

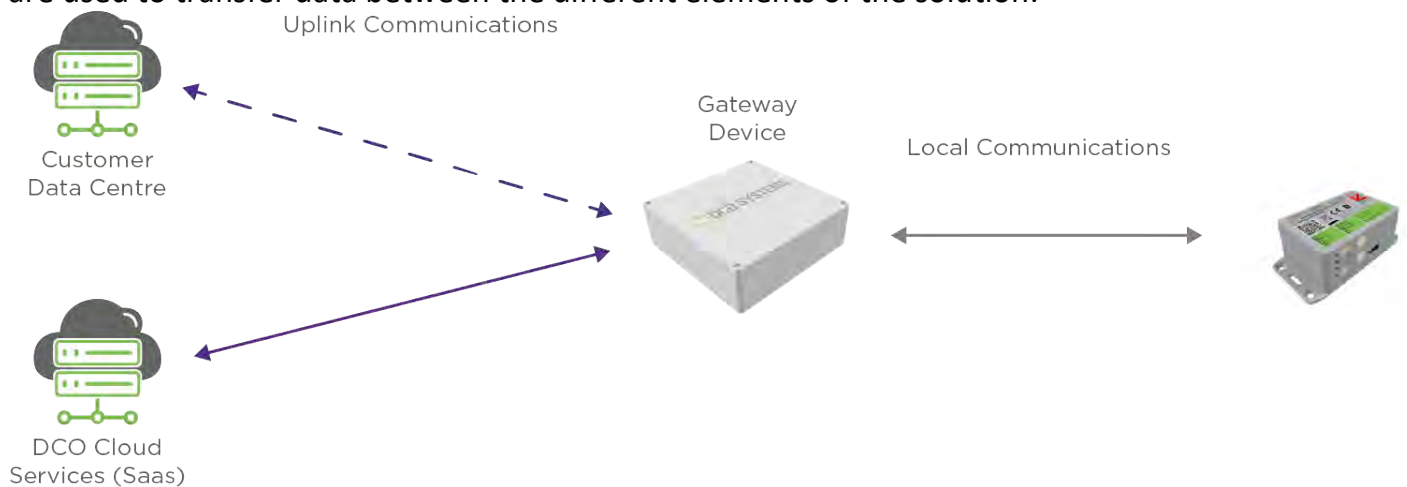


# Architecture Options (Communications)

DCO sensor and equipment monitors collect, process, and interpret their data locally using the connected inputs and sensors available to them. Having performed their local processing they then need to transmit that data on to other, often cloud based, systems. Those other systems then perform further analysis, raise alerts, and make the information available to end-users or other consumers.

## Communications Elements

The typical communications architecture of the DCO sensing solution has three main parts that are used to transfer data between the different elements of the solution:



- **Local Communications:** Wireless link from each individual sensor unit.
- **Gateway:** The unit responsible for bridging between the “Local” and “Uplink” communications system.
- **Uplink Communications:** The communications link responsible for transferring data from the onto the software (usually cloud SaaS platform) responsible for receiving, processing, and storing device data and messages.

## Local Communications

Example of the most common local communications technologies and standards available for use in a deployment.

### Local: ISM Radio Links

Our standard radios will manage up to 100m line of sight without issues, they will generally manage 50m+ even without line of sight (e.g., plant, equipment, walls, etc. in the way). We have a range of different antenna options that can be fitted depending on the site topology – ranging from simple internal antennas through to long distance Yagi antennas.

## Local: LoRaWAN

LoRaWAN compatible networking (frequency varies by territory) on public or private LoRaWAN networks. If the site is large and spread out, we recommend the LoRaWAN option for long ranges. That will support distances up to several hundred meters and potentially several kilometres for uninterrupted line of sight.



### Features:

- Excellent support for long range radio links, allowing a relatively few gateways (as few as 1) to cover large and highly distributed sites.
- Flexible, robust, and standardised solution featuring advanced security configurations and device life cycle management.
- Customer system has access to data via API-first platform that can be embedded in an existing IT environment.
- Scalable solution that allows you to add more monitors as needed and integrate easily into data collection.

## Local: NB-IoT / LTE-M

Local communications Operation on 4G and 5G networks supporting either NB-IoT or LTE-M capabilities. NB-IoT is a low-power wide-area wireless communications (LoWPAN) network that work.



This operation is ideal for collecting data over low power, low data rate links. This technology supports both public 4/5G networks and provides scope for a customer to implement a private 4/5G network on their own site if desired.

## Gateway Device

### DCO Gateway

A DCO Gateway unit can support up to 250 monitors. Gateway units are powered by either a 110-480VAC supply (can be a normal wall socket) or a 12-36VDC supply.



### Features:

- Gateways provide choice of local communications and uplink communications options.
- Uplink options include 3/4/5G mobile data uplink (default), local Wi-Fi and local Ethernet connectivity.
- DCO gateways can provide a range of different connectivity approaches for local connections to data – from something as simple as Modbus-TCP server endpoint (from which a remote system can pull the relevant register fields) to custom integrations.

- The gateway can also host most sophisticated interfaces based on Internet technologies (HTTP, REST, JSON) enabling customer systems to pull or push data to and from the gateway unit. (REST API interfaces).

## LoRaWAN Gateway

There are many manufacturers and suppliers of LoRaWAN gateways and generally any suitable gateway could be used for a LoRaWAN uplink. DCO can supply a LoRaWAN gateway(s) as part of a solution or the customer may specific and source the gateway themselves.

## Uplink Communications

The most common uplink communications technologies and standards available for use in a deployment. These technologies are generally applicable to any of the gateway devices chosen – including the DCO Gateway and the various vendor LoRaWAN gateways available.

### Uplink: 3/4/5G Mobile Network

Gateways (including DCO's) generally includes onboard support for 3, 4 and 5G networks using all commonly available network types. A particular benefit of this approach is the use of the same technology and infrastructure that normal smartphones would be using in the area. Modern phone networks are resilient and robust and the independent support by their owners eliminates any need for maintenance or support by the customer of the uplink.

DCO will generally supply the data connectivity (SIMs and eSIMS) required for most geographical locations (Europe, North America, etc.) as part of the SaaS pricing for the solution.

### Uplink: Customer WiFi / Ethernet

Gateways (including DCO's) generally include onboard support for Wi-Fi and Ethernet connectivity. This permits the customer to provide the uplink connection using existing networks.

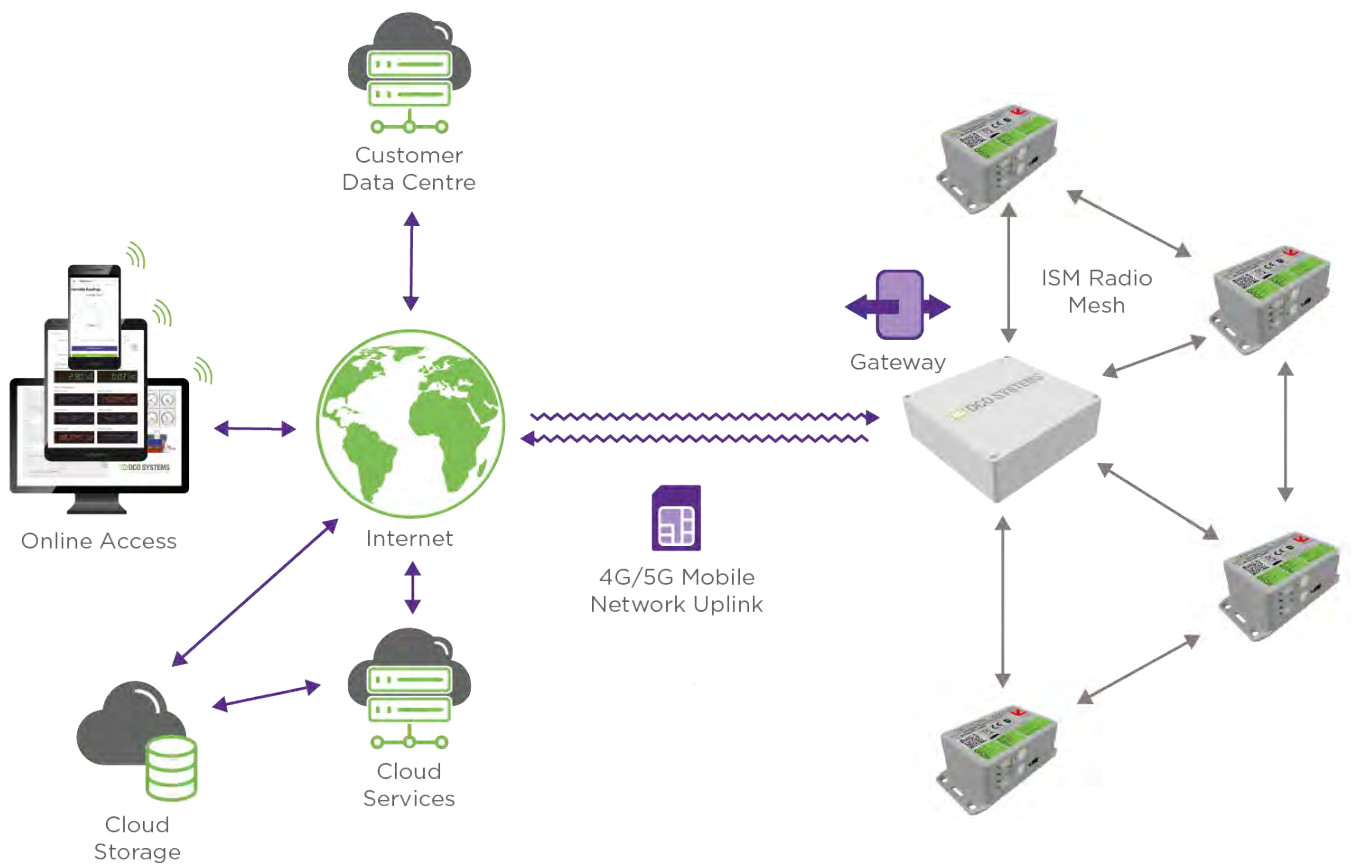
## Scenarios

Example scenarios showing complete end-to-end communications configurations.

### DCO ISM Radio Network

This architecture uses DCO’s out of the box ISM radio mesh network technology for local communications, a DCO gateway unit for local message transfer to a 4/5G mobile network link and DCO cloud-based SaaS tools for processing, alerting and display.

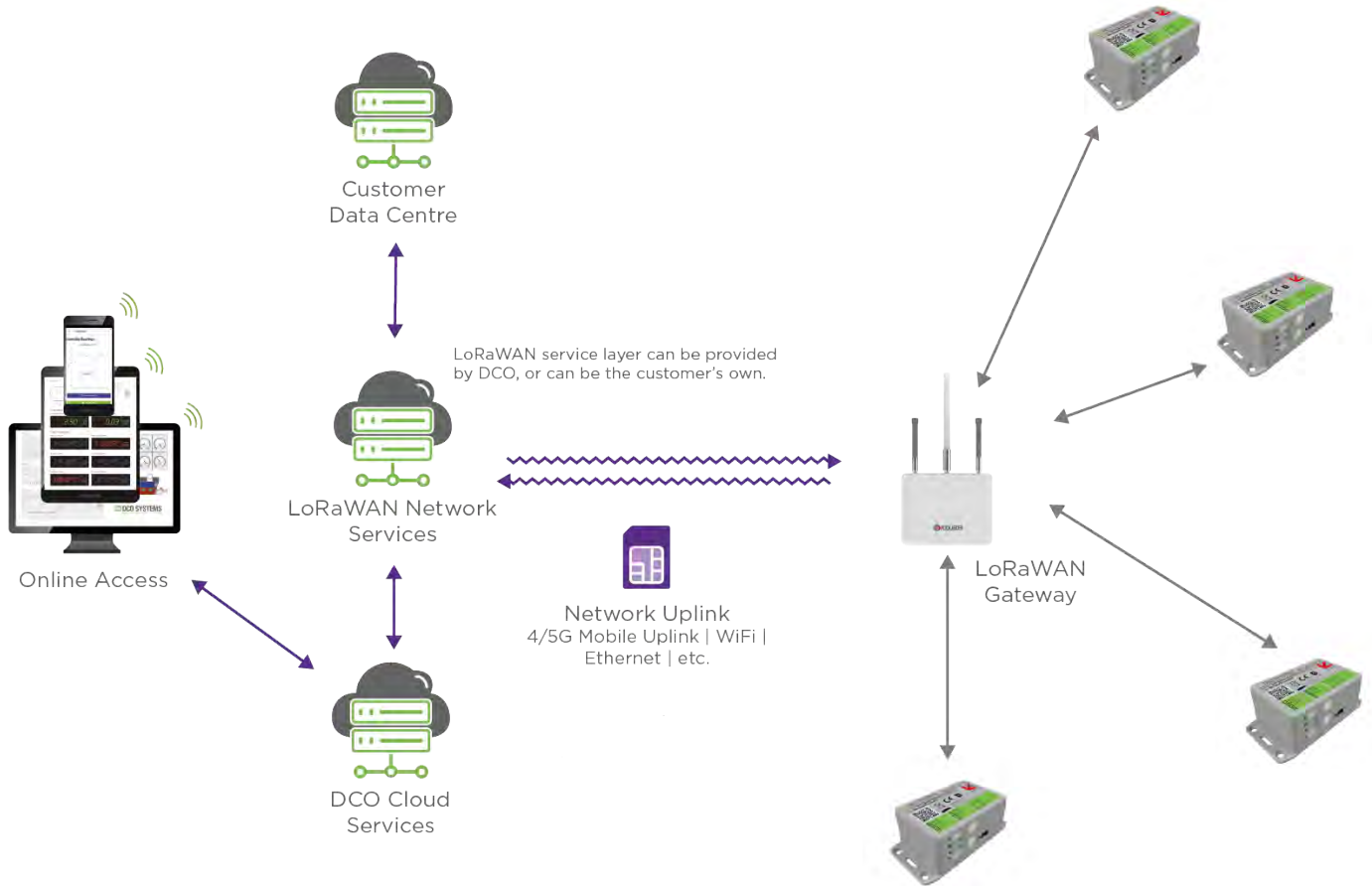
#### Communications Architecture: DCO Gateway and ISM Radio Links



## LoRaWAN Network

An architecture built around use of the standard based LoRaWAN technology. This architecture can support processing by both DCO SaaS solutions and customer hosted systems depending on where the LoRaWAN gateways are configured to send the data they receive.

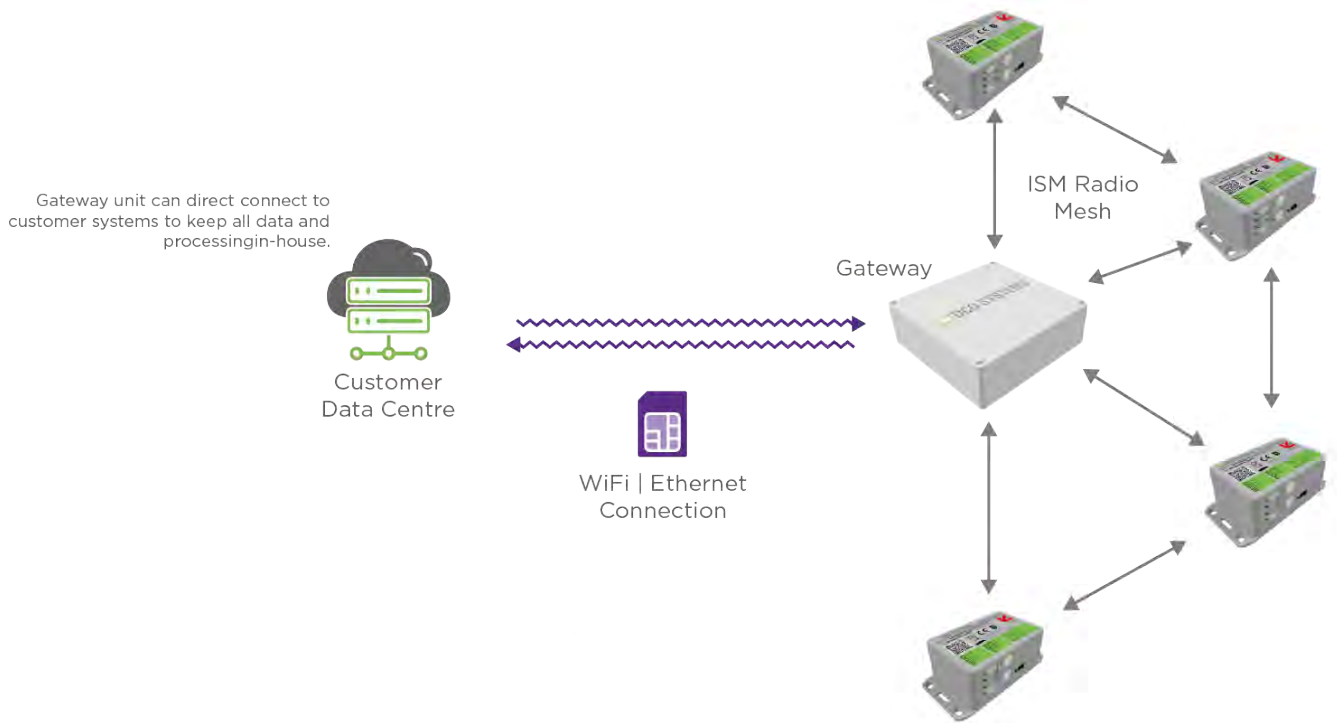
### Communications Architecture: LoRaWAN Gateway and Radio Links



### Direct Connect (to customer systems)

An architecture where the DCO gateway provides local radio communications but then forwards that data direct a customer system without the use of any other intervening public links or Internet infrastructure. This architecture is particularly suitable for sites where there is a concern about data going offsite as it makes it possible to keep all data and processing onsite.

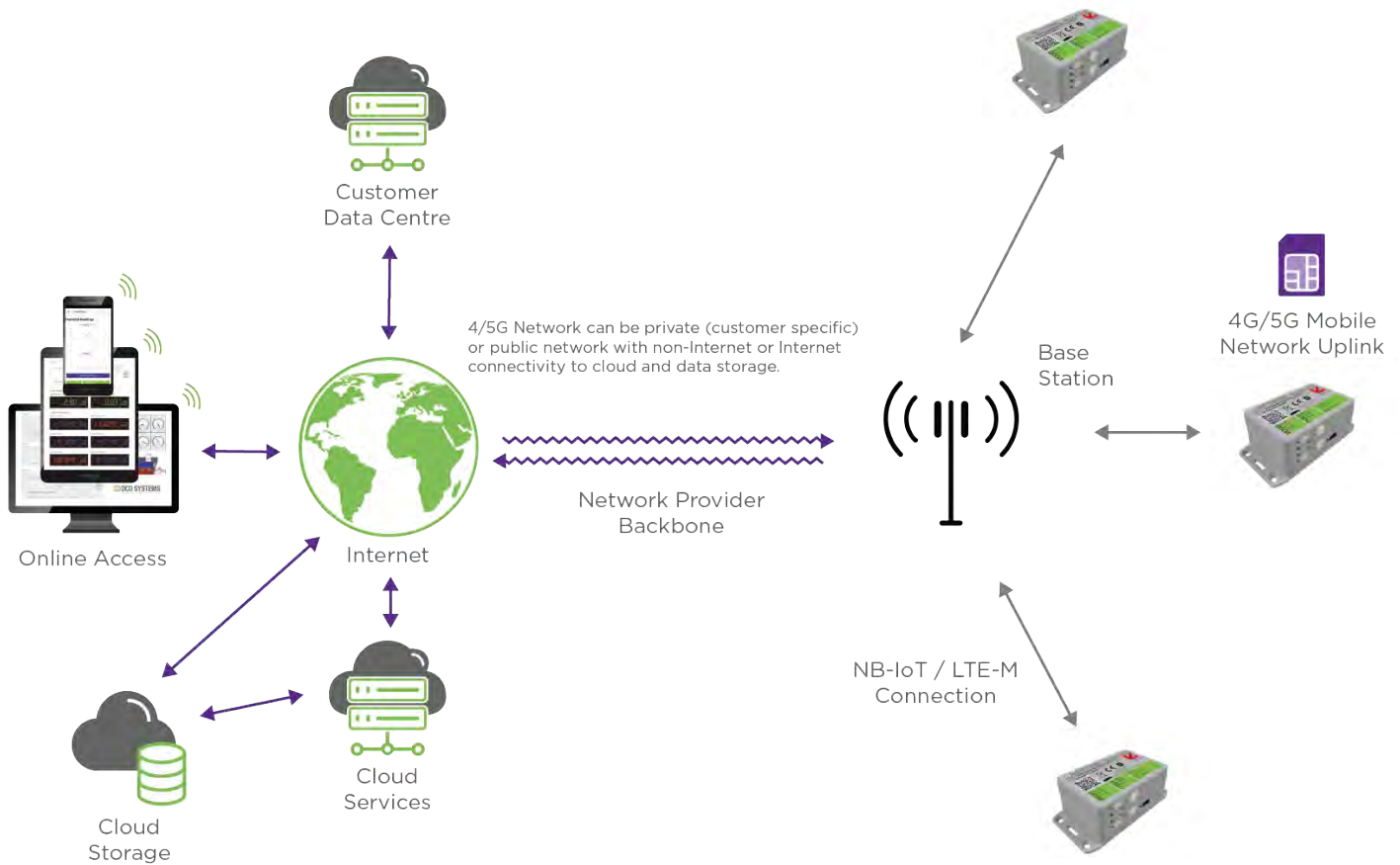
#### Communications Architecture: Direct Gateway to Customer with ISM Radio Links



## NB-IoT / LTE-M

An architecture where the NB-IoT / LTE-M connection provides both the local radio communications and the uplink to the gateway units and devices. In this scenario the gateway devices is generally a virtual device implemented as part of the SaaS platform.

### Communications Architecture: NB-IoT / LTE-M Mobile Network Uplinks



## Further information

Please contact DCO Systems to discuss which architecture is right for your application:

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