REAL TIME PATTERN & ANOMALY DETECTION

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ThingWorx Analytics Product Strategy

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AGENDA

- ❑ Device Monitoring
- ❑ ThingWatcher Overview
- ❑ Using ThingWatcher
- ❑ Early Access

KEY POINTS

- Automated anomaly detection offers significant advantages over other device monitoring solutions
- ThingWatcher, an upcoming ThingWorx Analytics product, offers a simple way to build anomaly detection into your products
- Early access to ThingWatcher is available now: contact dmagnoni@coldlight.com if you are interested

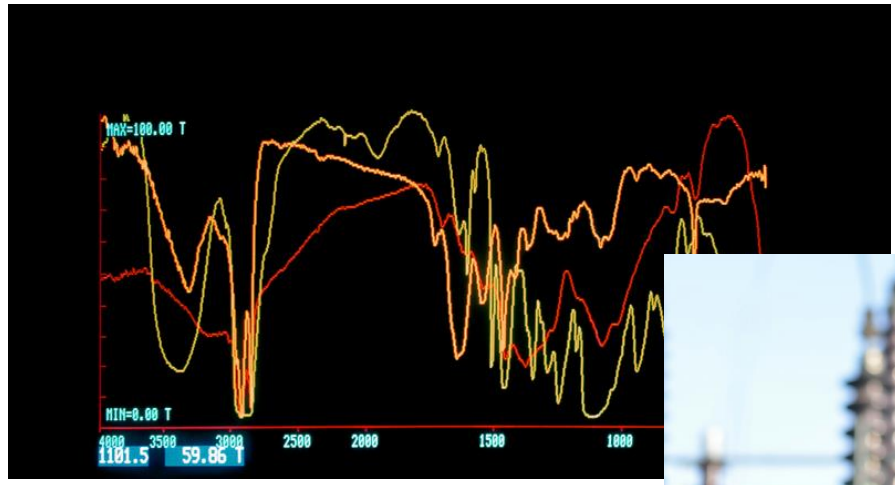
DEVICE MONITORING

- Goals: uptime, cost reduction

- Different approaches
  - Predictive Maintenance
  - Rules-based monitoring
  - Predictive Failure Analysis
  - Anomaly Detection

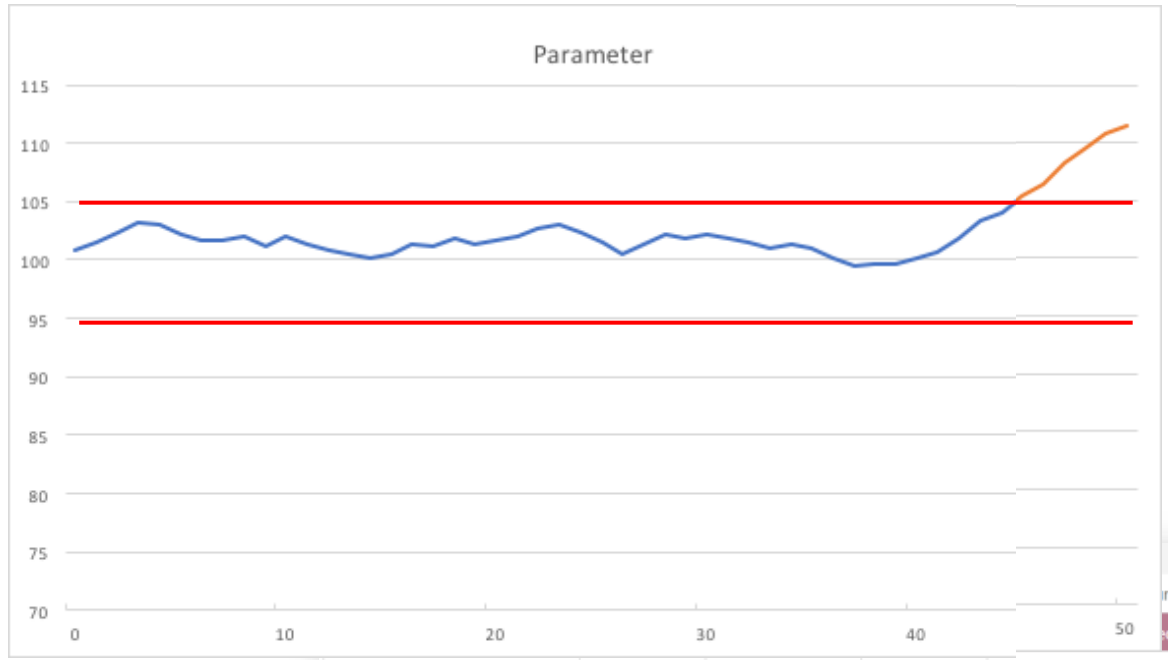
PREDICTIVE MAINTENANCE / ENGINEERING ANALYSIS

- Engineering analysis, often in comparison to calculated or previously measured values
  - E.g., vibration analysis vs. installation
- Benefits
  - Accurate
- Drawbacks
  - Difficult to manage
  - Expensive and time-consuming



RULE-BASED MONITORING

- Typically simple rules
- Benefits
  - Usually easy to set and monitor
  - Broad applicability
- Drawbacks
  - No warning prior to reaching rule trigger point
  - Difficult to use with complex signals



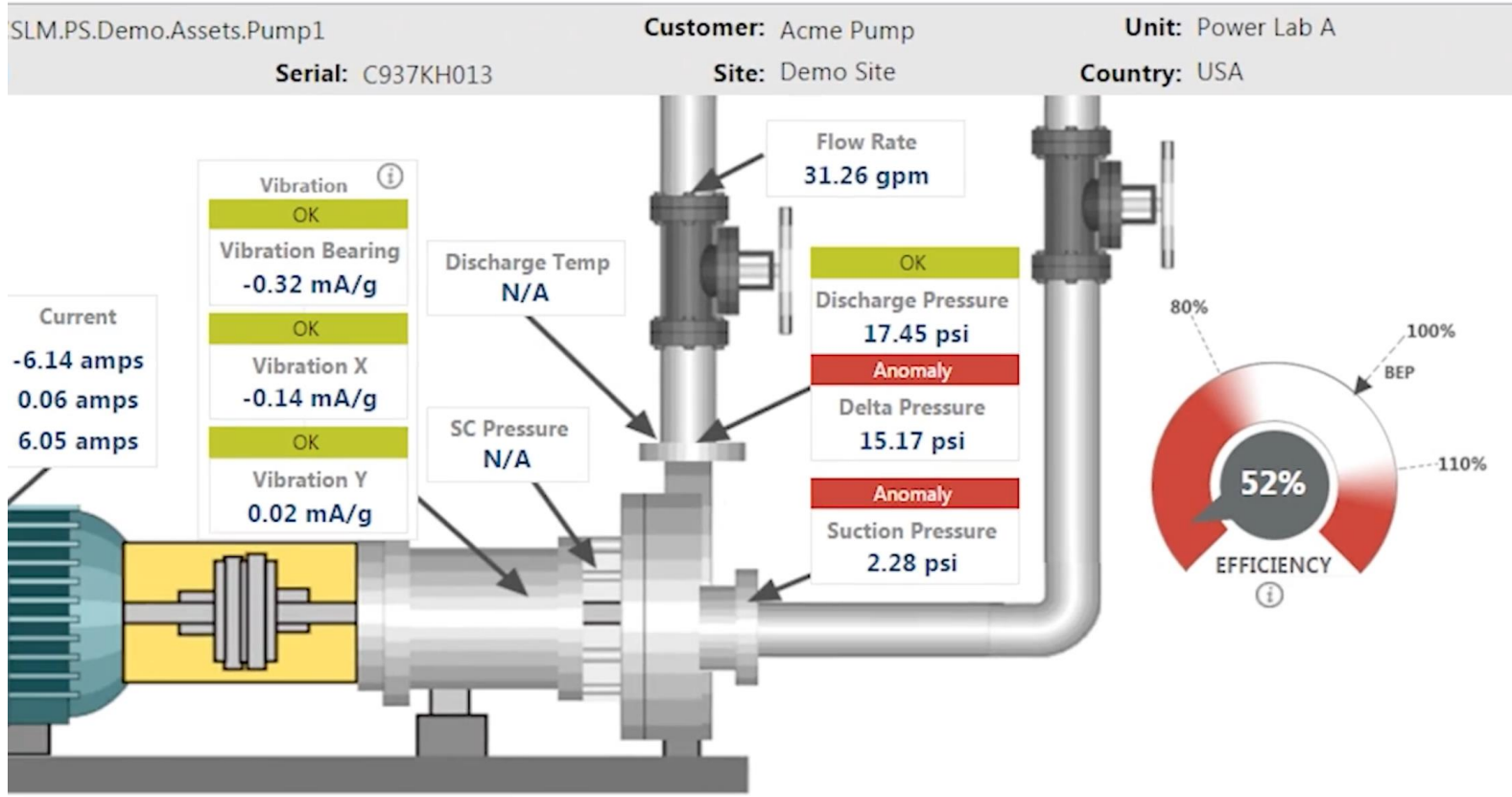
				Description
				ring machine operation.
				cted during operation
2016-03-04 12:05:13.534	Below	21128347	24 <= 25	Low Helium level detected during operation
2016-03-04 12:01:13.078	Below	21368803	25 <= 25	Low Helium level detected during operation
2016-03-04 12:01:13.065	Below	21368816	24 <= 25	Low Helium level detected during operation
2016-03-04 11:57:12.657	Below	21609224	22 <= 25	Low Helium level detected during operation
2016-03-04 11:57:12.601	Below	21609280	23 <= 25	Low Helium level detected during operation
2016-03-04 11:57:12.587	Below	21609294	25 <= 25	Low Helium level detected during operation
2016-03-04 11:53:12.104	Below	21849777	24 <= 25	Low Helium level detected during operation
2016-03-04 11:10:15.758	Above	24426123	10.0 <= 163.54	High temperature detected during operation
2016-03-04 11:10:15.726	Above	24426155	10.0 <= 104.0	High temperature detected during operation
2016-03-04 11:10:15.707	Above	24426174	10.0 <= 149.41	High temperature detected during operation

PREDICTIVE FAILURE ANALYSIS

- Predictive failure analysis using machine learning techniques
- Benefits
  - Easier to manage and scale than manual predictive failure analysis
  - Accurate for a wide variety of conditions
- Drawbacks
  - Requires training dataset including historical machine and failure information
  - More effort to manage than rules-based monitoring

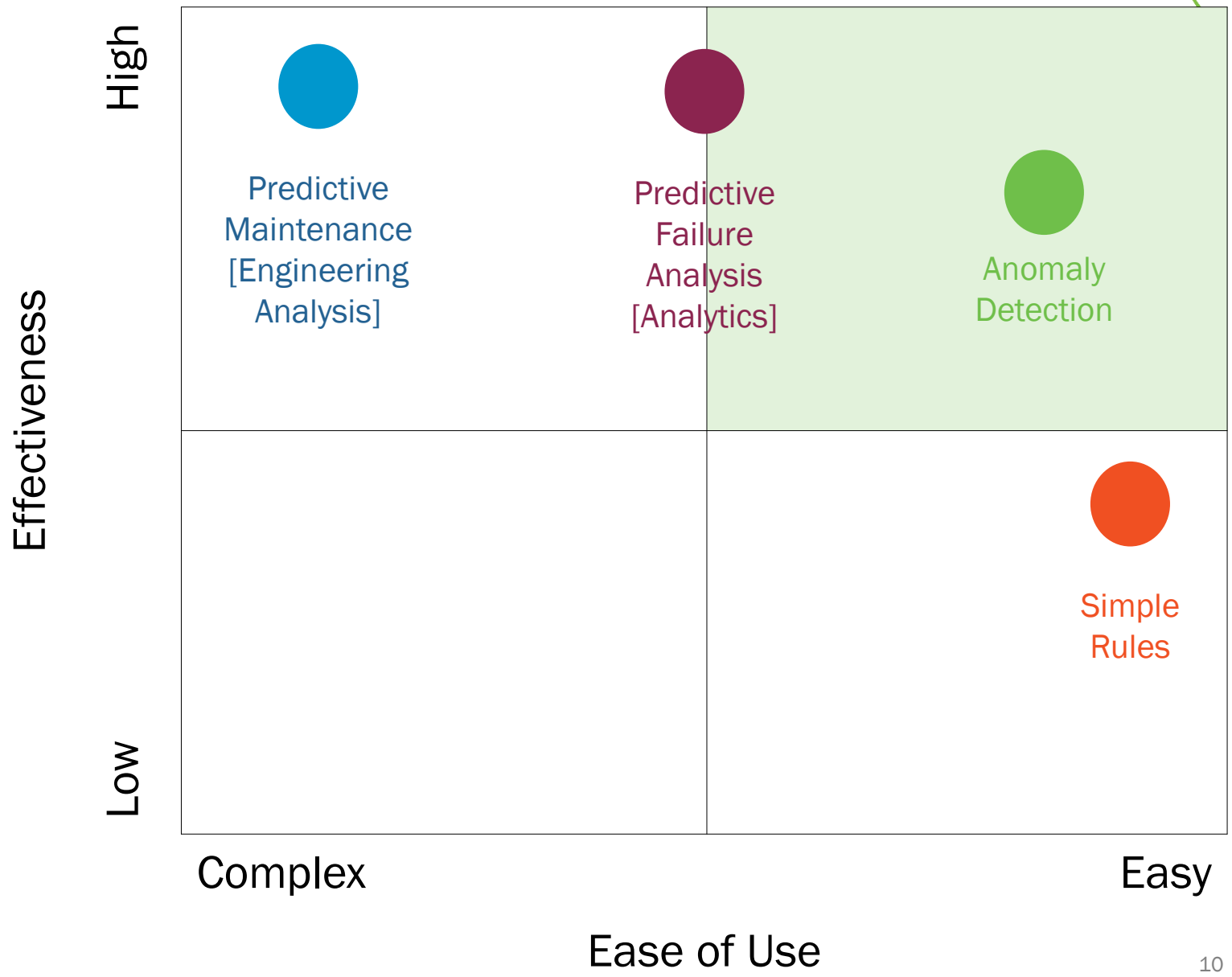
AUTOMATED ANOMALY DETECTION

- Anomaly detection reveals behavior changes
- Benefits
  - Easy to manage and scale
  - No historical data required
  - Good accuracy
  - Useful in complex situations
- Drawbacks
  - Not as accurate as predictive failure analysis
  - Requires training time to learn the signal
  - Not suitable for all signals



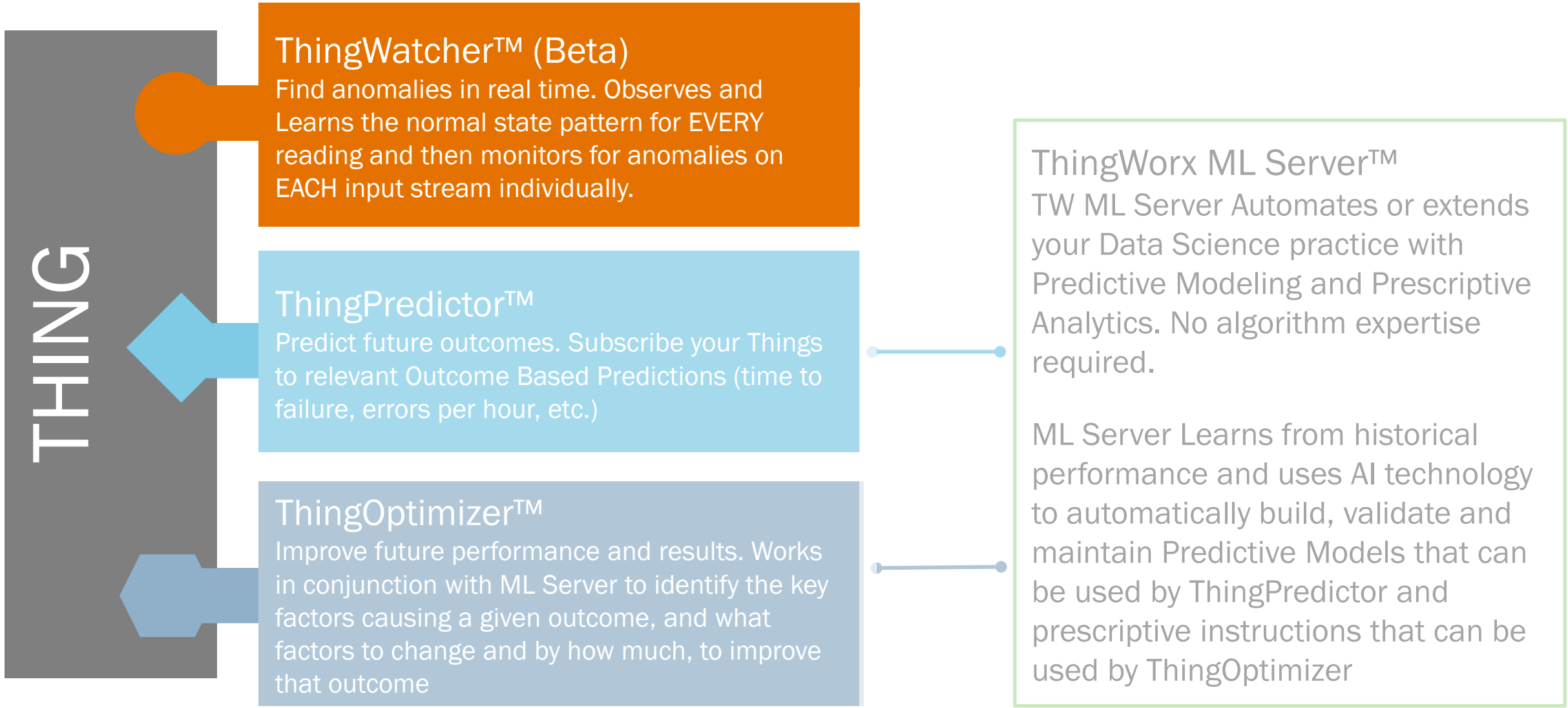
EASE OF USE VS. EFFECTIVENESS

- Automate Anomaly Detection balances ease and effectiveness
- Easy to use
  - Learns automatically
  - No historical data needed
  - Apply at edge or cloud
- Effective
  - Detects simple and complex anomalies
  - Can provide insight before failures



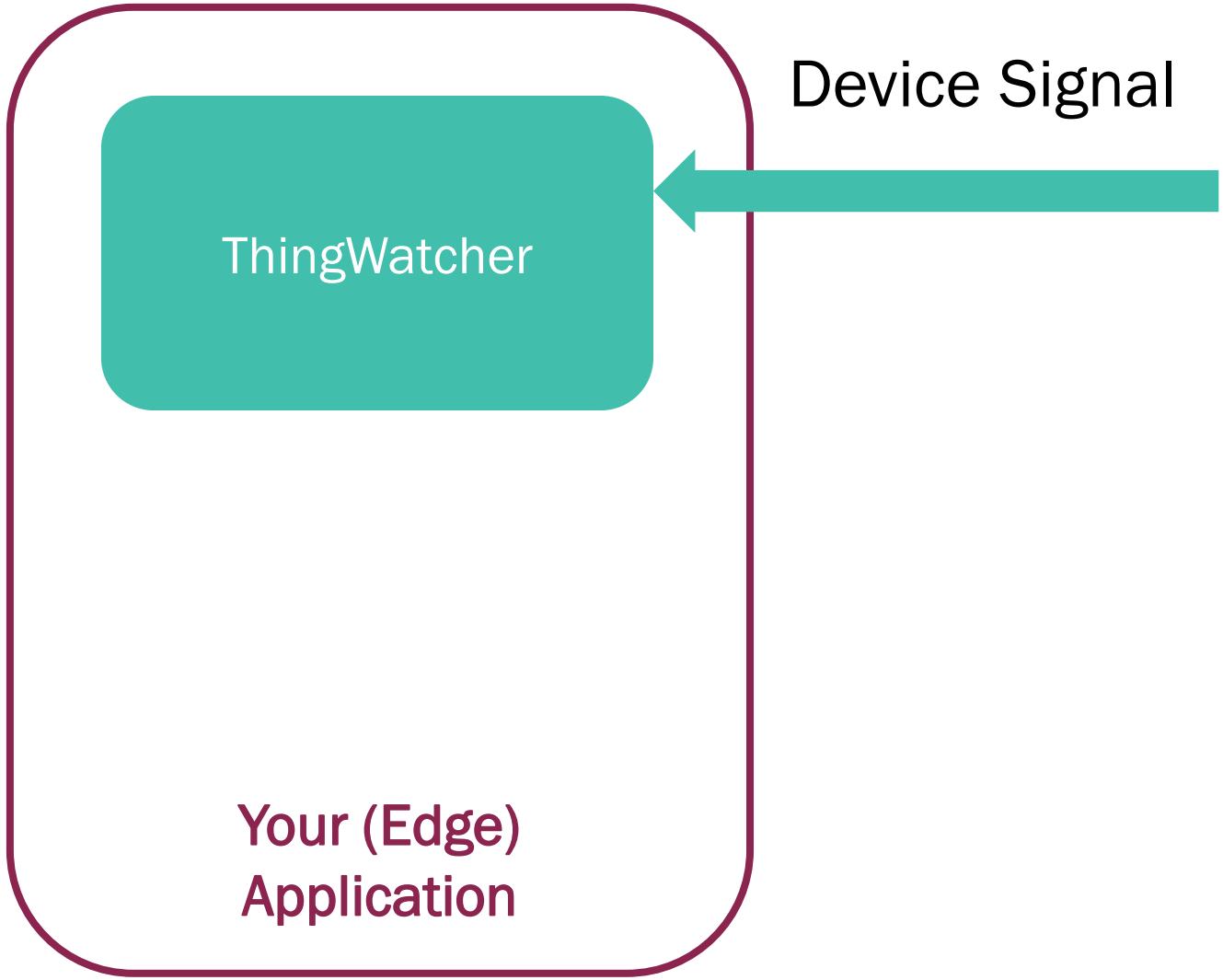
THINGWATCHER OVERVIEW

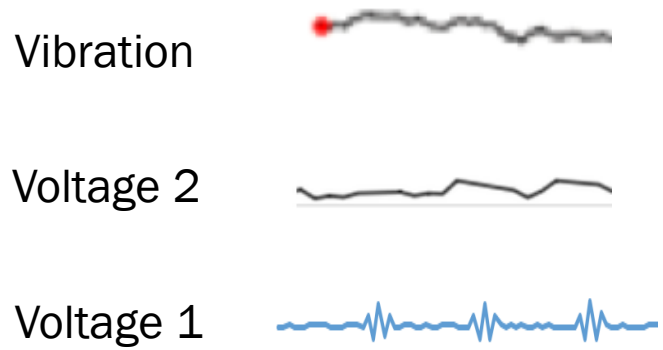
THINGWATCHER: STANDALONE ANOMALY DETECTION



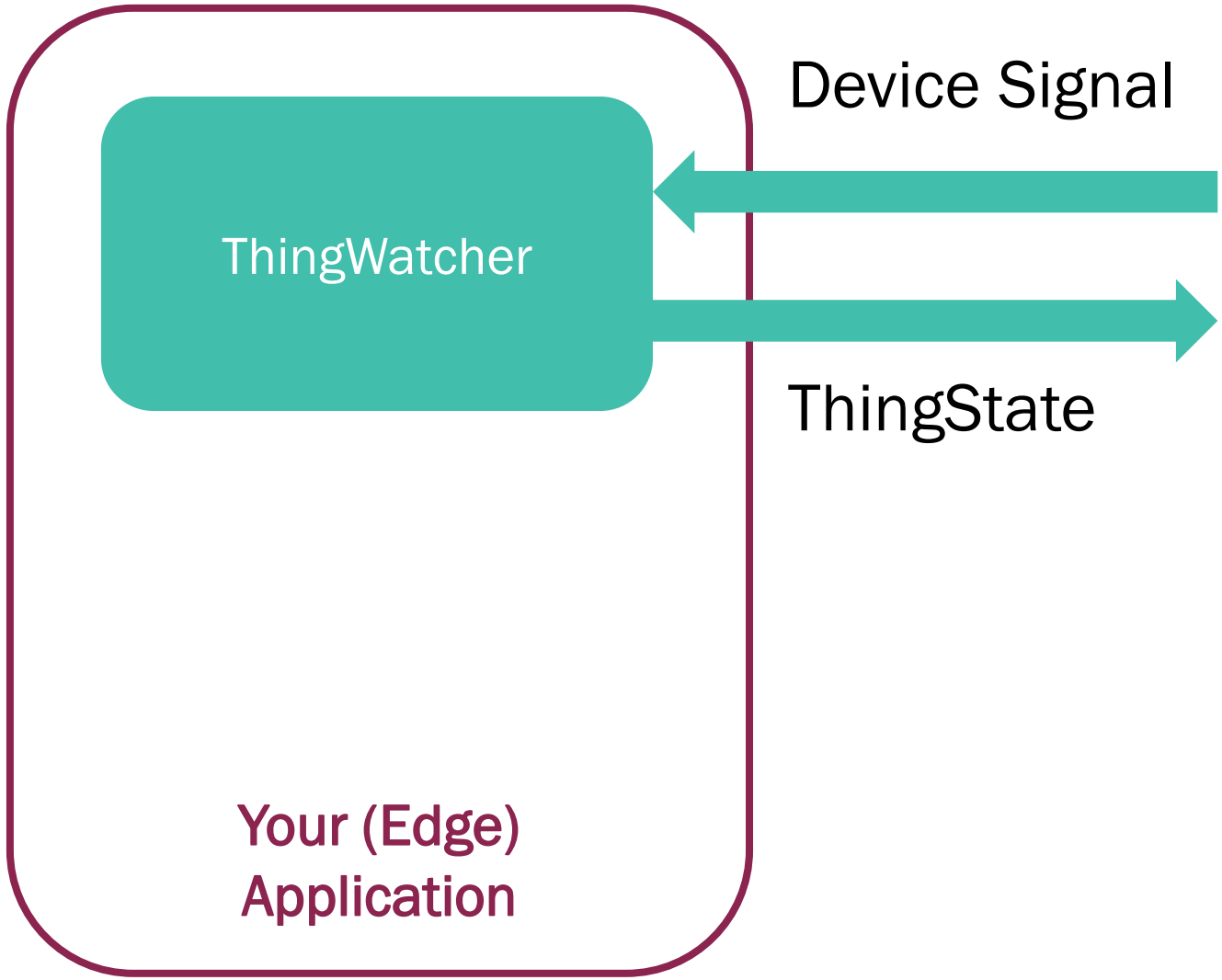
HIGH LEVEL OPERATION: BUILT INTO YOUR APPLICATION

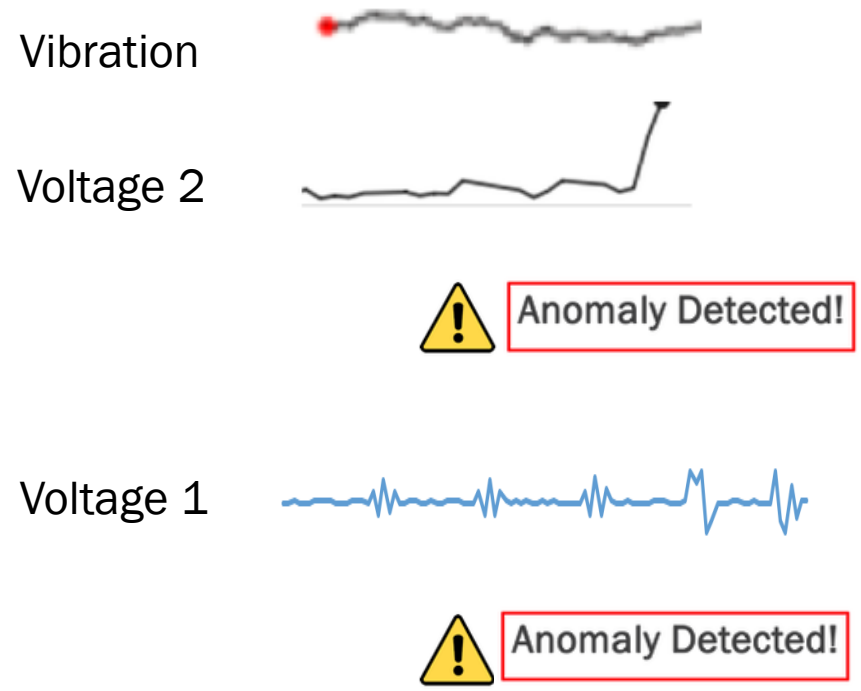
HIGH LEVEL OPERATION: MONITORS A SINGLE SIGNAL





HIGH LEVEL OPERATION

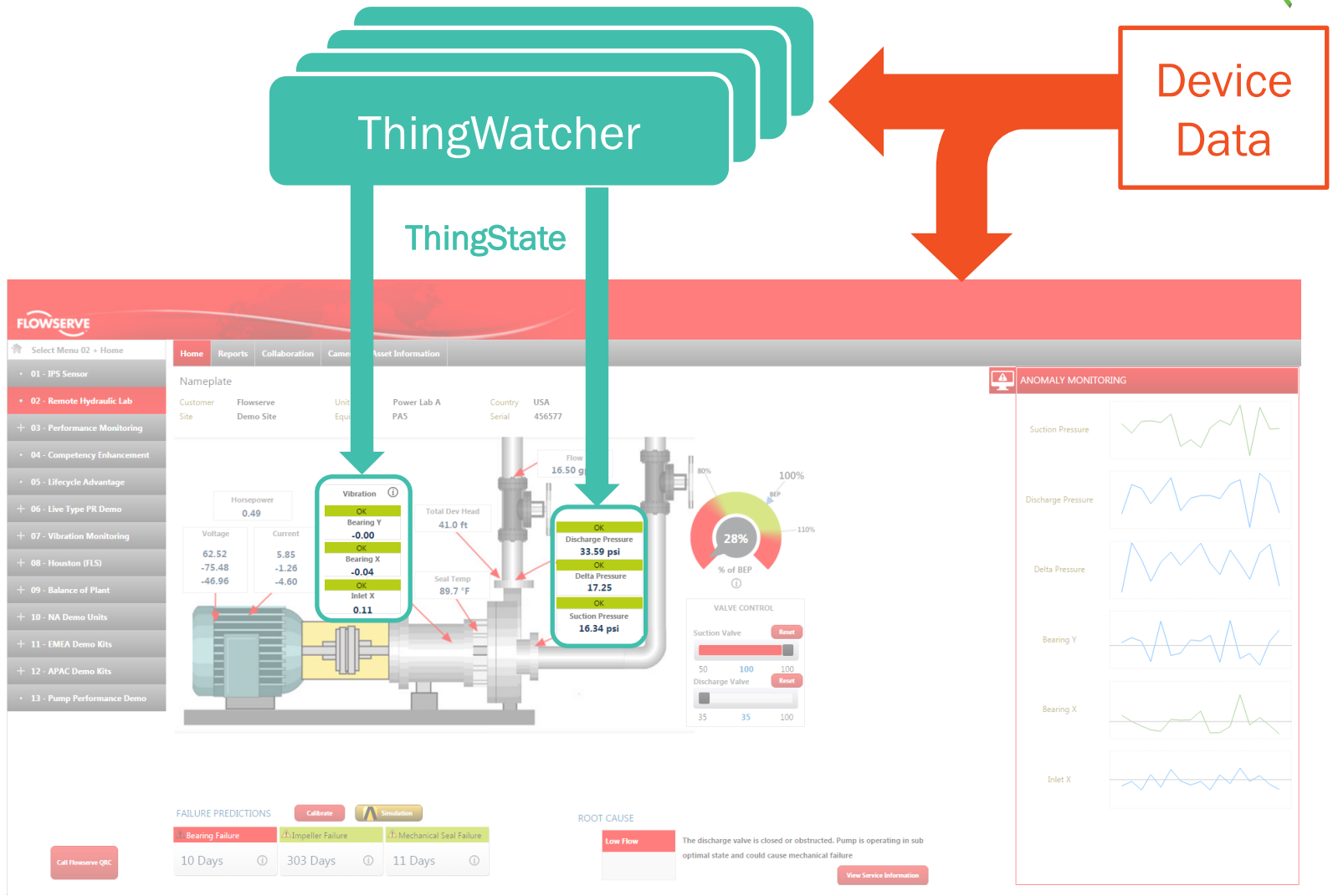




THINGWATCHER PHASES

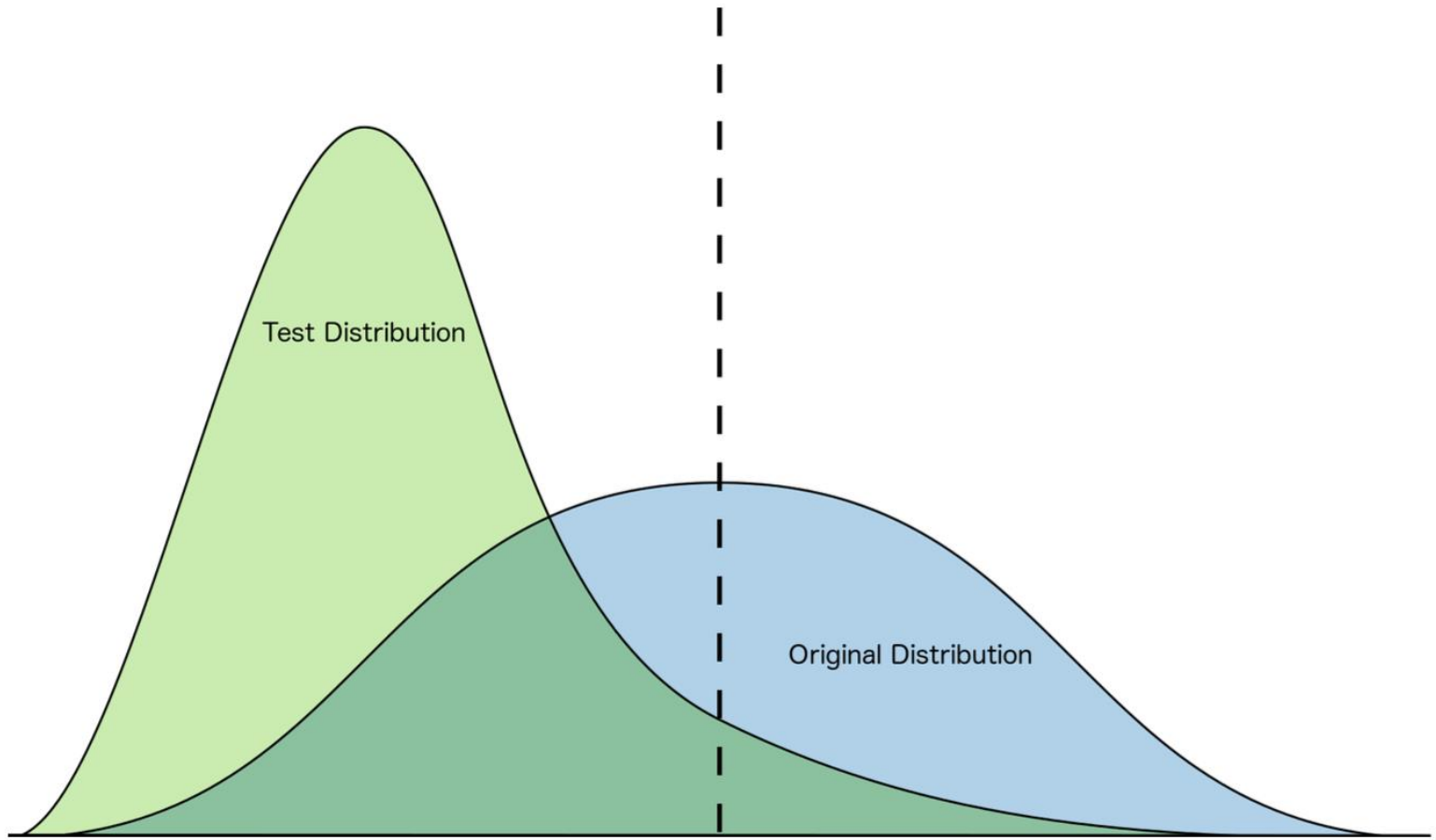
EXPOSING THINGSTATE

- Use ThingState to drive displays / actions
  - E.g., Flowserve demo
- Can handle any way you like
- Pending integration to make it easy to expose via Composer



UNDER THE COVERS

- Training
  - Model creation
  - Original distribution
- Monitoring
  - Evaluating incoming “test” distribution
- Anomaly test compares distributions
- Configurable sensitivity determines how different the two must be



THINGWATCHER GUIDELINES

- One signal per ThingWatcher
- Startup signal is assumed to be good
  - Make sure that things are stable before you start training
- Currently configure training time / data points
  - Must train at least one, and typically several “cycles” to ensure ThingWatcher sees enough normal

- Can configure sensitivity
  - Determines how likely you are to receive a false positive vs. false negatives
- Can also configure how many data points are used to test for anomalies
  - More data points improves accuracy, at the cost of a slower response

THINGWATCHER EARLY ACCESS

- Currently in beta status
  - GA planned for later this year
- Early access program provides software, support prior to GA
  - Goal is to obtain feedback on how it works, the current feature set, etc
  - Looking for partners and customers interested in trying out ThingWatcher in a variety of use cases
  - Capacity in the early access program is limited
- Contact dmagnoni@coldlight.com if interested

WRAP UP

KEY POINTS

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