Session Overview

- What is changing in MEDITECH version 6.0 with regard to ad-hoc report development strategies?
- What does the Data Repository (DR) environment look like in 6.0 and how does this differ from previous versions?
- How are the 6.0 Advanced Technology (AT) DR data structures fundamentally different than NPR data structures?
- What pre-6.0 NPR reports need to be developed in DR in a post 6.0 world?
- What are some of the issues encountered (so far) while developing DR Reports in a 6.0 environment and how have they been resolved?
Glossary of Terms in Session

- **Advanced Technology (AT)** – Term for the current development platform on which new and upgraded MEDITECH applications are being written.
- **Future Software? (FS)** – Underlying programming and “append” database technology on which AT applications are built.
- **Focus** – Precursor to AT, no longer used by MEDITECH.
- **Client Server (C/S)** – Term for previous version of MEDITECH applications software. Also, programming language and database technology introduced in the early 90s on which applications are developed.
- **MAGIC** – Term for version of MEDITECH applications introduced in the early 80s. Also, programming language and database technology on which these applications were built.
- **Non-Procedural Representations (NPR)** – Marco programming application used to automate code generation in MAGIC and C/S development. Also the term used of the Report Writer used in MAGIC and C/S applications. Finally, it is also a term to describe the underlying database structure that is common to MAGIC and C/S applications.
- **Version 6.0+** – Current version of MEDITECH applications being implemented. Comprised of both AT and C/S application technology.
- **Data Repository (DR)** – Application that replicates data from the MAGIC, C/S, or AT database to a Microsoft SQL Server database from which reports can be developed.
v6.0 Application Databases

v6.04 AT Application Database
- ARM - Authorization and Referral Management
- DR - Data Repository
- EDM - Emergency Department Management
- EMR - Electronic Medical Record
- HIM – Health Information Management
- MIS - Management Information Systems (Dictionaries)
- OM - Order Management
- PCS - Patient Care System
- REG - Synchronized data from ADM via interfaces
- UNV – System wide data (setup parameters, devices, etc.)

v6.04 C/S Application Database
- ABS, ADM, AP, BAR, CA, BBK, FA, GL, ITS, LAB, MIC, MM, MIS, MRI, PHA, PP, PTH, SCH
Data Flow Diagram & Ad-hoc Reporting

MEDITECH 6.0 Application Databases

C/S Application Databases

AT Application Databases

Data Repository on SQL Server 2005 or 2008 RDMS

livedb

livefocdb

DR Reports (SSRS)
6.04 Report Writing Options

- Customer Report Designer EE
- Report Writer (NPR)
- Query Dictionary
- Group Response Dictionary
- Customer-Defined Data Record Dictionary
- Screen Dictionary
- CDS (NPR)
NPR Report Writer Option in 6.0

Classic NPR Report Writer launched from within 6.0 Menu
Creating NPR Reports in 6.0

Creating NPR reports in 6.0 when using data from C/S databases is virtually identical to creating reports in 5.5/5.6 Client Server.
AT Report Designer Tool in MT Words

- “Completely redesigned our reporting tool from the ground up”
- “requires no MEDITECH-specific programming knowledge”
- “organizations gather data from throughout the MEDITECH system for use in customized reports”
- Developed with “customer feedback from regional events, 6.0 early adopters, as well as from customer proposals”
- “intuitive Desktop which allows you to quickly and easily navigate from one screen to the next”

Quotes from MEDITECH Web Site www.meditech.com
AT Custom Report Designer

Features similar to NPR
Executing Report Designer

New product with typical “beta blues” but continuously being improved by MEDITECH
Cross AT/CS DB Reports – DR is the Best Solution

- Patient Bed Board Report
- Physician Activity Report
- Infant Birth Height and Weight Report
- RX’s Entered Without Administration Documented
- Patients By Chief Complaint
- List of ER Patients Admitted By Location

Any report that uses registration, abstracting, or billing data as well as assessment, emergency department, or any other AT module data.

DR is ideally suited to develop these MT 6.0 reports.
About MEDITECH Data Repository

- It is a replication of application database information in a SQL Server Relational Database Management System (RDMS)
- Data Stored in Tables and Columns (versus AT Object, Record, Element or NPR DPM, Segment, Element)
- Uses the Transact-SQL programming language to develop code (typically Stored Procedures) that compile, filter, group, sort, and organize data from both AT and C/S applications using the DR’s livefocdb and livedb databases respectively
- SQL Server Reporting Services (SSRS) application provides robust report development and deployment capabilities
- SSRS Report Models and Report Builder allow non-technical staff to develop reports without direct IT involvement
- SSRS provides the ability to post ad-hoc reports to a web site for easy access from EMR or your intranet as well as the ability to schedule reports and publish to e-mail addresses or file shares
Four SQL Databases are in DR 6.0

- Live database for 6.0 C/S application
- Live database for 6.0 AT application
- Test database for 6.0 C/S application
- Test database for 6.0 AT application
Issues Working with the DR in 6.0

- Identifying where application data is stored within the DR (this is a problem in pre-6.0 DRs too)
- Selecting data to use in a report when it appears to exist within multiple places in the DR
- With AT application data and C/S application data in separate databases, how do we reintegrate this data?
- Other issues unique to the 6.0 DR environment:
  - Volume of data in 6.0 AT DR tables
  - Building additional indexes in DR databases
  - Dealing with DR table naming challenge
  - Column naming conventions
  - Use of compound primary keys
  - Construction of functions to centralize code
Likewise, in AT applications, information about the location of a field in the DR can be garnered from the help option.
Despite differing data schema in AT and C/S application databases, the SysDrColumns table in the livedb and livefocdb are identical.

NPR or AT field location information.

Acmeware has developed a series of functions that allow us to quickly search this metadata for a match to field data the location of which we are attempting to identify.
Choosing the Best DR Data Fields

Data fields can exist in many DR tables. Choosing the correct table will have an impact on performance and may also have an impact on report results.

AccountNumber is in more than three tables (two C/S tables and one AT table in this screenshot)
A large amount of C/S application data is transferred to the AT module via internal MEDITECH interfaces.

This data also flows to the DR into tables prefixed as RegAct...

We have decided not to use these tables so far because:

1. These internal interfaces are still being refined and on occasion, data has become out of synchronization,

2. In the DR, it is easy to get the information directly from the “system of record” (i.e., ADM, ABS, BAR, etc.)
DR livefocdb RegAcct... Tables

RegAcct... tables include data from CS ABS & ADM modules
Creating Cross Database Queries

Note the columns “SourceID” and “VisitID” are the key to JOINing cross database queries in the DR.

Key symbol indicates Primary Keys which determine uniqueness of record in a table.

Admission (Registration) main segment
Cross Database Query Syntax

Use of fully qualified reference to DR table objects

C/S ADM application database data

AT EDM application database data

Graphic Query Designer in SQL

Again, SourceID and VisitID are Keys
Dealing with the Volume of Data

- No records are deleted in the 6.0 AT application databases; data is only appended.
- The truth is that this was mostly true in C/S, although there are some notable exceptions (e.g., insurance changes, location changes during a visit, etc.)
- SQL Server allows developers to create indexes on tables using one or more field which can be highly effective at reducing the time required to generate a report.
- When near-instant response is required of an application (i.e., results to a web-portal based report), filtered and highly-indexed datamarts can be created using DR AT and C/S data.
AT Append Database has Complete History

Every newly documented and previously documented intervention (if not updated) is saved on an assessment including subsequent edits or cancellations.

Every computed version of an assessment response is saved as data.

The automated capture of data (e.g. vital signs) can result in an enormous volume.
C/S Nursing Data was Always Complicated, but AT PCS Takes it to a New Level

- Over 575 PCS tables in the DR
- Many PCS table names are very similar (e.g., PcsAcct_Main, PcsAcuity_Main, PcsAcct_AcuityMain)
- Linking a record in a AT PCS table back to the Patient/Visit to which the record is associated is much more difficult than C/S
- Assessments can have multiple interventions; interventions can be on multiple assessments
- Assessment questions and responses are no longer in the same table
- Interventions can have grouped questions, grouped questions can have multiple response instances
Key PCS Tables We’ve Identified

- **PcsAcct... (PCS Account Interventions)**
  - PcsAcct_Intervention
  - PcsAcctAct_IntActivity
  - PcsAcctAct_IntActAssessments

- **PcsAssmnt... (PCS Assessements)**
  - PcsAssmntData_Main
  - PcsAssmntData_Queries

- **Mis... (MIS Dictionaries)**
  - MisDocSect_QuestionSets
  - MisDocSect_Questions
  - MisGroupResp_GroupElements

With these eight tables, we have been able to generate reports with all and the most current assessment values for specified patients during their hospital or outpatient stay. However, using these tables correctly is no small challenge.
When building reports in the 6.0 DR environment, the relationship that exists among tables must be correctly “reconstructed” to accurately and efficiently identify data.

Example of correctly “joined” columns in PCS DR:

- $\text{PAD}_Q.\text{QuerySetID} = \text{MDS}_{QS}.\text{QuestionSetUrnID}$
- $\text{PA}_I.\text{InterventionUrnID} = \text{PAA}_{IA}.\text{InterventionActivityInterventionUrnID}$
- $\text{PAA}_{IA}.\text{InterventionActivityUrnID} = \text{PAD}_{M}.\text{IdentifierID}$

Variables:
- $\text{PAD}_Q = \text{PcsAssmntData}_\text{Queries}$
- $\text{MDS}_{QS} = \text{MisDocSect}_\text{QuestionSets}$
- $\text{PA}_I = \text{PcsAcct}_\text{Intervention}$
- $\text{PAA}_{IA} = \text{PcsAcctAct}_\text{IntActAssessments}$
- $\text{PAD}_{M} = \text{PcsAssmntData}_\text{Main}$
One of the most challenging issues to overcome when developing 6.0 reports is accommodating cases where MEDITECH has entered a compound field in a table primary key (i.e., a field made up of multiple elements). An example of this is the PcsAssmntDataID field used extensively throughout the PCS DR tables.

Example data comprised of VisitID, MisDocSectID (assessment screen), and more:

- V0-20090313130545[A^APGAR]
- V0-20090310130935[A^VS]
- V0-20090310130935[M^MAR.IVSITE^{222^.}]
- V0-20090310130935[O^PCS.PROG^28.0001]
- V0-20090310130935[O^PCS.PROG^7.0008]
- V0-20090310130935[O^PCS.PROG^7.0014]
- V0-20090310131124[A^ADM.AD]
- V0-20090310131124[A^ADM.ADL]
- V0-20090310131124[A^ADM.GEN.GEN]
Proposed Solution to Compound PK

- Compound primary keys cannot directly have indexes constructed on the internal elements that comprise the key.
- We propose constructing tables that break these PK fields into their constituent parts, whereby this table gets updated in near real time.
- Reports that require “joins” between components of a table’s compound primary key and another table (not an uncommon scenario) utilize our mapping table to more efficiently perform these joins.
- This is a work in progress as this solution has not been run against live data.
Function to Simplify Assessment Reporting

ALTER FUNCTION [fxAcmeGetAssessments]
(  
    @QuestionMnemonicList varchar(max),  
    @AllOrCurrent int, -- -1 = Current, 0 = All  
    @Instance int, -- -1 = most current instance, 0 = All instances, > 0 means instance = specified value for most recent intervention  
    @SourceID varchar(3),  
    @VisitID varchar(30)  
)

RETURNS @VALUES TABLE (  
    SourceID varchar(3),  
    VisitID varchar(25),  
    InterventionActivityDateTime datetime,  
    IdentifierID varchar(150),  
    Instance int,  
    QuestionMnemonic varchar(75),  
    QueryValue varchar(1000),  
    ElementValue Decimal(20,7)  
) AS

To further assist in PCS report development in the 6.0 environment, we have developed a SQL function where we pass an internal patient visit identifier, assessment question identifier, and flags indicating if we want the most current or all responses as well as whether we want a specific instance (or all instances) of these responses

This function is then used throughout our report development effort thereby centralizing code involved in identifying responses to specific assessment questions
Some Other Functions Developed to Simplify Development

Scalar-valued Functions

- dbo.fxAge
- dbo.fxBabyAge
- dbo.fxGetBabyBirthDateTime
- dbo.fxGetCdsDateTime
- dbo.fxGetEDC
- dbo.fxGetEGA
- dbo.fxGetEGA_Format
- dbo.fxGetInstance
- dbo.fxGetLMP
- dbo.fxGetMinute
- dbo.fxGetPcsMisDocSectID
- dbo.fxGetPcsVisitID
- dbo.fxGetShift
- dbo.fxIsWeekend

We have also found developing a series of SQL functions to address common 6.0 data manipulation issues, which has been helpful in our report development strategy.
Summary

- There are new report development challenges ahead in MEDITECH’s 6.0+ platform.
- NPR Report Writer and the AT Report Designer will play a key role in 6.0 ad-hoc report development.
- For 6.0 reports that require data from AT applications as well as C/S applications, the Data Repository is the right solution.
- The DR offers an easy solution to integrating data from AT and C/S applications as well as robust report development and deployment capabilities.
- There are notable challenges to developing reports in DR 6.0 that were not present in 5.6 and earlier DRs.
Discussion, Questions & Answers
Thank You

Other Acmeware Sessions:

- 805 DR Reporting Made Easy with SQL Server BI Tools - Tuesday 1:00pm (Jamie McDonald)
- 385 Digital Dashboards and Data Repository - Thursday 10:00am (Ian Proffer)
- 384 MUSE International - Friday June 4, 2010, 9:30am - 10:20am (Jamie McDonald)
- 383 SQL Server Upgrade Issues and Version Questions for DR - Friday 3:30pm (Ian Proffer)