

Connections Technical Assistance Grant

Utah Final Report

October 1, 2001 – August 31, 2002

This report has been prepared to provide a final account of the accomplishments of the **Utah Department of Health** (“Contractor”) under its contractual agreement with the **Task Force for Child Survival and Development** (“TFCSD”), October 1st, 2001 - August 31st, 2002.

Acknowledgement

The members of the Contractor's Connections team are all very happy with how the Connections collaborative has been progressing and growing. We hope that some of Utah's deliverables under this grant will enhance the body of knowledge related to the broad, but critical topic of integration.

Utah Connections Members

Rhoda Nicholas	Team Leader
Barry Nangle	Team Member
John Eichwald	Team Member
Stephen Clyde	Team Member
Michael Webb	Team Member
Don Gabriele	Ex-Team Member

We want to thank the TFCSD and the Robert Wood Johnson Foundation for making all this possible.

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Report on the Use of Funds

Because of unique funding constraints, the Contractor felt it would be beneficial to dedicate the largest portion of the Connections grant funding to securing skilled resources for the development of critical components of the CHARM Integration Infrastructure architecture. This was identified in the grant proposal. CHARM, or Child Health Advanced Records Management, is the Contractor's integration project.

Another portion of the grant funds was used to pay for specialized Java Programming training for members of the development team. Java is the language used to develop the components of the CHRAM Integration Infrastructure.

The budget report is included in the Appendix.

Report on the Accomplishment of Contractual Agreements

The Contractor has made the following agreements:

1. Provide two (2) representatives to the Connections meetings held between October 1st, 2001 and August 31st, 2002;
2. Reach a number of technical milestones associated with CHARM integration initiative;
3. Develop a number of white papers and electronic shareable deliverables.

Below is a point by point report on the results achieved at the end of the grant year, under each agreement made.

Agreement 1:

Provide two (2) representatives to the Connections meetings

Accomplishments: The Contractor sent at least two representatives to all the Connections meetings held during the 2001 - 2002 contract year, as follows:

1. October 2001, Jefferson City, MO: Barry Nangle and John Eichwald
2. February 2002, New York City, NY: Rhoda Nicholas and Don Gabriele. The Contractor used separate funding to send a third team member, Dr. Stephen Clyde.
3. June 2002, Portland, OR: Barry Nangle and John Eichwald. Dr. Stephen Clyde used personal funds to join the Portland Connections meeting.

Significance: Participating in the Connections forum has been extremely important to the Contractor's ability to develop a viable integration solution. The Contractor has been using the Connections forum to learn what solutions other Connections members are developing as well as to share lessons learned from its own integration project. Connections is unique in its concept and in the success it has achieved in promoting integration and integration best practices. In addition, the Contractor has often used virtual Connections meetings (phone calls, emails, Connections-Zone) in order to extend its ability to reach the group and expand its ability to discuss, share and "connect". The Contractor will be the site of the next Connections meeting after Providence, RI.

Agreement 2:

Reach a number of specific technical milestones on the CHARM project, in particular, the following components of the CHARM Server:

1. Query Manager
2. Security Management Services
3. Audit Services
4. Catalog Management Services
5. Performance Tracking Services
6. Alert Handler – Basic

Accomplishments: With funds awarded by the TFCSD, the Contractor was able to strengthen its project team by providing Java Programming training and by securing additional skilled resources, actually graduate students from the Computer Science Department of the Utah State University (USU).

The CHARM project follows an iterative and incremental development approach. As such, most of the components included in the system go through iterative development, each time getting better refined.

By February 2002, the CHARM project team completed the high-level architecture design for the CHARM Server and all major components were identified and sketchily developed. Since then, three planned proofs of concept were completed and demonstrated in front of the CHARM Core Council comprised of the managers of the participating programs. The proofs of concept included all significant components of the integration infrastructure. They validated the viability of the architecture and demonstrated the rough workings of the expected functionality.

With the completion of the three proofs of concept, the CHARM Server components identified in the grant proposal, as well as additional components, have all been sketchily developed and validated. These components will be further developed and refined during future iterations.

1. Query Manager - processes “queries” or requests for information received from the participating programs.
2. Security Manager - ensures appropriate user access privileges are enforced.
3. Audit Manager - maintains electronic audit trails of what information was retrieved and by whom.
4. Catalog Manager - maintains the catalog of available sharable data elements.
5. Performance Manager - maintains and uses internal system information for performance monitoring and tuning.
6. Alert Handler (Basic) - allows “exceptional conditions” to be set, managed, and issued in the form of alerts or notifications.

Below is some specific information about the accomplishments under Agreement #2. While, in a typical iterative approach, some areas are moving forward faster than others, future iterations will place more emphasis on other components.

Query Manager

1. Developed, implemented, and optimized an algorithm for processing a query’s execution strategy.

2. Explored different ways of handling timeouts and other kinds of errors in the Query Manager that would occur when the network fails or a CHARM agent becomes unavailable. Implemented an approach, but more exploration is needed in this area.
3. Studied methods for handling exceptions and defined a standard error message format.

Security Manager

1. Looked at user authentication and authorization issues experimenting with Siteminder (a Utah State product) on our own machines.
2. Decided on an approach that will allow for single-sign-on via Siteminder, but uses a CHARM developed servlet to augment its tracking abilities with a CHARM session Id. The CHARM server will use the Session ID to do authorization and access control. We implemented and tested a prototype of the servlet.

Audit Manager

Explored design issues. This will be further developed in future iterations.

Catalog Manager

1. Explored design issues for the Catalog.
2. We completed a new version of the Child Health Profile (CHP) based on an analysis of shared data provided by participating program.
3. We completed a version of the CHARM Meta-Model with better abstractions for data models, queries, results, data mappings and messages.
4. The query and result definitions in the CHARM Meta-Model can now represent implicit stacking. Where appropriate, we added explicit stacking directly added to the CHP data model.
5. Expanded the Catalog to use more of the CHARM Meta-Model.
6. The new Meta-Model and CHP data model have been loaded into the Catalog.
7. Encapsulated design decisions by creating appropriate views on tables.
8. Query and result definitions for testing purposes were been loaded in the Catalog.
9. Explored error handing techniques when referencing stored queries.

Performance Manager

Explored design issues. This will be further developed in future iterations.

Alert Handler

1. We examined the general architecture of the alert engine and decided to implement a separate instance of the alert engine for each participating program and have it configured for its particular needs.
2. Every instance of the alert engine will keep track of the parameters that guide the behavior (start, end, triggering conditions, etc.) of its program's alerts.
3. The alert engine will "do business" with its program's CHARM Agent and will not talk to the Core Agent directly.
4. Completed a prototype of the Alert Management subsystem and integrated it with the CHARM-II.

Significance: The CHARM Server and its architectural components constitute the core of the CHARM Integration Infrastructure. They coordinate the flow, content and security of the information shared among the participating programs. Without any one of these components, the architectural concept of CHARM would come short of realization.

Commercial-off-the-shelf (COTS) products providing similar functionality could have been purchased and customized for the needs of the CHARM project but the costs required to accomplish this would have been prohibitive, given the Contractor's limited funding resources.

Agreement 3:

Develop shareable deliverables

As part of this agreement, the Contractor has committed to making certain deliverables intrinsic to its own development process available to TFCSD. In addition, the Contractor has also committed to producing white papers specifically in order to be made part of the body of knowledge on systems integration.

The Contractor has committed the following deliverables:

- 1 Data Sharing Agreements
- 2 Shared Data Inventories & Data Models for:
 - Early Intervention System
 - Utah Immunization Registry
 - Electronic Birth Registration
 - Early Hearing Detection & Intervention System
 - Newborn Blood Screening Follow-up System
- 3 Process to Identify Shareable Data – White Paper
- 4 Electronic Data Dictionary
- 5 CHARM Architecture – White Paper
- 6 Requirements Gathering & Documenting Process – White Paper

Accomplishments: The Contractor deferred accountability and subject matter expertise to its team with specific members being assigned as point persons for each deliverable. In addition, a schedule for deliverable completion was developed and was used for progress tracking.

Point persons developed their own resource team to help complete their deliverables. These resources were already associated with the CHARM project.

The members of the Contractor's team held monthly meetings to discuss progress, content, and resolve issues. Between meetings, the team provided input on each other's deliverables. During the second part of the contract year, the Contractor experimented with using parallel methods for version control and feedback gathering. The team felt these methods added a level of overhead that could not be justified for this activity.

As most of the content of these deliverables was based on ongoing CHARM work, several project dependencies generated a number of small but unavoidable delays in the Contractor's delivery schedule. In addition, starting at the beginning of June 2002, the Contractor's team was reduced by one critical member and this person's deliverables had to be reassigned within the team, putting more pressure on an already tight schedule.

Below is an account of the completion of each deliverable. All deliverables are included under separate cover.

1. Data Sharing Agreements between the Participating Programs

With prior approval from the TFCSD, this deliverable has been modified. A “Data Stewardship Policy - Draft” will be the main deliverable, with a Data Sharing Agreement as an attachment. As such, the commitment has been met.

In working with the programs to develop data sharing agreements, both the programs and the project team all felt that full-blown program-to-program agreements would be too onerous to develop, manage and maintain, and would be largely unnecessary for anything other than documentation. Since the initial release of the CHARM system will only consider data sharing between programs internal to the Department, a simpler approach was proposed.

Following the Connections visit to NYC in February, 2002, where the Rhode Island team discussed their data sharing process, Utah decided to formalize the Department’s policy on data stewardship. Upon adoption of such a policy, CHARM would no longer be required to develop Data Sharing Agreements to regulate intra-program (internal) data sharing but would be well advised to do so for tracking and documentation purposes.

The UDOH has overall authority to collect and use the data under its purview, considers these data an asset and encourages appropriate sharing in order to maximize its value for public health purposes. In support of this position, a Data Stewardship Policy has been drafted. This policy has completed development and review by the Contractor’s Information Systems Steering Committee and is currently undergoing legal review. As discussed with TFCSD prior to the end of the grant period, this policy draft is being included as a deliverable in addition to a sample program-to-program data sharing agreement.

2. Data Models for the Shared Data

Data models of the shared data have been developed for the following systems:

- Early Intervention System
- Utah Immunization Registry
- Electronic Birth Registration
- Early Hearing Detection & Intervention System
- Newborn Blood Screening Follow-up System

These models are essential components of the CHARM system as they are the basis on which data exchange rules are defined. As programs enhance their systems through time, data models of the shared data will also need to evolve, in order to keep pace with the participating programs’ actual systems.

The models include both what the project team refers to as “Core” or strategic data, as well as “Shared” or tactical data. Core data is program data replicated in the CHARM core database and used to identify, de-duplicate and merge records. Shared data is retained in the programs but is part of the shared Child Health Profile that the programs agreed to exchange among themselves.

Because of the data-modeling-tool-dependent nature of these deliverables, it took longer to make them available in a tool neutral format. They will be turned over by the end of the first week in December 2002.

3. Process to Identify Shareable Data – White Paper

This is a white paper on the process the Contractor's CHARM project team followed to identify the data to be shared among the programs.

A great leap forward has been achieved in this area. Since time is an ally when it comes to new ideas getting accepted, during the grant year the programs have become a lot more accepting of, and a lot more interested in, an integrated environment that supports data sharing. Although time availability continues to be a problem and, due to successive budget cuts, all these programs are staffed at subsistence levels, cooperation is not an issue. In addition, based on the successful architectural proofs of concept, the programs are now confident that this project is neither "wishful thinking" nor a "mirage" and their openness to data sharing has increased considerably.

4. Electronic Data Dictionary in Reusable Format

This deliverable is part of the Data Models for the Shared Data.

5. CHARM Architecture – White Paper

This deliverable discusses technical concepts of the CHARM architecture. After taking a high level view of CHARM and positioning it in a conceptual hub-and-spoke architecture, it takes each major architectural component and discusses its technical components and their role. Separate sections are dedicated to the CHARM Server, CHARM Agents and the Alert Engine.

This study is a seminal paper on how critical political, organizational and operational considerations, which had been reflected in the CHARM requirements document and had shaped the conceptual solution, have been addressed in the system's technical implementation.

6. Requirements Gathering & Documenting Process – White Paper

This deliverable is discussing, in parallel, Requirements Gathering, in general, and a case study on how this activity was carried out by the CHARM project team. The discussion pays particular attention to how specific conditions and constraints force a project to streamline and simplify the process without jeopardizing the final product.

As most project in the public sector are experiencing constraints similar to those of CHARM, we hope that other projects will take heart by taking a look at the CHARM experience and not stop their drive just because there is not enough money.

Appendix: Utah Connections Budget Report

CONNECTIONS October 2001 – August 2002		
Funding Source: Task Force for Child Survival and Development		
Category	Budget	Expenditures
Personnel	\$0.00	\$0.00
In-State Travel	\$2,780.00	\$691.48
Out-State Travel	\$0.00	\$0.00
Current Expense	\$1,200.00	\$397.16
DP Cur. Exp.	\$12,000.00	\$14,891.36
DP Cap. Outlay	\$0.00	\$0.00
Contracts	\$36,000.00	\$36,000.00
Total	\$51,980.00	\$51,980.00