

The Enterprise Service Bus (ESB): Mule

Mule uses an enterprise service bus (ESB) called Mule to transfer data. Mule transfers this data via “data endpoints”. In the case of Rule Responder, each agent (EAs/OA/PAs) has their own endpoint for which data will travel upon. Additionally, Rule Responder only uses HTTP as a transfer protocol but others can certainly be implemented.

- **The Mule Config File:**

All endpoints and descriptors used with Mule are defined in the mule-all-config.xml file. Therefore, any changes must go here. Changes are then applied when the PragmaticAgentWeb.jar is rebuilt and implemented. The config file is located under:

PragmaticAgentWeb->conf->mule-all-config.xml

- **Endpoint Identifiers:**

Endpoint identifiers describe the endpoints that are used in the ESB. Each identifier has a name and an address.

- **Endpoint Identifiers - name:**

The name of the endpoint is **identically** linked to the agent name that is derived by both the OWL ontology and Prova. Therefore, they must be the same.

(Note that the names must be unique)

- **Endpoint Identifiers - value:**

The value of the endpoint is the address. In the case of Rule Responder, we always use:

<http://10.1.3.4:8080/...> where “...” represents the name of the tomcat servlet.

- **Mule Descriptors:**

Each OA is defined in the mule config file as a mule-descriptor. For example, WellnessRules is described as:

```
<mule-descriptor name="WellnessRules"
  implementation="ws.prova.mule.impl.ProvaUMOImpl" singleton="true">
  <inbound-router>
    <endpoint address="jms://topic:wellnessRules"/>
    <endpoint name="httpEndpointWR" address="http://localhost:9995">
      </endpoint>
    </inbound-router>
  <properties>
    <property name="rulebase" value="/use_caseWellnessRules/Wellness-
      Rules/WellnessRules-Responder.prova" />
  </properties>
</mule-descriptor>
```

- **Mule Descriptors - name:**

The name of the descriptor corresponds to the "XID" that is passed in with Rule Responder queries. It is the name of your Organizational Agent.

```
<mule-descriptor name="WellnessRules">
```

(Note that the names must be unique)

- **Mule Descriptors - Implementation:**

The implementation attribute of the descriptor is the java file that is executed when a message is received. In the case of RuleResponder, *wd.prova.mule.impl.ProvaUMOImpl.java* is used. It will use the OA's Prova knowledge base (defined under property) to handle the message.

```
implementation="ws.prova.mule.impl.ProvaUMOImpl" singleton="true"
```

- **Mule Descriptors - endpoint name:**

This endpoint name will be specific for every OA. For example, RuleML-2009 uses *http://localhost:9996* while WellnessRules uses *http://localhost:9995*. Consult with the server admin to see which port is best for you to use.

```
<endpoint name="httpEndpointWR" address="http://localhost:9995">
```

(Note that the endpoint name must match the endpoint definitions described previously)

- **Mule Descriptors - properties:**

Properties are used to further define the descriptor. In the case of Rule Responder, they are used to point to the Prova knowledge base to be used.

```
<property name="rulebase" value="/use_caseWellnessRules/Wellness-  
Rules/WellnessRules-Responder.prova"/>
```