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EMEA USERS CONFERENCE

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IoT Edge Intelligence – Providing Real-time Insight to Improve Efficiencies at a Large Sports Stadium

Presented by **Manu Namboodiri**
Sr. Director Business Development
Qualcomm Intelligent Solutions, Inc.

Overview

Agenda

1

Market and Industry
overview

2

Importance of the
edge

3

Edge analytics use
cases

4

Petco Park -
OSI/Qualcomm
smart stadium

5

oneM2M vision



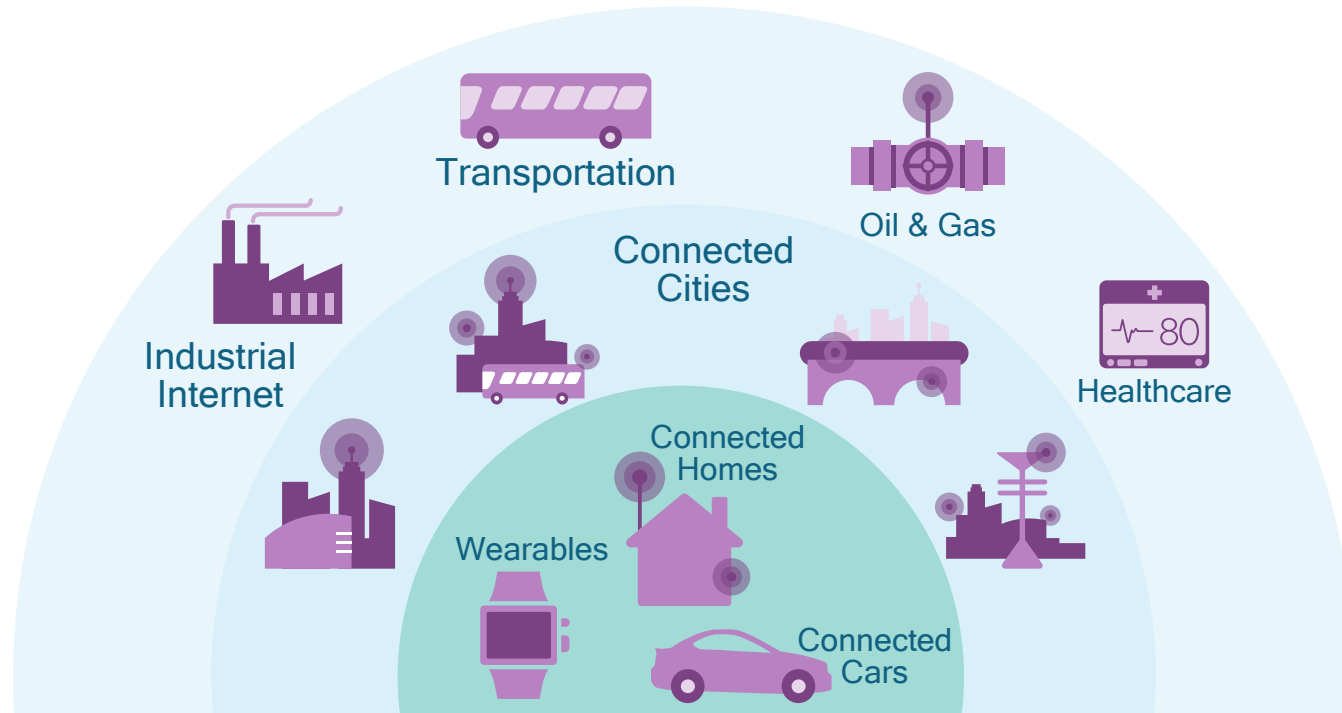
QUALCOMM®

Helping empower cities and industries worldwide with a scalable ecosystem of smart, efficient, sustainable technologies.



Internet of Connected Objects

20 billion connected objects are estimated by 2020



Smart Cities Market Opportunity Breakdown (2019E)

(Connected device shipments in millions)

| | | |
|----------------------------|-------------------------------------|----------------------------------|
| 1,140M Energy | 207M Security & Safety | 141M Water, Oil & Gas* |
| 467M Industrials | 687M Buildings & Lighting | 83M Transportation |

*Water, oil & gas infrastructure: Treatment, extraction, processing and transport

Smart Cities & IIoT

\$430B

Potential Technology Revenue

Total = **2.7B**
Devices



Smart Cities

World population living in urban environments

~50%
Today

~70%
in 2050



Bluetooth



NFC



3G/4G



Powerline



Wi-Fi



Fiber



Ethernet



Smart gateways
& small cells



Industrial IoT

Business investments in Industrial IoT solutions¹

\$2.1B

Today

\$8.3B

in 2020

Fleet Management

Supply Chain Optimization

Predictive Maintenance

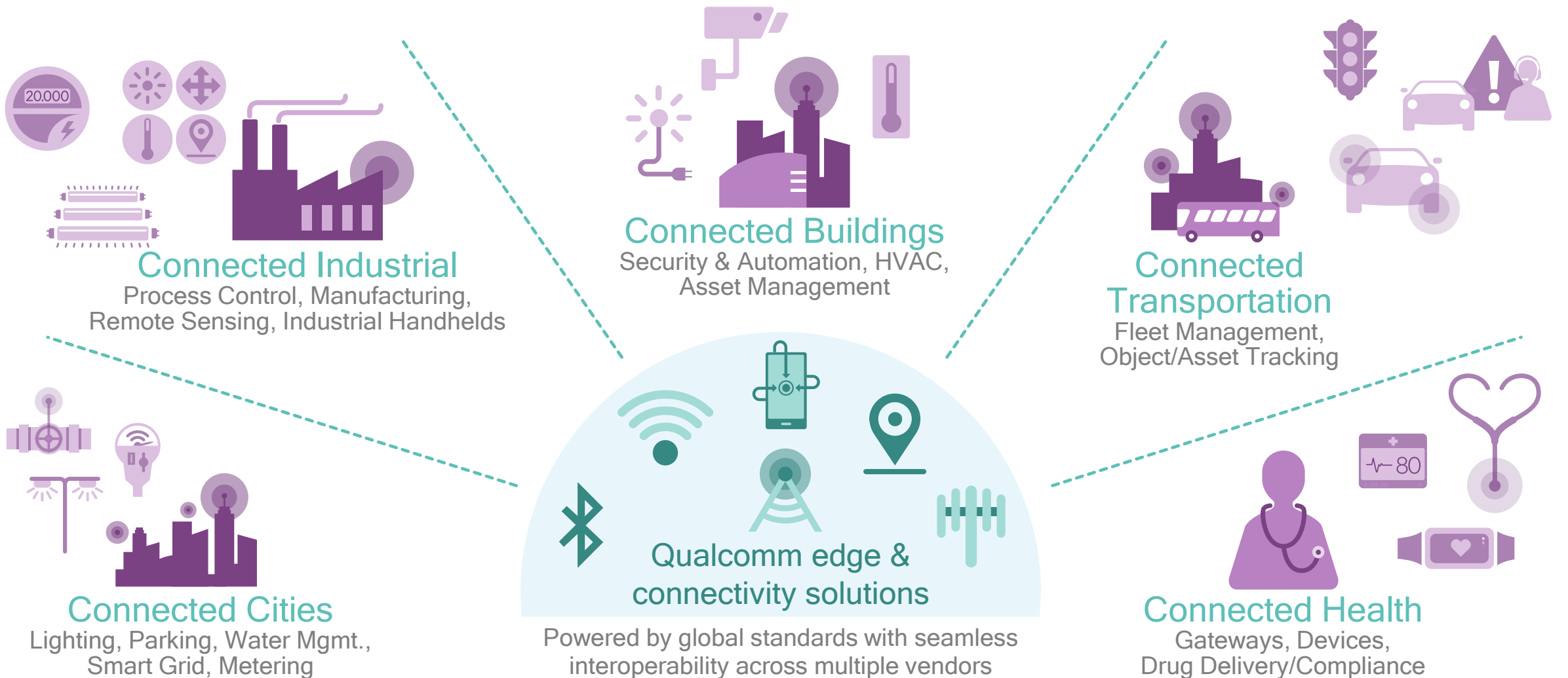
Asset Utilization

Equipment Monitoring

Grid Automation

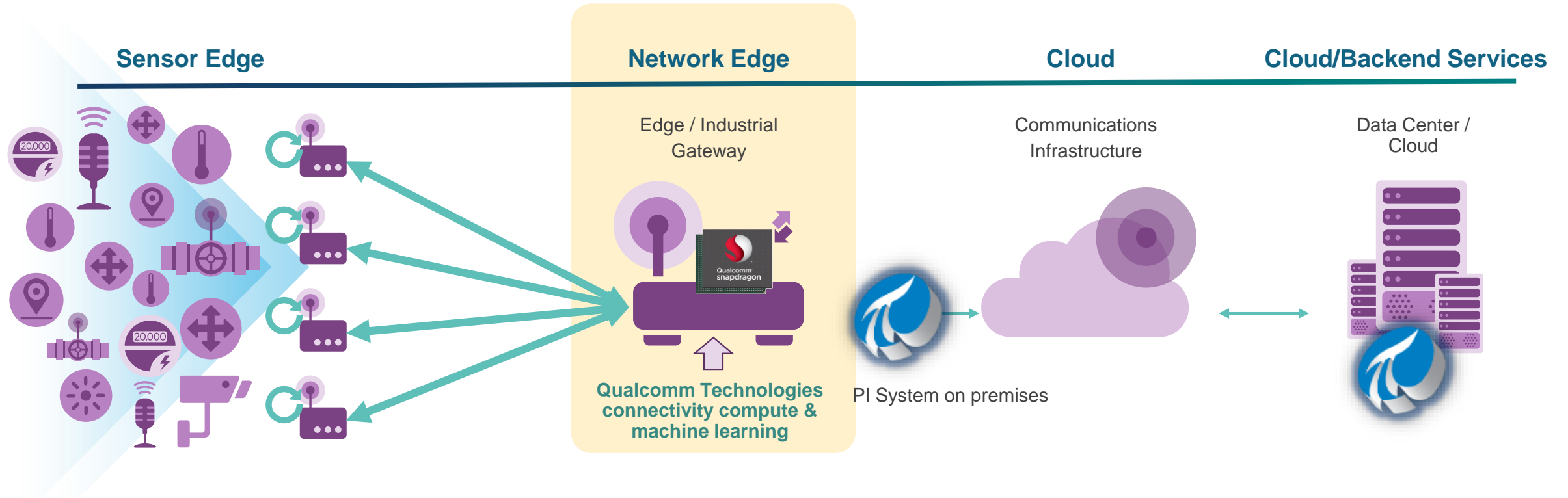
1. PwC 2016

Connectivity, edge, data driving Smart Cities & IIOT



Enabling the intelligent edge

Decision making at the point of data collection is key for Smart Cities & IIOT



Trends Driving Edge Analytics



Rapid response and local actuation requirements



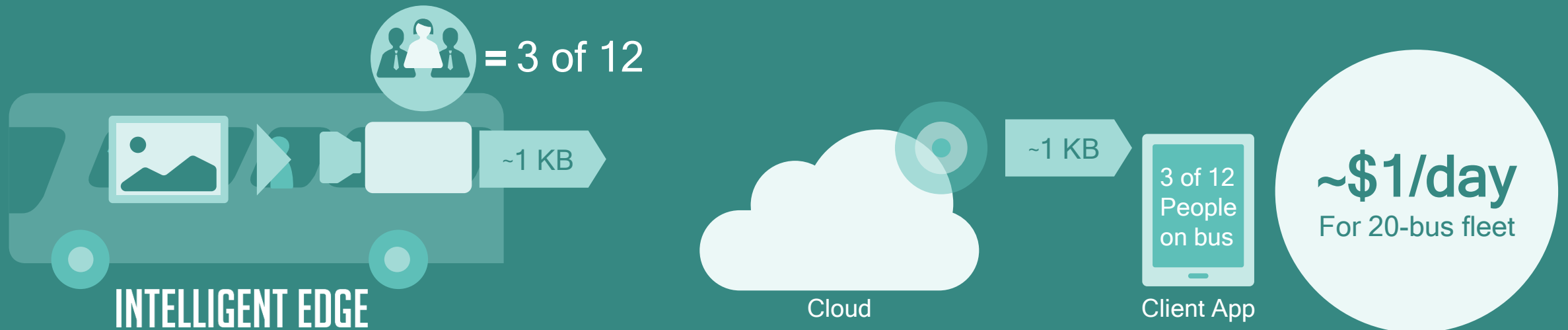
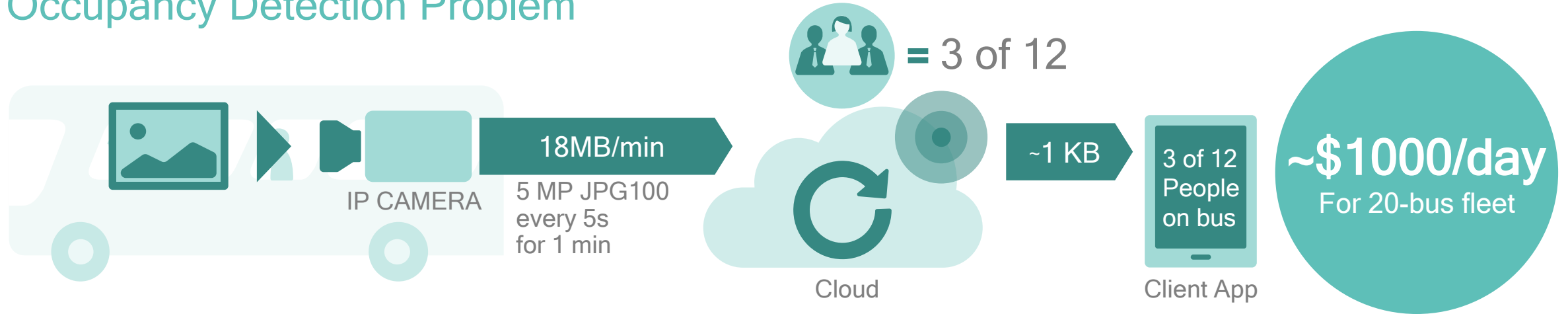
Exponential growth in data - cost prohibitive to send all data to the cloud



Increased processing, machine learning & storage capability at the edge

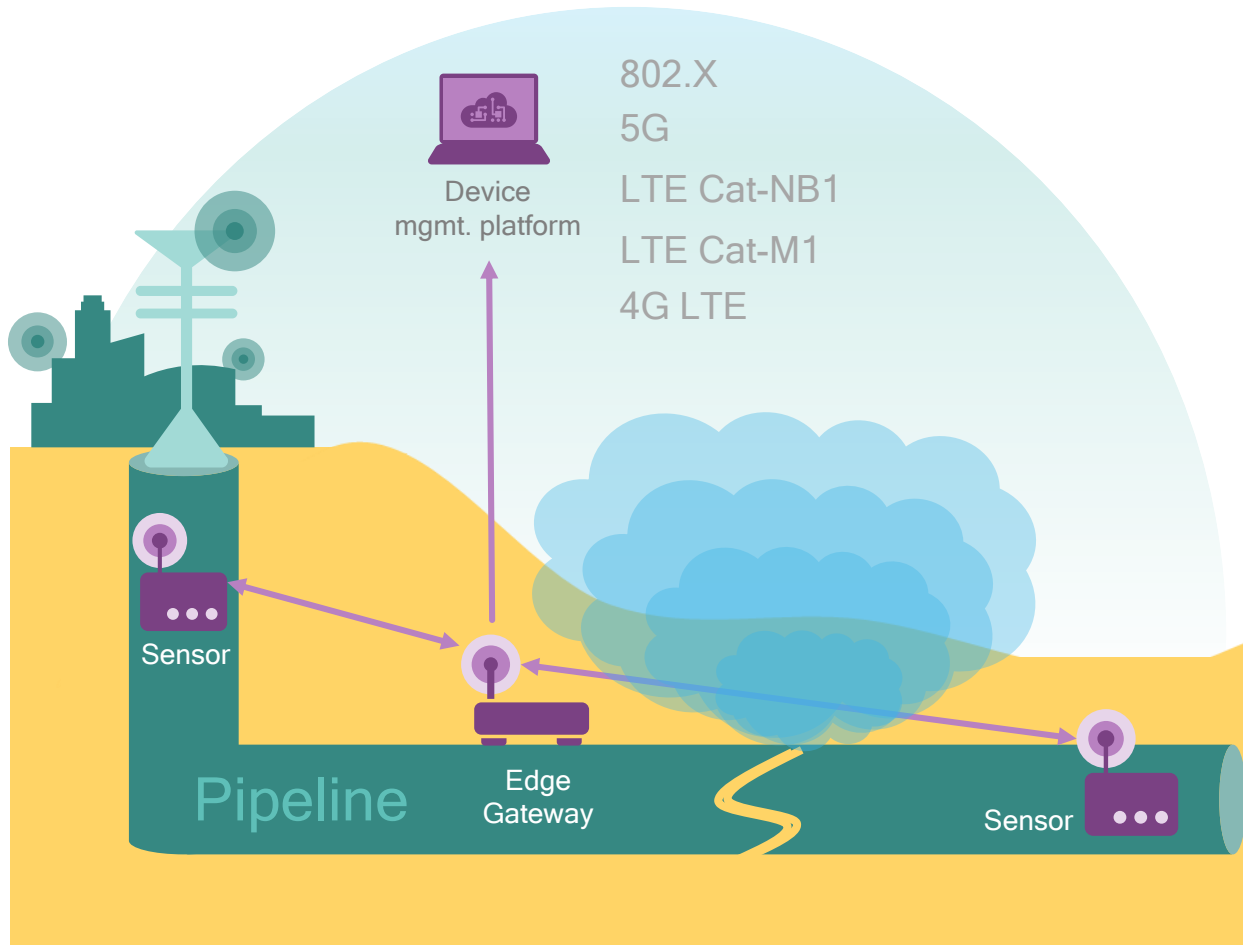
Edge Intelligence use case

Occupancy Detection Problem



Edge Intelligence at work

Pipeline Safety



Senate Bill 1371 directs CA. Public Utilities Commission to address pipeline leakage impact on environment



Sempra **\$1.46B** Pipeline Safety Enhancement Plan approved by CPUC



\$220M in Methane Sensor Enablement across 2400 miles of pipeline



Gateways



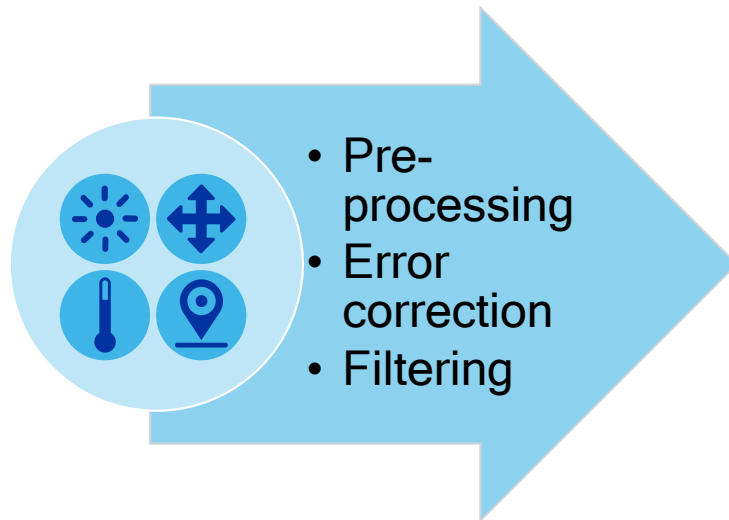
Sensors



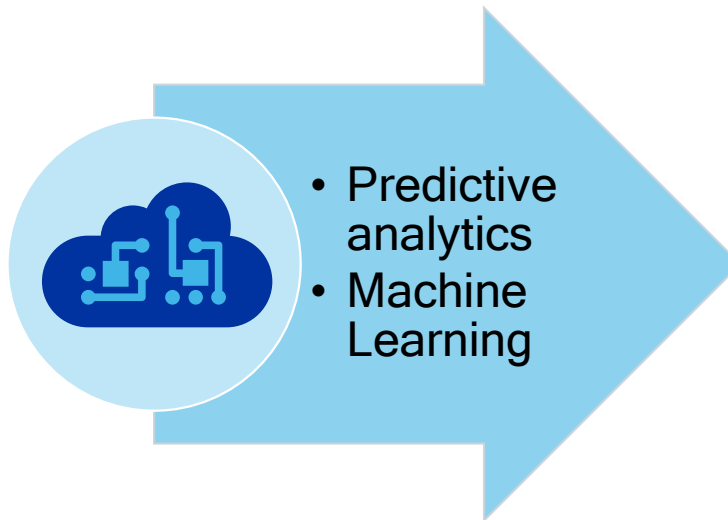
Device mgmt. platform

Evolution of edge workloads

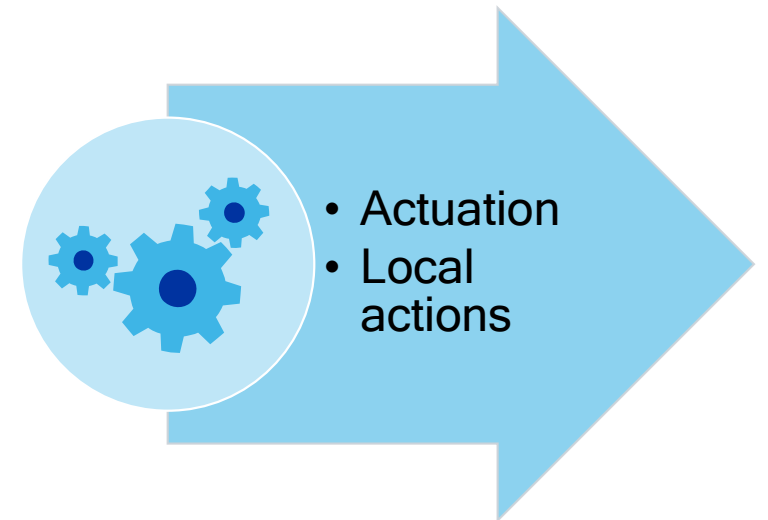
Data



Analytics



Control



Padres Smart Ballpark

Enabling efficiencies for a smart stadium



Petco Park

Enabling real-time data collection and insights



Compute & Connectivity

Edge Intelligence
Technology

Qualcomm[®]
Snapdragon™ 410

Qualcomm Wired &
Wireless Connectivity

Real-Time Sensor Data Collection

OSIsoft PI System

Capture

Search
&
Analyze

Visualize

Share

Gain Operational Intelligence from Data

Petco Park - Base ball stadium

Facility Snapshot

- Petco Park Details
 - Built in 2004 in downtown San Diego, California
 - 14-acre property, 1,600,000 ft² of usable space (including field)
 - Capacity - 40,162 attendees
 - Employees, 200 fulltime and 630 Part-time
 - Multi-tenant facility housing: administrative, engineering, concessions, etc.
- Types of Events
 - 90 Ballgames per year plus concerts, corporate events holiday events, motor-cross, etc.
- Previous sustainability projects
 - LED retrofits - one of the first stadiums in the country to do so

Petco Park

Stadium Operational Challenges

- Energy usage/waste - no ability to track or monitor
- Lack of granular visibility into resources usage
- No real time insight - most data was monthly or after 24 hours
- No ability to charge event organizers, vendors based on consumption
- Lack of data for future planning and investments - for ROI models

Petco Park - Smart Ballpark Goals

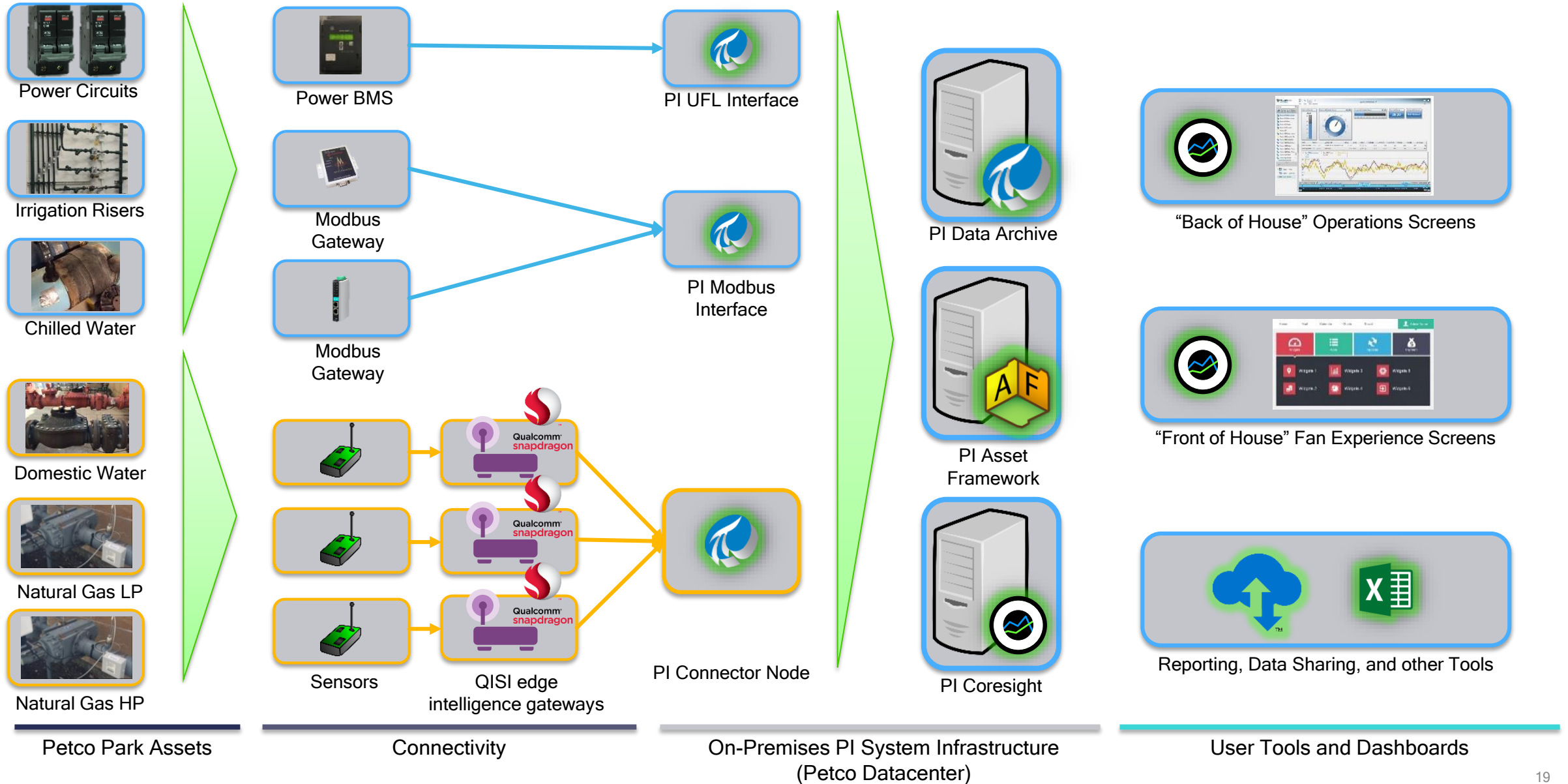
Project Goals

- Increase efficiencies of existing assets without expensive retrofits
- Real-time insight on resource utilization
 - Energy, gas, chilled water, potable water, irrigation water
- Data to monitor multi-tenant resource utilization - and plan for charges based on usage
- Data for future project planning and ROI models

**Increase efficiencies and reduce operational costs
by over 25% in the next five years**

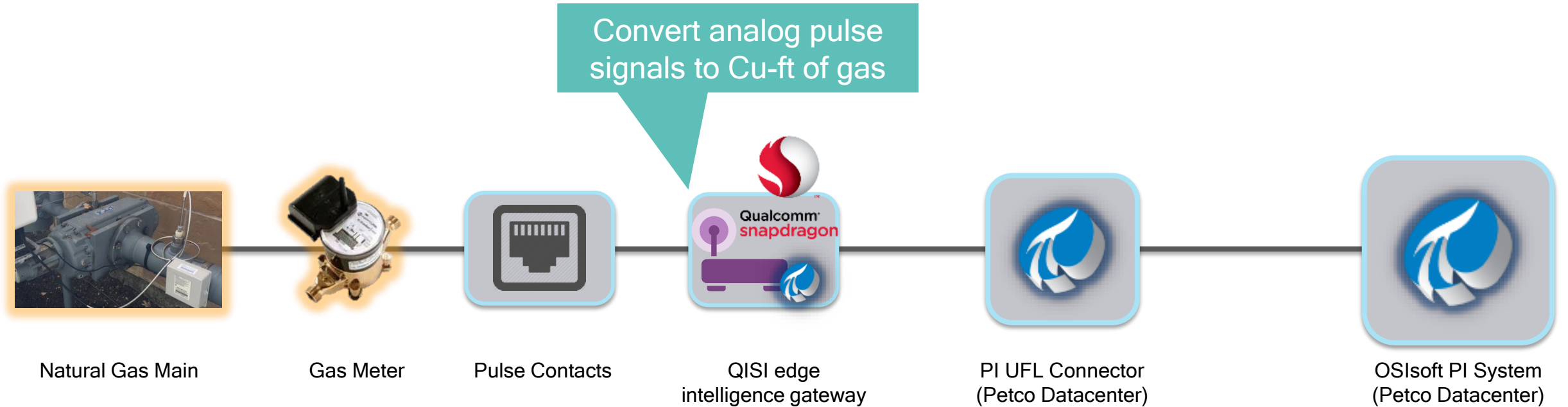


System Architecture



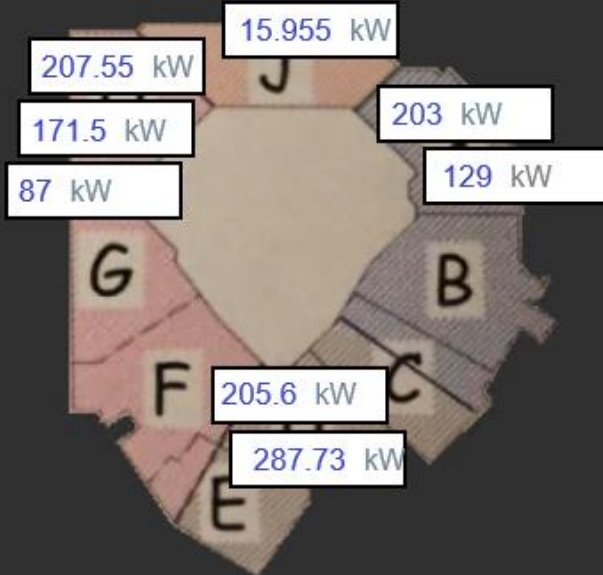
High Pressure Gas Integration

Connecting the unconnected, local edge processing





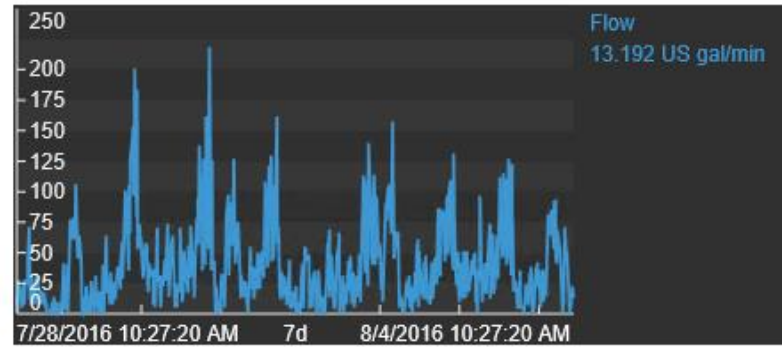
Stadium Power Submetering



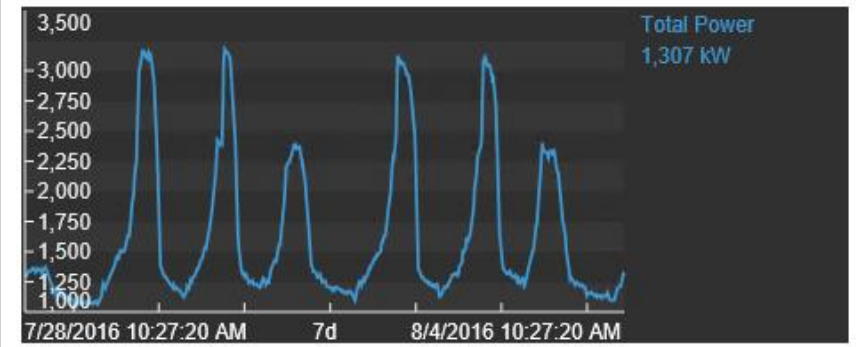
| Temperature (F) | Relative Humidity | Dewpoint | Pressure | Visibility | Wind Speed | Wind Direction | Weather |
|-----------------|-------------------|----------|------------|------------|------------|----------------|--------------|
| 72.606 °F | 64.789 % | 60.1 °F | 1,013.3 mb | 10 mi | 8.753 mi/h | Southwest | A Few Clouds |

| % Free Archive Disk Space | % Total Processor Time | Available Memory | System Up Time |
|---------------------------|------------------------|------------------|----------------|
| 98.626 % | 4.2303 % | 13,397 mb | 1.218E+07 s |

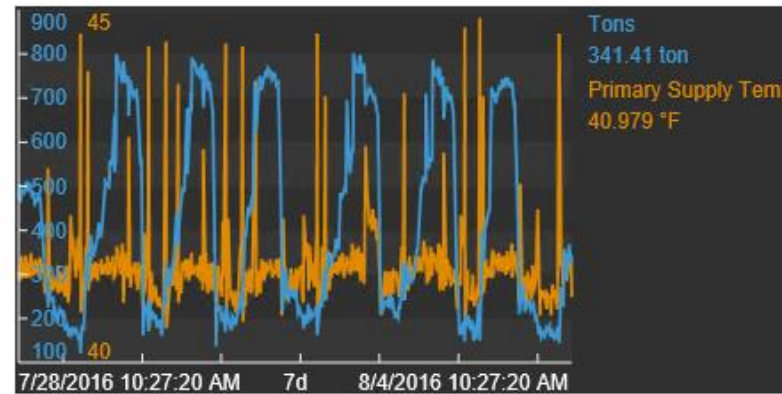
Water Use



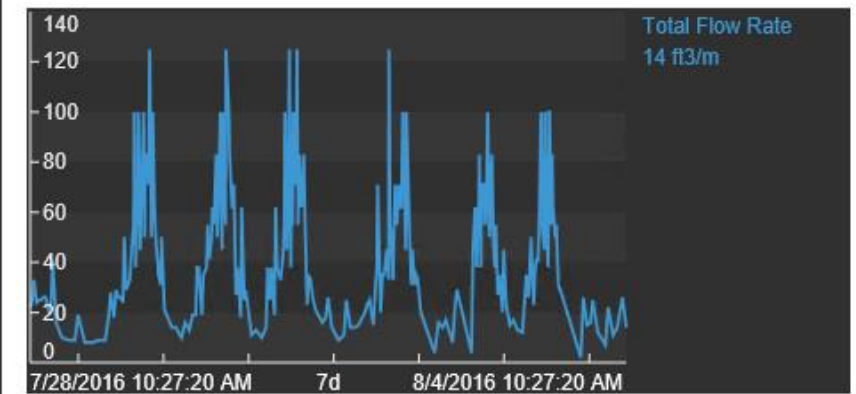
Electricity Use



Chilled Water Use



Natural Gas Use



Total Facility Usage

Total Flow Rate

13 ft³/m

Therms 1hr

11 therm

Energy Content Rate

8.6704E+05 BTU/Hr

[Dashboard](#)

Natural Gas Use Today

Low Pressure

2.7111 therm

65 therm

High Pressure

62.1 therm



8 propane tanks

Low Pressure Usage

Volume Flow Rate (CFM)

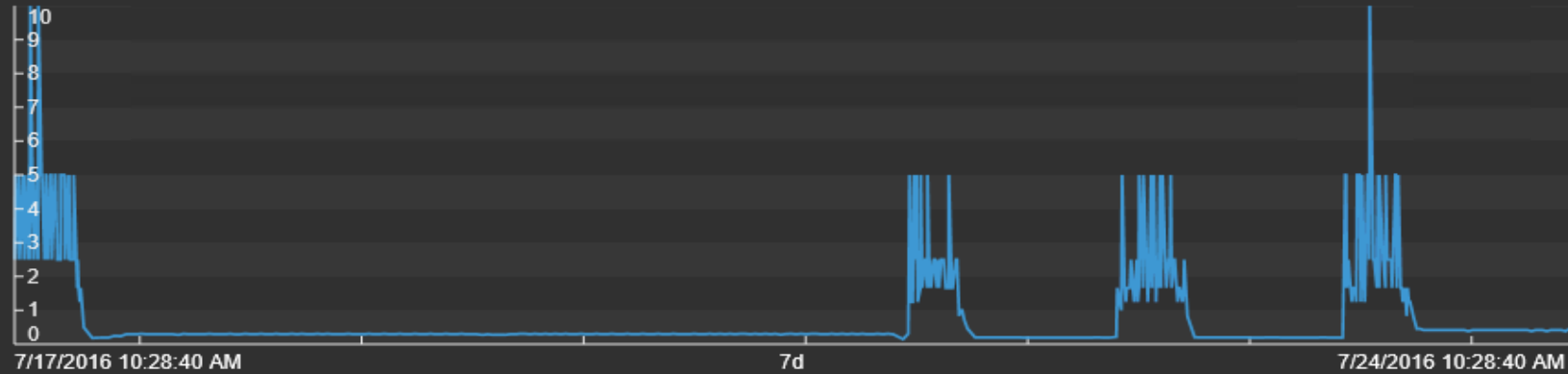
0.4484 ft³/m

Therms 1hr

0.21045 therm

Energy Content Rate

27,846 Btu/h



High Pressure Usage

Volume Flow Rate (CFM)

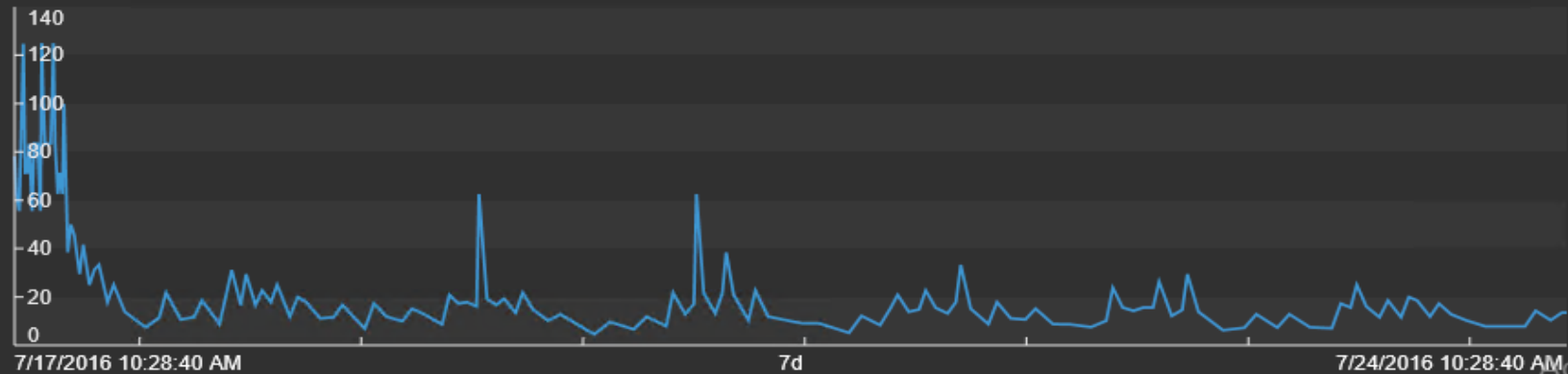
13.514 ft³/m

Therms 1hr

10.35 therm

Energy Content Rate

8.3919E+05 Btu/h



Total Facility Usage

5min Total
96.746 US gal
1hr Total
745.01 US gal
Flow
13.913 US gal/min

[Dashboard](#)

Water Use Today

Irrigation
15,535 US gal

20,239 US gal

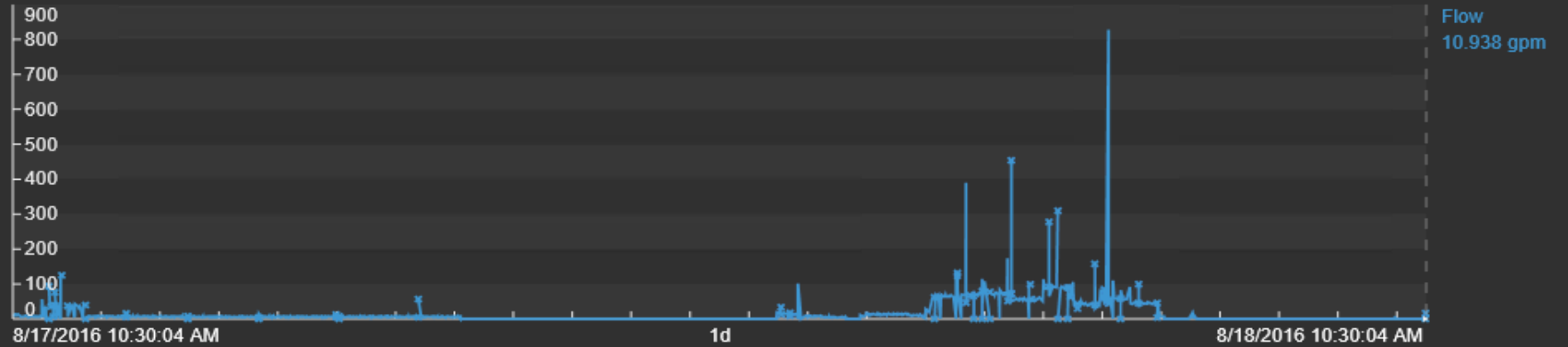
Potable
4,704.3 US gal



47.068 hot tubs

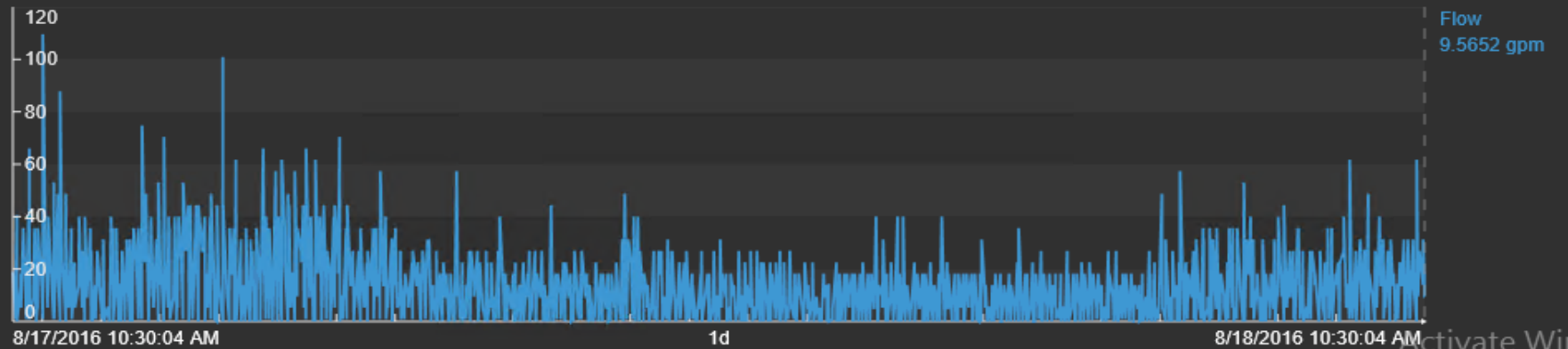
Irrigation Usage

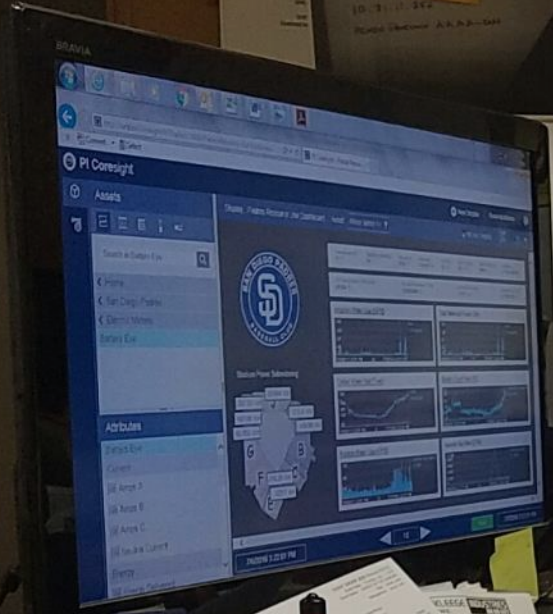
5min Total
0 US gal
1hr Total
0.49056 US gal
Flow
10.938 gpm



Potable Usage

5min Total
96.746 US gal
1hr Total
744.52 US gal
Flow
9.5652 gpm





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petco
park



Trends and standards to be aware of

The oneM2M standard (onem2m.org)

Technical specifications for a common connected service layer

- Over 200 members
- Started in 2012, first draft in 2015
- Rev 2.0 released August 2016 (AllJoyn, OCF)



Address areas such as

- Application Framework
- Discovery of sensors/actuators, services
- Policy based access control for data, services, sensors/actuators access
- Data Protection and Storage
- Authentication and Authorization
- Logging, Fault handling
- Device Management

Contact Information

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Questions

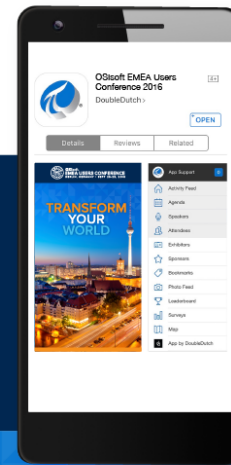
Please wait for the **microphone** before asking your questions



State your **name & company**

Please remember to...

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado





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