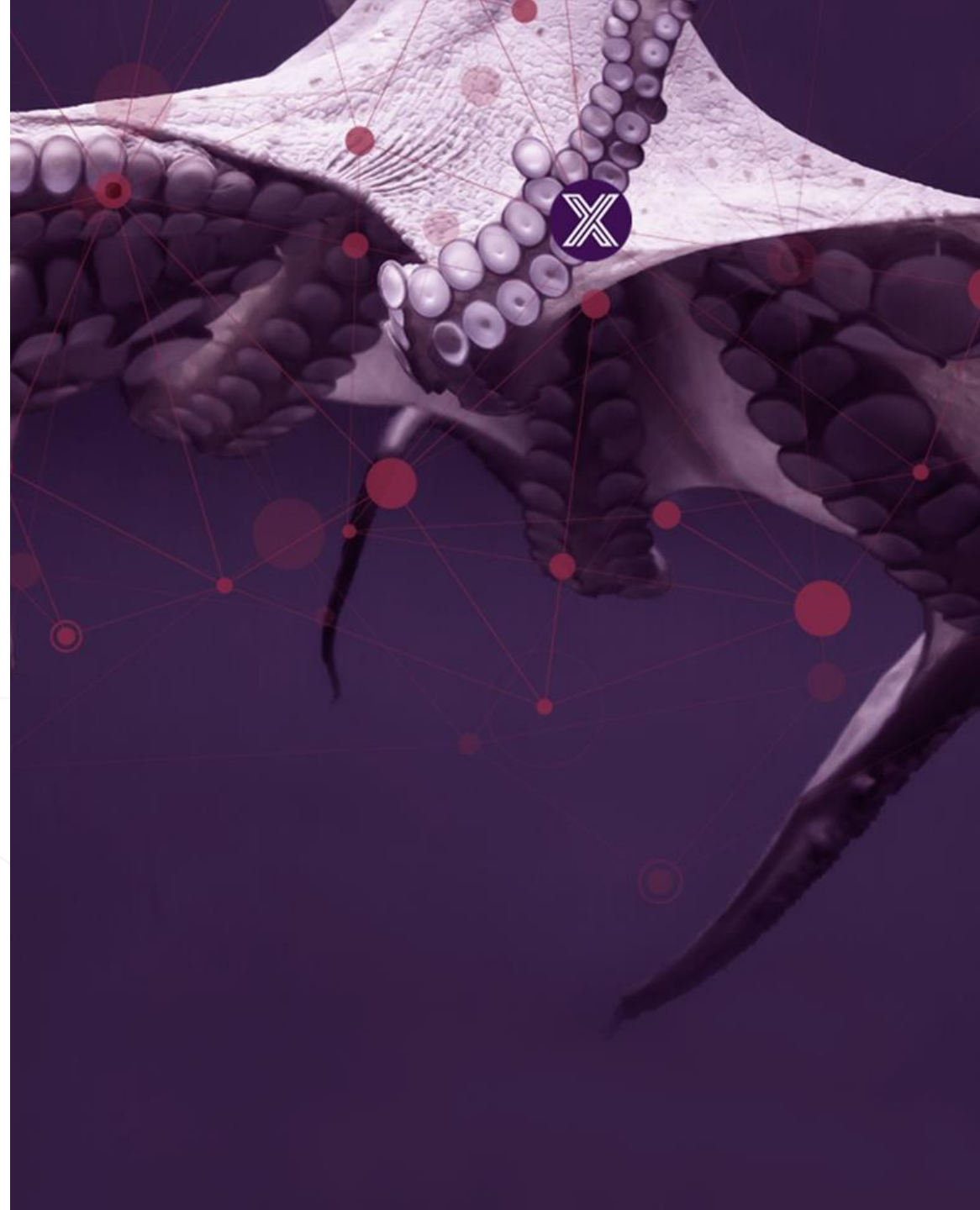


EDGE X FOUNDRY™

EdgeX DevKits

Tech Talks – Session 12



Today's Agenda

- What are EdgeX DevKits?
- EdgeX reminder/overview
- The first EdgeX Community DevKit
 - Raspberry Pi and Grove Sensors
 - Grove Device Service
 - How to use it
 - Example scenario
- Demo
- Q & A



James Butcher

- Senior Solutions Architect at IOTech
- 15 years working in middleware and IoT
- Focused on usability, adoption and roll-out of the technology
- Email - james@iotechsys.com



What are EdgeX DevKits?

- Aimed at helping users get started quickly with EdgeX
- Pre-configured software to work against specific hardware and sensor combinations
- Good for learning EdgeX – get real sensor data flowing quickly
- Can easily sketch out and prototype Edge IoT Proof of Concepts
- Verify real use cases with the sensors and then transition to real/industrial devices
- Both Community and Commercial DevKit options available





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Quick EdgeX Reminder

Introducing EdgeX Foundry

- An open source, vendor neutral project (and ecosystem)
- A **micro service**, loosely coupled software framework for IoT edge computing
- Hardware and OS agnostic, optional use of containers
- Linux Foundation, Apache 2 project
- Goal: enable and encourage growth in IoT solutions
 - The community builds and maintains common building blocks and APIs
 - Plenty of room for adding value and getting a return on investment
 - Collaborative approach, allowing best-of-breed solutions

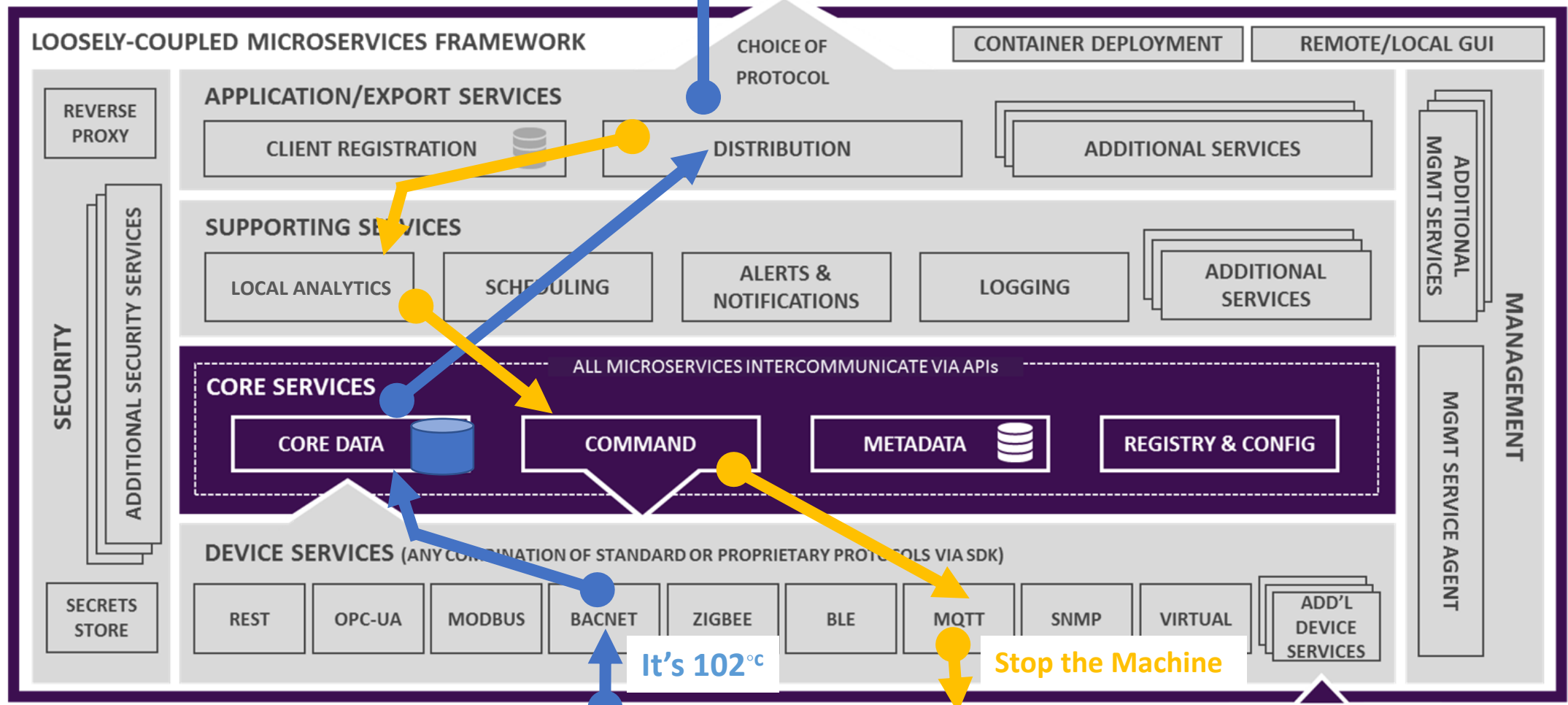


REQUIRED INTEROPERABILITY FOUNDATION

REPLACEABLE REFERENCE SERVICES



“NORTHBOUND” INFRASTRUCTURE AND APPLICATIONS



It's 102°C

Stop the Machine



“SOUTHBOUND” DEVICES, SENSORS AND ACTUATORS



EdgeX Micro Service Layers

- Contextually, EdgeX micro services are divided into 4 layers
- Crudely speaking, the layers of EdgeX provide a dual transformation engine
 - 1x - Translating information coming from sensors and devices via hundreds of protocols and thousands of formats into EdgeX
 - 2x - Delivering data to applications, enterprises and cloud systems over TCP/IP based protocols in formats and structures of customer choice
- **The DevKits are going to use and demonstrate all of the layers!**



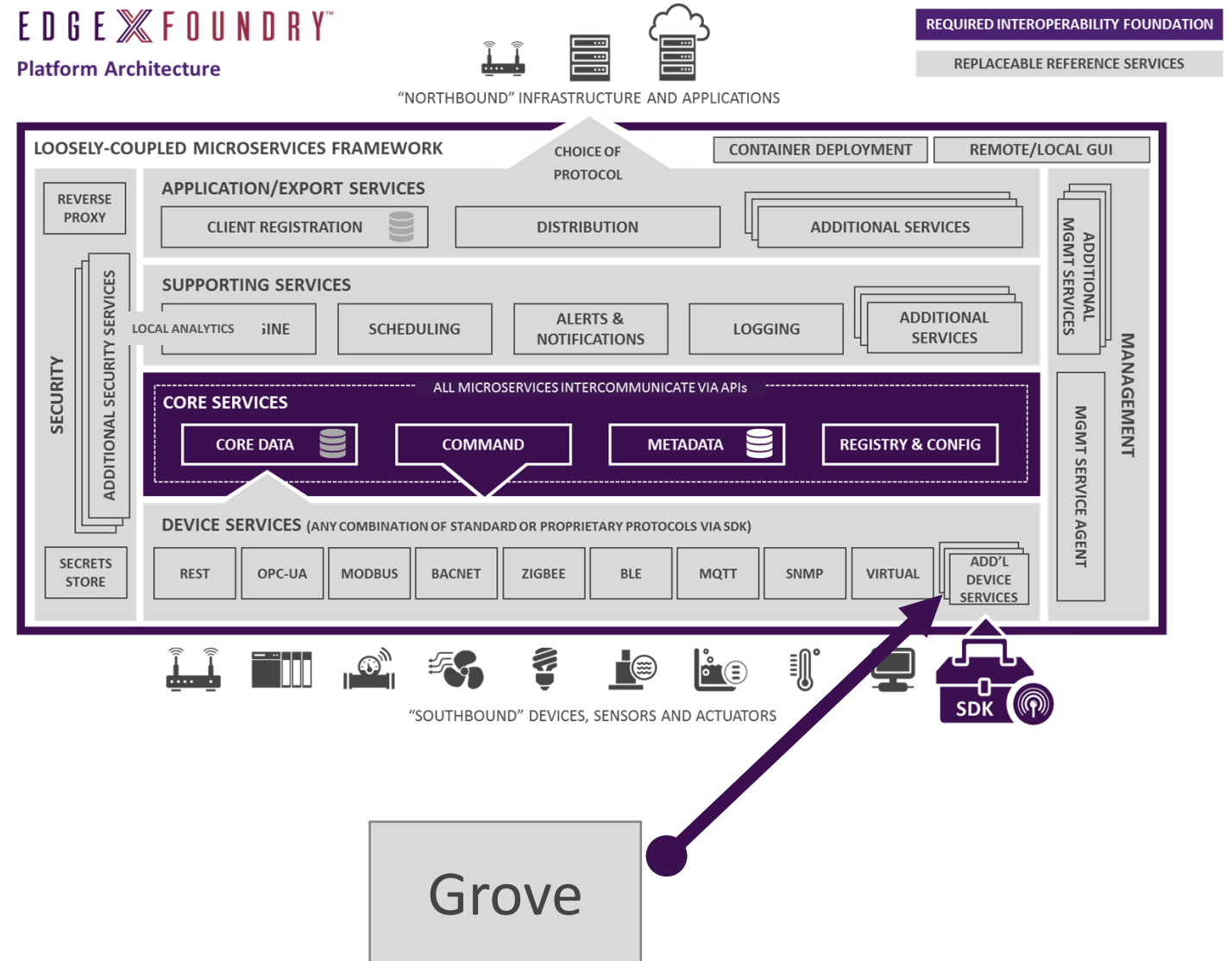


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Grove Sensors

An EdgeX Grove Device Service

- Needed to write a southbound Device Service that can interface with the Grove Devices
- Implemented with C Device Service SDK
- Based on open source libmraa <https://github.com/intel-iot-devkit/mraa/>
- Requires Device Profile (see next page)
- Typically ran as Docker container with default port 49992



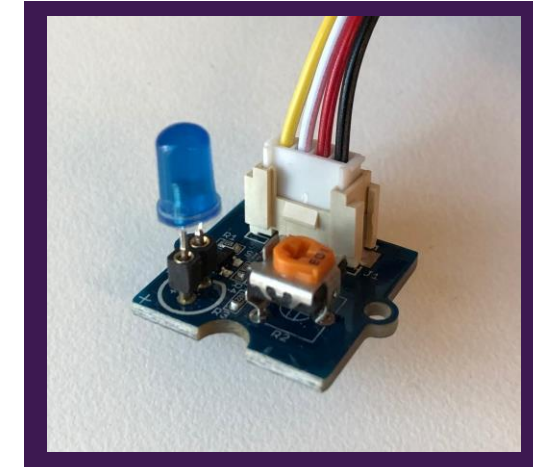
Grove Device Profile

- Maps each sensor's input/output to EdgeX variables within an EdgeX Device (see table)
- Initially supports sensors from GrovePi+ starter kit
- Two options:
 1. **Single Grove Device** which lists Resources & Commands all of the sensors
 2. **Multiple Grove Devices** with Resources & Commands for each sensor
- Default profile automatically creates a single device named "GroveDevice" – i.e. option 1
- /res/configuration.toml and /res/Grove_Device.yaml
- Individual devices modelled as yaml files under /profiles



Port	Interface	Grove Sensor
D2	GPIO	Blue LED
D3	GPIO	Green LED
D4	GPIO	Button
D6	GPIO	Red LED
D7	GPIO	Relay
D8	GPIO	Buzzer
A0	AIO	Light Sensor
A1	AIO	Sound Sensor
A2	AIO	Rotary Angle Sensor
I2C-2	I2C	RGB Backlit LCD

Grove Device Profile – Blue LED example



```
name: "Grove_Device"
manufacturer: "Seeed"
labels:
- "Grove LED, Grove Button, Grove Buzzer, Grove LCD, Grove LightSensor, Grove Relay, Grove RotarySensor, Grove SoundSensor"
description: "Grove Device to Read/Write sensors connected to GrovePI."
```

deviceResources:

```
- name: Blue-LED
description: "Turn the Blue LED to On/Off"
attributes:
{ Pin_Num: "D2", Interface: "GPIO", Type: "OUT" }
properties:
value:
{ type: "Bool", readWrite: "RW", size: "1", minimum: "0", maximum: "1", defaultValue: "0" }
units:
{ type: "String", readWrite: "R", defaultValue: "Enabled/Disabled" }
```

resources:

```
- name: Set_BlueLed
set:
- { operation: "set", object: "Blue-LED", property: "value", parameter: "Blue-LED" }
```

Commands:

```
- name: Set_BlueLed
put:
path: "/api/v1/device/{deviceId}/Set_BlueLed"
parameterNames: ["Blue-LED"]
responses:
- code: "204"
description: "valid and accepted"
expectedValues: []
- code: "400"
description: "bad request"
expectedValues: []
- code: "503"
description: "service unavailable"
expectedValues: []
```

To turn LED on:

```
curl '{" BlueLED": "true"}' http://localhost:49992/api/v1/device/all/Set_BlueLed
```

To turn LED off:

```
curl '{"BlueLED" : "false"}' http://localhost:49992/api/v1/device/all/Set_BlueLed
```

Port	Interface	Grove Sensor
D2	GPIO	Blue LED
D3	GPIO	Green LED
D4	GPIO	Button
	GPIO	Red LED
	GPIO	Relay
	GPIO	Buzzer
AIO		Light Sensor
AIO		Sound Sensor
AIO		Rotary Angle Sensor
I2C-2	I2C	RGB Backlit LCD



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Using a DevKit

Where to get an EdgeX DevKit?

- Community and Commercial DevKit options referenced from EdgeX website
- First EdgeX Community version just released:
 - **Raspberry Pi 3 64 bit with GrovePi+ Sensors**
 - See <https://www.edgexfoundry.org/devkits/>
 - Links to buy a Pi and GrovePi+ Sensor Kit
 - Instructions to install custom 64 bit Ubuntu OS image
 - Instructions to download and run the EdgeX software



Aim to Validate Real Use Cases

- Simulate real world scenarios with easy to use sensors
- Can span multiple industries and use cases
- Collect, visualize and make decisions with real data at the edge
- Prove there is value in the project
- Verify that EdgeX technology helps with this
- Evolve to use more industrial devices

The screenshot shows the EdgeX Foundry website with a navigation bar at the top containing 'About', 'Get Started', 'News & Events', 'Community', and 'EdgeX in Market'. Below the navigation bar is a 'View All' button and a row of industry filters: 'Agriculture', 'Oil & Gas', 'Manufacturing', 'Retail', 'Smart City', and 'Smart Building'. The main content area features six use case cards arranged in a 2x3 grid. Each card includes a representative image, a title, a brief description of the use case, and a 'Continue Reading' link.

Industry	Use Case Title	Key Benefit
Agriculture	Precision Irrigation	Decreasing water usage, improving crop yield, and ensuring food security through precision agriculture sensors & systems.
Oil & Gas	Tank Monitoring	Dramatically improving operations through remote tank monitoring.
Retail	Inventory Optimization & Theft Detection	Major gains in retail shelf inventory optimization and theft reduction enhanced by more behavioral data.
Smart Building	Security	Making private and public buildings safer through multi-level IoT security deployments (beyond cameras).
Smart City	Digital Parking Meters & Sensors	Beyond finding open parking spaces, more cost efficiently delivering paid meter compliance.
Smart Factory	Multitasking IIoT	Instrumenting nearly everything in smart factories streamlines operations and improves safety.

Today's DevKit Demo – Smart Factory

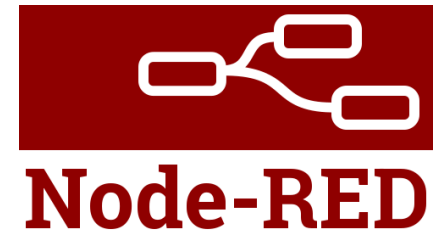
- Production / Output Quality Monitoring
 - Validate that the factory output meets required QA levels
 - e.g. bottles, cartons, packages, etc
 - Monitor and analyze size and weight of each item
 - Actuate control devices
- Production Line / Machine Monitoring
 - Validate machinery is operating correctly
 - Safety of human operators
 - Spot performance degradation ahead of breakage
 - Perform timely maintenance routines
 - Visualize on dashboards
 - Send to Cloud for storage and analysis



Today's DevKit Demo – Smart Factory

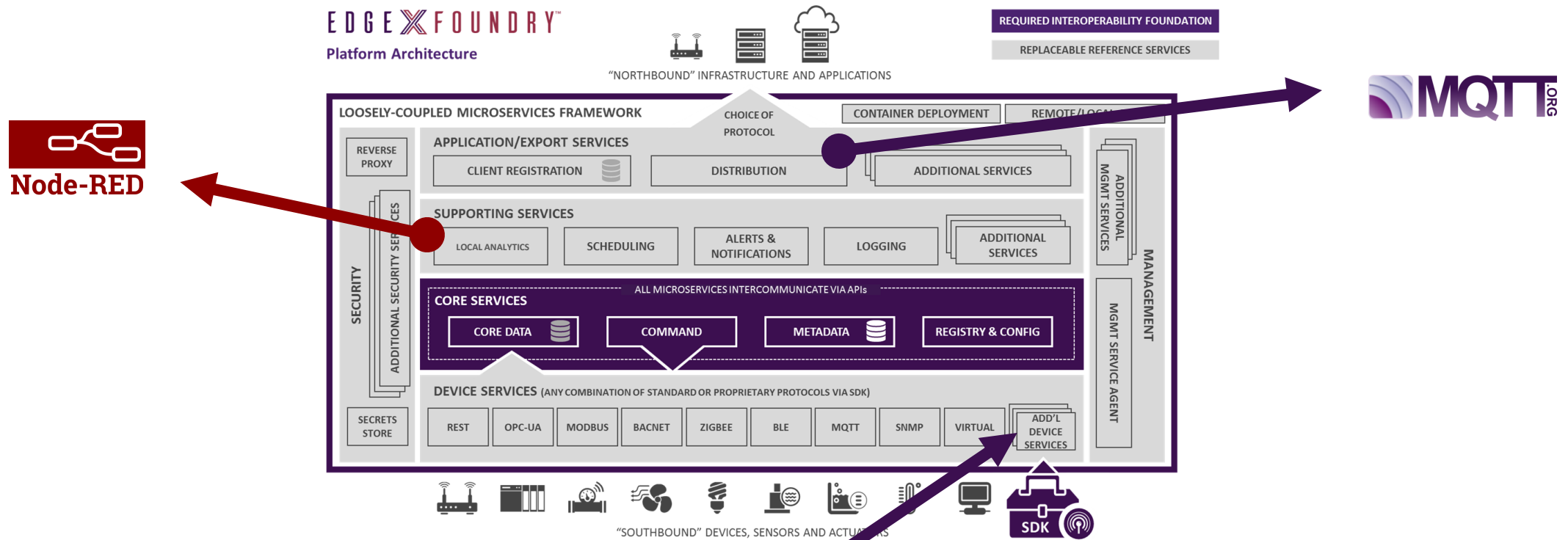
What does the demo do?

- Collect sensor data from some of the Grove Sensors with Grove Device Service
- Ingest into EdgeX through Core Services
- Translate data to northbound side, e.g. to MQTT
- Display data and make decisions at the Edge, e.g. with Node-RED:
 - Easy dashboarding
 - Flow programming capability
 - MQTT subscriptions to get data
 - REST calls to actuate



For convenience, Mosquito broker and Node-RED both come pre-installed on supplied Ubuntu Image

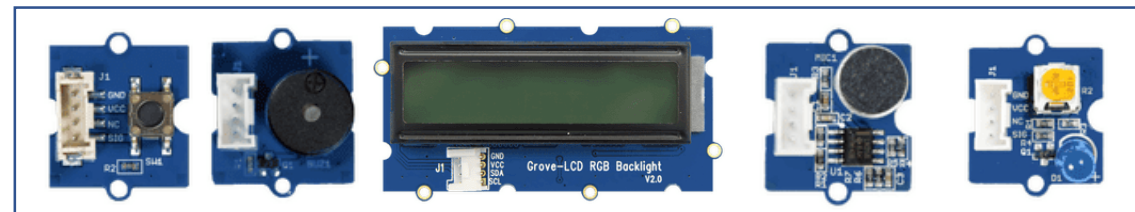
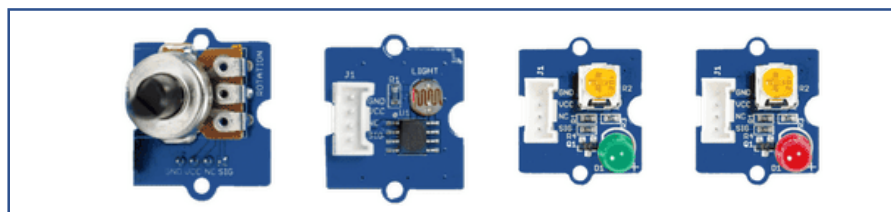
Today's DevKit Demo – EdgeX Architecture



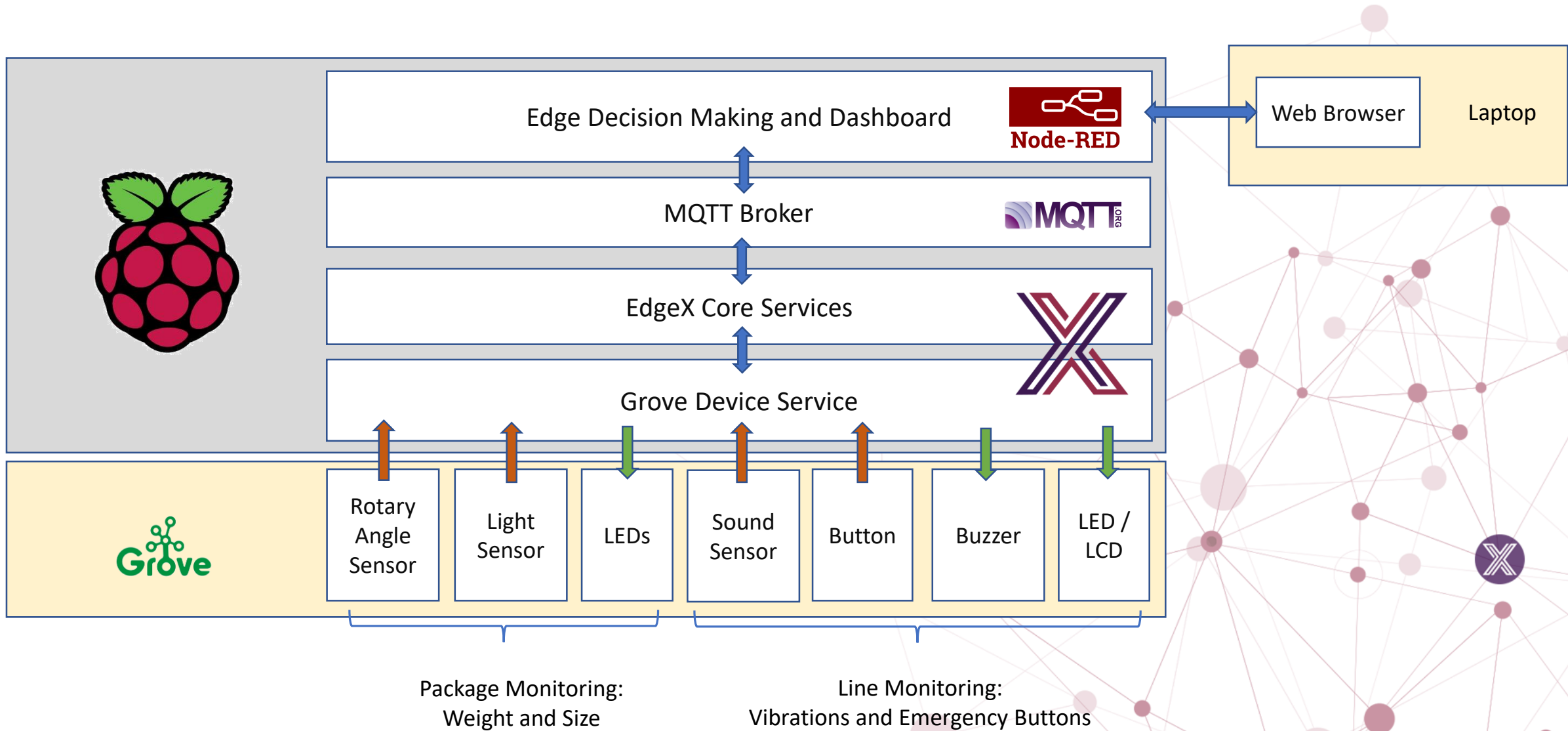
Package Monitoring

Grove

Production Line Monitoring



Today's DevKit Demo – Physical Architecture



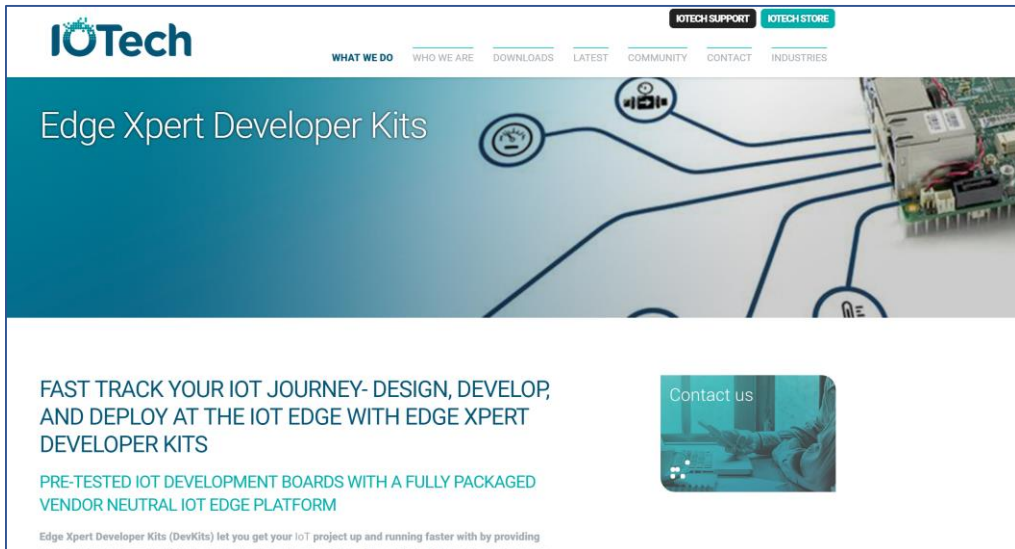


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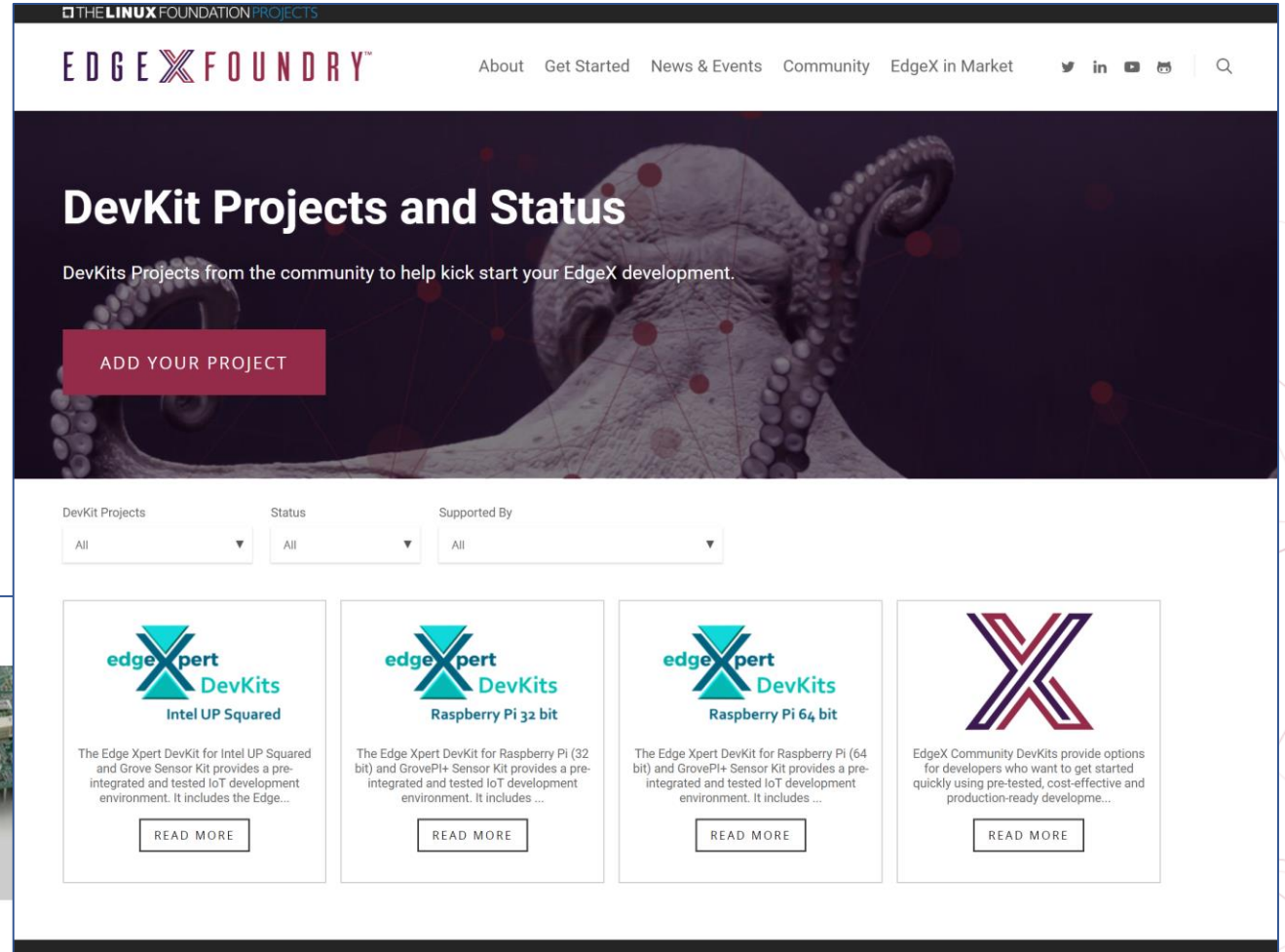
Demo Time!!

Following On

- More DevKits - different environments and sensors
- Sample use cases for different industries
- Blogs/Videos/Tutorials



The screenshot shows the IoTech website. The header includes the IoTech logo and navigation links: WHAT WE DO, WHO WE ARE, DOWNLOADS, LATEST, COMMUNITY, CONTACT, and INDUSTRIES. There are also buttons for IOTech SUPPORT and IOTech STORE. The main content area features the heading 'Edge Xpert Developer Kits' over a background image of a circuit board. Below this, there is a call to action: 'FAST TRACK YOUR IOT JOURNEY- DESIGN, DEVELOP, AND DEPLOY AT THE IOT EDGE WITH EDGE XPERT DEVELOPER KITS'. A secondary line of text reads: 'PRE-TESTED IOT DEVELOPMENT BOARDS WITH A FULLY PACKAGED VENDOR NEUTRAL IOT EDGE PLATFORM'. A 'Contact us' button is visible on the right side of the page.



The screenshot shows the EdgeX Foundry website. The header includes the EdgeX Foundry logo and navigation links: About, Get Started, News & Events, Community, and EdgeX in Market. There are also social media icons for Twitter, LinkedIn, YouTube, and GitHub, and a search icon. The main content area features the heading 'DevKit Projects and Status' over a background image of a ram's head. Below this, there is a sub-heading: 'DevKits Projects from the community to help kick start your EdgeX development.' A prominent red button says 'ADD YOUR PROJECT'. Below the main content, there are three dropdown menus for 'DevKit Projects', 'Status', and 'Supported By', all set to 'All'. The main content area displays four DevKit project cards, each with the 'edgeXpert DevKits' logo and a 'READ MORE' button. The cards are: 1. Intel UP Squared, 2. Raspberry Pi 32 bit, 3. Raspberry Pi 64 bit, and 4. EdgeX Community DevKits. Each card includes a brief description of the kit and its features.

Key Project Links

Access the code:

<https://github.com/edgexfoundry>

Access the technical documentation:

<https://docs.edgexfoundry.org/>

Access technical video tutorials:

<https://wiki.edgexfoundry.org/display/FA/EdgeX+Tech+Talks>

EdgeX Blog:

<https://www.edgexfoundry.org/news/blog/>

Join an email distribution:

<https://lists.edgexfoundry.org/mailman/listinfo>

Join the Slack Channels:

<https://edgexfoundry.slack.com>

Become a project member:

<https://www.edgexfoundry.org/about/members/join/>

LinkedIn:

<https://www.linkedin.com/company/edgexfoundry/>

Twitter:

<https://twitter.com/EdgeXFoundry>

Youtube:

<https://www.youtube.com/edgexfoundry>

EdgeX DevKits:

<https://www.edgexfoundry.org/devkits/community-devkit/>

Question and Answer Time



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