# CREATING ORDER FROM THE CHAOS OF IOT DEVICES

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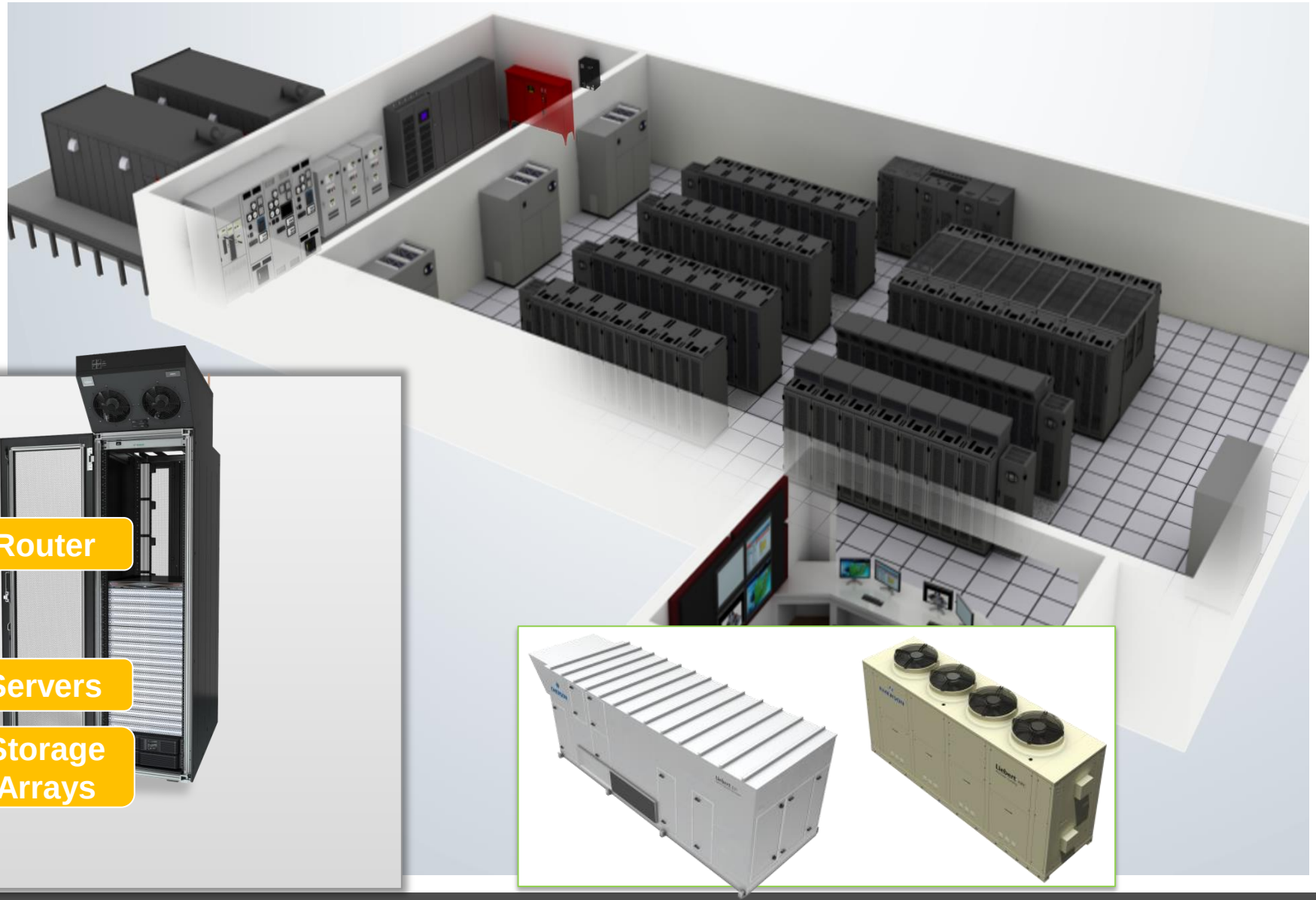
# EMERSON NETWORK POWER IS NOW VERTIV

# DATA CENTERS ARE COMPLEX ENVIRONMENTS

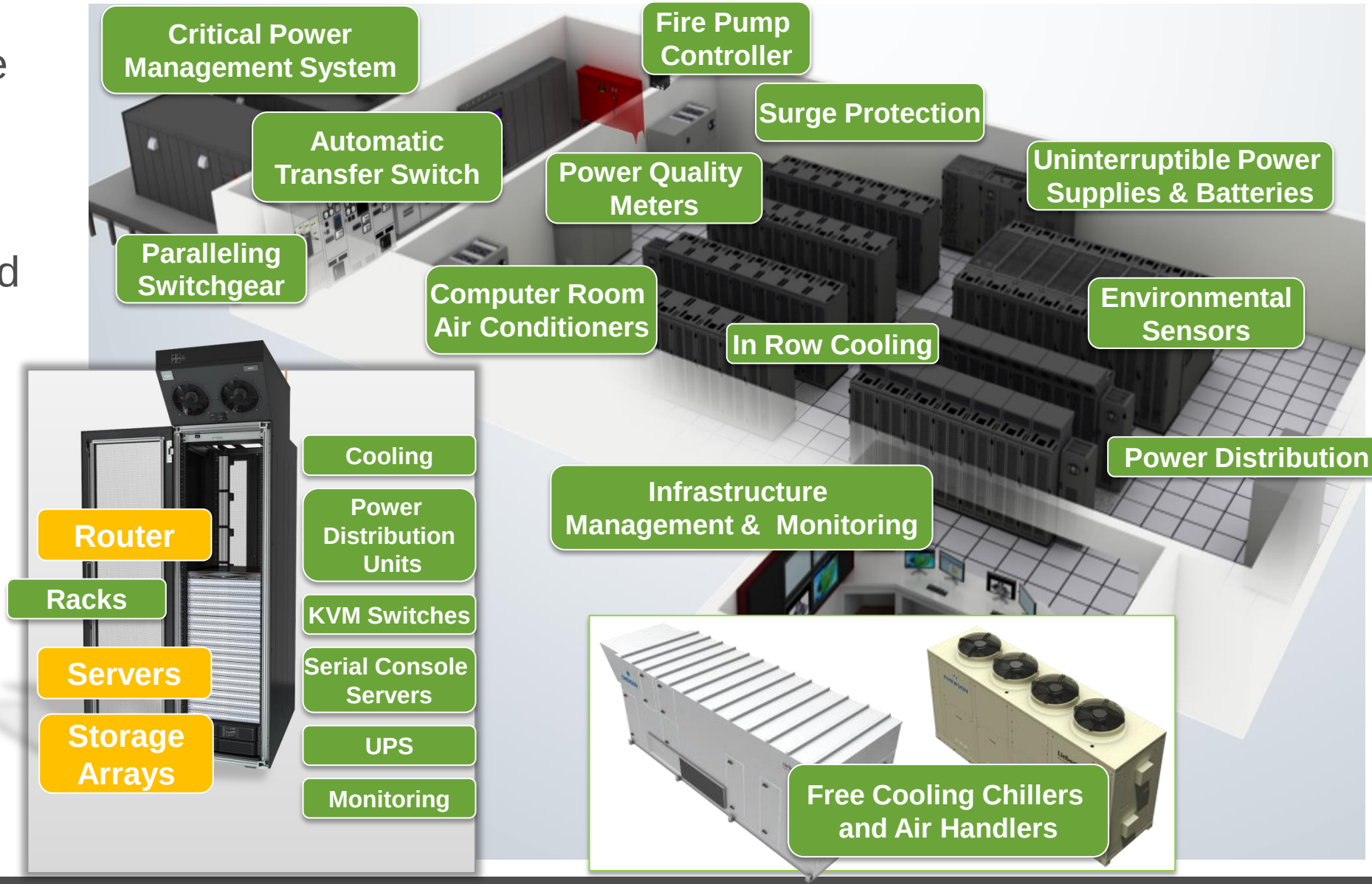
When most people think about data centers, they think about servers, storage arrays, and networks



# DATA CENTERS ARE COMPLEX ENVIRONMENTS

When most people think about data centers, they think about servers, storage arrays, and networks

In reality, many components and systems work together to create stable, functional data centers



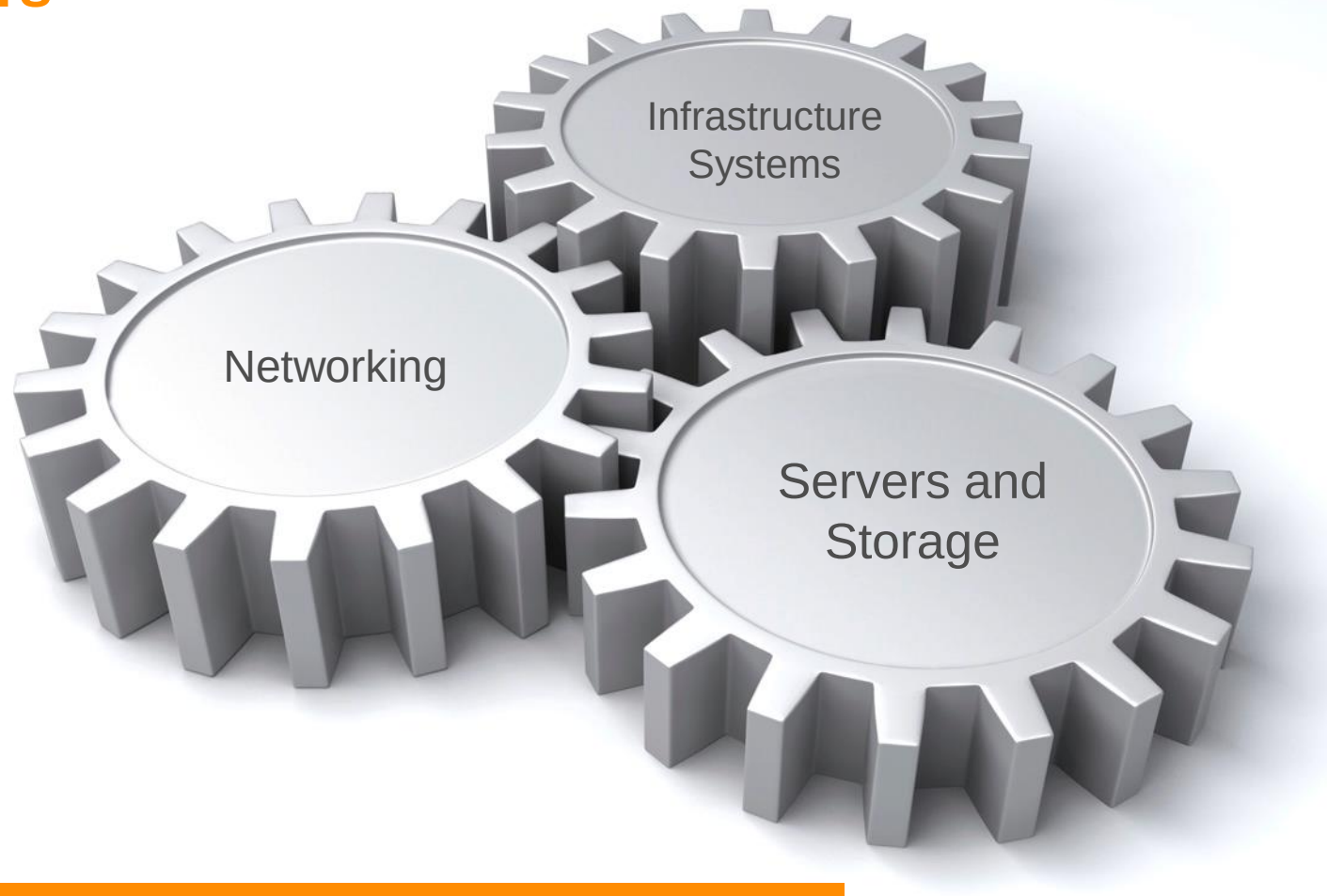
# DATA CENTERS: DENSELY PACKED IOT SYSTEMS

**Most devices in modern data centers are instrumented and connected…**

Typical systems:

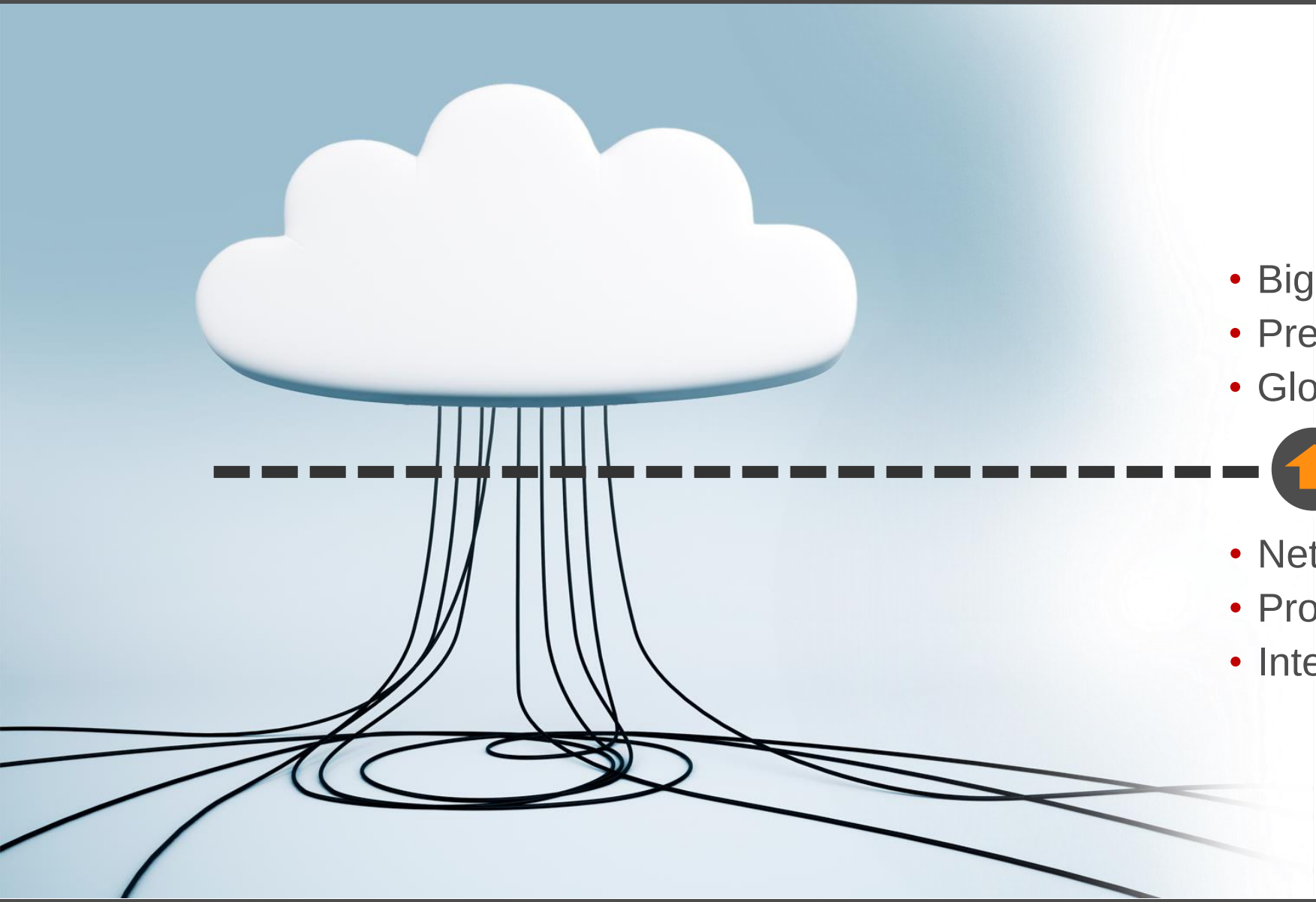
- Server and Storage Management
- Server Virtualization
- Software Defined Networks
- Power Distribution Systems
- Thermal Management Systems
- Environmental Sensors
- Battery Monitors

**… but many existing systems are closed and proprietary**




The challenge for IoT systems is to create value by interconnecting the current islands of functionality.

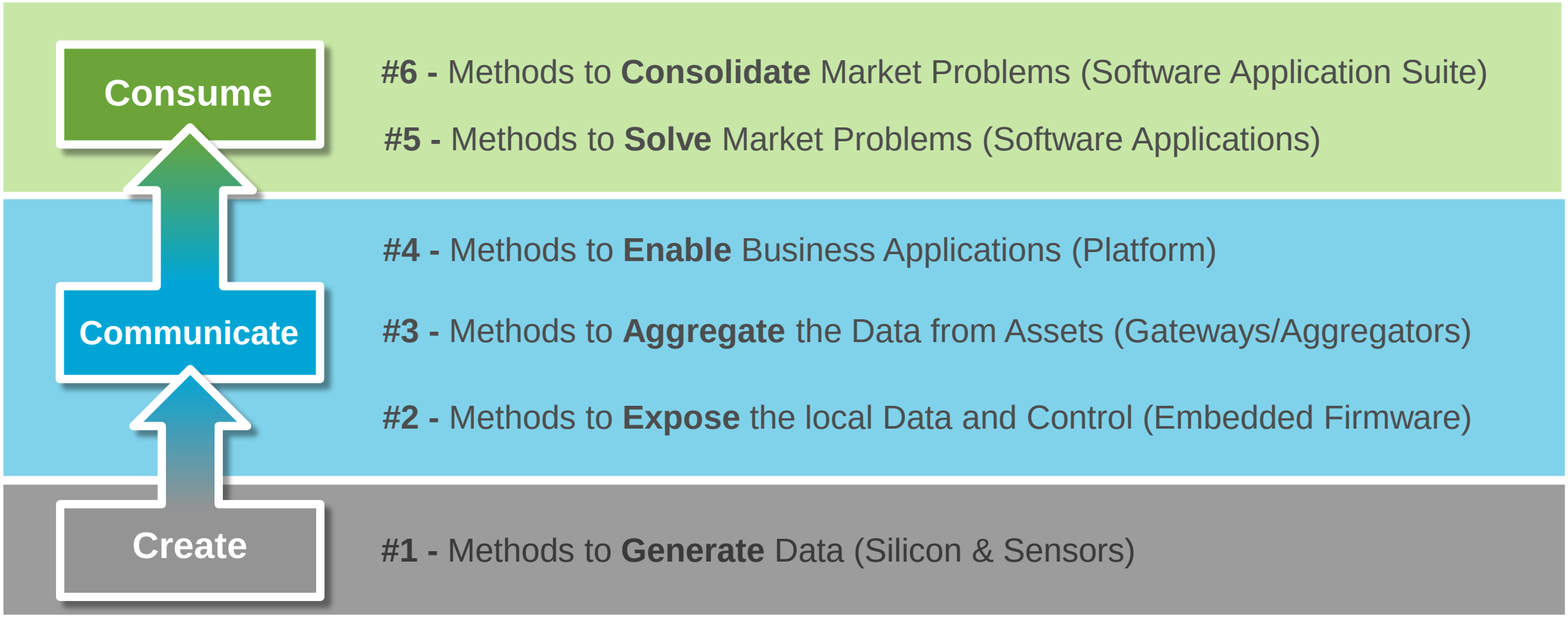
# IOT DISCUSSIONS OFTEN FOCUS ON SENSORS AND CLOUDS…



- Big Data
- Predictive Analytics
- Global Monitoring

- Networking
- Protocols
- Intelligent Devices

# … BUT REALITY IS A BIT MORE COMPLEX



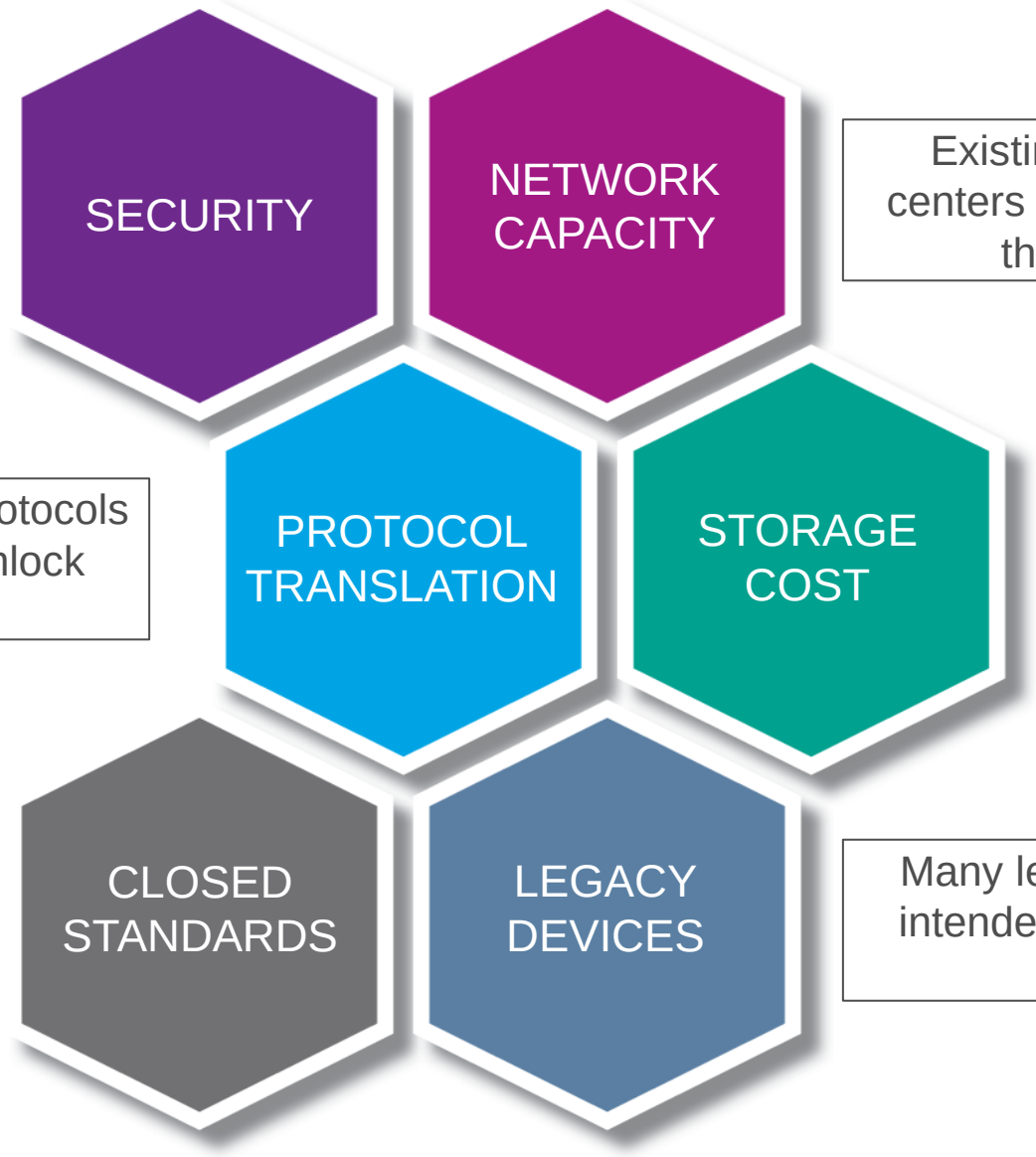

The 6 layer IoT model describes the functionality needed for a full system implementation

# BARRIERS FOR IOT SYSTEMS TO OVERCOME

Security of data and devices is paramount

Translation to consistent protocols is needed to efficiently unlock device data

Open standards will simplify data extraction and lower costs




Existing networks and data centers not designed to support the demands of IoT

Data storage costs can limit IoT implementations

Many legacy devices were not intended to connect into larger systems

# MUCH OF IOT'S COMPLEXITY IS DUE TO INCONSISTENCY BETWEEN DEVICES

**The issues with protocol translation, legacy devices, and closed standards really boil down to device-to-device inconsistency**


Different data

- Examples: KVA vs KW, varying measurement points

Different units

- Examples: °C vs ° F, W vs KW

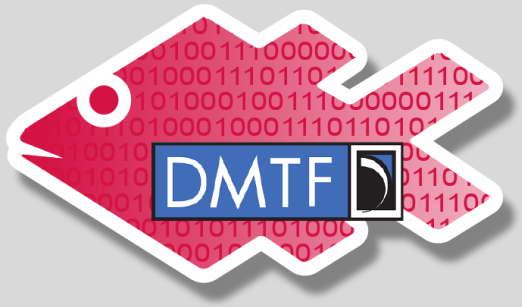
Different names

- Example: "inlet voltage" vs "input voltage"

Different protocols

- SNMP, ModBus, BACnet, IPMI, YDN23, HTTP, MQTT, ReST, proprietary protocols

# EFFORTS LIKE REDFISH ARE A GOOD START…




## REDFISH

**Protocol -** Uses well-understood, secure web services such as HTTP/S

**Data Model -** Light weight and extensible, capable of modeling any device

**Schema -** Clearly describes the data model for each device type

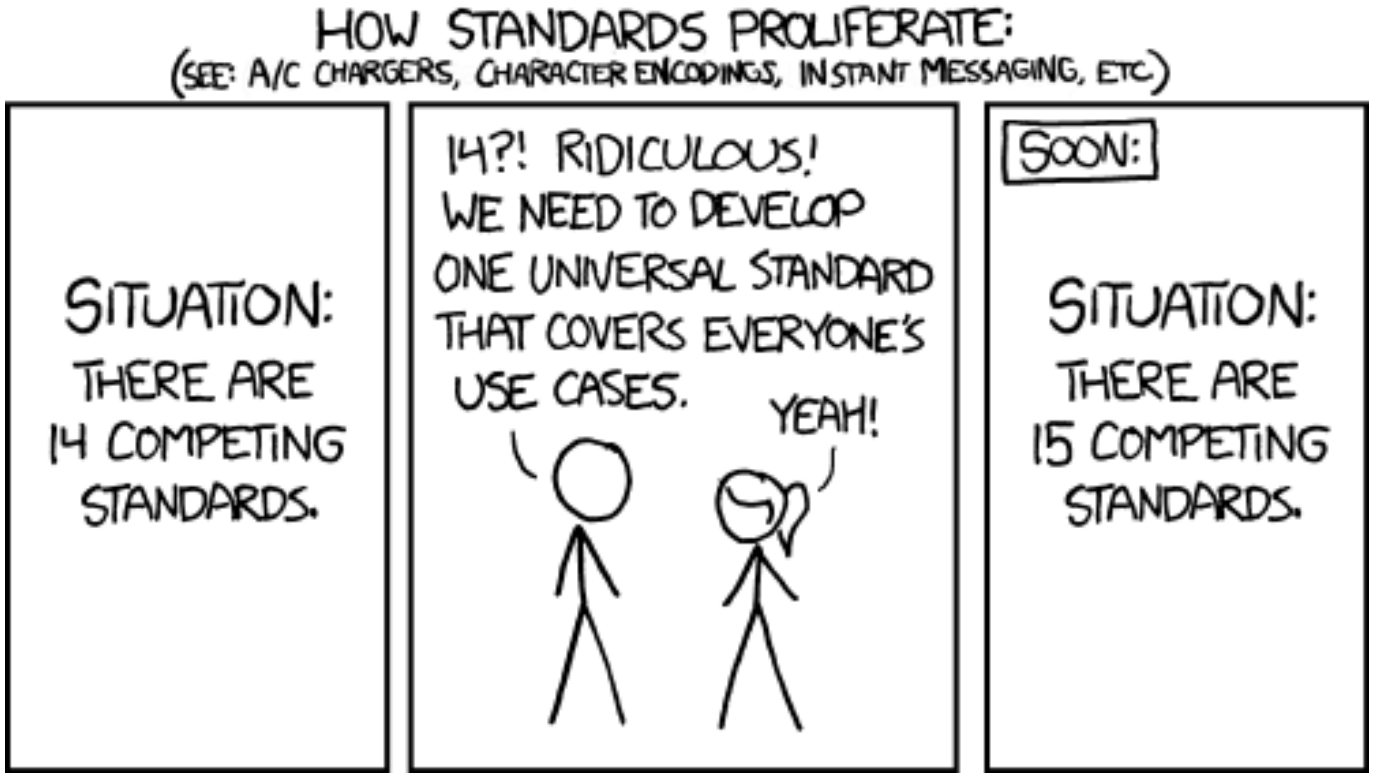
## Standard API for data center IT and facilities management

- Initially focused on servers
- Added storage, switches, and some infrastructure equipment
- Additional infrastructure schemas in the works

## Advantages:

- Simplifies communication with devices
- Reduces development time for new functionality
- Improves product interoperability
- Becoming broadly available, with strong industry support

# … BUT INTEROPERABILITY IS LARGER THAN A SINGLE STANDARD




Source: http://imgs.xkcd.com/comics/standards.png (CC-BY-NC-2.5)

Current devices are migrating to more common interfaces, protocols, and schemas, but legacy devices and protocols will exist for the foreseeable future

# DESIGNING IOT SYSTEMS TO DEAL WITH COMPLEXITY

## The Trellis™ Platform is a full system management stack for data center applications

The Trellis Universal Management Gateway (UMG) connects to individual devices

- The embedded Intelligence Engine provides protocol conversion, normalization, and aggregation
- Brings together Ethernet and serial-based devices and direct-connect sensors

The Trellis Software Suite uses consistent device data provided by the UMG

- Provides analytics, visualization, reporting, workflows, and control capabilities


**The Trellis Platform addresses complexity by performing protocol conversion and data normalization in an intelligent gateway**

# SIMPLIFYING THROUGH NORMALIZATION

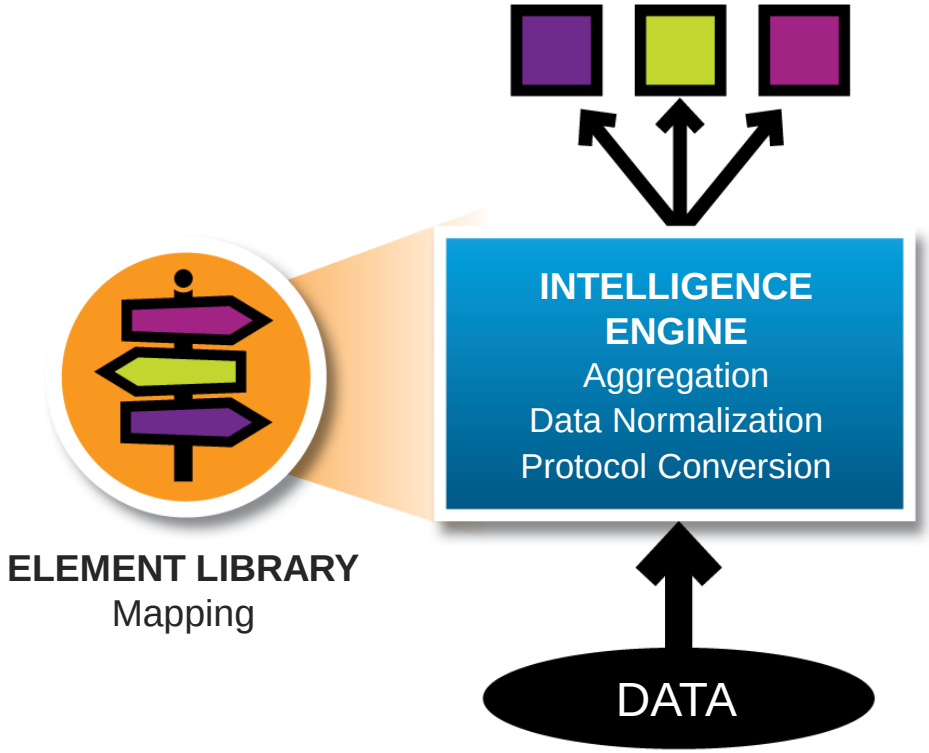
## Symbols and Element Libraries define the mapping of devices into a consistent data framework

At the system level, Symbols describe basic device characteristics, including:

- Device type
- “Faceplace data”

In the Intelligence Engine, Element Libraries add consistent mappings for:

- Protocol support
- Supported datapoints
- Device status
- Alarms and alerts




| Device Symbols | Element Library Device Models | Supported Manufacturers | Device Categories |
|---|---|---|---|
| 89,000+ | 2,300+ | 140+ | 50+ |

Symbols and Element Libraries allow data normalization and aggregation, freeing the software platform from the details of device interaction

# ADAPTABILITY IS KEY

## The Element Library Tool allows customization of device data mappings in the field

Home | Programmatic Names | Models | Symbols | symbolDatapoint | Packages | Admin | Help | About

**List of Models**

Add new Model

| Manufacturer (LIEBERT) | Model Name | Protocol (All) | Datapoints | Events | Commands | Rules |
|---|---|---|---|---|---|---|
| LIEBERT | CR020RA1C7S | VELOCITY/IP | 1 | 1 | 0 | 0 |
| LIEBERT | CR020RA1C7SD1811E000 | | | | | 0 |
| LIEBERT | DS053HUA0EI691A | | | | | 0 |
| LIEBERT | DS070ADA0EI833A | VELOCITY/IP | 1 | 0 | 0 | 0 |
| LIEBERT | LIEBERT218FA-100-M218FA-100-M | BACNET:SITELINK/RS-485 | 12 | 13 | 5 | 9 |
| | | MODBUS:IS-WEBADPT/RS-485 | 12 | 13 | 5 | |
| | | MODBUS:OC485-ADPT/RS-485 | 12 | 13 | 5 | |
| | | SNMPV1:IS-WEBADPT | 16 | 14 | 24 | |
| | | SNMPV2:IS-WEBADPT | 16 | 16 | 24 | |

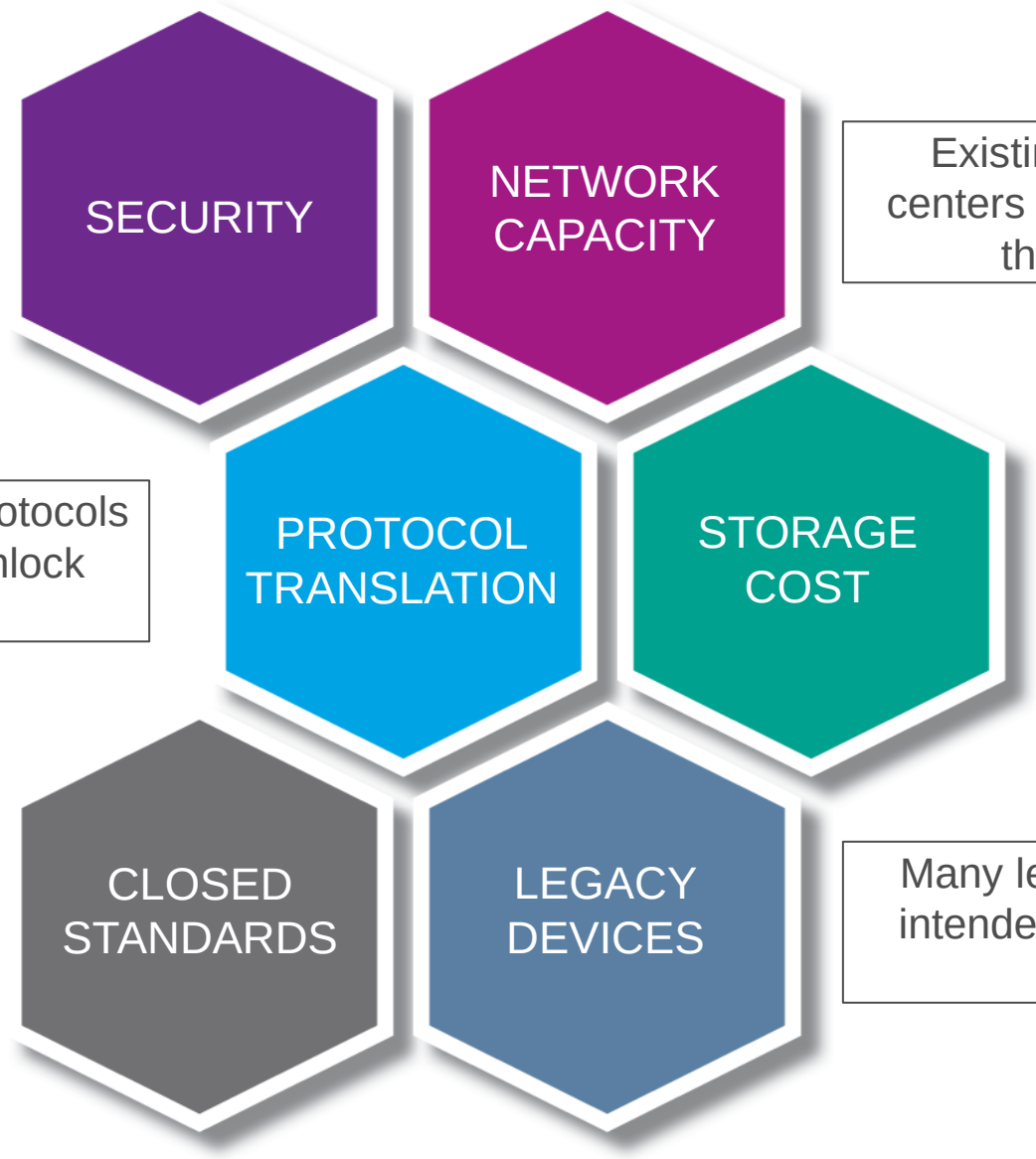
Not all devices match their published specs. Field adaptability is the only way to ensure that device data is captured correctly.

# ADDRESSING THE CHALLENGES OF IOT

Security of data and devices is paramount

Translation to consistent protocols is needed to efficiently unlock device data

Open standards will simplify data extraction and lower costs




Existing networks and data centers not designed to support the demands of IoT

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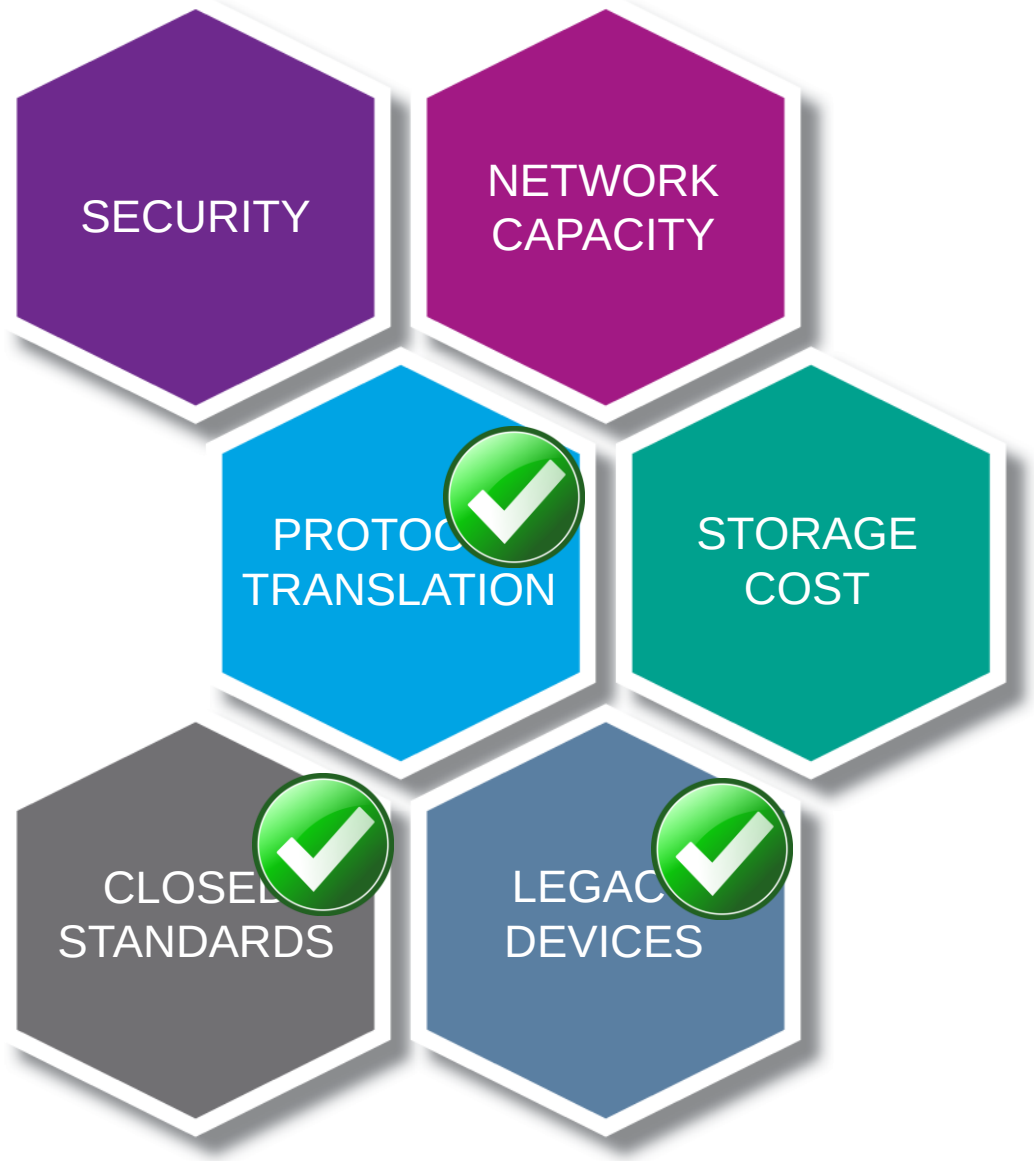
# ADDRESSING THE CHALLENGES OF IOT

Encapsulate device specifics at the gateway to allow higher-level software to use generalized device models



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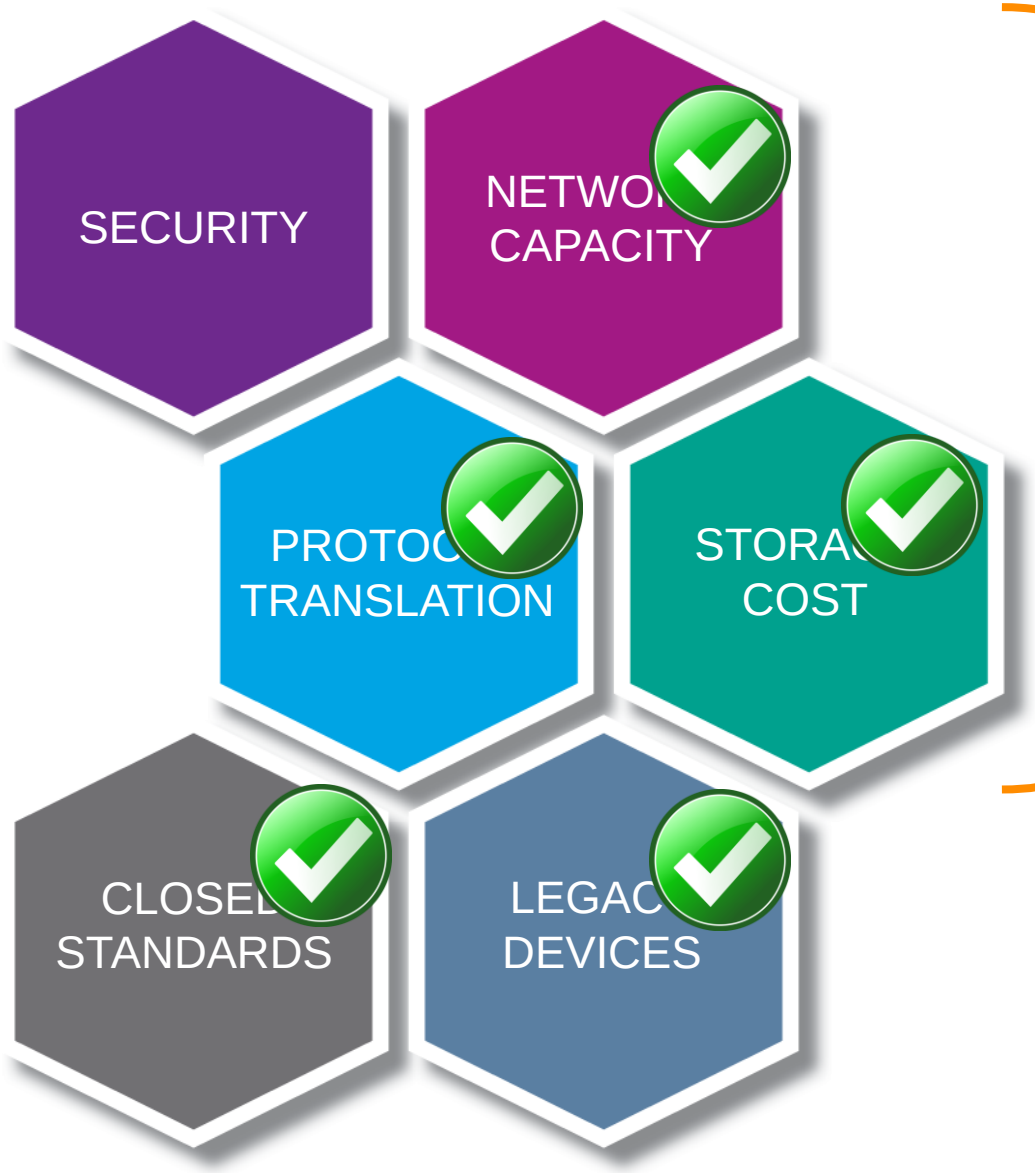


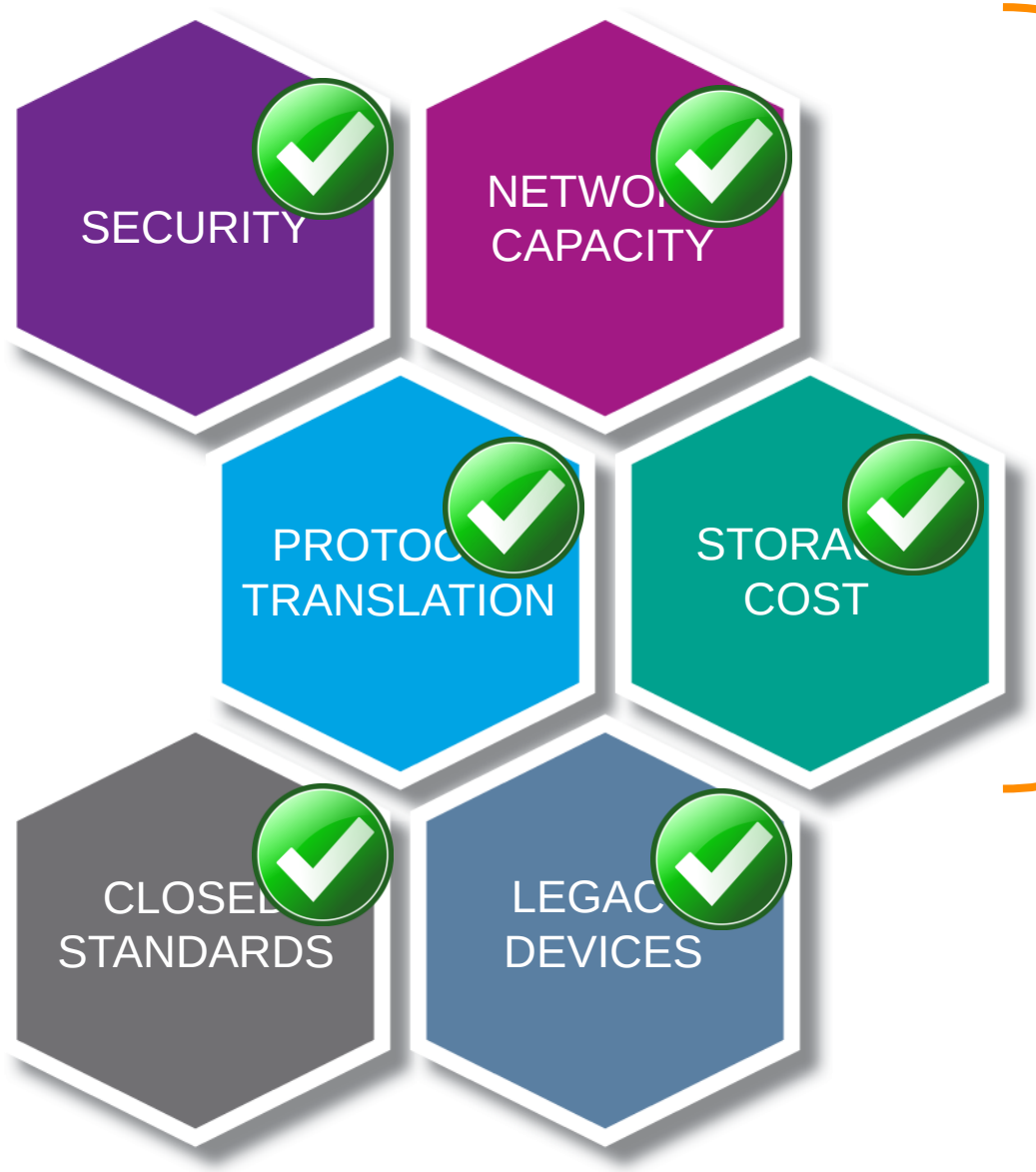

Aggregate and normalize device data; remove redundant data to limit network and storage requirements

Encapsulate device specifics at the gateway to allow higher-level software to use generalized device models

# ADDRESSING THE CHALLENGES OF IOT

Provide strong authentication and audit logs; mediate device access using a gateway

Encapsulate device specifics at the gateway to allow higher-level software to use generalized device models




Aggregate and normalize device data; remove redundant data to limit network and storage requirements

# THE TRELLIS™ PLATFORM

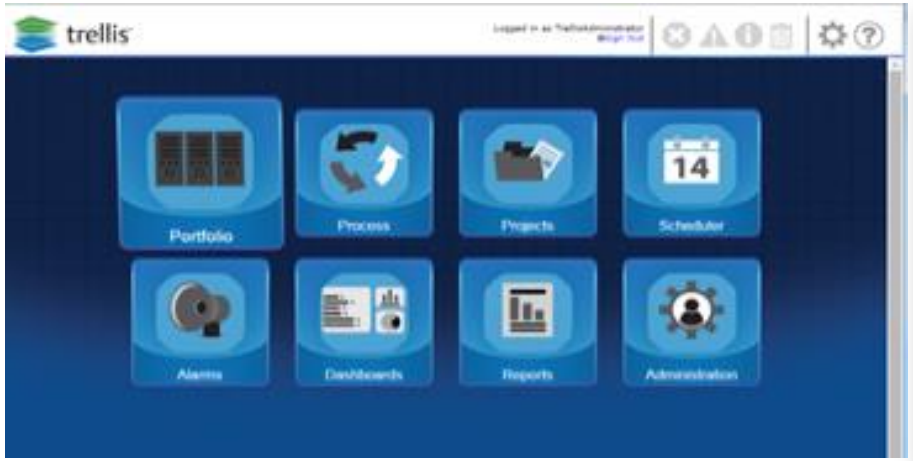
## The Trellis Platform is the industry-leading DCIM suite

A full complement of interconnected applications for data center infrastructure management

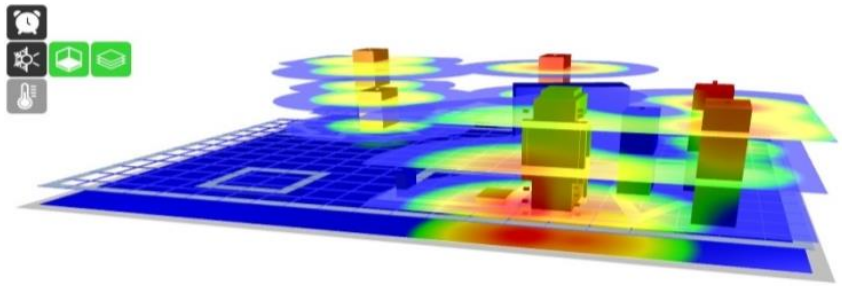
## Answers the questions:

- What do I have?
- Where is it?
- What is it doing?
- Is that OK?
- What should I do next?

# TRELLIS™ APPLICATIONS







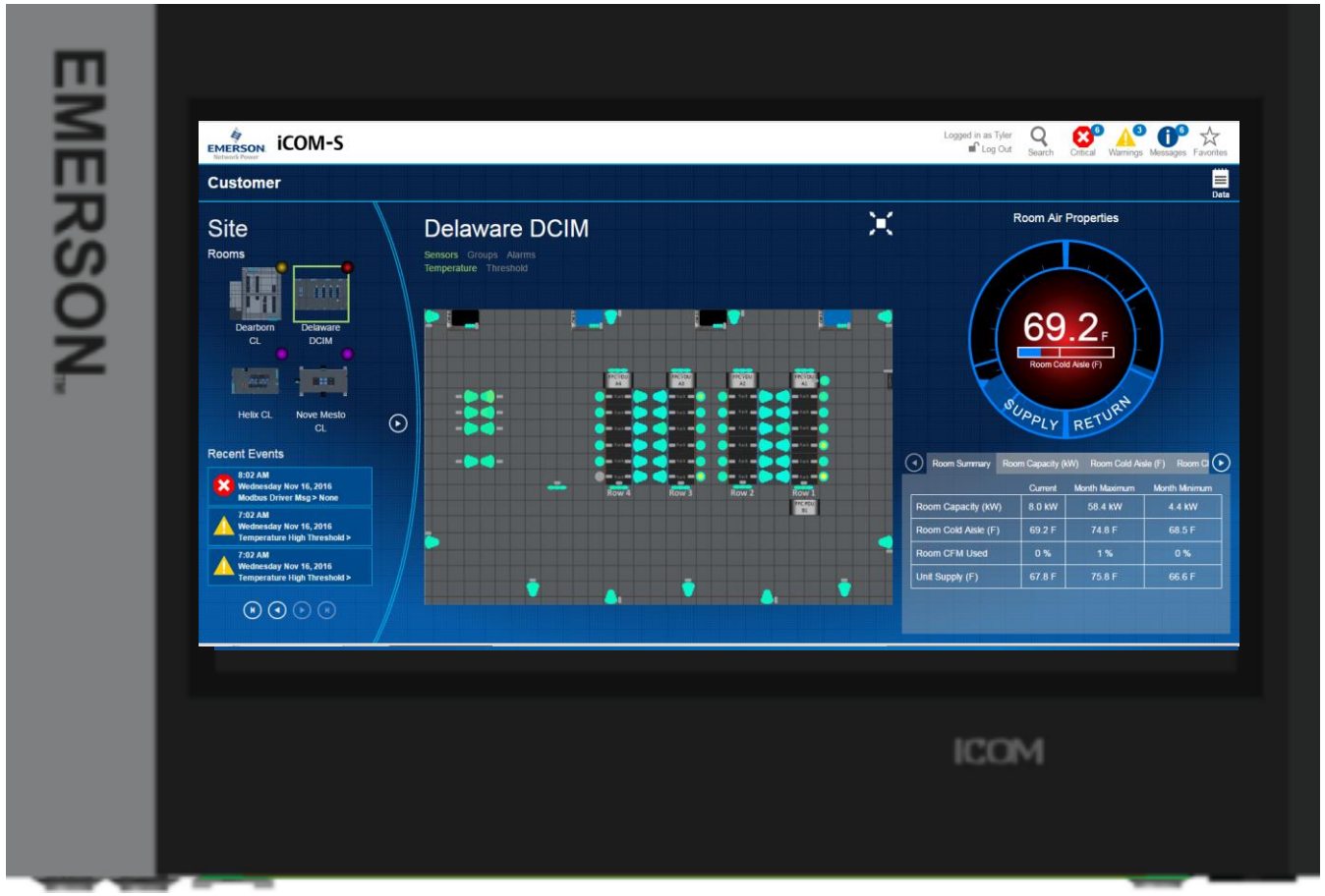
## Trellis applications provide a suite of management tools, including

- Inventory and capacity management
- Change planning
- Thermal management
- Power chain management
- Business process management
- Device monitoring
- Alarms and alerts
- Reporting and dashboarding

# THE ICOM-S THERMAL SUPERVISORY CONTROL

## Integrated wall-mounted thermal control system

- Works with the Trellis system and leverages the same data models
- Incorporates distributed sensing with multi-unit thermal systems control
- Extends the thermal control loop to the point of consumption




ICOM-S has demonstrated savings of up to 50% in thermal system energy usage by taking advantage of point-of-consumption feedback

# WHERE TO FIND US

## IoT Slam Briefing Room

www.iotslam.com/Emerson

## Website

www.vertivco.com

## Contacts

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