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North Carolina Statewide Technical Architecture

Implementation Guidelines:  
Data Architecture

STATEWIDE TECHNICAL ARCHITECTURE

# Implementation Guidelines: Data Architecture

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## Introduction

The intent of this document is to provide general implementation guidelines within the data domain. This will help to ensure that the State of North Carolina adopts uniform and consistent implementations of data solutions across the enterprise.

The key goal of this document is to outline implementation guidelines that, when followed by the solution developers, will lead to a well-designed data solution that has the flexibility to grow with changes in technology and can be maintained in an efficient and effective manner, which is a fundamental principle of the North Carolina Statewide Technical Architecture.

*This implementation guild is currently being revised both to better reflect the state of technology and improve upon existing architectural guidelines to better support state agency initiatives.*

## Implementation Guidelines

### Implementation Guidelines for Federated Metadata

#### **Guideline 1: Use and actively maintain the Federated Metadata Repository (FMR).**

##### **Rationale**

- Avoid defining data elements on an application-by-application basis.
- Each agency must use and actively maintain the information stored in the FMR to maximize collaboration.
- Establish and document consistent definitions for data elements with anomalies.

#### **Guideline 2: Propose new Federated Metadata Repository standards when applicable.**

##### **Rationale**

- Review data models for new repository standards.
- Propose new repository standards to the Metadata Element Review Team.

**Implementation Approach for Federated Metadata**

<b>Avoid New Deployment Migrate from Technology</b>	<b>Current Technology Direction</b>	<b>Emerging Technology</b>
Definitions of data elements on an application-by-application basis.	<p>Active use of the Federated Metadata Repository. Each agency must actively maintain the information stored in the FMR.</p> <p>Share data across the state through the use of the Service Broker, using FMR metadata exchange standards.</p> <p>Establish and document consistent definitions for data elements with anomalies.</p>	<p>XML formats for describing data exchange using the North Carolina Service Broker.</p> <p>(For more information on XML formats, refer to the Componentware Architecture chapter.)</p>

*Table 1 - Implementation Approach for Federated Metadata*

**Implementation Guidelines for Data Modeling**

**Guideline 1: Use a data-modeling tool to define logical and physical models.**

**Rationale**

- Data modeling tools ease the complication of creating logical and physical models.
- An agency should standardize on a single data-modeling tool for consistency.
- Many modeling tools are able to use the physical model to create data definition language (DDL) and actually create the database.
- The model created can be archived and used for future changes to the database.

**Guideline 2: Perform the logical modeling process before the physical modeling process.**

**Rationale**

- Avoid creating logical and physical models at the same time.
- Involve business users in the logical design phase.
- The creation of the physical model occurs after the logical model has stabilized.

**Implementation Approach for Data Modeling**

<b>Avoid New Deployment Migrate from Technology</b>	<b>Current Technology Direction</b>	<b>Emerging Technology</b>
Creating Logical and Physical Models at the same time	Use data modeling tools to define logical and physical models. Separate the logical and physical modeling process. Be sure to involve business people in the logical design phase. The physical model must occur after the logical model is nearer to completion.	BPM, UML, RUP

*Table 2 - Implementation Guideline Summary for Data Modeling*

**Implementation Guidelines for DBMS**

**Guideline 1: Use a relational database technology with ANSI-standard SQL92.**

**Rationale**

- Avoid implementation of non-relational database technology (e.g., IMS, VSAM).
- Avoid vendor-specific SQL extensions, which create database vendor dependence.
- Use flat files only in special cases, such as storing non-structured data and temporary work storage.

**Implementation Approach for DBMS**

<b>Avoid New Deployment Migrate from Technology</b>	<b>Current Technology Direction</b>	<b>Emerging Technology</b>
Non-relational database technology (e.g., IMS, VSAM, or flat files)	Relational database technology (RDBMS)	Object-Oriented Databases (ODBMS)
Vendor-specific SQL extensions	ANSI-standard SQL92	ANSI-standard SQL3

*Table 3 - Implementation Guideline Summary for DBMS*

**Implementation Guidelines for Data Access  
Middleware**

**Guideline 1: Use OLE DB or JDBC to separate business rules from the data access tier.**

**Rationale**

- Use of OLE DB or JDBC will isolate the business rule from the data access tier when data modeling or database technology changes occur.
- The OLE DB and JDBC Call Level Interfaces (CLIs) are designed especially for object-oriented languages.
- Much less software and related maintenance is required on the client side when the middleware is server based.

**Implementation Approach for Data Access Middleware**

<b>Avoid New Deployment Migrate from Technology</b>	<b>Current Technology Direction</b>	<b>Emerging Technology</b>
Workstation implementations of ODBC and ANSI SQL  ODBC versions prior to 3.5 (Microsoft Data Access Components (MDAC 2.12)).	Server implementations of OLE DB and JDBC.	None at this time

*Table 4 - Implementation Approach for Data Access Middleware*

## Implementation Guidelines for Data Access Implementation

**Guideline 1: Minimize duplication of data across the state by sharing data through the use of the North Carolina Service Broker (NCSB) or the interface engine (HIE).**

### Rationale

- Avoid the use of database gateway technologies.
- Use the NCSB and HIE to share data both within and between agencies to minimize duplication of data.

**Guideline 2: Use data access routines using embedded SQL.**

### Rationale

- Avoid implementing a significant amount of data access rules through stored procedures.
- Stored procedures must only be used when necessary to improve performance.
- Triggers must only be used to support referential integrity, not data access rules.

### Implementation Approach for Data Access

Avoid New Deployment Migrate from Technology	Current Technology Direction	Emerging Technology
Implementing a significant amount of data access rules through stored procedures	Data access routines using embedded SQL.	None
Database Gateway technologies	Use North Carolina Service Broker (NCSB) or HIE, especially for access to inter-agency data.	None

*Table 5 - Implementation Guideline Summary for Data Access Implementation*

## Implementation guidelines for Data Security

### Guideline 1: Implement a security model that considers application and database security.

#### Rationale

- Avoid any weak or obsolete security infrastructures.
- Document all the functional data security requirements in the security model.
- Document authorization/administration requirements and requests.
- Document the database-related physical security infrastructure.

#### Implementation Approach for Data Security

Avoid New Deployment Migrate from Technology	Current Technology Direction	Emerging Technology
Any weak or obsolete security infrastructure	Security model that considers application and database security, providing the proper documentation	Enhancements and updates to PKI, EC initiatives, and other security models

*Table 6 - Implementation Guideline Summary for Data Security*