

Grid Data Commons

A Shared Resource for Multiresolution AI-Driven Analytics

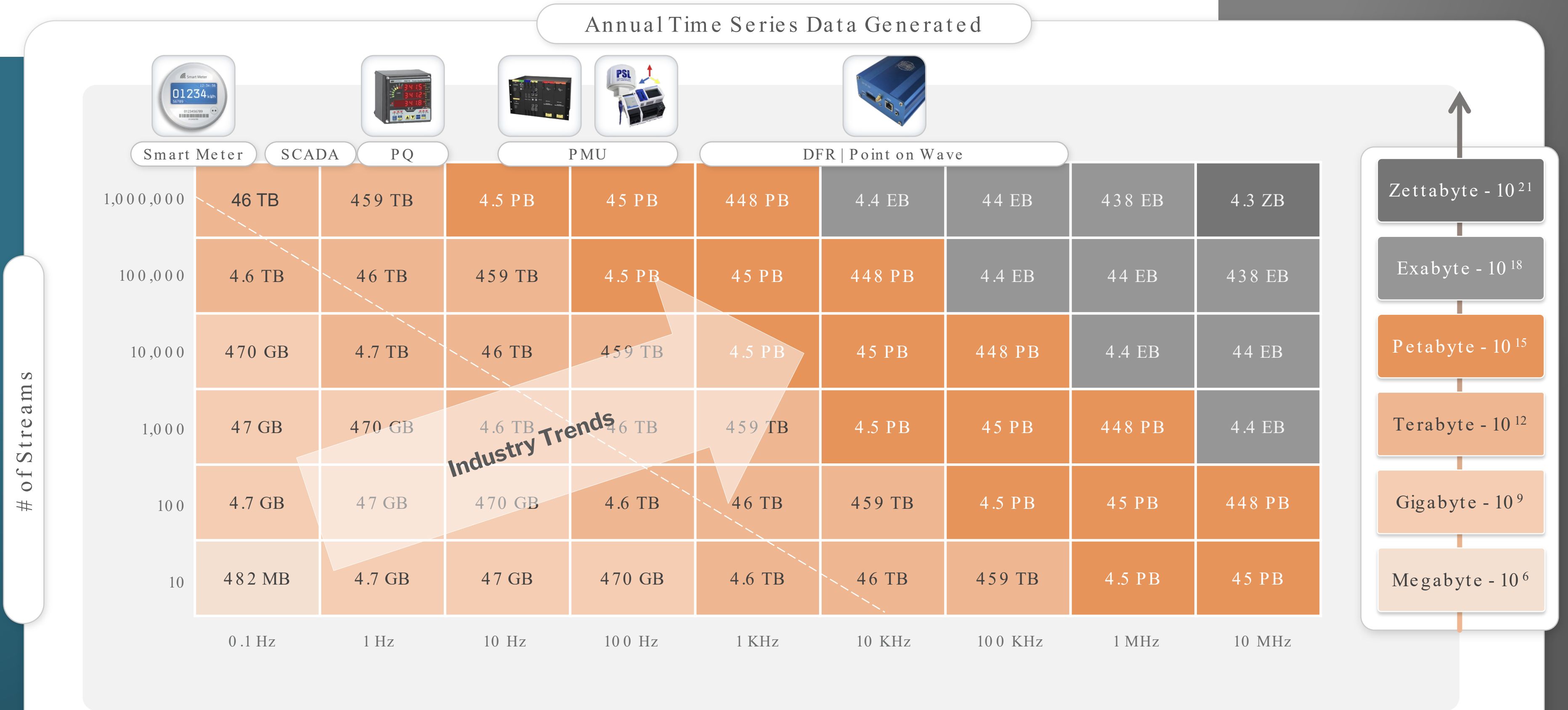
Justin Gilmer

NASPI Work Group Meeting and Vendor Show, September 23-24 2025, Charlotte NC

Outline

1. Intro
2. Contextualizing Power Grid Data and Challenges
3. PredictiveGrid TM Platform Advantages
4. Key Capabilities and Features
5. Examples
6. NI4AI Project Overview
7. Introducing the Grid Data Commons
8. Getting Involved

Data Volumes are Growing Radically



Utility Data Types

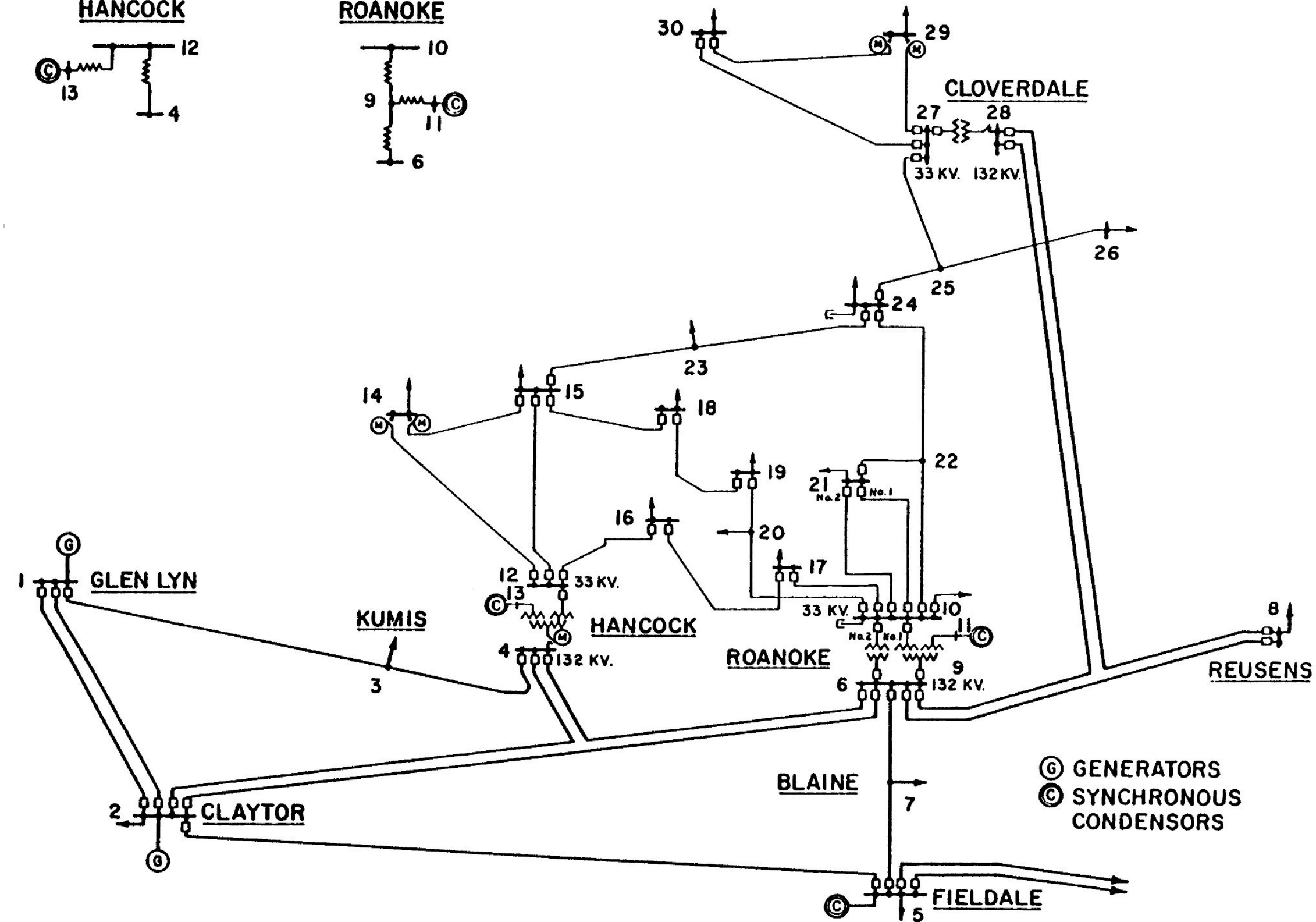
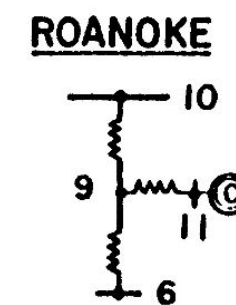
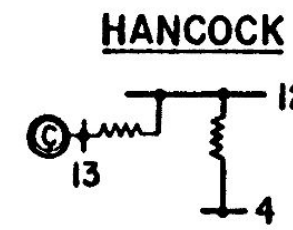
- Grid Timeseries Data
 - 0.001Hz \leftrightarrow MHz
 - AMI \leftrightarrow SCADA \leftrightarrow PMU/DFR \leftrightarrow CPOW
 - Events



Utility Data Types

- Grid Timeseries Data
 - 0.001Hz \leftrightarrow MHz
 - AMI \leftrightarrow SCADA \leftrightarrow PMU/DFR \leftrightarrow Events
- Grid Metadata
 - Assets
 - Internal Metadata
 - Topology

THREE WINDING TRANSFORMER EQUIVALENTS

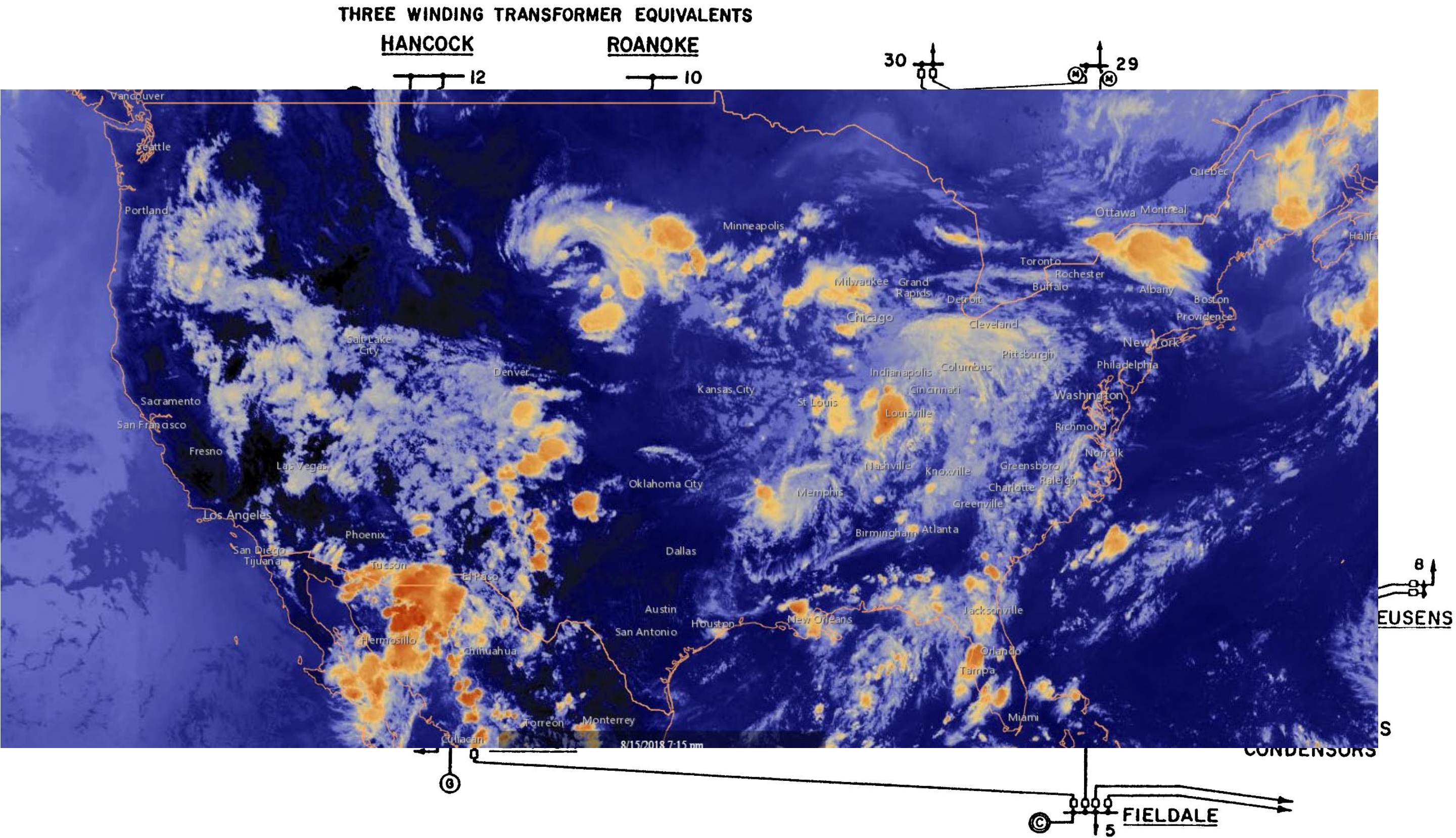


Ⓜ GENERATORS
Ⓢ SYNCHRONOUS
CONDENSORS

http://www.ee.washington.edu/research/pstca/pf30/pg_tca30bus.htm

Utility Data Types

- Grid Timeseries Data
 - 0.001Hz \leftrightarrow MHz
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 - Events
- Grid Metadata
 - Assets
 - Internal Metadata
 - Topology
- External Data
 - Weather
 - Space weather



A screenshot of GOES East Infrared Satellite Image - Latest 24 Hours Western Hemisphere over North America from 8/16/18. (Image credit: NOAA National Environmental Satellite, Data, and Information Service)

- Report rate agnostic
- Fast data lookup and retrieval (millions of points per second per stream)
- Historical and real -time computations
- Cloud-backed, store as much data as needed
- Linearly scalable for data ingestion
- Capable of ingesting **125+M** Points per second sustained
 - **~160_000 PMUs, ~4k WMUs**
- No data silos
 - AMI, PMU, SCADA, CPOW, DFR, Space Weather, events, etc. all co-exist
 - No need to rebuild data infrastructure for each application

Platform System Architecture

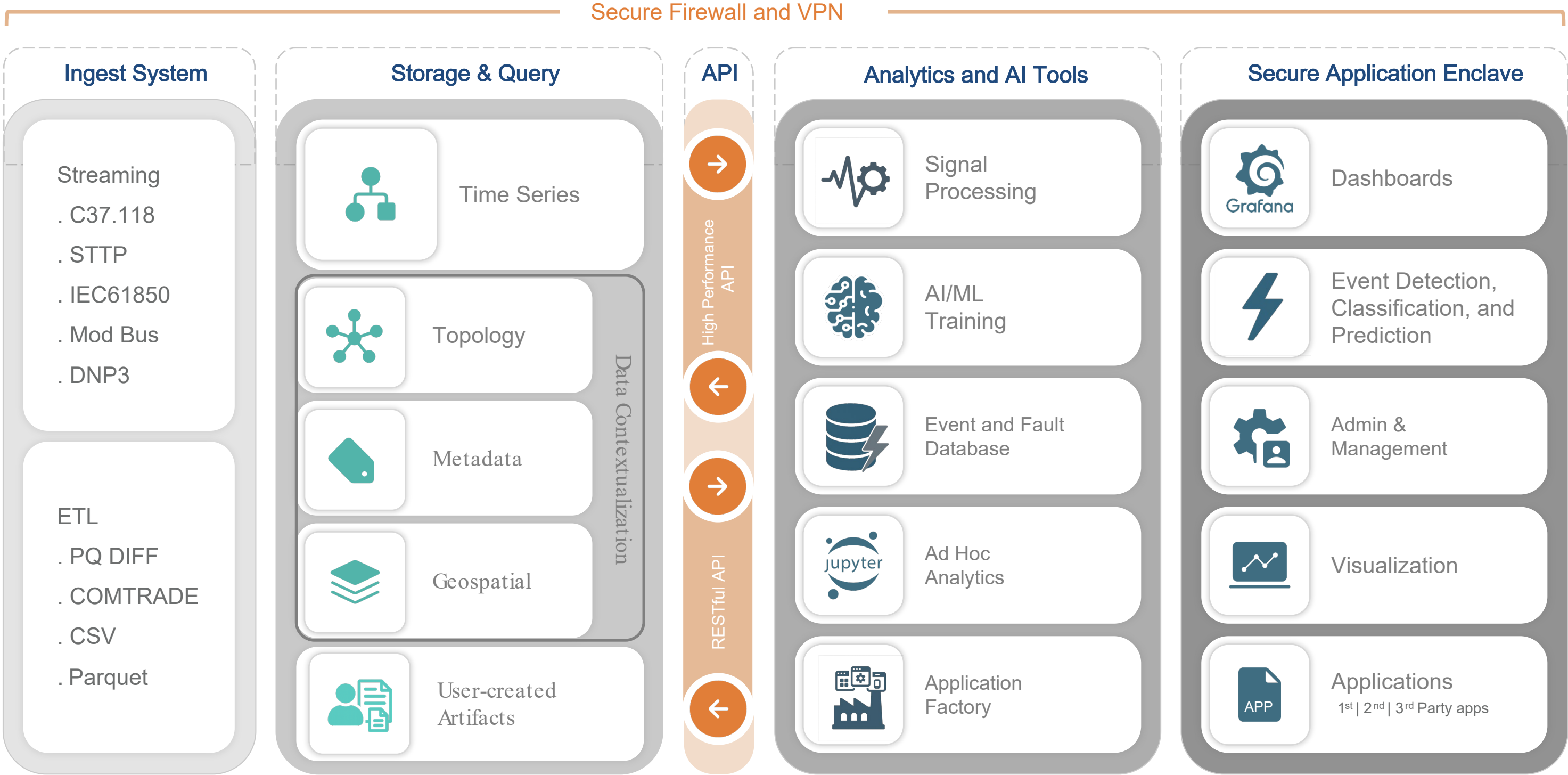
Everything Needed to Create Value from Real -World Time Series

Utility Data Sources

- Data Concentrator(s)
- Historians
- IOT/Devices
- Grid Sensors
 - . PMU
 - . AMI
 - . SCADA
 - . Power Quality
 - . IEDs
 - . DFR
 - . Continuous Point on Wave
 - . Proprietary 3rd Party

External Data Sources

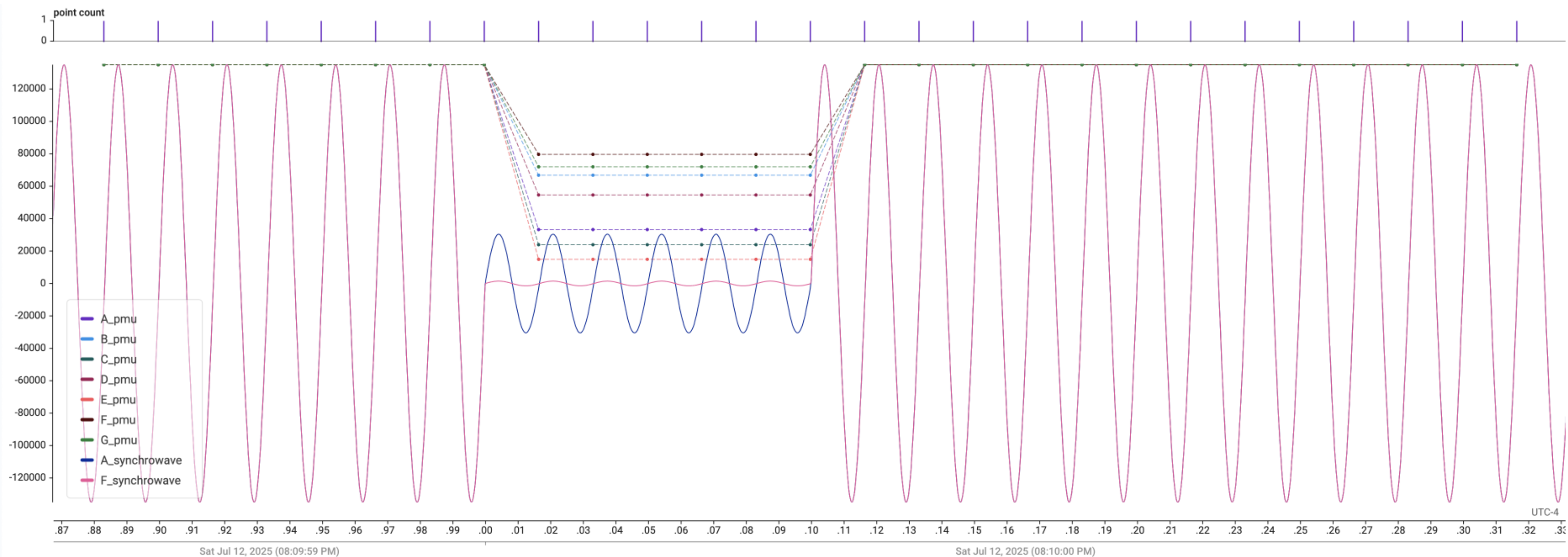
- Weather
- Environmental
- Satellite (time series)
- 3rd Party Sensors



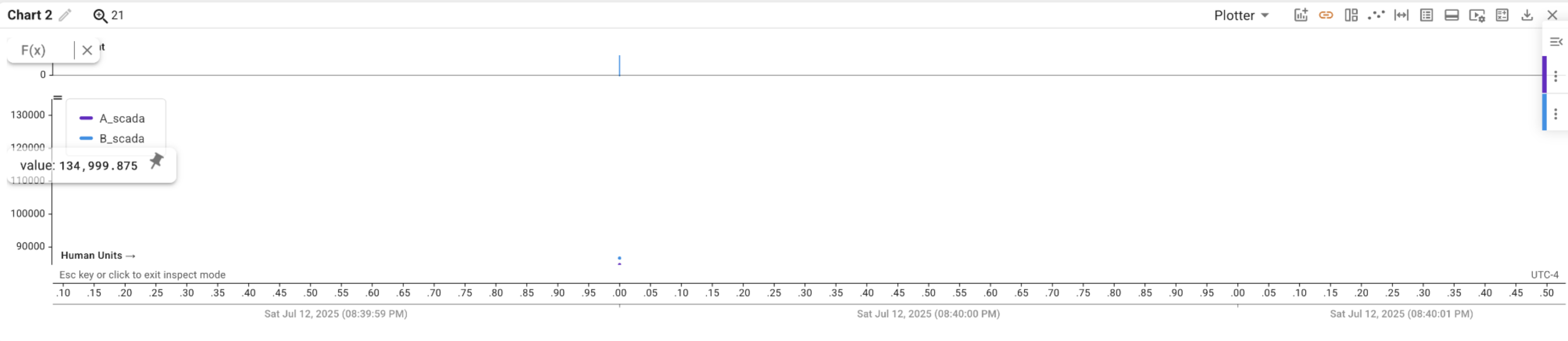
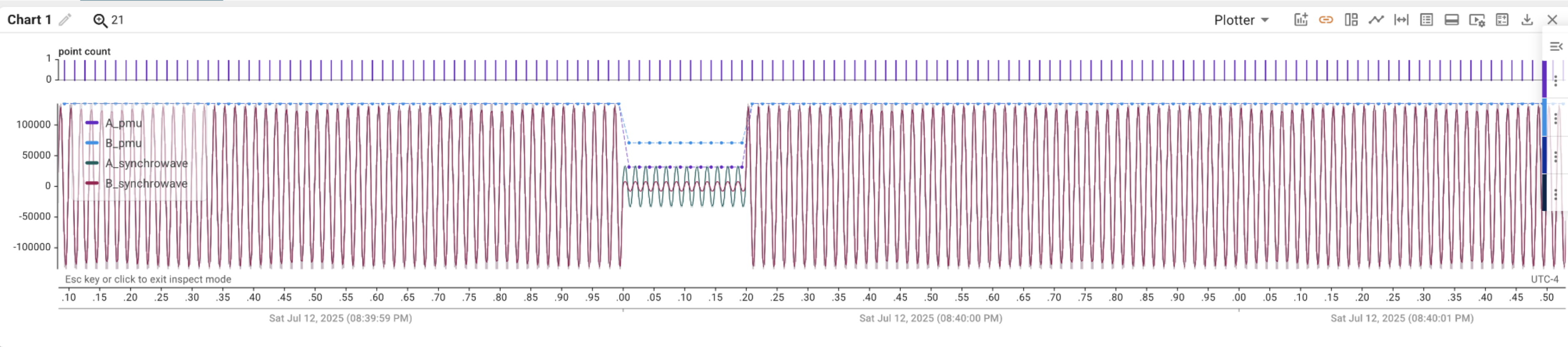
Containerized, Secure, Scalable & Reliable

Deployed on:



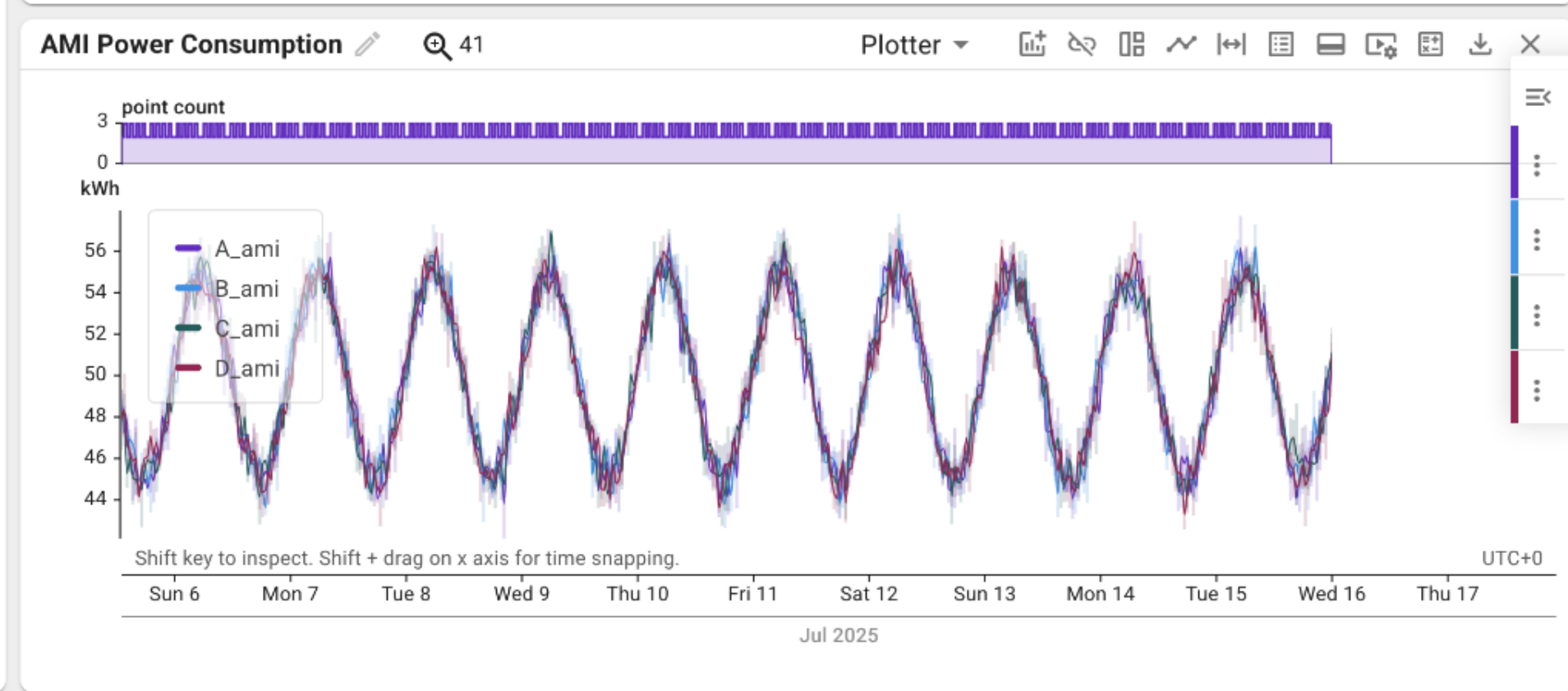
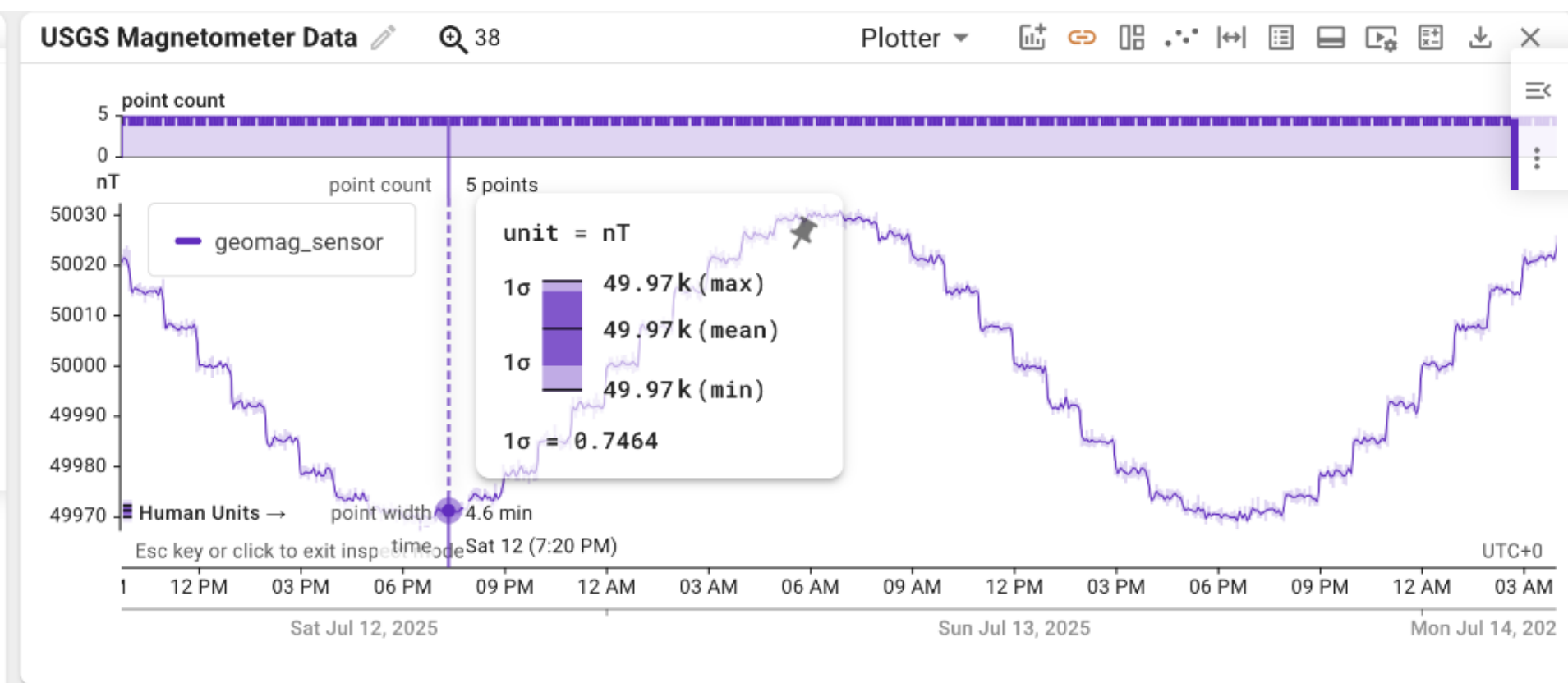
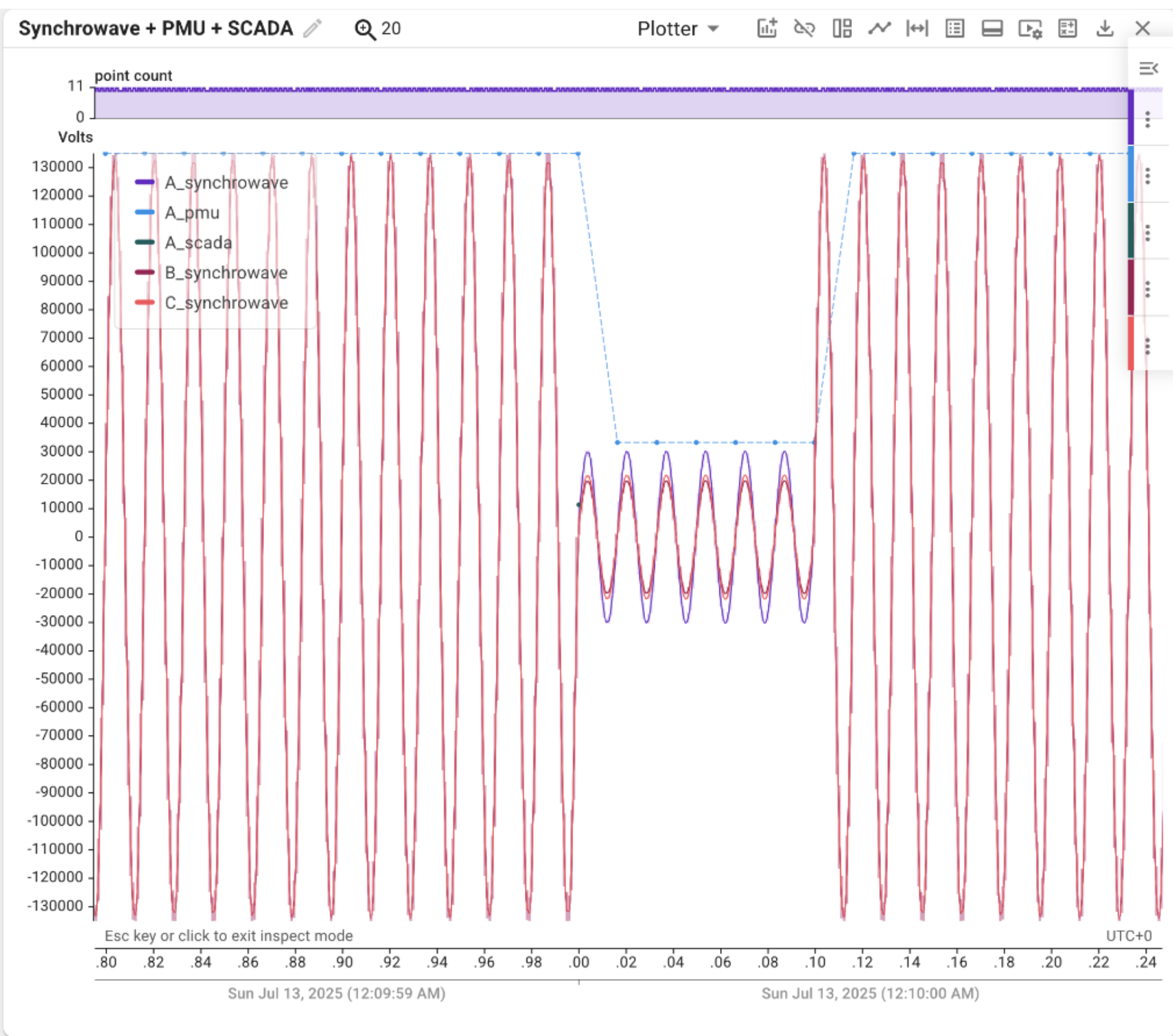


POW and SCADA



PMU, POW, AMI, Space Weather

PingThings



- 2018 ARPA -E Open Innovation Project between PingThings and UC Berkeley
- Open access data that is broadly available to anyone with an NI4AI user account
- Proprietary data ingested as part of pilot projects, where sponsoring orgs controlled data access

“The overarching objective is to remove any and all obstacles to the rapid development, adoption, and deployment of new use cases based on analytics, machine learning (ML), and artificial intelligence (AI) for sensor data measuring the electric grid.”



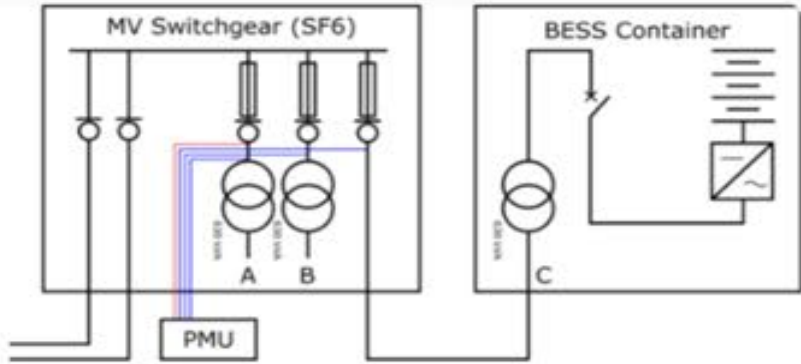
events

Anonymized transmission PMU data for wide-area events



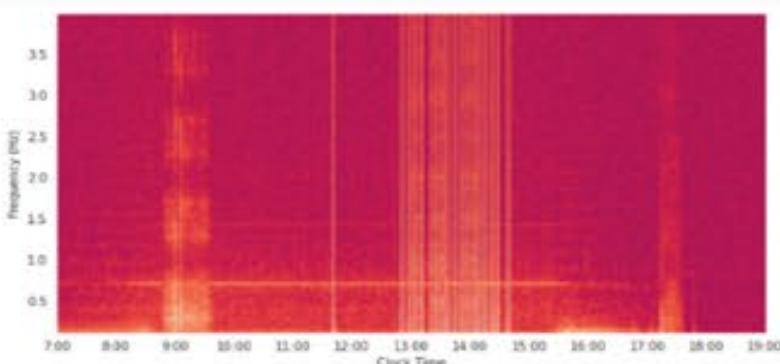
sunshine

PMU data archives from a distribution grid with community solar



POW/EPFL

Point on wave data for battery charging and discharging events



monitoring

Anonymized continuous monitoring data for four generators



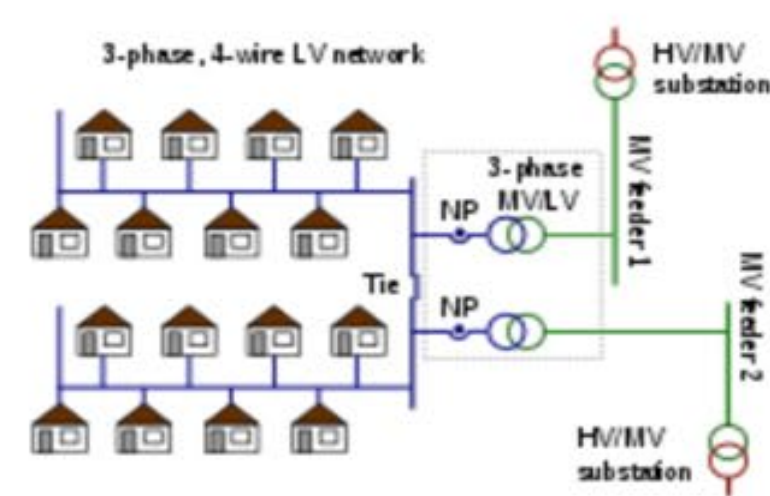
POW/underground

Continuous point on wave data for an underground cable



POW/signatures

EPRI/DOE library of 200+ fault event signatures including three-phase voltage and current waveforms



golden

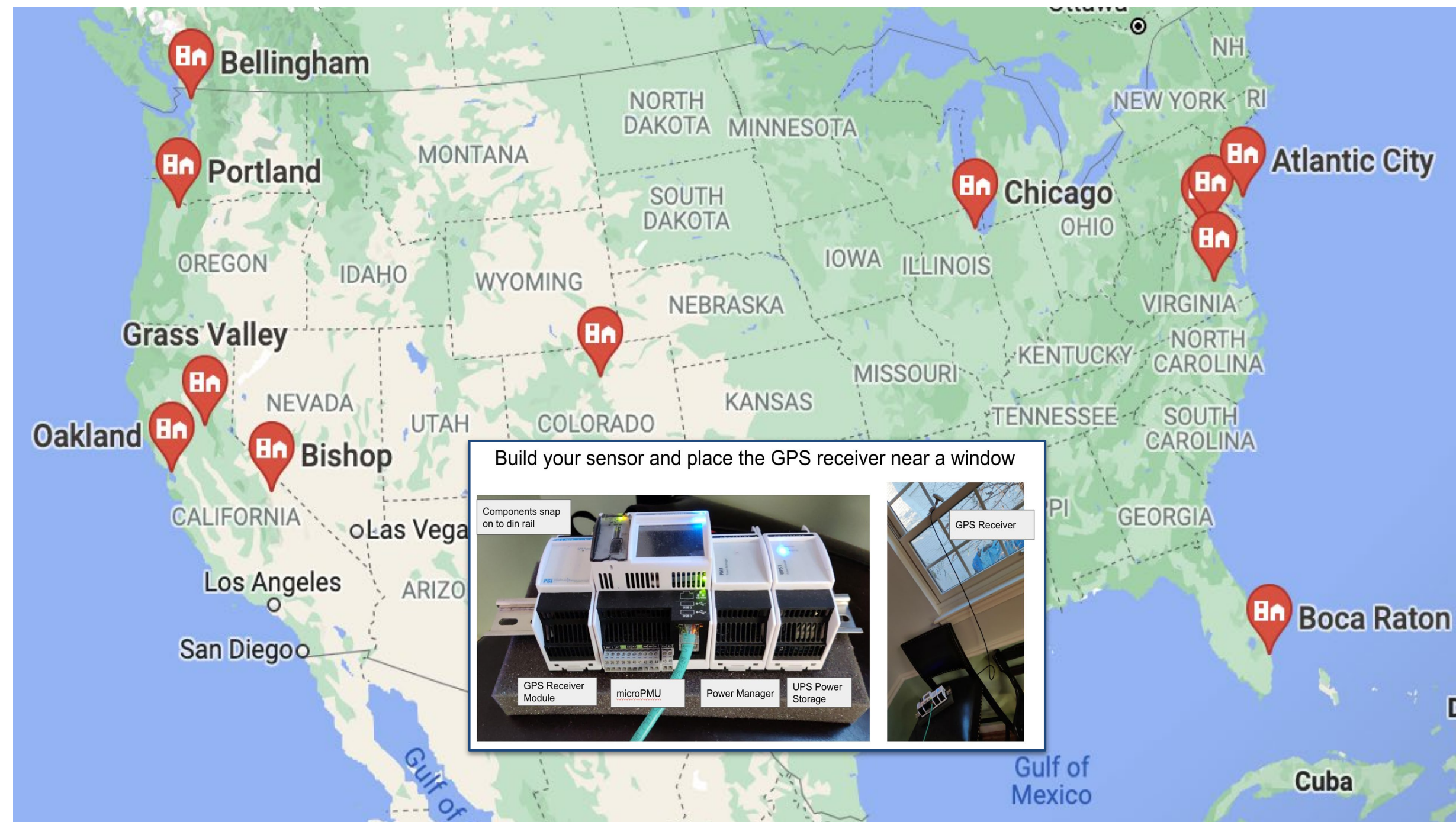
3 months of PMU data from 10 sensors deployed on a



ni4ai

Streaming data from PMUs in wall outlets with wide-area grid coverage

- PowerSide μ PMU
- 60Hz report rate
- Wide Geographic Region



Introducing the **Grid Data Commons**

- Expanding NI4AI's vision, hosted by PingThings
- Not limited to US data
 - Global data sets encouraged!
- Collaboration between industry, academia, and research institutions
- Roadmap soon to be announced!

- Seeking contributions
 - Datasets
 - Analytic models
 - Research partnerships
- Open call for dataset ingestion, requests, and collaboration
- Contact us to discuss
 - commons@pingthings.io
- Let's collaborate!