



Wyoming Integrated Statewide Education Data System

**Final  
Statewide Technical Model**

December 16, 2003

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## **Preface**

This document is the second of two versions of the Technical Model for the Wyoming Integrated Statewide Education Data System (WISE Data System) submitted by ESP Solutions Group and subcontractors SchoolNet and CPSI. This document was reviewed by the Wyoming Department of Education (WDE) and the Design Team, and revised accordingly.

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Table of Contents

<b>1</b>	<b>Overview.....</b>	<b>5</b>
1.1	Executive Summary .....	5
1.1.1	Purpose of Document .....	5
1.1.2	Profile of the Technical Design .....	5
1.2	Technical Model Background.....	6
1.3	Glossary of Terms.....	7
<b>2</b>	<b>Requirements .....</b>	<b>9</b>
2.1	Objectives for Statewide SIF Implementation .....	9
2.2	Architectural Components .....	9
2.2.1	The Zone Integration Server.....	9
2.2.2	Application SIF Agents .....	10
2.3	Technical Requirements for Wyoming Districts.....	10
2.3.1	Infrastructure .....	10
2.3.2	Data and Integration .....	11
2.3.3	Software and Hardware .....	13
2.3.4	Human Resources .....	15
2.3.5	Steps to a Successful Implementation .....	15
2.4	Technical Requirements for Wyoming Department of Education.....	16
2.4.1	Infrastructure .....	16
2.4.2	Software.....	16
2.4.3	Human Resources .....	18
2.4.4	Steps to a Successful Implementation .....	18
<b>3</b>	<b>Functional Components .....</b>	<b>20</b>
3.1	Zone .....	20
3.2	Zone Integration Server .....	20
3.3	Agent.....	20
3.4	Central Data Manager .....	20
3.5	School/District Software and Information Systems .....	21
3.6	Data Objects.....	21
<b>4</b>	<b>System Architecture .....</b>	<b>22</b>
4.1	Logical Model.....	22
4.1.1	Key to Logical Model Symbols.....	22
4.1.2	School Zone Logical Model .....	24
4.1.3	District Zone Logical Model .....	25
4.1.4	State Zone Logical Model .....	29
4.2	Data Flow.....	30
4.2.1	School Zone Data Flow .....	30
4.2.2	District Zone Data Flow .....	31
4.2.3	State Zone Data Flow .....	32
4.2.4	Combined Picture .....	33
4.3	Narrative Use Case.....	34
<b>5</b>	<b>Physical Model.....</b>	<b>36</b>
5.1	Components .....	36
5.2	Physical Implementation Options .....	36
5.3	Recommendations.....	38
5.3.1	Central Data Manager Software .....	38
5.3.2	Consortia.....	39
5.3.3	Option for Flat File Submission .....	40
5.3.4	Implementation Schedule .....	40
<b>6</b>	<b>Schools Interoperability Framework in Wyoming.....</b>	<b>42</b>
6.1	SIF Background and Operations .....	42

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6.1.1	Description of the SIF Project .....	42
6.1.2	SIF Data Objects and the SIF Specification .....	43
6.1.3	SIF Certification .....	44
6.2	SIF Vertical Reporting .....	44
6.2.1	SIF Interoperability.....	44
6.2.2	Vertical Interoperability.....	44
6.2.3	Vertical Reporting .....	44
<b>7</b>	<b>Content Analysis.....</b>	<b>46</b>
7.1	Current WDE data reporting requirements .....	46
7.2	Data Elements from WDE reporting requirements .....	46
7.3	Data objects from the SIF Specification and Draft Objects Specification – related to state required reports .....	47
7.4	Recommendations.....	49
<b>8</b>	<b>Issues.....</b>	<b>66</b>
8.1	SIF-Based.....	66
8.1.1	SIF Specification .....	66
8.1.2	SIF Compliance .....	66
8.2	Scalability .....	66
8.3	Security provisions.....	66
8.4	District Implementation of the Statewide Technical Model for SIF Implementation..	67
8.5	Student Identifiers.....	67
<b>9</b>	<b>Wyoming Statewide Student Identifier .....</b>	<b>68</b>

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# 1 Overview

## 1.1 *Executive Summary*

### 1.1.1 Purpose of Document

This proposed technical model uses the Schools Interoperability Framework (SIF) standard in a setting specific to the State of Wyoming to realize a Wyoming Integrated Statewide Education Data System. This system will be used to assist districts in meeting requirements for the collection, formatting and reporting of school and district data as needed by WDE's mandated reports. In addition, the system will provide schools and district systems with the benefits of interoperable systems. In general, the burden upon districts associated with data collection and management will be reduced.

### 1.1.2 Profile of the Technical Design

#### 1.1.2.1 Logical Models

The logical models presented in this document depict the arrangement of software systems, SIF agents, and zone integration servers. These are general arrangements of the components. These models could represent any SIF implementation, not specifically Wyoming.

#### 1.1.2.2 Data Flow Diagrams

These pictures are data flow diagrams depicting the flow of data from school to district to state using SIF. These are not physical representations so ideas such as the shared hosting of zone integration servers (consortia or cooperatives) is not represented.

These data flow diagrams focus upon processes and important new software functionality so zone integration servers are not represented. Also, zones are not clearly represented using this approach but in general there are school zones, district zones (possibly), and one state zone. These diagrams therefore, do not preclude more complicated arrangements such as zone-to-zone communication.

On these diagrams, direction of data flow is important. Various types of agents are conceptualized. For example specialized and probably relatively simple agents such as reporter agents and collector agents are modeled. The more complicated standard SIF agent is included. Report middleware mentioned in the diagrams is custom software or existing software that has the ability to collect information from other systems and construct reports to be packaged by a reporter agent. This process is currently called a Central Data Manager. It is an accumulator of data from other sources. It creates reports for the State in an internal (pre-SIF) representation.

#### 1.1.2.3 Physical Models

The physical models are descriptions of how software systems, SIF agents, and zone integration servers might be implemented in Wyoming. For example in a consortium or cooperative situation, multiple-district zones may be hosted in a single physical location.

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## ***1.2 Technical Model Background***

**Applications.** For the WDE project, applications are any software programs in operation by a school/district utilized to collect data needed to meet the WDE reporting requirements or to manage the operations of the schools and district.

**Information Categories.** For this project, it has been determined that there are twelve basic information categories of source information that are needed to formulate reports that are submitted to WDE or have been designated as an important information area. The additional information areas that have been identified as important, such as library management, will be included in the overall design. The twelve categories are as follows:

- Student Information – Personal data, demographics, enrollment, scheduling, attendance, report cards
- Discipline – Discipline incidents, actions
- Food Services – Meal eligibility, meals served
- Transportation – Routes, bus maintenance
- Financial – General ledger, accounts payable, purchasing, budgeting, payroll
- Human Resources – Employee data, assignments
- Directory – Staff contact information
- Student Performance – Assessments and benchmark reporting, honors, other performance evidence
- Programs – Eligibility and participation data (e.g., Title I, Migrant, Gifted, etc.) not including special education
- Special Education – Eligibility, participation, and other data for special education programs
- Library Information – Library resources management data and library management information
- Instructional Management Information – Systems that support the classroom teacher with tools for instruction such as instructional planning, instructional design, curriculum management, and grade books

**Wyoming Specific Agent Classifications.** For the Wyoming Statewide Technical Model, there are specific classifications of SIF agents recommended in the diagrams included in this document. At a high level these agents can be categorized as (1) vertical reporting agents and (2) standard SIF agents. A more detailed classification of agents includes:

- Application Agent (agent), which serves to transmit events/transactions from a specific application, such as a student information system.
- District SIF agent, which serves to collect objects from applications throughout the district or from school software packages and transmits events/transactions from receipt of the objects derived from application agents and/or software packages.
- District Vertical Reporting Agent, which serves to collect and report events and transactions transmitted from school and district application agents and submitting events and transactions in vertical reporting objects to the WDE Zone.
- State Agent, which serves as a collector and transmitter of data objects as submitted from the district-level Report Verifier Agent. The State agent transmits district data objects to the State Data Warehouse in aggregated reports.

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**Wyoming Specific Software Applications.** For this Statewide Technical Model document, there are three classifications of software applications that will be considered in the SIF implementation process. The three classifications are:

1. Commercially developed applications that respond to the information management requirements of the nine information categories identified above. The commercial applications (for example; a SIS application may or may not have an application agent available to Wyoming districts where that commercial software package is deployed.)
2. District developed or proprietary applications that may consist of a spreadsheet, flat file, or legacy system in use by a district. It is anticipated that such applications will require extraction or linkage procedures to convert data elements and transmit the elements to a collection and reporting software application that is designed to transmit the converted data to an agent.
3. A Central Data Manager application that can be made available to districts that can serve as a collector of objects from diverse sources of data transmission, organize the data objects, prepare report formats as required by WDE, and pass the objects through a vertical reporting agent.

### ***1.3 Glossary of Terms***

- SIF Objects – Data that is exchanged in SIF is defined using a series of data objects. Data Objects are the sets of information shared by software applications using the rules and definitions of the SIF Specification. A data object is expressed using XML and is comprised of XML schemas that define the semantics of information that can be managed by software applications. The SIF object that is approved for inclusion in the SIF specification contains related data elements, element characteristics, element attributes.
- SIF Agents – The SIF agent is the extension of each application that serves as the intermediary between the software application and the SIF Zone, allowing data sharing between applications regardless of vendor or platform type.
- ZIS – The Zone Integration Server is a software program that serves as the central communication point in a SIF Zone. The ZIS monitors all of the agents registered in the Zone and manages all transactions between and among agents, enabling the agents to provide data, subscribe to events, request data and respond to requests.
- Central Data Manager Application (CDM) – The CDM is a software program designed to serve schools and districts as a middleware application that extracts data objects and elements from software applications that do not and cannot have linkage to an agent. The CDM extracts the data and then converts to report formats for the transmission to the state.
- XML - “Extensible Markup Language” (XML) is a computer programming language that has been adopted by SIF for the management of transactions of data objects. Extensible Markup Language (XML) is a simple, very flexible text format derived from SGML ([ISO 8879](#)). Originally designed to meet the challenges of large-scale electronic publishing, XML is also playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere.
- Certification – No vendor or education agency or organization may claim to be SIF certified until certification criteria have been created and their product(s) has been tested and certified by SIF for certification. SIF has contracted with a third party organization that specializes in system testing and validation for certification.

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- Collector Agent – The agent that receives or collects reports.
  - Report Collector – A software system representing the reporting authority that mandates or collects reports.
  - Report Generator – The software system that creates reports, most likely through interfaces with other systems.
  - Reporter Agent – The agent that sends reports.
  - Vertical Interoperability – The same as the current interoperability paradigm except that information is exchanged among different education entities and possibly among multiple zones.
  - Vertical Reporting – Moving large, pre-specified data structures on a periodic basis from one education entity to another. Vertical reporting objects serve to organize and group data objects essential for the preparation of standard reports that are passed from a school to a district to the State Department of Education.
  - Interoperability – As used in this document and by SIF, interoperability refers to the ability of software systems to exchange information common to these systems in an automated manner. This is usually done with no human intervention and is contrasted with Vertical Reporting which does require a person to approve before data are moved.

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## 2 Requirements

### 2.1 Objectives for Statewide SIF Implementation

The Wyoming Department of Education has initiated this SIF implementation project to achieve the following objectives:

- The State of Wyoming intends to design a Wyoming Integrated Statewide Education Data System (WISE Data System) and develop an implementation plan and business case to support the design.
- The State of Wyoming has determined that the design for the WISE Data System will be a statewide implementation of the Schools Interoperability Framework (SIF) data model with the system supporting the SIF Specification for Interoperability and to operate on the SIF infrastructure standard.
- The State of Wyoming requires that the design and subsequent implementation plan for the development of the Wyoming Integrated Statewide Education Data System shall include an analysis conducted to define where each school district in the state of Wyoming is positioned in relation to the proposed model design and that the implementation plan shall include strategies for the development of the design and estimated costs for the implementation of the system.

### 2.2 Architectural Components

#### 2.2.1 The Zone Integration Server

A SIF implementation to support the Wyoming WISE Data System will be a distributed and networked system that consists of a Zone Integration Server (ZIS) at the state and a ZIS at each of the districts and/or a consortium of districts responding to a shared ZIS. Each ZIS supports one or more zones. The size of the zone is flexible and could consist of a single building, school, a small group of schools, a district, a group of districts, and, of course, the state zone. The SIF standard is a scalable solution for data exchange.

The WISE Data System Zone Integration Server is a program that provides data integration services to all the agents registered with it so that they can provide data, subscribe to events, publish events, request data, and respond to requests for data objects. The ZIS is responsible for all access control and routing within the system.

When selecting a zone integration server for use at either the state or the district level, it is essential that the ZIS is compatible with its counterparts. At this time, there is no compliance program for a ZIS, although a program is in development. A ZIS vendor should be an active participant with the SIF organization. For example, the company should have representatives who at a minimum participate in SIF's Infrastructure Working Group. In addition, the ZIS software should have been tested in at least two SIF Developer's Camps or during a SIF-sanctioned Connect-a-Thon. Also, the ZIS should be available for testing by vendor applications. Also, ensure that the ZIS provider has at least two implementations that are districtwide that involve at least two products, such as a student information system and a food service application. This

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implementation should also be in production as opposed to a pilot. The ZIS provider should be able to report the number of implementations that are considered to be in production.

Another key to finding a ZIS provider is to determine if the product coincides with the provider's other software offerings. If so, is there dedicated technical support staff for the ZIS? The provider should be able to provide a product with a SKU and must have technical support staff capable of answering questions. Many times, a vendor may be a reseller of a ZIS. In this case, make sure that there is a support system in place so that issues can be resolved in a timely manner. Establish who is called for technical support (reseller or ZIS provider).

ZIS providers must also keep up with the latest level of SIF specifications. At the very least, the latest release should be supported. In some cases the ZIS provider is willing to support draft objects to assist with the testing of a new specification or to provide essential data.

It is also recommended that the ZIS provider agrees to a three year pricing model be provided to both the state and district level so that budgets can be properly allocated.

### **2.2.2 Application SIF Agents**

Each software application utilized by a Wyoming school district will require an agent, which can be provided by the application vendor or, if not offered, can be provided by a third party agent developer. The application agent communicates with other application agents within the district via the ZIS and their respective agents. The ZIS vendor should also be able to assist in the registration of SIF agents during implementation. The vendor should be able to list the zone integration server vendors they have participated in either live deployments, SIF Connect-a-Thons or in a SIF Developer's Camp. Be sure to contact the ZIS vendor for verification.

For example, a school district in Wyoming that uses a student information application and a learning management application, in response to the need to collect data for the state enrollment report due in the fall term of the school year, will need to enter the required data into the applications. The application agents subsequently transmit the data objects/elements to the district ZIS. At the state level, a report manifest object would then request the appropriate data for state reporting purposes.

## **2.3 Technical Requirements for Wyoming Districts**

The proposed WISE Data System implementation will require a web-based system to operate on a statewide network. The infrastructure for the statewide model will support both Mac and PC computers with servers stationed at all ZIS points in the state.

### **2.3.1 Infrastructure**

In order to properly implement SIF in a district, the supporting infrastructure needs to be examined. These infrastructure elements include, but may not be limited to, availability of internet or wide area network (WAN) connections between the school sites and the district office, servers available, and data availability.

The WAN infrastructure needs to be evaluated to determine if data can be passed effectively between sites. Some districts do not have a WAN, but may have some type of Internet connectivity. This connectivity needs to be consistently available. Although the SIF infrastructure model is designed to accommodate loss of connectivity, there is a less likely chance of data corruption if the network connectivity is reliable since the best type of data delivery is in real time. It is recommended that the district develop a diagram of the connectivity between sites to determine weak points in the network. Include any wireless links that may be used for connectivity.

Within a local site such as a school, determine the methodology for entering data into the student information system. Is the data held at the school level or is it centrally located at the district level? This helps determine how many zones may be needed. For example, a district may have a student information system that is centrally administered but the media management system is housed in each school library, which may require the use of multiple zones. Ensure that the ZIS provider can support multiple zones; otherwise, the expense becomes immense in hardware and software support of the SIF implementation.

### 2.3.2 Data and Integration

An essential step to a successful SIF implementation is a review of the business process that a district follows today for the sharing of data for various network applications. For example, does the district download student data multiple times at the beginning of the school year for multiple imports? What applications need this information? What data needs to move and where?

Many of these applications can be clarified on two levels:

*Applications that provide districtwide information, such as transportation or mapping system.* Typically these applications are administered by a district level department that may “own” specific information. For example, the Food Service application may “own” the free and reduced lunch field in your student information management system.

*Programs that run on a school level.* These applications typically do not need to share information with other schools or with the district office. For example, a school might have a telephone communication system that takes student absence information and informs parents by phone when students are absent or tardy.

Below is a sample table school district SIF deployment plan.

O=Owner S=Subscriber

Data element	Student System	Food	Media	Photo ID	Field Size (District/SIF owner)
<b>STUDENT INFORMATION</b>					
Student Number	O	S	S	S	10/10
Alt Std Number (Bar Code)**	O		S		10/10

Data element	Student System	Food	Media	Photo ID	Field Size (District/SIF owner)
Last Name	O	S	S	S	17/50
First Name	O	S	S	S	12/50
Middle Name	O	S		S	10/50
Preferred Name	O	S	S	S	
Photo ID	S/O	S	S	O	Jpeg
Current Grade	O	S	S	S	02/03
Grad. Year	O		S	S	
Homerom Designator***	O	S	S		03/07
Lunch Status	S	O			01/??
Home School (owning school)	O	S	S		04/08
Withdrawal date	O	S	S	S	08/08
Mailing address					
Street #	O	S	S		05/06
Direction	O	S	S		02/04
Name	O	S	S		15/20
Type	O	S	S		04/04
Apt., etc.	O	S	S		10/05
City	O	S	S		18/04
State	O	S	S		02/04
Zip	O	S	S		09/13
Home phone	O		S		16/23
Graduation Year	O		S		02/04
Birth Date	O		S	S	06/08
Sex	O		S		01/06

Once the list is gathered, along with contact information for the vendor of the application, the district or the integrator can begin to determine if the application has an available SIF agent. If an agent is available, is it SIF compliant? If it is not SIF compliant, will the company be applying for compliancy in the future? Give the vendor a limit on the amount of time you are willing to wait until it is compliant. To assist in this process, many school districts are developing policies regarding SIF compliance.

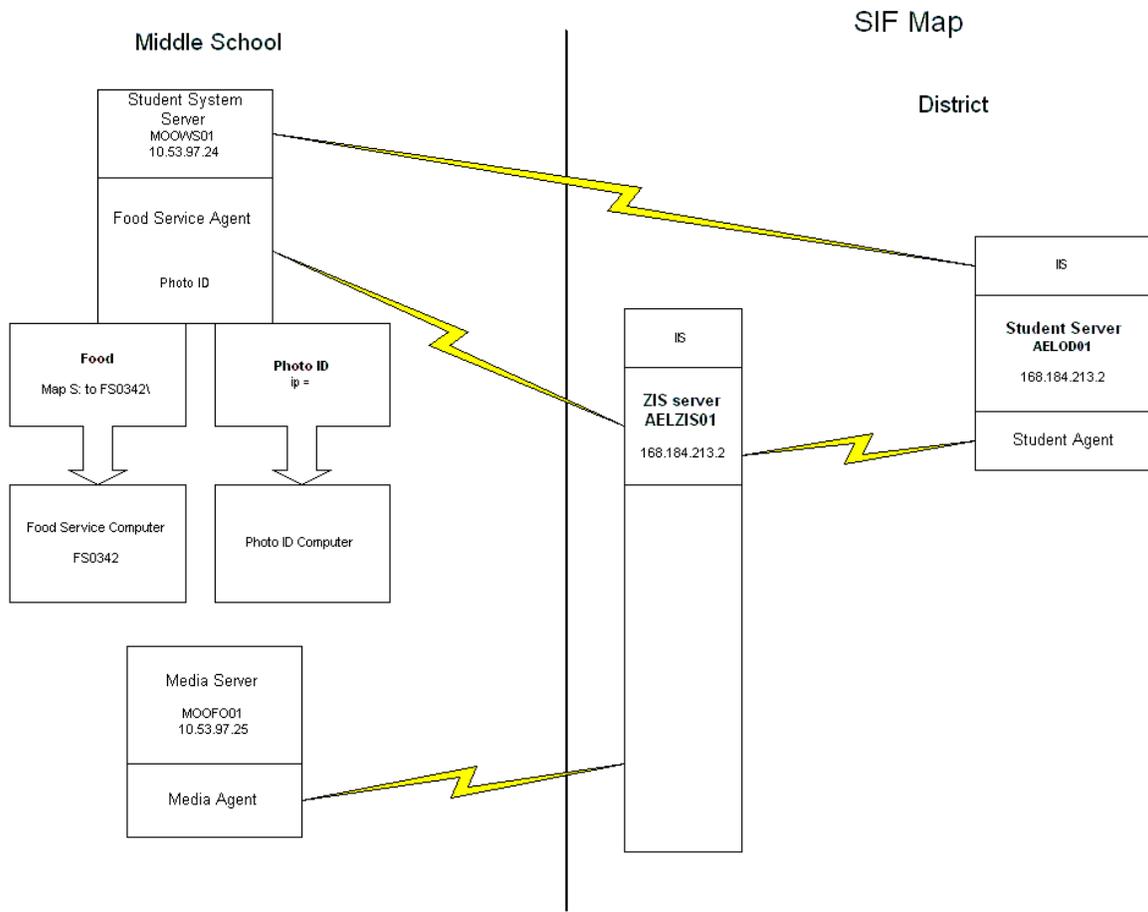
If the district has an application that does not have a SIF agent, it needs to be determined if the application is legacy or current. If it is current, meaning that the company is still in business and operating, contact the company to determine if a SIF agent is under development and when it will be completed. If the application is legacy, meaning that the company no longer exists, has no intention of developing an agent or the application is “home-grown”, then the district can evaluate how to proceed:

1. If a data extract is possible, a generic agent can be utilized or the district can possibly write an agent using an Agent Development Kit. If the district does not have programming staff available, a system integrator may be able to develop an agent.

2. If a data extract is not possible, the district needs to evaluate the applications usefulness and may want to purchase a new product with an available SIF agent or decide not to integrate that package now.

The next step is to determine the data owner for each application. For instance, the student information system may own student demographic information, but the food service application may own the free and reduced lunch data or the HR system may own the teacher and staff data.

Determine the data movement between applications. For instance, SIS data needs to be used to populate cafeteria systems, transportation systems, and library systems. HR data may need to move to the network system for logins, Exchange for e-mail, and the grade book application for teachers to enter grades. Once the data movement is determined, a diagram should be drawn so that the integration has an idea of what to look for in the agents to ensure proper and full integration.



### 2.3.3 Software and Hardware

Each district will need to determine the platform that will run the ZIS and agents. The ZIS is largely determined by the provider. Application agents are designed in a variety of ways depending on the type of application such as a school-level or a district level application.

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In order to properly determine hardware and software requirements, the first item that needs to be determined is the district's size. For example, Laramie County #1 has more students and would have more traffic than Laramie County #2. The hardware specifications will vary between ZIS vendors, but they all base their sizing on the following factors:

- SIF agents to be implemented
- number of schools in the district
- number of students in each school
- total number of students in the district
- number of buildings or locations other than the school sites
- number of teachers and all other employees in the district.

Many districts run multiple desktop operating systems, but many have standardized on one network operating system. A SIF deployment is a good time to standardize on a districtwide network operating system for future SIF agent implementations.

Will the district be hosting the Zone Integration Server or will they prefer to have it hosted at some regional site? For instance, many small schools may share a centrally hosted ZIS for connectivity to save time, money, and human resources. Larger districts will want to host the ZIS themselves as they have a need for greater bandwidth and a staff that can be trained to take care of the ZIS.

The district can select the ZIS and agent platform based on their current software expertise. A typical set of software requirements would include, for a Windows ZIS and SIF implementation:

- Windows 2000/2003 Server
- Windows SQL Server 2000
- Microsoft .NET Framework
- Microsoft IIS
- All Patches and Updates

ZIS server software is also available that runs on other platforms, requiring similar types of software for the operating system and databases. The ZIS should not require an extensive purchase of software, such as additional mapping software, as the expense becomes enormous.

A typical hardware configuration would be for the SIF implementation to sit on two servers – one for the ZIS and one for the agents that are registered.

- Twin Xeon processors
- 1 GB RAM
- 36 GB Hard Drive Space (Minimum)
- Network Card – 100 MB

The Central Data Manager (CDM) (*see Section 4, Functional Components*) is a piece of software that resides at the district level for the purpose of vertical data reporting to the state. Depending on the vendor recommendation, the district level Central Data Manager may require a separate piece of hardware. This hardware may need to be a file server or it could just be a workstation, depending on the proposal.

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### 2.3.4 Human Resources

Once a SIF implementation has been completed, very little, other than monitoring the system, will need to be done. However, initial implementation requires the cooperation of several people or roles in the district. A Project Lead and main contact for the SIF implementation should be appointed. This person would be the liaison between the various involved vendors and the various school district departments, schools, and IT staff. A list follows for the various human resource roles suggested to complete a SIF implementation at the district level.

- SIF Project Manager – this will be the person at the district that reports to the vendors and that the vendors report to
- Student Information System (SIS) data manager – this person is responsible for the extraction of data if there is no SIF agent for the SIS application
- Human Resources (HR) Data Manager – this person is responsible for the extraction of data from the HR system in a data format acceptable for SIF integration
- IT Manager or Technical Contact – this person is responsible for the setup of the servers at the district level and the upkeep of the SIF agent servers in the district
- Vendor Contact for SIF Project – this person is someone at the vendor’s site that the customer can contact for any information about the SIF project
- Vendor Technical Contact for SIF Project – this person is someone at the vendor’s site that is responsible, technically, for the SIF project at the district and will keep in contact with the district technical contact during the implementation

### 2.3.5 Steps to a Successful Implementation

Following are the steps to a successful SIF implementation in a school district.

1. Select a district SIF project manager.
2. Determine the data managers for the SIS, Learning Management and HR applications.
3. Determine the IT staff personnel who will be responsible for deploying the hardware and software for the SIF project.
4. Develop a project statement outlining the scope of the project and an estimated completion date.
5. Meet with district personnel to determine what applications are used for transportation, cafeteria, parent phone calls, e-mail, e-learning, network accounts, and any other application that might be integrated via SIF.
6. Write an RFP to gain access to vendors for SIF integration. The integrator must provide a ZIS and be able to work with the district staff to implement and deploy the SIF project to production mode.
7. Choose a vendor based on the determined specifications, taking special care to determine the viability of the offered ZIS and the status of SIF compliancy for applications.
8. Work with the vendor to assess the status of the district’s SIF readiness. Most of this information should be available from WDE staff based on for this project that included a review of the district’s infrastructure, hardware and software requirements, determination of the applications that are ready now for implementation, determination of the applications that will need an agent written in order to successfully integrate, and determination of which applications can use a pre-existing generic agent.
9. Contact vendors to gain a status report on the availability of agents for their applications.

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10. Order the hardware and software for the deployment. Install the software required on the designated hardware.
  11. Acquire the ZIS software and the application agents.
  12. Install the ZIS and register the compliant agents.
  13. Test the data integration. Once the data is determined to be processing correctly, the district can move to production mode.
  14. Install the necessary software, ZIS, and agents on the production servers and work on data cleansing and synchronization of the data.
  15. Work with the integrator on writing any agents required for implementation. These agents can be tested on the remaining test lab and then moved into production mode when the testing is determined to be successful.

## ***2.4 Technical Requirements for Wyoming Department of Education***

### **2.4.1 Infrastructure**

In order to properly implement SIF at the WDE, the first assessment will be of the supporting infrastructure. These infrastructure elements include, but may not be limited to, availability of internet or WAN connections between the school districts, servers available, and data availability. The WDE should consider its current network operating system of choice as a factor in selection of a ZIS vendor. This includes the database software used at the state level.

The SIF infrastructure includes data encryption between sites using HTTP and certificates. This infrastructure extends down to the district and school level. The state may need to consider standardizing on a certificate server (such as Verisign or MS Certificate Server) for encrypting data transmissions between districts and the state. In addition, current data connectivity between the districts and the state needs to be examined for network traffic and reliability. Any connections that are considered to be unreliable need to be addressed as a weak point in the infrastructure.

The state may also elect to host a number of small districts. This configuration will have an overall effect on the ultimate configuration of the zone integration server. These options are discussed in greater detail in ***Section 5, Physical Model***. This type of model can be implemented based on the results of the first implementation year. Zone Integration Servers are designed to be highly scalable and reconfiguration of the server should be able to handle the ability to scale up or scale out.

### **2.4.2 Software**

Software technical requirements on the state level will vary based on how the data from the district can be transmitted to the state. This would follow the Central Data Manager (CDM) component described in ***Section 3, Functional Components***. The CDM can act as a SIF agent to transmit data to the state. This model would require a piece that sits at the district level, along with a collection agent at the state level. This software would be customized for Wyoming to

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meet the needs to the state. The key to this function is to find an agent developer who is willing to assure that the CDM is capable of meeting SIF standards.

Existing databases at the state level could be SIF-enabled through the use of a SIF Agent Development Kit. All of the current ZIS vendors provide an agent development toolkit that the State can use to develop custom agents. The development kits themselves do not meet the criteria for SIF compliance, but the application or database itself could be certified by the State if they choose to do so. At a minimum, the agent can be run through the SIF test harness to assure compliance. Most agent development tools are made available on a yearly subscription charge basis since the vendor must keep up with the latest SIF standards.

The state level Collector Agent should have the capability to be modified with additional data collection elements with minimal disruption to both the State and districts. The corresponding district level agent (CDM) should have the ability to accept modifications quickly and easily from a centralized point without the need to update each agent individually. This agent also needs to provide error reporting information back to the State for troubleshooting purposes.

### **Hardware Requirements**

Hardware configuration is similar to a district level SIF deployment. However, on the state level, it is highly recommended that redundancy is built into the state-level ZIS for disaster recovery purposes.

The servers may be with additional hardware required for larger districts and the state level servers.

#### *Zone Integration Server*

- Twin Xeon processors
- 2 GB RAM
- 36 GB Hard Drive Space (Minimum) May want to consider mirrored hard drives for redundancy.
- Network Card – 100 MB

#### *Agent Server*

- Twin Xeon processors
- 2 GB RAM
- 36 GB Hard Drive Space (Minimum) May want to consider mirrored hard drives for redundancy.
- Network Card – 100 MB

#### *Database Server*

- 2 GB RAM
- 72 GB RAID 5 Hard Drive for database software
- Network Card – 100 MB

The State should be able to use any SQL server that they currently have, assuming they keep consistent with the ZIS database platform. Keep in mind that the amount of load on the database will increase as the number of districts, zones and application agents increase. The State should also be aware of the load that other non-SIF applications put on the database server.

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### 2.4.3 Human Resources

Once a SIF implementation has been completed, very little, other than monitoring the system, will need to be done. The initial implementation, however, does require the cooperation of several people in the WDE. Also, a Project Lead and main contact for the SIF implementation should be appointed. This person would be the liaison between the various involved vendors and the various school districts, WDE departments, schools, and IT staff. A list follows for the various human resources required to complete a SIF implementation at the district level.

- SIF Project Manager – this will be the person at the WDE that reports to the vendors and that the vendors report to
- Student Information System (SIS) data manager – this person is responsible for the extraction of data if there is no SIF agent for the SIS application
- Human Resources (HR) Data Manager – this person is responsible for the extraction of data from the HR system in a data format acceptable for SIF integration
- Data Warehouse Manager – this person is responsible for the data at the Data Warehouse level
- IT Manager or Technical Contact – this person is responsible for the setup of the servers at the state level and the upkeep of the SIF agent servers in the WDE
- Vendor Contact for SIF Project – this person is someone at the vendor’s site that the customer can contact for any information about the SIF project
- Vendor Technical Contact for SIF Project – this person is someone at the vendor’s site that is responsible, technically, for the SIF project at the WDE and will keep in contact with the state’s technical contact during the implementation

### 2.4.4 Steps to a Successful Implementation

Following are the steps to a successful SIF implementation in a State Department of Education.

1. Select a SIF project manager at the WDE.
2. Determine the data managers for the SIS, Data Warehouse, and HR applications.
3. Determine the IT staff personnel who will be responsible for deploying the hardware and software for the SIF project.
4. Meet with state personnel to determine what applications and databases will need to be integrated via SIF.
5. Determine the district’s that will be involved in the initial pilot of the SIF implementation for vertical reporting.
6. Write an RFP to gain access to vendors for SIF integration and vertical reporting. The integrator must provide a ZIS and be able to work with the state’s staff to implement and deploy the SIF project to production mode.
7. Choose a vendor based on the determined specifications, taking special care to determine the viability of the offered ZIS and the status of SIF compliancy for applications.
8. Choose an integrator that will work with the district’s to supply the required data that will be necessary for the vertical reporting. The districts should not experience downtime in the implementation of the vertical reporting.
9. Work with the vendor to assess the status of the state’s SIF readiness. This should include a review of the state’s infrastructure, hardware and software requirements, determination of

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the applications that are ready now for implementation, determination of the applications that will need an agent written in order to successfully integrate, and determination of which applications can use a pre-existing generic agent.

10. Determine the SIF readiness of the district level applications. The district level applications will need to supply data extracts to the ZIS in order to implement vertical reporting. The required data fields and data file formats will need to be determined at the state level so that the district can implement the extractions properly.

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## **3 Functional Components**

### ***3.1 Zone***

A SIF Zone is a communication network created by a Zone Integration Server (described below). This network allows groups of different software programs to communicate via SIF agents. Commonly, there can be school, district, regional, and state zones established for interoperability and information management.

### ***3.2 Zone Integration Server***

The SIF Zone Integration Server, a software program, serves as the central communication point in a SIF zone. A single Zone Integration Server can create multiple zones. The ZIS keeps track of all agents registered in the zone and manages all transactions between and among all agents within the school, the district and the state.

### ***3.3 Agent***

The district or educational agency that will be participating in the SIF implementation process procures SIF compliant application agents that serve as the extension of each software application (such as a student information system). This SIF compliant agent acts as the intermediary between the software application and a SIF Zone Integration Server. Application agents can be implemented within a school and/or operational district-wide.

### ***3.4 Central Data Manager***

In a SIF environment the choice to use vertical reporting instead of direct interoperability has to do with a desire to leave in the hands of the reporter control over what information is sent and when. If this is the case, then a report must be constructed rather than leaving information to be exchanged in the background by machines with no human intervention or audit capability.

The Central Data Manager Function is a concept necessary to accomplish the flow of report information from schools to the state. In short, it is the entity (person or machine) that puts information together into a report that is eventually transmitted to the state.

Here is an example of a manual data management function. Daily attendance information is kept at the school. Periodically, this information is sent to the district office. A clerk at the district office updates a spreadsheet with the attendance reports from each school. When it is time to submit the attendance report to the State the District clerk takes the spreadsheet and creates a report in the format mandated by the State and sends it to the State office. The clerk at the district office is performing the Central Data Manager function.

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Here is an example of an automated data management function. Daily attendance at the school is maintained in a SIF enabled district-wide student information system. A school clerk keeps the attendance information for a school current using the SIS. At the district there is a SIF enabled software system called the Central Data Manager. When it is time to submit the attendance report to the state, the CDM harvests data from the student information system, constructs a report and sends it to the State via a vertical reporting agent. The CDM software system performs the same function as the human in the previous example but does it in the context of an automated and SIF enabled environment.

SIF and SIF vertical reporting deal with the packaging and transmission of the report, not the creation of the report itself. The harvesting of information and construction of the report is performed by a computer application or person capable of communicating with a SIF agent. This function needs to be performed whether using a SIF environment or not (in order to accomplish reporting tasks). In a SIF environment the CDM function will most likely be performed by a software application. There are a wide variety of applications capable of fulfilling this function including, but not limited to, data warehouses, specialized report software, or existing education information systems with extensions for reporting. There are also a wide variety of levels of integration of the report construction function with other pieces of software.

### ***3.5 School/District Software and Information Systems***

School districts in Wyoming (educational agencies) identify software applications that meet the agency technology requirements for information management. These applications are specifically directed to the provision of data to respond to the WDE reporting requirements. Concurrently, it is determined that these applications either are provided by SIF vendor or agency members or are applications that can export data objects/elements to SIF compliant applications and/or SIF certified agents.

### ***3.6 Data Objects***

The school/district applications will transmit XML data objects (sets of information consisting of data elements) that are both mandated by WDE and are XML objects that are in the SIF Specification. These data objects are transmitted from the applications through the application agents to the SIF Zone Integration Server.

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## 4 System Architecture

This section describes the recommended high level logical and physical architecture of the WISE Data System system. Data flow diagrams are also provided to illustrate how data are transformed from one process boundary to another.

See <http://www.sifinfo.org/> for more information about the Schools Interoperability Framework, as well as data objects and communication choreographies associated with the Framework.

### 4.1 Logical Model

#### 4.1.1 Key to Logical Model Symbols

These symbols are used in the logical models in this document.



Software Package



Software System



State Data Warehouse

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 SIF Agent

 Vertical Reporting Agent

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### 4.1.2 School Zone Logical Model

This model represents the typical SIF implementation within a school. In this arrangement, heterogeneous software systems exchange data on a real-time basis.

School-based software packages exchange information. Each software package has a SIF agent that sends messages to and receives messages from a Zone Integration Server (ZIS). The ZIS routes the messages to appropriate other software packages (via the agent) that are interested in exchanging information.

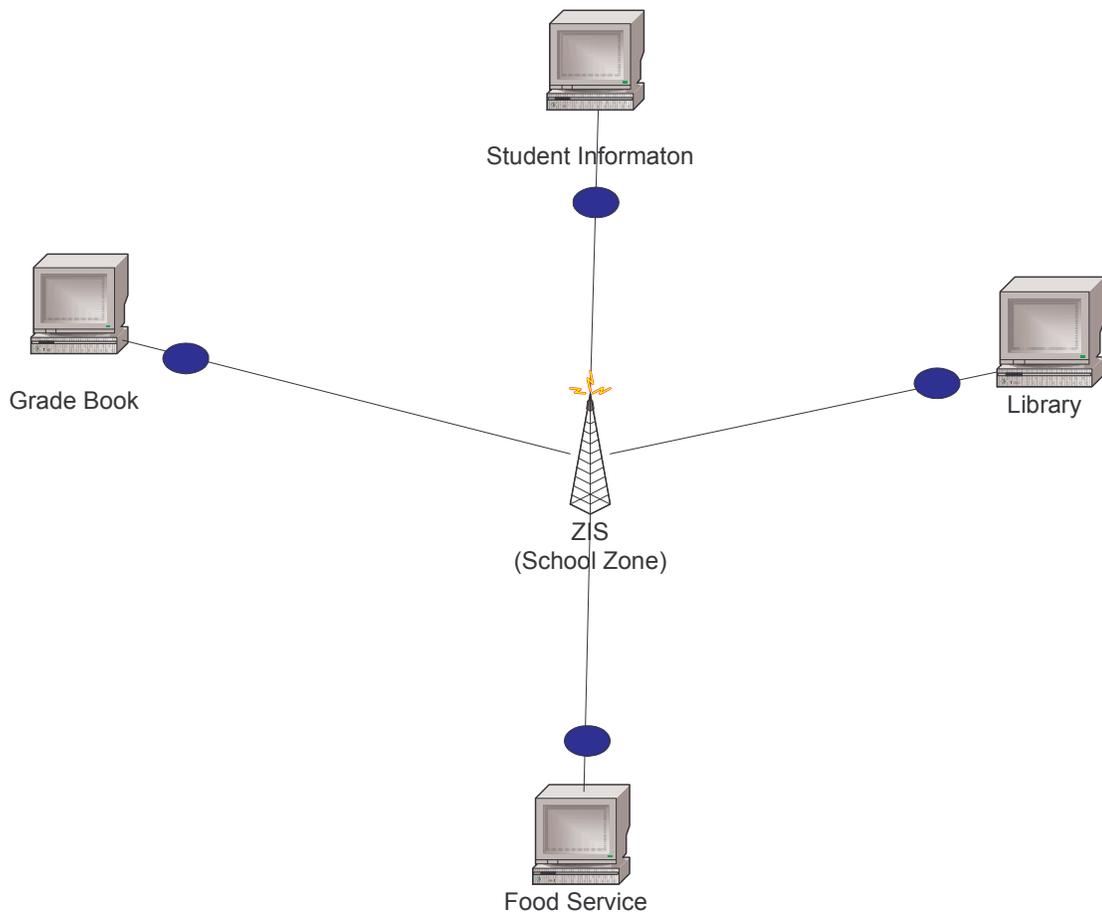


Figure 1

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### 4.1.3 District Zone Logical Model

The district zone is probably the most complicated situation because district systems are between schools and the State in the information flow. There are more options for arranging SIF components here than in other parts of the logical model. This section presents three possible arrangements, two of which are recommended.

The two recommended arrangements will be as follows. The district comes into each school zone and operates as a peer, getting transactional information. Then the Central Data Manager takes the transactional information and creates report data. Or, if the district has district-wide software systems such as a district-wide SIS, information flows via SIF or via internal format to the Central Data Manager. A third option is also presented in which the Central Data Manager obtains data using non-SIF methods.

#### 4.1.3.1 Option 1

The district system participates in school zones to harvest data. The central data manager operates like any other software package in the school zone. However, its main function is to collect data from the other systems. The information is collated and aggregated if necessary to create a district-wide repository of information.

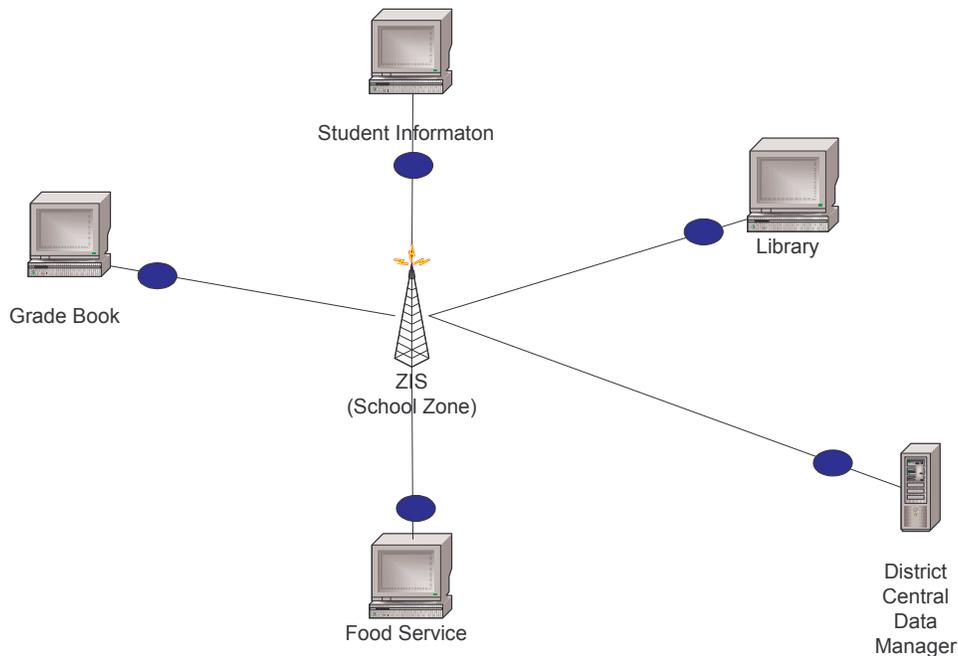


Figure 2

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#### 4.1.3.2 Option 2

The district system may get data from a district zone. In many cases, software systems have both school and district level components. For example a student information system may have a school product and a district product that share data. Or, a software system may only have a district level product that is used throughout the district such as a human resources system. In these cases the Central Data Manager may interoperate with the district level software system to obtain information.

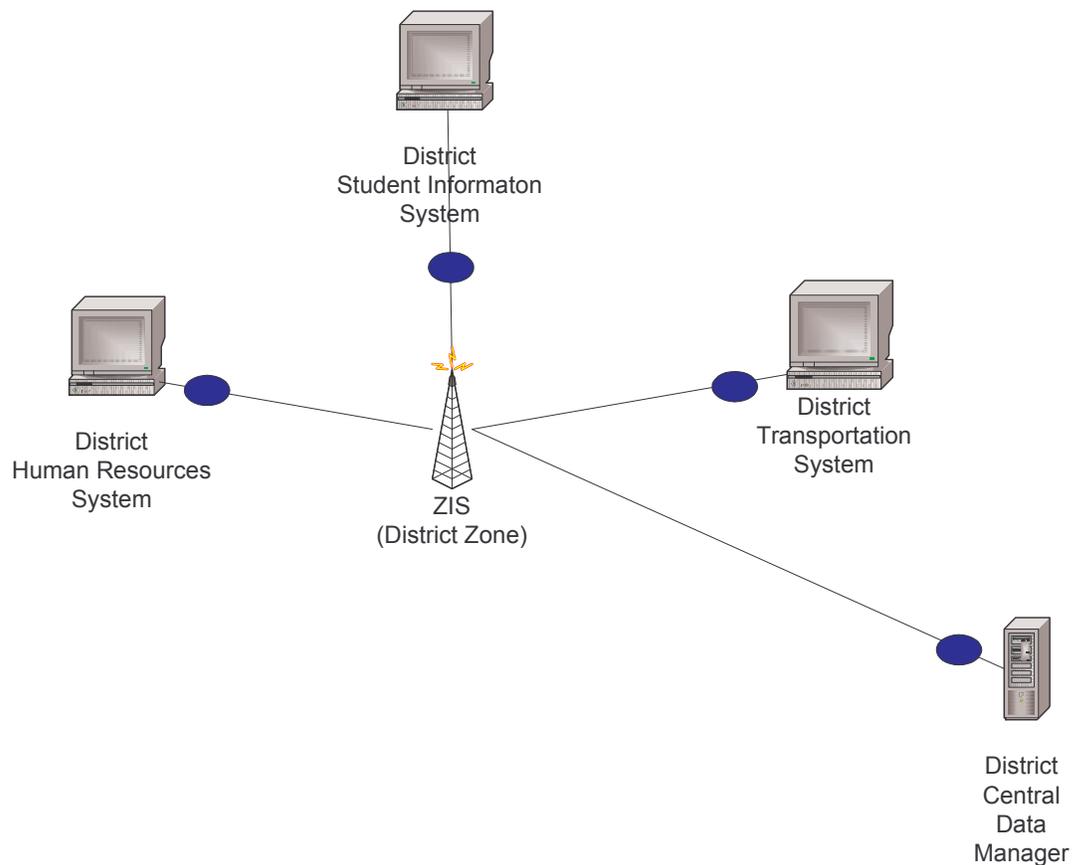
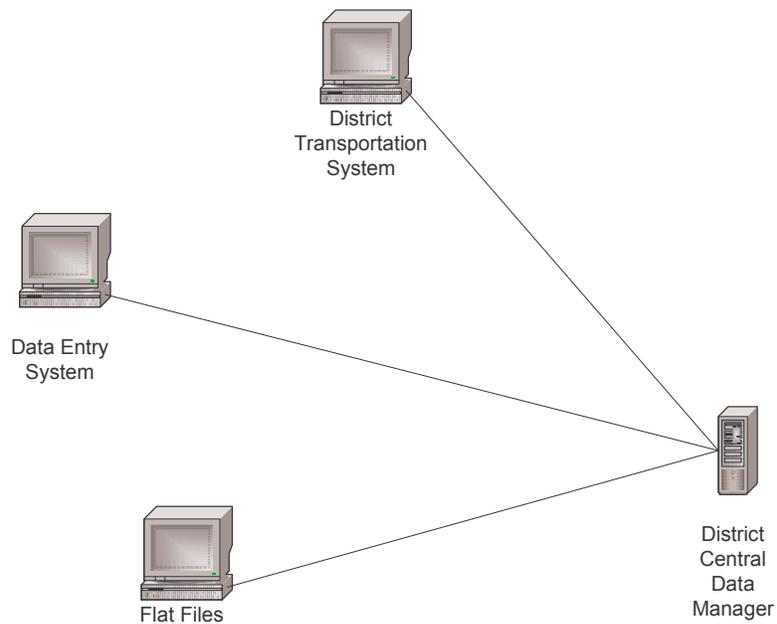


Figure 3

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#### 4.1.3.3 Option 3

The district system gets data from other (not SIF-based) sources. This method will phase out over time. An extreme example of this could be a situation in which the Central Data Manager is a district staff person entering and updating information about their district in a spreadsheet application. Although an electronic solution, this approach is not automated. Despite the low level of automation the spreadsheet data could be passed through an agent to the state zone.



**Figure 4**

#### 4.1.3.4 Two District Agent Types

The District Central Data Manager has two SIF faces (two types of agents) and participates in multiple zones. This diagram illustrates the crucial nature of the Central Data Manager function in the system. The Central Data Manager is a function used in this model and can be fulfilled by a wide variety of software systems or solutions. The Central Data Manager collects data from school zones or the district zone. It then sends information upward to the State via a vertical reporting agent.

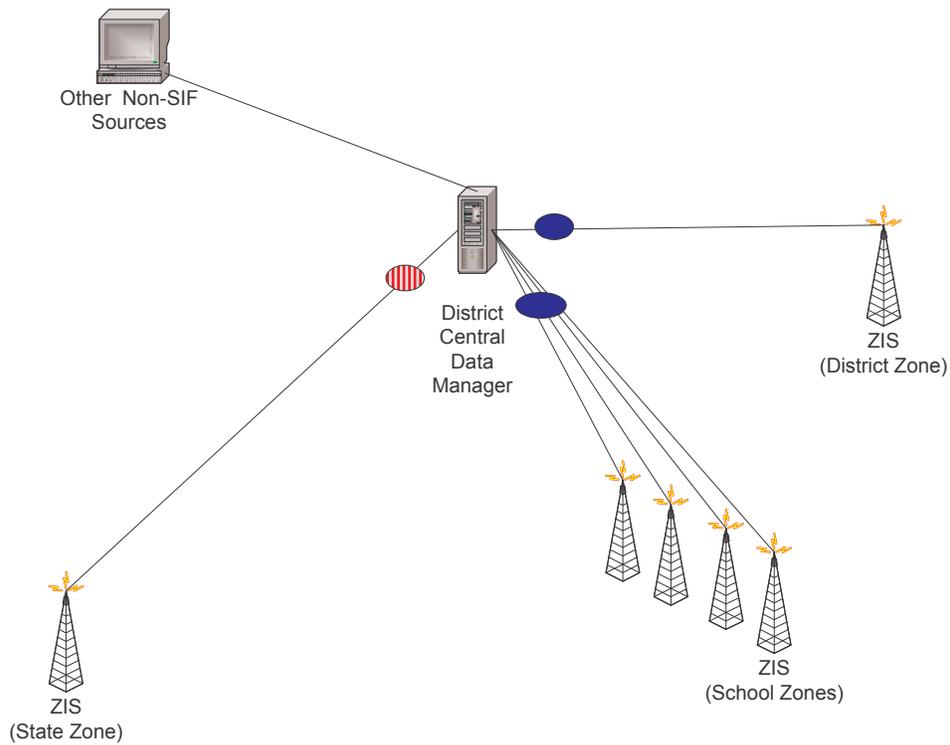


Figure 5

#### 4.1.4 State Zone Logical Model

The state zone exists for the purpose of collecting information from districts. Another possible use of the state zone is to distribute reports (e.g. verification reports) from the State to the districts. In Wyoming this is exclusively a vertical reporting situation.

Once there is some internal representation at a district of the reports intended for the State (Central Data Manager), a Reporter Agent turns the information into SIF objects and sends the report to the State Agent (Collector Agent).

An optional process to verify the correctness of the report could be implemented. This could be accomplished if the state system examined reports from districts and sent verification reports back to the districts. The districts would resend their reports until all tests imposed by the state system were passed.

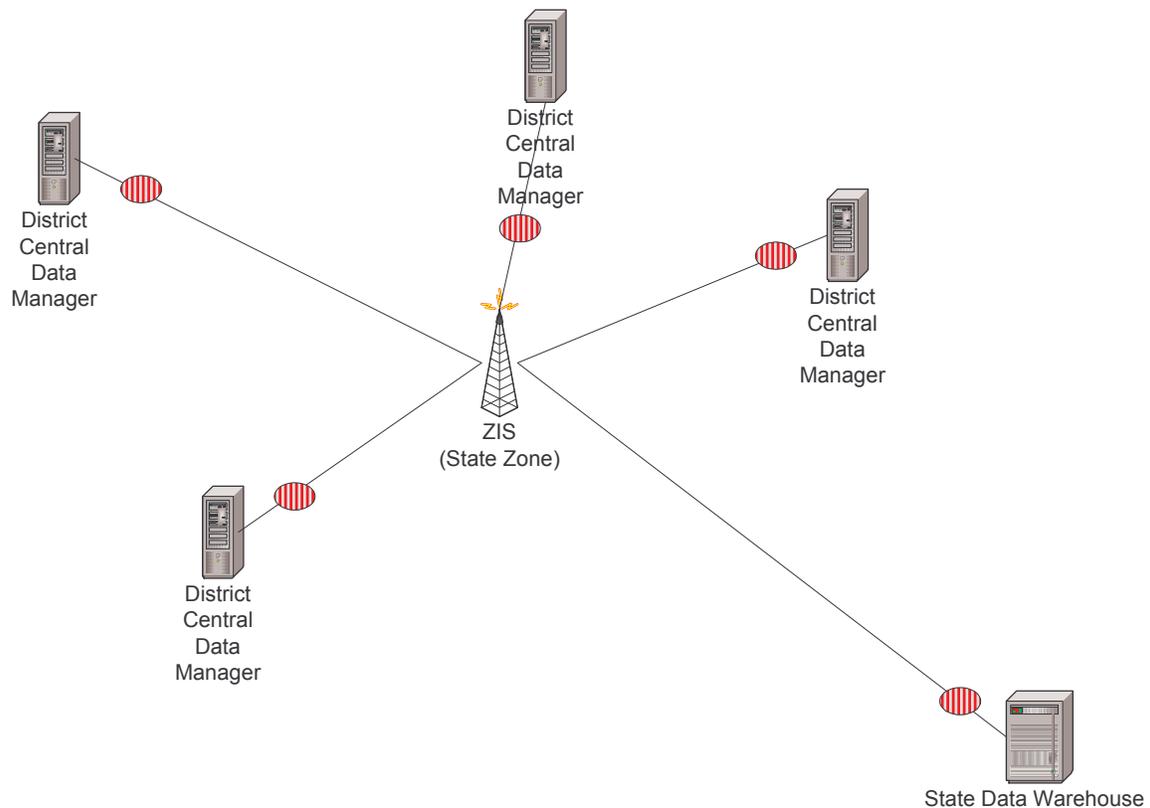


Figure 6

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## 4.2 Data Flow

### 4.2.1 School Zone Data Flow

Information between agents and their software packages are in proprietary or internal format. Agents convert data to SIF objects (within SIF XML messages) in order to communicate with other agents. Agents convert SIF objects back to proprietary format when receiving information.

**Note:** As stated earlier, these data flow diagrams model processes and transformations of data. The zone integration server is not represented in these diagrams in order to make these elements salient. This representation is also not suited to modeling zones.

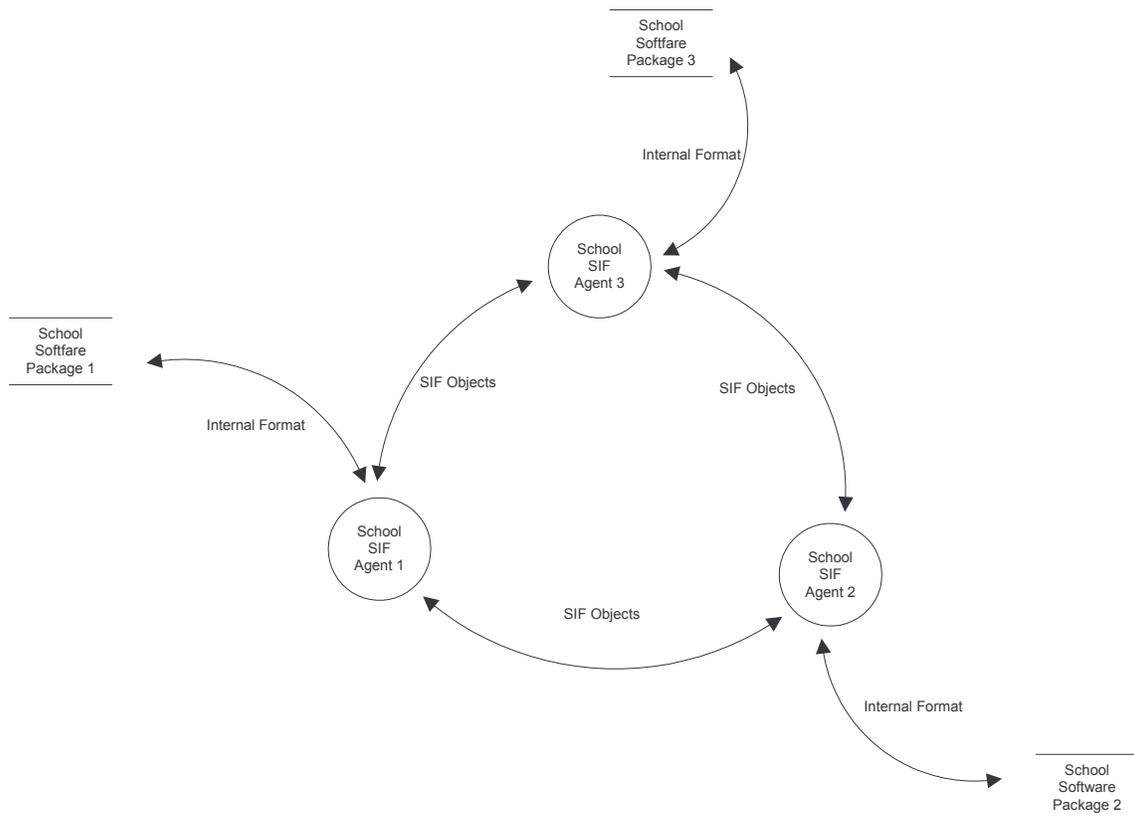


Figure 7

## 4.2.2 District Zone Data Flow

This diagram illustrates the various methods that the Central Data Manager could use to harvest data from schools and the district.

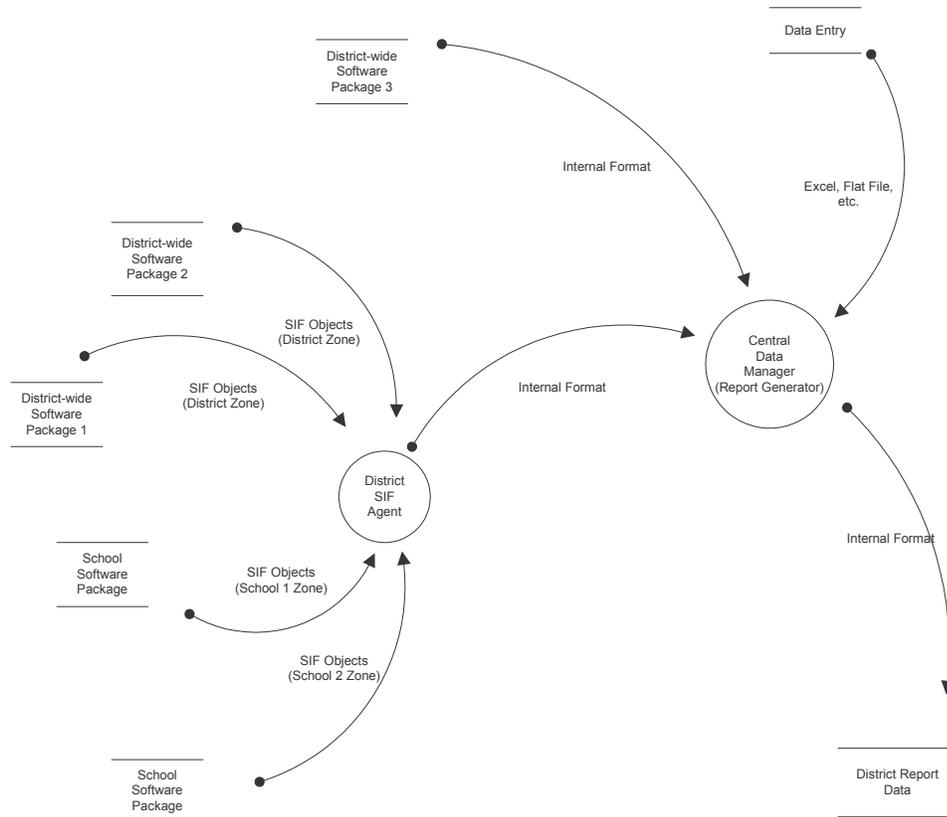


Figure 8

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### 4.2.3 State Zone Data Flow

Note that reports flow both between districts and the state. The State may send districts verification reports concerning the viability of the district report submission.

Districts may view reports or results of the transmission. Districts then certify that the report is final or resend the report.

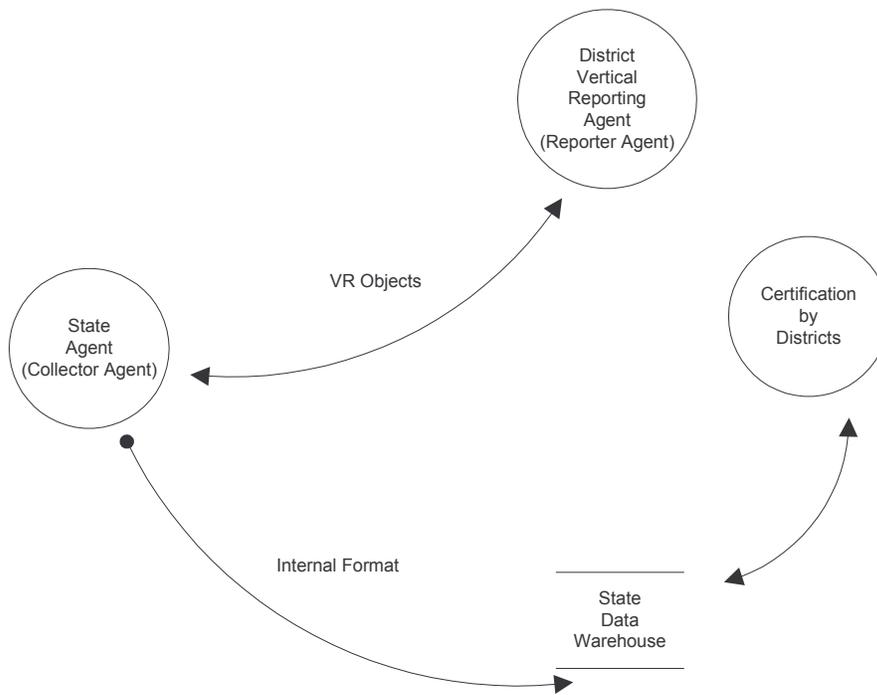


Figure 9

## 4.2.4 Combined Picture

The figure below depicts the data flow from school to district to state. It is a combination of all previous data flow diagrams.

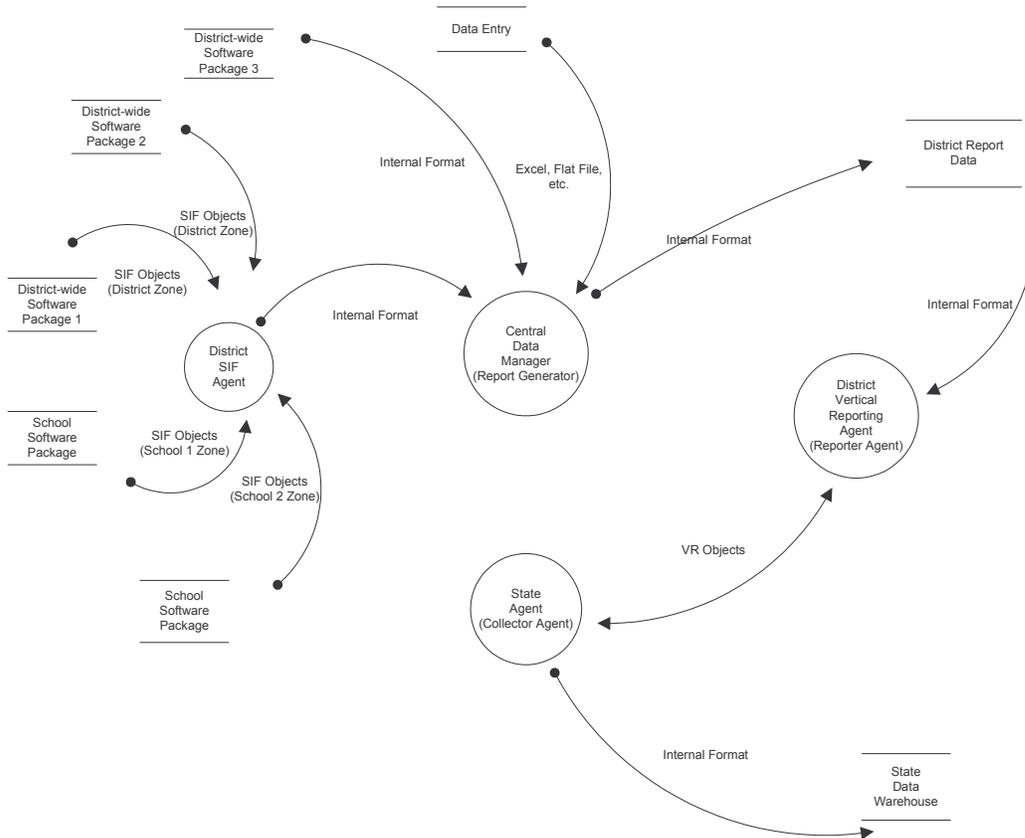


Figure 10

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### 4.3 Narrative Use Case

This section depicts the flow of one piece of information (a new student's Id number) from the school to the district to the state. In this process the information is entered, translated to and from XML, added to staging databases, added to state reports, and finally added to the state data warehouse.

#### **Step 1 – School staff member enters student Id(s)**

- Staff member enters a new student's Id into school student information system application student demographics form.
- Staff member saves records of all student Ids into the student information system.

#### **Step 2 – SIS Agent sends to the School Zone**

- SIF agent gets student's Id element from the SIS application.
- SIF agent creates an XML object with other SIF XML packaging.
- SIF agent passes Student Id in XML form to the School Zone Integration Server.

#### **Step 3 – CDM/District Agent receives from the School Zone**

- District staff member sends a request from the district's SIF Agent to the school zone for the student Id(s) or it is sent automatically as in step 2.
- The CDM/District Agent receives the transmission and translates it from XML into an internal format.
- The CDM/District Agent adds the student Id to the CDM database.

#### **Step 4 – District staff member generates a report from the CDM.**

- District staff member generates a report data from the CDM.
- District staff member verifies the correctness of the report.

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**Step 5 – District/Vertical Reporting Agent sends report to the State Zone.**

- District staff member directs the CDM to send a report to the state. This report contains the student Id.
- District/Vertical Reporting SIF agent gets student's Id from the CDM.
- SIF agent creates an XML object with other SIF XML packaging.
- SIF agent passes Student Id in XML form to the State Zone Integration Server.

**Step 6 – State/Vertical Reporting Agent receives the report.**

- The State/Vertical Reporting Agent receives the transmission and translates it from XML into an internal format.
- The State/Vertical Reporting Agent adds the student Id to a staging database.
- The state data warehouse system generates an error report.
- The error report is translated to XML and sent to the district system agent.
- The district corrects the report and resends (step 4 and 5). This process is repeated until the report passes all error checks.

**Step 7 – The state data warehouse is updated.**

- The final version of the report containing the student Id is added to the state data warehouse.

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## 5 Physical Model

The physical model in this section takes the pieces of the logical model and distributes them among various possible physical implementations. For example, a zone integration server that provides the school zone could be physically located and managed at the school; it could be located and managed at the district office; or, it could be located and managed at a central site for a consortium of districts. These are the decisions that need to be made in order to complete the physical model. This section describes again the pieces involved, the options for physical implementation, and a recommended arrangement.

### 5.1 Components

Following are architecture components mentioned elsewhere in this document.

Major Functionality to be managed:

1. Zones
2. Harvesting of data for reports (Central Data Manager function)
3. Construction of reports (Central Data Manager function)
4. Vertical Reporting
5. SIF Agent communication

Software to be installed and managed:

1. Zone Integration Servers
2. Central Data Manager Software: harvests data, construct reports
3. School-based information management software
4. District-based information management software
5. SIF Agents

Of the software components above, the following analysis will focus upon (1) Zone Integration Servers and (2) Central Data Manager. These are the two things that have the most flexibility in terms of how and where they can be installed and managed. Further, we will assume that SIF agents are installed and managed with the corresponding Central Data Manager, school-based software package, or district-based software package.

### 5.2 Physical Implementation Options

School

- Distributed – The zone integration server that provides the school zone is physically located and managed at the school.
- Centralized – The zone integration servers that provide school zones are located and managed at the district office.
- Consortium – The zone integration servers that provide school zones are located and managed at a regional consortium.

District

- District Managed – The zone integration server that provides the district zone, the Central Data Manager, and the vertical reporting agent is physically located and managed at the district office.
- Consortium - The zone integration server that provides the district zone, the Central Data Manager, and the vertical reporting agent is physically located and managed at a regional consortium.
- Hybrid – The Central Data Manager and vertical reporting agent are located at a regional consortium but the zone integration server that provides the district zone is located at the district office.

State

- State Managed – The State manages a vertical reporting agent and a zone integration server that provides a state zone.

The table below illustrates the implementation options. The rows represent the components and the columns represent where the component is located and managed. The grayed box with the word Yes means that the component can be reasonably located and managed by the location. The zone components in the chart below should be taken to mean the zone integration server that provides that zone. For example, the School Zone row indicates that the zone integration server that provides the school zone can potentially reside at the school, district, or consortium.

The Component Deployment Chart below shows all the reasonable possibilities for deployment of the major components. The columns in the table below indicate which components could be managed by a particular authority:

- School can host the School Zone.
- District can host School Zones, District Zones, and Central Data Manager.
- Consortia can host School Zones, District Zones, and Central Data Manager.
- State can host the State Zone.

Component Deployment Chart				
	School	District	Consortium	State
School Zone	Yes	Yes	Yes	
District Zone		Yes	Yes	
State Zone				Yes
CDM		Yes	Yes	

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## 5.3 Recommendations

### 5.3.1 Central Data Manager Software

It is proposed that the State of Wyoming contract with a software provider to build a data harvester and report generator (named here the Central Data Manager) that conforms to state reporting requirements. This system should be configurable to run on a single machine (or machine cluster) but host multiple districts. Along with this system, the software provider should also build an associated SIF agent that has standard SIF agent capabilities as well as vertical reporting capabilities.

The general functions of a Central Data Manager are discussed elsewhere in this document (Functional Components sections) as well as how the CDM integrates with other components of the system (logical models). Below are an initial list of functions that the CDM should have and an initial list of features. A software development process should be undertaken to specify the requirements, priority, and phases related to the functions and features of the system.

#### Functions

1. Receive SIF objects from districts and/or school-level agents (event or request)
2. For school-level objects, collate objects for all schools within a district
3. Validate business rules for the SIF objects
4. Convert data from SIF objects to WISE Data System formats; derive all calculated elements
5. Generate error and status reports for districts based upon business rules for WDE standard reports
6. Provide basic query functions and standard reports using the WISE Data System format data
7. Provide district downloads of data in WISE Data System formats
8. Allow districts to certify their WISE Data System data for use by WDE
9. Allow WDE to accept certified WISE Data System data for a district and transfer them to the WDE database
10. Repeat 6, 7 for district use

#### Features

1. Web interface for district users to manage their data submissions, run queries, view standard reports, receive error and edit reports, and certify their WISE Data System data
2. Web interface for WDE administrative functions
3. Report generation for districts on WISE Data System data
4. SIF agent for communications with district ZISs
5. SIF agent or other process for communications with WDE ZIS or database
6. Multiple installations with back-up process for redirecting users and for recovery of data
7. Administrative interface for updating business rules, adding objects, adding elements, adding standard reports

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### 5.3.2 Consortia

Three types of consortia are proposed:

1. Technical – provides ZIS services
2. Central Data Manager location
3. Service – provides training and technical support

The Technical and CDM locations may be the same or there may be fewer CDM locations. The service locations may also be aligned with the other locations.

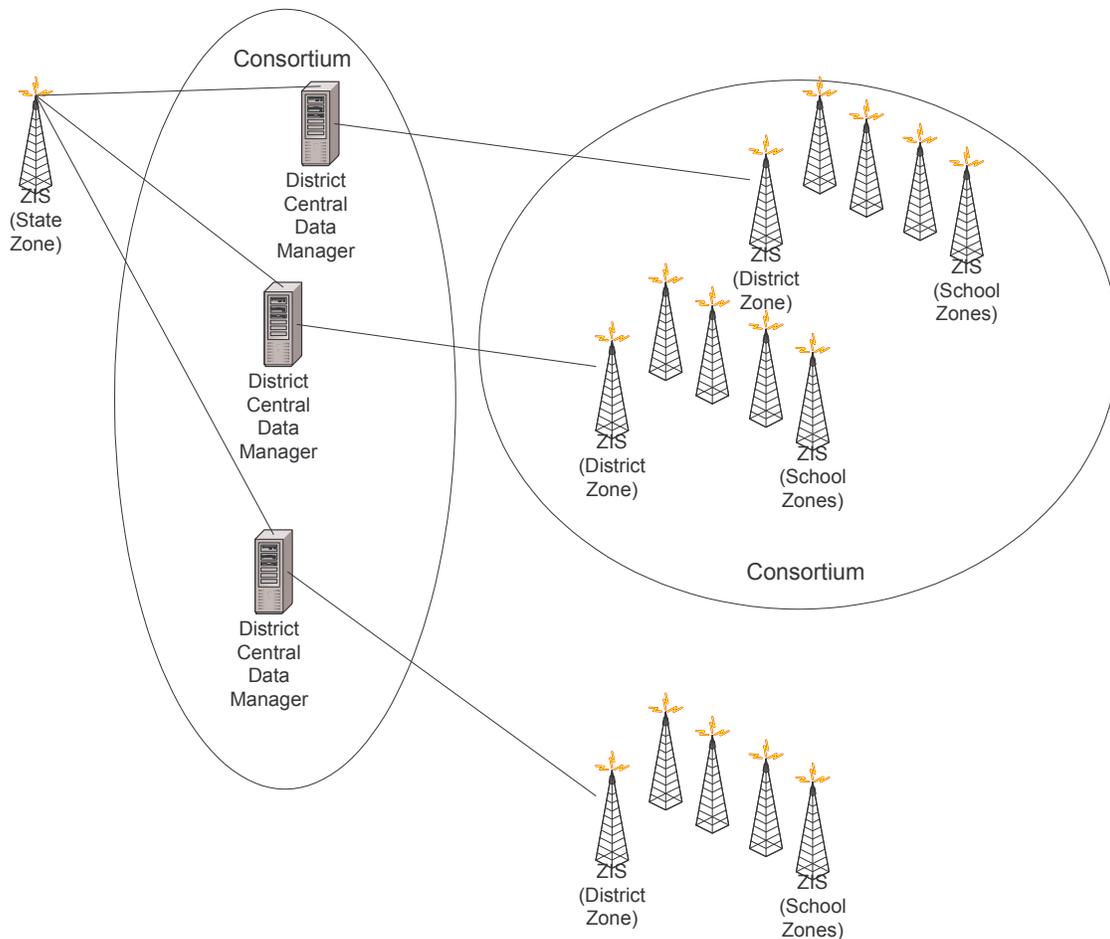
Up to eight Technical Consortia are proposed. The eight installations could be at district locations in year zero and year one, and then moved to network aggregation points in the second year. This would provide the eight districts with hands-on experience with a ZIS implementation. The experience gained could be passed to other districts through mentoring relationships. As network loads increase, placing the servers at network aggregation points would reduce unnecessary network traffic.

In the first year it is proposed that one to three Central Data Manager installations be created. These installations will perform the CDM function using software specific to the State of Wyoming. Although there may be multiple CDM installations, each district will have its own CDM instance. In other words, each district will have a separate CDM, but the 48 CDMs will be hosted in central locations. Each district will have full access to their Central Data Manager even if it is a single location at WDE.

As many as seven other centers are proposed to provide training and technical support in the use of the CDM and to help integrate agents with zones.

After the year zero and year one, districts may choose to implement their own school zones, district zones, and CDM. The Technical Consortia will begin by hosting district and school zones for the whole state. This is a viable arrangement early in the implementation schedule because network load is anticipated to be relatively low at first. Over time, as SIF capabilities increase in the districts, as use of the system increases, and as network load increases, the management and installation of school and district zones should be moved to the districts.

The figure below illustrates how the logical components may be grouped into consortia. The figure shows the state zone communicating with three district CDMs hosted at a single location. Two of the CDMs at that location communicate with district and school zones hosted at a consortium. One district hosts the district and school zones outside of a consortium but uses a consortium-based CDM.



### 5.3.3 Option for Flat File Submission

In order to accommodate districts that will take a long time to acquire software systems and SIF infrastructure, a flat file submission process should be implemented. The CDM should be able to receive non-SIF submissions or a SIF agent capable of translating flat files into SIF transmissions should be used to allow district not yet SIF capable to participate in the system.

### 5.3.4 Implementation Schedule

The tables below illustrate the proposed deployment of the major components. The state zone is not included in the tables below because it is proposed that the state zone always be deployed by the State.

Year 0 (2004-05): All zones and the CDMs hosted in up to 8 locations for 8 selected districts.

Year 1 (2005-06): The implementation would be extended to the rest of the states. The 8 locations would move to non-district facilities.

Year 0 and Year 1 Component Deployment Chart				
	School	District	Consortium	State
School Zone			Yes	
District Zone			Yes	
CDM			Yes	

Year 2 (2006-07) and Beyond: Some districts may choose to provide school zones and district zones for themselves.

Year 2 and Beyond Component Deployment Chart				
	School	District	Consortium	State
School Zone		Yes	Yes	
District Zone		Yes	Yes	
CDM			Yes	

As the WISE Data System is implemented, progress will occur in two distinct dimensions. First, the information areas will grow in representation as districts acquire software and the software becomes SIF enabled. Vendors as well as SIF will contribute to this process by adding data objects necessary to state reporting and education information management. Second, the State and districts will grow in their ability to implement SIF enabled software and SIF infrastructure.

It is expected that over future years more districts will become stand-alone districts with respect to SIF implementation. This will be desirable for some districts because they will want, among other things, to structure the implementation to suit their individual needs, provide quicker troubleshooting, or provide local control over data. Hybrid districts will phase out as districts become stand-alone and as the consortia become practiced at providing the specified services.

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## 6 Schools Interoperability Framework in Wyoming

### 6.1 SIF Background and Operations

This section of the Wyoming Technical Model defines SIF practices and processes in order to describe the SIF procedures to support the implementation plan for Wyoming districts and the WDE SIF implementation of the proposed data reporting system for the state. Following the description of SIF practices and processes, the authors have provided definitions of terms and procedures are essential in understanding the specifications and implementation of the SIF structure, standards and specification proposed for the school districts and the WDE.

#### 6.1.1 Description of the SIF Project

**SIF Vision and Organization.** The Schools Interoperability Framework (SIF) was organized by the educational technology industry to develop information management specifications that will ensure interoperability in the K-12 instructional and administrative environment. The vendor and educational agency memberships has grown to over 100 member organizations. Over the last three years, SIF has developed an industry initiative to provide a technical blueprint for K-12 software that will enable diverse applications to interact and share data now and in the future. Today, SIF is structured as a not for profit organization comprised of federal agencies/associations, state educational agencies, regional education agencies and school district members working together with prominent hardware and software developers and provider companies.

**SIF Data Model.** The data that can be exchanged in the SIF process is defined in the usage of a series of data objects. An example of an object is *StudentSchoolEnrollment*, which contains data elements including student ID, school name, school ID, student enrollment date and grade level, course scheduled, etc. These objects are expressed using XML language and are comprised of schemas that define the semantics of information that can be managed by software applications. When an application in a district (such as a student information system) makes a change in a SIF object, such as a different enrollment placement of a student into a grade, the application agent will generate a SIF\_Event message containing the changes that were made. The Zone Integration Server receives the SIF\_Event message and propagates the message to all the other agents that need updates to that particular object.

**SIF Structure.** The SIF organization is structured under a Board of Directors. The organization is administered by an Executive Director and staff in the organization's headquarters in Washington D.C. The organization is also served by a Technical Board, which is a body set up to analyze the technical development of the SIF Specification for Interoperability. The Tech Board is composed of co-leaders of established work groups chartered to develop data objects for the eventual inclusion in the SIF Spec. There are certain at large members also elected to the Tech Board to provide additional support in maintaining the responsibilities of the board.

**The Work Groups currently in operation in the SIF organization are:**

- **Data Warehouse Working Group.** Working group leads the definition of the detailed data that schools and parents need to improve student achievement and organizational effectiveness.

- 
- **Compliance Working Group.** Compliance working group creates the process and procedures for certifying software as SIF compliant.
  - **Customer Involvement, Requirements, Communications & Accords (CIRCA) Working Group.** The CIRCA focus is to structure customer/educator involvement in SIF pilot projects and assisting with the implementation of services to schools and school districts participating in SIF membership and/or SIF projects.
  - **Food Services Working Group.** This work group is concerned with data objects and interoperability processes directed to the food service sector of the education industry.
  - **Grade Book Working Group.** The goal of the Grade Book Working Group is the support of bi-directional transfer of data integral to student grading and reporting.
  - **Human Resources & Financials Working Group.** HR & Financials defines the SIF specifications for human resources specifically concerning administration and teaching staff and the financial business application data managed in the school district.
  - **Infrastructure Working Group.** Infrastructure develops and specifies a standard framework of messages and communication mechanisms that allow diverse application for the education industry to effectively exchange information over open networks in a platform-neutral manner.
  - **Instructional Services Working Group.** This work group focuses upon a set of data object specifications for instructional management, curriculum management, student assessments and evaluation, and special programs including special education, Title I, ELL, etc.
  - **Library Automation Working Group.** This working group provides the library automation centric entities necessary to effectively exchange relevant data via the SIF framework.
  - **Marketing Working Group.** This group focuses upon educating, informing and promoting the SIF program to vendors and the K-12 Community across the nation.
  - **Vertical Reporting Task Force.** This group was established over a year ago to design and develop vertical reporting data objects for the transmission of data from the school to the district to the state educational agency.
  - **Student Information Systems Working Group.** The SIS Work Group features the development of data objects for the management of student records information essential for the district's management of student information and required for district reporting to the state educational agency.
  - **Transportation and Geographic Information Working Group.** This group is concerned with the transportation requirements data monitoring requirements in a school district including scheduling and routing transportation of students.

## 6.1.2 SIF Data Objects and the SIF Specification

The SIF development of data sets evolves from the design of a business case that calls for a data object and its related data elements. The work group, subsequently, designs the data object, identifies corresponding elements, characteristics of the elements, and the attributes for each element. The work group then designs XML tables or schemas and submits the object to SIF as a draft object for membership evaluation and ultimate approval. The evaluation is conducted through a membership review process. When the object is removed from the review process, the working group must test the object in a SIF environment; and, if successful the object is submitted to the SIF membership for approval to be included in the SIF Published specification.

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### **6.1.3 SIF Certification**

SIF has established a certification process, which has been developed in order to provide an opportunity for a vendor or agency that desires to submit the transmission of SIF specification objects from a software application in conformity to the SIF standards/data model and/or the provision of SIF agents that are certified by SIF as meeting interoperability requirements. The vendor or agency that seeks certification must apply for the certification and conduct certain tests to validate the application to agent transactions in order for the vendor to obtain a certification.

## ***6.2 SIF Vertical Reporting***

This section explains concepts within SIF that are crucial to this technical model. WDE, districts, and schools will be implementing zones to create the interoperability, vertical interoperability, and vertical reporting situations described below.

### **6.2.1 SIF Interoperability**

Initially, a SIF zone was conceived and implemented as existing within a school where different software packages within the school cooperate in sharing common information. The idea was for peer software packages to be able to share information. Among other advantages, this reduced redundant data entry, allowed for more vendor innovation. The concept of a SIF zone is being expanded to include communication and sharing of data among different education entities rather than just software packages within a school. This new kind of communication is called Vertical Interoperability.

### **6.2.2 Vertical Interoperability**

Vertical interoperability is a situation in which SIF agents at different levels of an organization communicate using a SIF zone. Vertical interoperability involves data collection from multiple agents (upward) or publishing of information to multiple agents (downward). For example, a state department data warehouse may listen for changes in district level data warehouses and update its database on a regular basis. Or, a state department may wish to publish teacher certification data to districts.

### **6.2.3 Vertical Reporting**

Vertical reporting using SIF is a special case of vertical interoperability. It is distinguished by the movement of pre-specified (and possibly large) packages of data at designated or predictable intervals. The SIF objects that are contained in the report may be any SIF data objects, representing either aggregate information or granular information. The set of data objects help define the report. Other things that define the report are the date the report is to be submitted, the time period the report applies to, and the mandate that the report fulfills.

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There are four major differences between vertical reporting and other uses of SIF:

(1) Packages of Data - In vertical reporting, the data that is reported is always a predetermined set or package of data objects rather than smaller sets of data based upon queries or change events.

(2) Amount of Data - Reports tend to contain more data than transactional exchanges.

(3) Periodic Exchanges - Horizontal interoperability as well as other types of vertical interoperability involves more real-time and asynchronous exchanges of data.

(4) Many to One – The SIF publish/subscribe model is a one to many paradigm. An agent generates an event and the ZIS handles distributing the information to subscribers. The SIF request/response model is a one to one paradigm. An agent makes a request with no destination specified and the ZIS fills in the default provider or an agent makes a request to a specific destination. Vertical reporting is characterized by many agents sending the same set of SIF data objects to a single receiver. This is a many to one paradigm.

This specialized use of SIF involves reporting of official statistics or currently available data on a periodic basis rather than as a response to create, update, or delete events. These objects may be any SIF data object or set of data objects.

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## 7 Content Analysis

### 7.1 *Current WDE data reporting requirements*

The review identified 35 collections which are listed in the table “Impact on Current Collections of Conversion to WISE Data System.” (Current Collections.xls).

The table includes the following columns:

- “Current Status” - Characterizes the collection by frequency of collection and the time(s) of year when the report is due.
- “Information Areas Related to WISE Data System” - Identifies the general category, or categories, of data which would be impacted by WISE Data System implementation.
- “Elements Transferred to WISE Data System Collection” - Summarizes the impact of WISE Data System on the collections.
- “Elements Remaining to be Collected” - Reflects the extent of the collection which would remain, after WISE Data System implementation.

The majority of the collections listed (26 of the 35) would be eliminated with the implementation of the Wyoming Integrated Statewide Education Data System.

Four collections are identified as not within the scope of this study, including: “Graduate Follow-up from UW and Community Colleges,” “WDE 604: District Accreditation,” “WDE 605: School Accreditation,” and “WDE 679: College Achievement for Prior Year Graduates.”

Four collections would continue, with no impact by WISE Data System implementation, including: “WyCAS,” “WDE335: Vocational Expenditures,” “WDE 584: District Technology Status,” and “WDE 588: School Technology Status.” The recommendation is that “WyCAS” assessment data be imported into WISE Data System.

One collection, “WDE 545: Consolidated Grant Application,” would be partially addressed by WISE Data System collection. The WISE Data System project would incorporate the basic statistics required by the current collection; however, the proposed services and budgets areas of the Consolidated Grant Application would remain as a separate collection.

### 7.2 *Data Elements from WDE reporting requirements*

The analysis identified Wyoming data elements needed in schools and districts to provide the current WDE reports. The recommended list of data elements is presented in the “Wyoming Data Definitions for Wyoming Integrated Statewide Education Data System” spreadsheet ([WY Data Elements.xls](#)). A definition, value list and format information are provided for each element listed. The data element list references the form number(s) assigned by WDE which require the particular data item.

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Columns include:

- Category – A descriptor assigned to groups of data elements for this project.
- Element – The name assigned to a Wyoming data element for this project.
- Definition Codes – The recommended definition of the Wyoming data element, the options for the data element. The options for a data element may include a description of size and format for the element (“Date of Birth” allows entry of a date) or a value list (“Race” value list includes: White, African American, American Indian, Asian/Pacific Islander).
- Categ No – The number associated to the Category for the particular data element.
- ReqElementNo – The number associated with the Wyoming element within the Category list.
- ReqSeq – The sequential number assigned to the Wyoming data elements.
- WYForm(s) – The number of the Wyoming data collection form where the data element would be referenced or required.

### ***7.3 Data objects from the SIF Specification and Draft Objects Specification – related to state required reports***

Three spreadsheets have been developed which provide detailed information on the Schools Interoperability Framework (SIF) specifications, including the approved public specifications and the SIF specifications that are in development. As a member of the SIF organization, Wyoming Department of Education has full access to the SIF draft documents and specifications in development. Circulation of the full contents of the SIF Objects Details spreadsheet should be restricted to WDE staff members.

The SIF Objects Status spreadsheet ([SIFObjects.xls](#)) identifies the SIF objects which could transport data for schools and districts, and may be considered for use in state reporting. SIF Infrastructure objects were omitted, with the exception of Object number 1, SIF\_ZoneStatus. Objects numbered 2 through 25 are in the approved public SIF specification, version 1.2. Objects numbered 26 through 67 are in the SIF draft specification, published in February, 2003. Objects numbered 68 and above are SIF objects which are being revised or in development by SIF workgroups. Individual objects may be identified in all three areas; i.e. in the approved public specification, in the published draft specification, and/or in development.

The SIF Objects Details spreadsheet can be linked to this list of objects by use of the Object Number.

Columns include:

- Object Number – A number assigned to each SIF object for this project.
- Object Name – The SIF object name or acronym.
- Work Group – The SIF work group responsible for development and maintenance of the object.
- Object Status – The status of the object, including Approved, Draft, Dev (in development).
- Draft Date – The date of publication as a draft specification.
- Status in Fall 2003 – An area for comment and cross-references between objects.

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Of the 98 SIF objects listed, 12 objects are duplicated in the listing. The duplication indicates that there is a modification in development by a SIF work group. The “Status in Fall 2003” column provides a cross-reference between these duplicated objects.

The SIF Element Details spreadsheet ([SIFElementDetails.xls](#)) provides detailed descriptions of SIF “common elements.” These common elements serve as “building blocks” within the SIF specifications. Common elements are used in more than one SIF object, and provide a consistent set of information. Elements numbered 14 through 21 are included in the public SIF Approved Specification. Elements numbered 22 through 36 are in development and may be proposed for inclusion in version 1.5 specification.

The SIF Object Details spreadsheet refers to the SIF Element Details listing for items which are “common elements.”

Columns in the SIF Element Details spreadsheet include:

- Element Number – A number assigned to each element for this project.
- Element Item Number – A sequential number assigned to each item within the element.
- Element – The name of the element and items within the element.
- Attribute – The SIF attribute for the item within the element, including Type, Code, or Format. (The term “Attribute” is defined within the SIF specification.)
- Characteristic – The SIF characteristic for the item within the element. (The term “Characteristic” is defined within the SIF specification.)
- Description – The description of the element and item within the element. The description area includes illustrations and lists of codes or options, where feasible. More lengthy code lists are identified to at least one source, i.e., [STUDENTHB] refers to the [NCES Student Data Handbook](#).
- SpecVersion – The version of the approved SIF specification, or the expected date of publication as a draft specification.
- Deprecated – An “x” in this column indicates that the item is planned to change in future SIF specifications, to change the allowable codes, or to eliminate the item within the object. Caution should be exercised with data items to assure that future versions continue to provide the expected functionality.

The SIFObjectDetails spreadsheet ([SIFObjectDetails.xls](#)) provides a detailed description of most SIF objects, including objects in the approved specification, objects in the DRAFT specification, and objects in development by SIF work groups. Objects numbered 1 through 21 are included in the public SIF Approved Specification. Elements numbered 22 through 36 are in development and may be proposed for inclusion in version 1.5 specification. The listing of object details is abbreviated and purposefully excludes some DRAFT objects and objects in development, which were deemed not relevant to the current Wyoming requirements.

Columns include:

- ObjectNo – The number assigned to the SIF object in SIFObjects.xls for this project.
- ObjectItemNo – The sequential number assigned to the item within the SIF object.
- Element – The name of the item within the object.
- Attribute – The SIF attribute for the item within the element, including Type, Code, or Format. (The term “Attribute” and categories of attributes are defined within the SIF specification.)

- Characteristic – The SIF characteristic for the item within the element. (The term “Characteristic” and allowable codes are defined within the SIF specification.)
- Description – The description of the element and item within the element. The description area includes illustrations and lists of codes or options, where feasible. More lengthy code lists are identified to at least one source, i.e., {STUDENTHB} refers to the [NCES Student Data Handbook](#).
- ElementFlag – An “x” in this column indicates that the object item is (or is expected to be) a SIF “common element” included in the SIFElementDetails.xls.

This summary of SIF development highlights the scope of changes to SIF specifications. The major growth areas within the last year have been human resources, credentials, assessment information, student participation in support programs, LEA information, and aggregate statistic information. These growth areas are visible only to parties within the SIF membership.

## 7.4 Recommendations

The following chart identifies, for each Wyoming data element, the recommended SIF object to transport that data element for state reporting. When no current SIF object appeared to meet the need for Wyoming, the chart either 1) identifies a SIF object to be changed, or 2) recommends creation of a new SIF object to meet the WDE needs.

Columns include:

- Category – A descriptor assigned to groups of data elements for this project.
- Element – The name assigned to a Wyoming data element for this project.
- SIF Object Recommended – The name of the SIF object recommended to provide the Wyoming data.
- Object Status (Approved, Draft, In Development, Change or New) – Provides information on the status of the object within SIF, as follows:  
 APPR – Approved in current public SIF specification  
 DRAFT – Included in SIF DRAFT specification for use by SIF members only  
 In Devel – SIF specification is being developed by a work group, not yet published as DRAFT  
 Change – SIF object selected would need changes to add data element(s)  
 New – New SIF object would be needed
- WYForm(s) – The number of the Wyoming data collection form where the data element would be referenced or required.

The chart reflects analysis of Wyoming data element requirements, and recommendations for meeting Wyoming needs by use of Schools Interoperability Framework (SIF) data objects and elements, listing a total of 325 data elements.

The following SIF data objects table reflects the identification of approved and draft objects as proposed by SIF Work Groups in the Fall of 2003. SIF anticipates that final objects to be recommended for the SIF Version 1.5 release scheduled for the Spring of 2004 may include revisions of objects, omission of objects and/or the inclusion of additional objects not depicted in this table.

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
<b><i>Student Personal</i></b>			
Local Student ID	StudentPersonal/OtherId	APPR	613, 606, 660, 430, 595, 632, 110, 607, 425, 100, 103, 600, 630, 631, 670, 676, 545, 620, 671, 999
State Student ID	StudentPersonal/OtherId	APPR	613, 606, 660, 430, 595, 632, 110, 607, 425, 100, 103, 600, 630, 631, 670, 676, 545, 620, 671, 999
Social Security Number (Optional)	StudentPersonal/OtherId	APPR	999
Last Name	StudentPersonal/Name	APPR	671, 999
First Name	StudentPersonal/Name	APPR	671, 999
Middle Name	StudentPersonal/Name	APPR	671, 999
Generation Code	StudentPersonal/Name	APPR	671, 999
Guardian Name	StudentContact	APPR	999
Date of Birth	StudentPersonal/Demographics	APPR	425, 999
Place of Birth	StudentPersonal/Demographics	APPR	999
Gender	StudentPersonal/Demographics	APPR	606, 660, 430, 595, 632, 607, 425, 630, 670, 545, 671, 999
Race	StudentPersonal/Demographics	APPR	606, 660, 430, 595, 607, 425, 630, 670, 545, 671, 999
Ethnicity	StudentPersonal/Demographics	APPR	606, 660, 430, 595, 607, 425, 630, 670, 545, 671, 999
Home Language	StudentPersonal/Demographics	APPR	545, 999
US Entry Date	StudentPersonal/USEntryDate	Change	545, 999
Country of Origin	StudentPersonal/Demographics	APPR	545, 999
Migrant Last Qualifying Move Date	StudentParticipation/MigrantLastMove	Change	545, 999
Economic Status	StudentSnapShot/EconomicDisadvantaged	In Devel	606, 671, 607, 630, 660, 670, 671, 545, 999
Immigrant Status	StudentPersonal/Demographics	APPR	545, 999
<b><i>Student Characteristics</i></b>			
Health Flag	StudentSummary	New	999
Disability Flag	StudentSummary	New	999
Eligible to Enroll Flag	StudentSummary	New	999
ELL/LEP Flag	StudentSummary	New	999
Migrant Flag	StudentSummary	New	999
Meal Flag	StudentSummary	New	999
Homeless Flag	StudentSummary	New	999
At Risk Flag	StudentSummary	New	999

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
Gifted Flag	StudentSummary	New	999
Reading Test Flag	StudentSummary	New	999
Math Test Flag	StudentSummary	New	999
Science Test Flag	StudentSummary	New	999
Additional Indicator Flag	StudentSummary	New	999
Dropout Flag	StudentSummary	New	999
Transportation Status	StudentSummary	New	999
Truancy Flag	StudentSummary	New	999
Retained in Grade Flag	StudentSummary	New	999
504 Flag	StudentSummary	New	999
Parent Participation Flag	ParentParticipation	New	999
<b><i>Student Enrollment</i></b>			
County ID	LEAInfo/Address	In Devel	613, 602, 606, 609, 660, 430, 595, 632, 110, 607, 425, 584, 588, 118, 100, 103, 401, 600, 601, 630, 631, 670, 608, 676, 545, 620, 671, 999
District ID	SchoolInfo/SchoolDistrict	In Devel	613, 602, 606, 609, 660, 430, 595, 632, 110, 607, 425, 584, 588, 118, 100, 103, 401, 600, 601, 630, 631, 670, 608, 676, 545, 620, 671, 999
School ID	SchoolInfo/StatePrId & NCESId	In Devel	613, 602, 606, 609, 660, 430, 595, 632, 110, 607, 425, 584, 588, 118, 100, 103, 401, 600, 601, 630, 631, 670, 608, 676, 545, 620, 671, 999
Session Type	TermInfo/Type	DRAFT 2/2003	999
Calendar Type	TermInfo/Type	DRAFT 2/2003	999
Session Begin Date	TermInfo/StartDate	APPR	613, 602, 606, 609, 660, 430, 595, 632, 110, 607, 425, 584, 588, 118, 100, 103, 401, 600, 601, 630, 631, 670, 608, 676, 445, 620, 671, 999
Session End Date	TermInfo/EndDate	APPR	613, 602, 606, 609, 660, 430, 595, 632, 110, 607, 425, 584, 588, 118, 100, 103, 401, 600, 601, 630, 631, 670, 608, 676, 445, 620, 671, 999

<b>WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS</b>			
<b>Element</b>	<b>SIF Object Recommended</b>	<b>Object Status</b>	<b>WYForm(s)</b>
Enroll Date	StudentSchoolEnrollment/EntryDate	APPR	613, 602, 606, 660, 430, 595, 632, 110, 607, 425, 100, 600, 630, 631, 670, 676, 545, 620, 671, 999
Enroll Status/Eligibility	StudentSchoolEnrollment/EnrollStatus NOTE: EnrollStatus is deprecated - targeted for removal in future specs.	APPR	613, , 660, 430602, 606, 595, 632, 110, 607, 425, 100, 600, 630, 631, 670, 676, 545, 620, 671, 999
Entry Type	StudentSchoolEnrollment/EntryType	APPR	613, 602, 606, 660, 430, 595, 632, 110, 607, 425, 100, 600, 630, 631, 670, 676, 545, 620, 671, 999
Exit Date	StudentSchoolEnrollment/ExitDate	APPR	613, 602, 606, 660, 430, 595, 632, 110, 607, 425, 100, 600, 630, 631, 670, 676, 545, 620, 671, 999
Exit Reason	StudentSchoolEnrollment/ExitType	APPR	613, 602, 606, 660, 430, 595, 632, 110, 607, 425, 100, 600, 630, 631, 670, 676, 545, 620, 671, 999
Career Technology Concentrator Flag	StudentSummary	New	100
Completion Type	StudentSchoolEnrollment/ExitType	APPR	607, 670
National Scholarship	StudentTranscript	New	670
State/Local Scholarship	StudentTranscript	New	670
Days Enrolled	StudentSummary	New	100, 110, 600, 671
Days Absent	StudentSummary	New	600
Full Academic Year Status	StudentSummary	New	671
Grade Level	StudentSummary	New	613, 606, 660, 430, 595, 110, 607, 425, 600, 630, 608, 676, 545, 671, 999
Expected Graduation Date	StudentPersonal/GradYear	APPR	999
County of Residence ID	StudentTranscript	New	999
District of Residence ID	StudentTranscript	New	999
School of Residence ID	StudentTranscript	New	999
Rank in class	StudentTranscript	New	999
Number in Class	StudentTranscript	New	999
GPA	StudentTranscript	New	999
Post Graduate Plans	StudentTranscript	New	999
Completing College-Bound Coursework	StudentTranscript	New	670
<b><i>Program or Activity Participation</i></b>			

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
Program ID/Name	StudentParticipation/Type	DRAFT 2/2003	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
Eligibility Status	StudentSnapShot/ProgramEligibilityStatus	Change	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
Participation Status	StudentSnapShot/ProgramParticipationStatus	Change	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
Services/Activities	StudentPlacement/Service	DRAFT 2/2003	425, 545, 671, 620, 613
Settings	StudentPlacement/ServiceLocation	DRAFT 2/2003	425, 545, 671, 620
Eligibility Date	StudentParticipation/ProgramEligibilityDate	DRAFT 2/2003	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
End of Eligibility Date	StudentParticipation/EndOfEligibilityDate	Change	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
First Date of Service	StudentPlacement/StartDate	DRAFT 2/2003	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
Last Date of Service	StudentPlacement/EndDate	DRAFT 2/2003	613, 609, 660, 430, 595, 632, 425, 118, 100, 103, 401, 601, 608, 545, 620, 671
Days Served	StudentPlacement/FrequencyTime	DRAFT 2/2003	???
Hours per Week	StudentPlacement/HoursPerWeek	Change	???
Hours per Day	StudentPlacement/HoursPerDay	Change	???
Placement/Outcome	StudentPlacement/Outcome	Change	???
<b>Course Data</b>			
Session Type	TermInfo/TermSpan	APPR	595, 632
Calendar Type	TermInfo/Description	APPR	595, 632
Session Begin Date	TermInfo/StartDate	APPR	595, 632
Session End Date	TermInfo/EndDate	APPR	595, 632
Local Course Number	SchoolCourseInfo/DistrictCourseCode	APPR	595, 632
Local Course Name	SchoolCourseInfo/CourseTitle	APPR	595, 632
Time per Session	SectionInfo/TimePerSession	Change	595, 632
Class/Period	SectionInfo/ScheduleInfo/MeetingTime	APPR	595, 632
State Course Number	SchoolCourseInfo/StateCourseCode	APPR	595, 632
Special Course Type	SchoolCourseInfo/CoreAcademicCourse	In Devel	595, 632
Credit Earned/Status	SchoolCourseInfo/CourseCredits	APPR	999

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
Grade Earned/Status	StudentTranscript	New	999
Teacher ID	SectionInfo/ScheduleInfo/Teacher	APPR	999
Method Offered	SectionInfo/MediumOfInstruction	APPR	999
Offered	SectionInfo/Offered	Change	999
<b><i>English Proficiency</i></b>			
ELL/LEP Status	StudentParticipation/ELLStatus	Change	
English Proficiency Status	StudentParticipation/EnglishProficiencyStatus	Change	
English Proficiency Level	StudentParticipation/EnglishProficiencyLevel	Change	
Assessment Code	StudentAssessment/AssessmentType	DRAFT 2/2003	
Assessment Domain Code	StudentAssessment/DomainCode	Change	
Assessment Date	StudentAssessment/TestDate	DRAFT 2/2003	
Proficiency Level	StudentAssessment/ProficiencyLevel	Change	
Assessment Score	StudentAssessment/Score	DRAFT 2/2003	
Special Circumstances	StudentAssessment/SpecialCircumstances	Change	
Grade Level When Tested	StudentAssessment/StudentGradeLevel	DRAFT 2/2003	
<b><i>Student Assessment</i></b>			
Assessment Code	StudentAssessment/AssessmentType	DRAFT 2/2003	671
Assessment Date	StudentAssessment/TestDate	DRAFT 2/2003	671
Proficiency Level	StudentAssessment/ProficiencyLevel	Change	999
Assessment Score	StudentAssessment/Score	DRAFT 2/2003	999
Special Circumstances	StudentAssessment/SpecialCircumstances	Change	999
Grade Level When Tested	StudentAssessment/StudentGradeLevel	DRAFT 2/2003	671
Vision Accommodation	StudentAssessment/VisionAccom	Change	671
Language Accommodation	StudentAssessment/LanguageAccom	Change	671
Alternate Assessment	StudentAssessment/AlternateAssessment	Change	671
<b><i>Student Immunization</i></b>			
Immunization Type	StudentMedical/Immunization	DRAFT 2/2003	
Date of Immunization	StudentMedical/ImmunizationDate	Change	
Immunization Exemption Type	StudentMedical/ExemptionType	Change	
Begin Date of Exemption	StudentMedical/ExemptionBeginDate	Change	
End Date of Exemption	StudentMedical/ExemptionEndDate	Change	
<b><i>Student Disabilities</i></b>			

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
Date of IEP	StudentParticipation/EvaluationDate	DRAFT 2/2003	425
Primary Disability	StudentParticipation/ExceptionalityCategory	DRAFT 2/2003	425
Secondary Disability	StudentParticipation/ExceptionalityCategory	DRAFT 2/2003	425
Tertiary Disability	StudentParticipation/ExceptionalityCategory	DRAFT 2/2003	425
Placement Status	StudentParticipation/ProgramPlan	DRAFT 2/2003	425
Health Condition(s)	StudentMedical/CurrentConditions	DRAFT 2/2003	???
<b><i>Student Records Requests</i></b>			
FERPA Reference Number	RecordsRequest	New	
Date of Access	RecordsRequest	New	
Name of Person Accessing	RecordsRequest	New	
Purpose	RecordsRequest	New	
Data Accessed	RecordsRequest	New	
<b><i>Student Discipline Incident</i></b>			
Date of Occurrence	StudentDiscipline	Change	630
Event ID	StudentDiscipline	Change	630
Event Type	StudentDiscipline	Change	630
Student's Role	StudentDiscipline	Change	630
Injury Status	StudentDiscipline	Change	630
Weapon	StudentDiscipline	Change	630
Weapon Type	StudentDiscipline	Change	630
Drugs	StudentDiscipline	Change	630
Gang	StudentDiscipline	Change	630
Hate Crime	StudentDiscipline	Change	630
Alcohol	StudentDiscipline	Change	630
Discipline	StudentDiscipline	Change	630
Action Date	StudentDiscipline	Change	630
Action Date	StudentDiscipline	Change	630
Duration	StudentDiscipline	Change	630
Sequence	StudentDiscipline	Change	630
Special Education Hearing	StudentDiscipline	Change	630
<b><i>Incidents of Crime and Violence</i></b>			
Reference Number	IncidentCrimeViolence	New	631
Incident Type	IncidentCrimeViolence	New	631
Date	IncidentCrimeViolence	New	631
Context	IncidentCrimeViolence	New	631
Location	IncidentCrimeViolence	New	631

<b>WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS</b>			
<b>Element</b>	<b>SIF Object Recommended</b>	<b>Object Status</b>	<b>WYForm(s)</b>
Role	IncidentCrimeViolence	New	631
Reporter	IncidentCrimeViolence	New	631
Police	IncidentCrimeViolence	New	631
Victim	IncidentCrimeViolence	New	631
Gang	IncidentCrimeViolence	New	631
Hate Crime	IncidentCrimeViolence	New	631
Alcohol	IncidentCrimeViolence	New	631
Drugs	IncidentCrimeViolence	New	631
Weapon	IncidentCrimeViolence	New	631
Weapon Type	IncidentCrimeViolence	New	631
Value	IncidentCrimeViolence	New	631
<b><i>Staff Characteristics</i></b>			
Last Name	EmployeeInfo/Name	DRAFT 2/2003	602, 103, 620, 401, 100, 609
First Name	EmployeeInfo/Name	DRAFT 2/2003	602, 103, 620, 401, 100, 609
Middle Name	EmployeeInfo/Name	DRAFT 2/2003	602, 103, 620, 401, 100, 609
Suffix	EmployeeInfo/Name	DRAFT 2/2003	602, 103, 620, 401, 100, 609
Social Security Number	EmployeeInfo/SSN	DRAFT 2/2003	602, 103, 620, 401, 100, 609
Alternate Employee Number	EmployeeInfo/EmployeeId	DRAFT 2/2003	602, 103, 620, 401, 100, 609
Birth date	EmployeeInfo/BirthDate	DRAFT 2/2003	602
Sex	EmployeeCredential/Demographics	In Devel	602, 620
Race	EmployeeCredential/Demographics	In Devel	602
Schedule ID	SectionInfo	APPR	602
Actl Row	EmployeeSummary/SalaryStep	New	602
Highest Degree	EmployeeCredential/Education	In Devel	602
Assignment	EmployeeAssignment/JobClassification	DRAFT 7/2003	602, 401, 609
School ID	EmployeeAssignment/School	DRAFT 7/2003	602, 609
Grade Group	EmployeeCredential/Assignment/Grades	In Devel	602
Percent of Time	EmployeeCredential/Assignment/FTE	In Devel	602, 103
Function	EmployeeAssignment/JobFunction	DRAFT 7/2003	602, 103, 401, 100

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
Salary	EmployeeContract/BaseSalary	DRAFT 7/2003	602, 103, 401, 100
Extra Salary	EmployeeSummary/BaseSalary	New	602, 103, 401, 100
(Total Salary)	EmployeeSummary/TotalSalary	New	602, 103, 401, 100
Experience Code	EmployeeSummary/ExperienceLevel	New	602
FTE	EmployeeAssignment/JobFTE	DRAFT 7/2003	602, 401, 100
District Experience	EmployeeCredential/UnitYears	In Devel	602
State Experience	EmployeeSummary/StateExperience	New	602
(Total Experience)	EmployeeCredential/TotalYears	In Devel	602
Working Today	EmployeeSnapShot/EmployedFlag	New	620
<b><i>Salary Schedule</i></b>			
Step/Level	SalarySchedule/SalaryLevel	New	608?
Salary	SalarySchedule/SalaryAmount	New	608?
<b><i>High School Activities</i></b>			
See Program and Activities.			
<b><i>District Organization</i></b>			
Years Required	DistrictCourseRequire/Years	New	670
Course Area	DistrictCourseRequire/CourseArea	New	670
District Name	LEAInfo/LEAName	In Devel	CCD
Mailing Address	LEAInfo/Address	In Devel	CCD
Location Address	LEAInfo/Address	In Devel	CCD
Administrator Name	LEAInfo/ContactInfo	In Devel	CCD
Title	LEAInfo/ContactInfo	In Devel	CCD
Administrator E-Mail	LEAInfo/ContactInfo	In Devel	CCD
Website	LEAInfo/LEAURL	In Devel	CCD
Grades Served	LEAInfo/GradeLevels	In Devel	CCD
Operational Status (open, closed, inactive)	LEAInfo/OperationalStatus	In Devel	CCD
Unit Type (Regular LEA, Regional Center, State Agency, Federal Agency, Other)	LEAInfo/EducationAgencyType	In Devel	CCD
County	LEAInfo/Address	In Devel	CCD
Phone	LEAInfo/PhoneNumber	In Devel	CCD
Fax	LEAInfo/PhoneNumber	In Devel	CCD
<b><i>School Organization</i></b>			

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
School Name	SchoolInfo/SchoolName	APPR	608
Mailing Address	SchoolInfo/Address	APPR	608
Administrator Name	SchoolInfo/PrincipalInfo/ContactName	APPR	608
Title	SchoolInfo/PrincipalInfo/ContactTitle	APPR	608
Administrator E-Mail	StaffPersonal/Email	APPR	608
Website	SchoolInfo/SchoolURL	APPR	608
Grades Served	SchoolInfo/GradeLevels	In Devel	608
School Code	SchoolInfo/StatePrId & NCESId	In Devel	608
District Code	SchoolInfo/SchoolDistrict	In Devel	608
Location Category	SchoolInfo/Address	APPR	608
Location Address	SchoolInfo/Address	APPR	608
County	SchoolInfo/Address	APPR	608
Phone	SchoolInfo/PhoneNumber	APPR	608
Fax	SchoolInfo/PhoneNumber	APPR	608
One-Teacher	SchoolInfo/OneTeacher	Change	608
Small School	SchoolInfo/SmallSchool	Change	608
Title I	SchoolInfo/TitleIStatus	In Devel	608
Alternative School	SchoolInfo/SchoolFocus	In Devel	608
Charter	SchoolInfo/SchoolFocus	In Devel	608
Alternative Schedule	SchoolSchedule	New	608
Hours of Instruction Kindergarten	SchoolSchedule	New	608
Hours of Instruction Elementary	SchoolSchedule	New	608
Hours of Instruction Middle School	SchoolSchedule	New	608
Hours of Instruction High School	SchoolSchedule	New	608
Days in School Year	SchoolSchedule	New	608
School Lunch Type (Provision 3)	FoodserviceMealPrices/Provision3	Change	608
School Open (606?)	SchoolSchedule	New	608
Session Begin Date	SchoolSchedule	New	608
Session End Date	SchoolSchedule	New	608
<b>Financial</b>			
	FINBudget and FINAnnual	In Devel	118, 100, 103, 401, 601, 545
<b>School Technology</b>			
Room Type	SchoolTech	New	588
Outside Phone Connection	SchoolTech	New	588
Dial-up Internet Access	SchoolTech	New	588

<b>WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS</b>			
<b>Element</b>	<b>SIF Object Recommended</b>	<b>Object Status</b>	<b>WYForm(s)</b>
LAN to WEN Internet Access	SchoolTech	New	588
School Network Connection	SchoolTech	New	588
Total Computers	SchoolTech	New	588
Computers with Internet Access	SchoolTech	New	588
Computers Connected to School Network	SchoolTech	New	588
Outside Phone Connection in WEN Video Room	SchoolTech	New	588
Speaker Conference Phone in WEN Video Room	SchoolTech	New	588
Computer Use (Instruction, Administration)	SchoolTech	New	588
Computer Type	SchoolTech	New	588
Person Responsible for Maintenance and Support	SchoolTech	New	588
Satisfaction with Technical Support	SchoolTech	New	588
Full-Time Tech Support Count	SchoolTech	New	588
Part-Time Tech Support Count	SchoolTech	New	588
Delivery of Staff Development	SchoolTech	New	588
Person Responsible for Professional Development	SchoolTech	New	588
Curricular Area	SchoolTech	New	588
Extent of Improvement Efforts	SchoolTech	New	588
Focus of Improvement	SchoolTech	New	588
Implementation Level	SchoolTech	New	588
Curricular Area	SchoolTech	New	588
Importance of Technology	SchoolTech	New	588
Curricular Area	SchoolTech	New	588
Text: Technology Use	SchoolTech	New	588
Curricular Area	SchoolTech	New	588
Targeted for Improvement	SchoolTech	New	588
Gains by Statewide Tests	SchoolTech	New	588
Losses by Statewide Tests	SchoolTech	New	588
Gains by District Tests	SchoolTech	New	588
Losses by District Tests	SchoolTech	New	588
Gains by Teacher Tests	SchoolTech	New	588
Losses by Teacher Tests	SchoolTech	New	588
Positive Impact of Technology	SchoolTech	New	588
Negative Impact of Technology	SchoolTech	New	588
<b><i>District Technology</i></b>			
Types of Distance Learning	DistrictTech	New	584
Integrated or Separate Standards	DistrictTech	New	584

## WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS

Element	SIF Object Recommended	Object Status	WYForm(s)
FTE/Position	DistrictTech	New	584
Number Providing Professional Development	DistrictTech	New	584
Amount Spent	DistrictTech	New	584
Technology Categories	DistrictTech	New	584
Technology Funding Sources	DistrictTech	New	584
School Level	DistrictTech	New	584
Computer Platform	DistrictTech	New	584
Policy for CIPA	DistrictTech	New	584
WEN Filtering	DistrictTech	New	584
Local Library Housing	DistrictTech	New	584
Library Use of WEN for Internet	DistrictTech	New	584
Technology Skill Level	DistrictTech	New	584
Percentage of Staff by Type	DistrictTech	New	584
Technology in Individual Staff Plans	DistrictTech	New	584
<b><i>Directory Contacts</i></b>			
Listed in WDE Web Site	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Listed in Education Directory	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Function	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
First Name	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Last Name	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Middle Name	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Suffix	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Title	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Based at	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Phone	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
Extension	LEAInfo/ContactInfo and SchoolInfo/ContactInfo	Change	609
E-Mail			609
<b><i>Program Description</i></b>			
Program ID	ProgramInfo	New	613
District ID	ProgramInfo	New	613
School ID	ProgramInfo	New	613
Text: Method of Identification	ProgramInfo	New	613
Text: Program Description	ProgramInfo	New	613

<b>WYOMING DATA ELEMENTS AND RECOMMENDED SIF OBJECTS</b>			
<b>Element</b>	<b>SIF Object Recommended</b>	<b>Object Status</b>	<b>WYForm(s)</b>
Program Component(s)	ProgramInfo	New	613
<i><b>Transportation</b></i>			
Route Miles	TransportSnapShot	New	620
AM, Noon, PM	TransportSnapShot	New	620
Students Transported	TransportSnapShot	New	620
Bus Routes	TransportSnapShot	New	620
Male, Female	TransportSnapShot	New	620
Drivers	TransportSnapShot	New	620
Mechanics	TransportSnapShot	New	620
Vehicles Passing Stopped Bus	TransportSnapShot	New	620
Total Fleet Miles	TransportSnapShot	New	620
Activity Trip Miles	TransportSnapShot	New	620
Field Trip Miles	TransportSnapShot	New	620
Days Buses Used	TransportSnapShot	New	620
Summer School Days Buses Used	TransportSnapShot	New	620
Field Trips Outside State	TransportSnapShot	New	620
Field Trips Outside State over 50 Miles	TransportSnapShot	New	620
Actual Route Mileage	TransportSnapShot	New	620
Summer School Miles	TransportSnapShot	New	620
Other Miles	TransportSnapShot	New	620
Text: Other Miles Explanation	TransportSnapShot	New	620

The “WYElementChart” ([WYElementChart.xls](#)) chart in the report appendix provides more detailed information. It provides for each Wyoming data element, the recommended SIF object to transport that data element for state reporting. When no current SIF object appeared to meet the need for Wyoming, the chart either 1) identifies a SIF object to be changed, or 2) recommends creation of a new SIF object to meet the WDE needs. Where possible, SIF objects and elements are identified by the numbers which link to the SIFObjects, SIF ElementDetails, and SIFObjectDetails spreadsheet files.

Columns include:

- Category – A descriptor assigned to groups of data elements for this project.
- Element – The name assigned to a Wyoming data element for this project.
- Categ No – The number associated to the Category.
- ReqElementNo – The number associated with the Wyoming element within the Category list.
- ReqSeq – The sequential number assigned to the Wyoming data elements.
- WYForm(s) – The number of the Wyoming data collection form where the data element would be referenced or required.

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- SIF Object Recomm – The name of the SIF object recommended to provide the Wyoming data. This column is blank where there was no SIF object which would be an appropriate source for the data element.
  - SIF Object CHANGE – The name of the SIF object recommended for modification to provide the Wyoming data. The column is blank when there was no SIF object which seemed appropriate to be changed to carry the data element.
  - SIF Object NEW – The possible name of a new SIF object which would be developed to provide the Wyoming data element.
  - ObjectNo – The SIF Object number from SIFObject.xls for the SIF Object recommended or to be changed. NA (Not Applicable) is entered where no SIF object was identified which would serve the purpose.
  - ObjectItemNo – The item number within the SIF Object from SIFObjectDetail.xls for the SIF object recommended or to be changed. NA (Not Applicable) is entered where no SIF object or item was identified which would serve the purpose.
  - ElementNo – The element number assigned in SIFElementDetails.xls which would respond to the Wyoming data requirement.
  - ElementItemNo – The item number within the common element listed in SIFElementDetails.xls which would provide the Wyoming data.

Just over 53 percent of Wyoming’s required data elements (173 of the 325 required data elements) could use SIF objects or modified SIF objects to meet reporting needs. The listing reflects 129 data elements, nearly 40 percent of the elements, with a recommended SIF object. An additional 67 Wyoming data elements (20 percent) could be captured by modifying a SIF object. An additional 149 elements require new objects to be developed.

WYOMING DATA ELEMENT NEEDS	
WY data elements available via objects in SIF Approved Specification, v 1.2	48
WY data elements available via objects in SIF Draft, Feb 2003 and July 2003 (internal SIF documents)	36
WY data elements available via objects in development by SIF Work Groups (Sept 2003)	32
WY data elements requiring changes to current SIF objects	57
WY data elements requiring new SIF objects	152

This analysis is being dated almost immediately by the ongoing work in SIF standards development. The SIF organization is preparing to publish a new version of the object specifications in early 2004. Modifications are ongoing to the draft and pre-draft data objects and elements identified in these documents.

This analysis is valuable for connections between Wyoming requirements and SIF work, as it provides the initial Wyoming “watch list” for SIF objects and elements. Ongoing analysis is recommended to review Wyoming’s allowable data element codes and values with the SIF elements specifications, to assure that the nuances of Wyoming education operational data are accurately reflected.

These recommendations provide a Wyoming “action list” for recommending development of additional SIF objects and elements. The analysis identifies additional data elements for inclusion in specific SIF objects, and/or the development of new SIF objects and elements, to address WDE data reporting needs.

WY Data Elements Available from SIF Objects and Needed by Data Category		
	AVAILABLE	NEEDED
<i>Student Personal</i>	17	2
<i>Student Characteristics</i>	0	19
<i>Student Enrollment</i>	14	15
<i>Program or Activity Participation</i>	7	6
<i>Course Data</i>	12	3
<i>English Proficiency</i>	4	6
<i>Student Assessment</i>	4	5
<i>Student Immunization</i>	1	4
<i>Student Disabilities</i>	6	0
<i>Student Records Requests</i>	0	5
<i>Student Discipline Incident</i>	0	17
<i>Incidents of Crime and Violence</i>	0	16
<i>Staff Characteristics</i>	20	6
<i>Salary Schedule</i>	0	2
<i>District Organization</i>	13	2
<i>School Organization</i>	17	12
<i>Financial</i>	1	0
<i>School Technology</i>	0	36
<i>District Technology</i>	0	16
<i>Directory Contacts</i>	0	12
<i>Program Description</i>	0	6
<i>Transportation</i>	0	19

The above table will be helpful in analyzing implementation strategies for WISE Data System. Categories that are fairly well represented in SIF work include: student personal, course data, student disabilities, staff characteristics, and district organization. SIF coverage of finance data reporting is in early draft stages, and requires more analysis.

Several categories of data which appear important to Wyoming data collection are not yet visible in SIF work, including: student records requests, student discipline incident, incidents of crime and violence, salary schedules, school and district technology, directory contacts, program descriptions, and transportation.

Also, Wyoming’s approach to collecting data currently relies on derived and aggregated data reporting from school districts. An aggregate reporting specification is being developed to support movement of summary data, such as two- or three-dimensional tables consisting of rows and columns of statistics. These tools can be useful both in continuing to collect some aggregate statistics, as the State transitions to unit record information sources; and, in providing summary information back to schools and districts from the state.

The WDE data elements include some derived and summarized information on individual students and staff across a full school year. This is an area which needs further development across SIF specifications. Current objects support a “snapshot” or “single point in time” view of information, rather than a summary across a span of time.

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Wyoming should continue the commitment to active participation in Schools Interoperability Framework development and maintenance. It is important that the SIF organization hear the clear voice of local and state needs and priorities for data and technical support. And, the active participation will assure that school operation, as well as district and state reporting are adequately supported by the SIF specifications.

The recommended approach to Wyoming data requirements and objects is, in priority order:

- A. Use approved SIF objects, where possible.
- B. Use draft SIF objects, as needed.
- C. Use pre-draft SIF objects.
- D. Don't force the use of a SIF object.
- E. Recommend changes to SIF objects to meet Wyoming needs..
- F. Create new objects for Wyoming and SIF.
- G. Assume anything that Wyoming needs, SIF wants.

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## **8 Issues**

### ***8.1 SIF-Based***

In response to the WDE objectives for this project, the developers of the proposed design and implementation plan for the Wyoming Integrated Statewide Education Data System (WISE Data System) recommend that the school districts and supporting bodies of the State of Wyoming will need to fully understand the procedures and characteristics of the SIF standard and the effect of that standard in the management of district education data in reporting that data to the WDE.

#### **8.1.1 SIF Specification**

This Statewide Technical Model Document in proposing a SIF implementation process for Wyoming school districts supports the SIF specification for infrastructure and the adoption of SIF data objects as managed through the agent to ZIS structure that supports the specification.

#### **8.1.2 SIF Compliance**

This project is centered upon the ultimate participation of schools, school districts, and WDE in mandating compliance by participating vendors, and system providers in the eventual implementation and operation of the WISE Data System.

### ***8.2 Scalability***

The designers and future developers of the WISE Data System shall adhere to the security model specifications behind the SIF standard. The security model of SIF centers around three areas: encryption, authentication and access control. SIF provides application agents the ability to specify the encryption and authentication requirements for all other agents that eventually come into contact with their sensitive data. The SIF 1.1 Specification clarifies “that various communication protocols over which SIF data may be transferred, including SIF HTTPS, provide built-in support for easing the implementation details for encryption and authentication requirements. In addition, access control at the ZIS allows a zone administrator complete control over which agents are allowed to communicate which data to other agents.”

### ***8.3 Security provisions***

Both the ZIS and agents can play active role in security of the zone. In most cases, the ZIS provider has no control over how the application agent is developed. The zone administrators at the ZIS can set minimum security level for the zone by configuring the SIF HTTPS layer of the ZIS accordingly. Agents that cannot negotiate to these minimum levels will be unable to communicate. Application agents must have the ability to specify security levels on a message-

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by-message basis. As such, the ZIS must not communicate a message with defined security/authentication levels to receiving agents with lower security/authentication levels.

Given the asynchronous nature of most zone communication, delivery of messages must be robust. The ZIS must guarantee delivery of messages it acknowledges receipt of in the event of system crashes, power failure, etc. A similar mechanism should be built into agents; i.e. once an agent receives information from its corresponding application, delivery of that information to the ZIS should be robust.

#### ***8.4 District Implementation of the Statewide Technical Model for SIF Implementation***

The next significant action step resulting from the WDE and planning committee consideration of this first rendition of the Statewide Technical Model document, shall be the design and development of an implementation plan for the districts coupled with the WDE implementation plan. It is anticipated that the implementation plans shall be drafted and, subsequently adapted based upon the (a) results of the district surveys now being compiled; (b) the results of the on-line planning process; and, (c) the evaluation and recommendations for modifications to this draft of the Statewide Technical Model Document.

#### ***8.5 Student Identifiers***

In considering the design and subsequent development of the Implementation Plan for the districts and the state, a significant issue must be the consideration of student identifiers in managing the transfer of student information through the SIF data model process. The next section of this document defines the directions for a student identifier process for the WDE.

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## 9 Wyoming Statewide Student Identifier

### Overview

The following discussion is combined from documents across 10 other states in which ESP has conducted reviews and made recommendations for a statewide student identifier.

A “statewide student identifier” is a number assigned to each student in a state. States assign these numbers because they are the most efficient way to manage individual student records in an automated information system. Confidentiality is not only maintained but enhanced using these identifiers when student names appear less frequently on records.

The student identifier must be unique (assigned to only one student), unchanged (follow the student throughout the school years), unduplicated (only one per student), and ubiquitous (every state program uses it). Under these conditions, the Department of Education can collect and maintain individual student records with which to respond to changes and new information requirements such as those from No Child Left Behind without passing that burden on to schools and districts.

A glossary of terms is included at the end of this section.

### Why do states assign student identifiers?

- Confidentiality is enhanced by using a number in data files in lieu of a student’s name.
- A permanent and unique student identifier is the most reliable and accurate way to link across years and separate data files for analyses.
- A unique student identifier is the most efficient way to eliminate duplicate records to ensure a single student is counted only once for state funding and program evaluations.
- Statewide database systems run more efficiently using unique and unduplicated identifiers as keys for matching.

### What benefits come from having statewide student identifiers?

- The student identifier is the initial required component that enables the implementation of an individual student record system, which can reduce reporting burden on schools and districts, increase data quality, and shorten the cycle time for reporting information.
- Mobile students can be matched with their education records to allow prompt provision of services in a new school.
- Academic growth can be measured across time to evaluate the effectiveness of schools and programs for students.

**What characteristics must a statewide student identifier have?** A student’s state identifier must be:

- Unique—only one student is ever assigned each number.
- Unchanged (Permanent)—once a student is assigned a number, that number is always associated with that student.

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- Unduplicated—a student is assigned only one number, so the student is not duplicated in the database.
  - Ubiquitous—the student identifier is used for all records, all programs, all purposes.

**In order to achieve these characteristics, the statewide student identifiers must be assigned:**

- Using a single, unitary process established and maintained at the state level.
- From a pool of valid, unused numbers
- Only after verifying that the student has not previously been issued an identifier.

**To manage the identifiers, to ensure their integrity, and to maintain their confidentiality, the State must:**

- Establish policies and procedures consistent with both state and federal confidentiality laws.
- Establish access and use criteria, which clearly describe who can use or view the identifiers and for what purposes.

**What do people in states with individual student record systems and statewide student identifiers say about their experiences?**

- The initial work to implement them is worth the effort because reporting to the State is simpler, quicker, and less burdensome now.
- The transition to a statewide student identifier and an individual student record system motivates and enables schools and districts to make the technology improvements that all schools and districts must make to manage their work in today's environment.
- Electronic records are more confidential and protected than paper records were. Suppression of small group values that might reveal personally identifiable information about a student can be automated and enforced more successfully.
- When new or changed requirements for statistics about students arise (as No Child Left Behind exemplifies), the State can make the new calculations using the individual student records rather than passing that burden on to the schools and districts.
- The student information system software vendors are key partners in the implementation of the statewide student identifier and the individual student record system. They have accommodated these systems in other states and know what is required in most cases.

**What issues must be addressed to achieve both acceptance of and full compliance with a statewide student identifier?**

- Parents, students, educators, and advocacy groups must be shown how the student identifiers will be assigned and managed without revealing personally identifiable, confidential information about individual students.
- Schools and districts must be shown how they can incorporate the student identifier into their local information systems without inappropriate changes and expenses being required.
- Programs within the Department of Education must agree to comply with the statewide student identifier as the single student identifier for the state.

**What groups must be a part of the design and information gathering process for developing and implementing a statewide student identifier?**

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- State professional education associations
  - State legislative representatives
  - Department of Education program management staff
  - Department of Education data management staff
  - School and district educators and data managers
  - Parent and student advocate groups
  - Student information management software vendors

### **What issues must be understood and resolved?**

The issues discussed here are not mutually independent. In the analysis that follows, the options available for one issue may interact with the options described for another.

1. Uniqueness--At what level must the identifiers be unique (e.g., school, district, state, nation)?

An identifier must be unique, i.e., assigned to a student only one time. Within a population, the identifier must not be an alias for a single individual within the population. An alias is a second identifier for the same student. Thus each student must be unduplicated within the database. The population defined here encompasses all elementary and secondary students in Wyoming. Therefore, uniqueness must be maintained at the state level. The current student identifiers assigned by local schools and districts to their students are not unique across all districts. In fact, some commercial student information systems adopted by districts or schools may provide uniqueness only within a school building for a single year.

Statewide uniqueness can be achieved if districts assign identifiers that are unique within the district if the numbers also begin with a unique, state-assigned district number. However, this complicates the process of verifying and using those same numbers when students move across districts. The variance in the current length of identifiers (number of characters) across districts complicates this option.

There are certain benefits to using an identifier that is unique nationwide. At this time, the only such identifier is the Social Security Number (SSN). SSN provides functionality for tracking former students into postsecondary education, career technology education, and the Wyoming workforce. It also enables verification of the identity of students across states (with other agencies using SSN), and exchanging useful data with other state and federal agencies that provide services to families and individuals (e.g., verifying eligibility for services). These benefits can also be achieved by collecting SSN as an additional data element irrespective of its use as the student identifier. However, every student may not have an SSN, some parents will choose not to provide the SSN to the school, and use of the SSN raises other confidentiality issues.

Wyoming Recommendation: Ensure student identifiers are unique at the state level.

2. Burden--What level of burden should be imposed upon local schools and districts?

Burden is defined as the time, effort, and resources required to implement the student identifier system. This includes creating the system, assigning the identifiers, verifying an individual's

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identifier, and entering the identifiers wherever they are required. Burden also includes the effort to make the transition from an existing identifier system to a new one; or to add the new identifier into an existing system or perform a crosswalk from the local identifier to the state identifier each time a report is exchanged.

Clearly the level of burden must be limited to achieve compliance (both voluntary and practical) with the identifier process. Too high a level of burden will introduce unwanted errors as a consequence of the attention to detail required. Burden must be balanced by benefit. In the case of identifiers for Wyoming students, the benefits have already been determined to be high because they are critical to the functionality of the entire proposed individual student record system. The option that imposes the least burden, the use of existing school and district identifiers, fails to provide the functionality required as described in response to other issues. Burden is typically an issue to recognize and to manage.

A moderate level of burden can be achieved by allowing the continuing use of local identifiers within local information systems at the discretion of schools and districts. Crosswalking to the state identifiers at the time of state reporting is commonplace in districts within states that collect individual student records. An alternative is for the state identifier to be recorded in the local information systems as a separate field to be included with data extracts at the time reports to the WDE are created. In cases where the local student information system software does not allow for second identifiers, the crosswalk option would be necessitated. Some districts may indicate that they would prefer to use the state identifiers as their own internal identifiers. Such use could be possible if the WDE used a procedure to further mask the identifiers once the records entered the state database. One state with individual student records uses encryption to alter the identifiers within the state database to provide further security and confidentiality.

Wyoming Recommendation: Accept a moderate level of burden in exchange for the clear benefits from a functional student identifier within the information system.

3. Assignment--At what level will the identifiers be assigned to individual students (e.g., school, district, state, national)?

The Wyoming Department of Education must determine the pool of identifiers available to be assigned. However, assignment of the identifiers at the level of registration (either at the school or at the district) provides the quickest and least burdensome alternative. This issue is also related to uniqueness. The schools (or district office where central registration occurs) must follow a procedure that ensures unduplicated identifiers. Therefore, identifiers should be assigned at the lowest level possible without losing their uniqueness.

A reality is that parents and students cannot be relied upon to carry their student identifiers from one school to the next. Mobile families too often cannot identify their last school/district, do not have records with them, and cannot remember student identifiers. Thus, a system must be in place to avoid assigning an alias, a new identifier, when a valid identifier exists.

If a local identifier is to be assigned at registration and used for local purposes, then the assignment of the state identifier can be delayed until some time before the next reporting to the state. If the state identifier is to be used in the local student information system as the primary identifier, then a process for the identifier to be assigned promptly must be in place. An on-line student locator system that provides the identifier to be assigned or a list of available identifiers would be required at registration.

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Wyoming Recommendation: Determine the pool of identifiers available at the WDE. Either by assigning a subset of identifiers to each district or by providing a web-based student locator function, WDE should assign identifiers to individual students at the level where registration occurs (e.g., school or district).

*NOTE: SEA's typically require that their official student identifier appear on all reports and data submissions from the LEA. There is usually not a requirement that the state's identifier be used on all local files and records. A district or school could opt to use its own identifier system for local applications such as scheduling and grade reporting. A crosswalk table could be used to translate local identifiers to the state identifiers whenever reporting to the state is required.*

4. Timing--When will the identifier be assigned to a student (e.g., at registration, as soon as possible after registration, at the time of the first report to WDE)?

If the state identifier is to be used for local records, schools need an identifier immediately upon enrollment of a new student. Certain forms are completed at that time and begin to go their separate ways. Ensuring that the student's identifier is on each form immediately saves changes and mismatches later. The difference between assigning identifiers immediately and within a few hours is arguable. However, any system that takes days to assign an identifier presents a very different level of burden--and potential for errors that must be cleaned up later. An on-line student locator system that provides the identifier to be assigned or a list of available identifiers would be required at registration.

*WDE should require districts to submit enrollment data for students in a timely manner to ensure the data are available to the next district in which the student enrolls--even if the student enrolls and exits prior to a regular submission period.*

Wyoming Recommendation: For districts using the state identifier as their local identifier, it should be assigned at registration and be available to schools before enrollment forms begin to be distributed to their respective offices. If registration occurs at the school, then the school should be enabled to assign the identifier.

For districts NOT using the state identifier as their local identifier, the timing of the assignment should be any time before or concurrent with the next state reporting. WDE should require districts to submit enrollment data for students in a timely manner to ensure the data are available to the next district in which the student enrolls or exits prior to a regular submission period.

5. Verification Level--Where will the identifier be verified (school, district, state)?

When a student moves from one school or district to another, the student's identifier must be verified upon registration in the new district. Verification is the process made available to ensure that the identifier assigned to a student is valid and correct. Valid means that the identifier is one actually included in the pool of identifiers to be assigned. Correct means that the identifier is accurately matched to the student.

The identifier can be verified immediately upon registration or later as part of a validation process at the state level. The earlier the verification occurs, the fewer changes will be required later if an identifier is changed/corrected. The closer the verification occurs to the parent and student, the higher the probability of accuracy. Verification at the time of registration, when the parent and student are most likely to be present, is best. This requires that the person registering the student

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be authorized to assign the identifier according to a set of precise rules, or that the person have direct access to the assignment process.

Verification conducted at the state level using available demographics in the database, after submission of individual records is the least efficient. Some correct identifiers can be incorrectly challenged based upon duplications in the data elements used for verification, e.g., students with the same name, birthdate, and gender. In these instances, verification is then delegated back to the school. This state-level verification is a required component of the system, but the frequency of potentially incorrect identifiers can be greatly reduced by adequate controls at registration. An on-line student locator system would provide the verification necessary.

Wyoming Recommendation: Verify the identifier at the time of registration, if possible, when parents and students are available to answer questions and provide documents. Use an on-line verification system.

6. Assignment/Verification Process-How will the identifier be assigned or verified?

The assignment/verification process includes several steps:

- First, the registrar determines if the student already has an identifier assigned.
- Second, the registrar secures the existing identifier or causes a new one to be assigned.
- Third, the registrar records the identifier in local records for use in state reporting.

The registrar can accomplish the first step by asking the parent or student, or examining paper or electronic records from a prior school. Parents and students too often do not have the records, and at times cannot precisely identify contact numbers or addresses for the prior school (e.g., districts with county or descriptive names rather than city names). In the case of migrant worker families, enrollment in a prior school may have been too brief to generate an official record. An alternative is to establish a statewide reference file (locator system), such as a web page, that can be queried to determine the existence of a previously assigned identifier. The registrar could access the reference during the registration process. The second step could be accomplished using the statewide reference to learn the identifier or to request assignment of a new one. In the absence of such a reference, the registrar must contact the prior school. This is a critical point. Students who have existing identifiers can be assigned an alias identifier simply because that is easier than contacting a prior school, or because the prior school cannot be contacted or does not respond promptly. This might result in duplicate identifiers for a single student, rather than a single unique identifier. If such a number is meant to serve as a temporary placeholder for the unchanged identifier, procedures would be needed to replace the temporary identifier with the unchanged identifier as soon as possible.

Wyoming Recommendation: Registrars should assign and verify identifiers at the time of registration using a statewide reference for finding existing identifiers and a state-approved process for assigning new numbers.

7. Verification Data Elements-What data elements are required for verification of a student's identifier?

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When a student's identifier is in doubt, other unique combinations of information about the student must be used for verification. This is typically "directory information" as defined by the Family Educational Rights and Privacy Act (FERPA) along with a few other pieces of information included to increase the probability of describing a single student.

Directory information typically includes:

- Name
- Birthdate
- Gender
- Grade level

Additional detail information could include:

- Race/Ethnicity
- Place of Birth
- Parents' Names
- Date of First Immunization
- Prior schools/districts of enrollment, enrollment dates

Security and confidentiality issues must be considered. However, the more information available for query, the more likely existing identifiers will be found and used.

One state provides for a two-phase identification system. If the use of directory type data elements results in multiple matches, then other data elements, such as parents' names, race/ethnicity, and place of birth, are made available to the registrar for making a correct identification.

There is the possibility that parents would not approve the release of their children's information for inclusion in this locator system, should they be given the option to not comply. If this occurs, there may be a need for a flag in the locator system database that the information cannot be released and the WDE will need procedures to work directly with the person doing registration to determine if the suppressed student is the one being enrolled.

Wyoming Recommendation: Include as many of these data elements as practical in the verification resource.

#### 8. Confidentiality--Who may know the identifier?

FERPA and local policies will define the answer. If the identifier is a nominal code without intrinsic meaning, then it may be viewed as directory information. This assumes that links using this identifier are not generally available to the public. Prudent practice would call for the identifier to be treated as confidential, because knowledge of the number would place the holder one step closer to access to confidential information.

Wyoming Recommendation: Allow only education employees with a need to know to access the student identifier at the local level. Encrypt the identifier when it is passed to WDE and stored in statewide files.

#### 9. Imbedded Information--What meaning will be built into each number?

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SSN has no useful intrinsic meaning imbedded in the numbers. (Generally, the number may imply a region, year of assignment, or sequence, but any algorithm producing the number is obscure.)

Imbedded information typically adds to the length of a number. For example, county/district codes may add six characters to a number. Birthdate may add eight. A truly unduplicated, random number carrying no meaning has the advantage of requiring less restrictive security and confidentiality precautions. If the district number is imbedded, this could identify the student's first district of enrollment; however, that information can be carried in other fields within the database as well. In fact, any useful information that might be imbedded in the identifier can also accompany the identifier as a separate field.

Although unusual, directory information about a student can change. Names change. Even birthdates and gender can “change” when errors are corrected—or made. Any of these changes would require either a change in a student’s identifier or would create an anomaly, which would require a process to document.

Wyoming Recommendation: Do not imbed information in the student identifier.

#### 10. Length--How many characters can be in each number?

Shorter numbers can be entered, transcribed, and maintained with fewer errors. A common length provided for an identification number on generic scanner documents is 10. SSN is currently 9, but moving to 10 numbers has been discussed. For example, to accommodate 800,000 active students (Wyoming has about 84,500) and to retire numbers for former students for 100 years, requires 8 numbers, but would use only about 12% of those numbers. This provides 100 million minus one unique numbers.

Wyoming Recommendation: Limit the student identifier to 9 or 10 digits.

#### 11. Characters--What should be the nature of the characters in the identifier?

Any number, letter, or symbol could be used. Symbols and letters present problems with recognition and accuracy in entering—especially when mixed with numbers. Certain letters (e.g., o, l, i, z, E, b/d, q/p) are sometimes confused with numbers or each other. Using both numbers and letters provides for many more combinations for unique identifiers, and thus the ability to have shorter identifiers. Problematic numbers and letters could even be eliminated from use (e.g., neither 0 nor o ever assigned). Some state systems use letters and numbers in combination (e.g., a state assigned number beginning with a letter to distinguish it from a SSN.)

Letters require 26 bubbles for each character on a scanner form compared to 10 for numbers. Combinations of letters and numbers require 36 bubbles. Letters come in capital and lower-case forms that may or may not have meaning, but often cause confusion as to their use. Numbers are easier to distinguish from each other, they can carry intrinsic and extrinsic meaning, and they are more "universal" across languages and cultures. Numbers can be assigned without risking the creation of meaningful and undesirable combinations as with letters. Even in the absence of considerations that require restricting the length of the identifier, use of only numerals is preferable. They are easy to distinguish. They can be entered with efficient keystrokes using a number pad. They require less space and are associated with less bubbling error on scanner forms.

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Wyoming Recommendation: Use only numerals for the student identifier.

12. Rubric--What conditions will be imposed on the numbers?

If an algorithm or imbedded meaning is to be used, then the business rules adopted will answer this question. However, if a random number is used, then several rules can be followed to reduce data entry and clerical errors.

Leading and final zeros are sometimes accidentally, or by software design, dropped when numbers are entered or moved across databases. When the remaining numbers are justified left or right, then a reader or a computer application can misinterpret the identifier. Consecutive identical numerals at times are incorrectly entered too few or too many times. Eliminating all the cases described above would reduce the available pool of numbers by about 15%.

A final check digit (a number calculated by formula from the other digits) is sometimes used to provide a quick way to locate invalid numbers. With this methodology, if the verification formula checking the validity of a number does not generate the final digit as in the number reported, then there is an error. This check digit could be the 10th character. If a check digit is used, and it is not allowed to be zero, then the numbers eliminated because they end in zero could be assigned.

The check digit does not have to be a part of the identifier. The digit can be held in a separate field accompanying the identifier. With this option, the check digit is not always available.

Wyoming Recommendation: Use unduplicated random numbers with the exception of any with an initial or final zero, or any sequence of three or more identical numerals. Calculate a final check digit that can be used as a final digit or as a separate field.

**What process should Wyoming use to assign and maintain the student IDs?**

The process for working with districts to make the initial assignment of student identifiers is envisioned as described below.

1. Examine the fall 2004 submission enrollment file by identifying student records without complete data in key fields. Key fields are:
  - a. First Name
  - b. Middle Name
  - c. Last Name
  - d. Generation Code (e.g., Jr., III)
  - e. Birthdate
  - f. Gender
  - g. Race/Ethnicity
  - h. Grade Level
  - i. County, District, School ID Number
  - j. Local Student ID
  - k. Parent/Guardian Name
2. Send districts a list of these students for completion of their data.
3. Update the fall 2004 file.
4. For students in all grades, assign a permanent ID. Assign IDs within the range of numbers for the district. Create a file of these numbers and the key fields to send to districts.

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5. Send the file to districts for verification. Districts look for duplicates, missing students, incorrect key fields, etc.
  6. Districts submit any edits to WDE.
  7. Design and build the routine for assigning identifiers from the WDE student locator system.
  8. Design and build the on-line student locator system. Design and build the encryption routine for creating the individual student record research database.
  9. Design and build the routine for suppressing individual student data in the individual student record research database.
  10. Design and build the routine for suppressing aggregate statistics that reveal personally identifiable data in the public aggregate record database.

Districts may choose to implement and manage the state IDs differently. The chart below describes some options that may be implemented.

### **How are student identifiers stored using different national standards?**

Several national standards exist for the definition, storage, and exchange of education data. The student identifier is defined as follows in each. A resource for viewing additional data elements within these standards is [www.dspectweb.evalsoft.com](http://www.dspectweb.evalsoft.com). ESP has created this meta-database of elements and their definitions from these standards and over 900 data collections conducted by the U.S. Department of Education over the past six years.

NCES Student Data Handbook

Schools Interoperability Framework (SIF)

Standards for Postsecondary Exchange of Education Data Electronically/Exchange of Personal Records Electronically for Students and Schools (SPEEDE/ExPRESS)

Within representative statewide data systems, the student identifier is defined as follows:

Mississippi: Students are assigned the next sequential number when they are first reported to the state.

Texas: The SSN is the student ID. Districts are assigned a range of alternative IDs to assign to students without an SSN. When student records are submitted to the state, the SSN is encrypted into a personal ID (PID). The PID is maintained in internal files. Students whose records change from the SSN to an alternative ID or vice versa maintain their PID.

Michigan: An algorithm using name and demographic data is used to generate IDs. Duplicates occur and are resolved by the state.

Florida: The SSN is the ID reported by counties to the state. Students not using the SSN are assigned an ID by the local county. Counties must communicate with each other or use an on-line (not web) look-up when students move.

Nevada: State law establishes the SSN as the state's student identifier. Students without an SSN are assigned an identifier by the first Wyoming school enrolling the student. Schools must find and use a prior ID when a student transfers from another Nevada county.

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## **Glossary of Terms Used with Statewide Student Identifiers**

**Crosswalk** To change a number within one system to a corresponding number in another system

**WDE** Department of Education, the state education agency for Virginia

**Alias** A duplicative student identifier assigned to a student who already has an identifier assigned

**Unique** When an identifier is used for only one individual

**Unduplicated** When a student receives only one identifier; no aliases are created

**Ubiquitous** Identifier that is used in all records for all purposes across an entity

**Unchanged (Permanent)** Identifier that is the same for an individual as long as records are maintained

**FERPA (Family Educational Rights and Privacy Act)** 1976 federal law establishing a family's right to have certain personally identifiable data about a student protected from public exposure

**Check Digit** A number that is derived from a set of numbers; used to verify the validity of the set of numbers

**Leading Zeros or Blanks** Zeroes or blanks that occur at the beginning of a number

**Trailing Zeroes** Zeroes that occur at the end of a number

**Identifier** A number that represents an individual

**Algorithm** A business rule that defines how a number is derived

**Random** Numbers in no particular order, e.g., 28473645, 94273843, 18365384

**Sequential** Numbers in sequential order, e.g., 28473645, 28473646, 28473647, etc.

**Block** A set of numbers assigned, designated, or reserved for assignment to students by a specific district

**Individual Student Record System** A data collection, storage, and reporting system that contains individual (unit) records for students

**Student Information System (SIS)** A software application that performs basic student information functions for a school, such as enrollment, scheduling, attendance accounting, and grade reporting

**Aggregate Record** A value that is calculated from individual (unit) records, a statistic that describes a group

**Unit Record** A record (set of data) containing data for only one individual

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**Encrypt** To change an identifier to another number that cannot easily be deciphered to the original number

**Encrypted Identifier** The identifier that results from encrypting another identifier