April 22, 2022

PQ Users Group Meeting – Utility Updates

Introduction Key GPA Staff

GRID PROTECTION ALLIANCE

Grid Protection Alliance, Inc., specializes in the development and support of **innovative software solutions** for the **electric industry**.

GPA has a track record of innovation and **has led major software development projects** with client utilities and the Federal Government.

In addition to **custom application development**, GPA offers services for installation, set-up, integration, and on-going **maintenance of its open-source software**.

Dr. Christoph Lackner
Operating Officer & Lead Engineer

ROLE: Operational & Project Leadership

- Establishes new software development projects and assures the successful completion of established projects.
- Provides engineering oversight of GPA analytic applications.
- 8+ years' experience with synchrophasor data analytics and use of synchrophasor data in various applications such as state estimation, predictive maintenance, and system parameter estimation.
- Specializes in the development of real-time and offline data analytics for power systems.

Ritchie Carroll
Senior Solutions Architect

ROLE: Systems Architect & Lead Developer

- Oversees GPA software development and provides software system design and development services to utilities.
- 25+ years' expertise in high-performance software system design, development, and delivery. Has led numerous large software development projects.
- 10 years at the Tennessee Valley Authority leading synchrophasor software development among other operational systems.
- Active participant in NASPI and other industry efforts to improve synchrophasor data systems.

Stephen Wills
Senior Systems Analyst

ROLE: Software Development

- Major contributor to GPA software solutions and provides system support and integration services to utilities.
- 10 years' experience in developing .NET solutions, much of that time contributing significantly to GPA's core code base – the Grid Solutions Framework.
- Specializes in the management of data from substation devices – PMUs, DFRs, power quality meters, and relays.
- Prior to joining GPA, extensive experience at the Tennessee Valley Authority in development of synchrophasor data software.

Gabriel Santos
Software Engineer

ROLE: Software Development

- Recently joined GPA from the firmware industry
- Provides software development for PQDashboard environment
- 4+ years of experience in software development for electrical engineering applications

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Russell Robertson
Principal

ROLE: Strategic Studies

- Establishes collaborations within the utility industry to support the development and maintenance of open-source software.
- Founded GPA's open-source software and consulting-service business.
- Expertise in grid operations, IT/OT architecture, information management, and control systems.

New Format for Users Group Meetings

- **3 yearly Webex meetings**
  - April – 04/21
  - August/September - TBD
  - November/December - TBD
  - Focused on utility updates

- **In-person meeting**
  - Focused on newly developed GPA Products
  - Half-day TrenDAP workshop
  - Part of the EPRI Electrification Conference in Charlotte, NC
  - June 28

- **Potential separation of distribution and municipal power companies**
  - Any interest from transmission companies?

GPA 2022 Outlook

- New Product lineup
  - Same products/functionality
  - Separate applications for easier deployment

- Focus on move towards openXDA 3.0
  - A few utilities have started that process
  - Significant configuration for full potential
  - Includes move for all GPA PQ Applications

- Notification Updates
  - Improved email engine
  - Additional information to be included in emails
  - Improved self-service subscriptions

- Security Updates
  - IT managed access via Azure AD and other
  - Improved logon capabilities to comply with various regulations coming

- PQ Event Share
  - Already in place between Georgia Power and Georgia Transmission
  - Improved sharing of selected data between OpenXDA instances
  - Can be encrypted to ensure Data Security

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OpenXDA Product Suite Overview

We will be working with each of you as we transition to ensure we minimize any effect this has on existing Deployments

Move Towards OpenXDA 3.0

- New model based Topology
  - Various new Assets
  - Some algorithms require assets to be set up
    - Cap bank analytic (EPRI developed)
    - Various breaker analysis
  - Connectivity between Assets
  - Simplifies setup for channels

- New Configuration UI – System Center
  - Simpler workflows
  - Requires SystemCenter
  - Can hold additional meter information

- Various Improvements to Analytics
  - Fault Location on segmented lines
  - Fault Characterization for Breakers with air Gap resistors

Notification Updates

- Ability to send out Scheduled Emails
  - Nightly reports
  - Weekly Reports

- Ability to include Trending Information
  - Tie in with TrenDAP for Channels around faults

- Ability to include Lightning Information
  - Requires real time Lightning feed

- Self-service subscription page
  - Users can add subscriptions to pre-defined set of assets/locations
  - Admin can set approval required for protected assets
  - Users can manage their own subscription

Security Updates

- ## Single Sign-On System
  - User signs into openXDA and has access to other Applications

- ## Integration with Active Directory
  - Can use cooperate sign-on system
  - IT can manage accounts independently of GPA applications
  - Ensure compliance with executive orders

- ## PQDigest Security
  - Integrates with existing customer portals
  - Currently supports azure only
  - Integration with other systems in progress

open**MIC**
METER INFORMATION COLLECTOR

open**XDA**
eXtensible Disturbance Anaytics

open**SEE**
System Event Explorer

PQDashboard

System Event
Browser

Tren**D**AP
open-source trending-data analytics platform

System Center
for configuration of GPA's PQ Tool Suite

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PQ Event Share

- Allows different OpenXDA instances at different utilities to share PQ data automatically

- OpenXDA can send event data for select assets to another OpenXDA
  - Data can be encrypted
  - Utilities can limit what data to share with which endpoint

- OpenXDA 3.0 can transfer select asset models
  - Both instances of OpenXDA can be synchronized
  - Utility can select not to use updated models

- Earlier version already in use

PQ Event Share
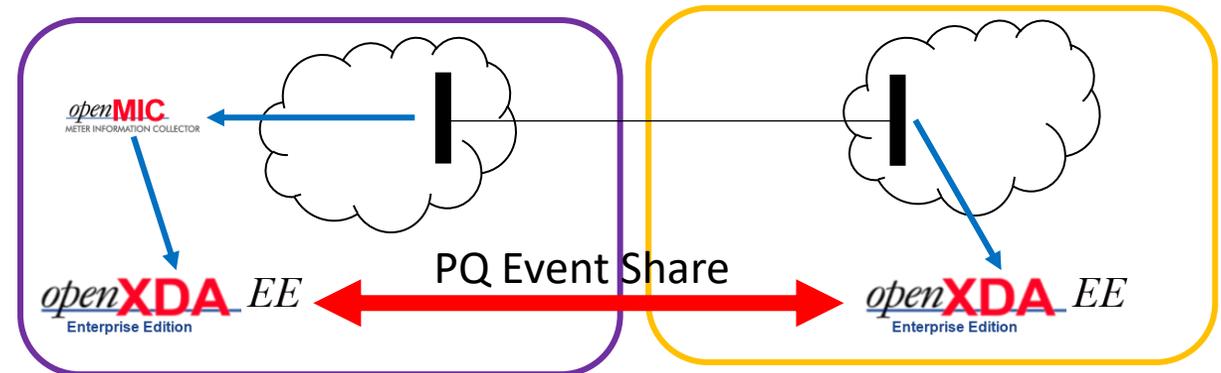
April 21, 2022
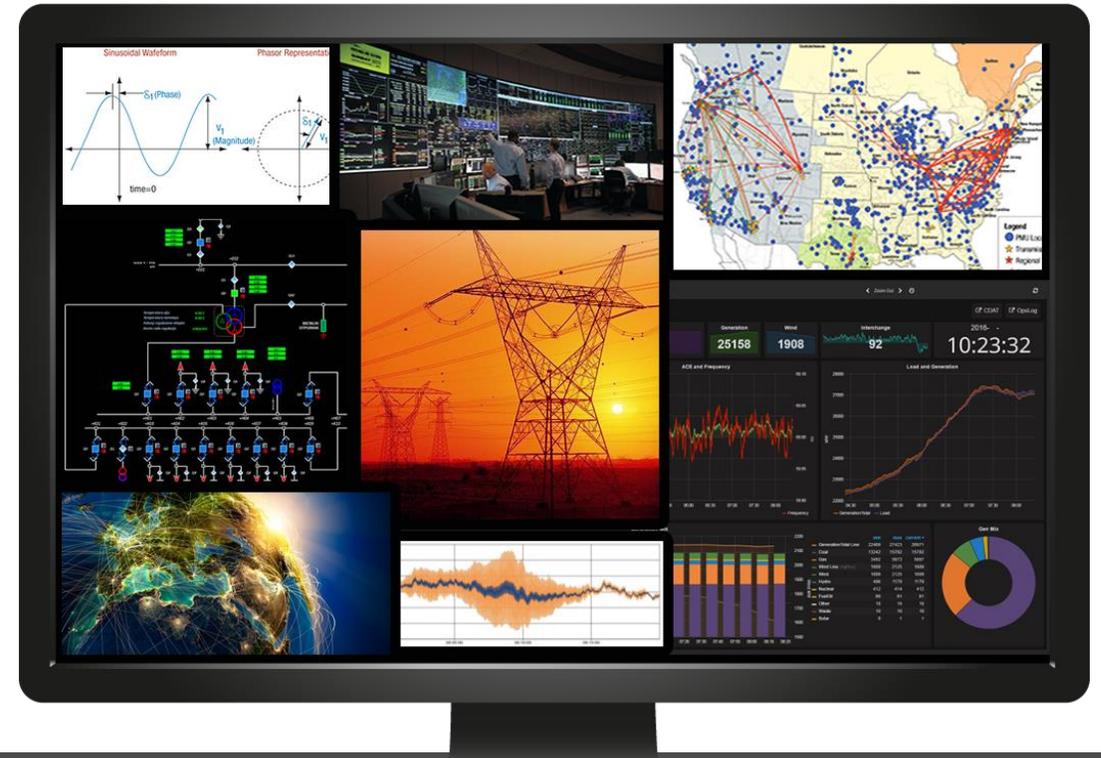
PQDigest Update

High-Level Data Flow
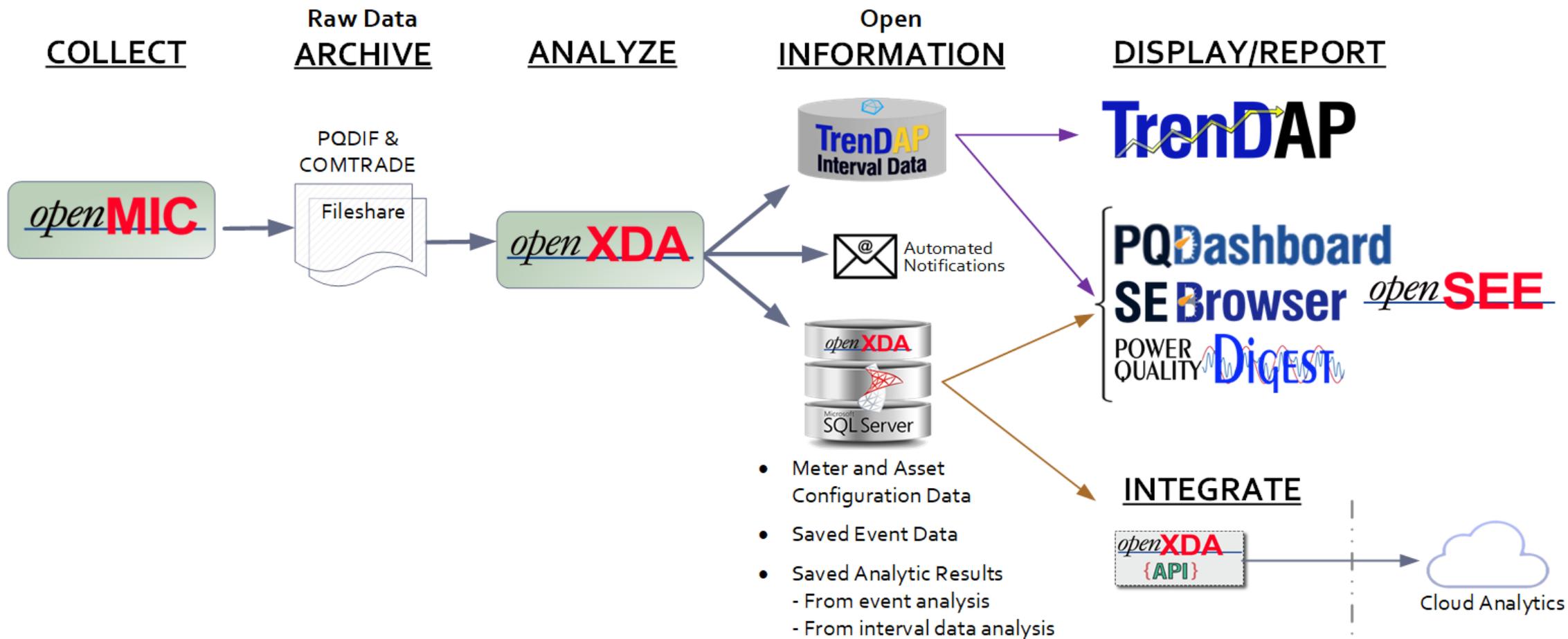
PQDigest Data Flow
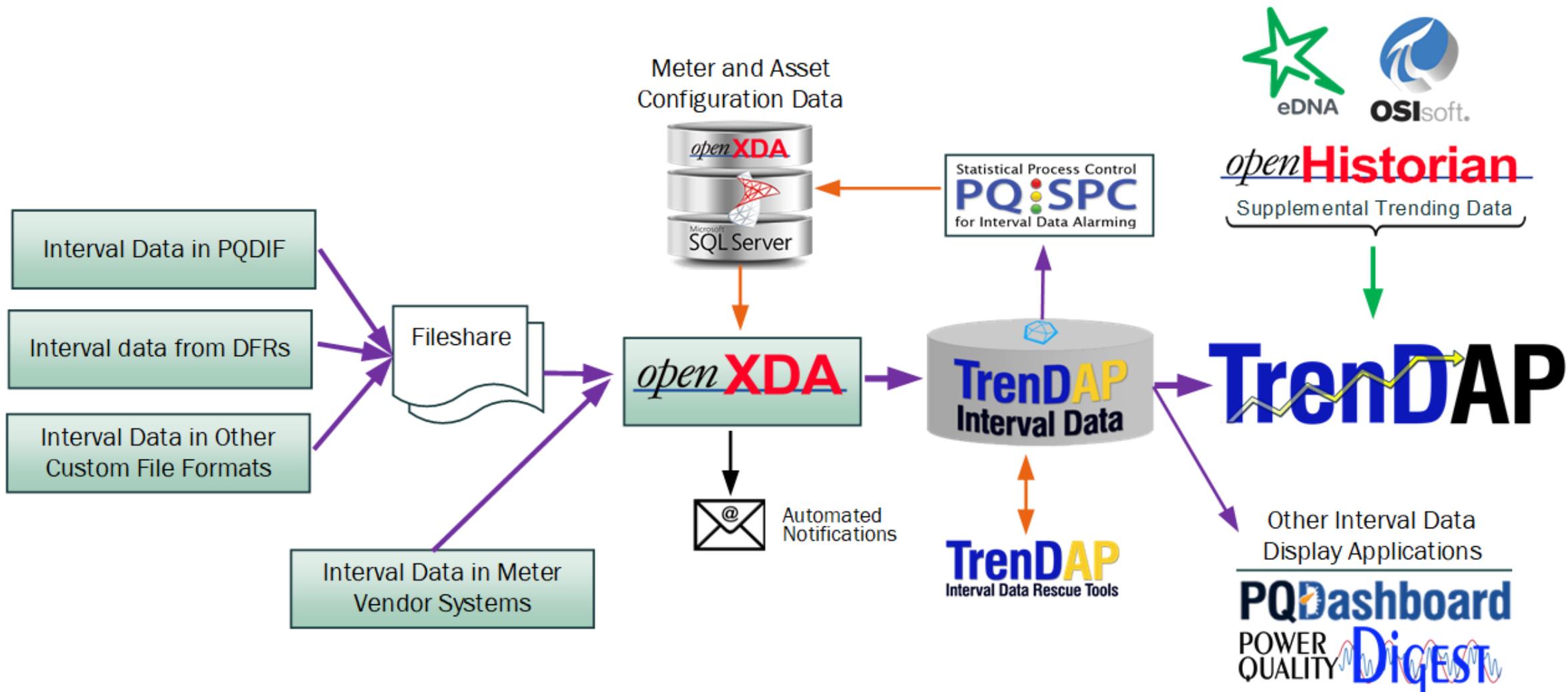
PQDigest Workflow

- Authentication driven by Azure

- Client only sees data from their meters

- Simplified workflow to reduce training of clients
  - Clients land on Home page from public internet
  - Home page shows monthly statistics for client's subset of meters
  - Client can search for events for their subset of meters in Event Search page (similar to SEBrowser)
  - Client can view trending data for a meter from their subset of meters
  - Client can see lightning strikes for a time period and region

The Home Page

- Monthly Aggregates
- Mag Dur Chart
- Quick Links
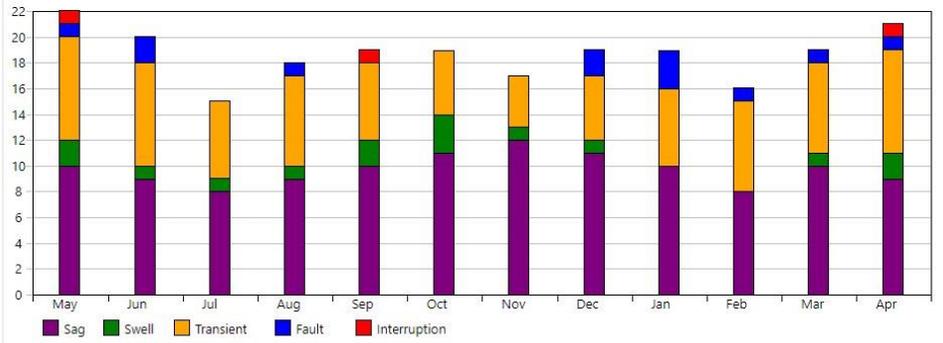
The Event Search Page

- Select Subset of meters
- Waveform Preview
- Trending data Preview
- Mag Dur for selected event

The Trending Data Page

- Select meter

- Select subset of channels

- Grouped by channel type

- Quick picker for time ranges

- Shows statistics and cumulative percentage data

The Waveform Viewer

- Based on openSEE

- Can compare waveforms

- Can choose analytic

- Phasor chart and values section based on chart clicks instead of hovering

The Lightning Page

- Uses free weather overlay service for precipitation contours

- Needs lightning database for strikes

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Round Table / Discussion

April 21, 2022
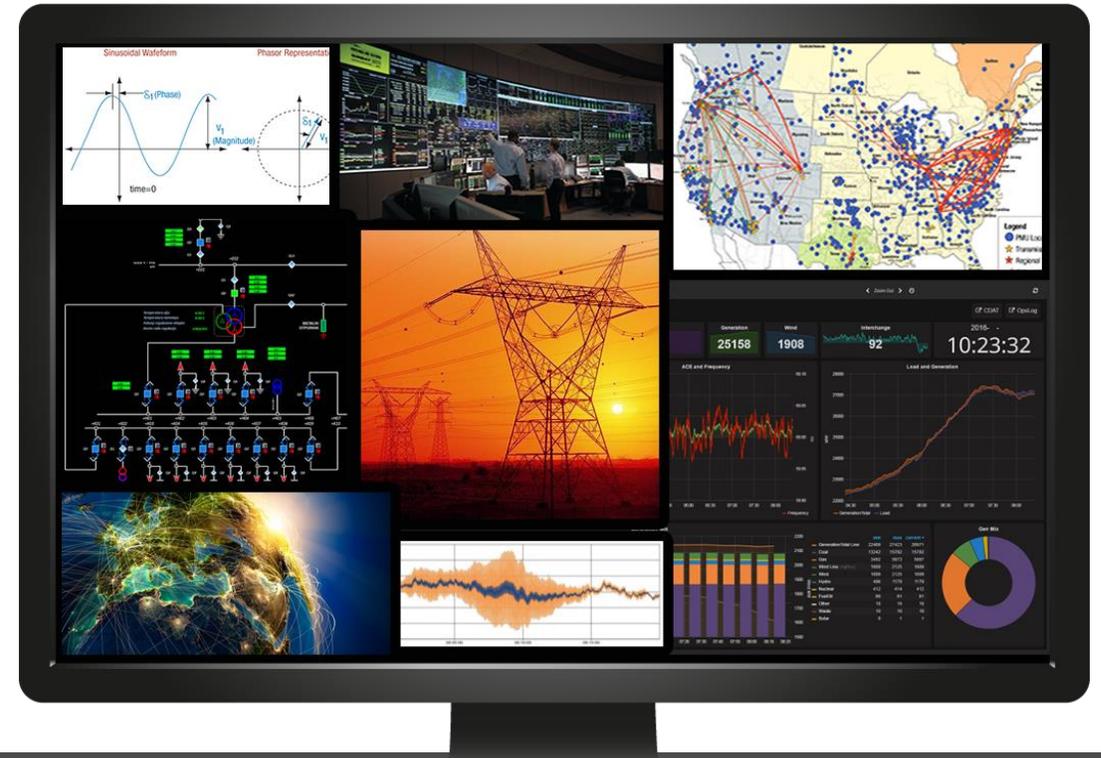
TrenDAP Update

High-Level Data Flow

COLLECT | Raw Data ARCHIVE | ANALYZE | Open INFORMATION | DISPLAY/REPORT

- Meter and Asset Configuration Data
- Saved Event Data
- Saved Analytic Results
  - From event analysis
  - From interval data analysis

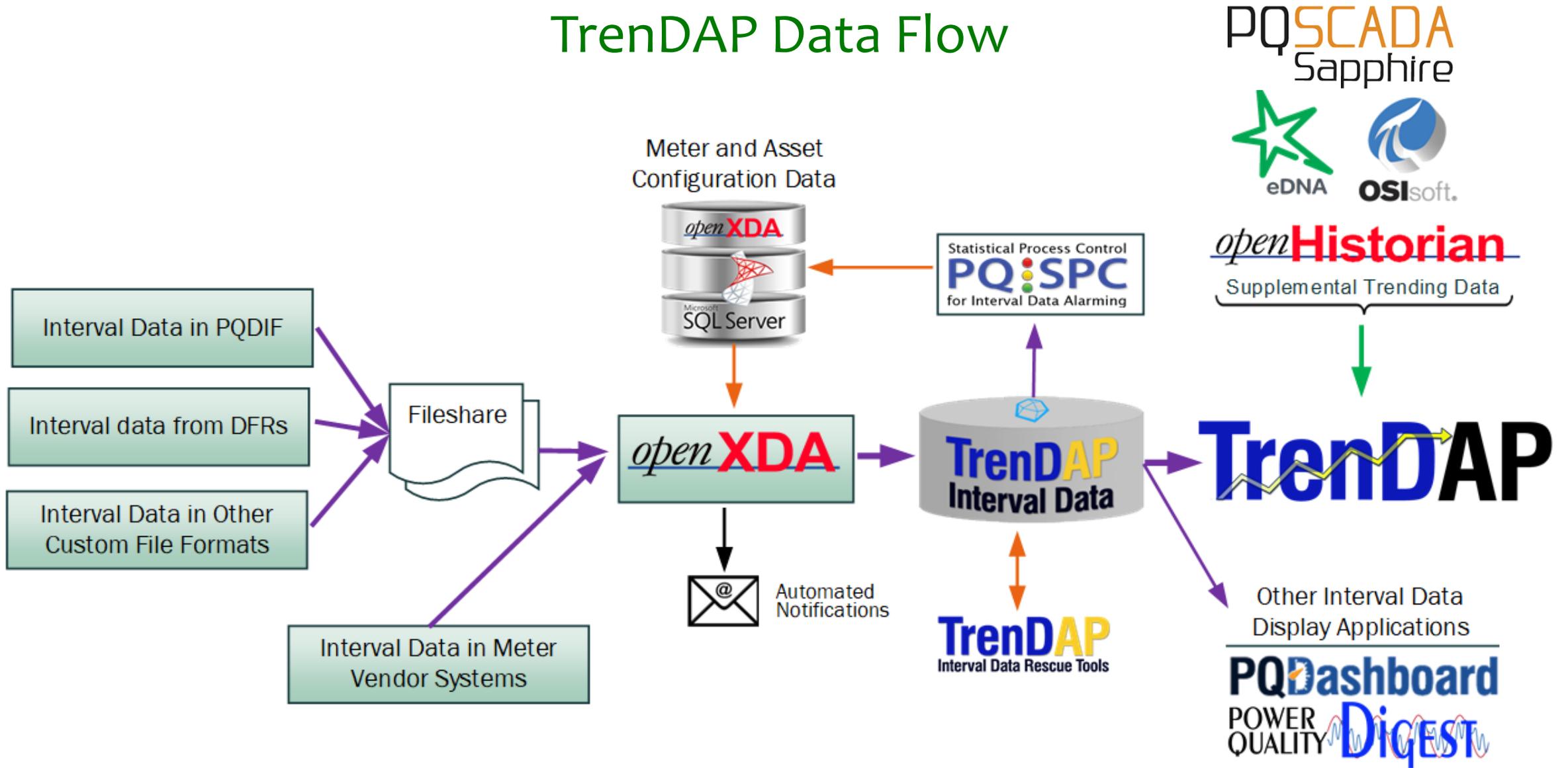INTEGRATE
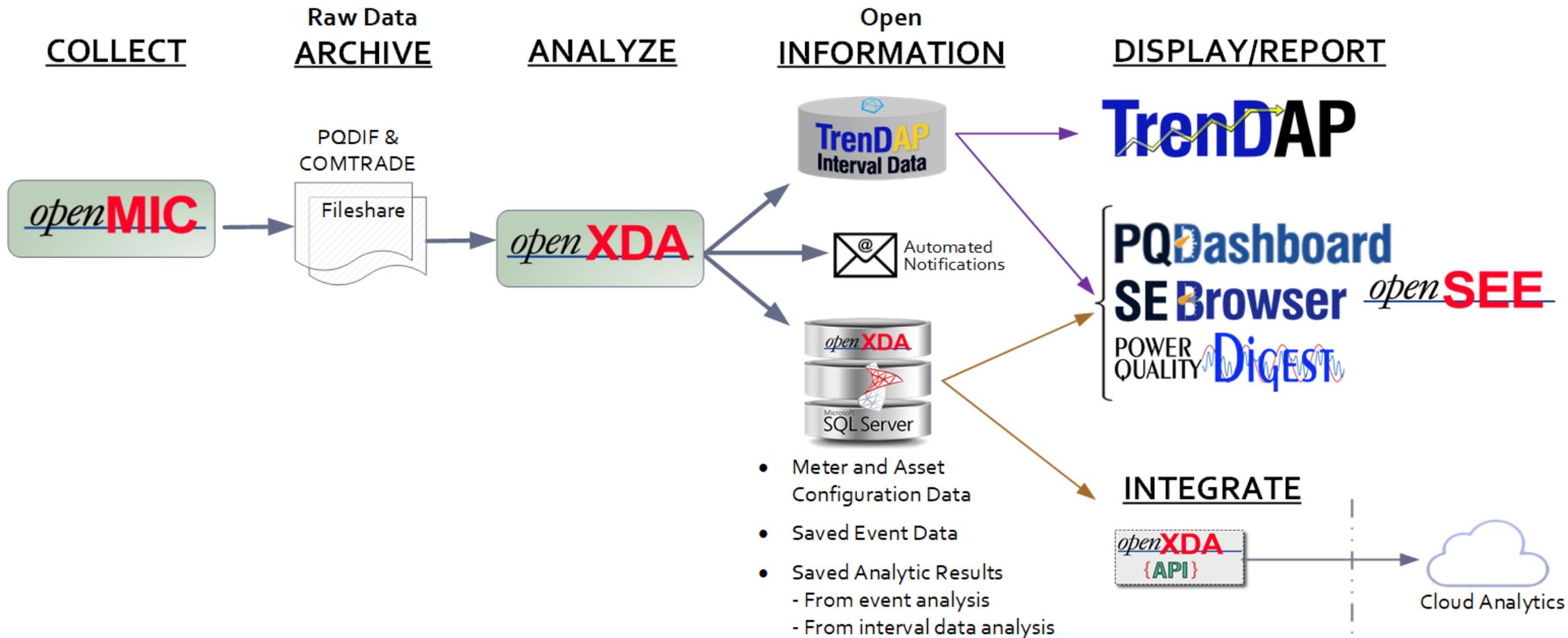
TrenDAP Data Flow

TrenDAP Handles Two Types of Data

- TrenDAP is optimized to display interval data that is collected by PQ Devices – a tuple (min, max, average) typically collected every 10 min
  - The source of this interval data is the TrenDAP database that has been processed by openXDA and the Sapphire Web API
  - TrenDAP can handle "instantaneous" (top-of-the-interval) values collected at the same periodicity by using the average
  - The minimum interval supported by openXDA processing is 1 minute

- TrenDAP can also display trending data from other data sources. Trending data is single-valued periodic data such as 4-second Transmission SCADA data that is stored in a historian.
  - Currently this external data is not connected to the openXDA asset model
  - There are no plans for external data to be processed by openXDA so that openXDA bad data detection and/or alarming can be applied to this data

TrenDAP Workflow

- **Define Data Sources**
  - TrenDAP database for interval data
  - Other sources for trending data

- **Establish Data Sets**
  - Can use an existing one – or create a new one
  - Can include one or more data sources
  - For a specific or relative time-range of interest and for a specific collection of values from each data source

- **Chart / Display Data in Widgets in a Workspace**
  - Can create multiple workspaces per data set
  - Multiple display widgets are currently available
  - The library or widgets is expected to grow significantly
  - Templatable

The Main Display

- Browser-based
- Simple Navigation
- Data Source
- Data Set
- Workspaces
- Recent Workspaces

- Multiple rows of one or more Widgets in a Workspace