Crossing the Finish Line…

The University of Mississippi’s Implementation of SAP Business Suite on HANA

2016 HERUG Conference - Session H-3
The University of Mississippi – About Us

- Mississippi’s flagship university with campuses in Oxford, Jackson, Tupelo and Southaven
- $1.9 billion operating budget; $594 million endowment
- 23,838 students for the 2015/16 academic year
- 59.3% enrollment growth since 2004
Our SAP Partnership

- Initial deployment in 1999/2000 (release 4.5B)
- North American pilot for SLcM in 2002/03
- Many, many upgrades
- Launched SAP Enterprise Portal in 2008
- Added UM Medical Center as a 2nd SLcM client in 2009
- Upgraded to UNICODE in December 2013
- Upgraded to Netweaver 7.4 and ERP 6.0 EhP7 in April 2015
- Launched SAP Business Suite on SAP HANA in December 2015
Why HANA? Why Now?

Pre-HANA Challenges
- Extremely long runtimes of jobs (hours vs. minutes/seconds)
- A culture of immediacy exists with students – the apps have to respond!
- 15+ years on SAP – we could not become a “legacy” system
- Data rich/information poor – A huge need for real-time analytics

HANA Project Goals
- Vastly improve access times to data
- Leverage our existing ERP investment through a major upgrade
- Establish an enterprise reporting/analytics strategy that leverages live data
Why HANA? Why Now?

- SLcM data model, plus our rapid growth in enrollment, lends itself to HANA
- SLcM/Org. Mgmt. relationship table (HRP1001) has about 49 million records
- The system “demand”/load fluctuates greatly – performance bottlenecks
The CIO of Walmart said, “it’s all about speed” and who doesn’t realize that now will lose in the future. It’s that simple….It is one of the paradigm shifts we have experienced in our 40 years….and now we have a new generation of software coming based on HANA....

People simply cannot go to their jobs and work on ancient systems when at home they are working more efficiently on their iPhones and iPads. With in-memory technology, we can solve these issues and much more.

Prof. Dr. h.c. Hasso Plattner – SAPPHIRE 2015 Keynote “The In-Memory Revolution: How SAP HANA Enables Business of the Future”

Why HANA? Why Now?
Sprint vs. Marathon
ABAP Remediation
ABAP Remediation
Options for custom ABAP development from SAP*

**Accelerate**
- *Reduce* the runtime windows of background / batch jobs
- *Improve* the application response times for end-users

**Extend**
- Address/enable *more users*
- Transition from background jobs to *interactive UI/UX*
- Add features and *improve usability*

**Innovate**
- New *processes*
- New *applications*
- New *consumption channels*

*From "Code Analysis – University of Mississippi" by Oliver Mayer, HANA COE (SAP)
## Performance Guidelines for ABAP Database Access*

### Keep the results set small
- Don’t retrieve rows from the database and discard them on the application server using CHECK or EXIT, e.g. in SELECT loops
- Make the WHERE clause as specific as possible

### Minimize amount of transferred data
- Use SELECT with a field list instead of SELECT * in order to transfer just the columns you need
- Use aggregate functions (COUNT, MIN, MAX, SUM, AVG) instead of transferring all rows to the application server

### Minimize the number of data transfers
- Use JOINs and/or sub-queries instead of nested SELECT loops
- Use SELECT...FOR ALL ENTRIES instead of lots of SELECTs or SELECT SINGLEs.
- Use array variants of INSERT, UPDATE, MODIFY, and DELETE

### Minimize the search overhead
- Define and use appropriate secondary indexes

### Keep load away from the database
- Avoid reading data redundantly
- Use table buffering (if possible) and don’t bypass it
- Sort data in your ABAP programs

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*From “Code Analysis – University of Mississippi” by Oliver Mayer, HANA COE (SAP)*
ABAP Remediation - Accelerate

- Started with transaction SCI (Code Inspector)
- Used an SCI variant geared towards performance
- Only ran against UM custom codebase
- **Caution** – SCI results are only as good as the options selected in the variant
<table>
<thead>
<tr>
<th>Object Type</th>
<th>Object Name</th>
<th>Package</th>
<th>Message Type</th>
<th>Message Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZHR...</td>
<td>CONFIGURATION REPORT</td>
<td>MY/NAO</td>
<td>1, E</td>
<td>DELETE statement for result of SELECT statement found</td>
</tr>
<tr>
<td>PROV...</td>
<td>DELIMITER...</td>
<td>KY/NAK</td>
<td>1, E</td>
<td>SELECT statement can be transformed. 10% of fields used</td>
</tr>
<tr>
<td>PROV...</td>
<td>SELECT...</td>
<td>KY/NAK</td>
<td>1, E</td>
<td>Selection check. No fields used</td>
</tr>
<tr>
<td>PROV...</td>
<td>SELECT...</td>
<td>KY/NAK</td>
<td>1, E</td>
<td>SELECT statement can be transformed. 4% of fields used</td>
</tr>
<tr>
<td>PROV...</td>
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<td>1, E</td>
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ABAP Remediation – *Accelerate* “Takeaways”

- Use a prioritized list based on program execution/last date run
  - Implemented SAP enhancement S38MREP1
  - Had statistics from January 2014 forward on our PRD system
- Addressed true code issues / inefficient code issues first
  - Implicit sorts / not sorting results from SELECT statements
  - SELECT *
  - Nested loops
  - ORDER BY on pooled/clustered tables
- Use SAT and SQLM to identify additional performance related issues
- **Key Takeaway** – SCI focuses on the ABAP code syntax/structure, etc. itself. SAT/SQLM is geared more towards the actual performance of the ABAP object.
Enterprise Reporting & Analytics
Enterprise Reporting

POC / Pilot
- October 2014 - February 2015
- Four vendors participated
- Hands on evaluation by IT staff

Procurement
- March - June 2015
- ITS/IHL approvals
- RFP/award bid for software
- Hardware procurement

Implementation
- August 2015 - Present
- "Tableau User Group" formed
- Partnership with IREP
Enterprise Reporting – Next Steps

• Evacuate SAP Business Warehouse
• Build new applications with reporting in mind / re-design existing applications
• Foster a culture of analytics across campus
  • Design/build appropriate CDS views & expose them to Tableau
  • Empower key stakeholders to inspire adoption and “data discovery”
• Enable predictive analytics library (PAL) in HANA
  • Forecasting future demands for academic coursework
  • Identifying potential “at risk” students
Production Landscape Migration
# Production Hardware Specs

## Development

- **Hitachi CB500**
  - 30 cores @ 2.5 Ghz
  - 512 GB RAM
  - 11 TB Usable disk
  - 8 GB FC
  - 10 GB Ethernet
  - SLES 11 SP3; ERP 6.0 EhP7 SPS 06; NetWeaver 7.4 SPS 08; HANA 1.0 Release 97

## QA & Production

- **Hitachi CB500**
  - 60 cores @ 2.5 Ghz
  - 1 TB RAM
  - 22 TB Usable disk
  - 8 GB FC
  - 10 GB Ethernet
  - SLES 11 SP3; ERP 6.0 EhP7 SPS 06; NetWeaver 7.4 SPS 08; HANA 1.0 Release 97
Production Landscape Migration

Development
- November 3-6, 2015
- Oracle DB - 154 GB
- HANA DB - 91 GB
- 40% DB compression

Quality Assurance
- November 3-6, 2015
- Oracle DB - 1 TB
- HANA DB - 388 GB
- 61% DB compression

Production
- December 18-19, 2015
- 22.5 hours for migration
- Oracle DB - 1 TB
- HANA DB - 457 GB
- 56% DB compression

FREEZE 10/31/2015

Ahead of schedule!
Post Migration “Sanity Checks”

• Production SAP system opened to developers at 3:30 p.m. on Saturday, December 19.

• Developers gathered both the UM campus and UMMC
  • Executed test scripts
  • Checked authorizations
  • Tested integration with external systems

• System opened to productive use by 6:30 p.m. that evening
Post Migration Update
Post Migration “Opportunities”

• Connection to external databases (due to UNIX to Linux OS change)
• Buffered tables (direct reads bypass table buffers)
• Implicit database sorts from Oracle
• Cluster tables to transparent tables and sorting
HANA Performance

The need for speed...

![Bar chart showing performance comparison between Oracle DB and HANA DB for various tasks.](chart.png)
HANA Performance

The need for speed (continued)...

- Retention Tool (~4k students)
- Student Activity Report (~20k bookings)
- Report on Student Schedule and Program Changes per Advisor
HANA Performance

The need for speed (continued)…

Has study (517)

Student (ST)

Study (CS)

Pgm. of Study (SC)

Functions: HRIQ_STUDENT_STUDIES_GET and HRIQ_PROGRAM_DATA_GET

CDS Views: PIQCDSTDYPROG and PIQCDSCSSTREGN
HANA and SLcM – Where are we now?

- Collaboration with SAP SLcM development team
  - Optimization of existing SLcM functions
  - Identification and delivery of standard SAP SLcM CDS views
  - Implementation of SAP Notes 2251457, 2272075 and 2283242 onto HANA sandbox system for analysis/review/testing
- Creation of custom CDS views
- Continued optimization of existing custom code base for HANA
- Implementing new ABAP programming techniques
New Techniques / New Tools

- ADT plugin for Eclipse IDE (ABAP on Eclipse) *
- HANA “switch”
- AMDPs (SQLScript)
- CDS Views *
- HANA optimized ALV grids
- SE16H – SE16 optimized for HANA
Future *Sprints* (or Marathons)...

- Implement Rapid Deployment Solution (RDS) for ESS/MSS & HR Renewal 2.0
- SAP Fiori UX
- S/4 HANA? S/4 HANA Finance?
- SuccessFactors?
For More Information…

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