets, however, the packet data is encrypted so only address information can be obtained.

Q: Why can't I see the IP addresses of the Device nodes?

A: Virtual Cable packets are encrypted. The Switchboard Server can only view the address (envelope) information and cannot read the packet data contents because it does not hold the encryption keys for the Networks. Only Gateways can encrypt and decrypt Virtual Cable packets. Only Gateways communicate directly with the Switchboard Server. You can manually input the local IP addresses of the nodes as part of their descriptive names.

8. Contacts & Support

Online Web Support

Please refer to <http://support.proxicast.com> for additional support documentation and access to our Knowledgebase which contains many resources such as TechNotes, Frequently Asked Questions, sample configurations and software updates.

E-Mail Support

Support E-mail: support@proxicast.com

Please provide the following information when you contact customer support:

- Product name and license number
- Current software version
- Operating system version
- Brief description of the problem and the steps you've taken to try to solve it

Corporate Headquarters

- Sales E-mail: sales@proxicast.com
- Telephone: 877-777-7694 (412-213-2477)
- Fax: 412-492-9386
- Web Site: www.proxicast.com, support.proxicast.com

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jQuery v1.4.4 Copyright © 2010 jQuery Foundation and other contributors

zTree v3.5 Copyright © 2011 hunter.z

ThickBox v3.1 Copyright © 2007 Cody Lindley

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mini_httpd

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