

Connect Edge Configuration Planning Guide



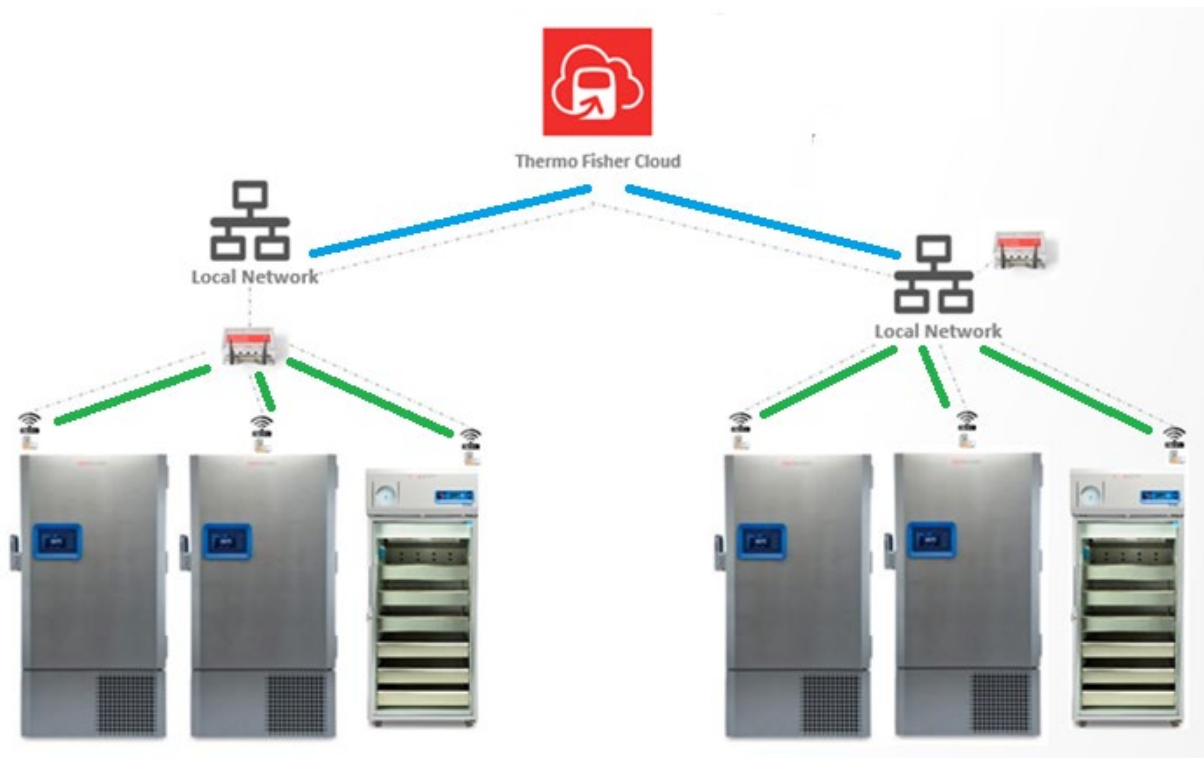
Thermo Fisher Connect Edge monitors your devices and laboratory equipment by collecting telemetry data through device adapters via a serial or USB connection. The data is sent across a network to a Connect Edge gateway, which forwards it to your Instrument Connect cloud account. The data can alternatively be sent directly to your own cloud or premise-based system (via OPC UA). You can then view the health of your devices and their historical readings or set parameters and notifications using your cloud portal account.

A variety of configuration options have been made available for connecting your gateway to the Internet, and for connecting each device adapter to an Ethernet or Wi-Fi network where it can communicate back to the gateway.

This document is designed to:

- **Present the various network connection strategies available with Connect Edge**
- **Compile a collection of gateway/adaptor configuration settings appropriate for your site**

Additional details, including TCP/UDP port allowance considerations, can be found in the Connect Edge User Manual and related documentation, available at www.thermofisher.com/rmresources



Overall Considerations

The Connect Edge system uses two segments of communication:

- A Connect Edge **gateway** requires an external Internet connection to the Thermo Connect cloud (**blue** path above).
- A Connect Edge **adapter** mounted on each monitored device communicates to the gateway via a common local network connection (**green** path above).

The above two networks are by default separate and isolated. The local adapter communication is by default not an external connection.

An optional “**local**” setting can be configured which allows the external network to be used for both Internet access AND communication with the device adapters.

The following requirement of the adapter connection (green path) is important to understand: **An Edge adapter can only deliver its information to the gateway via a local network connection which the gateway is also configured to use.** That connection can be the same as the gateway’s internet connection (if the “local” setting is configured), or it can be a wireless access point offered by the gateway itself, or it could be a completely different, isolated network connection; as long as both the gateway and the adapter are communicating on the same network.

The Connect Edge gateway offers the following connection options:

- **Eth 1** A wired external connection to the Internet
- **Wi-Fi 1** A wireless connection to the Internet
- **Eth 0** A wired connection to a local network
- **Wi-Fi 0** A wireless connection to a local network
- **Wi-Fi 0 AP** The gateway has the ability to generate its own Wi-Fi signal and act as an Access Point which adapters can use. When enabled, this makes use of the gateway's Wi-Fi 0 connection

Gateway Internet Connection

The gateway relies on an Internet connection for access to the Thermo Fisher Connect cloud portal. This choice is straightforward - choose either wired **Eth 1** or **Wi-Fi 1**. It is generally recommended to use the default **Eth 1** wired connection, to avoid the occasional issues commonly associated with any wireless network.



For the wired approach, you will connect an Ethernet cable from the gateway's Eth1 port to your DHCP (Dynamic Host Configuration Protocol) network with Internet access. If your IT needs to know the MAC (Media Access Control) ID of the gateway, this information can be found on a label on the back of the gateway.

*Note: If only one MAC ID is shown on your gateway label, that's the ID for Eth 0. The MAC ID for Eth 1 is the Eth 0 MAC ID + 2. MAC IDs are hexadecimal numbers, so if the last digit is 8, 9, or A-F, use a hexadecimal calculator to perform this addition.
E.g. $3484E4D8823B + 2 = 3484E4D8823D$*

Gateway Local Connection(s)

In addition to its external Internet connection, a gateway can use one or more Local connections. "Local" connections are used for two things:

- Local configuration of the gateway

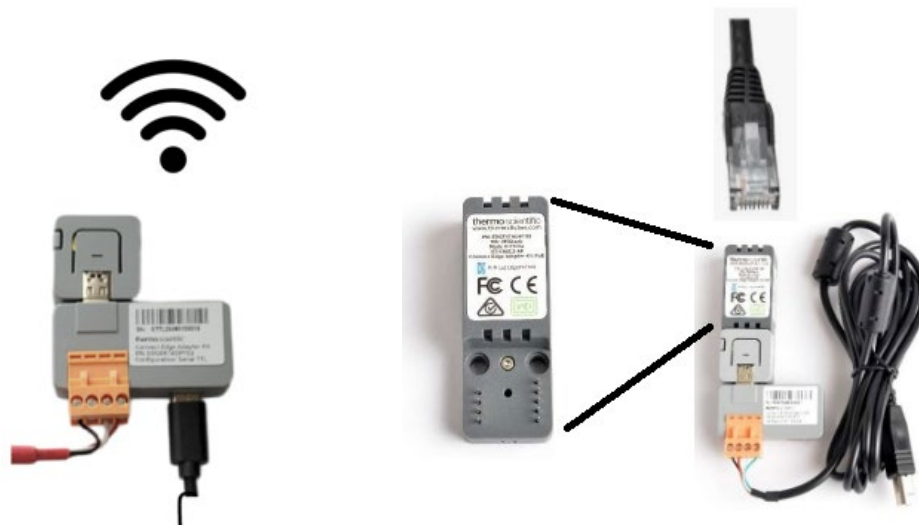
- Connecting to the same network that the adapters are to use

As mentioned earlier, An Edge adapter can only deliver its information to the gateway via the same local network which the gateway is using. Because of that requirement, you must define and configure the gateway's local connection(s) first, and then later program your device adapters to use that same local network.

The gateway can use one or more local network connections, accessed by any of the following interfaces:

- Wired Eth 0 (by default used for configuration with static IP 172.16.0.1, but is configurable)
- Wi-Fi 0
- The gateway's own Wi-Fi Access Point (uses the Wi-Fi 0 connection)
- The gateway's Internet connection (Eth 1 or Wi-Fi 1) when "Local" is enabled

Choose one of the above local interfaces to make the gateway's connection to the same network which your device adapters will use for communication.



Adapter Network Connections

A device adapter will be associated with each physical device that you will be monitoring. Adapters come in Wi-Fi/PoE and Ethernet-only models. Additionally, a Wi-Fi/PoE adapter can be converted to Ethernet with an optional Power Over Ethernet (POE) converter (center image above) to facilitate a wired Local connection. Some countries are only certified for PoE. Note that if the wired Ethernet connection is connected to a LAN (Local Area Network) port which indeed supplies POE, the adapter's power connector will not be needed.

Regardless of whether the adapter uses Wi-Fi or wired Ethernet to connect to a network, the choice of which network you connect to is important. Remember that it must be a network to which the gateway

also maintains a local connection. The gateway can use almost any of its interfaces for its own connection to that network:

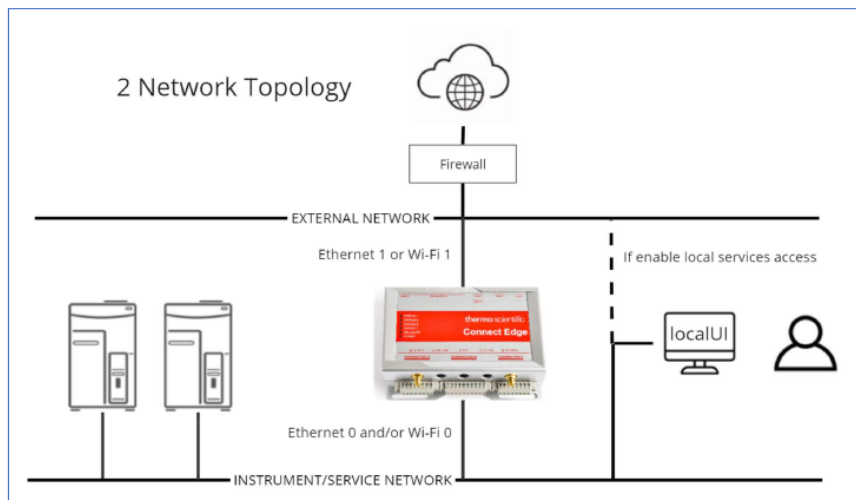
- Gateway's wired Eth 0
- Gateway's Wi-Fi 0
- Gateway's own Access Point (using Wi-Fi 0)
- Gateway's Eth 1, IF the gateway uses a wired Ethernet connection for Internet and has "Local" set
- Gateway's Wi-Fi 1 connection, IF the gateway uses wireless Internet access and has "Local" set

The only exception is the gateway's Eth 1 or Wi-Fi 1 interfaces, when those interfaces are NOT defined to be "Local". In that configuration, the gateway's Internet connection (on Eth 1 or Wi-Fi 1) is intentionally isolated from the gateway's various Local interfaces.

Topologies

When considering your connection choices, it's helpful to view the overall topologies that are available. You won't need to necessarily limit yourself to use a single topology; there are some overlaps that are appropriate for some installations.

Two-network Topology

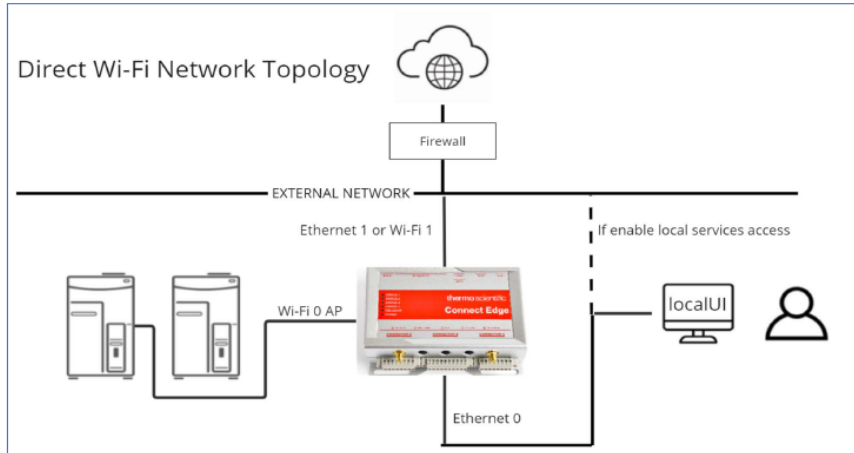


The above "2 network topology" retains isolation between the gateway's external Internet connection (Eth 1 or Wi-Fi 1) and the local network(s) used for communication with the monitored devices (Eth 0 or Wi-Fi 0).

This approach is useful when a common instrument/lab network is available for use by the monitored devices. That network does not need Internet access.

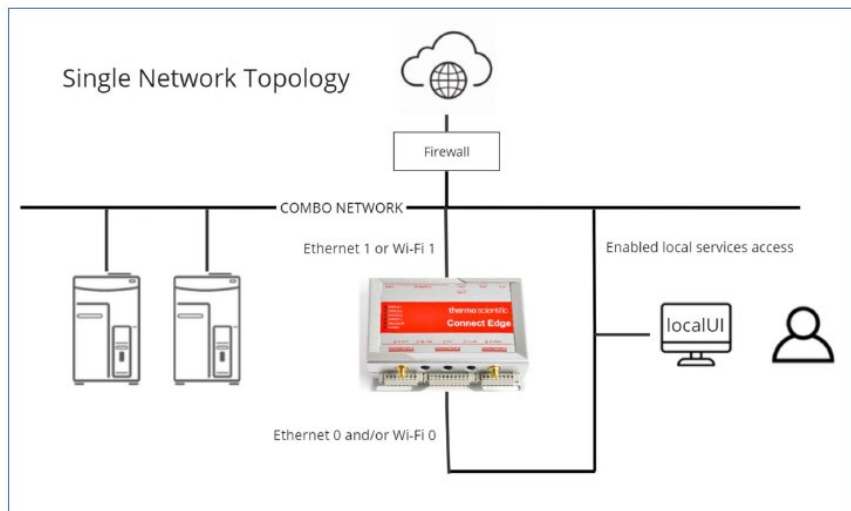
If both Eth 0 and Wi-Fi 0 are enabled and connected to a network, some devices could communicate wirelessly and others by Ethernet. The distinguishing point of this topology is its isolation of the network with Internet access. That is, Eth 1 and Wi-Fi 1 are NOT available for adapter connections; their "Local" setting is disabled.

Direct Wi-Fi Topology



The above “Direct Wi-Fi” topology is a slight variation of the one above. It continues to isolate the External network from the Local network(s), but it enables the gateway’s own Wi-Fi Access Point (AP) as the Wi-Fi 0 connection. The adapters then connect to this Wi-Fi AP directly, avoiding the need to connect to a house Wi-Fi at all. This reduces issues associated with house Wi-Fi APs going offline or changing credentials; the gateway’s own AP will remain up as long as the gateway itself is up. To note though, the device adapters must be in wireless range of the physical gateway. When using this topology, the gateway can accommodate a maximum of 10 adapters.

Single-Network Topology



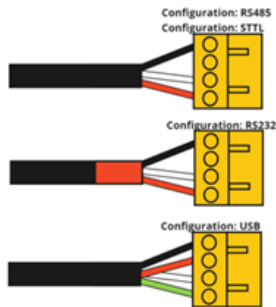
If network isolation is not needed, and if the monitored devices can access the same network used by the gateway for its Internet connection (Wi-Fi 1 or Eth 1), then a single network can be used. To allow this, the “Local” flag must be set for that connection. This opens ports 443 and 4443.

For all three topologies, the gateway’s User Interface is available using any of the local connections. Additionally, when the “Local” flag is set for the gateway’s Internet connection (Wi-Fi 1 or Eth 1), the UI can be accessed using that connection as well.

List and locate your devices

Begin populating the list below with the devices you will be monitoring. For now, leave the columns blank which refers to the corresponding gateway interface.

Adapter kits are available based on the type of serial connection available on your monitored device, and whether it will be monitored with a wired Ethernet connection (requiring a POE adapter). If you’re not sure whether you’ll use a wired adapter connection, leave that column blank for now as well.



Device Type	Model	Device Adapter Kit
ULT	UxF / HFU-T / TSU / 88000 TSX ULT Freezers TDE / RDE / FDE / HDE Series	EDGEKTADPT01 (RS485)* EDGEKTADPT51 (RS485, PoE)
Freezer	TSX Freezer Series	EDGEKTADPT02 (TTL)* EDGEKTADPT52 (TTL, PoE)
Refrigerator	TSX Refrigerator Series	
Incubator	Heracell Series	EDGEKTADPT03 (RS232)* EDGEKTADPT53 (RS232, PoE)
	Heracell VIOS Series	EDGEKTADPT04 (USB)* EDGEKTADPT54 (USB, PoE)

Additional adapter kits are being made available; be sure to check for new kits which support additional devices.

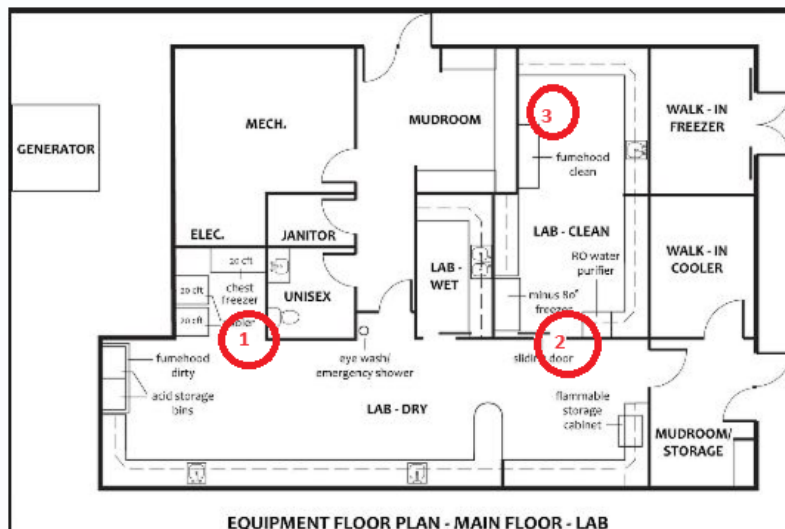
*For the latest list of supported models, visit: www.thermofisher.com/edgecompatible

LIST OF DEVICES TO MONITOR:

Monitored Device Name	Using this GW	Dev Type	Dev Make	Dev Model	Dev Connector	Adapter Kit	Map / Site	GW Network/ Interface
Ex: MyULT3	MyGW1	ULT	TFS	TSX ULT	RS485	EDGEKTADAPT01	Main Lab	Wi-Fi0 AP

As mentioned earlier, device adapters can connect to any local network, however they must be on the *same* network as the gateway they are intended to communicate with (or be within range to connect directly to a gateway being used as an access point). To determine connections or gateway quantities, it is necessary to know where each device will be located.

Using a separate sheet, find or draw a map of the locations where each device is located. Position your devices on that map e.g. below.



Identify available networks

Use the map(s) you created and include information about the available networks in the applicable areas. Make note of the Ethernet or Wi-Fi networks keeping in mind which type of adapter-gateway connection may be desired.

Group the gateways with the available networks and consider whether the gateway supports the number of desired adapters (or whether both the adapter and the gateway will be within 50–150-foot range, if using direct Wi-Fi configuration).

Select your configuration

Using the map, now choose whether each device should connect to the gateways using Wi-Fi or Ethernet or which network they should connect to in the event that there are multiple networks. Remember that the gateway itself can serve as a Wi-Fi Access Point if desired. We can now go back and fill in the column for each device adapter with this information. For greater flexibility or if equipment may later be moved, we recommend selecting Wi-Fi adapters with optional PoE converters.

Using your preferred topology and other information presented in this document, fill in the below table with a set of appropriate configuration parameters for your gateway:

Site info:

Customer Site _____
Customer Contact _____
Shipping Address _____
IT Contact Name _____

Gateway configuration:

Gateway Name _____
Organization _____
Location _____

Serial Number (from label) _____
MAC Eth 0 (from label) _____
MAC Eth 1 (from label, if presented) _____
(If not presented on label, the Eth 1 MAC can be calculated by adding 2 to the Eth 0 MAC (use a hexadecimal calculator))

Primary Topology (2-network, direct/GatewayAP, or single-network) _____

Internet connection Eth 1 / Wi-Fi 1:

Gateway Internet connection to use wired **Eth 1 vs. Wi-Fi 1?** _____
DHCP vs. static address? _____

If Wi-Fi 1 is used for Internet connection:

- Enable Local (y/n) _____
- Permitted Network (enter 0.0.0.0/0 for all) _____
- Using DHCP – if so, see below (y/n) _____
- Network Security (WPA2 recommended) _____
- Network Name / SSID _____
- Wi-Fi Password _____
- Radio Mode (auto-determined by AP) _____

If Static IP is used for the Eth 1 / Wi-Fi 1 internet connection (No DHCP):

- IP Address _____
- Subnet Mask _____
- Default Gateway IP _____
- DNS Servers _____

Local configuration: Eth 0

Enable gateway local Eth 0 interface (y/n; by default enabled)? _____

By default, Eth 0 is enabled with the below settings (for U/I access). Specify needed changes:

- Using DHCP (y/n; default No) _____
- IP Address (default 172.16.0.1) _____
- Subnet Mask (default 255.255.255.0) _____
- DHCP Server (y/n; default No) _____

Local configuration: Wi-Fi 0

Enable Wi-Fi 0 interface (y/n)? _____

The following must be configured:

- Wireless Mode (Station vs. Access Point): Station _____
- Using DHCP (y/n) _____
- SSID _____
- Wi-Fi Password _____
- Security Standard (WPA2 Highly Recommended) _____
- Radio Mode (e.g. 802.11 n/g/b) _____

If Static IP is used for Wi-Fi 0 (No DHCP):

- IP Address _____
- Subnet Mask _____

Local configuration: Wi-Fi 0 Access Point Mode

Enable gateway Wi-Fi 0 Access Point (y/n)? _____

The following must be configured:

- Wireless Mode (Station vs. Access Point): Access Point _____
- SSID (default is TF_GW_<last 4 digits of ETH 0 MAC address>) _____

- Wi-Fi Password (default is randomly assigned) _____
 - Static IP (default 172.16.1.1) _____
 - Subnet Mask (default 255.255.255.0) _____
 - Security Standard (WPA2 Highly Recommended) _____
 - Radio Mode (e.g. 802.11 n/g/b) _____
- If DHCP Server is enabled, the following must be manually configured
 - Starting IP Address provided (for adapters to use; default 172.16.1.100) _____
 - Ending IP Address provided (for adapters to use; default 172.16.1.199) _____
- Note: the gateway can support a max of 10 remote connections using its Wi-Fi 0 AP*
- Subnet Mask _____

Now that you have your gateway interfaces determined, fill in the remaining columns of your adapter list. Each adapter must communicate using one of the networks also used by the gateway, so we can identify the network by the gateway interface (e.g. Eth 0).

Additional considerations

- MULTIPLE GATEWAYS NEEDED DUE TO BANDWIDTH: A single Edge gateway can service up to 10 monitored devices when they connect via the gateway's Wi-Fi 0 Access Point. When other interfaces are used, the maximum number of devices that a single gateway can efficiently monitor may be greater, but will depend on various factors such as the type of device and the amount of metrology data generated by that device. It is recommended to not exceed 75% of gateway CPU usage which can be accessed in the InstrumentConnect portal under Gateway Management and then selecting the gateway in question to view further details.
- MULTIPLE GATEWAYS NEEDED DUE TO NETWORK/DISTANCE:
Other considerations may drive the need for additional gateways: Equipment is spread out. Certain equipment must connect via a different network. Gateway has met equipment/adaptor capacity. Equipment is out of range and cannot connect to intended gateway (direct Wi-Fi configuration).
- Keep in mind that device adapters configured to use the gateway's Wi-Fi 0 AP must be within wireless range of the physical gateway.
And that when using site Wi-Fi networks, both the gateway and the devices must be within wireless range of the site Wi-Fi's AP.
- Additional information including networking and firewall details can be found in the Connect Edge User Guide, available at www.thermofisher.com/connectedge