Application Note:
Method For Discovering Network Topology

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Texas Instruments, Inc.
San Diego, California USA
(619) 497-3845

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1. Purpose

This document describes a method for determining the network topology for any given network using a subset of the Z-Stack ZDO (Zigbee Device Object) layer APIs.

2. Method

Using **ZDP_IEEEAddrReq()**, one can start the process by issuing this request to the PAN coordinator since it always has short address 0x0000. The ReqType parameter should be set to 1, to obtain the list of devices that have associated to the coordinator. The StartIndex parameter can be used if the list contains more devices that can fit into one message.

By using the callback function **ZDApp_IEEEAddrRspCB**, one can obtain the list of associated devices which will include their short addresses, as well as the IEEE address of the coordinator.The NumAssocDev parameter in the callback function returns the number of devices that are associated with the coordinator.

Once the first list from the coordinator is returned, one can repeat the above procedure targeted at each short address in the list. By iterating this procedure over all parents and children, the application will be able to “map out” the topology of the entire network, similar to the Z-Network application.

3. Example using Z-Tool

In this example, the contrived network shown in Figure 1 was created, and visualized using the Z-Network application. The **NLME_PermitJoiningRequest()** function was used on the coordinator device to force the formation of the network in this manner. By passing in the parameter of 0x00 to NLME_PermitJoiningRequest, the user can deny other devices from associating to a particular router or coordinator. Passing in a parameter of 0xFF permits association.

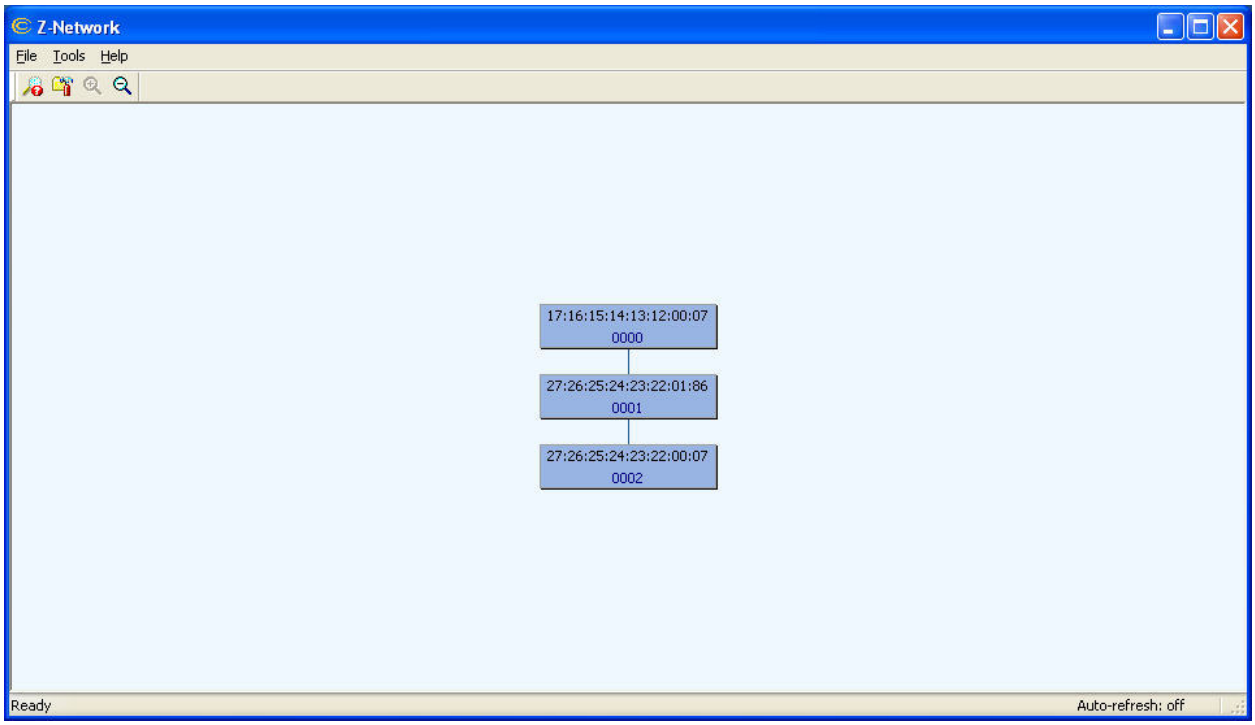

Figure 1. Network topology visualized using Z-Network

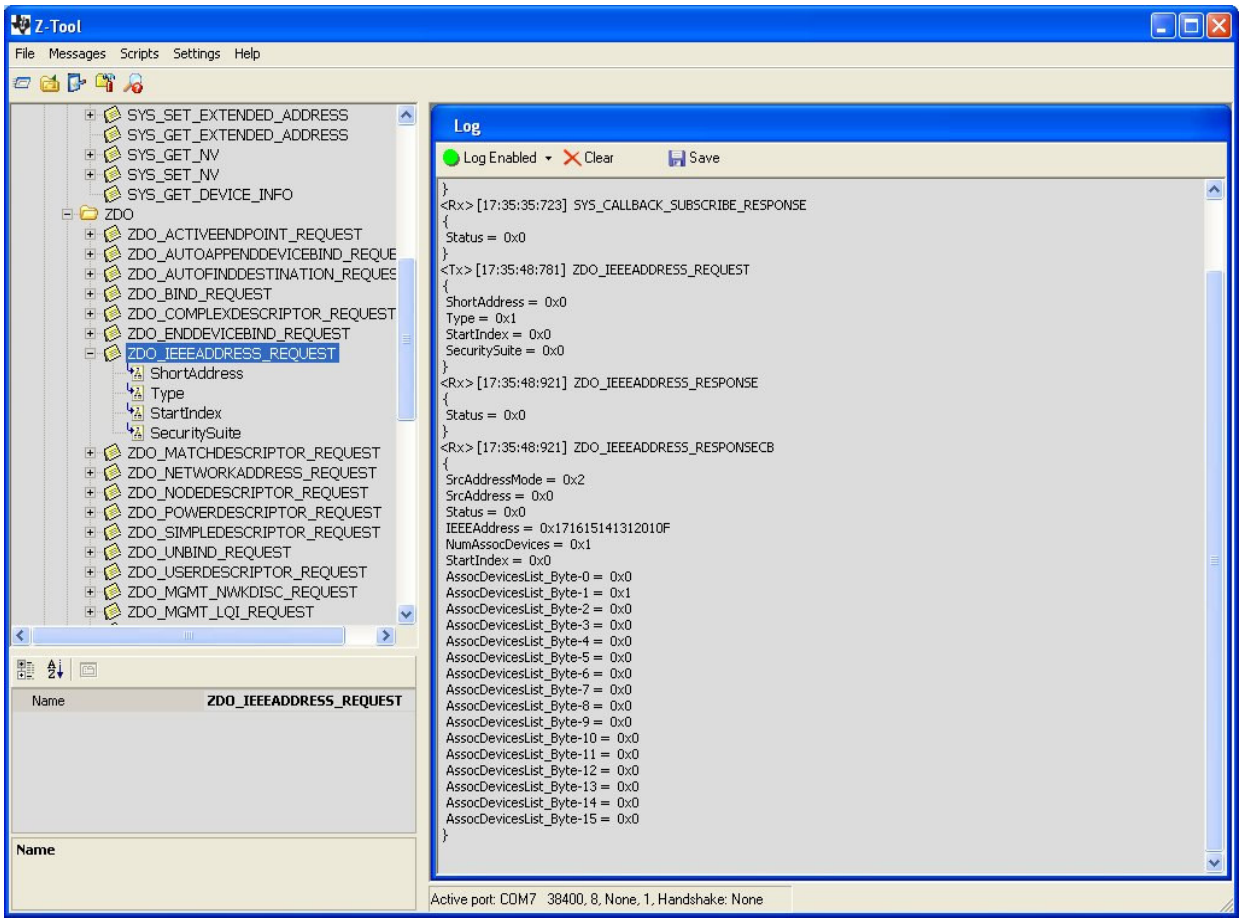

Figure 2. ZDO_IEEEADDRESS_REQUEST to short address 0x0000 (Coordinator)

The method described above can be demonstrated by exercising the ZDO MT (Monitor Test) functions using Z-Tool. These are compiled in via the MT_ZDO_FUNC compile option.

Figure 2 shows a screen capture of an instance of Z-Tool connected to the coordinator. One should first subcribe to the ZDO_IEEEADDRESS_RESPONSECB command (0xA81), then issue the ZDO_IEEEADDRESS_REQUEST with the ShortAddress parameter set to 0, Type set to 1, StartIndex set to 0, and SecuritySuite set to 0. The response is then displayed in Z-Tool, and we see that the coordinator has one device associated to it with short address = 0x0001.

ZDO_IEEEADDRESS_REQUEST is then issued to short address 0x0001, and we see that the router has one device associated to it with short address = 0x0002 (see Figure 3).

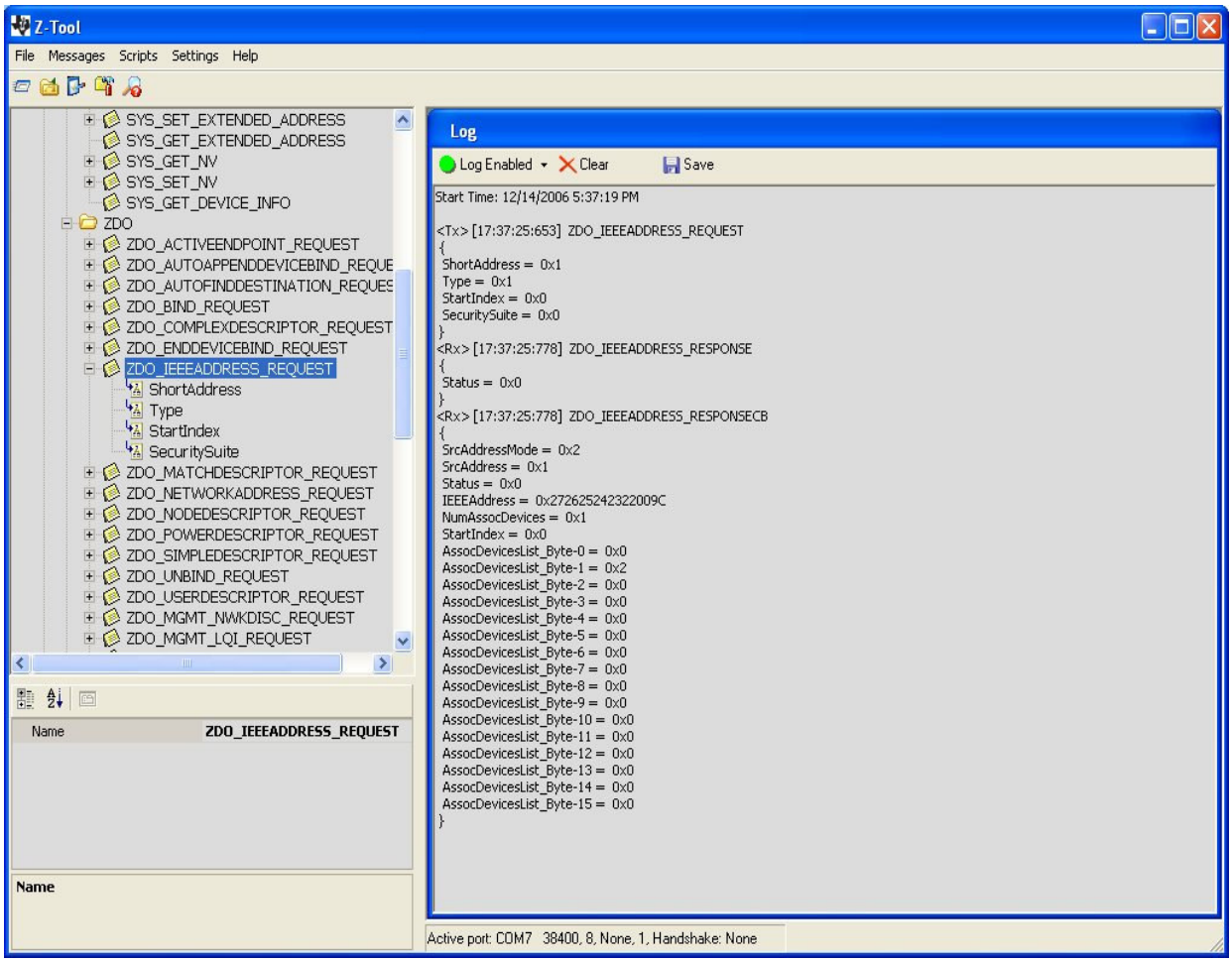

Figure 3. ZDO_IEEEADDRESS_REQUEST to short address 0x0001 (Router)

ZDO_IEEEADDRESS_REQUEST can then also be sent to short address 0x0002, and the user will see that no devices are associated with it. Thus, this is the end of the line, and the device discovery procedure is concluded.

4. Sequence Diagrams

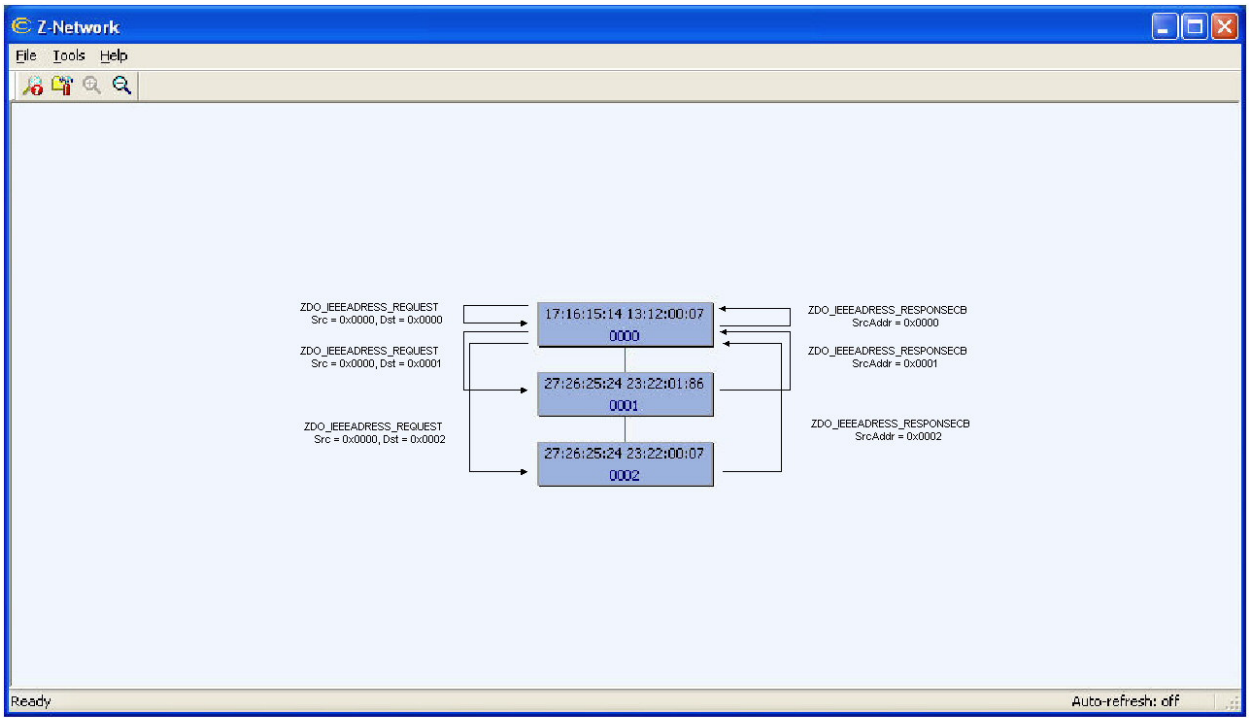

Figure 4. Sequence Diagram for ZDO_IEEEADDRESS_REQUEST and ZDO_IEEEADDRESS_RESPONSECB

Figure 4 shows the chain of ZDO_IEEEADDRESS_REQUEST calls on the left hand side of the device tree, and corresponding ZDO_IEEEADDRESS_RESPONSECB calls on the right hand side.