

# The AIP is the cornerstone of the implementations of OAIS

(Illustration through the **AXIS** architecture)

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## INTRODUCTION

In the OAIS standard, the Archival Information Package (AIP) is embedded in the system and not an interface of the system like the Submission Information Package (SIP) or the Dissemination Information Package (DIP). Many important projects sponsored by the European Union came to the conclusion that the key for concrete implementations of OAIS is to focus on the AIP as external interface and to merge the AIP, SIP and Persistent-DIP concepts. With that approach, the AIP are exchanged between systems and so the persistence and the interoperability are solved by the same constructs: indeed, the persistence is in fact the temporal interoperability of an evolving “Enterprise repository” and “Federated Archiving” requires space interoperability. It means that the approach offers a high degree of flexibility in the practical implementation of the full chain of the construction to the exploitation of the information assets. Each of the functional elements of the OAIS model is simply assumed existing in one or more occurrences. This allows of exploding the “System” (i.e. the S of the OAIS acronym) into independent functional blocks that could be delivered by independent suppliers and managed by independent parties; it allows also operating as a federation of organisations. The **AXIS** architecture proposes an open and customised specification of constructs for implementing the AIP in the form of “Autonomous eXchange Entities”. The AXE’s are structured through a three levels wrapping system fitting perfectly with the Object oriented and Honeycomb repositories like the ST5800 but also allows directly the adoption of powerful retrieval through constructs (like XAM or OAI) and of powerful “Package Wrappers” (like ZIP, METS and MXF). The **AXIS** architecture is planned to be made available in **open source** on the Web site of the **UNESCO** (end 2008).

## The **AXIS** FUNCTIONAL ARCHITECTURE

In **AXIS**, the AXEs are exported as **SIP**’s to become **AIP**’s after validation by the ingest module of the receiving functional bloc. This is illustrated at the figure 1.

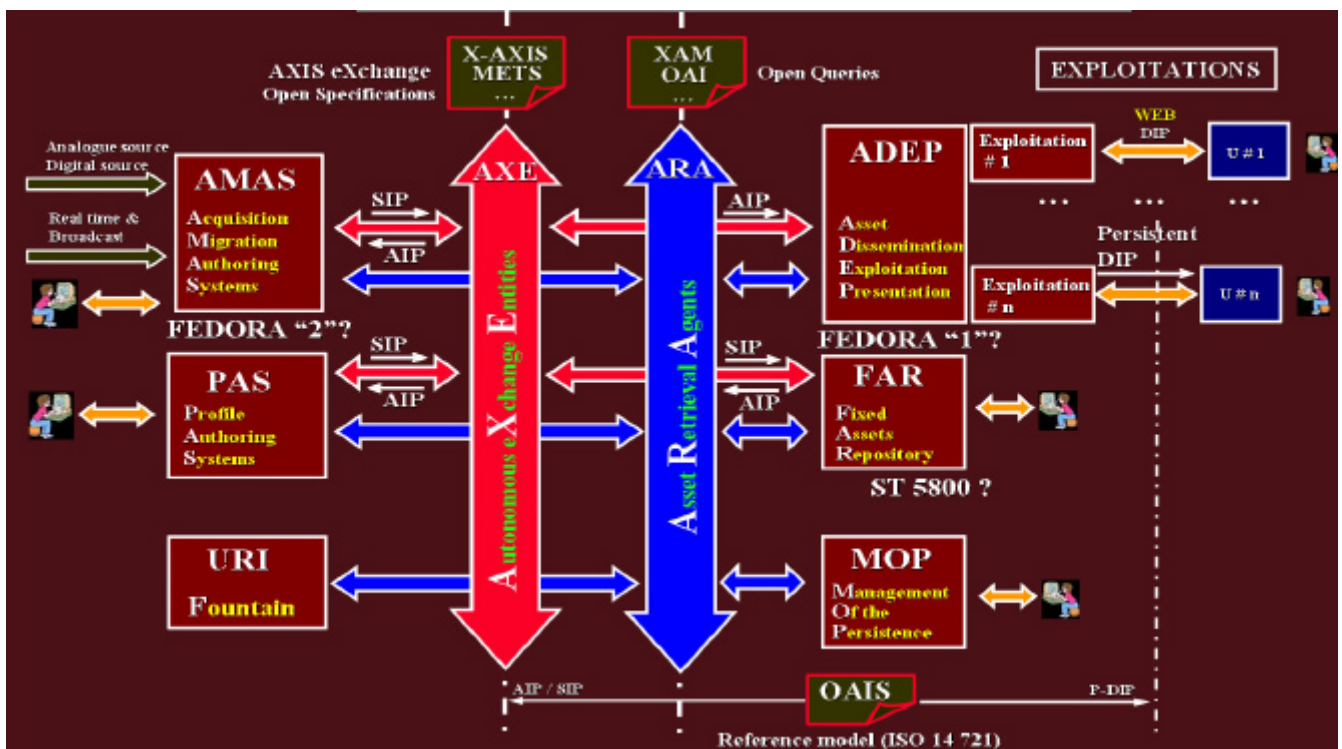


Figure 1: The **AXIS** FUNCTIONAL ARCHITECTURE

The **URI function** manages the identifiers as applicable per federated functions which could pertain to many different organisations. AXIS assumes that each Digital Object could be identified in several simultaneous ways. Each of the functional blocks presented on the figure could be replicated within the federation, be it in the same of the federated organisations, be in different ones.

The **AMAS function** constructs the AXE which could cover from a simple Digital Object to a “Rich Digital Object” including its full structure, semantics and rights control.

The **PAS function** ensures the definition of the profiles. They cover dedicated domains (such as bibliography; sports [tennis, basket, base-ball ...], music, education ...) or “backbone” (such as the FRBR). AXIS proposes a very general multi-domain backbone profile able to directly exploit a large variety of domain specific profiles and to implement most of the backbone profiles. This allows the implementation of the exchange of AXEs between systems not using the same backbone profiles or using different profiles for the same dedicated domain or from systems not having implicit profiles. So the same constructs ensures the migration and the interoperability. Notice that the profiles are themselves exchanged as AXEs and stored in the FAR.

The **FAR function** ensures the storage in the form of ‘Fixed Asset Repository’ (*The ST5800 could be one of the best possibilities*).

The **ADEP function** ensures the exploitation using queries based on static agents (such the XAM), on dynamic agents (such as in aceMedia) or on the harvested approach (such as in OAI-MHP). (*The FEDORA could be one of the best possibilities*).

The **MOP function** ensures the technologies watch and the persistence management

**The AXIS DATA MODEL ARCHITECTURE**

The persistence is “build-in” in the AIP modelling. The AXIS way of constructing the autonomous AIP is by organising them through a three layers wrapping: The first layer is the **AXE**. It is realized as a configuration management document called -awa-, represented, on the figure 2 on the top, by a blue rectangle with a yellow border; the second layer covers the ‘**ENTITIES**’, represented by red rectangles and the relations which are represented by green arrows; the third layer is realized by the ‘**DOCUMENTS**’, represented by blue rectangles.

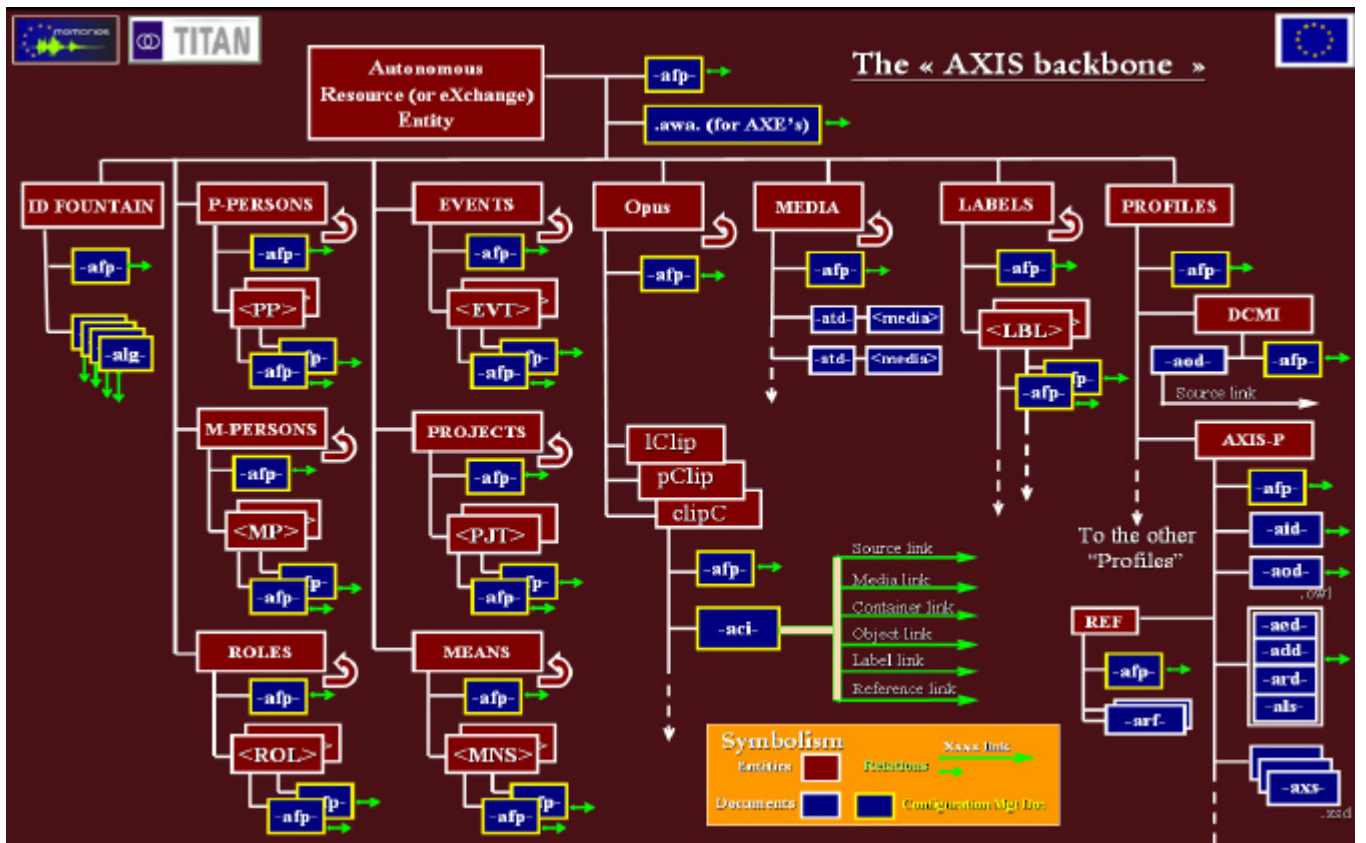


Figure 2: The AXIS DATA MODEL ARCHITECTURE

1. The first layer wrapper covers the **AXE**. It is the well known PACKAGE wrapper of the OAIS (It could be a simple ZIP file [wrapping a set of Files and Folders]. It could also be made using a simple METS profile expressing the structure of the second layer 'Entities').
2. The second layer wrapper is called **ENTITY** in some of the projects (my case) and is called 'container' in other researches. Each ENTITY is expressed by object oriented constructs like: Each ENTITY has a "Class-Of-Entity" defined in a profile (in AXIS, expressed in .owl) introducing the 'documents' [including typed relations] able and/or required for defining the instance of the ENTITY. The "Class-Of-Entities" covers namely the "Opus", "Clips", "ID-Fountain", "Physical\_Person", "Moral\_Person", "Roles", "Events", "Media", "Profile", "Package". The wrapper of the ENTITY layer is a 'Configuration management document', called -afp- (for Axis Foot Print) expressing the coherent sets (releases) of the 'documents', 'relations' and 'entities' representing the instance of the 'entity'. An example of such a document is presented at the figure 3. This layer is fundamental in the architecture: it give namely an embodiment to the Dublin Core terms and entries: "Composer" becomes an Entity of the "role" class while "Beethoven" becomes a physical persons who could play the role of "Composer". The -afp- and the -awa- documents are also managed as documents at the layer 3!


|                           | Creation                                  | Root       | Root  | Compo | Dupli | EVOLUTION  |            |            |            |            |            |  |   |   |  | Natural | Format | Format | Suffix | COMMENTS   |                                    |              |                         |  |  |  |  |
|---------------------------|---|------------|-------|-------|-------|------------|------------|------------|------------|------------|------------|--|---|---|--|---------|--------|--------|--------|------------|------------------------------------|--------------|-------------------------|--|--|--|--|
|                           | ARE                                       | ID         | Index | ID    | ID    | 0          | 1          | 2          | 3          | 4          | 5          | 5  |   |   |  |         |        |        |        |            |                                    |              |                         |  |  |  |  |
| DOCUMENTS                 | NIRS02                                    | 87654321   |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        | afp    | IClip  | rdf        |                                    |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974   |       |       |       |            |            |            | 0          |            |            |  |   |   |  |         |        | aci    |        | xml        |                                    |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974*A | 1     |       | 2FB   |            |            |            | 0          |            |            |  |   |   |  |         |        | bwf    | 96k24  | wav        | Intro: <i>Allegro</i>              |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974*A | 2     |       | 1FB   |            |            |            | 0          |            |            |  |   |   |  |         |        | bwf    | 96k24  | wav        | Romance: <i>Andante</i>            |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974*A | 3     |       | 1FB   |            |            |            | 0          |            |            | 1  |   |   |  |         |        | bwf    | 96k24  | wav        | Menuetto: <i>Allegretto - Trio</i> |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974*A | 4     |       | 1FB   |            |            |            | 0          | 1          | 2          |  |   |   |  |         |        | bwf    | 96k24  | wav        | Rondo: <i>Allegro</i>              |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974*A | 1     |       |       |            |            |            |            |            |            |  |   | 0 | 0  |         |        | jpg    | 600dpi | jpg        | Label                              |              |                         |  |  |  |  |
|                           | NIRS14                                    | 73760974*A | 2     |       |       |            |            |            |            |            |            |  |   | 0 | 0  |         |        | jpg    | 600dpi | jpg        | Box (Face)                         |              |                         |  |  |  |  |
| NIRS14                    | 73760974*A                                | 2          |       |       |       |            |            |            |            |            |            |  | 0 | 0 |  |         | jpg    | 600dpi | jpg    | Box (Back) |                                    |              |                         |  |  |  |  |
| ENTITIES                  | Indexes of the RELEASES of the ENTITY     |            |       |       |       | 0          |            |            |            |            |            |  |   |   |  |         |        |        |        |            |                                    | ENTITY Class | ENTITY Name             |  |  |  |  |
|                           | NIRS14                                    | 786589214  |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | phP    |            |                                    | role         | Wolfgang Amadeus MOZART |  |  |  |  |
|                           | NIRS14                                    | 785642145  |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | role   |            |                                    | role         | Composer                |  |  |  |  |
|                           | NIRS14                                    | 786584780  |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | phP    |            |                                    | role         | James LEVINE            |  |  |  |  |
|                           | NIRS14                                    | 785642158  |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | role   |            |                                    | role         | Director                |  |  |  |  |
|                           | NIRS14                                    | 787045152  |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | moP    |            |                                    | role         | Wiener Philharmoniker   |  |  |  |  |
|                           | NIRS14                                    | 785642146  |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | role   |            |                                    | role         | Orchestre               |  |  |  |  |
|                           | RDT120                                    | 142785     |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        | moP    |            |                                    | role         | Deutsche Grammophon     |  |  |  |  |
| UNESCO                    | 785642146                                 |            |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        | role   |        |            | role                               | Rights Owner |                         |  |  |  |  |
| Dates of EVOLUTION        |   |            |       |       |       | 2008-01-10 | 2008-01-11 | 2008-01-12 | 2008-01-13 | 2008-01-14 | 2008-05-09 | 2008-05-10   |   |   |  |         |        |        |        |            |                                    |              |                         |  |  |  |  |
| REFERENCES                | NIRS14-73956782 (OPUS)                    |            |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        |        |            |                                    |              |                         |  |  |  |  |
|                           | DG 427 811-2 & POL 924 (Original Matrice) |            |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        |        |            |                                    |              |                         |  |  |  |  |
|                           |   |            |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        |        |            |                                    |              |                         |  |  |  |  |
|                           |   |            |       |       |       |            |            |            |            |            |            |  |   |   |  |         |        |        |        |            |                                    |              |                         |  |  |  |  |
| ENTITY                    |   |            |       |       |       |            |            |            |            |            |            | Refinement of the Dublin Core                                |   |   | Current version of the -afp- document  |         |        |        |        |            | 5                                  |              |                         |  |  |  |  |
| Name of the ENTITY        |   |            |       |       |       |            |            |            |            |            |            | Eine Kleine Nachtmusik                                       |   |   | Date of the current version  |         |        |        |        |            | 2008-05-09                         |              |                         |  |  |  |  |
| Type of ENTITY            |   |            |       |       |       |            |            |            |            |            |            | IClip  |   |   | Current release of the ENTITY  |         |        |        |        |            | 1                                  |              |                         |  |  |  |  |
| IDENTIFIER of the ENTITY  |   |            |       |       |       |            |            |            |            |            |            | NIRS02-87654321-&-&-&  |   |   | Date of the Current RELEASE  |         |        |        |        |            | 2008-05-10                         |              |                         |  |  |  |  |
| External ID of the ENTITY |   |            |       |       |       |            |            |            |            |            |            | K. 525   |   |   | Configuration manager  |         |        |        |        |            | Jacqueline von Arb                 |              |                         |  |  |  |  |
| External ID of the ENTITY |   |            |       |       |       |            |            |            |            |            |            | K. 525   |   |   | Page number  |         |        |        |        |            | 1                                  |              |                         |  |  |  |  |
| RIGHTS OWNER(s)           |   |            |       |       |       |            |            |            |            |            |            | Deutsche Grammophon  |   |   | Total number of pages  |         |        |        |        |            | 1                                  |              |                         |  |  |  |  |
| Description of the ENTITY |   |            |       |       |       |            |            |            |            |            |            | Famous Chamber's music by V.A. MOZART. Wiener Philharmoniker |   |   | AXIS Foot Print document   |         |        |        |        |            |                                    |              |                         |  |  |  |  |
| KEY WORDS                 |   |            |       |       |       |            |            |            |            |            |            | Classical Music; Chamber Music                               |   |   |  <b>Stiftelsen Norsk Lydinstitutt Stavanger</b><br>Bjergsted Terrasse 5, 4007 STAVANGER (Norway) |         |        |        |        |            |                                    |              |                         |  |  |  |  |

Figure 3: Example of the second level wrapper (-afp-)

3. The third layer is obtained by a **wrapping of the two aspects of a document onto two files**: one of the couple of file contains the 'payload' and the other the 'metadata' pertaining to the 'document' [the same for the 'relation' which are also represented by two files]. Example: A typical 'entity' of the class "Clip" could be represented by one wave document; one mp3 document; one semantic metadata and one link to the original master (on a 78rpm disk). So, the wave document is represented by a .wav file and the wrapped associated file gives all technical details on the exact sample rate and size (96ks/s with 24 b/s), on the full explosion of the data elements of each of the UID's (many UID's could be attached to each 'document', 'relation' or 'entity'), on the semantic metadata specific to the wave file and on the link to all the 'entities' in which the document is attached. The **ST5800** is ideal for implementing the third layer wrapping. It is important to notice that metadata documents are managed as 'payload' having themselves their meta-metadata! The backward relations related to the 'payload' are also included in the metadata file.

## The AXIS MANAGEMENT of the PERSISTENCE and of the Open Interchanges

The persistence and the open interchanges are “build-in” in the AIP modelling.

One of the two key constructs is the concept of “ORTHOAGONALITIES” as illustrated by the figure 4.

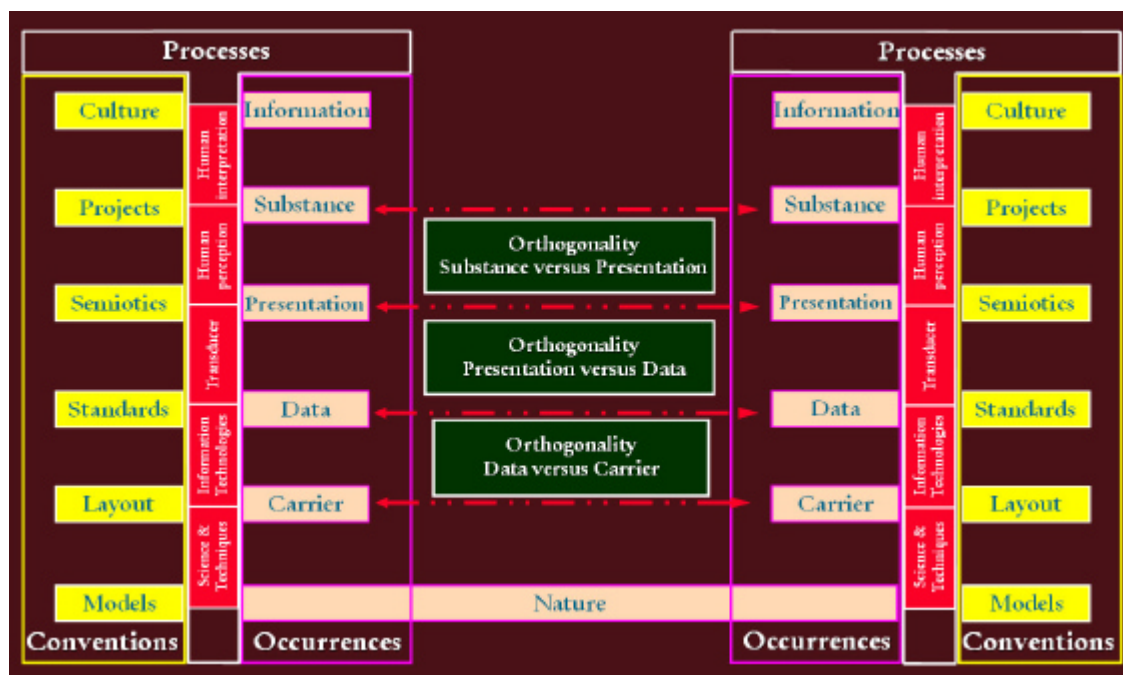


Figure 4: The layered orthogonalities

The second key construct is the concept of “INTEROPERABILITY WICKETS” based on the respective profiles of the two systems “A” and “B” as illustrated by the figure 5.

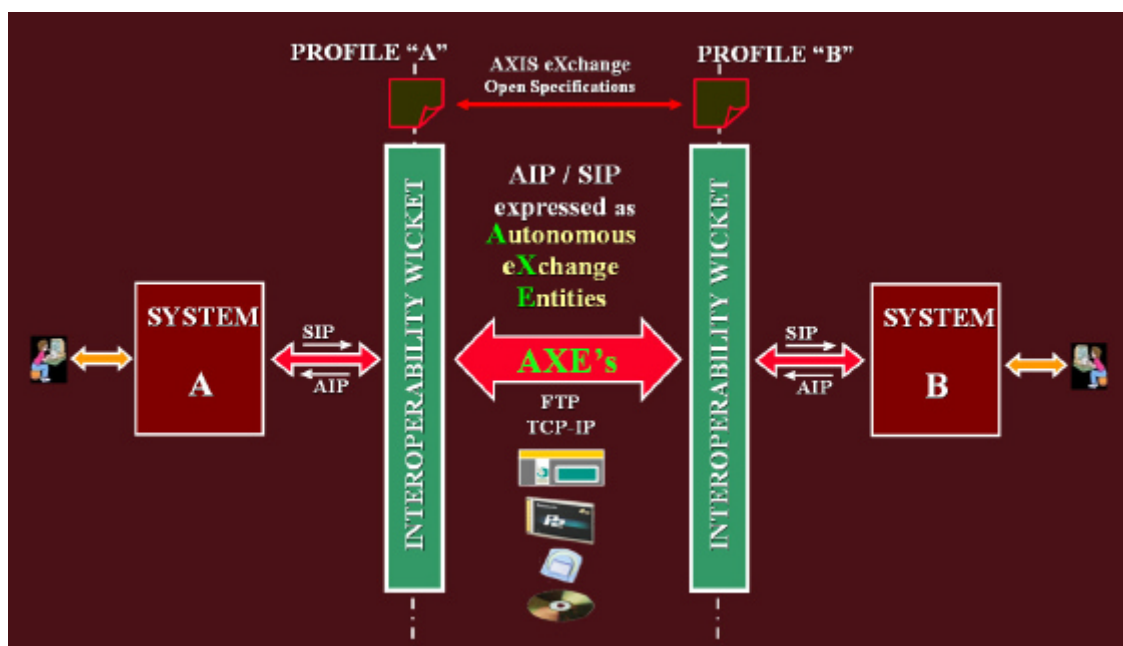


Figure 5: The interoperability wickets

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