CC-6LOWPAN-DK-868 Quick Start Guide

STEP 1 – Introduction

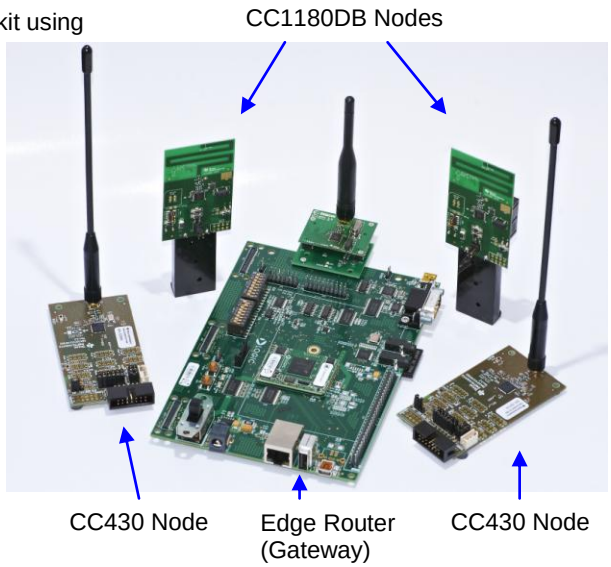
This guide describes how to set up a CC-6LOWPAN-DK-868 development kit using the pre-programmed devices of the CC-6LOWPAN-DK-868 Kit.

The 6LoWPAN development kit is designed to give a simple introduction to 6LoWPAN wireless networks in the 868/915MHz bands. The hardware consists of an OMAP-L138 based Edge Router equipped with a CC1180EM, 2 CC430F5137 based nodes and 2 CC1180DB nodes.

The CC1180DB boards consist of a network processor (CC1180) pre-programmed with a 6LoWPAN software stack, and a MSP430F5438A microcontroller that controls the 6LoWPAN device.

The CC430 based nodes consists of a CC430F5137 SoC (RF+MCU) that runs both the 6LoWPAN software stack and the controlling application.

The Edge Router board is running Linux and is pre-programmed with Sensinode Nanorouter 2.0 software, which acts as a bridge between IPv6 and 6LoWPAN. The Edge Router is connected to a PC via Ethernet. The Edge Router sets up the network and configures the 6LoWPAN network parameters.



The development kit demonstrates an example of a typical sensor network with a simple Network Analyzer software running on the nodes. The nodes are automatically given a unique IPv6 address and can be pinged from a PC using standard tools. Each node in the 6LoWPAN network also has a unique preprogrammed IEEE address.
The battery powered nodes can act as routers that on request report their key data to the Edge Router.

STEP 2 – Install the PC software and connect the Edge Router

Install the Windows IPv6 stack on a Windows XP PC. The IPv6 installation is not needed in Linux and Windows 7, since IPv6 is already installed.
Open a command prompt and write `ipv6 install`

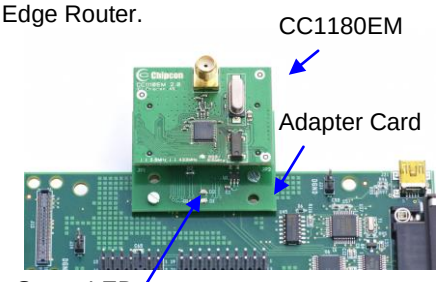
Assign the IPv6 address 2001::22 to the PC using the command prompt: (Run in administrator mode in Windows 7)
`netsh interface ipv6 add address "Local Area Connection" 2001::22`
Set up a default route using the command prompt: (Run in administrator mode in Windows 7)
`netsh interface ipv6 add route ::/0 "Local Area Connection"`

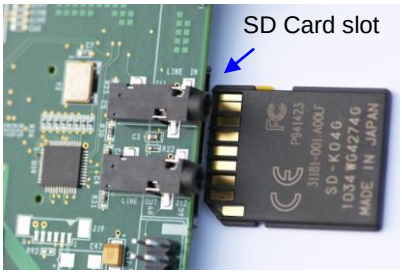
Note! You must change "Local Area Connection" to the actual name of the Ethernet connection you want to use. You can get it from **Windows Network Connections.** The IPv6 address 2001::22 has to be unique on your network.

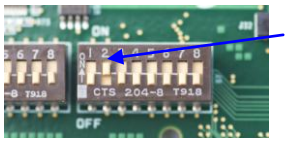
Plug in the power cable to the Edge Router and connect the Ethernet cable between the Edge Router and the PC. Make sure that the Edge Router is **not** powered on.
Insert the SD card into the slot on the Edge Router.

Connect the CC1180EM to the adapter card and connect an antenna to the CC1180EM.

Connect the adapter card to the J30 connector on the Edge Router. The adapter card can be fastened to the Edge Router by the provided M2 screws.







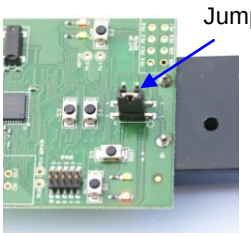
Make sure that the switch S7-2 is in position ON, and all other in position OFF.

Power on the Edge Router using the S4 switch.

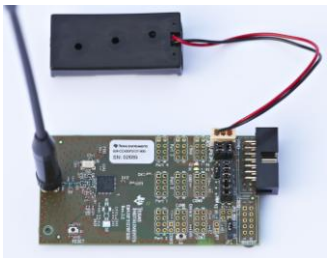
It will take approximately 40 seconds to boot the Edge Router. When the green LED on the Adapter Card goes ON it indicates that the Edge Router is up and running. You can connect the provided RS-232 NULL modem cable between the Edge Router and PC to get debug information, use e.g. Windows HyperTerminal with settings; Baud Rate 115200, 8 Data Bits, No Parity, One Stop Bit and No Flow Control.

STEP 3 – Connecting the nodes to the 6LoWPAN network

Insert batteries in one or more of the CC1180DB boards and make sure the jumper is connected between P1-1 and P1-2 to power on the node. It will automatically connect to existing network. LEDs D1 and D2 are controlled from the CC1180 network processor and gives status on node connection. When the CC1180DB node is connected to the network the green LED (D2) will be on, if not connected it will be off. The red LED (D1) blink when node is communicating. LEDs D3 and D4 are controlled from the host MCU and displays the RSSI value. Both LEDs off: RSSI above -40dBm, green LED on red LED off: RSSI between -40 and -65dBm, both LEDs on: RSSI between -65 and -90dBm, green LED off red LED on: RSSI below -90dBm. The red LED toggles with 1 sec interval if 3 concurrent reply messages were missed or Analyzer is not activated on PC.



Insert batteries in one or more of the CC430F5137 battery packs and connect an antenna. Connect the battery pack cable to power on the node.
LEDs D1 and D2 are controlled from the 6LoWPAN stack in CC430 and gives status on node connection. When the CC430 node is connected to the network the green LED (D1) will be on. The red LED (D2) blink when node is communicating.



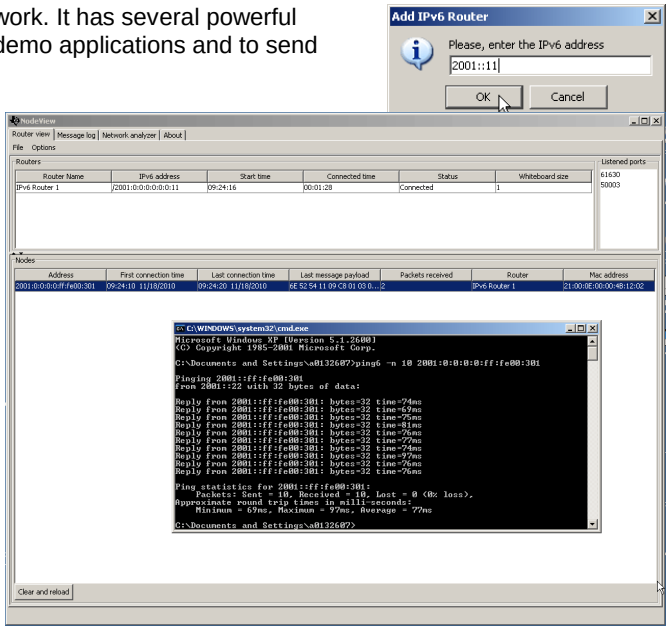
When nodes are powered on they connect automatically to the 6LoWPAN network, either directly to the Edge Router or via other nodes (Routers) in the network. Upon request from the Edge Router they send messages including network information to the Edge Router.

Warning! To minimize risk of personal injury or property damage, never use rechargeable batteries to power the boards. Do not leave the EVM powered when unattended.

Note that there should only be one active power source at any one time.

STEP 4 – Installing and Using NodeView Network Analyzer software

Node View can be used to interact with the nodes in the network. It has several powerful features such as Network Analyzer, message logs, running demo applications and to send custom data to nodes.
Download and install the latest Java runtime engine from www.java.com to your Windows PC.
Minimum version of Java to run NodeView is 1.6.0



Extract the provided NodeView package to C:\NodeView
NodeView package can be found via link on www.ti.com

Start NodeView by double-clicking the extracted NodeViewProDyn.jar file in C:\NodeView

Connect to your Edge Router by selecting File -> Add NanoRouter IPv6 in the RouterView tab.

Enter the IPv6 address of the Edge Router which is `2001::11`
The connected Edge Router is then shown in the Routers field.

The connected nodes are shown in the Nodes field. You can now use standard network tools to communicate with the nodes. To ping a node right-click a node and copy the IPv6 address of the node. Open a command prompt on your Windows XP PC and write: `ping6 -n 10 [IPv6 address]` Replace [IPv6 address] with the copied IPv6 address of the node you want to ping. This example will ping the node 10 times. Use the `ping` command on Linux and Windows 7. You can also view the network topology in the NodeView tab Network analyzer.

STEP 5 – Next steps

Extensive examples are provided to help you get started. Building and running each example is recommended to become acquainted with the devices. Refer to the examples' wiki page for more information.

For detailed information about the sample applications please see the following resources:

- CC-6LOWPAN-DK-868 wiki page: http://processors.wiki.ti.com/index.php/CC-6LoWPAN
- CC-6LOWPAN-DK-868 product web page: http://www.ti.com/6lowpan

- The Low Power RF Online Community has forums, blogs and videos. Use the forums to find information, discuss and get help with your design. Join us at www.ti.com/lprf-forum

STEP 6 – More Information

Caution! The kit contains ESD sensitive components. Handle with care to prevent permanent damage. To minimize risk of injury, avoid touching components during operation if symbolized as hot.

The hardware in this kit is FCC/IC certified and complies with ETSI/R&TTE over temperature from 0 to +35°C. The W5017 whip antenna (used on the Gateway) from Pulse has a gain of 2 dBi.

Important note: The CC-6LOWPAN-DK-868 kit is an educational tool that allows developers to get familiar with basic 6LoWPAN networks. It is **not** intended as a 6LoWPAN reference design.

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Caution

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

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Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

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If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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EVALUATION BOARD/KIT/MODULE (EVM)
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