

PingThings

The PredictiveGrid™ Platform *The Advanced Sensor Analytics and AI Platform*

The Problem: Operating in the Dark

There is a vast, untapped source of valuable information buried in the data collected from the grid. However, without the ability to extract and leverage this information, **utilities are left in the dark**. What is the health of this transformer? Can we safely energize these feeders? Do we need to mobilize a crew for that fault?

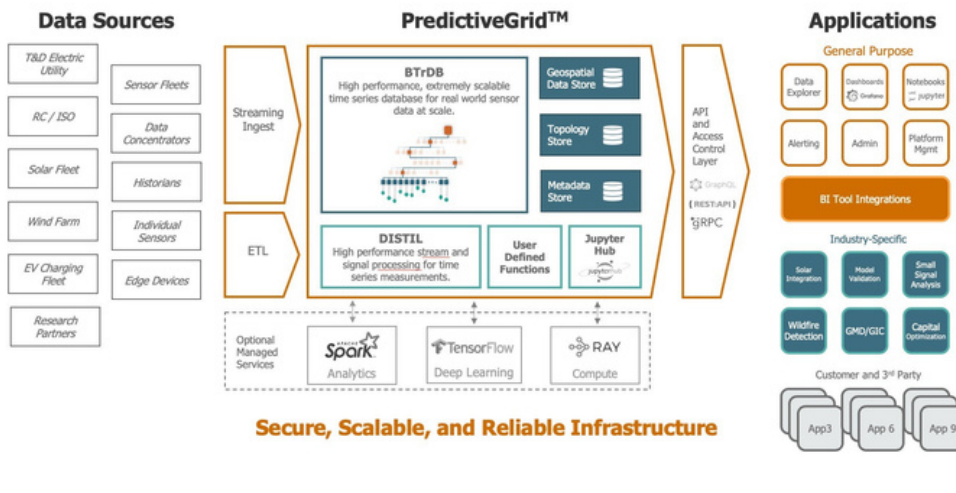
The Opportunity: Leveraging Existing Sensors

Millions of modern sensors, each taking sub-second measurements, are already deployed across the grid — **if only the data were easily available and usable**. Unfortunately, utilities' legacy data systems were not designed to handle the volume, velocity, and variety of data that contemporary sensors provide. These data "historians" were built to archive data and comply with regulatory requirements but not to use and learn from the data.

The Solution: Scalable Sensor Analytics on the PredictiveGrid™

The PingThings' PredictiveGrid™ is a distributed, horizontally scalable, fault-tolerant data analytics platform purpose-built for millions of sensors from electric utilities. It was **architected to ingest, store, access, visualize, analyze, and learn from this time series data with nanosecond resolution** at previously unimaginable scales.

Performance benchmarks demonstrated that the PredictiveGrid™ could simultaneously ingest and process data from every phasor measurement unit (PMU) in North America. It enables **virtually every analytic use case** including machine learning, deep learning, and artificial intelligence applications.



Overview

PingThings' PredictiveGrid™ is an advanced sensor analytics and AI platform for ingesting, storing, accessing, visualizing, analyzing, and learning from massive amounts of time series data.

Highlights

- The scalable analytics platform for high resolution sensor data.
- Supports PMU, continuous Point-on-Wave, PQ, and more with nanosecond time resolution.
- Ingests both streaming data and massive historical archives.
- Supports sample rates up to 1GHz.
- Scales easily to millions of sensors with petabyte data sets.
- Interactive visualization with <250ms queries at any scale.
- Your code is versioned, why not your sensor data and analytic results? Ours are.
- Never lose data again; automatic data replication and self-healing for system resiliency.
- APIs for major languages.
- State-of-the-art lossless data compression.
- Purpose built for both ad-hoc and real-time analytics.
- Uses best-of-breed machine learning and deep learning to enable AI out of the box.

3 Deployment Options



Use Cases for Data

Customers Drive ROI through Specific Analytics

- Advanced state estimation
- Awareness of real-time loads
- Cyber security and intrusion detection
- DG characterization
- Enhanced transformer and other asset modeling
- Failure signature identification
- Fault and anomaly detection, classification, prediction, and localization
- Island detection
- Line segment impedance model validation
- Oscillation detection
- Outage management
- Phase (ABC) identification
- Phasor-based control
- Rapid post-event analysis and reporting
- Sensor data cleaning and management
- Wide area monitoring
- Situational awareness
- Topology detection and estimation
- Voltage magnitude profile and variability
- And much more

Per McKinsey, Grid applications driven by sensor data are expected to yield **\$63B** in annual benefits.

"By 2020, [Synchrophasors] will be saving Californians from \$210 million to \$360 million in reliability benefits each year, plus on the order of \$90 million per year in reduced cost of electricity."

PredictiveGrid™	What We Do	Why It Matters
Future Proof for the Next Decade	<ul style="list-style-type: none">• Scale to 10,000's of sensors with sample rates up to 1 GHz.• Support any sensor type.• Benchmarks indicate PredictiveGrid™ is 1000x faster than competitors.	Data volume increases every year. Where competitors struggle with today's data volumes, PredictiveGrid™ can handle the vastly increased demands of the future.
Instant Visualization	Querying a year, month, minute, or microsecond of data return nearly instantly. Zoom and pan through your data with the same ease as Google Maps.	Rapid queries enable iterative data exploration to ask and answer questions easily. Competitors' solutions require an engineer to get coffee in between queries, making most analyses impractical.
Ad Hoc Analysis and Reporting	Query your data and analyze it with our integrated Jupyter Notebooks: an open source web application to create and share documents containing live code, equations, visualizations, and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.	An industry standard, Jupyter combines the interactivity of a spreadsheet with far more powerful tooling, in a report-ready format that lets users annotate and share their work easily. This means faster analyses, reproducible output, and less time preparing or rerunning reports.
Deep Learning and Machine Learning	The best deep learning and machine learning toolkits, like Google's TensorFlow, are open source and PredictiveGrid™ integrates with them.	AI will transform the grid. Better tools will allow utilities to attract the right talent and leverage a vast community of experts. Proprietary solutions shackle you to vendors and make help hard to find.
No Vendor Lock-In	PredictiveGrid™ integrates with the best open source tools and makes it easy for you to access and even export your data.	Proprietary software and data formats create vendor lock-in. We believe in having state-of-the-art software, analytics, and machine learning so that you don't want to leave.
Reliable and Resilient	Built with software engineering best practices, PredictiveGrid™ uses containerization with a redundant and fault tolerant, distributed architecture.	Our goal is real-time analytics and advanced AI using grid data. Resilience and uptime are prerequisites, so we designed the system to recover, repair, and keep running.
Business Friendly	PredictiveGrid™ uses open source software, is horizontally scalable on commodity hardware, and deploys easily. PredictiveGrid™ can run in parallel to other systems and be setup segregated from operational networks to the greatest extent possible, making it low risk.	PredictiveGrid™ is easy to deploy with rapid Time-To-Value. The platform is flexible enough to fit your specific business needs.