OSIsoft® UC 2010

Real Time Information — Currency of the New Decade

Next Generation of Wind Data

Integrating SCADA concepts for improved wind assessment and operations

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JOHN DEERE

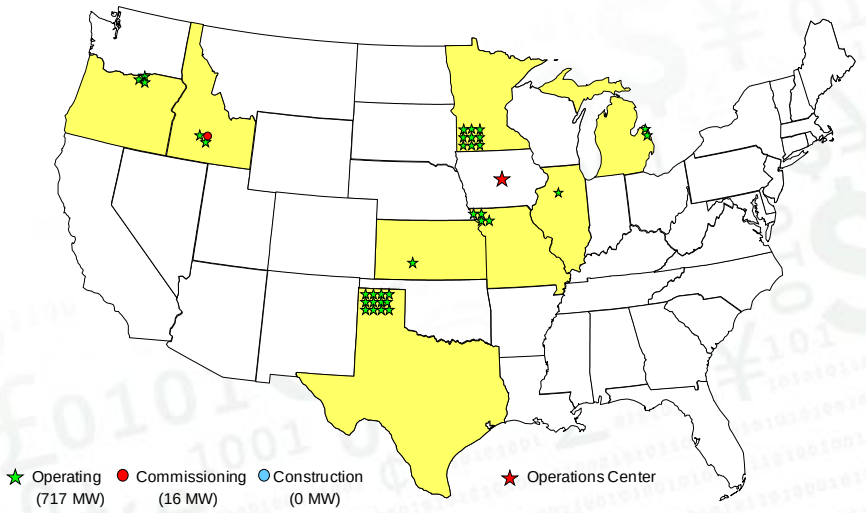
Wind Assessment and SCADA Manger

John Deere Renewables

John Deere Renewables

Developers, owners, financing partners, constructors, and operators of mid-sized wind farms

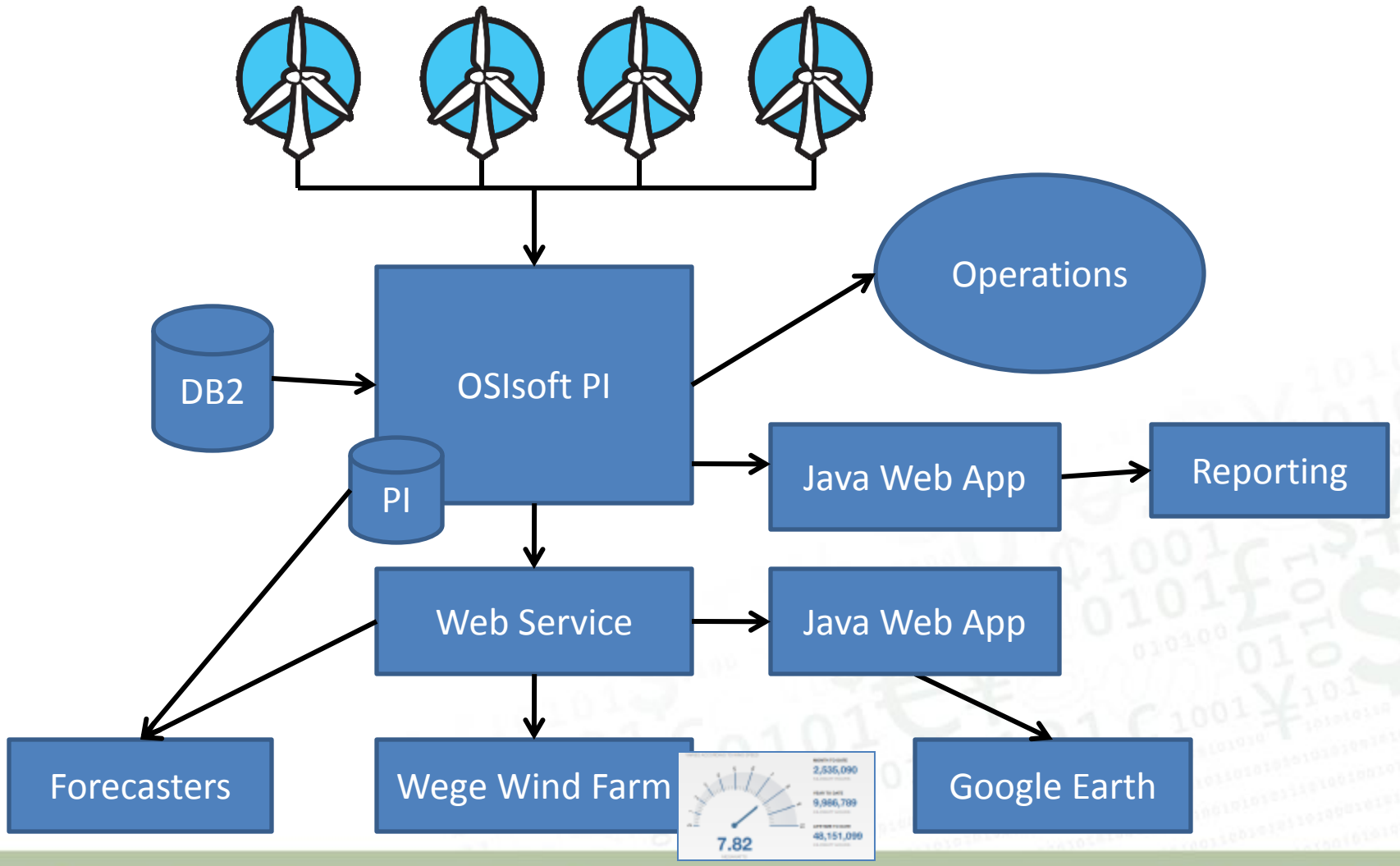
- Started in 2005 with community-based wind, tied to the landowners
- Current fleet:
  - 730+ MW of generation capacity
  - 420 turbines
  - 37 farms
  - 8 U.S. states



JDR SCADA Monitoring system

- JDR SCADA was custom built using the PI system
- Data from all wind turbines in fleet
- 4 WTG manufactures
- External access to 3rd parties
- Google Earth interface

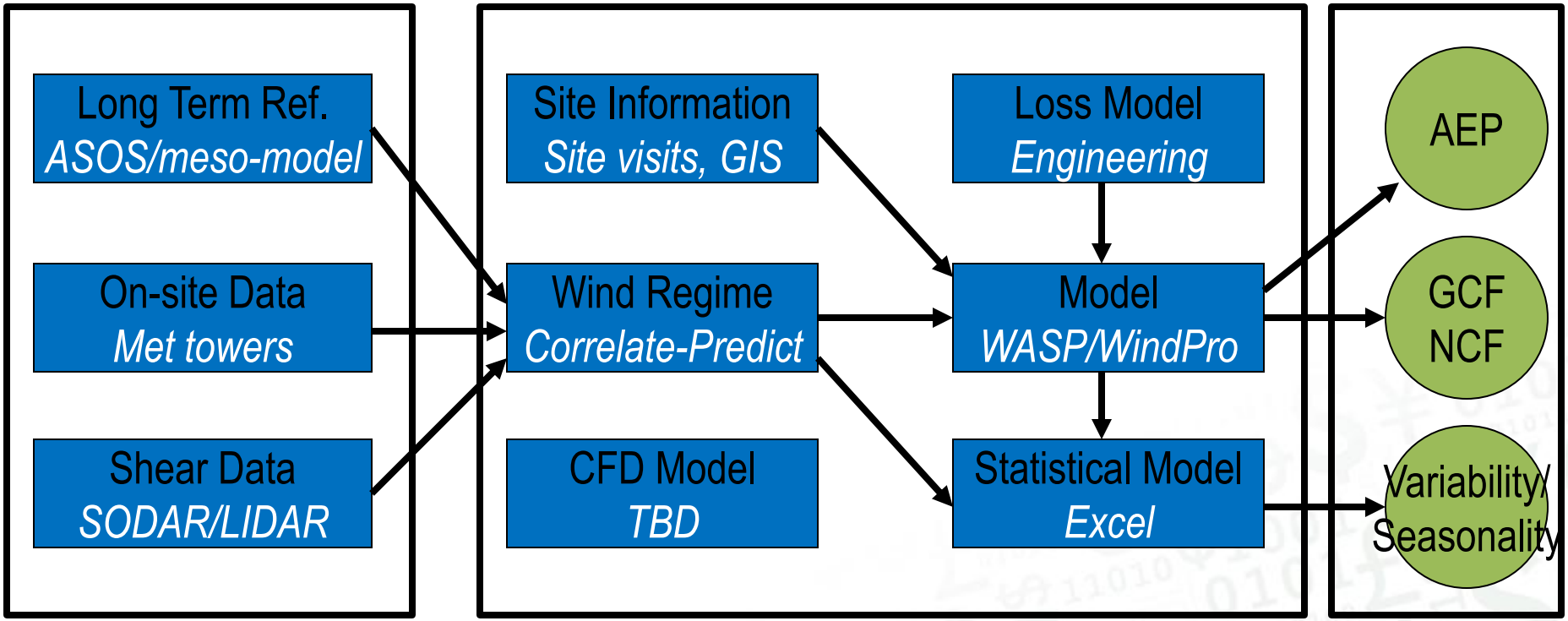
JDR SCADA Monitoring System



Wind Assessment and Operations

TIME FOR INNOVATION

Wind Assessment



Wind ➡ Modeling ➡ $$$

Wind Data Measurement

Long Term Ref.
ASOS/meso-model

On-site Data
Met towers

Shear Data
SODAR/LIDAR

Wind Data Measurement

Long Term Ref.
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Wind Data Measurement

Long Term Ref.
ASOS/meso-model

On-site Data
Met towers

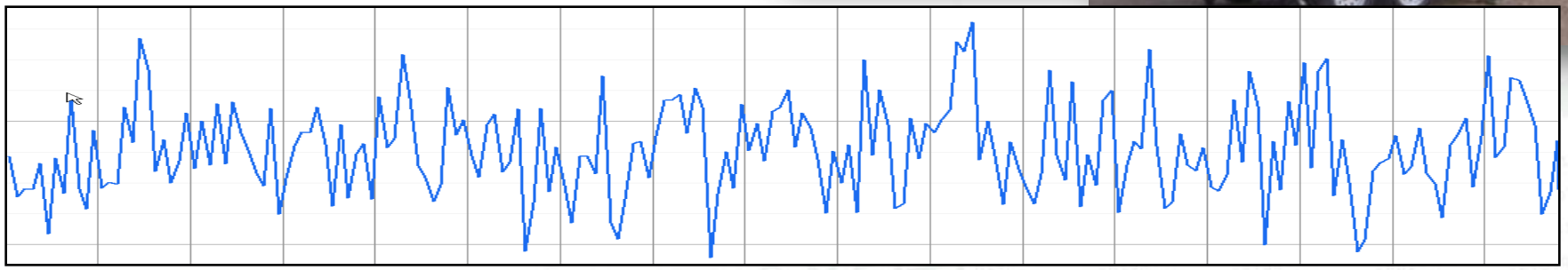
Shear Data
SODAR/LIDAR

Wind Regime

Long Term Ref.
ASOS/meso-model

On-site Data
Met towers

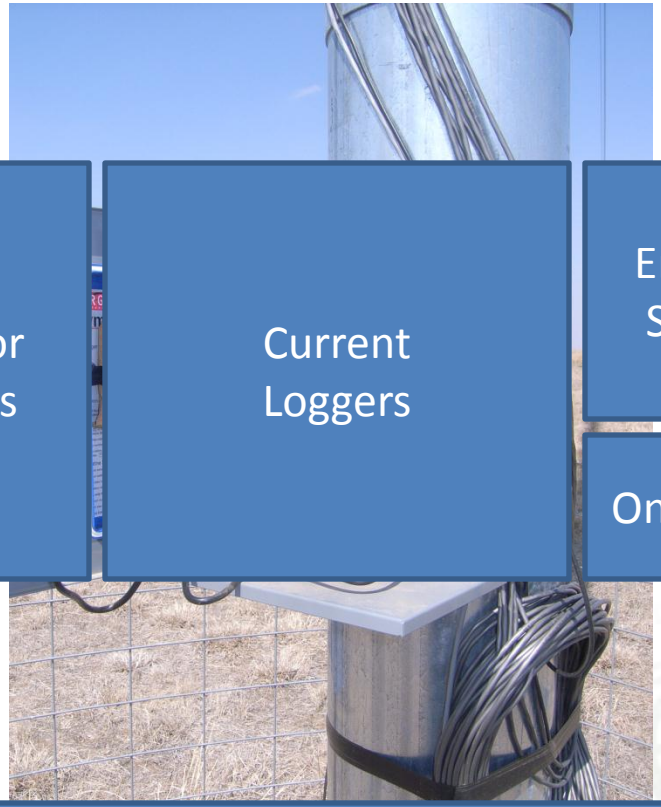
Shear Data
SODAR/LIDAR



Building better tools

- Convergence of technologies and industry
- New tools can be created by the application of PI process technologies for the more complete collection of data:
  - High Frequency
  - More sensors (integrated, coordinated)
  - Historization and storage of time series
  - More complete evaluation of recorded data
  - Integration with other systems (SCADA, NWP)

Wind Data Loggers



12 Sensor Channels

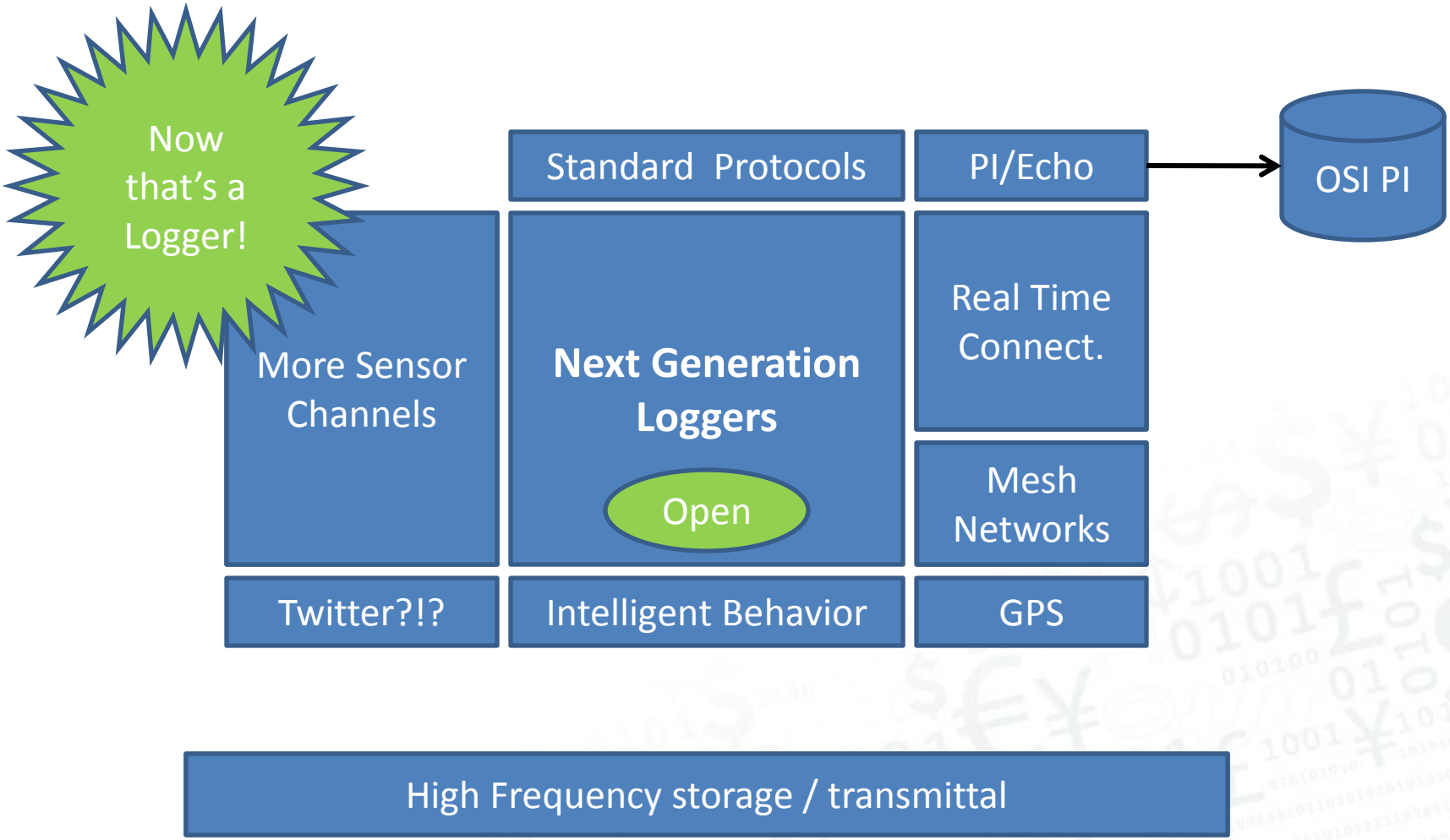
Current Loggers

Email via Sat/Cell

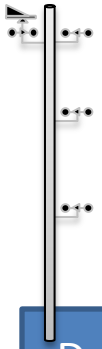
Once a Day

10 min average data

Next Generation Loggers



Loggers Integrated with PI



ZOMG!!11!!
LIGHTNING@!!!

Data Loggers

SODAR/LIDAR

Reference

OSI PI

QA/QC

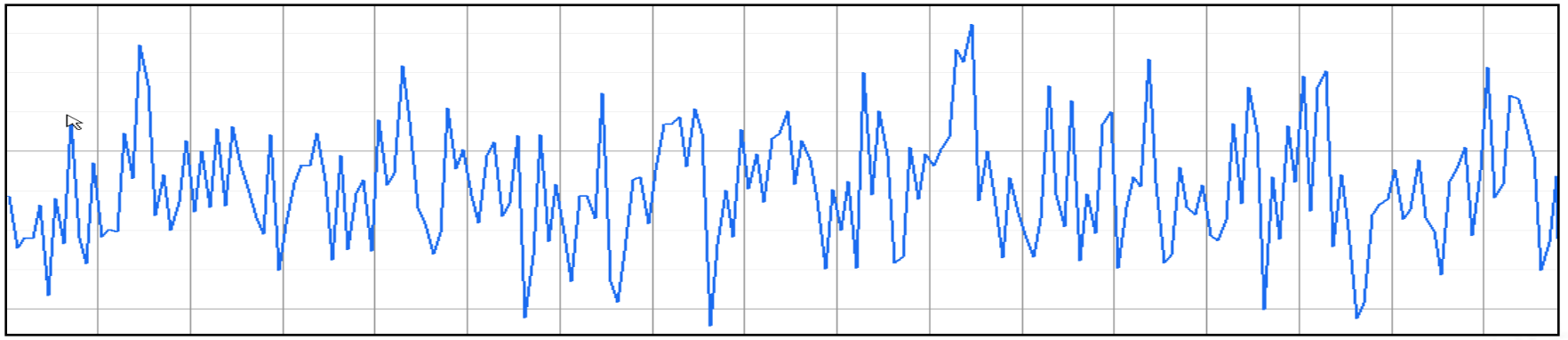
Real time Monitoring

Common Format

Consistent Storage

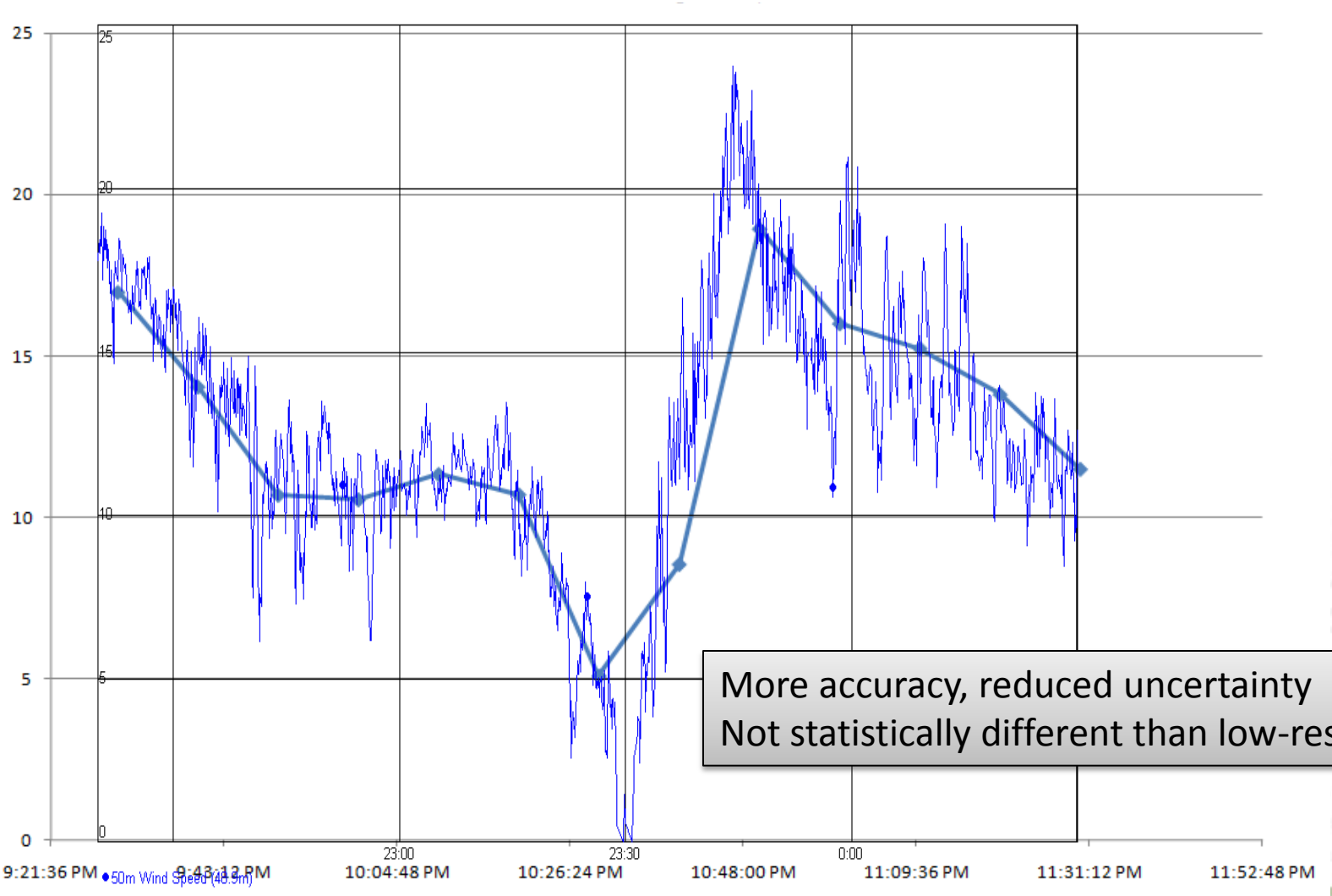
Analysis Tools

QA/QC of Wind data



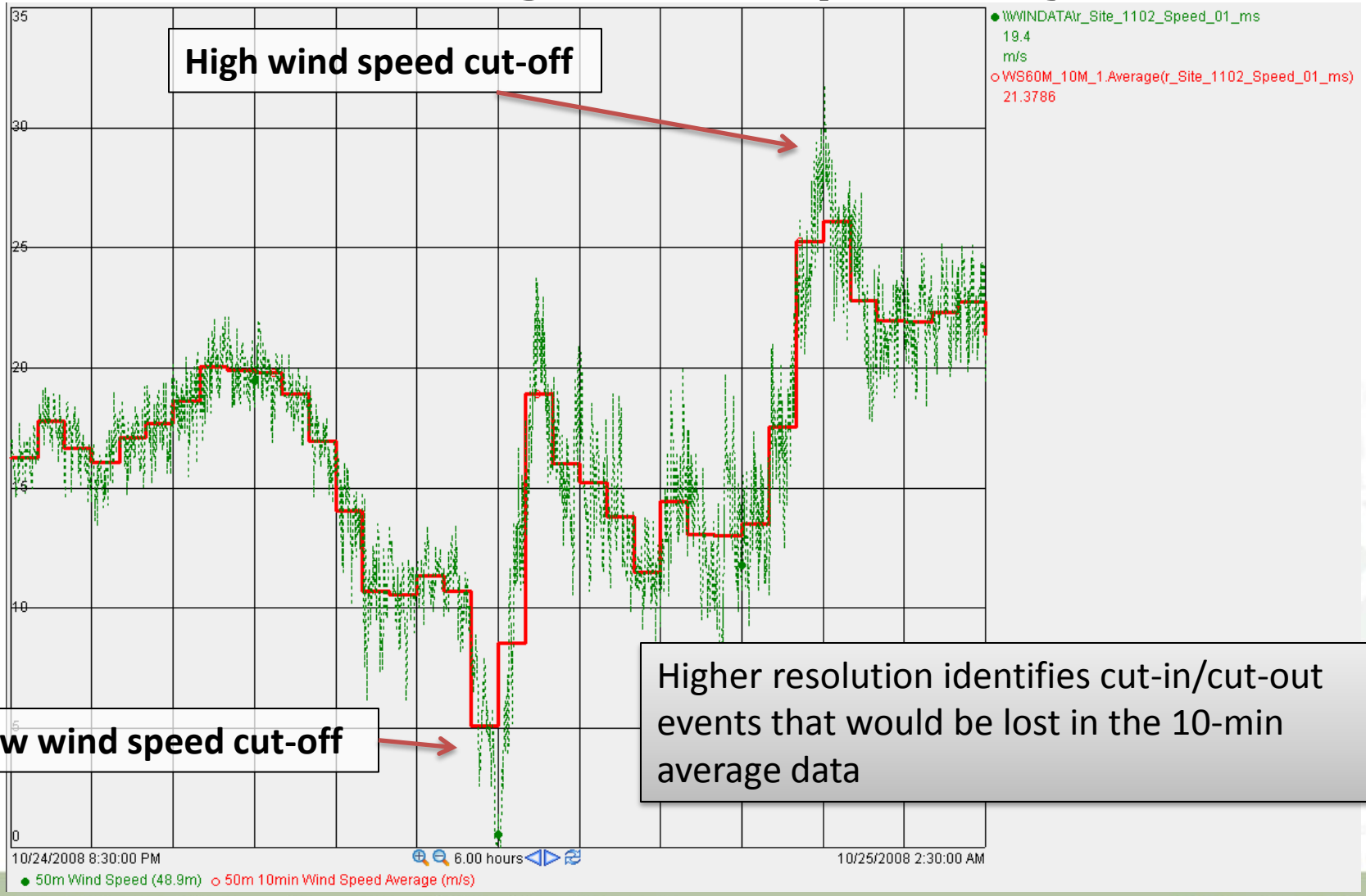
Missing Data	Icing Events	Sensor Changes
Tower Shadow	Damaged Sensors	Calibration Issues
Vibratory Mode	Sensor Degradation	Rain Events

Value of High Frequency Data



More accuracy, reduced uncertainty
Not statistically different than low-res data

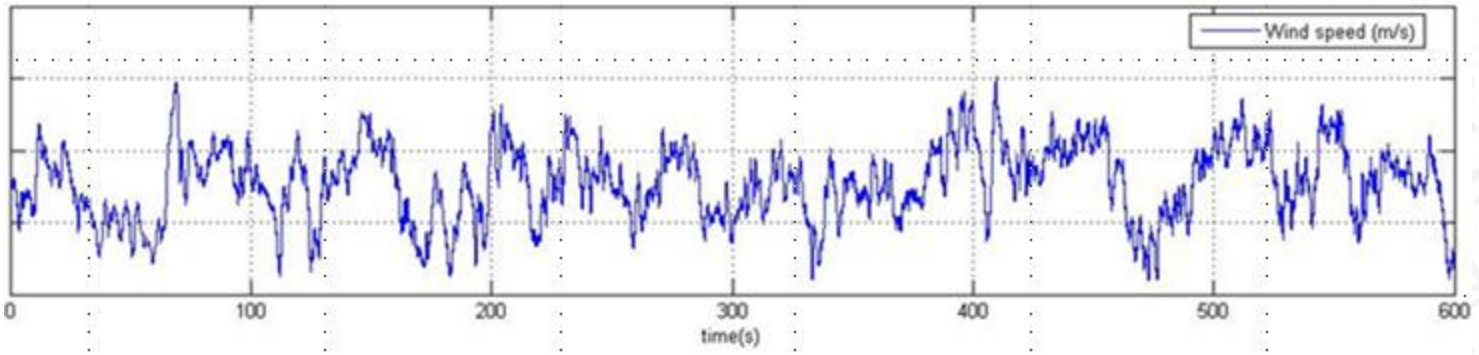
Value of High Frequency Data



Higher resolution identifies cut-in/cut-out events that would be lost in the 10-min average data

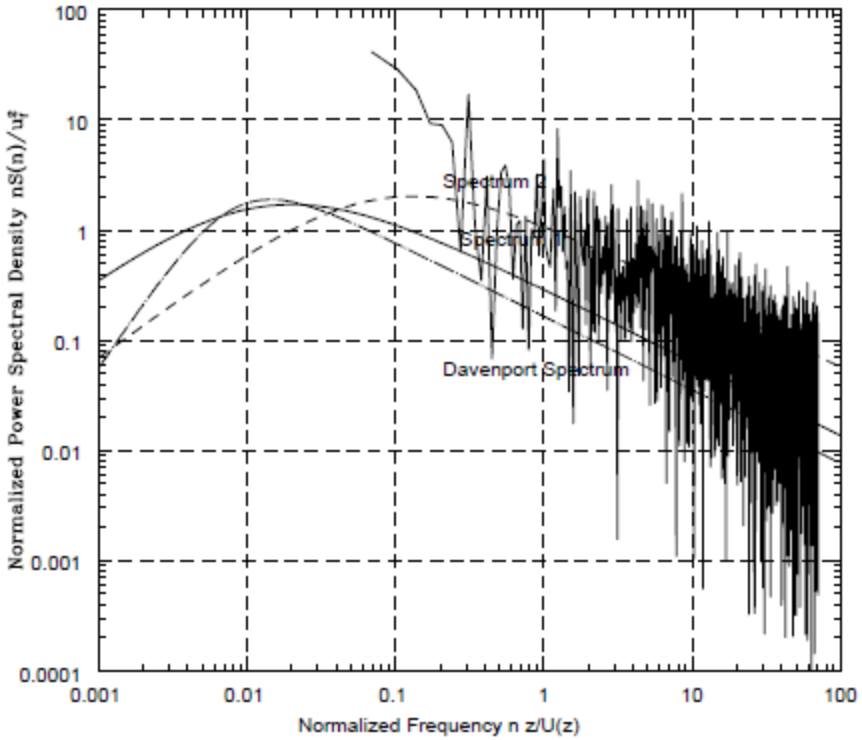
Turbulence Calculations

- Looking at turbulence in less than 10-min average data provides more insight
- Data recorded at high resolution would provide the source for better analysis



Signature of Gusts

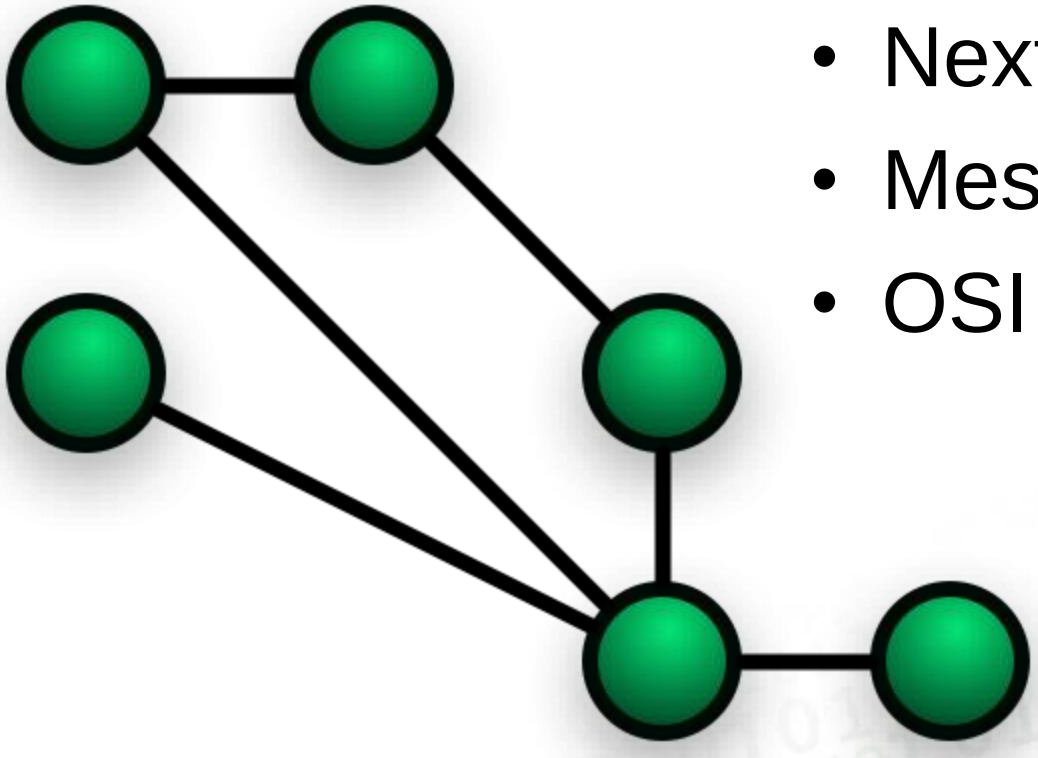
- Defining a spectral density analysis could define a '*signature*' of the turbulence.



Applications of Next Generation Loggers and PI Integration

RIDGELINE SENSOR NET

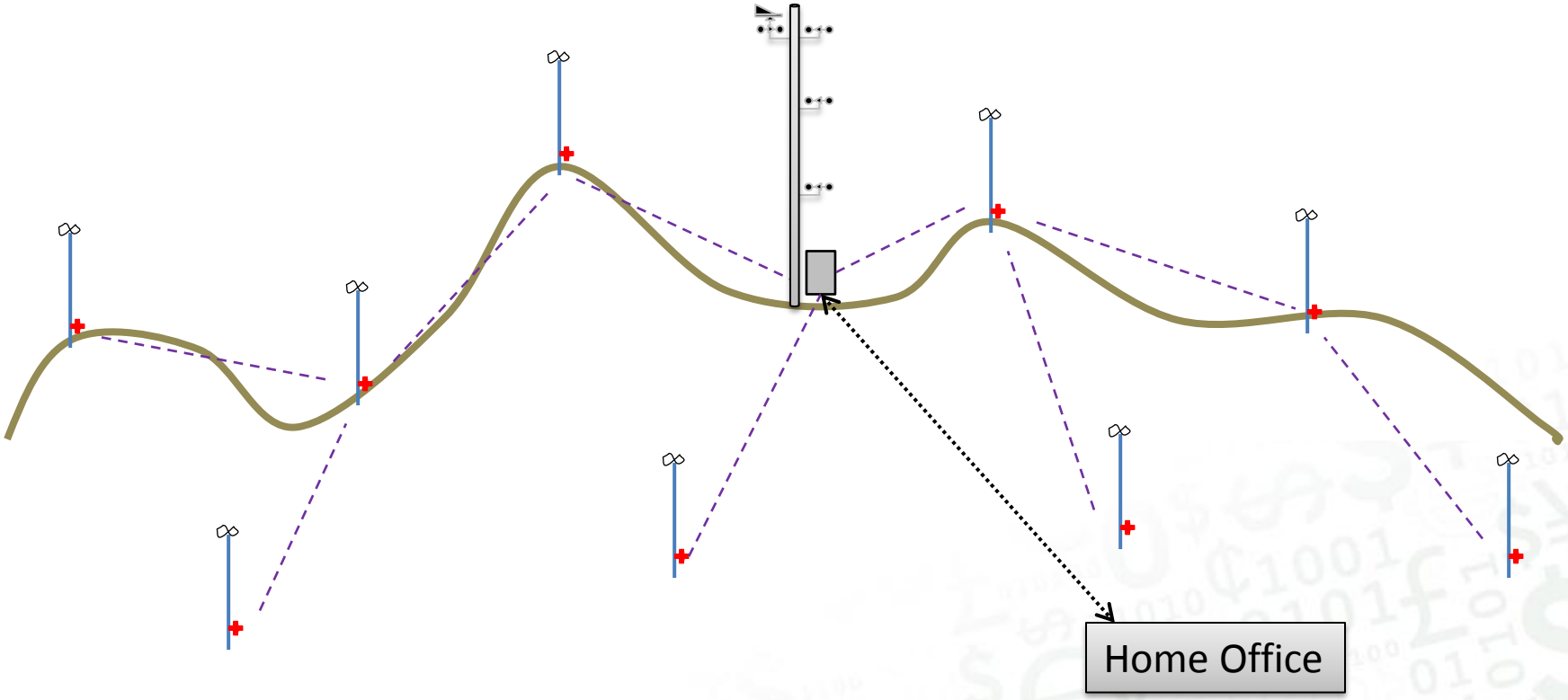
Ridgeline Sensor Network



Mash-up of technologies:

- Next-gen loggers
- Mesh networking
- OSI PI technology

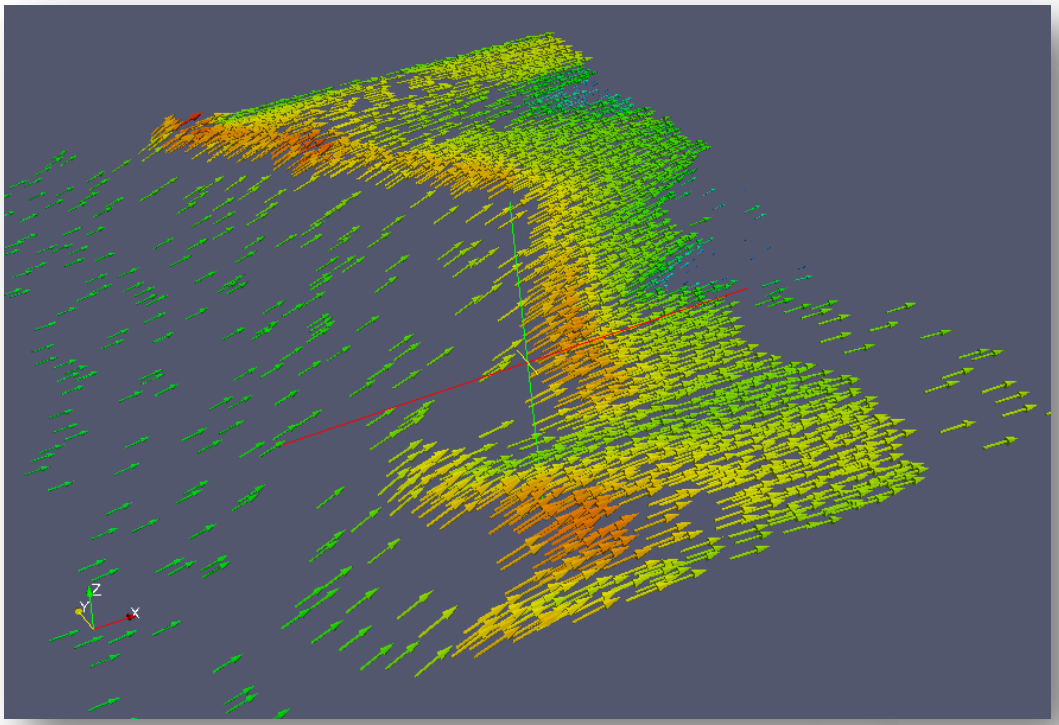
Ridgeline Sensor Network



Ridgeline Sensor Network

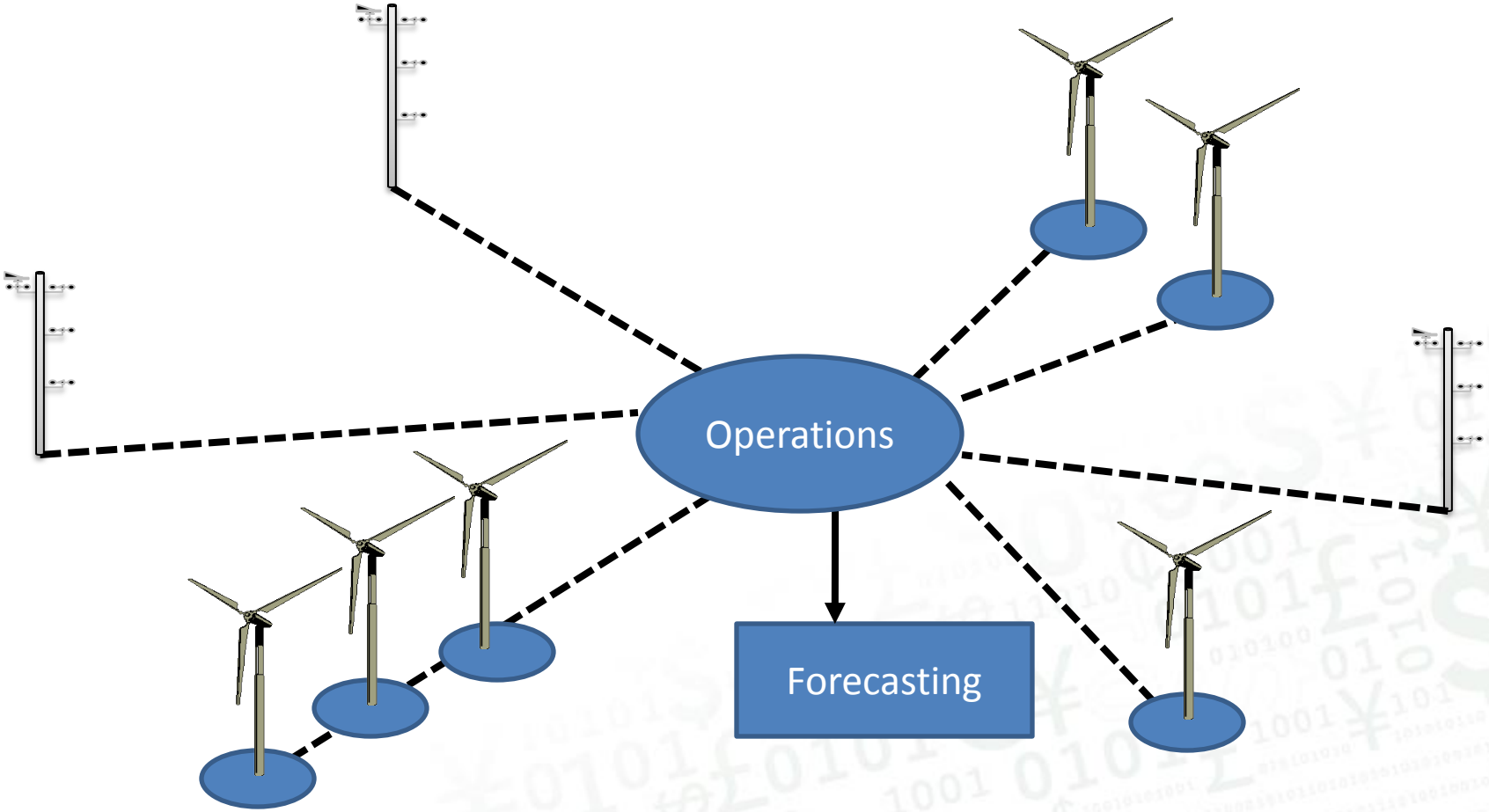
- Scout towers deployed along ridge line
- Collecting synchronized data
- Reporting back to the central tower

Ridgeline Sensor Network

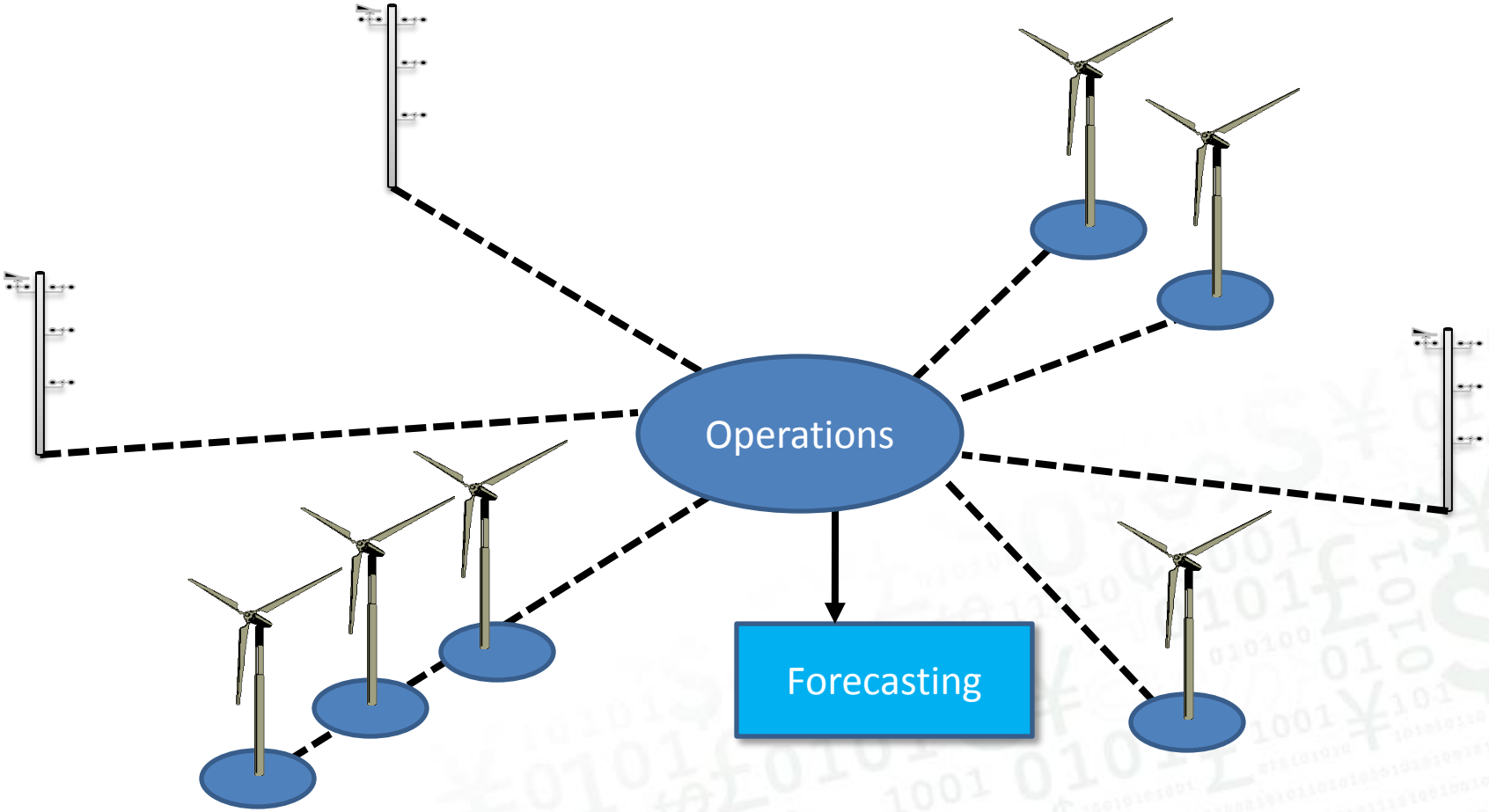


- Data is used to characterize wind flow over the ridgeline
- Validate CFD analysis
- Many applications beyond ridgeline

Community of Sensors



Forecasting Improvemetns



Future of Wind

Opportunity:

- Improved loggers
- More sensors
- Higher frequency
- New applications of technology in wind

Results:

- Refinement of analysis
- Reduced uncertainty

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Thank you