

Oscillation Detection

Real Time Dynamics Monitoring System (RTDMS)

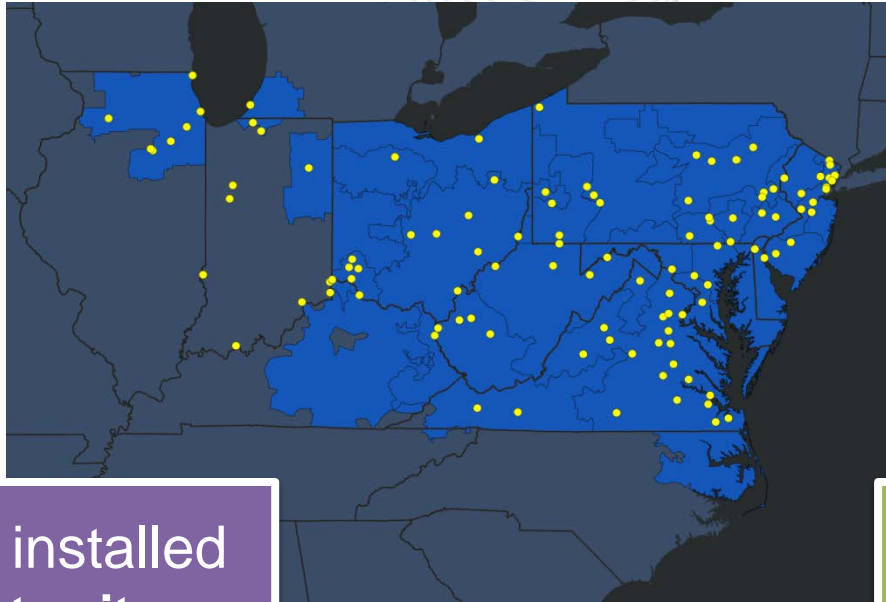
DMS - Phasor Data Quality Improvement

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Subbarao Eedupuganti, Sr. Engineer

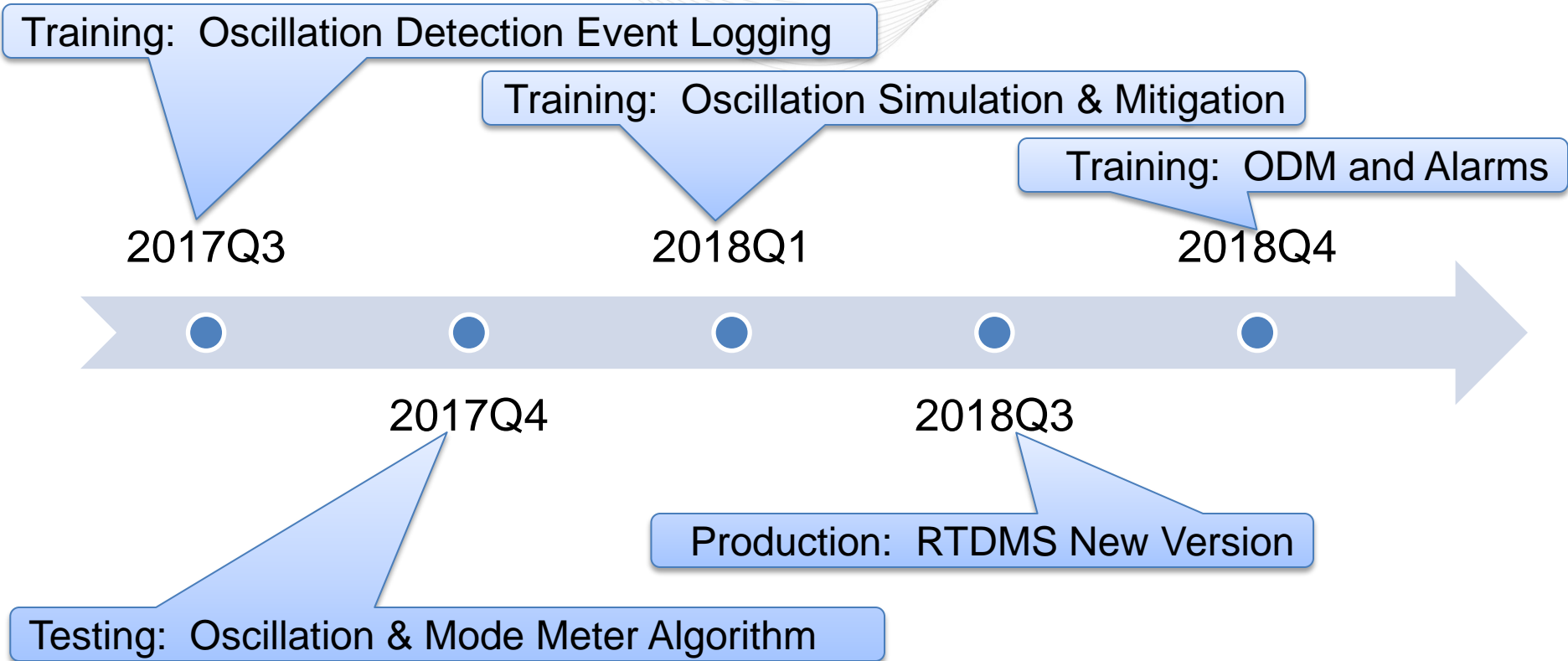
Outage Analysis Technologies

- Vision: To enhance workforce performance through advanced and integrated tools, and increase study engineer visibility into outage conflicts through expanded automated study.
- TSA/VSA
- RTDMS
- Emergency Procedures
- SmartLogs
- Intelligent Event Processor



**~400 PMUs installed
within PJM territory**

**PMUs installed at
+120 substations**



Oscillation Detection in new RTDMS:

Oscillation detection -

- RTDMS has new algorithm to detect major system oscillations and categorize the type (forced, local, and inter-area) based on frequency.
- RTDMS can detect oscillations in system voltage, voltage angle or voltage angle derivative, real and reactive power flow signals.
- Based upon the oscillation frequency, it will detect and categorize the oscillations in 4 bands: Speed Governor, Inter-area, Local Control System, and Torsional Dynamics.

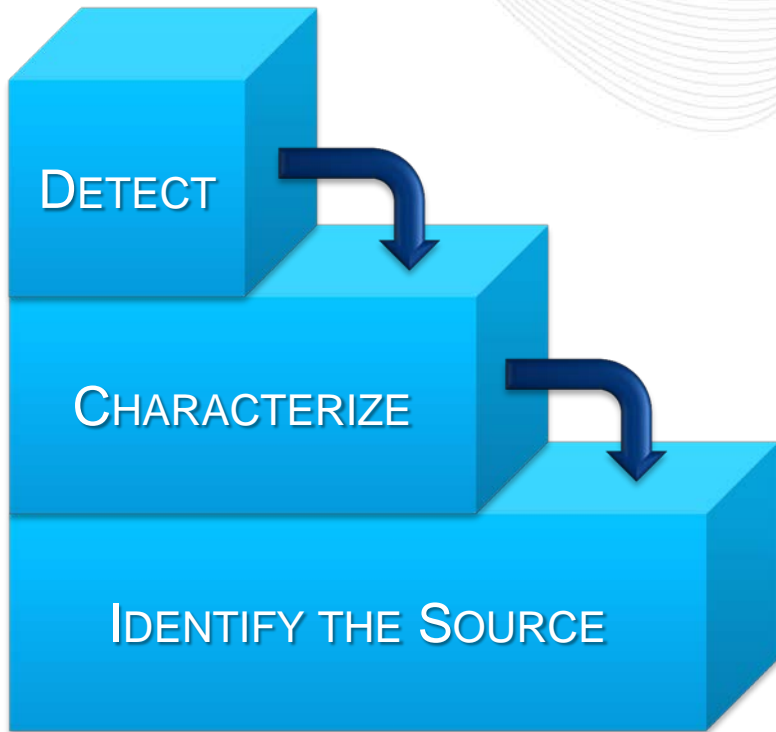
Mode Meter monitoring -

- Monitors known oscillations (manually created as a mode meter rule) and can also provide mode shape.

Additional Features (future scope):

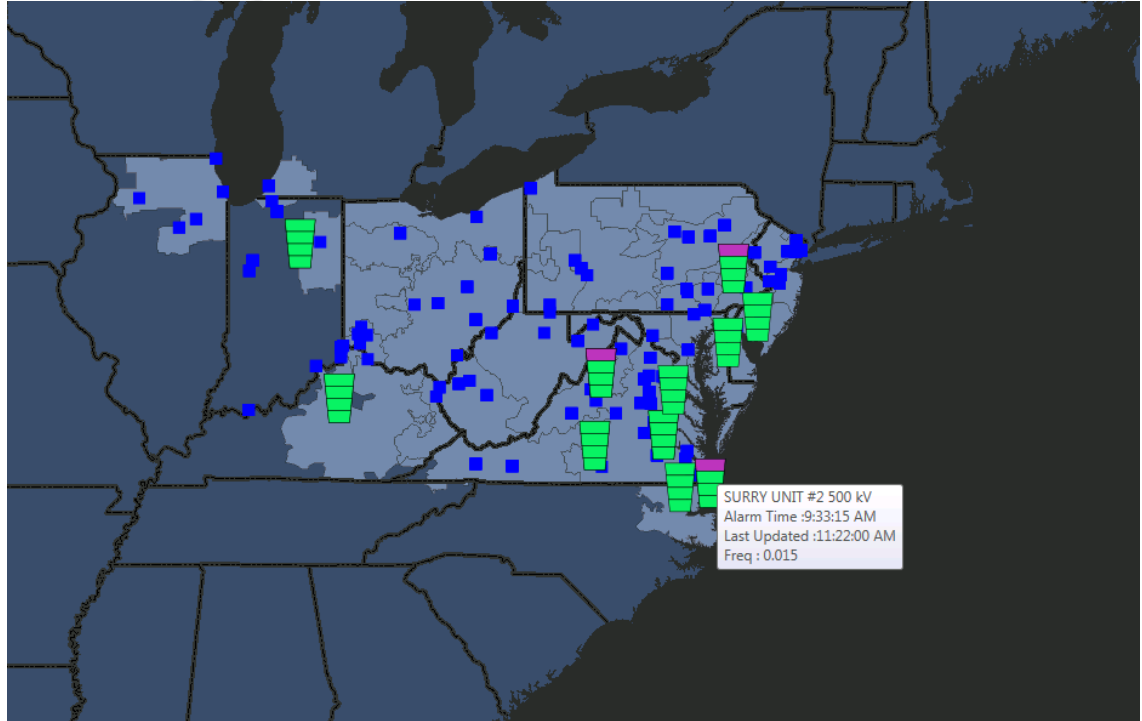
- Power flow path calculations (interfaces).
- Angle pair calculations.
- Voltage and Angle sensitivity.
- Islanding detection.
- Generation trip and load trip detection





Three main steps in real time oscillation detection.

PJM PMU and Oscillation Detection locations



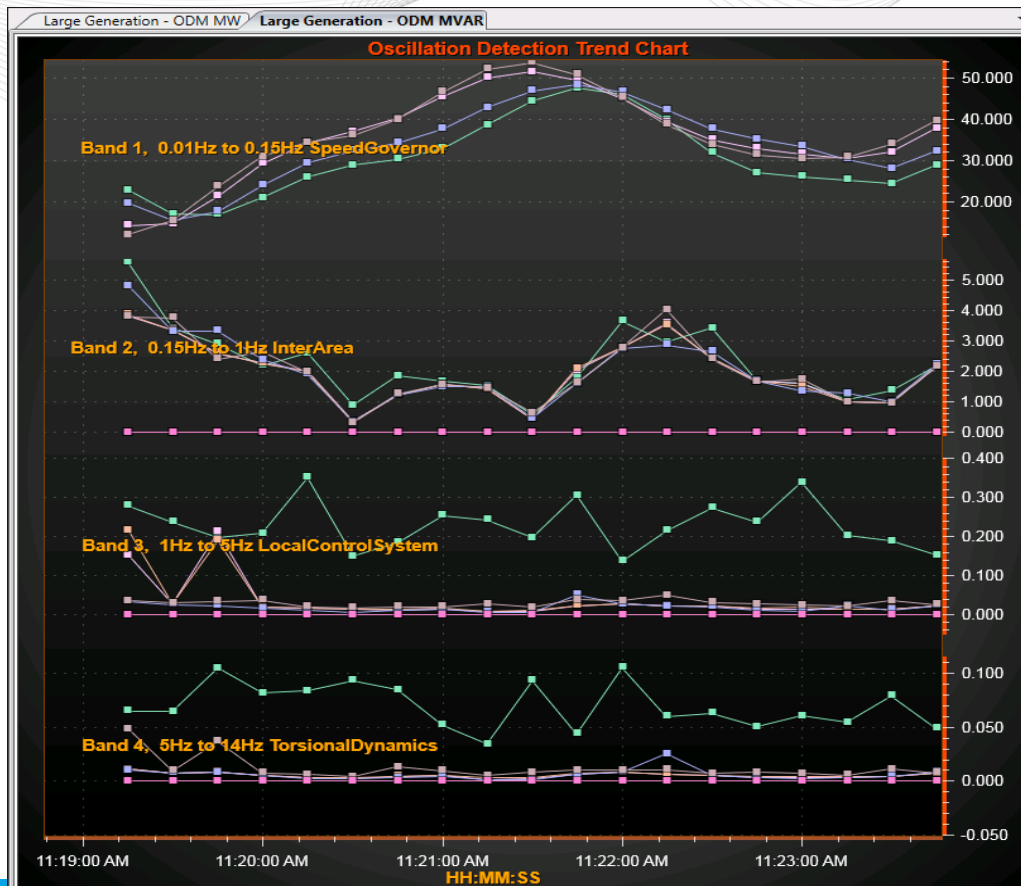
Oscillation Detection driven alarms

Alarms

Alarms

	Alarm Type	SignalType Name	Display Name	Start TimeStamp	Current TimeStamp	Comment
●	H4 Value 2 Band1 Oscillation	Oscillation	MT. STORM UNIT #3 500 kV	04/04/2018 11:17:00 AM	04/04/2018 11:20:30 AM	\nLPBand1:33.1384\nLPBand2:0.887222\nL
●	H4 Value 2 Band1 Oscillation	Oscillation	MT. STORM UNIT #2 500 kV	04/04/2018 11:17:00 AM	04/04/2018 11:20:30 AM	\nLPBand1:29.9886\nLPBand2:0.960332\nL
●	H4 Value 2 Band1 Oscillation	Oscillation	SURRY UNIT #2 500 kV	04/04/2018 09:33:15 AM	04/04/2018 11:20:30 AM	\nLPBand1:27.3691\nLPBand2:0.36989\nLP
●	H4 Value 2 Band1 Oscillation	Oscillation	SUSQ. UNIT #1 230 kV	04/04/2018 11:17:00 AM	04/04/2018 11:20:30 AM	\nLPBand1:33.9225\nLPBand2:0.889666\nL

Oscillation Detection calculations



- Deliver additional training on the use of RTDMS automatic Oscillation Detection Module (ODM)
- Incorporate Synchrophasor data heat maps (frequency, voltage magnitude, and voltage angle) into Dispatcher Interactive Map Application (DIMA)
- Compare static models between EMS and PSS/E cases to identify discrepancies in transformer parameters, including ratings and impedance.