Bienvenue
Donnez vie à vos données IoT grâce à l’analytique en streaming

Frederic Combaneyre
Streaming Solutions Manager
Volume
Velocity
Variety

Immediate low latency answers
Reduced time to decision action
Continuously evaluate opportunities and risks
More agile, more responsive
Better equipped to address big data
STREAMING ANALYTICS

CROSS-INDUSTRY APPLICABILITY AND VALUE

Fraud Detection
Real Time Marketing
Cyber Security
Supply Chain
IT Operations

Industry, Energy
Capital Markets
Manufacturing
Telecommunications
Enterprise Decisions
Internet of Things

- Smart Cities and Homes
- Connected Car/Transportation
- Connected Customer
- Communications
- Surveillance
- Building Management
- Agriculture
- Energy
- Manufacturing
- Insurance
- Retail
- Healthcare
- Smart Cities and Homes
- Connected Customer
- Surveillance
- Building Management
- Agriculture
- Energy
- Manufacturing
- Insurance
- Retail
- Healthcare
“IoT is a tool to enable better governance and not the end goal. Operational implementation is crucial — IoT data must be analyzed and visualized to allow for better decisions in city operations or for research purposes to improve the quality of life. Having constant, real-time information is useful only if a city can keep up on the analysis end and use the flow of information to pre-empt problems.”

Stephen Goldsmith
Harvard's Kennedy School of Government

Source: http://www.govtech.com/opinion/5-Key-Themes-to-Consider-When-Implementing-Internet-of-Things-Initiatives.html
THE IOT PROMISE

Sense

Understand

Act

Efficiencies
Quality of Life
Early Warnings
New Business Models

New Value
INTELLIGENCE FOR THE CONNECTED WORLD

**Connected Car**
Predict issues in the fleet before failures occur and provide new value added services. SAS for IoT Analytics uses data vehicle sensors and customer information to develop and deploy models that provide proactive information leading to better customer service.

**Connected Customer**
Provide your customers with the right content and offers in real time. SAS for IoT Analytics leverages data from connected devices to predict customer preferences, in real time. The result is timely suggestions and offers customers are more likely to accept.

**Connected Health**
Improve patient care and drive better patient outcomes. SAS for IoT Analytics allows health care organizations to leverage electronic medical recorders with health sensors to establish optimal care and monitor conditions in real-time to minimize risks.

**Connected Factory**
Identifies hidden patterns that predict failures improving production yield and product quality. SAS for IoT Analytics leverages equipment sensor and tag data to develop and deploy early warning models.
INTERNET OF THINGS

TRADITIONAL ANALYTICS LIFECYCLE

Data → ETL → Data Storage → Model Dev / Execute / Monitor → Alerts / Reports

Access – Store - Analyze
• Deploy SAS advanced analytics on various Intel based IoT gateways.
• Leverage Intel Wind River’s Helix Device Cloud platform for management of SAS Event Stream Processing’s footprint on gateways.
KEY TAKEAWAYS

Fast – Millions of events/second – sub-millisecond latency on commodity hardware

Agile – From lightweight embedded technology to cloud distributed architecture

Flexible – Flow Based programming Modeling for fast adaptation to change

High End Analytics – SAS® most advanced analytics and machine learning

Analytics at the Edge – Brings analytics at the closest of the event source.

Enterprise Class – Seamless integration with existing IT architecture and open source
Event Streams are **high throughput, low latency** data flows

SAS Event Stream Processing provides:

- **Millions of events per second** throughput
- **Millisecond-microsecond** response latency
- On standard **commodity hardware**

**Throughput** - *how many events per second can be ingested*

**Latency** - *the time it takes for an event to be processed through the defined workflow*
SAS® EVENT STREAM PROCESSING

ENGINEERED FOR AGILITY

Low footprint OS native application

From lightweight embedded technology to cloud distributed architecture

Fulfill new IoT architecture needs

- Lightweight embedding technology
- Cloud ready
- OS native application
- Clustering
- Dynamic model update

Edge  Small  Large  Cluster  Cloud
Pattern detection at event stream source
Offline, data at rest identifies emerging trends
Feedback new insights back into event streams
Dynamically update queries into live stream
Analytics on data at rest dynamically updated to live, in-motion event detection

Extends existing SAS Solution investment into streaming environments

Scoring events - Models developed on data at rest
Machine learning - Models defined in-stream
Text analytics - Extract entities, classify and identify sentiment
Multi-phase analytics – deep analysis with high-end analytics

Time pattern analysis
Business rules data quality and policy definitions
Filter, aggregate and correlate events
Reference historic data – Lambda architecture
Model definition and maintenance simplified with visual modeling interface

- Create and maintain streaming models easily for fast and flexible adaptive action
- Full set of components to build any type of process
- Incremental model testing

Easy deployment of streaming analytic models

- Deployment of existing analytic models using embedded SAS® DS2, SAS® Datastep or Python code
- Deploy ESP models as XML files
- Dynamic model update

Dataflow centric modeling

- Drag & drop visual modeler
- Visual, XML or C modeling
- Dynamic model update

Publish & Subscribe API (Java, C, Python)
Seamless integration with existing IT architecture

300+ out of the box endpoints

Native failover and guaranteed delivery

Integrates with open source analytics and stream processors as part of a managed workflow

Core component of multiple SAS solutions

SAS® Visual Scenario Designer, SAS® Customer Intelligence, SAS® Asset Performance Analytics, SAS® Cyber Security,…

Linux and Windows

Cloud Foundry with BOSCH or Chef

Failover

Guaranteed Delivery

Publish/Subscribe
SAS® EVENT STREAM PROCESSING

ECOSYSTEM INTEGRATION (300+ ENDPOINTS)

SYSTEMS & APPLICATIONS
- TERELA
- boardreader
- Axeda
- twitter
- spryware
- WebSphere
- TIBCO RendezVous
- ORACLE
- PI SYSTEM OSIsoft

OPEN SOURCE
- RabbitMQ
- nifi
- hadoop
- protobuf
- kafka
- Apache Camel
- python
- MAPR
- CLOUD FOUNDARY
- BOSH
- Chef
- cassandra
- YARN READY

STANDARDS
- FILE/ SOCKET
- XML / JSON
- ODBC
- JMS
- MQTT
- SYSLOG
- HTTP RESTFUL
- SMTP
- NETWORK SNIFTERS
- DB LOG SNIFTERS
- WEB SERVICES

PUBLISH & SUBSCRIBE API
CONNECT TO ANY SYSTEM WITH JAVA, C, PYTHON
FULLY DOCUMENTED AND EASY TO USE

RendezVous

STANDARDS

FILE/ SOCKET
XML / JSON
ODBC
JMS
MQTT
SYSLOG
HTTP RESTFUL
SMTP
NETWORK SNIFTERS
DB LOG SNIFTERS
WEB SERVICES

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PREDICTIVE ASSET MAINTENANCE

BUSINESS CHALLENGE

• Predict maintenance needs of individual trucks before failures occur
• Proactively service trucks at opportune time
• Provide new service offering with high fleet SLA

SOLUTION

• Data from 60+ sensors / truck
• Integrated data with product details, warranty claims, and related data sources
• Analytic models predict the likelihood of specific failures within 30 days with 90% accuracy
• Better root cause insight led to higher productivity
ENHANCED CUSTOMER EXPERIENCE

1. Melanie receives optimized email promo for Friday in-store shopping. Email contains list based on:
   - Melanie’s shopping history
   - Store quantities (other variables).

2. Melanie enters the store on Friday.

3. ESP monitors in-store router and detects that Melanie entered store (based on router & cell phone).

4. ESP looks up guest details based on phone/email/user details.

5. RTDM will execute decision to determine interaction:
   - Model uses shopping list, household details, and common purchase affinities
   - Guest frequently purchases children apparel and household cleaners
   - Cross sell higher-margin product offers
   RTDM will interface to SAS Marketing Optimization to retrieve optimized offer set.

6. RTDM pushes an SMS with an email/link that reflects:
   - Method: laundry detergent promo
   - Cherokee Girls short sleeve Tees (Sunday promo). The household has 2 kids (age 9 and 11)

7. Guest receives personalized email message containing list.
PATIENT MANAGEMENT

BUSINESS ISSUE

• Detect relevant patterns in patient real-time data to alert critical care teams
• Address Alert Fatigue
• Patient vital statistics from various sensors across different equipment
• Incoming lab results joined with real time sensor data

RESULTS

• Monitor data to trigger actions based upon detected patterns
• Send messages across email and SMS
• Alert immediately appropriate critical care teams
• Send immediate recommendation to remote patient
PREDICTIVE ASSET MAINTENANCE

CHALLENGE

• Monitoring Electronic Submersible Pump efficiency & well performance for deep sea drilling rigs

• Failure of one pump is $2M/day; one day of productivity loss equates to $20M in deferred revenue

SOLUTION

• Over 2.1 million sensors generating 3 trillion rows of data/minute monitored for potential failure (temperature, vibration, ..)

• Automated sub-second detection of spectral performance and sensor reading quality

• Solving more event-driven problems in shorter time than previously possible
PREDICTIVE ASSET MAINTENANCE

Continuous monitoring for patterns of interest

Detecting:
- Occurrence
- Detection
- Qualification
TOWN OF CARY

BUSINESS ISSUE

• Manual meter reading was not timely or efficient
• Holidays, unplanned staff absences and inclement weather disrupted meter reading schedules, which led to inconsistent billing periods
• When customers called to express dissatisfaction with high bills, the town was unable to provide information about when high usage occurred
• Implemented Aquastar, a wireless metering system from Sensus, which improved data collection for billing but still lacked customer-facing analysis and web portals

RESULTS

• The town can more quickly detect and stop leaks, and give customers valuable information so that they can use water more wisely
• Customers can set alerts that automatically notify them via email or text if usage rises above preset limits
• More granular, daily data helps the town better predict utility revenue, improve future rate setting, and target water conservation programs to areas with the highest cost-benefit reward.

“Hourly water meter usage data has transformed our customer service approach from reactive to proactive. Not only can we give detailed information on usage, we can identify possible problems to help citizens reduce bills and save water.”

Karen Mills
Town of Cary Finance Director
Merci