

# Student Data Aggregation Calculator

by



## Technical Design Overview

**Version:** 1.0

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## SYSTEM OVERVIEW

inBloom through its shared technology infrastructure is opening doors for school district staff that have typically only interacted with software systems as a means for entering student data or viewing static reports that are often outdated and incomplete. Given the breadth and depth of data the inBloom Data Store encompasses, access to real-time, accurate and relevant student data is now possible.

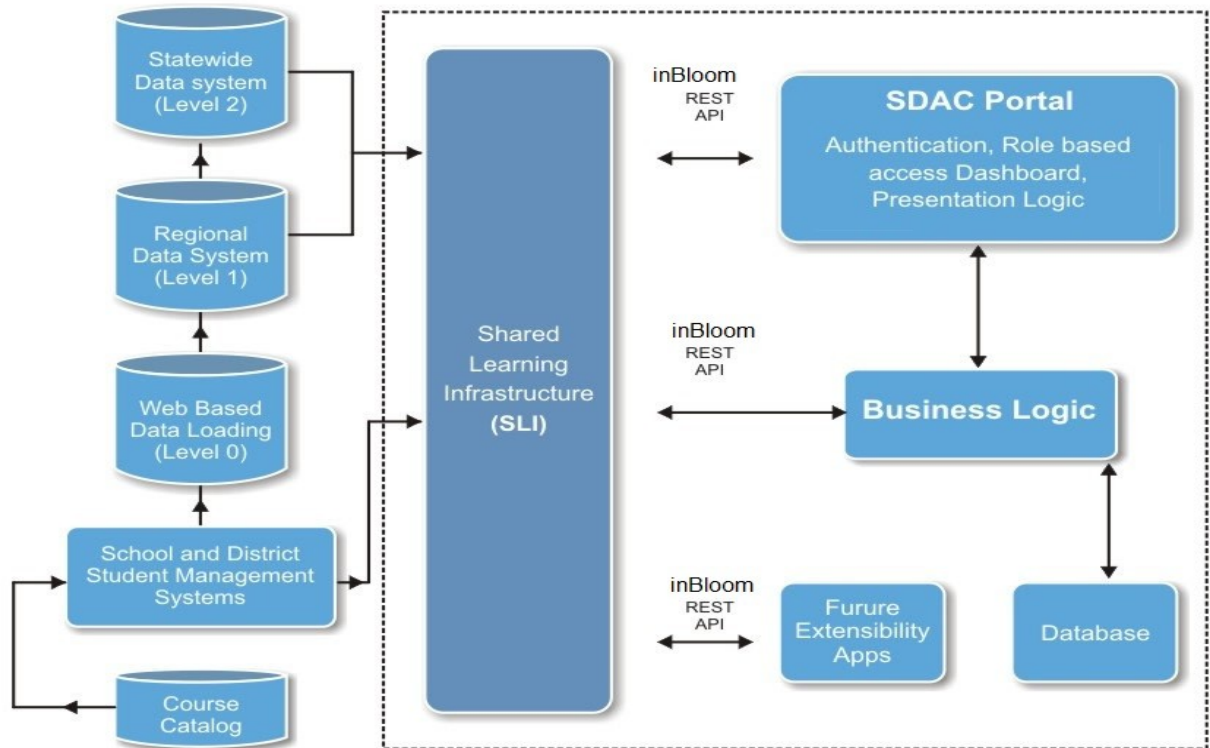
The approach in designing the Student Data Aggregation Calculator (SDAC) is focused on delivering an intuitive tool that will enable district personnel to view student data that is both relevant to their needs and that can lead to some actionable outcome.

The user interface is simple yet effective, the features and functions are extensive with a focus on usability and the technology stack is reliable and scalable. There are many stakeholders in the district who will benefit from the SDAC as a way to make data-driven decisions that impact student achievement.

To support this vision, the solution architecture will have the following characteristics:

- Accessibility of data and content anywhere and anytime by user role.
- Extensibility of functionality in the system environment.
- Interoperability with inBloom to support access management, access control, and data exchange.
- Adhere to standard security policies in the education domain.
- System usability & accessibility of web-based information and applications

# SOLUTION ARCHITECTURE



## Solution Architecture Description

The SDAC (Student Data Aggregation Calculator) application consists of a 3-tier architecture. The flag based search solution is designed to be a simplistic tool for district and school administrators, providing various reports.

The architecture is comprised of three distinct layers.

## Presentation Layer / User Interface

The presentation layer consists of the user interface designed for the web. The presentation layer presents relevant information in a context that is meaningful to end-users, allows discovery of information using flags (Individual Flags and Aggregate Flags) and provides for the communication with inBloom infrastructure using the inBloom API for authentication and student data.

The UI interface will ensure consistency and that users can access the information they need in a predictable, user-friendly, accessible environment.

## Business / Application Layer

The functions of the business/application layer are to:

- **Secure** access to information and applications
- **Support** the business process logic
- **Integrate** with disparate systems and applications
- **Process** user data and applications interactions
- **Facilitate** communication and collaboration.

This requires a reference SDAC.DomainModel.dll which is an entity framework model used to call all data access fields from the presentation/application layer.

## Data Layer

The SDAC portal is using Microsoft Entity Framework, which has many benefits including:

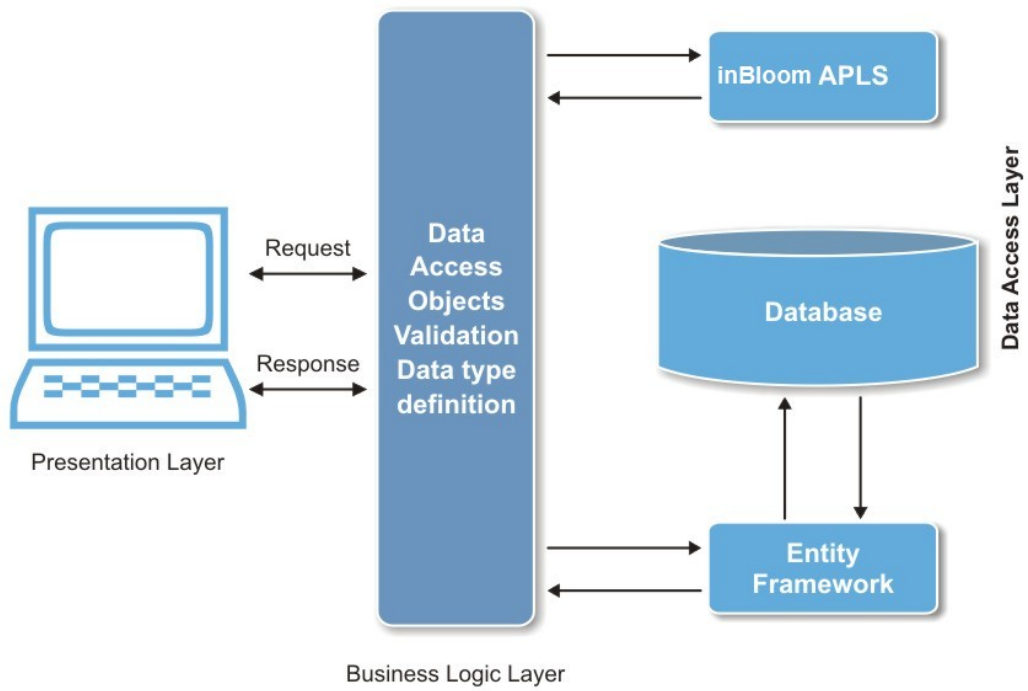
- The conceptual model can be represented in a better way by using relationships among entities.
- The underlying data store can be replaced without much overhead since all data access logic is present at a higher level.

This requires a reference to inBloomApiLibrary.dll which is a .NET wrapper framework (for inBloom Restful API's) in the Data layer. It contains all of Restful API calls.

See the detailed document regarding inBloomApiLibrary at <https://github.com/upeo>

This layer generates business objects and entities according to the database tables and provides the mechanism for:

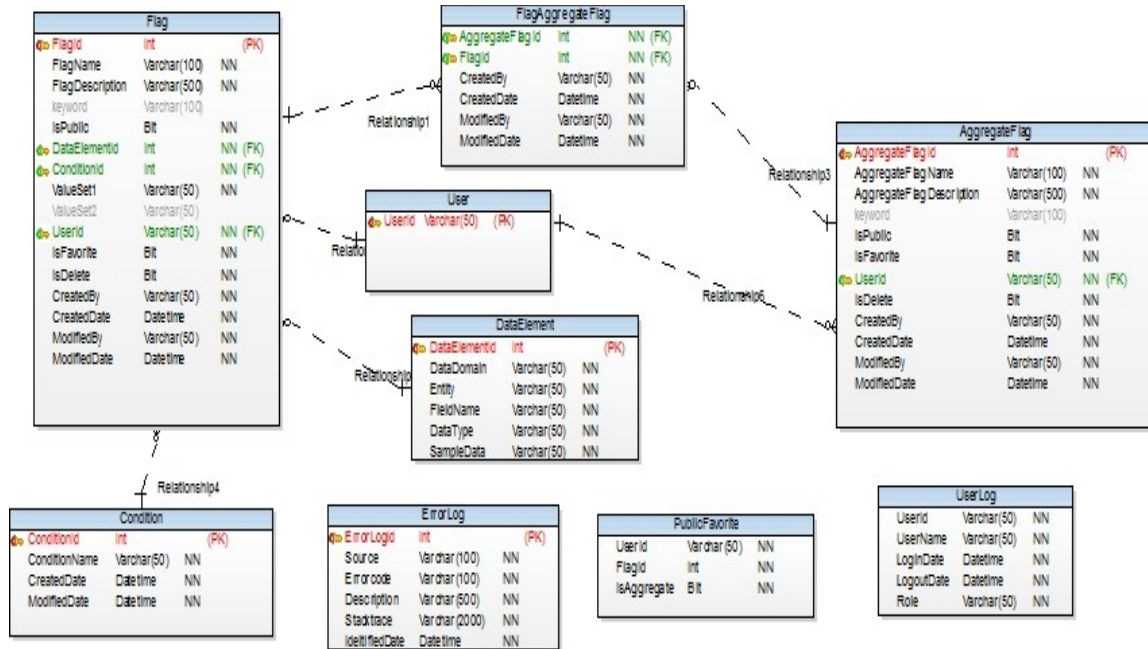
- Performing basic CRUD (Create, Read, Update, and Delete) operations.
- Easily managing "one to one", "one to many", and "many to many" relationships.
- Ability to have inheritance relationships between entities.



# DATABASE

## Entity Relationship Diagram

The following is an Entity Relationship Diagram outlining the tables and relationships that support the operation of the SDAC application.



## Data Dictionary

Table Name: Flag

Description: Table to create a new flag

Column Name	Type	Size	IS Null	Constraints	Description
FlagID	int		No	Primary Key	Identity Column
FlagName	varchar	100	No		Name given to a flag
FlagDescription	varchar	500	No		Description of the flag
Keyword	varchar	100	Yes		Keywords for the flag
IsPublic	bit		No	Default	Type of flag. 0 = Private and 1 = Public. Default is set to 0
ConditionID	varchar	50	No	Foreign Key	Condition selected for the flag
DataElementId	int			Foreign Key	Data Element selected bu the user
ValueSet1	varchar	50	No		First value set for the flag
ValueSet2	varchar	50	No		Second value set for the flag
UserID	varchar	50	No	Foreign Key	Id of user who created the flag
IsFavorite	bit		No		Set flag as favorite. 0 = No and 1 = Yes. Default is set to 0

IsDelete	bit		Yes		For soft delete. 0 = Default and 1 = Delete
CreatedBy	varchar	50	No		name of the user who created the flag
CreatedDate	datetime		No	Check	Created date
ModifiedBy	varchar	50	No		name of the user who modified the flag
ModifiedDate	datetime		No	Check	Modification date

Table Name: Aggregate Flag

Description: Table to create a new aggregate flag

Column Name	Type	Size	IS Null	Constraints	Description
AggregateFlagID	int		No	Primary Key	Identity Column
AggregateFlagName	varchar	100	No		Name given to an aggregate flag
AggregateFlagDescription	varchar	500	No		Description of the aggregate flag
Keyword	varchar	100	Yes		Keywords for the aggregate flag
IsPublic	bit	10	No	Default	Type of flag. 0 = Private and 1 = Public. Default is set to 0
IsFavorite	bit		No	Default	Set flag as favorite. 0 = No and 1 = Yes. Default is set to 0
UserID	varchar	50	No	Foreign Key	Id of user who created the aggregate flag
IsDelete	bit		Yes		For soft delete. 0 = Default and 1 = Delete
CreatedBy	varchar	50	No		Who created the aggregate flag
CreatedDate	datetime		No	Check	Created date
ModifiedBy	varchar	50	No		Who modified the aggregate flag
ModifiedDate	datetime		No	Check	Modification date

Table Name: Flag Aggregate Flag

Description: Table to describe the relationship between an individual flag and aggregate flag

Column Name	Type	Size	IS Null	Constraints	Description
AggregateFlagID	int		No	Foreign Key	Identity Column
FlagID	number		No	Foreign Key	Flag id used to create aggregate flags
CreatedBy	varchar	50	No		Who created
CreatedDate	datetime		No	Check	Created date
ModifiedBy	varchar	50	No		Who modified the combination
ModifiedDate	datetime		No	Check	Modification date



Table Name: Condition

Description: Table to select conditions for a flag

Column Name	Type	Size	IS Null	Constraints	Description
ConditionID	int		No	Primary Key	Identity Column
ConditionName	varchar	50	No		Name given to the condition
CreatedDate	datetime		No	Check	Created date
ModifiedDate	datetime		No	Check	Modification date

Table Name: User Log

Description: Table to maintain history of user

Column Name	Type	Size	IS Null	Constraints	Description
UserLogID	varchar	50	No	Primary Key	Identity Column
Role	varchar	50	No		Role of the user who has logged in
UserName	varchar	50	No		Name of the user who has logged in
LoginDate	datetime		No	Default	login time of the user
LogoutDate	datetime		No	Default	logout time of the user

Table Name: Error Log

Description: Table to maintain errors that occur during execution

Column Name	Type	Size	IS Null	Constraints	Description
ErrorLogID	int		No	Primary Key	Identity Column
Source	varchar	100	No		file/function where error has occurred
ErrorCode	varchar	100	No		Error number of the error that occurred
Description	varchar	500	No		Description of the error
Stacktrace	varchar	1000	No		Message text of the error that occurred
IdentifiedDate	datetime		No	Check	Date and time when error occurred

Table Name: Public Favorite

Description: Table used to track public flags designated as Favorite

Column Name	Type	Size	IS Null	Constraints	Description
UserId	varchar	50	No		Id of the user who set it to favorite
FlagId	int	50	No		Flag id to set flag to public
IsAggregate	bit		No		Check whether flag is aggregate or not. 0 = Normal flag and 1 = Aggregate flag



Table Name: Data Element

Description: Table to select a data element and its data type

Column Name	Type	Size	IS Null	Constraints	Description
DataElementId	int		No	Primary Key	Identity column for data element
DataDomain	varchar	50	No		Data domain for data element
FieldName	varchar	50	No		Field name of data element
Entity	varchar	50	No		Entity of the data element
DataType	varchar	50	No		Data type of particular data element
SampleData	varchar	50	No		Sample Data for data element

# USER INTERFACE

## Search

Welcome Mrs Linda Kim 

### Student Data Aggregation Calculator

[Help](#)

SchoolEast Daybreak Junior HighCourseELA 6ASectionELA 6A - Sec 5f09My FlagsAt Risk of FailureGO

SEARCH



















































ADD/EDIT

AGGREGATE

☒ Show Public Flags

+ NEW FLAG

+ AGGREGATE FLAG

Name	Description	Keyword	Actions
At Risk of Failure	Identifies students who have three or more absences in the last two weeks. District policy mandates students who are absent 5 or more days within a 15 day period be sent a notice of failure due to absences.	Grade Failure At Risk	    
English Language Learner	Students identified as having limited english proficiency	ELL	    
Free and Reduced Lunch Program	Students participating in a free or reduced lunch program	FRL Free Reduced Lunch	    
Honor Roll	Identifies students who have achieved a GPA of 3.5 or higher	Honor Roll Grade	    
In School Suspension	Students who due to a discipline event were given in school suspension	Suspension Discipline	    
Missing Assignments	Students who are missing one or more assignments	Missing Assignment Grade	    
October Birthday List	Students who were born in the month of October	Student Birthday	    
Out of School Suspension	Students who due to a discipline event were given out of school suspension	Suspension Discipline	    
September Birthday List	Students who were born in the month of September	Student Birthday	    
Tardy List	Students who are late to class as marked by the teacher	Attendance Tardy	    

Showing 1 to 10 of 10 Flags

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## Search Results



Welcome Mrs Linda Kim

### Student Data Aggregation Calculator

School

East Daybreak Junior High

Course

ELA 6A

Section

ELA 6A - Sec 5f09

My Flags

Honor Roll

GO

SEARCH

ADD/EDIT

AGGREGATE

Honor Roll

Identifies students who have achieved a GPA of 3.5 or less

Add Fields to Results

UPDATE

Add to Favorite

Export Results

Copy Flag

Edit Flag

Student ID	Name	Gender	Cumulative Grade Point Average
800000024	Oralia2 Simmer2	Female	3.2

Showing 1 to 1 of 1 Flags

1

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## Add/Edit Flag



Welcome Mrs Linda Kim

### Student Data Aggregation Calculator

School

Course

Section

My Flags

East Daybreak Junior High

ELA 6A

ELA 6A - Sec 5f09

At Risk of Failure

GO

SEARCH

ADD/EDIT

AGGREGATE

Enter information about the flag you would like to create.

Name\*

Enter a name for the flag

100 Characters remaining

Description\*

Enter a detailed description about the Flag. The first two lines of the text will be displayed as a short description. You can also expand the view to display the full description.

500 Characters remaining

Keyword

Enter one or more keywords for the flag (optional)

100 Characters remaining

Follow the steps below to setup the criteria for how the flag should function.

Select a Data Element

Apply a Condition

Set the Value

Preview and Save

Alternative/Supplemental Services

Field Name	Sample Data
Begin Date	2011-03-12
Program Sponsor	State Education Agency
Program Type	Regular Education
Services.Code Value	Test service 1
Services.Code Value	Test service 2

Is equal to

Is not equal to

Is greater than

Is greater than or equal to

Is less than

Is less than or equal to

Starts with

Does not start with

Ends with

Does not end with

Contains

Does not contain

Is between

Is not between

Is one of

Is not one of

Is blank or empty

Is not blank nor empty

Display students where:

Student Name	

Preview

Save

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## Aggregate Flag



Welcome Mrs Linda Kim

### Student Data Aggregation Calculator

School  
East Daybreak Junior High

Course  
ELA 6A

Section  
ELA 6A - Sec 5f09

My Flags  
At Risk of Failure

GO

SEARCH

ADD/EDIT

AGGREGATE

Enter information about the flag you would like to create.

Name\*

Enter a name for the flag

100 Characters remaining

Description\*

Enter a detailed description about the Flag. The first two lines of the text will be displayed as a short description. You can also expand the view to display the full description

500 Characters remaining

Keyword

Enter one or more keywords for the flag (optional)

100 Characters remaining

Select up to 5 flags to be included in the aggregate flag. Use the arrows or just drag and drop to add or remove flags.

☒ Show Public Flags

	Flag Name	Description	Keyword
<input type="checkbox"/>	Honor Roll	Identifies students who have achieved a GPA of 3.5 or higher	Honor Roll Grade
<input type="checkbox"/>	September Birthday List	Students who were born in the month of September	Student Birthday
<input type="checkbox"/>	Out of School Suspension	Students who due to a discipline event were given out of school suspension	Suspension Discipline
	In School	Students who due to a discipline event were given in	Suspension

>

<

Save

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## OTHER ASPECTS

### Error Handling

The most specific technique for exception handling, and the most useful in terms of gracefully recovering from the exception, is structured exception handling. Structured exception handling is a standard practice in .NET. It provides built-in support for structured exception handling. In structured exception handling, you wrap code that may throw an exception in a Try...Catch block and logs the exception in the database.

### Objects in the SDAC System

- Student
- Course
- Section
- District
- InBloomApi
- AuthenticateUser
- InBloomApiHelper
- EnumHelper
- ConfigurationHelper
- DescriptionAttribute
- ConfigurationSettingEnums
- QueryStringTokenEnum
- SessionEnum

### Logs

The SDAC application will log all the error messages generated in the system with the error source, error number, and error description so that erroneous activities can be understood by looking at the logs. The SDAC will also keep track of every time the user signs into the system.

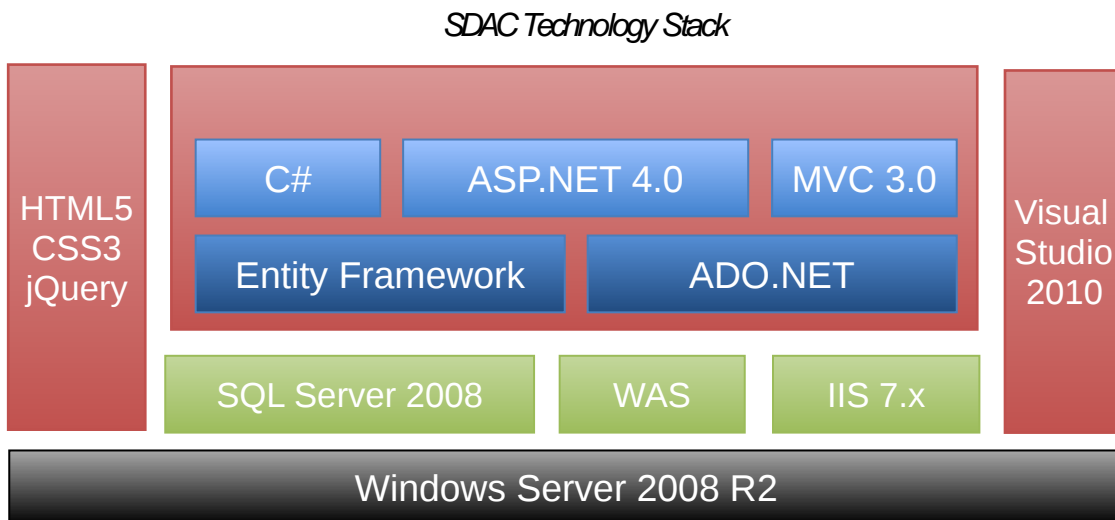
## SYSTEM CAPABILITIES

1. *Event logging*—offers a centralized logging framework, assists developers, quality assurance, support teams, and operations teams to troubleshoot issues, as well as track flow of data within a business transaction, and ability to track/audit user operations done via the exposed user interfaces.
2. *Role based access control (RBAC)*—offers a flexible RBAC framework, supports views for various roles like educators and roll up data for administrators. The system will restrict, in a timely manner, access based on changes in association with a student.
3. Interacts with a rich API layer (inBloom API) for service creation, orchestration, access, and management.



## IMPLEMENTATION TOOLS & TECHNOLOGIES

The SDAC application is architected, designed and implemented using a subset of the Microsoft Technology stack. This technology stack provides a firm foundation for building robust, scalable and maintainable applications. In addition, standard and open web technologies are also included in the design and development of the solution.



### Project Technology

- ASP.NET 4.0
- C#, JSON, LINQ, REST Services, JQuery, CSS

### Database

- Microsoft SQL Server 2008 R2

### Tools

- Project Management: Microsoft Project
- Development: Visual Studio 2010
- Source Control: SVN