Actian Hybrid Data Conference
2017 London
Disclaimer

This document is for informational purposes only and is subject to change at any time without notice. The information in this document is proprietary to Actian and no part of this document may be reproduced, copied, or transmitted in any form or for any purpose without the express prior written permission of Actian.

This document is not intended to be binding upon Actian to any particular course of business, pricing, product strategy, and/or development. Actian assumes no responsibility for errors or omissions in this document. Actian shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials. Actian does not warrant the accuracy or completeness of the information, text, graphics, links, or other items contained within this material. 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.
Actian X Hybrid Database
The New Ingres
Alex Hanshaw
Director of Engineering
Agenda

- Enterprise Challenges
- Introducing Actian X: The New Ingres
  - Actian X Hybrid Database
  - DataCloud Backup for Actian X
  - DataConnect for Actian X
  - EMA
- Actian X Japanese
- ESRI ArcGIS Plug-In
- OLTP New Features
Enterprise Challenges

- OLTP data, often the crown jewels of the business, needs to be an integral part of business decision making process.

- Feeding siloed OLTP data to a data-warehouse raises concerns around:
  - Data Currency
  - Data Security
  - Data Provenance
  - Data Governance
  - Data Veracity

- Siloed Challenges
  - Complexity
  - Latency
  - No OLTP feedback
Introducing Actian X: The New Ingres

- OLTP Application
- OLTP Query Plan
- I/O
- SQL Queries
- Hybrid Applications
- Enterprise Monitoring Appliance (EMA)
- Data Connect for Actian X
- Data Cloud Backup
- Hybrid OLTP & Analytics
- Columnar storage for Analytics
- Row storage for OLTP
- Ingres Query
- X100 Query Execution
- OLTP Application
- Analytics Application
**Actian X Hybrid Database**

- A Hybrid OLTP & Analytics solution that is not strictly HTAP – but better!
  - No need to change existing OLTP applications or migrate data
  - Allows incremental investment in analytics

- Actian X will handle both OLTP and Analytics Applications:
  - The Actian X solution is populated and refreshed via a Load process.
  - The columnar data is compressed to minimize the impact on OLTP operations.

- New Columnar X100 Table Type
  - Available on Linux 64-bit & Windows 64-bit
  - 12 times faster than HEAP on 6.7M rows
  - 22 times faster than HEAP on 33M rows
  - 23 times faster than HEAP on 200M rows
Actian X Hybrid Database

- Responding up to **10X** faster than your competition can be game-changing

- **Best-in-class analytics performance**
  - Single node & Scale-out Hadoop
  - Designed for the cloud

- **Use Cases:**
  - Fraud detection that identifies transactions in real time.
  - Product promotions that respond to real-time market opportunities.
  - Clickstream analytics to improve online shopping experience
  - Real-time IoT analytics to make adjustments to operational manufacturing systems
Actian X Hybrid Database: X100 Server

1. Vector Processing
   - Single Instruction Multiple Data

2. Exploiting Chip Cache
   - Process data in chip – not in RAM

3. Second Gen Columnar
   - Limit I/O
   - Most efficient real time updates on and off Hadoop

4. Smart Compression
   - Maximize throughput
   - Vectorized decompression in chip
   - Average 6:1 Compression Ratio

5. Storage Indexes
   - Created Automatically — simplifies schema
   - Quickly identify candidate data blocks
   - Minimize IO

6. Multi-Core Parallelism
   - Maximize concurrency, parallelism and system resource utilization
Actian X Hybrid Database

- Demonstration uses 170M row data set provided by United States Department of Transportation’s Bureau of Transportation statistics of historical airline on-time flight data from January 1995 to December 2016, https://www.transtats.bts.gov/ONTIME/
- Tests run on same system equipped with 24 cores and 128GB RAM
- Actian X and Oracle 12c both with default out-of-the-box configuration

<table>
<thead>
<tr>
<th>Item</th>
<th>Action</th>
<th>Oracle (Seconds)</th>
<th>Actian X (Seconds)</th>
<th>How many times faster is Actian X?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Load the Dimension tables</td>
<td>540</td>
<td>7</td>
<td>77</td>
</tr>
<tr>
<td>2</td>
<td>Display dashlets with all data</td>
<td>1200</td>
<td>11</td>
<td>109</td>
</tr>
<tr>
<td>3</td>
<td>Restrict result set to CY 2014</td>
<td>560</td>
<td>10</td>
<td>56</td>
</tr>
<tr>
<td>4</td>
<td>Restrict to a set of origins</td>
<td>458</td>
<td>10</td>
<td>46</td>
</tr>
<tr>
<td>5</td>
<td>Limit destinations to ATL/ ORD</td>
<td>340</td>
<td>10</td>
<td>34</td>
</tr>
<tr>
<td>6</td>
<td>Select longest 4 delays</td>
<td>125</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>Limit data set to Jan and Feb 2014</td>
<td>104</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>Dig into COS and DEN airports</td>
<td>58</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>Sort on Carrier Grid</td>
<td>40</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Select DL (Delta) for Feb 2014 from grid</td>
<td>36</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>SELECT COUNT(*) FROM ontime</td>
<td>430</td>
<td>0.008469</td>
<td>50773</td>
</tr>
</tbody>
</table>
Actian X Hybrid Database

- With Oracle 12c we got to see the hourglass...a lot!
  ...So we kept scaling back the dataset
With Actian X’s analytics capability we ran with the full data set and rendered the entire dashboard in ~10 seconds.
Actian X Hybrid Database: Analytics in a single step

- Just one small change to access the world’s fastest analytics engine:
  – CREATE TABLE OrderAnalytics . . . WITH STRUCTURE = x100;

- Twice as fast as SQL Server ‘16

- Identical connection methods
  – JDBC, ODBC, .Net, Ingres NET

- Identical query syntax

- Industry standard ANSI date & time datatypes only

- UTF-8 character set is the only character you need
DataCloud Backup for Actian X

Management & Monitoring

AWS Cloud
- Aurora
- S3
- Backup Service
- Backup Service
- ELB
- AZ1
- AZ2

On Premise
- Actian X Instance
- Agent
DataConnect for Actian X

- Quick start DataConnect server
  - Flat File & Database Connectors
- Ready to use generic, samples integrations and configurations for Actian X
- Sample source files
- Start-up guide
- Linux or Windows
  - Can connect to data sources on other platforms
- Synchronise Ingres & Vector Tables
SSH / Power Shell

EMA scripts check the health of the host and of the Ingres instance

EMA Web Interface

EMA Appliance
- Nagios Daemon
- Scheduler
- Event Processing
- Send Receive Alerts
- RRD
- Nagios Round Robin
- Database

Configuration Files

Managed Server
- Ema_check_X.sh
- EMA scripts check the health of the host and of the Ingres instance
- Actian X Instance

Enterprise Monitoring Appliance: Architecture
Enterprise Monitoring Appliance: Plug-Ins

- Nagios scripts to provide monitoring and alerts for Ingres
- Compatible with EMA, CA-Unicenter, ManageEngine, Splunk, SolarWinds, Ganglia, Tivoli, Microsoft SCOM, BMC TrueSight...
- Linux, all supported UNIX flavours and Windows
- Example scripts:
  - ema_check_disk.sh
  - ema_check_memory.sh
  - ema_check_ingres_lock.sh
  - ema_check_ingres.sh
    - servers
    - sessions
    - errlog
Actian X Japanese

- Localised version of Actian X for the Japanese market
- Automatically detects use of Japanese OS
- Lead platform Windows 64-bit
  - Linux 64-bit localisation to follow
- Working with an existing Japanese partner
ESRI ArcGIS Plug-In

- ArcGIS, ESRI's geographic information system (GIS) for working with maps and geographic information
- Use ArcGIS 10.x to view and manipulate Ingres geospatial data
- Supported Tools
  - ArcMap & ArcCatalog
- Free to use and available for download
  - esd.actian.com
OLTP New Features: Spatial Enhancements

- **3D R-Tree Indexing**
  - Improved Performance
  - 3D Hilbert Curves
  - `CREATE INDEX idx_flightpath ON flights(flightpath) WITH STRUCTURE=RTREE`

- **In-line 3D Spatial Functions**
  - `SELECT INTERSECTS (GeomZFromText('LINESTRINGZ(5 5 5, -5 -5 -5)'), GeomZFromText('LINESTRINGZ(8 8 -8, -8 -8 8')))`;
  - `SELECT AREA (GeomZFromText('MULTIPOLYGONZ((0 0 0, 10 10 1, 0 10 0, 0 0 0)), (0 0 0, 10 10 1, 10 0 2, 0 0 0)))')`;

Calculate Flight Path Intersection
OLTP New Features: Windowing Functions

- **LEAD & LAG**

- The following query shows the date, the weather, the previous day's weather and the next day’s weather:

- ```sql
SELECT wdate, forecast,
    LAG(forecast) OVER(ORDER BY wdate) AS lag,
    LEAD(forecast) OVER(ORDER BY wdate) AS lead
FROM weather ORDER BY wdate;
```
OLTP New Features: Merge

- MERGE combines multiple INSERT, UPDATE, and DELETE statements into one statement.
- The following query adds transaction incremental balances to a master account table. If an account is not in the master table yet, it is added.

```
MERGE INTO master_table t
USING trx x ON t.acct_no = x.acct_no
WHEN MATCHED THEN UPDATE SET
    balance = t.balance + x.balance
WHEN NOT MATCHED THEN INSERT VALUES
    (x.acct_no, x.balance);
```
MERGE INTO master_table t USING trx x ON t.acct_no = x.acct_no
WHEN MATCHED THEN UPDATE SET balance = t.balance + x.balance
WHEN NOT MATCHED THEN INSERT VALUES (x.acct_no, x.balance);
OLTP New Features: Reuse

- **TPC-H Query q11**
  
  ```sql
  select ps_partkey, sum(ps_supplycost * ps_availqty) as value
  from partsupp, supplier, nation
  where ps_suppkey = s_suppkey and s_nationkey = n_nationkey
  and n_name = 'GERMANY'
  group by ps_partkey having sum(ps_supplycost * ps_availqty) >
  (select sum(ps_supplycost * ps_availqty) * 0.0001000000
  from partsupp, supplier, nation
  where ps_suppkey = s_suppkey and s_nationkey = n_nationkey
  and n_name = 'GERMANY')
  order by value desc;
  ```

- **Row Counts:**
  - Nation: 25
  - Supplier: 10,000
  - PartSup: 800,000

- **QUERY PLAN** 5,5, no timeout, of reusable fragment producing temporary table T8 estimated 32000 tups, 224 pages
OLTP New Features: BLOB Enhancements

- **Data-At-Rest-Encryption for LONG datatypes**
  ```sql
  CREATE TABLE tx_payments(
    tx_customer CHAR(50) NOT NULL,
    tx_amount money, tx_payment long varchar ENCRYPT
  )
  WITH ENCRYPTION=AES256,
  PASSPHRASE='decoder ring';
  ```

- **WHERE clause comparisons of LONG datatypes**
  ```sql
  SELECT tx_customer, tx_amount FROM tx_payments
  where tx_payment LIKE '%Actian%';
  ```
OLTP New Features

- **Y2K38**
  - Integer4 values will wrap at 03:14:07 UTC on 19 January 2038
  - We have future proofed your Ingres installations beyond 2038!

- **IANA Time Zones**: [https://www.iana.org/time-zones](https://www.iana.org/time-zones)
  - Backward compatible with old II_TIMEZONE names
  - `$II_SYSTEM/ingres/utility/iisuitz`

- **Log File Rotation**
  - `max_log_sz` (Default: 200 MB, Min: 5 MB, Max: 1024 MB)
  - `errlog.log.YYYYMMDDHHMM`
Actian X Summary

Ingres Query Processing

OLTP Application

SQL Queries

Hybrid Applications

Analytics Application

X100 Query Execution

Ingres Query Execution

I/O

Row storage for OLTP

Columnar storage for Analytics

LOAD

Hybrid OLTP & Analytics

Enterprise Monitoring Appliance (EMA)

DataConnect for Actian X

DataCloud Backup

System & DB Monitoring

Actian X System & DB Monitoring
Thank you!
Lunch - Terrace Restaurant

Time: 11:45-12:45

#hybriddataconference