Sky Router Automatic Configuration Facility

Tech Note – TN1033
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4550 Automatic Configuration Facility (TN033)

Applicability

All model 4550 SkyRouters

Background Information

Previous models of Ctek's SkyRouter have provided an automatic configuration facility as documented in TN013. The Ctek 4550 provides a simplified facility that supports configuration of both the router and the radio. The major differences between the 4550 facilities and those of previous models arise from the fact that the 4550 contains a multi-carrier radio.

The resulting differences are:

1. It is now necessary for auto-configuration to ensure that the correct radio firmware is installed before configuring the wireless account information and router parameters.
2. The method of creating the configuration file (radio.conf) is now based on the Backup/Restore utility resident on every 4550 SkyRouter.

Theory of Operation

The radio module in the 4550 can be programmed to run on a number of wireless networks. Because it is a 4G device, the radio module receives almost all of its network and account specific configuration information from the network, the one notable exception being the selection of an APN, which is handled by the automatic configuration facility. Therefore, it is mandatory that the inserted SIM be the correct SIM for the radio module's resident firmware image. If there is a disagreement between the SIM and the installed radio firmware, the correct radio firmware will be loaded during the automatic configuration process.

The 4550 provides four areas for radio firmware and radio configurations:
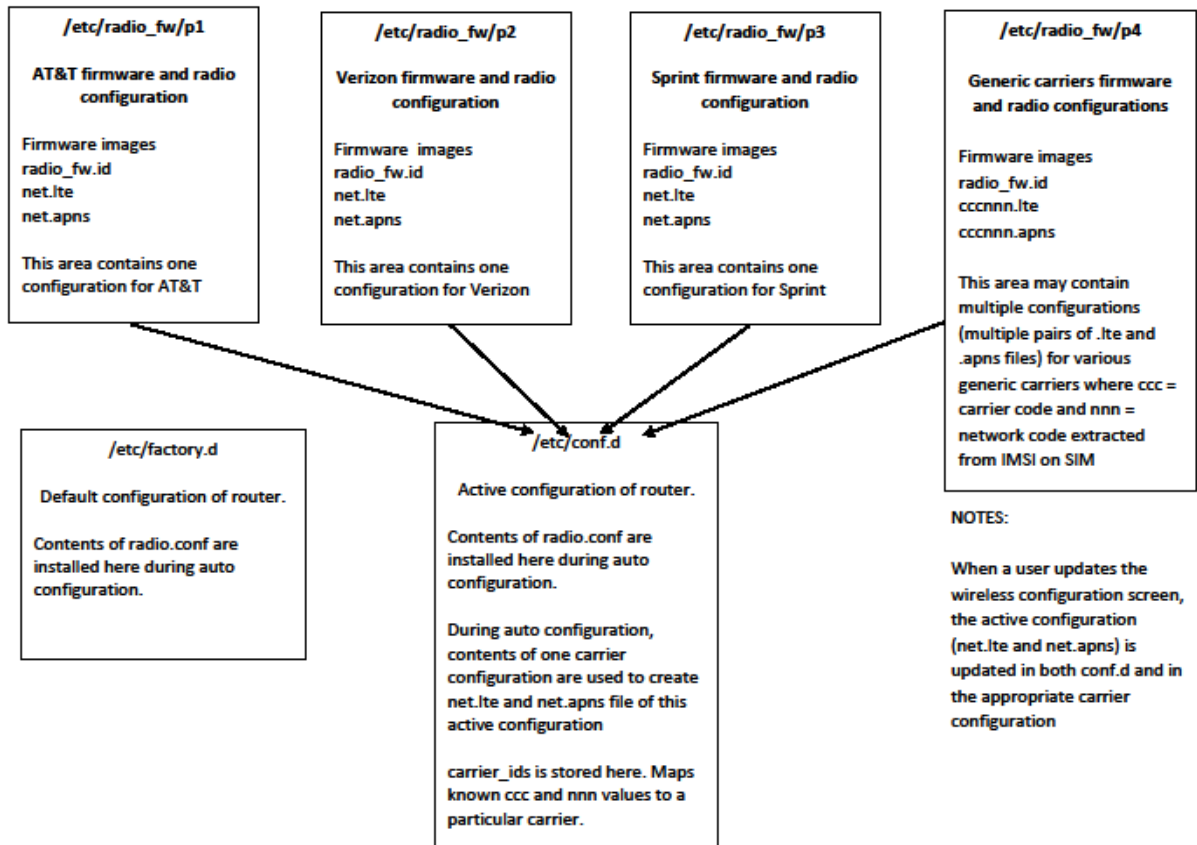
1. AT&T
2. Verizon
3. Sprint
4. Generic

The generic area is designed to accommodate most of the legacy GSM carriers and can actually contain numerous generic carrier configurations.

The automatic configuration facility examines the Country Code and Carrier Code components of the IMSI (from the SIM) to determine the desired network that the device is to operate on. If required the radio module's firmware imaged is reloaded from the appropriate area and the configured APN is selected before the SkyRouter specific portions of the automatic configuration are performed.

If a legacy GSM carrier, e.g. T-Mobile or any MVNO is going to be included in the automatic configuration process an updated configuration file (radio.conf) must be created using the SIM provided by that carrier. If, as in the case of an MVNO more than one Carrier Code or Country Code is employed the configuration file must contain entries from each combination that will be used.

Figure 1 depicts the directory structure for each network and its relationship to the active configuration and to the factory default area.

Figure 1

/etc/radio_fw/p1	/etc/radio_fw/p2	/etc/radio_fw/p3	/etc/radio_fw/p4
AT&T firmware and radio configuration	**Verizon firmware and radio configuration**	**Sprint firmware and radio configuration**	**Generic carriers firmware and radio configurations**
Firmware images radio_fw.id net.lte net.apns	Firmware images radio_fw.id net.lte net.apns	Firmware images radio_fw.id net.lte net.apns	Firmware images radio_fw.id cccnnn.lte cccnnn.apns
This area contains one configuration for AT&T	This area contains one configuration for Verizon	This area contains one configuration for Sprint	This area may contain multiple configurations (multiple pairs of .lte and .apns files) for various generic carriers where ccc = carrier code and nnn = network code extracted from IMSI on SIM

/etc/factory.d

Default configuration of router.

Contents of radio.conf are installed here during auto configuration.

/etc/conf.d

Active configuration of router.

Contents of radio.conf are installed here during auto configuration.

During auto configuration, contents of one carrier configuration are used to create net.lte and net.apns file of this active configuration

carrier_ids is stored here. Maps known ccc and nnn values to a particular carrier.

NOTES:

When a user updates the wireless configuration screen, the active configuration (net.lte and net.apns) is updated in both conf.d and in the appropriate carrier configuration

Things That Remain the Same

1. Auto configuration of SkyRouter parameters is still controlled by a file called radio.conf which must be placed in the same location as with previous models: /etc/conf.d. However, radio firmware, APN information, and other network specific information is stored in network specific directories as shown in Figure 1.
2. After installing the radio.conf file, auto configuration is still initiated by reset or power cycle.
3. Upon completion of the auto-configuration process, radio.conf will be renamed to radio.conf~. The unit will then reboot and should link up on its new data account.

Creating a Configuration File

The following steps will create an automatic configuration file for one or multiple carrier networks. The process described uses a single 4550 to create a set of configuration files for all networks that will be used. If an additional network is to be added later it may be added by repeating the steps below using the new (additional) network's SIM.

Note: For additional information on configuring a 4550 see TN032

1. Power down the unit to be configured
2. Remove the SIM from the unit
3. Power up the unit to be configured
4. Load the radio firmware for the network to be configured. See TN032.
5. Power down the unit to be configured
6. Install the SIM for the network to be configured

Note: Installed SIM must match the radio firmware installed in step 4

7. Power up the unit

Note: At this point, if the unit is configured for a legacy CDMA network (Sprint or Verizon) it will receive an activation download from the network. There may be some delay while the unit receives provisioning information from the wireless network. When completed, the network download will have set the MDN/MIN (Wireless Status – More) to the correct values for the account assigned.

8. On the Wireless Interfaces screen, verify that the correct APN is selected. On some networks, you may need to manually select the correct APN. Press update.
9. On the Wireless Interfaces screen set the Connection State to enabled and press update

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10. Perform a restart command
11. When the unit comes back up it should make a network data connection and receive an IP address
12. Perform all required setup that is not network dependent. Examples would be port forwarding, time and location source, serial PAD options, user accounts, etc. Be sure to press Update on each screen when the changes are completed
13. Repeat steps 1 – 11 for each carrier network to be supported.
14. Once all of the required networks have been configured, save the complete, multi-network configuration to a USB drive using the Entire System selection under the Backup/Restore utility. We recommend that the file saved be named *radio.conf* since that is its intended application.

Using the Configuration File

Once created the configuration file may be copied from the USB drive to the server or device that will be used to configure the 4550 SkyRouters in a production environment. To apply the configuration file to a SkyRouter apply the following steps:

1. The SkyRouter **must** have the appropriate network SIM installed
2. Using a file transfer application such as FTP copy the configuration file to a file named **radio.conf** in the **/etc/conf.d** directory of the SkyRouter.
3. Reset or power cycle the target SkyRouter

4. **NOTE:** If the **radio.conf** file is not installed in the **/etc/conf.d** directory the SkyRouter will boot and configure based on the parameters set using the UI.

5. In order to select proper firmware, the SkyRouter will analyze the IMSI, which is programmed on the SIM by the carrier. This provides the program with the country code and carrier code, which is used to determine whether the correct carrier firmware is installed in the radio. If the correct firmware is present, the process proceeds with router configuration and carrier account parameters. If different network firmware is required, that will be done before proceeding on to router configuration and carrier account parameter setup. This radio firmware programming step adds several minutes to the auto-configuration process as the radio firmware files are rather large.

6. When auto-configuration is running, you will see the LINK and SVC LEDs blinking an alternating green pattern. First one will be on and then the other. This pattern will continue until success or failure.

7. Upon success, the LINK and SVC LEDs will blink green in unison for 10 seconds. The unit will then reboot and you should see the router connect (Link) on the carrier account. Operational SVC and LINK patterns are the same as previous SkyRouter models.

8. Upon failure, the LINK and SVC LEDS will blink in unison with the Link being RED and the SVC being yellow. The unit will remain in this state indefinitely to insure that the failure is detected.