



## TN0001 - Configuration as a Name Server

TN0001 22 August, 2007

### Purpose:

The Ctek SkyRouter may be used as a freestanding Dynamic DNS (name server) for the purpose of routing wireless Wide Area Network traffic to a remote SkyRouter. This technical notice describes that configuration and its operation.

### Background:

Wireless networks dynamically assign Internet Protocol (IP) addresses to devices registering for packet side (IP) operation. Without an intermediary there is no way for a host system to know the currently assigned IP address and make a connection to a network registered SkyRouter or a LAN side device behind the SkyRouter. Ctek has implemented Name Server logic in each Series 4100 SkyRouter that allows it to be configured as this intermediate point for the purpose of converting a user assigned name to a network assigned dynamic IP address. Ctek's Name Server solution is based on standard IP addressing and DNS methods and should be easily adaptable to most Internet aware applications.

### Naming The Parts:

Throughout this technical notice we will be talking about two different SkyRouter configurations, one referred to as a Name Server and the other referred to as an Edge Router. A complete network is made up of one or more Edge Routers and one or at most two Name Servers. A pair of Series 4100 Name Servers can support a large number of Edge Routers. Exact configuration parameters can only be established once the traffic patterns are understood. We will also be referring to devices connected to the SkyRouter LAN as End Points and the application requesting access as the Host Application. Figure one shows this basic architecture.

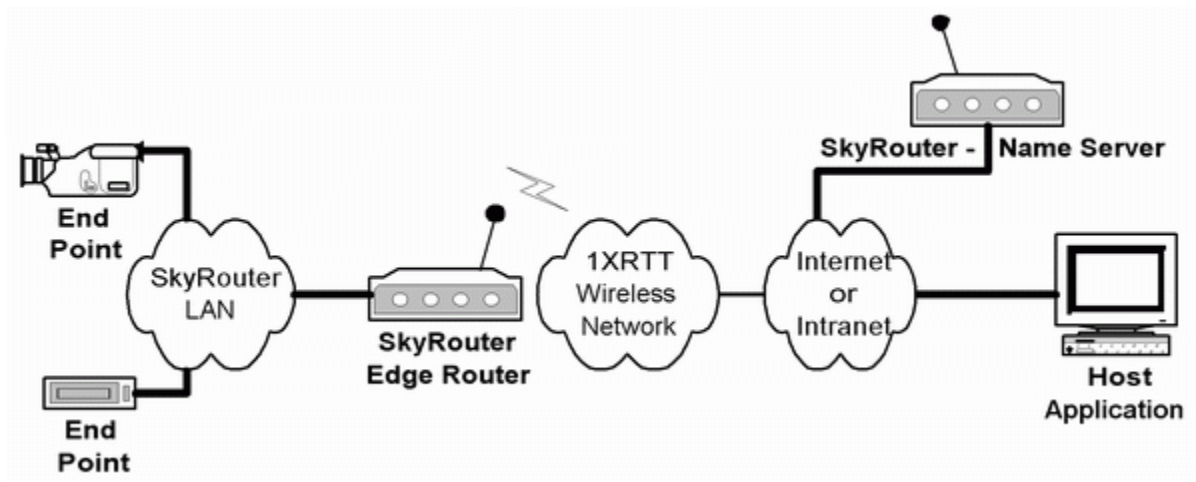


Figure 1



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### Theory Of Operation

A SkyRouter may be configured to operate as a wireless edge router or as a name server. If the edge router mode of operation is selected two additional options allow the user to choose between a "On Demand" and "Always On" method of interacting with the wireless network. All of these choices are made through the Wireless Interface Configuration screen within the SkyRouter's administrative menu hierarchy. Figure 2 below focuses on the data entry fields to select these operational characteristics.

http://68.15.89.142/admin-bin/cfg\_cdma.cgi - Microsoft Internet Explorer

Address http://68.15.89.142/admin-bin/cfg\_cdma.cgi

**Wireless Interface Configuration**

User Name: wirelessuser@somewireless.com  
Password: \*\*\*\*\*

Connection Type: Always On  
Inactivity Timeout: 30 Min

Use network provided dynamic IP address  Use the following static IP address: \_\_\_\_\_

Client For Dynamic IP Address Resolution:  None  SMS DNS  UDP DNS

Device Name: skyrouter\_01.somewireless.net

Primary Name Server: 192.168.68.01 Secondary Name Server: 192.168.68.01

Provide Network Name Server Facilities:  Yes  No

Update Home

Figure 2

### Edge Router Operation

SkyRouters configured to operate as edge routers will register with their assigned name servers based on the following parameters also assigned through the Wireless Interface Configuration screen shown in Figure 2.

**Connection Type** – Used to manage conditions under which a wireless WAN connection will be made.

Disabled – Never connect to the wireless network

On Demand – Only connect when there is outbound traffic to route

Always On – SkyRouter remains connected to the wireless network independent of whether there is outbound traffic or not. In this mode SkyRouter will automatically reconnect to the network if disconnected or if its IP lease expires



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**Device Name** – Establishes the name by which this particular SkyRouter will be known at the Name Server. To apply this setting you must do a restart from the top-level administration screen after all changes have been made. If the unit is in “Always On” mode it will first register with the wireless network and then with its assigned Name Server(s). If the unit is in “On Demand” mode network and Name Server registration will be deferred until the SkyRouter is asked to route data over the wireless WAN.

**Primary and Secondary Name Server** – Enter either phone number (SMS updates) or the IP address of the designated Name Server.

The choice of whether to use SMS Name Server updates or UDP Name Server Updates is an important one. If SMS is selected you will incur additional SMS charges from your wireless network operator in accordance with the wireless plan that is being used. If the UDP method of update is selected you will incur additional packet charges for these updates. In most cases the UDP method will be less costly. The SMS method of operation is especially attractive if you wish to use a Name Server that sits behind your firewall, as your firewall will have to open, for UDP traffic, Port 53.

The Primary and Secondary Name Server address fields may be set to either a 10 digit phone number (MIN) assigned to the SkyRouter acting as a Name Server or to a Static IP address that you have assigned to the SkyRouter that is providing Name Services.

### Name Server Logic – Edge Router Perspective

#### Initialization

When the SkyRouter is powered on or encounters a reset it will examine its flash memory settings to determine how to interact with the network, and with any assigned Name Servers. At this point the “Always On” and “On Demand” settings come into play.

#### Always On

In the Always On mode the SkyRouter attempts to register with the wireless network upon powering up. As soon as the registration is complete the SkyRouter will update its assigned Name Server(s) using either SMS or UDP as selected. From that point on the SkyRouter monitors the state of its connection to the wireless network. If the network de-registers the SkyRouter for either inactivity or because the DHCP lease has expired, the SkyRouter will once again attempt to register with the network and update its Name Servers. Also, in “Always On” mode the SkyRouter will, at a minimum, update its assigned Name Servers every 7 hours without regard to whether its IP address has changed or not. The Always On mode of operation insures that the Name Server has a very high likelihood of having an up to date IP address available for inbound applications.

#### On Demand

In the On Demand mode a SkyRouter does not attempt to connect to the wireless network or update any assigned Name Servers until a LAN side endpoint has requested that data be routed over the wireless WAN, or until a wake up request is received from a name server at the request of a host application. When either of these occur, the SkyRouter will register with the network and will also update its assigned Name Servers. A portion of the update message passed to the Name Server indicates whether the SkyRouter is in “Always On” or in “On Demand” mode. Neither the SkyRouter nor its assigned Name Servers makes any attempt to maintain an up to date IP address in the Name Server entry for “On Demand” clients beyond the life of the connection granted by the wireless network.



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### **Name Server Logic – SkyRouter Serving as a Name Server Perspective**

A SkyRouter configured to operate as a Name Server is a special purpose configuration that allows you to use name services to route inbound traffic to your conventional (edge router) SkyRouters and to endpoint devices on the LAN side of those SkyRouters. While two (2) SkyRouters may be configured as Name Servers for redundancy, in many cases one will suffice for the application's needs. To use this special configuration there are a few requirements that the set up must meet.

- 1) The Name Server SkyRouter must have a wireless plan that allows SMS messaging. Even in the UDP update mode SMS is used to perform wake up.
- 2) The Name Server SkyRouter must be assigned a Fixed (network routable) IP address on the terrestrial LAN that will be used by host applications wishing to connect to SkyRouters through the wireless network.
- 3) The IP address or Host Name assigned to a SkyRouter Name Server will need to be configured in the application client software as a Domain Name Service for that application. Since DNS is hierarchical in nature a higher level DNS can be assigned so long as the proper division of the application name space allows SkyRouter DNS requests to be passed down to the assigned address of the SkyRouter providing name services for your wireless endpoints.

Beyond these key points very little set up is required. You will need to configure the Name Server's LAN side addressing using the Ethernet Interface Configuration screen. These settings are discussed in detail in the appropriate SkyRouter User Manual. You will also need to select the Provide Network Name Server button on the Wireless Interface Configuration screen shown in figure 2. Lastly, if UDP updates has been selected for the edge routers you must insure that UDP traffic on Port 53 can be routed to the Name Server from the Internet. This is an especially important consideration in the event that your Name Server and Application clients are protected by a firewall.

### **Name Server Logic – Name Server Perspective**

#### **Initialization**

When a Name Server powers up or encounters a reset it attempts to refresh its records by sending Wake Up messages to all clients having previously created "Always On" registration records. Any Wake Up attempts that fail will be repeated on an 8 hour schedule. At this point the Name Server is in synchronization with its client base.

#### **Always On Edge Router Clients**

The Name Server will verify at 8 hour intervals that any Always On clients registered with it have updated their client records based on their internal 7 hour update time as described above. If the scheduled update has not occurred that particular edge router will go back into the wake up queue (see initialization) until its record is updated.

#### **On Demand Edge Router Clients**

When an "On Demand" client registers with the Name Server a client record is created indicating the length of time that the client intends to attempt to keep the connection active. Once that time has expired the edge router client record is marked as de-registered and no further action is taken unless a host application attempts to connect with the edge router.

#### **Host Application**



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When a host application wishes to connect with an edge router over the wireless network it sends a standard DNS request (IETF RFC 1035 and subsequent RFCs) to the Name Server providing Name Services for the wireless name space requested. There are three possible responses to this request.

- 1) A record on the requested name exists and is in a registered state. In this case the IP address of the edge router is returned.
- 2) A record exists but it is in a de-registered state. In this case a wake up request is issued and the records status is monitored for 45 seconds. At the end of the 45-second timer the Name Server will have either received an updated registration or it will mark the record as inactive. An error is returned indicating that the Name Server was unable to process the request. This condition should be used to trigger a retry attempt by the application at some interval greater than 45 seconds.
- 3) No record on the requested edge router exists. The Name Server responds with a no address exists error.

### **Methods of Creating Edge Router Client Records in the Name Server**

In order to allow a SkyRouter (edge router) to register with a Name server a client record must first be created on each Name Server unit. This is accomplished through the Name Server services screen found on the top level SkyRouter administration menu. The Name Server services screen supports the management of individual Name Services clients. Client records are accessed by their phone number (MIN) and may be added, deleted, or simply displayed.



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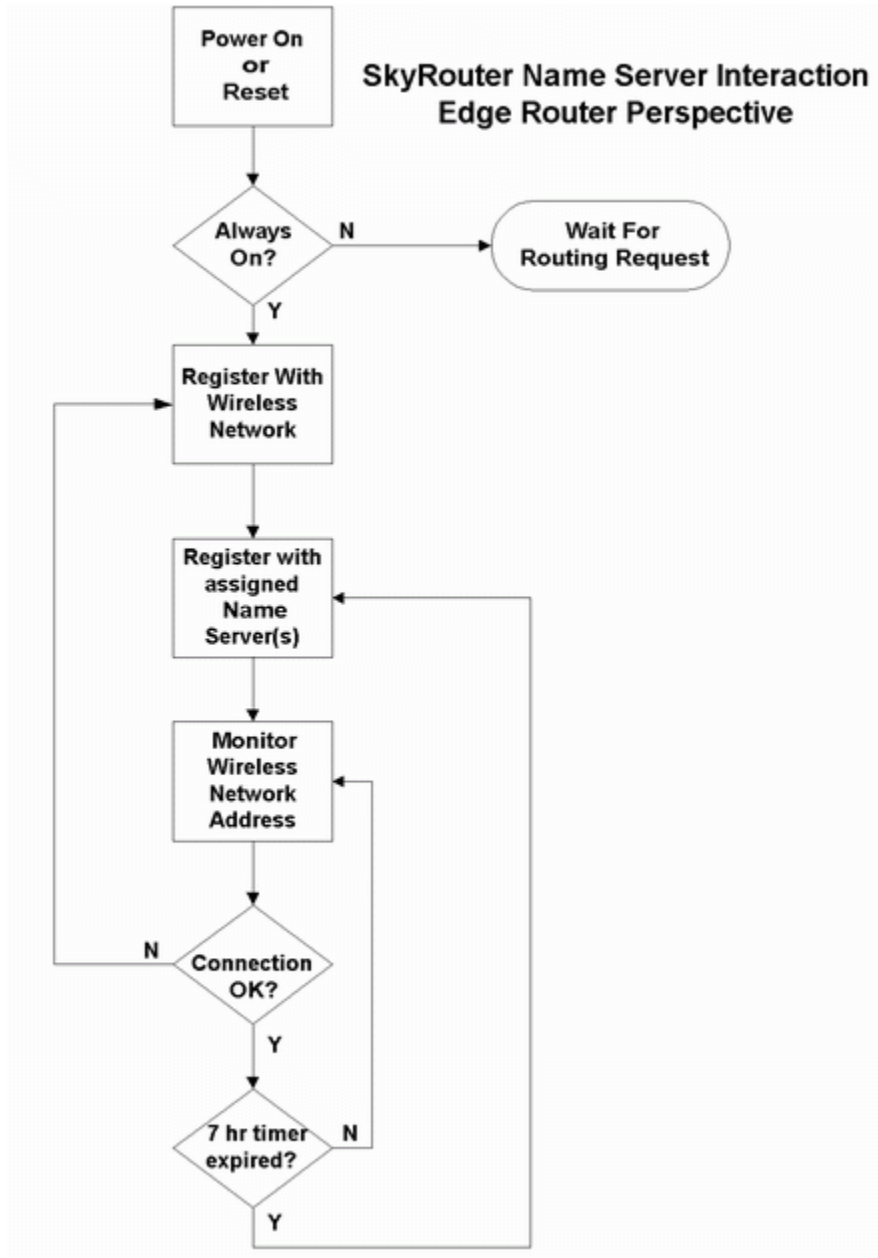


Figure 3



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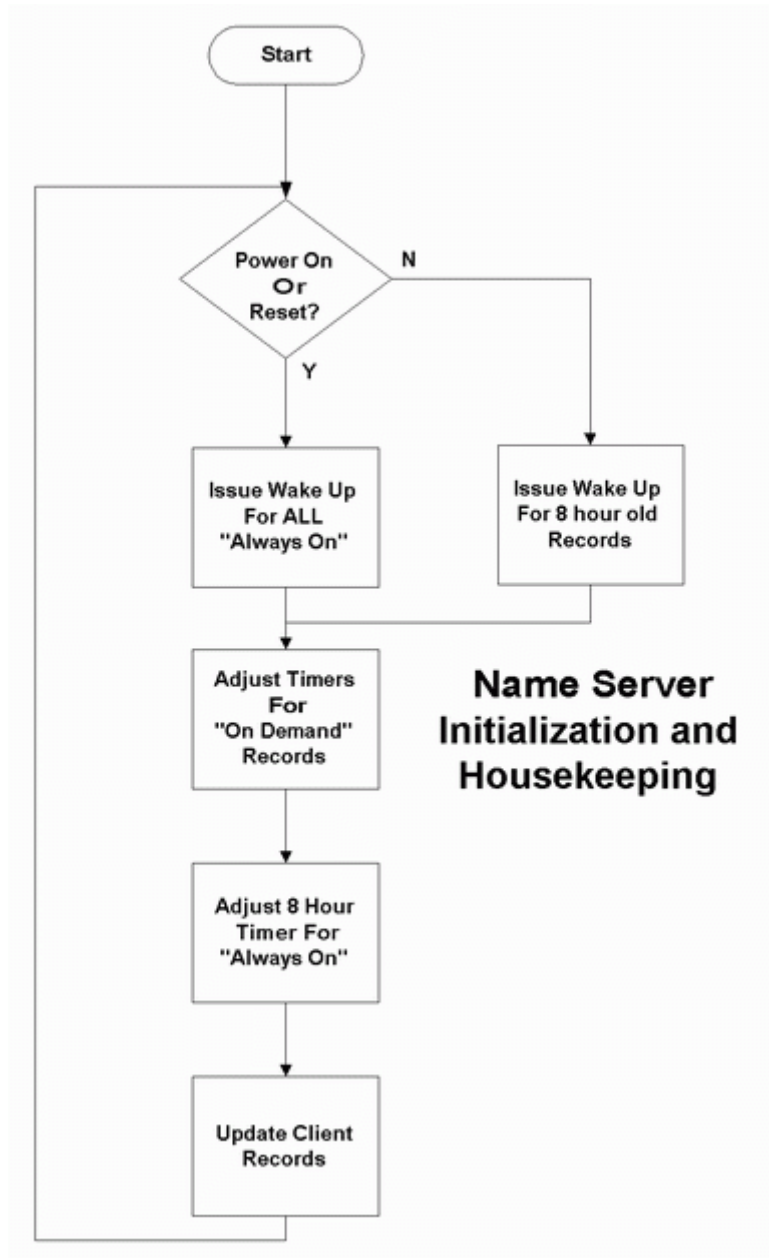


Figure 4