Edge Analytics with the PI System

Greg Holt, Staff Software Developer
Dan Lopez, Senior Systems Engineer

Today's Agenda

How did we **get here**?

- Where did the Edge Data Store come from?

What is the **use case** for the Edge Data Store?

- What are its **features** and **capabilities**?

How has the Edge Data Store been **used**?

- What are some interesting **success** stories?

How can you **learn more**?

How did we get here?

You asked for **more data collection**!

You need to **solve problems** and **answer questions** in places not **previously possible**! Low-cost **sensors** and **ubiquitous networking** are helping to solve the problem… and we want to help by providing **technology** to **collect** the **data** that you need!

Our Response: Our Pervasive Data Collection Initiative (PDC)

An addition to the other new initiatives taking place at OSIsoft

At the Edge
Collecting more data from more sources

In the Cloud
Enabling advanced analytics and new data-driven services

Sensors	Assets	Plant	Enterprise	Community
				
Millions of **Smart Devices**	Multiple **Sensors**	Multiple **Assets**	Multiple **Plants**	Multiple **Enterprises**

Pervasive Data Collection (PDC)

OSIsoft Cloud Services

PI System

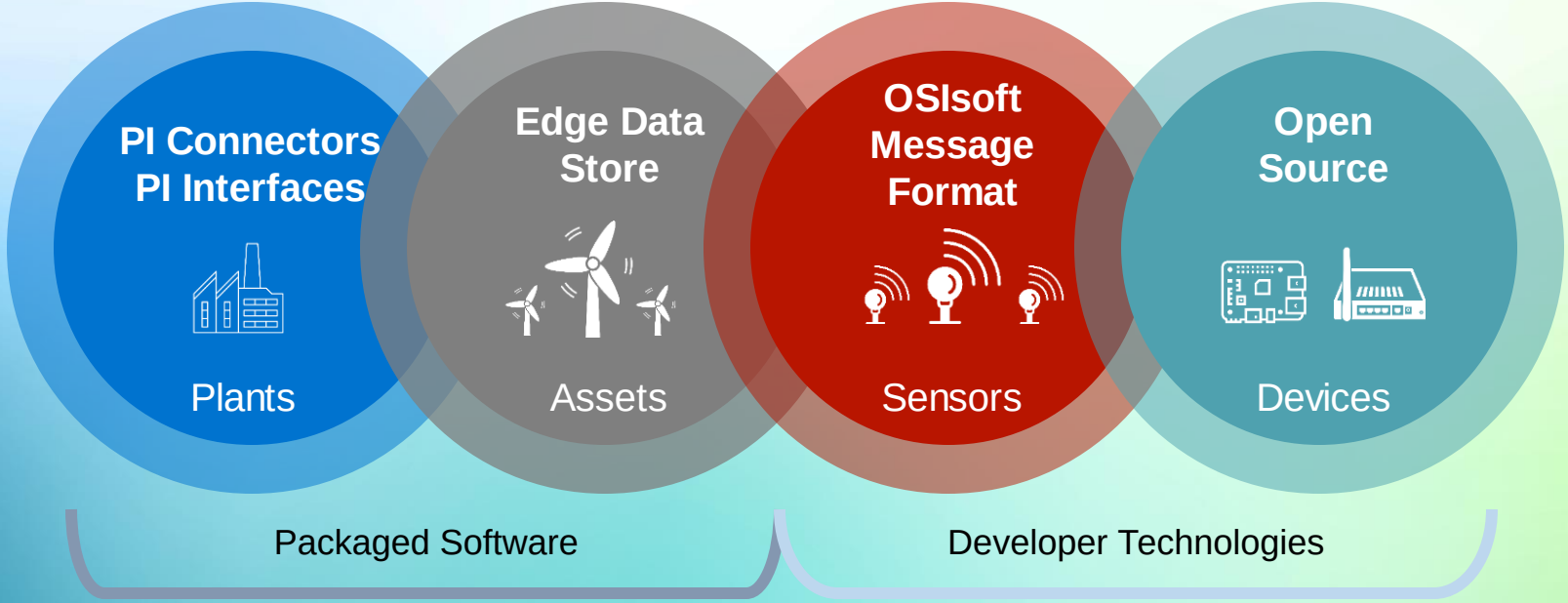
The Goal of Pervasive Data Collection (PDC)

Ensure that **no matter where** your operational **data resides**,

there are **OSIsoft technologies available** that

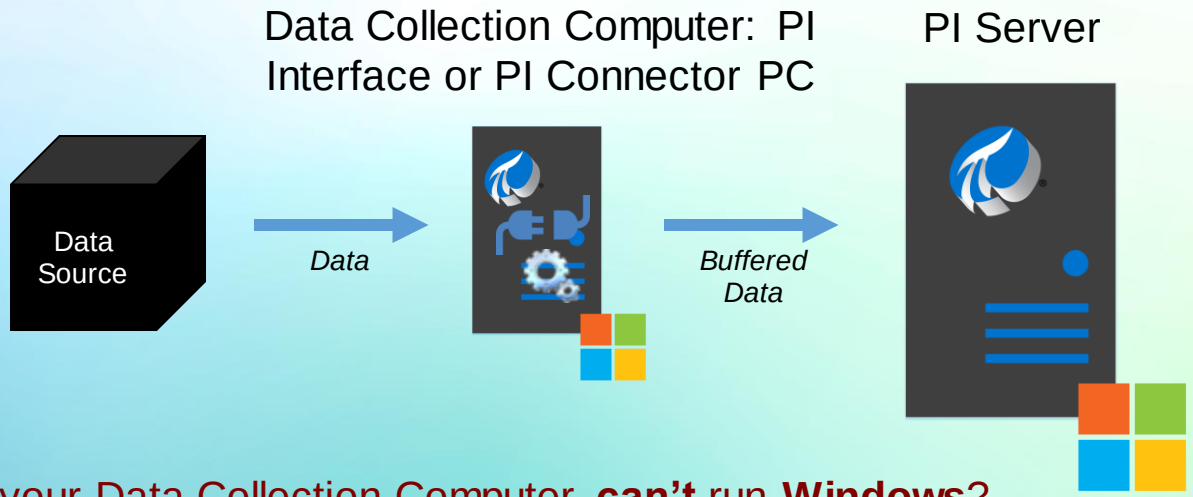
can **collect** and **store** that **data**

Outcomes of the PDC Initiative



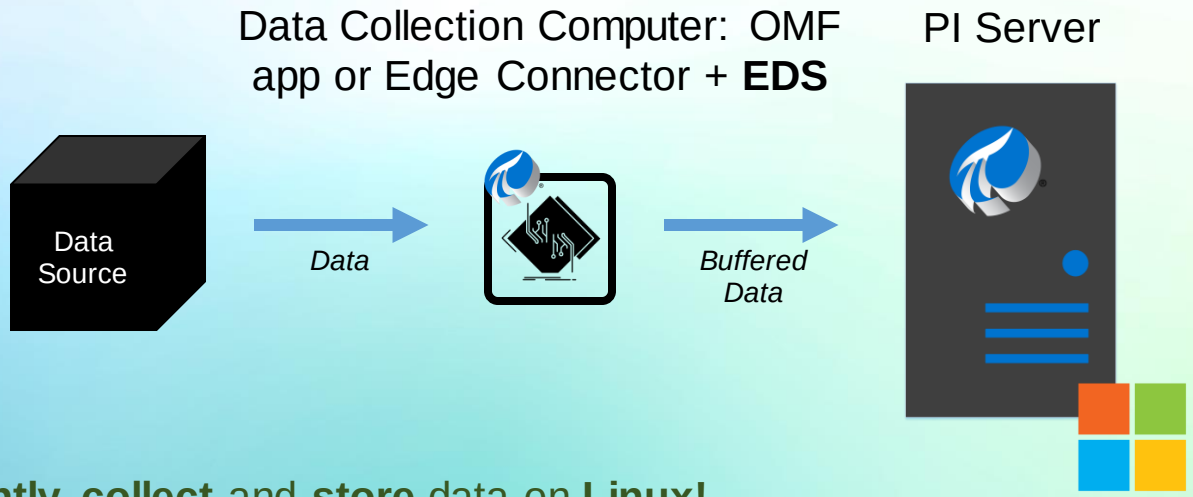
What is the use case for the Edge Data Store?

Consider an Example Architecture



- What if your Data Collection Computer **can't** run **Windows**?
- What if you need to analyze or visualize data **at the edge?**
- What if you want to send data directly from the **edge** to the **cloud**?

Unlock New Architectures with the Edge Data Store



- **Resiliently collect** and **store** data on **Linux!**
- **Retrieve**, **operate** on, and **enhance** data at the **edge**, prior to it arriving in a PI Server
- Egress data to **any OMF destination** (PI Server , OCS, or EDS)

EDS Feature Quick Summary

Edge Data Store

Assets

Persistent Storage

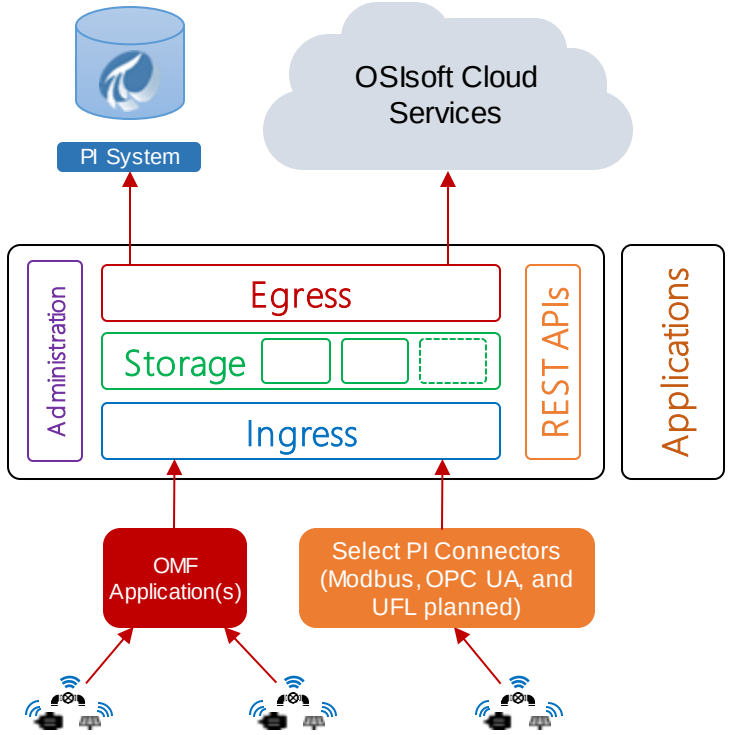
Self-Healing

Application Platform

- Cross **Platform** (Windows, Linux)
- Multiple Data **Ingress Options**
- **Analytics** Ready
- **Egress** to **PI Server** and **OSIsoft Cloud Services**
- **Developed**, **Sold**, and **Supported** by **OSIsoft**

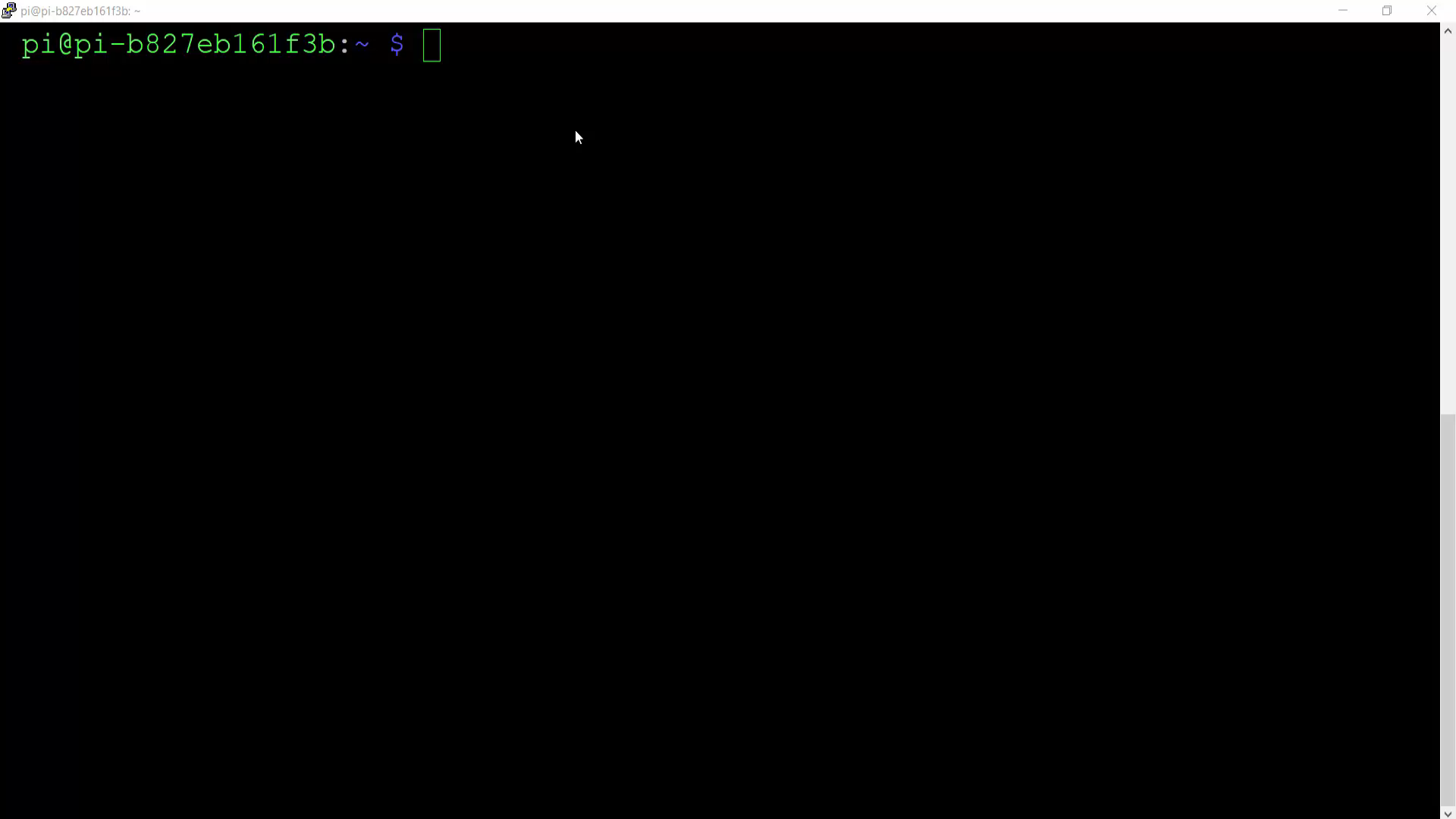
EDS Further Details

- Additional characteristics
  - **Sequential** data store for storing information
  - User-defined types that can have **multiple indexes**
  - **High-precision** time stamps (down to 100ns)
  - Same **REST API** as OSIsoft Cloud Services
- Device/OS requirements (minimum recommended)
  - Multi-core GHz CPU, **Intel** or **ARM**
  - **1GB** RAM typical
  - **Internal storage** (SSD preferred)
  - Operating system / architecture:
    - **Linux** 64-bit architecture *and* 32-bit ARM (Debian9)
    - **Windows** 32- and 64-bit
    - Docker **container capable**



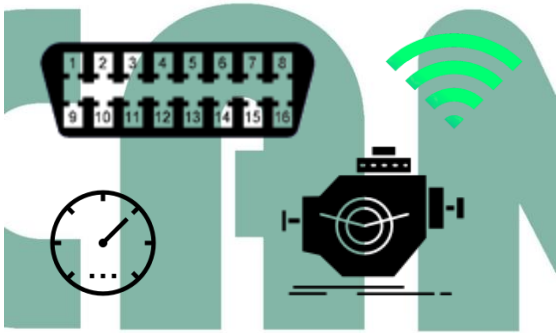
DEMO

Writing to and reading from an Edge Data Store


pi@pi-b827eb161f3b: ~
pi@pi-b827eb161f3b:~ $

How has the Edge Data Store been used?

Use Case Example: Real-time Vehicle Telemetry



CHALLENGE

Engine **telemetry** was both isolated from vehicle operators and from the central PI System

- Data needed to be both sent securely to the **central** Data Archive and also made available **immediately** within a vehicle for visualization and analytics

SOLUTION

A prototype installation of an EDS within a vehicle, connected to the vehicle's **CAN** bus

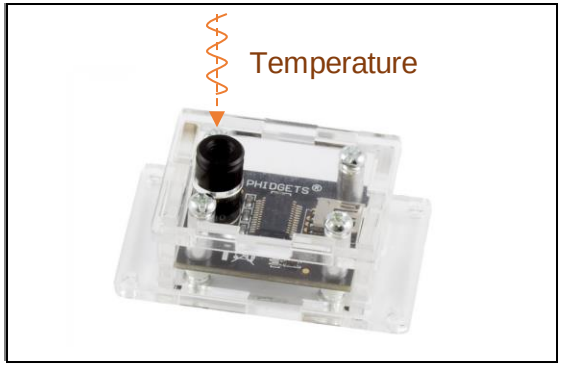
- An **OMF** application reads engine telemetry via the **CAN** bus and writes live values to the EDS, which are also **relayed** to the central PI System when in **network range**

RESULTS

Situational awareness and **CBM**

- Operators now have more immediately information about their vehicle's **state**
- Vehicle data within the central PI System can now be used for **condition-based maintenance** (CBM)

Use Case Example: Critical Asset Monitoring



CHALLENGE

Additional data is needed to preemptively detect potential issues with critical equipment

- The equipment cannot be modified or altered, though, since it is owned by a third-party vendor

SOLUTION

Non-contact IIoT sensors can be used to monitor the asset's condition and store data in a nearby EDS

- The EDS can then both make the data available locally, in a local display screen, and egress that data onward to the central server

RESULTS

Increased awareness and reliability

- Peace of mind from gaining additional insights into performance, while still respecting the original vendor's ownership of the asset

Use Case Example: Remote Oil Field Pumps

CHALLENGE

Timely detection of equipment failures

- Failures can go undetected for weeks in between on-site manual inspections
- Network connectivity to the pump locations is inconsistent

SOLUTION

A new remote asset monitoring service provided by IPCOS for detecting equipment issues

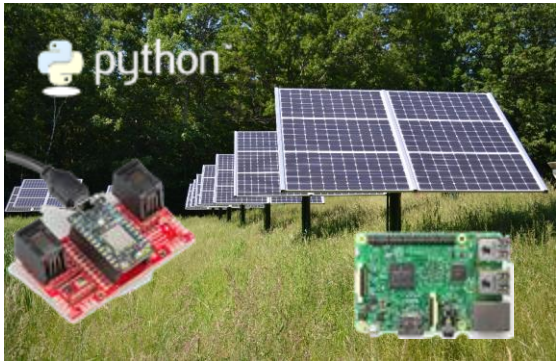
- Data is furthermore only send when an issue is detected, which drastically conserves the required bandwidth for remote monitoring

RESULTS

Reduced downtime

- Reduced downtime directly translates into reduced costs of production outages

Use Case Example: Anomaly Detection via Machine Learning (ML)



CHALLENGE

Network **bandwidth** at the edge is very **restricted**

- Data **transmission rates** need to **vary** depending on whether an **anomaly** is in progress or whether conditions are **normal**

SOLUTION

Data collected in an EDS is **analyzed** using a local **machine learning model**

- The model's **predictions** are compared with **expected** generation, and if a **discrepancy** is detected, data egress **rates** are **increased**

RESULTS

Varying the data egress rate from the EDS can **drastically save** network **bandwidth**

- The **same** ML training and analysis techniques can also be applied to **other data**, such as analyzing **network performance** and offering advance notice of potential connectivity problems

DEMO

Courtesy Eileen Pan, OSIsoft Intern, B.S. candidate, MIT

How can you learn more?

Take a Look at These Helpful Resources

- View online EDS documentation:
  - https://osisoft.github.io/Edge-Data-Store-Docs/V1/index.html
- Learn more about the OSIsoft Message Format, for writing data into the EDS:
  - https://omf-docs.osisoft.com/
  - https://omf-developers-companion.readthedocs.io/en/latest/
- Examine OMF-generating samples that can write data into the EDS:
  - https://github.com/osisoft/OSI-Samples-OMF
- Search (or submit!) feature requests regarding the Edge Data Store:
  - https://feedback.osisoft.com/forums/906877-edge-data-store

Reach Out After the Conference!

Greg Holt
Staff Software Engineer
OSIsoft
gholt@osisoft.com

Dan Lopez
Senior Systems Engineer
OSIsoft
dlopez@osisoft.com

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