Enhancing IoT Situational Awareness:

Connecting First Responders to Smart Buildings

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NIST

#PSCR2020

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Overview

Internet of Things Smart Buildings

Introduction

History of IoT projects at PSCR

Why Smart Buildings

How it could benefit first responders

The Technology

What public safety can use today and tomorrow
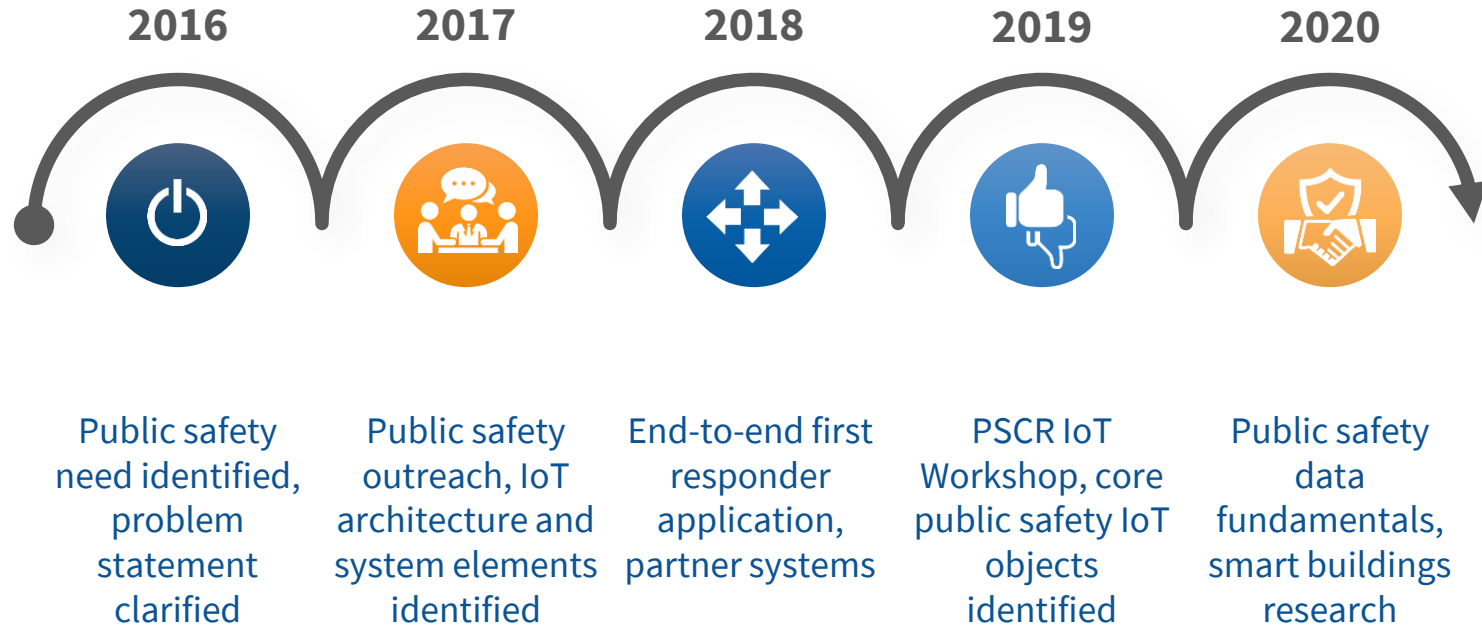
Technology Deep Dive

Protocols and architecture

Conclusion

What can PSCR and public safety do

PUBLIC SAFETY INTERNET OF THINGS

2016 — Public safety need identified, problem statement clarified

2017 — Public safety outreach, IoT architecture and system elements identified

2018 — End-to-end first responder application, partner systems

2019 — PSCR IoT Workshop, core public safety IoT objects identified

2020 — Public safety data fundamentals, smart buildings research

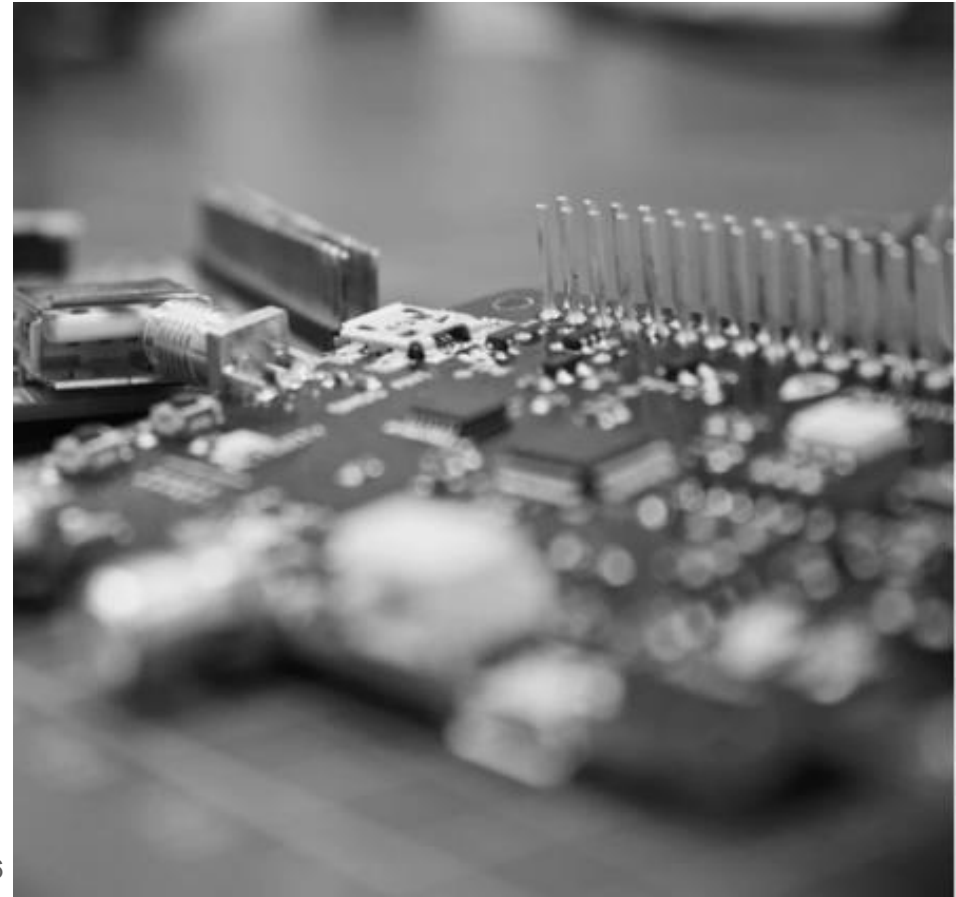# IoT: Enhancing Situational Awareness

Actionable Data

Real-time cyber physical interaction

Use existing technologies in new ways

Create user interfaces to prevent ambiguity

Save lives, decrease response times

Why Smart Buildings

## **Buildings are involved in many first responder incidents**

- **Pre-planned** data gathered from inspections
- **En-Route** data gathered from building alarms and dispatch
- **On-site** data gathered from building cameras or sensor systems
- **Post-incident** data gathered for scene reconstruction

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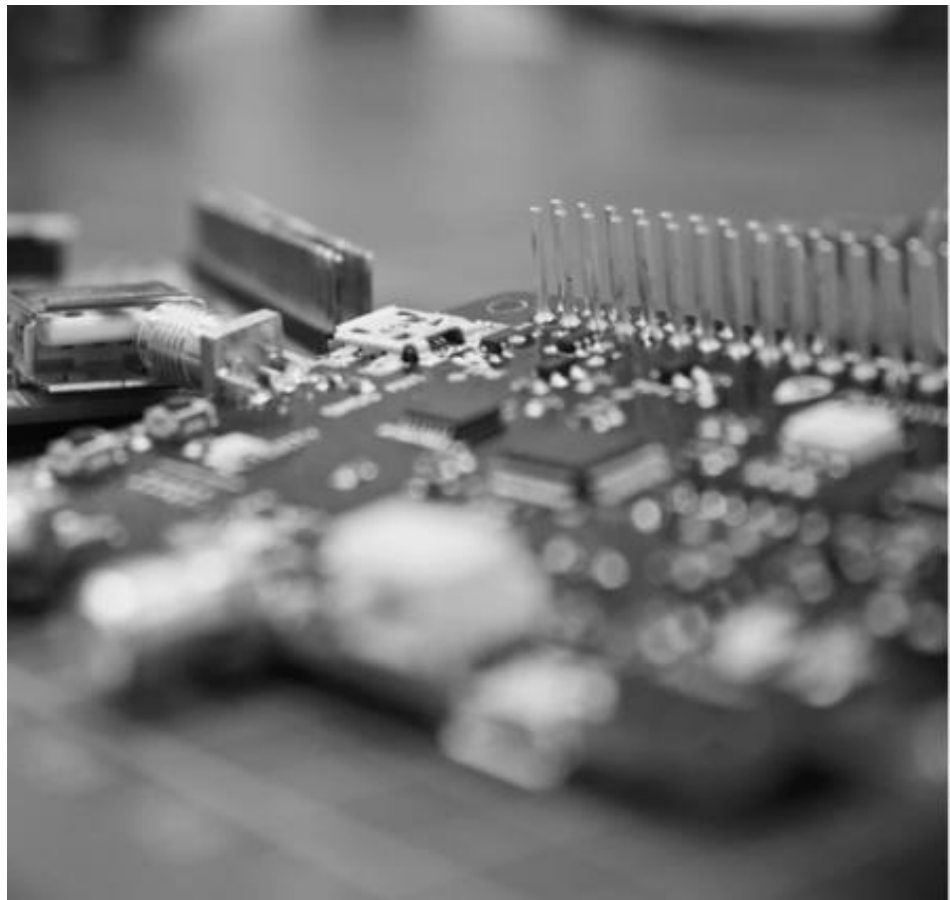
Why Smart Buildings

Use existing IoT data for public safety use

- Integration of technologies using flexible programming interfaces
- Creating technological consensus
- Use readily available technologies in more diverse ways
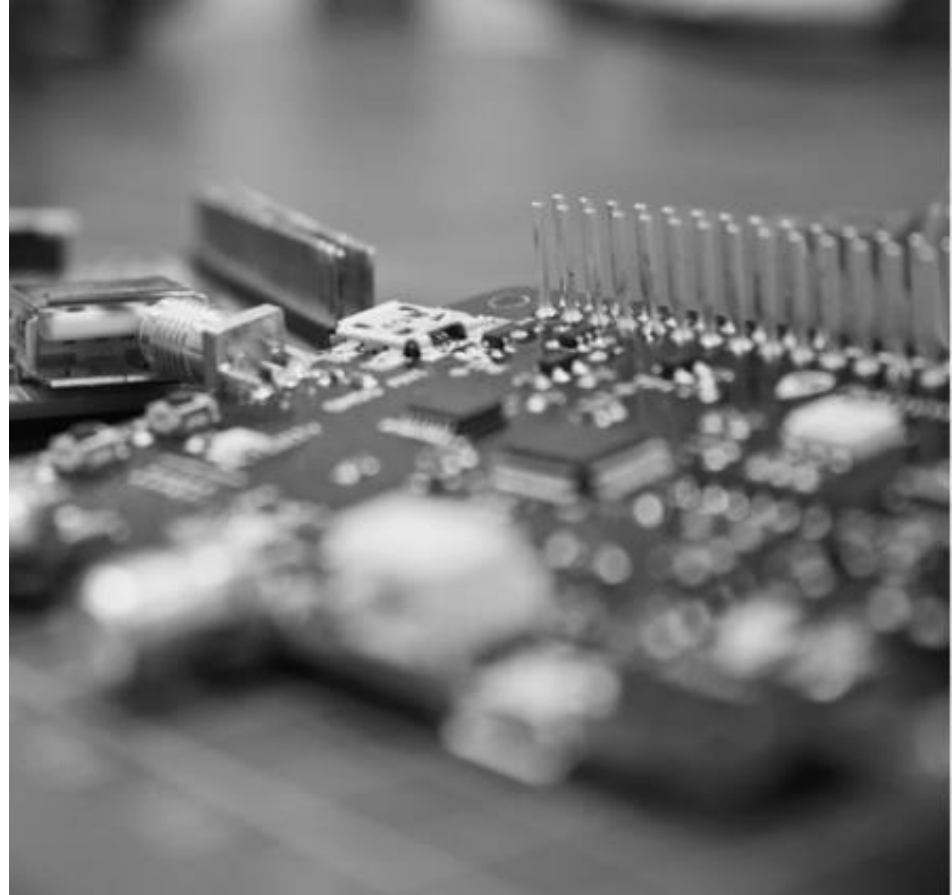
Demonstration of Real-Time Tactical Decision Aid Displays

National Fire Research Laboratory (NFRL) - NISTIR 7437

Demonstrated two prototype computer interfaces in Wilson, North Carolina with City of Wilson Fire Department

Study conclusions:

- Standardization of systems
- Reliability of sensor data
- Delivery of real-time building information to servers
- Avoiding information overload on responder displays

Telecommunications, Cybersecurity, Policy Graduate Program

Smart Building Data Sharing

Utilizing IoT and Smart Building technologies for public safety response

Secure accessibility methods to ensure data protection

Presenting relevant building data to responder groups

Gifford, K., Dr. (2020, May). *IoT Cybersecurity and Data Sharing*. Retrieved October 13, 2020, from https://www.colorado.edu/program/tcp/interdisciplinary-design-projects#iot_cybersecurity_and_data_sharing-341.

The Connected Building

- **Buildings are involved in almost every responder event**
  - Grenfell Tower London fire
  - Las Vegas shooting

- **The smartness in IoT technology depends on how the user benefits from the provided data**

Current Building Technology

The KNOX Box

Wall-Mounted safe that stores master keys and can only be opened by first responders

Computer Aided Dispatch

Contains static building information, such as floor plans and building contents

Some building systems automatically call emergency response

Current Tech Building Automation System

Fire Suppression

Automatically contacts public safety answering point

Reports specific building emergency

High redundancy and survival

Building Monitoring and Controls

Monitors building environment

Integrates security controls

Provides occupancy information and

controls

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Public Safety Answering Points

PSAP Processing of building data

- Data regarding building incident
  - Alarms

  - Location of alarm pull

  - Rooms with active fire suppression

PSAP Data Entry

- Manual Entry
  - Relayed by 3rd party monitoring service

  - Some data is auto-populated based on address or location

  - Multiple calls from same event are collated within a single answering point

Smart Notification Emergency Event Routing

Image Source: SimpleSense.io

Data Sharing

Eliminate data duplication between agencies

Use existing broadband and emergency systems

Intelligent Dispatch Response

Provide location information, rooms, occupants

Scale emergency responses

Building Connectivity

Local Access

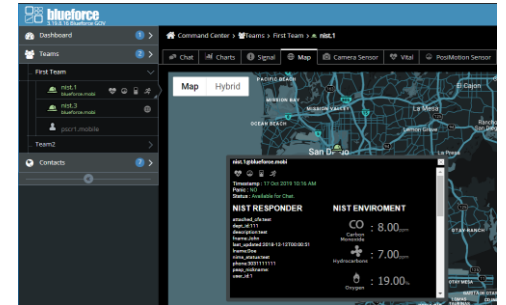Tap into building systems to enhance on-site awareness

Utilize local networks to increase coverage

Location

Use existing sensor systems to locate and identify individuals

Combine diverse tracking systems to provide accurate analytics to incident command

Image Source: Blueforce Development

Responder Identification and Access

Smart and Secure Access

Smart Connectivity

Seamless data transfer to and from responder-enabled smart building systems

Access Control

Universal access system for information exchange

Smart Applications

Machine to machine and human to machine IoT suite of tools for all responder groups

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Smart Building Systems
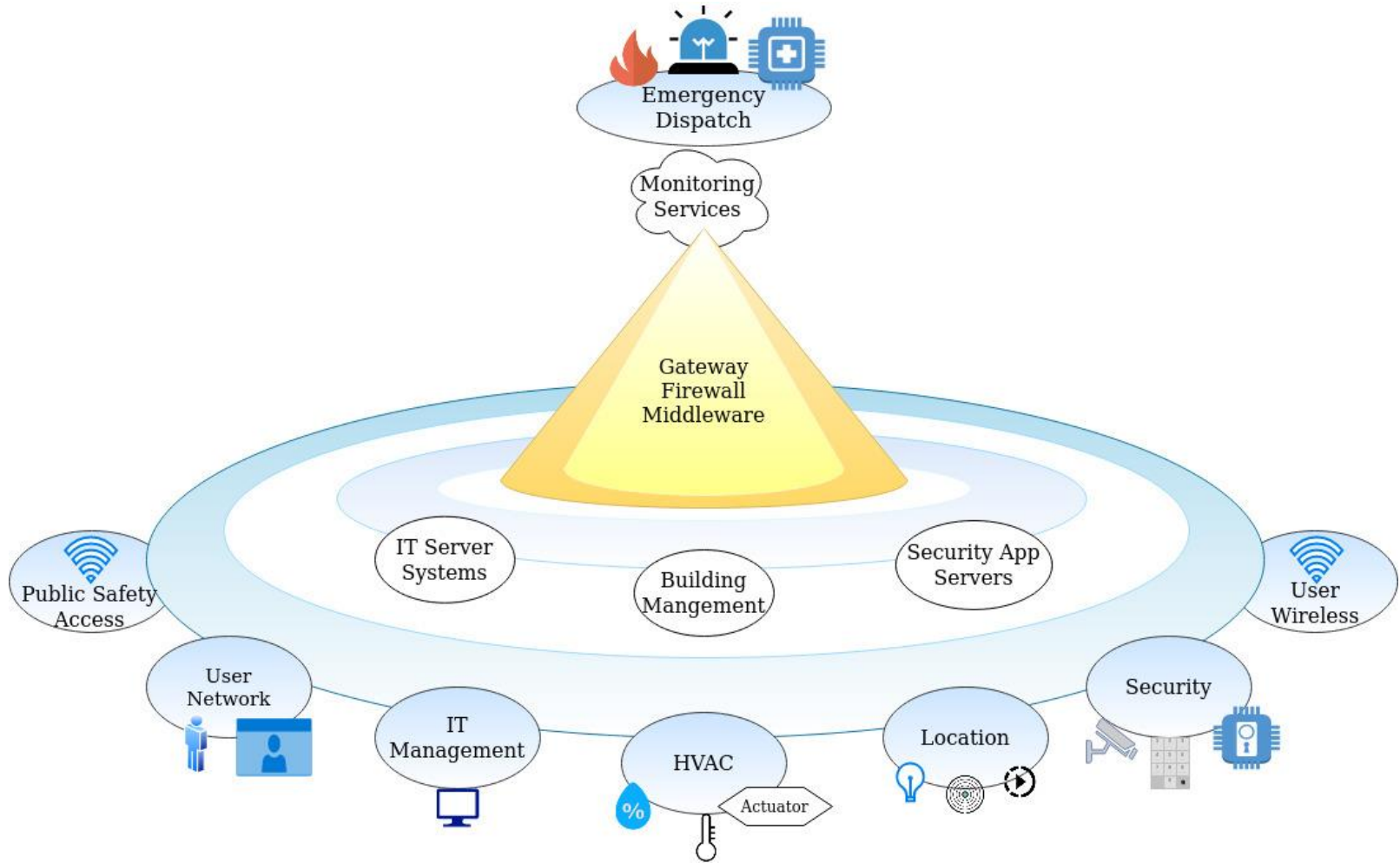
Requires Diverse Skill Sets

Technologists must have multidisciplinary backgrounds to understand the requirements for first responders

Technological Complex

Smart building systems require interoperability between many diverse technologies
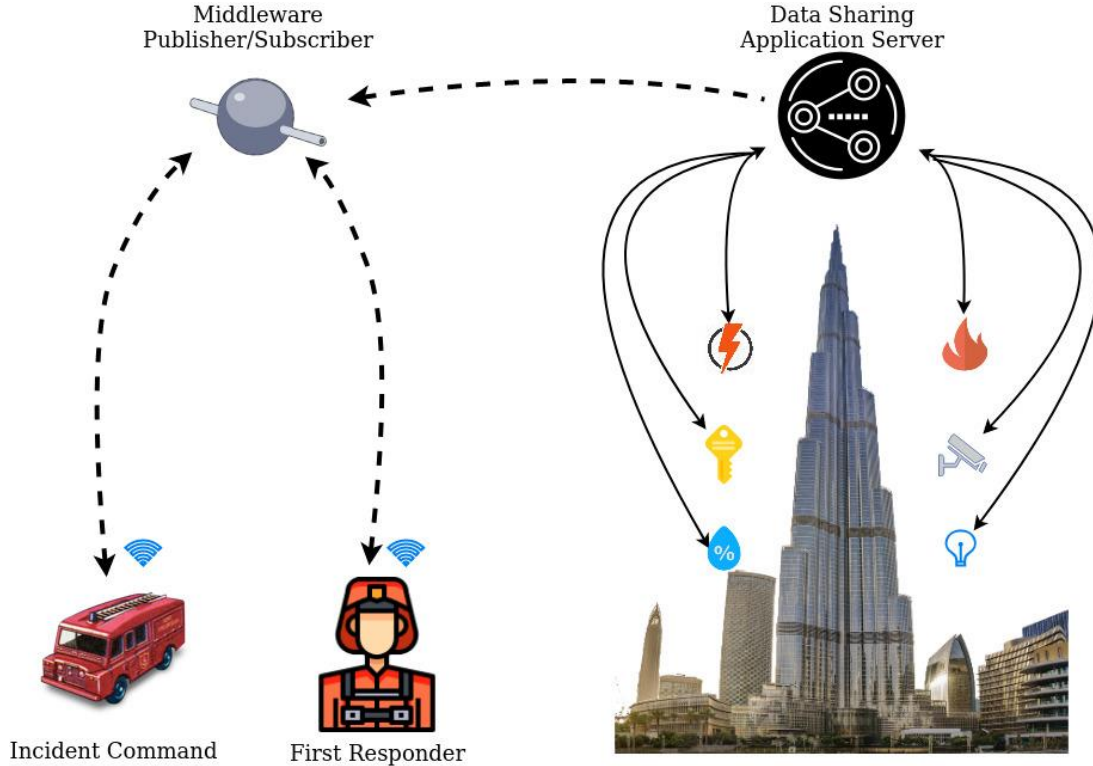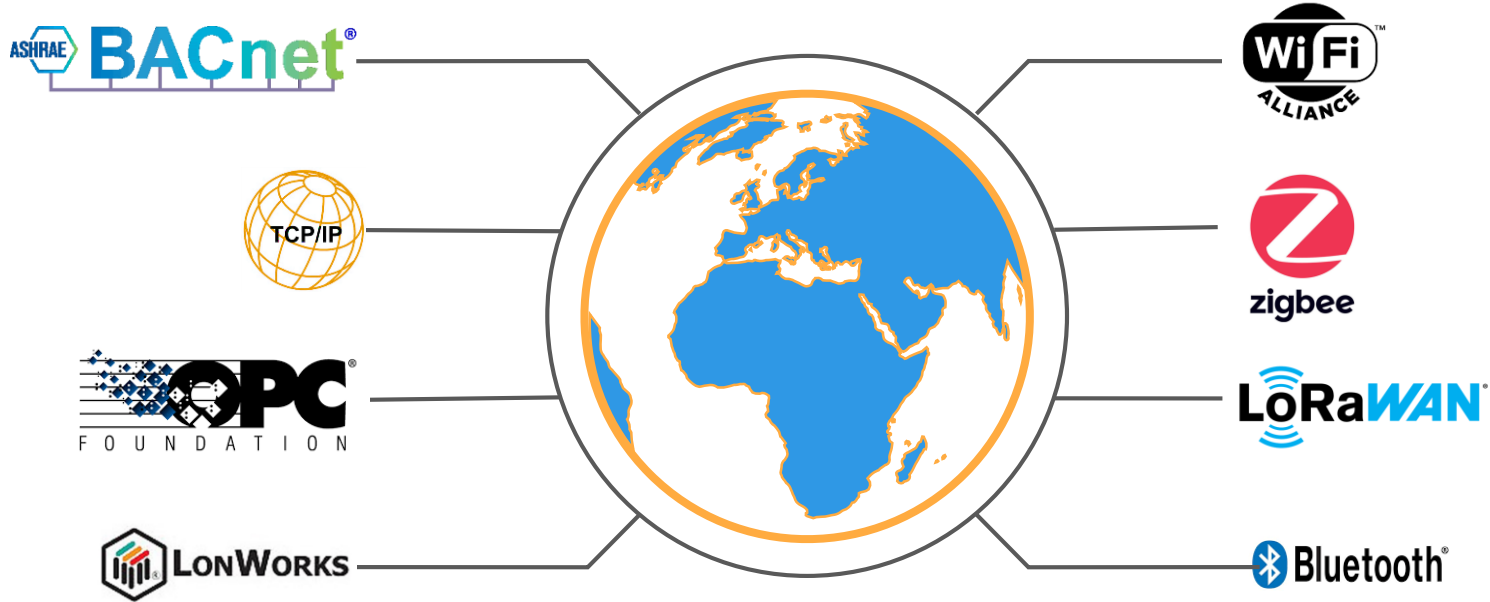
Building Systems: A Closer Look

Internet of Things **Middleware**

Middleware
Publisher/Subscriber

Data Sharing
Application Server

Middleware is a software/hardware platform that **intercepts and** formats disparate data sources then **distributes** relevant information to first responders

Incident Command

First Responder

Gifford, K., Dr. (2020, May). *IoT Cybersecurity and Data Sharing*. Retrieved October 13, 2020, from https://www.colorado.edu/program/tcp/interdisciplinary-design-projects#iot_cybersecurity_and_data_sharing-341.

Smart Building Protocols

Smart Building System Elements

IoT Sensors
C Programming
Embedded OS
Assembler

Databases
MongoDB, SQL,
Cassandra

APIs
REST, SOAP,
KAFKA

User Interface
JavaScript, C#,
SWIFT, Python

Data Encoding
JSON, XML

Transport Protocol
HTTP, CoAP, UDP
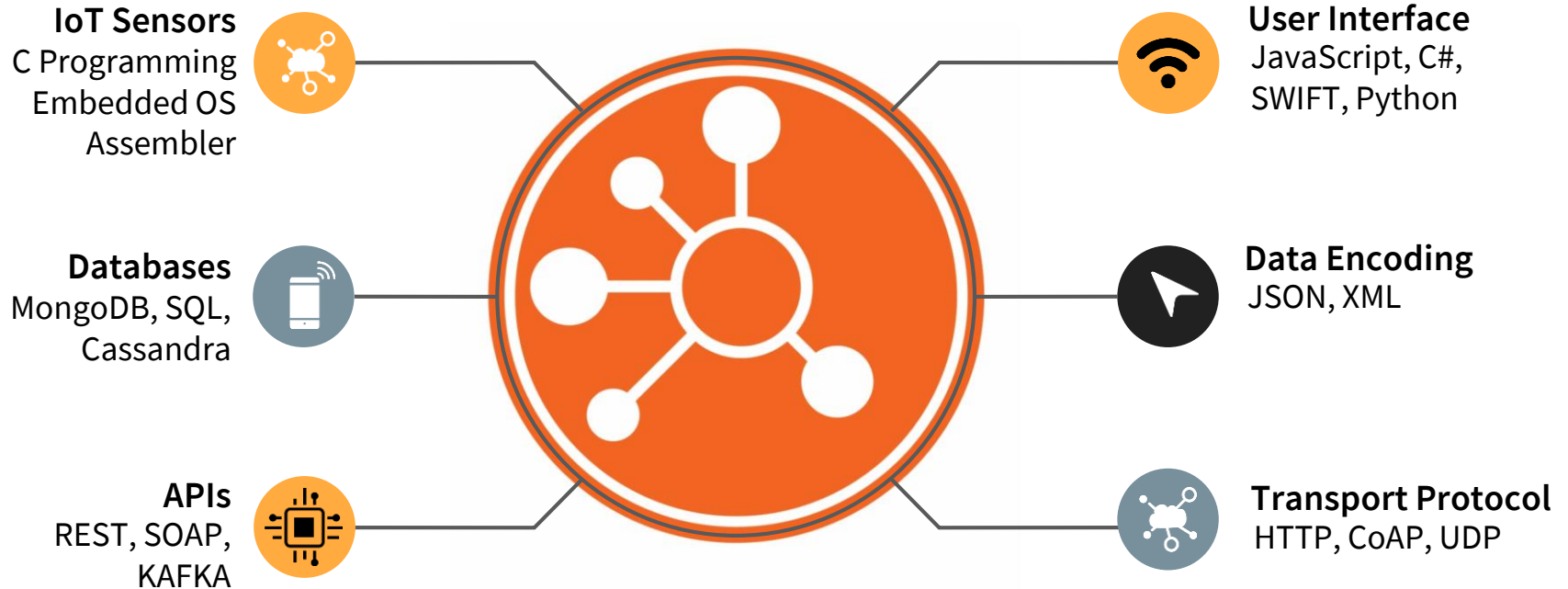
Actionable Interfaces from IoT Analytics

First responder applications should present **easily understood** interfaces

Interface schemas should be selected for specific application requirements

Image Source: Blueforce Development

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The Challenges of the Connected Building

Privacy and Security
Ensure data integrity and confidentiality

Unification
Common data exchange frameworks

Cost to Owner
Return on investment Features must be low-cost

Heterogeneous municipalities
Diverse neighborhoods may experience different levels of service

Call to action

Experts in building systems

    HVAC
    Cyber systems
    Building automation
    Security systems

Experience with smart building data

    IoT developers
    Building planners
    Application developers
    Communications experts

First responders

COME SOLVE WITH US

We would like to hear from you!

Thank you

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