Real-Time Actionable Insights with IBM Streams

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Real-time processing needs are growing

By 2025 We Will Generate 160ZB Annually

25% Of All Data Will Be Generated and Need Processing In Real-Time

Only A Small Percentage Of This Data Can Be Stored

* Data Age 2025: The Evolution of Data to Life-Critical. An IDC White Paper, Sponsored by Seagate
Continuous intelligence

– What if you could analyze data as it’s created?
– What if you could visualize your business?
– What if you could better predict your customers’ needs?
– What if you could gain insights from unstructured data like audio, text or video?
– What if could automate immediate actions?
– What if you always knew where your assets were, and where they would be?
– What if you could update machine learning models continuously?

And do it all in real time?
“Continuous intelligence is a design pattern in which real-time analytics are integrated into a business operation, processing current and historical data to prescribe actions in response to business moments and other events.”

Gartner: Innovation Insight for Continuous Intelligence
Continuous intelligence

– Engage data from inside and outside of applications or business operations
– Enable fast-paced digital business decisions and process optimization
– Leverage AI, ML, data analytics, real-time analytics and streaming event data to deliver business optimized solutions
– Ensure you can take advantage of the “perfect storm” of rising supply and demand for real-time situation awareness and responsiveness
Continuous intelligence example running over 1700 models in production
IBM Streams to act on all your data in real time

Market leader in streaming analytics
- Machine Learning
- Model Scoring
- Geospatial
- Video/Image
- Text, Speech to Text, Predictive, Descriptive

Enterprise Ready: included with Cloud Pak for Data
- Visual development
- Web console
- Management
- Enterprise connectors like JSON, JMS, MQ, MQTT
Streams to act on all your data in real time

Filter /Sample
Transform
Correlate
Classify, Annotate
IBM Streams offerings

Streams v4.3.1 July 2019
- Streams runtime
- Baremetal/VM

Streams for IBM Cloud Pak for Data
- Streams runtime
- Containers

Streaming Analytics
- Streams runtime
- Containers
- SaaS

Common runtime: develop anywhere and deployment everywhere

Available 1Q19

Free Lite Plan – 50 hours a month

Moved from VM to Containers in 2018
IBM Streams development options

**Streams Developer Edition, Streams Quick Start Edition**
- Dedicated Streams development IDE and tools
- Local machine

**IBM Cloud Pak for Data**
- Integrated data and AI project experience
- Containers*

**Watson Studio Streams Flows in IBM Cloud**
- Integrated data and AI project experience
- SaaS

*Moved from VM to Containers in 2018

**Quick Start** free for non-production

Available 4Q18

Plus IBM Runner for Apache Beam, Java, Scala, Python and beta plug-ins for VSCode and Atom

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IBM Streams at a glance
Out of the box with over 200 operators with 1300 functions

Communications data sources
- TCP/IP
- UDP/IP
- HTTP
- FTP
- RSS
- Messaging Toolkit (Kafka, XMS, IBM MQ, Apache ActiveMQ, RabbitMQ, MQTT)
- IBM Data Replication
- IP Packet ingest

Application development
- Java
- Scala
- Python
- Drag/Drop Streams Processing Language (SPL)
- VS Code, Atom for SPL

Primary analytics
- Filter
- Enrich
- Normalize
- Windowed Aggregations
- Machine Learning
- Scoring (SPSS, Python, R, MLlib)
- Signal Processing
- CEP & Pattern Matching
- xDR Mediation
- Geospatial
- Video/Image
- Text Analytics (AQL, UIMA)
- Speech to Text
- Rules
- Deep Packet Inspection

IBM Streams Scale-out Runtime

Hadoop
- HDFS, GPFS, Hive, Hbase, BigSQL, Parquet, Thrift, Avro

Data warehouse
- Hadoop
- IBM Db2, IBM Db2 Parallel writer, IBM Db2 Event Store, IBM Informix, IBM BigSQL, IBM Netezza, IBM Netezza NZLoad, Oracle, Microsoft SQL Server, MySQL, Teradata, HP Aster, HP Vertica

NoSQL
- Key Value Stores (Memcached, Redis, Redis-Cluster, Aerospike), Column Oriented Stores (Cassandra, Hbase), Document Oriented Stores (IBM Cloudant, Mongo, Couchbase, Elastic Search), Object Store

And even more at github.com/IBMStreams
Machine learning and real time analytics with IBM streams

Many different approaches to Machine Learning:

- Mechanisms: Supervised and Unsupervised
- Algorithms: Decision Trees, Regressions, Classification, Clustering, etc.
- Inputs: Single and multi-variant, rich feature vectors
- Streams has 20 ML algorithms that learn as you go in real time
- Streams scores models created offline from popular tools including IBM SPSS, Watson Machine Learning, SparkMLlib, Python, R & PMML libraries
- Native ML and Model scoring can all be integrated within a Streams application. With this approach, real time scores can be generated on the incoming data

“The science of getting computers to act without being explicitly programmed”¹

Use machine learning models created with Watson Studio to score live data on Streaming Analytics using Watson Studio Streams Flows.
Streams: Use the language of choice

Streams Processing Language (SPL)
- Tailored to stream processing
- High-level, declarative composition language
- Graphical editor support

Create topologies in Java
- Indirect support for Scala

Python topologies and operators
- Integration with Jupyter notebook
- Integration with IBM Watson Studio
- Add Python functions in line with SPL code

Publish/subscribe data exchange
- Between applications written in any language

Streams Processing Language

```java
Topology = new Topology("HelloWorld");
TStream<String> hw = topology.strings("Hello", "World!");
hw.print();
StreamsContextFactory.getEmbedded().submit(topology).get();
```

Python Topology

```python
class ECGPatientData:
    def __init__(self, username, password, sample_rate):
        self.username = username
        self.password = password
        self.sample_rate = sample_rate
        self.target_sample_rate = 100
        self.patient_id = patient_id

    def run(self):
        # Create topology
        topo = Topology("ECGPatientDataViz")
```
Advantage: Scale out with ease

Create logical application flow
– Without concern for throughput limitations

As needed, add parallel paths
– Based on runtime performance profiling

User-Defined Parallelism (UDP)
– Simple change in code or graphical editor
  • @parallel annotation
Static vs. dynamic composition

Static connections
– Specified at application development-time and do not change at run-time

Dynamic connections
– Partially specified at application development-time (Name or properties)
– Established at run-time, as new jobs come and go
  • Specifications can also be updated at run-time

Dynamic application composition
– Incremental deployment of applications
– Dynamic adaptation of applications
Application scenarios and real-world use cases

**IBM Streams** is being applied in many industries:

- Market and Customer Intelligence
- Call Center Customer Care
- Manufacturing
- Personalized Customer Experience
- Network Analytics
- IoT, Connected Car and Telematics
- Cyber Security
- Health and Improved Patient Outcomes
- Operational Optimization
Medtronic Sugar.IQ

IBM Technology

Watson Platform for Health
- Mobile app management
- Data management
- Integration
- Analytics with IBM Streams

Medtronic Sugar.IQ
Past–Present–Future

How have I done?
- Important glucose management* information

How am I doing?
- Near real-time personalized insights* for better decision making

What should I be doing?
- Predictive alerts** to help avoid incidents to stay ahead

The Results: Sugar.IQ with Watson

90%
AUC accuracy level when predicting the risk of hypoglycemia two to four hours in advance.***

Sugar.IQ 1.0 ‘Learning Launch’ showed*:

655
Hypo-related insights

699
Hyper-related insights

36 minutes
Average more in range per day

* Requires a Medtronic CGM device
** Planned feature
*** Data on File
† Data from all of the patients from Sugar.IQ ‘Learning Launch’ with Ver 1.0, Apr-Aug 2017. 256 total users
Medtronic Sugar.IQ Streams operators (grouped by job)

Data Ingest, Parsing
Data Cleaning
Glycemic Features
Motivational Insights
Glycemic Insights
Insight Delivery Triggers
MyData
Hypo Features (for model scoring)
Hypo Model Scoring

8 Applications
14,070 Operators
Fused into 240 processing elements
For continuous intelligence, **IBM Streams** is the clear choice

**Continued leadership in high volume, low latency streaming**
- Ingest and analyze **massive volumes of streaming data**

**Extend and embrace open source**
- **Over 100 included** in Streams (Spark, Eclipse, Yarn)
- **Apache Edgent** donated to open source
- [github.com/IBMStreams](https://github.com/IBMStreams) with over 50 projects

**Simplified development**
- Java, Scala and Python on native development
- Rules development with deployment to Streams
- Drag and Drop visual development
- Simplified **Web based development** in Watson Studio

**Applications**
- Telco and Finance Solutions from IBM Analytics Solutions
- Partner applications in Healthcare, Telco
- Accelerators for Customer Care and Clickstream analytics

**Multicloud deployment options with IBM Cloud Pak for Data**
What is the next step?

Try Streams with **Cloud Pak for Data** and score models built in Watson Studio against real time data for Continuous Insights.

Try **Streaming Analytics on IBM Cloud** to capture data and enable intelligent applications so you can spot opportunities and risks sooner than the competition.

Join the **IBM Streams developer community** which is a direct channel to IBM Streams developers and a place to discuss, learn and share ideas.
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Source:
1. https://online.stanford.edu/course/machine-learning-1