November 2nd, 2017

SAP Leonardo Live Digital Operations

Presented by

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CenturyLink – Meeting Tomorrow's Challenges Today

By 2020,

THE NUMBER OF POTENTIALLY CONNECTED THINGS WILL BE 1.8 TRILLION…	**…AND THE VOLUME OF DATA WILL BE 44 ZETTABYTES**
240 connected devices for every person on the planet	If an 11 oz cup of coffee represented 1 gigabyte… …this would have the volume of 44 Great Walls of China

CenturyLink Business is meeting tomorrow's challenges today with industry leading end-to-end solutions

NETWORK

INFRASTRUCTURE MANAGEMENT

MANAGED SECURITY SERVICES

MULTI-CLOUD

MANAGED SERVICES

BIG DATA & ADVANCED ANALYTICS

INDUSTRY PARTNERSHIPS

ARTIFICIAL INTELLIGENCE & DEEP LEARNING
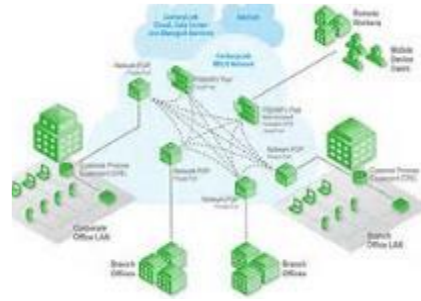
SAP Leonardo – CenturyLink Value Proposition

IoT
- End-to-End IoT Solutions from Infrastructure to Analytics

Big Data
- Big Data as a Service
- Big Data Analytics Solutions

Data Network
- World class data transport & DCs

Analytics
- Taking customers from Data to Decisions

Machine Learning
- World class ML and AI Capabilities

Cloud Platform
- Managed SAP
- Hana Enterprise Cloud
- Managed Big Data

Design Thinking
- Design to Value Roadmap
- Multi IoT Roadmap
- Leonardo Kick Start

Blockchain
- Building core Blockchain capabilities

CenturyLink Leonardo Related Solutions

- Big Data & Advanced Analytics
- Multi-IoT Practice
- Multi-Cloud Enablement, CAM
- Machine Learning/AI
- BI Competency Center
- Road mapping and Design thinking services

Digital Operations – Data Center Analytics
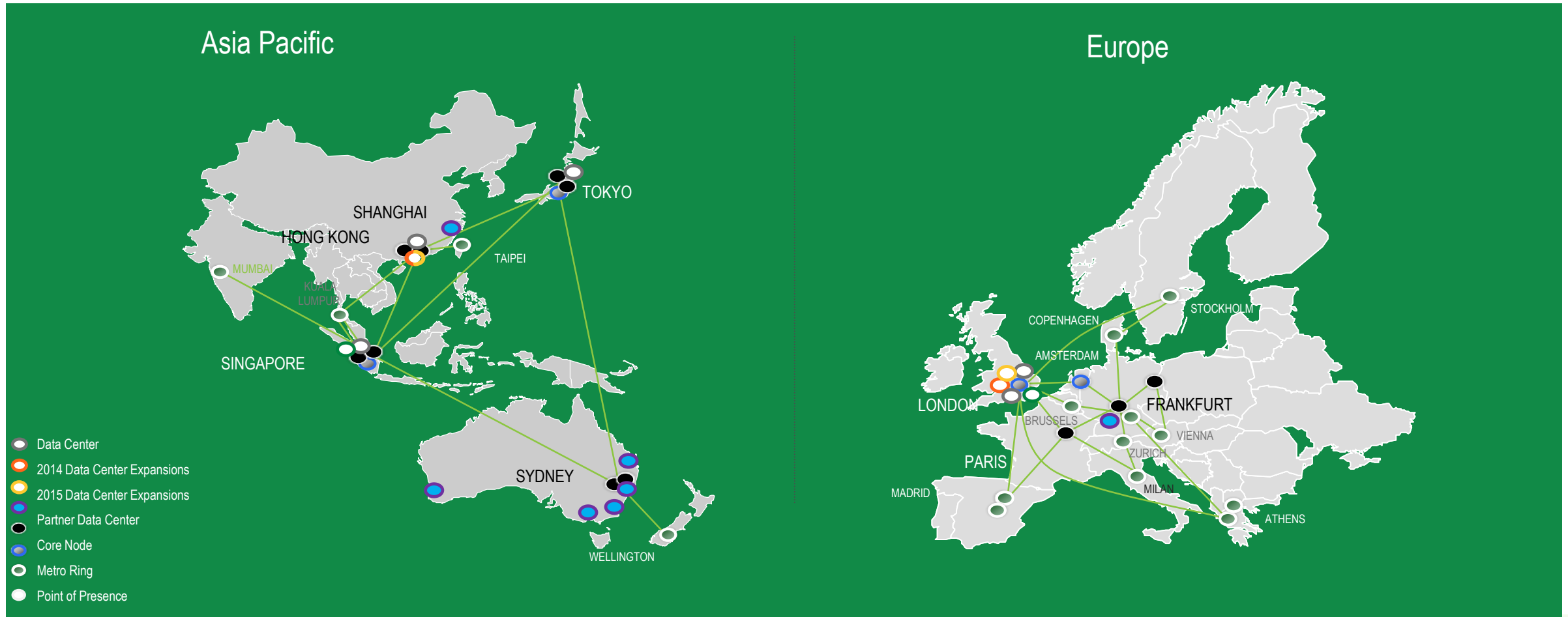
Data Center & Network Footprint

North America

Legend:
- Data Center
- 2014 Data Center Expansions
- 2015 Data Center Expansions
- Partner Data Center
- Core Node
- Metro Ring
- Point of Presence

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Data Center & Network Footprint

CenturyLink is a global leader in networking, colocation, cloud infrastructure and hosted IT solutions for enterprises

Asia Pacific

TOKYO
SHANGHAI
HONG KONG
TAIPEI
MUMBAI
KUALA LUMPUR
SINGAPORE
SYDNEY
WELLINGTON

Europe

STOCKHOLM
COPENHAGEN
AMSTERDAM
LONDON
BRUSSELS
FRANKFURT
VIENNA
PARIS
ZURICH
MADRID
MILAN
ATHENS

Legend:
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Data Center Analytics – Goals & Challenges

Business Goals

- Improve customer experience
- Maintain profitability (adhering to SLAs)
- Increase employee productivity of domain experts
- Capex planning
- Process improvement
- Prevent incidents
  through early detection
- Reduce MTTR by facilitating root-cause analytics
- Facilitate domain experts and harvest their knowledge

Functional Goals

- Reduce mean time to recovery
- Facilitate root cause analysis
- Prevent incidents through predicting them
- Detect incidents before they become impactful

Technical Goals

- Predictions on all unique streams
- Real-time
- Scalability
- Robust
- Resiliency
- Extensibility
- User interaction

Solutioning Challenges

60+ Data Centers Worldwide, 17 that are cloud enabled
- Monitor Network, Storage and Compute media
- Wiretap Cloud Application and Service Messages (not customer's apps)
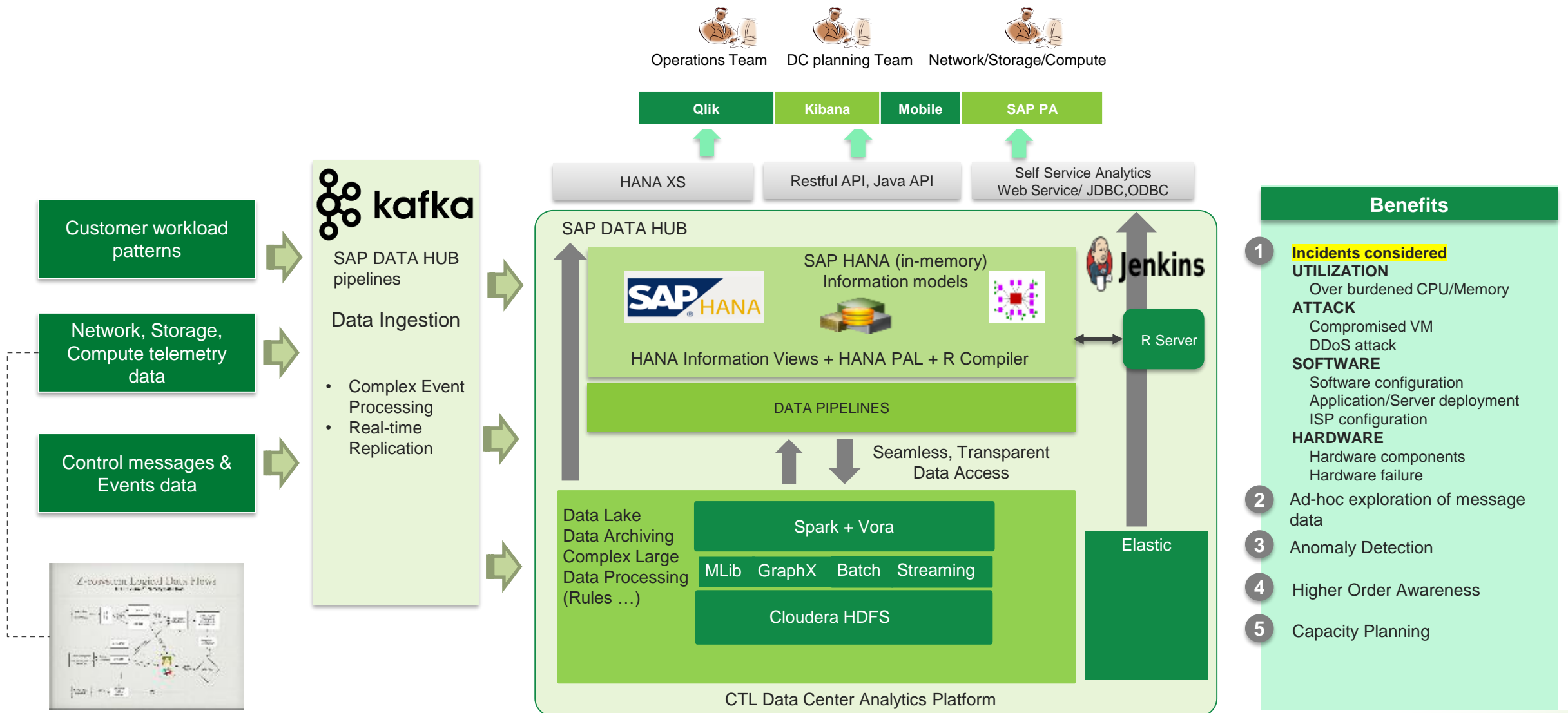- Install thousands of "Canary" (Customer Proxies)

Process 1 Billion + messages per day
- Fixed 150 Terabytes of storage by retention policy
- Bursting at 50K+ messages per second
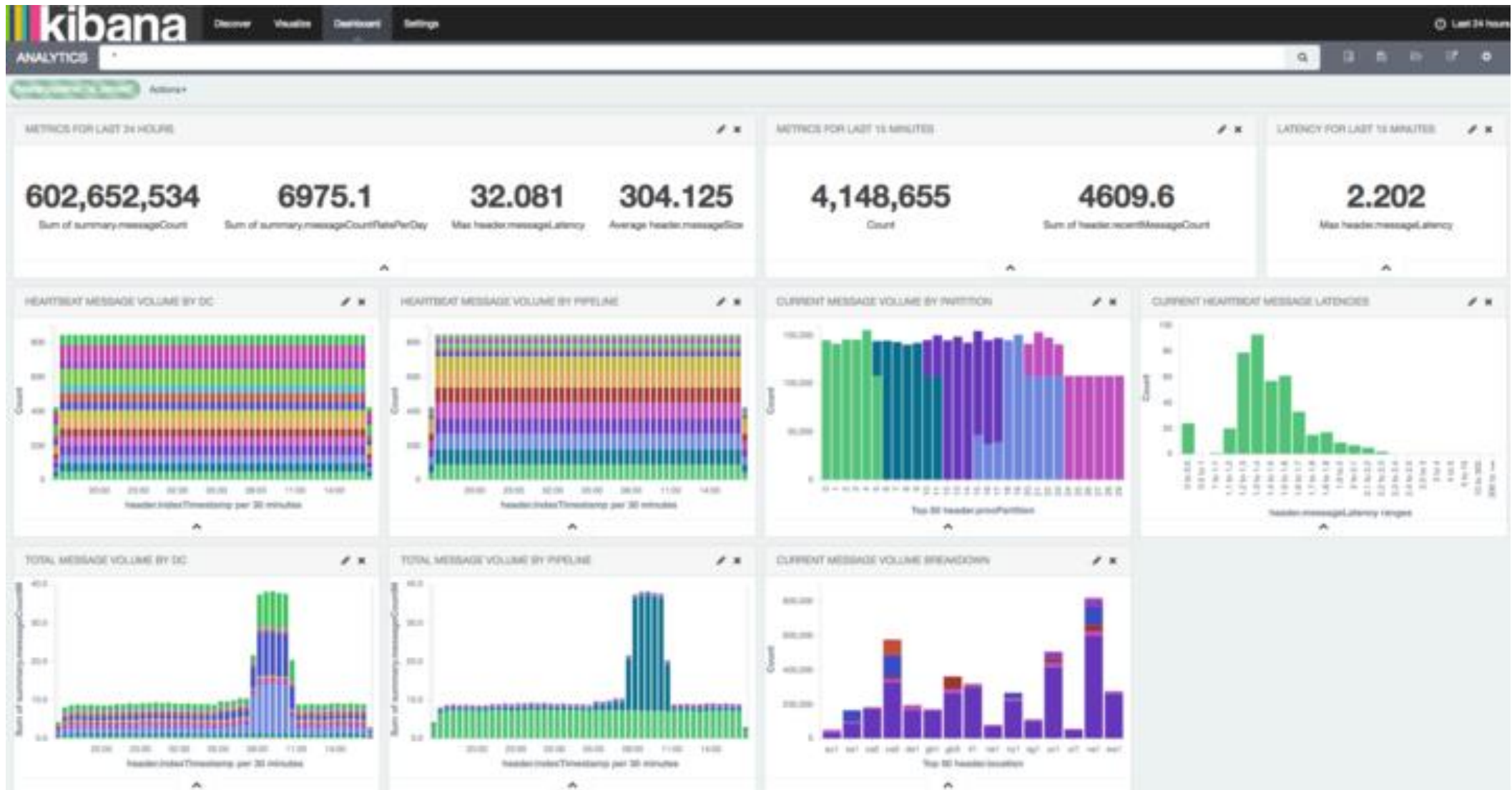- Real Time and Batch Processing

Solution Life Cycle
- COLLECT
  - Application exhaust
  - Zenoss telemetry
  - Canary data
- REPORT
  - Stability reporting
  - Capacity planning
  - Self service data
- ANALYZE
  - Incident Detection
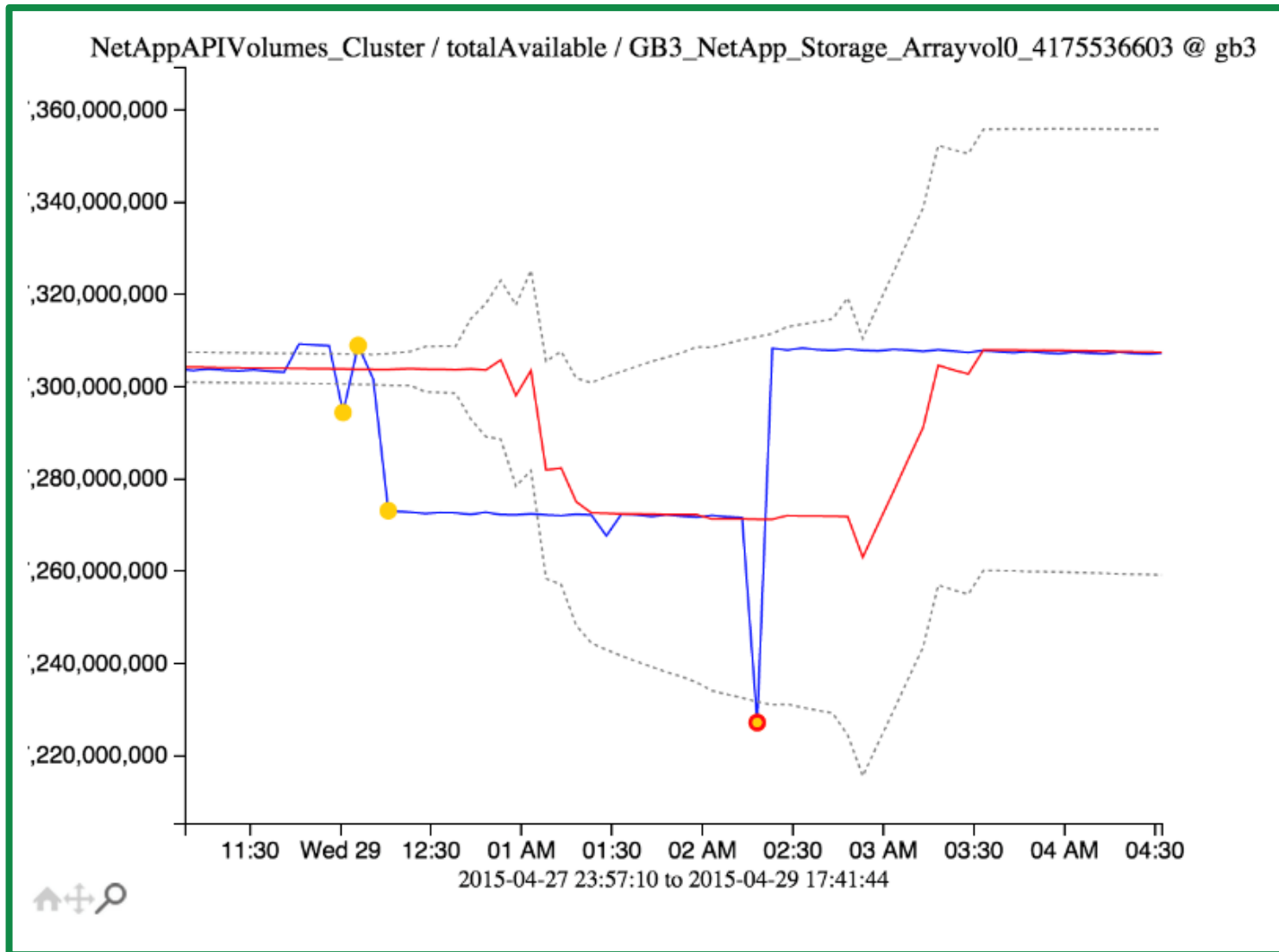 - Incident Prediction
  - Self-service detection

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SAP Leonardo –Digital Operations

Operations Team   DC planning Team   Network/Storage/Compute

Qlik	Kibana	Mobile	SAP PA

HANA XS	Restful API, Java API	Self Service Analytics Web Service/ JDBC,ODBC

Customer workload patterns

Network, Storage, Compute telemetry data

Control messages & Events data

kafka

SAP DATA HUB pipelines

Data Ingestion

- Complex Event Processing
- Real-time Replication

SAP DATA HUB

SAP HANA (in-memory) Information models

SAP HANA

HANA Information Views + HANA PAL + R Compiler

Jenkins

R Server

DATA PIPELINES

Seamless, Transparent Data Access

Data Lake
Data Archiving
Complex Large
Data Processing
(Rules …)

Spark + Vora

MLib   GraphX   Batch   Streaming

Cloudera HDFS

Elastic

CTL Data Center Analytics Platform

Benefits

1 **Incidents considered**
UTILIZATION
Over burdened CPU/Memory
ATTACK
Compromised VM
DDoS attack
SOFTWARE
Software configuration
Application/Server deployment
ISP configuration
HARDWARE
Hardware components
Hardware failure

2 Ad-hoc exploration of message data

3 Anomaly Detection

4 Higher Order Awareness

5 Capacity Planning

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Data Center Analytics – Outcomes

Data Center Analytics –Anomaly Detection

NetAppAPIVolumes_Cluster / totalAvailable / GB3_NetApp_Storage_Arrayvol0_4175536603 @ gb3

2015-04-27 23:57:10 to 2015-04-29 17:41:44

GOAL

Minimize time until resolution (TTR) through real-time detection

DEPENDENCIES

Capture the time series data for each piece of connected platform technology
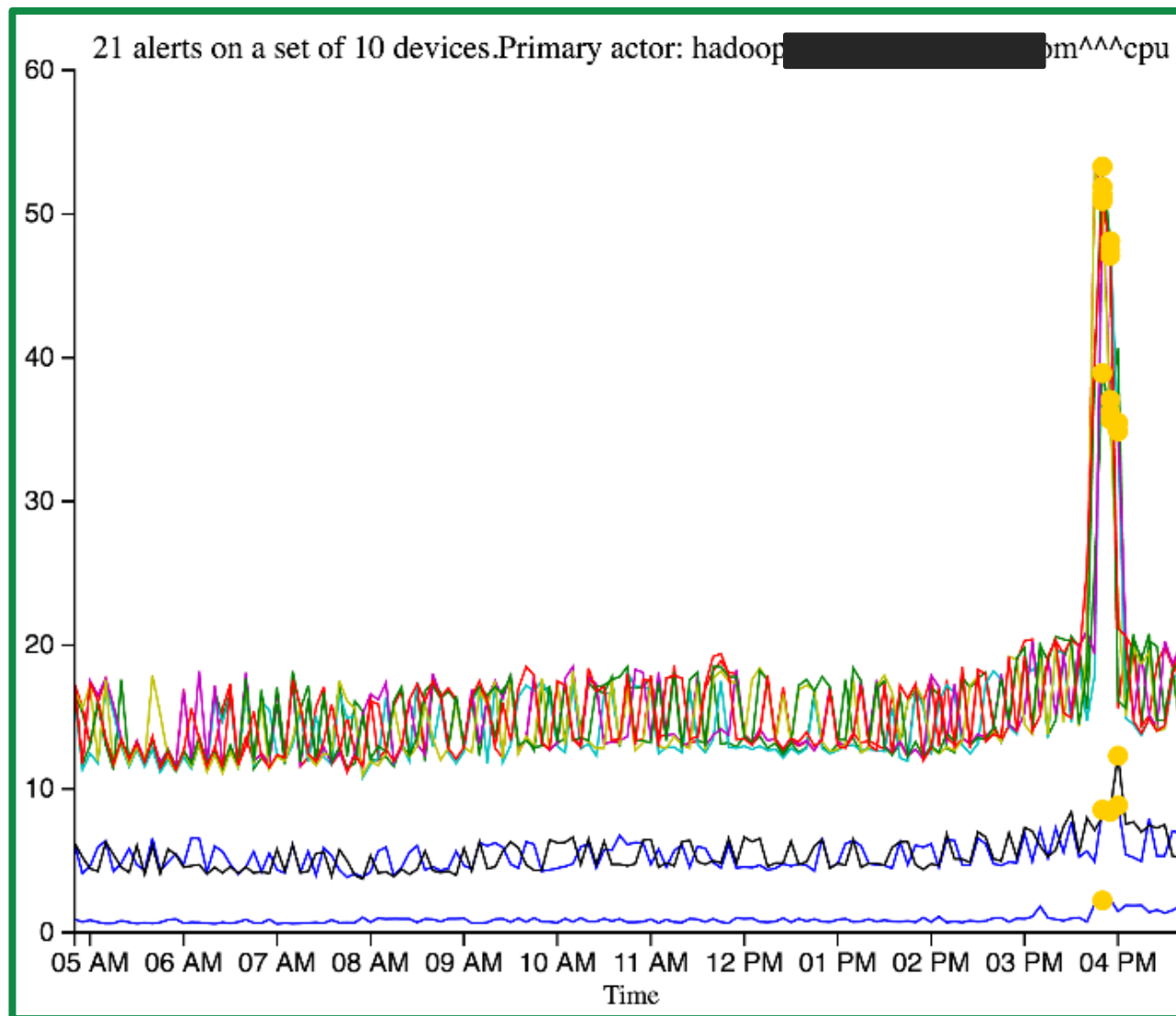
APPROACH

Find explicit and implicit anomalies within a time series vector

TECHNOLOGY

Prediction and clustering

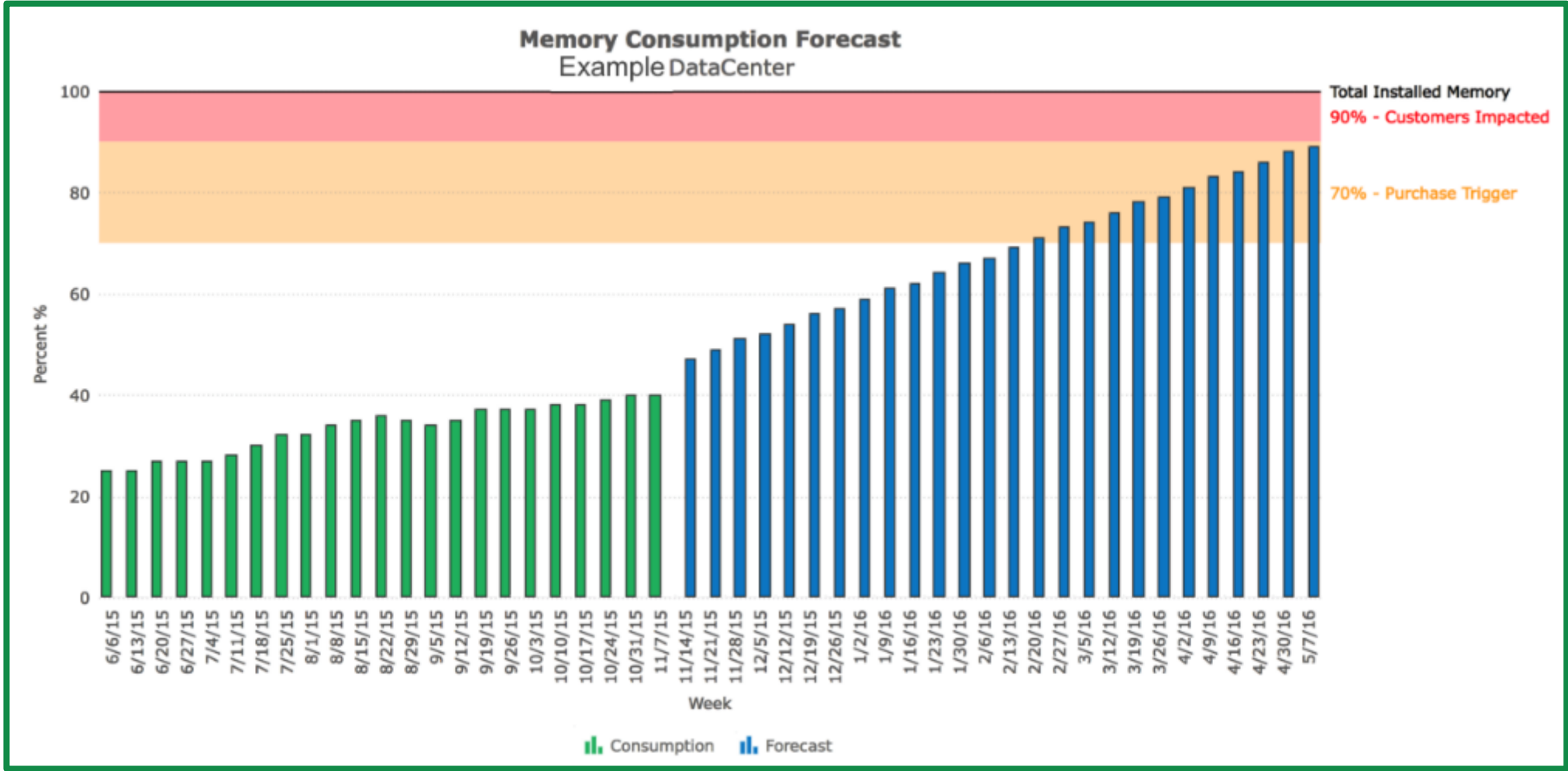21 alerts on a set of 10 devices. Primary actor: hadoop▮▮▮▮▮▮▮▮▮▮▮▮om^^^cpu

Group anomalous patterns together based upon time and shape

Create higher-order alerts

Capacity Planning

Forecast time at which we will cross critical thresholds
180 day horizon

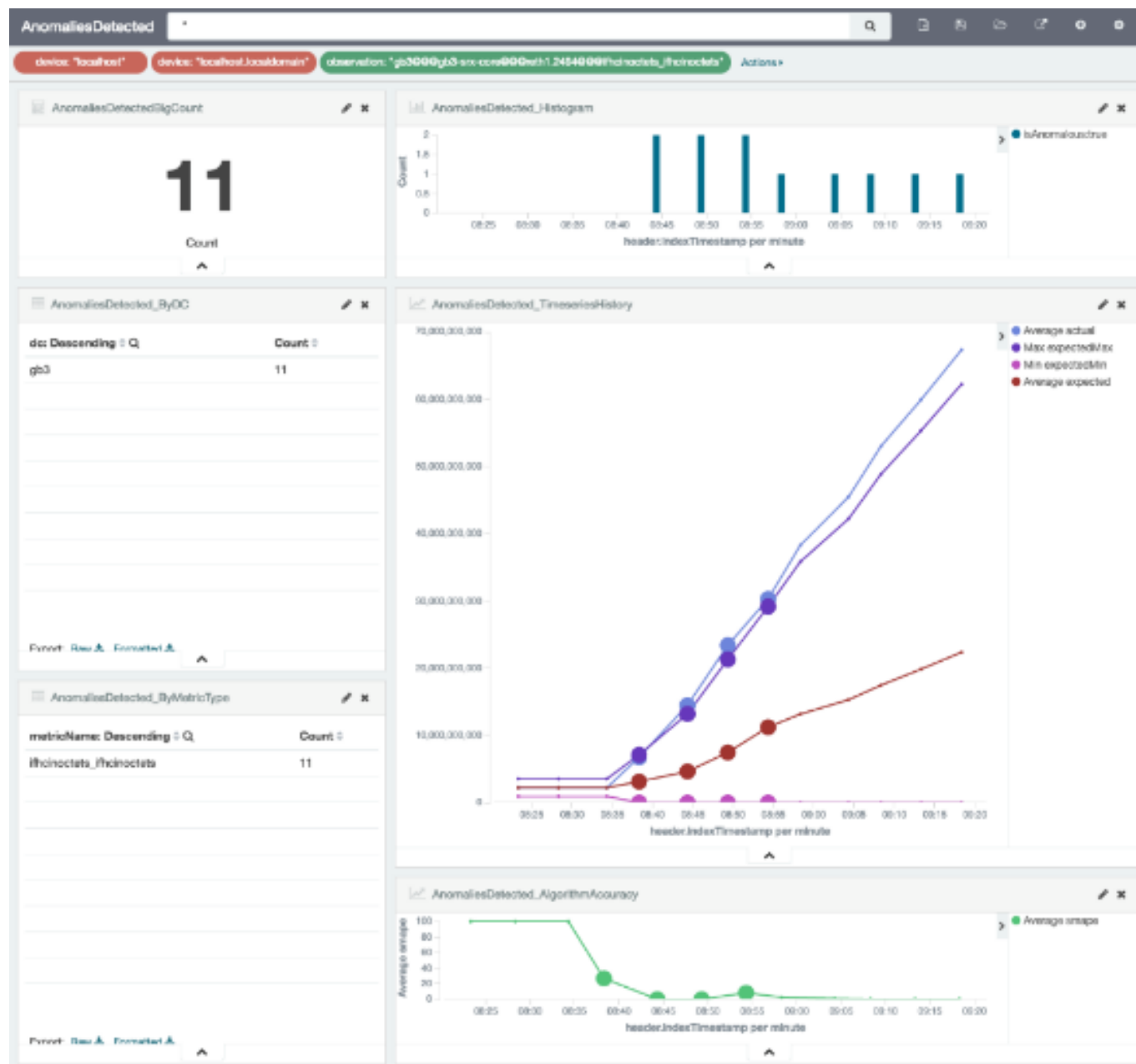Memory Consumption Forecast — Example DataCenter

Detecting Patterns to Predict Issues

Alignment of anomalies across devices through time

Alignment varies based upon type of incident
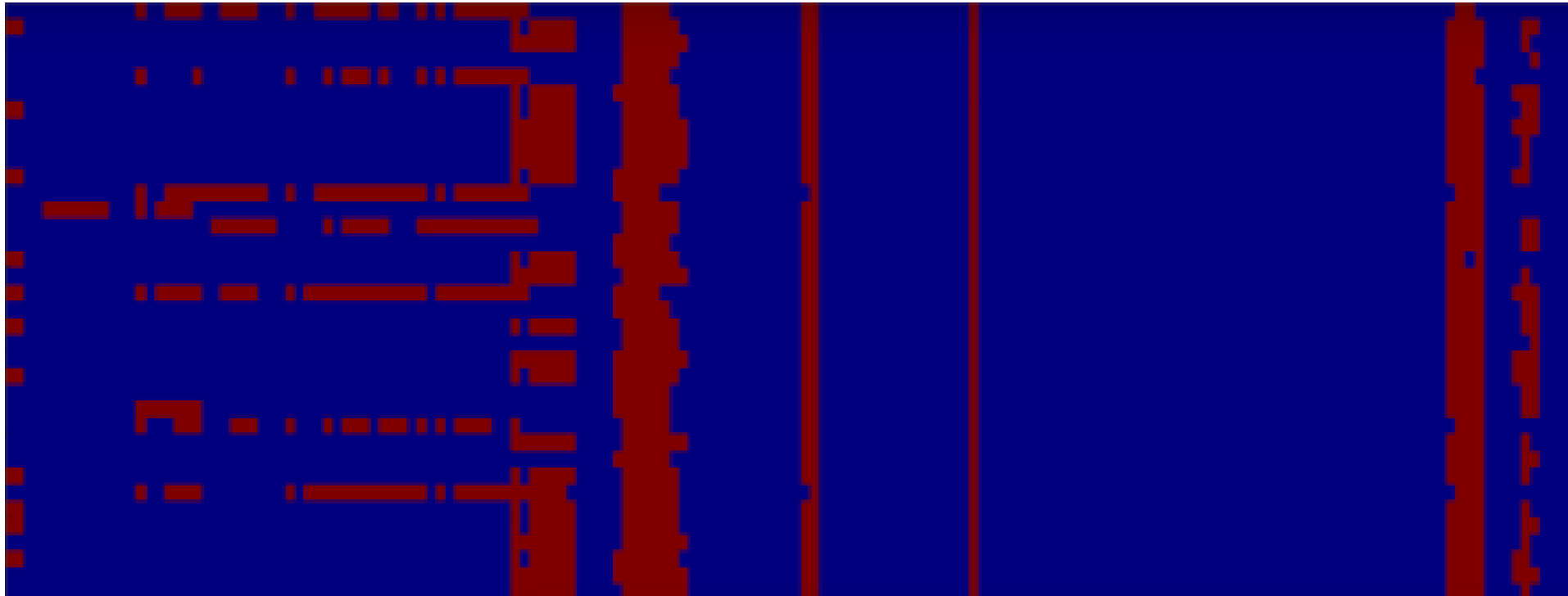
Anomaly Detection Dashboard

Processing message volume > 1,000,000,000/day

Analytics uptime > 99.9%

Stability of Cloud platform > 99%

~60MM+ predictions in 24hr.

Anomaly rate < 0.01% (0.0001)
~3K anomalies/day

Accuracy is ~90%
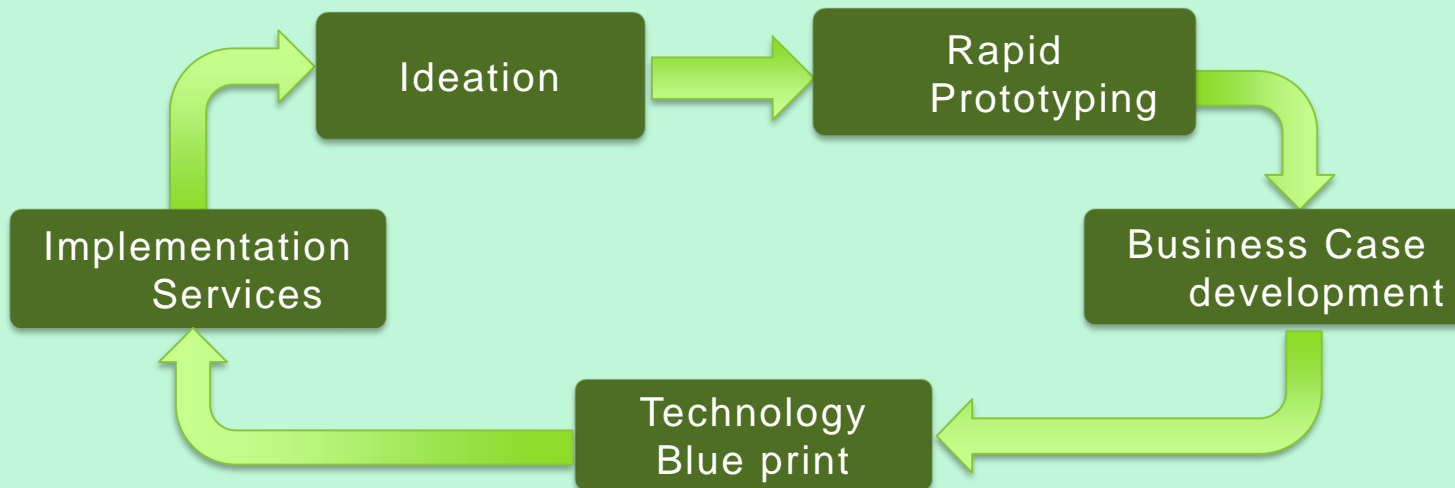
Prediction latency ~3.0 seconds
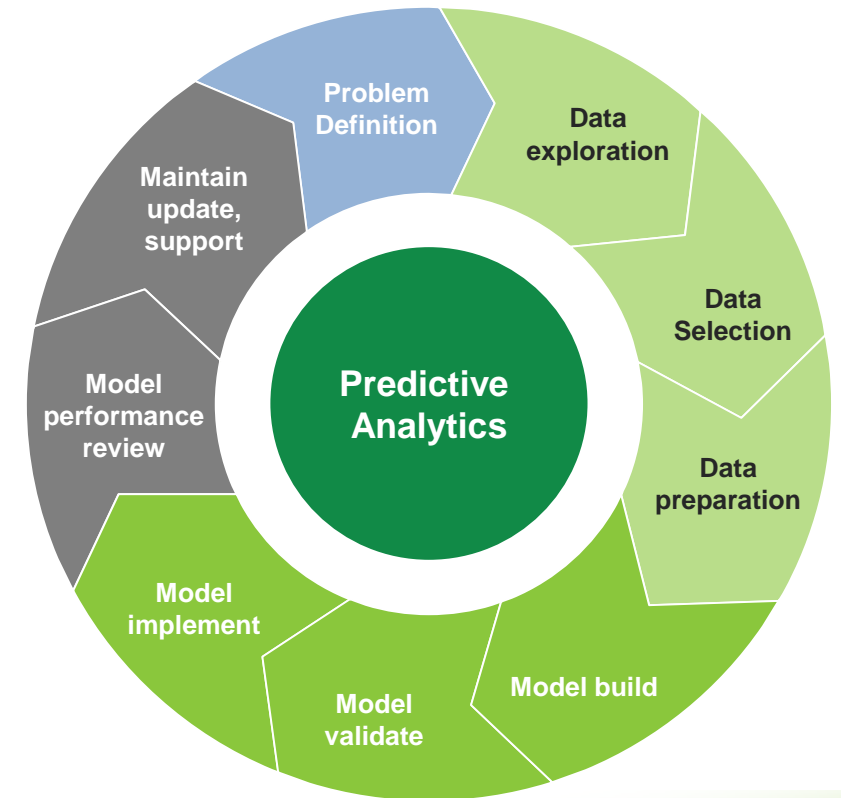
~30 Higher order alerts/day

CenturyLink Approach

SAP Datahub and Advance Analytics Quick Start Program

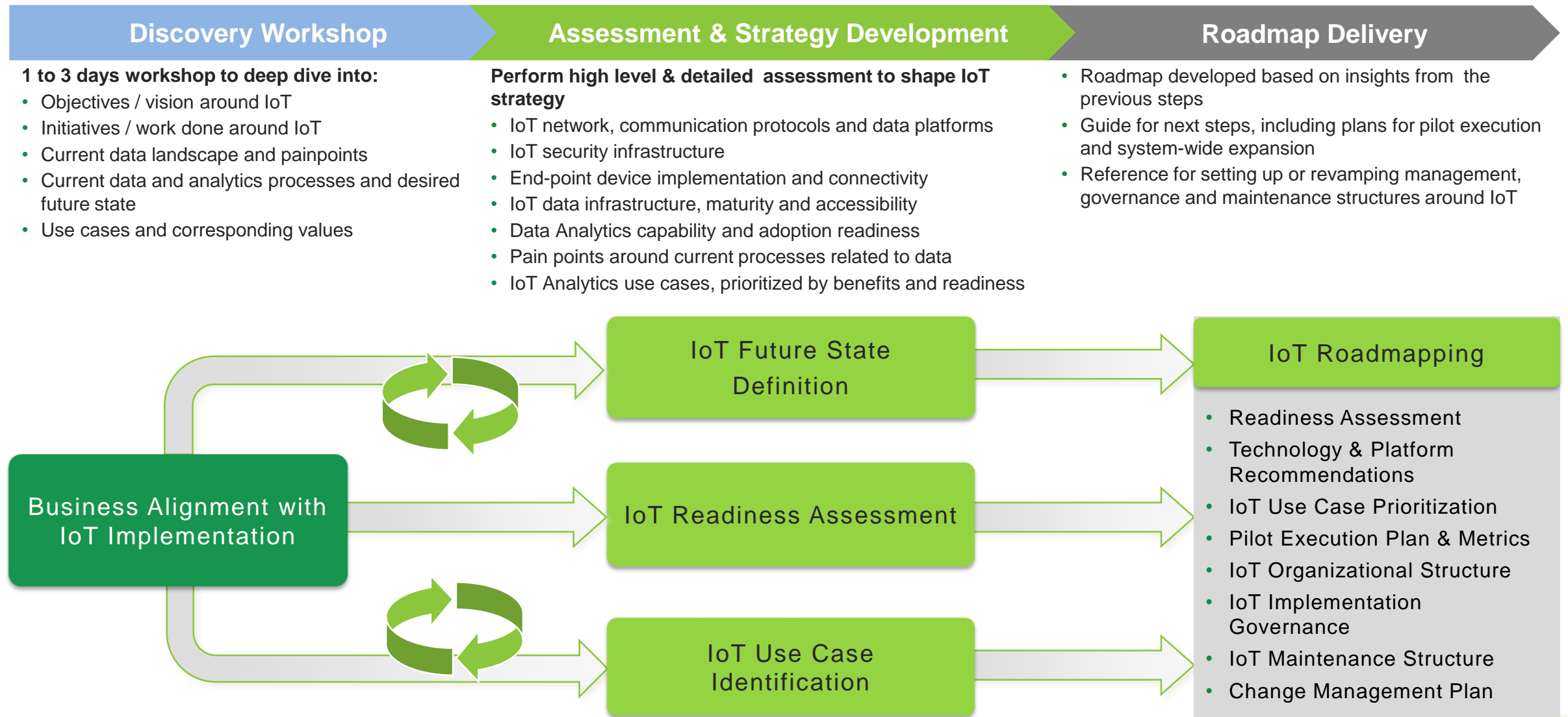**SAP Leonardo Design Thinking services**

**CAPstone
(CenturyLink Analytical Process)
Methodology**

Multi-IoT Strategy Roadmapping

Discovery Workshop	Assessment & Strategy Development	Roadmap Delivery

1 to 3 days workshop to deep dive into:
- Objectives / vision around IoT
- Initiatives / work done around IoT
- Current data landscape and painpoints
- Current data and analytics processes and desired future state
- Use cases and corresponding values

Perform high level & detailed assessment to shape IoT strategy
- IoT network, communication protocols and data platforms
- IoT security infrastructure
- End-point device implementation and connectivity
- IoT data infrastructure, maturity and accessibility
- Data Analytics capability and adoption readiness
- Pain points around current processes related to data
- IoT Analytics use cases, prioritized by benefits and readiness

- Roadmap developed based on insights from the previous steps
- Guide for next steps, including plans for pilot execution and system-wide expansion
- Reference for setting up or revamping management, governance and maintenance structures around IoT

Business Alignment with IoT Implementation

IoT Future State Definition

IoT Readiness Assessment

IoT Use Case Identification

IoT Roadmapping
- Readiness Assessment
- Technology & Platform Recommendations
- IoT Use Case Prioritization
- Pilot Execution Plan & Metrics
- IoT Organizational Structure
- IoT Implementation Governance
- IoT Maintenance Structure
- Change Management Plan

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Leonardo Related Use Cases by Industry

RETAIL & CPG
- signal detection
- consumer sentiment / paths to purchase
- marketing analytics
- customer lifecycle management
- Loyalty / attrition
- promotions

BANKING
- credit risk / fraud
- prospect acquisition
- share of wallet analysis & strategy
- Customer churn / paths
- Sentiment analysis

INSURANCE
- claims & sales fraud
- agent lifetime value analysis
- broker & adjustor effectiveness models

HEALTHCARE
- predicting readmissions
- sepsis prediction models
- healthscore calculation
- prediction of outcomes / quality of care for chronic diseases
- Paths to surgery

MANUFACTURING
- Predictive asset maintenance
- demand forecasting
- spare parts inventory planning
- pricing & margin
- warranty valuation
- supply chain optimization

TELCO
- cyber security threat detection
- equipment failure prevention
- next product to buy (NPTB)
- real time offers
- customer satisfaction / churn

CROSS INDUSTRY
- cybersecurity
- employee turnover/retention analysis; HR analytics
- customer churn analysis

OIL & GAS
- predictive asset maintenance
- intelligent exploration
- c-store sales optimization
- improved process safety/incident reduction

AUTOMOTIVE
- predictive asset maintenance
- auto sensors
- reporting location
- fleet management

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Questions

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THANK YOU

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