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Live Streaming SMF Data for Operational Insights

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IBM Corp.

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Chief Technologist
Rocket Software, Inc.

Theresa Tai
Executive IT Specialist
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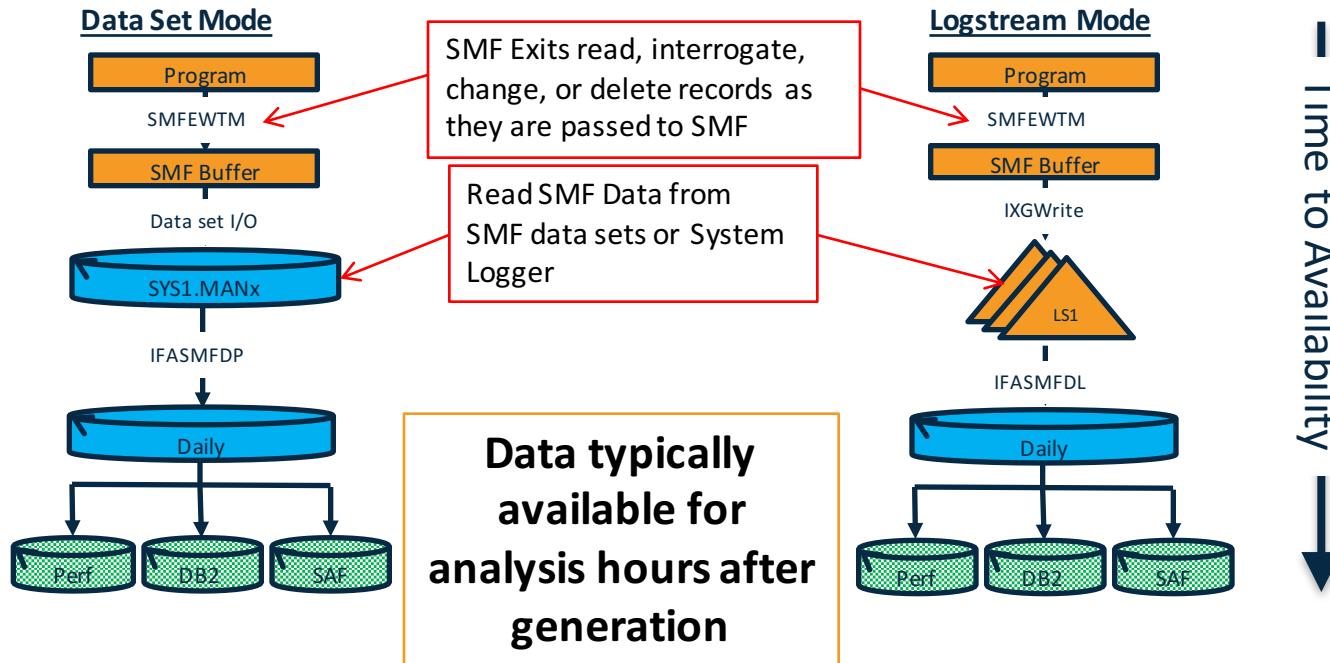
Agenda

- Understand the new SMF Real-Time recording infrastructure
- Analyzing SMF data with Apache Spark
- Analyzing SMF data with IBM DB2 Analytics Accelerator
- Live Demo

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Current SMF Infrastructure



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z/OS SMF Real-time Services

- New Real-Time SMF services provided on top of existing buffer technology
- Define new “Real-time Resources” for specific records
- Record SMF records only to a real-time resource – No disk required
 - Can co-exist with current SMF dataset/logstream technology
- APIs allow application to access SMF data as it is buffered
 - Unauthorized access policed via SAF
 - Connect/Get/Disconnect model similar to traditional QSAM access
- Potential use-cases include
 - Detecting security violations in real-time
 - Real time monitoring resource usage
 - Dynamic Job Scheduling based on current resource consumption

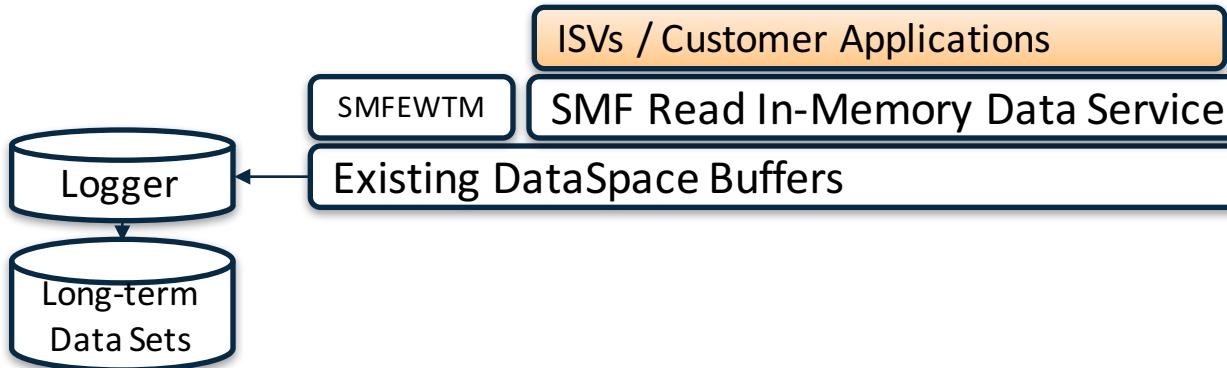


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An Overview

- New SMF callable services can provide bulk in-memory data retrieval or real-time data retrieval.
- Historical data, when available, can be pulled from in-memory buffer. When not available the data can be obtained from traditional long-term storage however the cross-over is NOT transparent, the application needs to manage this



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IEFU8x vs New Interfaces

Function	IEFU8X Exit	New Interface
Ability to Edit Records	Yes – Direct access to SMF record is provided	No – Record is copied to user's buffer
Authorization Requirement	Authorized load module, runs authorized	Problem State, Any Key
Caller's mode	Depends on the exit, IEFU83, IEFU84 and IEFU85 each provide access to different calling environments	P=H=S, Task mode
Record Selection	None – All records provided to the exit	Only records recorded to specific in-memory resource provided to caller
Security	Exit is authorized and has access to all records	Caller has to pass SAF check for access to that specific in-memory resource
Access Point	During SMFEWTM processing	After SMFEWTM processing has completed and returned to the caller

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Define an In-memory Resource

- Currently a single in-memory resource can be defined named IFASMF.INMEM
- The INMEM keyword is overloaded with this special *logstream name*
- RESSIZMAX can be used to define the buffer size
 - Temporary change to allow DSPSIZEMAX sizes less than 128MB
- Accepts all expected TYPE or NOTYPE statements
 - The TYPES recorded currently apply to DEFAULTLSNAME processing



```
*****  
/* */  
/* Define in-memory resource */  
/* */  
*****  
LSNAME INMEM (IFASMF.INMEM, TYPE(0:255), RESSIZMAX (16M))
```

Updated Display Commands

- Display SMF command updated to provide information about active connections to in-memory buffers
- The new command, D SMF,M provides the time the connection was made, the Address Space ID of the connecting address space and the number of records served to that connection

```
SY1  D SMF
SY1  IFA714I 15.51.38 SMF STATUS 240
      LOGSTREAM NAME          BUFFERS      STATUS
      A-IFASMF.INMEM          2122434    IN-MEMORY

SY1  D SMF,M
SY1  IFA714I 15.46.45 SMF STATUS 719
      IN MEMORY CONNECTIONS
      Resource: IFASMF.INMEM
      Con#: 0001 Connect Time: 2015.183 15:42:47
      ASID: 003B RECORDS: 00000418
```



Putting the Pieces Together

- How can this new data access pattern be used?
 - Turn on for any SMF records required for real-time analysis
 - Turn on SMF records that are “transient” – They do not require long-term storage and are only valuable for real-time analysis
 - Control access to real-time data – Only give SAF access to specific users
 - No need to change existing SMF configuration – Continue to store long-term data in data sets or logstreams



- **Detect excessive memory consumption – SMF30**
 - Monitor high water mark for real memory usage for jobs and send alerts if usage exceeds normal consumption
- **Detect security violations in real-time – SMF 80**
 - Monitor volume of datasets/files accessed per user within a given time period and raise alerts for above normal access rates

IBM Apache Spark IBM DB2 Analytics Accelerator and Loader

Streaming SMF Data Live Demo Gregg Willhoit, Rocket Software

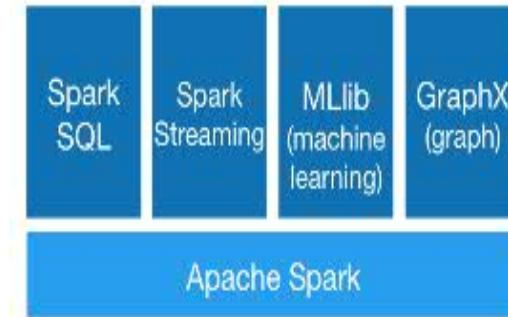


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Deeper insight of more data - faster

- Enhancing the IBM analytics portfolio
- Putting analytics wherever your data is
- “Intelligence” of data through machine learning
- High performance in-memory analytics
- Versatile / rich high-quality function (machine learning, streams, graph analysis, SQL)
- Time to value for the business and developers



Unified analytics programming model

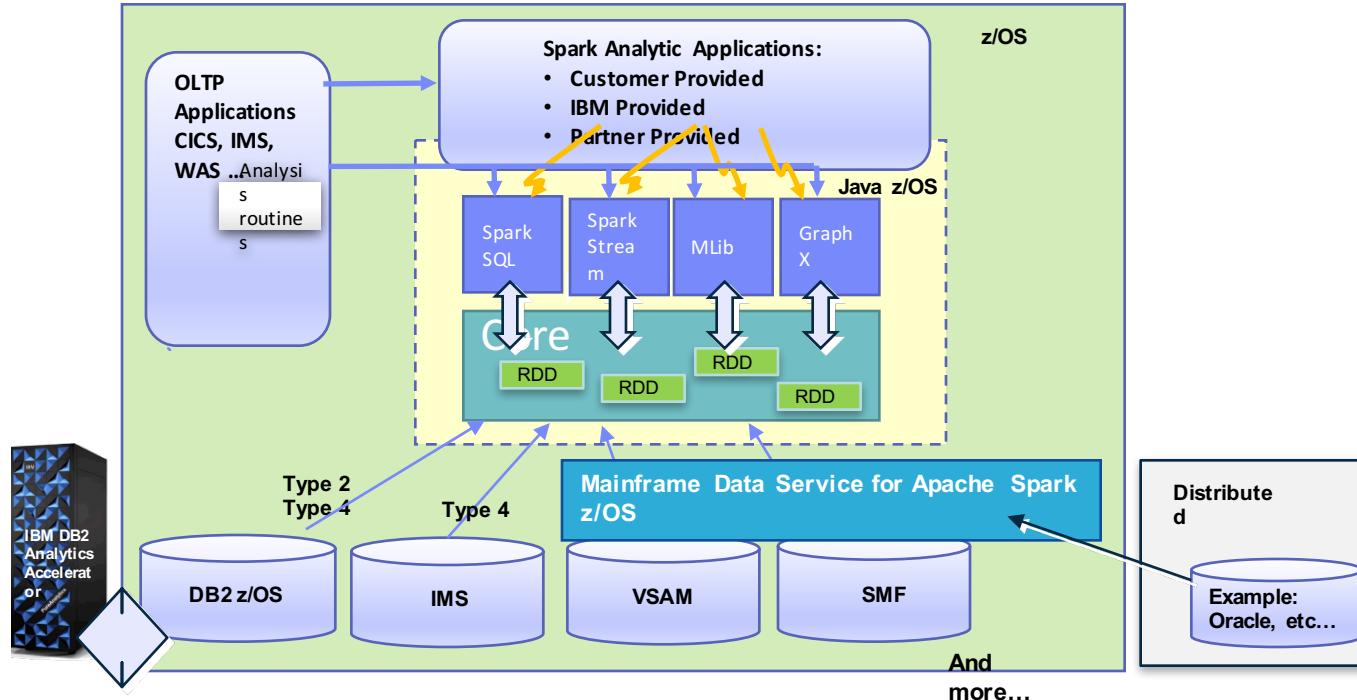
- Unified high-performance analytics platform for big data
- Light-weight. Embeddable, in-memory clustering
- Reuse existing skills - Java, scala, python...

*z/OS
Linux on z Systems
LinuxOne
Hadoop/BigInsights
Intel, Power
Cloud....*

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IBM z/OS Platform for Apache Spark

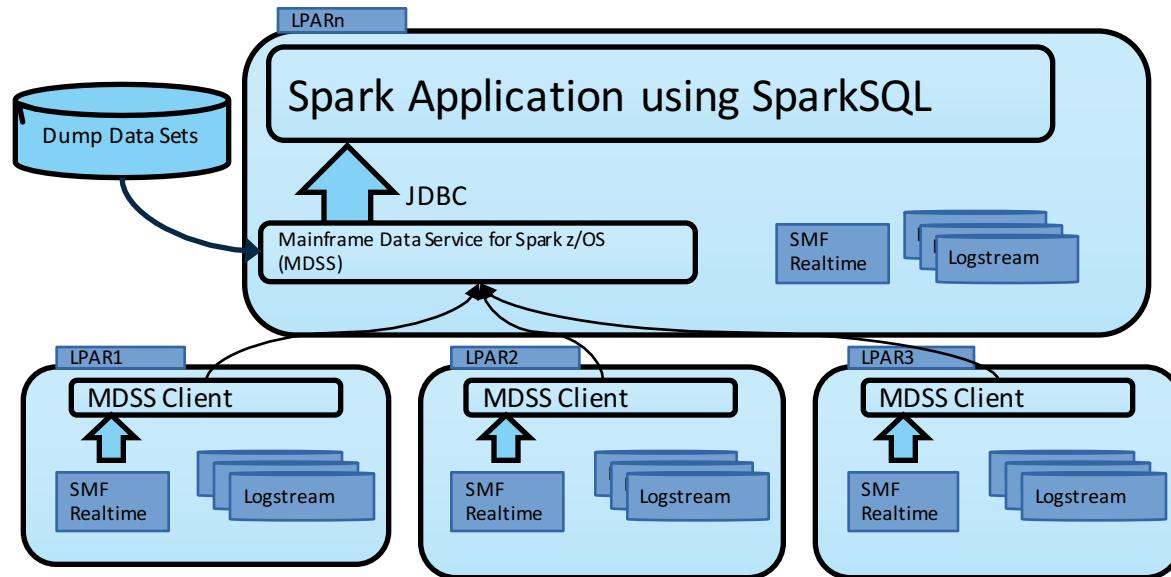


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Analyzing SMF Data with *Spark*

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New!

Spark application is agnostic to data source and number of sources

MDSS required on at least one system, MDSS agents required on all systems. No IPL required for installation

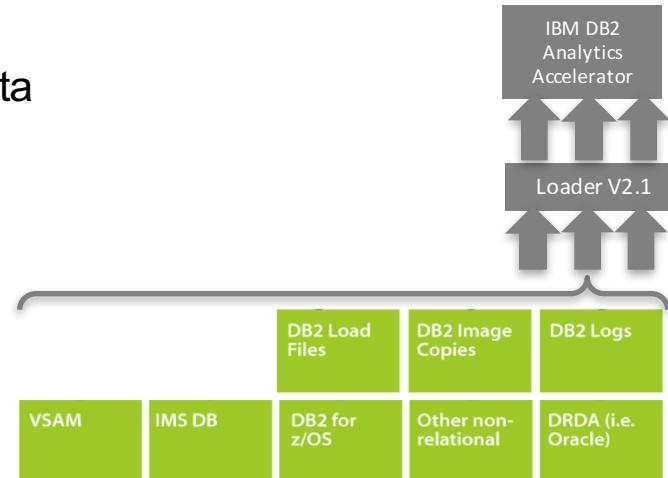
Logstream recording mode required for realtime interfaces

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- IBM DB2 Analytics Accelerator Loader for z/OS V2.1
 - Superset of IBM DB2 Analytics Accelerator Loader for z/OS
 - Existing jobs supported and profile migration provided
- Addressed challenges in loading non-DB2 data
 - Complexity
 - Manual or ETL process
 - Slow, due to intermediate write
 - Plus
 - Mapping facility and data validation
 - LOAD RESUME
 - Remote DB2 and other relational data



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Analytics Accelerator Loader Client Values



- Current IBM DB2 Analytics Accelerator Loader – The user must
 - Extract data from source (IMS, VSAM, Oracle, etc.)
 - Convert extracted data to DB2 external load file format
 - DataStage or other tooling can be used
 - Create a DB2 table that matches format of extracted data
 - Add newly created table to the Accelerator
 - Construct a DB2 Load utility field specification that describes the input data
 - Run Accelerator Loader batch job to load data to accelerator
- New Loader – Automates Entire Process
 - User builds a **SELECT** statement from data source(s) (IMS, VSAM, Oracle, ...)
 - **Automatically** creates the DB2 table
 - **Automatically** adds table to Accelerator
 - **Automatically** extracts specified source data
 - **Automatically** converts data to necessary DB2 format (in memory)
 - **Automatically** loads data to Accelerator
 - **Automatically** enables table for acceleration

Announced: January 25, 2016

General Availability
February 12, 2016

Single batch job!

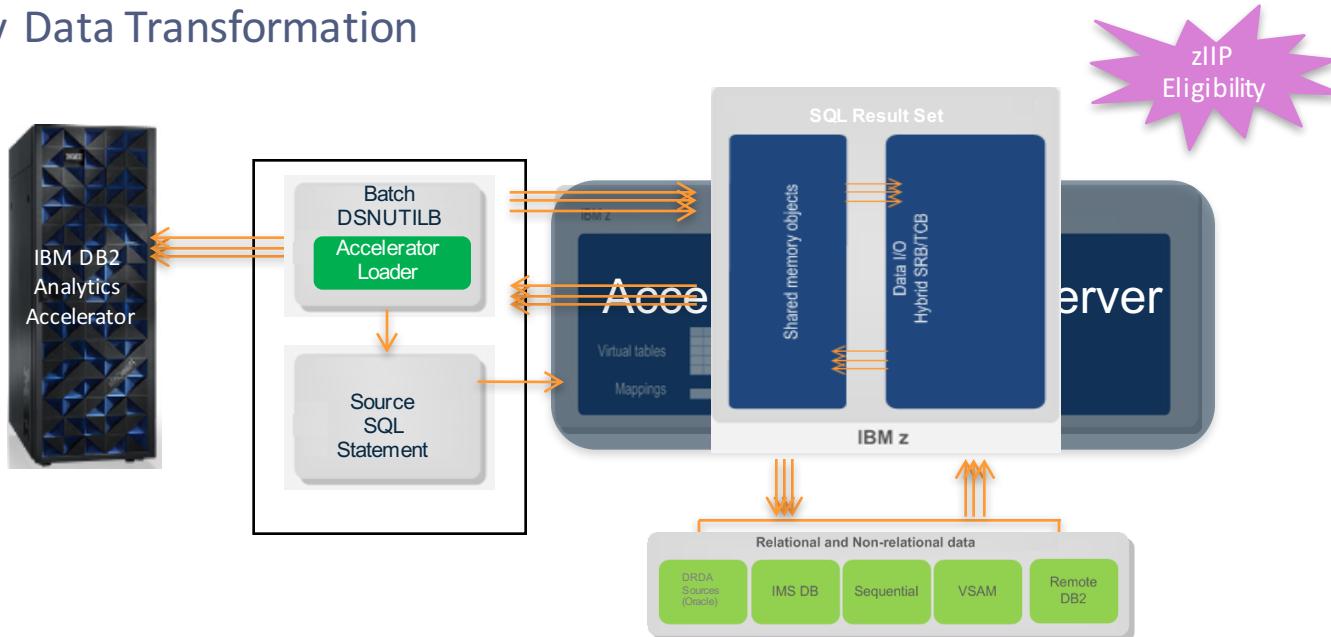
Complete your session evaluations online at <http://www-01.ibm.com/loaderv21/announce/acceleration>

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Analytics Accelerator Loader V2.1

In Memory Data Transformation



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IBM DB2 Analytics Accelerator V5.1 for z/OS

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A workload optimized, appliance add-on to DB2 for z/OS that enables the integration of analytic insights into operational processes to drive business critical analytics & exceptional business value.

SPEED

- Dramatically improve query response – up to 2000X faster – to support time-sensitive decisions
- Right-time. Low latency. Trusted. Accurate.

SAVINGS

- Minimize data proliferation
- Lower the cost of storing and managing historical data
- Free up compute resources

SIMPLICITY

- Simplify infrastructure, reduce ETL and data movement off-platform
- Non-disruptive installation

SECURITY

- Safeguard valuable data under the control and security of DB2 for z/OS
- Protected. Secured. Governed.

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- In-database analytics capabilities enable acceleration of predictive analytics applications
 - Enables SPSS/Netezza Analytics data mining and in-database modeling to be processed within the Accelerator
- In-database transformation supports the consolidation of ETL/ELT processing in DB2
 - for z/OS to enable a more cost-effective, simplified architecture
- Accelerator-only tables
 - can benefit statistics and analytics tools that use temporary data for reports
 - can also be used to accelerate data transformations, which are implemented via SQL statements.
 - To take full advantage of the product's high-speed capabilities, you can now store all interim results in accelerator-only tables.
 - This enables subsequent queries or data transformations to process all relevant data on the accelerator, and to implement high-speed in-database transformations.

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Introducing Accelerator-only Table Type in DB2 for z/OS

Creation (DDL) and access remains through DB2 for z/OS in all cases

Non-accelerator DB2 table

- Data in DB2 only

Accelerator-shadow table

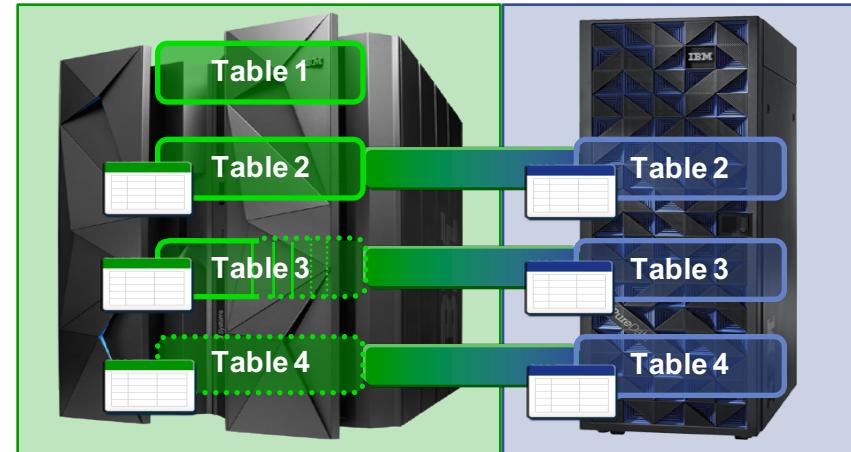
- Data in DB2 and the Accelerator

Accelerator-archived table / partition

- Empty read-only partition in DB2
- Partition data is in **Accelerator only**

Accelerator-only table (AOT)

- “Proxy table” in DB2
- Data is in Accelerator only



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Accelerator-only Tables – Technical Basics



- AOTs are created and dropped using DB2 DDL statements (CREATE; DROP)
 - Accelerator must be started
 - QUERY ACCELERATION behavior may have any value during CREATE/DROP
- SELECT and INSERT/UPDATE/DELETE operations using AOTs can only run on the Accelerator
 - QUERY ACCELERATION behavior must be set to ENABLE/ELIGIBLE/ALL
 - Accelerator-shadow tables, Accelerator-archived tables and other AOTs can be used in the same statement
- Dynamic and static SQL can be used with AOTs
- Support
 - Introduced in V4.1 at PTF 5 for DB2 for z/OS 10
 - V5.1 Accelerator supports DB2 for z/OS 10 and 11

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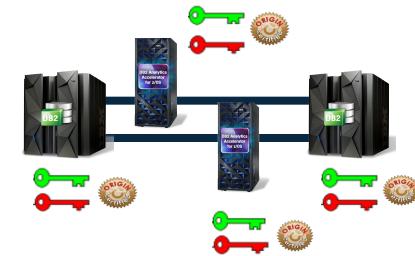
- **Encryption of data “at rest”**
 - Already available by default with N3001 self-encrypting disks (SEDs)
 - Addresses risk of stolen disks
- **Encryption of “data-in-motion”**
 - Encrypt network traffic between z Systems and the Accelerator using *Internet Protocol Security (IPsec)*
 - Network traffic includes:
 - DRDA traffic (e.g. queries and results, table loads)
 - Configuration Console traffic (passwords)
 - Incremental Update traffic
 - Requires configuration and enablement on z Systems and on the Accelerator
 - Addresses network sniffing (interception of TCP/IP packets)

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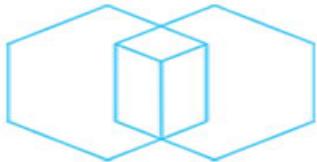
Implementing Encryption of Data-in-Motion

- Recommended setup is private data network, also see
<http://www-01.ibm.com/support/docview.wss?uid=swg27038935>
 - This is still the best and recommended alternative to ensure security
 - Private data network has no performance impact (> 2 TB/hour load thruput)
- Sample domains for encryption of data-in-motion:
 - Some customers have multiple data centers and connect the remote Accelerator over a non-private network (routed, accessible from intra-net)
 - Some customer have compliance rules (security policy) to encrypt all network traffic
- All incoming traffic to one accelerator is approximately 700-900 GB/hour



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Live Streaming SMF Data for Operational Insights

Modern operational analytics requires timely data-driven solutions. The SMF data recording process has been enhanced to provide data feed in real-time. You no longer have to wait for the data to become available either in SMF datasets or System Logger. This presentation introduces the live streaming of SMF data and potential methods to exploit data for insight in real time. Learn how your organization can analyze real-time SMF data using the DB2 Analytics Accelerator Loader EE with the IBM DB2 Analytics Accelerator or Apache SPARK to uncover operational insights.

Workshop Overview:

- 1-2 days, at Poughkeepsie Client Center, or at client's site upon request
- **Technology discovery**
 - SMF data set mode and log stream mode
 - IBM DB2 Analytics Accelerator V5.1 & Accelerator Loader V2.1
- **z stack innovations, optimization & zIIP eligibility**
- **Solution design** thinking and user-centric approach
- **Open Forum:** with the Designers, Architects, & Test Engineers (Poughkeepsie location only)



Request a Client Center workshop: ttai@us.ibm.com

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THANK YOU

Session Evaluations



YOUR OPINION MATTERS!



**Submit four or more session
evaluations by 5:30pm Wednesday
to be eligible for drawings!**

*Winners will be notified Thursday morning. Prizes must be picked up at registration desk, during operating hours, by the conclusion of the event.

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Learning Objectives



- Learning Objective 1 - Arial Regular (Black #000000)
- Learning Objective 2
- Learning Objective 3

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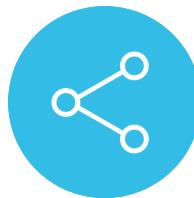
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- Take part in the **Hack-a-Thon** with **IBM** & **Rocket**



Network

- **Engage** with fellow attendees
- Connect with the **zNextGen®** community
- Join the **#SHAREatl** social media conversation



Influence

- Discover ways to **get involved** with SHARE
- Meet **SHARE Volunteers**

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