



Composer Pro Software Release Update Instructions - 1.7.x to 1.8.0

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As the operating system for the connected home, Control4 brings home automation and control to the broad market. Control4 technology is at the heart of an expanding ecosystem of leading consumer electronics products that work together effortlessly. Control4 designs and delivers award-winning control software and hardware for virtually any room, home or building from anywhere at any time. Control4 is an affordable, easy to use, and easy to install solution for digital living. From essential energy management to one-touch entertainment; from whole-home lighting control to comprehensive security systems, Control4 is the platform for managing all the pieces of today's connected life.

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1. Introduction

The main advantage of the Control4® Release 1.8.0 software update is that Control4's support of the ZigBee Pro stack enables Control4 interoperability with other ZigBee Pro-compliant devices.

The Release 1.8.0 software update is more complicated than previous Control4 system updates. You will be updating all of your ZigBee devices to run on the ZigBee Pro stack. Because of this, *a complete replacement of the firmware on all devices is required.*

For more information about ZigBee Pro, see Section 3.2, "ZigBee Pro." For more information about other enhancements and changes with the 1.8.0 software release, see the *Composer Pro Software Release Version 1.8.0 Release Notes*.

In addition:

- Not all devices are supported in Release 1.8.0. See Section 3.10, "Device Support" for details.
- When you start this update, you cannot revert back to a previous version of the software. See Section 4.2, "Prepare for the Update" for details.
- This update is recommended primarily for new installations. Note that even new installations will still require this update. A majority of the firmware on the devices you install for the first time will be using previous versions of the software.
- The Home Theater Controller (HTC) and Media Controller (MC) no longer can be used as Primary Controllers when this update is in place. See Section 1.4, "Upgrade Requirements."

IMPORTANT! Control4 highly recommends that you read and understand *all* of the information and instructions provided in the *Release Notes* and in this document prior to beginning your update to version 1.8.0. You can then use Section 2, "Quick Start" in this document as a reference regarding the major tasks needed to complete the update process.

1.1 Purpose

This document gives an overview of important Control4 ZigBee Pro concepts. It also describes the procedures you will use to update existing Control4 systems to Release 1.8.0.

1.2 Scope

This documentation has a "Quick Start" section; more detailed documentation follows. Control4 recommends that you spend some time reviewing the complete document prior to updating your first system to Release 1.8.0. However, at a minimum, please make sure that you follow the steps outlined in Section 2, "Quick Start."

1.3 Related Documents and Resources

- *200-00149 ZigBee Update Stick User Instructions*
- *200-00001 Composer Pro User Guide, Version 1.8.0*
- *TechDoc00007 Composer Pro Software Release Version 1.8.0 Release Notes*

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1.4 Upgrade Requirements

The requirements to upgrade include:

- The system must be version 1.6.0 or later. Versions prior to this (1.2.x or 1.3.x) first should be updated to version 1.7.3.
- The system's Primary Controller must be Home Controller HC-1000, HC-500, HC-300 or HC-200 (single Controller systems only). The Media Controller (MC) and Home Theater Controller (HTC) are no longer supported as Primary Controllers. They can continue to serve as Secondary Controllers in the system, however.
- Physical presence/action required. While the update can be started over 4Sight Remote Access, devices must be joined to the ZigBee Pro mesh network using a button press or button tap sequence. See Section 6, "Additional Information."

2. Quick Start

Follow these quick start instructions after you've read through this document. Use this section as a reference and checklist so you know how to proceed through each major step of the upgrade process.

1. Plan your ZigBee Pro upgrade:
 - a. Calculate how much time the ZigBee Pro firmware updates will take. See Section 4.1, "Plan Your Time and Effort."
 - b. Determine which Controller(s) will be updating EmberNet devices to MiniApp and which Controller(s) will be running ZigBee Server and ZigBee Access Points (ZAPs). See Section 3, "Important ZigBee Concepts."
2. Prepare your system for the update, and ensure that you have
 - a. Backed up your project. See Section 4.2, "Prepare for the Update."
 - b. Placed all devices (IP and ZigBee) online and identified them to the network.
3. Download and install Composer 1.8.0. See Section 4.2, "Prepare for the Update."
4. Update your Control4 system using Update Manager. See Section 4.2, "Prepare for the Update."
5. Create your ZigBee Pro mesh network. See Section 3, "Important ZigBee Concepts."
6. Enable an EmberNet Update Controller, or use a ZigBee Update Stick (ZStick) to migrate EmberNet devices to MiniApp. See Section 3.3, "Firmware."
7. When devices are in MiniApp mode, join them to the ZigBee Pro Network. See Section 3.4, "Join a Device to the Network."
8. Monitor the update status of the ZigBee devices using Network Tools. See Section 4.4.5, "EmberNet Upgrade Window – Network Tools."
9. After all devices have been updated and are online, use "Sync All Scenes" to ensure that all of your Lighting Scenes work correctly. See Section 4.4.15, "Lighting Scenes."
10. After the update is completed, back up the system again. The ZigBee Pro mesh information is included with the project in Release 1.8.0. If you ever need to reload the project on the system, you will want to load a project with the correct ZigBee Pro mesh information to avoid having to recommission the network.

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3. Important ZigBee Concepts

Before you begin the upgrade process, become familiar with and understand the terms and concepts in this section.

3.1 EmberNet

Control4 has used ZigBee (802.15.4) radio frequency (RF) communications in Control4 products since the initial products were released in 2005. For the purposes of distinction from ZigBee Pro, Control4 will refer to the 'original' stack as *EmberNet* in these instructions.

The EmberNet version of ZigBee was implemented by Control4 prior to the ratification of the ZigBee Pro standard by the ZigBee Alliance in 2007.

3.2 ZigBee Pro

With the 1.8.0 software release, all Control4 ZigBee devices will be updated to ZigBee Pro. Interoperability with third-party devices in the ZigBee Pro world is accomplished through support for standard profiles. Control4 is implementing support for the Home Automation (HA) profile so that any HA-compliant ZigBee Pro device will work in a Control4 system.

Additionally, Control4 is working with partners interested in developing ZigBee Pro devices. Control4 is providing a software development kit (SDK) and firmware to facilitate Control4 product development and ensure seamless interoperability.

Some of the network-level changes included in Control4's ZigBee Pro implementation include:

- Full on-air encryption of all RF communications—All RF communications are AES encrypted.
- Creation of the secure mesh network—Only devices that have been joined to the mesh network can communicate with each other.
- Secure join—Each ZigBee device needs to be 'joined' to the network by a physical action at the device (or by entering the MAC address via the provisioning). This is accomplished for all new devices through the Control4 identification process (identify devices). However, for updated systems, this means that devices which were previously identified in the project must be joined to the ZigBee Pro mesh also when they are updated.

3.3 Firmware

Firmware is the software program that resides on the device (Dimmer, Switch, etc.) and includes the ZigBee Pro stack for communications with the rest of the Control4 system as well as device-specific functionality.

There are two (2) types of Control4 firmware images for ZigBee Pro devices, depending on the amount of memory available on the device: MiniApp and Full Image.

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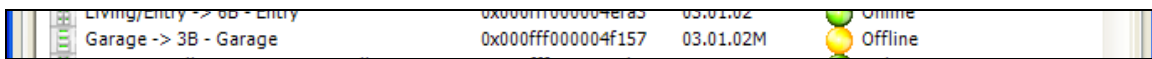
3.3.1 MiniApp

MiniApp is an important first stage in the upgrade process for these devices (not all devices, however):

- Control4 Dimmers
- Switches
- Keypads
- Outlet modules

These devices do not have sufficient onboard memory to update directly to the full ZigBee Pro firmware image, so updating these devices requires two (2) stages.

1. In the first stage, the device joins the ZigBee Pro mesh network, and the base ZigBee Pro network stack is installed. This firmware image is called *MiniApp*. When the device is running MiniApp, all it does is join the ZigBee Pro mesh network and cannot respond to commands or provide information to the system.
2. When a device is in MiniApp mode, the Control4 Installer must join that device to the ZigBee Pro network before the full ZigBee Pro firmware image can be installed (second stage). A device in MiniApp mode will have an 'M' at the end of the firmware version listed in Composer's Network Tools tab (see example below).



| | | | |
|----------------------------|--------------------|-----------|---------|
| Living/Entry -> 0B - Entry | 0x0001100004era5 | 03.01.02 | Online |
| Garage -> 3B - Garage | 0x000fff000004f157 | 03.01.02M | Offline |

Note: MiniApps do not handle button presses very well. The result is that by just clicking the button as you normally would to turn the light on and off, for MiniApps, it doesn't work reliably. If you hold the button for about one half of a second, it will usually work.

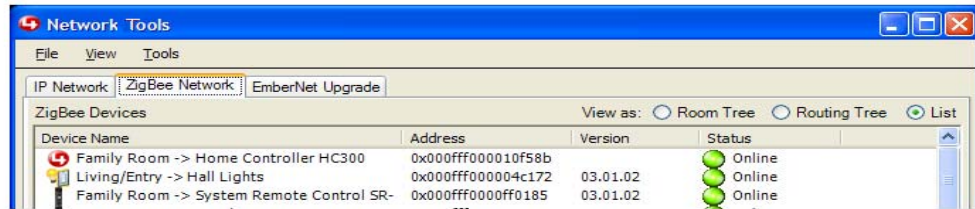
3.3.2 Full Image

All devices must have the *full image* to function correctly in the Control4 system. Devices that require MiniApp for the firmware update are then updated to the full image.

These devices have sufficient memory to update directly to the ZigBee Pro firmware:

- Control4 Thermostat
- System Remote Control SR-150
- System Remote Control SR-250

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Refer to Section 3.3.1, “MiniApp” for a list of devices that require MiniApp.

3.4 Join a Device to the Network

Because each Control4 system’s RF network is a secure ZigBee Pro mesh network, each device previously on an EmberNet network must be joined to the ZigBee Pro mesh network during the update process. You *join* MiniApp devices after the update to MiniApp is completed. After the device has joined the mesh network, it will finish updating to the full ZigBee Pro firmware image.

Devices that don’t need a MiniApp image must be joined to the ZigBee Pro mesh network after the update to ZigBee Pro firmware is completed.

To join a device to the mesh network:

New device with EmberNet firmware image

1. Update the new device firmware from EmberNet to ZigBee Pro. See Section 4.4.12, “Add an EmberNet Node that Is Not in the Project” for information about how to add a device to the system for manual updates.
2. Add the new device to your Composer project.
3. Identify the new device using **Connections > Network**.

New device with ZigBee Pro firmware image

1. Add the new device to your Composer project.
2. Identify the new device using **Connections > Network**.

Existing EmberNet device already in the project

1. Update the device firmware from EmberNet to ZigBee Pro.
2. Make sure the mesh network is in auto-join mode.
3. Join the device to the mesh network using the appropriate key presses.

Existing ZigBee Pro device that was previously on another mesh network

1. Use the appropriate key sequences on the device to Leave Network (see Section 4.4.11, “Leave the Network.” A device won’t try to join a mesh network if it has previously joined another mesh network and hasn’t been told to Leave Network.

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2. Add the device to the Composer project.
3. Identify the device using **Connections > Network**.

Recommissioning the mesh network with devices already in the project

Note: Recommissioning the ZigBee Pro mesh network should not be done very often. It will need to be done if the ZAP coordinator needs to be changed.

Follow these steps if you ever need to recommission your mesh network:

1. Use the appropriate key sequences on the device to Leave Network.
2. Make sure the mesh network is in auto-join mode (see the next section for details).
3. Join the device to the mesh network using the appropriate key presses (see Section 6.3, "Button Press Magic Sequences").

3.4.1 Enable Auto-Join

To join devices to the mesh network, enable **Auto-Join**.

You can perform Auto-Join using the following methods:

- **Identify**—When you identify a device, auto-join is enabled automatically, allowing devices to join the network. As long as the Identify window is open, any device already in the project can join the mesh network. The primary use of the Identify window is to identify specific devices that weren't previously in the project. Devices that attempt to join the mesh network not previously identified in the project are added to the mesh network and identified. The device being identified has to be the correct type of device and you use the correct driver loaded in the project.

Note: Only devices that are already identified in the project can be joined. Devices that are not identified in the project are not allowed to join (use the Identify dialog for these devices).

- **EmberNet Updates**—When an EmberNet Upgrade Controller is active in the Control4 system, the mesh network is kept in Auto-Join mode.
- **Allow Join**—Use the Composer Tools menu, **Network Tools > ZigBee Networks** tab and interface to Allow Joins to (or Secure) the mesh network. This setting persists until changed or until Composer is closed, at which time the mesh network returns to Secure mode.

3.5 ZigBee Server (zserver2)

Each Control4 system has one (1) ZigBee server only which can run on any HC-class Controller.

Note: The HTC and MC will not run the ZigBee server.

The ZigBee Pro Server process name is zserver2. The ZigBee Server does not have to run on the same Controller as the ZigBee Access Point (ZAP). Since the Controller running ZigBee Server does not require a ZigBee radio, the Home Controller HC-1000 makes an excellent ZigBee Server.

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3.6 ZigBee Access Point (ZAP)

Beginning with Release 1.8.0 every Control4 system has at least one ZAP. The Controller running the ZAP must have a ZigBee radio. One of the ZAPs is the mesh network coordinator responsible for the security of the network mesh. ZAP can run on each Home Controller HC-200, HC-300, HC-500, HTC, or MC in the Control4 system.

ZigBee devices communicate with the nearest (or strongest) ZAP. With multiple ZAPs the Ethernet network tunnels traffic to ZigBee devices, extending the ZigBee network range particularly on systems without a lot of ZigBee devices in the mesh.

Note: ZAP and zserver2 are separate processes, but both are required for the update. Only one (1) zserver2 and ZAP is required, but there may be several ZAPs. ZAP cannot run on the Home Controller HC-1000 because it doesn't have a ZigBee radio (which is required). ZigBee Server and ZAP can run (but don't have to) on the same Controller.

3.7 EmberNet Upgrade Controller (zserver)

You can configure any Home Controller HC-200, HC-300, HC-500, HTC, or MC to run the old zserver process (zserver). Either a ZStick or an EmberNet Upgrade Controller is needed to update EmberNet devices to ZigBee Pro.

Note: It is important to understand that the Embernet Updater (zserver) process and ZAP *cannot* be running at the same time on a single Controller unless a ZStick is used (see Section 3.8, "Zigbee Update Stick (ZStick)" for information). That is because they both use the ZigBee radio. The radio firmware either can be loaded for EmberNet or ZigBee Pro, but not both at the same time.

For a faster upgrade process, you can have up to the same number as you have channels with EmberNet devices, however, it is not necessary that you have the same number. A single Upgrade Controller will look for devices on all channels. Only one EmberNet Upgrade Controller/ZStick will be used on any given channel at a time.

After the EmberNet upgrade is completed, disable the EmberNet Upgrade Controllers to increase the security of your ZigBee Pro network.

3.8 Zigbee Update Stick (ZStick)

Control4 created an EmberNet ZigBee radio with a USB interface called the ZigBee Update Stick (C4-Z2420EU-USB).

The ZStick is available as a separate product for a nominal charge to Control4 Dealers. The ZStick is useful as a tool for Installers during the EmberNet upgrade process, and works well with Home Controller HC-200, HC-300, and HC-500. This device allows both ZigBee Pro and EmberNet to run on the same Home Controller HC-200, HC-300, or HC-500.

Note: The ZStick does not work on the HTC, the MC, or the HC-1000.

One of the primary advantages of the ZStick is that it allows single Controller systems to run both ZAP and zserver at the same time by adding another radio to that Controller while the update is in process.

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Multiple EmberNet Upgrade Controllers and/or ZSticks can be used if the system being updated has devices on multiple channels. For more information, see Section 4.4.4, “ZStick Use.”

3.9 Channel

In Control4 Software Release 1.7.0 and previous versions, Dealers used multiple ZigBee Servers running on different channels to enable more responsive and higher node count (or distributed) EmberNet networks. With ZigBee Pro, only one channel is used for the entire system. The channel is selected automatically based on an RF energy scan at the time that the ZigBee Pro network is established; but it can be changed manually. Multi-ZAP configurations automatically and seamlessly provide the benefits that used to be realized by multiple zservers and channels.

Prior versions of Control4 systems used Channels 1-14. With ZigBee Pro, the channel numbering now uses Channels 11-26 in order to comply with the channel numbering specified in the ZigBee Pro standard. The actual channel frequencies are the same throughout. The new channels are the same as the old channel number + 11.

Example: The default channel was **14** on which all EmberNet devices were shipped. In ZigBee Pro, it is now channel **25** (14+11=25).

The ZigBee channel number can be changed any time as long as the Control4 system is not being updated. All ZigBee Pro devices on the mesh network automatically move to the new channel.

3.10 Device Support

All devices: Control4 or third-party (Card Access, MechoShade, etc.)—that were previously part of the Control4 system must have updated ZigBee Pro firmware to function with Release 1.8.0. In the initial 1.8.0 release, Control4 has not completed the update of ZigBee Pro firmware images for all Control4 devices.

The following devices are not supported with ZigBee Pro firmware (Release 1.8.0):

- **System Remote Control v1 / v2**—Control4 does not support the original System Remote Control devices with Release 1.8.0.
- **LCD Keypad**—Control4 does not support the ZigBee LCD Keypad in Release 1.8.0. The plan is to develop this firmware and add support for the ZigBee LCD keypad in Release 2.0. The Ethernet LCD Keypad will work just fine.
- **Contact/Relay Extender**—Control4 does not support ZigBee Pro on the Contact/Relay Extender. Configure this device using Ethernet to control it in the ZigBee Pro system. There are no plans to add support for ZigBee Contact/Relay Extenders in Release 2.0.
- **Audio products**—The firmware for the Control4 Audio Matrix Switch, Multi-Channel Amplifier, and Multi-Tuner products was not updated to support ZigBee Pro. Configure these devices using Ethernet so they will work properly in a ZigBee Pro system. There are no plans to add ZigBee support for these products in Release 2.0.
- **Card Access devices**—Card Access is currently working on adding ZigBee Pro support for their products. Control4 has firmware in the current build for their wireless contact relay and their heavy-duty power controller. Support for their other products will be provided at a later time.

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4. System Software 1.8.0 and ZigBee Pro Upgrade Instructions

Software Release 1.8.0 and the ZigBee Pro upgrade process are not trivial tasks to perform.

4.1 Plan Your Time and Effort

The ZigBee Pro upgrade is not a "start-and-forget" upgrade. It will take a significant amount of time and attention to update your Control4 systems, but the benefits will be well worth the effort involved.

Note: Control4 Dimmers configured in switch-leg mode will not control a load while in MiniApp mode. If you try to turn on the Dimmer while in MiniApp mode, it will cause the Dimmer to reboot. Plan your update accordingly (or keep a work light handy that you can use for temporary lighting).

- Plan on 3-5 minutes per ZigBee device for the update from EmberNet to MiniApp. If you have multiple ZigBee channels in your current system, you can use multiple EmberNet Upgrade Controllers.
- After the devices are updated to MiniApp, they need to be joined to the network before they will continue with the update.
- The update from MiniApp to the ZigBee Pro firmware image will take an additional 3-4 minutes per device.
- If you have an EmberNet Upgrade Controller (or ZStick) AND a ZAP running at the same time, re-flashing EmberNet and ZigBee Pro devices can take place concurrently. You need to join MiniApp devices to the network when they are ready for this ZigBee Pro re-flash to take place.

Review the table below. Note that running the updates concurrently saves significant time.

Update Scenarios and Approximate Times:

| | 10 devices | 30 devices | 50 devices | 100 devices |
|---|-----------------------------------|---------------------------------|---------------------------------|----------------------------------|
| Prep Work | 30–45 min | | | |
| System Update 1.7.x to 1.8.0 | 30–45 min | | | |
| EmberNet to MiniApp @ 3-5 minutes/device | 30–50 minutes | 90–150 minutes | 150–250 minutes | 300–500 minutes |
| MiniApp to ZigBee Pro @ 3 - 4 minutes/device | 30–40 minutes | 90–120 minutes | 150–200 minutes | 300–400 minutes |
| 1 Controller (no ZStick) – Consecutive update process => Total Update Time | 120–180 minutes (~2–3 hrs) | 240–360 minutes (~4–6 hrs) | 360–540 minutes (~6–9 hrs) | 660–990 minutes (~11–16 hrs) |
| 2 Controllers (1 ZAP and 1 EmberNet Upgrade Controller) or 1 Controller and ZStick – Concurrent update process => Total Update Time | 100–150 minutes (~1.5–2.5 hrs) | 180–270 minutes (~3–4.5 hrs) | 260–390 minutes (~4–6.5 hrs) | 460–690 minutes (~8–11.5 hrs) |

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4.2 Prepare for the Update

Prior to updating to Release 1.8.0, verify that your system is working correctly. You don't want to try and figure out these types of questions during the middle of an update.

1. Are all your IP devices online?
2. Are all your ZigBee (EmberNet) devices online?
3. Is your basic programming working normally? Make sure everything has been tested.

WARNING! If you start the 1.8.0 update, you cannot go back. ZigBee devices cannot be re-flashed from ZigBee Pro or MiniApp to EmberNet firmware.

4.2.1 Back Up Your Project

Make a backup of your project. No significant project changes have occurred; but it is always good practice to have a backup when you perform an update. This is helpful for recovery if needed, but to diagnose any defects which might occur causing the loss of programming or bindings also.

4.2.2 Download and Install Composer 1.8.0

Composer 1.8.0 is required. To avoid inadvertent updates from prior versions, we have changed the default URL for the updates service. Composer 1.8.0 has the correct URL. Prior versions of Composer will continue to show the latest 1.7.3 release as the default update.

4.2.3 Update Your Control4 System Using Update Manager

1. Using Release 1.8.0, start the system update using Update Manager. The IP devices on your system will update just as they've always done. You can monitor their status using Update Manager.
2. After the IP update is finished, check all IP device behavior (ZigBee won't work yet) just to make sure there aren't any problems. We don't expect any, but it's always good to make sure.

Tip: During the upgrade process, please make a log which includes the specific times of each step, when you perform specific tasks, and when you find or notice any problems. If you need to contact Control4 Technical Support for assistance or to report problems, your notes will help us find the appropriate area of the logs to investigate more easily.

4.3 ZigBee Pro Upgrade Instructions

The following instructions provide information about how to upgrade your existing devices to ZigBee Pro.

4.3.1 Overview

The following steps are explained in more detail later in this document. However, to give some structure which might be lost in the detailed explanations, here is what you do to update to ZigBee Pro.

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1. Create your ZigBee Pro Network by selecting your ZigBee Server (zserver2) and ZAP Coordinator as described in Section 4.4, "ZigBee Server Selection.."
2. Enable an EmberNet upgrade Controller or insert ZStick as described in Section 4.4.3, "EmberNet Upgrade Controller Selection" or Section 4.4.4, "ZStick Use."
3. Monitor (if you want to) the update progress using the **Network Tools > EmberNet Upgrade** tabs as described in Section 4.4.7, "Network Tools."
4. Join devices which have been updated to MiniApp or ZigBee Pro to the ZigBee Pro network as described in Section 4.4.10, "Join the Network."
5. Monitor MiniApp to ZigBee Pro updates using the **Network Tools > ZigBee Network** tabs as described in Section 4.4.7, "Network Tools."
6. Make sure that all devices have been updated and are on the network.
7. Disable the EmberNet Upgrade Controller(s) and remove any ZSticks from the USB drive.
8. Synchronize your Lighting Scenes as described in Section 4.4.15, "Lighting Scenes."
9. Enjoy your new ZigBee Pro system. After the update has completed and the system is operational, you should make a new backup of the system. If you ever need to reload the project on this system, you need to load using a backup created after version 1.8.0. This ensures that you don't have to re-create the ZigBee Pro mesh network and recommission it.

IMPORTANT! Control4 recommends that you don't change any configurations while the system is updating. After you have configured the system and it has begun to update, you're usually better off leaving things alone until all of the processes are completed.

4.3.2 Update Your ZigBee Devices

If you skipped over Section 3, "Important ZigBee Concepts," we urge you to return and make sure you understand these important terms and concepts before you continue with your upgrade. It won't take more than a few minutes to read, and your proper understanding of the concepts is essential. Return to this section when you're finished.

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Devices that update:

- Your Dimmers, Switches, Keypads, and outlet modules will update as follows: **EmberNet -> MiniApp** -[Join]-> **ZigBee Pro**
- Your Thermostats and System Remote Controls will update as follows: **EmberNet -> ZigBee Pro** [Join]

While being updated from EmberNet to ZigBee Pro, Control4 Dimmers configured in switch-leg mode and running in MiniApp mode don't control loads. Dimmers configured in switch-leg mode will reboot if you turn on the load. If you have a significant number of Dimmers configured in switch-leg mode, you will want to ensure that you have an alternate light source if the update is being done at night.

All devices that attempt to join the ZigBee Pro network must have been previously identified in your project. Instructions for adding EmberNet devices to a ZigBee Pro network are described in Section 4.4.3, "EmberNet Upgrade Controller Selection."

4.4 ZigBee Server Selection

Your Primary Controller in the 1.8.0 system should be an HC-class Controller (example: Home Controller HC-300). If you have an HC-1000 as the Primary Controller, this is an excellent Controller on which to run ZigBee Server and will provide the best performance.

Note: Neither the Home Theater Controller nor the Media Controller will run the ZigBee Server.

When you first update your system to 1.8.0, create the ZigBee Pro mesh network. This includes selecting the ZigBee Server and ZAP Coordinator (which manages the security parameters of your network).

To create the ZigBee Pro mesh network:

1. Start **Composer** 1.8.0 and connect to a **Director**.
2. Click **System Design**.
3. From the project tree, select an HC-class Controller; example: **Home Controller HC300**.
4. In the Properties page, click **Edit ZigBee Configuration**.
5. View and use the drop-down lists to select the ZigBee Server and ZAP Coordinator as shown in the ZigBee Network Settings dialog in the screen examples below.

Note: The **Create** button takes you into the dialog box where the ZAP coordinator can be selected. The ZigBee Server and other ZAPs can be selected from the main dialog box. These can be changed at any time. However, you can change or select the ZAP coordinator by using the Create button to get to the appropriate dialogs. This is because changing the ZAP coordinator requires that the ZAP mesh network be re-commissioned.

6. Click **OK**.
7. Verify that your selections are correct and click **OK**.

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The first screen shows the ZigBee Server, ZigBee Channel and ZAP Controllers.

| Controller | Room | Enabled |
|-----------------------|---------------|--------------------------|
| HC200 | Wiring Closet | <input type="checkbox"/> |
| Media Controller | Wiring Closet | <input type="checkbox"/> |
| Home Controller HC500 | Room 3 | <input type="checkbox"/> |

| Controller | Room | Enabled |
|-----------------------|---------------|--------------------------|
| HC200 | Wiring Closet | <input type="checkbox"/> |
| Media Controller | Wiring Closet | <input type="checkbox"/> |
| Home Controller HC500 | Room 3 | <input type="checkbox"/> |

4.4.1 ZigBee Access Point Selection

After you create your ZigBee Pro mesh network (including your ZAP coordinator), you may use the ZigBee Network Settings dialog to configure one or more additional ZAPs.

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The ZAP coordinator is responsible for maintaining the security parameters of the ZigBee mesh network. All other ZAPs let you extend the mesh network and the bridge over Ethernet. Any Controller with a ZigBee radio can be enabled as a ZAP.

When the mesh network is operational, it is very disruptive to change the ZAP configuration. If you need to change the ZAP configuration, plan on taking up to 20 minutes for the ZigBee mesh network to reconfigure itself and stabilize. If you decide to re-create the mesh network (assign a different coordinator) re-commission the mesh by causing each device to be rejoined.

IMPORTANT! If you use the Controller that is designated as the ZAP coordinator as an EmberNet Upgrade Controller, the ZigBee Pro mesh network will not be operational. When you disable the Controller as an EmberNet Upgrade Controller, it will reconfigure itself for ZigBee Pro and the ZigBee Pro mesh will come online.

WARNING! Do not change your ZAP configuration while the system is updating. This will slow everything down and may cause problems.

4.4.2 Channel Selection

Channels in ZigBee Pro are numbered differently than they are in EmberNet; the equivalency is 11 + the old ZigBee channel number. Previously Channel **14** (now Channel **25** in ZigBee Pro) was used as the default channel for Control4 devices because it was outside the WiFi range.

A channel is automatically selected based on an RF energy scan conducted at the time the mesh was created. You can change that channel if you have better data from an RF analyzer.

WARNING! Do not change the channels while the devices are re-flashing.

After the system is fully updated, you may change the channel if you want to. Before you change channels, however, make sure all the devices are online so that they get notified of the channel change. Otherwise, nodes that are offline when a channel change occurs will eventually find their way to the correct channel, but it may take some time. There's no way to change the channel on any Control4 ZigBee Pro device manually.

If you are updating a system which has been configured with multiple zservers and channels, after the system updates to ZigBee Pro, all devices will be on the same channel. Multiple ZAPS will provide the same benefits which used to be obtained using multiple zservers and channels. See Section 4.4.6, "Special Provisions for Multiple Channel EmberNet System Upgrades."

4.4.3 EmberNet Upgrade Controller Selection

To update your EmberNet devices to ZigBee Pro, you need to have a Controller with a ZigBee radio operating on EmberNet. Either this can be one of the Controllers in your system (although if you use the same Controller that is running ZAP coordinator, your ZigBee Pro mesh network will be down) or a ZStick.

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If you have a ZStick (see Section 4.4.4, “ZStick Use”), all you need to do is plug it into the USB slot on any HC-200, HC-300, or HC-500 Controller on the system (see 200-00149 *ZigBee Update Stick User Instructions*).

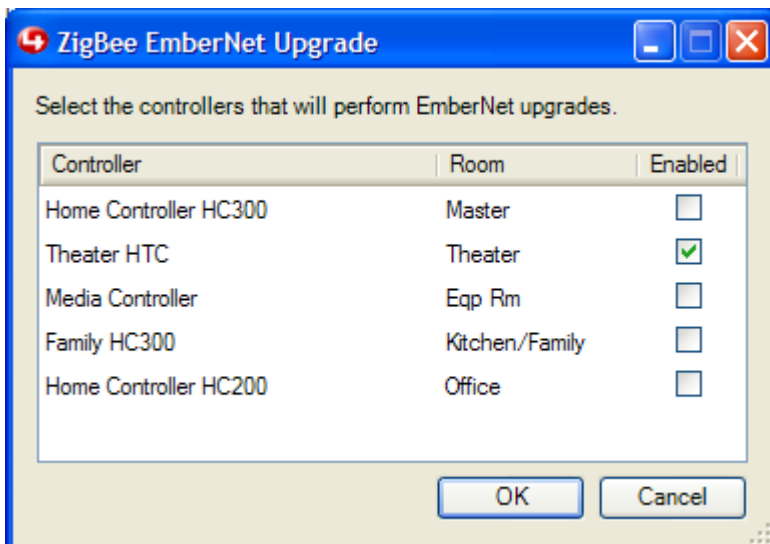
Control4 recommends that you use a USB extension cable included in the ZStick (C4-Z2420EU-USB) to separate the ZStick from the RF noise generated by the Controller. This is particularly important when using the ZStick with the HC-500. As soon as the ZStick is plugged in, that Controller will start functioning as an EmberNet Upgrade Controller. If that Controller is configured to run ZAP, it will also run ZAP because now it has two (2) radios available (the front panel radio and the ZStick).

Any Controller on your system with a ZigBee radio can be configured to run as an EmberNet Upgrade Controller. Control4 recommends that you choose a Controller with known good ZigBee capabilities (location, Controller type, etc.) as an EmberNet Upgrade Controller. You may have multiple EmberNet Upgrade Controllers, but there’s no need to have any more than the number of EmberNet channels you previously used on that system.

Note: In several of the Beta updates, we have observed that occasionally EmberNet devices can't be updated using the ZStick or the selected EmberNet Upgrade Controller. This is usually due to the weakness of the mesh. If this occurs, you may need to enable EmberNet Upgrade on a different Controller that is closer to the node(s) that need to be updated.

To select an EmberNet Upgrade Controller:

1. On the Composer **Tools** menu, select **Network Tools**.
2. Click the **EmberNet Upgrade** tab.
3. Click the **Controllers** button. The following screen appears.



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While you have an EmberNet Upgrade Controller configured in your system, the ZigBee Pro mesh network is placed in 'Auto-Join' mode. This means that any device attempting to join the mesh network can join as long as that device was previously identified in the Composer project.

When you finish updating the EmberNet devices, disable the EmberNet Upgrade Controller(s). This causes the front-panel radio on the Controller to be updated back to ZigBee Pro and lets you configure that Controller to function as a ZAP.

4.4.4 ZStick Use

If you have a single Controller system, you may want to use a ZStick. The ZStick provides an additional ZigBee radio running EmberNet and can run in conjunction with ZAP on a single Controller (Home Controller HC-200, H-300 or HC-500). The reason this is important on a single Controller system is that EmberNet and ZigBee Pro updates can occur concurrently rather than forcing all EmberNet devices to be updated before enabling ZAP for the ZigBee Pro updates.

ZSticks are useful also in updating homes where there are a large number of ZigBee devices (such as systems with multiple ZigBee channels) to increase the throughput of EmberNet upgrades while still allowing Secondary Controller(s) to function as ZAPs.

When you plug a ZStick into a Controller, it will show that Controller as enabled in the Controller selection dialog in the EmberNet Upgrade interface.

See 200-000149 *ZigBee Update Stick User Instructions* available on the Control4 web site for more information about using the ZStick.

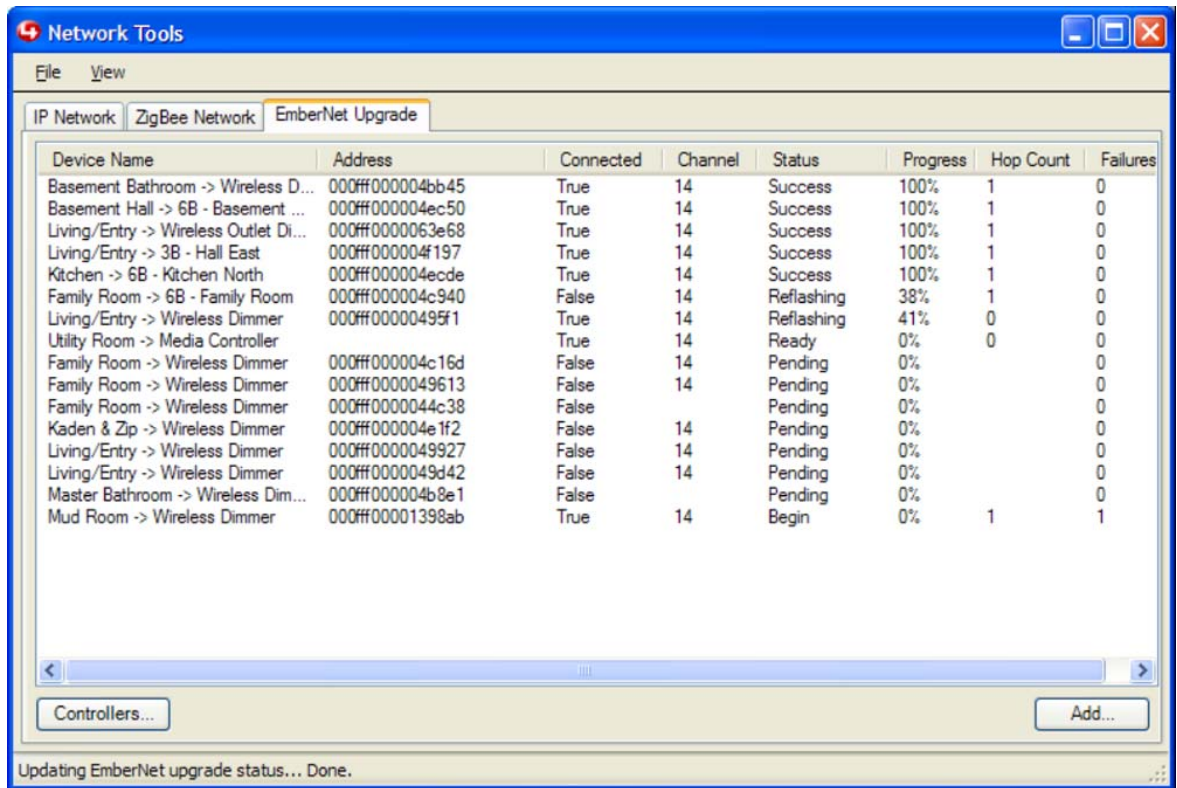
4.4.5 EmberNet Upgrade Window – Network Tools

Whether using a Controller as an EmberNet updater or a ZStick, the Controller is listed in the upgrade window along with any devices that need to be updated. It may take a few minutes for the front panel to be reconfigured to EmberNet, however.

Note: If you don't see the channel listed for that Controller after five (5) minutes, it is likely that the Controller front panel wasn't reconfigured for EmberNet correctly. You should try to use another EmberNet Upgrade Controller. Or if you know that ZigBee previously worked on the selected Controller, contact Control4 Technical Support for assistance.

The following screen shows the Network Tools page with ZigBee Network and EmberNet Upgrade tabs.

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The screenshot shows the 'Network Tools' application window with the 'EmberNet Upgrade' tab selected. The main area contains a table with the following columns: Device Name, Address, Connected, Channel, Status, Progress, Hop Count, and Failures. The table lists 18 devices with their respective addresses and current upgrade statuses. At the bottom of the window, there are buttons for 'Controllers...' and 'Add...', and a status bar indicating 'Updating EmberNet upgrade status... Done.'

| Device Name | Address | Connected | Channel | Status | Progress | Hop Count | Failures |
|---------------------------------------|------------------|-----------|---------|------------|----------|-----------|----------|
| Basement Bathroom -> Wireless D... | 000fff000004bb45 | True | 14 | Success | 100% | 1 | 0 |
| Basement Hall -> 6B - Basement ... | 000fff000004ec50 | True | 14 | Success | 100% | 1 | 0 |
| Living/Entry -> Wireless Outlet Di... | 000fff0000063e68 | True | 14 | Success | 100% | 1 | 0 |
| Living/Entry -> 3B - Hall East | 000fff000004f197 | True | 14 | Success | 100% | 1 | 0 |
| Kitchen -> 6B - Kitchen North | 000fff000004ecde | True | 14 | Success | 100% | 1 | 0 |
| Family Room -> 6B - Family Room | 000fff000004c940 | False | 14 | Reflashing | 38% | 1 | 0 |
| Living/Entry -> Wireless Dimmer | 000fff00000495f1 | True | 14 | Reflashing | 41% | 0 | 0 |
| Utility Room -> Media Controller | | True | 14 | Ready | 0% | 0 | 0 |
| Family Room -> Wireless Dimmer | 000fff000004c16d | False | 14 | Pending | 0% | 0 | 0 |
| Family Room -> Wireless Dimmer | 000fff0000049613 | False | 14 | Pending | 0% | 0 | 0 |
| Family Room -> Wireless Dimmer | 000fff0000044c38 | False | 14 | Pending | 0% | 0 | 0 |
| Kaden & Zip -> Wireless Dimmer | 000fff000004e1f2 | False | 14 | Pending | 0% | 0 | 0 |
| Living/Entry -> Wireless Dimmer | 000fff0000049927 | False | 14 | Pending | 0% | 0 | 0 |
| Living/Entry -> Wireless Dimmer | 000fff0000049d42 | False | 14 | Pending | 0% | 0 | 0 |
| Master Bathroom -> Wireless Dim... | 000fff000004b8e1 | False | 14 | Pending | 0% | 0 | 0 |
| Mud Room -> Wireless Dimmer | 000fff00001398ab | True | 14 | Begin | 0% | 1 | 1 |

If the Controller doesn't find the devices requiring an update in the project on the current channel, it will change channels approximately every two (2) minutes, looking for devices that need to be updated.

Only devices that were previously identified in the project are updated unless you have used the "Add..." dialog.

4.4.6 Special Provisions for Multiple Channel EmberNet System Upgrades

If you segmented the EmberNet mesh using multiple channels previously, you can use multiple EmberNet Upgrade Controllers or ZSticks to reduce the amount of time needed for the update.

When a ZStick or EmberNet Upgrade Controller is enabled, it starts scanning on Channel 14. If another Controller is already working on Channel 14, it changes to a different channel automatically.

All enabled Controllers continue to scan for devices to update—but only one will be on any given channel at a time. If you've configured the EmberNet system using multiple ZigBee channels previously, you don't need to do anything special for the channels to update. However, you may want to configure the old zservers as EmberNet Upgrade Controllers (or use ZSticks on those Controllers) to use the same ZigBee topology for the upgrade process that was used to make the system perform.

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4.4.7 Network Tools

The Network Tools application has been significantly enhanced for Release 1.8.0. You can access the Network Tools tab through the Composer Tools menu. It can be run as a standalone application also. There are three (3) tabs: IP Network, ZigBee Network, and EmberNet Upgrade.

The ZigBee Network tab shows the devices on the ZigBee Pro network. In this tab, you can view the devices organized by Room, by ZigBee routing, or in a flat list view (see example screens below).

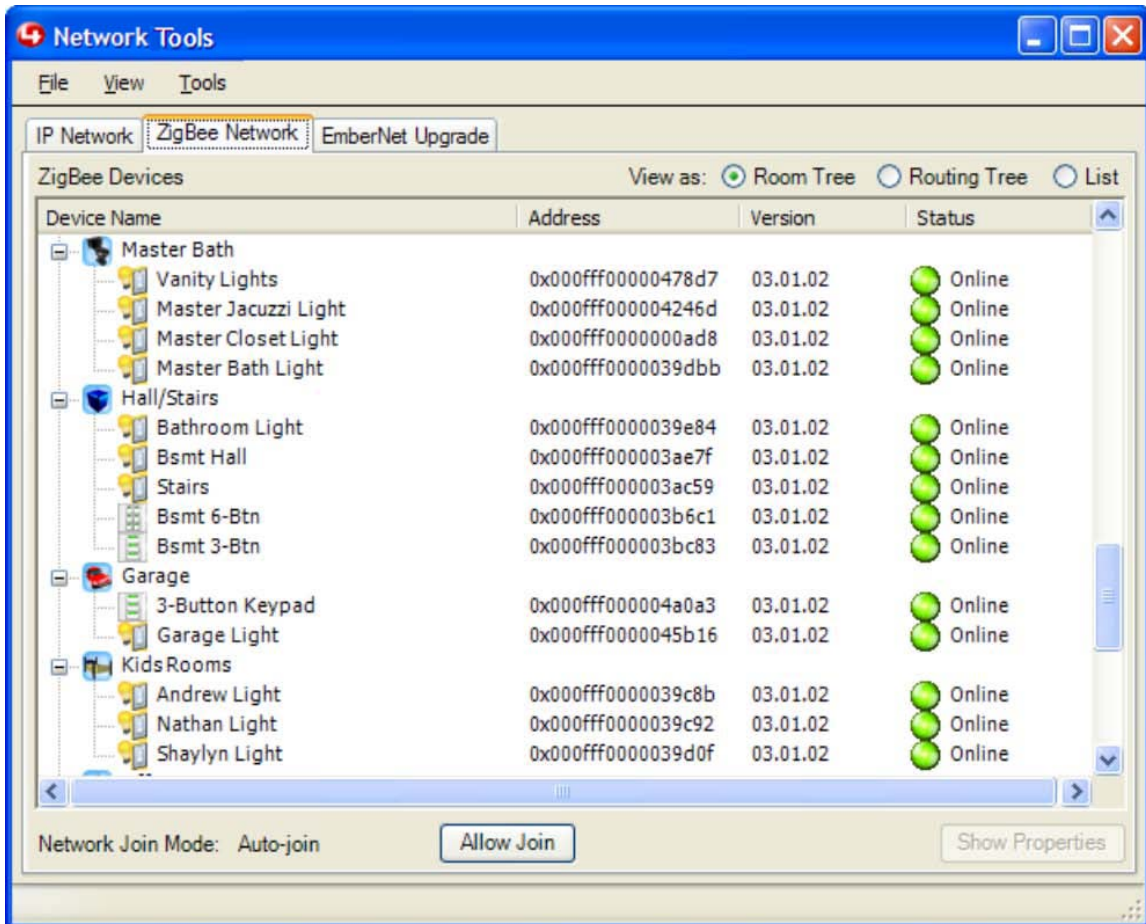
When you first start your update, you should see the Controller running ZigBee Server and ZAP in the routing tree view and marked as 'online.' The other ZigBee Pro devices are added and come online as they are updated to ZigBee Pro and joined to the network.

There are three (3) different and useful ways to view your ZigBee Pro devices. See the following sections.

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4.4.7.1 Room Tree

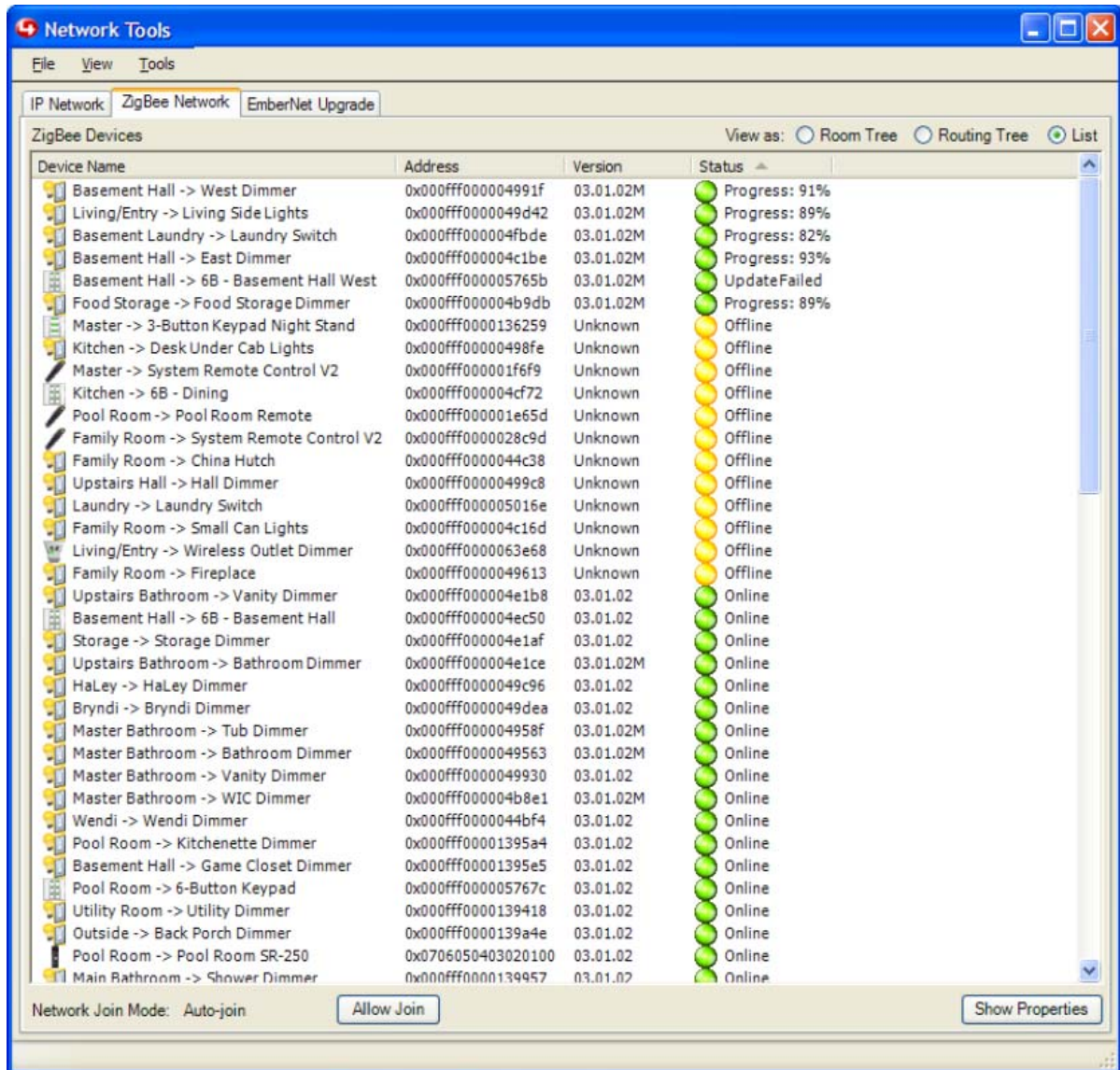
The **Room tree** is the default view. It shows all devices known to your project and whether they are online. This view is organized based on the project's room hierarchy.



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4.4.7.2 List View

The **List view** is very useful during an update procedure or anytime you want to sort the device information based on name, address, version, or status. It also shows all devices known to the project. Devices that show up with an 'M' in their version are in MiniApp mode.

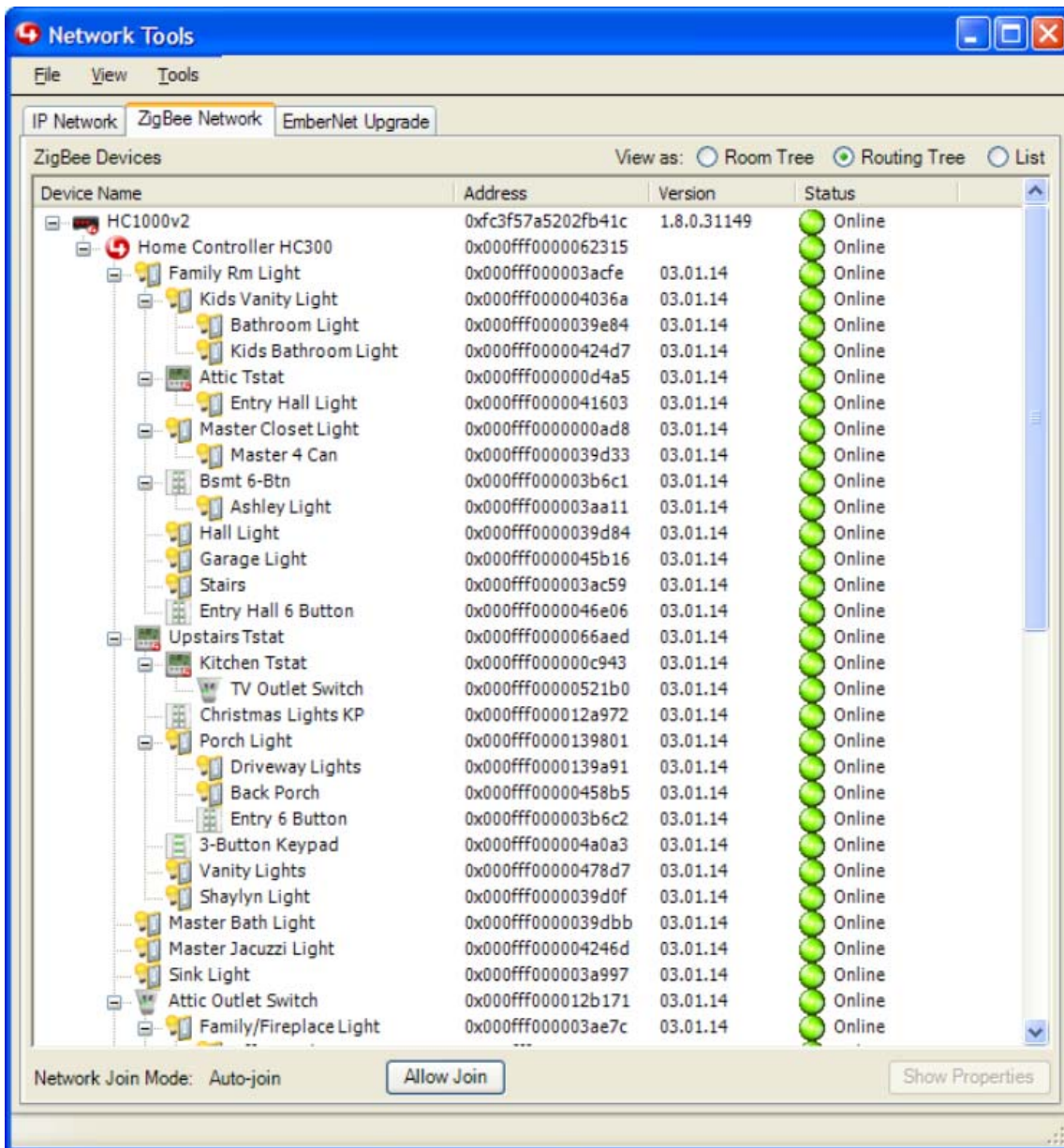


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4.4.7.3 Routing Tree

The **Routing tree** is different from the Room tree and the List view in that it only shows devices that are actually known to the ZigBee mesh network. Also, it shows the mesh network in a hierarchical view. Because there are multiple routes to any device on the mesh, you will see devices show up multiple times in the Routing tree view.



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We have configured the EmberNet Upgrade tab to show all ZigBee devices in the project that have not reported online via the ZigBee Pro mesh network, so you may occasionally see devices in this list that aren't actually in need of an update or are not available to update.

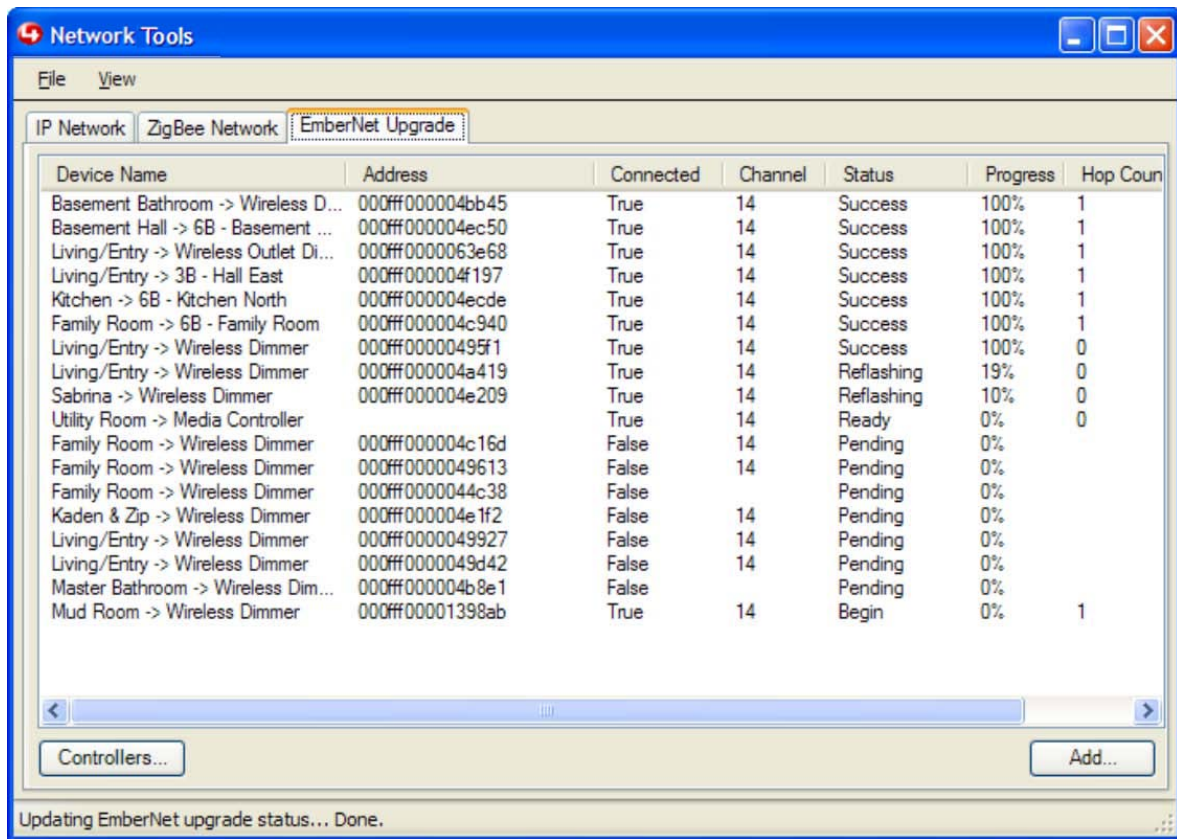
Examples:

- Any device in the project that does not have a valid ZigBee Pro firmware image (System Remote Control V2 or Card Access Motion Sensor).
- Any device in the project that previously has been updated to ZigBee Pro but has not reported online since the mesh network came up (an Outlet Switch that isn't plugged in).
- If the mesh network hasn't properly initialized, you will see all of your ZigBee Pro devices in this list.

When a device is updated to ZigBee Pro or MiniApp, it will show 100% progress and will be removed from the list of EmberNet devices only when it has been joined to the ZigBee Pro network.

This information about the update status of EmberNet devices will persist until the device is joined to the ZigBee Pro mesh, or until Director restarts. If Director restarts, all update status information will be reset.

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The screenshot shows the 'Network Tools' application window with the 'EmberNet Upgrade' tab selected. The window displays a table of device upgrade progress. The status bar at the bottom indicates 'Updating EmberNet upgrade status... Done.'

| Device Name | Address | Connected | Channel | Status | Progress | Hop Count |
|---------------------------------------|------------------|-----------|---------|------------|----------|-----------|
| Basement Bathroom -> Wireless D... | 000fff000004bb45 | True | 14 | Success | 100% | 1 |
| Basement Hall -> 6B - Basement ... | 000fff000004ec50 | True | 14 | Success | 100% | 1 |
| Living/Entry -> Wireless Outlet Di... | 000fff0000063e68 | True | 14 | Success | 100% | 1 |
| Living/Entry -> 3B - Hall East | 000fff000004f197 | True | 14 | Success | 100% | 1 |
| Kitchen -> 6B - Kitchen North | 000fff000004ecde | True | 14 | Success | 100% | 1 |
| Family Room -> 6B - Family Room | 000fff000004c940 | True | 14 | Success | 100% | 1 |
| Living/Entry -> Wireless Dimmer | 000fff00000495f1 | True | 14 | Success | 100% | 0 |
| Living/Entry -> Wireless Dimmer | 000fff000004a419 | True | 14 | Reflashing | 19% | 0 |
| Sabrina -> Wireless Dimmer | 000fff000004e209 | True | 14 | Reflashing | 10% | 0 |
| Utility Room -> Media Controller | | True | 14 | Ready | 0% | 0 |
| Family Room -> Wireless Dimmer | 000fff000004c16d | False | 14 | Pending | 0% | |
| Family Room -> Wireless Dimmer | 000fff0000049613 | False | 14 | Pending | 0% | |
| Family Room -> Wireless Dimmer | 000fff0000044c38 | False | | Pending | 0% | |
| Kaden & Zip -> Wireless Dimmer | 000fff000004e1f2 | False | 14 | Pending | 0% | |
| Living/Entry -> Wireless Dimmer | 000fff0000049927 | False | 14 | Pending | 0% | |
| Living/Entry -> Wireless Dimmer | 000fff0000049d42 | False | 14 | Pending | 0% | |
| Master Bathroom -> Wireless Dim... | 000fff000004b8e1 | False | | Pending | 0% | |
| Mud Room -> Wireless Dimmer | 000fff00001398ab | True | 14 | Begin | 0% | 1 |

4.4.8 Lost Nodes

The EmberNet upgrade process first updates nodes which have the largest hop count. This is a strategy to avoid 'islanding' devices. However, it is possible that in widely distributed systems without a strong mesh, a device could be left without access due to the update of its neighbor nodes.

During the course of an EmberNet upgrade, if you believe that you have lost nodes, the best strategy is to wait until all other nodes are updated. If the EmberNet Upgrade Controller starts changing channels, and you still have devices that haven't updated, it is probable that they are out of range of the radio in the Controller. You may need to enable EmberNet Upgrade on another Controller or move the Controller so that it can communicate with the devices that haven't been updated.

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4.4.9 LED Indicators

When devices finish updating to MiniApp or to ZigBee Pro, LED indicators show device status:

| LED | Color | State | Action |
|--|---|---|--|
| Dark LEDs, with short flash (millisecond) of color | Green flash | Dimmer, Switch, or Keypad in MiniApp. Not joined to mesh. | Press and hold bottom button 3- 4 seconds until the LEDs turn yellow and begin to blink. |
| | Blue flash | Dimmer, Switch, or Keypad in MiniApp. Joined to mesh. | No action needed. This device is joined to the mesh and is awaiting a reflash slot. |
| | Orange flash | Outlet Dimmer or Outlet Switch. Joined to the mesh. | No action needed. This device is joined to the mesh and is awaiting a reflash slot. |
| Rapid flash followed by steady flash (second on, second off) | Yellow steady flash (Outlet modules only, Orange steady flash) | Device is scanning for ZigBee Pro mesh network to join. | Release the button. The device is attempting to join the mesh. If successful, the LED will turn Blue. Outlet modules only, Orange. If the LED turns Red and then returns to the previous state, make sure Auto-Join is enabled. |
| | Solid Green | Full app, not join. | Ready to identify. |

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4.4.10 Join the Network

When a device is in MiniApp mode or has been updated to full ZigBee Pro firmware and is ready to join the network, it needs to be joined. If an EmberNet upgrade is going on, the network will be in Auto-Join mode. If not, ensure that Auto-Join is enabled.

To join a device to the network:

1. Use the appropriate button-press sequence on the device:
 - **SR-150 / SR-250**—Use the four-tap method on the **4** button to identify and join.
 - **Thermostat**—Use the four-tap method on the **center** button to identify and join.
 - **Dimmers/Switches/Keypads**—Press and hold the **bottom** button (bottom left on the 6-button keypad) 3-4 seconds to join when in MiniApp mode.
 - **Outlet modules**—Press and hold the **identify** button 3-4 seconds to join when in MiniApp mode.
2. If the network is not in Auto-Join mode, you can put it into Join mode by selecting **Allow Join** in the ZigBee Network tab (in Network Tools).
3. If the device has not been added and identified previously to the project, it will not join Auto-Join mode. Add the device to the project and identify it using the identify dialog to join it.
4. In MiniApp, when joining nodes to the network, join the closest devices to your ZigBee Access Point(s) first so that they can be updated to the full ZigBee Pro image. While devices further away can be joined to the network, they cannot be updated through routes that contain MiniApp devices.

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4.4.11 Leave the Network

After a device successfully joins a ZigBee Pro mesh network, it will never attempt to join another network or communicate to devices on another network. If you ever need to take a device to another project, you need to force the device to leave the current network.

To force a device to leave the current network, refer to this table for the proper button presses:

| Device | Leave Sequence |
|-------------------------|--|
| Dimmer, Switch, Keypad | 13 – Top button presses 4 – Bottom button presses 13 – Top button presses |
| Outlet Dimmer or Switch | 13 – Identify button presses |
| Thermostat | 13 – Left button presses 4 – Middle button presses 13 – Left button presses |
| SR-250 | Room Off, #, *, 1, 3, 4, 1, 3 – The System Remote Control will display “Leaving Network” |
| SR-150 | Room Off, #, *, 1, 3, 4, 1, 3 – The room off button will blink red 3 times |

4.4.12 Add an EmberNet Node that Is Not in the Project

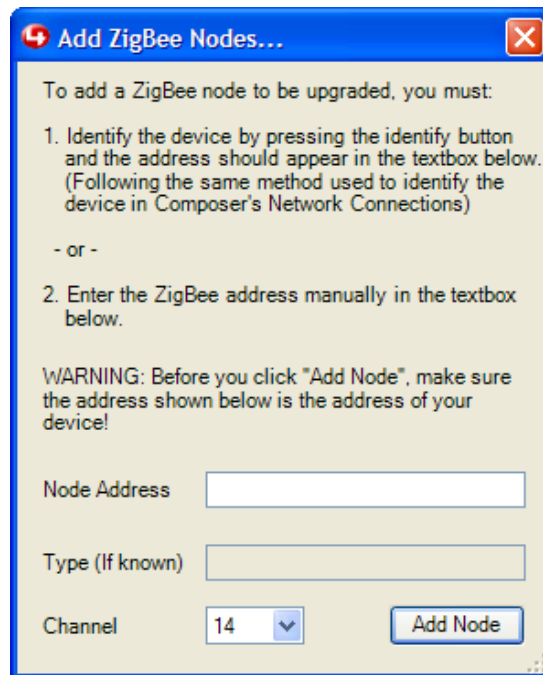
If you are adding a device with EmberNet firmware to a ZigBee Pro system, it can be updated using the EmberNet upgrade process described previously in this section. So the upgrade process can acknowledge this node and update it, press **Add**.

You can use either the standard Identify button press to “identify” it, or manually enter the ZigBee address. Please note that adding the device using this dialog does not add it to the project. That must be done in the standard way using System Design. It simply adds it to the list of devices that will be updated from EmberNet to MiniApp or ZigBee Pro. If the device is not on Channel 14, you may use the channel selector to pick a different channel.

After the device has been added in this manner it will appear in the EmberNet Upgrade window and begin to re-flash. It may take up to one (1) minute for the device to be listed and the re-flash to start.

After an EmberNet device has been updated to MiniApp, add it to the project in the normal way. Use System Design to add the appropriate driver to the project. Then use the **Connections > Network** tab to identify the device in the normal manner.

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4.4.13 Backups

Always back up the project after the update is completed. This is important in case it ever needs to be restored from backup. If it does need to be restored, you will need a current backup with the correct ZAP mesh parameters to avoid re-commissioning the ZAP mesh network.

4.4.14 Logging

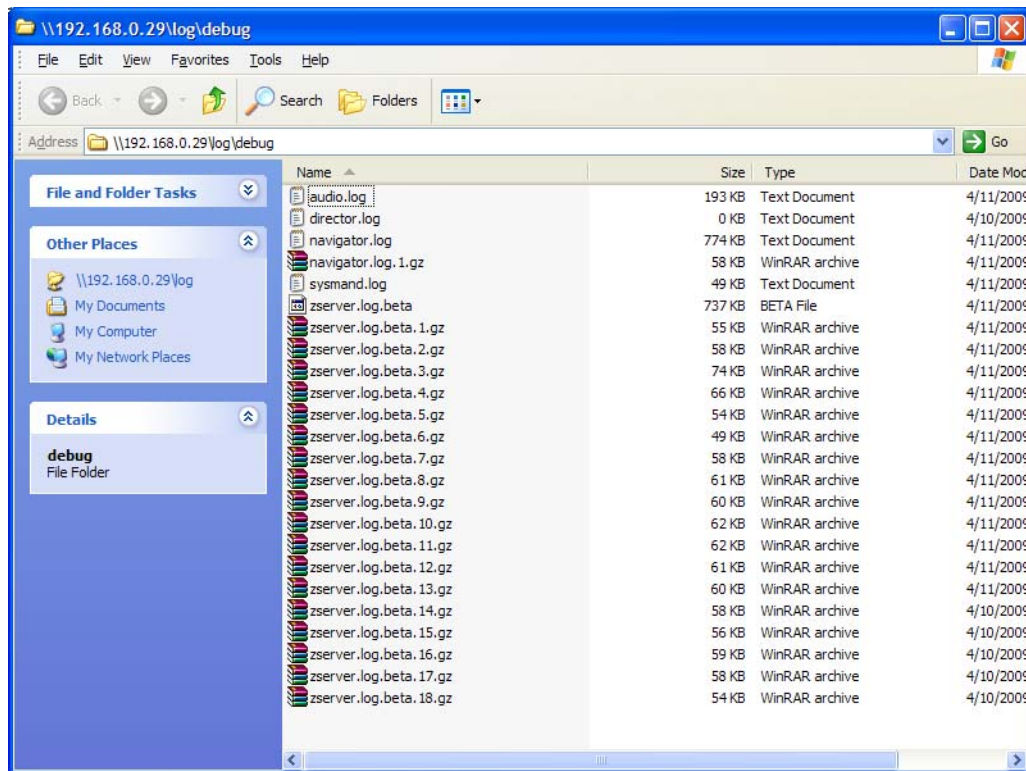
The zserver, EmberNet updater, zserver2, and ZAP processes all automatically log to /var/log/debug/zserver.log on the Controller which hosts them. These logs are not consolidated, so if you are asked to provide logs, open the network share for each Controller running one of those processes and gather the logs.

To send logging information to Control4 Technical Support:

1. Open the network shares (//ipaddress/log/debug) and zip up all the zserver.log.beta and director.log files which are present.
2. Do this for each Controller running director, zserver, zserver2, or zap.
3. Send the zip files to egreenwood@control4.com.

The following screen shows a list of log files.

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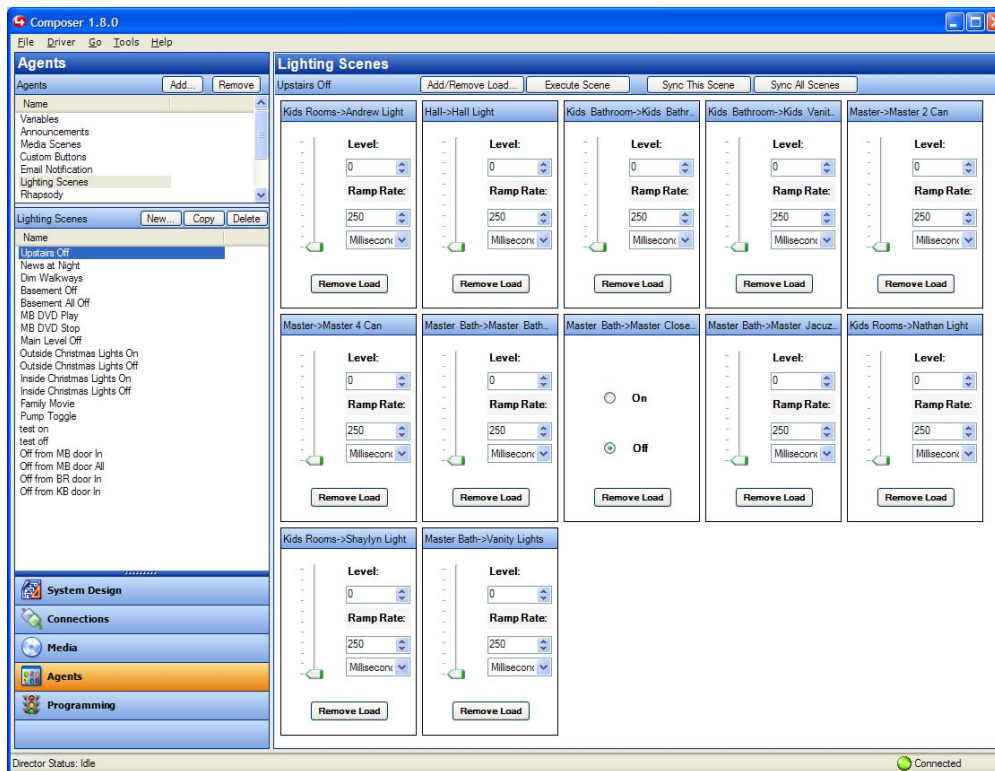
4.4.15 Lighting Scenes

Most of the changes in Release 1.8.0 are not visible to the user. However, one of the visible changes is with Lighting Scenes. Control4 has implemented Lighting Scenes using 'multicast' in ZigBee Pro.

Each device on the mesh network knows which scenes it belongs to and what its behavior should be when that scene is activated. When the Control4 system calls a scene, the system sends a multicast to all devices on the mesh network. Devices that belong to the Lighting Scene execute their behavior as previously specified.

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See the following Lighting Scenes Agent screen.



This implementation is fully backwards compatible with existing scenes. However, if you want to use your scenes immediately, ensure that each device belonging to the scene knows what it's supposed to do. This happens automatically in the background, but it can take a long time to synchronize all scenes in the background.

If you want to use a scene right away, use the **Synchronize this Scene** or **Synchronize All Scenes** in **Composer > Agents > Lighting Scenes**. This action causes a flurry of ZigBee Pro mesh network activity, as all devices are sent the necessary scene information.

It may take up to five (5) minutes for this to complete depending on the number of scenes and the number of devices in each scene. It makes no sense to do this until all devices have been fully updated to ZigBee Pro, joined to the mesh network, and all re-flashing is completed.

Devices that don't support the ZigBee Pro multicast (for example, Lutron lights controlled through the Lutron HomeWorks driver) still work in scenes but will receive their commands in a unicast architecture (such as was previously used).

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5. Example Report

Here's an example of the report Control4 gave the Control4 Technical Support team when a house was updated:

IP addresses:
192.168.0.21 - HC1000 v2 (was not the master during my update but is now my master - no logs)
192.168.0.11 - HC200 (used as an EmberNet updater)
192.168.0.16 - HC300 (used as an EmberNet updater)
192.168.0.29 - HC300 (master during update process - continues to run zserver2 and zap)

April 4, Update notes
10:17 - started update to .542
11:35 - finished IP device updates
 tested and made sure everything was working with the IP network
12:47 - started EmberNet updaters on HC-200 (.0.11) and HC-300 (.0.16)
12:55 - reflash stopped on both EmberNet updaters
12:58 - ZAP came up???
13:02 - restarted same two Controller as EmberNet updaters
13:09 - first nodes started to reflash on both Controllers (.0.11 and .0.16)
13:11 - **reflash stopped??**
13:14 - reflash started again - two different nodes on (.0.11)
13:19 - **reflash stopped??**
13:19 - thinking that somehow running 2 EmberNet updaters was causing problems, I disabled EmberNet updater on my HC-200 (.0.11)
13:19 - two more nodes started to reflash on HC300 (.0.16)
13:29 - **reflash stopped??**
13:34 - reflash started again on its own (by this time I decided to leave it alone and just observe) - reflash continued, finally completing some devices for a period of time
13:49 - **reflash stopped??**
13:54 - re-entered dialog and re-selected HC-300 as my updater (after doing this I really did leave it alone)
* there are several Host Reboots, I wrote down some at 15:21, 16:25, 17:04 but there were others that I didn't see

During the time that the above was happening, I walked around and used the 3second bottom button hold to join devices to the mesh network when the blinky lights indicated they were ready. I didn't notice any trouble in the ZigBee Pro update process.

I had to stop watching things at 17:30 but I just left it running.

When I got up Sunday morning, there were four nodes still on EmberNet - 2 were remote controls (SR-150 and SR-250). I restarted EmberNet updater and they updated quickly - without incident.

There were 3 nodes that reported updated failed in ZigBee Pro - but these all ended up coming online by end of day Sunday.

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6. Additional Information

6.1 Concurrent vs. Consecutive Updates

Because there are two (2) stages to updating most Control4 devices to ZigBee Pro: 1 – update to MiniApp, and 2 – update to full image, Control4 has provided the ability for these stages to happen concurrently.

As long as there are two (2) ZigBee radios in use, as soon as a device completes its update to MiniApp it can be joined to the mesh and continue being updated to the full image. If only one (1) radio is available, then these processes happen consecutively. The radio is configured to run on EmberNet until all devices have been updated to MiniApp. Then the radio needs to be reconfigured to run as ZAP and complete the update for all devices. The benefit to running these processes concurrently is that the total update time is reduced significantly. See Section 4.1, “Plan Your Time and Effort” for details.

6.2 ZigBee Radio Location and Relevance to the Updates

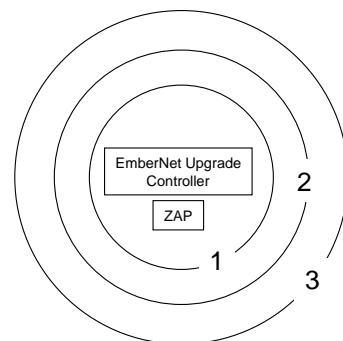
It's helpful to understand what happens during the update process, and how the location of the various ZigBee radio(s) can affect the performance of the update.

- The zserver process (EmberNet Upgrade Controller and ZStick use this process) will update those nodes on the EmberNet network that have the most hop counts. That way the outlying devices don't get stranded as the mesh is weakened by the update of a device closer to the zserver.
- The ZigBee Server/ZAP updates work most effectively when devices closest to the radio are joined to the new mesh first. This allows the ZigBee Pro mesh to be strengthened so that it can reach nodes at greater distance from the ZAP. Devices that are too far from the ZAP cannot join until the ZigBee Pro mesh is strengthened.

Scenario 1: EmberNet Upgrade Controller (or ZStick) and ZAP located together

In this scenario, devices that are three (3) hops away from the EmberNet Upgrade Controller are converted to MiniApp first, then devices that are two (2) hops away are converted, and finally those devices that are closest—one (1) hop away—are converted to MiniApp.

Because the ZAP is located in the same place, it may not be able to communicate with the devices in MiniApp that are located two (2) and three (3) hops away. The continuation of the ZigBee Pro update from MiniApp must wait until devices close enough to the join the ZigBee Pro Mesh have been updated to MiniApp.

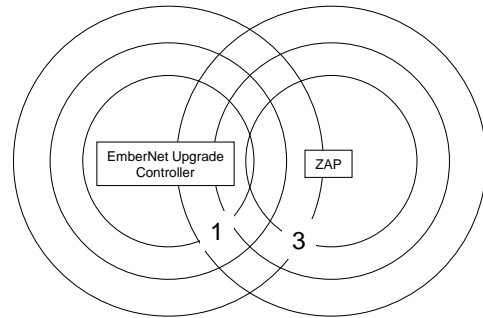


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Scenario 2: EmberNet Upgrade Controller (or ZStick) and ZAP positioned for optimal update timing

In this scenario, some of the devices that are the farthest away from the EmberNet Upgrade Controller are adjacent to the ZAP.

When a device at location 3 is updated to MiniApp, it is close enough to join the ZigBee Pro mesh immediately and continue the update. Because the ZigBee Pro mesh is built from the inside out, it will increase in strength as the EmberNet mesh is reduced.



6.2.1 ZigBee Radio Strength on Various Controllers and the ZStick

ZStick's ZigBee radio and various Controllers have different performance characteristics.

- The ZStick is a ZigBee radio on a USB interface. It doesn't have any amplification, and may not be able to reach distant EmberNet nodes in a sparse mesh network. Because the ZStick can be plugged into any HC-class Controller, if you need to access distant nodes, you may need to move the ZStick to another Controller. You may get better results also by using a USB extension cable to change the location of the ZStick radio.
- The Home Theater Controller and Media Controller have good ZigBee radios, and work very well as EmberNet Upgrade Controllers and as ZigBee Access Points.
- The Home Controller HC-300 and HC-200 both have good ZigBee radios, and also work well as EmberNet Upgrade Controllers and as ZAPs.
- Due to the RF noise generated by the hard drive, the ZigBee radio on the Home Controller HC-500 has less range than the other Controllers mentioned. If you are using a ZStick in conjunction with an Home Controller HC-500, use a USB extension cable.

In general, if your system was working well using EmberNet, you probably have adequate range to update it to ZigBee Pro effectively. However, understanding the implications of radio location and radio strength may enable you to optimize the update process.

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6.3 Button Press Magic Sequences

| Button Tap Functions | In-wall Lighting & Keypads | 1-Button Products | Thermostats (Buttons Left & Center) | System Remote Controls | Mini-App Mode (Bottom Button) |
|---|------------------------------|-------------------|-------------------------------------|---|----------------------------------|
| Identify | 4 (Top Button) | 4 | 4 (Center Button) | 4 (Red 4) | Press and Hold for 4 Seconds |
| Reboot | 15 (Top Button) | 15 | 15 (Center Button) | SR-250: Rm Off, #, *, 1, 5, 4, 1, 5 SR-150: Rm Off, #, *, 1, 5, 4, 1, 5 | N/A |
| Channel Blink | 7 - 4 - 7 | 7 | 7 - 4 - 7 | SR-250: List, Info, Config, 2, 4, 8, 6, #, * SR-150: Rm Off, #, *, 7, 4, 7 | N/A |
| Reset Application Defaults | 9 - 4 - 9 or 9 - 9 - 9 | 9 | 9 - 4 - 9 or 9 - 9 - 9 | SR-250: List, Info, Config, Factory Defaults | N/A |
| Leave & Reset Factory Defaults | 13 - 4 - 13 | 13 | 13 - 4 - 13 | SR-250: Rm Off, #, *, 1, 3, 4, 1, 3 SR-150: Rm Off, #, *, 1, 3, 4, 1, 3 | Press and Hold for 13 Seconds |