Intelligence at the Edge for Industrial IoT
FogHorn Background

Edge Intelligence Software for Industrial IoT

- Silicon Valley Start-Up Est. 2014
- Purpose-Built Edge Platform
- Key Industrial Partnerships
- Experienced, Successful Team

Series A in Q2 2016
Series B in Q4 2017
#1 Hot IoT Startup to Watch in 2017

The 10 Coolest Tech Startups of 2016

10 Internet of Things Companies to Watch

1. Qualcomm
2. Cisco
3. Intel
4. FogHorn Systems
5. Amazon Web Services
6. Microsoft
7. Everythng
8. Google
9. Tesla
10. IBM
Ascendancy of Edge Computing

Return to the Edge and the End of Cloud Computing

SPEAKER
Peter Levine, Andreessen Horowitz

Edge computing will blow away the cloud

The next multibillion-dollar tech market was quietly born this year, says A-list VC Peter Levine

Proprietary and Confidential
...IoT devices will grow to as many as 30 billion devices by 2020.

Industrial IoT Data Volume Overwhelming

Edge intelligence will drive real value in Industrial IoT

*Less than 1 percent of the data being generated by the 30,000 sensors on an offshore oil rig is currently used to make decisions.*

McKinsey

Edge solutions are critical for IoT

*Cloud models are not designed for the volume of data IoT generates.*

Cisco

**“Things” generate more data every day**

1 PB  Mining
480 TB  Jet engine
24 TB  Automated manufacturing
1 TB  Large refinery
0.8 TB  Large retail shop
0.5 TB  US Smart meters
Maximize insight by analyzing real-time asset data
• Streaming ML
• Clean diverse/noisy OT data for maximum insight
• Determine sensor health in real-time

Apply your best intelligence to the Edge
• Update models on-the-fly
• Deploy with confidence

Optimal Edge performance
• Sub millisecond decisioning enables new applications
• Compact, commodity hardware/software foundation, No FPGA

*Edge computing shifts processing from central servers or a cloud to the asset. This enables richer data, faster reactions, and lower bandwidth requirements.*
FogHorn Edge Intelligence for Industrial IoT

Key Customer Benefits
- Lowers bandwidth/hosting costs
- Triggers real-time insights
- Enables proactive use cases
- Maximizes security and privacy

FogHorn Differentiators
- Tiny footprint
- OT-centric
- Cloud agnostic

Main Use Cases
- Condition Monitoring
- Predictive Maintenance
- Asset Performance Management
- Industrial Process Optimization
Control logic, streaming analytics and ML inferences achieve far higher fidelity on live data

Edge processing delivers:
- Higher quality, cleaner data
- Reduction in false positives
- Maximum insight
- Faster response
- Better inferences
- Fault tolerance
Closed Loop Machine Learning

- Business Insights
- Operational Insights
- Filtered, Normalized, Enriched Data
- Edge ML™
- VEL™ CEP Analytics
- Data Enrichment
- Deep Learning Models
- ML Models
- Enterprise Reference Data
- MES

- Python
- R Studio
- Matlab
- Spark MLib
- TensorFlow

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Industrial IoT Use Cases

Manufacturing APM and Process Intelligence
Drilling Equipment Predictive Maintenance
Pipeline Leak and Corrosion Detection
Compressor/Valve Predictive Analytics
Pump Condition Monitoring and Predictive Maintenance
Turbine Performance Monitoring and Optimization

Renewable Energy Output Forecasting
Wind Turbine Optimization and Predictive Maintenance
Mining Equipment Tracking and Asset Optimization
Locomotive Fuel Consumption and Remote Monitoring
Smart Cities and Smart Buildings
Intelligent Real-Time Health Monitoring
MANUFACTURING

Improving Capacitor Production Yield

ANALYTICS/ML ON WINDING MACHINE DATA DETECTS EARLY DEFECTS

**CHALLENGE**
- Hard-to-detect failure conditions reducing yield and increasing scrap
- No real-time monitoring of large amounts of sensor data
- No OT-centric analytics for manufacturing team members

**FOGHORN SOLUTION**
- FogHorn VEL™: Real-time analytics on winding machine sensor data
- EdgeML™: ML on normalized data streams for real time failure alerts
- Iterative refinement of VEL analytics and ML models to assist operators

**BENEFITS**
- Improve yield, reduce scrap
- Deliver real-time analytics to OT staff
- Smart, not scheduled, maintenance
Automated Flare Stack Monitoring

**REAL TIME VIDEO ANALYTICS AND ROOT CAUSE CORRELATION ANALYSIS**

**CHALLENGE**
- Monitor large number of flare stacks
- Limited communications / compute resources
- Ensure compliance with environmental/regulatory requirements
- Reduce large spend on maintenance and compliance

**FOGHORN SOLUTION**
- FogHorn installed into existing gateways (<1Gb)
- Real time audio / video analysis of flare feeds
- Convolutional neural networks (CNN) for deep learning
- Sensor fusion correlate flare state with compressor audio

**BENEFITS**
- Lower Opex and maintenance costs
- Broad compliance monitoring
- Improved safety
CHALLENGE

- Optimize fuel usage
- Detect sub-optimal operating conditions
- Reduce mobile networking costs of monitoring

FOGHORN SOLUTION

- FogHorn installed into on-board hardened data collection systems
- RT analytics on idling & throttle data based on location, speed & time
- Proactive alerts sent to command centers for operational optimization
- Video only sent on abnormal conditions reducing cellular costs

BENEFITS

- Reduction in fuel and cellular costs
- Optimize crew and train performance
- Ensure safe operating conditions
Optimizing Elevator Performance

**CHALLENGE**

- Monitor 1.5M+ elevators / escalators deployed globally
- Limited communications / compute resources
- Mine sensor information for actionable insights
- Reduce inspection / repair fees of ~ $2K/event

**FOGHORN SOLUTION**

- FogHorn installed on existing motion sensor kits, <1 Gb footprint
- CEP time-aligns state and activity data in <20 lines of code
- 40+ ML models generate predictive maintenance alerts

**BENEFITS**

- Smart, not scheduled, maintenance
- Reduce costly repair and servicing
- New managed service revenue

50+ ML MODELS ON TINY CONTROLLERS DELIVER PREDICTIVE MAINTENANCE
Wind Farm Output Forecasting

REAL TIME TURBINE CONTROLS-DRIVEN MACHINE LEARNING FORECASTS

CHALLENGE
• Monitor large volumes of windmills
• Limited communications / compute resources
• Accurately predict, report and meet 24 hour power generation goals

FOGHORN SOLUTION
• FogHorn installed into existing gateways
• Models trained on 20+ attributes to predict power generation
• Real-time scoring on power generation with alerts for problems
• Enables technician tuning of settings or revised forecast

BENEFITS
Alerts with 90 minutes lead time
Constantly updated power forecasts
Ensure government compliance

WIND ENERGY

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