



WAN Fail-Over & Traffic Redirect

Technote LCTN0011

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This TechNote applies to LAN-Cell models:

LAN-Cell 2:

LC2-411 (firmware 4.02 or later)

CDMA:

1xMG-401
1xMG-401S

GSM:

GPRS-401

Minimum LAN-Cell Firmware Revision: 3.62(XF2).

Note for Original LAN-Cell Model (1xMG & GPRS) Users:

The WAN Fail-Over & Traffic Redirect screens in the original LAN-Cell's Web GUI differ slightly from the examples in this Technote. See the LAN-Cell's *User Guide* for more information on WAN Fail-Over & Traffic Redirect configuration.

Document Revision History:

Date	Comments
November 12, 2008	Initial Release

Introduction

The LAN-Cell offers 2 distinctly different mechanisms for ensuring that WAN-bound traffic is routed to an available WAN gateway.

WAN Fail-Over

WAN Fail-Over is the LAN-Cell's method of monitoring its internal WAN interfaces (Ethernet wired WAN port, Cellular 3G modem WAN port, and Dial-Backup serial port) and sending packets to the highest priority interface that is operational. (Note: The LAN-Cell 2 also offers WAN load balancing – that topic is not covered here.)

Traffic Redirect

Traffic Redirect is a technique the LAN-Cell uses to reroute WAN-bound traffic to a different LAN subnet that contains another WAN gateway device (e.g. another LAN-Cell or third-party router).

Each mechanism has advantages and is appropriate for different network topologies. WAN Fail-Over and Traffic Redirect can be used in tandem to provide an unprecedented level of WAN availability. In both instances, the LAN-Cell routes packets directly to the interfaces based on a user-defined priority scheme.

WAN Fail-Over is used when all of the LAN-Cell's interfaces are directly connected to WAN access devices such as DSL/Cable modems, satellite modems, analog telephone modems, etc. Traffic redirection is used when additional WAN access is provided by another network device such as a router or gateway located on a different subnet from the LAN-Cell. Under traffic redirection, the LAN-Cell passes all WAN-bound traffic to the remote gateway whenever the LAN-Cell's primary and backup WAN interfaces are not available.

This TechNote illustrates examples of WAN Fail-Over and Traffic Redirection.

Example 1: WAN Fail-Over

You can assign a relative routing priority to each of the LAN-Cell's WAN interfaces (wired Ethernet, Cellular, Traffic Redirect and Dial-Backup). The LAN-Cell uses these values to determine the interface to which packets are routed. When configured to WAN Fail-Over mode, the LAN-Cell will attempt to use the next lowest priority interface as higher priority interfaces become unavailable.

In this example, the LAN-Cell 2 is being used to provide redundant Internet connectivity to a remote office LAN. The primary WAN connection is a DSL modem, backed up by a 3G Cellular modem and finally by a 56Kbps telephone modem.

Figure 1 shows the LAN-Cell 2 with a DSL modem connected to the wired Ethernet WAN port, a 3G cellular modem card inserted, and a dial-up analog telephone modem connected to the AUX (serial) port. All three of these WAN interfaces will be available to the LAN-Cell on a relative priority basis. The LAN-Cell will fail-over among these interfaces automatically with little or no impact on the LAN PC's connected to the LAN-Cell. When a higher priority interface becomes available again, the LAN-Cell will "fall-back" to use that interface.

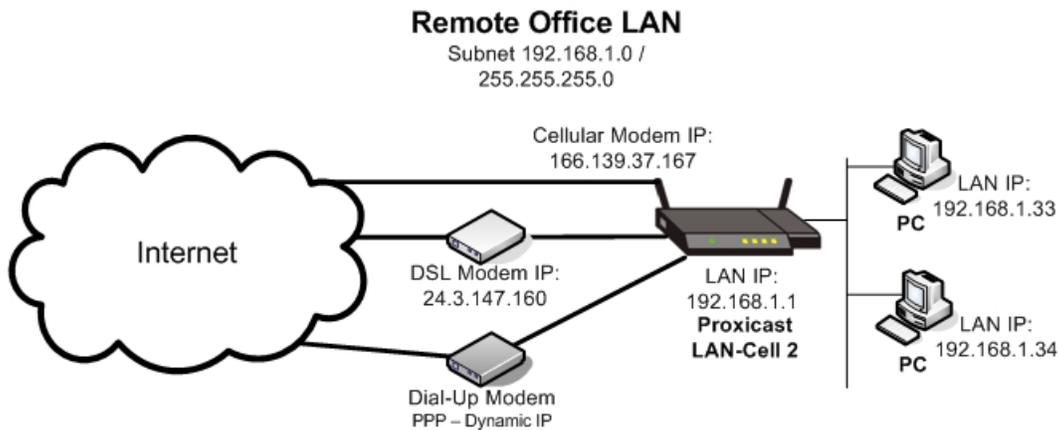


Figure 1: Example WAN Fail-Over Network Topology

Usage Notes

- By default, the LAN-Cell is configured for automatic fail-over / fall-back between the wired Ethernet WAN (highest priority) and the Cellular 3G modem (second highest priority). The Dial-Backup WAN (serial) port is not enabled by default and has the lowest routing priority.
- The Dial-Backup WAN port must have a lower priority (higher metric value) than either the WAN or Cellular interfaces.
- The same basic configuration can be used with cable modems, T1 lines, satellite modems, etc. Configure each WAN interface as necessary for a connection.
- The wired WAN port can also be connected to a LAN port on another router rather than directly to a modem (a cross-over cable may be required). The LAN address of the secondary router must be in a different subnet than the LAN-Cell's LAN IP address/subnet.
- There is additional information on LAN-Cell WAN, Cellular, and Fail-Over configuration parameters in the *LAN-Cell User's Guide*.

LAN-Cell Configuration

First, configure the WAN, Cellular and Dial-Backup interfaces for your specific equipment and connection type.

In our example, the DSL modem has a static IP address of 23.4.147.160 / 255.255.240.0 with a default remote gateway of 24.3.144.1 (Figure 2).

The screenshot shows the WAN configuration interface with the 'WAN' tab selected. Under 'ISP Parameters for Internet Access', 'Encapsulation' is set to 'Ethernet' and 'Service Type' is 'Standard'. Under 'WAN IP Address Assignment', 'Use Fixed IP Address' is selected. The IP address is 24.3.147.160, the subnet mask is 255.255.240.0, and the gateway IP address is 24.3.144.1.

My WAN IP Address	24 . 3 . 147 . 160
My WAN IP Subnet Mask	255 . 255 . 240 . 0
Gateway IP Address	24 . 3 . 144 . 1

Figure 2: WAN Parameters

The CDMA cellular modem needs only the ISP Access Phone Number of #777 set. It will receive a dynamic IP address from the carrier (Figure 3).

The screenshot shows the WAN configuration interface with the 'Cellular' tab selected. 'Cellular Setup' is enabled. Under 'ISP Parameters for Internet Access', 'Authentication Type' is 'None', 'ISP Access Phone Number' is '#777', and 'Always On' is checked. Under 'WAN IP Address Assignment', 'Get Automatically from ISP' is selected, and the IP address field shows '0 . 0 . 0 . 0'.

Figure 3: Cellular Parameters

The Dial-Up modem needs its PPP username, password and ISP telephone number entered along with a modem initialization command string (Figure 4).

The screenshot displays the WAN configuration page, specifically the 'Dial Backup' tab. The interface is organized into several sections:

- Dial Backup Setup:** Includes a checked checkbox for 'Enable Dial Backup'.
- Basic Settings:** Contains fields for 'Login Name' (user31), 'Password' (masked with asterisks), 'Retype to Confirm' (masked), 'Authentication Type' (CHAP/PAP), 'Primary Phone Number' (5551234), 'Secondary Phone Number' (Optional), 'Dial Backup Port Speed' (115200), 'AT Command Initial String' (at&fs0=0), and an 'Advanced Modem Setup' button labeled 'Edit'.
- TCP/IP Options:** Features radio buttons for 'Get IP Address Automatically from Remote Server' (selected) and 'Use Fixed IP Address' (with a field for 'My WAN IP Address' set to 0.0.0.0). It also includes checkboxes for 'Enable NAT (Network Address Translation)', 'Enable RIP' (with 'RIP Version' set to RIP-1 and 'RIP Direction' set to Both), 'Broadcast Dial Backup Route', and 'Enable Multicast' (with 'Multicast Version' set to IGMP-v1).
- Budget:** Includes a selected radio button for 'Always On'.

Figure 4: Dial-Backup Parameters

Next, select the **NETWORK->WAN** menu, then the **General** tab (Figure 5).

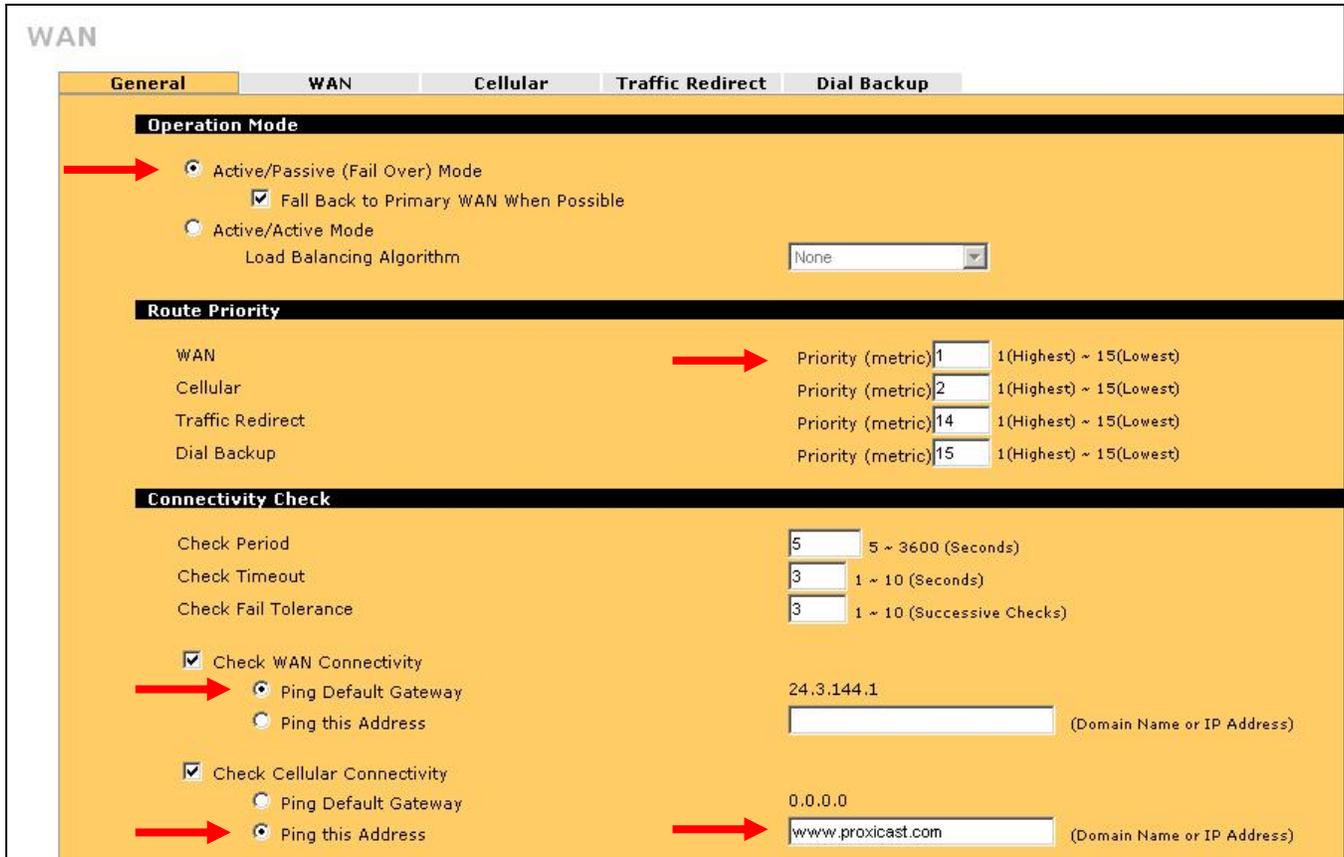


Figure 5: Configuring WAN Fail-Over

Ensure that the **Operation Mode** is set to Active/Passive. Select **Fall Back to Primary WAN When Possible** if you want to use the secondary WAN interfaces only when necessary.

Set the relative **Route Priority** of each WAN interface; typically the wired Ethernet WAN is the highest priority and Cellular is the second highest, however you can reverse these values if your Cellular connection has higher bandwidth, lower cost or if you there is some other reason to prefer the Cellular connection over a wired Ethernet connection.

Although not required, using the **Continuity Check** feature in conjunction with WAN Fail-Over can improve the LAN-Cell's responsiveness to failed connections. The Continuity Check feature periodically sends an ICMP (ping) packet out of the selected interface(s) to determine the "end-to-end" continuity of communications. This helps the LAN-Cell detect certain types of "hung" connections which are not reported "down" at the physical layer.

Check Period – how often to send the ICMP packets (e.g. every 5 seconds)

Check Timeout – how long to wait for an ICMP reply from the target IP address (max latency)

Check Fail Tolerance – number of consecutive reply failures before the interface is considered "down"

Where possible, selecting Ping Default Gateway will give the most reliable results. However some ISP's (and most cellular network operators) do not respond to ICMP packets sent to their gateways. In these cases, select another well-know and reliable IP address or domain name as the target. Your own mail or web server is often reasonable choice. Avoid using "public" hosts such as Google or Microsoft as these servers may not respond to ICMP packets in the future, thereby effectively disabling your WAN interface(s) on the LAN-Cell.

Note: On earlier LAN-Cell models, the Continuity Check feature is not available.

Testing WAN Fail-Over

The easiest way to test if WAN Fail-Over is working is to remove one or more of the WAN interfaces. In our example, removing the cable from the LAN-Cell's WAN port to the DSL modem will force the wired WAN interface to go down and the Cellular interface to become active. You can test Internet connectivity by pinging some Internet IP address or going to a remote web page.

When you reconnect the WAN cable, you will see alerts in the LAN-Cell's log indicating that the WAN connection is up, the Cellular connection has been taken down and that the LAN-Cell has fallen back to use the primary WAN connection (Figure 6).

Latest Alerts	
Date/Time	Message
2008-11-24 06:22:39	Cellular connection is down.
2008-11-24 06:22:39	Cellular connection has been dropped - fall back to WAN(Connected 76 seconds).
2008-11-24 06:22:09	Cellular connection is down.
2008-11-24 06:22:09	Cellular connection is down.
2008-11-24 06:21:57	WAN connection is up.

Figure 6: WAN Fall-Back Alert

You can test failure of both the WAN and Cellular interfaces by removing the WAN cable, and then disabling the Cellular card on the WAN->CELLULAR page. This will cause the LAN-Cell to make a dial-up connection using the external telephone modem.

Note About DNS Resolution

In a WAN Fail-Over situation, you may have issues with resolving DNS names to IP addresses. If you are able to connect to Internet hosts via their IP address but not their DNS name, the issue is most likely that your ISP's are not permitting DNS lookups from devices outside of their network.

The LAN-Cell is a caching DNS-relay server. You should configure your LAN devices to use the LAN-Cell's LAN IP address as their DNS server – the LAN-Cell will forward DNS requests to the proper ISP based on the currently active WAN interface.

Example 2: Traffic Redirect

The LAN-Cell also supports a “virtual” WAN interface called Traffic Redirect. You can indicate the IP address of backup gateway (a device that has its own pathway to the WAN) to which the LAN-Cell will forward all packets whenever the LAN-Cell has no primary or secondary direct WAN connection.

In this example, the LAN-Cell 2 is on a network that includes another gateway router. This router could be another LAN-Cell, for example, one with a 3G cellular modem for a different carrier than the primary LAN-Cell. Or the secondary gateway could be an existing router with a slower, higher cost WAN connection.

Figure 1 shows the example LAN-Cell 2 with only a 3G cellular modem card inserted. The LAN-Cell is on a common Ethernet LAN segment with the secondary gateway.

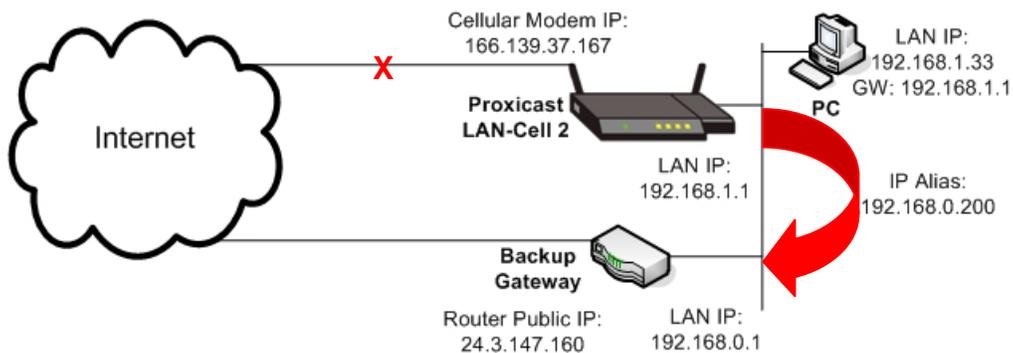


Figure 7: Example Traffic Redirect Network Topology

Usage Notes

- The LAN-Cell and the backup gateway must be on different IP subnets but on the same physical network. You can connect the backup gateway directly to one of the LAN-Cell’s LAN ports.
- LAN client devices should set the primary LAN-Cell as their default gateway. The traffic redirect function will route the packets to the backup gateway with no configuration changes necessary on the client devices.
- Traffic Redirect works when either the wired WAN, Cellular WAN or both are configured on the primary LAN-Cell.
- The routing priority of Traffic Redirect must be lower than the WAN and Cellular interfaces.
- There is additional information on the Traffic Redirect and IP Alias configuration parameters in the *LAN-Cell User’s Guide*.

LAN-Cell Configuration

Configure the primary LAN-Cell for its normal WAN/Cellular operation.

Configure the backup gateway for its normal operation and WAN connectivity

Notice that in the example shown in Figure 7, the LAN-Cell and the backup gateway are on different logical IP subnets on the same physical network (LAN-Cell = 192.168.1.1 and backup gateway = 192.168.0.1). This is required for Traffic Redirect to work properly. To handle this situation, an IP Alias (VLAN) must be defined on the LAN-Cell to allow it to make a LAN connection to the backup gateway's subnet in addition to its own subnet.

Select **NETWORK->LAN->IP ALIAS** from the LAN-Cell's menu (Figure 8). Enable IP Alias #1 and enter a valid IP address that is part of the backup gateway's subnet. Do not enter the backup gateway's address here. Check with the administrator of the backup gateway's subnet to determine a valid IP address for the LAN-Cell's IP Alias. Also, you may need to enable RIP for the LAN-Cell and backup gateway to properly exchange routing information.

Figure 8: LAN IP Alias Parameters

Next, go to the **NETWORK->WAN->TRAFFIC REDIRECT** screen. Enable the Traffic Redirect feature and enter the LAN IP address of the backup gateway (Figure 9).

Figure 9: Traffic Redirect Parameters

By enabling Traffic Redirect, the WAN **Continuity Check** feature is automatically enabled for the Traffic Redirect interface (Figure 10). The backup gateway's IP address is selected as the target destination; if the backup gateway does not respond to ICMP packets, enter the address or DNS name of another device to check. The Continuity Check feature is used to determine if the Traffic Redirect interface is available. You may optionally configure the WAN & Cellular continuity check parameters as required by your application.

Note: On earlier LAN-Cell models, the Continuity Check feature is not available.

The screenshot shows the WAN configuration interface with the following details:

- Operation Mode:**
 - Active/Passive (Fail Over) Mode
 - Fall Back to Primary WAN When Possible
 - Active/Active Mode
 - Load Balancing Algorithm: None
- Route Priority:**

WAN	Priority (metric)	1	1(Highest) ~ 15(Lowest)
Cellular	Priority (metric)	2	1(Highest) ~ 15(Lowest)
Traffic Redirect	Priority (metric)	14	1(Highest) ~ 15(Lowest)
Dial Backup	Priority (metric)	15	1(Highest) ~ 15(Lowest)
- Connectivity Check:**
 - Check Period: 5 (5 ~ 3600 (Seconds))
 - Check Timeout: 3 (1 ~ 10 (Seconds))
 - Check Fail Tolerance: 3 (1 ~ 10 (Successive Checks))
 - Check WAN Connectivity
 - Ping Default Gateway: 192.168.0.1
 - Ping this Address: [] (Domain Name or IP Address)
 - Check Cellular Connectivity
 - Ping Default Gateway: 0.0.0.0
 - Ping this Address: [] (Domain Name or IP Address)
 - Check Traffic Redirection Connectivity
 - Ping Default Gateway: 192.168.0.1 (indicated by a red arrow)
 - Ping this Address: [] (Domain Name or IP Address)

Figure 10: WAN Continuity Check for Traffic Redirect

Testing Traffic Redirect

You can easily test the Traffic Redirect feature by removing the LAN-Cell's WAN cable (if used) or by changing the Cellular 3G card's configuration such that it cannot make a connection (e.g. change the ISP Access Phone number on the **WIRELESS->CELLULAR** screen).

Note: You cannot test Traffic Redirect by disabling the Cellular interface. The Traffic Redirect function is managed by the interface software – the WAN/Cellular interfaces must be enabled but not able to route traffic for the Traffic Redirect feature to work.

Note About DNS Resolution

When Traffic Redirect is active, you may have issues with resolving DNS names to IP addresses. If you are able to connect to Internet hosts via their IP address but not their DNS name, the issue is most likely that your ISP's are not permitting DNS lookups from devices outside of their network.

The LAN-Cell is a caching DNS-relay server. You should configure your LAN devices to use the LAN-Cell's LAN IP address as their DNS server – the LAN-Cell will forward DNS requests to the proper ISP based on the currently active WAN interface.

You may also need to inform the LAN-Cell about the availability of a DNS server on the backup gateway's subnet so that DNS requests can be passed to that subnet when Traffic Redirect is active. Go to the **ADVANCED->DNS**

screen and enter the IP address of a DNS server on the backup gateway's subnet (Figures 11-13). In many cases, the backup gateway's IP address can be used -- it will relay the DNS request to the appropriate server.

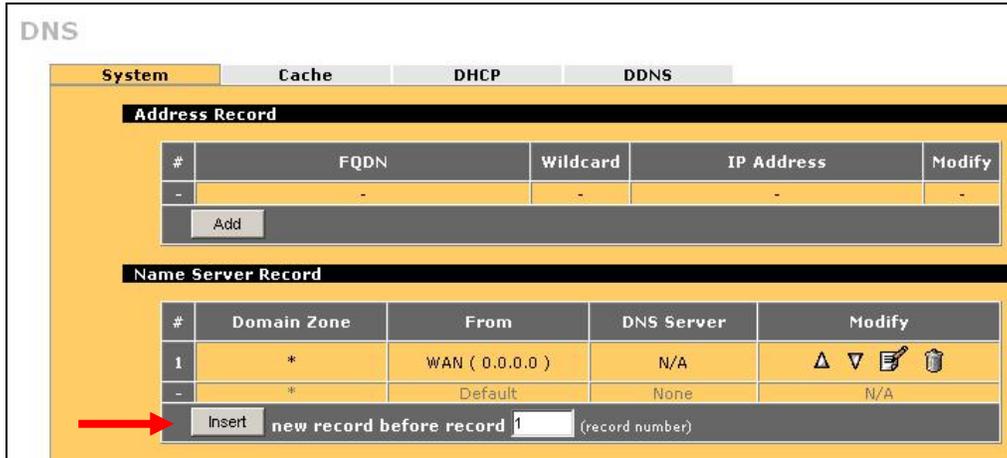


Figure 11: Insert DNS Server

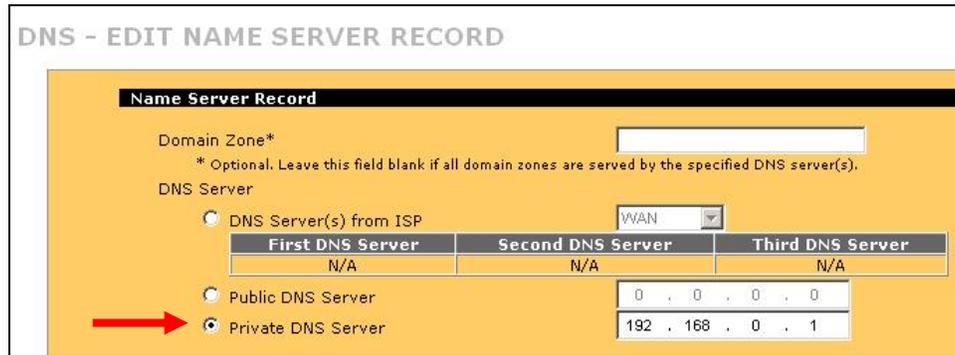


Figure 12: DNS Server on Backup Gateway Network

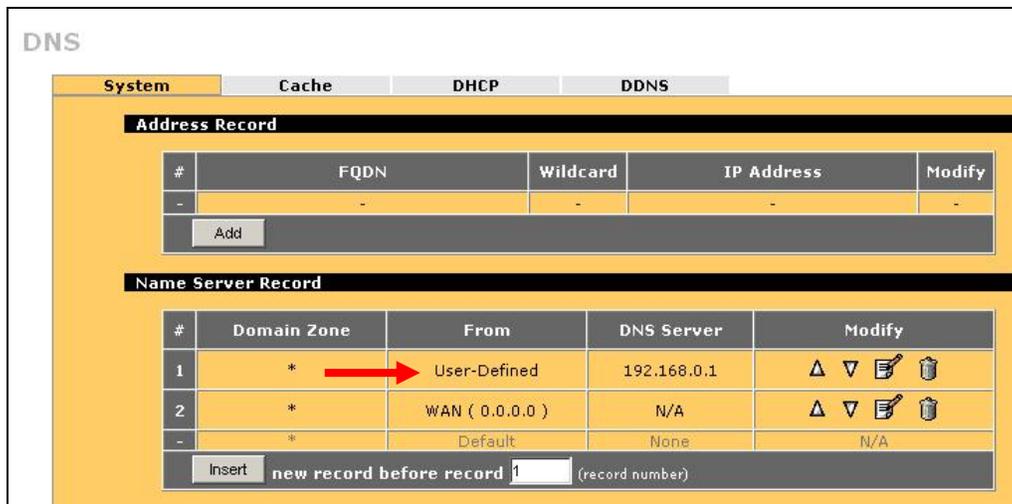


Figure 13: DNS Server on Backup Gateway Network

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