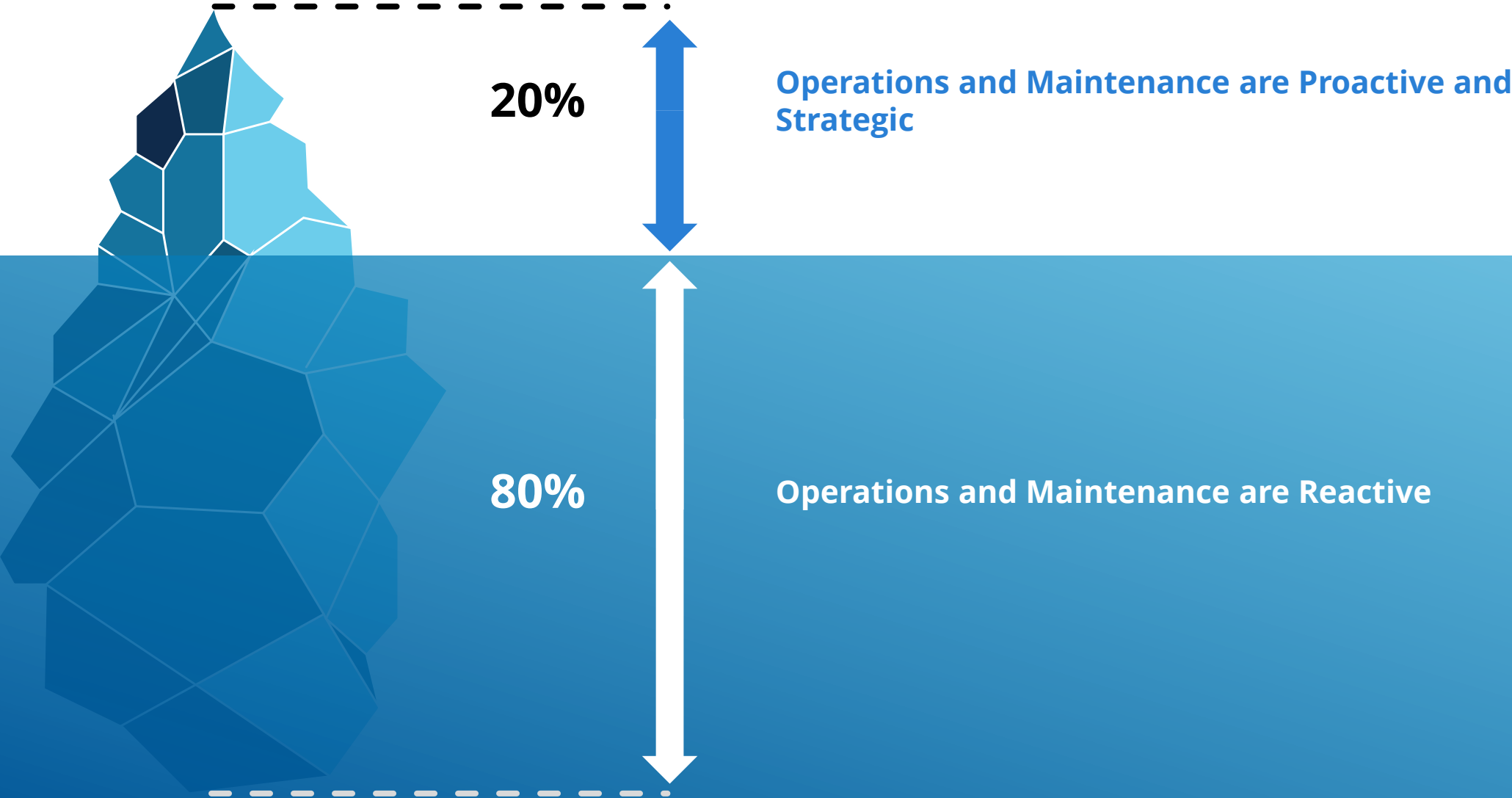


MAINTENANCE AND OPERATIONS

COMMON STATE OF OPERATIONS & MAINTENANCE

THE GLOBAL PROCESS INDUSTRY LOSES \$20 BILLION ANNUALLY FROM UNPLANNED DOWNTIME* Source: ARC Advisory Group



REACTIVE vs. PROACTIVE OPERATIONS & MAINTENANCE

80% OF O&M ARE REACTIVE

STEPS TO BECOME PROACTIVE

05

Advanced machine learning and A.I driven maintenance

04

Real time analytics and sensing insights to predict machine reliability

03

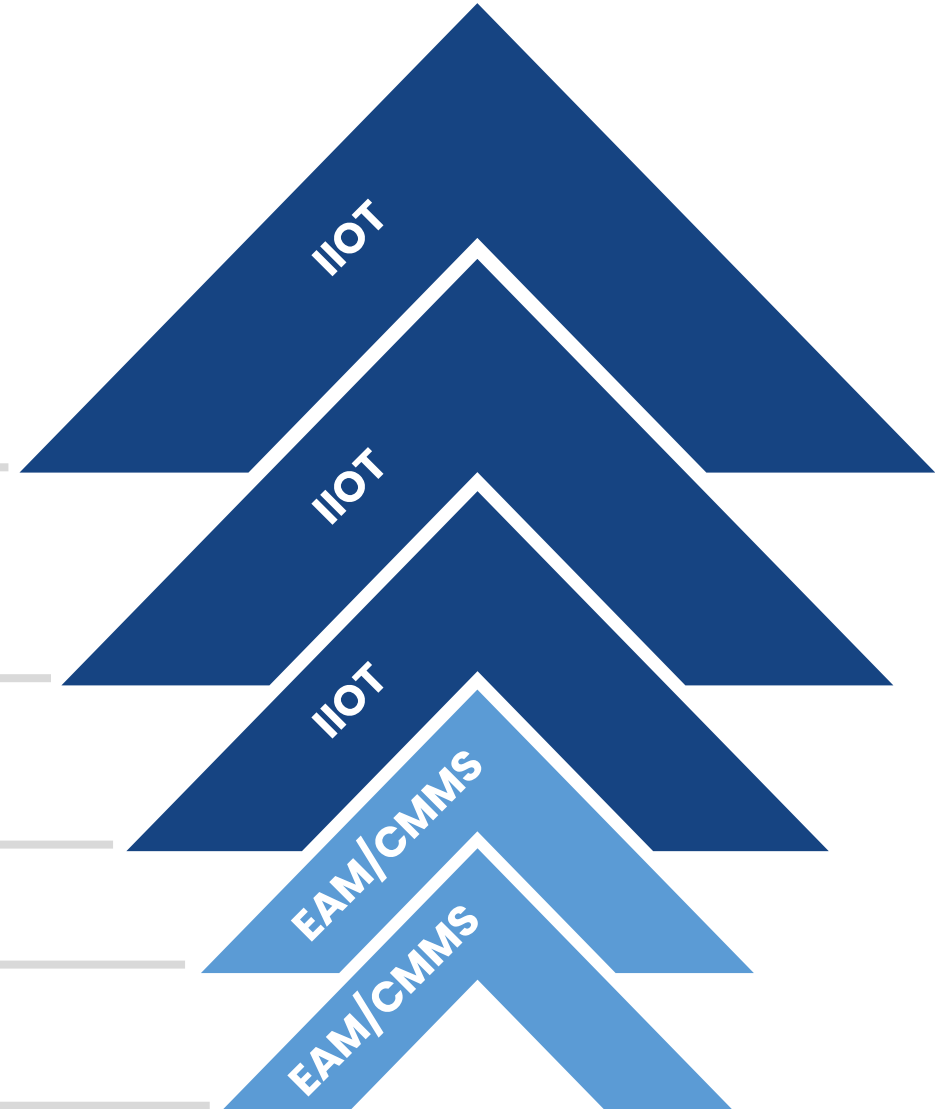
Condition monitoring based on simple logic and thresholds

02

Schedule and plan maintenance based on usage and time

01

Fix when broken



EAM SYSTEMS ADDRESS MANY CHALLENGES

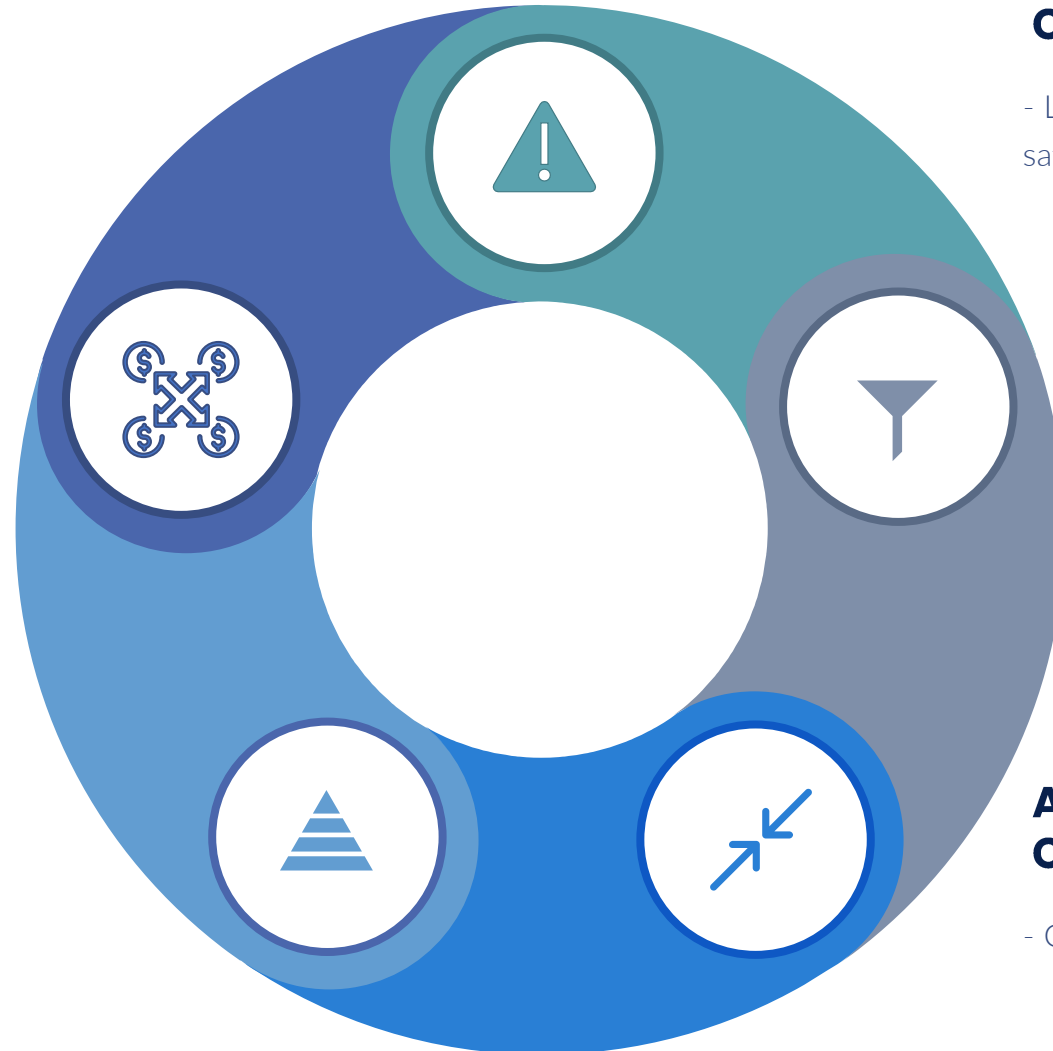
ASSET MANAGEMENT ENABLES ORGANIZATIONS TO EXTEND THE USEFUL LIFE OF ASSETS AND REDUCE ASSET RELATED EXPENSES

TOTAL COST OF OWNERSHIP

- Asset costs throughout their lifecycle
- Useful life of assets

EFFICIENCY

- Operational & labor efficiency; production reliability
- Service levels and customer satisfaction



COMPLIANCE

- License/regulatory/environmental & safety compliance risk

SYSTEM CONSOLIDATION

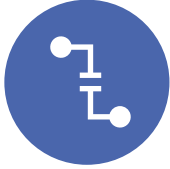
- Multiple, siloed asset management systems

ASSET CONVERGENCE

- Operational & IT assets

CURRENT O&M CHALLENGES

CRITICAL CHALLENGES WITH EAM FOR PROACTIVE OPERATIONS & MAINTENANCE (O&M)



CHALLENGE 1

Connectivity to the physical asset for real-time monitoring and predictive failures



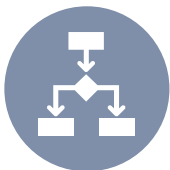
CHALLENGE 2

Maximo is not designed for large amounts of real-time, high frequency, streaming data.



CHALLENGE 3

Static schema for reports and manual investigation.



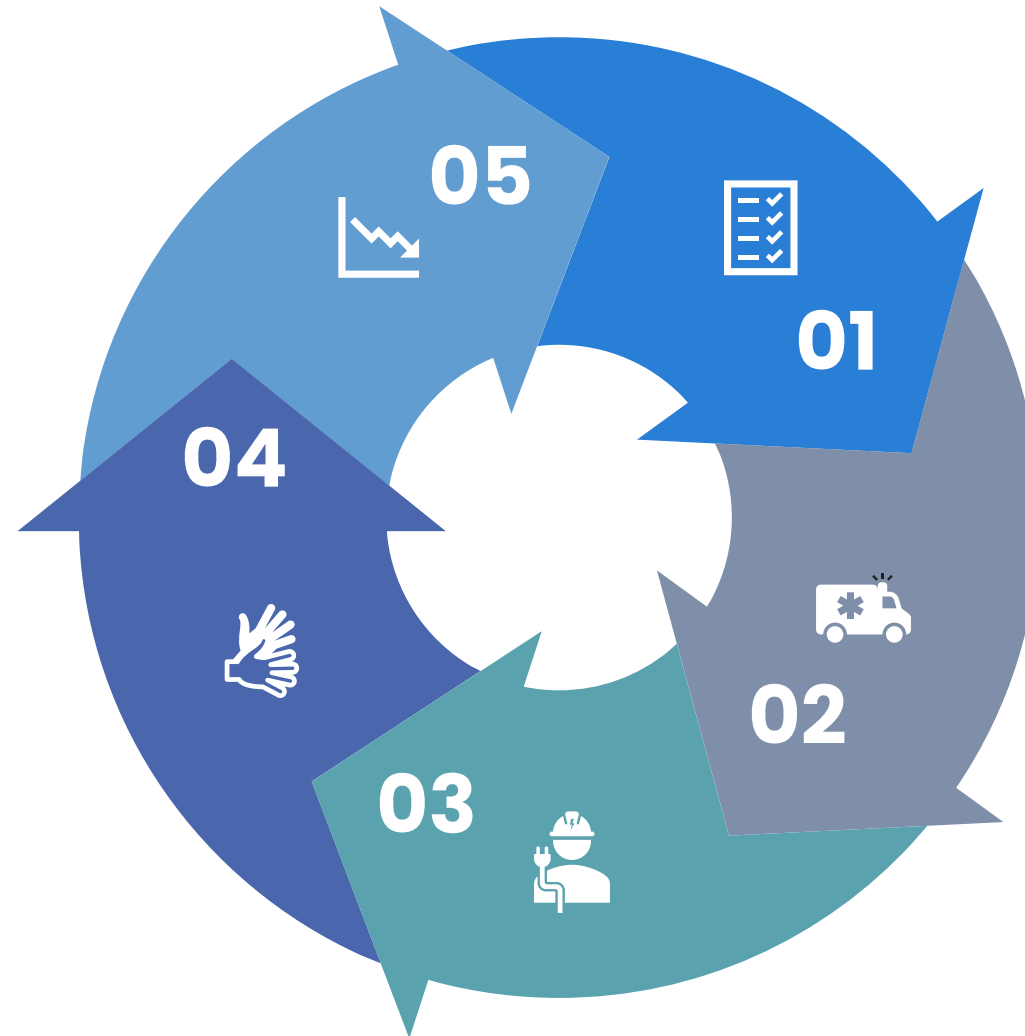
CHALLENGE 4

The inability to correlate data from multiple systems and on a unified dashboard.



COMMON OPERATIONS & MAINTENANCE

TRADITIONAL MAINTENANCE PROCESSES DO NOT ALLOW FOR PROACTIVE RESPONSE TO REAL-TIME ASSET HEALTH



01 PLANNED MAINTENANCE

Maintenance that is planned based on run hours or set schedules.

02 UNPLANNED MAINTENANCE

Asset fails triggering an unplanned maintenance activity.

03 ACTUAL MAINTENANCE

Maintenance technicians provide maintenance on Planned and Unplanned maintenance requests.

05 STATIC/MANUAL REPORTS

Predefined Reports with no on the fly schema for search and investigation.

04 MANUAL FEEDBACK

Maintenance technicians provide manually entered feedback into the system.

OPTIMIZED OPERATIONS & MAINTENANCE

A CONNECTED ASSET AND ANALYTICS APPROACH FOR OPERATIONS & MAINTENANCE

06 REAL-TIME ALERTS, REPORTS, AND INVESTIGATION

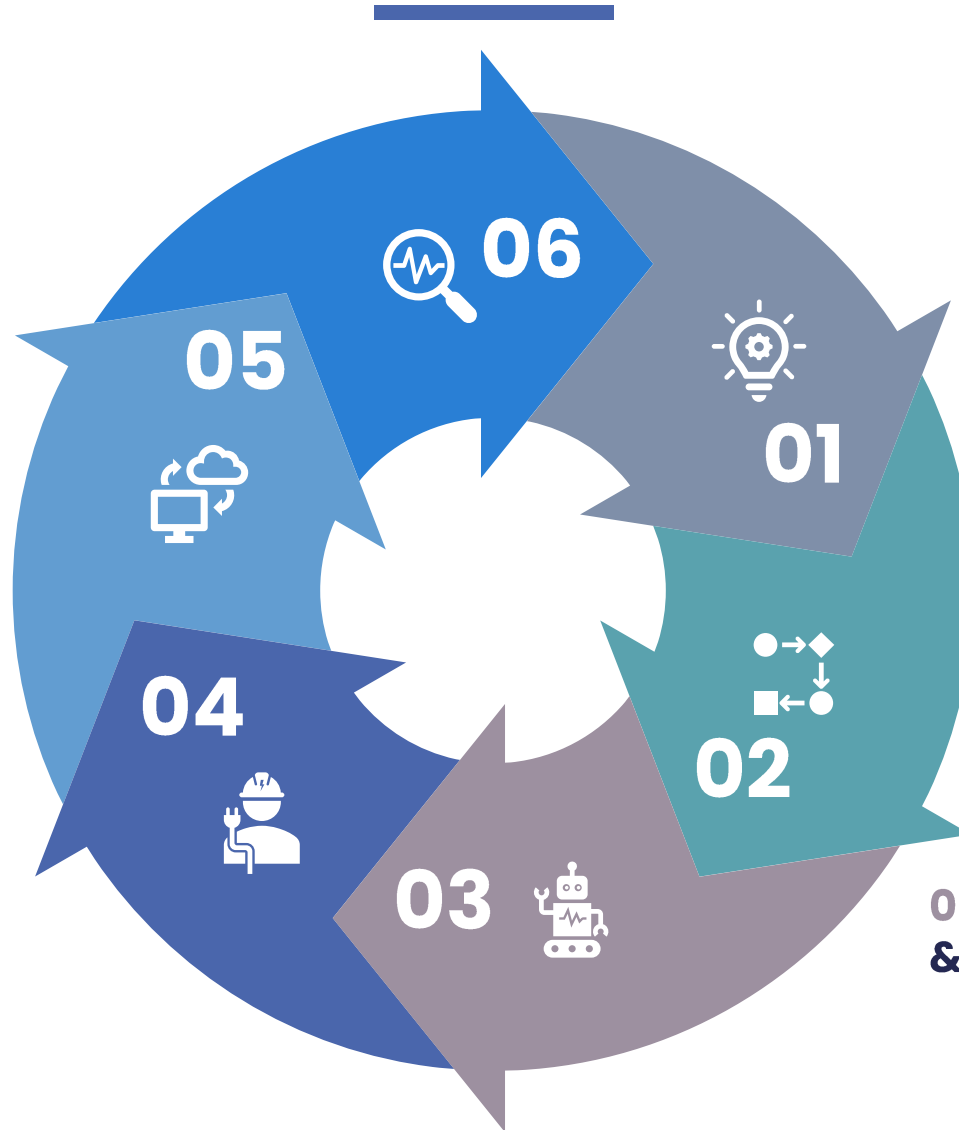
Monitoring the health of the asset and the EAM/CMMS allows for immediate reporting, alerting, and deeper investigation .

05 AUTOMATED AND MANUAL FEEDBACK

Real-time CbM and PdM Monitoring solutions provide immediate feedback to the EAM/CMMS.

04 ACTUAL MAINTENANCE

The physical process of preserving the asset or equipment being maintained.



01 MAINTENANCE RESOURCE OPTIMIZATION

Optimizing Maintenance resources allows for improved scheduling, reduced downtime, and improved asset utilization.

02 CONDITION BASED MAINTENANCE (CbM)

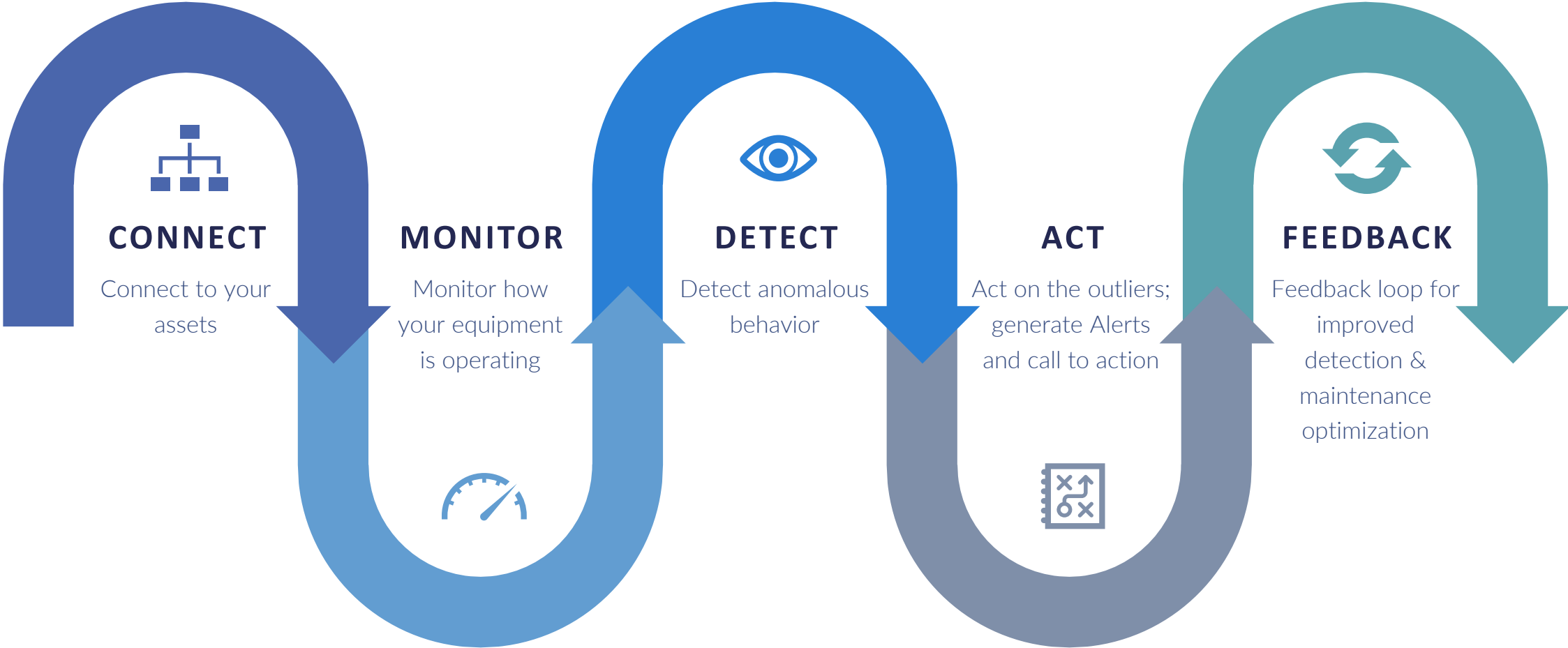
Monitor the condition of an asset based specific thresholds to determine when maintenance needs to be done.

03 PREDICTIVE MAINTENANCE (PdM) & MACHINE LEARNING (ML)

Utilize Machine Learning for Predictive Maintenance with advanced ML Algorithms. Learn and improve from what your data tells you.

THE SMS APPROACH

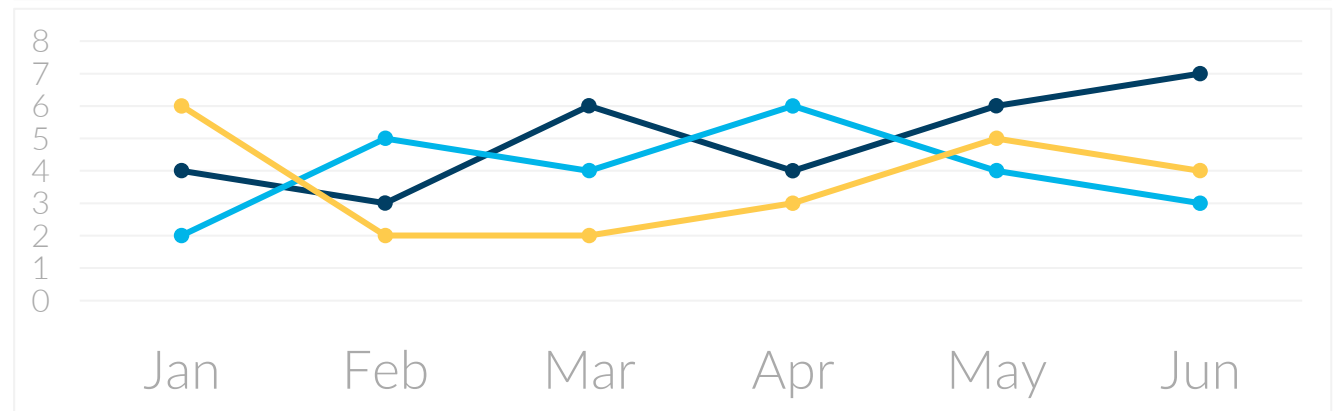
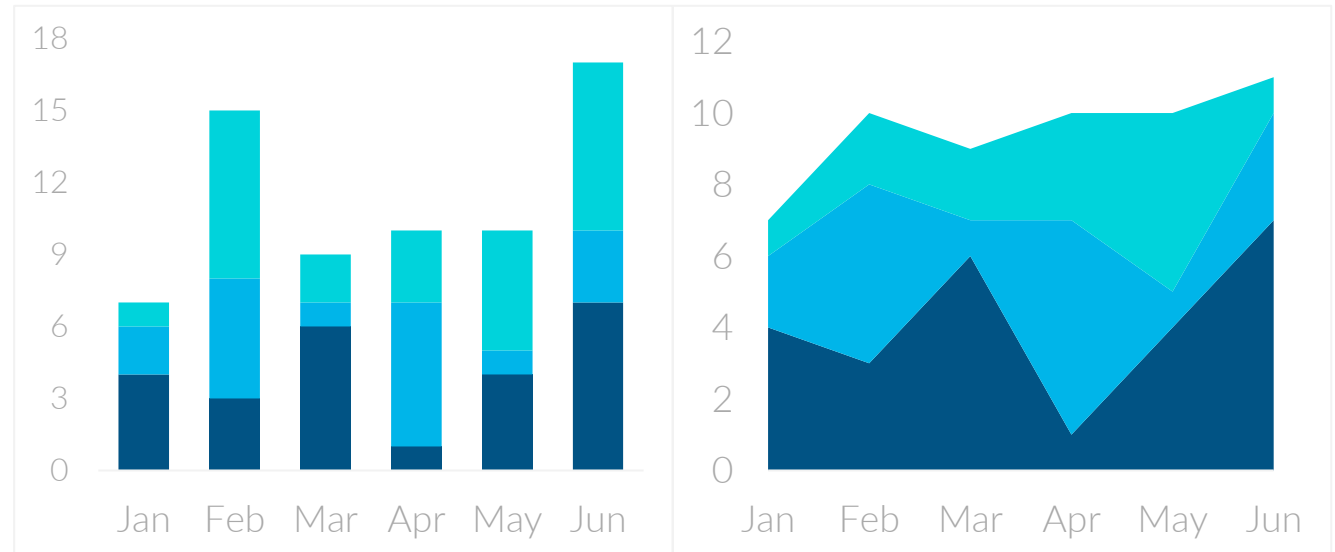
IMPLEMENTING A CONNECTED MAINTENANCE AND ANALYTICS PROGRAM



SUPPORTING ASSET PERFORMANCE MANAGEMENT (APM)

A FEW COMMON KEY PERFORMANCE INDICATORS SMS COMMONLY PRODUCES

Overall Equipment Effectiveness (OEE)
Availability/Reliability (Uptime %)
Performance
Quality/Yield
Mean Time Between Failure (MTBF)
Mean Time to Repair (MTTR)
Mean Time to Failure (MTTF)
Planned vs Unplanned Work
Unplanned Downtime
Work Order Closure Rate
Maintenance Cost Per Asset
Labor Costs



CONNECTED MAINTENANCE: SPLUNK

INDUSTRIAL IOT AND ANALYTICS PLATFORM FOR ASSET PERFORMANCE MANAGEMENT (APM)

01. SEARCH AND INVESTIGATION

Identify and resolve issues up to 70% quicker
Reduce escalations up to 90%
Find and fix problems, investigate incidents across all of your operations

02. PROACTIVE MONITORING

Monitor operational systems and assets in real-time
Identify issues and attacks before they impact service, safety and revenue
Monitor specific patterns, trends and thresholds

03. OPERATIONAL VISIBILITY

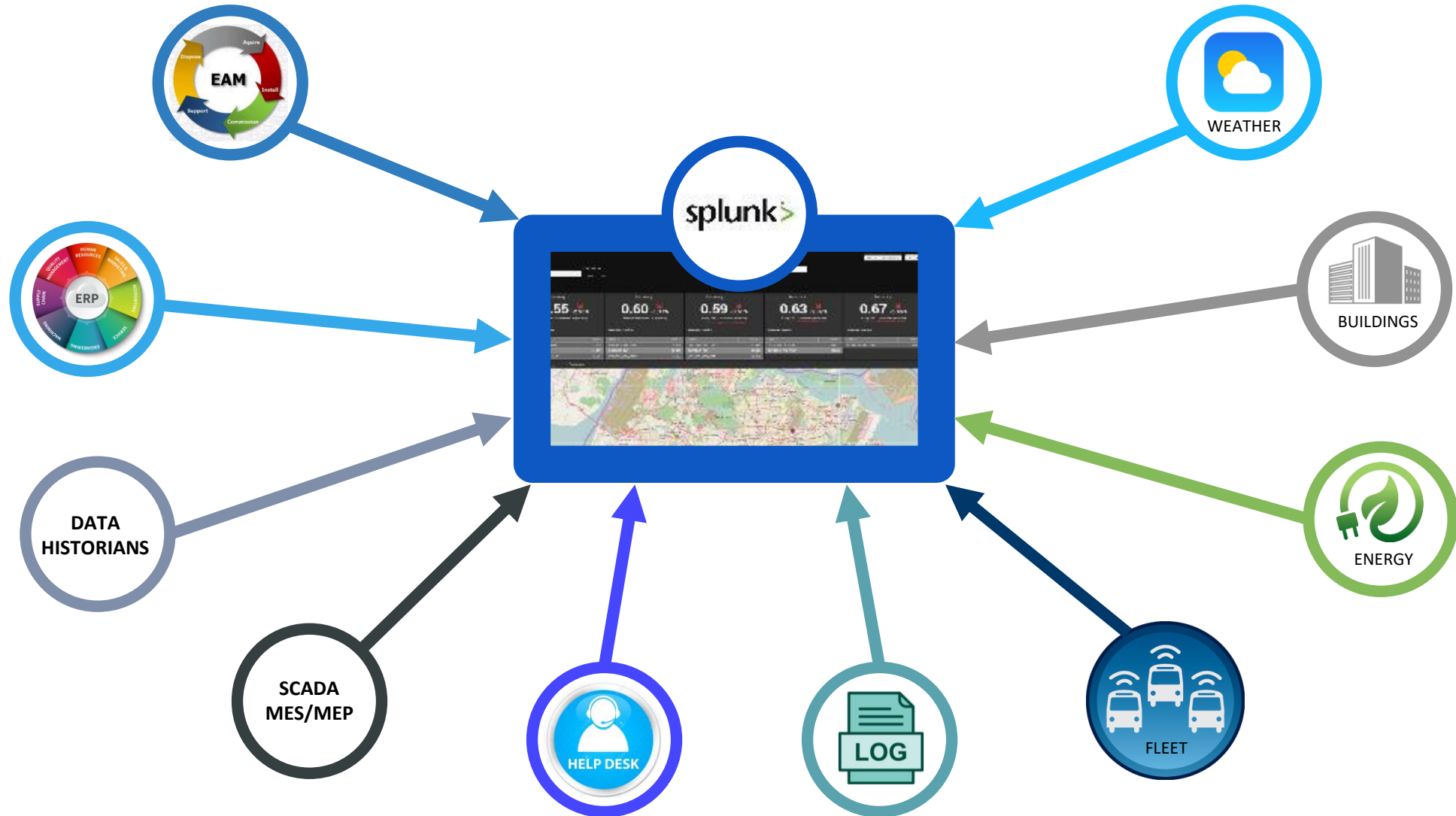
Track performance, and make better decisions
Visualize trends in sensor and event data to better plan for capacity
Use existing machine data from your OT and IT systems

04. INTEGRATE/CORRELATE

EAM Integrations – Maximo, Infor, SAP, Oracle
YouBIM – 2D/3D Asset Visualization of Assets
Industrial Connectivity – Kepware, OPC, MQTT, Litmus
ERP Integrations – SAP, Oracle, JD Edwards

BYOD: BRING YOUR OWN DATA

DATA-TO-EVERYTHING PLATFORM WITH POWERFUL DATA CORRELATION AND ADVANCED ANALYTICS



REPORTS AND VISUALIZATION

SPLUNK VS TRADITIONAL BI AND IOT PLATFORMS FOR REPORTING AND VISULIZATION

SPLUNK (IDEAL FOR INVESTIGATION)



"Schema-on-the-Fly"

101
010

Data in native format



Enrich at read



New data = no changes needed



New questions = no changes needed



"Data in motion" (Real-time)



Fast time-to-value

TRADITIONAL (IDEAL FOR REPORTING)



Define Static schema



ETL into Schema



Enrich at write



New data = new columns



New questions = new columns



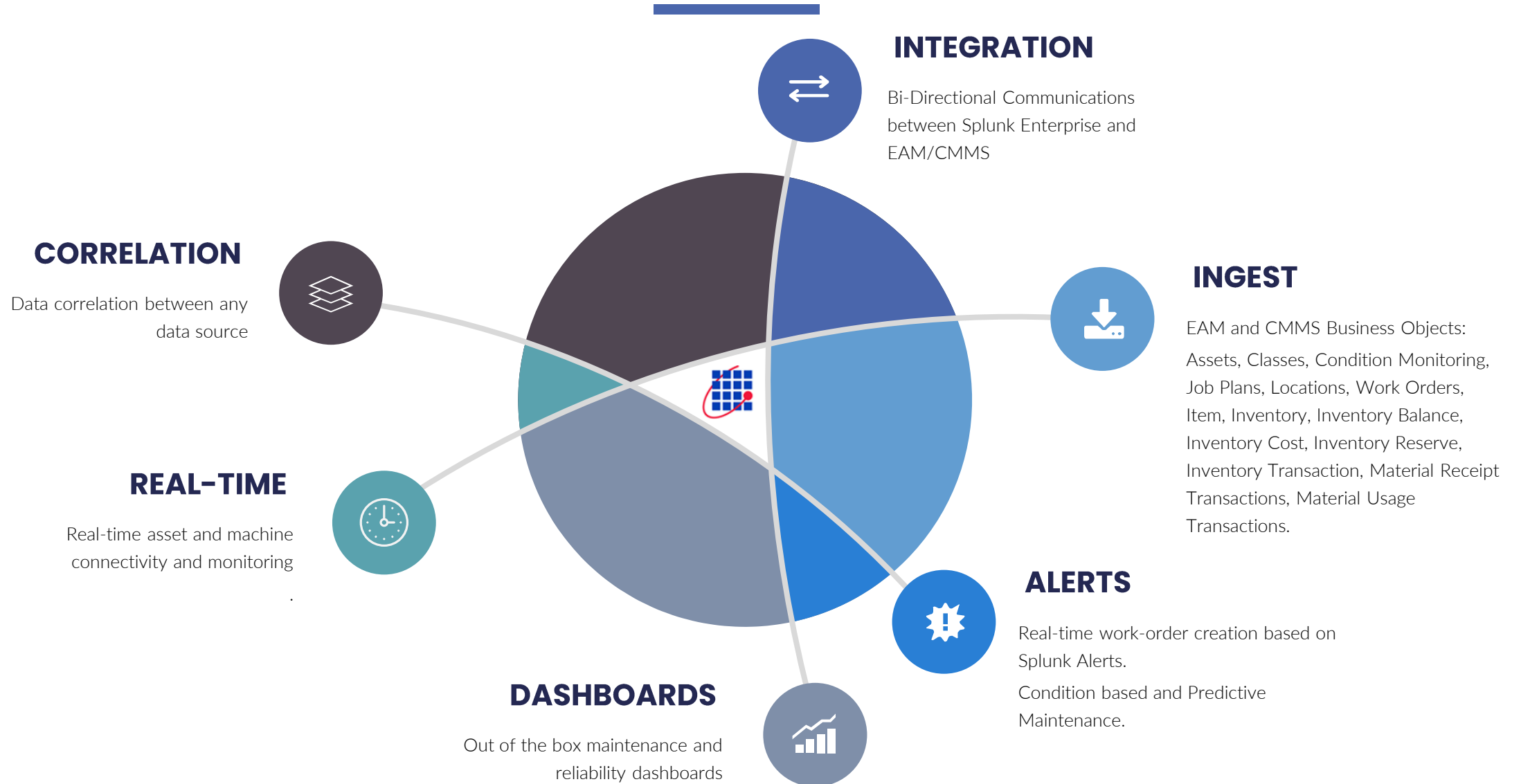
"Data at rest" (delayed info)



Labor Intensive & time consuming

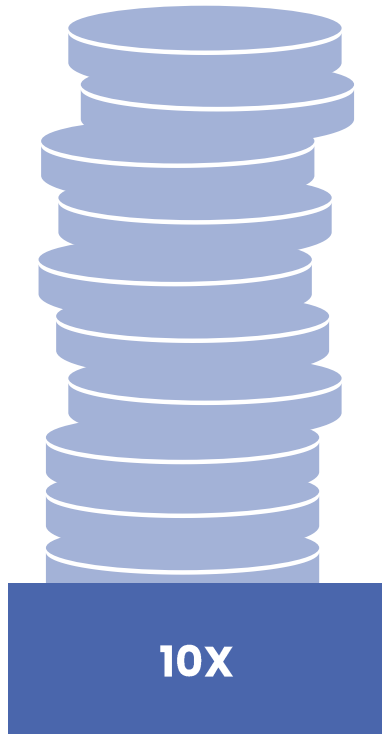
SMS SPLUNK APPS FOR MAINTENANCE

FEATURES FOR SMS SPLUNK APP FOR EAM AND ASSET PERFORMANCE MANAGEMENT



BENEFITS

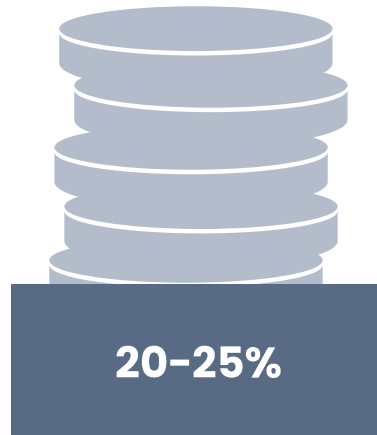
BENEFITS OF IMPLEMENTING A CONNECTED MAINTENANCE AND ANALYTICS PROGRAM



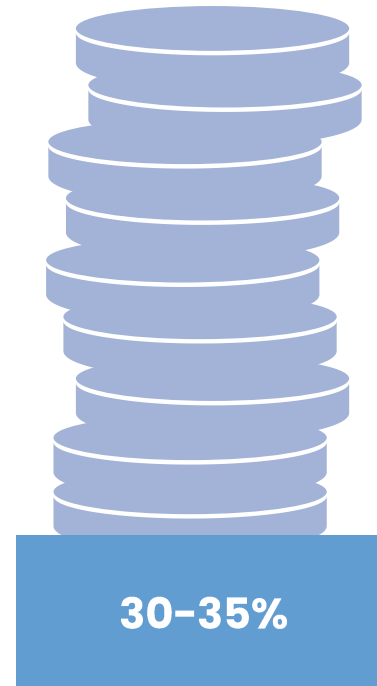
RETURN ON INVESTMENT



REDUCTION IN DOWNTIME



REDUCTION IN MAINTENANCE COSTS



BREAKDOWNS ELIMINATED



INCREASE IN PRODUCTION OUTPUT