Part II - INFORMATION ARCHITECTURE
Chapter 4 - LOGICAL DATA MODEL

CMS
CENTERS for MEDICARE & MEDICAID SERVICES

MITA
Medicaid Information
Technology Architecture

Table of Contents

List of Figures

List of Tables

No table of figures entries found.

Introduction

The Medicaid IT Architecture (MITA) Framework Information Architecture (IA) recommends data standards, identifies enabling technologies, and interoperable designs for data exchange.

A data model is a preliminary representation that serves as the plan from which architects and designers construct the final object. Data models document the data and the characteristics of that data required to satisfy the needs of a State Medicaid Enterprise. Data models serve as a blueprint or plan for building information systems, and as a tool that enables the reengineering of business processes and enterprise strategies. Specifically, system architects and designers use the MITA data models for guidance in developing messages to produce interoperable technical services.

The topics covered in this chapter include:

- Logical Data Model
- Components of the Logical Data Model
- Developing the Logical Data Model
- Using the Logical Data Model

Purpose

The Logical Data Model (LDM) provides the mechanism for ensuring the completeness of the business model and serves as a tool that enables the reengineering of Medicaid business processes. Using a shared data model, States will achieve true plug-and-play capabilities of services and interoperability.

The LDM provides the following:

- A focus on the data that comprises the organizational, rather than individual, business processes.
- Facilitation of business-focused data analysis.
- Aid in understanding enterprise-wide standardized business rule definitions and business data usage as well as help in uncovering existing data defects.
- A basis for performing data integration and harmonization.
- Improved data quality.

Scope

The MITA Framework discusses the concepts related to the LDM. The following points describe the scope of the model:

- **Identified Data** – The LDM is the framework of all the data required by the defined processes and services described in the Business Architecture (BA) artifacts.

- **Common State Data** – Includes all of the data needed for the Medicaid Enterprise regardless of the technology, location, or organization currently performing the process.
- **Electronic Health Record (EHR)** – The LDM extends to be compatible with EHR requirements.
- **Unique State Specifications** – The SMA is responsible for supplementing the LDM with its unique data requirements in the SMA LDM. The LDM does not contain information regarding any state-specific processes and data.

The IA does not contain a physical data model. Each SMA will be responsible for developing their own specific physical data models based on their specific implementation.

Logical Data Model

The LDM presents a detailed version of the Conceptual Data Model (CDM). **Figure 4-1** represents the LDM extended from the CDM for the Determine Provider Eligibility business process described in Part II, Chapter 3, Conceptual Data Model, Figure 3-1.

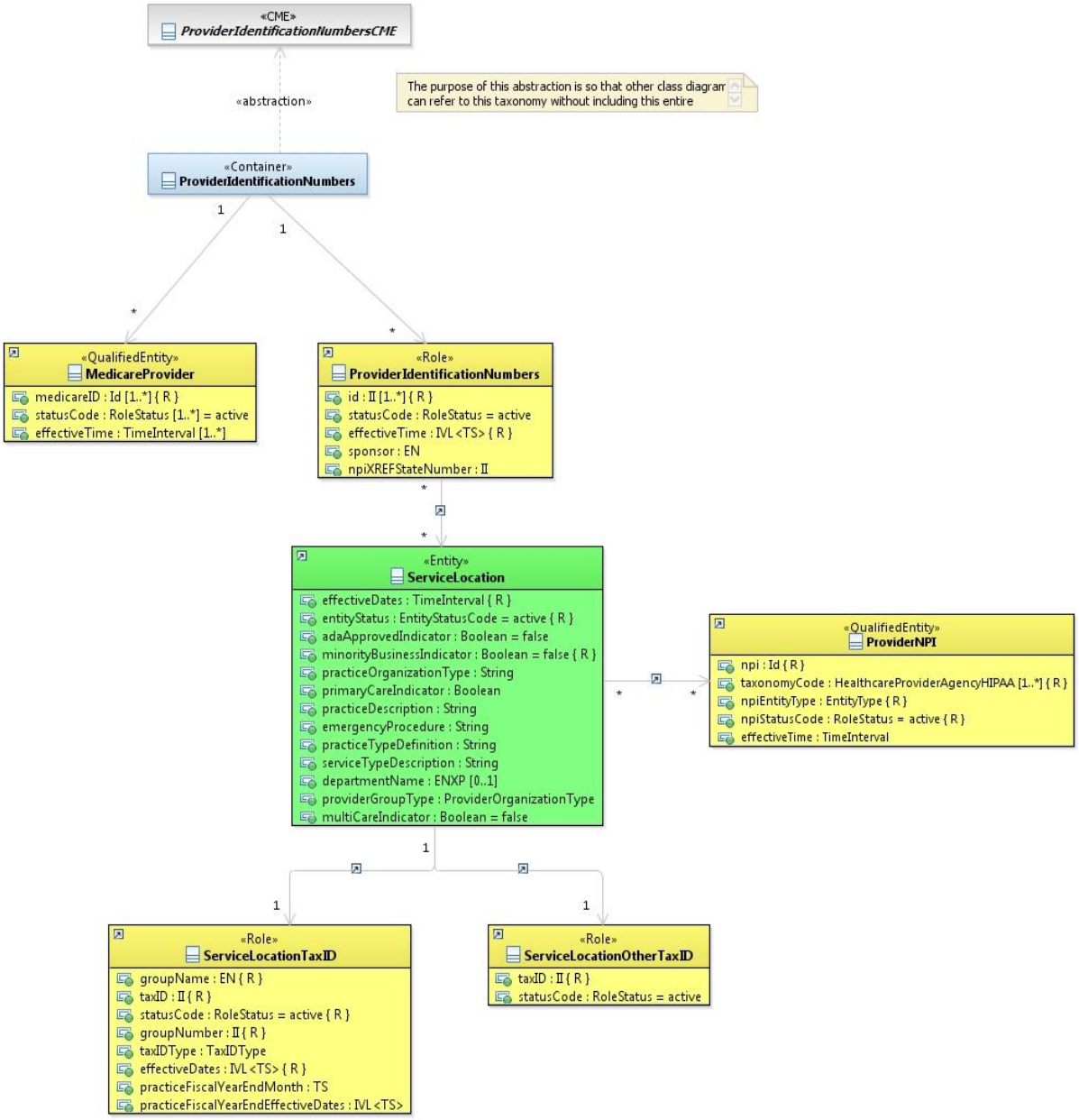

Figure 4-1. Sample Logical Data Model

In **Figure 4-1**, the classes related to Provider Identification Numbers have additional details (e.g., IDs, status codes, dates). In data modeling, the LDM refers to these additional details about classes associated to the Provider Identification Numbers as attributes. In **Figure 4-1,** attribute multiplicity indicates required or optional attributes by displaying a relationship of many (* indicates an optional element), one (nothing appears after the attribute indicates a required element), or one-to-many (1..* indicates an optional element). In addition, the system uses an attribute to locate a particular entity. Typically, the system can locate a

Provider's data by using the ID, in which case the LDM would label this attribute as a key attribute. The LDM also references any associated properties. Data organization rules also apply to the data model in order to:

- Minimize duplication.
- Ensure precise capture of standardized business rule definitions.
- Prevent loss of information.
- Aid in model management.

The data modeling term used for the application of these rules is normalization. The objective of the LDM is to have a fully attributed and normalized data model.

Components of the Logical Data Model

In the MITA Framework, the LDM contains the following associated data:

- **Class** – A class represents a person, place, thing, organization, event, or concept of interest to the Medicaid Enterprise. It is an object (or concept) to store information. In general, a class will have the following characteristics:
  - A stereotype allowing an extension of the UML vocabulary with specific properties, e.g., "Organization" contains the id, name, address, website, email, and taxid attributes.
  - One or more attributes that distinguish between individual occurrences of that entity.
  - At least one relationship to another entity.
- **Class Properties**
  - **General** – General Information includes the name of the class and visibility.
  - **Attributes** – An attribute is an item of data, a fact, or a single piece of information about an entity (e.g., the attribute Member Birth Date provides information about the entity Member). An attribute will have the following characteristics:
    - Identified by name containing the visibility, data type, default value, and multiplicity, i.e., many (*), zero or one (0..1), one (1), at least one or more (1*). Multiplicity indicates the number of occurrences and whether the attribute is an optional or required element.
    - Defined using clear, precise, and unambiguous language that identifies and distinguishes them from any other actual or possible item.
    - Specific stereotypes, constraints, and relationships.
- **Relationships** – Relationships depict the business requirements joining two entities and traces the interaction between the entities in either direction.
- **Documentation** – The documentation should contain definitions that are clear, precise, and unambiguous and use examples or exclusions as needed to improve clarity.

- **Domains** – The human-friendly computer hostnames translated into IP addresses where the system stores a specified entity or attribute.
- **Related Standards** – The industry agreed-upon rules applied to the entity or attribute.
- **Entity-Relationship Diagram (ERD)** – Entity-relationship diagramming is the method that produces a formal, graphical depiction of the model. It includes classification or super classes, common classes, common data types, common vocabulary, input messages, and output messages.

Figure 4-2 is a sample ERD.

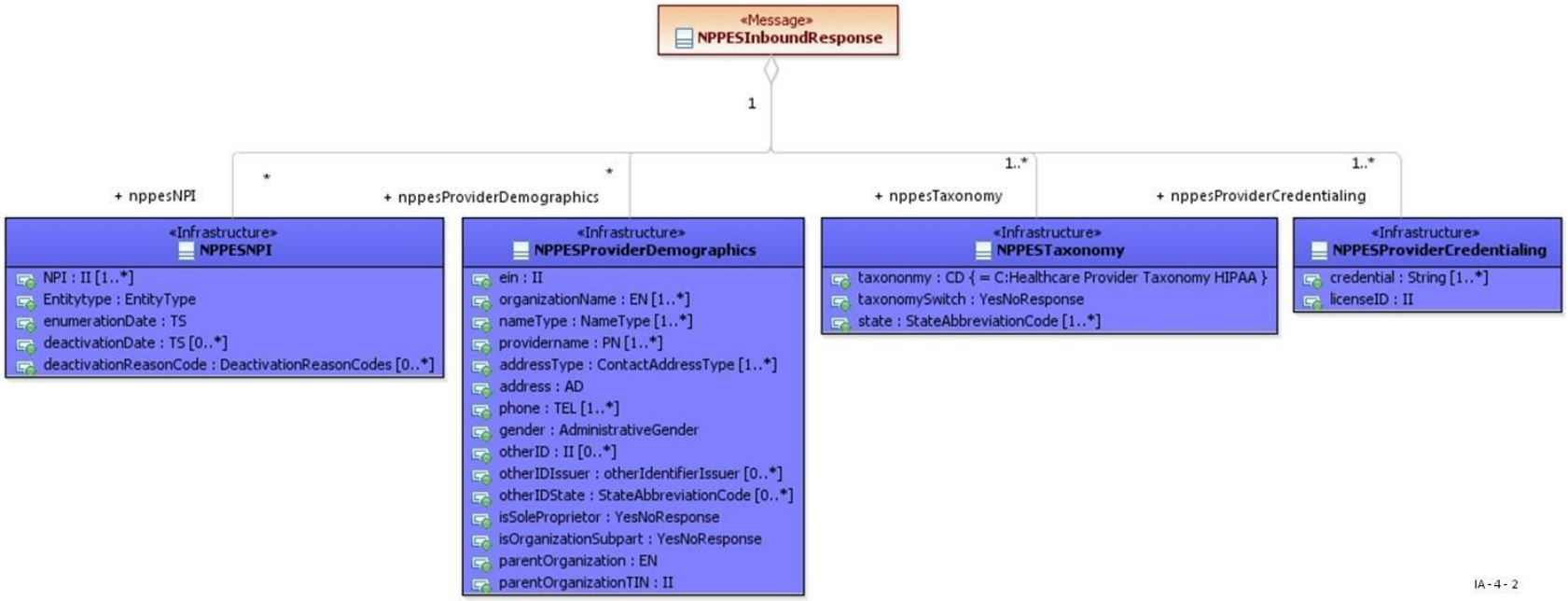

Figure 4-2. Sample Entity-Relationship Diagram

Developing the Logical Data Model

The following steps describe the process the MITA team uses in developing the LDM:

- **Collaborate** – Participate in design discussions to review and receive input from stakeholders and industry organizations on desired or expected outcomes and areas of concern. Review Business Process Template (BPT) and the Business Capability Matrix (BCM).
- **Develop** – Create the LDM based on the CDM.
- **Validate** – Verify the harmonized LDM against the business process requirements more detailed LDM.

Using the Logical Data Model

The LDM identifies the data, data types, values, and data relationships used by the Medicaid Enterprise. It also specifies the details for data used by the TA services of the Medicaid Enterprise.

The LDM provides a means of ensuring the completeness of the business model and serves as a tool that enables the reengineering of Medicaid business processes. It also helps to ensure that implementations are interoperable and plug-and-play capable. With participation by States, partners, and other stakeholders, the LDM becomes a tool to enable interoperability and data sharing. The SMA will extend the LDM with its unique data requirements and use the model to develop its state-specific physical data model. The SMA should identify any components and solutions that have high applicability for reuse by other States. Further definition of the artifacts including the System Development Life Cycle (SDLC) deliverables, business requirements and process flows, conceptual and logical data models, and how to provide them to the national repository will follow in subsequent guidance.