SAP MII & ESP INTEGRATION

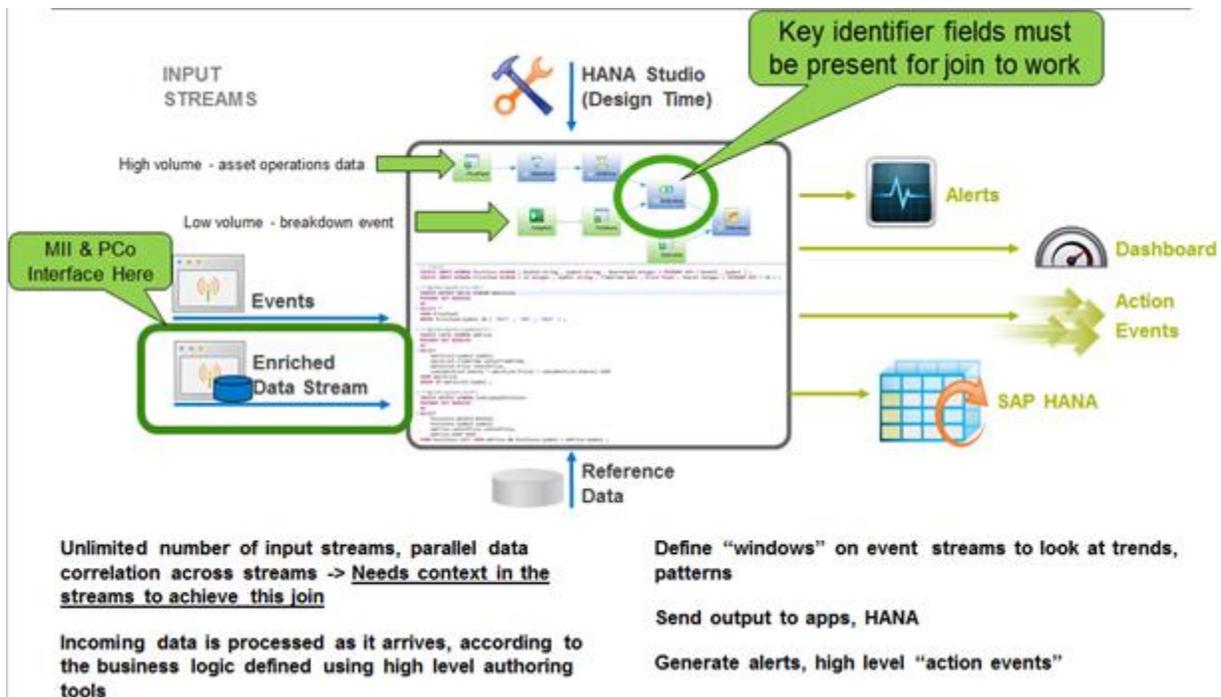What SAP Event Stream Processor (ESP)

In short ESP is really good at inline data analytics so as the data arrives to the stream it's waveform (sliding window typically) is instantly correlated with other various waveforms to identify patterns in the data. It can also stream this data, in tremendously large volumes, to HANA database tables for longer-term predictive and operational analytics. It has it's origins in the financial sector for high-frequency trading and trading analytics but we believe that there is value in this engine for driving in-line process analytics and controls visibility to operations folks for live/real-time process improvements

SAP MII & ESP Integration – What is SAP Manufacturing Integration & Intelligence (MII)

SAP MII & ESP Integration – The SAP MII product is very good at providing local operations KPI views with SAP ERP context around them and around the data and it also has a product called SAP Plant Connectivity (PCo) bundled along with it that interfaces directly to the various Operations Technology (OT) systems. Combining these together you have a very powerful ERP centric view of your live and historical operations data for driving live performance management and KPI data to improve processes in real-time. This view of data can be pushed to ERP to drive live insight in ERP on what is happening at various plants and locations or to local operator dashboards and screens to further drive operations visibility and capture additional context around events from operators. This type of data can then be loaded into the local MES or central ERP/HANA instances or both in a seamless, to the systems & workers, manner to ensure consistency of data and information.

SAP MII & ESP Integration Architecture

The SAP MII, PCo, ESP, and HANA products all have various technical features that can be jointly leveraged to drive local and central OT data but with ERP context so that the data can be correlated in-line and also after the fact once it's stored in the HANA database tables. Having context to various event points also enables ad-hoc analysis of the detected events to drive operations improvements across multiple systems simultaneously. The most common architectural scenarios for integration MII/PCo and ESP together is to stream live data from PCo directly to ESP in high-volumes and then to also include lower volume data (such as data from an operator or an MES/ERP system) into the stream in parallel to the OT data. Then using the context provided by MII/PCo to the data to feed the "Enriched Data Stream" of ESP you have the ability to correlate the data across streaming inputs as it happens. Conceptually the interface looks like this:

INPUT STREAMS

HANA Studio (Design Time)

Key identifier fields must be present for join to work

High volume - asset operations data

Low volume - breakdown event

MII & PCo Interface Here

Events

Enriched Data Stream

Reference Data

Alerts

Dashboard

Action Events

SAP HANA

Unlimited number of input streams, parallel data correlation across streams -> Needs context in the streams to achieve this join

Incoming data is processed as it arrives, according to the business logic defined using high level authoring tools

Define "windows" on event streams to look at trends, patterns

Send output to apps, HANA

Generate alerts, high level "action events"

Architecture

What happens is that the live operations data needs to be correlated with live execution and enterprise information to have the proper identification fields but also needs to know the additional conditions that the assets are operating in to determine the proper course of action, if any, that needs to be raised as an event and pushed to MII for reporting or process improvement recommendations or to HANA for the predictive analytics and multi-asset/distributed asset comparisons. This is all done agnostically of the underlying historian/SCADA/DCS/HMI vendor because it's using the SAP MII and PCo products to achieve this. On a more technical level the following diagram shows the details behind the various interfaces between the different SAP products and how they are used:
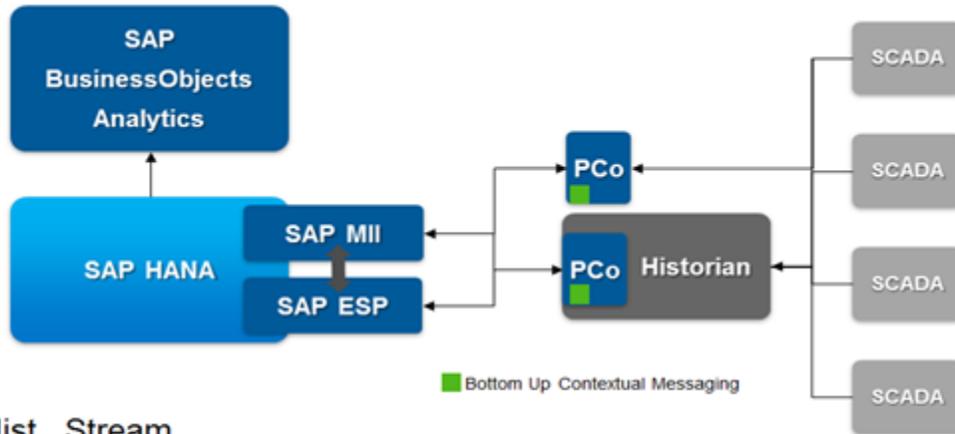
BuCM = Bottom-up Contextual Messaging
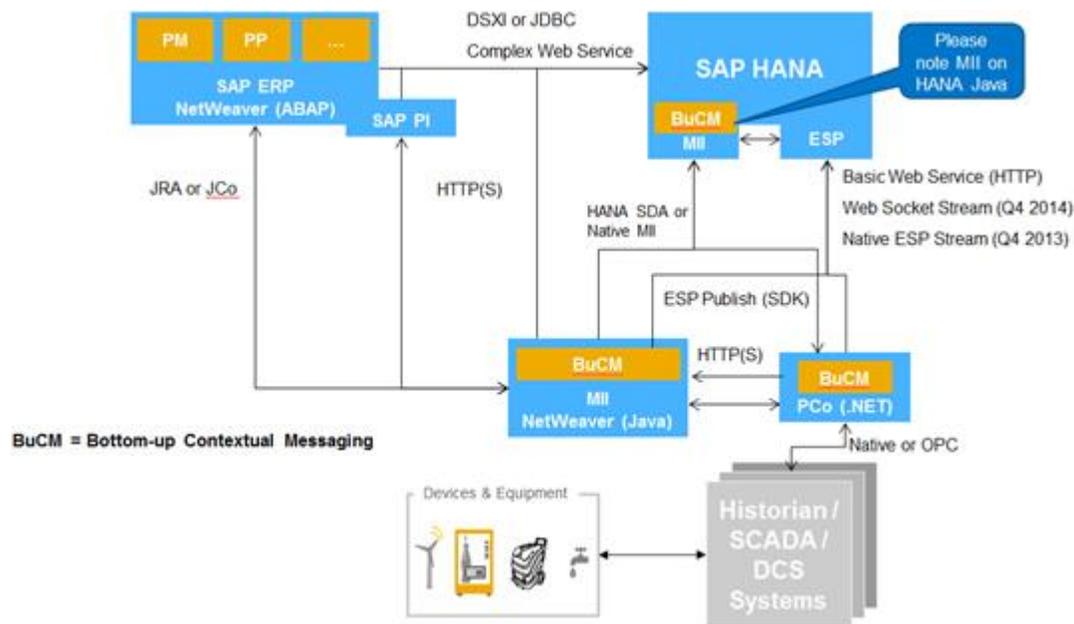
There are many ways to leverage the above interfaces to drive process improvements and visibility to live operations data in-line with the acquisition or after the fact in a larger analytical HANA model across huge time frames and assets. Again this is all possible because of technology improvements to the SAP MII product for mapping in ERP data to the various tag sensor data points using the Plant Information Catalog (PIC) and would continue to improve with the "Remote Administration & Configuration of PCo" topic that is currently in the customer Co-Innovation process but is planned to support pushing meta-data from the PIC to the notification streams of the PCo engine to

address specifically the requirement of BuCM that is shown in the above diagram.

Something Important to Keep in Mind about SAP MII & ESP Integration

When people ask me about this scenario I am always very pleased to hear that they have given a lot of thought and are also very eager to implement this scenario to bolster their existing analytics capabilities. I am also confronted with a common question around reliability of the data and how accurate the streaming engine is for loading data to HANA. We are aware of the fact that sometimes in the SCADA, DCS, or Tiered Historian layers data gets buffered so that the "Current' values do not update until the buffered data moves through the network but only then if your hooked to a historian will the most recent, or Current, data value be updated and that is what will appear in the stream. So this streaming feed behaves more like a video feed rather than a guaranteed delivery/replication mechanism of the historian data. There are ways that are built into the ESP engine to detect the flat-lining of tag data which in ESP Terms is called "Data Aging". This is a common scenario in the financials sector as well and why it's already handled by ESP to detect this occurs. From here ESP can send a "Data Retrieval" style message to MII which can then synchronously query the Historian Event Table for all of the events missed during the detected flat-lining or data aging time period and then load the HANA tables with the missing data. The scenario looks like the below in case you are a more visual person:

SAP
BusinessObjects
Analytics

SCADA

SCADA

PCo

SAP MII

SAP HANA

PCo Historian

SCADA

SAP ESP

SCADA

■ Bottom Up Contextual Messaging

SCADA

	Hist.	Stream
Time1	91	91
Time2	93	93
Time3	98	--
Time4	93	--
Time5	91	91

Leverage **Data Aging Feature** of ESP to detect buffering and notify MII to synchronously acquire historical data to retrieve the complete event record and load it into HANA

The above scenario is a very common one to come across in the real-world especially when working with a large number of distributed assets but it's important to know that this scenario only needs to be configured for your particular business rules and not implemented as a custom development project.