

June 2019

ExtremeGuest Gateway

Release 10.757

Installation Guide – Rev AA

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Introduction

ExtremeGuest Gateway (XGG) is a software application product that connects users on the local area network to the internet while applying policies and services to the inline sessions of the users. The application is built on a stateful firewall that is automatically configured based on the policies and services required to be applied to the users. Furthermore, it incorporates DHCP servers which are automatically configured for the required deployments.

XGG is delivered on bare metal or on ESXi (VMWare) for HA clustering where scale is required.



2 Initial Deployment and Basic Configuration

Overview

- Make a plan
- Environmental and Power Considerations
- Aquire access to XGG
- Access XGG on WAN side
- Access XGG on LAN side
- Load a license
- Configure FQDN
- Load an SSL certificate
- Test from the LAN

Make a Plan

Complete the Installation Questionnaire and Checklist (IQC) Form



Have a Plan that Makes Sense for a Router



- The XGG product behaves as a router with added functionality in the area of securing and containing personal networks
- An XGG must have at least two connected Ethernet interfaces
 - One for the WAN
 - One for the LAN
- Additional Ethernet interfaces are sometimes required
 - Multiple uplink control
 - Out-of-Band communication (e.g. with a Property Management System)
- Since XGG behaves as a router, bridging between ports is not supported
 - Connecting both the WAN and the LAN to the same L2 is not supported
- Clustering of multiple XGGs requires dedicated Ethernet connections

Have Details in the Plan

- Physical links
- WAN addresses
 - Public IP(s), FQDN
- LAN addresses
 - L3 IP scheme
 - L2 VLAN scheme
- Downstream equipment
 - Wireless LAN controllers and APs
 - Switches, preferably a complete topology
 - Unique administrative credentials for each operator

Environmental and Power Considerations

- UPS is highly recommended for all production environments
 - Protecting against power outages is critical
 - Bad power may destroy your power supplies and kill the storage SSDs
- Line conditioning is highly recommended for all production environments
 - Lightning strikes may destroy power supplies and kill Ethernet ports
 - Random power drops and lightning may result in filesystem corruption
- High temperatures may result in random reboots and hardware failures
- Air cooling and air flow are critical for keeping appliances operating under their design temperature



XGG Default Network Configuration upon Installation

- First network adapter is a DHCP server
 - Default LAN



- Last network adapter is a DHCP client
 - Default WAN
- First network adapter is a DHCP client
 - Default WAN

Metwork Adapter 1	WAN Public IP	V Connect	\otimes
Network Adapter 2	LAN Physical	 Connect 	\odot
Network Adapter 3	VM Only Net 3	▼ Connect	\odot
Network Adapter 4	VM Only Net 4	▼ Connect	\odot

- Last network adapter is a DHCP server
 - Default LAN

To Access the XGG on the WAN side

- Default WAN the "0th" physical (or virtual) network interface
 - Bare Metal Machines
 - Typically, ix0 / igb0 / em0
 - Typically, the left / bottom most port Virtualized Machines
 - Typically, vmx0 / em0
 - Typically Network Adapter 1 in VMware



- Default WAN is a DHCP client
 - Plug a cable into a network that has a DHCP server
 - Read the IP address acquired by XGG via DHCP server UI or via the XGG VGA console
- Navigate with web browser

<u>https://ip.addr.of.xgg/admin/</u>

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To Access the XGG on the LAN side

- Default LAN the nth (last) physical (or virtual) network interface
 - Bare Metal Machines
 - Typically, ix3 / igb3 / em3
 - Typically, the right / top most port
 - Virtualized Machines
 - Typically, vmx1 / em1
 - Typically, Network Adapter 2 in VMware
- Default LAN is a DHCP server
 - Plug DHCP client (laptop) into default LAN
 - Check DHCP address from the XGG
 - Typically, this is IP address 192.168.5.10 / 24
- Navigate with web browser (example: <u>https://192.158.5.1/admin/</u>)

Notes

Be careful with default LAN port because a DHCP server is enabled. Connecting the default LAN port to production LAN may crash the LAN.



Certificate Warning

- XGG ships with a self-signed cert
- Unusable for production
- Need to install a real certificate
- Bypass warning for initial config



WAN Bootstrap Configuration Available w/o License



• Allows NOC personnel to perform all but the most fundamental bootstrapping remotely (including license installation, SSL cert, etc.)

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XGG First Administrator and License

- Create a first administrator
 - XGG has no default administrative access
 - Make unique Administrators for each person



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- Security Tips
 - It is not recommended to use role admins
 - It is not recommended to make login "admin"
 - Password strength based on time needed to crack it
 - Long passwords with only lower case letters work just as well as short passwords with many different character classes
- Copy IUI to clipboard
 - The IUI is your "serial Number" of the installed XGG
 - IUI is unique and different for every installation (bare metal or virtual). An example of an IUI follows:



- Navigate to license portal
 - Set DNS name
 - Assign IUI immutable
 - Acquire license



• Load license into XGG. Example license follows:



XGG Initial Configuration

- System :: Options :: Device Options
 - Set time zone
 - Set FQDN
- System :: Certificates
 - Create Certificate Chain (private key)
 - Create CSR enter appropriate information
 - Send CSR to third-party for signature
 - Receive signed certificate (and intermediates)
 - Edit Certificate Chain, add signed certificate and intermediates

XGG Backup

- Regular backups are stored on XGG by default
- Remote backup server should be configured
- XGG can be easily setup to another warm spare XGG
- Manual restore on warm spare to take over original

Administrators

- Admin Roles
 - "Group" admins together and limit access read/write read/only to certain views
 - Micro-granular access control on a per table basis
- Admin ACLs
 - Limit access to XGG web GUI and/or SSH
 - You can accidentally lock yourself out
- SMB Access
 - Create an active server, add a policy (or WAN target) to drop firewall, enable

SMB on role

- Permits access to
 - custom portals and TFTP datastore read/write
 - Backups and Log files read only

Upgrades

- XGG upgrade
 - Approximately 125 MB download for XGG software package from Extreme Portal
 - Some XGG upgrades will cause packages to be downloaded over the internet, max 300 MB, usually less
 - Existing user connections are unaffected; no new connections due to web server restart
- FreeBSD OS Kernel upgrade
 - Some XGG upgrades bring down a kernel update and health notice will appear
 - Navigate to System :: Update and press the reboot and upgrade button
 - Requires a single reboot, 30 seconds to a few minutes of downtime
- FreeBSD OS upgrade
 - Some XGG upgrades will cause a health notice regarding an OS upgrade
 - Navigate to System :: Update and press the reboot and upgrade button
 - Will require multiple reboots and significant downtime as OS is pulled during reboot
 - Alternatively download new ISO / IMG, backup, reinstall and restore

End-to-End Test

- Connect a device to XGG LAN
- Set the device for DHCP
- Get a DHCP address from XGG
- Ping an address on the Internet
- Ask Google "What is my IP?"
- Try an Internet speed test

```
C:\Windows\system32\cmd.exe

      Pinging 8.8.8.8 with 32 bytes of data:

      Reply from 8.8.8.8 bytes:32 time:15ms TTL:127

      Reply from 8.8.8.8:

      Bytes:32 time:16ms TTL:127

      Ping statistics for 8.8.8.8:

      Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

      Approximate round trip times in milli-seconds:

      Minimum = 10ms, Maximum = 16ms, Average = 13ms

      C:\Users\Admin>ping www.google.com

      Pinging www.google.com [172.217.164.100; bytes:32 time:9ms TTL:127

      Reply from 172.217.164.100: bytes:32 time:9ms TTL:127

      Reply from 172.217.164.100: bytes:32 time:10ms TTL:127

      Reply from 172.217.164.100: bytes:32 time:10ms TTL:127

      Ping statistics for 172.217.164.100:

      Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

      Approximate round trip times in milli-seconds:

      Minimum = 9ms, Maximum = 16ms, Average = 11ms
```

2 Installing ExtremeGuest on a Bare Metal Physical Appliance

Overview

- Download the rXg IMG installer
- Prepare a bootable USB drive
- Ensure bare metal hardware prerequisites are met
- Install rXg from a USB IMG
- Proceed with rXg initial configuration

Installation Files

Login into Extreme Portal and download the installation files:

- .img file is for rawrite to USB stick
- .img.md5 is a checksum for the IMG file
- .iso files are for rawrite to CD-R / DVD-R
- .iso.md5 is a checksum for the ISO file
- Most bare metal installs will be via USB stick written via IMG file
- Bare metal install may also be accomplished via CD-R / DVD-R written via ISO file

How to do Checksum Verification

MacOS

• A MD5 is integrated into the base operating system and accessible via Terminal.

Windows MD5

• Use the following URL: <u>https://www.microsoft.com/en-us/download/details.aspx?id=11533</u>

MD5 signature is 32 bytes.

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03/02/2019 04:41 PM 1,008,178,688 11.1-RELEASE-p15-amd64-rxg-10.337.img 03/02/2019 04:41 PM 79 11.1-RELEASE-p15-amd64-rxg-10.337.img.m 03/02/2019 04:41 PM 40,432 11.1-RELEASE-p15-amd64-rxg-10.337.img.m 03/02/2019 04:41 PM 101,179,556 11.1-RELEASE-p15-amd64-rxg-10.337.img.m	d5 ar2 o1000+2	200.par2		
C:\Users\simon\Downloads>fciv 11.1-RELEASE-p15-amd64-rxg-10.337.img // // File Checksum Integrity Verifier version 2.05. // 702da5188343eaf2e614358e40065f9a 11.1-release-p15-amd64-rxg-10.337.img				
C:\Users\simon\Downloads>type 11.1-RELEASE-p15-amd64-rxg-10.337.img.md5 MD5 (11.1-RELEASE-p15-amd64-rxg-10.337.img) = 702da5188343eaf2e614358e40065f9a				
C:\Users\simon\Downloads>				~

Windows - Preparing a bootable USB drive

- Requires USB image direct "rawrite" tool
 - Rufus https://rufus.ie/en_IE.html

Drive Properties -				
Device				
				````
Boot selection				
11.1-RELEASE-p15-amd64-rxg-1	0.215.img	~ 🕗	5	SELECT
Partition scheme	Targe	t system		
<ul> <li>Show advanced drive propert</li> </ul>	ties			
<ul> <li>Show advanced drive propert</li> </ul>	ties			
<ul> <li>Show advanced drive proper</li> <li>Format Options —</li> </ul>	ties			
<ul> <li>Show advanced drive propert</li> <li>Format Options —</li> <li>/olume label</li> </ul>	ties			
<ul> <li>Show advanced drive propert</li> <li>Format Options —</li> <li>/olume label</li> </ul>	ties			
<ul> <li>Show advanced drive proper</li> <li>Format Options —</li> <li>/olume label</li> <li>File system</li> </ul>	Cluste	er size		
<ul> <li>Show advanced drive proper</li> <li>Format Options —</li> <li>/olume label</li> <li>file system</li> </ul>	Cluste	er size		
Show advanced drive propert Format Options — /olume label file system	Cluste	er size		
Show advanced drive propert Format Options — Volume label File system Show advanced format optio	Clustr Ins	er size		
<ul> <li>Show advanced drive proper</li> <li>Format Options —</li> <li>/olume label</li> <li>ile system</li> <li>Show advanced format optio</li> <li>Status —</li> </ul>	Clusto	er size		
<ul> <li>Show advanced drive proper</li> <li>Format Options —</li> <li>Volume label</li> <li>File system</li> <li>Show advanced format option</li> <li>Status —</li> </ul>	Cluste ns READY	er size		
<ul> <li>Show advanced drive proper</li> <li>Format Options —</li> <li>/olume label</li> <li>iile system</li> <li>Show advanced format optio</li> <li>Status —</li> </ul>	Clustr ns READY	er size		
<ul> <li>Show advanced drive propert</li> <li>Format Options —</li> <li>/olume label</li> <li>'ile system</li> <li>Show advanced format optio</li> <li>Status —</li> <li>Status —</li> </ul>	Cluste ns READY	er size		CLOSE

Win32 Disk Imager - <a href="https://sourceforge.net/projects/win32diskimager/">https://sourceforge.net/projects/win32diskimager/</a>

nareo Folders/l	Dropbox/tmp/1	1.1-RELEASE-p15	5-amd64-rxg-	10.215.img	2	•
Hash						
None 🔻	Generate	Сору				
Read Only	Allocated Partit	ions				
Read Only Progress	Allocated Partit	tions				_
Read Only Progress	Allocated Partit	ions				

_

### MacOS - Preparing a Bootable USB drive

- CLI Terminal dd
  - dd if=12.0-RELEASE-p6-amd64-rxg-10.633.img of=/dev/rdisk2 bs=1m
  - Replace rdisk2 with the appropriate disk number
  - Use hdiutil list to find the correct disk number
- GUI Disk Utility
  - Varies with MacOS version
- GUI Etcher
  - https://balena.io/etcher
  - Can do ISO emulation

## System Requirements Calculator

The following screens show the typical system requirements for the number of SULs:



Enter SUL: 100		1
License Specifications Max Uplinks: 2 Max Uplinks: 2 Max Per-uplink Bandwidth: Max Throughput: 200Mbps Max VLAIs: 150 Max Local IPs: 300 Max States: 20000 Max States: 20000 Max Packets/second: 3500 ( Max Groups: 20 Max coups: 20 Max custom Portals: 2	200Mbps (one direction)	
Minimum Requirements Cpu Cores 4 Cpu Speed 2000mhz Ram 8GB SSD size GB 35 Public IPs 1	Recommended Requirements Cpu Cores 6 Cpu Speed 2300mhz Ram 1268 SSD size in GB 54 Public IPs 1	

License Specifications	
Max Identities: 37500	
Max Unlinks: 3	
Max Per-uplink Bandwidth: 6	00Mbps
Max Throughput: 600Mbps	
Max VI ANs: 450	
Max Local TPs: 900	
Max States: 60000	
Max Packets/second: 10500 (	one direction)
Max Policies: 30	
Max Groups: 60	
Max custom Portals: 6	
Max custom Portals: 6	
Max custom Portals: 6 Minimum Requirements	Recommended Requirements
Max custom Portals: 6 Minimum Requirements Cpu Cores 4	Recommended Requirements Cpu Cores 6
Max custom Portals: 6 Minimum Requirements Cpu Cores 4 Cpu Speed 2000mhz	Recommended Requirements Cpu Cores 6 Cpu Speed 2300mhz
Max custom Portals: 6 Minimum Requirements Cpu Cores 4 Cpu Speed 2000mhz Ram 8GB	Recommended Requirements Cpu Cores 6 Cpu Speed 2300mhz Ram 12GB
Max custom Portals: 6 Minimum Requirements Cpu Cores 4 Cpu Speed 2000mhz Ram 8GB SSD size GB 55	Recommended Requirements Cpu Cores 6 Cpu Speed 2300mhz Ram 12GB SSD size in GB 96

Scale	Minimum		Highl	y Recomme	nded	Max			
SULs	CPU cores	Mem GB	Disk GB	CPU cores	Mem GB	Disk GB	Managed IPs	VLANs	Throughput
10	4	8	40	6	12	80	30	15	20 Mbps
50	4	8	40	6	12	80	150	75	100 Mbps
100	4	8	40	6	12	80	300	150	200 Mbps
200	4	8	80	6	12	160	600	300	400 Mbps
500	4	8	100	6	12	200	1500	750	1000 Mbps
750	6	12	200	8	16	400	2250	1125	1500 Mbps
1000	8	16	250	10	20	500	3000	1500	2000 Mbps

#### Note

Request a copy of the System Requirements Calculator from your Extreme Networks representative.

#### **Physical Ethernet Ports**

- A minimum of two physical Ethernet ports are required
  - Recommended at least four
  - Install PCI-e cards to get more ports
- Intel Ethernet chipsets are preferred
  - Appears as em / igb / ix
- Intel i350-T4 card is an easy way to get 4 x RJ45 Ethernet ports
  - Under \$50 on eBay new, under \$25 on eBay used
- High density 6-port PCI-e cards available from Smalltree
  - 4U chassis / ATX mobo can fit 28 ports on PCI-E + 4 on mobo = 32 ports

#### **Persistent Storage Device – IOPS**

- For Lab Testing anything will probably be fine, even platter HDD
  - HDDs deliver insufficient IOPS to support production environments
- SSD persistent storage devices are required for production
  - Less than 50 SUL SSD required budget for 50,000 IOPS
  - Less than 300 SUL SSD required budget for 100,000 IOPS
  - Less than 1000 SUL SSD required budget for 200,000 IOPS
- High throughput hardware RAID (presents 1 volume) of HDDs is acceptable
- Software RAID via ZFS is currently CLI and not officially supported

#### **Persistent Storage Device – Endurance**

- Demonstration any SSD or HDD is fine
  - Consumer grade SSDs lack the endurance for production environments
- DWPD / DPD minimum requirements going less than this kills drives fast
  - Less than 50 SUL DWPD / DPD 1
  - Less than 300 SUL DWPD / DPD 5
  - Less than 1000 SUL DWPD / DPD 10
- DWPD / DPD is sometimes software configurable and often ship with DWPD / DPD 0.3
- NAND SDD Recommendations
  - Samsung SM863, SM1635, SM1725Up to DWPD / DPD 10
  - Intel S3710
     Configurable DWPD / DPD up to 10
- 3D XPoint SDD Recommendations
  - Intel Optane SSD 900P
     Configurable DWPD / DPD up to 10
  - Intel SSD DC P4800X
    - Intel SSD DC P4801X

- Configurable DWPD / DPD up to 10 Configurable DWPD / DPD up to 30
- Configurable DWPD / DPD up to 60

#### **BIOS / UEFI Boot Order**

- Most PCs boot to HDD by default
- You must change the boot order or temporarily select the USB boot device
  - Typically achieved by pressing F1 / F11 / F12 / DEL at boot / POST
- Once you get the PC to boot from USB, the following screen appears:



## Installation Process

- 1. Boot the system from the USB IMG.
- 2. Click **Enter** at the prompt to begin the base operating installation process.

The following dialog boxes appear during the installation process:





The system automatically reboots when the base operating system is installed. The following screens appear:





Once the base OS install is complete, the FreeBSD login screen appears. (Press **CTRL-D** to manually refresh the login screen.)



Use the VGA console to find the DHCP assigned WAN IP address for admin access. Follow Initial ExtremeGuest Gateway Installation Guide 21

Configuration in Section 1 of this document when complete.



# 2 Installing ExtremeGuest as a Virtual Appliance

### Overview

- Deploy virtualization infrastructure
- Setup VM networking
- Acquire RG Nets support credential
- Download rXg ISO installer
- Create virtual machine
- Install rXg from ISO
- Proceed with rXg initial configuration

## Virtualization Infrastructure

- VMware is the only virtualization infrastructure tested and supported
  - VMware ESXi is the only tested and supported infrastructure for production
  - VMware Fusion and Workstation are known to be usable for testing
- Hardware oversubscription is not supported
  - The product is a router and designed to be the default gateway for the endusers
  - DRS or other such settings should be configured to benefit end-user experience
  - The physical hardware in the host should exceed the license calculator requirements
  - Additional hardware resource margin is highly recommended
  - Deploying a "virtual simulated guest" is also highly recommended

#### **Production Physical ESXi Host Recommendations**

- Multiple physical Ethernet network adapters [ NICs ]
  - The product is a router and expects at least two virtual interfaces
  - If large scale dynamic VLAN assignment on LAN is required, then this implies dedicated physical LAN port
- Two physical persistent storage devices
  - boot drive small SSD ESXi will be installed here, ESXi will boot off of this device
  - primary datastore large SSD high endurance (DWPD/DPD > 10

recommended)

- standalone ESXi virtual machines stored here
- clustered ESXi single virtual SAN VM consumes 90% of this volume
- Sufficient CPU and RAM no oversubscription
- Hardware compatibility is critical
  - Installation may not complete if drivers are missing

#### Create ESXi Networking

- Minimum two vSwitches with two Port Groups
  - one vSwitch and one matching Port Group for WAN and another pair for LAN

							_		
Navigator		host.locald	Iomain - Netw	orking					
<ul> <li>Host</li> <li>Manage</li> </ul>	Port g	roups	Virtual switc	hes P	hysical NICs	VMker	nel NICs	TCP/IF	stacks
Monitor	A 4	dd standan ctions	d virtual switch	Add 📑	uplink 🥖 B	Edit settings	C Ref	resh	
Add standard vir	tual switch - vSwitc	h1							
Add uplink									~
vSwitch Name		vSwitch1	1						ns
MTU		1500							
Link discovery		Click to e	kpand						
* Security									
Promiscuous r	node	<ul> <li>Accept</li> </ul>	t 🔿 Reject						
MAC address	changes	O Accept	t O Reject						
Forged transm	its	<ul> <li>Accept</li> </ul>	t O Reject						
							Add	Cancel	mp
	Update Op	otions	localhost.loc	root			Comp.	eted su	07/04/20
	Import VA	qq	Mesources	root	07/04/20	07/04/20	U Falled	- The ta	07/04/20



							Q Search	
Naviga	tor 🖂	Q localhost.loca	Idomain - Netw	orking				
- 🗍 Host		Port groups	Virtual switch	es	Physical NICs	VMker	nel NICs TCP/	IP stacks
Mani	age	🧐 Add port gr	oup 🥖 Edit se	ettings	C Refresh	Actio	ns	
- Shy -					-		Q Search	
E s 2	Add port group - WAN	-						ls ~
<u>©</u> N	Name	WAN						
	VLAN ID	0	A					<b>À</b>
		0	<u> </u>					-
	Virtual switch	vSwitc	h0		•			
	* Security							
	Promiscuous mode	<ul> <li>Accej</li> </ul>	ot OReject O	Inherit fr	om vSwitch			
	MAC address changes	O Acce	pt OReject O	Inherit fr	om vSwitch			
	Forged transmits	<ul> <li>Acce</li> </ul>	pt OReject O	Inherit fr	om vSwitch			
								- 20
							Add Cancel	
		Refresh Network S	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/20
		Update Network C	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/20.
		Import VApp Update Options	Hesources	root	07/04/20	07/04/20	Completed su	
							<b>C</b>	

$\rightarrow \mathbf{G} \mathbf{C}$	https://172.16.13.13	/ui/#/host/nel	twork	🛛	<u>भ</u>	Search	
						Q Search	
Navigator	D localhost.local	domain - Netwo	orking				
Host	Port groups	Virtual switche	es P	hysical NICs	VMken	nel NICs TCP	/IP stacks
Manage Monitor	🤵 Add port gr	oup 🥒 Edit se		C Refresh			
						Q Search	
🗐 s 🤮 Add port group - LA	N						ls ~
Name Name	LAN						A
VLAN ID	4095	0					A
Matural australa							ns
VII (dal Switch)	vSwitc	h1	•				
▼ Security							
Promiscuous mod	ie 💿 Acceș	ot OReject O	Inherit from	n vSwitch			
MAC address cha	inges O Accep	ot 🔿 Reject 🔿	Inherit from	n vSwitch			
Forged transmits	<ul> <li>Acces</li> </ul>	ot OReject O	Inherit from	m vSwitch			
							18
						Add Cance	p
	Refresh Network S	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/20
	Update Network C	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/20
	Herresh Network S	localhost.loc	root	07/04/20	07/04/20	Completed su	
	Import VApp	Resources .	root	07/04/20	07/04/20	G Failed - The ta	07/04/20
	Update Options	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/20

## vSwitch Settings

- Promiscuous mode is needed to pass DHCP
  - WAN side if DHCP default WAN is being used for initial access

iware [,] ESXi ^{*,}		. /	root@17	2.16.13.137 -	-   Help -	Q Search	
Navigator	D Ocalhost.loca	idomain - Netwo	orking				
🛿 Host	Port groups	Virtual switch	es I	Physical NICs	VMker	nel NICs TCF	VIP stacks
Manage	S Add port ar	oup 🥒 Edit se	ettinas	C Refresh	Actio	าร	
Monitor				•		Q Search	
🛾 s 🤮 Add port group - WA	N						ls ~
Name	WAN						
MANID		ন					- <b>`</b>
VDANID	0	0					ns
Virtual switch	vSwitc	h0		•			. 8
✓ Security							- 8
Promiscuous mode	e O Accep	ot OReject O	Inherit fre	om vSwitch			
MAC address char	nges O Accep	ot 🔿 Reject 🔿	Inherit fro	om vSwitch			
Forged transmits	<ul> <li>Accept</li> </ul>	ot 🔿 Reject 🔿	Inherit fre	om vSwitch			
						Add Cance	
	Refresh Network S	localhost loc	root	07/04/20	07/04/20	Completed su	_ >mp.
	Update Network C	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/2
	Import VApp	Resources	root	07/04/20	07/04/20	Failed - The ta	07/04/2
	Update Options	localhost.loc	root	07/04/20	07/04/20	Completed su	07/04/2

- LAN side is always going to be needed because XGG is DHCP server

	https://172.16.13.13	//ui/#/nost/ne	IWOIK		w K	Search		
						<u> </u>	Search	
Navigator	localhost.loca	aldomain - Netw	orking					
🔲 Host	Port groups	Virtual switch	es	Physical NICs	VMker	nel NICs	TCP/I	P stacks
Manage	Add port o	roup 🥒 Erlit a		C Refresh				
Monitor	- Aud port g	roup / cuir si		C Heirest		Q Sear		
Add port group - LAN						-		15 ~
9 N								
Name	LAN							
VLAN ID	4095	0						λ.
Virtual switch		ch1		•				ns
	VSWID	GITT						
▼ Security								
Promiscuous mode	<ul> <li>Acce</li> </ul>	ept 🔿 Reject 🔿	Inherit fr	om vSwitch				
MAC address changes	<ul> <li>Acce</li> </ul>	pt OReject O	Inherit fr	om vSwitch				
Forged transmits	Acce	ot Relect	Inherit fr	om vSwitch				
						Add	Cancel	
	Defrech Natural S	localhost loc	mont	07/04/20	07/04/20	Con	aniatari eu	p∨
	Update Network C	localhost.loc	root	07/04/20	07/04/20	Con	pleted su	07/04/20.
	Refresh Network S	localhost.loc	root	07/04/20	07/04/20	Con	pleted su	07/04/20.
	Update Network C	localhost.loc	root	07/04/20	07/04/20	O Con	pleted su	07/04/20.
	Import VApp	Resources	root	07/04/20	07/04/20	G Falle	ed - The ta	07/04/20.

- VLAN 4095
  - Set to pass tags
  - Required on LAN

### Setup Additional vmkernel Adapter

- Recommend public IP with proper firewall configuration.
  - Modify Default TCP/IP stack with proper default gateway, DNS, and hostname

🥖 Edit settings 🛛 🤁 Refre	esh 🛛 🏠 Actions						
Name ~	IPv4 gateway ~	IPv6 gateway	Preferred DNS	~	Alternate DNS		
vMotion stack							
E Provisioning stack							
E Default TCP/IP stack	192.168.2.1		192.168.2.1				
						3 it	
				_			
Add VMkernel NIC							
Port group	New port gro	up 🔻					
New port group	Public Manage	ement					
Virtual switch	vSwitch0	¥		- 1			
VLAN ID	0	0					
MTU	1500						
IP version	IPv4 only	▼		- 1			
<ul> <li>IPv4 settings</li> </ul>							
Configuration		atic					
Address	65.34.89.110						
Subnet mask	255.255.255.0						
TCP/IP stack	Default TCP/I	P stack		- 1			
Services	vMotion	Provisioning	nce logging				
	Managemen	t Replication NFC rep	olication				

• Management network with VPN connectivity is also OK.

## **Configure Firewall**

• Edit settings for SSH Server and vSphere Web Client.

Virtual switches	Physical NICs	VMkernel NICs	TCP/IP stacks	Firewall rule	s	
Edit settings						
Key 🗸	Incoming Ports ~	Outgoing Ports ~	Protocols ~	Service ~	Daemon	~
sshClient		22	TCP	N/A	None	
sshServer	22		TCP	N/A	None	
syslog		1514, 514	UDP, TCP	N/A	None	
updateManager		80, 9000	TCP	N/A	None	
vit	3260		TCP	N/A	None	
	Virtual switches	Virtual switches     Physical NICs       C Refresh     C Actions       Key     Incoming Ports ~       sshClient     sshServer       syslog     22       updateManager     updateManager       vit     3260	Virtual switches     Physical NICs     VMkernel NICs       C Refresh     C Actions       Key     Incoming Ports     Outgoing Ports       sshClient     22       sshServer     22       syslog     1514, 514       updateManager     80, 9000       vit     3260	Virtual switches     Physical NICs     VMkernel NICs     TCP/IP stacks       C Refresh     C Actions       Key     Incoming Ports     Outgoing Ports     Protocols       sshClient     22     TCP       sshServer     22     TCP       syslog     1514, 514     UDP, TCP       updateManager     80, 9000     TCP       vit     3260     TCP	Virtual switches     Physical NICs     VMkernel NICs     TCP/IP stacks     Firewall rule       C Refresh     Actions     C Se       Key     Incoming Ports     Outgoing Ports     Protocols     Service     ~       sshClient     22     TCP     N/A       sshServer     22     TCP     N/A       syslog     1514, 514     UDP, TCP     N/A       updateManager     80, 9000     TCP     N/A	Virtual switches     Physical NICs     VMkernel NICs     TCP/IP stacks     Firewall rules       C Refresh     C Actions     C Search       Key     Incoming Ports     Outgoing Ports     Protocols     Service     Daemon       sshClient     22     TCP     N/A     None       sshServer     22     TCP     N/A     None       syslog     1514, 514     UDP, TCP     N/A     None       updateManager     80, 9000     TCP     N/A     None       vit     3260     TCP     N/A     None

Port groups	Virtual switches	tual switches Physical NICs		TCP/IP stacks	Firewall rule	Firewall rules		
🖉 Edit settings   🤩 Refresh   🎄 Actions								
Name 🔺 🕓	🗸 Key 🗸	Incoming Ports $\lor$	Outgoing Ports $\sim$	Protocols ~	Service ~	Daemon ~		
vsanvp	vsanvp	8080	8080	TCP	N/A	None		
vSphere Web	webAccess	80		TCP	N/A	None		
vSphere Web	vSphereClient	443, 902		TCP	N/A	None		
vvold	vvold		0	TCP	N/A	None		
WOL	WOL		9	UDP	N/A	None		
						43 items		

• Enter desired subnets.

Firewall Settings
Allowed IP Addresses
All connections from all IP addresses
<ul> <li>Only allow connections from the following networks:</li> </ul>
10.40.52.0/24,24.176.189.224/29
Select each network with a comma. Example:
192.168.0.0/24, 192.168.1.2, 2001::1/64, fd3e:29a6:0a81:e478::/64
OK Cancel

## Create a Guest Virtual Machine

- VMware wizards are designed for creating virtual servers... this is a router and requirements are very different
- Custom VM creation is required
- Choose FreeBSD 64-bit OS type

<ul> <li>1 Select creation type</li> <li>2 Select a name and guest OS</li> <li>3 Select storage</li> </ul>	Select a name and guest OS Specify a unique name and OS		
4 Customize settings 5 Ready to complete	Name rXg Virtual machine names can contain up to 80 character Identifying the unset operating up to 80 character	rs and they must be unique within each ESXI instance.	na evetem
	Compatibility Guest OS family	ESXI 6.5 virtual machine Other	T T
	Guest OS version	FreeBSD (64-bit)	<b>T</b>
<b>vm</b> ware			

## System Requirements Calculator

The following screens show the typical system requirements for the number of SULs:

Enter SUL: 1000			Enter SUL: 500	
License Specifications Max Identities: 125000 Max Uplinks: 10 Max Per-uplink Bandwidth: 102 Max Throughput: 2000Mbps Max VLANs: 1500 Max Local IPs: 3000 Max States: 200000 Max States: 200000 Max Groups: 200 Max Groups: 200 Max custom Portals: 20	4Mbps e direction)	<u>A</u>	License Specifications Max Identities: 62500 Max Uplinks: 5 Max Per-uplink Bandwidth: 10 Max Throughput: 1000Mbps Max VLANS: 750 Max Local IPs: 1500 Max States: 100000 Max Packets/second: 17500 (of Max Policies: 50 Max Groups: 100 Max custom Portals: 10	000Mbps one direction)
Minimum Requirements Cpu Cores 8 Cpu Speed 2000mhz Ram 16GB SSD size GB 131 Public IPs 5	Recommended Requirements Cpu Cores 10 Cpu Speed 2300mhz Ram 2068 SSD size in GB 252 Public IPs 10	<u>//</u>	Minimum Requirements Cpu Cores 4 Cpu Speed 2000mhz Ram 8GB SSD size GB 74 Public IPs 3	Recommended Requirements Cpu Cores 6 Cpu Speed 2300mhz Ram 12GB SSD size in GB 138 Public IPs 5

Enter SUL: 100		Enter SUL: 300
License Specifications Max Udentities: 12500 Max Uplinks: 2 Max Per-uplink Bandwidth: Max Throughput: 200Mbps Max VLANs: 150 Max Local IPs: 300 Max States: 20000 Max Packets/second: 3500 ( Max Policies: 10 Max Groups: 20 Max custom Portals: 2	200Mbps one direction)	License Specifications Max Identities: 37500 Max Uplinks: 3 Max Per-uplink Bandwidth: 600Mbps Max Throughput: 600Mbps Max VLANs: 450 Max Local IPs: 900 Max States: 60000 Max Packets/second: 10500 (one direction) Max Groups: 60 Max custom Portals: 6
Minimum Requirements Cpu Cores 4 Cpu Speed 2000mhz Ram 8GB SSD size GB 35 Public IPs 1	Recommended Requirements Cpu Cores 6 Cpu Speed 2300mhz Ram 12GB SSD size in GB 54 Public IPs 1	Minimum Requirements       Recommended Requirements         Cpu Cores 4       Cpu Cores 6         Cpu Speed 2000mhz       Cpu Speed 2300mhz         Ram 8GB       Ram 12GB         SSD size GB 55       SSD size in GB 96         Public IPs 2       Public IPs 3

Scale		Minimum			y Recomme	nded	Max		
SULs	CPU cores	Mem GB	Disk GB	CPU cores	Mem GB	Disk GB	Managed IPs	VLANs	Throughput
10	4	8	40	6	12	80	30	15	20 Mbps
50	4	8	40	6	12	80	150	75	100 Mbps
100	4	8	40	6	12	80	300	150	200 Mbps
200	4	8	80	6	12	160	600	300	400 Mbps
500	4	8	100	6	12	200	1500	750	1000 Mbps
750	6	12	200	8	16	400	2250	1125	1500 Mbps
1000	8	16	250	10	20	500	3000	1500	2000 Mbps

#### Note

Request a copy of the System Requirements Calculator from your Extreme Networks representative.

#### **Guest Machine Virtualized Networking**

VMware provisions all guest VMs with a single network interface by default

Network Adapter 1	WAN Public IP 🗸 🗹 Connect	0
Network Adapter 2	LAN Physical  Connect	0
Network Adapter 3	VM Only Net 3	0
Metwork Adapter 4	VM Only Net 4	0
Metwork Adapter 5	dev to host em0 🔻 🗹 Connect	0
▼ ■ Network Adapter 6	VM Only Net for SCL Dev	0
Status	Connect at power on	
Adapter Type	VMXNET 3	
MAC Address	Automatic V 00:0c:29:59:3a:dd	

- Best practice is to create several additional interfaces
  - VMware Licensing is locked to interfaces
  - Create more interfaces than you need
  - Prevents relicensing problems
  - Unused interfaces can be disconnected
  - Use vmxnet3 driver
- Last interface is the default WAN
  - DHCP client by default
- First interface is the default LAN
  - DHCP server by default
  - DHCP will go to outside world if connected

#### **Initial Power On**

- Make sure virtual CD/DVD is set to connect at power on
- VM BIOS will attempt network boot by default

✓ [™] CD/DVD Drive 1	Datastore ISO file
Status	Connect at power on
CD/DVD Media	[NAS] iso/11.1-RELEASE-p9-amd64-rxg-9.901.iso Browse
Virtual Device Node	IDE controller 1   Master
Note	

CD/DVD "Connect at power on" option often unchecks itself, so confirm the setting is correct.

## Virtual Network Adapter Order

- Sometimes there is a virtual network adapter order problem
  - Network Adapter 1 -> vmxnet3
     Network Adapter 2 -> vmxnet0
- Edit settings :: VM Options :: Advanced :: Edit Configuration
- Different network configurations require different modifications

P Add parameter 🛛 💢 Delete parameter			QS	earch	
Key	~ V	/alue			$\sim$
csi0.pciSlotNumber	1	16			
sb.pciSlotNumber	3	32			
thernet0.pciSlotNumber	1	192			
thernet1.pciSlotNumber	2	224			
thernet2.pciSlotNumber	2	256			
thernet3.pciSlotNumber	1	160			
hci.pciSlotNumber	3	37			
mci0.pciSlotNumber	3	38			
					59 items

/ Configuration Parameters	
+ Add parameter X Delete parameter	Q Search
Key ~	Value ~
scsi0.pciSlotNumber	16
usb.pciSlotNumber	32
ethernet0.pciSlotNumber	160
ethernet1.pciSlotNumber	192
ethernet2.pciSlotNumber	224
ethernet3.pciSlotNumber	256
ehci.pciSlotNumber	37
vmci0.pciSlotNumber	38
	63 items
	OK Cancel

#### **Non-Linear Network Adapter Order**

- Compare MAC addresses
  - ifconfig vmx0 ... ifconfig vmx1 ... ifconfig vmx2 ... ifconfig vmx3 ... to find MACs
  - open up virtual Network Adapter settings in VMware to find MACs
  - sometimes network adapter order is not linear and may need to be corrected after install

ethernet0.pciSlotNumber	160	🔶 🔶 vmx0
ethernet1.pciSlotNumber	1184	🔶 🔶 vmx4
ethernet2.pciSlotNumber	192	🔶 vmx1
ethernet3.pciSlotNumber	224	<b>•</b> vmx2
ethernet4.pciSlotNumber	256	vmx3

- Power off VM Edit settings :: VM Options :: Advanced :: Edit Configuration
  - Change the value of the following pciBridge settings from TRUE to FALSE pciBridge5.present pciBridge6.present pciBridge7.present
  - Do not make any changes to pciBridge0.present and pciBridge4.present
  - Do not use this approach for more than four adapters
- Re-check the pciSlotNumber of the virtual network adapters after rebooting

## Boot from Virtual CDROM and Begin Install Process

1. Press **Enter** at the prompt to begin base operating installation process.





The following dialog boxes appear during the installation process:

Archiv Extracting di	• Extraction	n files			
<pre>base.txz kernel.txz</pre>	- t	42%	3		
Overall Pro	ress:				
	718	1			







The system automatically reboots when the base operating system is installed. The following screens appear:



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- 2. Use VGA console to find the DHCP assigned WAN IP address for admin access.
- 3. Follow Initial Configuration in Section 1 when complete.

https://rxg.local/admin/
build 10.281 12.0-RELEASE
VMware Virtual Platform 4 2900 8192 21 ZKOJXHHRFQYJZUNIBEKLFCHN
Standalone
емØ 172.16.252.129/24 Uplink ем1 192.168.5.1/24 Management LAN
FreeBSD/amd64 (rxg.local) (ttyv0)
login:

## Troubleshooting

- 1. If the installation is complete but there is no GUI, possible reasons are:
  - a. Total conversion takes time. The installation process includes:
    - Running customized BSD installer
    - FreeBSD installer puts on base OS
    - FreeBSD installer puts on XGG software
    - To this moment ... pure FreeBSD no application yet
    - FreeBSD installer reboots machine
    - Machine boots to bare FreeBSD
    - Application software is started for first time by RC
    - Application software performs FreeBSD total conversion
- 2. If the installation completes and reports errors on console, possible reasons are:
  - a. The VM has a single Ethernet interface
  - b. This is routing software, you must have at least two interfaces.
- 3. The VM has insufficient CPU / RAM / disk space for a minimum license
  - a. Presently 4 cores, 8 GB RAM, 20 GB disk space

ouild 10.607 12.0-RELEASE-p3 #16	
Лммаre Virtual Platform L 2700 1024 З ZKOJXHLRUTCS	
Standalone	
ем0 192.168.92.155/24 Uplink	
IUMBER OF NETWORK INTERFACES IS INSUFFICIENT	- 2 PORT MINIMUM
IUMBER OF CPU CORES IS INSUFFICIENT	- 4 CORE MINIMUM
MOUNT OF SYSTEM RAM IS INSUFFICIENT	- 8 GB MINIMUM
MOUNT OF HARD DISK SPACE IS INSUFFICIENT	- 20 GB MINIMUM
reeBSD∕amd64 (rxg.local) (ttyv0)	
logint -	

- 4. Refer to the license calculator and confirm that a virtual machine was built that meets the minimum requirements.
- 5. The safest approach is to build a new virtual machine with the appropriate configuration.

#### Setup Auto-start for the Application VM(s)

- Enable autostart, modify Stop delay to 60 seconds
- Enable autostart for each VM, starting with the first VM started, such as XGG CC

System Ha	rdware Lie	censing	Packages	Services	Security & users				
Advanced sett	ngs	🥖 Ed	it settings						
Autostart		Enat	oled		No				
Swap Time & date		Star	t delay		120s				
	Stop	delay		120s					
	Stop	action		Power off					
	Wait	Wait for heartbeat No			1				
	🐴 En	🚰 Enable 📑 Start earlier 🚔 Configure 🚔 Disable   🧲 Refresh   🎂 Actions 📕							
				Q Search					
		Virtual	Virtual machine ~			Shutdo $\checkmark$	A~	S∨	S~
	👘 rX	🞒 rXg GW1			Not Appli	Un	12	12	
		🔓 rX	🞒 rXg GW2			Not Appli	Un	12	12
		🔓 rX	🞒 rXg CC			Not Appli	Un	12	12
		Quid	Quick filters					3 i	tems "

	Change autostart configuration	
	Enabled	• Yes No
	Start delay	120 seconds
ExtremeG	Stop delay	60 seconds 2
	Stop action	Power off
	Wait for heartheat	





🕞 Enable 🛛 🦓 Start earlier 🚔 Configure 🛛 🙀 Disable	C Refresh	🏠 Ac Search	tions	3
Virtual machine	Shutdo v	A~	S~	<b>.</b> .~
🚰 rXg GW1	Not Appli	Un	12	60 s
🎒 rXg GW2	Not Appli	Un	12	60 s
🔂 rXg CC	Not Appli	Un	12	60 s
Quick filters			3 i	tems 🦼