Vertical Solutions Working Group

June 30, 2020

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Agenda

**Accenture** is using EdgeX Foundry in its AIP+ platform. This presentation is to cover their strategy, use cases, and more.

Meeting recording & slides to be posted to:
https://wiki.edgexfoundry.org/display/FA/Vertical+Solutions+Working+Group
By way of an introduction.....

Name : Allan Haughton
Employer : Accenture - Applied Intelligence Platform (AIP+)
Role : AIP+ IOT Gateway Development (Global Lead)

Leading a multinational team to create an advanced Edge Analytics gateway as part of the AIP+ initiative. Also working with the Accenture Security Practice to create IOT security thought leadership material, and representing Accenture IOT Security at international events.
AIP+ Cloud platform

Intelligent Solutions — E2E, Industry-specific data foundation layer, analytical records, model templates


AIP+ Powered Apps
Un-trap data and unlock new speed to value

**265+ apps**: Workforce Analyzer, Network Cost Optimizer, Commercial Insights Visualizer, Digital Worker, Marketing Mix Optimizer, Telco Retail Forecaster...

Engagement+
Turn insights into action and extend capabilities with living, learning experiences

Rapid Application Workbench
Low-code/no-code development of industry & domain-relevant applications

Experience Builder
Choreograph real-time events, contextual data & corresponding actions.

Conversational AI Builder
Rapidly build virtual agent solutions in a technology-agnostic environment.

Cognition+
Turn insights into action and extend capabilities with living, learning experiences

Data Science Workbench
Data Scientist Playground

Model Catalog
Model publication and reuse

Model Manager
Model operationalization

Analytics records – AI/ML models library – Data services – AI engines – Content analytics – Automation

Data Supply Chain+
Connect the enterprise by automating the collection, integration of all data.

DBMS
Files.
Social
News
Device
Sensor

- Ingestion
- Preparation
- Transformation

Core+
Networking, Computing and storage infrastructure services

Automation – Orchestration – Provisioning – Configuration – Deployment – Enablement

Platforms

Security & Governance

Security Framework
Tenant & Application Segregation Policies
ISO & HiTrust Certification
CDP-GDPR Ready
FedRamp Certified (AFS)
HIPAA Compliance
Certificate Authority
Vault
User Store
Antivirus
Authentication & Authorization

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A collection of modular, pre-integrated AI services and capabilities

augmented by Accenture IP

that helps accelerate and scale new outcomes

**Speed to Scale**
- Pre-built industry and functional solutions
- Automated data science tools, empowering more people to benefit from AI

**Speed to Confidence**
- E2E Security
- Data governance services & capabilities (GDPR, CCPA, HDS, HiTrust® etc.)
- Patented, competitively differentiated Accenture IP

**Speed to Value**
- Fast E2E solution provisioning
- Pre-built modules to accelerate customization to your business needs
- Rapid application prototyping

**Flexible Commercials**
- as-a-service (pre-integrated solutions & support)
- as a collection of accelerators for integration (existing infrastructure)

**Core+** for speed to deployment - accelerate setup, management, monitoring and deployment of new intelligence with integrated, as-a-service technologies.

**Services+** for speed to confidence – maximize performance with value-added services like architecture advisory, system/platform consultation, and implementation delivered by our experts.

**Data Supply Chain+** for speed to connectivity – connect the enterprise by automating the collection, integration and mobilization of data.

**Cognition+** for speed to intelligence – empower users with AI applications and automated data science while crafting new insights and continuously learning systems.

**Engagement+** for speed to action – turn insights into action and extend capabilities with living, learning experiences.

**Applied Intelligence Solutions** for speed to scale – pre-built solutions to enrich services with industry and functional IP.
Introducing the AIP+ Edge
Extending AIP+ for Distributed Analytics

The AIP+ Edge Agent extends the AIP+ analytics capability by acting as an intelligent node. Operating close to IOT/IIOT information sources to enable real time insights and actions at the edge.
AIP + Edge: Speed to Intelligence

End-to-End development and deployment for Rules and Models
- Integration with AIP+ Data Science Tools
- Model / Rules Authoring and Management
- Low-Code/No-Code Edge Pipeline Configuration
- Automated Deployment to Devices

Wide device range
- Modular architecture supports all device types
- Extensive range of hardware, OS, and Edge protocols
- Commercially supported Edge framework

Edge-Optimized Analytics & ML
- Models, Applications and Rules executing at the Edge
- Support for Model quantization & AI accelerated Hardware
- Fast and memory efficient data ingestion with Chronicle smart storage
- Edge Efficient Model portfolio

Cloud-independent Edge
- Open source and container-based Edge Agent
- Edge Models and Applications reusable across PaaS providers: GCP, Azure, AWS...
- Expanding EdgeX content ecosystem
AIP+ Edge: **Key Features**

End-to-End tools & edge software enabling intelligence on multitudes of devices

**Agent Builder**
- Generation of Agent Software
- Configuration of Edge Pipelines
- Enforcing Edge Model characteristics

**Software Manager**
- Automated Agent and Models Provisioning
- Campaign Management

**AIP+ Data Science Tools**
- Edge specific-templates
- Reusable Models
- Low-code design of dashboards and visualizations

**AIP + Edge Agent**
- Efficient execution of models and rules at the edge
- HW acceleration support
- Wide range of devices & communication protocols

**Commissioning App**
- Low touch device setup by in-field technicians

**Chronicle**
- Compact, highspeed Time Series Database
Edge Intelligence - Key Applications

- **Time Sensitive**
  - Production line monitoring
  - Safety monitoring
  - Production availability and optimisation
  - Quality Control
  - Augmented reality
  - Smart Grid
  - Smart City
  - Cold Chain
  - Process automation

- **High Data Volume**
  - Video analytics (Quality/safety)
  - Robotics
  - Security analytics
  - Preventative, Predictive, Prescriptive Maintenance
  - Digital Twin
  - 5G base station data filter/aggregator
  - Smart Stadium
  - Smart signage optimization
  - Smart Mall
  - Smart Building
  - Smart Stadium
  - In store Demographics
  - Consumer fraud detection

- **Context Sensitive**
  - Augmented reality
  - Smart Grid
  - Smart City
  - Cold Chain
  - Process automation
  - Quality Control
  - Production availability and optimisation
  - Safety monitoring

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Why we chose EdgeXFoundry
The reality of the IOT – it’s really hard !!!!

IOT solution landscape is fragmented

- Numerous options for cloud or on-premise analytics platforms.
- Wide variety of IOT device manufacturers
- Multiple OS choices and variants
- Variety of chip architectures
- Many competing IOT frameworks
- Vast amount of IOT protocols – some proprietary, some standards based, some evolving, some with incomplete implementations
- Varying degrees of device intelligence

And there are many operational challenges

- Long design lives means obsolescence has to be factored in
- Autonomous operation requires high reliability
- Remote deployed locations require secure remote access for maintenance/debug.
- Safety is often key design requirement.
- High operational availability expectations mean that patches and upgrades can require weeks of planning to avoid outages
- Faults in the IOT network are difficult to find and fix.
What I like about EdgeX Foundry

Being able to select an IOT Edge framework designed from the ground up to be Hardware and OS agnostic, with multiple options for cloud connectivity was a good starting point

But, the real clinchers were the

- rich variety of IOT protocol connectors (greater use case coverage)
- incredibly flexible Microservice Architecture (easy to integrate Accenture IP)
- Ability to download and execute dockerized images (analytics technology agnostic)

EdgeX Foundry allows Accenture to concentrate on the Analytics models that generate value for our clients without needing to worry about the underlying gateway technology or connectivity, and to do this safe in the knowledge that the gateway solution can be ported to multiple IOT gateway devices with minimal effort
AIP+ Edge Agent Foundation: EdgeX Framework

LOOSELY-COUpled MICROservices FRAMEWORK

EXPORTING AND APPLICATION SERVICES
- ADDITIONAL SERVICES
- APPLICATION SERVICE

SUPPORTING SERVICES
- RULES ENGINE
- SCHEDULING
- ALERTS & NOTIFICATIONS
- LOGGING
- ADDITIONAL SERVICES

CORE SERVICES
- CORE DATA
- COMMAND
- METADATA
- REGISTRY & CONFIG

DEVICE SERVICES (ANY COMBINATION OF STANDARD OR PROPRIETARY PROTOCOLS VIA SDK)
- REST
- OPC-UA
- MODBUS
- BACNET
- ZIGBEE
- BLE
- MQTT
- SNMP
- VIRTUAL
- ADD'L DEVICE SERVICES

“SOUTHBOUND” DEVICES, SENSORS AND ACTUATORS

“NORTHBOUND” INFRASTRUCTURE AND APPLICATIONS

Platform Architecture

SECRET STORE

ADDITIONAL SECURITY SERVICES

SECURITY

REVERSE PROXY

ADDITIONAL SECURITY SERVICES

ADDITIONAL SERVICES

CHOICE OF PROTOCOL

CONTAINER DEPLOYMENT

REMOTE/LOCAL GUI

ADDITIONAL SERVICES

MGMT SERVICE AGENT

MANAGEMENT

ADD'L DEVICE SERVICES

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## AIP+ Edge Agent - Architecture

### AIP+ Edge Services

- **Model Manager**
  - Deploy, Operationalize and Maintain of Edge Models

- **Agent Builder**
  - Customize AI-powered SW for devices in a low-code envt.

- **Device Inventory**
  - Repository of devices provisioned in AIP+

- **Software Manager**
  - Device SW provisioning & lifecycle campaigns

- **Device Manager & Data Gathering**
  - Device config / Monitoring
  - Device / Sensor Telemetry

### AIP+ Edge Agent

- **AIP+ Edge Orchestration**
  - Manage dockerized model pipeline execution

- **AIP+ Edge Analytics**
  - Run containerized analytics models and Rules at the Edge

### Core Services

- Core Data
- Database (Redis)
- Command
- MetaData
- Registry & Config

### Supporting Services

- Scheduling
- Alerts & Notification
- Logging

### Device Services

- Connectors interacting with Devices or IoT objects over standardized and proprietary protocols and interfaces, including:
  - BLE
  - Zigbee
  - Modbus
  - CANopen
  - MQTT
  - BACnet
  - OPC UA
  - Profinet
  - Chronicle
  - Device Data Simulator

### Edge Devices

- Sensors, Actuators and Connected devices sending and receiving data, alerts or commands.

### AIP+ Export Services

- Device registration and AIP+ communication
  - AIP+ Export
  - Device Registration

### Commissioning App

- Low-touch in-field device setup

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AIP+ Edge Agent - Accenture Extensions to EdgeX

AIP+ Edge Agent
- Speed to Edge Intelligence: run containerized models on a wide range of edge devices

AIP+ Edge Orchestrator / SMA
- Provisioning / Management of Edge micro-services
- Sequencing / Orchestration of Edge data pipelines
  - Sensors / models / rules / apps / export
  - Serially and in Parallel

AIP+ Services
- Export Services for communication to AIP+
- Custom Alerts & notification, scheduling, logging

Device Data Simulator
- Allows IOT device interactions to be simulated
- Enables test Automation
- Can replay captured Video for analytics use case reproduction and training

Chronicle TSDB
- Low-footprint, low-power, efficient TSDB
- Device Service to store sensor data at high fidelity
Accenture provides End-to-End tools & edge software enabling intelligence on multitudes of devices

**AIP+ Edge is part of an end to end solution**

- **Agent Builder**
  - Generation of Agent Software
  - Enforcing Edge Model characteristics

- **Software Manager**
  - Agent and Models Provisioning
  - Campaign Management

- **AIP + Edge Agent**
  - Efficient execution of models at the edge
  - Wide range of devices & communication protocols

- **AIP+ Data Science Tools**
  - Edge specific-templates
  - Reusable Models
  - Low-code design of dashboards and visualizations

- **Comissioning App**
  - Low touch device setup by in-field technicians

- **Chronicle**
  - Compact, highspeed Time Series Database
IoTech Edge XPert – the Commercial EdgeX Framework

Accenture has selected IoTech’s EdgeXpert implementation of EdgeXFoundry as the foundational component for AIP+ Edge gateways. This gives Accenture the security of technical support – particularly with respect to the wide number of IoT protocol connectors provided by EdgeXpert.

Supported IoT protocols

Available
- ModBus (RTU and TCP)
- BACnet (MSTP and IP)
- OPC UA
- MQTT
- Simulink
- IO-LINK
- EtherNet/IP

Bluetooth Low Energy (BLE)
Grove Sensor
File
Virtual
CAN

On Roadmap
- OPC UA (Pub/Sub)
- EtherCAT
- PROFINET
- SIMATIC
- CAN

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Where I would like EdgeX to head

Accenture is investing significant effort into ensuring that EdgeX is a valuable component in AIP+ distributed analytics models.

It would be wonderful to collaborate on some of the generic issues with deploying, configuring, monitoring and maintaining IOT devices and networks in the field.

- Tooling to support remote IOT device deployment, configuration, monitoring and administration – including remote login and debug capability
- Support for Intelligent connected IOT devices (cameras, semi autonomous devices, distributed analytics pipelines)
- Recommended frameworks – especially with respect to Video analytics and Robotics.
- Certification schemes for supported/recommended devices.
- Better realtime /deterministic support (e.g. IoTech’s XRT)
Thank You!
Thank you