The Optimal Reference Guide:

Our Vision for D3M

Extraordinary insight into today's education topics

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Foreword

By Glynn D. Ligon, Ph.D.

Several times recently someone has remarked, "Data driven decision making—is there any other kind?" I hardly know where to start a response. In 22 years of work in school districts, I cringed often whenever a school board took action based upon impassioned anecdotal appeals made by a few individuals rather than ask for formal analysis of data by administrative staff. I watched principals and teachers follow their hearts into initiatives that only distracted their schools from productive teaching and learning. I watched a state legislature cite a news article in another state as the basis for denying a driver's license to dropouts. When I personally followed up with the journalist, he admitted that his statistics were not nearly as glowing as the original (and only) article claimed. No, all decision making may be data driven, but there is a huge need to improve the objectiveness, timeliness, quality, validity, accessibility, and usefulness of education data so decision makers will rely upon them.

In ESP Solution Group's earlier publication "Steps for Ensuring Data Quality," the highest level of data quality is defined as "Data-Based Decisions Made with Confidence." This highest level of data quality is achieved when the decision makers have the confidence in their data to rely upon them.

In this white paper, the professionals at ESP Solutions Group have combined their experiences and expertise to describe a comprehensive framework for supporting data driven decision making by an education agency. The perspective from which the paper is written is that of a state education agency. However, a district model would have the same components managing data across schools.

In my linear models course in graduate school, there was one over-riding lesson: "Begin by clearly stating the question to be answered. Everything else flows from a clear question—data needed, sampling design, analyses, and the criteria required to consider the findings to be statistically significant." This same over-riding lesson guides our emphasis on data driven decision making.

- We must begin by understanding the purposes for which users need the data (What are the questions they want answered?).
- Then we can define the data we must collect and manage.
- Finally, we can design and implement the information system required to support the entire data management process from policy to standards to systems to access to use.

This paper follows all three of these steps. In the process, the D3M Framework™ described provides a working model for an education agency's information technology solution.

Data-Driven Decision Making (D3M.com™)

We have assembled a premier group of partners to deliver state-of-the-art solutions for state education agencies that are modular, extensible, and user friendly.

Whereas other solutions may move data from LEA to SEA systems, ESP's D3M Framework is designed to:

Move the ***Right*** Data.

Move the Data the ***Right Way***.

Move the Data ***Right Away***.

Move the *Right* Data. For 20 years, ESP has provided LEAs, SEAs and USED with expertise and leadership on issues related to data management. Our proven processes and customizable tools enable SEAs to make informed decisions regarding the agency's data collections, repositories, and reports and the means to sustainably maintain their enterprise systems.

Move the Data the *Right Way*. Our staff of expert consultants bring experience and intelligence in support of SEA information management projects. Our PMI trained and certified Project Managers ensure that no important details are dropped. Our Project Directors each draw on years of experience working directly in and with SEAs and LEAs and are accountable for the overall success of the project.

Move the Data *Right Away*. Our State Report Manager (SRM) framework works in synergy with Edustructure's SIF Vertical Reporting Framework (VRF) or as a stand-alone web application to enable SEA system administrators to control every aspect of the vertical data flow. From a simple centralized system that enables reliable upload and certification of October 1 data to complex distributed systems that use SIF to automate daily synchronization and verification, ESP's State Report Manager is a product without peers.

ESP Solutions Group and our D3M Framework partners are the industry leaders in successfully deploying systems that automate the **collection**, **verification**, and **transformation** of local data into statewide standardized data sets, optimized for reporting.

Collection – intelligent system support for transferring authority and access of LEA data to the SEA.

Verification – educator-friendly resolution of element, file, and system documented verification rules.

Transformation – mapping, aggregating, and running algorithms against data to create new data sets.

Historically, school districts maintained all detailed data about education and used it to report to the state-level, who in turn, reported it to the federal-level. As NCLB radically increased the amount of data that states needed to comply with new federal mandates, the system became increasingly jammed and the need for more sophisticated data systems became apparent.
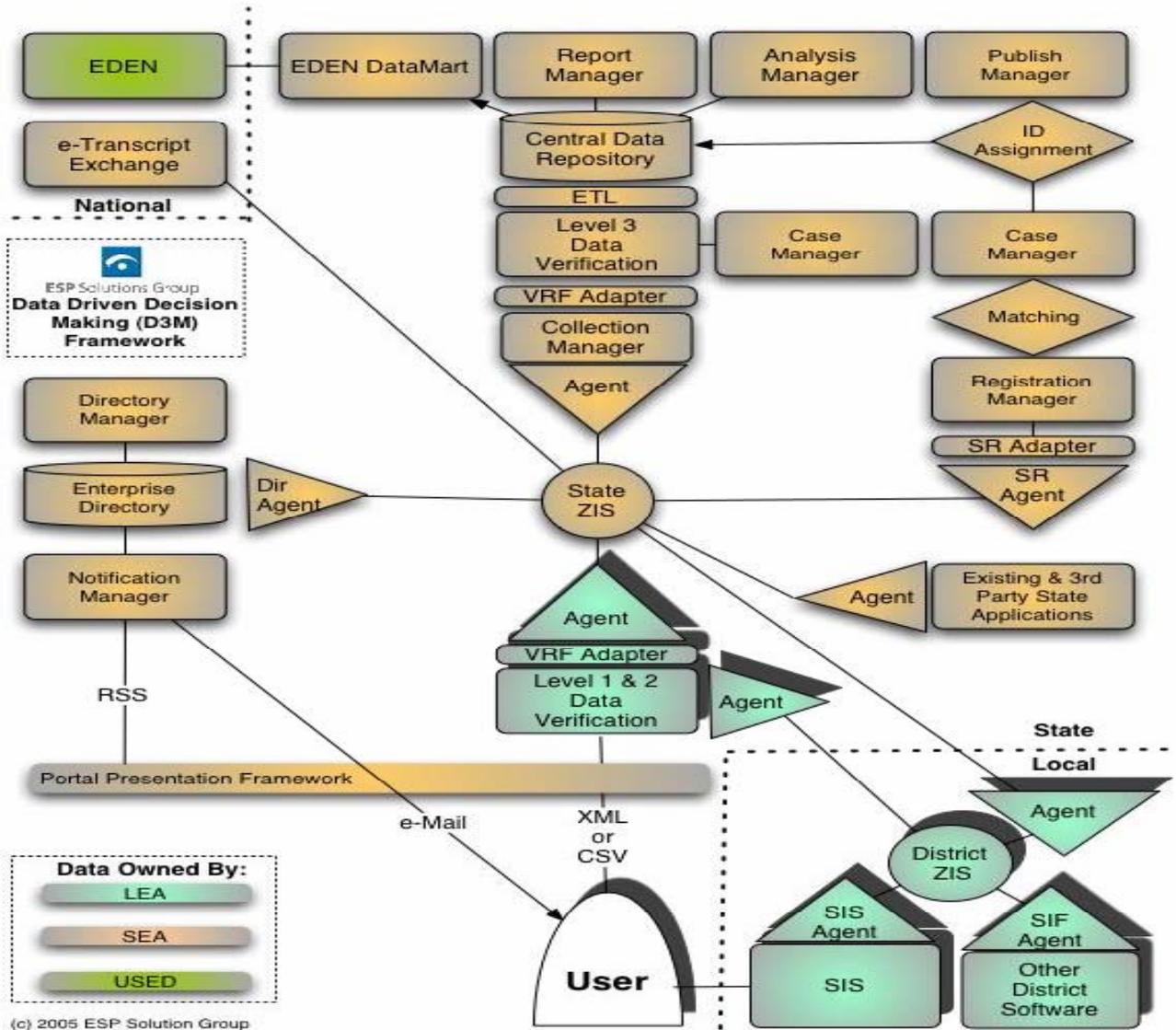
ESP Solutions Group specializes in building efficient and effective data systems for states, large districts, and USED to allow for better data-driven decision making at all levels. Our D3M Framework enables both SIF-enabled and non-SIF-enabled to utilize the same vertical report infrastructure. The Framework can be described in three strands:

1. Directory and Portal Services
2. Unique Student Record Management
3. SEA Data Collection Management

1. Directory & Portal Services
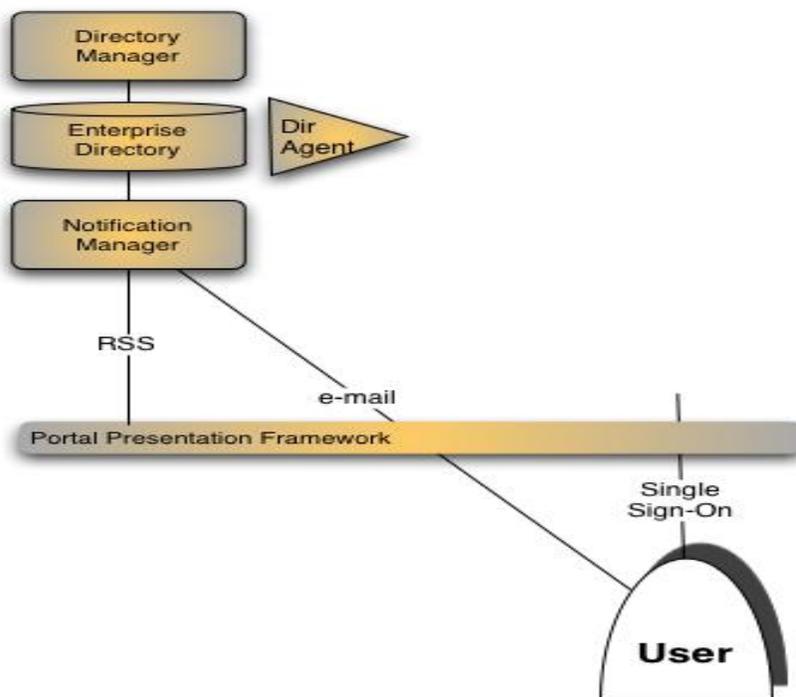
The foundation of any information management system is its capacity to manage the unique identities of people as individuals and as groups. Within the context of agency operations, individuals may both serve as users of the information systems and as the most important entities within these system data repositories. A directory is required to provide a current, authoritative, and operational source for personal information.

The core structure of the directory is hierarchical, encompassing state, region, district, and school. The standard for this structure is LDAP (Lightweight Directory Access Protocol). The complexities associated with individual roles within this hierarchy are maintained in a relational database. Identifying attributes are associated with the person through a unique identifier (i.e student ID for students, certification number for teachers).

Authorization data are the applications, services, and data types the entity is allowed to see. This is based on the role or roles the entity has in that particular organization. The entity-role-organization relationship is maintained in a relational database working in conjunction with the LDAP.

Access data are the URL, passwords, and login information that enable single sign-on to those applications and services to which the entity (user) is authorized.

One or more relational databases exist within the LDAP structure. This is necessary because of the rigid hierarchical structure of LDAP that in turn allows great access speed and searching efficiency. On the other hand, the LDAP lends itself to a flexible approach to service provisioning as necessary within the world of the SEA/LEA. A relational database can store the complex data and feed appropriate pieces to the LDAP data base. These two or more data stores working together along with their web user interface comprise the enterprise directory.

The D3M Framework will:

- enable data administrators to maintain authoritative information on schools and districts, including organization name, type, code, grade span, etc.
- enable educators to maintain personal profile information (including name, contact, title, etc.), maintain password related information, associate themselves with one or more organizations, and manage roles within organizations.

A D3M Portal provides:

- Security
- Presentation frame
- Session navigation
- View persistence and workflow

Security is critical when student data is being viewed and accessed. Authorization and access have already been discussed. Data view selection is the most complex technical issue. Often data will be stored in the most granular level and different users with different permissions will use constructed "views" of that data that have been aggregated, collated, or transformed. It is critical that the workflow and logic of the code that delivers the data be capable of removing or hiding any data in a view that corresponds with the level of access of the entity viewing the data. When properly implemented, the data are MORE secure than when sitting on the office secretary's cabinet or in folders on the teacher's desk.

Presentation frame refers to the content display code that is being used in the portal. There are a variety of ways that data can be displayed over the internet. There can be raw XML data, classic HTML with or without links embedded, PDF files, RSS (Really Simple Syndication) news feeds, JSP pages, ASPX pages, PHP-driven HTML, Java, or .NET driven XHTML, etc. The list is long. Some portals will be better at managing a wide variety of data formats and others will not. Knowing your presentation frame allows the SEA to make choices about how content developers will store and display the enterprise's information. The other technical feature to be concerned about is the presence in some web pages of client-side code-ASP pages that could contain ActiveX controls and embedded JavaScript in a JSP page. Some portals don't handle these things well or render them appropriately. It is important for the designers of the SEA's portal to know the limitations of the technology they are working with.

Session navigation refers to how the user's activities and work is stored as they move through the work of their day in the portal. The portal will want to be designed such that a user can use a "back" button to retrace their steps. This is not as easy as using the back button on a browser because the work might have spanned multiple applications and multiple portlet instances (a portlet is, in simplified terms, a browser window in the portal). For user satisfaction with a portal, this is an important feature.

Related to that is the question of **view persistence**. Once a user calls one of these portlets, the user will want to go back to that and maybe even want to make that particular "view" there every time the user logs in.

With regard to **workflow**, it is critical that the portal be capable of handling moderately complex transactions, such as emailing a form within a working portlet, utilizing common services wherever the user is, or even being able to allow collaborative work or allow applications that manage collaborative work to operate in the portal. Common services are described in more detail below.

2. SEA Data Collection Management
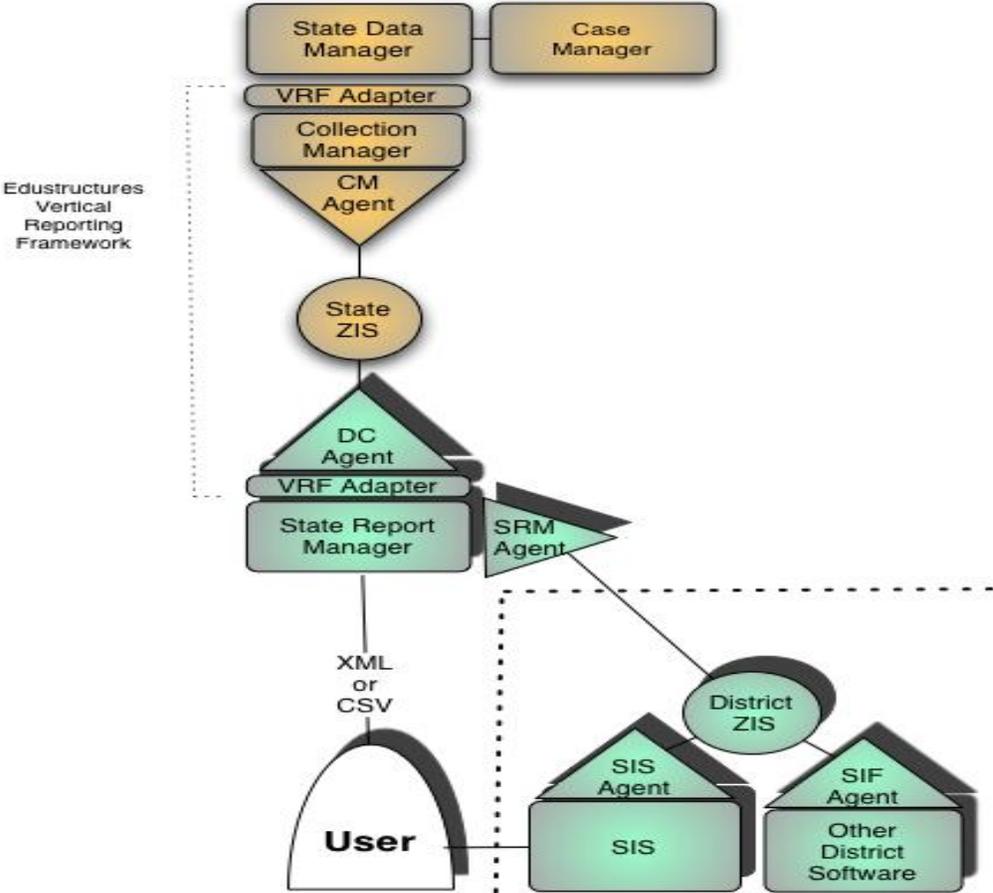
The D3M Framework is the most advanced end-to-end management system successfully deployed in multiple states. In Missouri, ESP has deployed its State Report Manager to automate the collection of pre-code data to support the state assessment program. In Wyoming, ESP and Edustructures deployed a statewide SIF Vertical Framework that automates statewide data collection down to the daily student-teacher relationship.

The State Report Manager (SRM), from ESP Solutions Group, is designed to enable K-12 school districts to load and validate their student data before submitting to test publishers or the state. Designed by experts in K-12 education, data quality, and data management, SRM provides a streamlined method for managing this process and a contemporary and easy-to-use user interface that can run in your web browser.

Either CSV and SIF Data Sources. At first, few if any districts will have all data elements supported by SIF sources. SIF objects are variable and will vary from district to district. Each district may have a different configuration for what objects are furnished via SIF and therefore which other data elements must be provided through CSV files. In ALL cases, the SIF data sources are considered authoritative. Any data fields provided in CSV files that already have a SIF source will be ignored. SRM v1.1 supports for the following SIF objects:

Student Objects:

- StudentPersonal
- StudentSnapshot
- LEAInfo
- SchoolInfo
- StudentSchoolEnrollment
- StudentSectionEnrollment

Course Objects:

- TermInfo
- SchoolCourseInfo
- SectionInfo

Teacher/District Objects:

- LEAInfo
- SchoolInfo
- StaffPersonal

In addition to retrieving information from SIF sources, SRM 1.1 also supports SIF change events. These events are periodically published by the object owners and represent updates to the data. For instance, a student changing districts will generate a StudentSchoolEnrollment event when the change is made in the SIS. The SRM Agent will be listening for these events and will then pull the data into its database and store it for pick up by SEA.

SRM 1.1 may process SIF events once per day. This would typically be at the end of the day or during the night. This would mean that all inbound events are queued up through the day and processed in one batch. Updated data and reports would be available the following morning.

Data Verification. SRM automates three levels of data verification:
Level 1: Element Verification Rules
Level 2: File Verification Rules
Level 3: System Verification Rules

Certification. Certification is the capacity for data accountability holders in the district to "certify" that the data being sent to the state represents their district accurately.

3. Unique Student Record Management
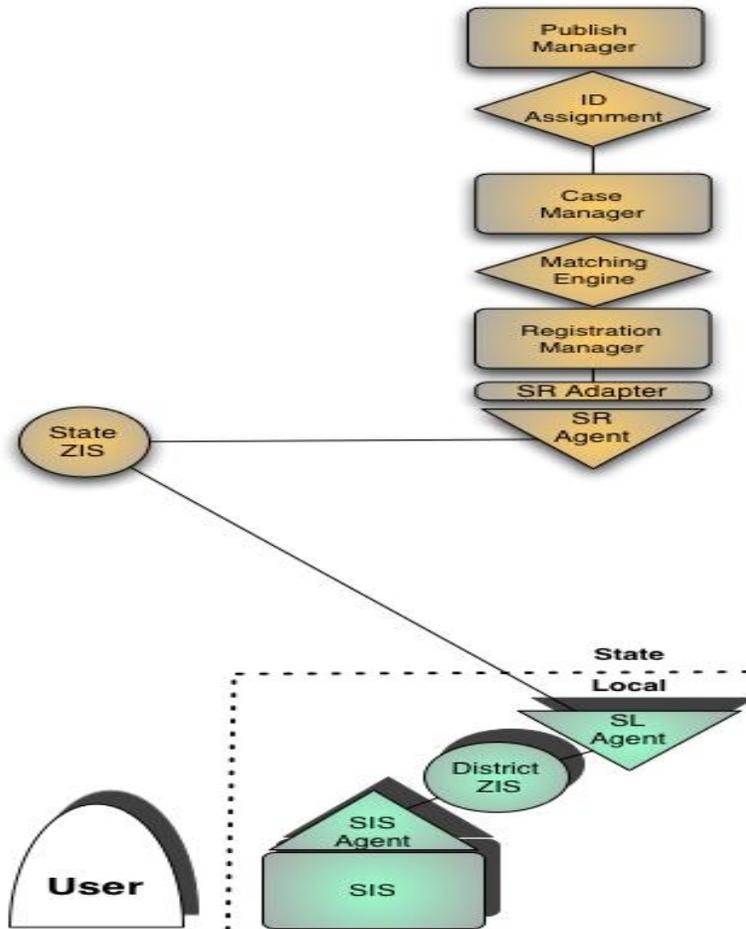
The second main component of identity management that the D3M Framework identifies six capabilities that LEA and SEA users need in a properly designed student ID and record collection system:

- Register Students and Un-Register Students
- Manage Cases
- Update Student Records

Register and Un-Register. Despite the political concerns which have led some states to use terms such as "student test number" and "student locator" to describe these systems, the core function is to register each student uniquely with the state. For all the reasons below, an equally important un-register feature needs to be in place. In addition, reliable un-registration provides an opportunity for districts to generate reliable drop-out and graduate reports.

Manage Cases. Cases result when the system identifies a potential error in the data. Simple errors such as faulty entry into a web form produce immediate resolution. Some types of errors can be managed as bulk cases. The most complex, frequent error types should be supported by automated workflow. When, for example, Sammy Student is reported with the same birth date from two districts for the same time, an e-mail should be sent to both districts asking that one or both consider un-registering the student. (Both LEA data administrators would be directed to a URL to log-in and un-register that student).

Update. A critical factor for states to consider in deploying such a system is the question of collection frequency. While the state may only need a certified report "snapshot" 1-4 times a year to produce federal reports (depending on how many programs are included), LEAs would be well served at times if they could update a student record in between collection cycles.

About ESP Solutions Group

ESP Solutions Group provides its clients with *Extraordinary Insight™* into K-12 education data systems and psychometrics. Our team is comprised of industry experts who pioneered the concept of "data driven decision making" and now help optimize the management of our clients' state and local education agencies.

ESP personnel have advised school districts, all 52 state education agencies, and the U.S. Department of Education on the practice of K-12 school data management. We are regarded as leading experts in understanding the data and technology implications of the **No Child Left Behind Act (NCLB)**, **Education Data Exchange Network (EDEN)**, and the Schools **Interoperability Framework (SIF).**

Dozens of education agencies have hired ESP to design and build their student record collection systems, federal reporting systems, student identifier systems, data dictionaries, evaluation/assessment programs and data management/analysis systems.

To learn how ESP can give your agency *Extraordinary Insight™* into your K-12 education data, contact Greg Nadeau at 781-370-1017 or gnadeau@espsg.com.

This document is part of *The Optimal Reference Guide* Series, designed to help education data decision makers analyze, manage, and share data in the 21st Century.

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