

LinuxDays 2007

Are Open Source EAI solutions mature for professional use?

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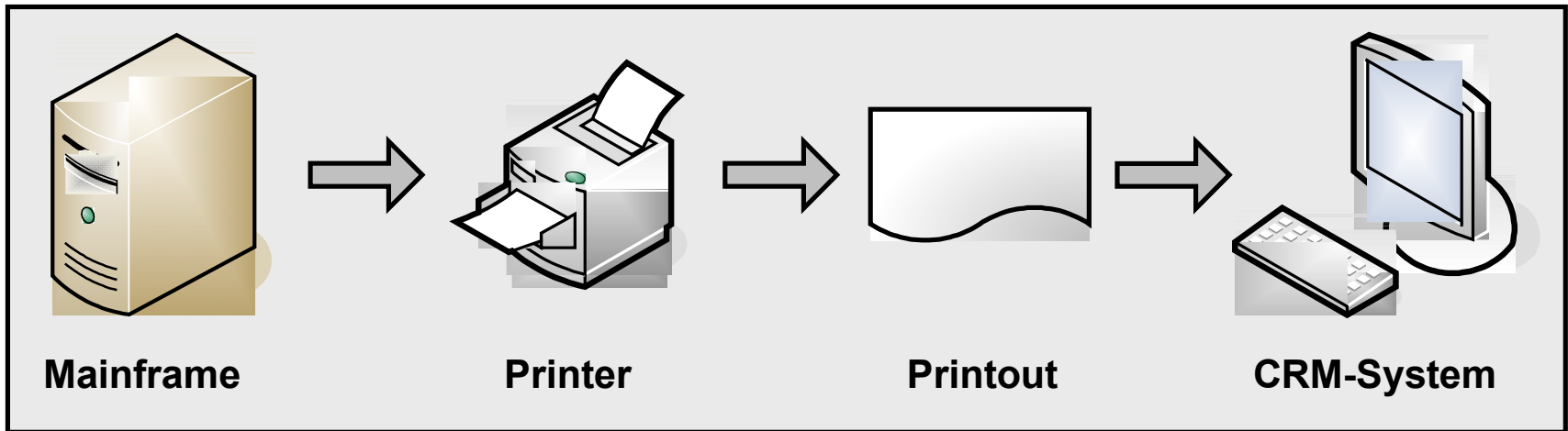
2007/02/02

***Promotion and support of the use of FOSS
in SMEs and organizations in general and
with focus on Luxembourg in particular.***

IT Infrastructure

- Multiplicity of different subsystems
- Information exchange with different external systems
- Information from one system are needed in others
- Data redundancy

➔ ***Need for data integration***



■ Advantages

- Works directly with every subsystem
- No programming necessary

■ Disadvantages

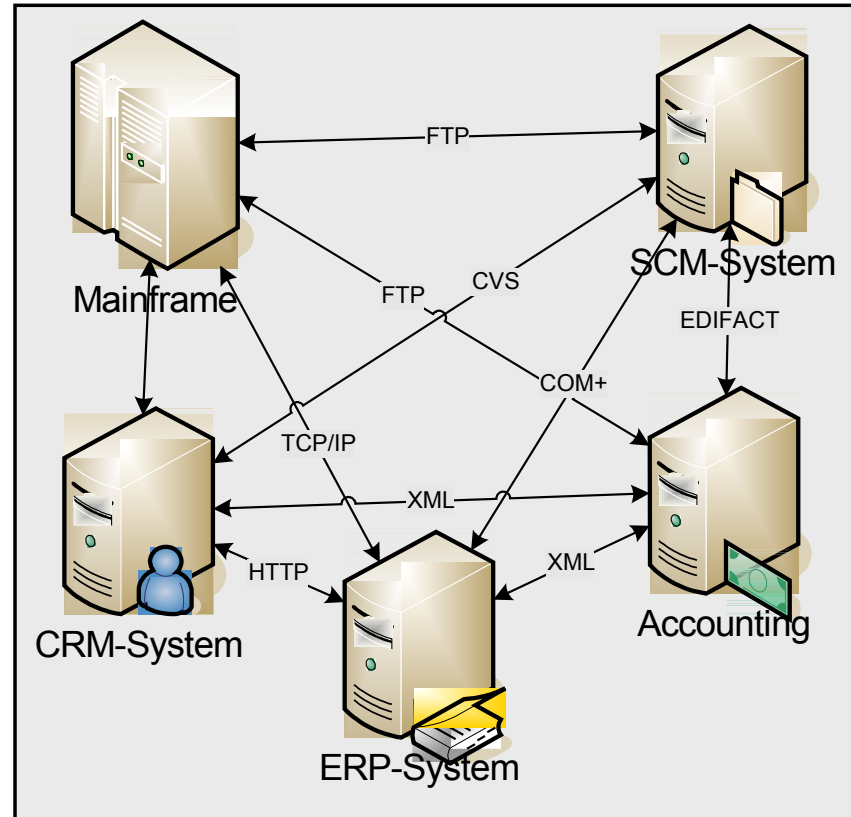
- Very error prone
- Takes a long time for data input
- Quite expensive due to the need of human resources

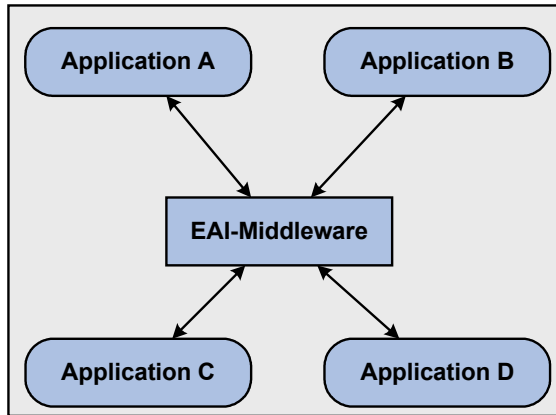
■ Advantages

- Can be relatively easy to implement for small IT-infrastructures
- Cheap in the acquisition phase
- Automatic and quick transfer of information
- No errors due human interaction

■ Disadvantages

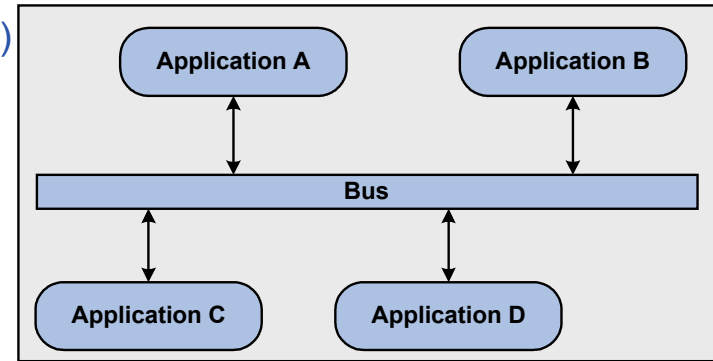
- No means to administrate the resulting information exchange network
- Hard to track down errors
- No monitoring
- Becomes quickly very complex





Hub&Spoke (central)

Bus (decentral)



■ Advantages

- Just one interface for every application
- Easy to maintain
- Monitoring and administration of the whole infrastructure available
- High scalability
- Use of open standards
- Additional features like transaction, tracking, logging and security

■ Disadvantages

- Normally high initial costs
- Trained personal needed
- Single point of failure (for Hub & Spoke)

Many commercial solutions that implement these concepts are available, e.g.:

- *Ascential: Enterprise Integration Suite*
- *IBM: WebSphere Business Integration Server*
- *Inubit: Integration Server*
- *Microsoft: BizTalk*
- *SAP: NetWeaver*
- *SoftProject: X4*
- *Sun: Composite Application Platform Suite (CAPS)*
- *TIBCO: Business Works*
- *VITRIA: Business ware*
- *webMethods: Integration Server*
- ...

- **Initial costs**
Very high hardware and licence cost
- **Support costs**
Quite high costs for support contracts
- **Support quality**
The practise has shown, that SMEs don't have a high support priority
- **Staff**
special staff has to be hired and trained because of system complexity
- **Product live cycle**
Product livetime and upgrade intervall is dictated by the vendor



➔ ***Alternatives from the Free and Open Source Software (FOSS) area?***

Study to evaluate potential of FOSS EAI-Systems identified 31 different Systems:

- 1060 NetKernel
- Babeldoc
- Business Integration Engine
- Clover.ETL
- Conductor DocSOAP XDK
- ConnectorWorks
- DataServer
- elemenope
- it.gim
- Jengine
- mec-eagle
- MessageForge
- Mirth
- Mule
- NaradaBrokering
- Octopus
- OpenAdaptor
- OpenEAI
- OpenQueue
- OpenSymphony
- Orbeon PresentationServer
- OSMQ
- Proteus
- Retic / JyRetic
- ServiceMix
- S-integrator
- SolAce
- Tambora
- xBus
- Xineo XIL
- XMLBlaster

Too many projects for in-depth evaluation

➔ ***Phased evaluation process necessary***

Phase 1: Evaluation against core criteria

➔ Some systems have been filtered out

Phase 2: In-depth evaluation of the remaining system

➔ Evaluation matrix

Evaluation against core criteria:

- Architecture
 - Component based
 - Connectors
 - Transformers
- Licence
 - System has to be completely free of any charges
 - Allow to view, modify & spread the code
- Documentation
 - Has to be free of any charges
 - Reasonable overview about the system and its application
- Project state
 - Should be technically mature
 - Should be applicable for EAI integration

Results evaluation phase 1:

- 1060 NetKernel
- Babeldoc
- Business Integration Engine
- Clover.ETL
- Conductor DocSOAP XDK
- ConnectorWorks
- DataServer
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Results evaluation phase 1:

- 1060 NetKerne
- **Babeldoc**
- Business Integration Engine
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- OpenQueue
- OpenSymphony
- Orbeon PresentationServer
- OSMQ
- **Proteus**
- **Retic/JyRetic**
- ServiceMix
- S-integrator
- So.Ace
- Tambora
- **xBus**
- Xineo XIL
- XMLB.aster

Just 6 projects passed the first evaluation phase

In-depth evaluation of the remaining projects:

- ***Babeldoc***
- ***JyRetic***
- ***Mule***
- ***openadaptor***
- ***Proteus***
- ***xBus***

- **Projects are introduced in detail**
- **Evaluation is accomplished by a checklist**
- **Covers 50 different significant issues**
- **Evaluation involves multiple aspects**

Evaluation aspects:

- General parameters
Licence, soft- & hardware requirements, os-support...
- Architecture
Structure, API, message handling, business logic, routing, scalability...
- Features
Connectors, transaction, compression, workflow, recomposition...
- Security
Encryption (message & channel), authentication, tracking...
- Support
Consulting, documentation, tutorials, FAQ, mailing lists, forums...

Evaluation aspects (continued):

- Usability
Graphical user interface, configuration, test schema implementation...
- Project state
References, time on market, community, number of contributors...

Results are transferred to the evaluation matrix

System	Babeldoc	JyRetic	Mule	Openadaptor	Proteus	xBus
Database-based connectors	• JDBC	• SQL • SQLTree (source) • SQLTreePlus (source) • Xindice	• JDBC	• JDBC	• JDBC	• JDBC
Programmable transformation	• JavaScript • XML • XSLT	• XSLT	• Groovy • Java • PHP • XSLT	• Java properties file • XSLT	• Java • XSLT	• XSLT • Java • Property files
Application-based connectors	No	No	• AS400	• MQ Series • Tibco	• Tibco	• AS400
Decomposition	Yes	Yes	Yes	Yes	Yes	Yes
Recomposition	No	No	Yes	Yes	No	No
Transactional support	Yes	No	Yes	Yes	Yes	Yes
Workflow support	No	No	No	No	No	No
Command line control	Yes	Yes	Yes	Yes	Yes	Yes
Compression support	Yes	Yes	Yes	Yes	No	No
<i>Security</i>						
Authentication	No	No	Yes	Yes	No	Yes
Communication channel encryption	No	No	• SSL • TLS • HTTPS	• SFTP	No	• HTTPS
Message encryption	Yes ⁴	No	• PQP	JCE	No	
Message tracking	Yes	Yes				
<i>Support</i>						

System	Babeldoc	JyRetic	Mule	Openadaptor	Proteus	xBus
<i>Architecture</i>	⊕	⊕⊕	⊕⊕	⊕⊕	⊕	⊕
<i>Features</i>	⊕⊕	⊕	⊕	⊕	○	○
<i>Security</i>	○	⊖⊖	⊕⊕	○	⊖⊖	⊖⊖
<i>Support</i>	⊖	○	⊕⊕	⊕	⊖	○
<i>Usability</i>	○	⊕⊕	○	⊕	⊖	○
<i>Project state</i>	⊕	⊕	⊕	⊕	⊖	○
Overall rating	○	⊕	⊕⊕	⊕	⊖	○

- Mule & openadaptor a feasible for larger projects in sensitive domains & the need for high connectivity
- JyRetic, Babeldoc & xBus are feasible for smaller projects in secured environments without highly sensitive information
- Proteus comes with a very small footprint & documentation. Testschema implementation could not be started.

Conclusion:

There **are** technically mature projects on the FOSS market

But: as well some optimizations are necessary

- Usability
- Professional support
- Domain specific protocols
- Product specific connectors

➔ **Project Freegate to compensate these issues**

Facts

Project name: FreeGate

Project objective: Creation of an easy to use, free of charge EAI-system with local support in Luxembourg by the means of FOSS.

Project scope: Healthcare for beta phase, will be extended to other domains afterwards

Project start: 2005/11/14

Duration phase I: 183MD / 14,5 month

Duration phase II: open

Project partners:

ZITHA 
Clinique Ste Thérèse

 **FACHHOCHSCHULE TRIER**
Hochschule für Technik, Wirtschaft und Gestaltung
University of Applied Sciences

 **Hôpital Kirchberg**



Further partners are welcome!

Activities

2. Market survey
3. Requirement analysis
4. Detailed concept
5. Marketing strategy

Outcomes

- ✓ Survey about FOSS EAI systems
- ✓ Requirement specification for FOSS EAI system
- ✓ Strategy plan
- ✓ List of partners for phase II
- ✓ Scientific publications

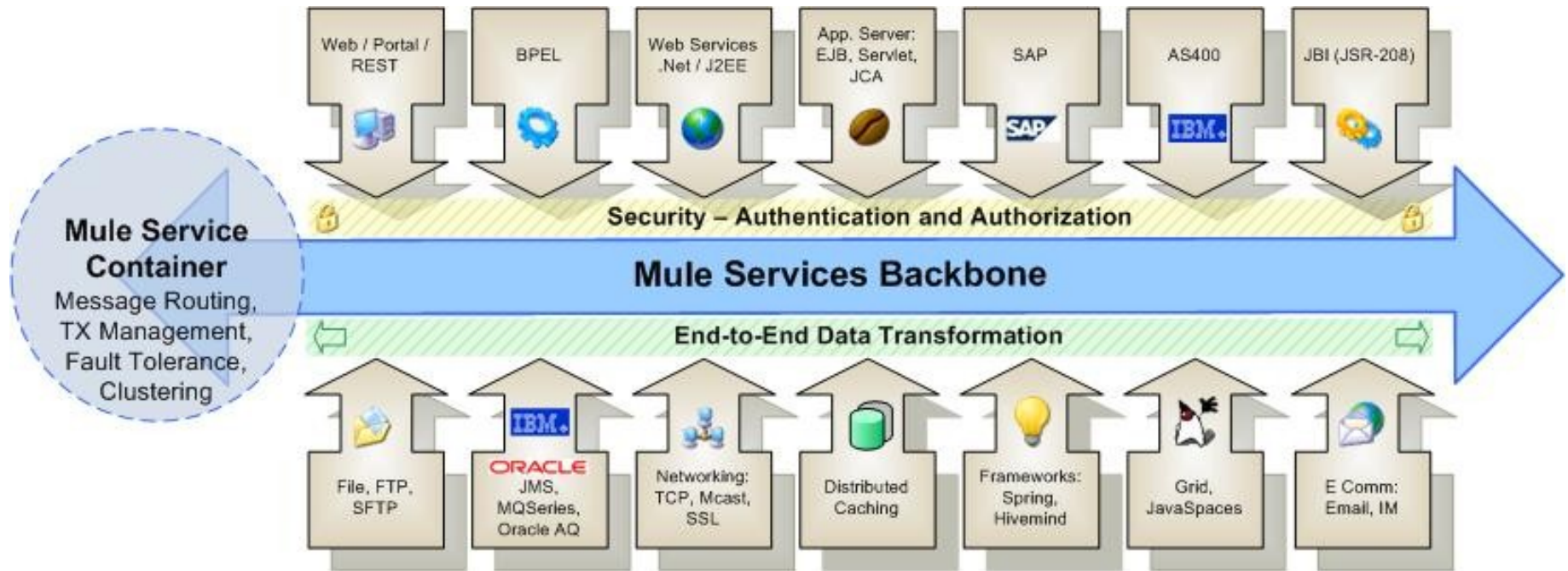
Activities

- Realization partners will actively participate in the development of the EAI-system
- The beta sites will test the system supported by the CRP Henri Tudor and the realization partners
- The CRP Henri Tudor will be phased out after the development of the EAI-system
- The realization partners will take over the paid, local support for the EAI-system
- The realization partners will provide training, enhancement and consulting services for the software
- The resulting EAI-system will be free of any charges

Outcomes

- ✓ Free of charge & easy to use EAI system
- ✓ Network of local companies that enhance the EAI-system, support the customers and provide trainings
- ✓ Community that create further features and tools for the EAI-system

Mule has been chosen to base the development onto



- Provides a wide range of transports, components & transformers
- Uses latest technologies (J2EE, IoC, JBI, SEDA, SOA,...)
- Powerfull framework with additional functionalities (e.g. security, transaction management, scalability, distribution)

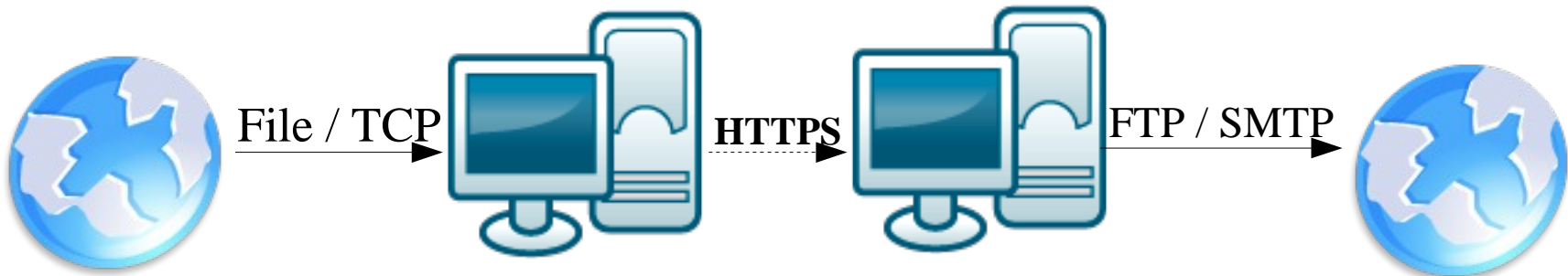
Problem

- Mule does not provide a sophisticated IDE
- Mule uses XML files for the configuration of the ESB, which can become very complex

Scenario:

- First instance provides server ports for the file and the TCP protocol

- Second instance provides client ports for FTP and SMTP

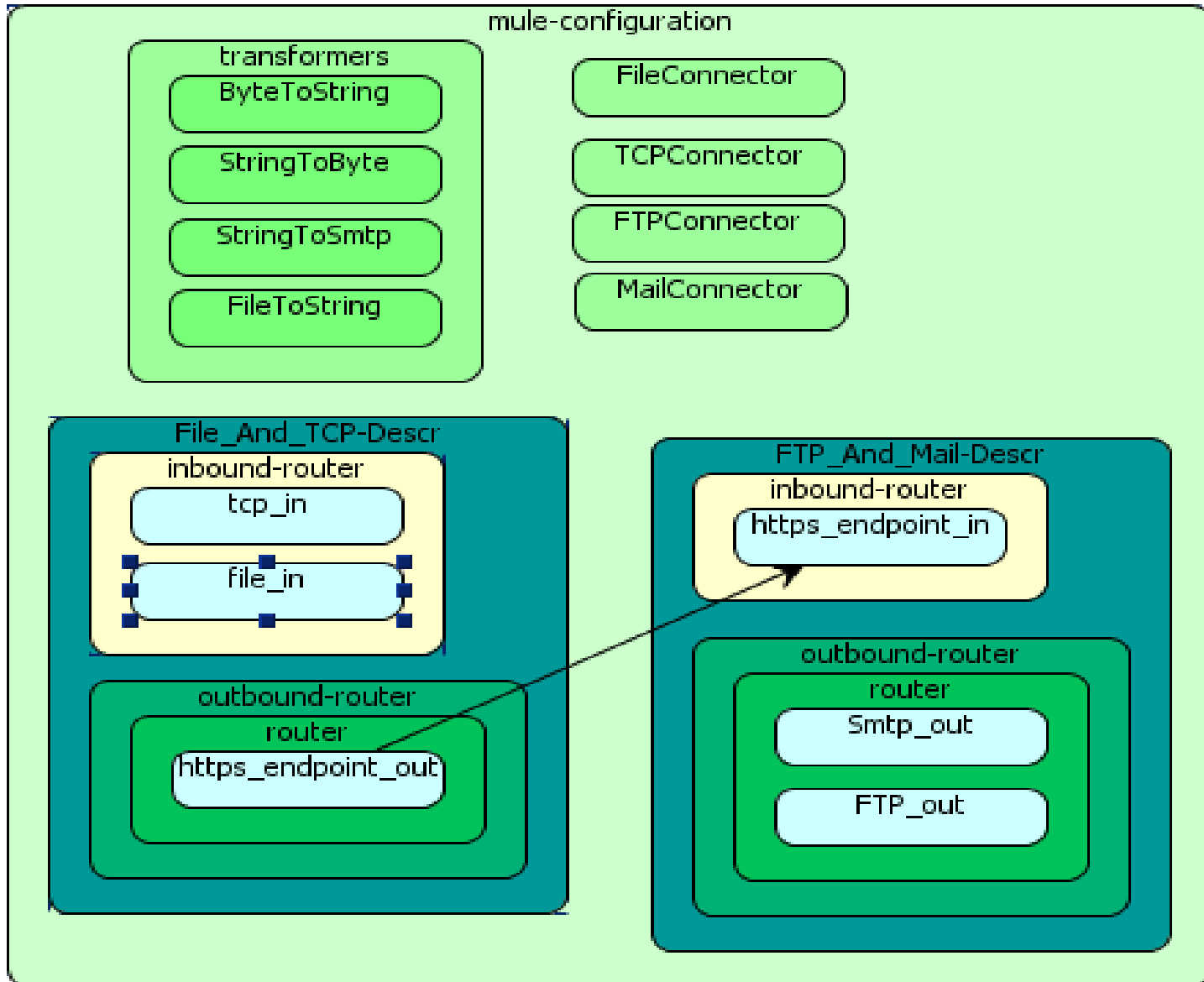


The incoming messages of the first instance shall be sent to the second instance over HTTPS

```
<mule-configuration version="1.0" id="Configuration1">
  <connector name="FileConnector" className="org.mule.providers.file.FileConnector" />
  <connector name="TCPConnector" className="org.mule.providers.tcp.TcpConnector" />
  <connector name="FTPConnector" className="org.mule.providers.ftp.FtpConnector" />
  <connector name="MailConnector" className="org.mule.providers.email.SmtpConnector" />
  <transformers>
    <transformer name="ByteToString" returnClass="java.lang.Object" className="org.mule.transformers.simple.ByteArrayToString" />
    <transformer name="StringToByte" returnClass="java.lang.Object" className="org.mule.transformers.simple.StringToByteArray" />
    <transformer name="StringToSmtp" returnClass="java.lang.Object"
      className="org.mule.providers.email.transformers.StringToEmailMessage" />
    <transformer name="FileToString" returnClass="java.lang.Object" className="org.mule.providers.file.transformers.FileToString" />
  </transformers>
  <mule-descriptor name="File_And_TCP-Descr" initialState="started" singleton="false"
    implementation="org.mule.components.mycomponents.MyComplIncome">
    <inbound-router matchAll="false">
      <endpoint transformers="ByteToString" type="senderAndReceiver" address="tcp://localhost:12345/" />
      <endpoint transformers="FileToString" connector="FileConnector" type="senderAndReceiver" address="file://" />
    </inbound-router>
    <outbound-router matchAll="false">
      <router enableCorrelation="IF_NOT_SET" className="org.mule.routing.outbound.FilteringOutboundRouter">
        <endpoint name="endpoint_1" type="senderAndReceiver" address="https://desthost:12345/" />
      </router>
    </outbound-router>
  </mule-descriptor>
```

```
<mule-descriptor name="FTP_And_Mail-Descr" initialState="started" singleton="false"
  implementation="org.mule.components.mycomponents.MyCompOutgoing">
  <outbound-router matchAll="false">
    <router enableCorrelation="IF_NOT_SET" className="org.mule.routing.outbound.FilteringOutboundRouter">
      <endpoint transformers="StringToEmailMessage" connector="MailConnector" type="senderAndReceiver" address="vm://" />
      <endpoint transformers="StringToByte" connector="FTPConnector" type="senderAndReceiver" address="vm://" />
    </router>
  </outbound-router>
  <inbound-router matchAll="false">
    <endpoint name="endpoint_2" type="senderAndReceiver" address="https://desthost:12345/" />
  </inbound-router>
</mule-descriptor>
</mule-configuration>
```

Mule configuration in Freegate



Freegate V0.5-prealpha 200610171010

File Export Help View

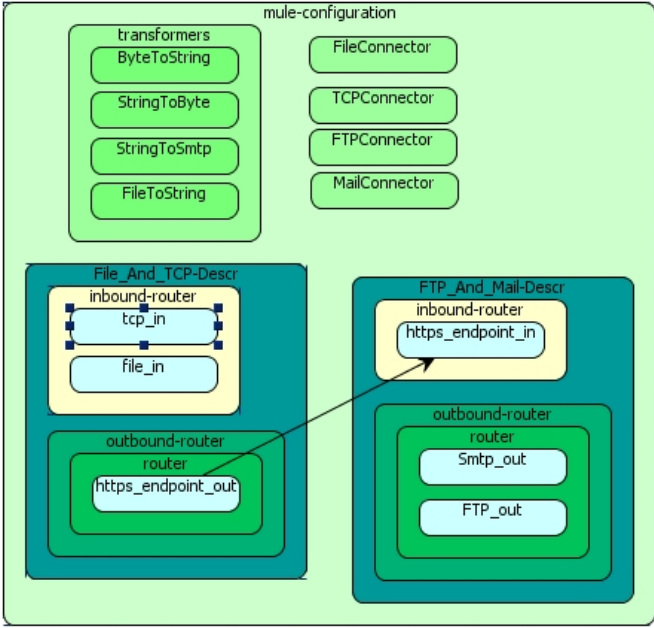
ToolBox Window

endpoint

- transaction
- filter
- security-filter
- properties

Drawing Window

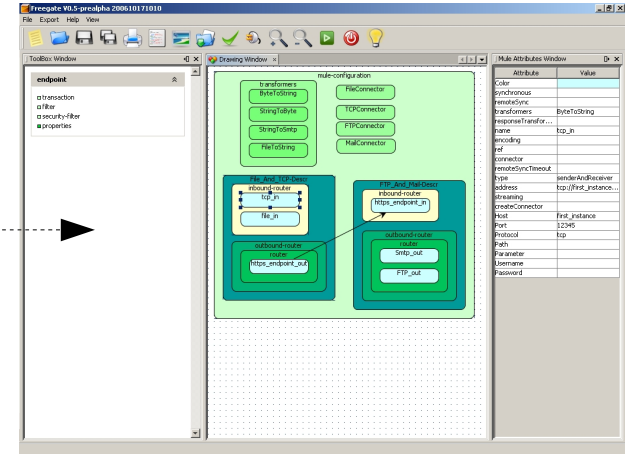
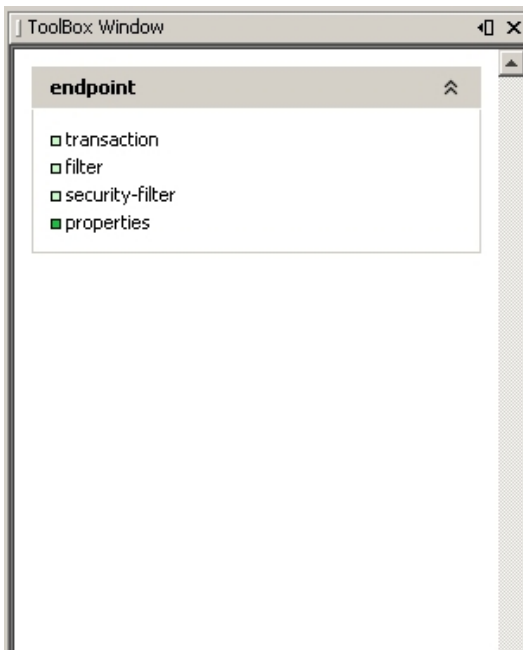
mule-configuration



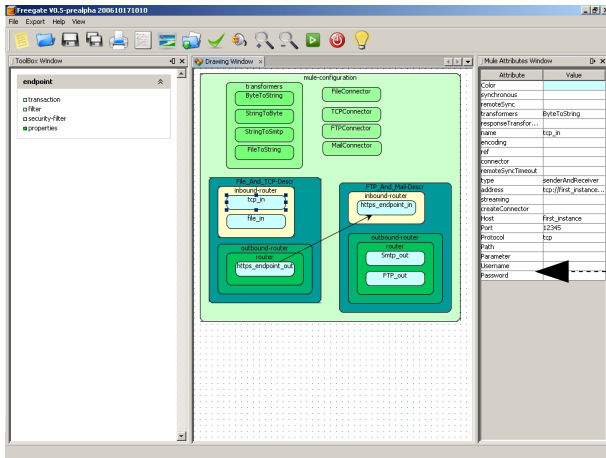
The diagram illustrates a Mule configuration structure. At the top, there are two columns of components: a 'transformers' column containing ByteToString, StringToByte, StringToSmtp, and FileToString; and a 'connectors' column containing FileConnector, TCPConnector, FTPConnector, and MailConnector. Below these are two main configuration blocks. The left block, 'File_And_TCP-Descr', contains an 'inbound-router' with 'tcp_in' and 'file_in' components, and an 'outbound-router' with a 'router' containing 'https_endpoint_out'. The right block, 'FTP_And_Mail-Descr', contains an 'inbound-router' with 'https_endpoint_in' and an 'outbound-router' with a 'router' containing 'Smtp_out' and 'FTP_out'. Arrows indicate connections between the 'https_endpoint_out' of the left router and the 'https_endpoint_in' of the right router.

Mule Attributes Window

Attribute	Value
Color	
synchronous	
remoteSync	
transformers	ByteToString
responseTransfor...	
name	tcp_in
encoding	
ref	
connector	
remoteSyncTimeout	
type	senderAndReceiver
address	tcp://first_instance...
streaming	
createConnector	
Host	first_instance
Port	12345
Protocol	tcp
Path	
Parameter	
Username	
Password	



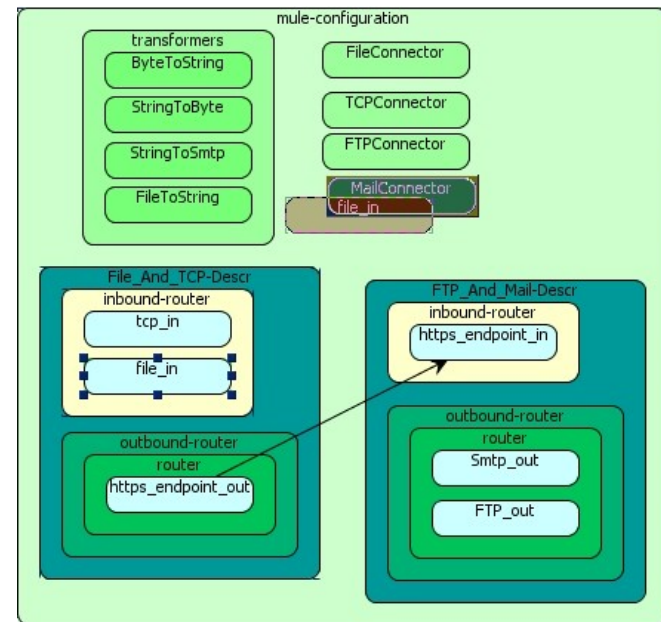
- Shows all possible elements that can be inserted in the current selected element (here an endpoint)
- Inserting an element by dragging from the Toolbox window to the Drawing window

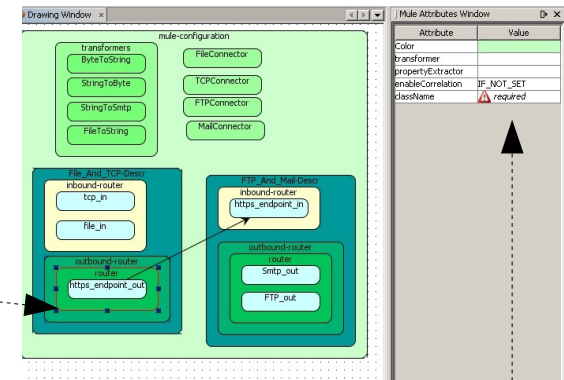
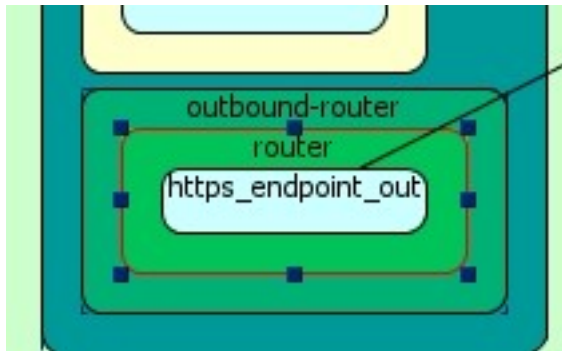


- Shows the attributes for the current selected element
- Verifies the input (e. g. no port higher than 65535)
- Highlights required attributes

Mule Attributes Window	
Attribute	Value
Color	
synchronous	
remoteSync	
transformers	ByteToString
responseTransformers	
name	tcp_in
encoding	
ref	
connector	
remoteSyncTimeout	
type	senderAndReceiver
address	tcp://first_instance...
streaming	
createConnector	
Host	first_instance
Port	12345
Protocol	tcp
Path	
Parameter	
Username	
Password	

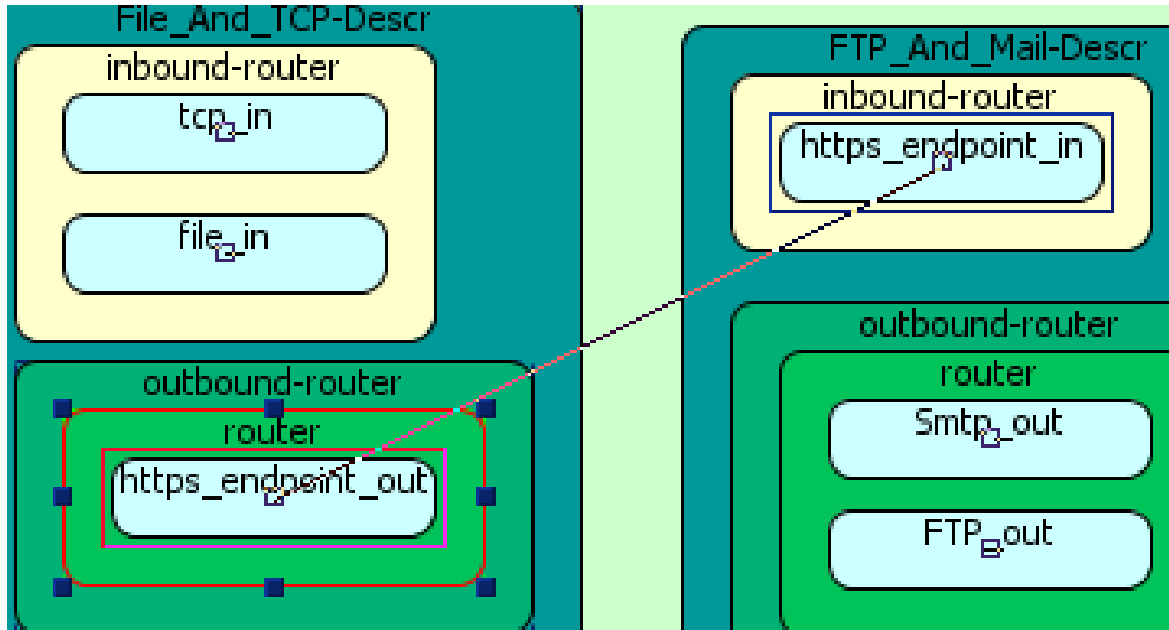
- Moving, reordering and resizing elements
- Elements can only be dropped if the destination is valid. This is shown in another color and a denying / accepting mouse cursor
- Element colors can be set individually



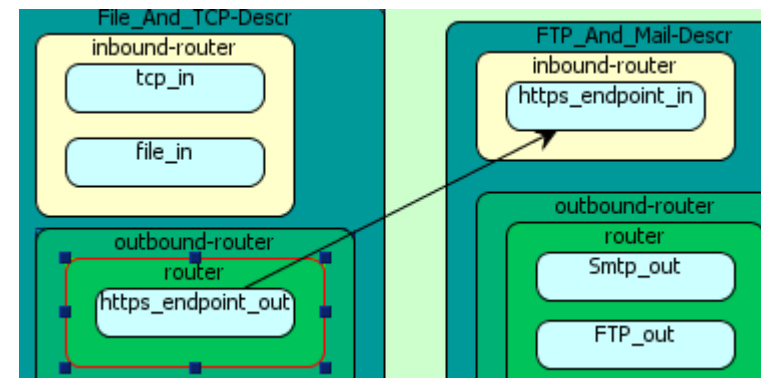


- All elements will be marked if the validation fails and a required attribute is not set yet.
 - The required attributed is marked with an exclamation mark
 - The element is bordered red

propertyExtractor	
enableCorrelation	IF_NOT_SET
className	! required

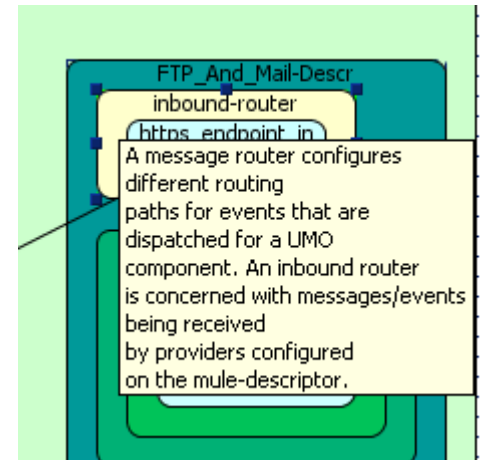


- In the connect mode endpoints ports are highlighted and can be visually and logically connected
- The outbound endpoint adopts the settings from the inbound router



- Setting attributes in an outbound endpoint causes a search for matching inbound endpoints
- Importing a mule-configuration causes a dynamic search for matching endpoints and draws the arrows
- Deleting an arrow causes the deletion of the settings in the outbound endpoint
- If the settings of a connected inbound endpoint are changed, the connected outbound endpoint adopts the new settings

- Zoom the Drawing window in and out
- Print the configuration
- Export the configuration as png
- Comments of the mule dtd are shown as tooltips



Why is a Message Container needed?

A Message Container ..


- represents the structure of an expected message type and allows to access and modify message fields easily.
- message fields can be restricted
- allows to validate the structure and the content of an incoming message
- The structure of the Message Container can be specified over a – in Freegate embedded - editor.

Message Container Properties

Elements

- order
 - Address
 - Street
 - PO Box
 - City
 - Coutry
 - Name
 - newCustomer
 - givenName
 - surName
 - Birthdate
 - invoice
 - pos
 - price
 - Time
 - additionalAddress
 - Street
 - PO Box
 - City

Element Properties

Attribute	Value
name	order
description	
repeatingDelimiter	^
fixedFieldLength	false
escapeCharacter	~
encoding	UTF-8
version	
creationDate	10.01.2007
delimiterLevel1	
delimiterLevel2	 required



The maximum occurrence of this element, set to 0 if unbounded

- Global settings that belong to the whole message are located in the root element

Element Properties


Attribute	Value
name	order
description	
repeatingDelimiter	^
fixedFieldLength	false
escapeCharacter	\
encoding	UTF-8
version	
creationDate	10.01.2007
delimiterLevel1	
delimiterLevel2	

Element Properties

Attribute	Value
name	Street
type	String
minOccurs	1
maxOccurs	1234
fixed	true
defaultValue	true
description	
fieldLength	 required
maxLength	
minLength	1
pattern	

- Message fields can be identified by a fixed field length or by delimiters

- Message field attributes are type dependent
- Following types are yet supported:
 - String
 - Integer
 - Decimal
 - Boolean
 - Base64
 - Datetime
 - Binary

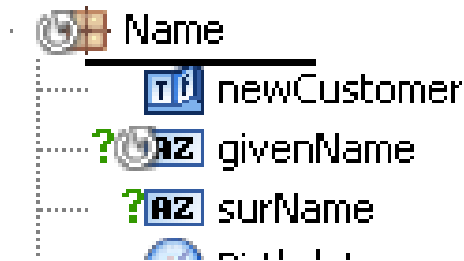
Element Properties	
Attribute	Value
name	newCustomer
type	Boolean
minOccurs	1
maxOccurs	∞
fixed	true
defaultValue	true
description	
fieldLength	 required
trueValues	yes, new
falseValues	no, old

Element Properties	
Attribute	Value
name	Street
type	String
minOccurs	1
maxOccurs	1234
fixed	true
defaultValue	Highway to Hell
description	
maxLength	∞
minLength	1
pattern	

Element Properties	
Attribute	Value
name	Birthdate
type	Datetime
minOccurs	1
maxOccurs	∞
fixed	true
defaultValue	true
description	
format	yyyy-mm-dd
timezone	Europe/Berlin
locale	DE

Sophisticated UI which supports:

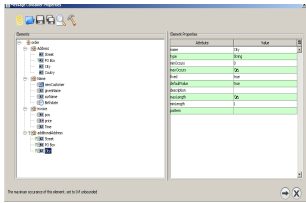
- Drag and Drop
- Copy / Paste
- Type and Cardinality can be determined over the tree icons
- Highlighted XML preview



```

<?xml version="1.0" encoding="UTF-8"?>
<msgfield name="order" description="" repeatingDelimit
  
```

1. Specifying the message structure



2. <XML/>

```
<?xml version="1.0" encoding="UTF-8"?>
<msgfield name="order" description="" r
version="" creationDate="10.01.2007" de
<msgfield name="Address" required="tr
<msgfield name="Street" type="Strin
defaultValue="true" description="" maxl
<msgfield name="PO Box" type="Integ
defaultValue="true" description="" minl
<msgfield name="City" type="String"
defaultValue="true" description="" maxl
<msgfield name="Country" type="Strin
defaultValue="true" description="" maxl
</msgfield>
<msgfield name="Name" required="true"
<msgfield name="newCustomer" type="
maxOccurs="unbounded" defaultValue="tru
<msgfield name="givenName" type="Str
maxOccurs="unbounded" defaultValue="tru
<msgfield name="surName" type="Strin
defaultValue="true" description="" maxl
<msgfield name="Birthdate" type="De
maxOccurs="unbounded" defaultValue="tru
locale="DE" />
</msgfield>
<msgfield name="invoice" required="tr
<msgfield name="po" type="Integer"
defaultValue="true" description="" cana#
tc#38:#228:c#38:#228:s#38:#223:t" minl
<msgfield name="price" type="Decima
defaultValue="true" description="" minl
<msgfield name="Time" type="String"
defaultValue="true" description="" maxl
timezone="Europe/Berlin" locale="DE" />
</msgfield>
```

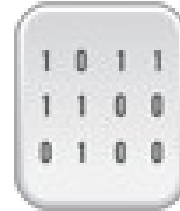


3. Java Source Code



```
* Return List<AbstractMessageField> the children which are a
*/
public java.util.List<AbstractMessageField> getAllChildrenOfCFL
java.util.List<AbstractMessageField> classChilds = new jav
for (AbstractMessageField maf : getChildren()) {
    if (maf.getClass().getName().equals(class.getName()))
        classChilds.add(maf);
}
return classChilds;
```

4. Java Classes



5. JAR file



- Java Objects are pooled in a jar package, which can be referenced by any other Java class, or sent to other instances with the included informations.

Accessing a message field in the message container:



```
Order order = new Order();
...
Address address = order.getAddress();
Street street = address.getStreet();
String payload = street.getContent();
```

- Classes include additional methods, depending on the attributes (e. g. getElementPath(), isRequired(), isLeaf()...)
- Classes include type dependent validation methods
- Access on child elements is name dependent (e. g. getStreet(), getInvoice, getSurName())

- Runtime administration of Mule
- Monitoring
- Centralized management for distributed installations
- Templates / wizards to improve the usability
- Mapping
- Implementation of domain specific protocols
- Implementation of application specific connectors
- Creation of a data dictionary

- Freegate is an open source EAI system
- Freegate is easy to use
- Freegate will be comparable to proprietary solutions
- Freegate provides a sophisticated user interface
- Freegate expands the functionality of the Mule ESB

Thank you for your patience and attention