

Shareable Local Name Authority Reference Model (Draft)

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1. Introduction

The Shareable Local Name Authority (SLNA) Reference Model provides a framework for understanding the relationships among the entities managing and sharing authority data in a global ecosystem. Reference model is "a framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment. A reference model is based on a small number of unifying concepts and may be used as a basis for education and explaining standards to a non-specialist"¹. The OAIS Reference Model is designed to "facilitate a broad, discipline independent, consensus on the requirements for an archive or repository to provide long-term, preservation of digital information"². Even though it is designed with a focus on preservation, the concepts in the OAIS Reference Model, such as logical model of information packages and the functional entities, are applicable beyond the preservation community to general digital information management. Authority data is a type of information (usually digital) used and maintained across multiple domains. Therefore the SLNA Reference Model reuses the concepts of the Open Archival Information system (OAIS) Reference Model whenever applicable. When necessary, a component of the OAIS model is modified, or a new concept is developed specific to the authority management community.

The SLNA Reference Model is described in the following sections:

- **Section 1:** Introduction
- **Section 2:** describes the shareable authority environment as a system of systems in comparison to the OAIS's federated archive model.
- **Section 3:** describes the actors and roles in the Shareable Authority System of Systems, reusing the producer, consumer, and management roles in OAIS model, and added a few more roles related to authority data aggregation and services.
- **Section 4:** describes the Authority Information Package (AuIP) in comparison to the OAIS's Archive Information Package (AIP).
- **Section 5:** describes the Authority Management (AuM) and the Authority Sharing and Planning (ASP) functional entities, which are specific to authority management community.
- **Section 6:** Conclusion

¹ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 1-14.

<https://public.ccsds.org/Pubs/650x0m2.pdf>

² OAIS Reference Model (ISO 14721), accessed 2018.04.08 <http://www.oais.info/>

- **Section 7:** Appendix lists the reused OAIS functional entities, quoted from the OAIS Reference Model document³.
- **Section 8:** Appendix. National Strategy for Shareable Local Name Authorities National Forum participants

The Shareable Local Name Authority Reference Model is one of the deliverables for National Strategy for Shareable Local Name Authorities National Forum (SLNA-NF). SLNA-NF focuses on person and organization entity management and sharing; subject entities are not within the scope of the SLNA-NF project or this SLNA Reference Model. For reference, the SLNA-NF white paper is available: <http://hdl.handle.net/1813/56343>

2. Shareable Authority Environment

This Shareable Authority ecosystem is a system of systems (SoS) consisting of multiple authority information systems (AuIS), as illustrated in Figure 1 below. Each of the individual systems is an independent system consisting of organizations, people, content, services, and systems, maintaining the authoritative registry of names for a specific community. Meanwhile the various AuIS systems interact with each other, sharing data and services.

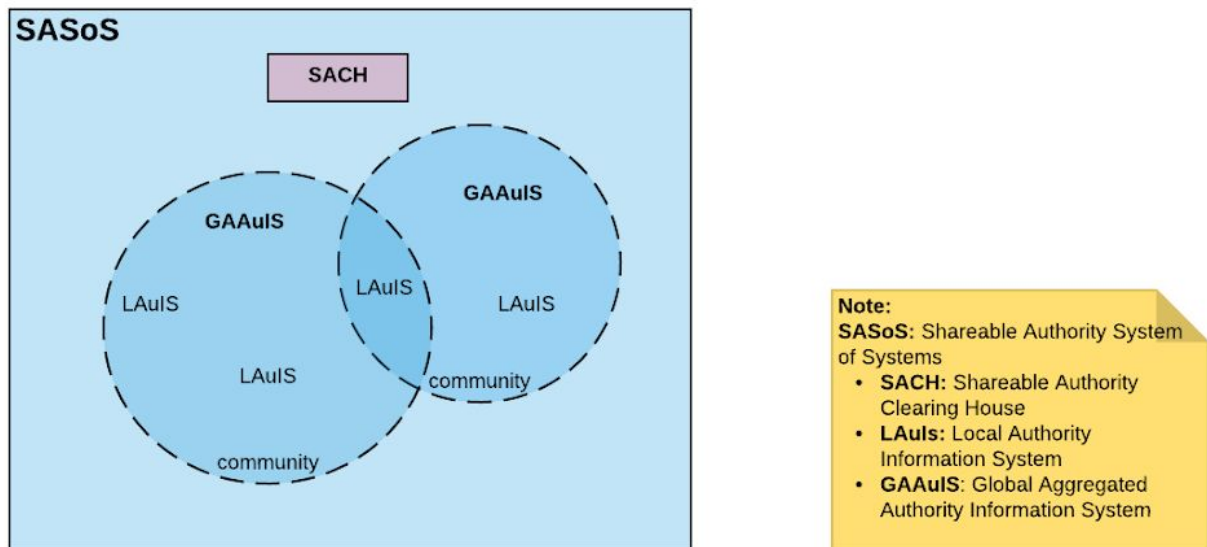


Figure 1. Shareable Authority System of Systems (SASoS)

There are various types of systems within the SASoS:

³ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. <https://public.ccsds.org/pubs/650x0m2.pdf>

- **Local Authority Information Systems (LAuIS):** are local institutional name registries, which may interact with global aggregated authority information systems and may also interact with other local authority information systems.
- **Global Aggregated Authority Information Systems (GAAuIS):** are shared, cross-domain name registries, aggregating authorities data from multiple sources, and providing data and/or services to local authority information systems.
- **Shareable Authority Clearing House (SACH):** a common catalog of authority information systems, and a neutral independent organizational entity

SACH and GAAuIS are different conceptual entities from the point of view of the reference model, but the implementation of SACH and GAAuIS can be the same organization and hardware or software system.

Figure 1.a. illustrates the relationships among producer, consumer, and management with LAuIS, GAAuIS and SACH. The functional entities within the LAuIS or GAAuIS are described in more detail in Section 5 and Section 7 (Appendix 1).

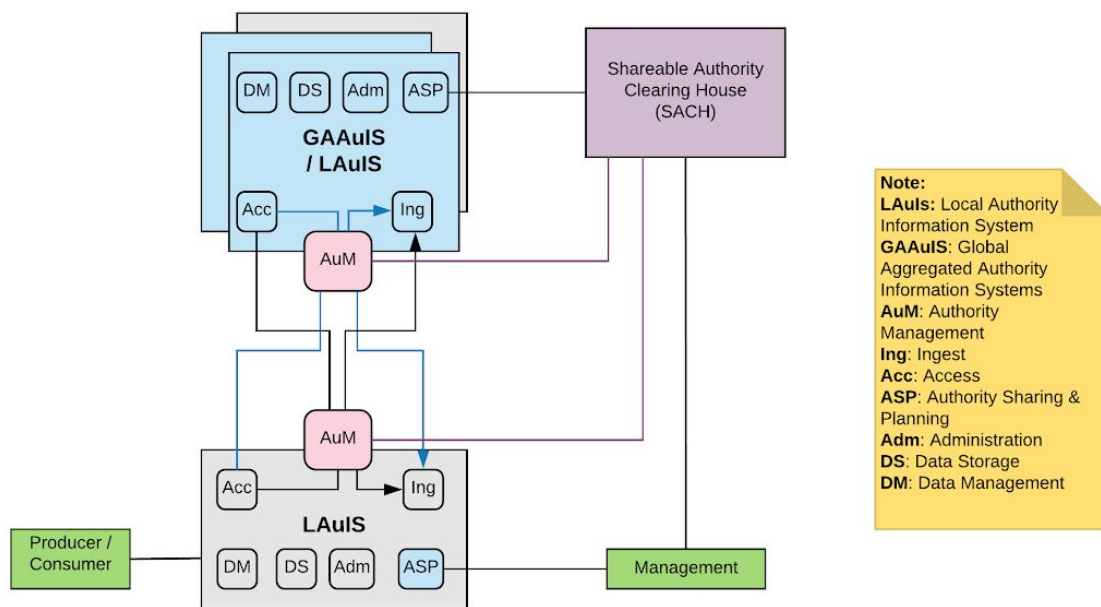


Figure 1.a: Systems Relationship within SASoS

Each Authority Information System (AuIS) has its own implementation of Authority Management (AuM) services and functions. As elaborated in more detail later, the AuM functional entity includes local implementation decisions concerning data sources, matching algorithms, publication policies, etc. Therefore, the AuM functional entity bridges the local authority information system and external authority information systems, being a LAuIS or

GAAuIS. The services and functions within AuM enables the two AuISes to interoperate with each other directly with SACH's facilitation. This differs from the OAIS Federation model which includes multiple OAISes and a Common Catalog for the global community illustrated in Figure 1.b. The two OAIS systems do not interact with each other directly but only access the common catalog.

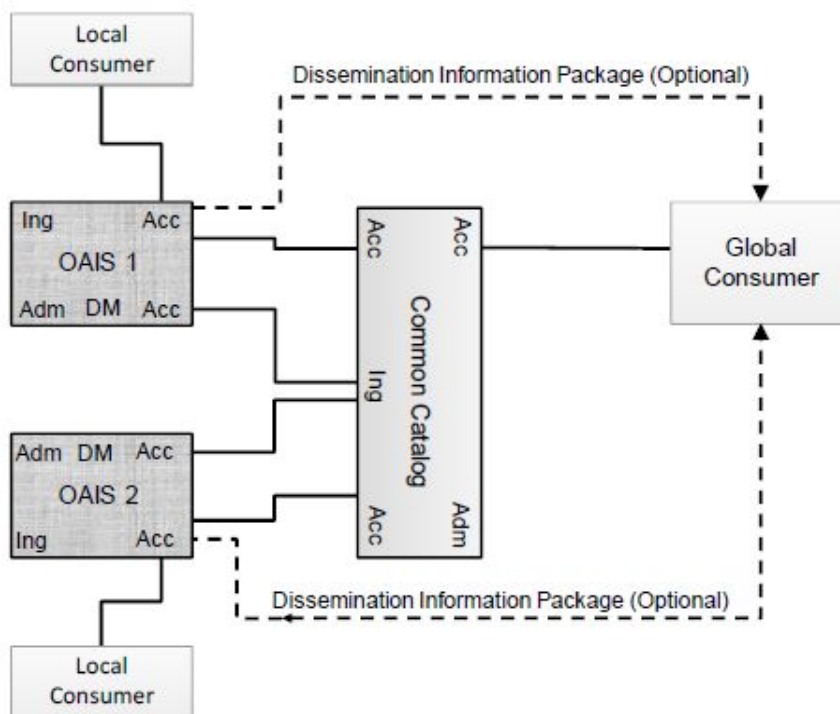


Figure 1.b.: An OAIS Federation Employing a Common Catalog (OAIS, Figure 6-3)⁴

Due to various domains and diverse business requirements, as mentioned in section 4.4 of the SLNA-NF White Paper⁵, multiple GAAuIS systems coexist. Local institutions might interact with different or multiple GAAuIS systems based on their own needs. It is very unlikely to have one GAAuIS aggregating all data from all the LAuIS and satisfy diverse business needs and governance models across various domains.

⁴The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 6-5.

<https://public.ccsds.org/Pubs/650x0m2.pdf>

⁵ *National Strategy for Shareable Local Name Authorities National Forum : White Paper*. Page 10-11.

<http://hdl.handle.net/1813/56343>

As recommended in sections 7.7.2 and 7.7.4 of the SLNA-NF White Paper⁶, access to a common catalog of authority information systems (Shareable Authority Clearing House (SACH)) facilitates the discovery of data and services provided by various local or global authority information systems. SACH is similar to the common catalog in the OAIS Federation model (Figure 1.b.) except that SACH is a catalog of the AuIS systems rather than the archival information collections. If a neutral, open, and independent organizational entity, SACH would help decouple the governance issues from the business models, and not only enable the community to focus on mutual interests, but also afford data aggregators freedom to develop their own business models.

3. Actors and Roles

In the shareable authority ecosystem, there are different ways to categorize actors. Based on the organization types, actors can be defined as Libraries, Cultural heritage organizations, Scholarly organizations, Publishers, Researchers, or Service providers. They may be organizations or individuals; the latter may include metadata professionals, catalogers, curators, developers, or system administrators.

No matter how actors are categorized, their roles can be summarized abstractly into the three roles defined in OAIS model, reproduced in bullets below⁷:

- Producer : The role played by those persons or client systems that provide the information.
- Consumer: The role played by those persons, or client systems, who interact with OAIS services to find preserved information of interest and to access that information in detail.
- Management: The role played by those who set overall OAIS policy as one component in a broader policy domain, for example as part of a larger organization.

In the shareable authority system of systems, three additional roles are defined related to authority data aggregation and services:

- Service provider: The role played by those persons or client systems that provide the software or service to access or modify the information. This role can be different from the data producer.

⁶ *National Strategy for Shareable Local Name Authorities National Forum : White Paper*. Pages 46-47. <http://hdl.handle.net/1813/56343>

⁷ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 1-10, 1-13, 1-14. <https://public.ccsds.org/Pubs/650x0m2.pdf>

- Service consumer: The role played by those persons or client systems that use the software or service to access or modify the information. The service consumer can be the data producer or the data consumer.
- Data aggregator: The role played by those persons or client systems that aggregate data from multiple sources and/or provide processed data or services to other data or service consumers.

The same actor may have multiple roles. For example, the metadata professional might enact both the data producer and the data consumer roles. System administrators might enact both the service provider and the service consumer roles.

4. Authority Information Package (AuIP)

Authority Information Package (AuIP) adopted the logical model of information in the OAIS model with a few modifications:

- **Representation information:** describes the data model used by AuIS
- **Content:** refers to the authority data, consists of one or more name objects
- **Authority Source Description (AuSD):** describes the authority information system in order to provide the context of the AuIP. It is similar to the combination of the Packaging Information, Package Description, and the Description Information in the Archival Information Package (AIP) model in OAIS (Figure 2.b)⁸. AuSD also includes the service description for the service provided or used by the authority information system. AuSD is included in the AuIP so that two AuIPs from different AuISes can be matched, deduplicated, or synchronized in authority management; this is discussed in further detail in section 5 below.
- **Policy:** refers to the institutional policy for Local AuIS, the cross-institutional policy for global aggregated AuIS. Policy provides the usage agreement of AuIP concerning the issues discussed in section 4.4 of the SLNA-NF White Paper⁹.
- **Name object:** is the data object for a person or organization with minimum identifiable information, such as identifier, attributes, and relationships.

⁸ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. <https://public.ccsds.org/Pubs/650x0m2.pdf>

⁹ *National Strategy for Shareable Local Name Authorities National Forum : White Paper*. Pages 10-11. <http://hdl.handle.net/1813/56343>

Figure 2.a. illustrates the logical model of authority information package (AuIP):

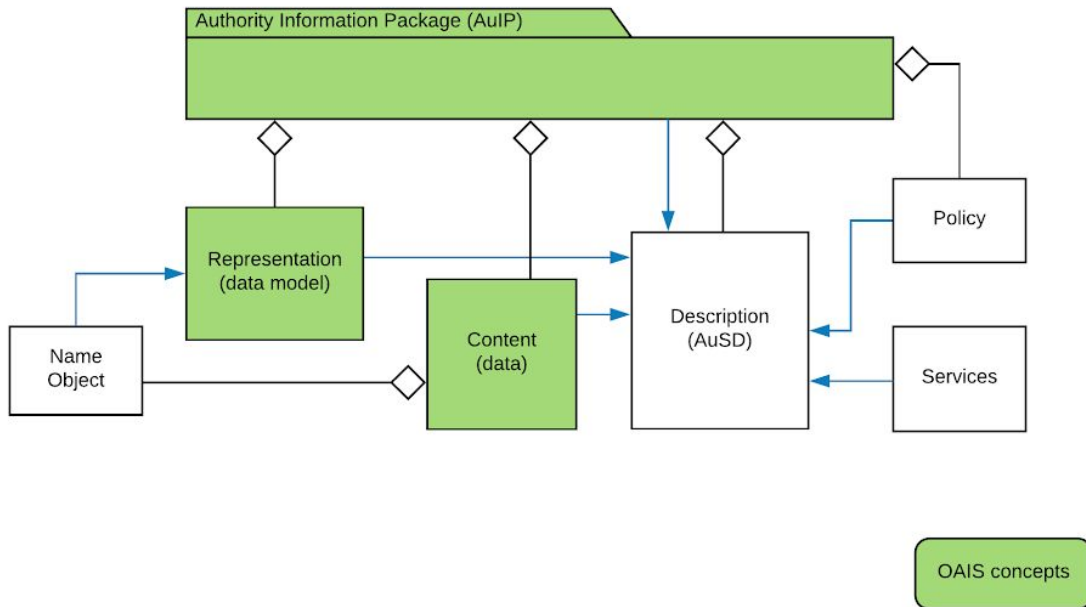


Figure 2.a.: Authority Information package (AuIP)

In the OAIS model, an Information Package is a logical container composed of Content Information, and Description Information that can be used to store in the system or to transport the information among systems.

Below are the terms definitions from OAIS model¹⁰:

- **Content Information:** an Information Object consisting of a Data Object and its Representation Information.
- **Representation information:** the information mapping a Data Object into more meaningful concepts
- **Preservation Description Information:** the information which is necessary for adequate preservation of the content information.
- **Packaging information:** the information that is used to bind and identify the components of an information package.
- **Package description:** the information intended for use by Access Aids.

¹⁰ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 1-12, 4-33.
<https://public.ccsds.org/Pubs/650x0m2.pdf>

Figure 2.b. illustrates the logical model of an Archival Information Package in the OAIS model.

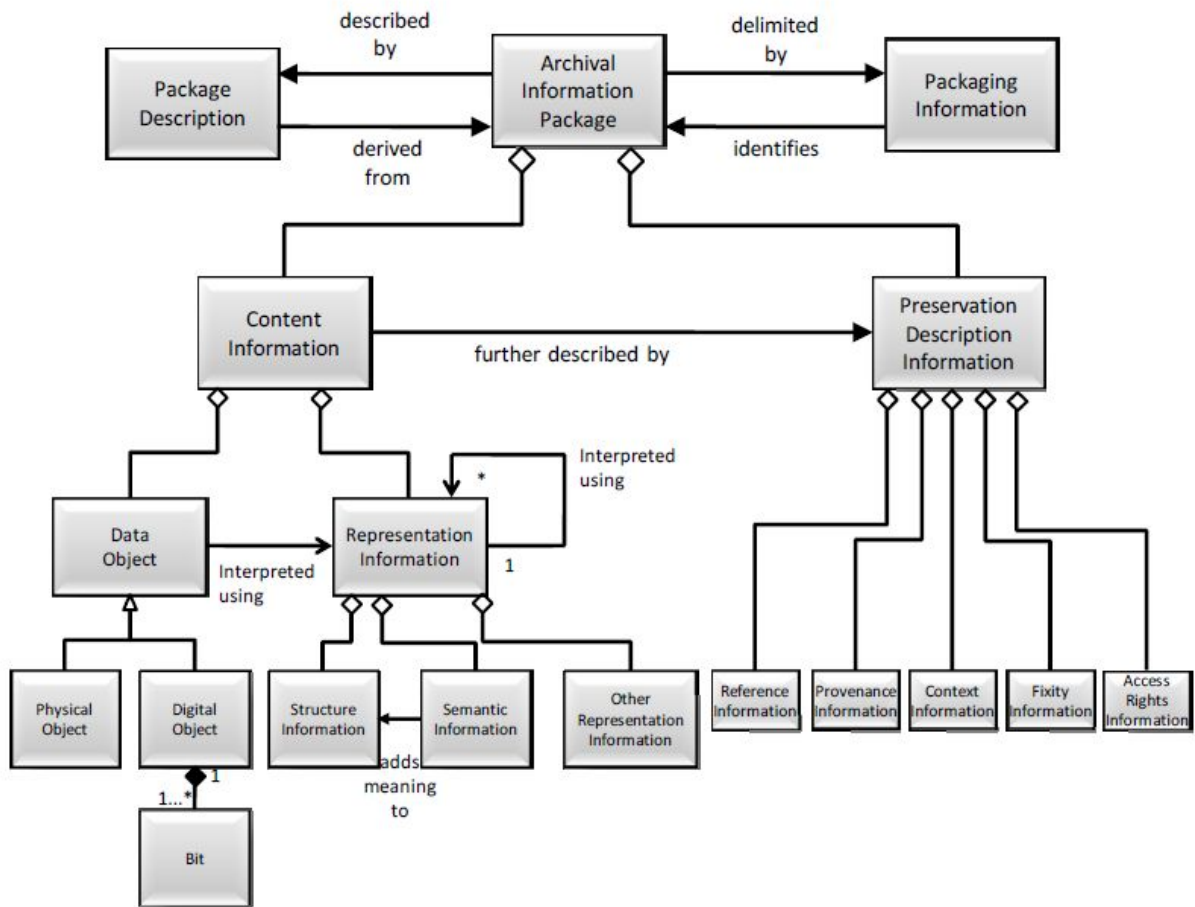


Figure 2.b: Archival Information package (AIP) (OAIS, Figure 4-18)¹¹

5. Functional Entities

Figure 3.a. illustrates the Authority Information system (AuIS) functional entities within the SaSoS ecosystem. Figure 3.b. illustrates the OAIS functional entities. Each Authority Information System (AuIS) includes all OAIS functional entities with an addition of Authority Management (AuM). The Authority Sharing & Planning (ASP) functional entity in AuIS model is a modification of "Preservation Planning" in OAIS model. The individual OAIS functional entity models are briefly described in Section 7 (Appendix).

¹¹ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-40.
<https://public.ccsds.org/Pubs/650x0m2.pdf>

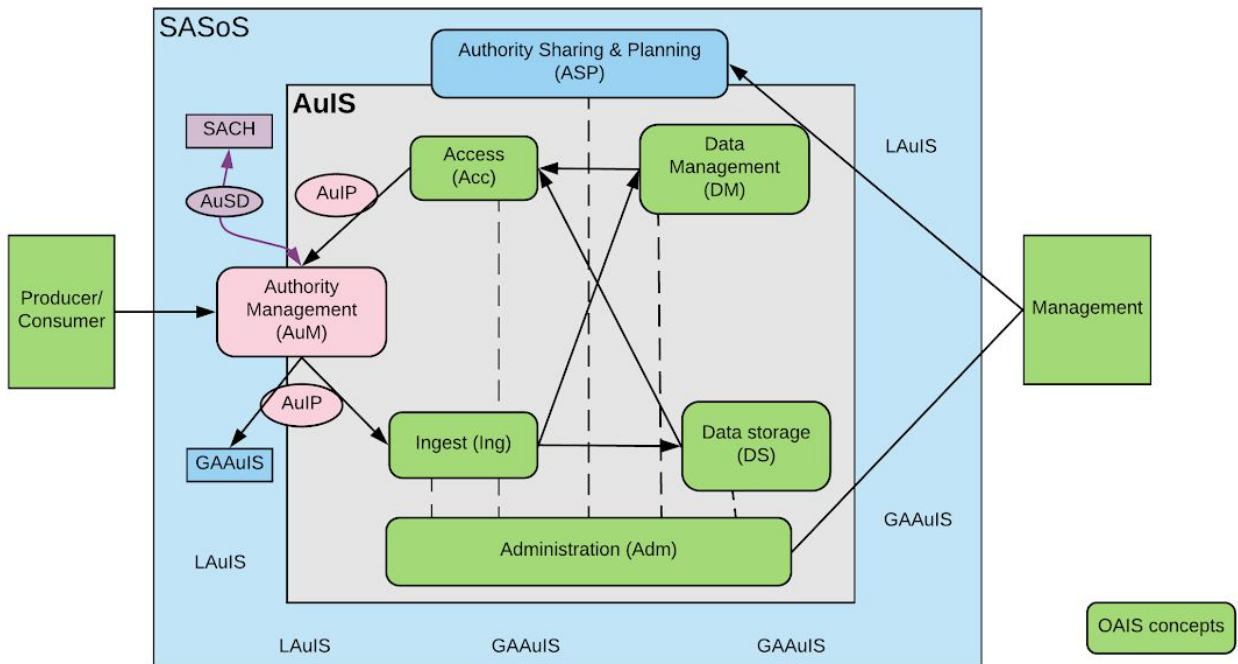


Figure 3.a.: Authority Information system(AuIS) functional entities

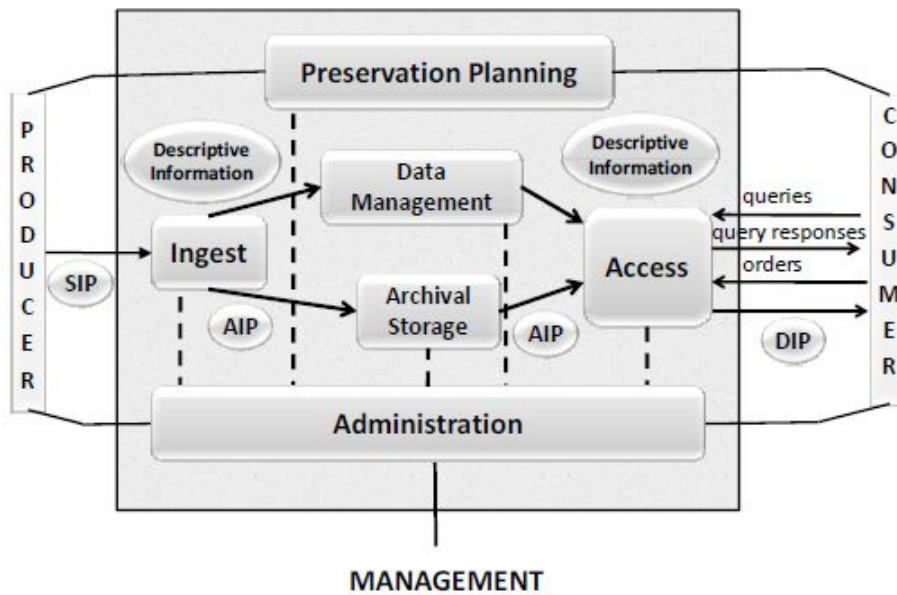


Figure 3.b.: OAIS Functional Entities (OAIS, Figure 4-1)¹²

¹² The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-1. <https://public.ccsds.org/Pubs/650x0m2.pdf>

Authority Management (AuM)

Figure 4 illustrates the Authority Management (AuM) functions:

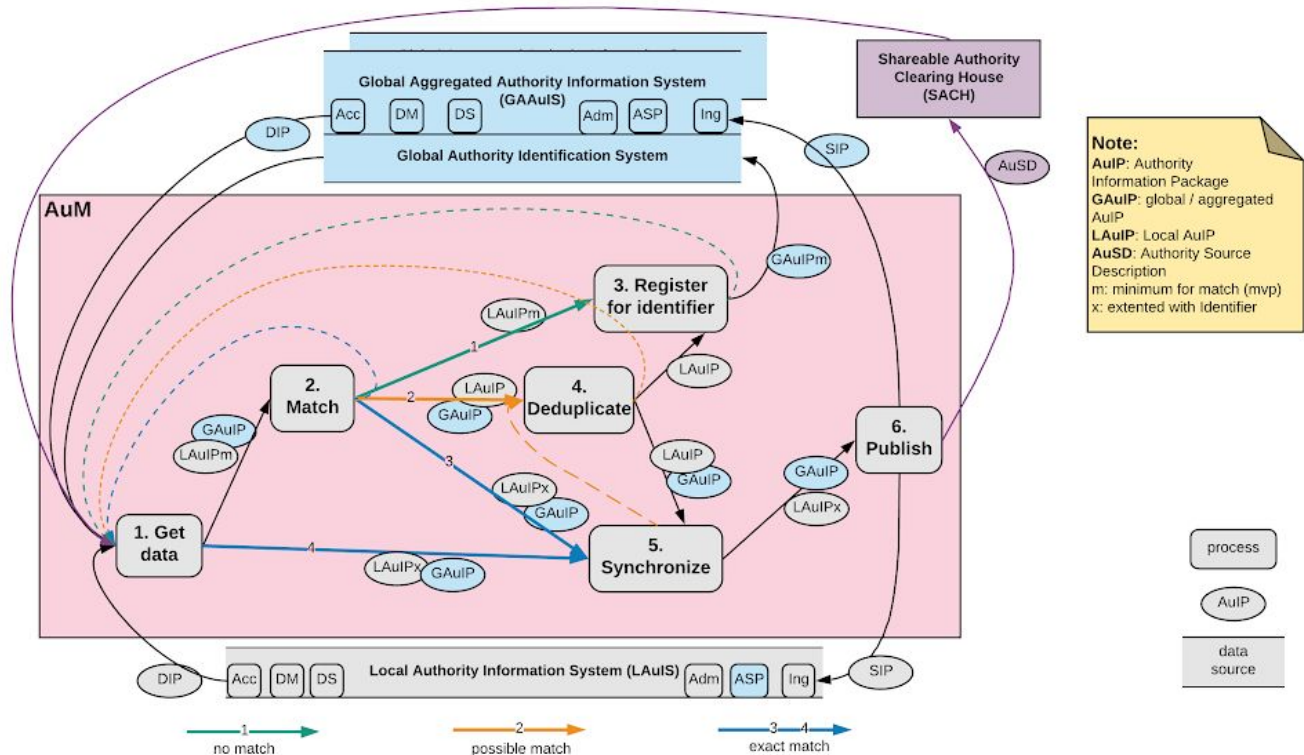


Figure 4: Authority Management (AuM) Functional Entity

Authority Management (AuM) functional entity is specific to the Shareable Local Name Authority Reference model and is an extension to the OAIIS model. It handles the reconciliation, deduplication, synchronization among various authority information systems, as well as the alignment of data model and transformation of data.

1. Get data: select local and/or global data sources, get data from those data sources via their access services.
2. Match (reconcile): match text names to name entities with identifier(s) against data source(s) via the reconciliation service with specific algorithms, returns a scored list of potential entities matching the specified criteria, in order to obtain an identifier from the authority source.

If no match,

3. Register for persistent identifier with global authority identification system(s) either via self-registration, or third party registration

If possible match,

4. Deduplicate: resolve conflicts that arise when names are ambiguous, most often because there are more than one name objects with same or similar names.

If exact match,

5. Synchronize the data from multiple sources

6. Publish the synchronized authority data to local LAuIS as well as global GAAuIS, submit the update to the authority information systems for ingestion, and update the authority source description (AuSD) in the Shareable Authority Clearing House (SACH), if necessary.

As discussed in section 4.2 and 5.3 of the SLNA-NF White Paper¹³, data alignment and data quality are two major concerns in authority data management and sharing within the SASoS. Most of the functional entities in Authority Management model, including *match*, *register for persistent identifier*, *synchronize*, and *publish*, all include the process to align the data model of one data source to another and transform the data accordingly, as illustrated in Figure 5:

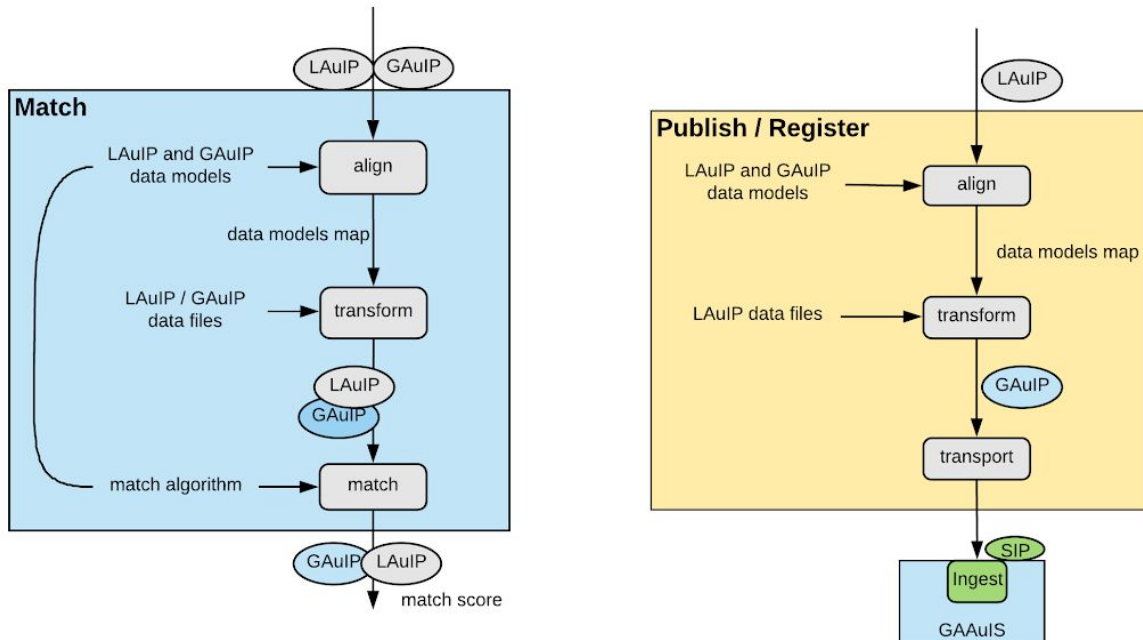


Figure 5. Match and Publish Functional Entities

A common core data model and standard format for each of these function entities will minimize or even eliminate the complexity of data model alignment and data transformation, recommended in section 7.7 of the SLNA-NF White Paper¹⁴.

¹³ *National Strategy for Shareable Local Name Authorities National Forum : White Paper*. Pages 7-9; 15-21. <http://hdl.handle.net/1813/56343>

¹⁴ *National Strategy for Shareable Local Name Authorities National Forum : White Paper*. Pages 46-47. <http://hdl.handle.net/1813/56343>

Authority Sharing & Planning (ASP): The strategic planning for sharing authority data has to occur both within the local institution and across the global community to facilitate a mutual beneficial relationship.

The functions within OAIS Preservation Planning functional entity (Figure 6) are applicable to the Authority Sharing & Planning (ASP) functional entity if replacing "preservation" with "authority sharing".

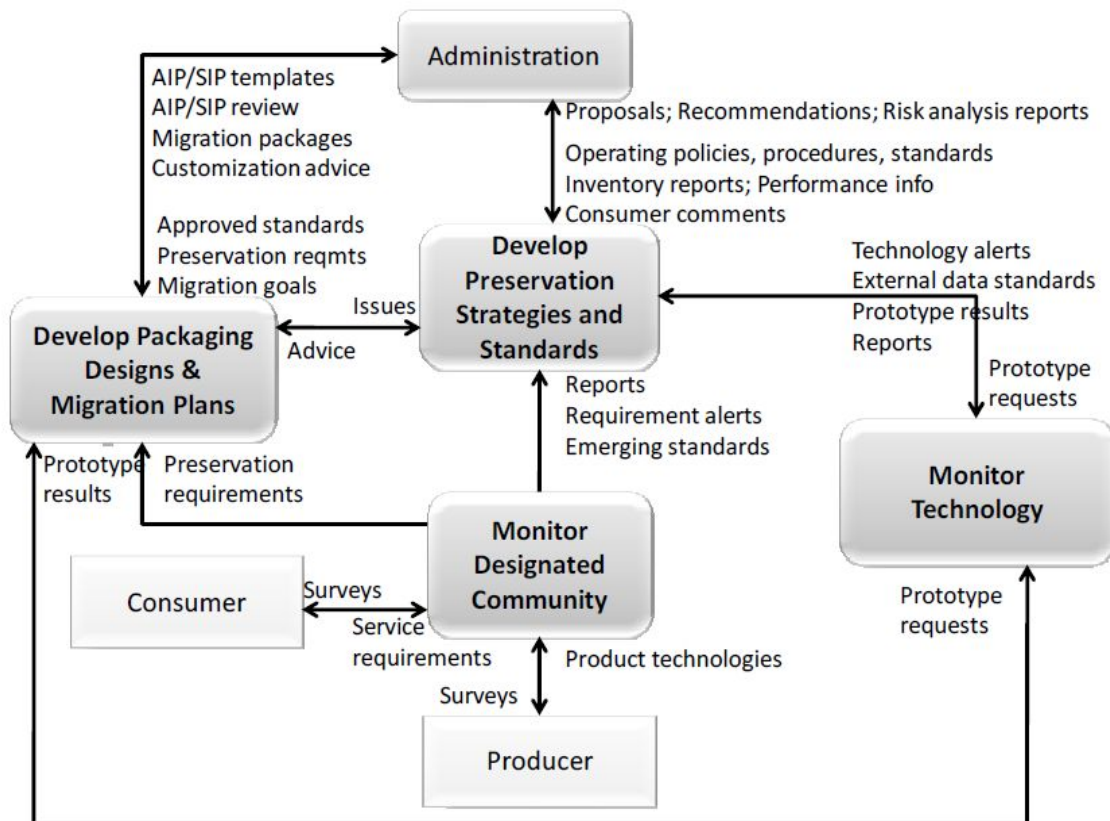


Figure 6: OAIS Preservation Planning Functional Entity (OAIS, Figure 4-6)¹⁵

6. Conclusion

The Shareable Local Name Authority (SLNA) Reference Model is an extension of OAIS model. The majority of the OAIS functional entity models such as *Ingest*, *Access*, *Data Management*, *Data Storage*, *Administration*, and *Planning* are reused in the SLNA Reference Model, as are concepts such as information packages and functional entities. The Authority Management

¹⁵ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-14.
<https://public.ccsds.org/Pubs/650x0m2.pdf>

(AuM) functional entity is specific to the SLNA reference model to illustrate the functions and services for managing and sharing name authorities among multiple authority information systems.

7. Appendix. OAIS Functional Entities

The description and figure of the five OAIS functional entities are quoted from the section 4.1 Functional Model in the OAIS model document:

Ingest (Ing): provides the services and functions to accept submission information packages from producer and prepare the contents for storage and management within the system, as illustrated in Figure A1:

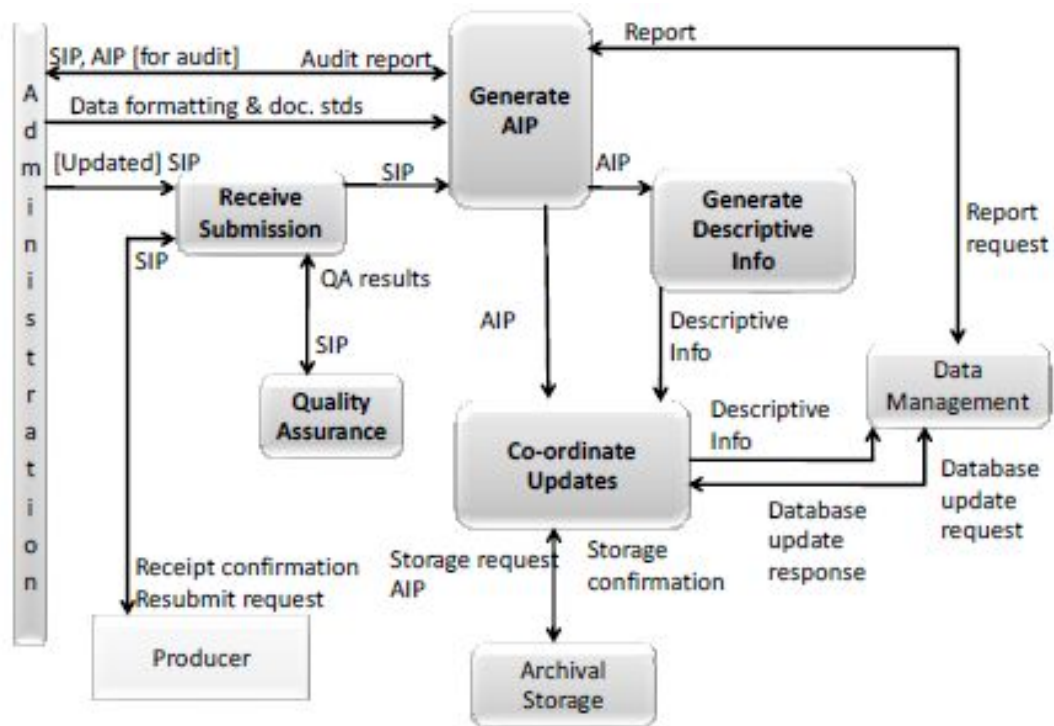


Figure A1: OAIS Ingest Functional Entity (OAIS, Figure 4-2)¹⁶

¹⁶ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-5. <https://public.ccsds.org/Pubs/650x0m2.pdf>

Access (Acc): provides the services and functions that support consumers in determining the existence, description, location and availability of information stored in the OAIS, and allowing consumers to request and receive information products, as illustrated in Figure A2:

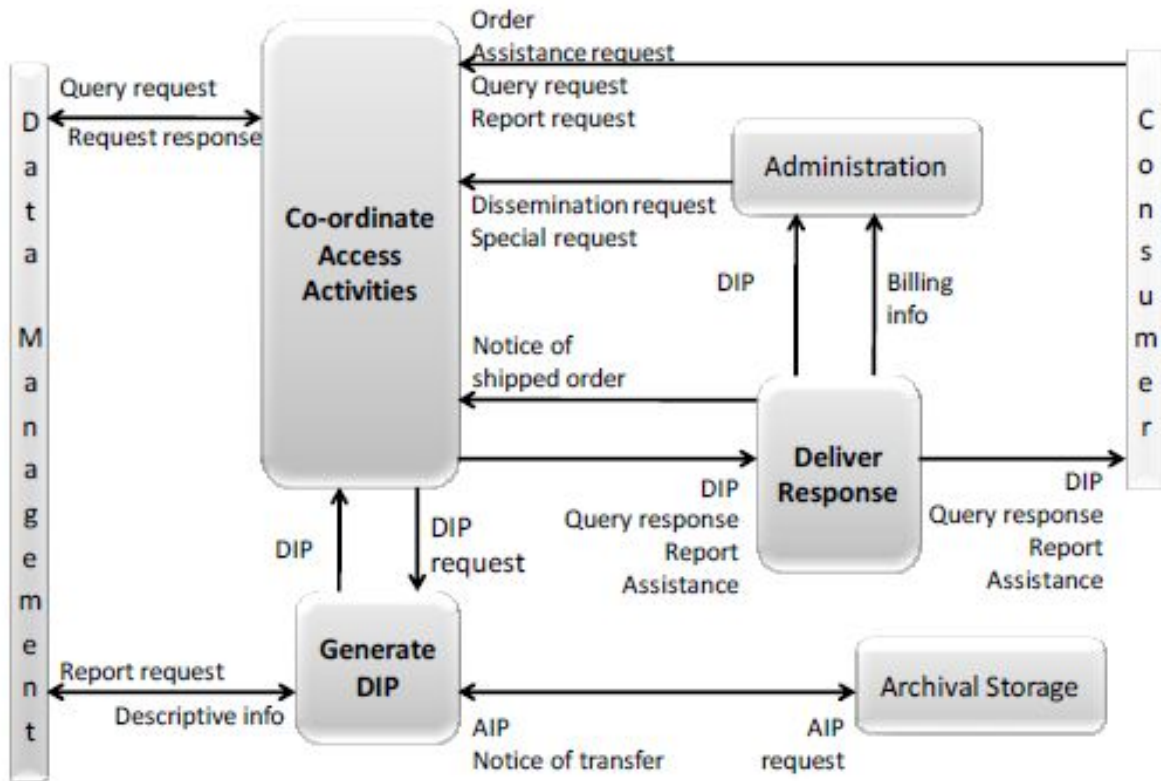


Figure A2: OAIS Access Functional Entity (OAIS, Figure 4-7)¹⁷

¹⁷ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-16. <https://public.ccsds.org/Pubs/650x0m2.pdf>

Data management (DM): provides the services and functions for populating, maintaining, and accessing both descriptive information and administrative data used to manage the system, as illustrated in Figure A3:

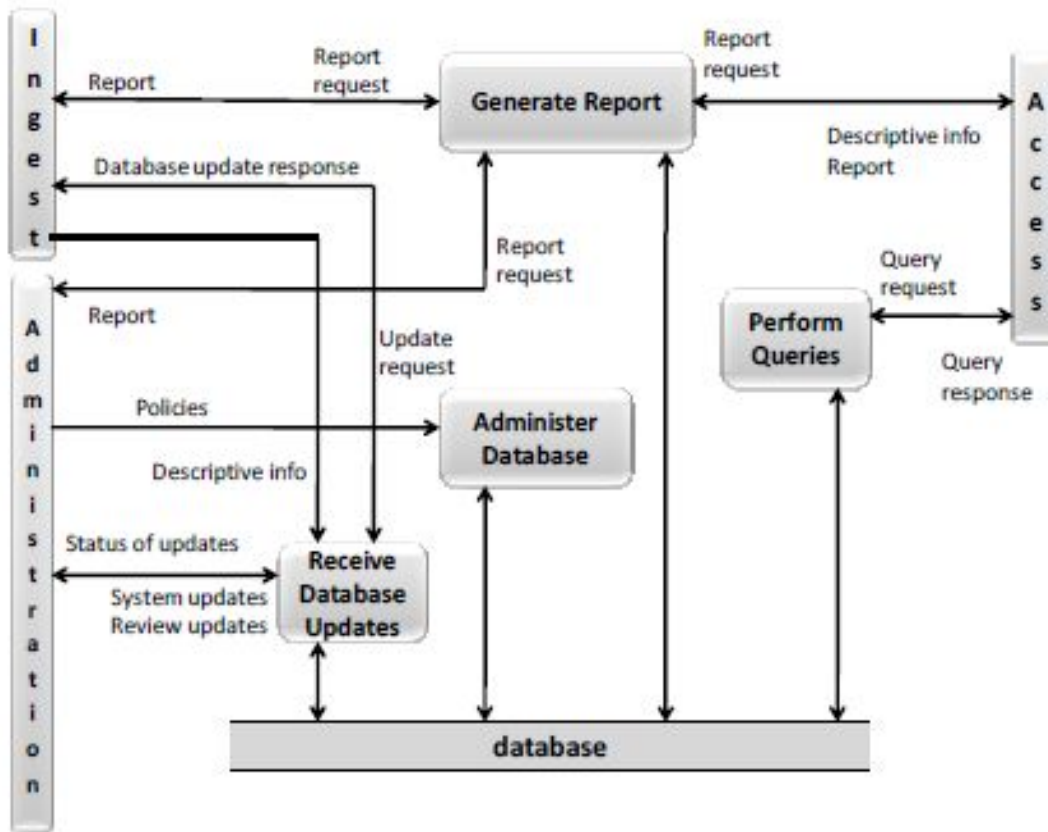


Figure A3: OAIS Data Management Functional Entity (OAIS, Figure 4-4)¹⁸

¹⁸ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-10. <https://public.ccsds.org/Pubs/650x0m2.pdf>

Data Storage (DS, Archival Storage): provides the services and functions for the storage, maintenance and retrieval of information packages, including receiving data, providing data, managing storage hierarchy, refreshing the media on which the data are stored, performing routine and special error checking and providing disaster recovery capabilities, as illustrated in Figure A4:

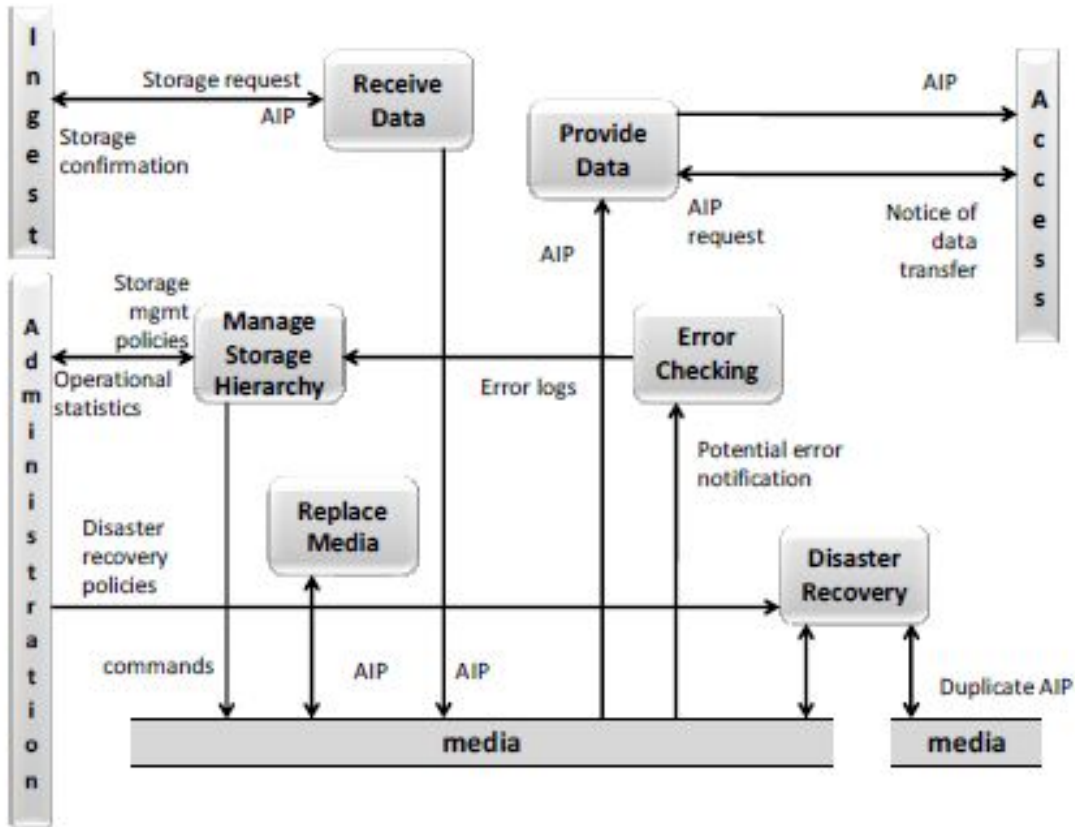


Figure A4: OAIS Archival Storage Functional Entity (OAIS, Figure 4-3)¹⁹

¹⁹ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-8. <https://public.ccsds.org/Pubs/650x0m2.pdf>

Administration (Adm): provides the services and functions for the overall operation of the system, as illustrated in Figure A5:

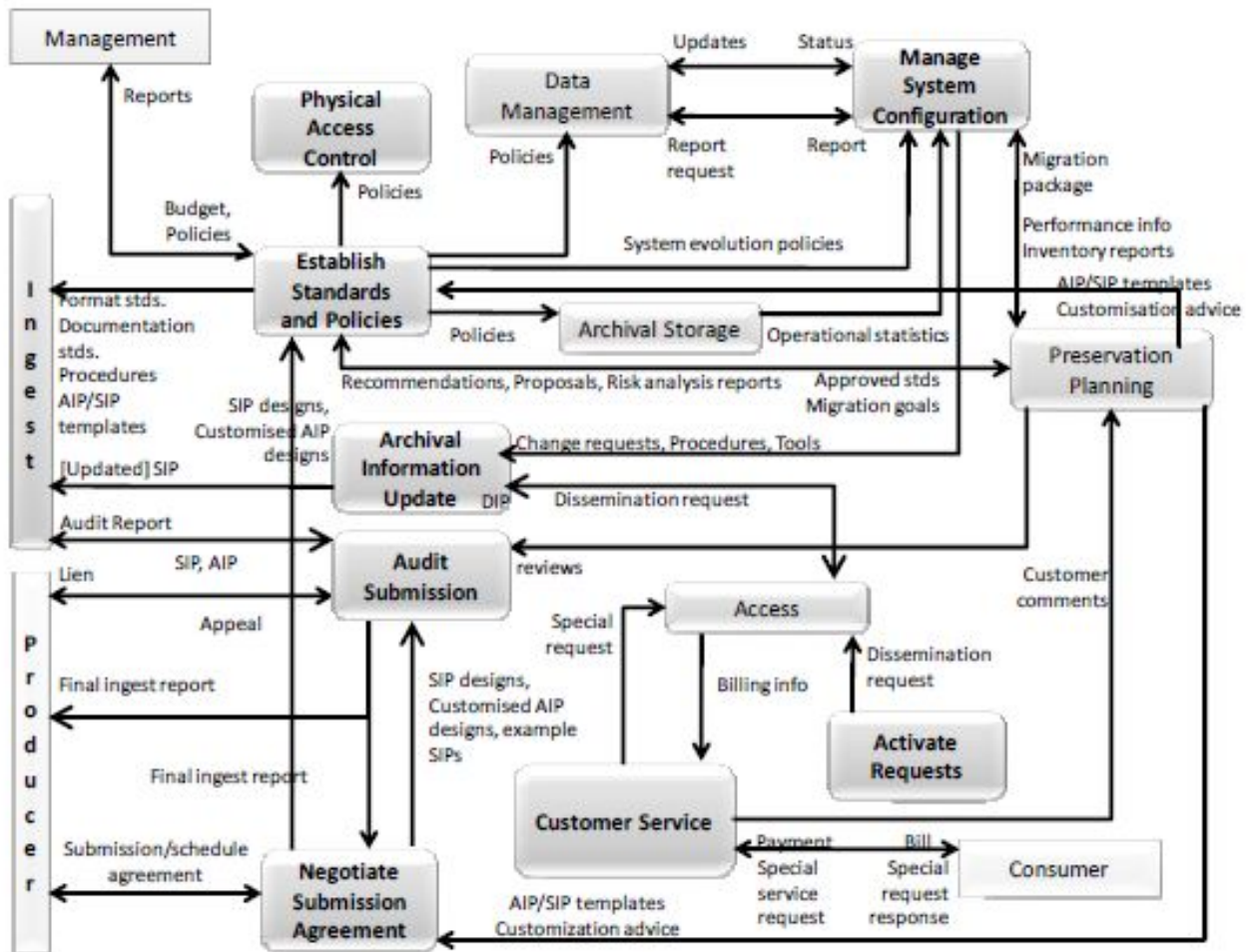


Figure A5: OAIS Administration Functional Entity (OAIS, Figure 4-5)²⁰

²⁰ The Consultative Committee for Space Data Systems (June 2012). *Reference Model for an Open Archival Information System (OAIS)*. Magenta Book. Issue 2. Page 4-11. <https://public.ccsds.org/Pubs/650x0m2.pdf>

8. Appendix. National Strategy for Shareable Local Name Authorities National Forum participants

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