Delivering More Efficient & Scalable O&M with Modern Monitoring

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Objectives

- Overview of 4 Main Tiers of monitoring and control platforms*
- Tier alignment and large deployments
- Optimizing O&M management
- Optimizing individual systems
- State & Potential of Onsite control hardware

Disclaimer – This presentation contains opinions based on market observations of the presenter
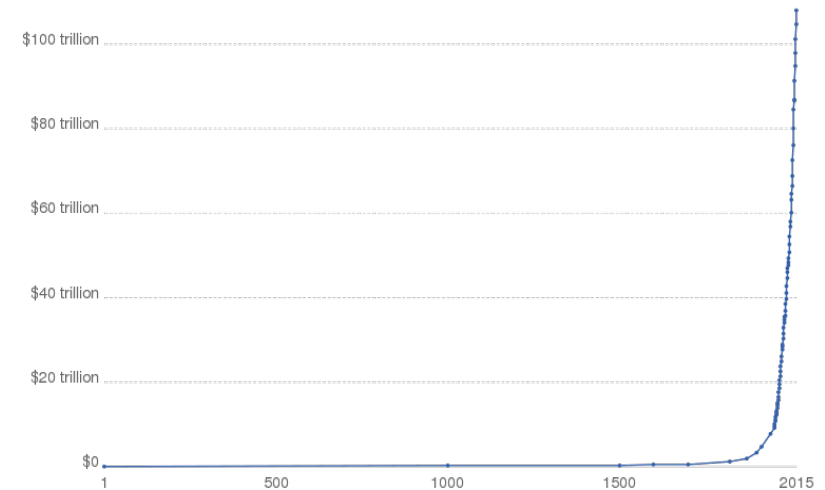
Scalability & Efficiency

Efficiency
- Early warning to assist with planning
- Minimizing time to reach a diagnosis or decision.

Scalability
– Doing this at scale, so it's not a linear relationship. Ex. Transistors vs. I.C. Or other forms of automation

World GDP over the last two millennia
Total output of the world economy; adjusted for inflation and expressed in international-$ in 2011 prices.

$100 trillion

$80 trillion

$60 trillion

$40 trillion

$20 trillion

$0

1   500   1000   1500   2015

Source: World GDP - Our World In Data based on World Bank & Maddison (2017)

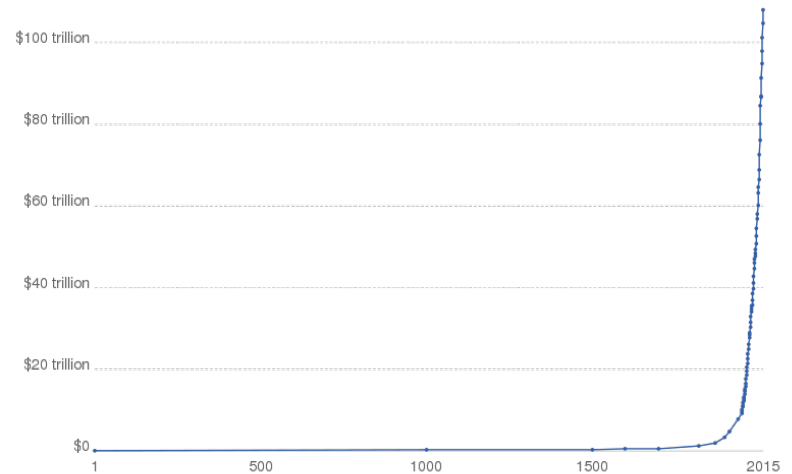Example of Mfg. and Tech Efficiency gains

Scalability & Efficiency

Scalable and efficient systems improves
- Response times
- Reach and support
- To maximize reach and response alignment between hardware, network, business

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Example of Mfg. and Tech Efficiency gains

Hardware Capabilities

Tier	Comm Opt.	Data Logging	C & C	Automation	Notification
Tier 1	Local	Alarm act. stamp	n/a	n/a	Alarm
Tier 2	Local, Portal	Alarm and motor act. stamp	Full log ret.	Treatment safeguards	Alarm – limited labels
Tier 3	Local, remote, portal	Alarm and motor act, sensor state	Full log ret., alarm control	Processing rate adjustment, treatment safeguards	Alarm & Alert
Tier 4	Portal, direct remote, local	All I/O, commands, sensor data, logic state, and hardware health	Full log ret., All I/O and adv. Logic	Able to operate off trend data w/o primary inputs, adjust processing rates, treatment safeguards, remote updates	Alarm & Alert with Full Descriptions

I/O logging, and sensor types important

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Platform Capabilities

Network Structure:

     One to One or Relay

     Hub & Spoke

     Mesh to Hub

     Hybrids

<Insert network topology illustrations here>

Platform Capabilities

Tier	Data Management	C & C	Analysis	Notification
Tier 1	Alarm act. Stamp (history)	n/a	n/a	Alarm
Tier 2	Alarm and motor act. stamp	Full log ret.	Flow graph plots	Alarm – limited labels
Tier 3	Alarm and motor act, sensor state retrieval	Full log ret., alarm control, I/O commands	Flow graph plots, I/O activity plots	Alarm & Alert w/ labels, mult. addresses
Tier 4	Full export, and history	Full log ret., All I/O and adv. Logic, Bulk task management	Flow graph plots, I/O activity plots, alarm/alert recommendations	Alarm & Alert with Full Descriptions, Notification protocols

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Platform Capabilities

Optimizing O&M of Larger Customer Bases

- Mass data exporting for regulatory compliance
- Trend analysis
- Bulk management instructions
  - Vacation homes
  - Weather event management
  - Remote tasking

Examples:
- 50 sites
- 100 sites
- 1500 sites

Optimizing Individual Sites

Tools

- Auto adjustments
    - Flow monitoring routine examples
- Preventative notifications
    - allow for planning & better owner experience (homeowner education, early notice)
- Notification protocols

- Compensate for input, level, or flow sensor failure.
    - Overcome issue like floats now nuisance issue not showstopper as system can keep going.

Current State & Future of Onsite Controls

Common Sensors Today

- Pump monitoring via controls (aka Indirect flow monitoring)
  - Elapsed time meters
  - Event counters
  - Current sensor monitoring
  - Phase monitoring (3 phase applications)***
  - Pressure gauges***
  - Level sensors (ex. Floats) & Dosing Timers (drawdown testing)
- Flow monitoring with flow meters
  - Analog vs. digital
  - Magnetic vs. ultrasonic (typ.)

- Pump Health Temp & Seal Fail Alarms

    Common thread, measuring quantity over time

Current State & Future of Onsite Controls

Common Sensors Today & Tomorrow

- PH
- Dissolved Oxygen
- UV Intensity
- Flow Meters
- ORP Probes
- New Types of Level Sensors

Closing Thoughts & Q&A

"Less is more only when more is to much" – Frank Loyd Wright

Thank you