We Connect the Systems that Power Education®

Solving the pK-12 Data Sharing and Reporting Challenges

Acquire Security, Efficiency, and Information with SIF®

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EDUSTRUCTURES

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Executive Summary

As educators, legislators, and parents press for educational excellence through No Child Left Behind (NCLB) and other initiatives, the growing "accountability" movement seeks to improve learning through the effective use of school data. However, extracting and reconciling data, and preparing accountability reports becomes—in most school districts and State Education Agencies (SEAs)—a labor-intensive and time-consuming process, fraught with inaccuracies and security concerns.

The conflict between increased data management needs and organizational constraints (software and database compatibility, administrative resources, etc.) is driving a paradigm shift from manual data extraction to automated, integrated sharing and reporting solutions.

This white paper examines some of the challenges facing education and identifies emerging solutions built around the standard for data sharing in education, the Schools Interoperability Framework (SIF®).

> *Recommendations to states and districts: consider School Interoperability Framework (SIF) Compliance Certification as a requirement in all RFPs and purchasing decisions in order to ensure interoperability.*
>
> —National Education Technology Plan Action Steps, US Department of Education

Data Silos or Actionable Information?

Libraries, cafeterias, bus routes, classroom instruction, testing and assessment, special education—the time-honored work of schools goes on while an important change has occurred in the process of managing education. Over the past few decades, most school systems have adopted software solutions to automate critical functions and capture mountains of data on their students. But the ability to *capture* data does not necessarily translate to schools' ability to *use* or even easily access data. While data sharing between departments is essential for both accountability reporting and daily operations, critical data is often trapped in "silos" simply because applications— designed as stand-alone solutions—were not built with interoperability in mind. This problem exists with both off-the-shelf and home-grown software solutions. Even when interoperable software packages become available, most schools are unlikely to replace existing solutions due to time and cost prohibitions, as well as dependencies on certain functionality.

The options? For many local and state education agencies (LEAs and SEAs), the answer is a patchwork of ad hoc solutions, which include custom, fragile, point-to-point integration techniques and FTP transfers of exported text files. While point-to-point eventually gets the data where it is needed, the data is still siloed and extremely dependant on manual processes and even on specific individuals within an organization. At best, point-to-point is an unsustainable "work-around" response to ever-growing demands for secure and timely access to highly accurate data.

A better option? Increasingly, LEAs and SEAs are turning to the Schools Interoperability Framework (SIF®) to solve data interoperability, accessibility, and reporting challenges in education through a standards–based IT infrastructure and technologies. The SIF specification has been designed by educators and education software developers to address the specific business needs of education. Using SIF, integration of data from disparate locations and data sources is rapid, secure, more cost-efficient and more accurate than any point-to-point solution. Further, SIF guarantees interoperability between best-of-breed applications, meaning schools can leverage their existing technology investment in SIF compliant applications, rather than solution compromise.

The Anatomy of Interoperability in Education

Fundamentally, school districts, state agencies and the federal government need to integrate data from multiple and disparate sources. However, the number of disparate and non-interoperable applications within an education enterprise—coupled with the unique reporting needs and legislative mandates within various localities—has placed a heavy burden on IT managers, administrators, and even teachers to find a means to manage data.

In this section, we'll contrast and compare the "common" approach of point-to-point data exchange, with the SIF standard for data interoperability in education.

Point-to-Point: The Challenges Inherent in a "Stop-Gap" Solution

Most IT departments take a responsive approach to integration challenges, managing to new requirements with quick solutions that satisfy immediate needs. Consequently, components in the education architecture (e.g., student and personnel databases, directory management solutions, student information solutions) are integrated in a way that minimally impacts the overall infrastructure. This need for a "quick-fix" is most frequently addressed with point-to-point data exchange schemes. The short-term benefits of this approach are low up-front costs and the fact that point-to-point initially gets the job done. Unfortunately, point-to-point does not scale well to growing databases and the addition of new components, and it generally provides little or no value to beyond the need for which it was specifically designed. Because architecture reuse is not a consideration, each architecture component must have a dedicated, physical connection to all others in order to achieve total connectedness.

For example, let's assume a district has an IT infrastructure consisting of ten software applications, each performing a function (e.g., "authorize user," "calculate class fees," "assign grade level") that has value outside its native application. The district wants to share data between applications and attempts to link applications into a data-sharing network. As illustrated in Figure 1, they begin by linking two applications together, yielding one connection. Adding a third application, they must link it to each of the first two. Adding this application has caused the total number of connections to increase to three. Adding the fourth application requires linking it to each of the existing three, producing a grand total of six dedicated connections.
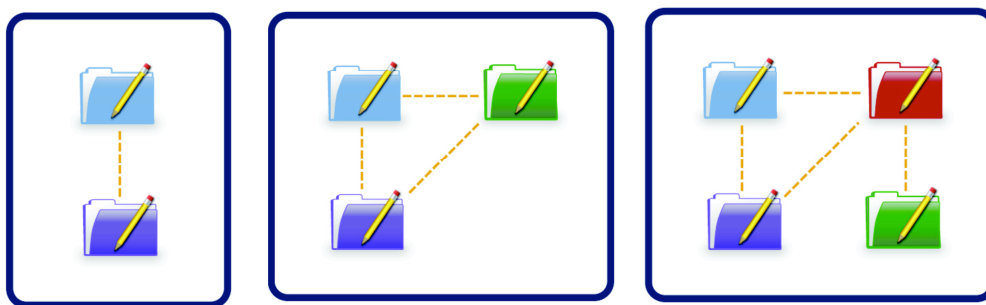
Figure 2

Interestingly, each time the district adds a just single application component to the network, more than one connection must be built to link it in. In fact, the number of new links required is proportional to the size of the network at the time the component is added. When the district is finished networking all ten application in our example, the point-to-point scheme will result in *45* physical connections, as depicted in Figure 2. This is known as the "n squared" problem where a completely connected graph of applications requires $n/2 * (n\text{-}1)$ connections. However, if this graph is "directed," where integration activities require bidirectional channels the number climbs to $n * (n\text{-}1)$, a number which becomes completely unmanageable.
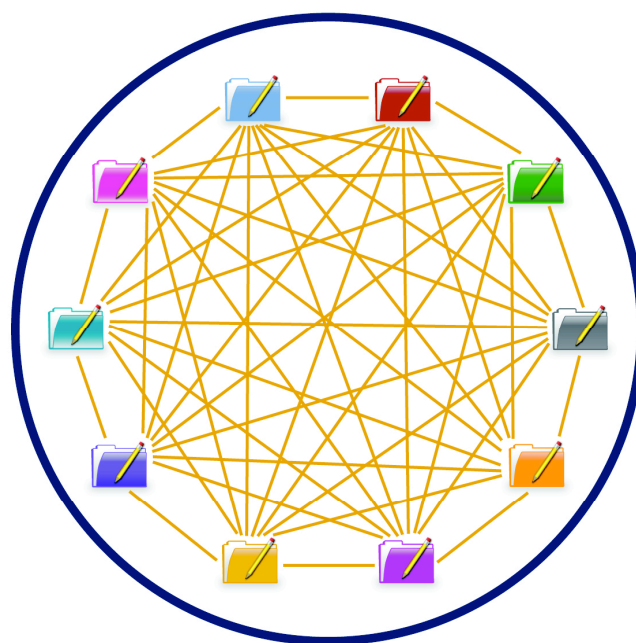

Figure 1

This vast number of connections creates a fragile architecture—imagine the chaos if one or two connections are lost or become disabled for a time. Further, as application vendors enhance their solutions and distribute new software versions, existing point-to-point connection may be broken by new code (if installed). The investment in time and resources made to build the initial point-to-point architecture may discourage (or simply make it unfeasible) the installation of software updates, or the replacement of outdated applications with newer, feature-rich solutions. Finally, point-to-point generally cannot update data changes in real time; instead, some type of batch operation is scheduled, leaving long periods of time when the student information system and other applications have inconsistent data.

While point-to-point may appear to be a simple answer for data sharing, IT maintenance costs swell exponentially and connection sprawl can strangle the infrastructure

as more and more one-off solutions are piled atop one another. This often results in full dedication of IT resources toward simply "keeping the lights on," leaving little left over to support new, strategic initiatives.

SIF: An Enterprise Solution for Education

In comparison, SIF is a sophisticated, Service–Oriented Architecture (SOA) developed to solve data interoperability, accessibility, and reporting challenges in education through standards–based IT infrastructure and technologies. SIF eliminates the instability and cumbersome nature of point-to-point connections. Instead, applications exchange information indirectly via shared middleware components, which act together to distribute messages between isolated applications. This architecture is known as a SIF zone.

The middleware components of a SIF zone include a Zone Integration Server (ZIS)—which acts as distribution hub for messages between applications—and two or more SIF agents (one SIF agent for each participating software application). In the zone diagram below (Figure 3), note that each application only has one integration point—from the application to the ZIS.

This architecture shields any application in the SIF zone from the technical details of all other applications, resulting in a web of loosely coupled integration relationships that span the SIF zone. This characteristic is extremely powerful because it provides a comprehensive, flexible IT environment that scales to support nearly any data integration need in the education enterprise, from small districts to statewide integration implementations. Further, SIF establishes choreography that supports both horizontal and vertical data and application integration, enabling faster and more accurate reporting between districts, states and federal agencies. And the fact that all SIF-enabled applications use the same integration methodology, makes training and troubleshooting much easier. And, because SIF is an open standard, vendors can choose from a variety of technology platforms (Java, .NET, C++, etc.) to implement their agents.

Figure 3

The SIF messaging infrastructure has the following features that would be difficult to achieve with any point-to-point solution:

- Time and data savings—data is entered only once and in one application that automatically (in real-time) propagates this data to other applications. Further, if

an agent is temporarily unavailable, the ZIS automatically queues all of the messages intended for that agent until the agent comes back online—data is never lost. This is known as a "durable queue."

- More effective and accurate exchange of data—Using SIF forces districts to catch and correct "dirty" data at the source. New data, changes and corrections are entered once—from a single point of entry—and propagated throughout the enterprise, assuring that data is consistent across the enterprise.

- Authoritative data sourcing—in a SIF Zone, no more than one application is authoritative for any specific type of data. This prevents collisions and helps improve data integrity across all applications.

- Event reporting—data can be added or changed in real time in all participating applications.

- Request/response processing—an agent can request all data of a specific type, or data matching certain criteria, and the ZIS will retrieve the data on that agent's behalf from the agent for the authoritative application.

- Data-driven decision-making—no longer is critical data trapped in "silos." SIF provides vital information—not just data—that allows administrators and teachers to make informed educational and administrative decisions based on accurate, timely data.

The Time for a Standard is Now

While other educational interoperability standards exist—including SCORM and IMS, for Web-based e-learning—SIF is the leading industry standard, based on a technical blueprint for pK-12 products that enable software from different companies to share information. SIF facilitates the timely and secure transfer of highly accurate data that allows school administrators and educators to make informed educational and administrative decisions. Ultimately, the objective of SIF interoperability—by allowing educators quickly assess and respond to educational needs--is to increase in the educational achievement of all pK-12 students.

SIF has matured and now includes over 7,000 data elements. The organization behind the standard, the SIF Association (SIFA), is now over 900 members strong, including solution vendors, districts, SEAs and the US Department of Education, and continues to evolve the SIF specification to meet real-world needs. SIFA's formal certification program provides third-party validation for products developed using the SIF specification. A software solution that successfully completes the SIF Certification program can carry the "SIF Certified" logo indicating it has been tested and certified to properly communicate and share information with other SIF Certified software programs.

While SIF was initially conceived to provide data interoperability within LEAs, the standard has become an especially compelling methodology for statewide longitudinal data system projects. Indeed, recent federal grants for longitudinal data systems were overwhelmingly awarded to SEAs proposing SIF-based implementations. Further, the reputation of SIF for delivering successful interoperability in US schools has

expanded internationally. In 2007, the British Educational Communications and Technology Authority (Becta) implemented the UK's first SIF proof-of-concept, and Australia is in the planning phases for SIF implementations nation-wide.

Conclusion

Point to point integration is the past; SIF is the present and future of school application interoperability. The increased reliability, security, and efficiency of SIF's standards-based approach means that districts and SEAs save time, money and headaches while delivering more accurate data. SIF lets educators:

- Close the gap by integrating data across applications and physical sites

- Protect existing investment in expensive applications software

- Gain access to timely, accurate information when and where it's needed

- Save time, effort and expense while gaining new, powerful capabilities from more timely data, more accurate data and more well-integrated data

> *Data collection systems must be transparent and accurate so that we can understand what is working and what isn't and for whom. But it's not enough just to collect data. We also need to use the data we collect to implement change, including by personalizing learning to make it more relevant and engaging for students— and thereby truly ensure that no child is left behind.*
> —Bill Gates, Chairman, Microsoft, March 2007

About Edustructures

Edustructures is the recognized leader in SIF integration solutions for education, making it possible for market-leading solutions to reliably and securely share data in real-time. Edustructures delivers:

- Premier SIF technology—the SIFWorks® integration platform is the foundation of more SIF implementations, in the U.S. and internationally, than any other SIF solutions provider

- Comprehensive Professional Services—best practiced-based implementations and ongoing customer support assure SIF success

- Strategic industry relationships—ensuring that *we connect the systems that power education*™

For more information about Edustructures, please visit www.edustructures.com, or call toll-free at 877.790.1261