

SmartNode[™] Virtual SmartNode (vSN)

User Manual



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Warranty Information

For license and warranty information, refer to Appendix B, "End User License Agreement" on page 50.

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About This Guide

This guide describes the Virtual SmartNode (vSN) virtualization software, installation, and basic configuration.

Audience

This guide is intended for the following users:

- Operators
- Installers

Structure

This guide contains the following chapters and appendices:

- Chapter 1 on page 8 provides information about vSN features and capabilities.
- Chapter 2 on page 11 provides information about installing and configuring the vSN.
- Chapter 3 on page 41 describes how to update vSN software and firmware.
- Chapter 4 on page 47 describes how to contact Patton for assistance
- Appendix A on page 46 provides specifications for the vSN
- Appendix B on page 50 provides license information that describes acceptable usage of the software provided with the Virtual SmartNode.

For best results, read the contents of this guide before you install the Virtual SmartNode.

Chapter 1 General information

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Overview

Congratulations on becoming the owner of Virtual SmartNode (vSN) virtualization software. Identical to Patton's Trinity Operating System (OS) firmware that runs on all recent Patton devices (including the Enterprise Session Border Controller (eSBC) SN5300, and SN55XX) vSN makes Trinity OS available for virtualized environments.

The Virtual SmartNode enables enterprises and service providers to secure their VoIP network by using their existing virtualization infrastructure without installing additional hardware. The vSN runs on common virtualization infrastructure including VMware, KVM, Hyper-V and VirtualBox.

This user manual describes how to install and operate the vSN. If questions or problems arise during installation or use of this product, contact Patton Electronics Technical Support at +1 301 975 1007.

Features

The Virtual SmartNode combines highly flexible SIP routing and manipulation features with powerful quality of service (QoS) IP routing functions to build professional and reliable VoIP and data networks

Features include:

- **VoIP Security**—Network separation with SIP Back 2 Back UA, intrusion protection, DoS prevention, trust peer, Signaling encryption (SIP-TLS), Stateful Firewall
- Session Control—Dynamic SIP Session allocation for a high number of calls. SessionRouter allows flexible call routing and numbering plan adaptations, CLIP/CLIR, hold, transfer, and much more.
- **SIP Normalization**—SIP-to-SIP Interworking Normalizing different, vendor specific SIP implementations or *dialects*. Demarcation point, separation between networks
- Network Monitoring & Assessment—Network monitoring probe* for QoS measurements and proactive alerting to minimize problems. SLA assurance at demarcation point
- Load Balancing—Call load distribution across multiple network links.
- IP Routing & Networking—IPv4 & IPv6 Routing Protocol support; GRE, VRRP, RIP, L2TP, etc.
- High Availability—Stateful call failover incl. proactive dead call detection. SBC redundancy and failover to secondary, virtual instances
- **Proprietary Software**—vSN uses proprietary Patton's Trinity OS[™] software for added security

System Requirements

Virtual SmartNode requires the following system resources per virtual machine (VM) instance:

- **CPU**—64-bit x86 architecture (single core or more)
- **RAM**—A minimum of 1 GB
- **HDD**—1 GB
- Network—At least one (virtual) Ethernet adapter

Functional Principle

The Virtual SmartNode uses a floating license model through the Patton Cloud, to enable the features required for each specific use-case.

The Patton Cloud automatically distributes the obtained licenses (see figure 1) to where they are needed (vSN and other Patton devices). This enables you to easily scale up/down SBC services on Virtual SmartNode devices but also on regular SmartNode devices.





Software Images

Patton delivers different types of virtual SmartNode images: a set of pre-installed images for the different hypervisors and a generic upgrade image, that is the same for all hypervisors.

The image deliveries can be distinguished by their file extensions:

- **Pre-Installed images**—You can mount the delivered pre-installed image as bootable virtual HDD and start vSN immediately. Patton ships the pre-installed image in different formats, suitable for different hypervisors:
 - / /VHD—VirtualBox virtual disk image (e.g. vSN_3.15.3.vhd)
 - / /VDI—VirtualBox virtual disk image (e.g. vSN_3.15.3.vdi)
 - / /VMDK—VMware virtual disk image (e.g. vSN_3.15.3.vmdk)
 - / /QCOW—QCOW2: QEMU Copy-On-Write disk image (e.g. vSN_3.15.3.qcow2)
 - / /**RAW**—Raw image format (e.g. vSN_3.15.3.raw)
- **Upgrade Image (tar)**—Once the virtual SmartNode is up and running you don't want to re-install it for each software upgrade, because this will drop your persistent configuration files. Instead you can use the same upgrade procedures as for physical devices, i.e., download the upgrade image from a TFTP or web server, manually, with auto-provisioning (Example delivery: *vSN_3.15.4.tar*) or through the Patton Cloud (min. Cloud Service plan Advanced required).

Chapter 2 Installation

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Introduction

This chapter describes installing Virtual SmartNode (vSN) software on the following virtual machines:

- "Installing the vSN on VMware ESX" on page 12
- "Installing vSN on VirtualBox" on page 21
- "Installing the vSN on KVM" on page 25
- "Installing the vSN on Hyper-V" on page 29

Installing the vSN on VMware ESX

Installation consists of the following:

- Copying the pre-installed vSN image into the datastore (see section "Copying the pre-installed vSN image into the datastore" on page 12)
- Running the virtual machine and doing the initial configuration (see section "Running VM and Initial Configuration" on page 19)

Copying the pre-installed vSN image into the datastore

For a VMware VM to directly boot from Patton's pre-installed vSN image (VMDK) you have to add the image into one of VMware's data stores

- 1. Run the *vSphere Client* application (see figure 2).
- 2. Select an ESX server farm in the inventory and open the *Summary* tab (see figure 2).

2 172.19.110.100 - vSphere Client				
File Edit View Inventory Adm	inistration Plug-ins Help			
🖸 🔯 🧑 Home 🕨 🛃 I	nventory 🕨 🎁 Inventory			
d e				
172.19.110.100 srv-AAA srv-asterisk srv-asterisk.8 srv-dcontroller srv-lync srv-naglosOrig srv-dpixblutbull2.04	ServerFarm VMware ESXi, Getting Started. Summary Configuration Issues Remote Tech Support Mode General	4.1.0, 800380 Virtual Machines Resource Allocation (SSH) for the host ServerFarm has been e	Performance Configuration Local Us nabled Resources	ers & Groups Events Pe
srv-rd-windows srv-test Trinity_ESX	ty_ESX Manufacturer: Processor Type:	Dell Inc. PowerEdge T420 12 CPUs x 2.199 GHz Intel(R) Xeon(R) CPU E5-2430 0 @ 2.20GHz	CPU usage: 208 MHz Memory usage: 10961.00 MB	Capacity 12 x 2.199 GHz Capacity 32722.18 MB
	License: Processor Sockets:	vSphere 4 Essentials Licensed for 2 physical CPU 2	Datastore Capacity	Free Last Update 292.03 GB 29.09.2016
1	Cores per Socket:	6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

Figure 2. vSphere Client window

- 3. Right-click on one of the data stores on the right and select Browse Datastore....
- 4. Create a new folder for the new VM (see figure 3).

Iders Search	[datastore1] /
1	Name
ISO srv-asterisk srv-lync srv-dcontroller	150 srv-asterisk srv-lync srv-doontroller
1 New Folder	
Enter a name for the new folder.	12.04
vSN1	
	OK Cancel 1

Figure 3. Datastore Browser window

5. Select the created folder and upload the provided pre-installed vSN image (VMDK). (see figure 4)

🛃 Datastore	Browser - [datas	tore1]					
BR	📁 🖗 🖗		×	8			
Folders Sear	ch]		[[datastore1]vSN1			
801			-11	Name	Size	Provisioned Size	Туре
	O v-asterisk v-lync v-dcontroller v-nagios v-test v-AAA v-rd-ubuntu12.04 v-r			esse_3.10.T6076-1.vmdk	71'680.00 KB	136'552.00 KB	Virtual Disk

Figure 4. Datastore Browser [datastore1] window

Creating a new VM

- 1. Run the *vSphere Client* application (see figure 5 on page 14).
- 2. Select an ESX server farm in the inventory

17	2.19.1	10.100	- vSphe	re C	lient	t i
File	Edit	View	Invento	ry	Adr	ministration
	-	6	Home	Þ	5	Inventory
6	6					
	172	. 19.110 srv-AA srv-ast	0.100 A erisk			Serve Gettir

Figure 5. Run vSphere Client application

- 3. Click the *File* menu and select *New* > *Virtual Machine* or press ctrl + *N* to start the machine-setup wizard.
- 4. On the *Configuration* panel click the Custom button (see figure 6).

Configuration Name and Location Datastore Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller	Configuration C Typical Create a new virtual machine with the most common devices and configuration options. Custom Create a virtual machine with additional devices or specific configuration options.
Select a Disk Ready to Complete	



- 5. Click the *Next* button.
- 6. On the *Name and Location* panel, enter a VM name (see figure 7).

Configuration	Name:
Name and Location	vSN1
Datastore Virtual Machine Version	Virtual machine (VM) names may contain up to 80 characters and they must be unique within each vCenter Server VM folder.
CPUs Memory	VM folders are not viewable when connected directly to a host. To view VM folders and specify a location for this VM, connect to the vCenter Server.
Network SCSI Controller	
Select a Disk Ready to Complete	

Figure 7. Wizard Name and Location panel

- 7. Click the *Next* button.
- 8. On the *Datastore* panel, select a datastore where you have uploaded the pre-installed vSN image (VMDK) (see figure 9 on page 15).

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2 • Installation

Datastore	Name	1 1	Capacity	Provisioned	Free	Туре	Thin Provisioning	Acces
Virtual Machine Version	[datastore1]		926.50 GB	700.21 GB	292.03 GB	VMFS	Supported	Single
Guest Operating System								
CPUs								
Aemory								
letwork								
CSI Controller								
elect a Disk								
Ready to Complete								

Figure 8. Wizard Datastore panel

9. Click the *Next* button.

10. On the Virtual Machine Version panel, select the latest version (see figure 9).



Figure 9. Wizard Virtual Machine Version panel

- 11. Click the Next button.
- 12. On the *Guest Operating System* panel, click the *Linux* button to make it the guest operating system (see figure 10).

Configuration Name and Location	Guest Operating System:
Datastore Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	 Microsoft Windows Linux Novell NetWare Solaris Other Version: Other Linux (64-bit) Identifying the guest operating system here allows the wizard to provide the appropriate defaults for the operating system installation.



- 13. Click the Version menu and select Other Linux (64-bit).
- 14. Click the Next button.
- 15. On the CPUs panel, select at least 1 CPU (see figure 11).

Configuration Name and Location Datastore	Number of virtual processors:
Virtual Machine Version Guest Operating System CPUs	The number of virtual processors that can be created for a VM depends on the number of licensed CPUs on a host and the number of processors supported by the quest OS.
Network SCSI Controller Select a Disk Ready to Complete	Click Help for information on the number of processors supported for various guest operating systems.

Figure 11. Wizard CPUs panel

- 16. Click the *Next* button.
- 17. On the Memory panel, reserve at least 1 GB of RAM (see figure 12).



Figure 12. Wizard Memory panel

18. Click the Next button.

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19. On the *Network* panel, set up the networking environment for the VM, for example one virtual network interface as shown in figure 13 on page 17 (network and adapter names may be different on your server farm).

Configuration Name and Location Datastore	Create Network Connections How many NICs do you want to connect?	1 •
<u>Virtual Machine Version</u> <u>Guest Operating System</u> <u>CPUs</u> <u>Memory</u> Natural	Network NIC 1: VM Network	Adapter Power On
SCSI Controller Select a Disk Ready to Complete		
	If supported by this virtual machine version, mo virtual machine is created, via its Edit Settings d	re than 4 NICs can be added after the ialog.
	Adapter choice can affect both networking perform the VMware KnowledgeBase for more information supported for various guest operating systems and	ance and migration compatibility. Consult on choosing among the network adapters I hosts.

Figure 13. Wizard Network panel

- 20. Click the Next button.
- 21. On the *SCSI Controller* panel, click the *LSI Logic Parallel* button to make it the SCSI controller (see figure 14).



Figure 14. Wizard SCSI Controller panel

- 22. Click the Next button.
- 23. On the *Select a Disk* panel, click the *Use an existing virtual disk* button to make it the type of disk the vSN will use (see figure 15 on page 18).

Configuration Name and Location	A virtual disk is composed of one or more files on the host file system. Together these files appear as a single hard disk to the guest operating system.
<u>Datastore</u> <u>Virtual Machine Version</u> <u>Guest Operating System</u>	Select the type of disk to use.
CPUs Memory Network	C Create a new virtual disk
SCSI Controller Select a Disk Select Existing Disk	 Use an existing virtual disk Reuse a previously configured virtual disk.
Advanced Options Ready to Complete	C Raw Device Mappings Give your virtual machine direct access to SAN. This option allows you to use existing SAN commands to manage the storage and continue to access it using a datastore.
	C Do not create disk

Figure 15. Wizard Select a Disk panel

- 24. Click the Next button.
- 25. On the *Select Existing Disk* panel, browse for the uploaded pre-installed vSN image (VMDK) in the datastore (see figure 16).

Configuration Name and Location	Disk File Path	
Datastore	[datastore1]vSN1/vSN_3.15.3.vdmk	Browse
Virtual Machine Version		
Guest Operating System		
CPUs		
Memory		
Network		
SCSI Controller		
Select a Disk		
Select Existing Disk		
Advanced Options		
riurai ieea opuoria		

Figure 16. Wizard Select Existing Disk panel

- 26. Click the *Next* button.
- 27. On the *Advanced Options* panel, change the *Virtual Device Node* type to *IDE*. Leave the *Mode* options at the default settings (see figure 17 on page 19).

Configuration Name and Location Datastore Virtual Machine Version Guest Operating System CPUs	Specify the advanced options for this virtual disk. These options do not normally need to be changed. Virtual Device Node DE (0:0)
Memory Network SCSI Controller	Change to IDE Mode
Select a Disk Select Existing Disk Advanced Options Ready to Complete	Independent Independent disks are not affected by snapshots. C Persistent Changes are immediately and permanently written to the disk.
	C Nonpersistent Changes to this disk are discarded when you power off or revert to the snapshot.

Figure 17. Wizard Advanced Options panel

28. On the Ready to Complete panel, review the settings for the virtual machine (see figure 18).

Configuration	Settings for the new	virtual machine:	
Name and Location Datastore Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Select Existing Disk Advanced Options Ready to Complete	Name: Host/Cluster: Datastore: Guest OS: CPUs: Memory: NICs: NIC 1 Network: SCSI Controller: Create disk: Virtual Device Node: Disk file path: Disk mode:	vTrinity1 ServerFarm. datastore1 Other Linux (64-bit) 1 1024MB 1 VM Network LSI Logic Parallel Use existing disk IDE (0:0) [datastore1] vTrinity1/vSBC_3.10.T6076-1.vmdk Persistent	

Figure 18. Wizard Ready to Complete panel

29. Click the Next button.

Running VM and Initial Configuration

Once you have installed the vSN VM, you run it by doing the following:

- 1. sRun the *vSphere Client* application.
- 2. Select the vSN VM in the inventory.
- 3. Click on the *Power On* button (see figure 19).

ile Edit View Inventory Administration Plug-ins Help Image: State Sta								
🔳 II 🕨 🗐 🚳	13 🔮 😓 🤇							
172.19.110.100 srv-AAA srv-asterisk srv-asterisk1.8	vTrinity1 Getting Started Sur	nmary Resource Allocation Performance E						
srv-lync srv-nagiosOrig srv-rd-ubuntu12.04 srv-rd-windows srv-test Trinity_ESX	Guest OS: VM Version: CPU: Memory: Memory Overhead: VMware Tools: IP Addresses: DNS Name:	Other Linux (64-bit) 7 1 vCPU 512 MB 126.95 MB Not installed						
	State: Host: Active Tasks:	Powered Off ServerFarm						
	Commands							
	Power On B Edit Settings							

Figure 19. Running the VM

4. Switch to the *Console* tab. After a short delay, the login prompt displays.

We recommend you login and perform some initial configuration for the new VM such as changing the administrator password and enabling ssh management access as follows:

- 5. Login with the default administrator account: username *admin*, no password.
- 6. Create a **new administrator** account (and invalidate the default account) by entering the following commands:

```
node> enable
node# configure
node(cfg)# administrator <username> password <password>
node(cfg)#
```

 Optionally, change the IP address. By default, the vSN instance tries to lease an IP address over DHCP. To display the assigned address, enter the *show ip interface* command. If you want to replace it by a static address, enter the following commands.

```
node(cfg) # context ip
node(ctx-ip) [ROUTER] # interface IF1
node(if-ip) [LAN] # no ipaddress DHCP
node(if-ip) [LAN] # ipaddress IF1 <a.b.c.d/m>
node(ip-if) [LAN] # end
node#
```

8. Persistently **store the configuration** changes:

copy running-config startup-config

To reload the vSN instance, enter the reload command. To shut off the VM, type poweroff.

 Note
 The Virtual SmartNode is installed. For information on operating vSN software, refer to the User Manuals & Configuration Guides section of the Virtual

 SmartNode
 product page to download the most recent release of the Trinity

 Command Line Reference Guide.

Go to section "Connecting to Patton Cloud" on page 38 to lease needed licenses from Patton Cloud.

Installing vSN on VirtualBox

Installation consists of the following:

- Creating a new VM (see section "Creating a new VM")
- Running the virtual machine and doing the initial configuration (see section "Running VM and Initial Configuration" on page 23)

Creating a new VM

- 1. Run the Oracle VM VirtualBox Manager application.
- 2. Run the Machine / New... menu to start the machine-setup wizard.
- 3. On the *Name and operating system* panel, enter a VM *Name* (see figure 20).

Please of machine intend to througho	hoose a descriptive name for the new virtual and select the type of operating system you install on it. The name you choose will be used but VirtualBox to identify this machine.
Name:	vSN1
Type:	Linux 😥 🌈
Version:	Other Linux (64-bit)

Figure 20. Wizard Name and operating system panel

- 4. Click on the *Type:* menu and select *Linux*.
- 5. Click on the Version: menu and select Other Linux (64-bit)

- 6. Click the *Continue* button.
- 7. On the *Memory size* panel, reserve at least 1 GB of RAM (see figure 21).



Figure 21. Wizard Memory size panel

- 8. Click the *Continue* button.
- 9. On the *Hard disk* panel, click the *Use an existing virtual hard disk file* button to select the hard disk (see figure 22).
- 10. Select the VDI file from the set of delivered pre-installed images

aru	aisk	wight detailt_to		73897
If y ma sel fol	you wish you achine. You c lect one from der icon.	can add a virtual h an either create a the list or from and	ard disk to the new hard disk other location	e new file or using the
If y this on	ou need a m s step and m ce the machi	ore complex storages to a changes to the changes to the changes to the is created.	ge set-up you the machine	can skip settings
Th	e recommen	ded size of the har	d disk is 8.00	GB.
000	Do not add a Create a virti Use an exist	virtual hard disk ual hard disk now ing virtual hard dis	k file	
	vSN_3.15	.3.vdi (Normal, 13	3.35)	0 🗔
40.				
		Go Back	Create	Cancel

Figure 22. Wizard Hard disk panel

11. Click the *Create* button.

Optionally, change the network settings of the created VM. By default, the VM is created with one Ethernet interface in a private NAT-ed network. If you want to reach vSN from outside the host OS, you have to change the interface to bridged mode as follows:

- 1. Right-click the vSN1 VM and select the Settings... menu
- 2. Click the *Network* tab (see figure 23).
- 3. Click the Attached to: dropdown menu and select Bridged Adapter.
- 4. Select the physical network interface over which vSN shall be reachable.
- 5. Click the *OK* button.

				vSN1	- Network			
			\bigcirc] 🚫			
General	System	Display	Storage	Audio Net	work Ports	Shared Folders	User Interface	
		(Adapteri	Adapter 2	Adapter 3	Adapter 4		
🖸 Er	able Netv	work Ada	pter					
	Attach	ned to:	Bridged Ad	apter				
	1	Name:	en4: Thund	lerbolt Etherr	net (Public)			0
	Adva	anced						
?							Cancel	ОК

Figure 23. Network Settings window

Running VM and Initial Configuration

Once you have installed the vSN VM you run it by following the procedure below:

- 1. Run the Oracle VM VirtualBox Manager application.
- 2. Right-click the created vSN1 VM and select the *Start/Normal Start* menu. Alternatively, you can start the VM from the command line by entering the following command:

VirtualBox --startvm vSN1

A new window with the console output of the vSN instance displays (see figure 24).

	vSN1 [Running]	
Starting	firmware: 3.10.T6076-1	
Creating	random number data	success
Starting	syslog	success
Creating	board descriptor	success
Creating	rsa key	success
Creating	dsa key	success
Creating	ssl certificate	success
Starting	application	success
Checking	startup-config	missing
Checking	shipping-config	success
Checking	minimal-config	success
Applying	shipping-config	success
Starting	background services	success
Boot time The syste Patton El Test: 3.1	e: 12.02s em is up lectronics Company vSBC 10.T6076-1 2016/10/04	
d573cb 10	ogin: _	
	🔯 💿 🖶 🌽 🛄 🔛 🚱 🗨 Righ	t 96 + Left 96 //

Figure 24. Console window

We recommend you login and perform some initial configuration for the new VM such as changing the administrator password and enabling ssh management access as follows:

- 3. Login with the default administrator account: username *admin*, no password.
- 4. Create a **new administrator** account (and invalidate the default account) by entering the following commands:

```
node> enable
node# configure
node(cfg)# administrator <username> password <password>
node(cfg)#
```

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5. Optionally, **change the IP address**. By default, the vSN instance tries to lease an IP address over DHCP. To display the assigned address, enter the *show ip interface* command. If you want to replace it by a static address, enter the following commands.

```
node(cfg)# context ip
node(ctx-ip) [ROUTER]# interface IF1
node(if-ip) [LAN]# no ipaddress DHCP
node(if-ip) [LAN]# ipaddress IF1 <a.b.c.d/m>
node(ip-if) [LAN]# end
node#
```

6. Persistently **store the configuration** changes:

```
# copy running-config startup-config
```

To reload the vSN instance, enter the reload command. To shut off the VM, type poweroff.

 Note
 The Virtual SmartNode is installed. For information on operating vSN software, refer to the User Manuals & Configuration Guides section of the Virtual

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 product page to download the most recent release of the Trinity Command Line Reference Guide.

Go to section "Connecting to Patton Cloud" on page 38 to lease needed licenses from Patton Cloud.

Installing the vSN on KVM

Installation consists of the following:

- Creating a Virtual SmartNode disk (see section "Creation of a Virtual SmartNode disk")
- Set up a virtual machine on KVM Virtual Manager (see section "Virtual Machine Setup")
- Run the virtual machine and do the initial configuration (see section "Running VM and Initial Configuration" on page 23)

Creation of a Virtual SmartNode disk

1. Connect on the kvm-server via ssh -X

ssh -X administrator@srv-kvm.testlab.intranet

2. Start Virtual Machine Manager

```
virt-manager &
```

3. Download the desired disk images for the VM

```
cd /var/lib/libvirt/images
sudo wget https://www.patton.com/support/upgrades/license.asp?model=vsn&path=qcow2
```

Virtual Machine Setup

The KVM Virtual Manager (see figure 25 on page 26) is a graphical desktop application from which new Virtual Machines, such as the Virtual SmartNode, can be set up.

Virtual SmartNode User Manual

2 • Installation



Figure 25. KVM virt-manager window

Creation of a new virtual machine

1. Navigate to the New Virtual Machine Create button, and follow the description as shown in figure 26.

Ŧ	New VM	×
Þ	Create a new virtual machine Step 1 of 4	
Conne	ction: QEMU/KVM	
Choose	e how you would like to install the operating system	n
\bigcirc I	Local install media (ISO image or CDROM)	
\bigcirc	Network Install (HTTP, FTP, or NFS)	
\bigcirc	Network Boot (PXE)	
•	Import existing disk image	
	Cancel & Back Sorward	

Figure 26. New Virtual Machine Wizard window

2. Select "Generic" for OS Type and Version and specify the image previously downloaded (see figure 27 on page 27).

	Choose Storage Volume	+ ×
Create a new virtual machine Step 2 of 4	Size: 219.83 GiB Free / 4.93 GiB In Use Location: /var/lib/libvit/images Volumes	
Choose an operating system type and version OS type: Generic Version: Generic Cancel Cancel Forward	Volumes + Size Format Used By vSN_3.13.2.qcow2 133.35 MiB qcow2 SN42-Trinity	
	Image: Second	🖋 Choose Volume

Figure 27. Selection of Virtual SmartNode Disk

- 3. Specify the CPU and Memory to be assigned to the Virtual SmartNode (see figure 28). The minimum requirements are:
 - CPU: 1
 - RAM: 1024MB
 - Disk: 1024MB

-	N	lew VI	М	×
Create a Step 3 of 4	new v	/irtua	al m	achine
Choose Memory a	nd CPU	settir	ngs	
Memory (RAM):	1024	-	+	МіВ
	Up to 38	54 Mil	B ava	ilable on the host
CPUs:	1	-	+]
	Up to 4 a	availal	ble	
Car	icel	«	Bac	k Sorward

Figure 28. Memory and CPU Settings

4. For the last step setting up the virtual machine, define a Name for the Virtual SmartNode and review your settings, before clicking *Finish* (see figure 29).

-	New VM	×
Cre Step	eate a new virtual machine	
Ready to be	gin the installation	
Name:	SN42	
OS: Install: Memory: CPUs: Storage:	Generic Import existing OS image 1024 MiB 1 /var/lib/libvirt/images/test.qcow2 Customize configuration before install	
	br1: Host device eth1	
	Cancel & Back Prinish	

Figure 29. Finalize VSN Setup

Virtual SmartNode Initial Configuration

We recommend you login and perform some initial configuration for the new VM such as changing the administrator password and enabling ssh management access as follows:

- 1. Login with the default administrator account: username admin, no password.
- 2. Create a **new administrator** account (and invalidate the default account) by entering the following commands:

```
node> enable
node# configure
node(cfg)# administrator <username> password <password>
node(cfg)#
```

3. Optionally, **change the IP address**. By default, the vSN instance tries to lease an IP address over DHCP. To display the assigned address, enter the show ip interface command. If you want to replace it by a static address, enter the following commands:

```
node(cfg)# context ip
node(ctx-ip)[ROUTER]# interface IF1
```

```
node(if-ip)[LAN]# no ipaddress DHCP
node(if-ip)[LAN]# ipaddress IF1 <a.b.c.d/m>
node(ip-if)[LAN]# end
node#
```

4. Persistently **store the configuration** changes:

```
# copy running-config startup-config
```

Go to section "Connecting to Patton Cloud" on page 38 to lease needed licenses from Patton Cloud.

Installing the vSN on Hyper-V

Installation consists of the following:

- Download a Virtual SmartNode image (see section "Download a vSN Virtual Image Disk" on page 29)
- Set up a virtual machine on HyperV (see section "Installing the vSN on Hyper-V" on page 29)
- Run the virtual machine and do the initial configuration (see section "Virtual SmartNode Initial Configuration" on page 37)

Download a vSN Virtual Image Disk

1. Navigate to the <u>virtual SmartNode Product webpage</u> on patton.com and select the Hyper-V image for download and store it on your server (see figure 30 on page 30).

Smart	Nởđe							(• •	irtual	SmartNod	e •
SmartNodes are the scalability and ser	e leading and field proven CPEs vice availability.	running Patton P	roprietary OS. The sam	ie, feature	-rich softwo	are used for	the CPEs can a	lso be used in vir	tual environi	ments for a high lev	el of
View All	Features & Benefits	Overview	Applications	Specifica	itions	Ordering	; Information	Trial	Services	Related Info	rmation
Virtual Sma	rtNode Use Cases				Virtua	al Smar	tNode Al	l Licenses			
SIP Trunking Minimum Cloud Sc CSP-C2E/STANDAR Feature Licenses CBFL-VSN CBFL-1B CBFL-1B CBFL-REG Optional CBFL-SIP-TLS Hosted PBX Minimum Cloud Sc CSP-C2E/STANDAR CBFL-1B	rvice Plan D Standard Plan, single organization, (M) Cloud Based Feature License (12 m back calls using 2 SP Legs) Cloud Based Feature License (12 m Cloud Based Feature License (12 m Cloud Based Feature License (12 m D Standard Plan, single organization, (M) Cloud Based Feature License (12 m V) Cloud Based Feature License (12 m (M)	12 months, 10 mans onth) for running Tri onth) for 1 additions onth) to enable IP Pi onth) to enable IP Pi onth) to enable SIP-1 12 months, 10 mans onth) for running Tri onth) for 1 additions	iged devices included nity on one virtual machine I SIP Sessions (SIP back-to- icket Forwarding (routing) IIP Registrar 1LS iged devices included nity on one virtual machine I SIP Sessions (SIP back-to-	e - -	Minimum CSP-C2E, Feature I CBFL-VSI CBFL-IB CBFL-IPF CBFL-IPF CBFL-SIF CBFL-SIF CBFL-SIF CBFL-VPI	a Cloud Ser ISTANDARD Licenses - -FAILOVER -TLS -TLS -TLS -TLS -TLS -TLS -TLS - -TLS - -TLS - - - - - - - - - - - - - - - - - - -	vice Plan Standard Plan, s Cloud Based Fee (MM) Cloud Based Fee Cloud Based Fee Cloud Based Fee Cloud Based Fee Cloud Based Fee Cloud Based Fee Autor Based Fee Cloud Based Fee System	ingle organization, 1 ture License (12 moi ture License (12 moi 2 SIP Legs) ture License (12 moi ture License (12	2 months, 10 r nth) for runnin nth) for 1 addii nth) to enable nth) to enable nth) to enable mages Virtual S VMDK VMDK, V	managed devices inclu ig Trinity on one virtual tional SIP Sessions (SIF IP Packet Forwarding (the SIP Registrar seamless outbound SII SIP-TLS 1 VPN Session (OpenVI SmartNode Ima TDI	ded imachine Pback-to- routing) P call PN, IPSec BB@S
CBFL-IPR CBFL-REG	Cloud Based Feature License (12 m Cloud Based Feature License (12 m	onth) to enable IP Pa onth) to enable the S	icket Forwarding (routing) iIP Registrar		Xen Prox Hype	mox er-V		Xen KVM Hyper-V	VMDK OFMU (VHD, VH	ncow / qcow2), IDX	RAW
			© Open ← → ~ ↑ [Organize ▼ 1 # Quick access ■ Desktop	 « Loca New folder s 	al Disk (C:) : Name	 Users > Irinity.vhdx 	Public > Public	Documents > Hy Date mo 05.02.201	rper-V > Virt dified 19 09:06	tual hard disks Type Hard Disk Image F	✓ Č) Seard Size 532 480 KB

Figure 30. vSN Product Page For Image Download

Pictures

Virtual Machine Setup

1. The first step consists of preparing the Network for the Virtual SmartNode to be used. This is done using the Virtual Switch Manager (see figure 31 on page 31).

Virtual SmartNode User Manual

2 • Installation

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ve
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Figure 31. Network Setup

2. Set up a new Virtual Matching using the Wizard. Specify a name for your Virtual SmartNode (e.g. vSN44) (see figure 32 on page 32).

🖳 New Virtual Machine Wiz	ard	×
🛄 Specify Nan	ne and Location	
Before You Begin	Choose a name and location for this virtual machine.	
Specify Generation	The name is displayed in Hyper-V Manager. We recommend that you use a name that helps you identify this virtual machine, such as the name of the guest operating system or workload.	ou easily
Assign Memory	Name: SN44	
Configure Networking	You can create a folder or use an existing folder to store the virtual machine. If you don't sele	ect a
Connect Virtual Hard Disk	folder, the virtual machine is stored in the default folder configured for this server.	
Installation Options	Store the virtual machine in a different location	
Summary	Location: C:\ProgramData\Microsoft\Windows\Hyper-V\ Browner	owse
	▲ If you plan to take checkpoints of this virtual machine, select a location that has enough space. Checkpoints include virtual machine data and may require a large amount of space.	free e.
	< Previous Next > Finish (Cancel

Figure 32. Setup of a New Virtual SmartNode Instance

New Virtual Machine Wiza Specify Generation	rd eration	×
Before You Begin Specify Name and Location Specify Generation Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	 Choose the generation of this virtual machine. ③ Generation 1 This virtual machine generation supports 32-bit and 64-bit guest operating systems and provides virtual hardware which has been available in all previous versions of Hyper-V. ○ Generation 2 This virtual machine generation provides support for newer virtualization features, has UEFI-based firmware, and requires a supported 64-bit guest operating system. ① Once a virtual machine has been created, you cannot change its generation. 	đ
	< Previous Next > Finish Cancel	

Figure 33. Select Generation 1

- 3. Specify the CPU and Memory to be assigned to the Virtual SmartNode (see figure 34 on page 34). The minimum requirements are:
 - CPU: 1
 - RAM: 1024MB
 - Disk: 1024MB

New Virtual Machine Wiza Assign Mem	rd ×
Before You Begin Specify Name and Location Specify Generation Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	Specify the amount of memory to allocate to this virtual machine. You can specify an amount from 32 MB through 12582912 MB. To improve performance, specify more than the minimum amount recommended for the operating system. Startup memory: 022 MB Use Dynamic Memory for this virtual machine. When you decide how much memory to assign to a virtual machine, consider how you intend to use the virtual machine and the operating system that it will run.
	< Previous Next > Finish Cancel

Figure 34. Memory Specification - Min. 1024MB

4. Select the IP Network to be used by the Virtual SmartNode (see figure 35 on page 35).

🖳 New Virtual Machine Wizar	d	×
🐸 Configure Ne	etworking	
Before You Begin Specify Name and Location Specify Generation Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	Each new virtual machine includes a network adapter. You can configure the network adapter to us virtual switch, or it can remain disconnected. Connection: VLAN130-VMSwitch	e a
	< Previous Next > Finish Cancel	

Figure 35. Select the Previously Set Up Network

5. Select the Hyper-V virtual disk, which was previously created through downloaded image from the <u>Patton</u> <u>Product Page</u> (see figure 36 on page 36).



Figure 36. Connect to Virtual Disk

6. Click *Finish* (see figure 37 on page 37) to complete virtual machine setup, and begin configuring the Virtual SmartNode.

🖳 New Virtual Machine Wiza	rd ×
Completing t	the New Virtual Machine Wizard
Before You Begin Specify Name and Location Specify Generation Assign Memory Configure Networking Connect Virtual Hard Disk Summary	You have successfully completed the New Virtual Machine Wizard. You are about to create the following virtual machine. Description: Name: SN44-Trinity Generation: Generation 1 Memory: 1024 MB Network: VLAN130-VMSwitch Hard Disk: C:\Users\Public\Documents\Hyper-V\Virtual hard disks\SN44-Trinity.vhdx (VHDX, dynam
	< Previous Next > Finish Cancel

Figure 37. Finalizing New Virtual Machine Setup

Virtual SmartNode Initial Configuration

We recommend you login and perform some initial configuration for the new VM such as changing the administrator password and enabling ssh management access as follows:

- 1. Login with the default administrator account: username admin, no password.
- 2. Create a **new administrator** account (and invalidate the default account) by entering the following commands:

```
node> enable
node# configure
node(cfg)# administrator <username> password <password>
node(cfg)#
```

3. Optionally, **change the IP address**. By default, the vSN instance tries to lease an IP address over DHCP. To display the assigned address, enter the show ip interface command. If you want to replace it by a static address, enter the following commands:

```
node(cfg)# context ip
```

```
node(ctx-ip)[ROUTER]# interface IF1
node(if-ip)[LAN]# no ipaddress DHCP
node(if-ip)[LAN]# ipaddress IF1 <a.b.c.d/m>
node(ip-if)[LAN]# end
node#
```

4. Persistently store the configuration changes:

```
# copy running-config startup-config
```

Go to section "Connecting to Patton Cloud" on page 38 to lease needed licenses from Patton Cloud.

Connecting to Patton Cloud

A virtual machine running vSN has to lease licenses from a Patton Cloud in order to provide access to the functional features. The following features require a license:

- Virtual SmartNode instance (required to operate a vSN)
- IP packet routing (NAT/NAPT, VRRP, GRE, BGP, RIPv1/v2)
- SIP session (one license per parallel session),
- SIP registrar
- SIP security (TLS)
- SIP Failover (Seamless outbound SIP call hunting)
- VPN Tunnel (OpenVPN, IPsec, L2TP)

All but the *sip-sessions* and VPN license are so called *feature licenses*, which means that each VM needs exactly one license to unlock the corresponding feature. The *sip-sessions* and VPN license are *quantitative licenses*: a VM needs one license to complete one SIP session. The Cloud can be configured to statically assign *sip-sessions* to VMs or to automatically lease them to those VMs that need them. Figure 38 on page 38 illustrates the operating principle of the Cloud





In addition to the licenses required to unlock Trinity features, each VM also has to lease a *virtual-instance* license from the Cloud. Hence, on the Cloud, you need at least the same number of *virtual-instance* licenses than the number of vSN instances you want to launch in parallel.

Cloud Configuration Example

Figure 39 and figure 40 on page 40 illustrate a possible configuration option for the Cloud.

vSN	✔ X
Status	
Enabled Devices are allowed to lease licenses	
LICENSE	RANGE +
A Failover and Balancing Failover and balancing	
A IP Routing Internet protocol routing	
 SIP Handover Handover of ongoing SIP calls 	
a SIP Registrar	
A SIP Sessions SIP Sessions	10100
A Virtual-Machine Instance Allows the device to run as virtual-machine instance	
VPN - Tunnels Virtual private networking (OpenVPN, IPsec, and L2TP)	10100

Figure 39. Example vSN device license profile

Devices — License Assign	nent	
Show instructions for connecting de	vices 4	
4b5594	vSN	♣ vSN
0800274B5594	Test	
vSN78	VSN	♣ vSN
080027547DDD	Productive	

Figure 40. Profile assignment

This configuration sets up a device profile that applies to each connected vSN connecting to the Patton Cloud, from where the licenses are being managed.

Configuration Example to Attach a vSN Instance to the Cloud

By default, the *nodems-client* connects to the cloud at <u>https://nodems.patton.io</u>.

Configure your Organization Key, in order for the virtual SmartNode to show up in your Patton Cloud Organization.

The following configuration snippet shows a possible example of how to connect a vSN instance to the Cloud.

```
nodems-client
  organization-key *******
  resource any
  no shutdown
```

Chapter 3 Software Upgrade

Chapter contents

Introduction

Introduction

To upgrade vSN running in a VM, you don't have to boot-strap the machine again using the new pre-installed image. Instead, you instruct the VM to upgrade itself with the TAR file provided separately (e.g. $vSN_3.15.2.tar$).

There are different methods for performing a self-upgrade. These methods are identical to those available for physical Patton devices:

• **Patton Cloud**: With minimum Cloud Service Plan Standard, software upgrades can be done easily, with 2 clicks.

				a Marc Ad
f Software Update for 1	Device			
Please select the target software version an update shall be scheduled.	d the time of day when t	~		
Target Build				
Select software version to update to		-		
Date and Time		ve informatio		
Schedule update for now midrught 00	00 roon 1800 custor			
Reboot Method		_		
Graceful — reboot only after all call Forced — reboot immediately after	s are closed the software update			
c	ancel Schedule Up	odate		
	II ESoft	vare		
MANUAL here) ON	actor (3.15.1-	hentikon 19021	Cyclinie	
AL MACHINE	NUMBER 11	or BOOT-UPS		
	UPDATE	HISTORY	TO VERSION	RESUL
			3.15.1-19021	V 500
			314.3-19023	V 100

Figure 41. Software Updates dialog

• **TFTP via CLI**: Store the new software (TAR file) to a TFTP server and use the following CLI command to perform the upgrade:

copy tftp://<tftp-server-ip>/<path-to-tar> flash:

• HTTP via CLI: Store the new software (TAR file) to a web server and use the following CLI command to perform the upgrade:

copy http://<web-server-ip>/<path-to-tar> flash:

• Web GUI: Log into the VM's web GUI, execute the *System / Firmware Upgrade menu*, click the *Upgrade* button, select the TAR file on your local disk and click *Start*.

Virtual SmartNode User Manual

				- Device
Firmware Upgrade				C 006
- Images				
Test Build Build Date	3.10.T6076-1 2016/10/04			
				Upgrade
- Upgrade Status	Upgrade		0	
Status	✓ Reboot to activate Image File	C:\fakepath\vSBC_3.10.T6076-1.	i Browse	
			Start Cancel	

Figure 42. Firmware Upgrade dialog

• **Auto-Provisioning**: Configure the vSN instance to automatically check for a newer software on a TFTP or web server. Refer to the *Trinity Command Line Reference Guide* (Chapter 13, "Auto Provisioning of Firmware and Configuration" on page 194) for more information.

Chapter 4 Contacting Patton for assistance

Chapter contents

Contact information

Contact information

Patton Electronics offers a wide array of free technical services. If you have questions about any of our other products we recommend you begin your search for answers by using our technical knowledge base. Here, we have gathered together many of the more commonly asked questions and compiled them into a searchable database to help you quickly solve your problems.

Refer to the following for information on contacting Patton Technical Services for Free Support:

REGION	North America	Western Europe	Central & Eastern Europe
Location	Maryland, USA	Bern, Switzerland	Budapest, Hungary
Time Zone	EST/EDT UTC/GMT - 4/5 hours	CET/CEDT UTC/GMT + 1/2 hours	CET/CEDT UTC/GMT + 1/2 hours
Business Hours	Monday-Friday 8:00am to 5:00pm	Monday-Friday 09:00 to 12:00 13:30 to 17:30	Monday-Friday 8:30 to 17:00
Email	support@patton.com	support@patton.com	support@patton.com
Phone	+ 1 301 975 1007	+41 31 985 25 55	+36 439 3835
Fax	+1 301 869 9293	+41 31 985 2526	

Appendix A **Specifications**

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Voice Signaling

- G.711 A-Law/-Law (64 kbps)
- G.722 (64 kbps)
- G.726 (ADPCM 16,24,32,40 kbps)
- G.723.1 (5.3 or 6.3 kbps)
- G.729ab (8kbps)
- Transparent ISDN data
- ilbc-13.33k (SIP-SIP only)
- AMR-NB (4.75, 5.15, 5.9, 6.7, 7.4, 7.95, 10.2, 12.2 kbps)

Call Routing & Services

- Regular expression number matching
- Regular expression number manipulation
- Least Cost Routing
- Call load distribution
- Number blocking
- Short-Dialing
- Digit collection
- Distribution-Groups and Hunt-Groups
- Seamless call failover
- Detection of RTP loss
- SIP Back-to-Back User Agent
- SIP Registrar

Security

- Network separation
- SIP back to back UA*
- TLS*
- Open VPN* / IPSec* / L2TP*
- DoS detection & prevention
- Intelligent ACL
- Trusted peer

IP Networking*

- IPv4 & IPv6 Dual Stack
- Routing Protocol support GRE, VRRP, BGP, RIPv1&v2
- Policy, Packet and packet length Based Routing
- IP Multi-Netting, VLAN, Secondary IP
- Network Address and Port translation (NAT/NAPT)
- IPv4 & IPv6 DHCP Client & Server

Quality of Service

- PacketSmart[™] Network Assessment & Monitoring^{*}
- Voice priority, DownStreamQoS™
- Traffic Management, shaping policing
- IEEE 802.1p, IEEE 802.1Q, 4096 VLANs (Tag insertion/deletion), TOS, DiffServ Labeling

Management

- Patton Cloud Managed
- Dynamic resource licensing model (leased / floated)
- Changeable MAC address
- Web/HTTPs, CLI with Telnet and SSH access
- Web Wizard
- Fully Documented CLI
- Telnet and HTTPs access
- TR-069, TFTP, HTTP, HTTPS configuration up- and download
- TR-069, TFTP, HTTP, HTTPS firmware upgrade
- SNMPv1-3 agent
- Radius, Tacacs+
- Separate config domain (LAN side config and WAN side config)
- MIB II and private MIB
- Built-in diagnostic tools
- Secure Auto-Provisioning with built in root CA

Licensing

- Each vSN instance requires 1 license (e.g. CBFL-VSN)
- Software feature licenses can be obtained from Patton Cloud

• See <u>patton.io</u> for more details

Performance Requirement

• 500 MHz per 250 calls

Virtualized Machine System Requirements

- CPU: 64bit x86 architecture (single core or more)
- Hypervisor (KVM, VMware, VirtualBox, Hyper-V)
- RAM: a minimum of 1024 MB
- HDD: min. 1024 MB
- Network: at least 1 Ethernet adapter (virtual)

Appendix B End User License Agreement

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End User License Agreement

By opening this package, operating the Designated Equipment or downloading the Program(s) electronically, the End User agrees to the following conditions:

1. Definitions

- A) "Effective Date" shall mean the earliest date of purchase or download of a product containing the Patton Electronics Company Program(s) or the Program(s) themselves.
- **B)** "Program(s)" shall mean all software, software documentation, source code, object code, or executable code.
- C) "End User" shall mean the person or organization which has valid title to the Designated Equipment.
- **D**) "Designated Equipment" shall mean the hardware on which the Program(s) have been designed and provided to operate by the End User.

2. Title

Title to the Program(s), all copies of the Program(s), all patent rights, copyrights, trade secrets and proprietary information in the Program(s), worldwide, remains with Patton Electronics Company or its licensors.

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3. Term

The term of this Agreement is from the Effective Date until title of the Designated Equipment is transferred by End User or unless the license is terminated earlier as defined in section "6. Termination" on page 52.

4. Grant of License

- A) During the term of this Agreement, Patton Electronics Company grants a personal, non-transferable, non-assignable and non-exclusive license to the End User to use the Program(s) only with the Designated Equipment at a site owned or leased by the End User.
- **B)** The End User may copy licensed Program(s) as necessary for backup purposes only for use with the Designated Equipment that was first purchased or used or its temporary or permanent replacement.
- **C)** The End User is prohibited from disassembling; decompiling, reverse-engineering or otherwise attempting to discover or disclose the Program(s), source code, methods or concepts embodied in the Program(s) or having the same done by another party.
- D) Should End User transfer title of the Designated Equipment to a third party after entering into this license agreement, End User is obligated to inform the third party in writing that a separate End User License Agreement from Patton Electronics Company is required to operate the Designated Equipment.

5. Warranty

The Program(s) are provided "as is" without warranty of any kind. Patton Electronics Company and its licensors disclaim all warranties, either express or implied, including but not limited to the implied warranties of merchantability, fitness for a particular purpose or non-infringement. In no event shall Patton Electronics Company or its licensors be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of the use of or inability to use the Program(s), even if Patton Electronics Company has been advised of the possibility of such damages. Because some states do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitation may not apply to you.

If the Program(s) are acquired by or on behalf of a unit or agency of the United States Government, the Government agrees that such Program(s) are "commercial computer software" or "computer software documentation" and that, absent a written agreement to the contrary, the Government's rights with respect to such Program(s) are limited by the terms of this Agreement, pursuant to Federal Acquisition Regulations 12.212(a) and/or DEARS 227.7202-1(a) and/or sub-paragraphs (a) through (d) of the "Commercial Computer Software—Restricted Rights" clause at 48 C.F.R. 52.227-19 of the Federal Acquisition Regulations as applicable.

6. Termination

- A) The End User may terminate this agreement by returning the Designated Equipment and destroying all copies of the licensed Program(s).
- **B)** Patton Electronics Company may terminate this Agreement should End User violate any of the provisions of section "4. Grant of License" on page 51.
- **C)** Upon termination for **A** or **B** above or the end of the Term, End User is required to destroy all copies of the licensed Program(s)

7. Notices

Patton devices may log, collect and report data related to installed software, licenses, feature utilization, product performance, device management, service quality and other parameters which is used for quality control, product improvement, license management, service level management and technical support. Collected data may be reported to Patton or a service provider delivering its services connected to the device.

Patton may use this information for other business purposes, such as to alerting you to updated products or services, securing access to software updates, and assisting in order processing.

Any and all information collected by Patton or its assigns will be kept strictly confidential and will not be sold, rented, loaned, or otherwise disclosed to any third party except as required by law.

8. Other Licenses

The Program may be subject to licenses extended by third parties. Accordingly, Patton Electronics Company licenses the Programs subject to the terms and conditions dictated by third parties. Third party software identified to the Programs includes:

- The LGPL (Lesser General Public License) open source license distributed to you pursuant to the LGPL license terms (http://www.gnu.org/licenses/lgpl.html).
- RedBoot (Red Hat Embedded Debug and Bootstrap) embedded system debug/bootstrap environment from Red Hat distributed to you pursuant to the eCos license terms (ecos.sourceware.org/license-overview.html) and GNU General Public License (GPL) terms (www.gnu.org/copyleft/gpl.html). Source code is available upon request.

9. Unenforceable Provisions

If any part of these terms and conditions are found to be invalid or unenforceable under applicable law, such part will be ineffective to the extent of such invalid or unenforceable part only, without in any way affecting the remaining parts of these terms and conditions.

10. Governing Law

The rights and obligations of the parties pursuant to these terms and conditions are governed by, and shall be construed in accordance with, the laws of the State of Maryland, USA.

User may be subject to other local, provincial or state and national laws. User hereby irrevocably submits to the exclusive jurisdiction of the courts of the State of Maryland, USA for any dispute arising under or relating to this agreement and waives user's right to institute legal proceedings in any other jurisdiction. Patton shall be entitled to institute legal proceedings in connection with any matter arising under this agreement in any jurisdiction where User resides, does business, or has assets.

11. Waiver

No waiver of any of the provisions of these terms and conditions will be deemed to constitute a waiver of any other provision nor shall such a waiver constitute a continuing waiver unless otherwise expressly provided in writing duly executed by the party to be bound thereby. Any other terms and conditions of sale, to the extent not inconsistent herein, regarding a Patton device, program, license or service remain in full force and effect.