TECHNICAL REPORT

ISO/TR 24014-2

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Public transport — Interoperable fare management system —

Part 2: Business practices

Transport public — Système de gestion tarifaire interopérable —

Partie 2: Pratiques commerciales

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Foreword

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In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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ISO/TR 24014-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Road transport and traffic telematics*, in collaboration with Technical Committee ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO/TR 24014-2, together with ISO/TR 24014-3:2013 and the future second edition of ISO 24014-1, will cancel and replace ISO 24014-1:2007.

ISO 24014 consists of the following parts, under the general title *Public transport — Interoperable fare management system*:

— *Part 1: Architecture*

— *Part 2: Business practices* [Technical Report]

— *Part 3: Multi-application media* [Technical Report]

Introduction

ISO 24014-1 defines the reference functional model of an Interoperable Fare Management System (hereafter IFM functional model). The scope of ISO 24014-1 excludes irrelevant aspects related to interoperability, particularly organizational and physical implementation.

Among the matters that are outside the scope and not clearly or concretely described in ISO 24014-1, this Technical Report provides a conceptual framework to guide the integration of such business practices, which is important when constructing an IFMS compliant with ISO 24014-1

For this purpose, this Technical Report provides a conceptual framework that is described below.

ISO 24014-1 states that a full IFMS is described by its functional model of IFMS and its Set of Rules. Therefore, Set of Rules is one of the necessary components to understand the full or whole IFMS environment. However, ISO 24014-1:2007 is limited in description, only addressing Set of Rules in addition to some security and identification rules specifically stated as "… regulations achieving IFM policies expressed as technical, commercial, security and legal requirements and standards relevant to only IFMS."

The objective of this Technical Report then is to aid readers in their understanding of the whole structure of Set of Rules by concretely clarifying the relationship with IFM functional model.

In the introduction of ISO 24014-1, it is noted that there may be cases where multiple existing IFMSs work together collaboratively while distributing their functions across the different IFMSs. Specifically, these cases that consider integrating/distributing functions between existing IFMSs are one of the most effective ways of implementing and expanding the interoperability of existing IFMSs. However, there are no concrete descriptions about the interoperability of multiple existing IFMSs, because, from the viewpoint of ISO 24014-1, multiple existing IFMSs that achieve interoperability are functionally considered as a single IFMS.

This Technical Report clarifies how interoperability that is realized among multiple existing IFMSs or expanded to them can be understood from both IFM functional model and Set of Rules viewpoints. Further, this Technical Report explains how cases of collaboration, in which IFM functional model and functional model of non public transport applications are involved, can be interpreted from the viewpoint of IFM functional model.

Public transport — Interoperable fare management system —

Part 2: Business practices

1 Scope

This Technical Report introduces a generic conceptual framework that can be applied to all Interoperable Fare Management Systems (hereafter IFMS) compliant with ISO 24014-1, as the basis for business practices relating to the conceptual framework for an IFMS, which is described in ISO 24014-1.

This generic conceptual framework comprises three parts:

a) structure of Set of Rules;

b) collaboration of functional models;

c) integration of Set of Rules.

A "Structure of Set of Rules" is applied to Set of Rules covering the whole domain of IFMS functionality in all aspects of a system including

— a structure based upon IFM-roles in the domain of IFM functional model,

— a structure based upon roles, abstract objects performing a set of functions, in all IFM domains, and

— a structure based upon business entities in all IFM domains.

These structures provide a method to easily understand the Structure of Set of Rules as a whole.

Collaboration of functional models is applied when different functional models that collaborate exist, such as might be defined by the coexistence of applications on a medium, between functional models of existing IFMS, or between IFM functional model and functional model of a non-PT system. Such relationships are best explained and understood from the viewpoint of a three-dimensional model as defined in Clause 6.

"Integration of Set of Rules" is applied to clarify the extent of interoperability that may exist between existing IFMSs which are collaborating by quantifying the integration of Set of Rules based upon "Structure of Set of Rules".

This Technical Report is used as a tool for business practices. Any organizational references and concrete descriptions in examples within this Technical Report are purely informative.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 24014-1, *Public transport — Interoperable fare management system — Part 1: Architecture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24014-1 and the following apply.

3.1
core part of set of rules
rules relating to only IFM-roles and the use cases defined in ISO 24014-1, which defines the functions of a fare management system relating to interoperability

3.2
extra part of set of rules
rules including IFM-partners/IFM-silent-partners and other use cases except use cases defined in ISO 24014-1, which work to decide serviceability of an IFMS and do not affect interoperability of the system

3.3
full IFM functional model
functional model played by all IFM-roles and IFM-partners

Note 1 to entry: See 6.1 for the relationship among full IFM functional model, extra IFM functional model and IFM functional model.

3.4
extra IFM functional model
difference between full IFM functional model and IFM functional model

3.5
IFM functional model
functional model defined in ISO 24014-1

3.6
IFM-partner
role resides in the outside of IFM functional model, and performs a set of interactive fumctions in a functional model/use cases

3.7
IFM-role
role within the IFM

Note 1 to entry: Corresponds to the definition of "entity" in ISO 24014-1:2007.

3.8
IFM-silent-partner
role resides in the outside of IFM functional model, and does not perform a set of interactive functions in a functional model/use cases

3.9
management IFM-role
IFM-role played by security manager and registrar for administrating IFMs

3.10
non-PT-role
role within non-public transport systems

3.11
operational IFM-role
IFM-role played by product owner, product retailer, application retailer, collection and forwarding, service operator, application owner, customer service, and customer related to PT daily operation

3.12
serviceability
level of functionality of a fare management system apart from interoperability such as kinds of payment means, kinds of medium, methods of acquiring medium

4 Symbols and abbreviated terms

IFMSs Interoperable Fare Management Systems

PT Public Transport

5 Structure of Set of Rules

5.1 Classification of Set of Rules

Set of Rules is defined in ISO 24014-1:2007 as "regulations achieving IFM policies expressed as technical, commercial, security and legal requirements and standards relevant to only IFMS". IFM Policy described by Set of Rules defines all the functionality of IFMS, and thus all the conditions necessary for constructing IFMS can be understood through Structure of Set of Rules. Therefore, the concept of Structure of Set of Rules gives PT stakeholders a guideline from which to draw the whole picture of IFMS, currently configured or as planned, compliant with ISO 24014-1.

Core part of Set of Rules is the subset of Set of Rules, which defines functions related to interoperability in a functional IFMS. From the viewpoint of existing IFMSs, the structure of core part of Set of Rules is a useful concept when integration or distribution of core part of Set of Rules is done to realize interoperability among existing fare management systems. (See Clause 7 and ISO 24014-1:2007, Annex B, Figure B.4.)

Extra part of Set of Rules, also a subset of Set of Rules, is outside of the core part of Set of Rules. It defines the contents of each element related to serviceability, such as payment options and accepted media.

From the viewpoint of multiple functional model collaboration, which is introduced in 6.1 for functional models outside public transport area, the structure of extra part of Set of Rules is a necessary concept for harmonization of services in collaboration with multiple functional models.

5.2 A table form of Set of Rules

In order to clearly show the structure of Set of Rules, a table form is proposed as a way of describing Set of Rules. In Figure 1, the columns represent the IFM-roles and the rows represent the Use Cases defined in ISO 24014-1. Based upon IFM-roles and the Use Cases, and by properties of rules, each rule can be identified, defined and related. The following table form represents Structure of Set of Rules with three characteristics of each rule: related Use Cases, related roles and related properties.

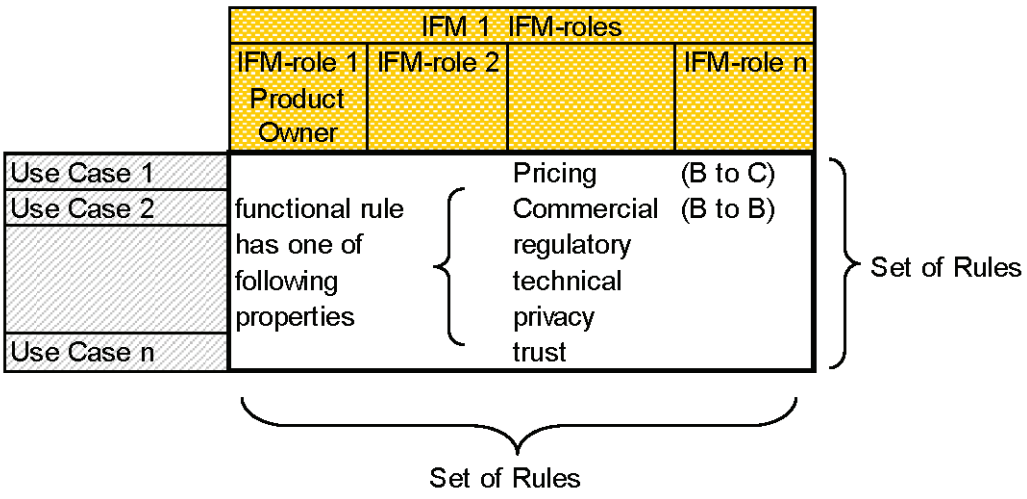


Figure 1 — Concept model of table form of Set of Rules

In ISO 24014-1, the following definitions are included:

— Pricing Rules: rules defining the price and payment relationships to the customer.

— Commercial Rules: rules defining the settlement and commission within the IFMS.

The description of a structure of Set of Rules in the table form makes it possible to easily relate specific rules to IFM-roles and vice versa. For example, if IFM-roles are selected, rules that should be applied to relevant IFM-roles can be known. If rules are sorted out by transit properties such as being related to pricing, commercial, regulatory or others, all the relevant rules can be systematically known, which are required by implementing transit properties.

The description of the structure of Set of Rules in the table form does not mean simply grouping of rules, but showing a process of making rules in compliance with IFM functional model. Rules identify which IFM-roles are subject to the rules and how such IFM-roles are related to each other. The structure of Set of Rules gives a guide to making a real Set of Rules to PT stakeholders, and helps them to understand an IFMS through analysing the existing Set of Rules. The structure of Set of Rules is a tool to aid in the process of relating rules with roles.

5.3 Structure of core part of Set of Rules

IFM-roles and Use Cases necessary for making core part of Set of Rules are given by ISO 24014-1. As explained in 5.2, in the concept model of the table form of core part of Set of Rules (see Figure 1), from the viewpoint of each rule, the columns are IFM-roles that are governed by appropriate rules, and the rows are the Use Cases to which the rule is applied. The cross points contain individual rules that are subdivided into the properties of the rules, such as, pricing, commercial, regulatory, technical, privacy, and trust.

A generic table for applying core part of Set of Rules when used as a template is expanded as shown in Figure 2. In this generic table, a row representing an instance of the Use Cases is subdivided into its properties. At the cross points of the columns and the rows, concrete rules are described, relating Use Cases defined in ISO 24014-1 and IFM-roles specific to a property category.

Requirements per Set of Rules		IFM-roles								
Use Cases	Sub-categories	Application Owner	Application Retailer	Product Owner	Product Retailer	Collection and Forwarding	Security Manager	Registrar	Service Operator	Customer
Certification of Organisation	Pricing									
	Commercial									
.....	regulatory									
etc.	technical									
	privacy									
	trust									

Set of Rules

Set of Rules

Figure 2 — Generic table form of Set of Rules

As guidance for actually making a table form of core part of Set of Rules, a table form addressing Use Cases of Product is described in Annex A.

5.4 Structure of extra part of Set of Rules

Roles which are outside IFMS Functional model, even if they have functions relating to IFMS, are not described in ISO 24014-1, because from the interoperability point of view of functional IFMS, they need not be considered. However, these roles have to be considered from serviceability point of view.

These roles are categorized by attributes into two types. One is a role which has an interactive relationship with IFM-roles and becomes an Actor in Use Cases defined in ISO 24014-1. This role actively performs a

set of functions of implementing serviceability of an IFMS in cooperation with IFM-roles, and if necessary in collaboration with roles outside the IFMS. This is called IFM-partner. Full IFM functional model, the functional model including serviceability, which defines functions of IFM apart from interoperability, is described as interactive relationships among IFM-roles and IFM-partners.

The other is a role which must obey rules created by interactive relationships among IFM-roles and IFM-partners. Therefore, the role is a party governed by Set of Rules, but is not a player in full IFM functional model. This is called IFM-silent-partner.

As IFM-partners and IFM-silent-partners are also roles as well as being characterized by their IFM-roles, the description of the structure of extra part of Set of Rules should be designed in a similar form to the structure of core part of Set of Rules. The table form is expanded from core part of Set of Rules with addition of columns of IFM-partners/IFM-silent-partners. This table presents Set of Rules for the whole IFM functions. In this table, relationships about serviceability applied to non-PT systems can be contained.

The table form of Set of Rules expanded into the whole IFMS functionality is given in Figure 3. Additional use cases may be required depending on the IFMS functionality.

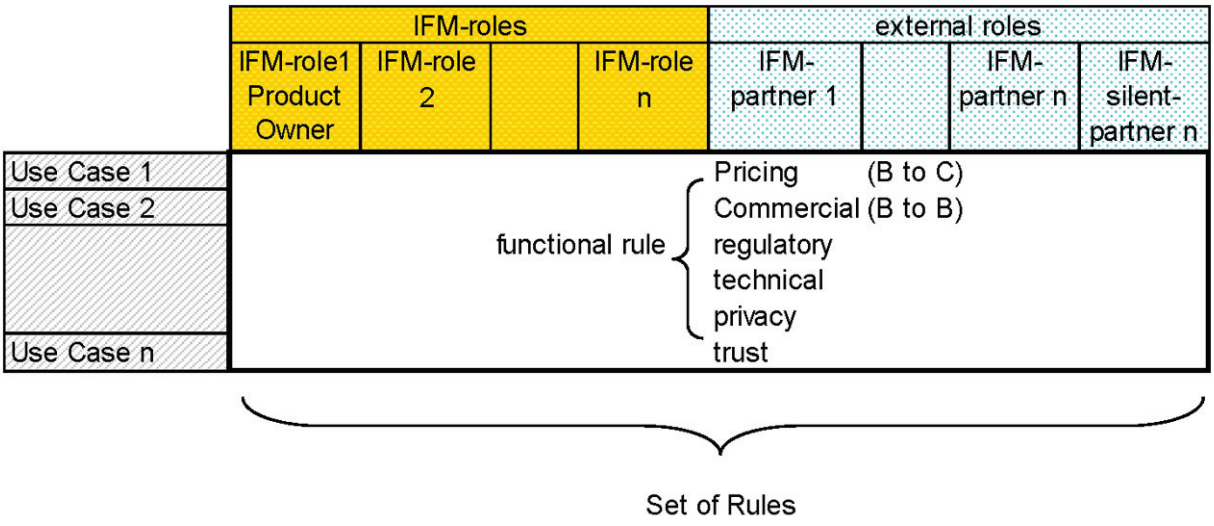


Figure 3 — Extension of table form with IFM-partners/IFM-silent-partners

5.5 Transforming structure of Set of Rules into business entities

In an existing IFMS, objects responsible for rules are not roles but are business entities within real organizations. To make the table form of Set of Rules a practical guideline to construct an IFMS, a transformation from roles to business entities should be provided.

Figure 4 explains a way of transforming a table from roles to business entities. The following should be noted when the table form of Set of Rules with business entities is created.

— One role may correspond to multiple business entities and one business entity may correspond to multiple roles.

— The correspondence between roles and business entities may be different from Use Case to Use Case. Therefore, this correspondence table may be specific for each Use Case.

— Each allocation of roles to business entities may differ from one existing IFMS to another.

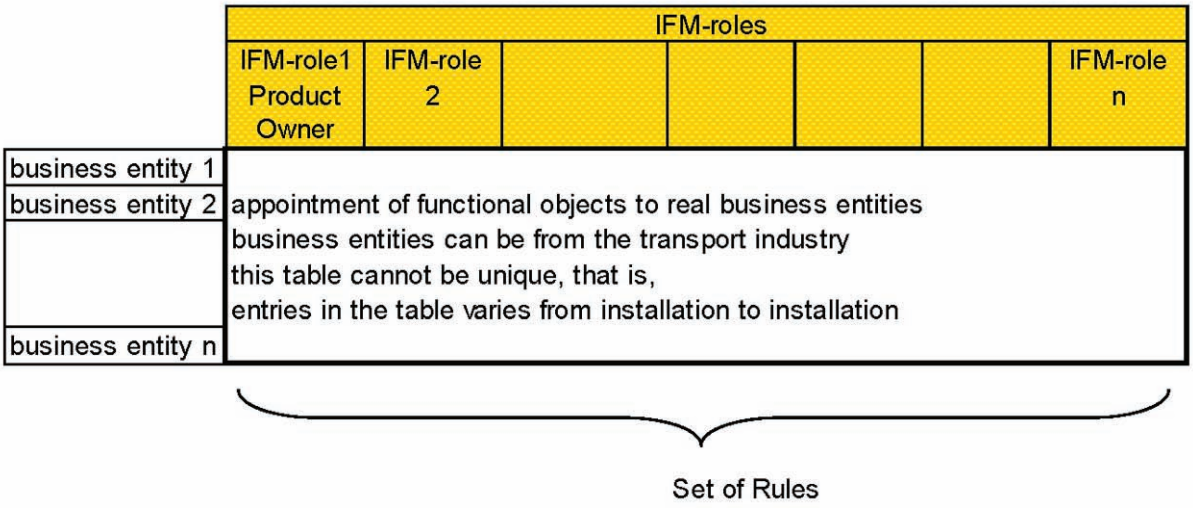


Figure 4 — Transformation table from functional to business entities

According to this concept, Figure 5 is created as the table form of the whole Set of Rules, including core part and extra part, by applying correspondence of business entities with roles. The table form of the whole Set of Rules useful for business practice can be obtained after filling out the table in Figure 5 for all the Use Cases.

By sorting the rules of all the tables shown in Figure 5, in relation to a specific business entity, there will be a subset of Set of Rules by which each entity is governed. This will be done for each business entity.

By sorting rules according to the property of rules, such as Pricing, Commercial, etc., the subset of Set of Rules required to implement policies which relate to each property can be systematically determined.

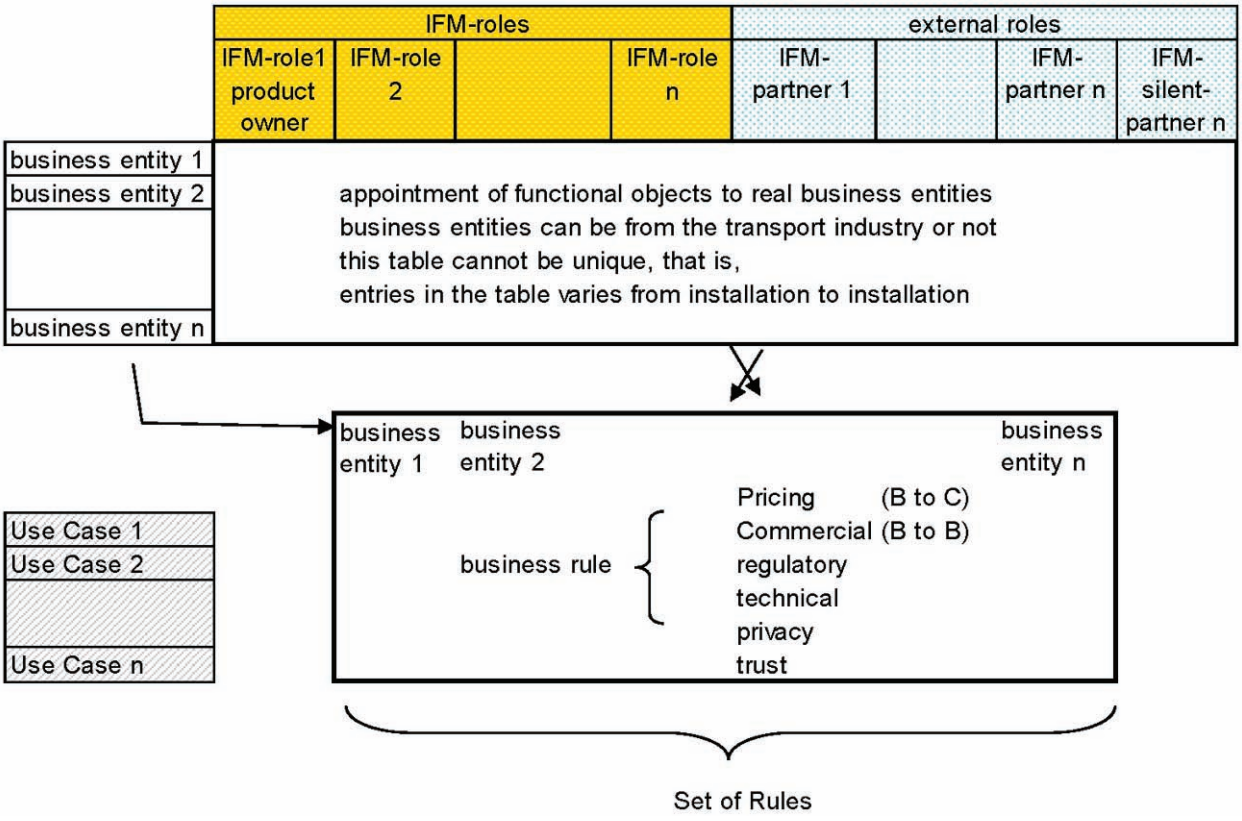


Figure 5 — Transforming into a final form

6 Three Dimensional Model in collaboration among functional models

6.1 Collaboration among functional models

For expanding interoperability, there are cases where multiple existing IFMSs work together by integrating/distributing the functions within them, such as:

— multiple applications (PT applications) are loaded on a single medium;

— existing IFMSs make own Products (PT products) usable on Applications of other existing IFMSs.

In these cases, there are collaborations between corresponding functional models of existing IFMSs for related applications.

When IFMS Applications and non-PT applications are loaded on a single medium, there may be cases where the related applications jointly achieve some serviceability. Even in these cases, there are collaborations between full IFM functional model and the corresponding functional model for non-PT applications.

The situations described above are called multiple functional models collaboration.

Multiple functional model collaboration is an effective way to realize and improve both interoperability and serviceability. At the same time, this kind of collaboration can take any form of patterns. And in case of non-PT functional models, the domains where collaborations can happen between the full IFM functional model and non-PT functional model may differ depending upon the corresponding to a set of functional models. Therefore, a tool to understand in a general way these kinds of collaborations is very useful in addressing business practices.

NOTE The domain for the structure of Set of Rules, which is the whole IFMS domain, and the domain for full IFM functional model do not necessarily coincide. As described in 5.4, in the former domain, IFM-roles, IFM-partners, and IFM-silent-partner are involved parties. In the latter domain, only IFM-roles and IFM-partners are involved (See Figure 6).

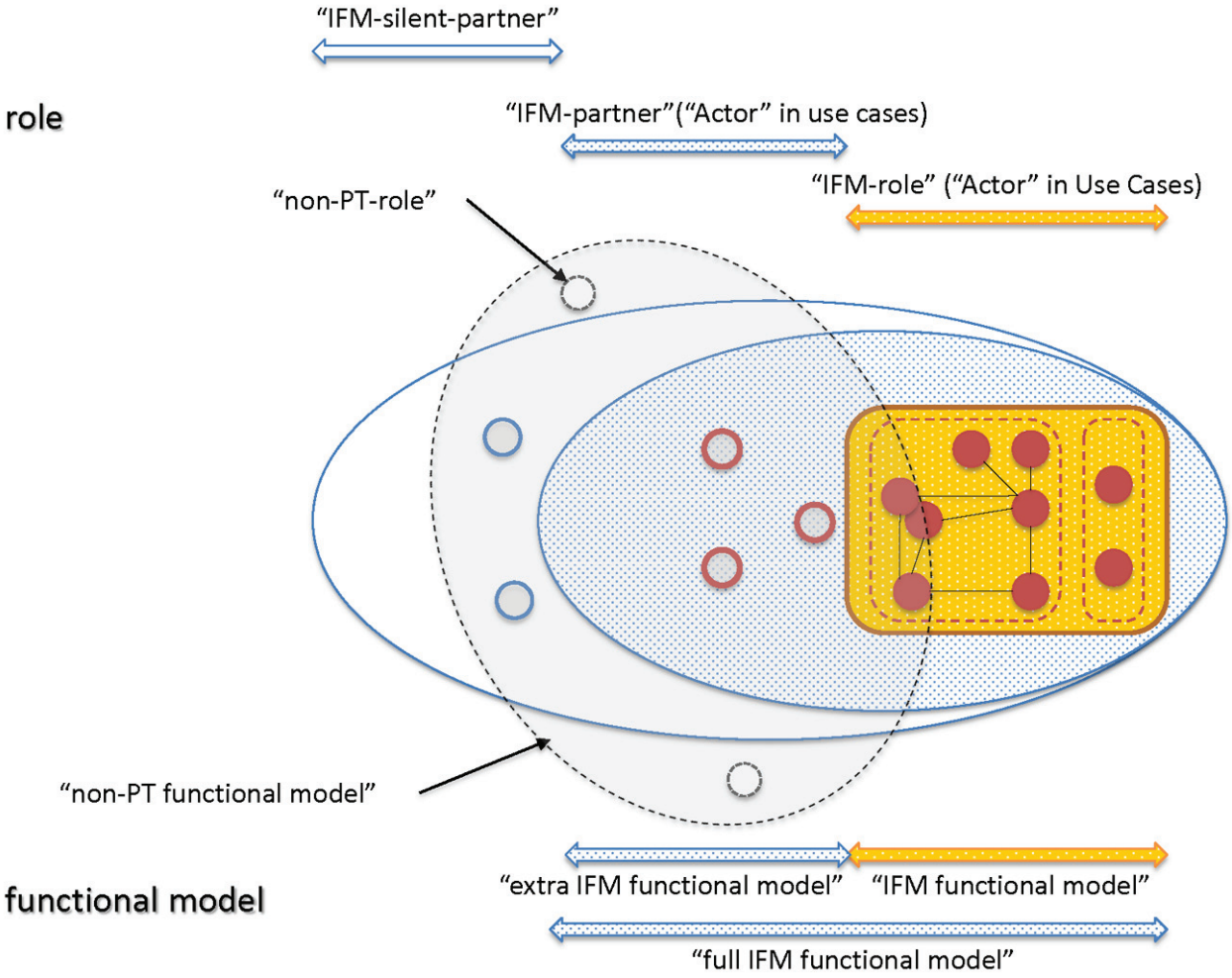


Figure 6 — Relationships among roles and functional models within multiple functional model collaboration

6.2 Three Dimensional Model

6.2.1 Concept of Three Dimensional Model

In this section, a Three Dimensional Model (TDM) is introduced as a tool to understand functional structure of mutual relationship for collaboration among multiple functional models. In the TDM, each functional model in multiple functional models collaboration is placed in a three dimensional space as a detached plane, so that the collaboration among functional models can be understood as a graphical relationship of functional models represented by planes in the three dimensional space and their intersection.

IFM functional model is described by the IFM-roles and their mutual relationship. Full IFM functional model can be described by the same elements (IFM-roles/IFM-partners and their mutual relationship) as in the case of IFM functional model. Therefore, it would be appropriate in the TDM to describe mutual relationships among respective functional models in multiple functional models collaboration as a set of mutual relationship of the roles in the functional models.

6.2.2 Usefulness of Three Dimensional Model

By virtue of the following two viewpoints, in the TDM, multiple functional models collaboration environment can be understood from many perspectives without changing involved functional models:

— TDM gives a dynamic view to understand multiple functional models collaboration as the relationship between IFM-roles/IFM-partners in existing IFMSs. And the TDM also gives the same view for the relationship between IFM-roles/IFM-partners and non-PT-roles.

— By seeing each functional model as a plane, the necessary functions for realizing multiple functional models collaboration, of IFM-roles/IFM-partners in existing IFMSs and non-PT-roles, can be determined.

6.3 Three Dimensional Model for IFMS

6.3.1 Characteristics of TDM for IFMS

An Application of existing IFMS is mapped on IFM functional model due to ISO 24014-1. For this reason, IFM functional models of the existing IFMSs in multiple functional models collaboration can be drawn as multiple functional models which share the same domain, but are placed within different planes (see Figure 7).

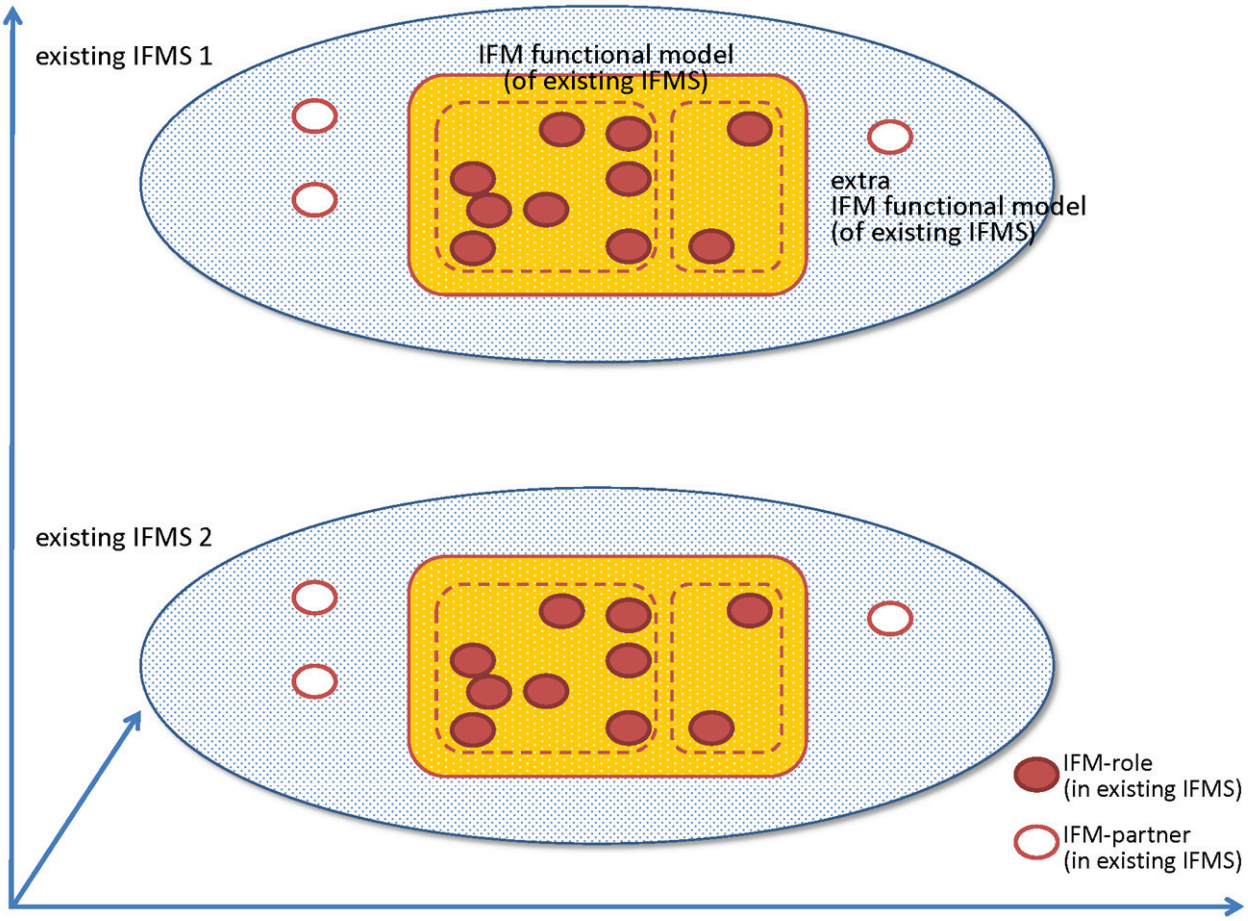


Figure 7 — IFM functional models of existing IFMS in a three dimensional space sharing the same domain

6.3.2 TDM for functional model of existing IFMSs

Collaboration between functional models for existing IFMSs is explained from the mutual relationship point of view.

IFM functional model defines the interoperability of the IFMS. For making multiple existing FMSs interoperable, at least the function of IFM-roles in existing IFMSs corresponding to Management IFM-roles should be unified, though implementation of the function may be distributed within corresponding roles in the existing IFMS.

Mutual relationship between IFM-roles in existing IFMSs corresponding to the operational IFM-roles can be in any form and levels, such as, from an integration of Set of Rules to a sharing of whole or part of functions performed by a business entity. Also, an integration of Set of Rules and a sharing business entity co-exist in a mutual relationship for an IFM-role (see Figure 8).

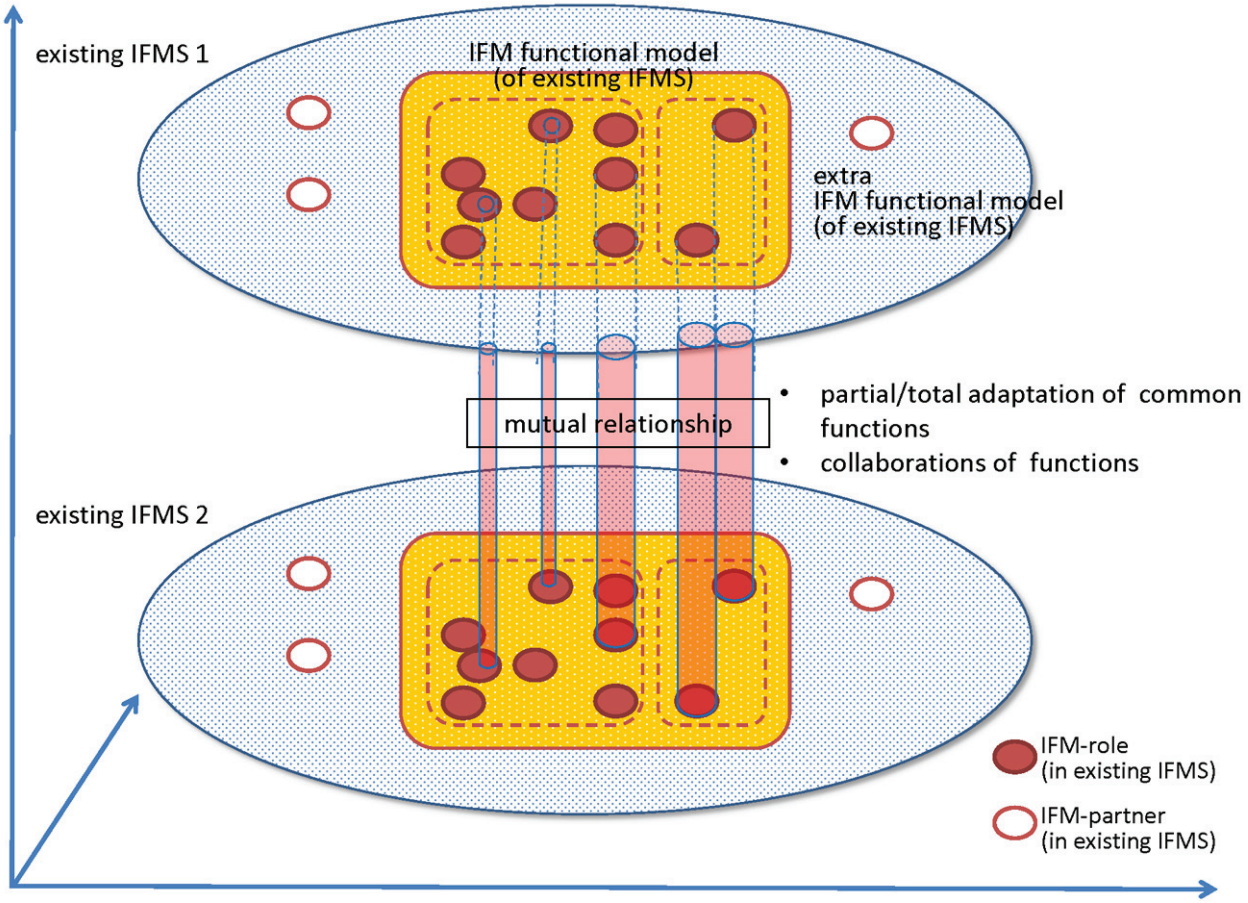


Figure 8 — Combination of mutual relationship

6.3.3 FM Functional model and TDM for functional model of existing IFMSs

By mapping functional models of multiple existing IFMSs and their mutual relationship among IFM-roles in existing IFMSs onto a two dimensional plane, they can be reduced to a single IFM functional model. For this reason, multiple existing IFMSs which are interoperable can be seen as one IFMS from a functional viewpoint (See Figure 9).

On the other hand, from the each existing IFMS point of view, projecting a set of mutual relationship onto each functional model produces functional model of the existing one where interoperability is realized by the introduced set of mutual relationships.

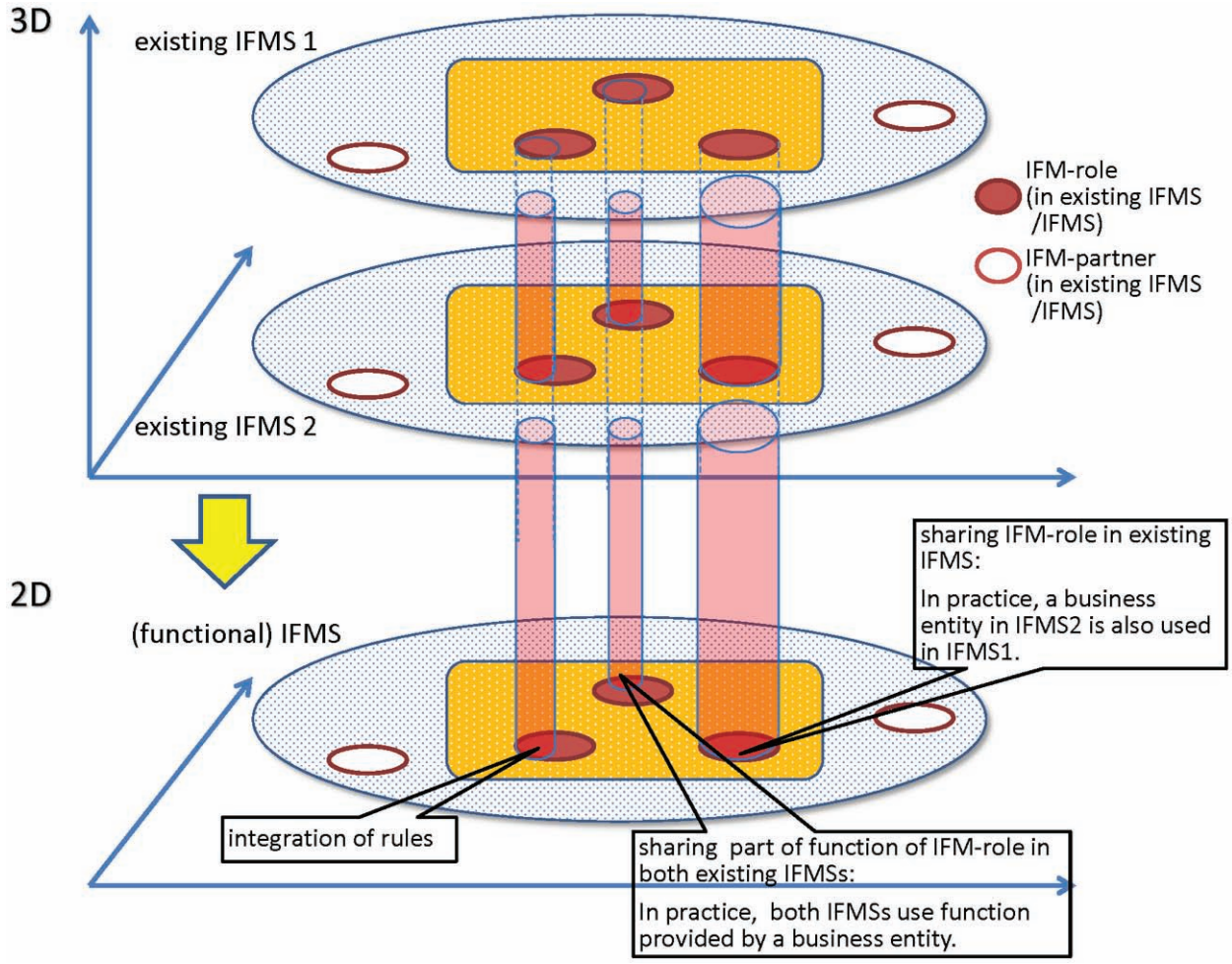


Figure 9 — Mutual relationship from functional viewpoint of IFM functional model

EXAMPLE In the case a functional IFMS has the interoperability, where existing IFMS 1 and existing IFMS 2 have a common Product, the following mutual relationship may exist:

— "integration of rules": Rules, which Application/Product Owner defines relating to the common Product, such as, requirements of usage data and data elements on Medium, are integrated.

— "sharing part of functions of IFM-role": The common Product is processed by automatic gate/vending machine of a Product Retailer.

6.3.4 TDM including Extra IFM functional model

By using IFM-partners introduced in Clause 5, mutual relationship of functions in Extra functional model between existing IFMSs can be modelled using the TDM. This is useful, for example, when the same payment scheme is to be used, or when using media with multiple applications.

6.4 Three Dimensional Model for IFMS and non-PT system

6.4.1 Characteristics of TDM for IFMS and non-PT system

In multiple functional models collaboration for IFM functional model and non-PT functional model, mutual relationship between functional models can be analysed through the TDM. However, the following amendment would be necessary, in comparison with multiple functional models collaboration for existing IFMSs:

Full IFM functional model and non-PT functional models are defined by different domains and architectures. In the TDM under multiple functional models collaboration for IFMS and non-PT, IFM functional model and non-PT functional models are placed in the three dimensional space such that they are on different planes that are either partially overlapped or not overlapped at all when they are projected onto a two dimensional plane. Note that the functional model of non-PT and full IFM functional model of IFMS should overlap somewhere on a two dimensional plane, on which they are projected, if there is to be a relationship between them.

6.4.2 IFM functional model and TDM for IFMS and non-PT system

It is important to distinguish whether or not mutual relationship relates to the IFM-roles in core part, which are involved in interoperability, or IFM-partners in extra part, which are connected with serviceability.

Mutual relationship has various forms, as in multiple functional models collaboration of IFMS and non-PT system(s), such as, from harmonization of rules to sharing functions, including the cases where one becomes an agent for the other. Also, even in mutual relationship for a pair of roles, there could be various combinations by harmonization of rules and sharing functions (see Figure 10).

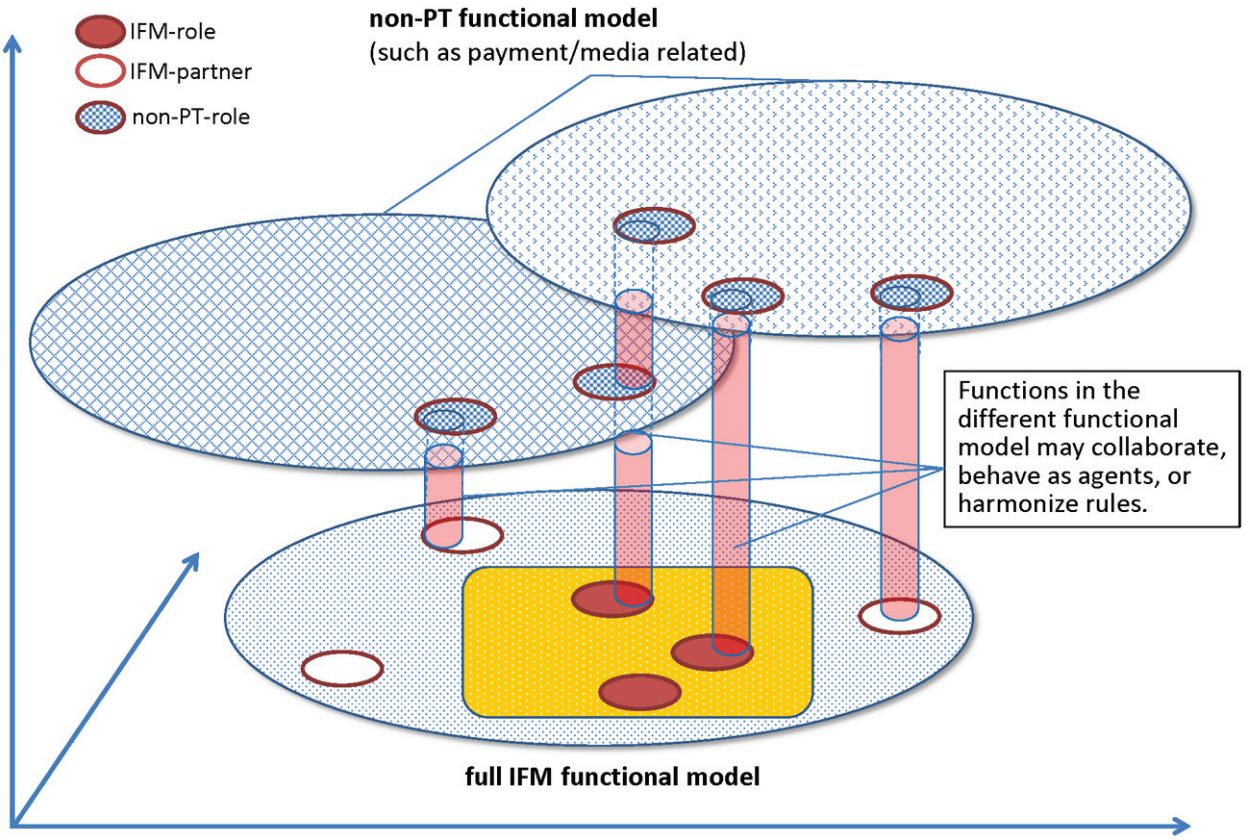


Figure 10 — Function collaboration between IFM and non-PT functional models

6.4.3 Individual functional model reflecting mutual relationships

Full IFM functional model need not change under multiple functional models collaboration with non-PT. Only the functions in each related role (IFM-role/IFM-partner and non-PT-role) are required to reflect conditions for their mutual relationship appropriately. Note that mutual relationship of IFM-role shall be compliant to ISO 24014-1. IFM-partners would be added into the resulting functional model.

By reflecting conditions for mutual relationship with full IFM functional model, in the functional model of a non-PT, terms and conditions for the non-PT are revealed for realizing multiple functional models collaboration with an IFMS (see Figure 11).

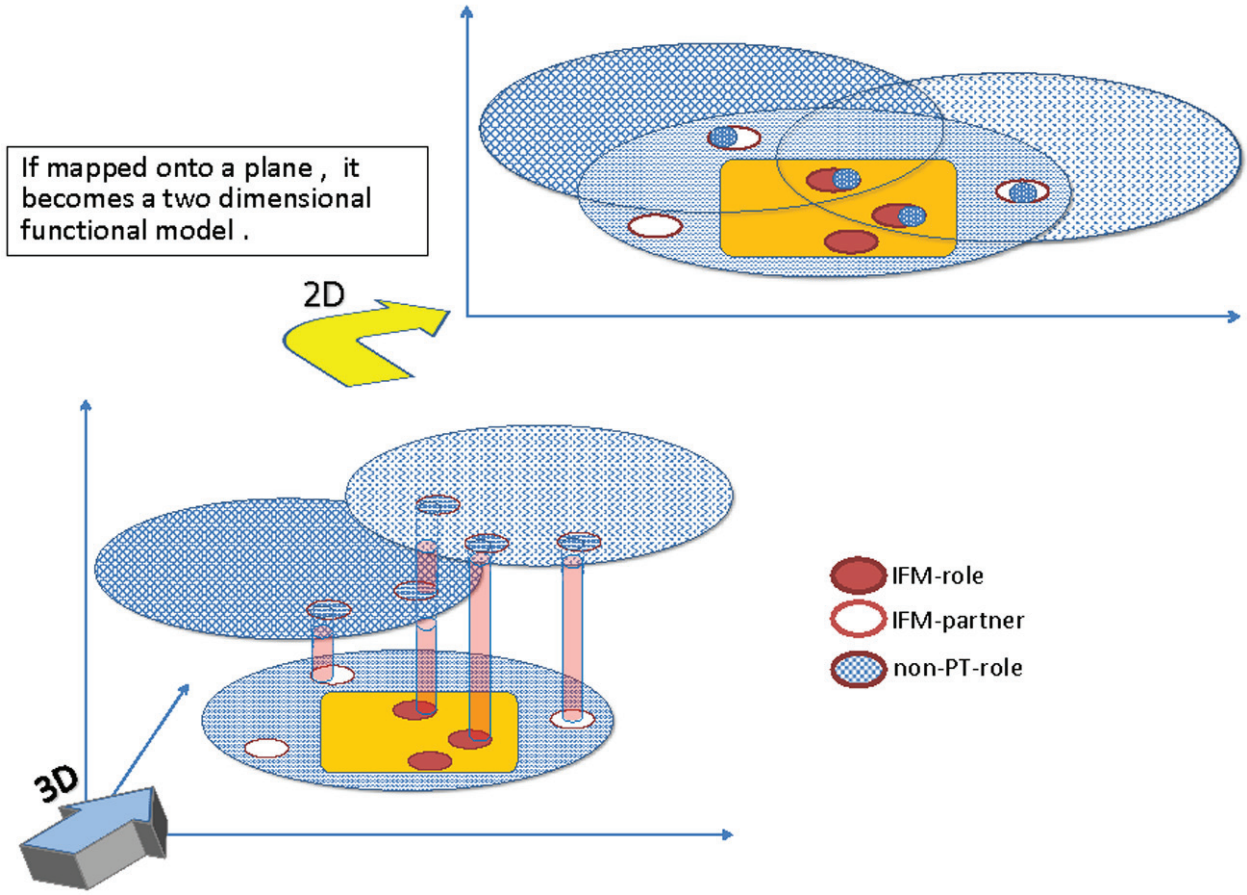


Figure 11 — Resulting functional model from multiple functional models collaboration between IFMS and non-PT

7 Integration of Set of Rules

7.1 Integration of Set of Rules and Interoperable States

7.1.1 Integration of Set of Rules and Collaboration of functional models

The Three Dimensional Model (TDM) described in Clause 6 provides a tool for depicting the collaboration between existing IFMSs necessary for interoperability between them. However the TDM can only depict the specific set of functions that reflect the relationships at a specific point in the process.

It is one of the most rational business practices for PT stakeholders to expand interoperability through evolution in collaboration and so it can be expected that some additional capability may be needed to depict such evolution.

As the evolution proceeds in the TDM, new relationships may be created or existing relationships expanded between associated roles.

The process of evolution can be seen as a step-wise integration/distribution of functions, which is realized by gradual integration of related rules in Set of Rules. Therefore, a new tool based on Set of Rules is required, by which a process for upgrading the status of collaboration for interoperability is understood, illustrating the gradual integration.

7.1.2 Integration of Set of Rules and Two states of Interoperability

Fare Management Community (FMC) is defined as a body that shares a fare management policy. Using this terminology, an IFMS can be restated as a fare management system shared by one of these communities and the Interoperability as defined in ISO 24014-1 is further defined as a potential ability by which a customer could travel through multiple public transport systems managed and operated by FMC with a single medium.

Based upon the Interoperability defined in ISO 24014-1, and specifically the commercial interoperability, by which a customer actually can travel through PT, can be constructed. Therefore, the tool to express the status of interoperability should show how much these two different stages of interoperability are fulfilled.

Interoperability defined in ISO 24014-1 can be available with sufficient integration of rules for IFM-roles (excluding Customer) in Set of Rules, that is, Business to Business, hereafter B to B. On the other hand, commercial interoperability, in addition to B to B, needs integration of additional rules, that is, for IFM-roles of Public Transport business and Customers, that is, Business to Customer, hereafter B to C.

Among the classified rules of Set of Rules defined by ISO 24014-1 and Clause 5, rules for B to B exist for all the classifications except Pricing. On the other hand, rules for B to C exist for all except technical, trust, and Commercial. See Clause 5. Figure 12 illustrates this.

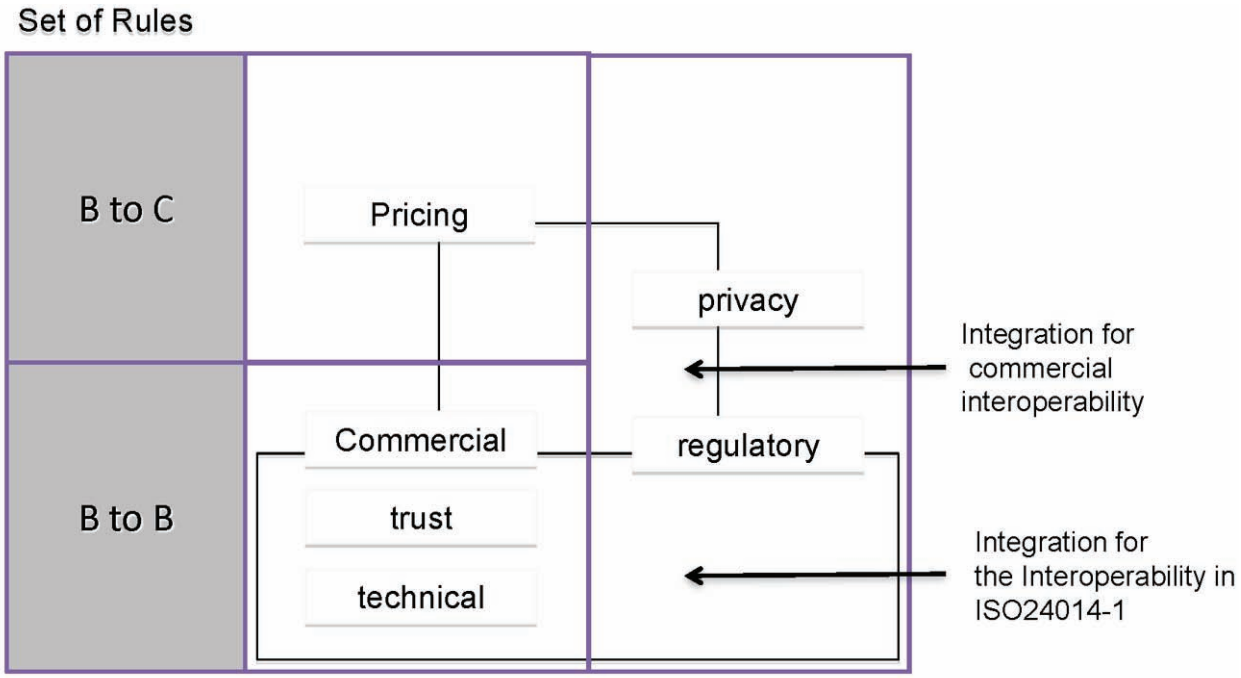


Figure 12 — Relationship between classified rules from two stages of interoperability

Based upon Figure 12, an image of integration of Set of Rules for multiple existing IFMSs is shown in Figure 13.

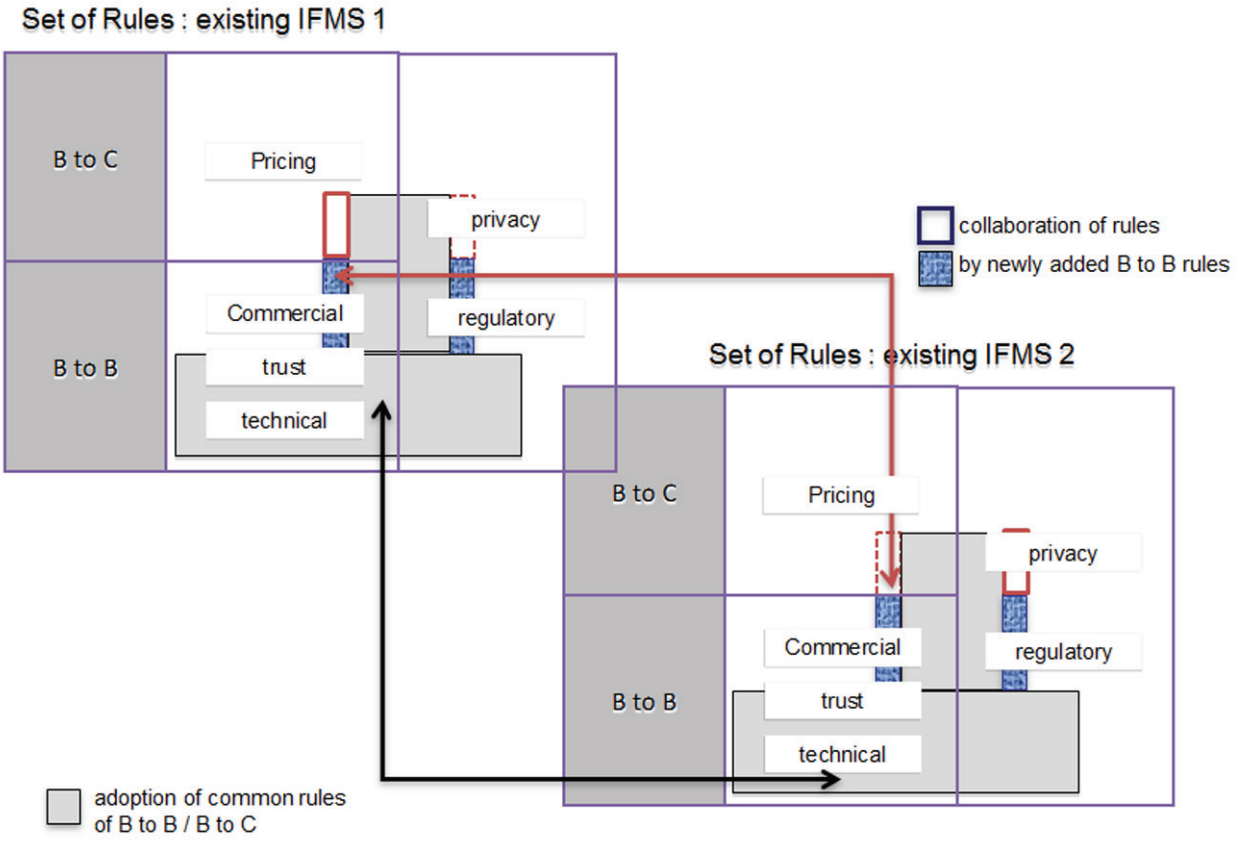


Figure 13 — Image of Integration of Set of Rules

There are two ways for integration of rules for B to C. One is to adopt common rules. The alternative is to make it possible for specific B to C rules of other existing IFMS to be accepted with new additional B to B rules between them. The latter is described as Business to Business to Customer, hereafter, B to B to C.

Integration of rules with B to B to C is one of the useful business practices, because the integration can be expanded while relying on the existing IFMSs rules. For example, information of existing IFMSs and existing products can be shared with related IFMSs.

7.1.3 Integration of Set of Rules and Interoperable States

As explained in 7.1.2, it is important to analyse how the two stages of Interoperability are realized. For the case of integration of Set of Rules, Set of Rules should be classified into rules for B to B, B to B to C, and B to C, based upon IFM-roles of existing IFMS involved in the rules.

Technical and trust rules in the B to B rules are a basis for interoperability defined in ISO 24014-1. Therefore, to address integration of these rules separately gives a better understanding of the status of Interoperability defined in ISO 24014-1.

Following this argument and contrasting to Clause 5, Figure 14 shows the classification of Set of Rules for understanding how two stages of interoperability are realized. By representing degrees of integration for each classification of Set of Rules in this clause, the two stages of interoperability are realized are understood easily. Also it helps to understand successive changes of interoperable states caused by changes of the degree of integration.

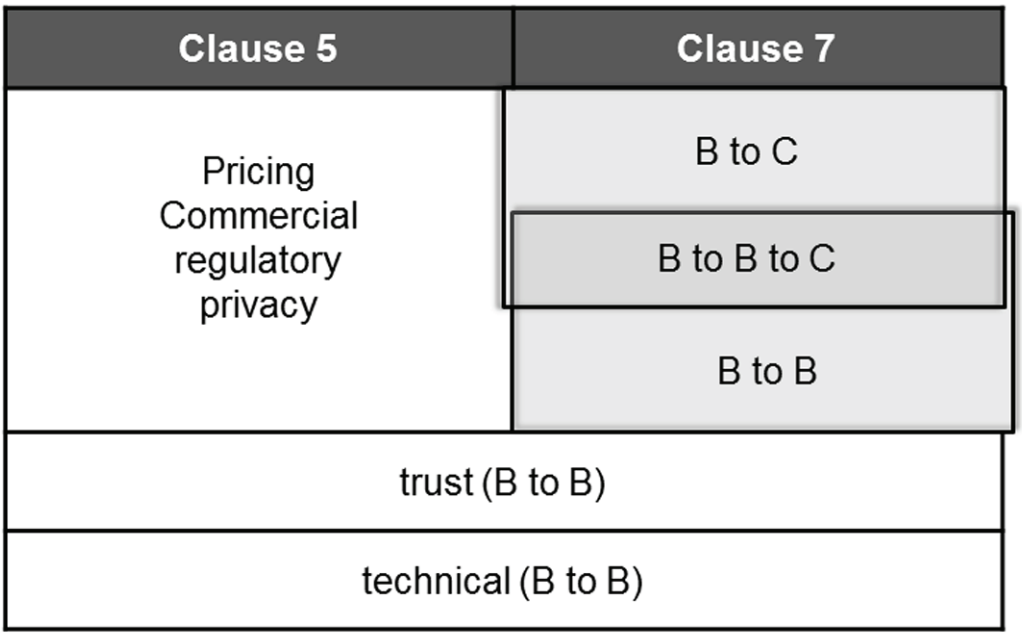


Figure 14 — Comparison of classification

Figure 15 shows a concrete tool to understand the states. This has two axes, where ordinate (vertical axis) is the classification of Set of Rules defined in this clause, and abscissa (horizontal axis) is the degree of integration for classification. The ordering of the classification of set of rules is based on rules related only for interoperability defined in ISO 24014-1 to rules for commercial interoperability.

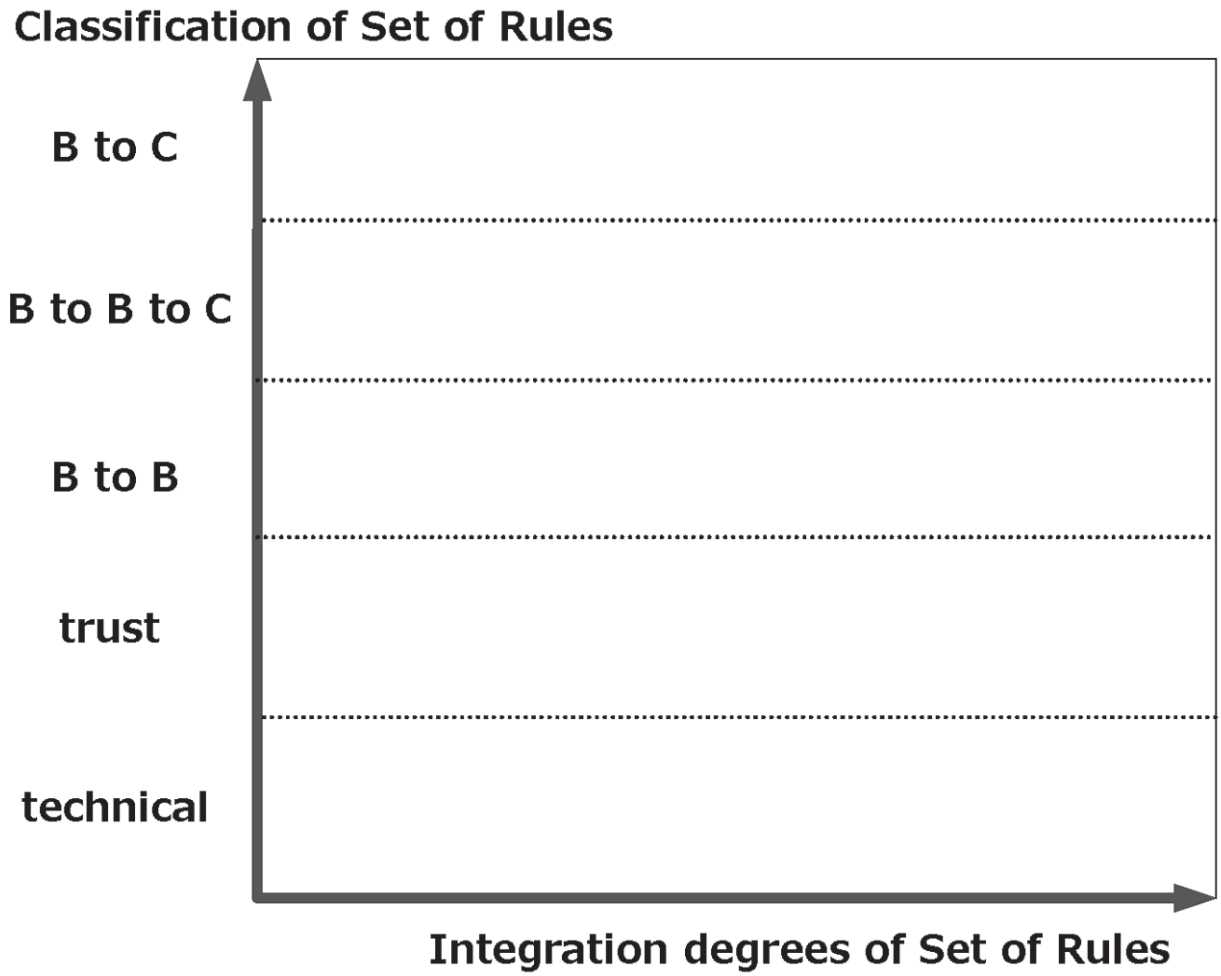


Figure 15 — Interoperable States Chart

7.2 Migration Paths to expanding Interoperability

7.2.1 Plans to advance Interoperable States

On Figure 16, a point represents a specific set of classified rules of Set of Rules and its degree of integration. A series of points become a path to expanding interoperability for existing IFMSs. Therefore, to describe a process of how to integrate rules with which order is a plan by which to show a route to advance the state of interoperability.

In addition, there are multiple ways of expanding interoperability. With the states chart, possible expansion paths to interoperability can be shown for a set of specific existing IFMSs.

7.2.2 Back office centric management / Media centric management

An IFMS can be classified by the way of its management. Management classification depends upon where the main process of management of Products devoted to, mainly fare calculation and billing to Customers is done. In an IFMS with back office centric management (hereafter back office centric IFMS), such a process is normally done in the back office. In an IFMS with media centric management (hereafter media centric IFMS), it is done between MAD and a medium. As most of the existing systems use a combination of both mechanisms, this is a relative concept.

7.2.3 Typical patterns of progress

Although there are multiple ways of reaching advanced stages of interoperable states, typical patterns exist.

Pattern for a media centric IFMS

In case of a media centric installation of an IFMS, it is extremely difficult to change contents on the medium for the alteration/modification of the Applications and/or the Products. Therefore, the following pattern is very likely. First the integration starts from the technical rules and the trust rules. And then integration of the Commercial rules relating to commercial interoperability is gradually processed (see Figure 16).

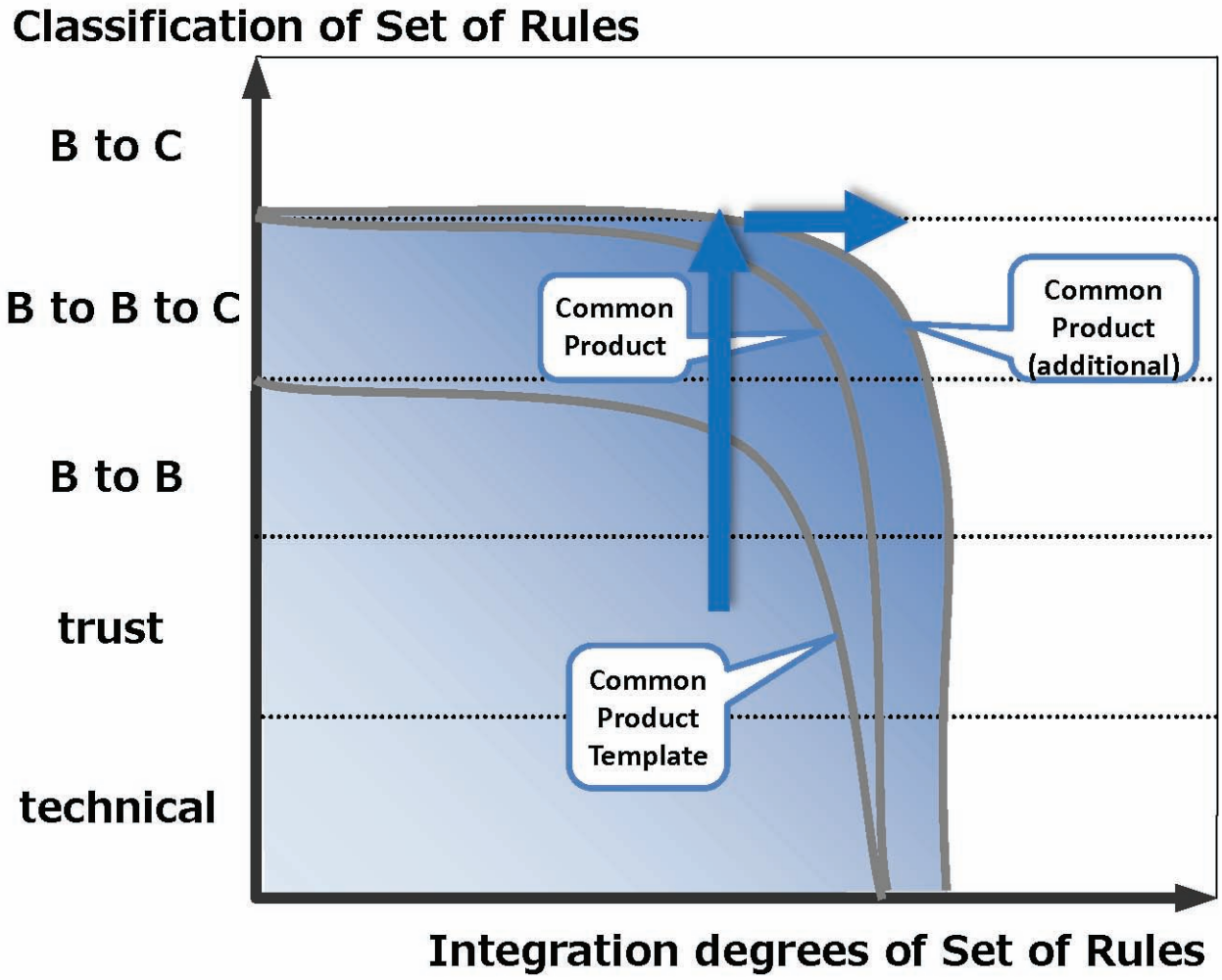


Figure 16 — Pattern for a media centric IFMS

Pattern for a back office centric IFMS

In case of a back office centric IFMS, it is not necessary to change the contents on the Media for the alteration/modification of the Applications and/or the Products.

In a similar fashion, it is not difficult to change the contents on a medium if the medium has flexibility about loading applications, such as mobile phones.

Therefore, in among back office centric IFMSs and IFMSs using these kinds of media, a migration pattern could be taken where the integration of the technical and trust rules and the integration of the Commercial rules can proceed in parallel (see Figure 17).

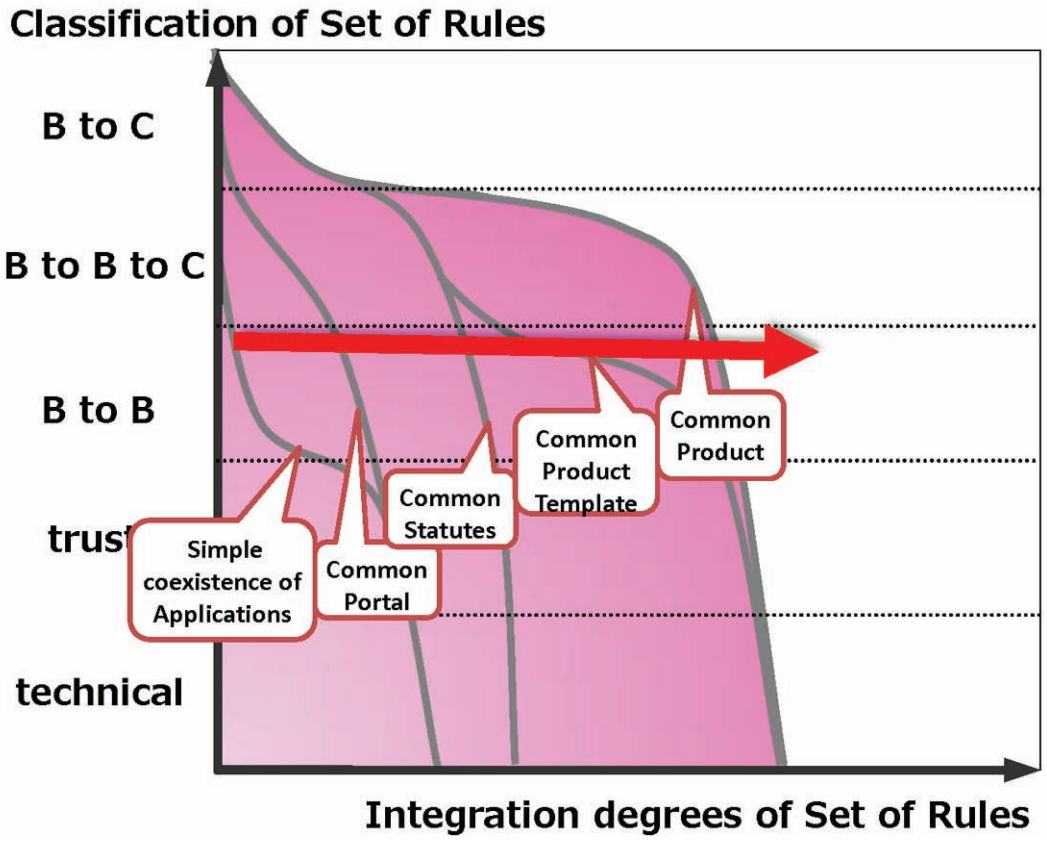


Figure 17 — Pattern for a back office centric IFMS

Annex A
(informative)

Example of Set of Rules with Structure

Table A.1 is an example of Set of Rules in the form of the table in Figure 2.

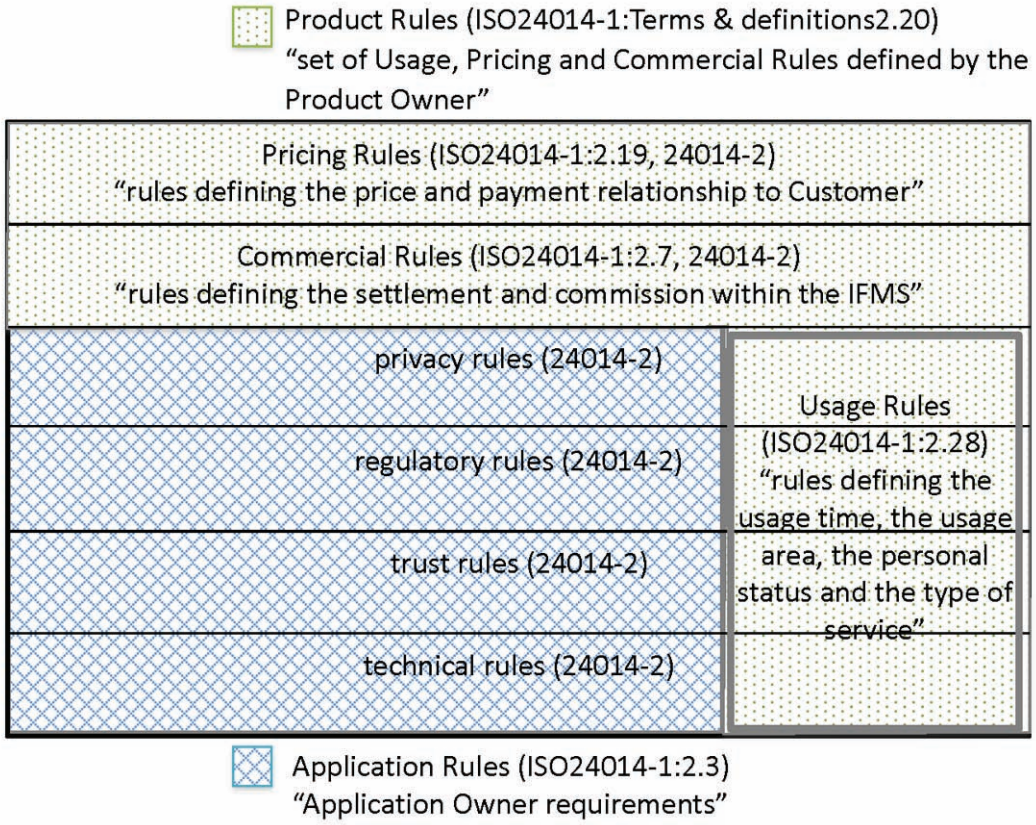
Table A.1 — Set of Rules in the form of the table in Figure 2

Use cases	Sub-categories	IFM-roles									Key Issues
		Applications Owner	*Applications Retailer*	*Product Owner*	*Product Retailer*	*Collection and Forwarding*	*Security Manager*	*Registrar*	*Service Operator*	*Customer*	
6.4.4 Acquisition of product	Pricing				collects money from the customer according to his product pricing rules and the authorization of product owner					*accepts the product rules and the price *pays the price	Set of Rules shall define which specifications shall be used: - Technical - Trust Model - Privacy Model Set of Rules should define for the Use Case 6.4.4 Acquisition of Product: - How Product, Retailers are authorized by Product Owner, this may include - the definition of the product pricing - the choice of distribution channels and their operation - the freedom for the Product Retailer beyond these definitions -who is responsible to inform customer about the product (regulatory framework, trust model, privacy model, ...)
	Commercial			Authorizes product retailer							
	Regulatory			relationship between product owner and the customer relies on the regulatory framework	relationship between product retailer and the customer relies on the regulatory framework				relationship between service operators and the customer relies on the regulatory framework	is informed about the regulatory framework for the product	
	Techical			use of technical specification	use of technical specification	use of technical specification				*use a certified applications * acquire a certified product	
	Privacy			use of privacy model	use of the privacy model	use of the privacy model				is informed about privacy model of the product and accepts	
	Trust			use of trust model specification	use of trust model specification	use of trust model specification				is informed about trust model of the product	

Annex B
(informative)

Classifications of rules in Set of Rules in Part 1 and Part 2

Figure B.1 shows differences of classification between ISO 24014-1 and ISO/TR 24014-2.



NOTE Quotations are from ISO 24014-1:2007.

Figure B.1 — Differences of classification between ISO 24014-1 and ISO/TR 24014-2

This comes from different objectives in each document as follows:

ISO 24014-1

ISO 24014-1 describes a role model of IFM-roles as IFM functional model. Therefore, the classification of Set of Rules in ISO 24014-1 has been done according to the IFM-role who performs the main role in each rule. For example:

— Application Rules: rules defined by Application Owner.

— Product Rules (Pricing Rules, Commercial Rules, Usage Rules): rules defined by Product Owner.

In other words, aspects of describing the process of IFM-roles involved in a rule are not considered as a factor of classification of Set of Rules.

ISO/TR 24014-2

ISO/TR 24014-2 describes “Structure of Set of Rules” and “Integration of Set of Rules”. These deal in processes to make or adjust rules.

Therefore, the way of classifying rules of Set of Rules is done for these purposes from various aspects based upon related IFM-roles and related Use Cases.

— Structure of Set of Rules

— In the structure of Set of Rules, a table form is proposed and used to analyse Set of Rules from various aspects.

— IFM-roles relating to a rule can be understood by Use Case and IFM-roles in related rows of the table. Therefore, there would be no need for making such additional classifications to specify who decides the rule among related IFM-roles, e.g. Application Rules and Product Rules.

— Rules consisting of Usage Rules can be classified as privacy rule, regulatory rule, trust rule, technical rule according to their contents. If they are classified into one single Usage Rule, we cannot understand the properties of the rules.

— Integration of Set of Rules

— In the integration of Set of Rules, rules are classified based upon the pattern of relationship with Customers, in order to specify the degree of realization of interoperability defined in ISO 24014-1 and commercial interoperability. Therefore, the classification based upon Application Owner and product Owner is not appropriate.

Annex C
(informative)

European example of multiple functional models collaboration and their migration paths

The EU-IFM Project, which proposes the following practice for migration, is one of the illustrative examples of a typical pattern of progress as described in 7.2.3 (see Figure C.1).

Separate applications natively issued on the same media

In the situation where media are native (i.e. non downloadable), technical interoperability can be achieved by mutual agreements to accept each other's media (cross acceptance) or to issue their applications in the same media. This state is an approach explained in Figure 16.

Separate downloadable applications for multi-application media

In this situation, multi-application downloadable devices are used.

— Customers do not need to get special media for each area or application.

— Extension of interoperability requires little effort from infrastructure.

— When they move out of the territory of their usual IFMS, customers download the applications they need either locally or routed by one or more web-portals to the appropriate application and product retailers, or through over-the-air provisioning of mobile phone devices.

This state corresponds to Simple coexistence of Applications in Figure 17.

Common "bridging" application downloadable for ubiquitous usage

A common IFM Application can be downloaded by the customer to his media in addition to his current PT Application, if any.

The services available by using this application are developed progressively according to political and business decisions by the PTLEs towards more integrated states, fares or payment systems.

Customers do not need to download any local application for their occasional trips when this application can be used.

This step requires a progressive standardization of the application and of the associated data model in the area, as indicated by the arrow in Figure 17.

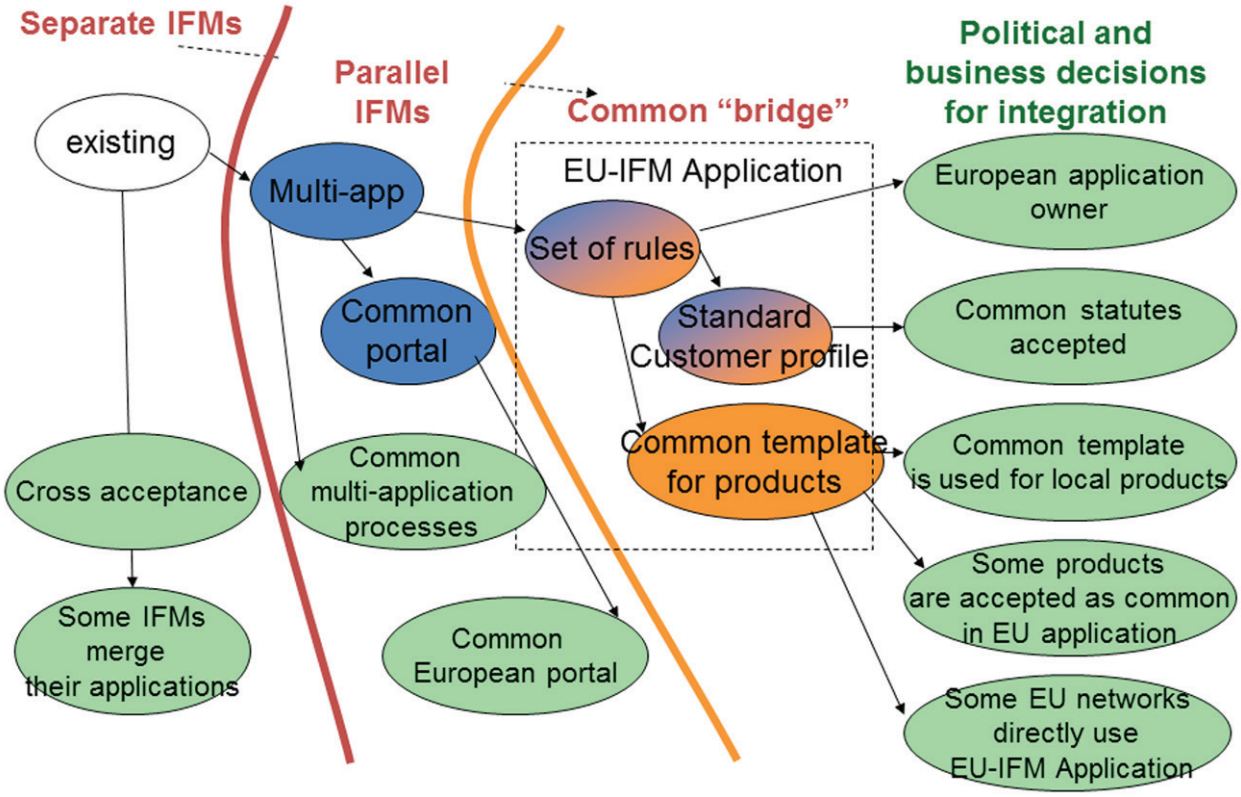


Figure C.1 — European EU-IFM migration path

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