



Appliance Deployment Guide

System Release 2.1

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Revision History

Revision	Release Date	Change Description
A	December 9, 2013	Initial release.

1 Introduction

This document provides network planning, installation, and configuration of the On-Ramp Wireless Appliance as a part of the On-Ramp Wireless Total Reach Network. On-Ramp Wireless offers two different configurations of the Appliance:

- Single Appliance (590-0020-00)
- Dual Appliances for a High Availability (HA) option (590-0021-00)

For more details about On-Ramp Wireless Appliances, refer to the *On-Ramp Wireless Appliance Data Sheet (010-0039-00)*.



Figure 1. Racked On-Ramp Wireless Appliance (Dual Appliances for High Availability)

This document is compatible with the software versions shown in the following table.

Table 1. Compatible Software Versions

Software	Version
System Release	2.1.3 or higher
AP	6.6 or higher
OTV	1.0.8 or higher

1.1 Overview

The On-Ramp Wireless Appliance is designed to be a plug and play computer server that contains all of the necessary software required to store, manage, and maintain the On-Ramp Wireless Total Reach Network. The Appliance should be racked in an office data closet or remote data center. The software installed is comprised of On-Ramp proprietary software and third party open source software. Refer to the following figure for physical layout of Appliances.

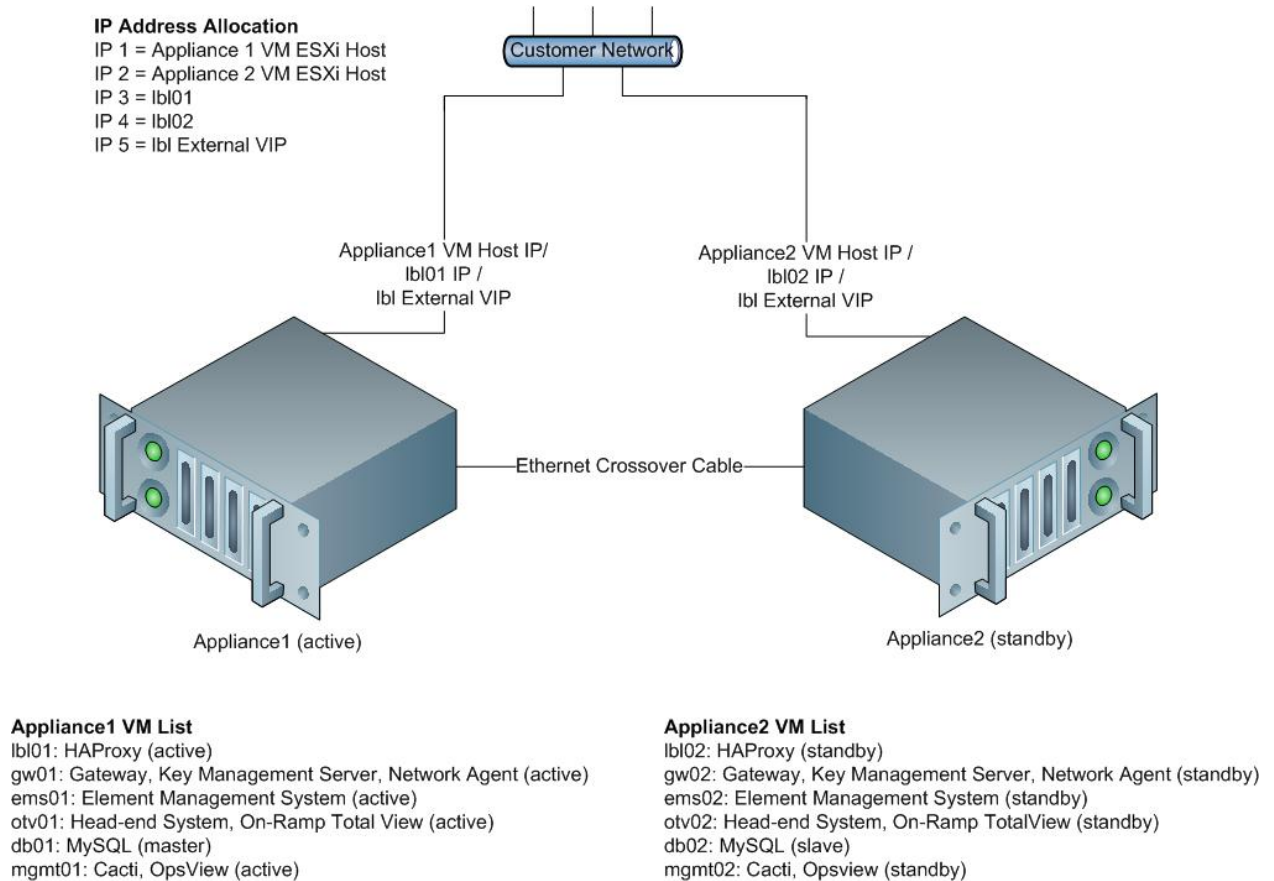


Figure 2. On-Ramp Wireless Appliance Physical Layout

On-Ramp Wireless back office software includes:

- **Gateway (GW)** – On-Ramp Wireless Gateway sends and receives AP data.
- **Element Management System (EMS)** – The EMS is a web interface that manages and monitors the On-Ramp Total Reach Network (TRN).
- **Key Management Service (KMS)** – The KMS stores endpoint network access security keys.
- **Network Agent (NA)**
- **Head-End System (HES)**
- **On-Ramp Total View (OTV)** – The OTV is a web interface that manages endpoint data and allows the import and export of endpoint data.

The Appliance also includes the following open source third party applications.

- **HAProxy** – for routing and load balancing
- **MySQL Database** – for storage
- **Opsview** – for application, network, and hardware monitoring
- **Cacti** – for network graphing
- **VMware ESXi** – for server virtualization

Refer to the following figure for logical layout of Appliances.

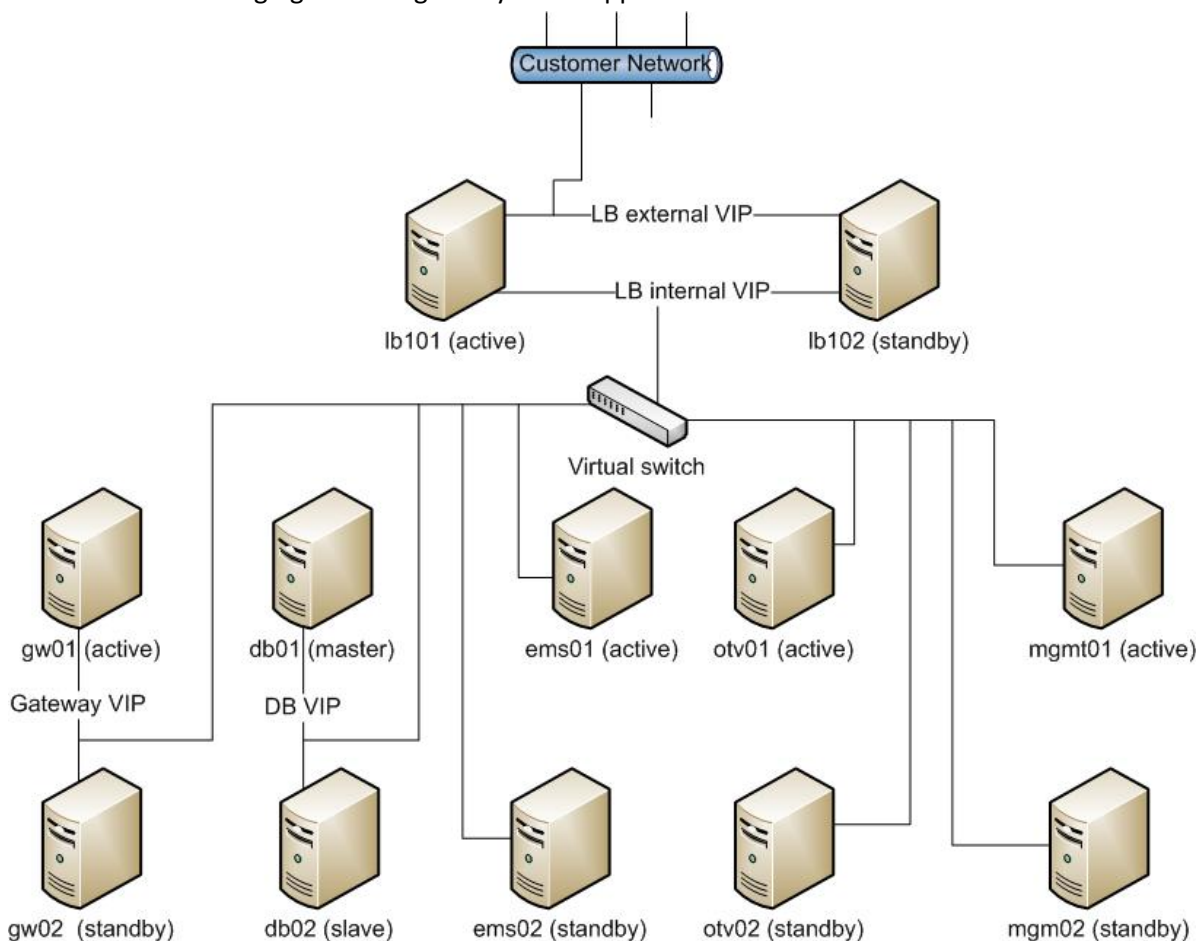


Figure 3. On-Ramp Wireless Appliance Logical Layout

1.2 Referenced Documents

The following documents provide additional details about the Appliance and installed software.

- **On-Ramp Wireless Appliance Data Sheet (010-0039-00)**
Provides detail about product specifications of the Appliance.
- **EMS Operator Guide (010-0107-00)**
Provides instructions on using On-Ramp Wireless Element Management System (EMS) to manage and monitor the On-Ramp Total Reach Network.
- **OTV Operator Guide (010-0106-00)**
Provides instructions on using On-Ramp Total View (OTV) to manage endpoint data.
- **AP Deployment Guide (010-0021-00)**
Provides instructions on how to deploy an On-Ramp Wireless Access Point.

2 Network Planning and Configuration Considerations

Prior to physically installing On-Ramp Wireless Appliances, network planning and configuration must be considered. The following figure provides an example of the On-Ramp Wireless Total Reach Network architecture. This example illustrates the communication paths required for the Total Reach Network (TRN).

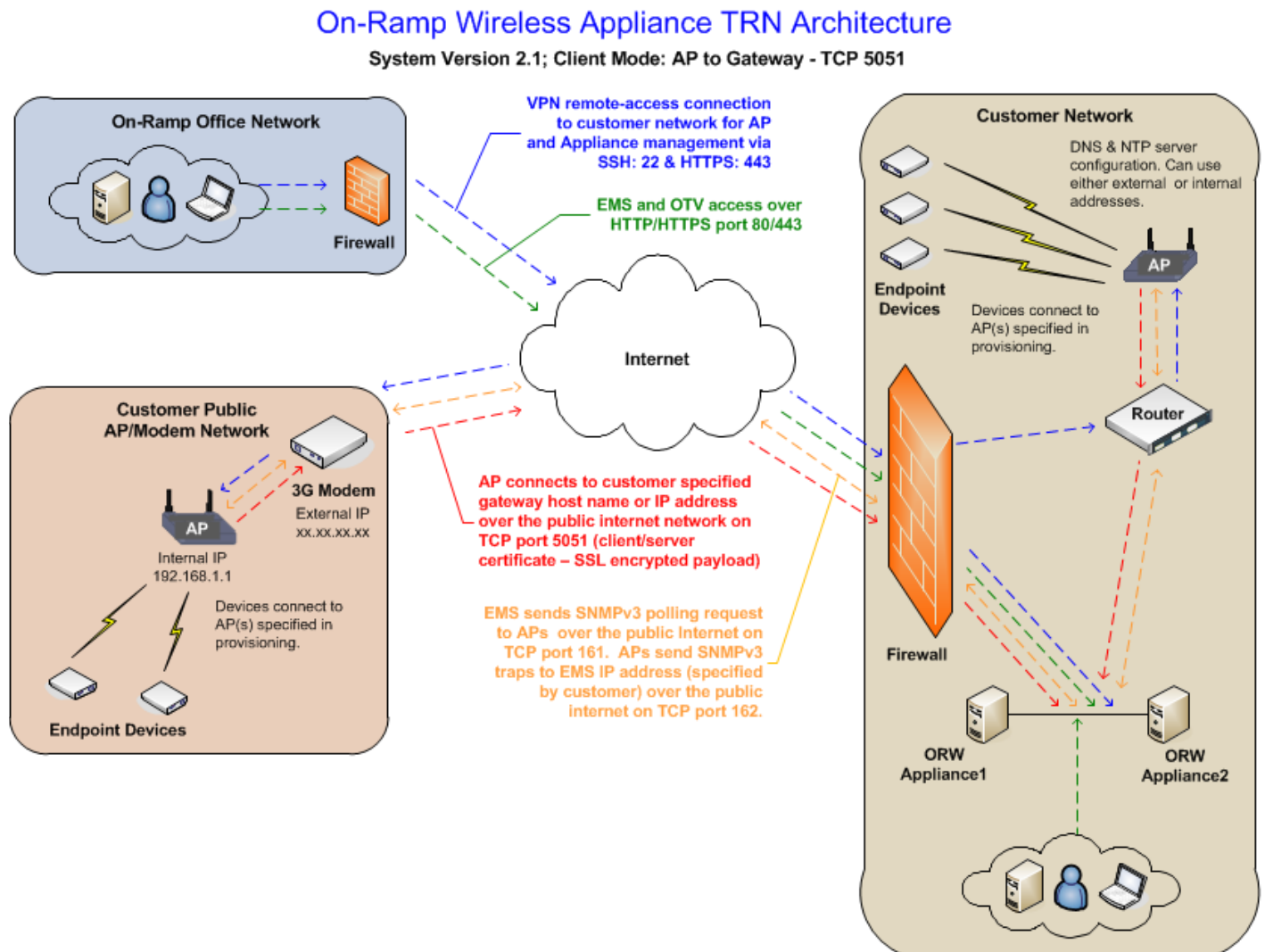


Figure 4. On-Ramp Wireless Appliance TRN Architecture

2.1 Network Planning

Network planning is critical for a successful Appliance installation and the reliable operation of the On-Ramp Total Reach Network. The following issues must be addressed in the network planning and design process.

- Determine the remote access type (e.g., VPN) into the Appliance for remote management.
- Determine the Gateway listening port for the Access Point (AP). The default is TCP port 5051.
- Determine the EMS SNMP trap port. The default is TCP port 162.
- Determine the AP SNMP data polling port from EMS. The default is TCP port 161.
- Determine whether the OTV website will be private or publically accessible. If publically accessible, On-Ramp Wireless recommends using HTTPS SSL certificates. The default is TCP port 80 and 443.
- Determine whether EMS website will be private or publically accessible. If publically accessible, On-Ramp Wireless recommends using HTTPS SSL certificates. The default port is TCP port 8080 and 8443
- Determine whether data will be automatically sent and/or pulled from OTV and HES by third party applications.

2.2 Network Configuration

The following network configuration settings must be administered prior to the Appliance installation:

- Provide three (3) internal IP addresses for a single Appliance configuration or five (5) IP addresses for an HA Appliance configuration.
- Provide an external domain name for the Gateway if the APs are deployed on a public internet or an internal host name if the APs are on a private network. The APs will be pointed to this location.
- Provide an external IP address for EMS for AP SNMP traps.
- Provide VPN access to the Appliance for management.
- Allow inbound SSH/TCP over port 22 to the Appliance for SSH management.
- Allow inbound TCP over port 903 to the Appliance for vSphere management.
- Allow inbound HTTP/TCP over port 80 to the Appliance if EMS and/or OTV is publically accessible.
- Allow inbound HTTPS/TCP over port 443 to the Appliance if EMS and/or OTV is publically accessible.
- Allow inbound TCP over port 5051 to the Appliance for the APs to connect to the Gateway if the APs are deployed on a public internet.

NOTE: A rule must be set up for each AP if the firewall allows specific IP addresses.

3 Physical Installation

3.1 Physical Installation Prerequisite

A single Appliance installation requires the following:

- 2U of 19" rack space
- 2 power outlets (dependent on country)
- 1 Ethernet cable

A dual Appliance installation requires the following:

- 4U of 19" rack space
- 4 power outlets (dependent on country)
- 3 Ethernet cables

3.2 Physical Installation for Single Appliance

The following steps and recommendations below provide guidance for installing a single Appliance.

1. Mount the ReadyRails into the rack. Instructions are provided in the package.
2. Mount the Appliance onto the ReadyRails. Instructions are provided in the package.
3. Plug both power supplies into power sources. For redundant power, use different power sources between power supplies 1 and 2. Refer to the following figure.
4. Plug the Ethernet cable into port 1 on the Appliance and into the cabinet switch. See the white Ethernet cable shown in the following figure.
5. Power-on the Appliance. The power button is located in the upper left corner on the front face of the Appliance.



Figure 5. Single Appliance Cabling

3.3 Physical Installation for Dual Appliance

The following steps and recommendations below provide guidance for installing a dual Appliance.

1. Mount the ReadyRails for both Appliances into the rack. Instructions are provided in the package.
2. Mount the Appliances onto the ReadyRails. Instructions are provided in the package.
3. Plug the four power supplies into power sources. For redundant power, use different power sources between power supplies 1 and 2. Refer to the following figure.
4. Plug the Ethernet cable into port 1 of each Appliance and into the cabinet switch. See the white Ethernet cable shown in the following figure.
5. Plug the Ethernet cable into port 3 of Appliance 1 and Appliance 2. See the blue Ethernet cable shown in the following figure.



Figure 6. Dual Appliance Cabling

4 Access Appliance and Start Services

4.1 Appliance IP Address Configuration

If the Appliance IP addresses were not obtained prior to shipping, the ESXi host and HAProxy IP addresses must be configured.

Follow the steps below to reconfigure the Appliance ESXi host IP address.

1. Plug a monitor and keyboard into the Appliance.
2. Press the F2 key twice.
3. Log in with **username** = *root* and **password** = *password*.
4. Highlight the third option, **Configure Management Network** and press the Enter key.
5. Select the third option, **IP Configuration** and press Enter.
6. Change **IP Address** and press Enter.
7. Pressing the Esc key allows you to exit.

NOTE: IP addresses for both Appliances must be changed for a dual Appliance setup.

To reconfigure the Appliance HAProxy IP address, please contact support@onrampwireless.com.

4.2 Tools Required to Access Appliance

The On-Ramp Appliance runs VMware ESXi server as the virtual host. VMware vSphere Client v5.1 or higher is required to access and control VMware ESXi. VMware vSphere Windows installer can be downloaded from https://<esxi_server_ip>/, use IP 1 or 2 from diagram 2.

When the Appliance host is accessible, there are two ways to manage the Appliance through the command line. The first method is with the use of the Console tab in the vSphere client. The second method is through an SSH client like Putty or Cygwin. When using an SSH client, an SSH connection must be made to the *lb0x.appl.local* external IP address. When logged onto *lb0x.appl.local*, any virtual machine can be reached. The following charts list all the virtual machine host names and IP addresses.

Table 2. Appliance Host Names and IP Addresses

Appliance 1		Appliance 2	
lbl01.appl.local	192.168.255.1	lbl02.appl.local	192.168.255.2
gw01.appl.local	192.168.255.20	gw02.appl.local	192.168.255.21
db01.appl.local	192.168.255.10	db02.appl.local	192.168.255.11
ems01.appl.local	192.168.255.30	ems02.appl.local	192.168.255.31
otv01.appl.local	192.168.255.32	otv02.appl.local	192.168.255.33
mgt01.appl.local	192.168.255.3	mgt02.appl.local	192.168.255.4

4.3 Start Virtual Machines

All On-Ramp Wireless services are set to automatically start when a virtual machine is powered on. On-Ramp Wireless services depend on other On-Ramp Wireless services and/or third party applications. Therefore, the virtual machines must be powered on in a specific order or the Appliance may not function properly. Virtual machines can only be powered on through the vSphere client interface. The following steps describe how to start a virtual machine.

1. Download the vSphere client specified in section 4.2.
2. Connect to the Appliance with **IP address / Name = ESXi host IP Address**, **username = root**, and **password = password**, then select the **Login** button.
3. Select the **Ignore** button on the certification pop-up.
4. Expand the virtual machines under the host in the left window.
5. Select the **lb01** virtual machine.
6. Select the **Green Right Arrow** button to power on the virtual machine. The bottom window shows the state of the virtual machine. The status should read *Completed* before moving on to the next machine. Refer to Figure 7 below.
7. Start the following virtual machines below in the order listed as described in step 6.
 - a. db01
 - b. mgt01
 - c. gw01
 - d. ems01
 - e. otv01

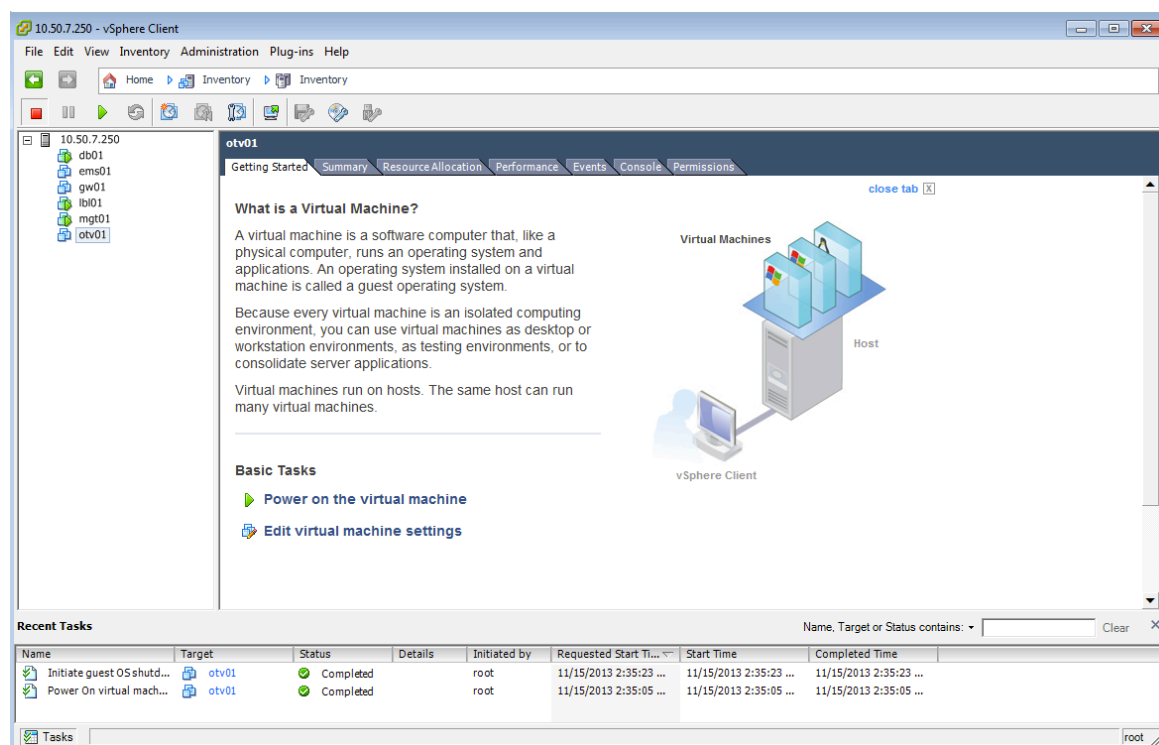


Figure 7. Power on Virtual Machine Via vSphere Client

For dual Appliances, virtual machines must be started in the following order using step 6 in the procedure above.

1. lbl01
2. lbl02
3. db01
4. db02
5. mgt01
6. gw01
7. gw02
8. ems01
9. ems02
10. otv01
11. otv02

5 Appliance Security

The On-Ramp Wireless Appliance security is designed to be locked down by default. The configuration limits the amount of access into the Appliance to prevent the network and data from being compromised. On-Ramp Wireless recommends the following to decrease security risks.

- Keep all virtual machines Linux-based.
- Limit local Linux accounts to only system administrators.
- Do not open any unnecessary ports outside the required On-Ramp Wireless required ports.
- Route specific AP IPs to the Appliance.
- Limit SSH access through vSphere, lbl01, and lbl02.
- Use SNMP v3 for all SNMP communication.
- Use SSL certifications for AP, EMS, and OTV.
- Use SSL certifications for EMS and OTV web applications.
- Ensure all web application user accounts are named and set up with the appropriate privileges (e.g., Administrator, Operator, or Guest). See EMS and OTV Operator Guides for more information.

6 Appliance High Availability, Data replication, and Data Disaster Recovery Options

On-Ramp Wireless offers an active/passive N+1 High Availability option with two Appliances. Both Appliances are configured with the exact same services but the services on Appliance 1 are active while services on Appliance 2 are on standby. Standby means that the virtual machines and their services are powered up and running but no traffic is sent to those virtual machines until the primary virtual machine, on Appliance 1, is no longer available.

The On-Ramp Wireless Appliance comes preinstalled with Opsview, a third party network monitoring application. Opsview is preconfigured to monitor and alert all virtual machines and On-Ramp Wireless services. The alerts are configured to send emails to the On-Ramp Wireless Network Operations team but can be configured to also include customer emails.

Data replication is offered for the dual Appliance option. Appliance 1 runs a MySQL database configured as a master and Appliance 2 is configured as a slave. Data is replicated from master to slave in real time. If the master database goes offline, the slave database can be configured as the master.

Data disaster recovery is also offered for the dual Appliance option. A database dump can be set up and stored locally on the machine for off-site storage. The database dump can be done on a single Appliance but there are some performance implications due to the locking of database tables. Please contact support@onrampwireless.com to discuss configuration options.

7 Appliance Installation Verification

7.1 OTV Validation

1. Open a web browser.
2. Go to http://<load_balancer_vip>/otv.
3. Log in with username = admin password = onramp.
4. Refer to the OTV Operator Guide (010-0106-00) for how to use OTV.
5. Contact support@onrampwireless.com for issues.

7.2 EMS Validation

1. Open a web browser.
2. Go to http://<load_balancer_vip>/ems.
3. Log in with username = admin password = onramp.
4. Refer to *EMS Operator Guide 2.1* (010-0107-00) on how to use EMS.
5. Contact support@onrampwireless.com for issues.

7.3 Gateway Validation

1. Log into EMS.
2. Add an AP to the Total Reach Network. For directions on how to do this, refer to both the *AP Deployment Guide* (010-0021-00) and the *EMS Operator Guide for CommSys 2.1* (010-0107-00).
3. Select **Access Point** tab.
4. Validate the **Network State** to ensure that the AP is *Registered*.

7.4 HES Validation

1. Log into EMS.
2. Add an AP to the Total Reach Network. To do this, refer to both the *AP Deployment Guide* (010-0021-00) and the *EMS Operator Guide for CommSys 2.1* (010-0107-00).
3. Add endpoints. Refer to *EMS Operator Guide for CommSys 2.1* (010-0107-00).
4. Log into OTV.
5. Select the **Devices** tab.
6. Validate the endpoints that appear in the devices list.

8 Troubleshooting Guidelines

Use the following table to help troubleshoot a problem.

Table 3. Troubleshooting Guidelines

Problem	Action
Appliance does not power up (Status LED is not illuminated or flashing)	<ul style="list-style-type: none">■ Verify power supplies are plugged into a power source.■ Verify power source has power.■ Contact On-Ramp Wireless for assistance.
Appliance is not on network	<ul style="list-style-type: none">■ Verify Ethernet cable is plugged into port 1 of the Appliance and into network.■ Verify IP addresses of ESXi host.■ Contact On-Ramp Wireless for assistance.
Cannot Access OTV	<ul style="list-style-type: none">■ Is otv01 virtual machine started?■ Is routing in place to access Appliance on port 80?■ Is OTV service started?■ Contact On-Ramp Wireless for assistance.
Cannot access EMS	<ul style="list-style-type: none">■ Is ems01 virtual machine started■ Is routing in place to access Appliance on port 80?■ Is EMS service started?■ Contact On-Ramp Wireless for assistance.
AP cannot access Gateway	<ul style="list-style-type: none">■ Is gw01 virtual machine started?■ Is Gateway service started?■ Is firewall open to allow traffic from AP IP addresses to Gateway on port 5051?■ Contact On-Ramp Wireless for assistance.

Appendix A Appliance Installation Configuration Worksheet

AP Installation Configuration	Required information	✓ Completed
Appliance 1 VM ESXi Host IP address		
Appliance 2 VM ESXi Host IP address (dual Appliance only)		
lbl01 IP address		
lbl02 IP address (dual Appliance only)		
lbl External VIP		
Subnet Mask		
Gateway		
VPN access for management services		
SSH access to Appliance over port 22 for management		
vSphere access to Appliance over TCP port 902 and 903		
AP access to load balancer VIP over TCP port 5051		
AP access to load balancer VIP over TCP port 162		
EMS and OTV access to Appliance over TCP port 80 and 443		
Appliance access to APs over TCP port 161		
Appliance access to NTP server over TCP port 123		

Appendix B Appliance Specifications

The Appliance is equivalent to a server. The following table provides the basic specification information for the Appliance. For detailed product specifications, refer to the *On-Ramp Wireless Appliance Data Sheet (010-0039-00)*.

Size	2RU
Power (2)	Dual, Hot Plug, Redundant Power Supplies, 750W
Processor (2)	Intel Xeon E5-2670 2.60GHz, 20M Cache, 8.0GT/s QPI, Turbo 8 cores
HDD (2)	Dual 200 GB Solid State Drives
HDD (6)	1.2TB 10K RPM SAS 6Gbps 2.5 in Hot-plug Hard Drives
Raid Controller	PERC H710 Integrated RAID Controller, 512MB NV Cache
Memory	4GB RDIMM, 1600MHz
Network card	Broadcom 5720 QP 1 Gbps Network Daughter Card
Operating System	Scientific Linux v6.3
Third Party Software	<ul style="list-style-type: none">■ MySQL■ Apache Tomcat■ Eclipse Jetty■ Cacti■ Opsview