IOTech and EdgeX

The EdgeX Adopter Series

January 19th, 2021

Today's Agenda

- Edge Market Trends

- IOTech Snapshot

- Leveraging EdgeX

- Our Products

- Edge Xpert
  - Architecture
  - Device & Cloud Connectivity
  - AI & Computer Vision

- The Time-Critical Edge

- Edge Management at Scale

- Customer Use Cases

- EdgeX Futures

- Q&A

IOTech

Today's Presenters

Keith Steele | IOTech CEO

- 30-year Global Middleware pioneer and entrepreneur
- Proven record of starting and growing successful software companies
- Champion of Open Standards in Distributed and Embedded Computing
- Founding Chairman, EdgeX Technical Steering Group, Marketing Outreach TSG Chair

James Butcher | IOTech Product Manager

- Responsible for Edge Xpert product strategy, roadmap and delivery
- Previously IOTech Solutions Architect helping customers with EdgeX
- Dedicated to usability and performance of IOTech products
- QA & Test Working Group Chair, EdgeX Foundry

Market Trends &
IOTech Snapshot

State of the IoT Edge

- The leading verticals in Edge growth/investment
  - Industrial, energy & utilities, transportation and logistics lead the way, but some new areas are growing fast
  - Healthcare IoT - $534.3B by 2025
  - Smart City - $124B in 2020
  - Retail - $36B in 2020
- The Edge market trends – what we are seeing:
  - Customers want more 'solutions' than pieces/parts – Vendor collaboration
  - Proprietary versus flexibility to bring (or select) best of breed applications (analytics, cloud, visualization, …)
  - **Increasing adoption of AI/ML at the Edge e.g., Video inferencing becoming a key application at the Edge across multiple verticals**
  - Zero touch
    - "Plug it in and it works" management
    - Automatic sensor / device provisioning
  - **Hybrid Cloud/Edge - Acceleration from fully centralized cloud-based systems to distributed architectures driven by edge computing**

IOTech

IOTech: The Edge Software Company

- **We accelerate 'Time to Value' for solutions at the IoT Edge**
  - Shield our customers form complexity
  - Configuration versus coding
- **Our Products:** Edge Application Enabling Platforms & Tools supporting the rapid development, deployment and management at scale of software applications at the IoT Edge
- **Open and vendor neutral:** We enable best of breed user choice – cloud, silicon, hardware, application and minimize vendor lock-in
- **Horizontal edge stack** with ready-made vertical specializations
  - Retail, Utilities & Energy, Smart Venues, Manufacturing, Transportation
- **Go-to market strategy through Global partner network**
  - Our GTM Partners include: Dell Technologies, Microsoft, Intel, Accenture, HP, Schneider Electric, AWS and Google
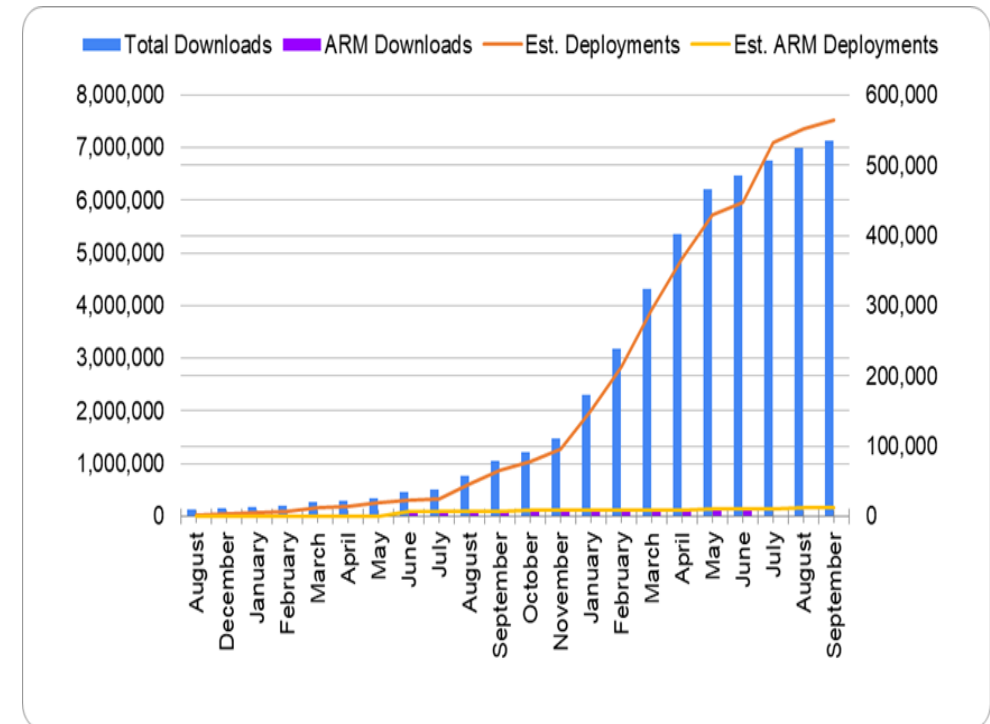
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Leveraging EdgeX

Leveraging Open Source & Ecosystems

- Standard Open API's
- Utilize broarder development specialties
- Leverage larger ecosystem of companies
- Faster to GTM
- Save development costs
- Cross pollination with other OS projects
- Well tested

- Over 180 EdgeX contributors
- >7 million container downloads
- ~ 500K deployments
- ~ 6K website users a month
- ~ 30 global contributors per month
- > 150 commits per month
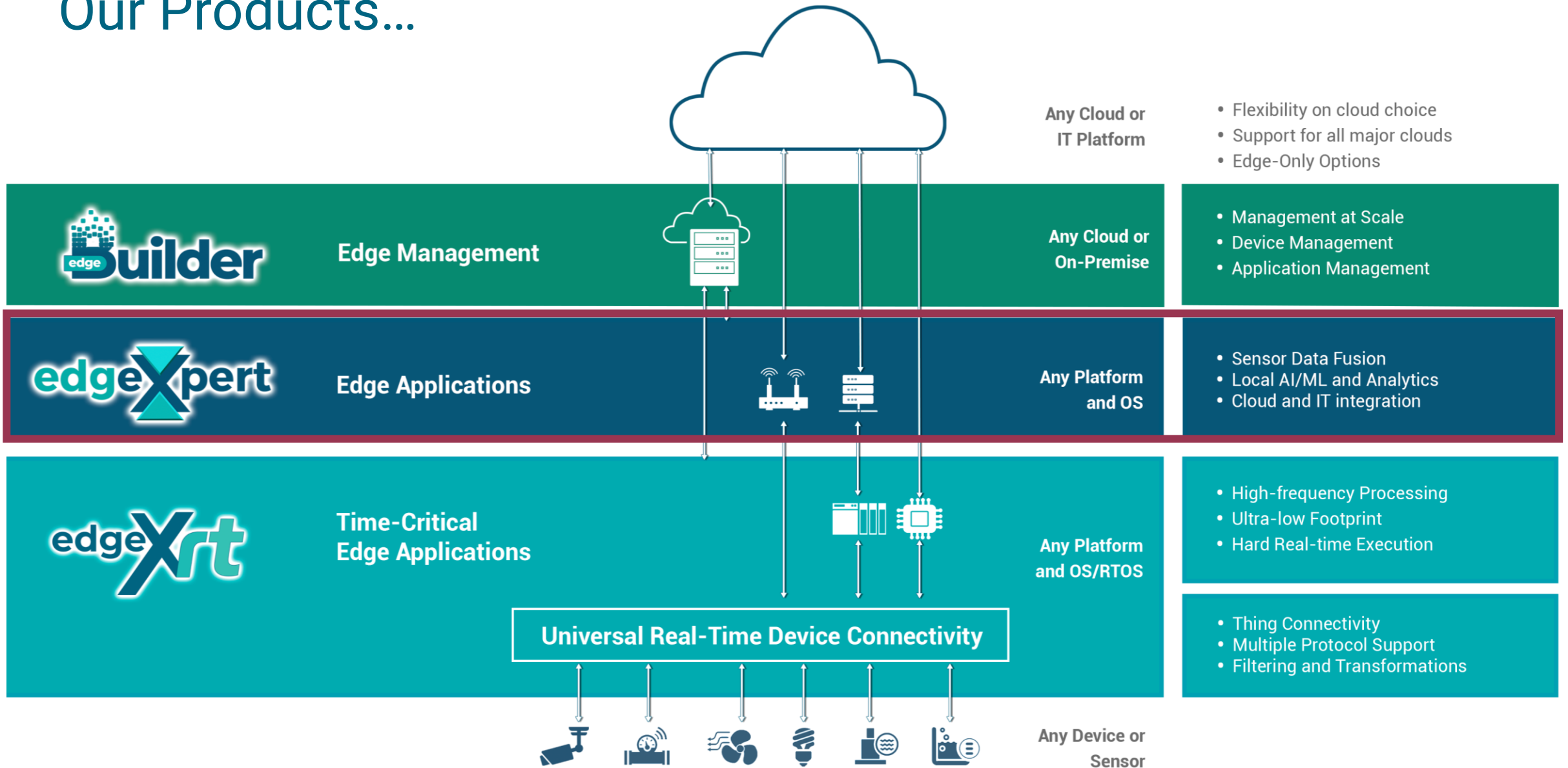
IOTech − A Major EdgeX Community Contributor

- A founding member of EdgeX

- We have led the EdgeX Foundry's technical steering committee since its inception in 2017

- IOTech team members have made over 1100 commits and ½ million lines of code to EdgeX Foundry (2nd largest contributor)

- IOTech have played a key role implementing EdgeX Device Service SDK and overall Test and QA processes

- Outstanding innovation and contribution awards to Andy Foster and Cloud Tsai

- Major contributor to EdgeX marketing team, including leading the EdgeX website update

- Currently 4 TSC members from IOTech − Jim White, Keith Steele, Iain Anderson, James Butcher

- We know EdgeX!

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Our Products...
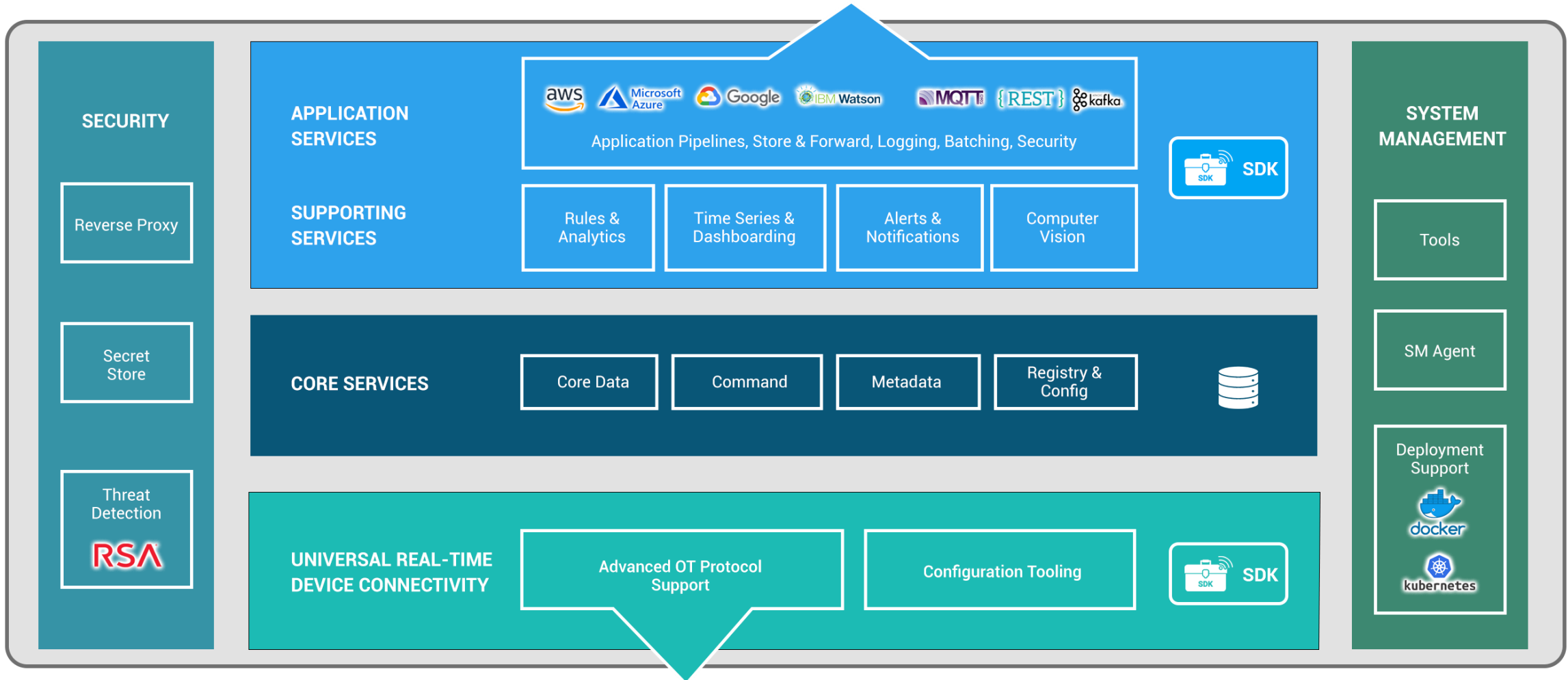
Our Products…

Edge**Builder** — **Edge Management**
- Any Cloud or On-Premise
  - Management at Scale
  - Device Management
  - Application Management

Any Cloud or IT Platform
- Flexibility on cloud choice
- Support for all major clouds
- Edge-Only Options

edge**X**pert — **Edge Applications**
- Any Platform and OS
  - Sensor Data Fusion
  - Local AI/ML and Analytics
  - Cloud and IT integration

edge**X**rt — **Time-Critical Edge Applications**
- Any Platform and OS/RTOS
  - High-frequency Processing
  - Ultra-low Footprint
  - Hard Real-time Execution

Universal Real-Time Device Connectivity
- Thing Connectivity
- Multiple Protocol Support
- Filtering and Transformations

Any Device or Sensor

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Edge Xpert
Commercial Implementation of EdgeX Foundry

Southbound Device Connectivity and Tooling

Intelligent Device Connectivity for the IoT Edge

- Based on EdgeX Device Services but enhanced, productized and ruggedized for industrial use
  - Performance enhancements
  - Robust and deployment-ready
  - Many not available in community
- Advanced online tooling to create device profiles
  - Intuitive wizards that greatly simplify creating & editing profiles
  - **Free use for EdgeX users: https://dct.iotechsys.com**
  - Creation of open-source library of EdgeX device profiles

Modbus RTU & TCP

ASHRAE **BACnet**™ IP & MSTP

OPC UA™

OPC UA™ Pub-Sub

{ REST }

MQTT .ORG

Bluetooth™ Low Energy

zigbee

EtherCAT®

EtherNet/IP™

CAN

CANopen®

SIEMENS S7

PROFI NET®

ONVIF®

FILE

GPS

MEMS

Grove

2021 Roadmap   RFID   **ØMQ**

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Cloud Connectivity

Easily integrate and share edge data to your choice of northbound Cloud & IT systems

- Based on EdgeX Application Services
- Enhanced for out-of-the-box use with extra App Service SDK functions
- Built-in support for authenticated steaming to the main cloud vendors, requiring just simple configuration:
  - AWS IoT Core
  - Microsoft Azure IoT Hub
  - Google Cloud IoT Core
  - IBM Watson IoT Platform
- Built-in support for MQTT, REST and Kafka, again requiring just simple configuration for use
- Filtering, Batching, Store and Forward, Security, etc

Computer Vision Capability

Major trend in customers deploying computer vision, AI and ML at the edge

- Camera Connectivity and Control: ONVIF

- Stream Management: GStreamer

- Vision Inference: OpenVINO
  - Inference results flow into Edge Xpert
  - Other engines to follow, e.g. TensorFlow

- Strong Partner Network
  - Intel, Hark (retail domain) and others

- Edge Data Fusion
  - Matching inference results with sensor data

- Edge Management
  - IOTech Edge Builder Product
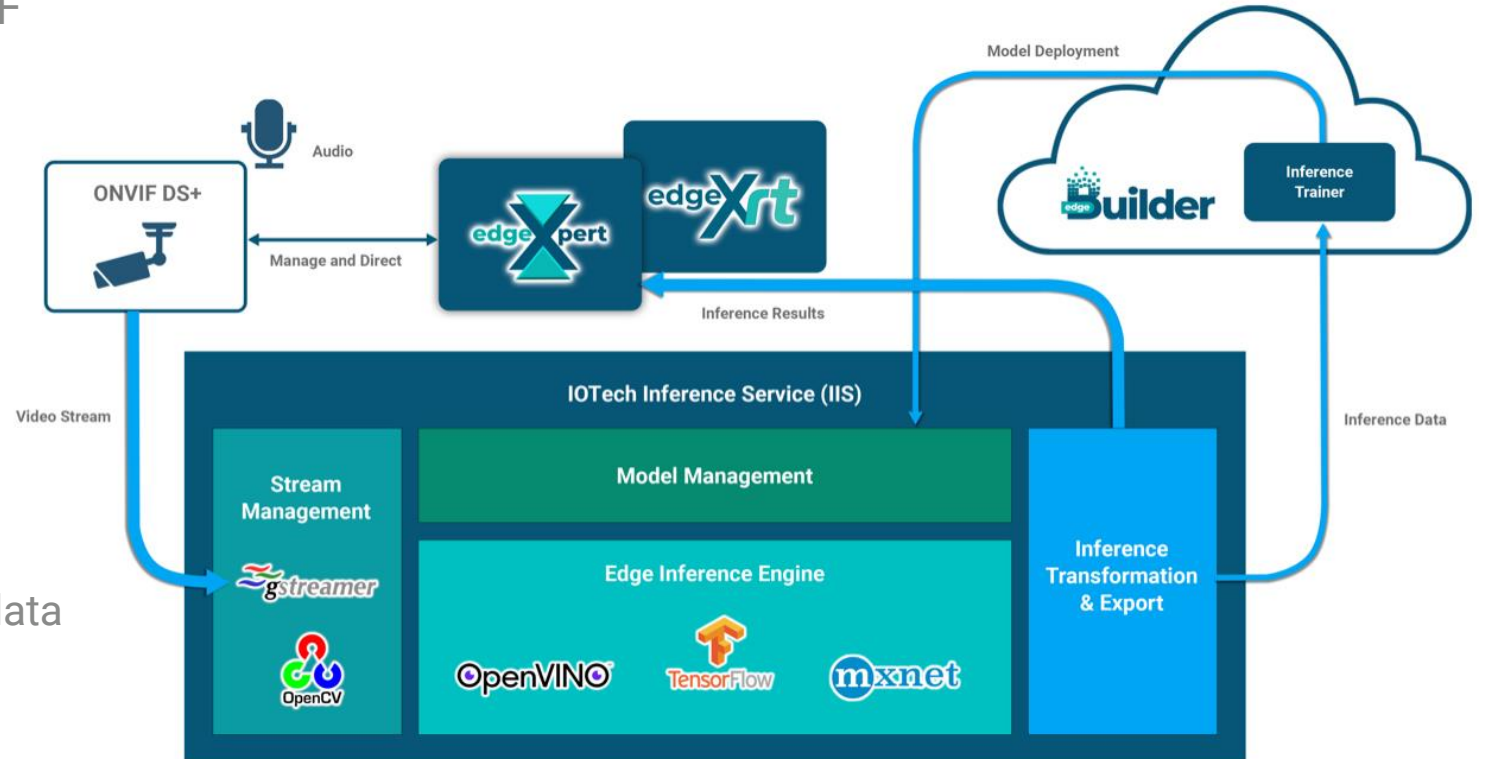
Why Edge Xpert?

Edge Xpert Provides:

- Key value-add IP not available in the open source EdgeX Foundry

- Full commercial grade support for trusted deployment in business critical applications

Business Benefits:

- Simplified Development Processes

- Faster Time To Market

- Reduced Risk

- Reduced Total Cost of Ownership

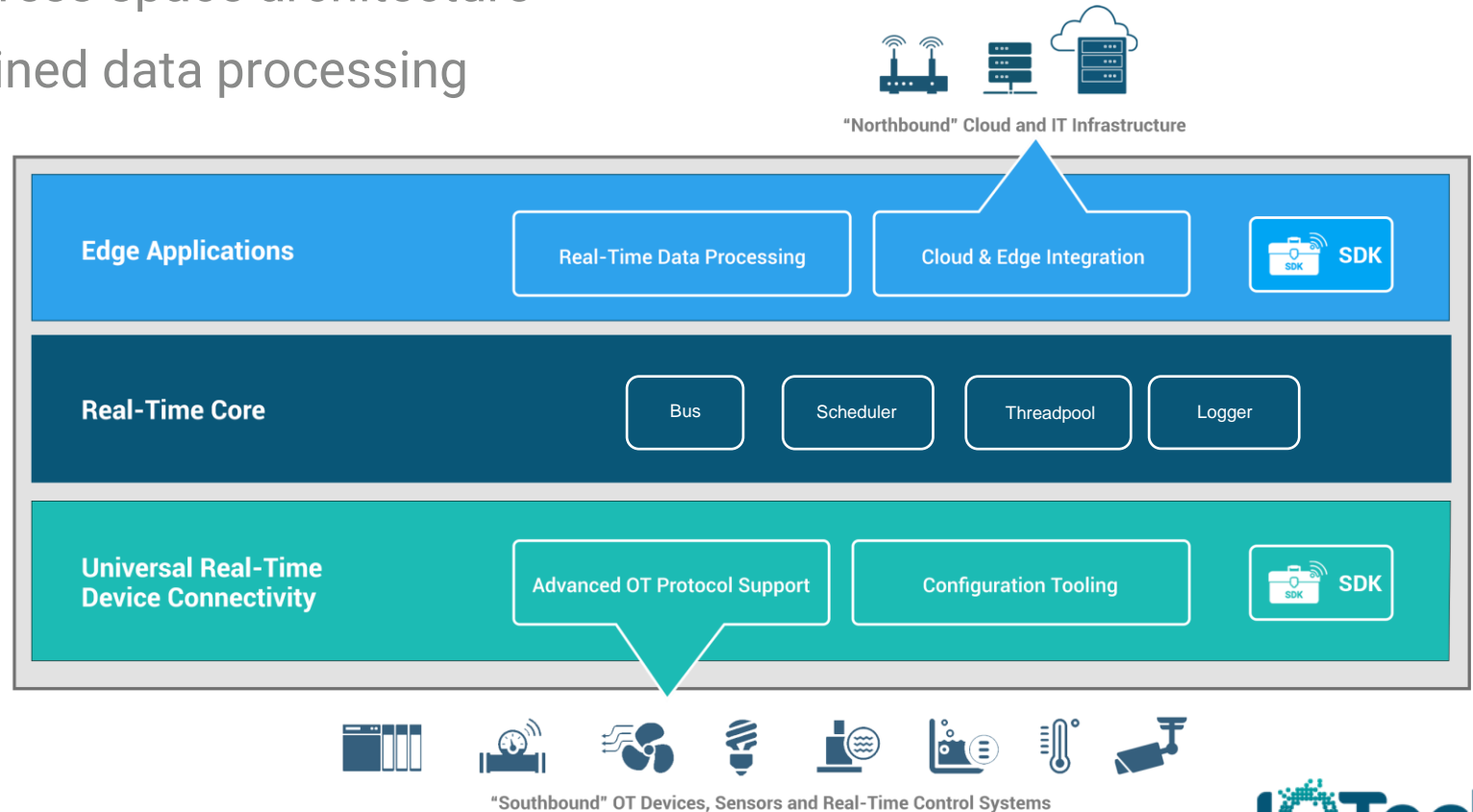| Category	Feature	EDGE X FOUNDRY	edgeXpert
Southbound Device Connectivity	Edge Device Connectivity	◐	●
	Industrial Control Connectivity		●
	IP Camera Control	◐	●
	Device Configuration Tooling		●
Edge Decision-Making and Control	Edge Rules	◐	●
	Edge Analytics		●
	Time Series Data Storage		●
	Dashboarding		●
	Vision Inference		●
Northbound Enterprise Connectivity	Application Functions SDK	◐	●
	REST and MQTT Support	◐	●
	Kafka Support		●
	Cloud Vendor Integration	◐	●
Deployment-Ready Support	Productization and Usability	◐	●
	Tooling and Management	◐	●
	Security	◐	●
	Technical Support Guarantees		●
	Consultancy, Pilots and Training		●
	Accelerated Roadmap Options		●

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The Time-Critical Edge

Introducing Edge XRT

The first edge software platform designed specifically for the Time-Critical and Resource-constrained edge

- Complementary to Edge Xpert and EdgeX systems

- Implemented in C, single address space architecture

- Pluggable, dynamic, user defined data processing

"Northbound" Cloud and IT Infrastructure

- Footprint < 100 KBs
- Latency < 100 µSec
- Real-time predictability
- Legacy portability

Edge Applications	Real-Time Data Processing	Cloud & Edge Integration	SDK
Real-Time Core	Bus	Scheduler	Threadpool	Logger
Universal Real-Time Device Connectivity	Advanced OT Protocol Support	Configuration Tooling	SDK

"Southbound" OT Devices, Sensors and Real-Time Control Systems

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Edge Management at Scale

Introducing Edge Builder
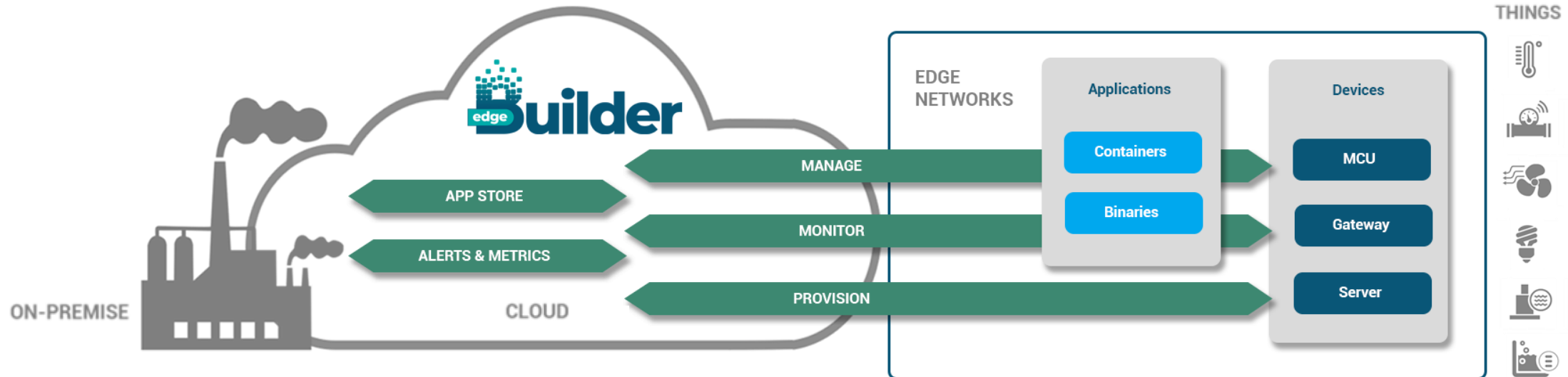
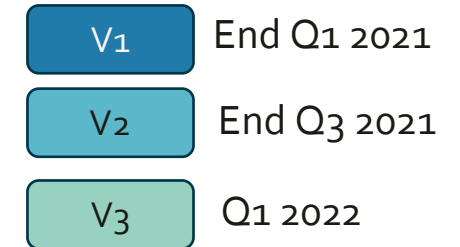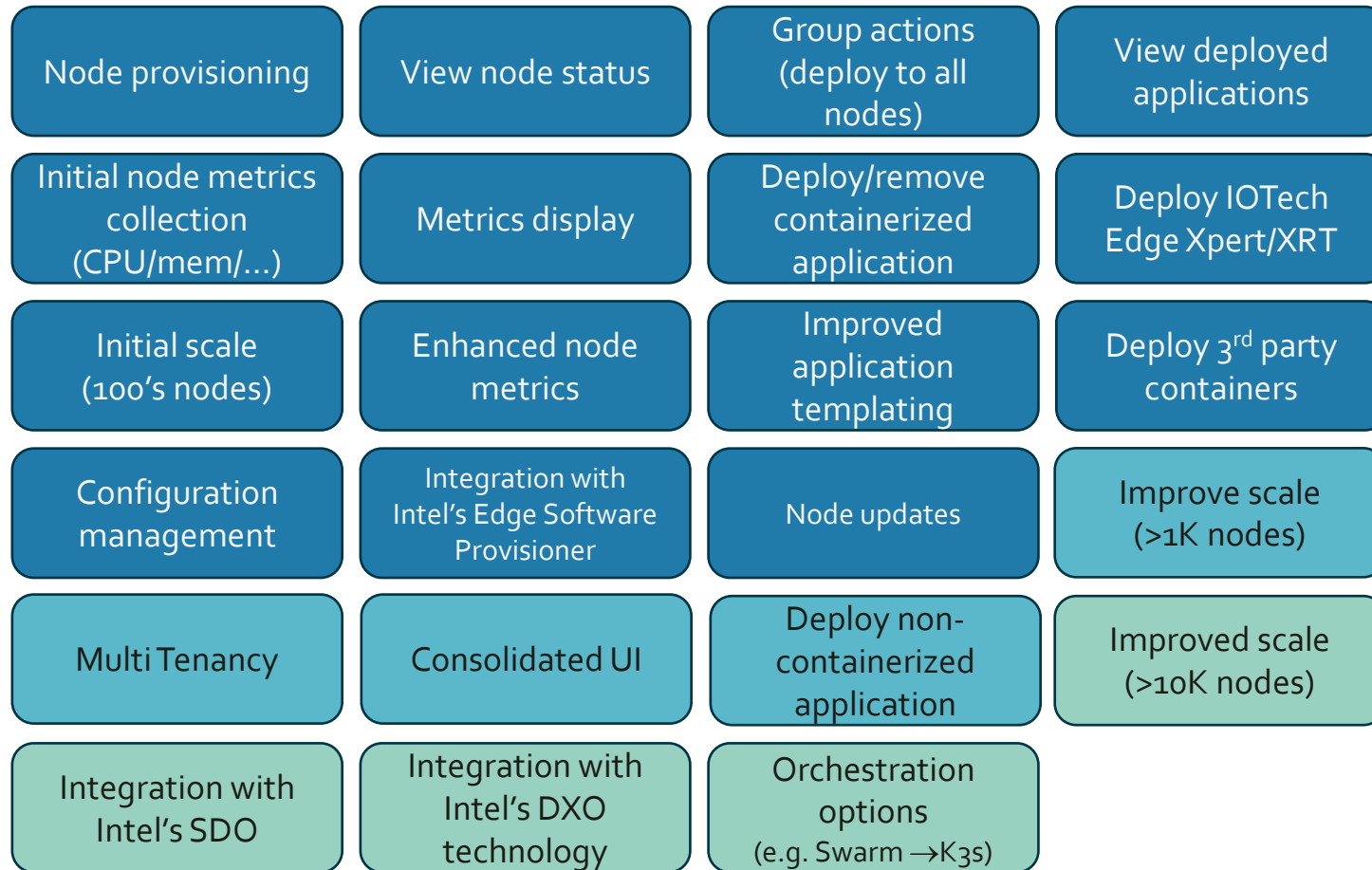
- **Designed by Edge Specialists**

- **Driven by Customer Requirements**

- **Independent of Edge Solution deployed**

- **Architected to support Cloud and On Prem**

- **Multi-Cloud Support**

- **Containerized & Non- Containerized Deployment**

- **Leverages Open Source**
  - Leverages Open Source for faster GTM and Openness

- **Manages any Applications**
  - Deployment & orchestration
  - Lifecycle management - start, stop & restart
  - Application monitoring
  - Data monitoring
  - Device/Sensor provisioning

- **Manages the Node**
  - Device onboarding
  - Install/update OS, firmware, infrastructure, certs install & update
  - Node monitoring

Edge Builder Road Map

Node provisioning	View node status	Group actions (deploy to all nodes)	View deployed applications
Initial node metrics collection (CPU/mem/…)	Metrics display	Deploy/remove containerized application	Deploy IOTech Edge Xpert/XRT
Initial scale (100's nodes)	Enhanced node metrics	Improved application templating	Deploy 3rd party containers
Configuration management	Integration with Intel's Edge Software Provisioner	Node updates	Improve scale (>1K nodes)
Multi Tenancy	Consolidated UI	Deploy non-containerized application	Improved scale (>10K nodes)
Integration with Intel's SDO	Integration with Intel's DXO technology	Orchestration options (e.g. Swarm →K3s)	

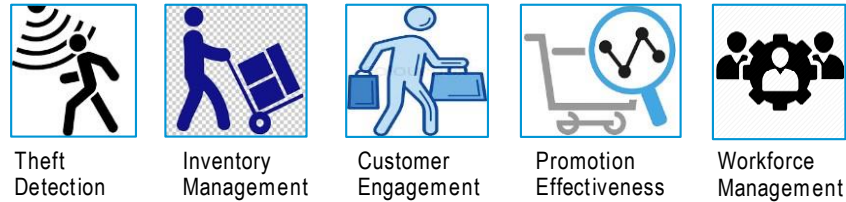|	
V1	End Q1 2021
V2	End Q3 2021
V3	Q1 2022

Edge Builder Webinar Link:
https://www.iotechsys.com/contact/updates/events/i/iotech-webcast-series-edge-management-at-scale/

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Customer Use Cases

Partner Solutions in Retail - HP

Theft Detection | Inventory Management | Customer Engagement | Promotion Effectiveness | Workforce Management

"SOUTHBOUND" DEVICES, SENSORS AND ACTUATORS

Extensive support* for Sensor protocols / Connectors

Modbus RTU & TCP | BACnet IP & MSTP | OPC UA | EtherNet/IP
IO-Link
MQTT | Bluetooth | zigbee | Simulink
EtherCAT | CAN | PROFINET | Onvif®
Grove | GPS | FILE | CANopen
OPC UA Pub-Sub

HP Engage Edge
Accelerate your Retail Solutions

Ready-to-deploy
- Edge Gateway HW/SW Bundle **(Intel certified RRK - "RFP-Ready-Kit")**
- Designed for extensive IOT use cases in Retail/Hospitality
- World-class compute hardware choices – Intel 4th-8Th generation
- Backed by HP's world class warranties/services

Powerful, Compact yet ruggedized design
- For everyday retail environments
- Powered by Intel 8th Gen Core-i7 processor (& choices)
- Extensive on-board ports / connectivity options

Ships with pre-loaded Edge Gateway Software
- Powered by HP ThinPro OS
- Linux Foundation EdgeX open framework
- Commercial Grade Support (SLAs)
- Extensive IoT Connectivity options
- Extend your use case recipes post-initial deployment

*schedules being worked

Partner Solutions in Energy - Accenture

Remote monitoring of gas turbines across the distribution network

- The operator of one of the largest natural gas distribution networks needs to reliably and remotely monitor their systems with Edge IoT Technology

- **Business Challenge:**

  - Ensure gas is available 24/7 so its flow around the pipelines must be accurately monitored and controlled
  - The large compression tanks are driven and controlled by powerful turbines provided by different vendors

- **Why Edge Xpert was selected:**

  - Capability to monitor data from turbines provided by different vendors using different protocols
  - Cloud-agnostic and on-premise solution
  - Agile approach needed so flexible microservice architecture required
 - Open source basis key, but with SLA guarantees
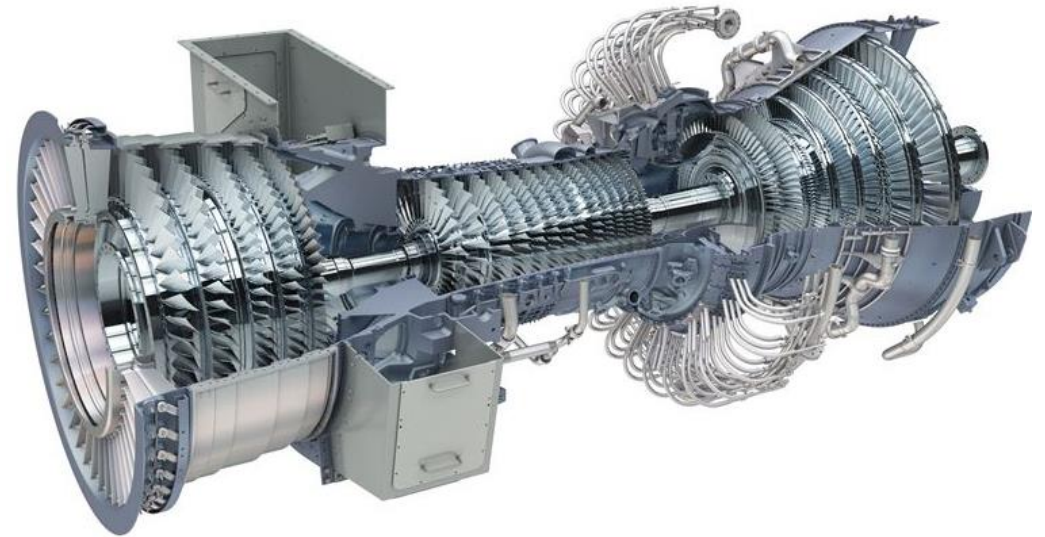
Accenture & IOTech with AIP+
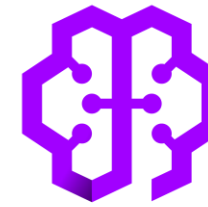
AIP+
Applied
Intelligence

Accenture incorporates Edge Xpert in the AIP+ Edge Agent

- Accenture to benefit from a commercially supported EdgeX framework and IOTech's library of Device Protocol Implementations

- Edge Xpert integrated with Accenture's Edge IP

- Hear why Accenture chose EdgeX and IOTech https://youtu.be/3k6RaBs93Ug
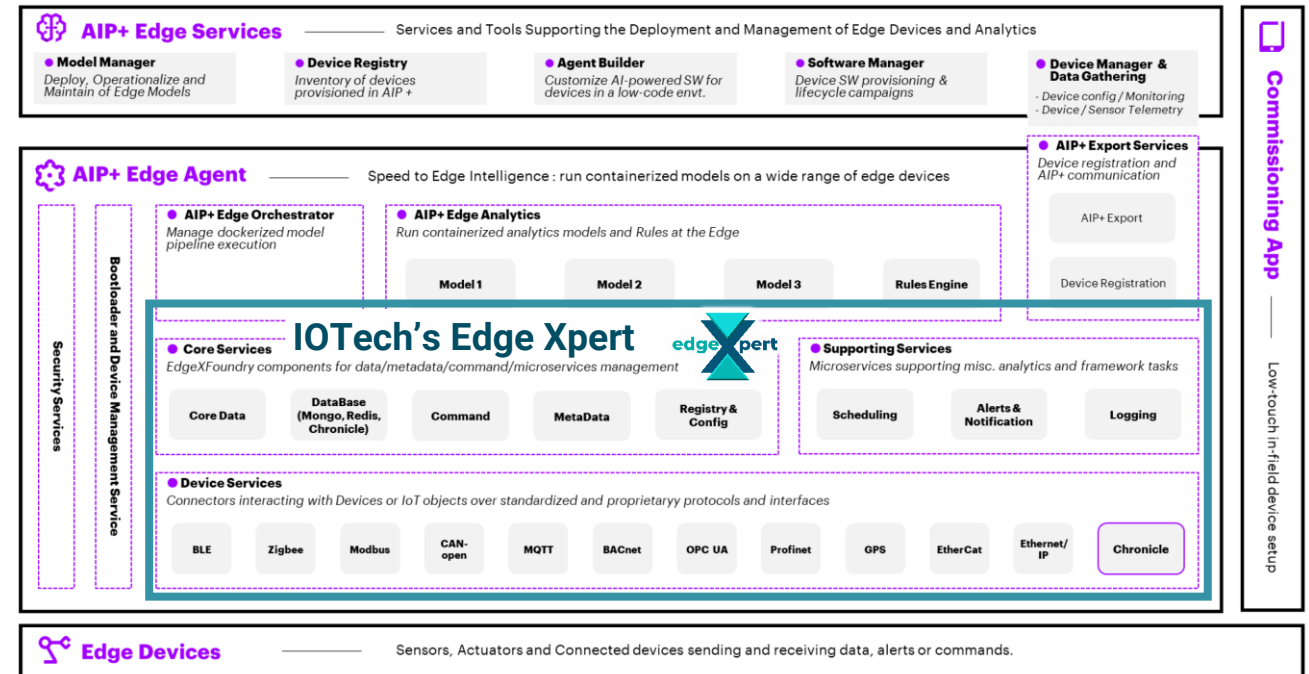
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"IOTech's solutions and deep device expertise will strengthen Accenture's own edge software and further help AIP+ to deliver new customer outcomes by combining edge processing with a wide range of device data sources"
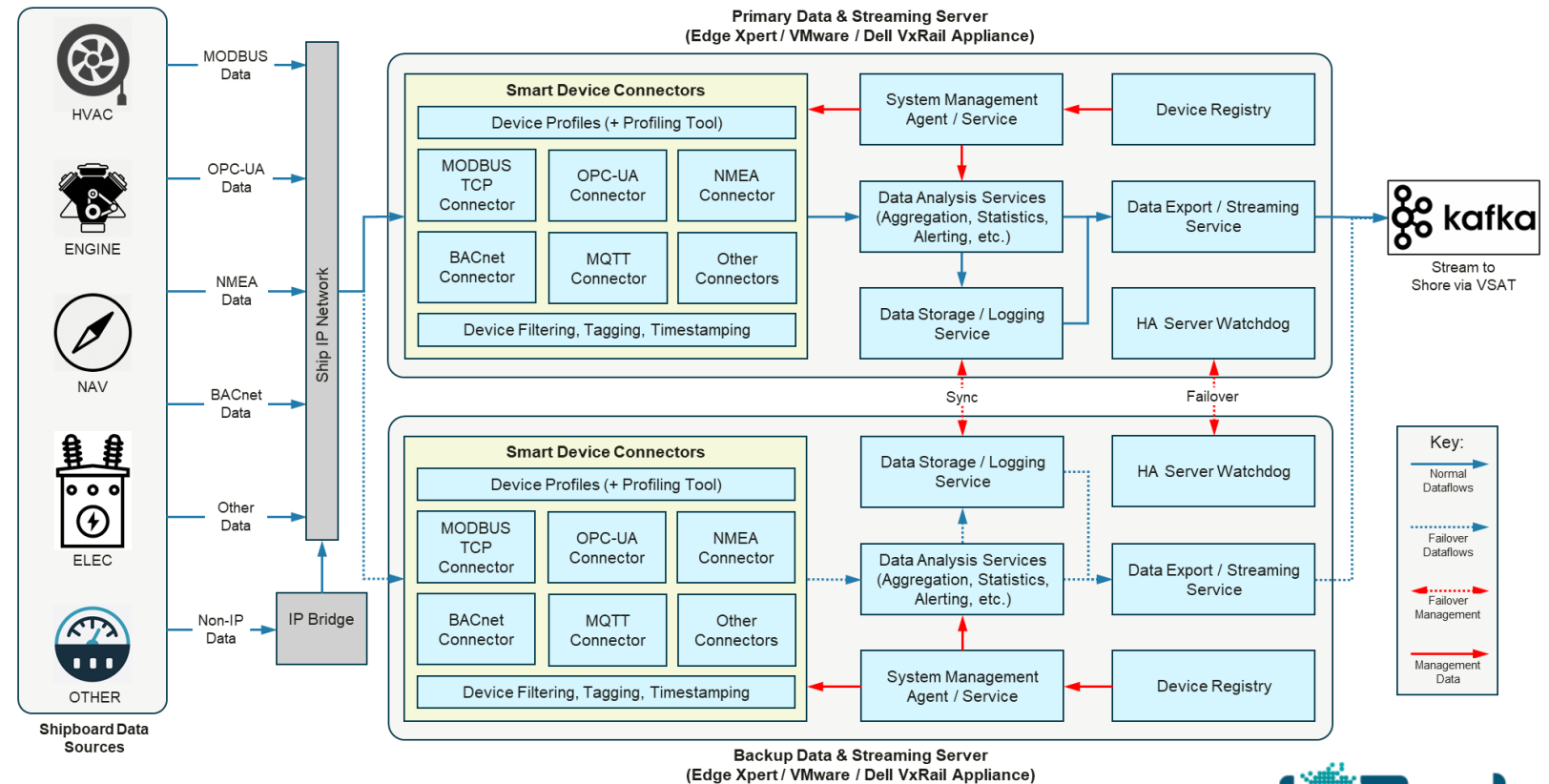
Peter Utzschneider, Managing Director, Accenture Platforms Product Management

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# Partner Solutions in Transportation - Ship Borne Monitoring
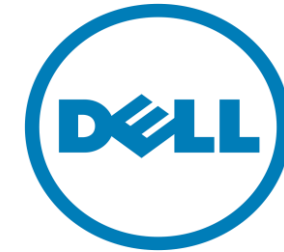
- Large European shipbuilding company

- Edge Xpert positioned as the Data Acquisition System (DAS) in the ship

- Pilot project with potential roll out to many ships

- Southbound: Modbus, OPC-UA, GPS, BACnet

- Northbound: Kafka – store and forward, failover solutions

Shipboard Data Sources

HVAC — MODBUS Data
ENGINE — OPC-UA Data
NAV — NMEA Data
ELEC — BACnet Data
OTHER — Other Data / Non-IP Data

Ship IP Network

IP Bridge

Primary Data & Streaming Server (Edge Xpert / VMware / Dell VxRail Appliance)

Smart Device Connectors
- Device Profiles (+ Profiling Tool)
- MODBUS TCP Connector
- OPC-UA Connector
- NMEA Connector
- BACnet Connector
- MQTT Connector
- Other Connectors
- Device Filtering, Tagging, Timestamping

System Management Agent / Service
Device Registry
Data Analysis Services (Aggregation, Statistics, Alerting, etc.)
Data Export / Streaming Service
Data Storage / Logging Service
HA Server Watchdog

Sync — Failover

Backup Data & Streaming Server (Edge Xpert / VMware / Dell VxRail Appliance)

Smart Device Connectors
- Device Profiles (+ Profiling Tool)
- MODBUS TCP Connector
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- Other Connectors
- Device Filtering, Tagging, Timestamping

Data Storage / Logging Service
HA Server Watchdog
Data Analysis Services (Aggregation, Statistics, Alerting, etc.)
Data Export / Streaming Service
System Management Agent / Service
Device Registry

kafka
Stream to Shore via VSAT

Key:
- Normal Dataflows
- Failover Dataflows
- Failover Management
- Management Data

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Partner Solutions in Hybrid Cloud – AWS and Google

- The cloud vendors represent major opportunities to IOTech
- No cloud vendors have complete IoT 'Thing' connectivity - none have a 'Time Critical' story, some have no edge products
- We are seeking to leverage AWS and Google partnerships, early days with Google but good progress with AWS…
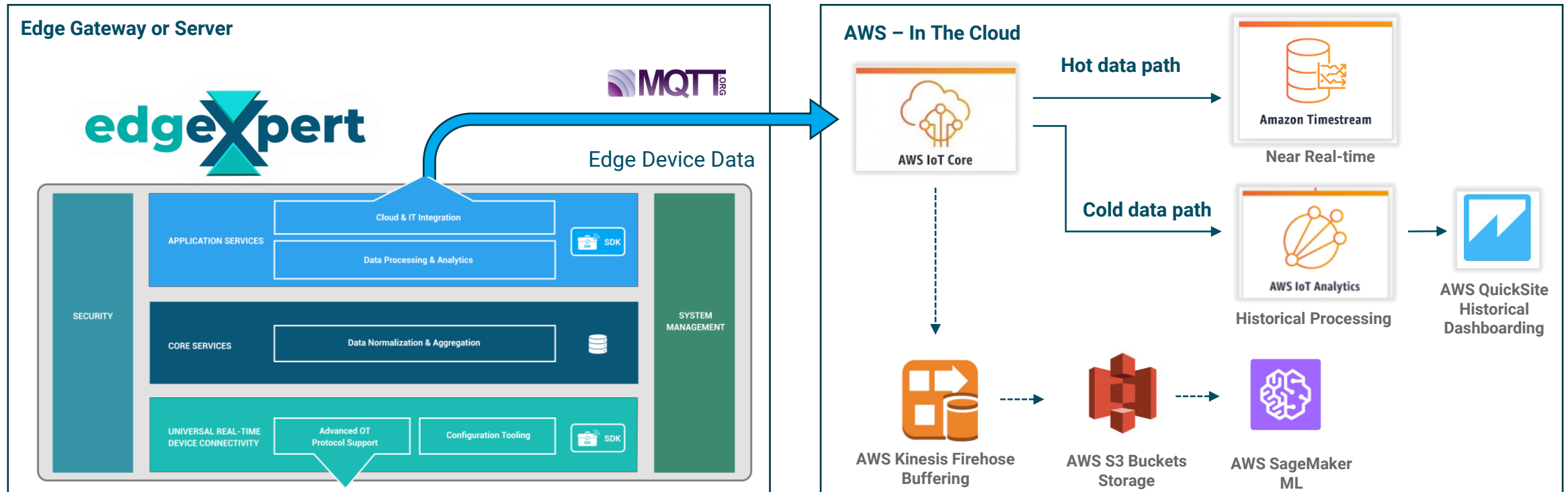
AWS Leveraging Edge Xpert - Demo

EdgeX Futures

EdgeX Futures

Our thoughts on futures….

Features we believe are key from the EdgeX community going forward:

- Completion of the EdgeX V2 APIs in the Ireland release

- Completion of the messaging architecture within EdgeX

  - Device Service to Application Service message bus

  - This is key for more dynamic data flow and bi-direction Cloud comms

- Migration tools supporting V1.x to V2.x user upgrades

  - For example: device profiles and meta data

- EdgeX LTS (Jakarta release)? To help our own LTS and customer support plans

- Continued gathering of performance metrics

  - Especially scalability measurements (and improvements)

- Consideration of deployment concerns

  - Edge Xpert to be deployed on 1000s of nodes; advanced configuration can help

EDGE X FOUNDRY™

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Summary

- IOTech has helped grow EdgeX to be the dominant Global Open Edge Platform

- We will continue to contribute, innovate and provide leadership in the EdgeX Foundry and LF Edge ecosystem

- Exciting new developments coming in 2021

  - Edge Xpert Video inferencing support

  - Major enhancements to our cloud connectivity (Bi-directional data flow)

  - Significant investment in usability

  - At the end of Q1 we will launch Edge Builder – Edge management at scale

  - We will soon launch our own on-line store

  - Major customer win announcements soon with XRT!!

- We're looking forward to working with you all in 2021
  (hopefully face to face!!!)

IOTech

Q&A

Thank You
https://www.iotechsys.com/