IZOT™ ROUTER EVK EDITION & IZOT ROUTER STANDALONE EDITION INSTALLATION OVERVIEW

MAY 2015

HOUSE KEEPING

- Provided that Avenet Memec have your email address, these slides will be sent out to you
- The session is being recorded for download purposes
- Please hold questions until the Q&A at the end of the session

AGENDA

- IzoT Product Road Map for Buildings
- IzoT Routers
- Documentation
- Configuring the Router
- Using the IzoT Router with U60 DIN Network Interfaces
- Restoring Factory Defaults
- LonTalk/IP Vs IP-852 & Config Server
- Do I need an IzoT Router in a LonTalk/IP Network?
- Migration for Existing Networks
- Installing the IzoT Router in a LonTalk/IP Network
- Host IP and LonTalk/IP Addressing
- LonTalk/IP Derived Addresses
- IP Addressing Compression
- LonTalk/IP Multicast Addressing
- Mapped Addressing
- IP Routes
- IzoT Net Services Lontalk-IP Interfaces
- Finding the Host IP Address & LonTalk/IP Address of the IzoT Router
- Persistent Routes for PCs and Linux computers
- Commissioning with IzoT CT
- Using the IzoT Router with BACnet
- Using SSH & SFTP
- Updating the IzoT Router Software
- Summary
- Q&A

IZOT PRODUCT ROADMAP FOR BUILDINGS

Field Components and Tools

Management Tier

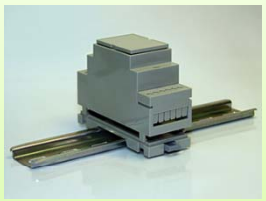
IzoT Net Server
Shipping

IzoT CT
Shipping

Control Tier

U60 Module
Shipping

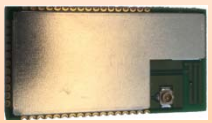
IzoT Router
FCS Jun'15



U60 DIN
FCS Jun'15

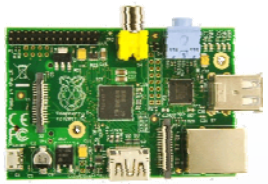
Device Tier

FT 6050 / 6010
Neuron 6050
Shipping

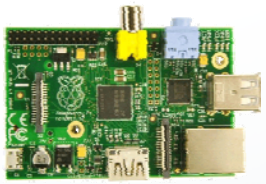


CPM 4200
Wi-Fi Module
FCS Jul'15

Development Tools



IzoT SDK 2
FCS Jun'15



IzoT ShortStack
FCS Jun'15

FT 6000 EVK
Shipping

NodeBuilder 4.4
FCS Jun'15

CPM 4200 Wi-Fi EVK
FCS Jul'15

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IZOT ROUTERS

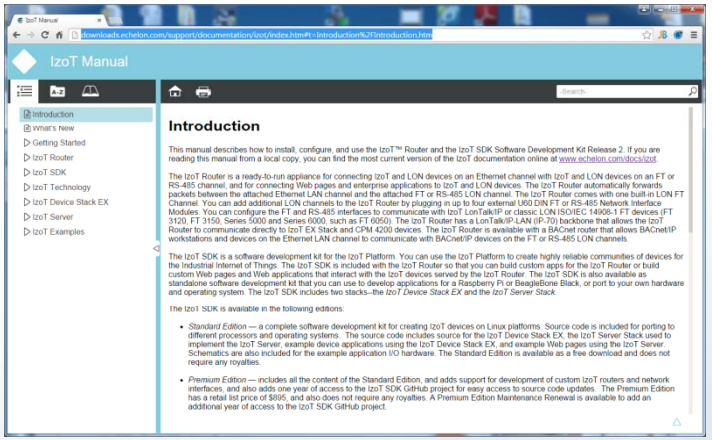
INTEGRATE MULTIPLE LINKS AND PROVIDE CLOUD ACCESS

EVK Edition: Now
Standalone Release: Jun'15

- IzoT Router
  - Easy connectivity to head-end applications and cloud services
  - Multi-channel
    - FT, Ethernet, and optional Wi-Fi
    - Expand with up to four external USB modules for 7-channel routing
  - Multi-protocol
    - LON (Classic LonTalk)
    - LonTalk/IP
    - BACnet/IP (option)
    - *IP-852 (new for Jun'15)*
  - IzoT Server with REST API for custom Web page support
  - Custom Python app support
- U60 DIN Network Interfaces
  - FT and RS-485 models

DOCUMENTATION

- Documentation is available online now
- http://www.echelon.com/docs/izot
- Topics covered:
  - Setting up the IzoT Router
  - Determining the IP address of your IzoT Router
  - Using the LED indicators
  - Configuring a DHCP reservation
  - Assigning a fixed IP address
  - Reading the IzoT Router LED indicators
  - Using the IzoT service/connect button
  - Configuring the IzoT Router
  - Restoring the IzoT Router factory defaults
  - Installing the IzoT Router in a LonTalk/IP network
  - Installing multiple IzoT Routers in a network
  - RNI and IP-852 network interfaces
  - Using the built-in LON FT channel and adding U60 DIN network interfaces
  - Using the protocol analyser RNI
  - Updating the IzoT Router software
  - Troubleshooting

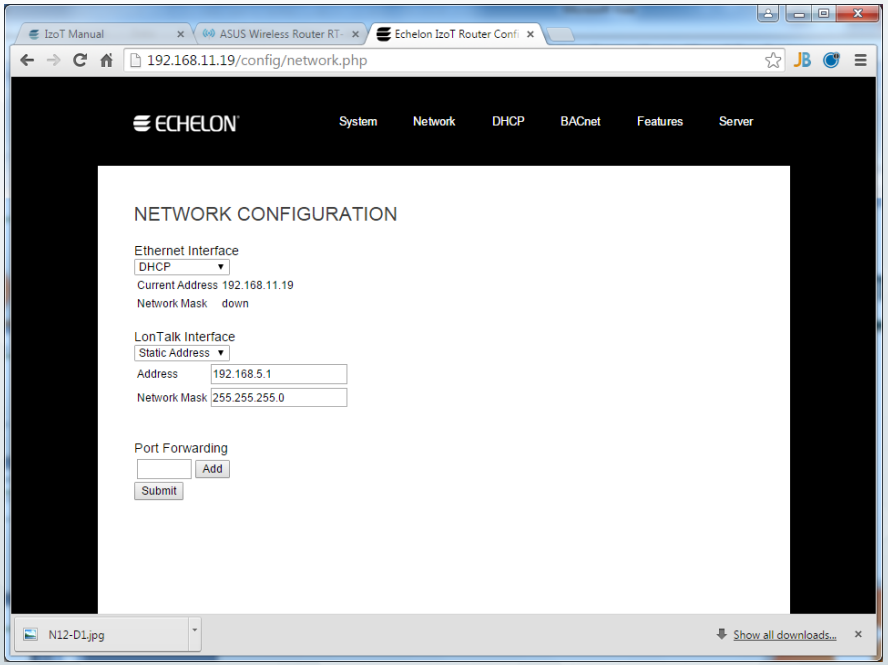


CONFIGURING THE IZOT ROUTER

- Default router user name and password is **admin/password**
- Default server user name and password is **admin/admin**
- Other server web pages use **izot/izot**
- Default Secure Shell (SSH) and Secure FTP (SFTP) user name and password is **debian/debian**
  - More later....

CONFIGURING THE IZOT ROUTER (CONT.)

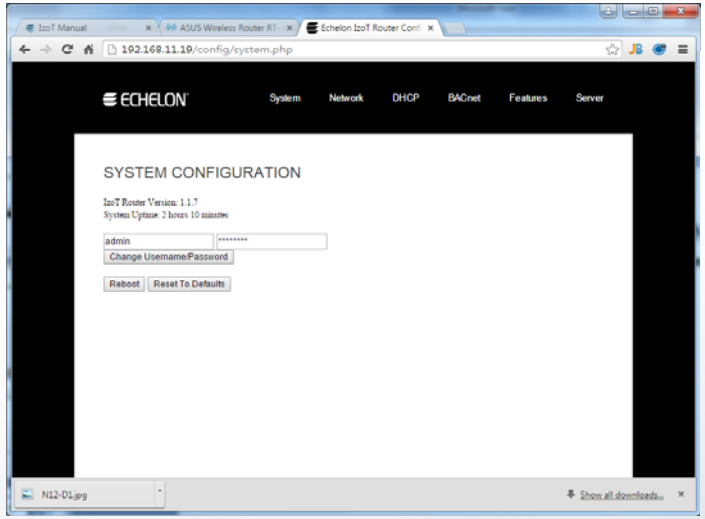
- Ethernet and LonTalk DHCP Vs Static addressing
  - Configurable in “Network” tab
  - Reboot needed for changes
- LonTalk DHCP
  - Configurable in “DHCP” tab
  - Server, Relay or disabled
  - Reboot needed for changes
- IzoT Router Services
  - Configurable in “Features” tab
  - IzoT Server
  - RNI
  - LonTalk routing
  - BACnet routing
  - FT Termination

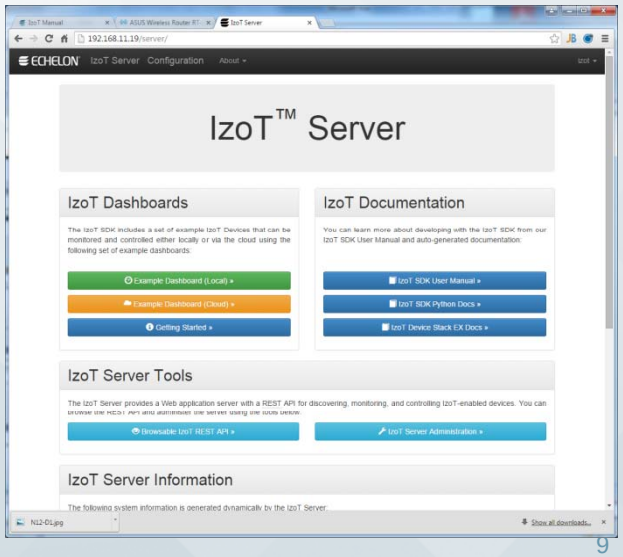


CONFIGURING THE IZOT ROUTER (CONT.)

- IzoT Router System Configuration
  - Configurable in the “System” tab
  - User name and password
  - Reboot
  - Reset to factory defaults

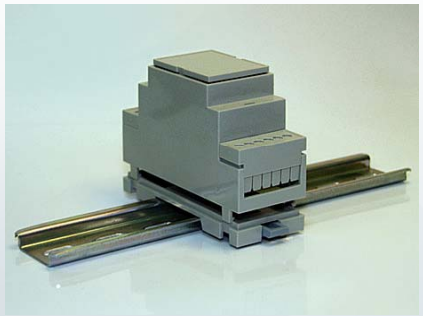
- IzoT server
  - Accessed via the “Server” tab

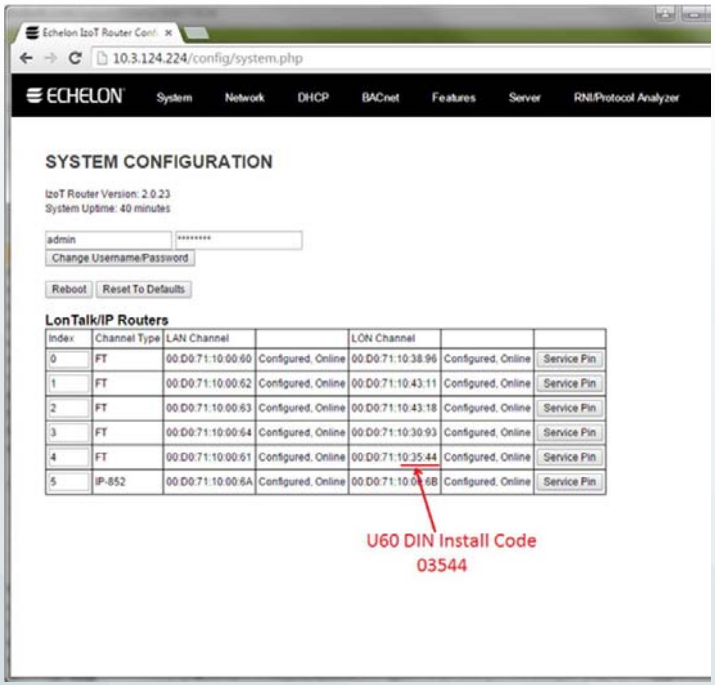




USING THE U60 DIN NETWORK INTERFACE WITH AN IZOT ROUTER

- Up to 4 U60 DIN FT or U60 DIN RS-485 (or a combination) Network Interfaces can be used with an IzoT Router to provide additional network connectivity.





RESTORING IZOT ROUTER FACTORY DEFAULTS

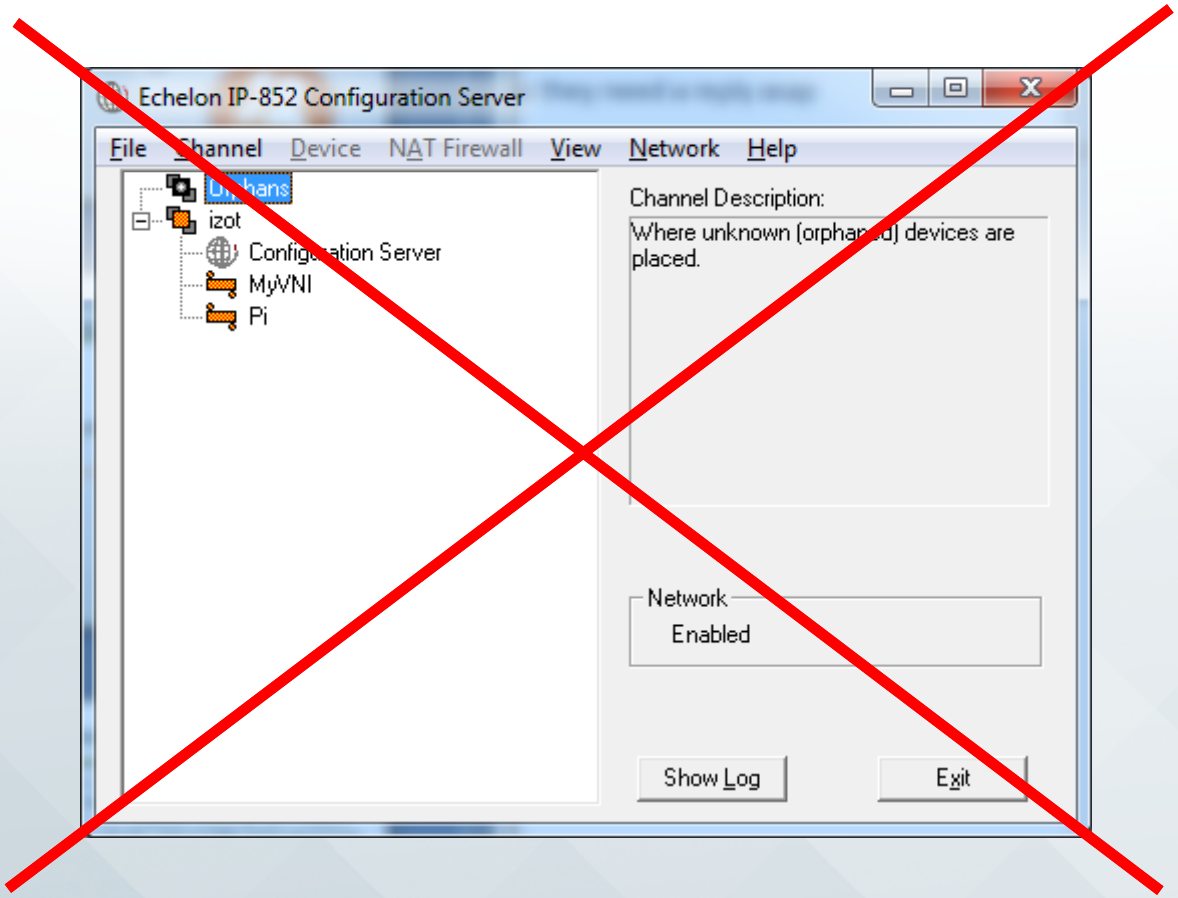
- Use the “System” tab or…
- Press the connect button
- Using a paper clip press the **Reset** button

- Wait 10 seconds until the Connect LED starts flashing red
- Release the connect button or..
- Hold the connect button while power cycling the IzoT Router

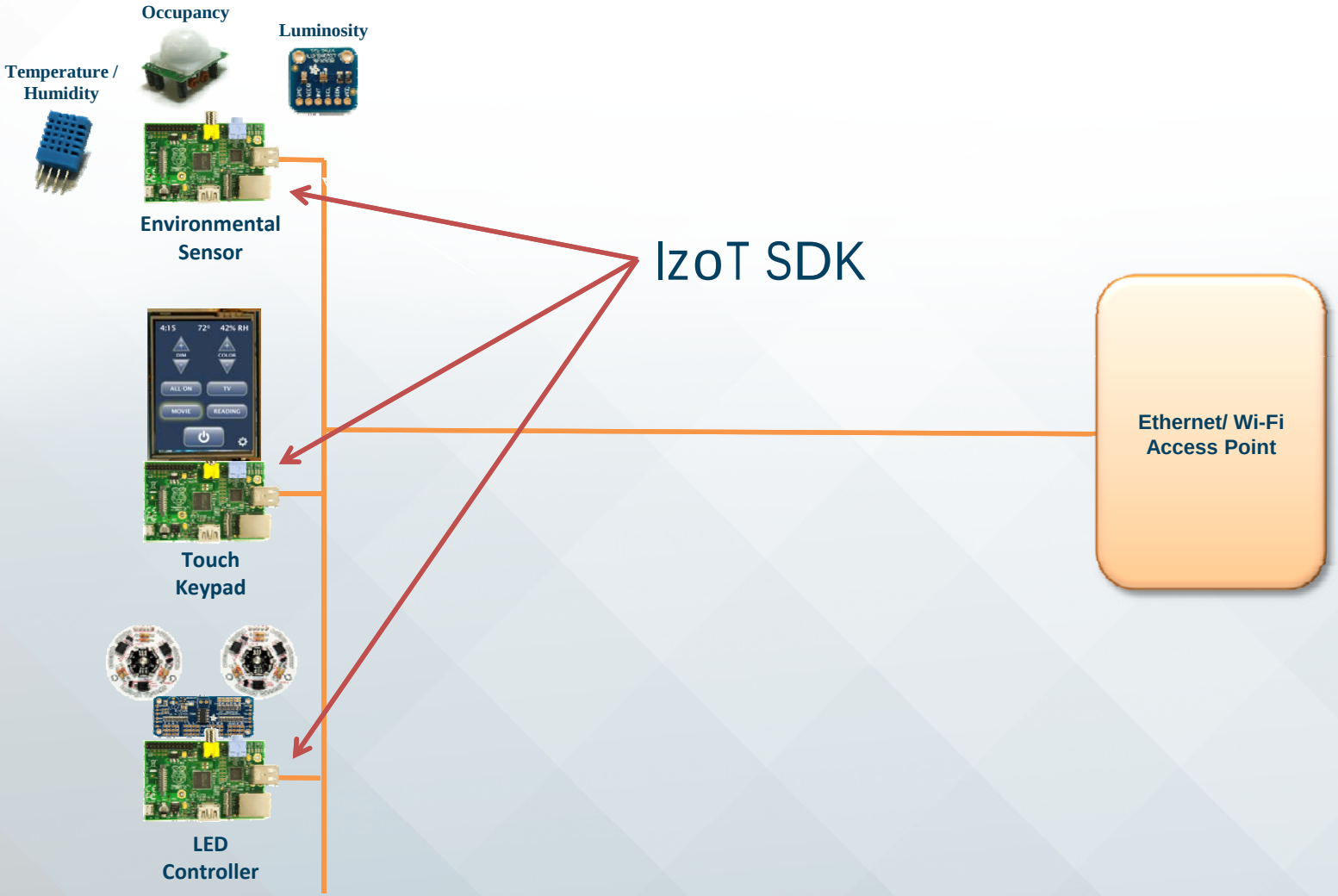
- IzoT Server defaults are set per the IzoT SDK User’s Manual

LONTALK/IP VS IP-852 + CONFIG SERVER

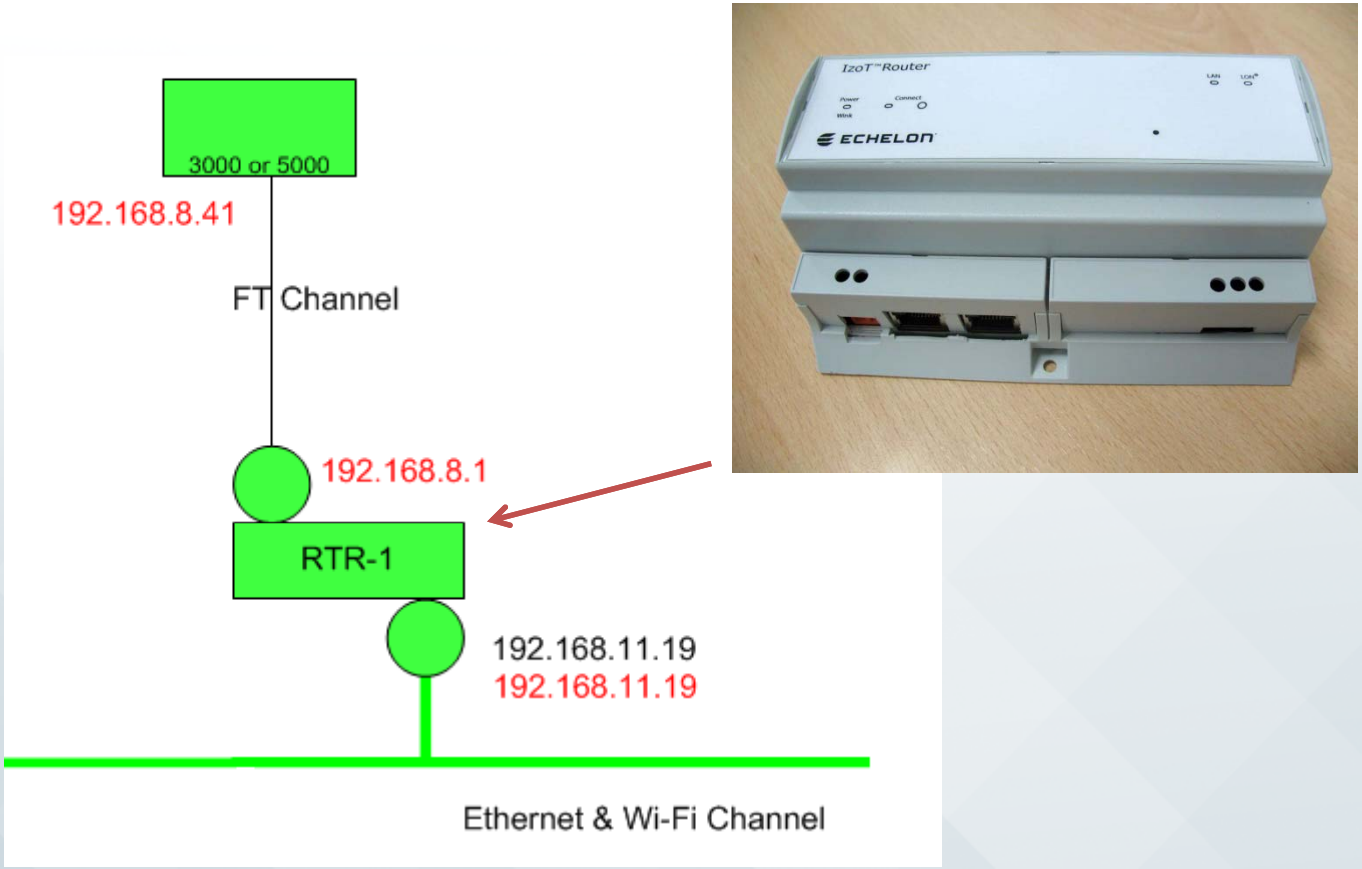
LonTalk/IP != IP 852



DO I NEED AN IZOT ROUTER TO CREATE A LONTALK/IP NETWORK?



MIGRATION FOR EXISTING INSTALLATIONS

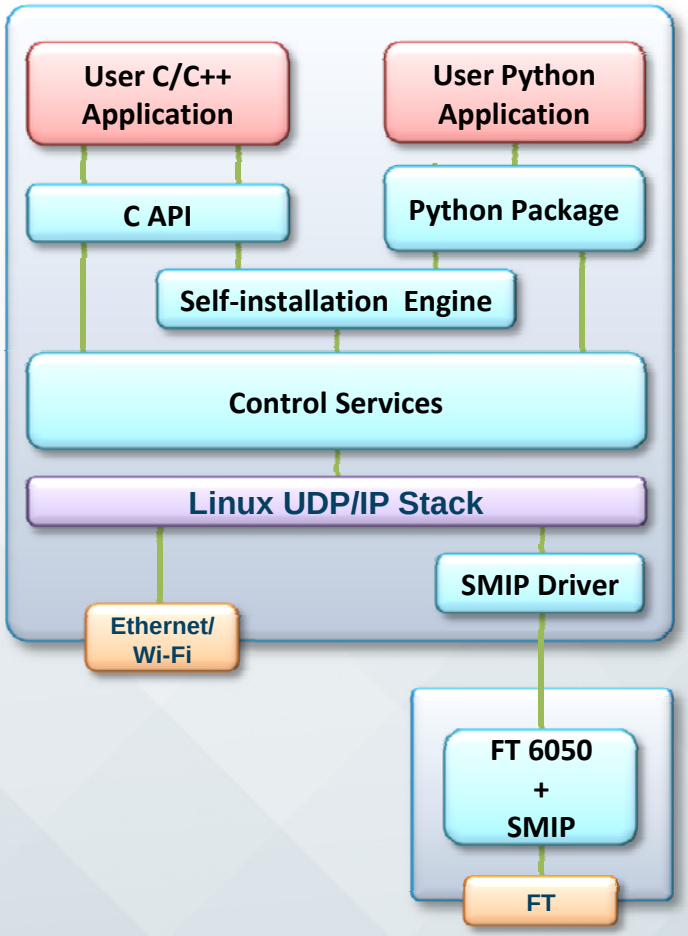


INSTALLING THE IZOT ROUTER IN A LONTALK/IP NETWORK

- IzoT Router default is to use Interoperable Self Installation (ISI)
- Default “Router Type” is a repeater
- Can be managed by an IzoT Net Server
  - IzoT Net Server will automatically configure it for remote network management during commissioning
- Multiple routers can be used to support large networks
  - 300 device for networks managed by ISI
  - 32,385 devices for networks managed by IzoT Net Server

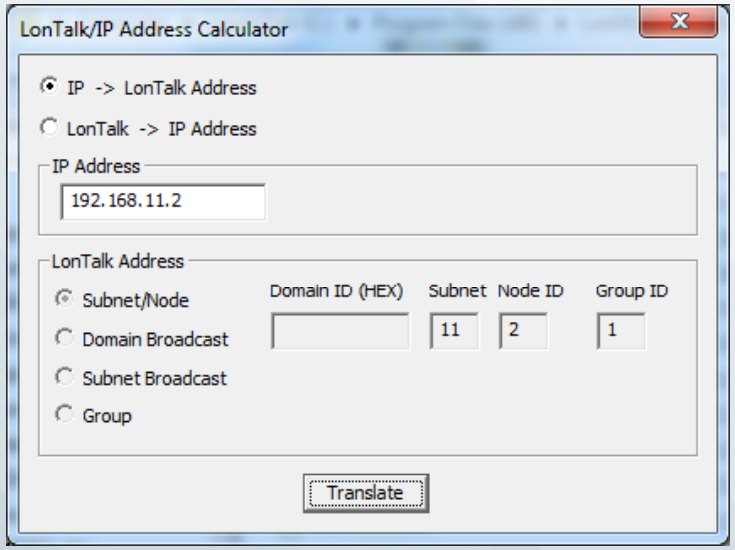
HOST IP AND LONTALK/IP ADDRESSING

- Each device in a LonTalk/IP network has two types of addresses:
  - Host IP address
    - Assigned typically by a DHCP server
  - Lontalk/IP address
    - Assigned by Interoperable Self Installation (ISI) engine
    - IzoT Net Server
    - Derived from LonTalk D/S/N address



LONTALK/IP DERIVED ADDRESSES

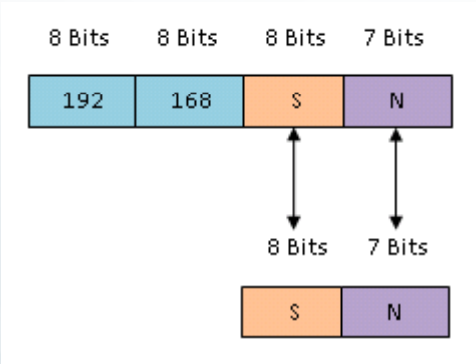
- Domain ID length 0: IP address is of the form 192.168.S.N
  - Set in OpenLNS Object Browser
- Domain ID length 1 with value DD: IP is of the form 10.DD.S.N
- Domain ID length 2 with the value D1D200 (last byte must be zero): IP address is of the form D1D2.S.N
- LonTalkIpAddressCalculator.exe



IP ADDRESS COMPRESSION

IPv4

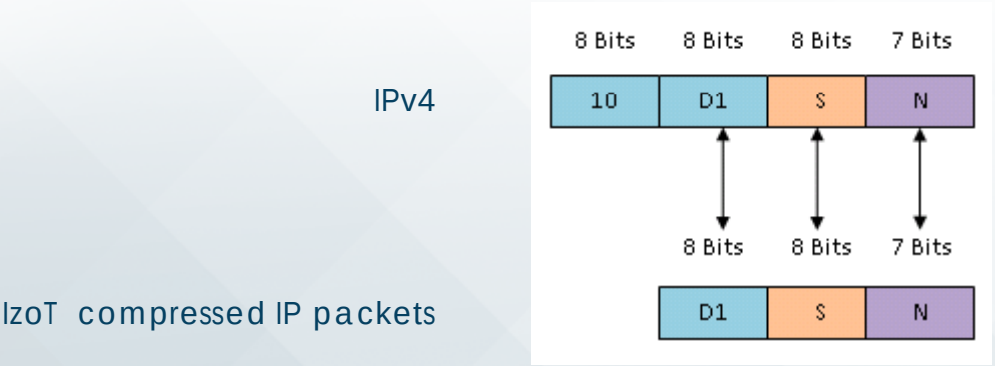
- 0-length domain ID



IP ADDRESS COMPRESSION

IPv4

- 1-byte length domain ID



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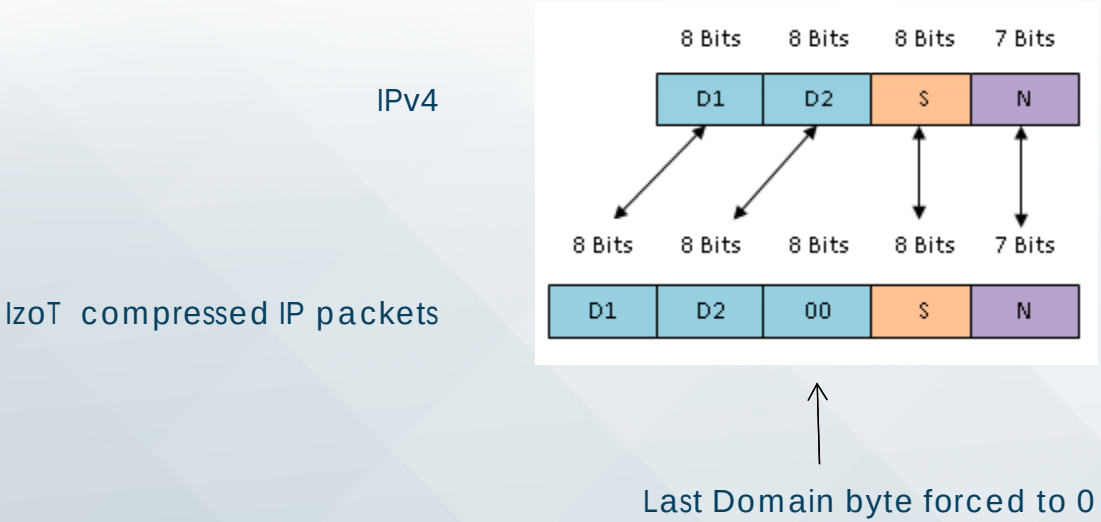
IP ADDRESS COMPRESSION

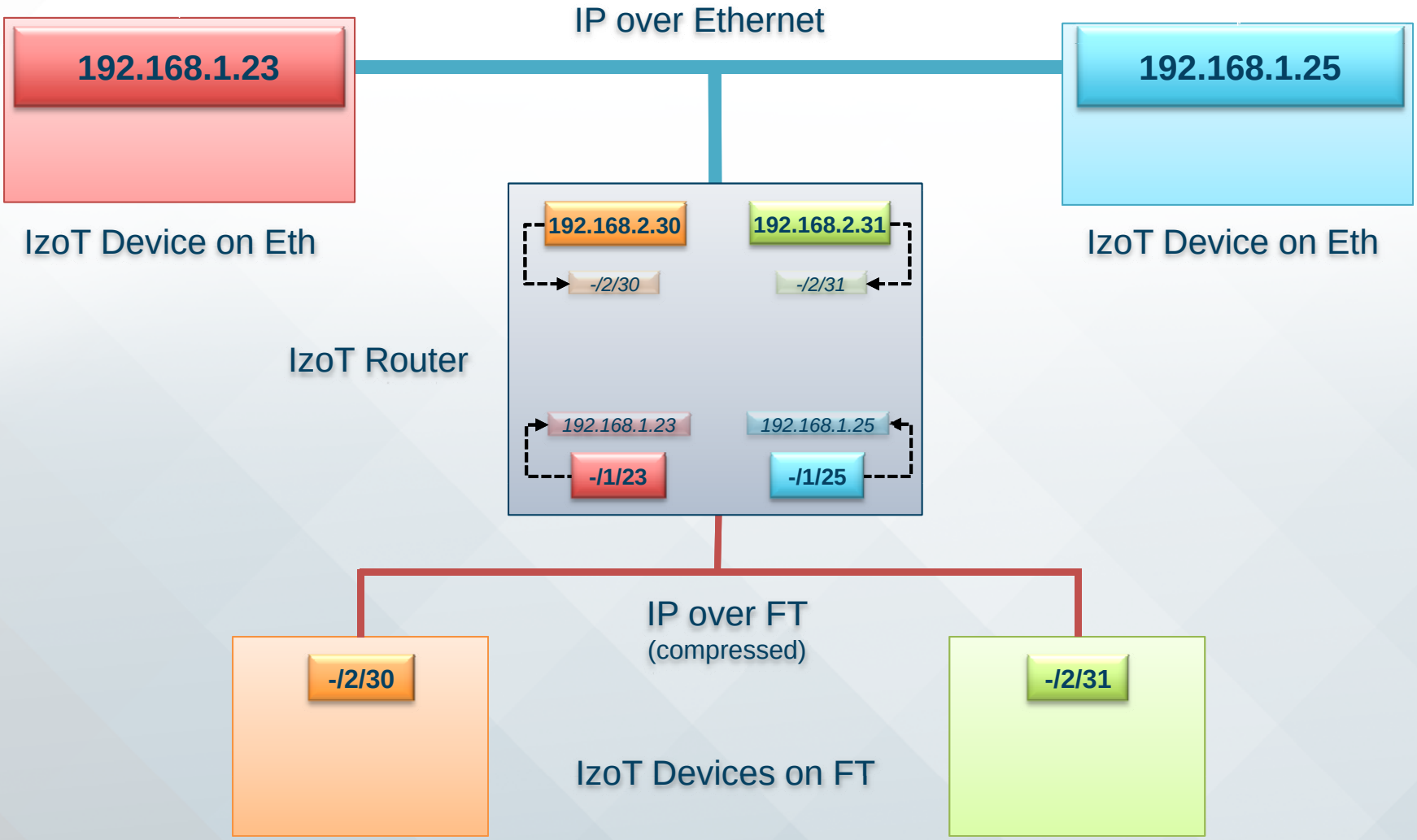
IPv4

- 3-byte length domain ID



IPv4 ADDRESS COMPRESSION/DECOMPRESSION

EXAMPLE



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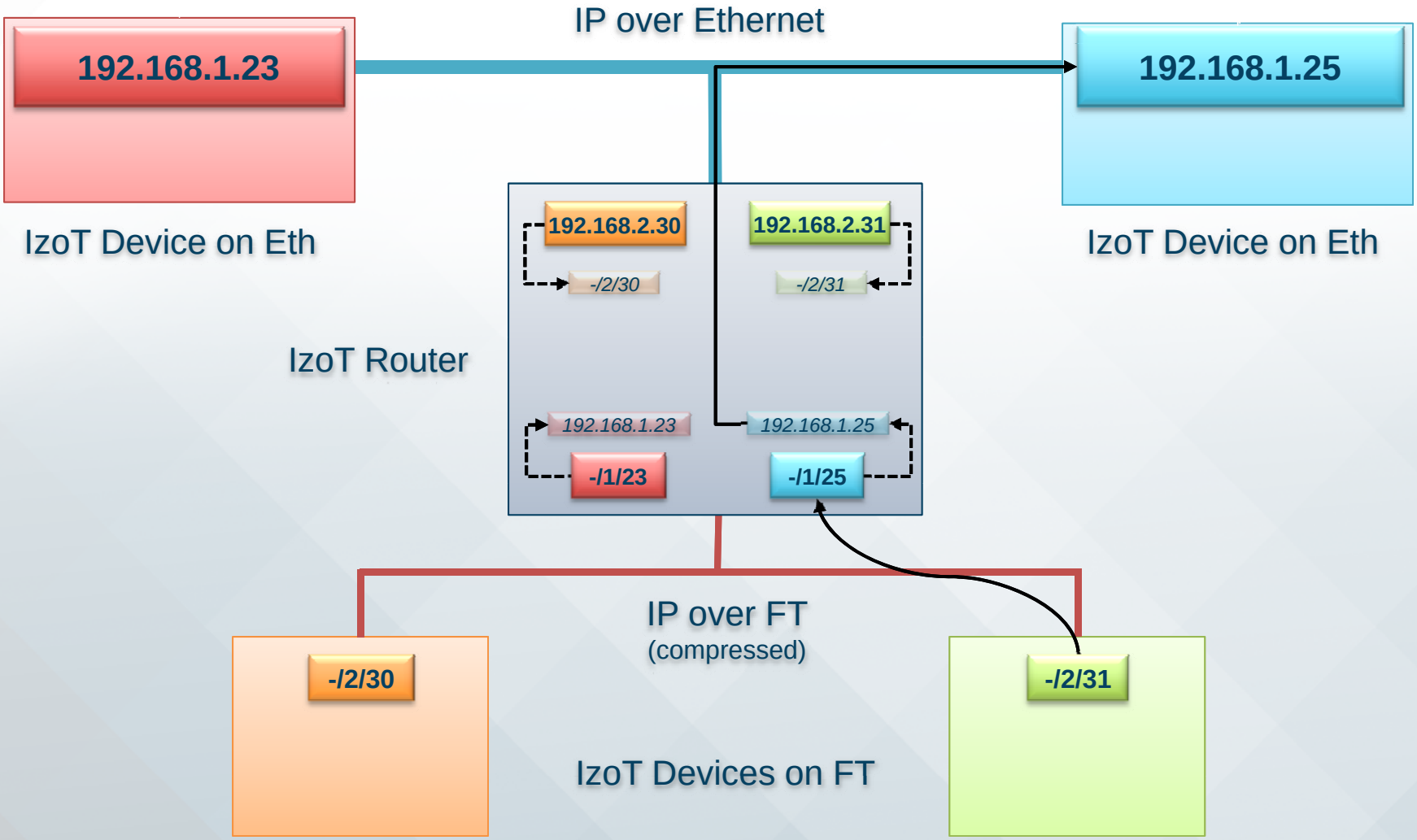
IPv4 ADDRESS COMPRESSION

DECOMPRESSION EXAMPLE



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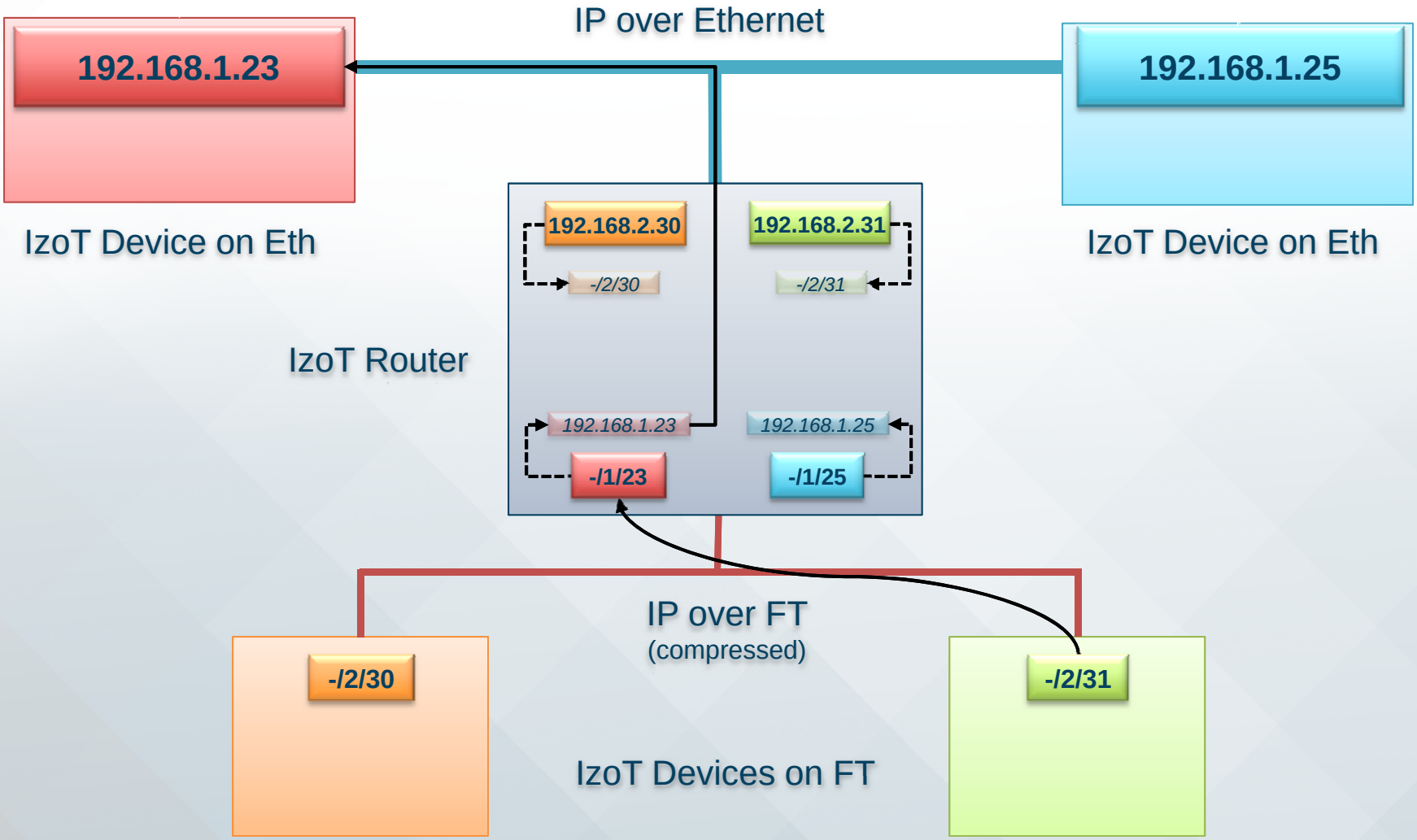
IPv4 ADDRESS COMPRESSION

DECOMPRESSION EXAMPLE



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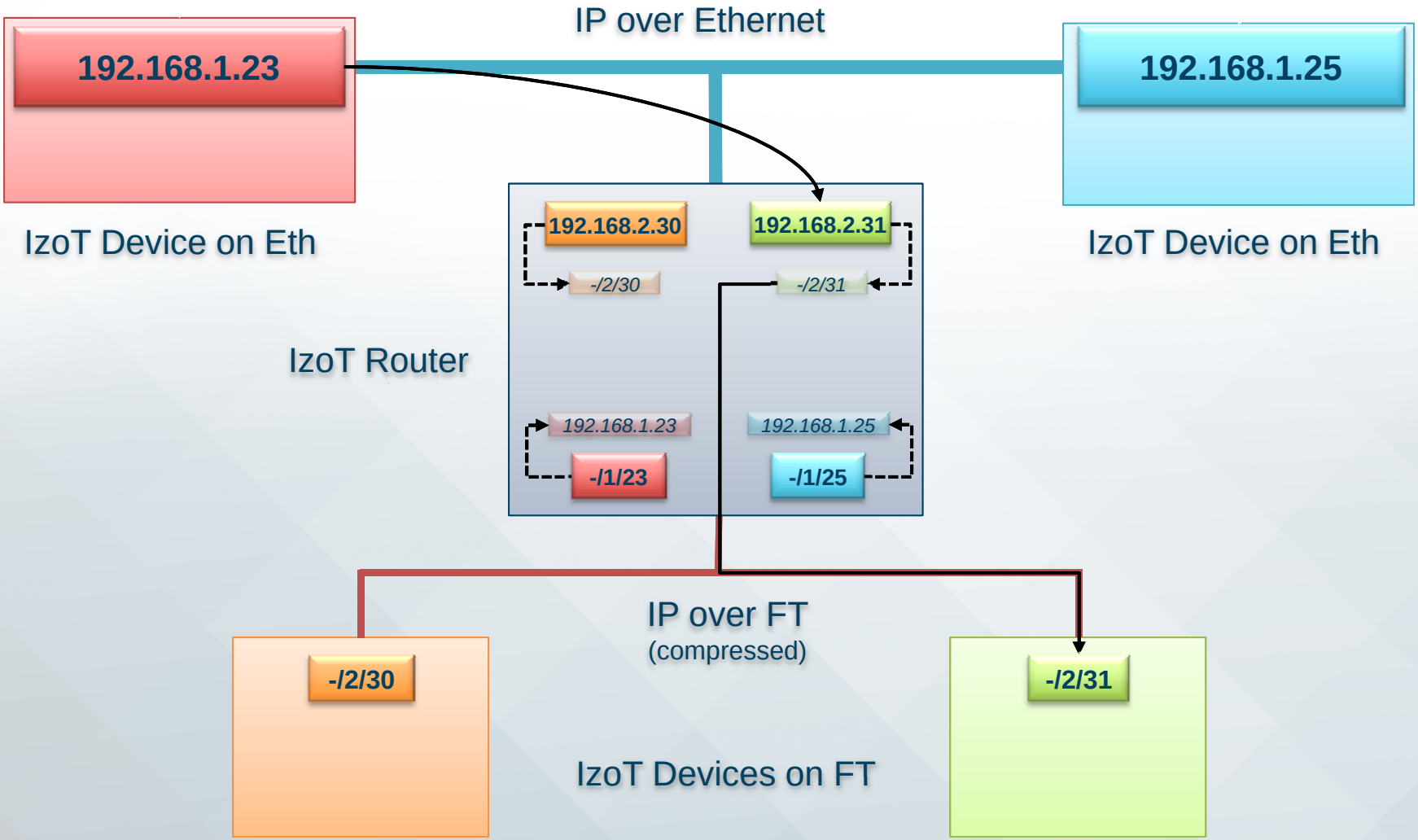
IPv4 ADDRESS COMPRESSION

COMPRESSION EXAMPLE



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LONTALK/IP MULTICAST ADDRESSING

- LonTalk/IP uses domain broadcast, subnet broadcast and group addressing
- LonTalk/IP passes network wide broadcast, subnet broadcast and group addressing through an IP infrastructure using IP multicast addressing
  - BACnet uses BACnet/IP Broadcast Management Device (BBMD) hardware to achieve network wide addressing at extra cost

LONTALK/IP IP MULTICAST ADDRESSING (CONT.)

- Messages with a destination address of 239.192.0.s should be forwarded to the ".s" subnet
- Messages with a destination address of 239.192.0.0 should be forwarded to all subnets within the network
- Messages with a destination address of 239.192.1.g should be forwarded to all subnets in the network
- All traffic will use source and destination port 2541
- Intermediate IP routers should be set up accordingly
  - VLANs can help

MAPPED ADDRESSING

- Mapped addressing allows one IzoT devices to learn another's host IP addresses allocated by the IP infrastructure
- The first transmission to a device in a peer to peer connection is always sent using a LonTalk/IP multi-cast address with the destination LonTalk/IP address encapsulated
- The recipient will reply from its host IP address
- The LonTalk/IP address will be encapsulated in the reply or it will be indicated that the LonTalk/IP address can be derived from the host IP address
- Subsequent transactions will use the actual host IP address as the target address

MAPPED ADDRESSING EXAMPLE #1

- Device A has host IP address of 10.3.124.55.
- LNS assigns its address to domain 050600, subnet 1, node 2 (05.06.1.2).
- When sending to 050600/1/2, LNS uses IP multicast address 239.192.0.1 and includes the destination domain/subnet and node Id in the UDP packet.
- Device A responds with source host IP address of 10.3.124.55 and includes its LonTalk address in the UDP packet.
- LNS learns from this that the IP unicast address for 050600/1/2 is 10.3.124.55, so subsequent messages to 050600/1/2 are sent using the unicast address 10.3.124.55 and include the Lontalk/IP destination address in the UDP payload.

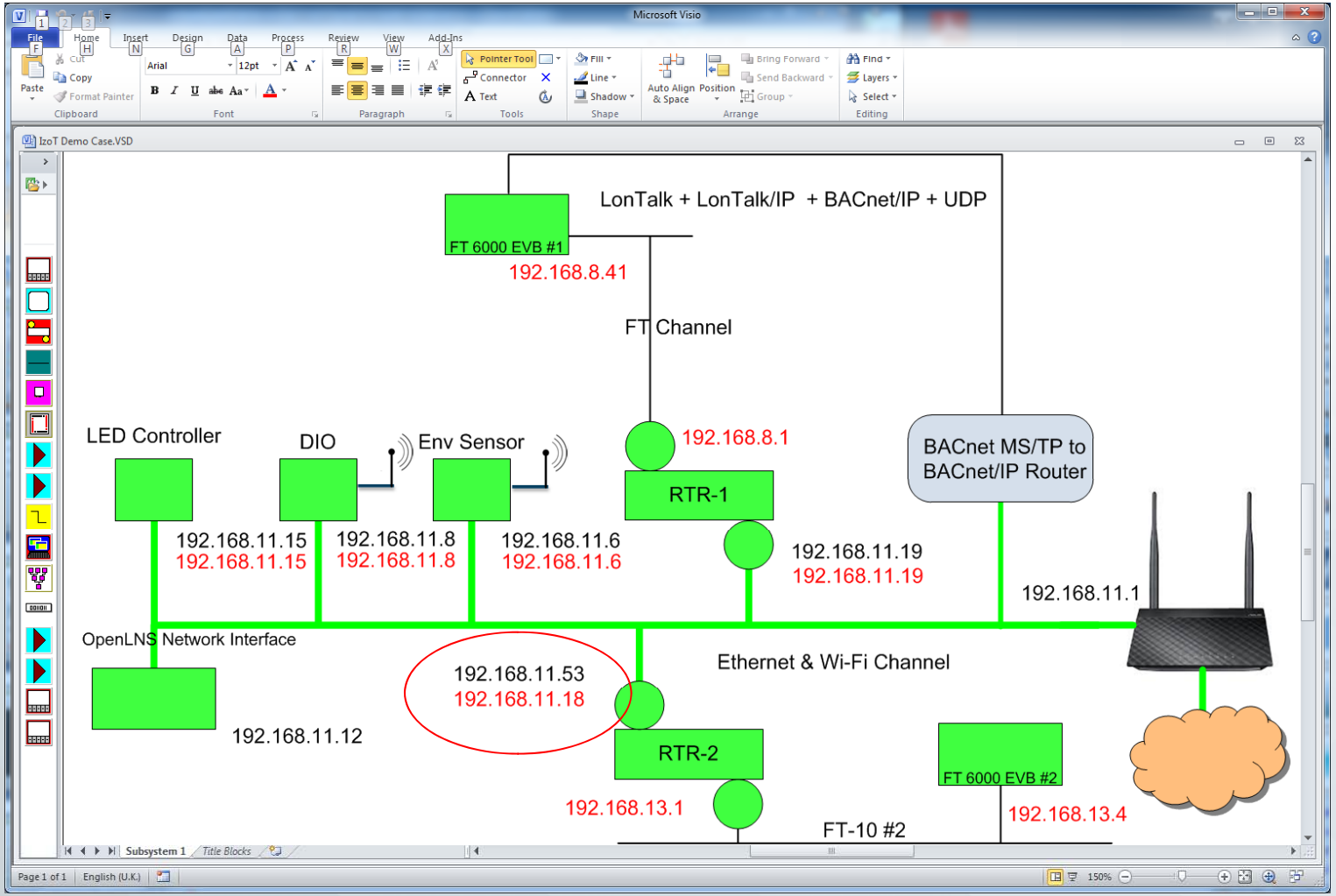
MAPPED ADDRESSING EXAMPLE #2

- Device B has host IPaddress 05.06.1.3
- LNS assigns LonTalk/IP address of domain 050600, subnet 1, node 3, which happens to be the same as the host IP address.
- When sending to 050600/1/3, LNS uses IP multicast address 239.192.0.1 and includes the destination domain/subnet and node Id in the UDP packet.
- Device B responds with source IP address of 05.06.1.3 and indicates that the LonTalk/IP source address can be derived from the IP source address.
- LNS learns from this that the IP unicast address for 050600/1/3 is derived, so subsequent messages to 050600/1/3 are sent using the unicast address 05.06.1.3 and do NOT include the LonTalk/IP destination address in the UDP payload.

IP ROUTES

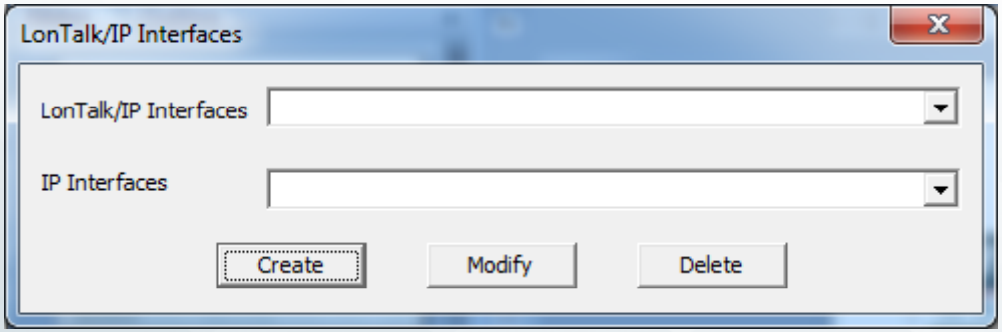
- IP routes tell a device how to reach another device on a different IP subnet when using unicast addressing
- Routes are part of a default gateway's configuration
- Can be manually added to a device (if supported)
- If a device does not know how to reach an address, it will forward the message to the default gateway for it to handle
- IzoT Router's "near" and "far" LonTalk/IP subnets can be found in the Identifiers tab of the router properties in CT or by looking at the router's domain tables from NodeUtil
- IzoT Router's host IP address can be found from the DHCP server or NodeUtil
- If a router's LonTalk/IP address is not the same as its host IP address a route is needed for it to respond to unicast addressing
  - CT manage test

IP ROUTES (CONT.)



IZOT NET SERVICES LONTALK-IP INTERFACES

- Found under IzoT Net Service Utilities



FINDING THE HOST IP ADDRESS & LONTALK/IP OF THE IZOT ROUTER

- From NodeUtil
- From IzoT CT
- From DHCP server

IP ROUTES (CONT.)

Addresses

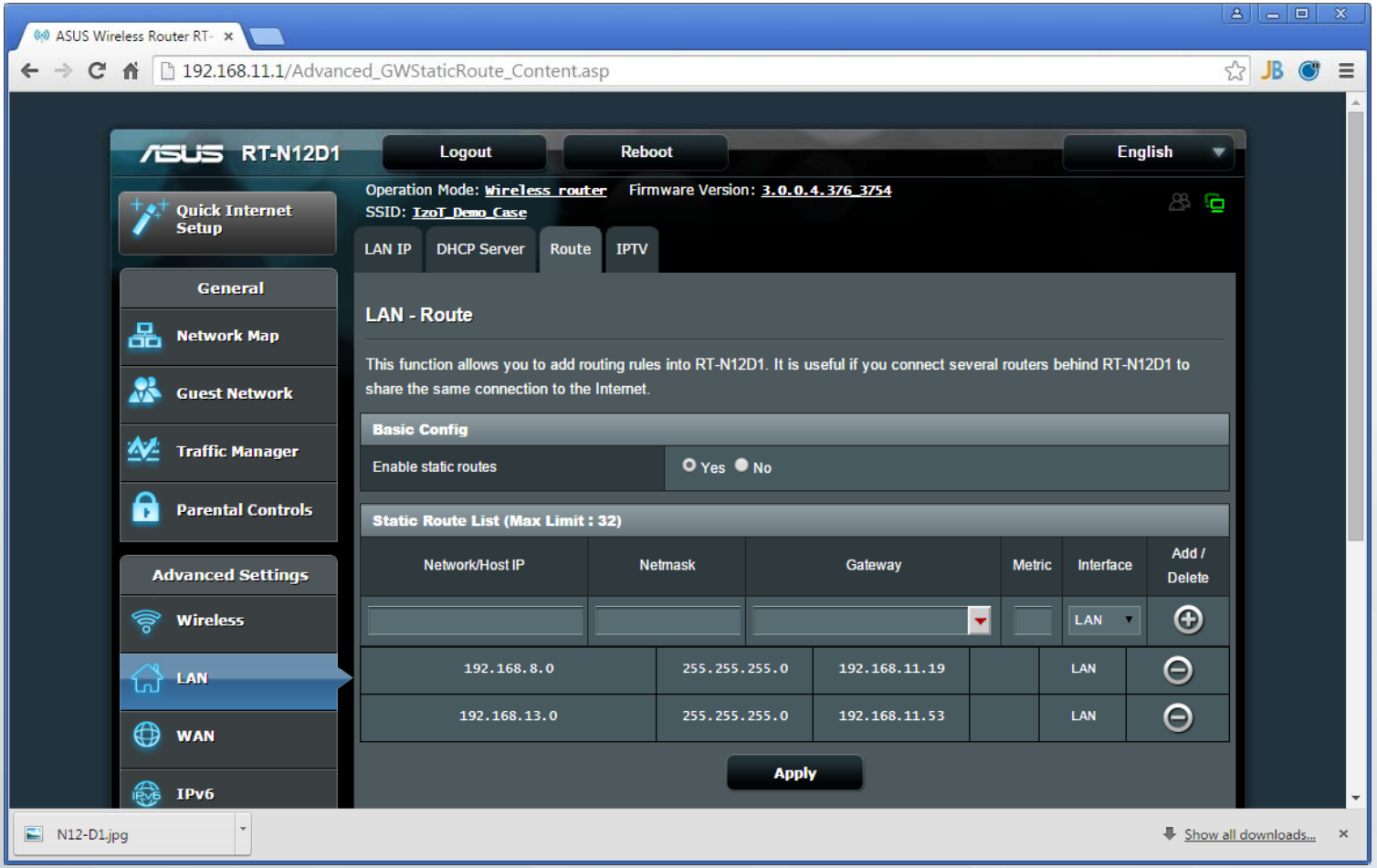
Router	LAN Host IP Address	LAN LonTalk/IP Address	LON LonTalk/IP Address
RTR-1	192.168.11.19	192.168.11.19	192.168.8.1
RTR-2	192.168.11.53	192.168.11.18	192.168.13.1

Routes

Router	LonTalk/IP Address	Subnet Mask	Gateway
RTR-1	192.168.8.0	255.255.255.0	192.168.11.19
RTR-2	192.168.11.18	255.255.255.255	192.168.11.53
	192.168.13.0	255.255.255.0	192.168.11.53

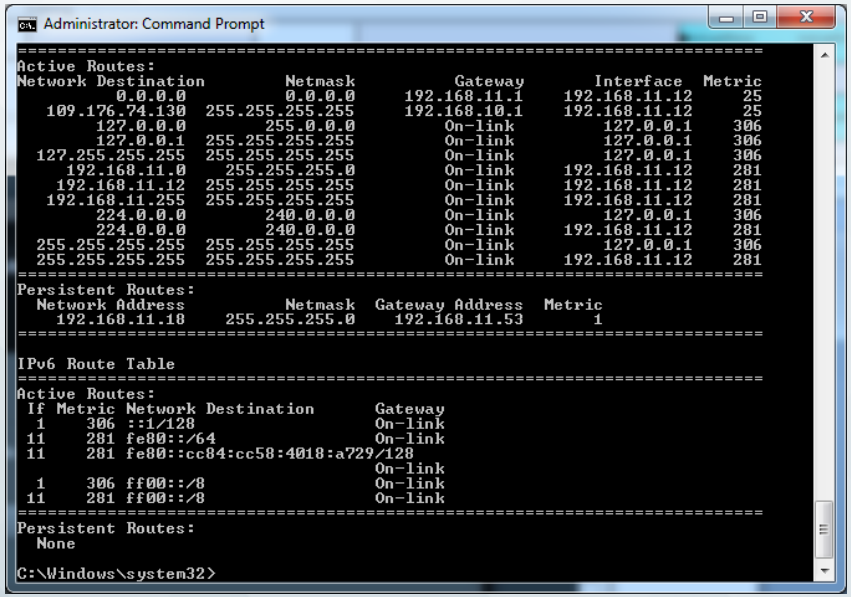
Note: Routes to different subnets are a normal IT setup procedure

IP ROUTES (CONT.)



PERSISTENT IP ROUTES FOR PCS

- From a command prompt elevated to administrator:
- route –p add 192.168.11.18 mask 255.255.255.255 192.168.11.53
- Needed in this instance as the Host IP and LonTalk/IP addresses are on the same subnet
  - Normally handled at the default gateway
- Route print



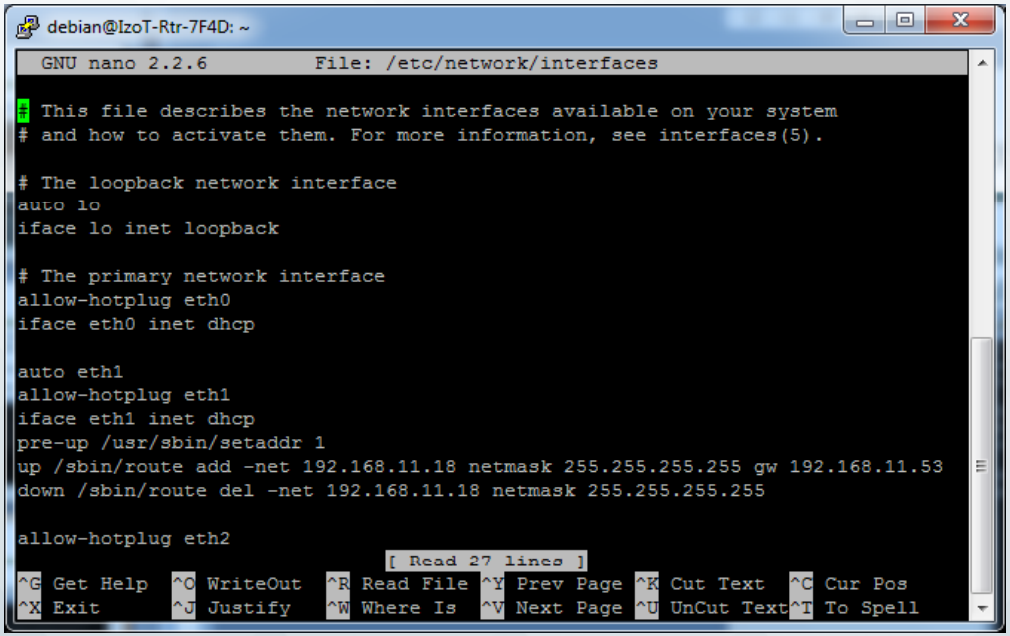
PERSISTENT IP ROUTES FOR LINUX DEVICES

- Add to /etc/network/interfaces, for example:

up /sbin/route add -net 192.168.11.18 netmask 255.255.255.255 gw 192.168.11.53

down /sbin/route del -net 192.168.11.18 netmask 255.255.255.255

- sudo route –n



COMMISSIONING THE IZOT ROUTER WITH IZOT CT

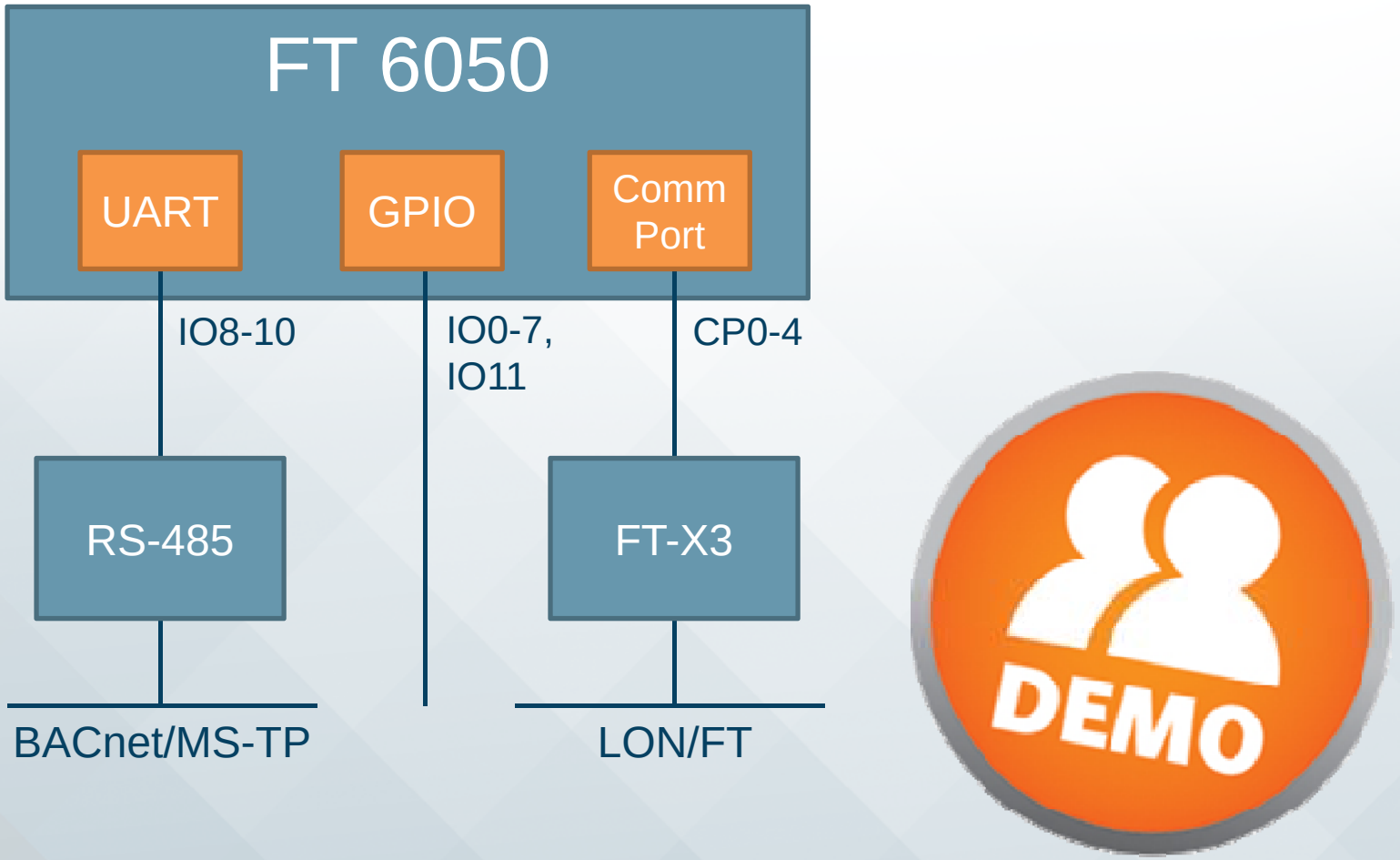
- Once commissioned with CT, if the router is using the configured algorithm:
  - Will filter traffic
  - You might experience lack of communications with NodeLoad or NodeUtil

- https://echelon.zendesk.com/hc/en-us/articles/204228014-How-to-use-NodeUtil-or-NodeLoad-with-IP-852-or-LonWorks-IP-or-IzoT-Router-KB942

USING THE IZOT ROUTER WITH BACNET

- The IzoT router is used to translate BACnet/IP to BACnet-over-FT-10 (BAClon)
- Allows FT-10 based devices to have a BACnet/IP interface as well as LonTalk, LonTalk/IP and UDP interfaces
- BACnet routing is an option with standalone version
- BACnet MS/TP availability scheduled for June 2015
  - Uses RS485 transceiver connected to the Neuron Chip's SCI I/O model

FT 6050 SUPPORT FOR BACNET/MS-TP



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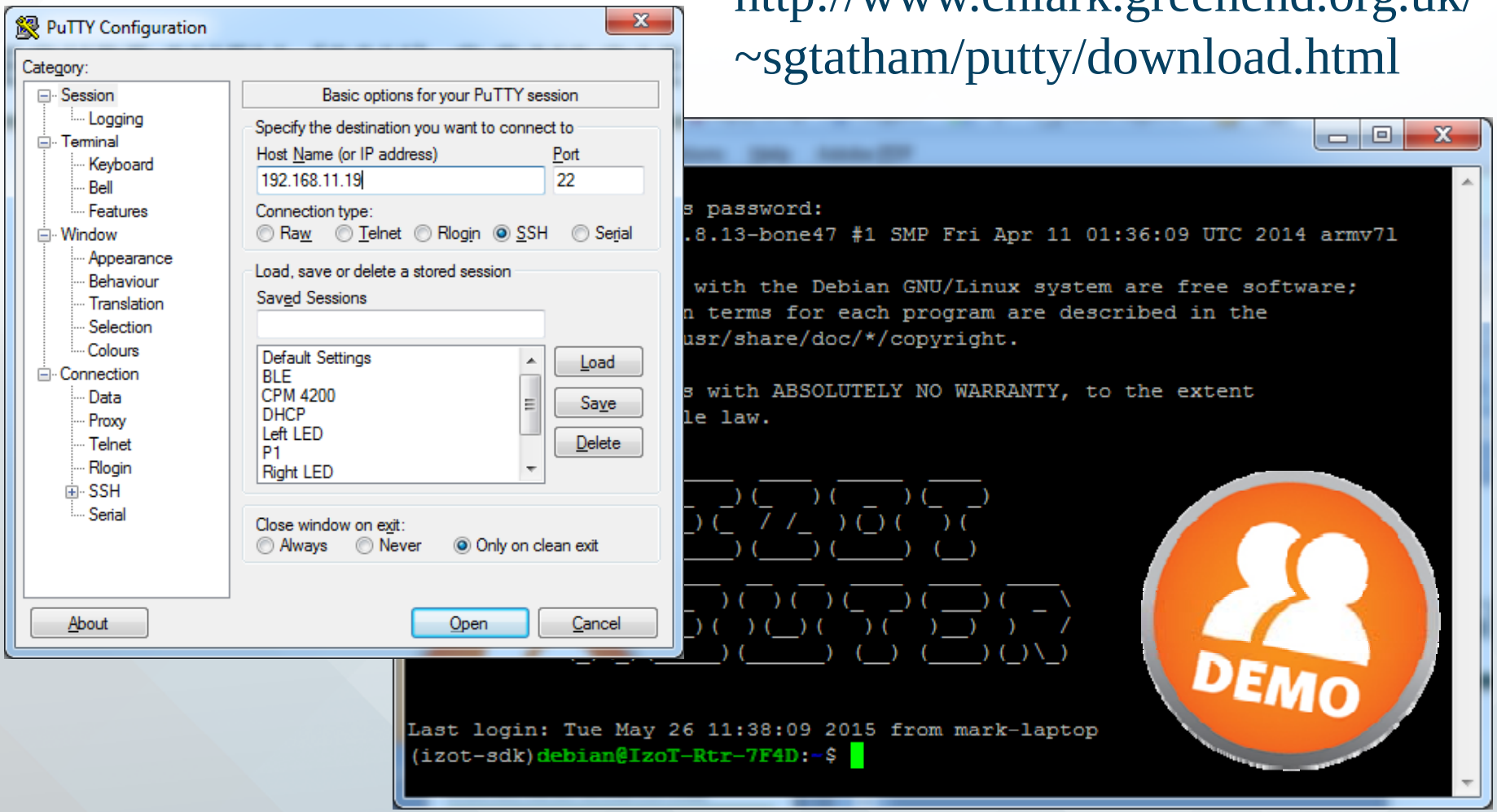
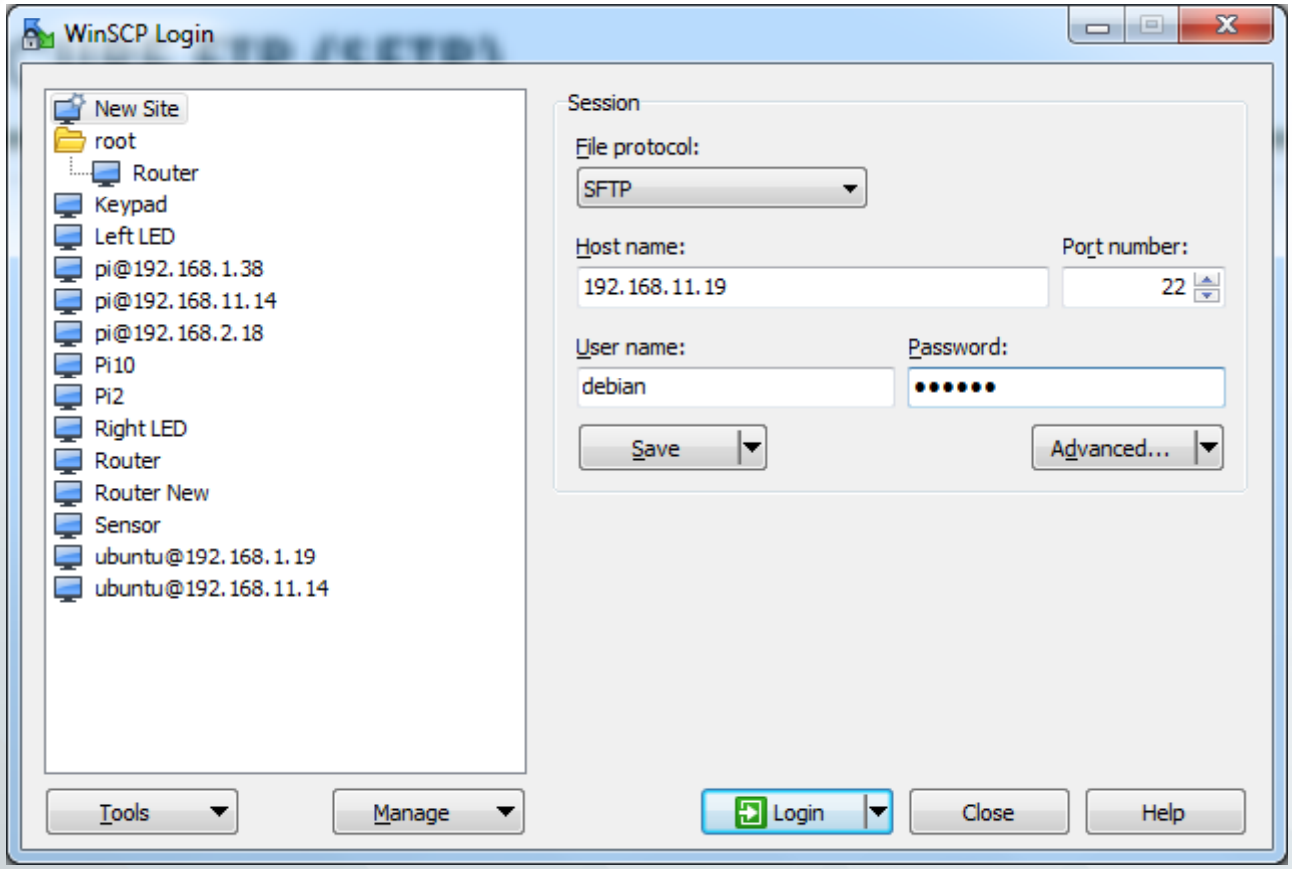
SECURE SHELL (SSH) CONSOLE CONNECTIONS

http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html



SECURE FTP (SFTP)



http://winscp.net/eng/download.php

UPDATING THE IZOT ROUTER SOFTWARE

- In the documentation
- You will need to contact support for the relevant links
- Router software updates include the IzoT Server
- Download and install update
  - Use SSH console to install the update
- Re-flash using a complete router software image
  - Uses a bootable USB flash drive
  - Establishes factory defaults

IZOT ROUTER INSTALLATION SUMMARY

For IzoT CT Installations:

- Pick your domain length and ID
- Create your network infrastructure in IzoT CT
- Create static routes to “far side” subnets as defined in IzoT CT in default gateway and subsequent paths as necessary
- Make sure LonTalk/IP multicast address can pass through IP network infrastructure
- Add devices in to IzoT CT, commission and test network
- Job done!

Q&A

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THANK YOU