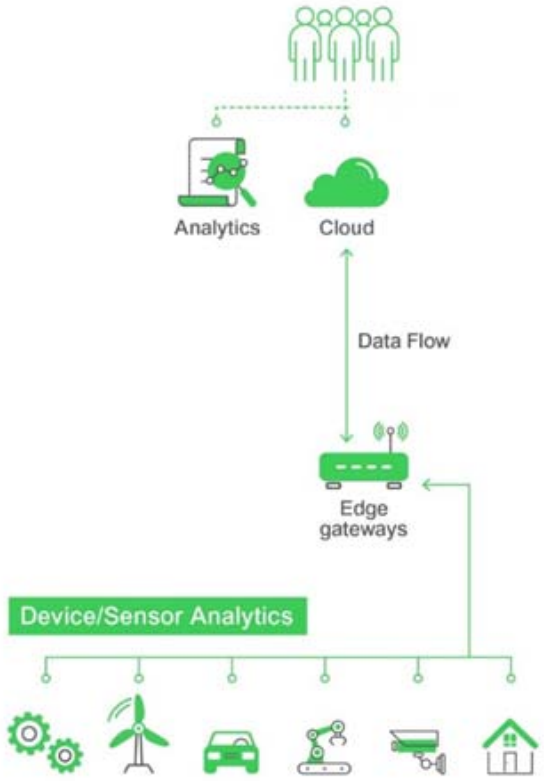
A Deployment Strategy for the Edge

By John Gray, PE, RCDD
Power Systems Manager at Schneider Electric



Learning Objectives

1. What is the edge?
2. Where is the edge?
3. Projected growth rates of edge deployments
4. Challenges with deploying, operating and maintaining edge physical infrastructure
5. Deploying edge physical infrastructure
6. Examples of edge physical infrastructure solutions

Presenter's Bio

John Gray PE RCDD, Power Systems Manager,
Innovation Executive Briefing Center

John Gray is the Power Systems Manager at the Schneider Electric Innovation Executive Briefing Center (IEBC) where he is responsible for mission critical power train solutions demonstrations. He has been an electrical engineer for 32 years serving in varying roles including mission critical electrical system design, construction, project management, integrated systems testing, systems commissioning, troubleshooting, maintenance and facility operations.

A graduate of the University of Missouri at Columbia earning a Bachelor of Science degree in Electrical Engineering, he is a licensed professional engineer, a Schneider Electric Edison Expert and a Registered Communications Distribution Designer (RCDD).

The Goal

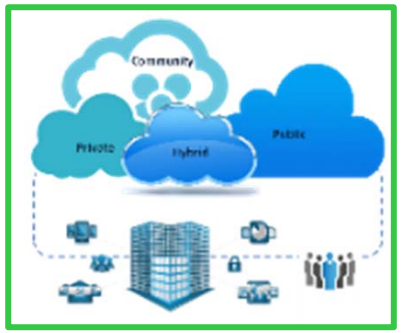
Deploy edge physical infrastructure in a cost-effective manner that is speedy to deploy, efficient to operate and maintain, all while remaining agile for the life span of the installation.

What is the Edge?

- The edge is vast
- The edge is application driven
- The edge places content and compute power close to the consumer or point of use
- The edge is a high-performance bridge to the cloud aimed at reducing latency

Millennials have different expectations
(Always On – Always Available)

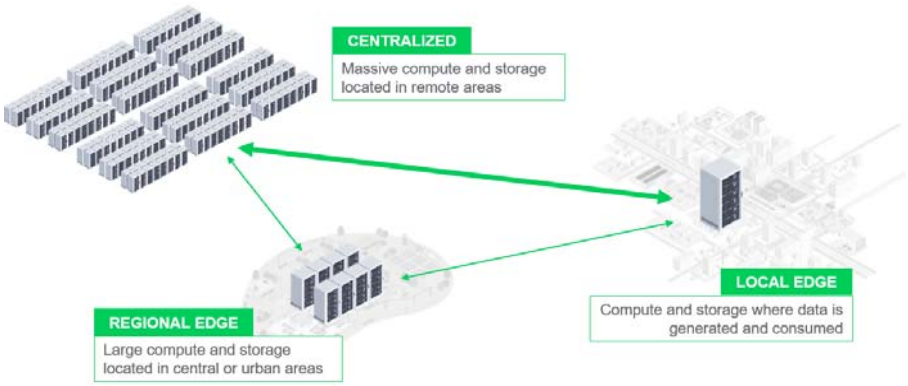
Size doesn't matter



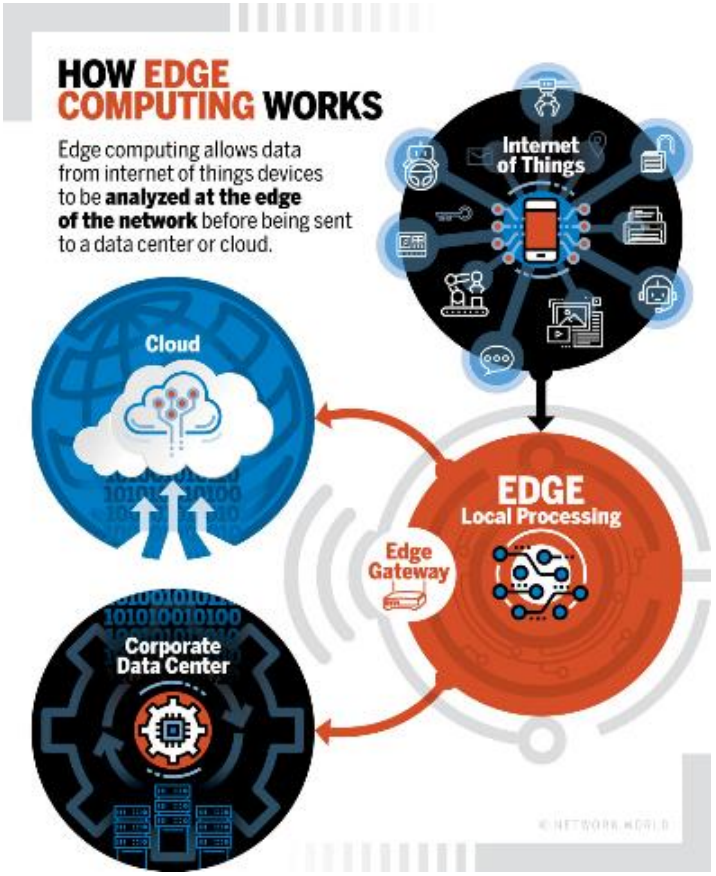
Nature of computing is leading to a very complex hybrid environment

What is the Edge?

"The edge data center as defined in this report sits one layer below this regional level at a neighborhood or local level, bringing computing and storage still closer to the user, or to the point where data is being generated. These facilities are often in small buildings or a prefabricated form factor supporting ***1 to 10 IT racks with power densities between 2 and 10 kW/rack***. Some are located at the base of cell phone towers for optimal backhaul availability."

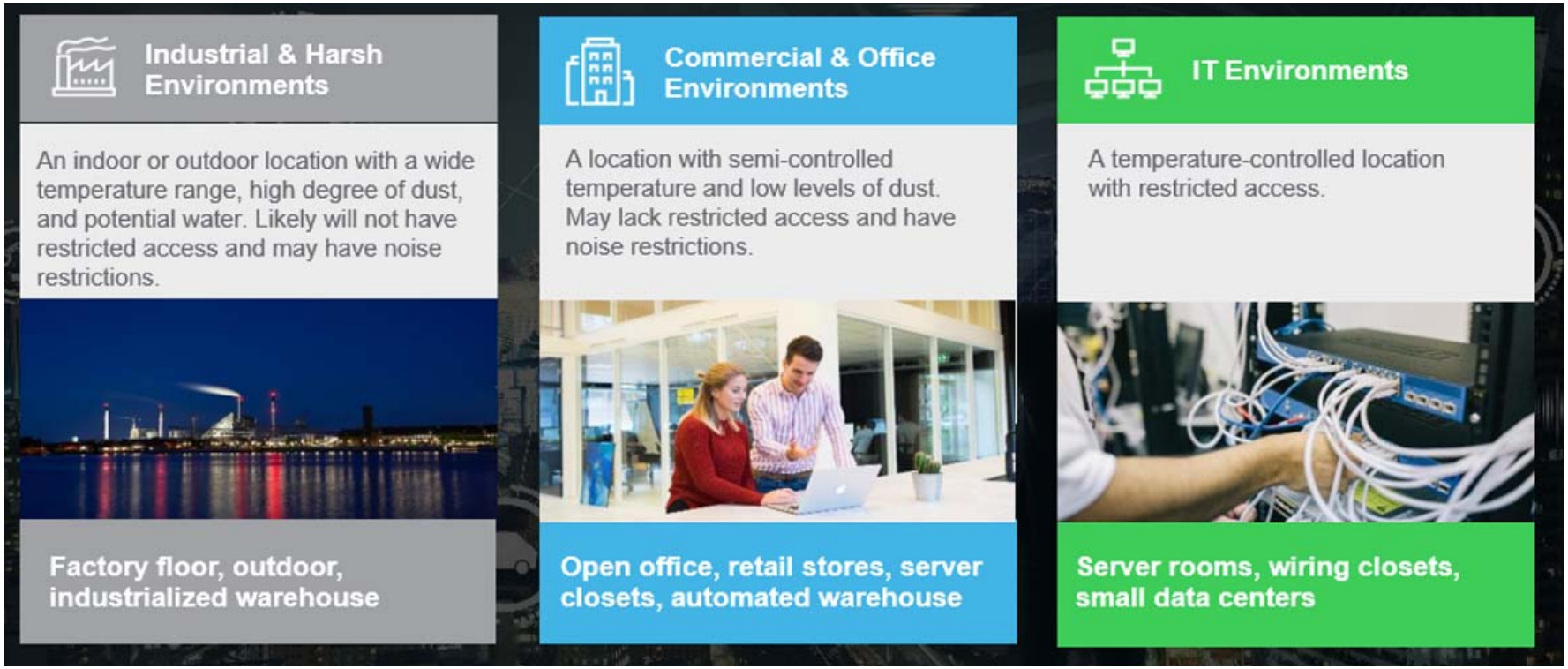


Source: AFCOM White Paper "Edge Computing – Planning and Implementation"



Source: **"What is edge computing and why it matters"** by By Keith Shaw, Network World, NOV 13, 2019, https://www.networkworld.com/article/3224893/what-is-edge-computing-and-how-it-s-changing-the-network.html

Where is the Edge - Edge Environments



On-prem and Edge Compute Data Center Verticals

Education

Financial

Healthcare

Retail

Telco

Government

Education Edge

- Remote learning
- Virtual Reality / Augmented Reality
- Cloud technology
- Mobile education – videos, podcasts, online learning
- Game-based learning

Telco Edge

1. Support for 5G

2. Data Center as a Service

Wireless Edge

Wired Edge

Central Office Transformation

Radio Access Network

Central Office DCaaS

Healthcare Edge

Robotic surgery

Medical wearables

Telemedicine

The Edge is Also Here

- **Industrial building**
  - Security systems, access control
  - CCTV & Emergency lighting
  - Building management
  - Lift
  - Labs
  - Broadcasting

- **Energy and power plants**
  - SCADA systems
  - Control room
  - Security equipment

- **Pharmaceutical / life science**
  - Production Process Control Equip.
  - Manufacturing Support Equipment
  - Control Rooms
  - Laboratories

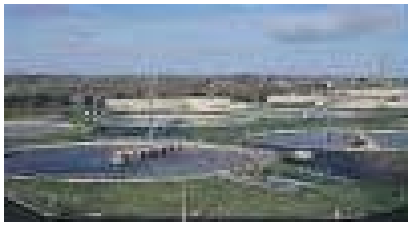
- **Process industries (semiconductor)**
  - Clean room, HVAC
  - Critical process automation
  - Automation system for TFT, Plasma, LCD
  - Manufacturing test & assembly

And Here…

- **Oil and gas**
  - Detection and Sprinkler flood operation
  - Emergency Shutdown Devices
  - Process Control Systems: SCADA & DCS

- **Transportation (tunnels, trains)**
  - Integrated monitoring & automation
  - Signalization lamps
  - Control center
  - Building automation
  - Emergency, security systems

- **Water / WasteWater, treatment**
  - SCADA systems
  - Security systems
  - PLCs, pumps, drives

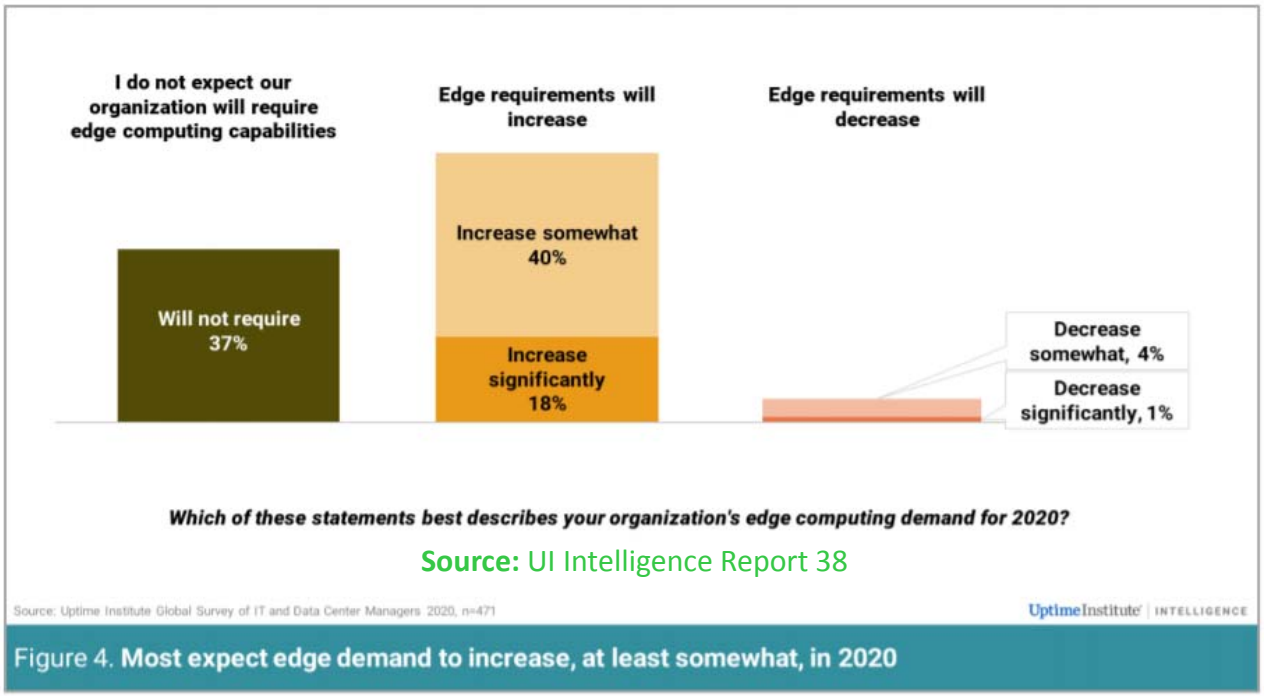


- **Mining**
  - SCADA & DCS
  - Security
  - Control rooms

Projected Growth of Edge Deployments

Uptime Institute global data center survey 2020

Which of these statements best describes your organization's edge computing demand for 2020?



Source: UI Intelligence Report 38

Figure 4. **Most expect edge demand to increase, at least somewhat, in 2020**

Growth at the Edge

"Companies will spend more than ***$700 billion*** over the next decade on edge IT infrastructure and data center facilities, reaching approximately ***102,000 MW by 2028***."

> "Edge Computing - Planning and Implementation", AFCOM White Paper, https://it-resource.schneider-electric.com/white-papers/edge-computing-planning-and-implementation

"**Gartner predicts** that by 2022, more than half of enterprise-generated data will be created and processed outside of data centers, and that ***by 2025 about 75% of data will be analyzed and acted upon at the edge***."

> "A 5G future for the telecom industry", by Rob van den Dam, Global Telecommunications Industry Leader, February, 2020, https://inform.tmforum.org/insights/2020/02/a-5g-future-for-the-telecom-industry/

"The trends toward greater cloud use and edge demand are tectonic in scale;…"

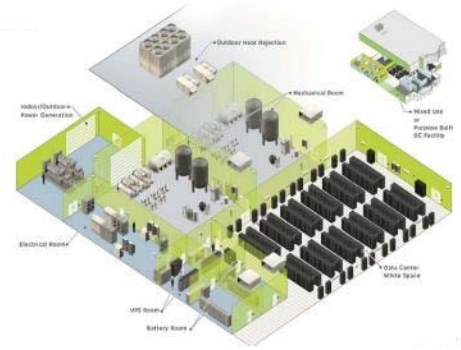
> Andy Lawrence, executive director of research at Uptime Institute from "**State of the Industry** A Roundtable Discussion With Mission Critical Professionals" by Amy Al-Katib, Mission Critical Magazine July 22, 2020

Common Edge Physical Infrastructure Challenges

New Paradigm

Tier 3 99.99% uptime & availability across the entire network architecture

Data center standards



Edge standards

Key Imperatives

1. Redundancy
2. Monitoring
3. Data Center Staff
4. Organization
5. Security

1. Standardized & Redundant Physical Infrastructure
2. Remote Monitoring & Management
3. Physical Security

Physical Security

Access Control Risks

BREACHED ENCLOSURES

ENCLOSURES LEFT OPEN

Physical Security

More than half of CIOs point to security management as a major focus of their time.

CIO Magazine

A data breach costs corporations on average 4M USD

IBM

Rise of regulations like PCI, GDPR, HIPPA make physical security compulsory.

Physical Security

29%

of data breaches are due to physical security

TrendMicro

Physical Security

Challenges

- Edge data centers are often placed within a highly accessible room (i.e. shared office space)
- No dedicated space, so open racks are unsecured

Recommended steps

- Move equipment to locked room or locked enclosure(s).
- Use biometric or other access controls
- For harsh environments, secure equipment in enclosure that protects against fire, flood, humidity, vandalism & EMF effects
- Deploy security & environmental monitoring 24x7, video surveillance

Standardization

The benefits of standardization include streamlining of:

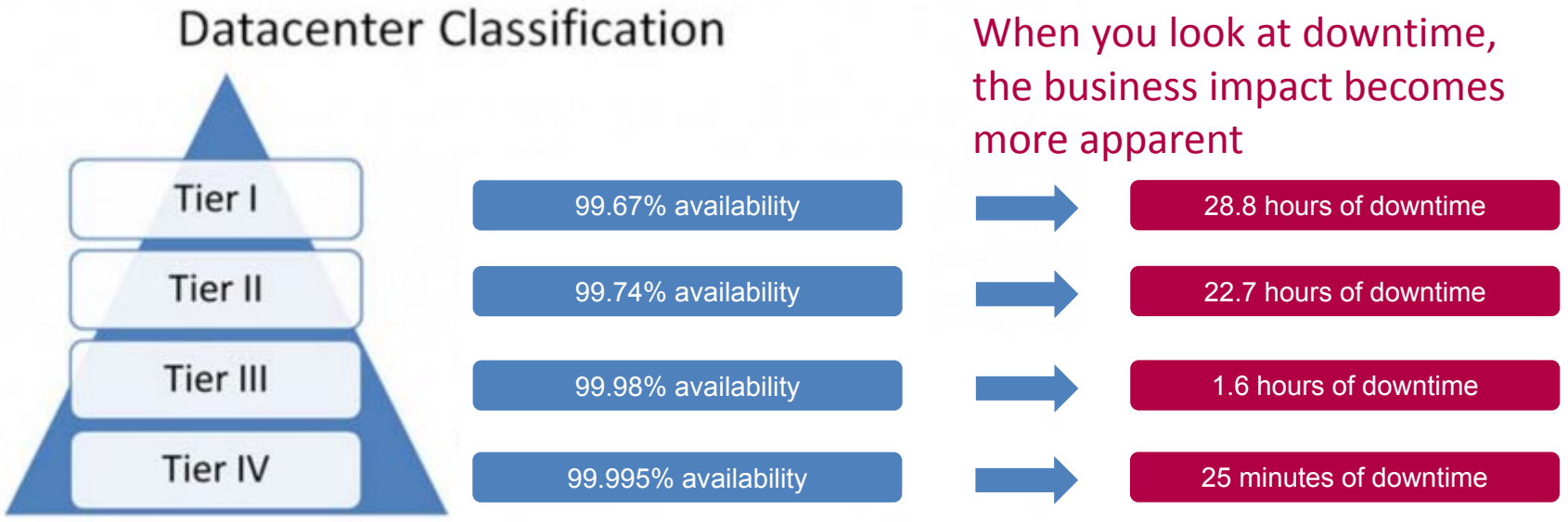
1. Purchasing of all necessary components which comprise the edge physical infrastructure:
    1. Enclosure, UPS, Cooling, Rack, rack Power Distribution Units, controls, monitoring…
2. Engineering design
3. Integration
4. Installation
5. Monitoring and management
6. Maintenance
7. Expansion (Scaling)

$$$ **Standardization = CapEx and OpEx Savings** $$$

$$$ $$$

Resiliency and Availability

Current thinking on availability focuses on individual sites



When you look at downtime, the business impact becomes more apparent

Source: http://www.nexdatacenter.com/blog/data-center/types-and-tiers-of-data-centers/

See Schneider Electric White Paper 256 "Why Cloud Computing is Requiring us to Rethink Resiliency at the Edge" by Kevin Brown and Wendy Torell

Our Perception of “Failure” is Inadequate and Needs to Evolve

Current paradigm

Failure is a disruption to any IT equipment within a single data center

- Focused on the centralized data center
- Failure of IT rack meant a failure
- Doesn’t comprehend branch/remote sites

New paradigm

Failure comprehends user interruption, including loss of connectivity at localized / micro data centers

- Focuses on the system performance
- Considers employees at localized sites
- Considers functions at localized sites

Availability of Dependent Systems

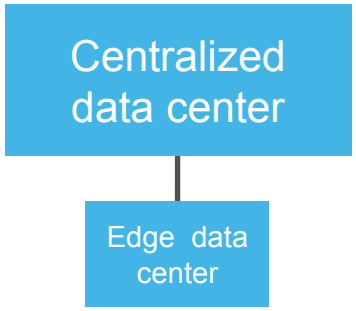
If my focus is the availability of only the centralized Tier 3 data center...

Centralized data center

Availability = **99.98%**

Downtime = **1.6 hours/year**

But, if I take the viewpoint of the employees in an edge data center…



$Availability_{system} = Availability_1 * Availability_2$

Tier 3 Cloud Data Center Availability = 99.98%

Tier 1 Edge Data Center Availability = 99.67%

Availability = 99.98% x 99.67% = **99.65%**

Downtime = **30.7 hours/year**

Data Center Best Practices Must be Extended to the EDGE for Highest Reliability and Availability

Cloud-based Management and Monitoring

Local/Metropolitan

Regional/Continental/Global

Source: "What's in Store for Telcos, Mobile Edge Cloud, 5G in 2020"
Edited by: Chris Preimesberger, eWEEK | March 11, 2020

Monitoring & Security

Common Environmental Risks

Water, heat, and equipment failures accounted for 11 percent of all data center outages in 2016.

OVERHEATING

FLUIDS/LEAKS

HIGH HUMIDITY

CONTAMINANTS

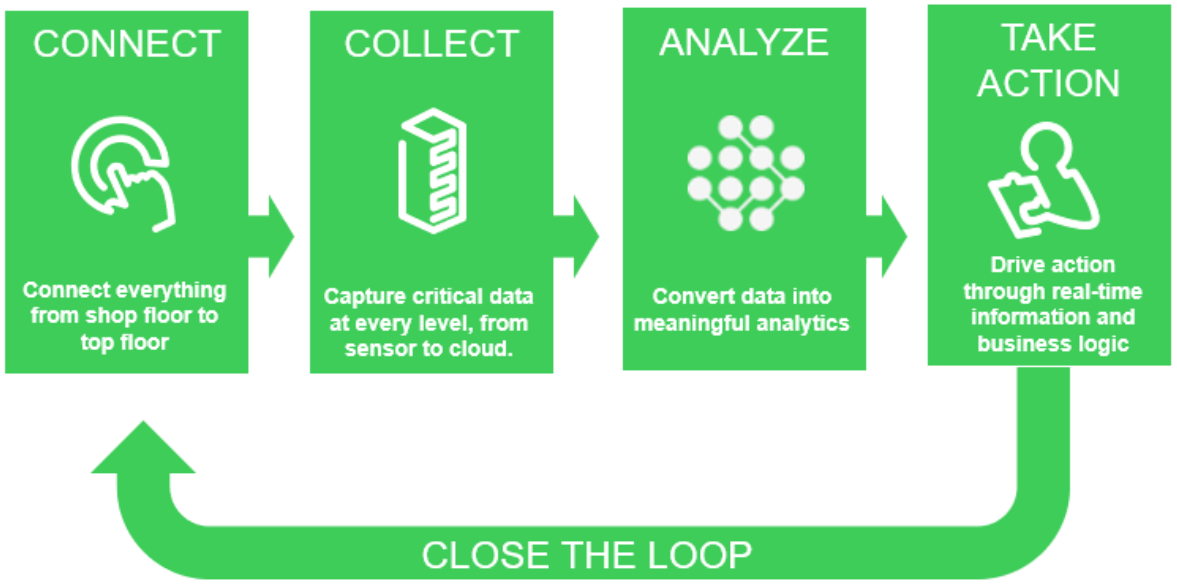
FIRE/SMOKE

Physical Access Control Risks

BREACHED ENCLOSURES

ENCLOSURES LEFT OPEN

Remote Monitoring and Management at the Edge



Translating data into actionable intelligence and better business decisions

STAFFING: The ICT World Is Facing a Skilled Worker Shortage

- Look no farther than Bicsi's ICT Today April/May/June 2020 issue to read a great article by Randal R Reusser titled: "The ICT Talent Shortage".
- "A third trend is the ongoing and anticipated skills shortage: designers, engineers, and operators are in short supply, and this will get far worse before it gets better."
  - Andy Lawrence, executive director of research at Uptime Institute from "**State of the Industry** A Roundtable Discussion With Mission Critical Professionals" by Amy Al-Katib, Mission Critical Magazine July 22, 2020

- Interestingly, ***a new trend around Generation Z shows that many entrants into the technology sector don't look for higher education degrees. Rather, they aim for on-the-job training and industry-specific certifications.***
  - "State of the Data Center March 2020" – The Data Center Institute AFCOM

Uptime Institute Global Data Center Survey 2020

UI Intelligence Report 38

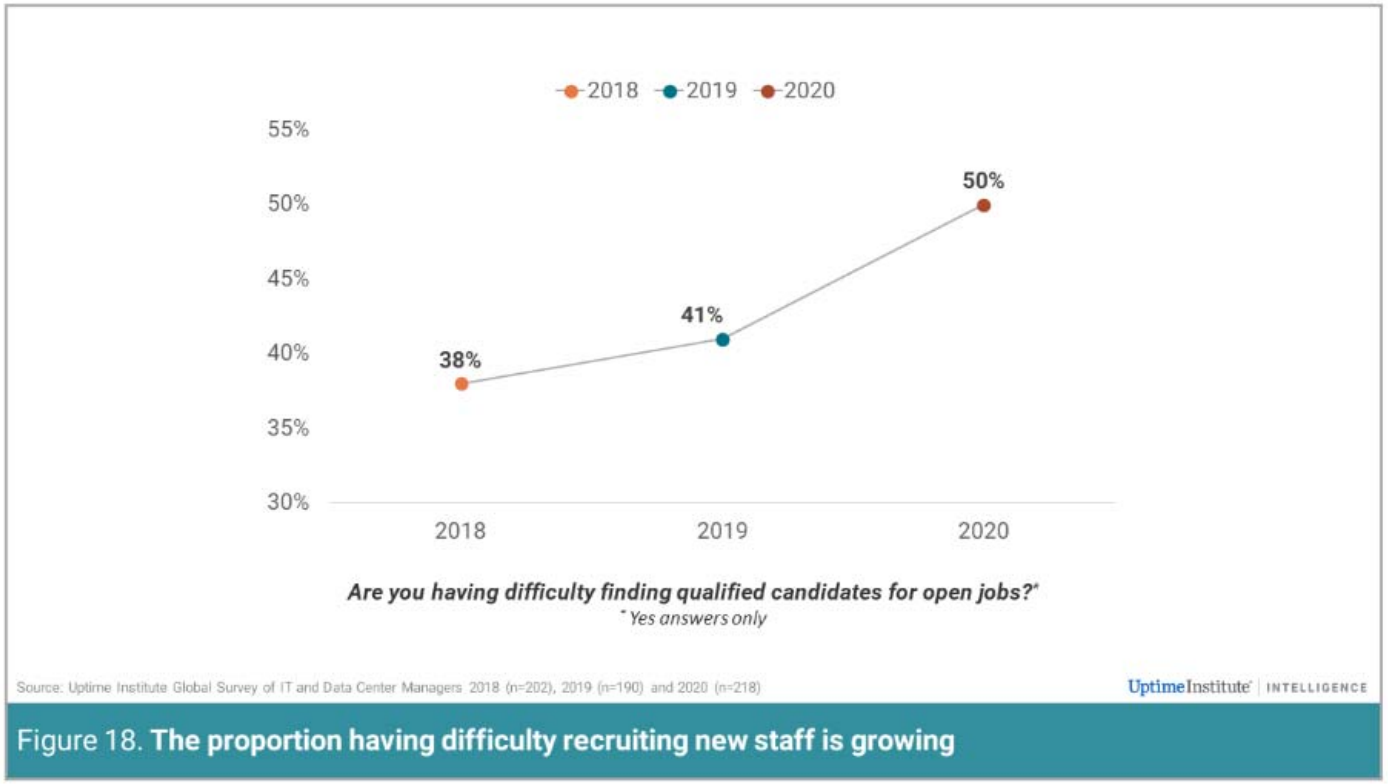


Figure 18. **The proportion having difficulty recruiting new staff is growing**

Deploying Edge Data Center Infrastructure

Mission Critical: As edge computing gains popularity, **how do you see the construction market shifting**? Will we continue to see large concentrations of facilities in major markets like today, or will more individual sites pop up in isolated areas?

Ascierto: The opportunity is to supply, build, or operate local edge data centers — small micro data centers that are designed to operate near the point of use, supporting applications that are not suited to run in big, remote data centers, even in mid-sized regional colocation data centers. Unlike most larger data centers, **micro data centers will mostly be built, configured, and tested in a factory and delivered on a truck.** Typical sizes will be 50 to 400 kW, and there are expected to be a lot of them. Edge micro data centers will be managed remotely by software and AI to orchestrate edge workloads in a programmable way. Colos, clouds, carriers, and specialists are focusing on new capabilities.

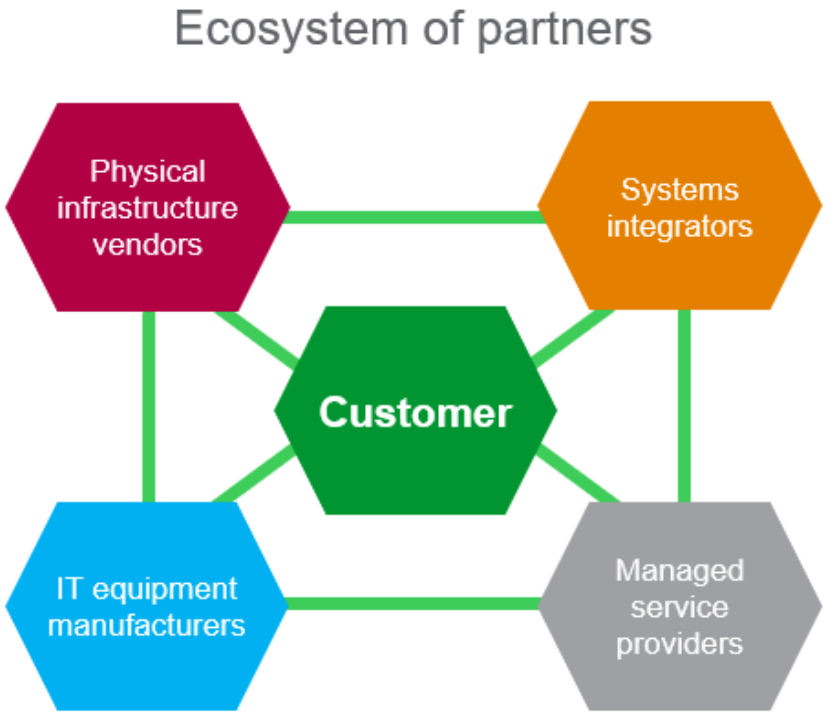
Source: Rhonda Ascierto, vice president of research at Uptime Institute from "**State of the Industry** A Roundtable Discussion With Mission Critical Professionals" by Amy Al-Katib, Mission Critical Magazine July 22, 2020

The Deployment Ecosystem

Deployment

Ability to pre-configure technology platforms and devices before shipment increases deployment speed and can reduce field engineering costs by 25 to 40%, increase order processing speed by 20% and reduce maintenance costs by 7%.

World Wide Technology



Source: Schneider Electric White Paper 277 Solving Edge Computing Infrastructure Challenges

Example of a Fully Integrated Edge Micro Data Center

Source: Schneider Electric White Paper 277 Solving Edge Computing Infrastructure Challenges

Let’s look at a few examples here in the lab of Edge Physical Infrastructure

Summary of Edge Data Centers

- Application Driven
- Reduces Latency
- 1 – 10 Cabinets/site
- 2 – 10 kW/Cabinet
- Ubiquitous (everywhere)
- Mostly built, configured, and tested in a factory and delivered on a truck

Challenges:

- Physical Security
- Standardization
- Resiliency
- IT Staff
- Monitoring and Managing

Thank

You