APPLICATION NOTE

CONFIGURING THE CX111 FOR THE SSG SERIES

How to Configure the SSG Series for 3G Wireless WAN Termination Using the CX111 Cellular Broadband Data Bridge

Table of Contents

Table of Figures

Introduction

Enterprise branches need WAN resiliency to provide uninterrupted service to their customers and employees alike. This has direct implication to the revenue and operational costs. Financial transactions such as credit card processing, disaster recovery situations such as wired-line failures due to natural causes, temporary/first day connectivity needs have necessitated increased up-time with the enterprise HQ (head quarter) or the data center. So far, ISDN, DSL or dial-up modems have provided majority of the WAN backup connectivity options. These services are usually low-speed, high latency and have high recurring costs.

Due to their ubiquitous presence, the use of third-generation (3G) wireless networks has become a common deployment option for both primary and backup connectivity. With the introduction of Juniper Networks® CX111 Cellular Broadband Data Bridge, Juniper offers a simple way to provide wireless connectivity when used as a backup 3G connection (Juniper Networks SSG5 Secure Services Gateway and SSG20 Secure Services Gateway only) or as a primary connection (all Juniper Networks SSG Series Secure Services Gateways).

Scope

The purpose of this application note is to provide an overview that shows how to configure and deploy the CX111 for 3G wireless WAN termination using the CX111 Cellular Broadband Data Bridge on Juniper Networks SSG Series Secure Services Gateways.

Design Considerations

Supported Hardware

- Juniper Networks SSG Series Secure Services Gateways

Software Requirements

- Juniper Networks ScreenOS® software versions 5.4.0r16, 6.2.0r6, 6.3.0r3, or later
  - There is a Dynamic Host Configuration Protocol (DHCP) memory leak issue with earlier ScreenOS versions when used with the CX111
- CX111 firmware 1.6.10 or later

Card Compatibility

As of the date of this writing, about 50 different modems (USB and ExpressCard) have been certified to work with the CX111 Cellular Broadband Data Bridge. The latest list of modems can be found on the CX111 documentation in the Technical Publications section for CX111 (**www.juniper.net/techpubs/hardware/junos-cx/cx111/**).

Card Activation

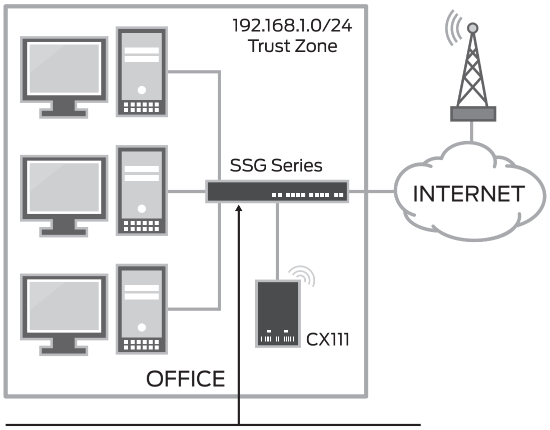
Before cards can be used, they need to be programmed with the subscriber information required to access the service provider's network. This is normally referred to as the card activation process. When the service is purchased, the carrier will request the card's ESN number, normally found printed on the wireless card. This is then used to identify the card by the different activation protocols.

Cards directly purchased from the wireless carrier can ship pre-activated, or sometimes they will ship with a companion software used to perform the initial activation. In either case, cards already activated do not have to be reactivated.

Cards can optionally be activated from the CX111. This requires users to log into the bridge's UI using a Web browser (details about accessing the UI are discussed in the following sections). The activation process only requires users to access the activation page and click on the activate button.

Description and Deployment Scenario

The CX111 ships with a default configuration that should accommodate most deployment scenarios. The deployment model assumes that the CX111 is connected to a DHCP-enabled interface.



Deployment
The CX111 acts as a DHCP server and relays the public address obtained from the 3G network to the SSG Series.

Figure 1: Deployment model

The CX111 will maintain the wireless modem (or modems, if more than one modem is used) in a disconnected state, and will trigger a new connection as soon as the SSG Series device requests a new lease and initiates data transfer. Modem(s) will be disconnected only when no interesting traffic passes through for an idle amount, and only reconnected when interesting traffic starts again. The idle timeout default is 20mins and can be changed by using the CX111's Web UI.

When using the 3G link as the primary connection, long lease times can be used, as generally there won't be a need to constantly connect and disconnect the line. On the other hand, if the bridge is used to provide a backup connection, short lease times (in the order of a minute) are commonly used, so when the primary link is active, the backup link can be disabled, triggering a disconnection, in the worse case, after a lease time.

The CX111 assigns the address received from the wireless service provider to the gateway (normally this is a public address). For obvious reasons, only a single device can be connected to the CX111 at any given time, or else multiple devices will contend for the only address passed to the CX111. The CX111 works in "pass through" mode, simply relaying all traffic from the wireless network to the DHCP client.

Management Interface

The CX111 provides a Web-based management interface, and it can be accessed even when 3G modems are not used. Since "pass through" mode is used (instead of a routed connection, with the bridge doing Network Address Translation (NAT)), the management interface cannot be accessed through the normal data channel. When the modem is not active or not inserted, a 192.168.30.x/24 network address is provided to the SSG Series platform and 192.168.30.1 becomes the temporary management address for the CX111.

The management interface is still accessible through the Ethernet port, but VLAN tagging is used to separate management form data traffic using the following parameters

Table 1: Management Network Settings

CARD MODEL	WIRELESS TECHNOLOGY
Management subnet	192.168.0.0/24
Management address	192.168.0.1
VLAN ID	3900

Power over Ethernet

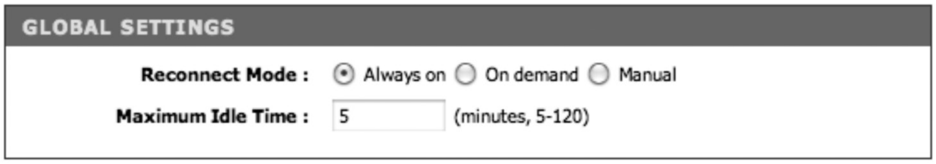
When available, Power over Ethernet (PoE) can be used to power the bridge. In the event that the bridge is connected through a switch or a gateway that does not support PoE, an external power supply can be used (provided with the basic install kit).

When PoE is used, the device will require 4 W to 10 W of power depending on how many modems are connected, so plan the power budget accordingly.

Dial Modes

The CX111 can be configured in two modes, “always on” or “dial on-demand.” In the “always on” mode, the bridge connects to the 3G network after booting. The connection is always maintained, as long as there are no network or connectivity problems.

In “dial on-demand” mode, the bridge will only initiate a connection when it receives traffic from the interface connecting the bridge and gateway. In particular, DHCP request messages will trigger a connection. Similarly, the connection will be dropped after a configurable inactivity timeout. The configuration is found under the Modem->Settings tab.



GLOBAL SETTINGS

Reconnect Mode : ◉ Always on ○ On demand ○ Manual

Maximum Idle Time : 5 (minutes, 5-120)

Figure 2: Dial modes

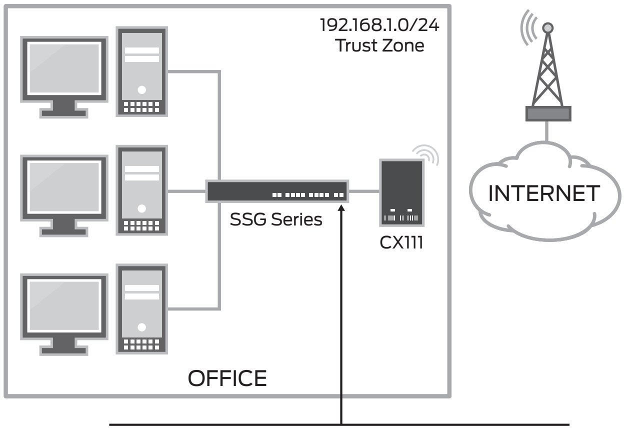
Regardless of the mode, the bridge can accept multiple cards simultaneously. In the event of a failure or inability to connect, the remaining card(s) will be used. The connection priority is user configurable through the bridge’s management interface.

Deployment Scenarios

In the following section, we will discuss several common deployment scenarios and provide the associated configurations.

CX111 Used for Primary Connectivity

This first scenario shows the gateway configuration when the 3G network is used as the primary WAN link. On Juniper Networks SRX Series Services Gateways and SSG Series Secure Services Gateways, this can be achieved using the default configuration by simply connecting the bridge to the ethernet0/0 interface.



Primary Access
CX111 used as the primary link.
The SSG Series obtains a public address through DHCP.

Figure 3: 3G network as the primary link

```
set zone “Trust” vrouter “trust-vr”
set zone “Untrust” vrouter “trust-vr”
set interface “ethernet0/0” zone “Untrust”
set interface “bgroup0” zone “Trust”
set interface bgroup0 port ethernet0/2
set interface bgroup0 port ethernet0/3
set interface bgroup0 port ethernet0/4
set interface bgroup0 port ethernet0/5
set interface bgroup0 port ethernet0/6
set interface ethernet0/0 dhcp client enable
set interface ethernet0/0 dhcp client settings update-dhcpserver
set interface bgroup0 ip 192.168.1.1/24

set interface bgroup0 dhcp server service
set interface bgroup0 dhcp server enable
set interface bgroup0 dhcp server ip 192.168.1.2 to 192.168.1.100

set policy id 3 name “Any Permit” from “Trust” to “Untrust”  “Any” “Any” “ANY”
nat src permit log count
exit
```

Management Access

A VLAN-tagged logical interface can be used in order to provide access to the bridge’s management console. NAT will also be used to facilitate access from any device behind the gateway, eliminating the need for complex routing (as all traffic to the bridge’s management interface will be translated as if it originated from the management subnet).

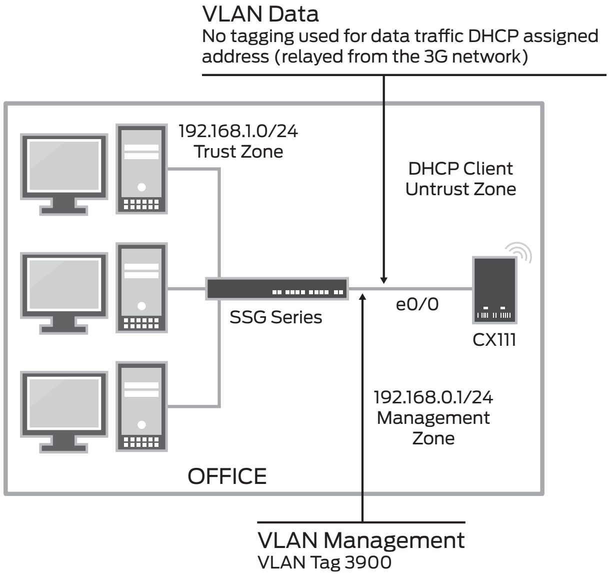


Figure 4: Management access

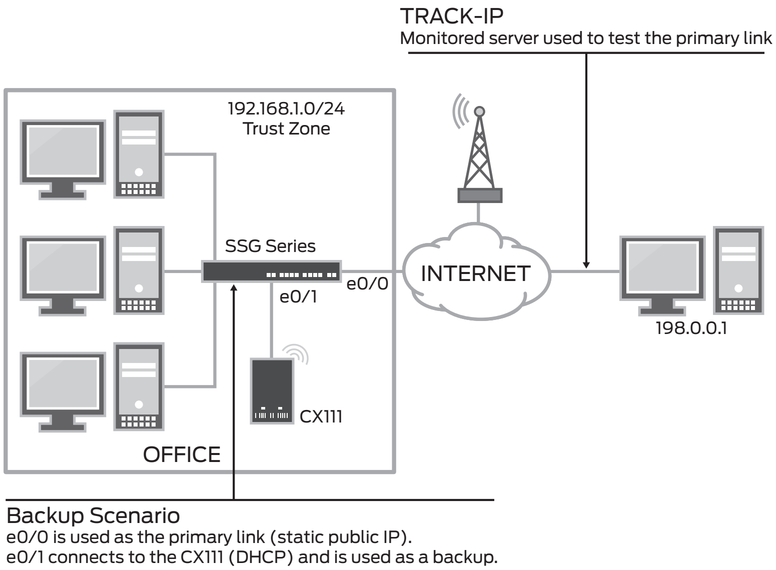
```
set zone “Trust” vrouter “trust-vr”
set zone “Untrust” vrouter “trust-vr”
set zone id 100 “Management”

set interface “ethernet0/0” zone “Untrust”
set interface “ethernet0/0.1” tag 3900 zone “Management”
set interface “bgroup0” zone “Trust”
set interface bgroup0 port ethernet0/2
set interface bgroup0 port ethernet0/3
set interface bgroup0 port ethernet0/4
set interface bgroup0 port ethernet0/5
set interface bgroup0 port ethernet0/6

set interface ethernet0/0 dhcp client enable
set interface ethernet0/0 dhcp client settings update-dhcpserver
set interface ethernet0/0.1 ip 192.168.0.2/24
set interface bgroup0 ip 192.168.1.1/24
set interface bgroup0 dhcp server service
set interface bgroup0 dhcp server enable
set interface bgroup0 dhcp server ip 192.168.1.2 to 192.168.1.20

set policy id 3 name “Any Permit” from “Trust” to “Untrust”  “Any” “Any” “ANY”
nat src permit log count no-session-backup
exit
set policy id 6 name “Management Access” from “Trust” to “Management”  “Any”
“Any” “HTTP” nat src permit log
exit
```

CX111 Used for Backup Access Using Track-ip

Only Juniper Networks SSG5 Secure Services Gateway and SSG20 Secure Services Gateway can support the CX111 as both backup and primary. All other SSG Series devices support CX111 only in primary connection mode.

In this example, the bridge will only be used when the primary interface is down. It is possible to configure default routes with different metrics, but this will mean that only physical failures in the primary interface will be detected. In some instances, such as when layer 2 protocols are not able to detect end-to-end failures, or when multiple network hops separate the SSG Series from the remote resources, other means to trigger a failover are desired.

This example shows how to configure track-ip to monitor a set of devices. Different weights can be used to change the failover behavior. When each probe is given a weight higher than 255, a single failure will trigger a failover. If instead multiple probes are used, each with a small weight (lower than 255), more than one failure will be required to fail over. To enable the backup, the sum of the weights of the failing probes must be larger than 255.



TRACK-IP
Monitored server used to test the primary link

Backup Scenario
e0/0 is used as the primary link (static public IP).
e0/1 connects to the CX111 (DHCP) and is used as a backup.

Figure 5: Backup interface using track-ip

When using track-ip, the backup interface connecting to the CX111 will be disabled as long as the primary link is active (that is, as long as the probes are responding). This is useful when using on-demand mode, as it will guarantee that the modem will be disconnected while the primary link is up.

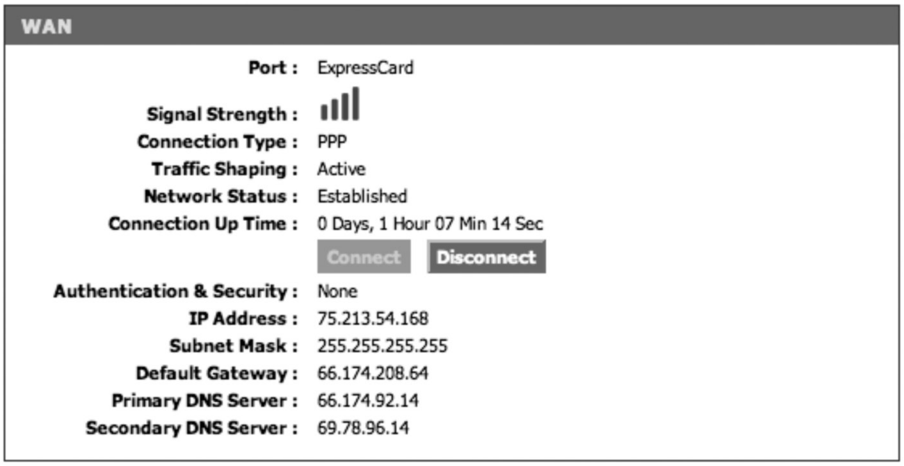
```
set zone “Trust” vrouter “trust-vr”
set zone “Untrust” vrouter “trust-vr”
set zone id 100 “Management”
set interface “ethernet0/0” zone “Untrust”
set interface “ethernet0/1” zone “Untrust”
set interface “ethernet0/1.1” tag 3900 zone “Management”
set interface “bgroup0” zone “Trust”
set interface bgroup0 port ethernet0/2
set interface bgroup0 port ethernet0/3
set interface bgroup0 port ethernet0/4
set interface bgroup0 port ethernet0/5
set interface bgroup0 port ethernet0/6

set interface ethernet0/0 ip 198.1.1.1/24
set interface ethernet0/1 dhcp client enable
set interface ethernet0/1.1 ip 192.168.0.10/24
set interface bgroup0 ip 192.168.1.1/24

set interface ethernet0/0 monitor track-ip ip
set interface ethernet0/0 monitor track-ip ip 198.0.0.1 interval 5
set interface ethernet0/0 monitor track-ip ip 198.0.0.1 weight 255
set interface ethernet0/0 backup interface ethernet0/1 type track-ip

set interface bgroup0 dhcp server service
set interface bgroup0 dhcp server enable
set interface bgroup0 dhcp server option dns1 192.168.1.1
set interface bgroup0 dhcp server ip 192.168.1.2 to 192.168.1.20
set route 0.0.0.0/0 gateway 198.1.1.2

set policy id 6 name “Management Access” from “Trust” to “Management”  “Any”
“Any” “HTTP” nat src permit log
exit
set policy id 3 name “Any Permit” from “Trust” to “Untrust”  “Any” “Any” “ANY”
nat src permit log count
exit
```

The probe status can be obtained from the “get interface monitor” command.

```
SSG5-> get interface ethernet0/0 monitor track-ip
ip address           intval threshold wei gateway         fail-count success
198.0.0.1                 5         3 255 0.0.0.0                  0 74%
failure weight: 255, threshold: 1, not failed: 0 ip(s) failed, weighted sum = 0
```

Monitoring

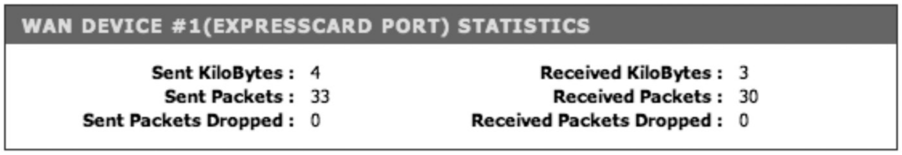
The 3G signal strength and connection status can be monitored from the bridge’s management interface, which is found under status -> device info tab. The signal strength bars are only displayed for 3G modems that support Dynamic Signal Strength.



Port : ExpressCard
Signal Strength : ▂▄▆█
Connection Type : PPP
Traffic Shaping : Active
Network Status : Established
Connection Up Time : 0 Days, 1 Hour 07 Min 14 Sec
Authentication & Security : None
IP Address : 75.213.54.168
Subnet Mask : 255.255.255.255
Default Gateway : 66.174.208.64
Primary DNS Server : 66.174.92.14
Secondary DNS Server : 69.78.96.14

Figure 6: Modem status

Traffic statistics can be found under the Status->Statistics page.



Sent KiloBytes :	4	Received KiloBytes :	3
Sent Packets :	33	Received Packets :	30
Sent Packets Dropped :	0	Received Packets Dropped :	0

Figure 7: Modem statistics

Summary

As more and more wireless carriers expand their coverage and upgrade their networks to offer 3G wireless data services, enterprises worldwide can look to use 3G as a backup connectivity solution for many deployments and in some cases, even use 3G wireless as primary data access.

Juniper Networks SSG Series Secure Services Gateways provide best-in-class security and routing with flexible LAN and WAN options. With the CX111 Cellular Broadband Data Bridge, the SSG Series offers wireless WAN connectivity solutions with increased uptime and reduced operating cost. The CX111 combined with the SSG Series is simple and easy to configure and deploy.

About Juniper Networks

Juniper Networks, Inc. is the leader in high-performance networking. Juniper offers a high-performance network infrastructure that creates a responsive and trusted environment for accelerating the deployment of services and applications over a single network. This fuels high-performance businesses. Additional information can be found at **www.juniper.net**.

Corporate and Sales Headquarters
Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, CA 94089 USA
Phone: 888.JUNIPER (888.586.4737)
or 408.745.2000
Fax: 408.745.2100
www.juniper.net

APAC Headquarters
Juniper Networks (Hong Kong)
26/F, Cityplaza One
1111 King's Road
Taikoo Shing, Hong Kong
Phone: 852.2332.3636
Fax: 852.2574.7803

EMEA Headquarters
Juniper Networks Ireland
Airside Business Park
Swords, County Dublin, Ireland
Phone: 35.31.8903.600
EMEA Sales: 00800.4586.4737
Fax: 35.31.8903.601

To purchase Juniper Networks solutions, please contact your Juniper Networks representative at 1-866-298-6428 or authorized reseller.

3500185-001-EN   Mar 2010

♻ Printed on recycled paper