Data and Compliance
Leverage the complexity of data
Data and sources of data continue to grow

Percentage of uncertain data

We are here

2010

2020

10^{23}

Sensors & Devices

Social Media

VoIP

Enterprise Data
Technologies & methods to address data challenges are expanding

**Volume**
- MB, TB, GB, PB, EB
- Secure, manage, and govern the data
- Automate archiving, filtering, and disposal of data

**Variety**
- Structured data – sensors, financial, accounts
- Unstructured data – email, social, video, audio, natural language
- Image analytics
- Cognitive analytics
- Sentiment analysis

**Velocity**
- Real-time analytics
- Stream computing

**Veracity**
- Uncertainty due to data inconsistency & incompleteness, ambiguities, latency, deception, approximations
- Engineering methods
- Probability
- Fuzzy set theory
- Cognitive computing
Capabilities exist to move beyond basic reporting and gain further insight from the data.

**Enterprise Level**
- Measure and control
  - Gain observability over the system and automate control functions

**Insight**
- Integrate data from multiple sources to enable participation and action
- Share information, analyzing and acting upon it given real-time conditions

**Outcome Based**
- Optimize using rules, constraints and intelligent agents
- Predict and orchestrate to continuously assure an outcome that is better than the sum of the individual parts

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**Connect disparate data**
- **Monitor and automate**
- **Sense & respond**
- **Analyze & optimize**

**Progress/maturity over time**
- Basic Functionality
- Advanced Functionality
The Jefferson Project: Smarter water management innovation from IBM, RPI and The FUND for Lake George

- **Goal:**
  - Understand and manage complex factors – from road salt, storm water runoff and invasive species – threatening one of the world’s most pristine natural ecosystems and an economic cornerstone of the New York tourism industry

- **Lake George**
  - 32 miles long, 2.5 miles wide, maximum depth of 200 feet
  - 145 tributaries and over 170 islands
  - Land surrounding the lake remains 95% natural forestland
  - $1B in tourism activity in the surrounding region

- **Lake Stressors**
  - Salt Content: Lakewide chloride concentration has tripled to 15.7 ppm since 1980
  - Algae Impact: Chlorophyll levels in surface waters has increased by 50% as quantities of algae in the lake have grown
  - Invasive Species: 5 species have been discovered, including Asian Clam and Zebra Mussel

- **Making the Lake Smarter**
  - 40 sensing platforms will be deployed to monitor weather, water chemistry and quality, lake currents and stream flows
  - Model lake using a supercomputer capable of performing 188 trillion operations per second
  - More than 20 scientists collaborating and working with 30 years of historical data

[Lake George Video]
Analytics leads to actionable insight to address compliance

Volume
Terabytes to exabytes of existing data to process

Variety
Structured, unstructured, text, multimedia

Velocity
Streaming data, milliseconds to seconds to respond

Veracity
Uncertainty due to data inconsistency & incompleteness, ambiguities, latency, deception, model approximations

Predictive Risk Analytics

Environmental Compliance Analysis (fuel, emissions)

Commercial Risk Assessment

Real Time Operational Analytics

Sustainability Analysis

Capital Planning

Actionable insight to optimize outcomes