



Competitivi împreună

Attn.: Allevo  
From: Sabin Breazu  
Subject: FinTPc - architecture



# Software Architecture

## Project: TOSS

### Release: FinTPc

### Version: 3.0

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Instrumente Structurale  
2014-2020

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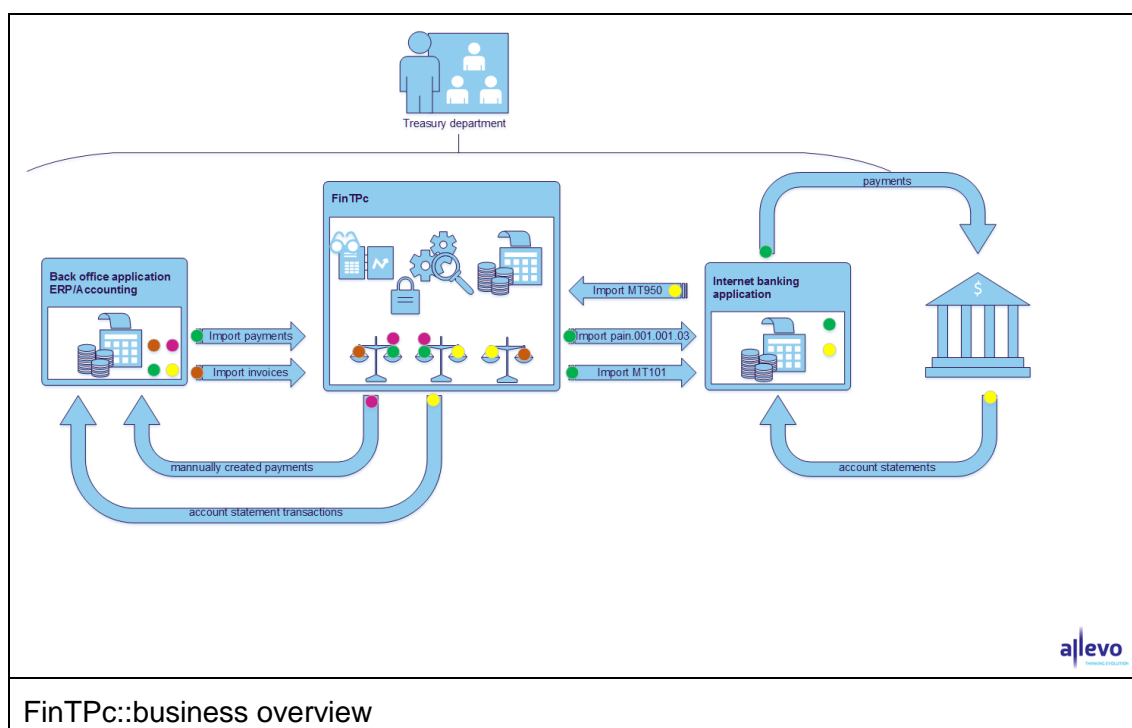
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## 1 Introduction

This product is designed for those corporations working towards integrating their payment flows. It ensures centralized management of financial operations of one corporation or of a company group, providing a single interface for administration, monitoring and reporting of all the payments, regardless of the bank institution through which they are performed.



FinTPc::business overview

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### 1.1 Intended audience

Architects  
Developers  
Testers  
Implementers  
Sales and Marketing

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## 2 Architecture

The IEEE<sup>1</sup> recommendation defines an architecture as the fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution. Architectures represent the abstraction used to understand any system and also form the basis for a shared understanding to all its stakeholders.

Application architecture seeks to build a bridge between business requirements and technical requirements by understanding use cases, and then finding ways to implement those use cases in the software.

An architectural overview is aimed at providing a shared understanding of the architecture across a broad range of people including the developers, marketing, management and possibly potential end-users. An architectural overview is ideally produced early in the development lifecycle and serves as the starting point for the development. An architectural overview should be at a high level of abstraction. All the major functionalities and components of the architecture should be described but the descriptions may lack detail and precision as they often use natural language rather than formal notations.

This current document is describing this high level, overview architecture from different perspectives.

Unlike this architectural overview, the detailed architecture of the application should be a living document that is constructed collaboratively by the development team as the development proceeds. As it develops, the detailed architecture document can be used to assess the impact of different requirements changes. All this detailed architecture documentation is structured into a different document – “FinTPc – detailed architecture”.

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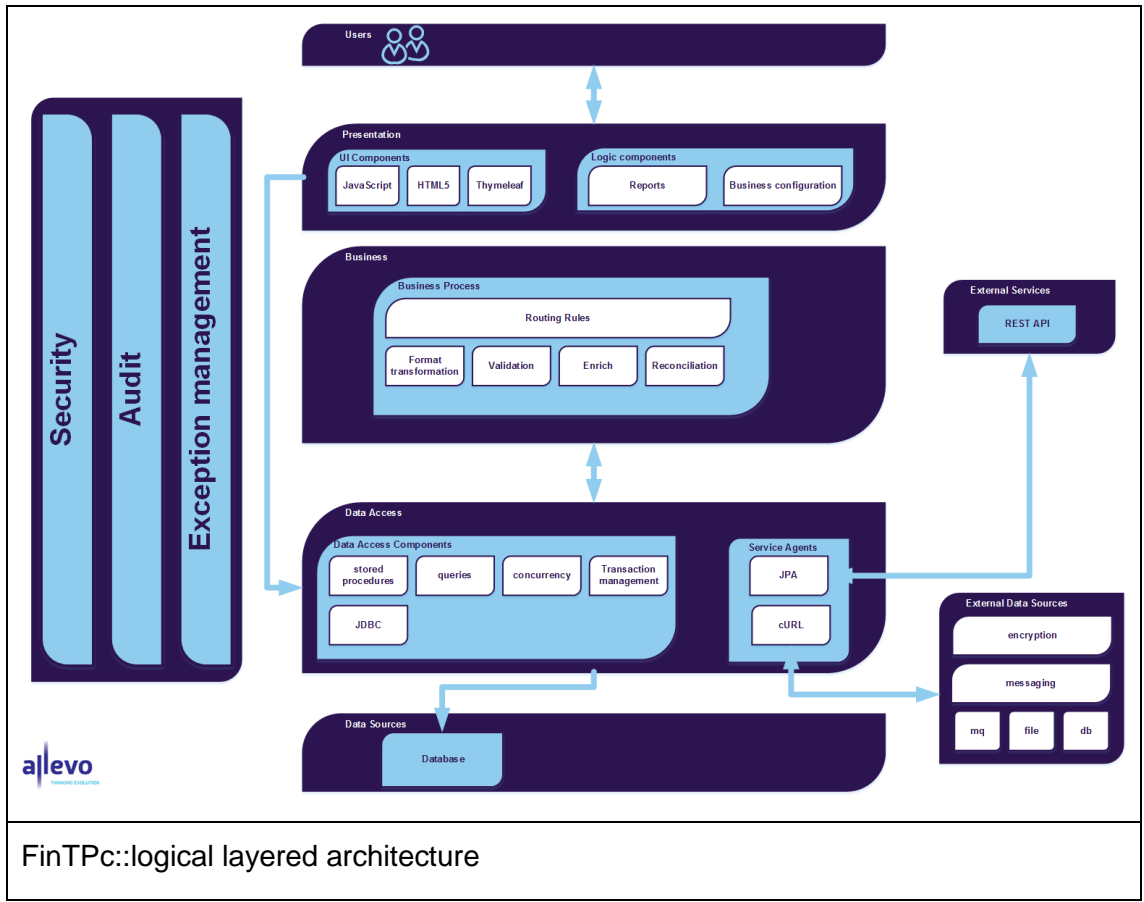


<sup>1</sup> Institute of Electrical and Electronics Engineers

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2.1 Logical architecture

2.1.1 Logical layered architecture



The upper diagram describes a layered architecture style of the application.

The components of the *Presentation* layer access the information via the *Data Access* layer in order to be available on user request. The mentioned UI components are used to display information and also accept user input.

The *Business* layer components represent the core functionalities of the system and encapsulate business logic. The whole business process is managed and guided by those routing rules and their available instruments like format transformations, validations, enrichment or reconciliation; all these are applied on financial instruments. This layer has access to information and stores information communicating to the *Data Access* layer.

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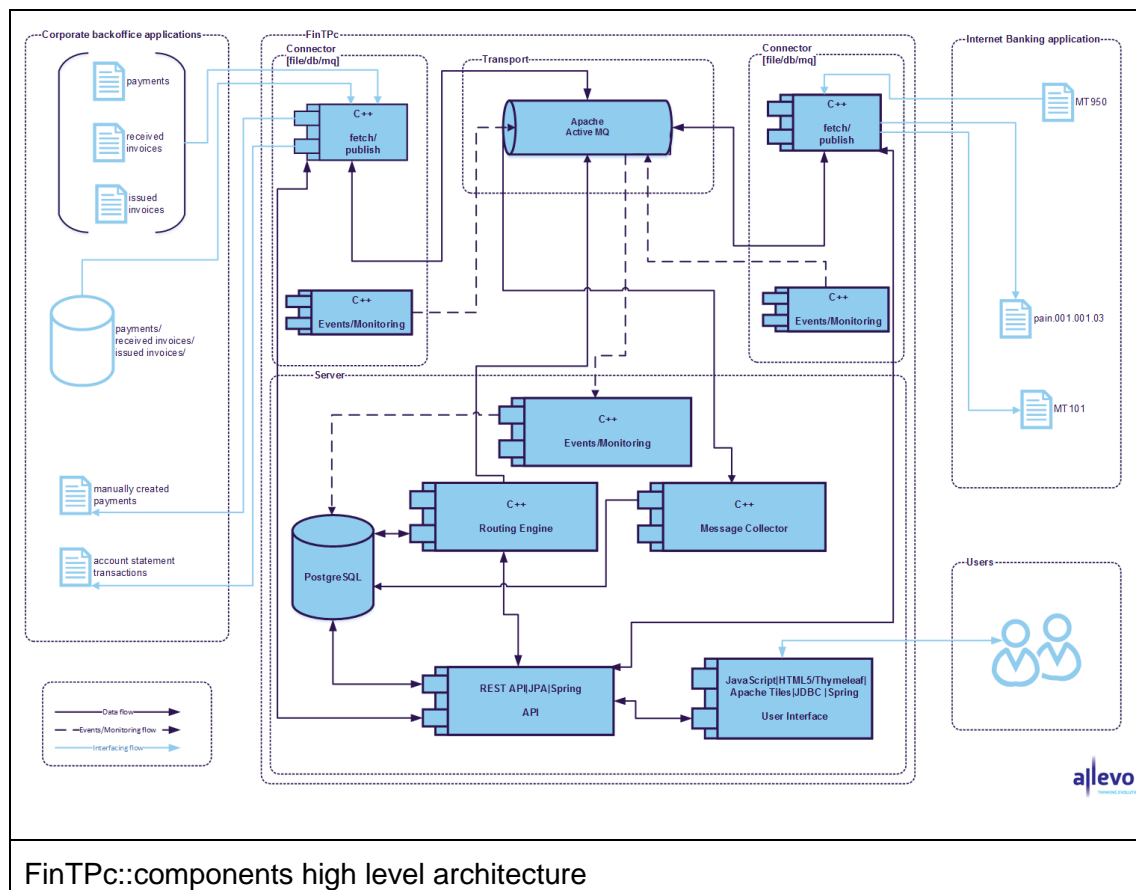
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The *Data Access* layer provides different ways of retrieving and sending information from and to the data sources (that may be internal – database or external) by using either direct access or service agents.

The cross cutting concerns identified are the following: Security, Audit and Exception Management. These will be addressed on most layers.

### 2.1.2 Logical component architecture



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The upper diagram describes the interaction between all the application components when processing financial instructions.

There are specific *Connectors* configured to communicate either to *Corporate back office applications* side or to *Internet banking application* side in the purpose of collecting data and also publishing the output generated by FinTPc server – using the fetch / publish options. Each connector may be configured to handle structured file formats or database records. Also different format transformations and encryption may be active at this stage.





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FinTPc allows input from *Corporate back office applications* organized into structured and dedicated files storing different types of payments, received or issued invoices; multiple instructions may be stored into single files. The application also allows the same kind of input, but stored and structured into database tables.

FinTPc allows input from *Internet banking application* organized into structured and dedicated files representing Swift standard statement messages (MT950).

The output generated at the *Corporate back office applications* side contains files storing payments manually generated by application users via the user interface facilities and also transported and transformed accounting statement transactions extracted from incoming MT950.

The output generated at the *Internet banking application* side contains files representing Swift standard messages: pain.001.001.003 and MT101 containing multiple initiated payments instructions grouped according to standards; these can further be uploaded into different banking applications.

*Events/Monitoring* components are attached to connectors to register and transport processing events. All data collected by those connectors is enqueued into configured Active MQ queues.

The *Message Collector* component is monitoring those queues and then collects data in order to register it to specific structures into the FinTPc database.

Once they reached the database, the *Routing engine* component is starting the processing and routing phase, which may include business actions like: transformations, enrich, validations. There may be routing decisions that need to be taken by users.

The users interact with the application via the *User Interface* component. They can have access to organized and structured financial instructions and also taking decision regarding their routing flow.

Component	Connector
Responsibilities	<ul style="list-style-type: none"> <li>▪ Fetch / Publish data from / to the partner applications.</li> <li>▪ Ensure financial data batching / de-batching.</li> <li>▪ Embed data into an envelope that allows non-invasive tracking and audit.</li> <li>▪ Perform validations.</li> <li>▪ Encrypt data.</li> <li>▪ Data format conversion</li> </ul>
Collaborators	<ul style="list-style-type: none"> <li>▪ Back office applications</li> <li>▪ Internet banking applications</li> <li>▪ Transport component</li> <li>▪ Events/Monitoring component</li> </ul>

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Notes	<ul style="list-style-type: none"> <li>The multiplicity of instances may depend on the format types of inputs managed (file / db / mq) and other business flow constraints.</li> <li>Can use local installed clients (activemq-cpp-library, odbc) to locally or remotely connect to defined interfaces.</li> <li>Ensures persistent end-to-end transactions.</li> <li>Ensure communication breaks detection along with connection restoring.</li> <li>Offers complex configuration options.</li> <li>Offers interoperability.</li> </ul>
Component	<b>Events/Monitoring</b>
Responsibilities	<ul style="list-style-type: none"> <li>Collect process generated events (performance, and other details like size or amount) by collaborator components.</li> <li>Synchronize and publish events.</li> </ul>
Collaborators	<ul style="list-style-type: none"> <li>Connector component</li> <li>Transport component</li> <li>Message Collector component</li> <li>Routing Engine component</li> </ul>
Notes	<ul style="list-style-type: none"> <li>The multiplicity of instances depends on the number of connectors defined.</li> <li>Ensures persistent end-to-end transactions.</li> <li>Addresses the Audit concern.</li> </ul>
Component	<b>Transport</b>
Responsibilities	Message transactional secure transportation
Collaborators	<ul style="list-style-type: none"> <li>Message Collector component</li> <li>Routing Engine component</li> <li>Connector component</li> <li>Events/Monitor component</li> </ul>
Notes	Apache Active MQ queues
Component	<b>Message Collector</b>
Responsibilities	<ul style="list-style-type: none"> <li>Collect messages fetched by other connectors.</li> <li>Store those messages to the database and triggers the processing stage.</li> </ul>
Collaborators	<ul style="list-style-type: none"> <li>Transport component</li> <li>Routing Engine component</li> <li>Database component</li> </ul>
Notes	<ul style="list-style-type: none"> <li>Ensures persistent end-to-end transactions.</li> <li>Ensure communication breaks detection along with connection restoring.</li> </ul>

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	<ul style="list-style-type: none"> <li>Offers complex configuration options.</li> </ul>
<b>Component</b>	<b>Routing Engine</b>
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>Parallel execution of routing jobs associated with the messages received from Message Collector component.</li> <li>Reconcile messages with internal/external confirmations specific to different business flows.</li> <li>Reconcile messages with others, based on defined business rules.</li> <li>Perform validations.</li> <li>Enrich message data.</li> <li>Format conversions.</li> <li>Drive data archiving.</li> </ul>
<b>Collaborators</b>	<ul style="list-style-type: none"> <li>Database component</li> <li>API component</li> <li>Transport component</li> </ul>
<b>Notes</b>	<ul style="list-style-type: none"> <li>Ensures persistent end-to-end transactions.</li> <li>Ensure communication breaks detection along with connection restoring.</li> <li>Offers complex configuration options.</li> <li>Offers scalability.</li> </ul>
<b>Component</b>	<b>Database</b>
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>Store configuration application data.</li> <li>Store financial instruments data.</li> <li>Store online archived data.</li> <li>Provides data manipulation instruments (triggers, stored procedures) according to defined business rules or user intervention.</li> </ul>
<b>Collaborators</b>	<ul style="list-style-type: none"> <li>API component</li> <li>User Interface component</li> <li>Routing Engine component</li> <li>Message collector component</li> </ul>
<b>Notes</b>	<ul style="list-style-type: none"> <li>Ensures data integrity and consistency.</li> </ul>
<b>Component</b>	<b>API</b>
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>RESTful API</li> <li>enable 3rd party applications to communicate with the FinTP central repository of data</li> </ul>
<b>Collaborators</b>	<ul style="list-style-type: none"> <li>User Interface component</li> <li>Routing Engine component</li> <li>Database component</li> </ul>

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Notes	<ul style="list-style-type: none"> <li>Offers interoperability.</li> </ul>
Component	<b>User Interface</b>
Responsibilities	<ul style="list-style-type: none"> <li>Allow user authorization.</li> <li>Allow application configuration using friendly screens.</li> <li>Allow users to operate financial instruments.</li> <li>Provides advanced options for financial instruments searching and reporting.</li> <li>Ensures data confidentiality (limit data access) by specific rights.</li> </ul>
Collaborators	<ul style="list-style-type: none"> <li>Routing Engine component</li> <li>Database component</li> <li>API component</li> </ul>
Notes	

### 2.1.3 Component interaction model

The diagram below shows the basic interaction actions between the identified application components for a specific scenario. The sample scenario consists of an end to end flow for payment transactions - collected from an application (used by the treasury department of a given corporation) and exported for other banking applications. We considered as input a payments file that is going to be split into individual payments inside the application and enriched with missing data. Then the user has to decide whether to authorize them towards banking application or reject some of them for whatever reasons. After authorization the payments are grouped together and transformed to a standard bank compliant format (in this sample MT101 or pain.001).

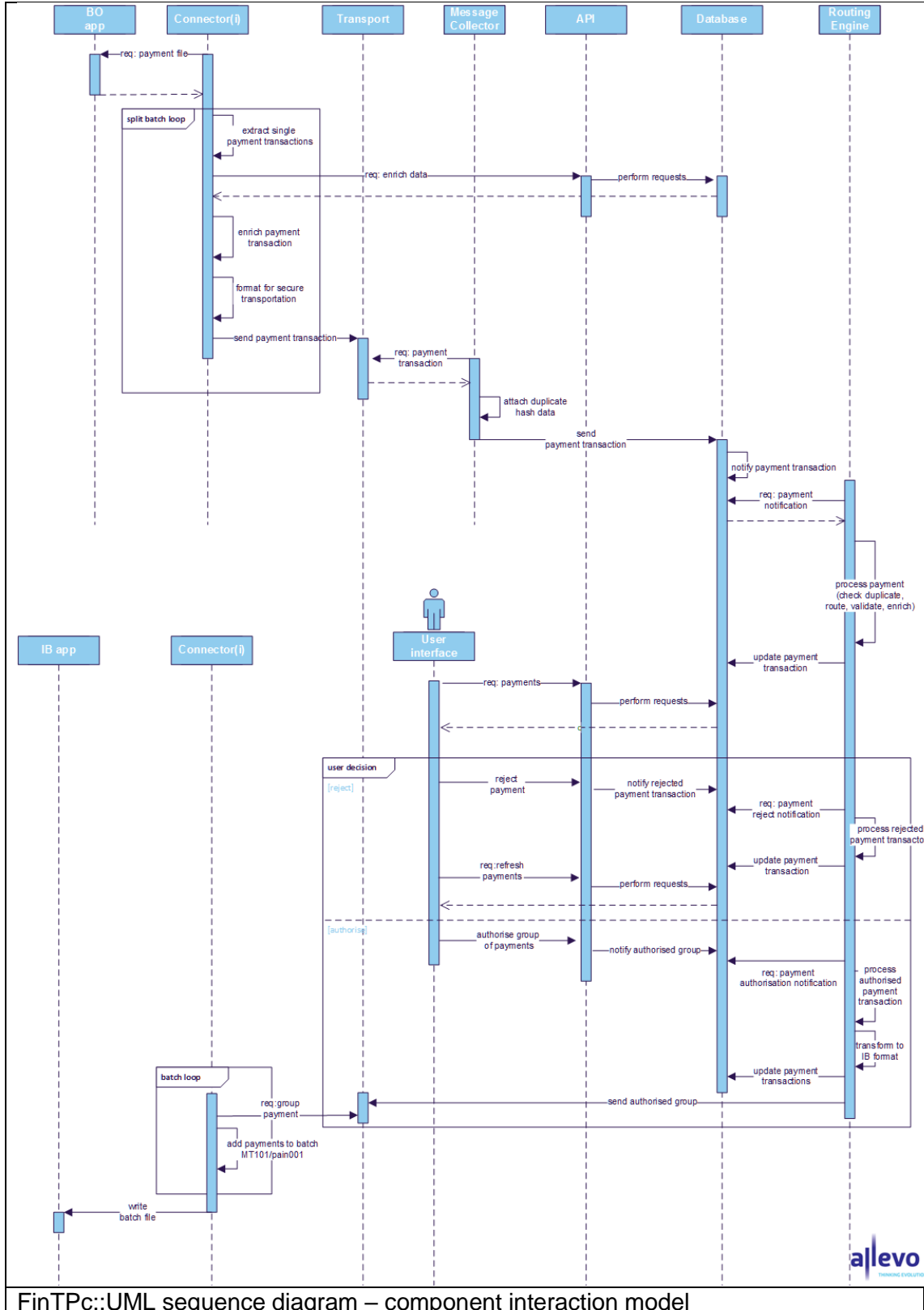
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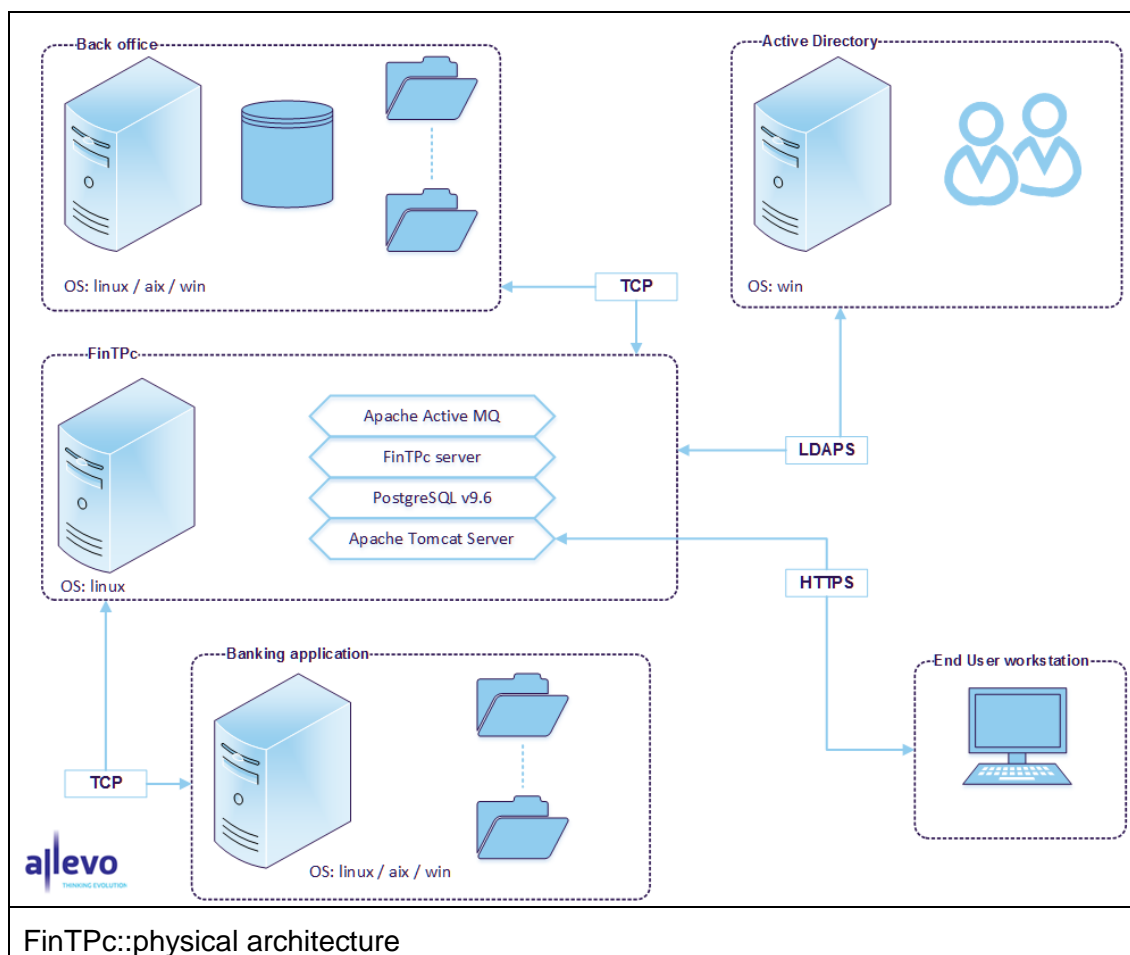


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FinTPc::UML sequence diagram – component interaction model

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**2.2 Physical architecture**



In this sample scenario we considered the external interfaces distributed on two dedicated server machines. All of the FinTPc components, except connectors are deployed on single server. The connectors are deployed as close to the business data source as possible and will use a transactional transport layer to send data back and forth to the server. Also the Active directory used for user authentication is distributed on separated server.

There can be used different physical architecture scenarios, depending on the number of transaction processed:

*Scenario 1:* Single server installation (recommended for a low number of transactions - i.e. several thousand a day)

- All components are installed on a single machine.
- The connectors will access remote or local data.

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*Scenario 2:* Single server with distributed data (preferred installation type for a medium number of transactions - i.e. several tens of thousands a day)

- All components except connectors are installed on a single machine.
- The connectors are deployed as close to the business data source as possible and will use a transactional transport layer to send data back and forth to the server.

*Scenario 3:* Multi server installation (optimized for scalability - i.e. several hundred thousand transactions a day)

- Routing Engine component can be deployed to a dedicated server. It will use the available number of processors to run parallel jobs.
- Events Monitor component can be deployed to a dedicated server.
- Data server can be deployed to a dedicated server or multiple servers.
- Web application server and application can be deployed to a dedicated server.
- The connectors are deployed as close to the business data source as possible and will use a transactional transport layer to send data back and forth to the server.

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### 2.3 Technology selection

The distribution model of this project is open source. Therefore the major architectural and technological constraint is represented by the compliance of FinTPc code and any other embedded product or library with GPL v3 license model. The design and implementation stage will include also advanced scanning procedures in order to be able to certify this license compliance.

Our implementation of the application is based on integration with following products, as seen in the architecture diagrams: Apache Tomcat, Apache MQ and Postgresql. However, these prerequisites are not fully mandatory. The design of the application should allow integration with different other technologies like IBM WebSphere MQ, IBM WebSphere Application Server, Jboss, Weblogic, Oracle database and others given a convenient migration and configuration.

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