SAP HANA SPS 09 - What’s New?
Smart Data Streaming
(Delta from SPS08 to SPS09)
SAP HANA Product Management
November, 2014
Agenda

Introduction to Event Stream Processing
Use Cases
Technical Details
Functional Highlights
Pricing & Licensing
Where to get more information
Introduction to Event Stream Processing
SAP HANA Smart Data Streaming
A new SAP HANA optional component, available beginning with HANA SPS09

• Extends the capabilities of the SAP HANA Platform with the addition of real-time event stream processing

• Capture data arriving continuously from devices and applications

• Act on new information as soon as it arrives: alerts, notifications and immediate response to changing conditions

• Stream live information to operational dashboards

• Highly scalable – process hundreds of thousands or even millions of events per second
Streaming data sources are becoming ubiquitous

- Sensors
- Click streams
- Social media
- Transactions
- Market prices
Event stream processing uses continuous queries

Database Queries

Step 1: Store the data
Step 2: Query the data

Continuous Queries

Step 1: Define the continuous queries and the dataflow
Step 2: Wait for data to arrive. As it arrives, it flows through the continuous queries to produce immediate results
Smart data streaming extends the capabilities of the SAP HANA Platform

Stream capture

- Capture data arriving as individual events – at potentially high speeds
  - Hundreds of thousands or millions of events per second
  - Micro-batching and parallel processing to optimize load speeds
- Capture events that are published from streaming sources
  - e.g. message bus
- Filter, transform or enrich the data on the way in
  - Capture only the data you want, in the form you need it
- Prioritize data
  - Capture high value data in HANA and direct other data into Hadoop

Immediate Response

- Monitor incoming event streams
  - Watch for trends or patterns
  - Monitor correlations
  - Detect missing events
  - Continuously update and monitor aggregate statistics
- Generate alerts, notifications
- Initiate immediate response
Complex Event Processing extracts insight from events

- Virtually no useful information in a single isolated event
- Event window – e.g. 30 min
- Sensor readings – 10’s of thousands per second
- e.g. Compare variance of trends across multiple sensors against historical norms
- Alert
Leveraging proven technology:
SAP rated “Leader” in 2014 Forrester Wave: Big Data Streaming Analytics

SAP HANA smart data streaming is based on the same technology as SAP Event Stream Processor

Forrester cited our plans for delivering Event Stream Processing technology as a HANA service
Use Cases
The Internet of Things: insight from smart devices

Thousands of devices continuously sending bits of information

Insight from combining and correlating
- Combine data across related devices
- Watch for trends or patter

Active monitoring: alerting and response
- Rather than simply storing the data and analyzing it later
- Identify where there is value in immediate awareness and response
- Let event stream processing generate alerts or initiate immediate action

Location monitoring: alert operations staff if equipment is not where it’s supposed to be

Predictive maintenance: detect imminent failure and take preventative action

Smart grid: anticipate overloading and take action before it occurs

Personalized offers – based on current activity, location, etc
Active equipment monitoring

- Collect streaming messages from sensors on smart devices
- Actively monitor: generate real-time notifications
- Continuous access to current status information
Oil & Gas
Energy consumption analytics

Business Challenges

• Need to know the efficiency in energy consumption to produce new energy (Electricity to Heat, Gas to Heat, Fuel to thermal power)
• Energy regulations require the production of daily operational activities reports
• Monthly reports produced for Energy Commission for analysis of plans and facts

Technical Challenges

• SCADA meters produce 2.5 billion events per day, need to filter them, do simple analytics and store for 5 years
• Need to get data from accounting and financial systems
• Do real-time analytics on information of different natures (streamed and replicated)

Benefits

• Use Sybase ESP to ingest data from SCADA meters, filter (down to 2.5 million) and clean it before storing in SAP HANA with optimized ESP adapter
• Use Sybase Replication Server to replicate into transactional from accounting systems running on top of ORACLE
• SAP HANA to store long term data and produce complex daily and monthly reports to the business and regulators

Real-Time insights on energy consumption efficiency

Complex reporting in SAP HANA and long term data storage

Massive in-flight data sets analysis
SAP HANA Data Center Intelligence

Use Case: Real-time

Scalable streaming of events
Example: Syslog events from a network
Connects all event sources of the data center and stream events in real time to SAP HANA for further analysis.

Correlate events and derive actions
Example: Send alerts on defined error conditions
Correlates events from different sources within a given time window, generates actions (such as notifications and alerts), and triggers processes.
Short Term Load Forecasting

Load sensor data into OSI

Real-time Load Forecasting

Real-time Alerting

Continuous display of historical data and forecast
SAP Enterprise Threat Detection

The magnitude of the problem:
- The most important logs in an SAP system generate altogether between 100k and 1M records/hour
- 300 systems generate up to 300M records/hour, which is about 90GB/hour

Types of attack patterns:
- Related to human behavior
- Of technical origin

Browse and explore events
- Overview by system, timeframe, context, …
- Filter and search
- Create alerts

View and work on alerts
Capital Markets: Real-Time Risk Consolidation and Monitoring

Monitor and Analyze live data across multiple dimensions; alerts at any level

- Real-time consolidation across multiple trading platforms, multiple asset classes
- Real-time valuation using live market prices
- Custom pricing algorithms for non-liquid securities
- Incoming trades immediately update all sensitivity calculations
- Real-time P&L calculations
- Continuous limit monitoring and alerting; set limits at any aggregation levels
Business Challenges
- Maintain a fair and honest trading environment
- Provide a highly competitive trading platform
- Integrate with international markets

Technical Challenges
- Detect abusive trading patterns in real-time – at high speed market rates
- Require a solution that can be rapidly deployed
- Ability to integrate multiple data sources
- Easy to deploy new/updated monitoring algorithms

Benefits
- Allowed for rapid development and deployment
- Enables a fair trading environment
- Reduced operational costs of surveillance and trade monitoring function

The combination of simplicity and power provided by the functionality of SAP ESP gave our developers the critical tools to create the sophisticated applications in extremely challenging schedules to meet regulatory and corporate needs.

Abdullah Akoglu, Lead Developer, Turkish Derivatives Exchange Inc.
Real-time click stream analysis

**Monitor user behavior in aggregate**
- Respond to trends in real-time
- Jump on surges before they subside
- Give more prominence to topics attracting viewers now

**Customize offers based on individual patterns of behavior**
- Don’t limit customization to historical behavior, but include current behavior

**Prevent fraud**
- Watch for patterns that indicate likelihood of fraud; act before the fraud takes place
Technical Details
What does this look like to a HANA application developer?

- Design time tools are available as a plugin to SAP HANA Studio
- Installed via HANA Installer
- Streaming server(s) runs on dedicated host(s)
- Administration via SAP HANA Studio and Cockpit
- Streaming projects are managed in the HANA repository and can be included in, and deployed as DU’s
- Optional – licensed separately from base
SAP HANA system with one or more streaming nodes

- Streaming capacity scales independently of SAP HANA core
- Add streaming nodes for additional stream processing capacity
- Streaming projects connect to SAP HANA database via SAP HANA ODBC driver
- Streaming projects can send events to XS application using http output adapter
Streaming hosts can be, but do not have to be, HANA-certified servers.

HANA System (One SID)

1. Client Network
2. Intra-node Network
3. Storage Network for HANA and ES
4. Streaming Persistency Network

Certd. HW Box

HANA Scale-Out

Node 1

Node 2

Standby Node

Certd. Storage for data and redo logs of HANA and ES

Certd. HW Box

Certd. HW Box

Certd. HW Box

Hot data

Warm data

Redo logs

SAP HANA core

SAP HANA core

SAP HANA core

Dynamic Tiering Node

Host

Streaming Cluster

Streaming Node

Streaming Node

Non-certd. Storage for Streaming

Non-certd. Storage for Streaming

log store

binaries, traces, core dumps

Certd. Storage for Streaming

Intra-node Network

Client Network

Storage Network for HANA and ES

Streaming Persistency Network
Hardware considerations

- Although streaming does not require HANA-certified configuration, hardware should be from an SAP hardware partner: [http://scn.sap.com/docs/DOC-8760](http://scn.sap.com/docs/DOC-8760)

- See the smart data streaming sizing guide for indicative capacity for each of the T-shirt sizes. Some systems can go much larger (e.g. 200 cores)

- System configuration must consider network bandwidth and HANA DB workload for stream capture

<table>
<thead>
<tr>
<th>T-Shirt Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cores</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>XL</td>
</tr>
</tbody>
</table>
Installation of smart data steaming

1. **Download from Service Marketplace**
   - Separate download from SAP HANA core (since it’s optional)

2. **Install via SAP HANA installer**
   - Add to an existing SAP HANA system
   - Install as part of a new SAP HANA system install

3. **Additional download packages:**
   - SAP HANA Studio – streaming plugin
   - Smart data streaming client package – adapters, ODBC driver, SDK’s
Design time tools in SAP HANA Studio

Streaming plug-in for SAP HANA Studio includes a visual editor for defining continuous queries and directing stream flow, plus run/test tools.
SAP HANA Administration Console

- Streaming nodes will be listed in the landscape view of the SAP HANA Administration Console in the HANA Studio
- Will show status and provide ability to stop/start nodes
- Note: only at the node level. For project level monitoring and control, use the Cockpit.
Streaming integrated into SAP HANA Cockpit:

- New, web based monitoring and administration console for SAP HANA Systems
- 5 new tiles provided by the Streaming Catalog that can be added to the user’s dashboard in SAP HANA Cockpit
- Clicking on a tile will open up a drill-down page, for example, clicking on the "Streaming Nodes" tile will open up the page "Streaming Nodes".
Functional Highlights
Design Time

- Streaming “projects” define the input streams, continuous queries, and outputs
- Projects are defined in CCL – the stream processing language used
- Streaming plugin for HANA studio provides both a CCL editor and visual editor, along with testing tools
Streaming projects connecting to HANA tables and views

- **High speed event stream capture into HANA tables**

- **Update HANA tables based on analysis of incoming event streams**
  - Streaming projects can apply inserts, updates, and deletes to HANA tables – not limited to event logging
  - This allows HANA tables to “mirror” event windows in streaming projects

- **Join event streams to HANA tables/views**
  - Reference HANA tables/views directly in CCL projects

- **Pre-load reference data from HANA DB into streaming projects**
  - With ability to set refresh interval

- **Run event-driven analytics on HANA DB**
Operational Dashboards and UI options for streaming applications

- **Design Studio 1.4** - current plans* include support for visualization of streaming data, with connectivity to HANA streaming projects

- **HTML 5 (inc. SAP UI5)** - Standard REST interface and websocket support enables custom html5 applications (including SAP UI5) to receive/display streaming data

* Plans subject to change
SAP HANA smart data streaming provides a range of connectivity options

**Included:**
- Message bus: JMS, IBM MQ, TIBCO
- Web Service SOAP, REST
- http post
- Websockets
- Databases
- Files
- TCP Sockets
- SAP RFC
- SAP Replication Server (in)
- Logfile (in)
- Microsoft Excel (out)
- Email (out)
- HTTP snapshot query (out)

**Parsing/Formatting**
- JSON
- XML events
- XML docs
- CSV
- FIX
- JMS Object Arrays

**Extensible:**
- Adapter Toolkit supports pluggable transport/parse/format modules written in Java
- API's for C/C++, Java, .NET
Streaming Scalability

- Streaming projects are multi-threaded and will scale across all available cores
- Streaming hardware scales independently of HANA core; can run one or more streaming nodes in a single HANA system
- Large projects can be broken into smaller inter-connected projects running on different nodes
- Partitioning feature eliminates bottlenecks within a project by providing multiple parallel processing paths

SAP HANA smart data streaming provides extreme scalability.
Throughput capacity can always be increased by adding hardware.
Life Cycle Management for Streaming Projects

- Streaming content (project definitions) are stored in the HANA Deployment Infrastructure (alias HANA Repository)
- Can be included in HANA Delivery Units
- Deployment of DU’s that contain streaming projects will deploy and activate the streaming projects
Licensing
Smart data streaming is an optional HANA component: requires an additional license

- Licensed per core for all available cores across any/all production nodes running in the smart data streaming cluster
- Customer deployments range from 4 to 200 cores
- 8-32 cores will be typical for a single implementation
- Separate license key is required
  - License keys are obtained/installed in the same way as for SAP HANA core

For pricing information, contact your AE
Where to get more Information
How to find SAP HANA documentation on this topic?

SAP HANA documentation on the SAP Help Portal knowledge center at http://help.sap.com/hana

Documentation for new SAP HANA optional components will be added here
Smart data streaming in the SAP HANA Developer Center

When smart data streaming is released, find links to the streaming developer center in the SAP HANA Developer Center

Prior to release, you can get insight into this technology in the SAP ESP developer center, since smart data streaming is based on the same technology:

http://scn.sap.com/community/developer-center/esp
Disclaimer

This presentation outlines our general product direction and should not be relied on in making a purchase decision. This presentation is not subject to your license agreement or any other agreement with SAP.

SAP has no obligation to pursue any course of business outlined in this presentation or to develop or release any functionality mentioned in this presentation. This presentation and SAP’s strategy and possible future developments are subject to change and may be changed by SAP at any time for any reason without notice.

This document is provided without a warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. SAP assumes no responsibility for errors or omissions in this document, except if such damages were caused by SAP intentionally or grossly negligent.
Thank you

Contact information

Jeff Wootton
SAP HANA Product Management
AskSAPHANA@sap.com
How to find SAP HANA documentation on this topic?

- In addition to this learning material, you can find SAP HANA platform documentation on SAP Help Portal knowledge center at http://help.sap.com/hana_platform.
- The knowledge centers are structured according to the product lifecycle: installation, security, administration, development:
  - SAP HANA Platform SPS
    - What’s New – Release Notes
    - Installation
    - Administration
    - Development
    - References
  - SAP HANA Options
    - SAP HANA Advanced Data Processing
    - SAP HANA Dynamic Tiering
    - SAP HANA Enterprise Information Management
    - SAP HANA Predictive
    - SAP HANA Real-Time Replication
    - SAP HANA Smart Data Streaming
    - SAP HANA Spatial

Documentation sets for SAP HANA options can be found at http://help.sap.com/hana_options:
No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. Please see http://global12.sap.com/corporate-en/legal/copyright/index.epx for additional trademark information and notices.

Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors.

National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP SE or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP SE or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

In particular, SAP SE or its affiliated companies have no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation, and SAP SE’s or its affiliated companies’ strategy and possible future developments, products, and/or platform directions and functionality are all subject to change and may be changed by SAP SE or its affiliated companies at any time for any reason without notice. The information in this document is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of their dates, and they should not be relied upon in making purchasing decisions.