



RightSolution™

Architectural view model for an integration platform

Ph.D. Tomasz Górski



Agenda

- Introduction,
- „1+5” architectural view model,
- Architecture modelling elements of integration platform,
- UML Profiles for integration platform’s architecture modelling,
- Integration platform design for electronic circulation of prescription,
- Further works,
- Summary.



Introduction

- **Service-oriented architecture** is the concept of creating IT systems based on defining of services that system should offer.
- The basis for the specification of the modeling method is the SOA reference model, with particular emphasis on the integration layer.
- In this layer, the basic element is a **enterprise service bus (ESB)**. It is software, which enables the efficient and standardized communication between connected applications.
- **Integration platform** consists of enterprise service bus and connected information systems.



Architectural view model „1+5”

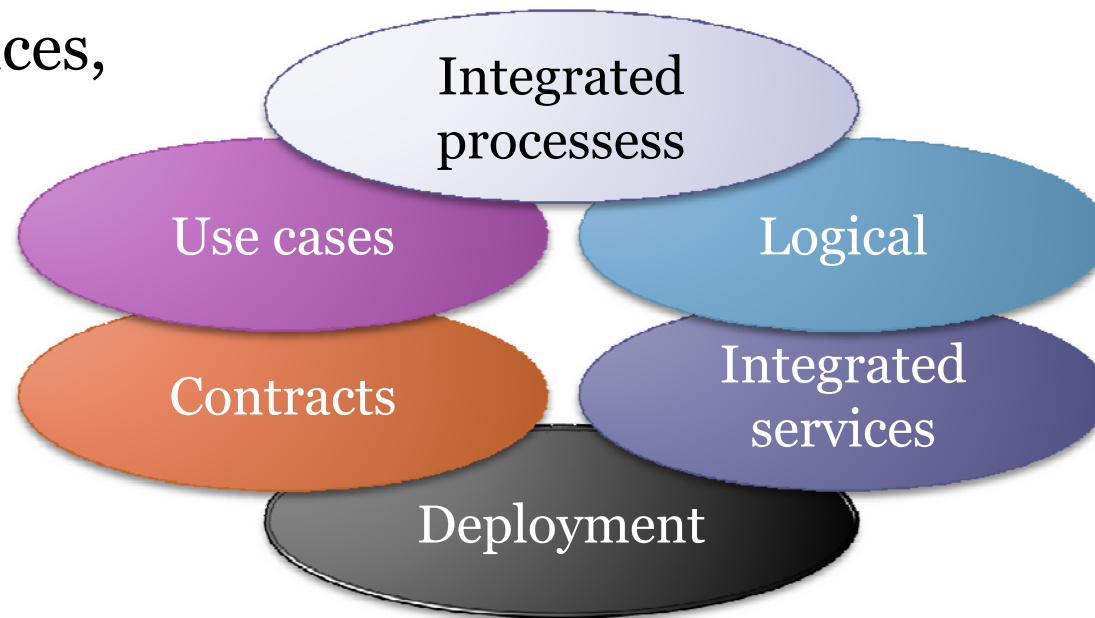
- Architectural view model for integration platform should encompass:
 - View of integrated business processes,
 - In the service-oriented approach one of the basic elements is notion of contract. It should also be included in architectural description.
 - Moreover, very important are integration mechanisms and mediation flows that should be presented in the description of architecture. Hence the need for integrated services view, and manner of their integration on the enterprise service bus.
 - Use case view should also be extended by stereotypes required for presenting functionality exposed for other computer systems.
- Hence redefined architectural view model was proposed which is tailored to the needs of integration platforms designing. This model was called "1+5".



Architectural view model „1+5”

The model consists of following architectural views :

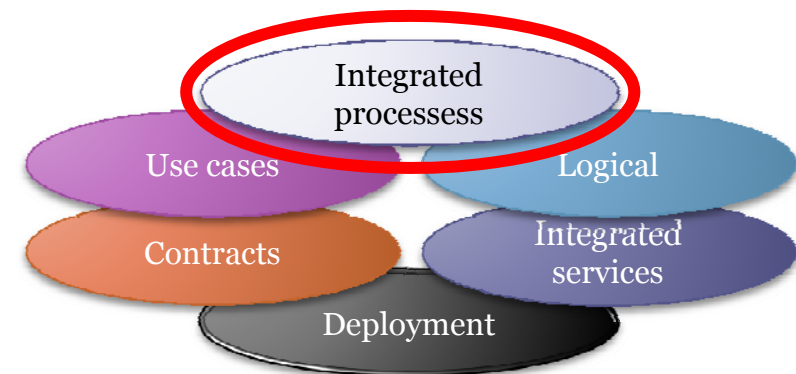
- Integrated processes,
- Use cases,
- Logical,
- Integrated services,
- Contracts,
- Deployment.





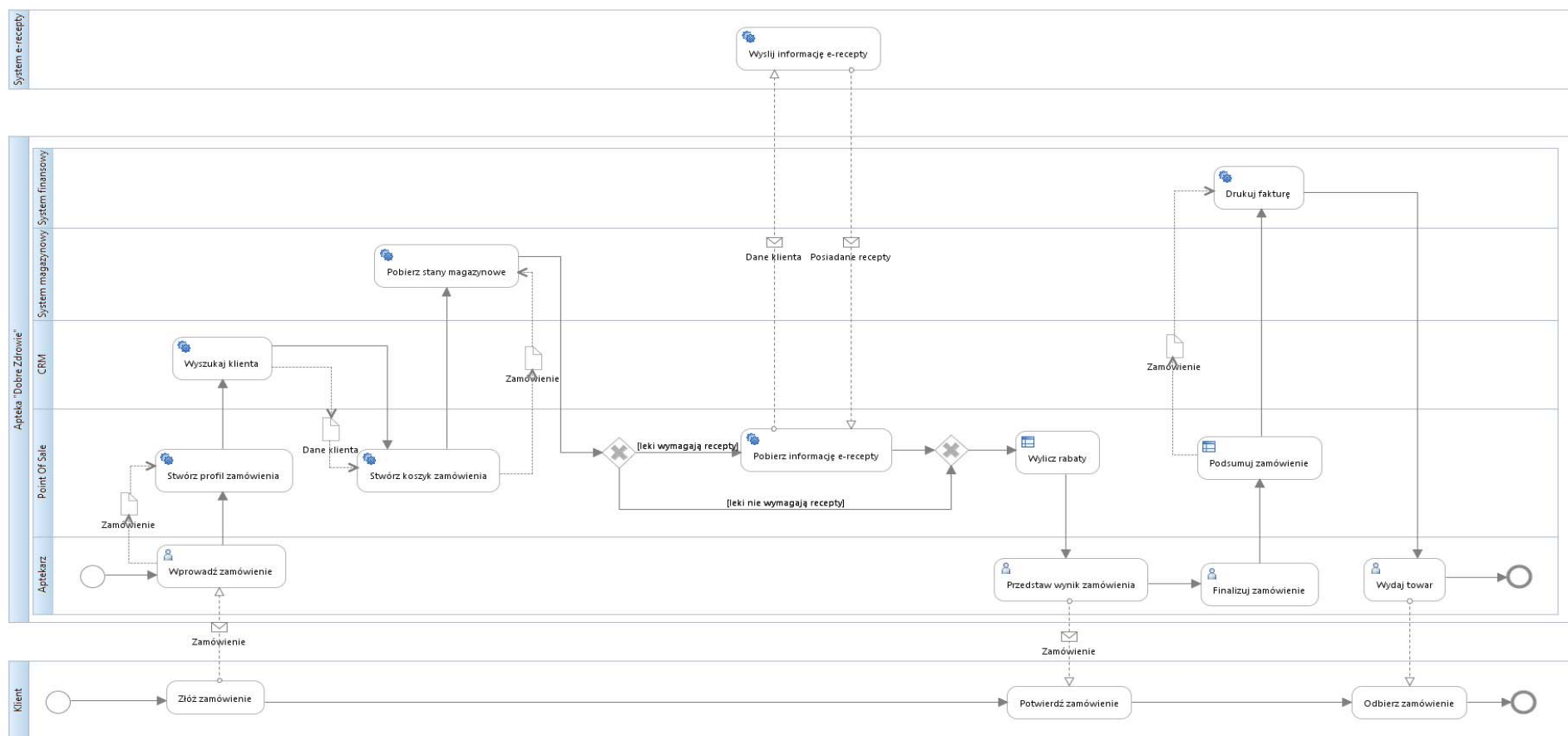
Integrated processes view

- The purpose of this view is the identification of business processes defined across all the analyzed organizations, which require integration.
- The view is presented in the **Processes Model**.
- Business processes are presented on a **business process diagram of BPMN language**.
- This is a basic view for the rest architectural views. In this view are identified all services which require support by information system. Those services are identified from manual, human and automated tasks.





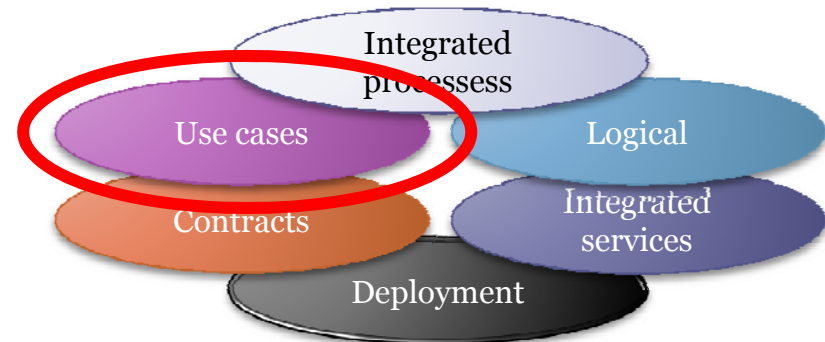
Example: Pharmacies integration





Use cases view

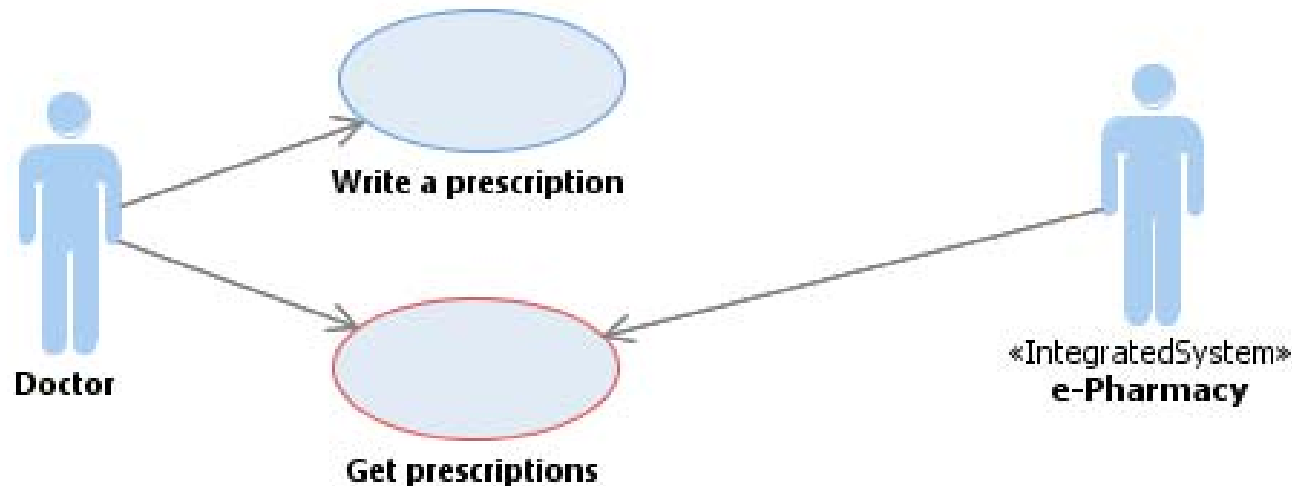
- Use cases view defines the scope and expected functionality of information systems.
- This view is presented in the Use case model.
- The functionality of system is presented on use case diagrams.
- One of the main tasks of this view is presentation of system's use cases provided by the platform to other systems. In order to distinguish actors, actors who are computer systems that use the services exposed by the enterprise service bus, a new stereotype <<IntegratedSystem>> was proposed, which is part of the newly created UML profile "UML Profile for Integration Platform".





Example: Use cases view

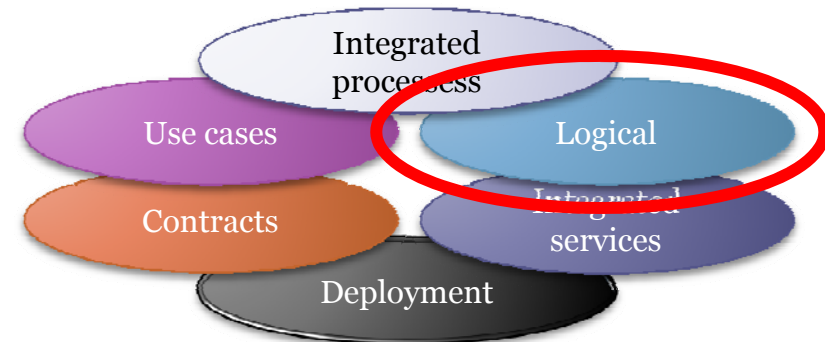
- Use case diagram shows application "e-Prescription" with a separate system "e-Pharmacy", integrated by the integration platform.





Logical view

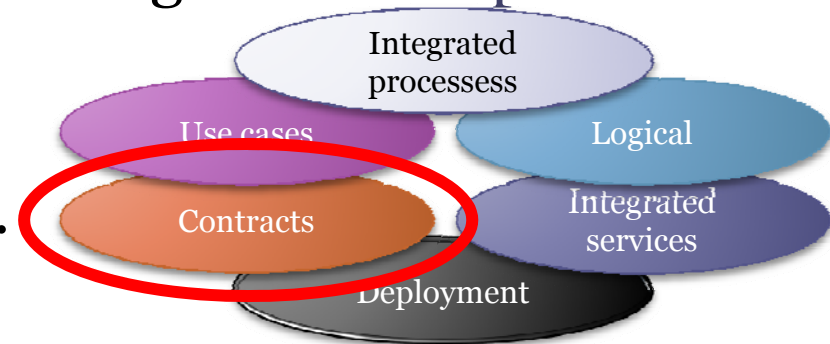
- The view presents the **realizations** of the use cases identified in information systems. For this purpose following diagrams are used: sequence, communication, and classes.
- Moreover, the important task of this view is to present the structure of business entities defined in the integrated processes view.
- On class diagrams are presented structures of classes needed for realization of requests of human tasks.
- Elements of Logical view are presented in the **Design model**.





Contracts view

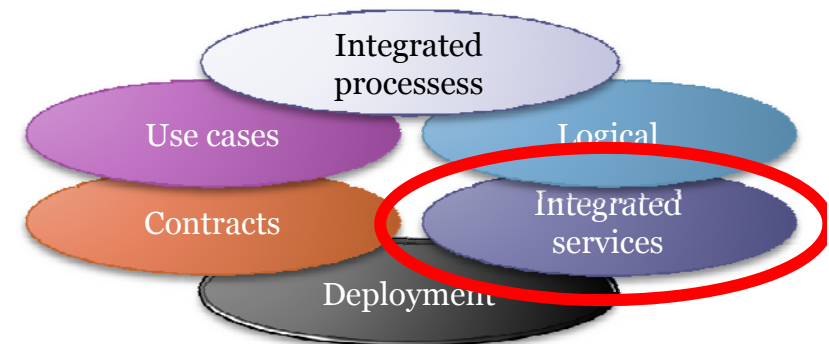
- This view is presented in the **Services model**.
- It is important to present participants of the integration which are systems that are connected to enterprise service bus. So, it is important to define the contracts that will be implemented on the platform integration. This view is used to illustrate the cooperation of components in order to realize the contract.
- The definition of a contract presents two parties: the component implementing the service (**<<provider>>**) and a component that uses the service (**<<consumer>>**).
- Contracts are presented in the UML diagram – **composite structures diagram**.
- The contract is represented on this diagram as a **collaboration**.





Integrated services view

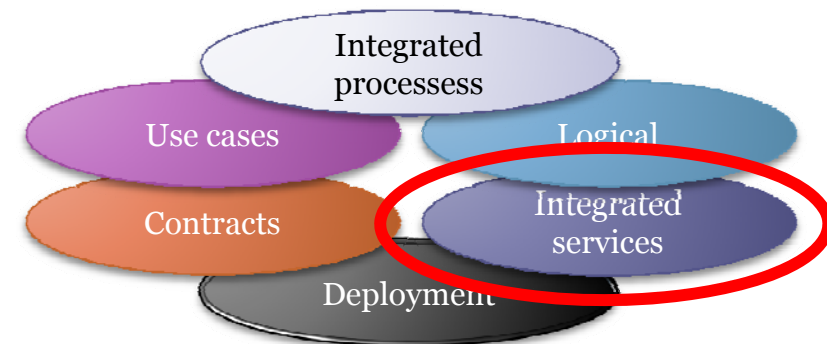
- The purpose of this view is to show all services included in the integration platform.
- This view is presented in the **Services model**.
- The view presents service customers and providers through appropriate interfaces and references on **UML component diagram**. These are components with stereotype **<<capability>>** on integration platform according to SoaML.
- The central part of the component diagram is enterprise service bus. It is presented as a component with stereotype **<<ESB>>**, which is part of the created UML profile "**UML Profile for Integration Platform**".





Integrated services view

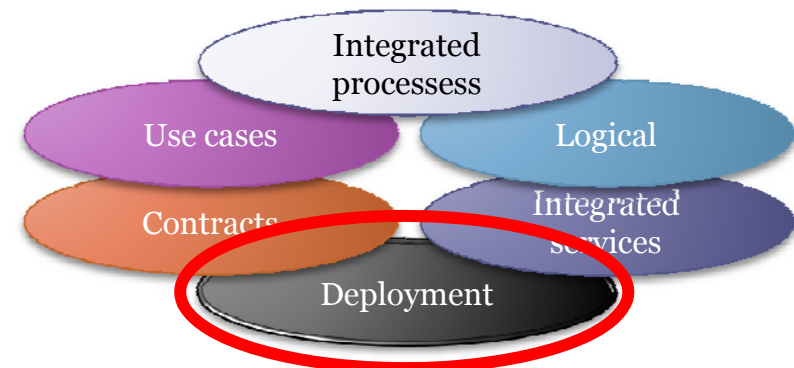
- Furthermore, important aim of this view is to present mediation flows on enterprise service bus.
- For this purpose, activity diagram is used with applied UML profile "UML Profile for Integration Flows."
- In this way, UML activity diagram was extended, and its special form was obtained for modeling mediation flows on integration platform. Thus was proposed a new UML diagram: mediation flows diagram.





Deployment view

- This view is represented in the **deployment model**.
- System specifications at the physical level should include a description of the deployment architecture of software and hardware equipment required for proper operation of the proposed integration platform.
- UML diagram which realizes these tasks is **deployment diagram**, which specifies the location of the designed application on the infrastructure nodes in the organization.





Architecture modelling elements

Model	View	Diagram
Processes	Integrated processes	(BPMN) Business process
Use cases	Use cases	(UML) Use case
		(UML) Activity
Design	Logical	(UML) Sequence
		(UML) Communication
		(UML) Class
Services	Integrated services	(UML) Component
		(UML) Activity
	Contracts	(UML) Component
		(UML) Composite structure
Deployment	Deployment	(UML) Deployment



UML profiles for architecture modelling

- Existing UML Profiles:
 - UML Profile for Business Modelling,
 - SoaML – Service oriented architecture Modelling Language,
- Newly created UML Profiles:
 - UML Profile for Integration Platform – encompasses stereotypes representing elements of integration platform like: ESB, IntegratedSystem,
 - UML Profile for Integration Flows – contains stereotypes representing elements of mediation flows like: ContentEnricher, ContentFilter, Translator.



UML Profile for Integration Platform

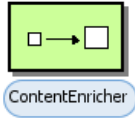
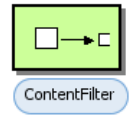
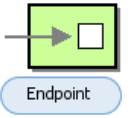
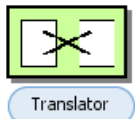
- Profiles and stereotypes applied for modelling architecture of integration platform.

Name of UML profile	Stereotype
SoaML	All
Business Modelling	All
Integration Platform	IntegratedSystem
	MessageType
	ESB
	AdapterType
	UDDI



UML Profile for Integration Flows

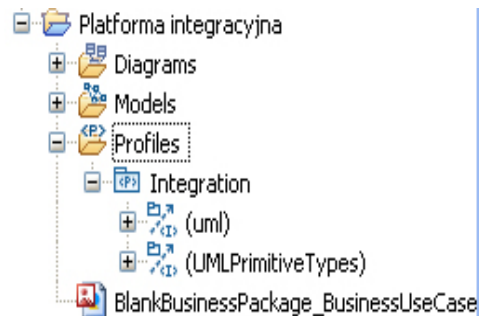
Description of selected stereotypes in profile “UML Profile for Integration Flows”.

Pattern's name	Pattern's icon	Pattern's description
ContentEnricher		Enrichment of message content.
ContentFilter		Message content filter.
Endpoint (Message Endpoint)		Point of sending or receiving messages.
EnvelopeWrapper		Wraps the data to be sent in accordance with the requirements of the messaging system.
Translator		Transformation of data formats.



UML Profiles

- Profiles with required stereotypes were created in IBM Rational Software Architect 8.0.



New UML Profile

Create a new UML Profile

Profile Name: Integration

File Name: Integration_Profile

Import Model Libraries

- ☒ UML Primitive Types
- ☐ Java Primitive Types
- ☐ Ecore Primitive Types

Destination Folder: Platforma integracyjna Browse...

Working Sets

- ☐ Add project to working sets
- Working sets: Select...

< Back Next > Finish Cancel

There are no problems associated with this profile.

General Information

This section describes general information about this profile.

Name:	Integration
Location:	C:\Documents and Settings\Paweł\IBM\rational\workspace\Platforma integracyjna\Integration_Profile.epx
Size:	1 669 bytes
Last modified:	7 kwietnia 2011 16:01:14
Editable:	true



Business case

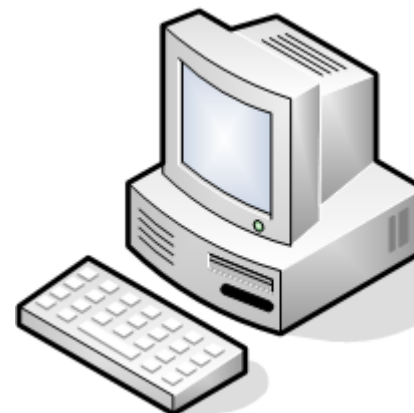


- **Physical circulation of prescription.**

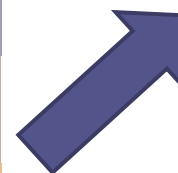
Doctor's computer program



Pharmacist's computer program



Prescription





Business goal

- **Electronic circulation of prescription.**

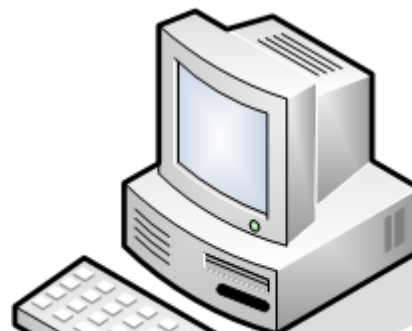


Doctor's computer program



Prescription

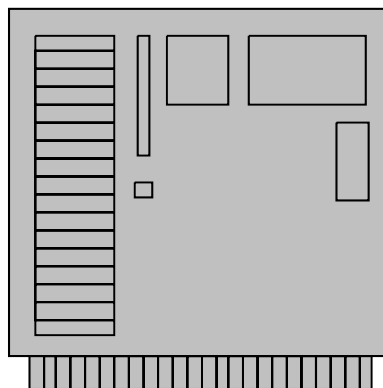
Pharmacist's computer program



Prescription

Prescription's
realization

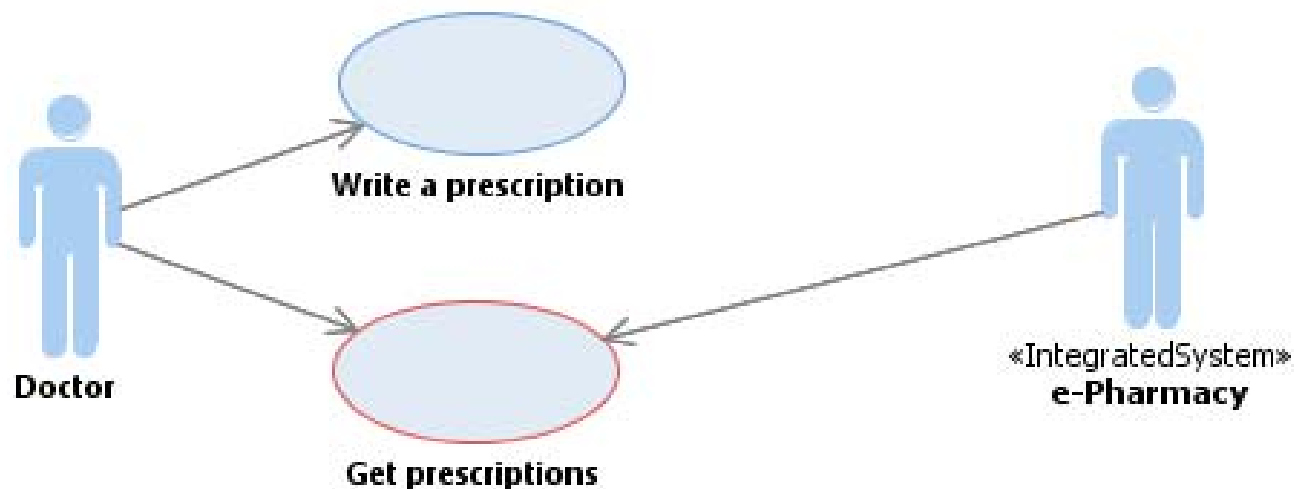
Prescription's
realization





Design of integration platform

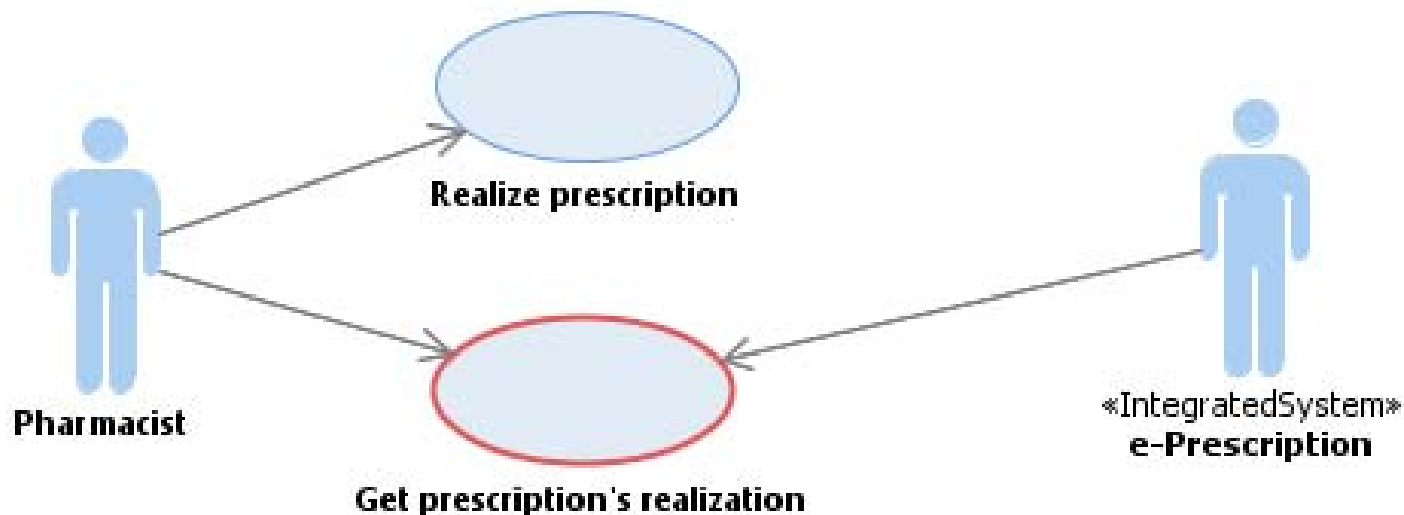
- The application which implements the functionality was called "e-Prescription". Doctor must be able to write prescriptions and view them. This second feature will be available for a pharmacist in order to find a prescription to be realized.
- Figure below shows the use case diagram for the application "e-Prescription" with a separate system "e-Pharmacy", integrated by the integration platform.





Design of integration platform

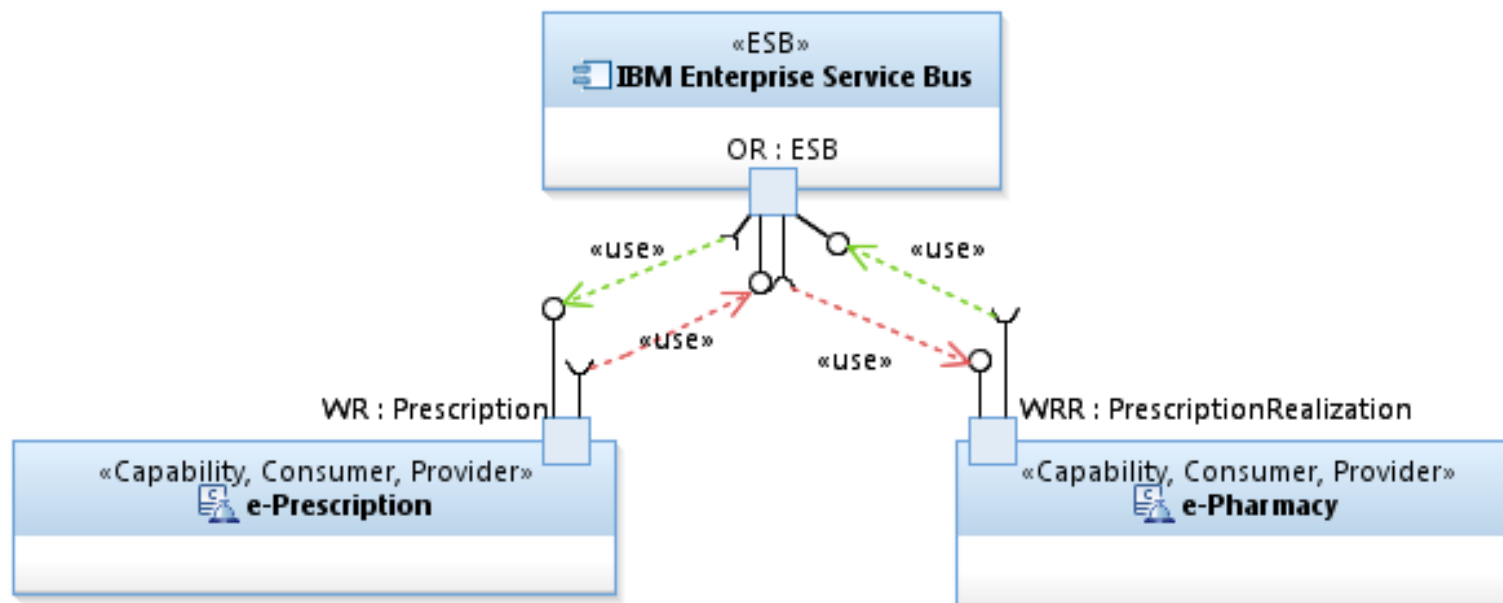
- The other side is a pharmacist, which realizes prescriptions issued by doctors. The pharmacist must be able to realize prescriptions and view realizations of prescriptions. This second feature will be available for the doctor to find the realization of prescription that has previously been issued.
- The application which implements the functionality was called "e-Pharmacy".





Design of integration platform

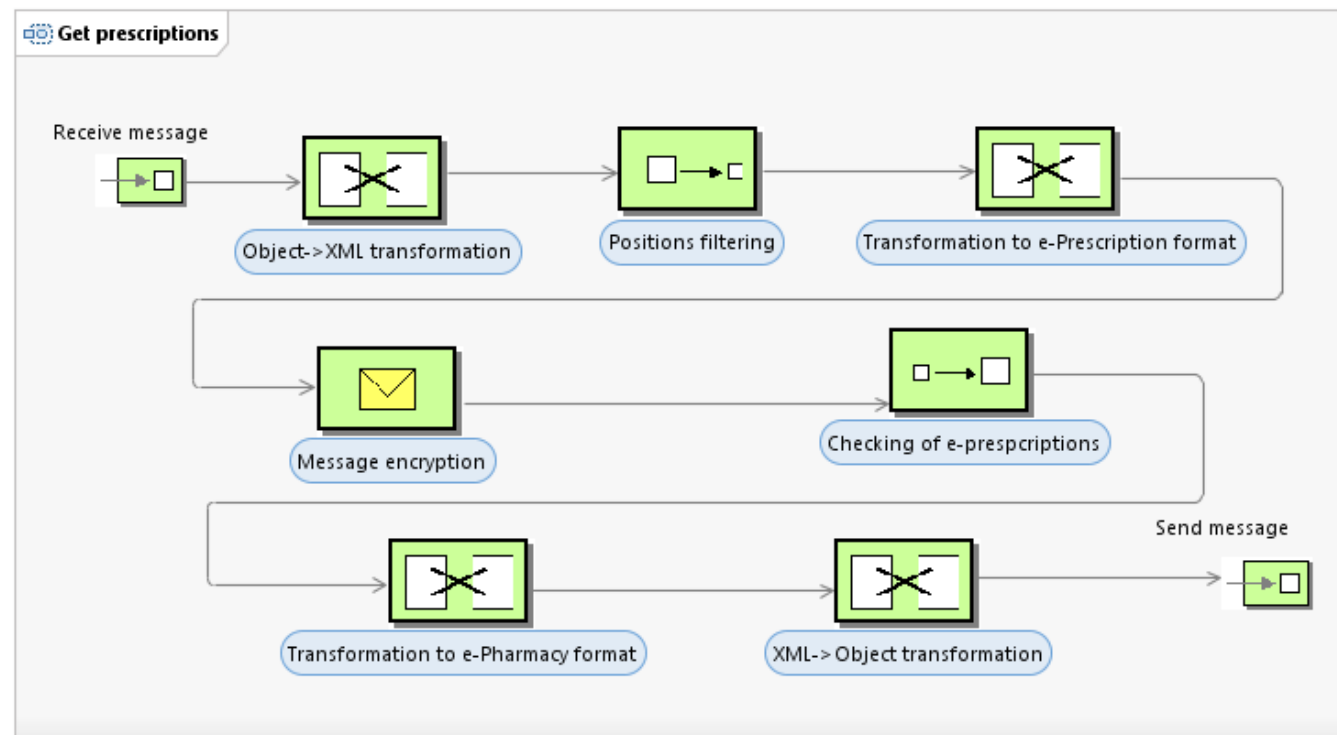
- Use cases "Get prescriptions" and "Get prescription's realization" are implemented as services and they are exposed to the integration platform using WSDL. Services exposed from individual systems and required by individual systems are shown in the UML component diagram. This diagram is a representation of integrated services view of architectural model "1+5".





Design of integration platform

- In integrated services view is also used mediation flow diagram. Mediation flow diagram for getting prescriptions is shown below.





Design of integration platform

- Prescription in XML file format.

```
<recepta>
  <nr>12345678901234567890</nr>
  <swiadczeniodawca>
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    <adres>
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      <nrLokalu></nrLokalu>
      <kodPocztowy>00-000</kodPocztowy>
      <miejscowosc>Nazwa miejscowości</miejscowosc>
      <poczta>Poczta</poczta>
    </adres>
    <telefon>022-123-45-67</telefon>
    <identyfikator>1234567890-12</identyfikator>
  </swiadczeniodawca>
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  <uprawnienia>XX</uprawnienia>
  <chorobyPrzewlekłe>X</chorobyPrzewlekłe>
  <pacjent>
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    <adres>
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      <nrDomu>14</nrDomu>
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    </adres>
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  </pacjent>
```

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  <pozycja>
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    <dawkowanie>
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      <ident>12345678901234567890</ident>
    </ktoRealizowal>
  </pozycja>
  ...
</specyfikacja>
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  <imie>Imie</imie>
  <nazwisko>Nazwisko</nazwisko>
  <nrPrawa>000000000</nrPrawa>
</lekarz>
```



Design of integration platform

- Both applications were written in **Java Server Faces** technology.
- Integration was realized with using of **IBM Enterprise Service Bus**.
- Applied tools:
 - IBM Rational Software Architect 8.0,
 - IDE Eclipse,
 - Application server Tomcat,
 - Database server MSSQL Server,
 - IBM Enterprise Service Bus 7.0.



Scenario of using the platform

Write prescription – application „e-Prescription”.

Doctor's computer program



Aplikacja medyczna

Rejestracja pacjenta
Rejestracja leku
Umówienie wizyty
Recepta

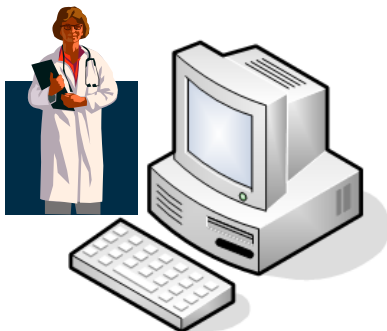




Scenario of using the platform

Write prescription – application „e-Prescription”.

Doctor's computer program



Wyszukiwanie recept

Wyszukiwanie

Pola wyszukiwania

Nr recepty Nr prawa lekarza PESEL pacjenta ☒ Identyfikator świadczeniodawcy

87082805350

Wyniki wyszukiwania

Numer	Świadczeniodawca	Pacjent	Lekarz	Data wystawienia	Data realizacji od	Oddział NFZ	Choroby przewlekłe	Uprawnienia
777	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	Wed Nov 02 00:00:00 CET 2011	Wed Nov 02 00:00:00 CET 2011	13	☒	
88888888888	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	Fri Nov 04 00:00:00 CET 2011	Fri Nov 04 00:00:00 CET 2011	1	☒	
09876543210987654321	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	Mon Nov 07 00:00:00 CET 2011	Mon Nov 07 00:00:00 CET 2011	7	☐	

Znaleziono 24 recept, Obecnie wyświetlanych: 3 recepty, od 22 do 24. Strona 8 / 8.

Specyfikacja wybranej recepty

Nazwa	Dawka	Jednostka	Częstość	Ilość	Jednostka
tabletki	50.0	tabletek	3	2	tabletki
syrop	500.0	ml	3	20	ml
antybiotyk	3.0	opakowania	2	2	tabletki



Scenario of using the platform

Get prescriptions – application „e-Pharmacy”.

Pharmacist's computer program



Wyszukiwanie recepty do realizacji

Wyszukaj

Pesel pacjenta do wyszukanie recepty: 87082805350

Znajdź

Wyniki wyszukiwania

1 2 3 4 5 > >>

Numer	Świadczeniodawca	Pacjent	Lekarz	Data wystawienia	Data realizacji od	Oddział NFZ	Choroby przewlekłe	Uprawnienia
123	NZOZ Rodzina	Jakub Bednarski (87082805350)	()	2011-10-27	2011-10-30	10	☒	null
777	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	2011-11-01	2011-11-01	13	☒	null
88888888888	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	2011-11-03	2011-11-03	1	☒	null
09876543210987654321	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	2011-11-06	2011-11-06	7	☐	null

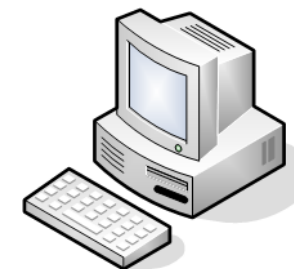
Znaleziono 24 recept, Obecnie wyświetlanych: 4 recepty, od 21 do 24. Strona 5 / 5.



Scenario of using the platform

Realize prescription – application „e-Pharmacy”.

Pharmacist's computer program



Realizacja recepty

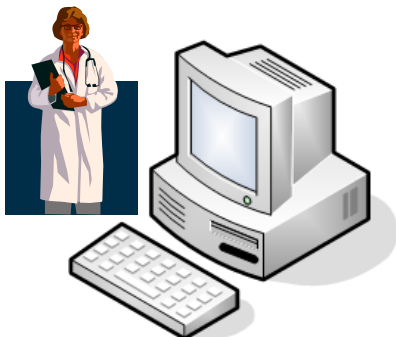
Recepta									
Pacjent:	Jakub Bednarski (87082805350)								
Lekarz:	Lekarz Lekarski (1234567)								
Recepta:	Nr:	09876543210987654321							
	Wystawiona dnia:	2011-11-06							
	Realizacja od:	2011-11-06							
	Choroby przewlekłe:	☐							
	Oddział NFZ:	7							
Specyfikacja recepty									
Nazwa	Dawka	Jednostka	Częstość	Ilość	Jednostka	Zrealizowana	Data realizacji	Kod realizującego	Realizujący
tabletki	50.0	tabletek	3	2	tabletki	☒	2011-11-07 	7654321	Adam Abacki
syrop	500.0	ml	3	20	ml	☒	2011-11-07 	7654321	Adam Abacki
antybiotyk	3.0	opakowania	2	2	tabletki	☐			



Scenario of using the platform

Get prescription's realization – application „e-Prescription”.

Doctor's computer program



Wyszukiwanie realizacji recept

Wyszukiwanie								
Pola wyszukiwania								
Nr recepty	Nr prawa lekarza	PESEL pacjenta	Identyfikator świadczeniodawcy					
☒	☐	☐	☐					
09876543210987654321				Szukaj				
Wyniki wyszukiwania								
K < > I								
Numer	Świadczeniodawca	Pacjent	Lekarz	Data wystawienia	Data realizacji od	Oddział NFZ	Choroby przewlekłe	Uprawnienia
09876543210987654321	NZOZ Rodzina	Jakub Bednarski (87082805350)	Lekarz Lekarski (1234567)	Mon Nov 07 00:00:00 CET 2011	Mon Nov 07 00:00:00 CET 2011	7	☐	null
Znaleziono 1 recept, Obecnie wyświetlanych: 1 recepty, od 1 do 1. Strona 1 / 1.								
Specyfikacja wybranej recepty								
Nazwa	Dawka	Jednostka	Częstość	Ilość	Jednostka	Zrealizowana		
tabletki	50.0	tabletek	3	2	tabletki	☒		
syrop	500.0	ml	3	20	ml	☒		
antybiotyk	3.0	opakowania	2	2	tabletki	☐		



Business goal achieved

- Electronic circulation of prescription.

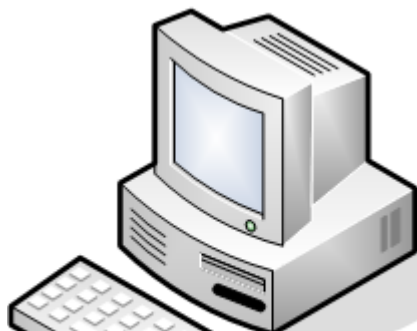


Doctor's computer program



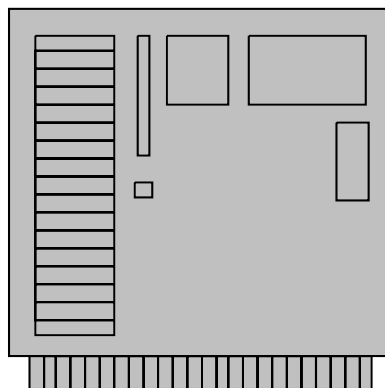
Prescription

Pharmacist's computer program



Prescription

Prescription's
realization



Prescription's
realization



Further works

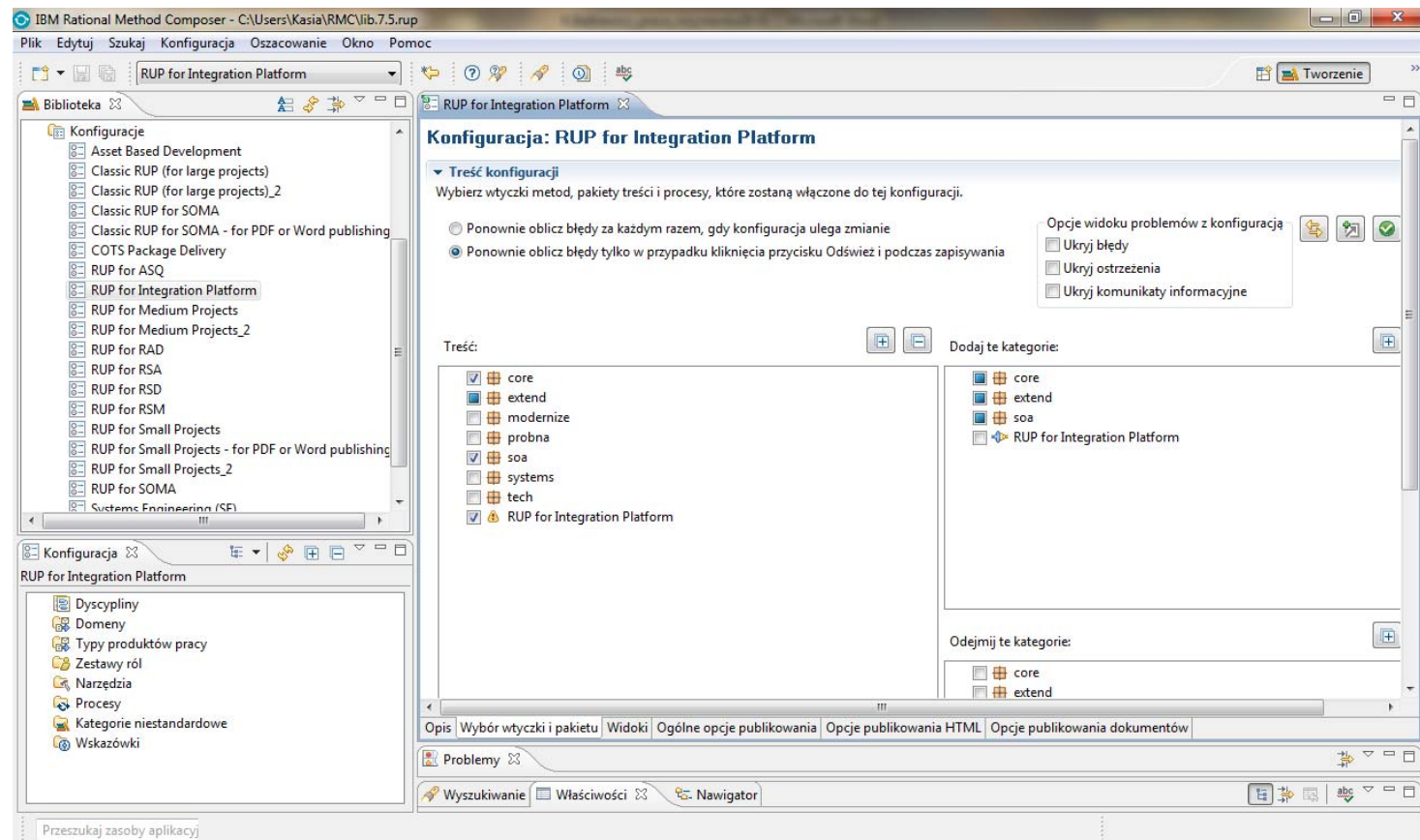
- Further studies are moving into following directions:
 - **Design automation of integration platform,**
 - Performance analysis of integration platform (simulation model of integration platform),
 - **Configuration of integration platform development process.**



Configuration of Integration Platform Development Process

- Configuration was prepared in IBM Rational Method Composer:

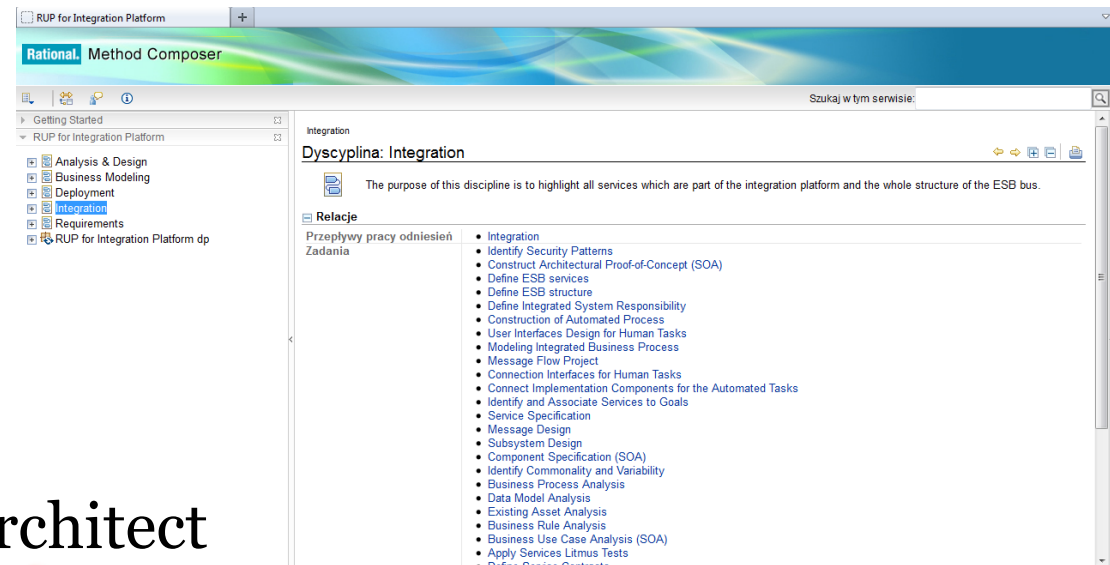
- ▢ Roles,
- ▢ Tasks,
- ▢ Work products.





Configuration of Integration Platform Development Process

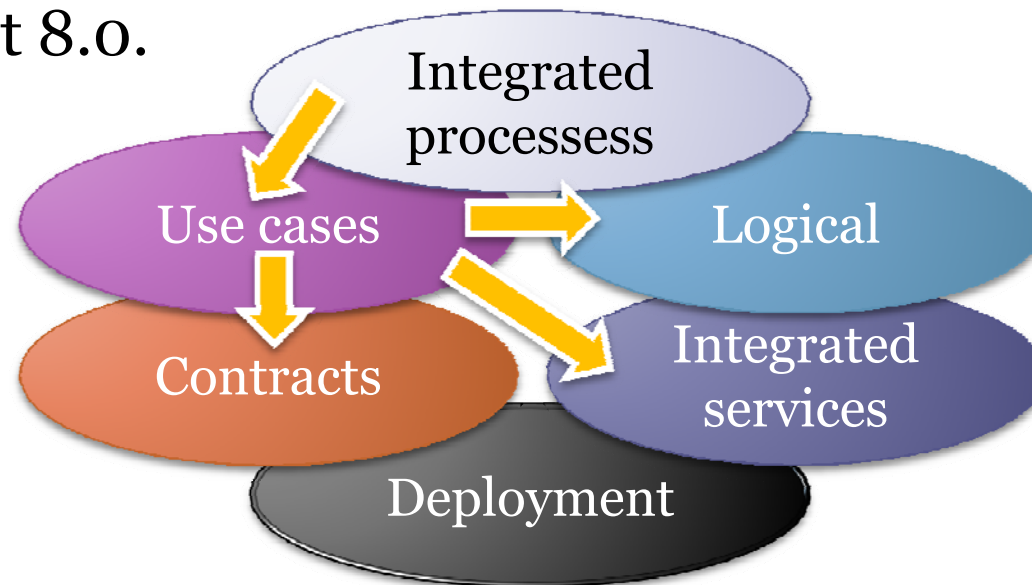
- New discipline and tasks:
 - Modelling integrated business process,
 - User interface design for human tasks,
 - Message flow design,
 - Definition of contracts.
- New role – Integration Architect





Design automation of integration platform

- New transformations were proposed of model-to-model type:
 - Integrated processes to use cases views transformation,
 - Use cases to logical views transformation,
 - Use cases to integrated services views transformation,
 - Use cases to contracts views transformation.
- All transformations were realized in IBM Rational Software Architect 8.0.





Summary

- New architectural view model „1+5” was presented which is better suited to specific of integration solutions.
- New UML profiles were proposed : UML Profile for Integration Platform, UML Profile for Integration Flows.
- Modelling and design of integration platform were made in IBM Rational Software Architect 8.0.
- Example of application of architectural view model „1+5” was presented: electronic circulation of prescription.



RightSolution™

Thank you for your attention!

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