Running a Production Environment of SAP HANA in the Cloud

Don Whittington, Vice President & CIO, Florida Crystals Corporation
Kevin Reid, CEO/CTO, Virtustream
In this session, Florida Crystals Corporation (FCC) CIO, Don Whittington, and Virtustream CEO and Co-founder Kevin Reid will discuss how FCC implemented HANA as a Service.

Through certified cloud and hosting services, Virtustream makes it possible for FCC to utilize SAP HANA across test, development and production environments.

With more than 100 SAP related instances and other servers, FCC, the world’s largest sugar refiner, whose products are sold under the Domino®, C&H® and Redpath® brands, now runs HANA on Virtustream’s infrastructure-as-a-service (IaaS) enterprise class cloud, which enables the company to streamline applications, planning, predictive analysis, and sentiment analysis in real-time.
• Intro to Florida Crystals / ASR Group & Virtustream
• Florida Crystals SAP Landscape in the Cloud
• SAP’s HANA Petabyte Cloud Initiative
• HANA POC’s for BW and ERP
• The Migration to HANA
• POC Metrics
• Transition to Production (BW)
• Real World Benefits & What We Learned
• Q & A
Florida Crystals Corporation and the Sugar Cane Growers Cooperative of Florida formed a strategic partnership that is now the largest fully integrated sugar cane refiner in the world, taking products from field to shelf. The addition of the Domino®, C&H®, and Redpath® brands created a full North American distribution capability. Acquisition of European Sugar Holdings, S.à.r.l. marked the beginning of a truly global supply chain.
The strategy of growth through acquisition has consistently increased the operating complexity and the need for innovative solutions that support the business requirements.

1995
- FCC selects and implements SAP
- Begins vertical integration strategy – consumer products
- FCC and SCG acquire Jack Frost (RSI)
- American Sugar Refining (ASR) is acquired by RSI
- Domino Foods sales and marketing cooperative is launched with its own SAP system
- Agile and adaptive systems infrastructure is adopted and developed

1998
- FCC and SCG acquire Jack Frost (RSI)
- American Sugar Refining (ASR) is acquired by RSI
- Domino Foods sales and marketing cooperative is launched with its own SAP system
- Agile and adaptive systems infrastructure is adopted and developed
- Assets are optimized across the combined enterprise
- All SAP systems are upgraded to the same version
- C&H acquired establishing national footprint
- American Sweetener Corp acquired from CHR Hansen
- Redpath Sugar is acquired by ASR providing North American footprint
- Acquisition did not come with any technology applications
- Required to get off of Seller’s technology within 90 days
- Leveraging technology carve-out from past acquisition
- Sugar Stix acquisition enhances tabletop product line & capacity
- Acquisition of Ingenio San Nicolas provides capacity and distribution capabilities in Mexico
- Optimization of production & distribution assets & related business processes are planned in conjunction with a continuous improvement initiative.

2001
- Assets are optimized across the combined enterprise
- All SAP systems are upgraded to the same version
- C&H acquired establishing national footprint
- American Sweetener Corp acquired from CHR Hansen
- Redpath Sugar is acquired by ASR providing North American footprint
- Acquisition did not come with any technology applications
- Required to get off of Seller’s technology within 90 days
- Leveraging technology carve-out from past acquisition

2005
- Assets are optimized across the combined enterprise
- All SAP systems are upgraded to the same version
- C&H acquired establishing national footprint
- American Sweetener Corp acquired from CHR Hansen
- Redpath Sugar is acquired by ASR providing North American footprint
- Acquisition did not come with any technology applications
- Required to get off of Seller’s technology within 90 days
- Leveraging technology carve-out from past acquisition

2006
- Redpath Sugar is acquired by ASR providing North American footprint
- Acquisition did not come with any technology applications
- Required to get off of Seller’s technology within 90 days
- Leveraging technology carve-out from past acquisition

2008
- Redpath Sugar is acquired by ASR providing North American footprint
- Acquisition did not come with any technology applications
- Required to get off of Seller’s technology within 90 days
- Leveraging technology carve-out from past acquisition

2010
- Redpath Sugar is acquired by ASR providing North American footprint
- Acquisition did not come with any technology applications
- Required to get off of Seller’s technology within 90 days
- Leveraging technology carve-out from past acquisition
Florida Crystals evaluated cloud computing service providers and selected Virtustream to efficiently address the business challenges of the growth through acquisition strategy.

<table>
<thead>
<tr>
<th>Business Challenge</th>
<th>Solution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commodity based business</td>
<td>Minimize corporate overhead</td>
</tr>
<tr>
<td>• Industrial, Foodservice and Grocery Sales Channels</td>
<td>• Outsource technology (facilities &amp; ops, h/w &amp; s/w, administration) so that Florida Crystals can focus on core business functionality</td>
</tr>
<tr>
<td>Growth through acquisition</td>
<td>Develop and implement an agile and flexible infrastructure</td>
</tr>
<tr>
<td>• Acquire and quickly integrate businesses with minimum cost and business interruption</td>
<td>• Leverage elasticity to ramp resources up and down during test periods</td>
</tr>
<tr>
<td></td>
<td>• Take advantage of rapid scalability to facilitate post acquisition integration while being able to shrink in size as acquired systems are disposed</td>
</tr>
<tr>
<td>Geographically dispersed business relying on centralized infrastructure</td>
<td>Implement highly available environment with robust Disaster Recovery capabilities to mitigate risk</td>
</tr>
<tr>
<td>• Locations in multiple countries and time zones running on multiple instances</td>
<td>• Leverage virtualization along with a service provider’s multi-data center infrastructure (single global instances)</td>
</tr>
<tr>
<td>Complex organizational &amp; ownership structure</td>
<td>Maintain data for resource consumption by logical business unit useful for internal billing</td>
</tr>
<tr>
<td>• Multiple owners with varied levels of investment</td>
<td>• Leverage portal reporting capabilities available at the resource level</td>
</tr>
<tr>
<td>• Shared services organizations across enterprise for some functional areas</td>
<td></td>
</tr>
</tbody>
</table>
Virtustream Snapshot

- Enterprise-class Cloud software solutions
- Private, Public, Hybrid, Federated Clouds
- World-class µVM™ Cloud technology
- Hardware and virtualization agnostic
- Numerous cloud IP patent filings
- Privately held, Intel Capital backed
- 70+ SAP Production Customer on Cloud
What is the Enterprise Cloud?

The Enterprise-Class Cloud

- Supports complex heterogeneous IT environments
- Optimizes both legacy and web-scale applications
- Secures access to cloud – physically and logically
- Complies with audit and industry regulations
- Assures applications with performance SLAs
- Delivers consumption based pricing
- Efficiently shares infrastructure - production + test/dev
- Delivers benefits of multi-tenant cloud elasticity/scale
- Enables IT-on-demand
Processing work loads in a cloud computing model is similar to operating electric devices at home. Imagine being charged for every electrical device’s rated capacity?

*Thankfully you do not. You pay for actual aggregate energy consumed, measured in kilowatts (kW)*

**However …**

Most providers size IaaS requirements by virtual machine (VM) which is driven by application peak loads, leading to as much as 30% excess capacity.

Virtustream maximizes efficiency by sizing, pricing and “SLAing” IaaS requirements by the most granular capacity infrastructure measurement possible. Something we call a µVM™ (Micro-VM) …
We recognize the most important consideration of any enterprise is security. Our approach utilizes proven physical and logical techniques, enhanced by state of the art virtual security.

Key Design Features

- Secure environment built around best practices
  - Defence in-depth
  - Least privilege operations
  - Separation of resources, traffic & data
  - Access denied by default
  - Vulnerability & patch management
- Secure network segregated into zones based on level of trust associated with intended purpose
- Custom, secure portal requiring 2-factor authentication with role-based access
- 24x7 Real-time security monitoring built using enterprise class Security Information & Event Management (SIEM) tools
- Audit & log data management for compliance reporting including privileged user auditing
xStream’s application and data replication features can be configured on or off premise, allowing us to create tailored client solutions with integrated disaster recovery capability.

- Fully managed service with resource SLAs
- Continuous optimized platform
- Secure client network extension or Internet based connectivity
- Remote management of xStream On Premise appliance
- Transformation Collocation for clients who wish to transition
- Mission critical client workloads
- Single, secure Portal for self-managing all configurations
- Standard client workloads and Business Continuity workloads
- Data and application level replication
- Portal
xStream Management Portal

Manage your cloud Infrastructure consumption, Performance and VM’s

Monitor your cloud Workload performance

Follow @ASUG365 and #ASUG2013 on Twitter
Supporting Enterprise Customers

Secure Enterprise Class Clouds:
- Private Clouds: On Premise and Virtual
- Public Clouds
- Cloud Staging and Networks

- Application Monitoring
- Application Management
- Cloud Optimization

Advisory Services
- Cloud Adoption Strategies
- Cloud Migration Services
- Cloud Integration Services

Cloud Cover

Software Appliance
- Hybrid
- Managed Service

Applications
- Data
The vision: All of SAP's ERP customers together in a Petabyte in-memory cloud

Existing 250 TB of HANA servers procured, built, and run in Santa Clara, CA to support scale out testing, internal development, joint Intel/SAP R&D, and this business case

Engineering work on SAP "Cloud Frame" technology to support the automated creation of hosted HANA clusters in a large server farm

Integration of Virtustream as a Partner running and testing Customers on the Petabyte cloud

Selection of Florida Crystals as Pilot Customer
Goals and Results of ERP and BW on HANA PoCs
Leverage SAP solutions ... to enable Information Systems Transformation

- **Analytics**
  - BW on HANA
  - Self-service BI
  - Explorer - EIS
  - Virtustream Cloud
  - HANA In-Memory cloud
  - SAP ‘on Demand’, SoD, Jam, Sourcing

- **Agility**
  - SAP Business Suite on HANA
  - Imagine SAP as fast as Excel!

- **Speed**
  - Personalized UI
  - Mobility
  - Workflow

- **Intuitive User Experience**

**Eliminate Non-Value-Added Work**
- Automate Manual & Routine Work
- Eliminate Paper and E-Mail
- Optimize Workflow & Mobility
- Real-time Analytics / Info

Follow @ASUG365 and #ASUG2013 on Twitter
Objectives:

- Further Abstraction of Technology
- Focus on Business
- Elasticity
- True Consumption Based Model
- Real Time Reporting

- Validation of HANA in a managed service cloud infrastructure setting
### The Two Project Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>PoC Objectives</th>
</tr>
</thead>
</table>
| **ERP on HANA as Managed Service in cloud data center** | • **Demonstrate cost and customer experience advantage of (central cloud) deployment**  
  — Optimized, consolidated SAP IT landscape -> Improved performance  
  — Centralized, consolidated data in cloud -> ease of data migration  
  — Centralized, consolidated application landscape -> ease of patching/upgrading, new app introduction  
  — Shared application and database infrastructure -> more cost effective, optimized Dev/Test, backup/restore, Disaster Recovery and High Availability  
  — Managed hw/sw infrastructure -> reduced enterprise IT burden  
  • **Compare performance of ERP on HANA on cloud infrastructure to current ERP/SQL Server cloud implementation**  
  — Transaction response times on known lengthy standard SAP transactions (batch and OLTP)  
  — Stress testing on "simulated month-end" close                                                                                                                                                                   |
| **BW/BO on HANA as Managed Service in cloud data center** | • **Demonstrate cost and customer experience advantage of (central cloud) deployment**  
  — Optimized, consolidated SAP IT landscape -> Improved performance  
  — Centralized, consolidated data in cloud -> ease of data migration  
  — Centralized, consolidated application landscape -> ease of patching/upgrading, new app introduction  
  — Shared application and database infrastructure -> more cost effective, optimized Dev/Test, backup/restore, Disaster Recovery and High Availability  
  — Managed hw/sw infrastructure -> reduced enterprise IT burden  
  • **Compare performance of BW on HANA on cloud infrastructure to current BW/BO cloud implementation and original on-premise implementation**  
  — BW query response times on select reports  
  — BW batch data loading times                                                                                                                                                                                 |
**The migration steps**

1. ERP 6.06 FCC system copy
2. Download
3. Upgrade to 6.16
4. Migration
   - CI
   - SQL to HANA

**ERP (6.16) on HANA, FCC setup**

- VM App
- VM CI
- Single node
- Scale-out

**CI:** Central Instance

**GPFS:** Cluster file system

- Migration accomplished in 3 Weeks including Performance and Functional Testing
### Phase Activities

#### Testing I
**SAP & Virtustream Functional Test**
- Compare performance of top 30 transactions in SD, PP, QM, FI, CO, MM modules
- Execute transactions 3x on HANA and on MS SQL system

#### Testing II
**FCC User Test**
- 12 end users at FCC
- Tested 184 key transactions, reports, background jobs, batch jobs and test scripts
- Across FI, CO, MM, SD, HR modules (HANA only)

#### Testing III
**FCC User Stress Test**
- Month-end close live stress test
  - 75+ FCC users, 3 sessions each
  - 2000+ transactions executed
  - 320+ month-end and daily business transactions
  - Typical 3-4 day workload compressed into 3 hours
  - All main ERP functional areas tested (FI, HR, MM, SD)

### Performance Test Results and End-User feedback

- **FI/CO F110 payments:** "very impressed with results. Much faster than other systems. 372 invoices paid in a single run"
- **FI/CO SQ01 query on BSEG table** “relatively quick for 6 months of postings. Times out in other systems. But timed out for entire year.
- **SD analysts:** Custom report transaction ZV25 "finished in under 30 seconds vs. about 2 minutes in other systems"
- **MM analysts:** MSC1N create batch “much quicker than our regular test system the 1st time executed, not as quick the 2nd time”

### User Stress Test Results and Feedback

- **HANA performed well** (max CPU load 26%, max memory 199 GB)
- **Bottlenecks due to app server, added 2nd app server during test**
- **End-user feedback:**
  - “Holy smokes this is a lot faster”
  - “This query takes >1 minute in production and returned in <2 sec”
  - "Performance of MB51 was phenomenal”

#### Transaction Demo
Watch video

---

Follow @ASUG365 and #ASUG2013 on Twitter
The migration steps

1. BW 7.3 FCC system copy
2. Download of install files
3. VM CI
4. Migration - CI - SQL to HANA
5. Import of Q&A data, post tuning
6. Perform Data Validation, Execute Performance Metric

From BW 7.3 on SQL Server to BW on HANA

CI: Central Instance
GPFS: Cluster file system

Migration Accomplished in 2 Weeks including System Copy, DB Migration, Performance Testing and Functional Testing
Data Manager (DM time*) Comparison

Query Set 1: Most Used Queries – HANA Optimized

### Most Used - HANA Optimized
**Query Set 1 – Avg DM time Comparison (1st Run)**

![Bar chart showing time comparison between BW on MSSQL and BW on HANA (after optimization).]

- **Time (sec)**
  - BW on MSSQL: 16.406
  - BW on HANA (after optimization): 1.848

**89% improvement**

### Before/After HANA Optimization
**Query Set 1 – Avg DM time Comparison (All Executions)**

![Bar chart showing time comparison between BW on HANA (before and after optimization).]

- **Time (sec)**
  - BW on HANA (before optimization): 2.87
  - BW on HANA (after optimization): 1.848

**36% improvement**

### Most Used - HANA Optimized
**Query Set 1 - Avg DM time Comparison (All Executions)**

![Bar chart showing time comparison between BW on MSSQL and BW on HANA (after optimization).]

- **Time (sec)**
  - BW on MSSQL: 3.636
  - BW on HANA (after optimization): 1.848

**49% improvement**

### Table: Query Sets

<table>
<thead>
<tr>
<th>Set</th>
<th>Query</th>
<th>Comment</th>
</tr>
</thead>
</table>
| 1   | 5 x Type 1 | Most frequently used/HANA Optimized  
Same MultiProvider – all part-providers converted to HANA-optimized |
| 2   | 2 x Type 2 | Most frequently used  
Not HANA-optimized |
| 3   | 3 x Type 3 | Longest runtime/Not HANA optimized  
DSO / non-cumulative Infocube part-providers |

* DM (Data Manager) – the time needed to prepare and execute SQL statements of BW queries in the DB
Query Set 2 and 3 Non-HANA Optimized

Most Used – Not HANA Optimized Query Set 2 - Avg DM time Comparison (All Executions in Seconds)

- Time (sec)
  - BW on MSSQL: 4.365
  - BW on HANA (before optimization): 0.854

80% improvement

Longest Runtime - Not HANA Optimized Query Set 3 - Avg DM time Comparison (All Executions)

- Time (sec)
  - BW on MSSQL: 84.125
  - BW on HANA (before optimization): 2.533

97% improvement

Query Sets

<table>
<thead>
<tr>
<th>Set</th>
<th>Query</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4 X Type 1</td>
<td>Most frequently used/HANA Optimized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same MultiProvider – all part-providers converted to HANA-optimized</td>
</tr>
<tr>
<td>2</td>
<td>1 X Type 2</td>
<td>Most frequently used Not HANA-optimized</td>
</tr>
<tr>
<td>3</td>
<td>5 X Type 3</td>
<td>Longest runtime/Not HANA optimized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DSO / non-cumulative Infocube part-providers</td>
</tr>
</tbody>
</table>

DM (Data Manager) – the time needed to prepare and execute SQL statements of BW queries in the DB.
As expected, HANA significantly faster for all phases

**Test Setup**
- Executed 1 data load process after of converting the DSO (Data Store Object) and InfoCube to HANA-optimized and compared to BW on MS SQL
- Since HANA does not have any impact on the data extraction from the source system, we excluded this step from our analysis. The test focused on:
  - Loading the data from PSA (BW Persistent Staging Area) to DSO
  - Activating DSO load request
  - Loading data from DSO to InfoCube

**Test Cases**
- Load data from the PSA to DSO
- Load data from the DSO to Cube

**Data Size**
- 11616 records

**Results Summary**
- HANA significantly faster for all phases
- Load time (94% and 56% improvement)
- Activation time (82% improvement)

# After Hana Optimization
### Phase | Activities | Key Findings
--- | --- | ---
**Migration** | ▪ Copy BW QA system (BW 7.3)
▪ Data Migration | ▪ Source data size 650 GB
▪ Compressed size 95 GB for 36794 tables

**Testing I**
SAP & Partner | ▪ Performance test top 10 customer queries (5 most frequently used, 5 longest running)
▪ Executed queries serially, multiple times both on HANA and SQL Server systems
▪ Before/after HANA opt. of key info providers
▪ Validated DM response time | ▪ Data management response time improvement
   – Set 1 queries (most used, HANA optimized): 89% on first run and 49% across all executions
   – Set 2 queries (most used, non-optimized): 80% improvement
   – Set 3 queries (longest running, non-optimized): 97% improvement

**Testing II**
Load performance | ▪ Executed single data load process
▪ Before/after optimizing DSO & InfoCube
▪ Validated load & activation times | ▪ Significant data load improvement on select DSO, cubes
   – 94% improvement in load time
   – 82% improvement in activation time

**Testing III**
Validate scale | ▪ Scheduled and ran 30 CATT jobs in parallel, simulating 30 concurrent users executing the same set of queries | ▪ Average query performance consistent with single query executions
▪ HANA IndexServer statistics:
   – Heap memory usage remains low (5% of limit)
   – Memory consumption was steady during the test

---

1). Virtustream had already upgraded from BW 7.01 prior to PoC
2). Data Manager. Time to prepare & execute BW query SQL statements in DB
3). CATT is a standard test tool available in every ABAP application
FCC BW on HANA Production Landscape

**BW** on HANA Live since 3/24/2013

**ERP** on HANA scheduled to go live in Q2 2013
Advantages of Running HANA in a Cloud environment:

- Flexibility During migration – Fast Upgrades and Patches
- Easy to Use Snaps and Fall Back during Testing
- Cloning and Copying systems increases flexibility and repetitiveness of the migration process reducing risk during the final production migration
- Consumption based approach makes it easy to repeat the process at low cost
- Improved TCO especially with regards to upfront HW investments
- HANA can be offered in a managed service offering concept together with the rest of the infrastructure
- Dynamically Scalable Solution
Thank You For Attending

Don Whittington
Vice President & CIO
Florida Crystals Corporation

Kevin Reid
CEO/CTO
Virtustream Inc.
Follow @ASUG365 and ASUG CEO Bridgette Chambers @BChambersASUG on Twitter to keep up to date with everything at ASUG.

Follow the ASUGNews team of Tom Wailgum: @twailgum and Courtney Bjorlin: @cbjorlin for all things SAP.
THANK YOU FOR PARTICIPATING

Please provide feedback on this session by completing a short survey via the event mobile application.

SESSION CODE: ####

For ongoing education on this area of focus, visit www.ASUG.com