

SEA Application Architecture



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Introduction

The Decision Support Architecture Consortium Project (DSAC), under the general sponsorship of CCSSO, offers a collaborative, standards based, cost effective approach to defining and creating SEA data systems.

DSAC solutions are built around the concept of “vertical reporting” that address federal reporting requirements. Beyond satisfying NCLB mandates, DSAC solutions will define frameworks and platforms for the more effective use of system wide data to improve student instruction and assessment, and program resource utilization.

An effective architecture for state level decision support for improving and sustaining academic performance is comprised of four key elements:

Human Systems

- A. Core Processes that include those “business” processes whose definition, support and proper execution are critical to an effective decision support system geared to improving instruction.
- B. Enabling Processes that include those business, policy, staff development, communication and organizational processes necessary for the organization to reach its goals.

Data Systems

- C. An Application Architecture of databases and technology tools that comprise the information systems necessary for instructional improvement efforts.
- D. System Interfaces between the USED, state education agency, government agencies, quasi-public, local/regional agencies.

There is a tremendous overlap between each of the 50 states’ needs and unique conditions that define each state. Where possible, CCSSO-CELT’s DSAC will draw on open standards and efficiencies of scale and, where appropriate, the Consortium will create individualized resources to support each state’s distinct needs.

I. Architecture for Decision Support

A. Core Processes

With the passage of No Child Left Behind, all states must now undertake six core processes:

1. **Set Academic Standards and Curriculum** – a process to identify, define, refine, communicate and monitor the state’s standards for learning by subject and grade. In some states this includes the naming of courses and the establishment of course requirements. This may include statewide textbook selection and the selection of instructional management tools for the LEAs to use.
2. **Administer Performance Based and Standardized Assessments** – a process to define the performance criteria that should be achieved by students as relates to the standards and a method to assess and report each student’s progress relative to the criteria.
3. **Certify Educators** – a process to establish teacher and educational administrator competency levels as related to the state standards and to certify teachers that have achieved the proper level of competency.
4. **Conduct Data Driven Analysis and Interventions and Manage Accountability Systems** – the process of collecting and analyzing assessment data to identify and conduct interventions at the school, classroom and student level. Also includes defining expected performance levels for districts, schools and teachers, and holding them accountable for achieving these levels, with the appropriate rewards provided for success.
5. **Distribute Grants/Aid and Ensure Compliance** – the process of collecting data and distributing funding to school districts either as direct state aid or through state or federal grants. Grants can be either competitive or based on entitlement formulas. This process also ensures compliance with federal and state requirements (such as Title I compliance).
6. **Collect and Report Data** – the process of collecting student, educator, and program/organization data from the school districts relative to all aspect of educational information.

Processes 1-6 above are common to all 50 states, although the particular implementation priorities, sequences, and norms may vary.

B. Enabling Processes

All of the above core business processes are linked with each other and supported by enabling processes which include:

1. **Use Data to Drive Decisions** – The process of using proper organizational constructs and data analysis tools to provide quality decision making in a timely manner.
2. **Assess Funding Needs** – Ensuring that funds and grants are provided to implement and support the Core Business Process at the state and LEA level.
3. **Establish Policies with Stakeholder Involvement** – Objectives and processes established by the legislature to determine the type of outcomes that are desired in the state.
4. **Publish Information and Provide Communication** – The process of providing information to LEAs, communities, parents and key business stakeholders relative to student achievement and the curriculum that is available to assist them.
5. **Provide Technical Assistance and Staff Development** – Training of staff so that they are capable of using the technology and understanding the processes associated with improving academic performance.
6. **Manage Internal Processes** – Managing internal processes to create clearly defined procedures, role descriptions, measures and technology based systems to ensure efficiency and effectiveness.
7. **Provide Organization/Staffing** – Ensuring that the proper organizational structure and staffing is in place to support the Core Business Process.

C. Application Architecture

The applications architecture (databases, applications and infrastructure) and the core processes are integrated so that there is a comprehensive system comprised of the hard and soft elements within each of the Core Business Processes.

To properly support and accomplish the core processes, all states need the following 12 system components, at a minimum, to support NCLB requirements:

1. **Enterprise Directory + Security Portal:** a set of synchronized LDAP and relational databases with distributed administration tools that maintain core information, authentication, and authorization data for school organizations and those educators (administrators) that require personalized access to state on-line applications.
2. **Student ID + Record Collection (SPED, Voc, etc.):** a system to register each student with the state, assign and maintain a unique random ID, and collect individual student records several times a year.

3. **Educator Certification Management:** a system to register and license educators and maintain licensure information through a teacher's career.
4. **Staff Record Collection and Highly Qualified Determination:** a system to collect individual records linked to the state certification system for both licensed and unlicensed educators.
5. **State Curriculum Management (learning standards, courses):** a system to publish state learning standards, course definitions, and recommended/restricted content (textbooks).
6. **State Assessment Results Management:** each state needs a system to accept individual and aggregated results from their assessment vendor to merge into decision support tools to support accountability determinations.
7. **Grant and Program Data Collection:** states require applications to collect information from school and district personnel above and beyond the individual student and staff records collected. Workflow can be enabled to utilize the web to improve efficiency.
8. **End of Year Finance Data Collection:** states need to collect structured tables of financial data each year.
9. **Safety and Discipline Information Data Collection:** districts must report every incidence of violence through the state to the Federal government. Since an incident is not a characteristic of the student, a separate system needs to track each incident as it relates to above identified students.
10. **Facilities and Technology Plan Data Collection:** all school districts must report certain technology related data to the state. Many states require districts to report additional information related to facilities.
11. **Data Warehouse:** all of the above information must be stored in granular and structured format in an enterprise data warehouse.
12. **Decision Support Tools:** all of the data in the data warehouse and some of the dynamic collection databases must be made accessible to authenticated and unauthenticated users. Initially these queries may be highly structured to fulfill reporting requirements. Eventually, state decision support environments will integrate with district environments to provide educators, students and parents with all relevant data to support student learning.

The specific boundaries among the above twelve (12) suggested sub-systems are somewhat arbitrary. However, the list is offered as a reasonable set of sub-systems around which a project can be defined.

D. System Interfaces

In addition to the above twelve required components, states may also provide LEAs with the following types of systems:

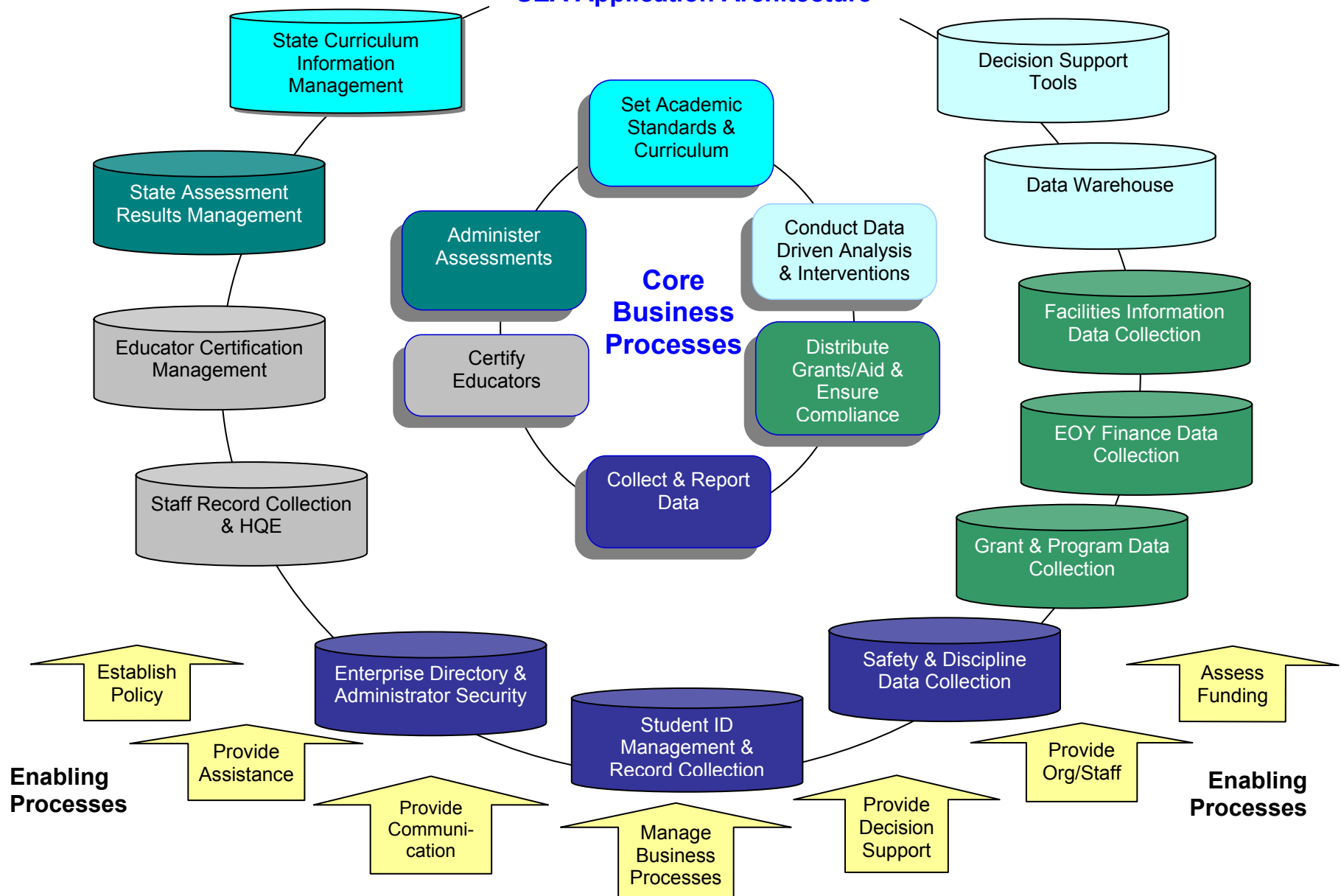
1. **Administrative Applications**
 - Student Information System (SIS)
 - Special Ed

- Food Service
 - Library Management
 - Transportation
 - HR
 - Finance
2. **e-Learning Applications**
- Curriculum and Learning Standards Management
 - Instructional Management System
 - Course Management System
 - Learning Management System
 - Online Assessments
 - Digital Library
 - Online Professional Development
 - Online Tutoring
 - Student Work Portfolio
3. **Decision Support Applications**
- Data Warehouse
 - Decision Support Tools
4. **Learning Community Applications**
- Parent/Student Communication and Collaboration
 - Portal and Middleware Services

The core processes, applications architecture (databases, applications, and infrastructure), and the enabling processes are integrated so that there is a comprehensive system comprised of the hard and soft elements within each of the core business processes. The picture that follows shows the core business processes and the interplay of the application architecture with the supporting enabling architecture.

Architecture for Decision Support

SEA Application Architecture



II. Universal State Functional Requirements

These requirements are intended to document those information systems SEAs must have to fulfill their responsibility under No Child Left Behind including the following programs:

CFDA Code	Title
84.002	Adult Education – State Grant Program
84.010	Title I Grants to Local Education Agencies
84.011	Migrant Education – Basic State Grant Program
84.013	Title I Program for Neglected and Delinquent Children
84.027	Special Education – Grants to States
84.048	Vocational Education – Basic Grants to States
84.126	Vocational Rehabilitation Services –Grants to States
84.144	Migrant Education – Coordination Program
84.186	Safe & Drug-Free Schools & Communities – State Grants
84.213	Even Start – State Educational Agencies
84.243	Tech-Prep Education
84.287	21 st Century Learning Centers (After School)
84.318	Enhancing Education Through Technology (E2T2)
84.331	Grant to States for Workplace and Community Transition Training for Incarcerated Youth Offenders
84.365	English Language Acquisitions, Language Enhancement, and Academic Achievement Program for Limited English Proficient Children

At minimum, the state system must:

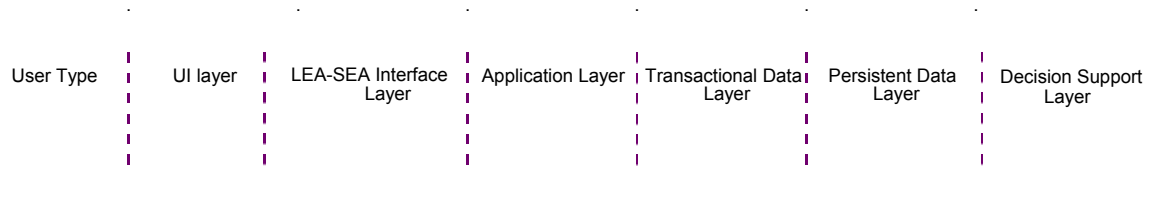
1. Enable both LEA and SEA defined users to authenticate and access appropriate applications.
2. Enable LEA and SEA users to maintain an accurate directory of school organizations and data reporting administrators.
3. Enable LEAs to register and re-register students for unique, consistent over time, state assigned, student IDs.
4. Enable the SEA to collect individual students records from LEAs with the following characteristics/elements:
 - a. Student ID (Local)
 - b. Student ID (State)
 - c. Social Security Number (OPTIONAL)
 - d. Last Name
 - e. First Name
 - f. Middle Name
 - g. Generation Code
 - h. Date of Birth
 - i. Race/Ethnicity

j. City of Birth	cc. USA Entry Date
k. City of Residency	dd. English Proficiency (LEP Status)
l. Gender	ee. Home Language
m. Meal Status	ff. Migrant Last Qualifying Move Date
n. Economic Disadvantage	gg. Summer Migrant Service
o. Grade Level	hh. Summer Migrant District
p. Enrollment Status	ii. Summer Migrant Year
q. Exit Status	jj. Regular Year Migrant
r. Exit Type	kk. Regular Year Migrant School
s. Days in Membership	ll. Regular Year Migrant School Year
t. Days Attended	mm. IDEA Disabled (IEP)
u. Days Absent	nn. Primary Disability Type
v. Session Type	oo. Secondary Disability Type
w. School Year (Session Begin Date)	pp. Title I Participation
x. School Year (Session End Date)	qq. Title I Related Supplemental Services
y. Graduation Time	rr. IDEA Related Supplemental Services
z. School ID	ss. Truancy Status
aa. Entry Date	tt. Discipline Status
bb. Exit Date	

5. Enable SEAs to process and integrate from assessment vendors the following elements linked to state student ID.
 - a. Reading Assessment Score
 - b. Reading Proficiency Level
 - c. Mathematics Assessment Score
 - d. Mathematics Proficiency Level
 - e. Science Assessment Score
 - f. Science Proficiency Level
 - g. Other Assessment Score
 - h. Other Assessment Proficiency Level
 - i. Score Interpretation
 - j. Other Indicator Status
 - k. Full Academic Year Status
 - l. English Proficiency Progress
 - m. English Proficiency Status

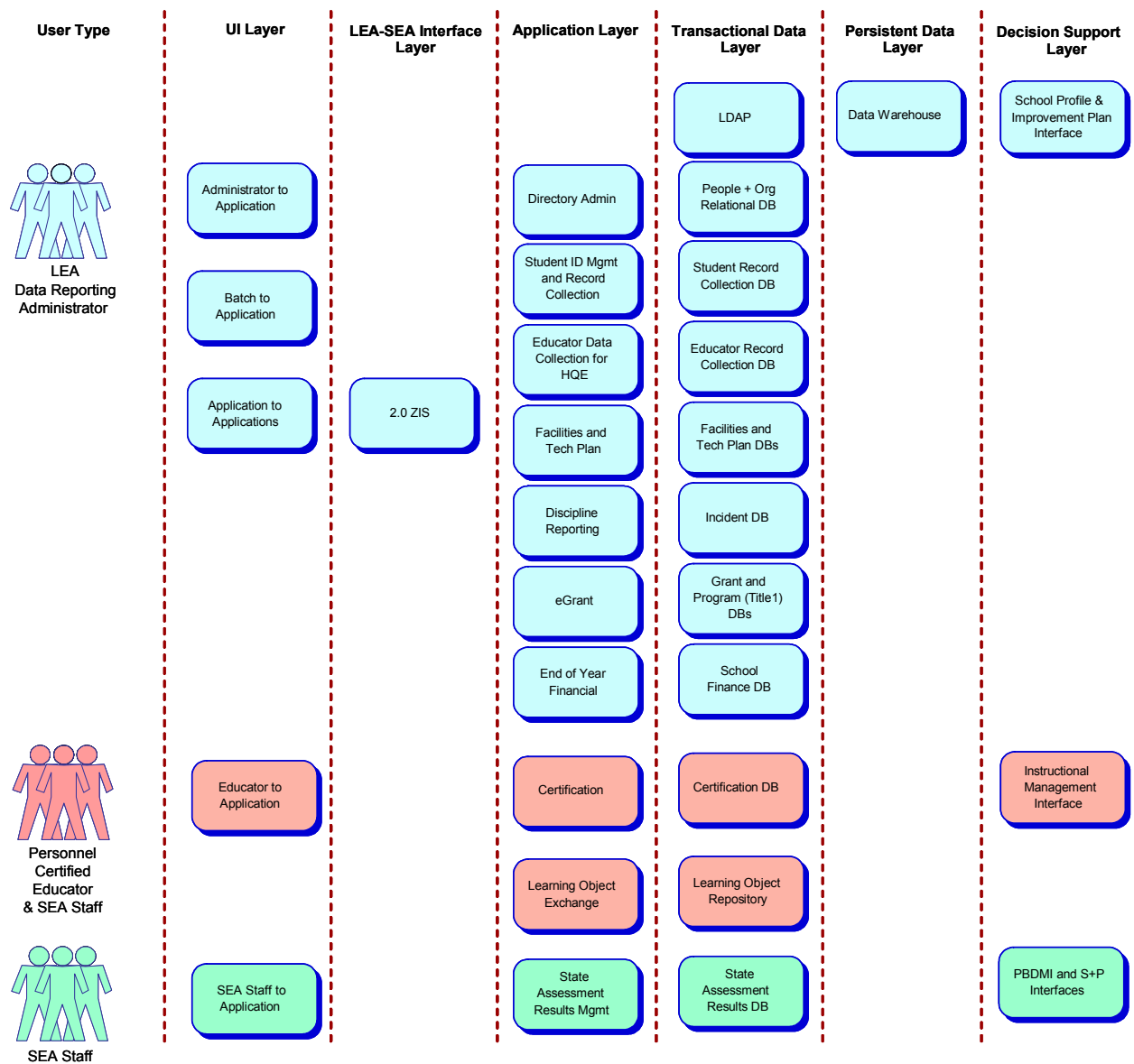
6. Enable the SEA to maintain teacher certification information and substantially improve processing efficiency.
7. Enable the SEA to collect from the LEA records on each employed educator (certified or paraprofessional) with the following elements:
 - a. Staff ID
 - b. Staff Type (Elementary, Secondary, Paraprofessional)
 - c. Teaching in Credential (Y, N)
 - d. Highly Qualified (Y, N)
 - e. New to the School (Y, N)
 - f. Academic Subject
 - g. Teaching Experience Range
 - h. Teacher Credential
 - i. Teacher Highest Education Level
 - j. Teachers Trained in Technology
 - k. ELL Instructors ESL (Certified/Not)
 - l. ELL Instructors Bilingual (Certified/Not)
8. Enable the SEA to collect information from LEAs on each incidence of violence or drug use, linked to state student ID for both offender and victim.
9. Store snapshots of data from all of the above inferred systems in a data warehouse that enables retrieval of granular and aggregate reports.
10. Enable SEA and LEA staff to analyze confidential and public data from above to determine Adequate Yearly Progress for each school and district sub-group, Highly Qualified Educator metrics, conduct research, and fulfill other such statutory and regulatory state and federal reporting requirements.
11. Enable public access to public data above, structured as profiles for each school and district.

From a systems perspective, these requirements can best be understood by looking at them in seven distinct tiers:



1. **User Type** - The three types of users that SEAs system directly touch are (1) the LEA or regional service provider responsible for data reporting; (2) educators certified by the state; (3) SEA staff and others responsible for managing systems for (1) and (2) above.

2. **UI Layer** – Similarly, there are three main interfaces that users need: (1) direct user entry by authorized users through web-based templates; (2) user upload of batch files that are staged, cleaned, validated and signed-off on by authorized users; and (3) application to application interoperability, with user controls built into a SIF-compliant application registered as a web service in UDDI in a 2.0 SIF Zone Integration Server (ZIS).
3. **LEA-SEA Interface Layer** – When a 2.0 ZIS is deployed, the maintenance of web service registration and SIF 1.x compliant agents must be managed. An example of how this would work is a user at the LEA level registering a student. This requires that a unique student ID (SASID) be assigned by the state from within the district's student information systems (SIS). Invisible to the user, the district's SIS would use its authority within the 2.0 ZIS to send a student locator object request to the state's SASID manager, which would then return the correct previously assigned SASID or, if new to the state system, would assign a new one.
4. **Application Layer** – The application layer tends to define the scope of individual projects. While common enterprise components such as server operations, data warehouse, decision support and user support require their own, ongoing technical teams, application boundaries should be scoped to produce fully functioning applications with clear return on the public funds investment.
5. **Transactional Data Layer** – In general, each application will have its own transactional database maintaining the most current information from the application.
6. **Persistent Data Layer** – At pre-defined intervals, a snapshot of the transactional data is stored as granular data in a data warehouse. N-dimensional "cubes" bring together aggregate reports for use in decision-support.
7. **Decision Support Layer** – A specific category of tools (applications) needs to be deployed to manage both structured reporting and interfaces as well as ad hoc querying tools.



CCSSO-CELT-USOeC General Systems Requirements for State Education Agencies to create PBDMI data set and fulfill core business processes of No Child Left Behind

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