Implementing AMIE

This document describes how to connect a local account management system to AMIE. In particular it describes how to do this using the reference implementation. You should have the companion documents *The AMIE Model* and *AMIE Installation and Configuration* as references. This document assumes that AMIE is installed in **/amie** as described in *AMIE Installation and Configuration*.
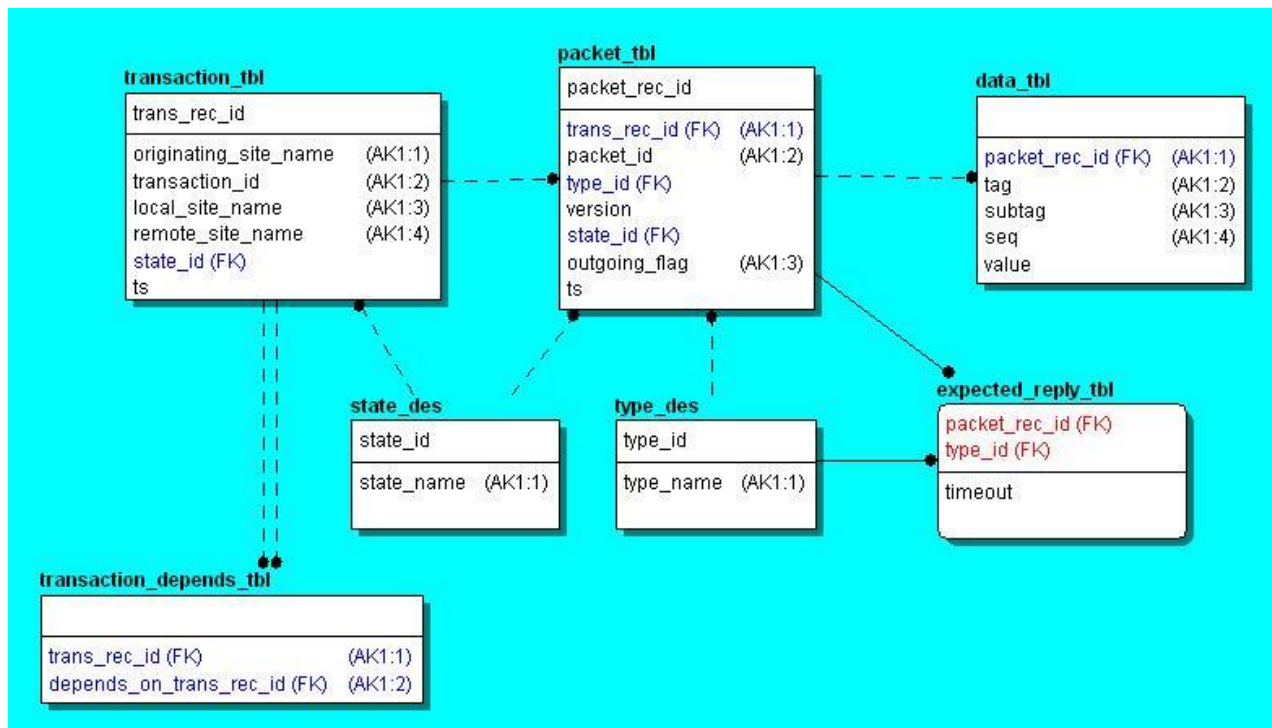
Reference Implementation Database

The reference implementation is found under **/amie**/reference-implementation. It implements the transaction and packet model described in the document *The AMIE Model*.

It uses an "intermediate database" which stands between AMIE and the local account management database. This database has the following tables:

    state_des
    type_des
    transaction_tbl
    transaction_depends_tbl
    packet_tbl
    data_tbl
    expected_reply_tbl

DDL to create these tables can be found in **/amie**/reference-implementation/ddl. Due to referential constraints (i.e. foreign keys), the tables need to be created in the order listed. The ER diagram of this database seen here can be found in **/amie**/reference-implementation/ddl/amie.jpg.

The major work for a site using the reference implementation is thus the creation of transactions, packets, and data for outgoing data, and moving incoming data into the local account management database (as well as state tracking for incoming data). This involves writing SQL queries (inserts, updates, and selects) between the intermediate database and the local account management database. It does not involve any changes to AMIE or the completion of stub functions. See **Creating a Transaction** at the end of this document for a sample of what is needed.

State

The **state_des** table defines the various states for transactions and packets. This table is complete. No local implementation is required, other than to use this table to set the states for transactions and packets. The states are a superset of those required by AMIE. The *state_name* values are *in-progress*, *completed*, *failed*, *on-hold*, and *rejected*. The first 3 are used by AMIE. AMIE will only process transactions and packets that are *in-progress*[1].

Types

The **type_des** table defines all the AMIE packet types. This table is complete. No local implementation is required, other than to use this table to set packet types. The *type_name* values are the AMIE packet types:

    data_account_create
    data_project_create
    notify_account_create
    notify_account_inactivate
    notify_account_reactivate
    notify_person_duplicate
    notify_person_ids
    notify_project_create
    notify_project_inactivate
    notify_project_modify
    notify_project_reactivate
    notify_project_resources
    notify_project_usage
    notify_user_create
    notify_user_modify
    notify_user_reactivate
    notify_user_suspend
    request_account_create
    request_account_inactivate

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[1] An exception to this rule is for incoming packets that have been marked as *failed*. If a site resends a packet, AMIE will reject it as a duplicate packet, unless the corresponding incoming packet has been marked as *failed*. In that case AMIE will replace the incoming packet with the newer version.

request_account_reactivate
request_person_merge
request_project_create
request_project_inactivate
request_project_modify
request_project_reactivate
request_project_resources
request_user_create
request_user_modify
request_user_reactivate
request_user_suspend

inform_transaction_complete

Transactions

The **transaction_tbl** contains the properties for a transaction. The *trans_rec_id* is an auto-generated key for this table. The columns *originating_site_name*, *local_site_name*, and *remote_site_name*[2] are character data of up to 16 characters. The *transaction_id* is chosen by the originating site and is an integer with up 38 digits. The *state_id* is a foreign key into the **state_des** table. The *ts* is an auto-generated timestamp that records when the transaction was inserted in the database.

NOTE: the local implementation is only responsible for creating transactions when it is the originating site, i.e. when it is the one to send the first packet. AMIE will create the transaction when an incoming packet is the first packet for the transaction.

The **transaction_depends_tbl** is list of transaction dependencies – which transactions must be completed before AMIE can process a transaction. This allows multiple transactions to be prepared when the data is ready without having to wait for one transaction to complete before loading the data. The *trans_rec_id* is a foreign key into the **transaction_tbl**. It references the transaction that has dependencies. The *depends_on_trans_rec_id* is also a foreign key into the **transaction_tbl**. This references a transaction that must be completed before the *trans_rec_id* transaction can be processed.

One use of this table would be to create one transaction for creating a project as well as transactions for creating accounts for that project. The account transaction would depend on the project transaction and would not be processed until the project transaction competed.

Packets
The **packet_tbl** contains the packet properties:

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[2] The presence of these 3 columns allows a single database to be used by a site when it wants to participate in multiple AMIE instances without having to use the same local site name in each instance.

packet_rec_id	an auto-generated key for the packet
trans_rec_id	a foreign key into the **transaction_tbl** and specifies the transaction to which the packet belongs.
packet_id	the packet ID that AMIE specifies
type_id	a foreign key into the **type_des** table that specifies the packet type
version	the AMIE version for this packet.[3] The contents of the packet are determined by the version and affect the data found in the related data tables for the packets.
state_id	a foreign key into the **state_des** table that specified the packet state.
outgoing_flag	1 if the packet is an outgoing packet, 0 if it is an incoming packet
ts	an auto-generated timestamp to record when the packet was inserted in the database.

The **expected_reply_tbl** provides a list of replies[4] for outgoing packets that is expected to be sent back by the remote site after processing the packet. The *packet_rec_id* column is a foreign key into the **packet_tbl** that references the outgoing packet expecting a reply. The *type_id* column is a foreign key into the **type_des** table which specifies the packet type of the reply. The *timeout* column is the number of minutes that the remote site has to send the reply.

The **data_tbl** contains the data values[5] associated with a packet. The data is essentially tag-values pairs, except that it must also support lists of such values as well as structured data. The columns *tag, subtag, seq,* and *value* represent the data. The *packet_rec_id* is a foreign key into **packet_tbl**.

In the following examples, XML[6] is mapped to *tag, subtag, seq, value* records.

The simple item:

<first_name>Michael</first_name>

could be represented as

FirstName, *null*[7], 0, Michael

The list of items

```
<dn_list>
  <dn>dn1</dn>
  <dn>dn2</dn>
</dn_list>
```

---

[3] As of the writing of this document, AMIE is only at version "1.0" so the version column would be set to "1.0"

[4] Even though there can be more than one expected reply, this does not mean that all of the replies have to be sent back. One and only one of the replies in the list must be sent back.

[5] Only the following characters should be used: tab, linefeed, and return characters: (octal 011, 012, 015), and characters in the octal range 040 – 177. Other characters will be rejected by the XML parser,

[6] The use of XML is intentional since AMIE converts the data in the packets to and from XML.

[7] *null* is the database NULL value.

could be represented as two records

> DN, *null*, 0, dn1
> DN, *null*, 1, dn2

A data structure like

> ```
> <phone>
>    <number>217-244-0072</number>
>    <ext>2345</ext>
> </phone>
> ```

could be represented as two items

> PhoneNumber, *null*, 0, 217-244-0072
> PhoneExt, *null*, 0, 2345

or as a structured item (still two records)

> Phone, Number, 0, 217-244-0072
> Phone, Ext, 0, 2345

A list of structured items like

> ```
> <sfos_list>
>   <sfos>
>      <number>1234</number>
>      <abbr>CHEM</abbr>
>   </sfos>
>   <sfos>
>      <number>5678</number>
>      <abbr>BIO</abbr>
>   </sfos>
> </sfos_list>
> ```

could be represented with 4 records:

> Sfos, Number, 0, 1234
> Sfos, Abbr, 0, CHEM
> Sfos, Number, 1, 5678
> Sfos, Abbr, 1, BIO

The reference implementation specifies exactly what the *tag, subtag, seq* records must be for each packet type. These will be described in the Packet Data section below.

NOTE: the local implementation is responsible for creating outgoing packets and data. Once created, AMIE will manage the sending of the packets to the remote site and creating the incoming packets. The local implementation is responsible for processing the incoming packets, creating outgoing packets in reply, as well as managing the state of incoming packets.[8]

Packet Data

The packet data required for the various packet types specified by the reference implementation for AMIE version "1.0" is described in the sections below. The specifications map XML XPaths[9] to *tag, subtag, seq* combinations.[10]

XPATH

XPath is an XML-query mechanism. It uses Unix-like path syntax to refer to parts of XML files. While a full explanation of XPath is beyond the scope of this document, the mapping of XPath to the XML data in AMIE files is a bit simpler. Examples will suffice.

The simple XML item
　　　　<pi>
　　　　　<first_name>…</first_name>
　　　　</pi>
can be represented by *pi/first_name*.

The list of items
　　　　<dn_list>
　　　　　<dn>…</dn>
　　　　　<dn>…</dn>
　　　　</dn_list>
can be represented by *dn_list/dn*[11]

The structured item
　　　　<pfos>

---

[8] AMIE will manage the state of outgoing packets. This means that when AMIE receives an expected reply for a packet it sent, it will change the state of the outgoing packet to *completed*. It does not manage the state for incoming packets. The local implementation should change the state of an incoming packet to *completed* or *failed* when it generates the outgoing packet reply.

[9] Using XPath here not only provides a concise means to specify the packet data, but also ties this data to the XML. This can be essential when trying to determine why AMIE rejected a packet due to an XML validation failure.

[10] The *value* that is part of the data is not specified here since only the *tag, subtag,* and *seq* values are needed to describe the record.

[11] This path refers to all the **dn**'s. In fact, it also would refer to all the **dn**'s if the XML were
　　　　<dn_list>
　　　　　<dn>…</dn>
　　　　</dn_list>
　　　　<dn_list>
　　　　　<dn>…</dn>
　　　　</dn_list>

```
    <number>…</number>
    <abbr>…</abbr>
  </pfos>
```

can be specified as *pfos* (which thus refers to everything in <pfos>), or as two paths *pfos/number* and *pfos/abbr*.

As with the case of a list of items, the path for list of structured items is much the same

```
    <sfos_list>
      <sfos>
        <number>…</number>
        <abbr>…</abbr>
      </sfos>
      <sfos>
        <number>…</number>
        <abbr>…</abbr>
      </sfos>
    </sfos_list>
```

The path could be *sfos_list/sfos*.

Attributes within tags are denoted with @ in the path. For example:

```
    <job id='123' host='abc'></job>
```

The paths involved here are *job/@id* and *job/@host*.

The most complicated case involves mixed content:

```
    <hours units="min">59
        <date>2002-10-10</date>
    </hours>
```

The date is *hours/date*. The units are *hours/@units*. The path that refers to 59 would be *hours/.[12]*

Packet Specifications

The specification for each of the packet types is given below. In the tables for each packet, the left column are the *tag, subtag, seq* combinations, and the right column is the corresponding XPath. The reader should consult the AMIE schema[13] for details about the values for a given path.[14]

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[12] The use of dot(.) is slightly different here than in pure XPath. In XPath, for example, *hours/.* is the same as just *hours*. But in AMIE is means the textual content only, i.e., excluding any subtags.

[13] The XML schema used to define these packet types can be found in **/amie**/schema/xsd/1.0/amie.xsd.
A graphical, html-navigable version of this schema can be found in **/amie**/schema/xsd-doc/1.0/html/amie.html.

[14] For example, some paths may be required, while others are optional; some paths may have a specific list of possible values; other paths may be Boolean values; dates must be in the format yyyy-mm-dd; etc.

In the tables, if a path is a simple item, then only the *tag* is shown. The *subtag* and *seq* are assumed to be *null* and 0 respectively. If the path is a list of items, then only the *tag* and *seq* are shown. The *subtag* is assumed to be *null*. If the path is a single, structured item, then only the *tag* and *subtag* are shown. The *seq* is assumed to be 0. If the path is a list of structured items, then *tag, subtag*, and *seq* are all shown. Also, for lists, two items are shown (with *seq* 0 and 1) followed by ellipses (…). This does not imply that a list has to have two items – this is only to indicate that it is a list of items instead of a single item.

Required *tags* and *subtags* are shown in **bold**.

data_account_create

tag …	path
Comment	comment
DnList, 0 DnList, 1 …	dn_list/dn
PersonID	person_id
ProjectID	project_id

data_project_create

tag …	path
Comment	comment
DnList, 0 DnList, 1 …	dn_list/dn
PersonID	person_id
ProjectID	project_id

notify_account_create

tag …	path
AcademicDegree,**Degree**,0 AcademicDegree,**Field**,0 AcademicDegree,**Degree**,1 AcademicDegree,**Field**,1 …	academic_degree_list/ academic_degree/degree academic_degree/field
AccountActivityTime[15]	account_activity_time
Comment	comment
NsfStatusCode	nsf_status_code
ProjectID	project_id
ResourceList, 0	resource_list/resource

---

[15] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

ResourceList, 1 …	
RoleList, 0 RoleList, 1 …	role_list/role
ResourceLogin, **Resource**, 0 ResourceLogin, **Login**, 0 ResourceLogin, **Resource**, 1 ResourceLogin, **Login**, 1 …	resource_login _list/ resource_login/resource resource_login/login
StartDate	start_date
UserBusinessPhoneComment	user/personal_info/business_phone/comment
UserBusinessPhoneExtension	user/personal_info/business_phone/extension
UserBusinessPhoneNumber[16]	user/personal_info/business_phone/number
UserCitizenship	user/personal_info/citizenship
UserCity	user/personal_info/city
UserCountry	user/personal_info/country
UserCountryOfAccess	user/personal_info/country_access
UserDepartment	user/personal_info/dept
UserDnList, 0 UserDnList, 1 …	user/dn_list/dn
UserEmpCode	user/personal_info/emp_code
UserEmail	user/personal_info/email
UserFax	user/personal_info/fax
UserFirstName	user/personal_info/first_name
UserGlobalID	user/personal_info/global_id
UserHomePhoneComment	user/personal_info/home_phone/comment
UserHomePhoneExtension	user/personal_info/home_phone/extension
UserHomePhoneNumber[17]	user/personal_info/home_phone/number
UserLastName	user/personal_info/last_name
UserMiddleName	user/personal_info/middle_name
UserNotifierLogin	user/notifier_login
UserOfficeAddress	user/personal_info/address/off_address
UserOrganization	user/personal_info/organization
UserOrgCode	user/personal_info/org_code
UserPasswordAccessEnable[18]	user/password_access_enable
UserPersonID	user/personal_info/person_id
UserPosition	user/personal_info/position
UserRemoteSiteLogin	user/remote_site_login
UserRequestedLoginList, 0	user/req_login_list/req_login

---

[16] UserBusinessPhoneNumber is required if UserBusinessPhoneComment or UserBusinessPhoneExtension is present.

[17] UserHomePhoneNumber is required if UserHomePhoneComment or UserHomePhoneExtension is present.

[18] XML Boolean – value should be one(1) for true, zero(0) for false.

UserRequestedLoginList, 1 …	
UserRole	user/role
UserState	user/personal_info/address/state
UserStreetAddress	user/personal_info/address/str_address
UserStreetAddress2	user/personal_info/address/str_address2
UserTitle	user/personal_info/title
UserZip	user/personal_info/address/zip

notify_account_inactivate

tag …	path
AccountActivityTime[19]	account_activity_time
Comment	comment
PersonID	person_id
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

notify_account_reactivate

tag …	path
AccountActivityTime[20]	account_activity_time
Comment	comment
PersonID	Person_id
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

notify_person_duplicate

tag …	path
GlobalID1	global _id1
PersonID1	person_id1
GlobalID2	global_id2
PersonID2	person_id2

notify_person_ids

tag …	path

[19] XML datetime format yyyy-mm-dd**T**hh:mm:ss-hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**
[20] XML datetime format yyyy-mm-dd**T**hh:mm:ss-hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

PersonID	person_id
PrimaryPersonID	primary_person_id
PersonIdList,0 PersonIdList,1 …	person_id_list/person_id
RemoveResourceList,0 RemoveResourceList,1 …	remove_resource_list/resource

ResourceLogin, **Resource**, 0
ResourceLogin, **Login**, 0
ResourceLogin,UID,0
ResourceLogin, **Resource**, 1
ResourceLogin, **Login**, 1
 	
…
	resource_login _list/
	   resource_login/resource
	   resource_login/login
	   resource_login/uid

notify_project_create

tag …	*path*
Abstract	abstract

AcademicDegree,**Degree**,0
AcademicDegree,**Field**,0
 	
AcademicDegree,**Degree**,1
AcademicDegree,**Field**,1
…
	academic_degree_list/
	   academic_degree/degree
	   academic_degree/field

AccountActivityTime[21]	account_activity_time
AllocationType	alloc_type
Applications	applications
Background	background
BoardType	board_type
Comment	comment
Deliverables	deliverables
DiskSpace	diskspace
EndDate[22]	end_date
Facilities	facilities
GrantType	grant_type
GrantNumber	grant_num
Justification	justification
Languages	languages
Memory	memory
Methodologies	methodologies
Milestones	milestones

---

[21] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**
[22] XML date format yyyy-mm-dd

NsfStatusCode	nsf_status_code
OtherResources	other_resources
PfosAbbreviation	pfos/abbr
PfosDescription	pfos/description
PfosNumber	pfos/number
PiBusinessPhoneComment	pi/personal_info/business_phone/comment
PiBusinessPhoneExtension	pi/personal_info/business_phone/extension
PiBusinessPhoneNumber[23]	pi/personal_info/business_phone/number
PiCitizenship	pi/personal_info/citizenship
PiCity	pi/personal_info/city
PiCountry	pi/personal_info/country
PiCountryOfAccess	pi/personal_info/country_access
PiDepartment	pi/personal_info/dept
PiDnList, 0 PiDnList, 1 …	pi/dn_list/dn
PiEmail	pi/personal_info/email
PiEmpCode	pi/personal_info/emp_code
PiFax	pi/personal_info/fax
PiFirstName	pi/personal_info/first_name
PiGlobalID	pi/personal_info/global_id
PiHomePhoneComment	pi/personal_info/home_phone/comment
PiHomePhoneExtension	pi/personal_info/home_phone/extension
PiHomePhoneNumber[24]	pi/personal_info/home_phone/number
PiLastName	pi/personal_info/last_name
PiMiddleName	pi/personal_info/middle_name
PiNotifierLogin	pi/notifier_login
PiOfficeAddress	pi/personal_info/address/off_address
PiOrganization	pi/personal_info/organization
PiOrgCode	pi/personal_info/org_code
PiPersonID	pi/personal_info/person_id
PiPosition	pi/personal_info/position
PiRemoteSiteLogin	pi/remote_site_login
PiRequestedLoginList, 0 PiRequestedLoginList, 1 …	pi/req_login_list/req_login
PiState	pi/personal_info/address/state
PiStreetAddress	pi/personal_info/address/str_address
PiStreetAddress2	pi/personal_info/address/str_address2
PiTitle	pi/personal_info/title
PiZip	pi/personal_info/address/zip
Processors	processors

---

[23] PiBusinessPhoneNumber is required if PiBusinessPhoneComment or PiBusinessPhoneExtension is present.
[24] PiHomePhoneNumber is required if PiHomePhoneComment or PiHomePhoneExtension is present.

Progress	progress
ProjectID	project_id
ProjectTitle	project_title
ProposalNumber	proposal_num
Qualifications	qualifications
RecordID	record_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

ResourceLogin, **Resource**, 0
 ResourceLogin, **Login**, 0
 	
 ResourceLogin, **Resource**, 1
 ResourceLogin, **Login**, 1
 …
	resource_login _list/
	    resource_login/resource
	    resource_login/login

RoleList, 0 RoleList, 1 …	role_list/role
Sector	sector
ServiceUnitsAllocated	su_alloc

Sfos, Abbreviation, 0
 Sfos, Description, 0
 Sfos[25], **Number**, 0
 	
 Sfos, Abbreviation, 1
 Sfos, Description, 1
 Sfos, **Number**, 1
 …
	sfos_list/
	    sfos/abbr
	    sfos/description
	    sfos/number

StartDate[26]	start_date
StatementOfWork	statement_work
Support	support

notify_project_inactivate

tag …	*path*
AccountActivityTime[27]	account_activity_time
Comment	comment
ProjectID	project_id

---

[25] Sfos is not required. However, if an Sfos is specified, then the Number is required.
[26] XML date format yyyy-mm-dd
[27] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

ResourceList, 0 ResourceList, 1 …	resource_list/resource

notify_project_modify

tag …	*path*
Abstract	abstract
ActionType[28]	action_type
Applications	applications
Background	background
Comment	comment
Deliverables	deliverables
DiskSpace	diskspace
Facilities	facilities
Justification	justification
Languages	languages
Memory	memory
Methodologies	methodologies
Milestones	milestones
OtherResources	other_resources
PfosAbbreviation	pfos/abbr
PfosDescription	pfos/description
PfosNumber[29]	pfos/number
PiPersonID	pi_person_id
Processors	processors
Progress	progress
ProjectID	project_id
Qualifications	qualifications
ResourceList, 0 ResourceList, 1 …	resource_list/resource
Sector	sector

Sfos, Abbreviation, 0
Sfos, Description, 0
Sfos[30], **Number**, 0
 	
Sfos, Abbreviation, 1
Sfos, Description, 1
Sfos, **Number**, 1
…
	sfos_list/
	   sfos/abbr
	   sfos/description
	   sfos/number

StatementOfWork	statement_work

---

[28] ActionType must be one of **add**, **delete** or **replace**.

[29] PfosNumber is required if PfosAbbreviation or PfosDescription is also present.

[30] Sfos is not required. However, if an Sfos is specified, then the Number is required.

10/16/2012

Support	support

notify_project_reactivate

tag …	*path*
AccountActivityTime[31]	account_activity_time
Comment	comment
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

notify_project_resources

tag …	*path*
ChangedAllocationChange[32]	changed_field_option/su_alloc_info/alloc_change
ChangedEffectiveDate[33]	changed_field_option/su_alloc_info/effective_date
ChangedEndDate[34]	changed_field_option/end_date
ChangedServiceUnitsAllocated	changed_field_option/su_alloc_info/su_alloc
Comment	comment
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

notify_project_usage

tag …	*path*
Attribute, **Name**, 0 Attribute, **Value**, 0 Attribute, **Name**, 1 Attribute, **Value**, 1 …	attribute_list/attribute/name attribute_list/attribute/value
Charge	charge
Comment	comments …
CpuDuration, User[35] CpuDuration, System[36]	cpu_duration/user cpu_duration/system
EndTime[37]	end_time

---

[31] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

[32] Value must be one of **set**, **increment**, or **decrement**.

[33] XML date format yyyy-mm-dd

[34] XML date format yyyy-mm-dd

[35] XML duration format **PT**h**H**m**M**s**S**

[36] XML duration format **PT**h**H**m**M**ss**S**

ExecHost, **Name**, 0	exec_host_list/host_info/host
ExecHost, Memory[38], 0	exec_host_list/host_info/mb_reserved_memory
ExecHost, Processors,0	exec_host_list/host_info/processors
ExecHost, **Name**, 1	
ExecHost, Memory, 1	
ExecHost, Processors, 1	
…	
JobIdentity, **LocalJobID**	job_identity/local_job_id
JobIdentity, GlobalJobID	job_identity/global_job_id
JobName	job_name
MachineName	machine_name
Memory	memory
NodeCount	node_count
Processors	processors
ProjectID	project_id
Queue	queue
RecordIdentity, CreateTime[39]	record_identity/create_time
RecordIdentity, **RecordID**	record_identity/record_id
StartTime[40]	start_time
SubmitHost	submit_host
SubmitTime[41]	submit_time
UsageType	usage_type
UserLogin	user_login
WallDuration[42]	wall_duration

notify_user_create

tag …	*path*

SitePersonId, **Site**, 0
 SitePersonId, **PersonID**, 0
 	
 SitePersonId, **Site**, 1
 SitePersonId, **PersonID**, 1
 …
	site_person_id_list/
	   site_person_id/site
	   site_person_id/person_id

UserBusinessPhoneComment	user/personal_info/business_phone/comment
UserBusinessPhoneExtension	user/personal_info/business_phone/extension
UserBusinessPhoneNumber[43]	user/personal_info/business_phone/number
UserCitizenship	user/personal_info/citizenship

---

[37] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

[38] Memory units are Megabytes (Mb)

[39] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

[40] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

[41] XML datetime format yyyy-mm-dd**T**hh:mm:ss**-**hh:mm or yyyy-mm-dd**T**hh:mm:ss**Z**

[42] XML duration format **PT**h**H**m**M**ss**S**

[43] UserBusinessPhoneNumber is required if UserBusinessPhoneComment or UserBusinessPhoneExtension is present.

UserCity	user/personal_info/city
UserCountry	user/personal_info/country
UserCountryOfAccess	user/personal_info/country_access
UserDepartment	user/personal_info/dept
UserDnList, 0 UserDnList, 1 …	user/dn_list/dn
UserEmpCode	user/personal_info/emp_code
UserEmail	user/personal_info/email
UserFax	user/personal_info/fax
UserFirstName	user/personal_info/first_name
UserGlobalID	user/personal_info/global_id
UserHomePhoneComment	user/personal_info/home_phone/comment
UserHomePhoneExtension	user/personal_info/home_phone/extension
UserHomePhoneNumber[44]	user/personal_info/home_phone/number
UserLastName	user/personal_info/last_name
UserMiddleName	user/personal_info/middle_name
UserOfficeAddress	user/personal_info/address/off_address
UserOrganization	user/personal_info/organization
UserOrgCode	user/personal_info/org_code
UserPersonID	user/personal_info/person_id
UserPosition	user/personal_info/position
UserState	user/personal_info/address/state
UserStreetAddress	user/personal_info/address/str_address
UserStreetAddress2	user/personal_info/address/str_address2
UserTitle	user/personal_info/title
UserZip	user/personal_info/address/zip
NsfStatusCode	nsf_status_code

notify_user_modify

tag …	*path*
ActionType[45]	action_type

AcademicDegree,**Degree**,0
AcademicDegree,**Field**,0
 	
AcademicDegree,**Degree**,1
AcademicDegree,**Field**,1
…
	academic_degree_list/
	   academic_degree/degree
	   academic_degree/field

BusinessPhoneComment	business_phone/comment

---

[44] UserHomePhoneNumber is required if UserHomePhoneComment or UserHomePhoneExtension is present.
[45] ActionType must be one of **add**, **delete** or **replace**.

BusinessPhoneExtension	business_phone/extension
BusinessPhoneNumber[46]	business_phone/number
Citizenship	citizenship
City	address/city
Comment	comment
Country	address/country
CountryOfAccess	country_access
Department	dept
DnList, 0 DnList, 1 …	dn_list/dn
Email	email
EmpCode	emp_code
Fax	fax
FirstName	first_name
HomePhoneComment	home_phone/comment
HomePhoneExtension	home_phone/extension
HomePhoneNumber[47]	home_phone/number
LastName	last_name
MiddleName	middle_name
NewDn	new_dn
NotifierLogin	notifier_login
OfficeAddress	address/off_address
Organization	organization
OrgCode	org_code
PersonID	person_id
Position	position
RemoteSiteLogin	remote_site_login
RequestedLoginList, 0 RequestedLoginList, 1 …	req_login_list/req_login
State	address/state
StreetAddress	address/str_address
StreetAddress2	address/str_address2
Title	title
ValidCert	valid_cert
Zip	address/zip

notify_user_reactivate

tag …	*path*
Comment	comment

---

[46] BusinessPhoneNumber is required if BusinessPhoneComment or BusinessPhoneExtension is present.

[47] HomePhoneNumber is required if HomePhoneComment or HomePhoneExtension is present.

DnList, 0 DnList, 1 …	dn_list/dn
PersonID	person_id
ProjectID	project_id
ReasonCode	reason/reason_code
ReasonDescription	reason/description

notify_user_suspend

tag …	*path*
Comment	comment
DnList, 0 DnList, 1 …	dn_list/dn
PersonID	person_id
ProjectID	project_id
ReasonCode	reason/reason_code
ReasonDescription	reason/description

request_account_create

tag …	*path*

AcademicDegree,**Degree**,0
AcademicDegree,**Field**,0
 	
AcademicDegree,**Degree**,1
AcademicDegree,**Field**,1
…
	academic_degree_list/
	   academic_degree/degree
	   academic_degree/field

Comment	comment
GrantNumber	grant_num
NsfStatusCode	nsf_status_code
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource
RoleList, 0 RoleList, 1 …	role_list/role

SitePersonId, **Site**, 0
SitePersonId, **PersonID**, 0
 	
SitePersonId, **Site**, 1
SitePersonId, **PersonID**, 1
…
	site_person_id_list/
	   site_person_id/site
	   site_person_id/person_id

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UserBusinessPhoneComment	user/personal_info/business_phone/comment
UserBusinessPhoneExtension	user/personal_info/business_phone/extension
UserBusinessPhoneNumber[48]	user/personal_info/business_phone/number
UserCitizenship	user/personal_info/citizenship
UserCity	user/personal_info/city
UserCountry	user/personal_info/country
UserCountryOfAccess	user/personal_info/country_access
UserDepartment	user/personal_info/dept
UserDnList, 0 UserDnList, 1 …	user/dn_list/dn
UserEmpCode	user/personal_info/emp_code
UserEmail	user/personal_info/email
UserFax	user/personal_info/fax
UserFirstName	user/personal_info/first_name
UserGlobalID	user/personal_info/global_id
UserHomePhoneComment	user/personal_info/home_phone/comment
UserHomePhoneExtension	user/personal_info/home_phone/extension
UserHomePhoneNumber[49]	user/personal_info/home_phone/number
UserLastName	user/personal_info/last_name
UserMiddleName	user/personal_info/middle_name
UserOfficeAddress	user/personal_info/address/off_address
UserOrganization	user/personal_info/organization
UserOrgCode	user/personal_info/org_code
UserPasswordAccessEnable[50]	user/password_access_enable
UserPersonID	user/personal_info/person_id
UserPosition	user/personal_info/position
UserRemoteSiteID	user/remote_site_id
UserRemoteSiteLogin	user/remote_site_login
UserRequestedLoginList, 0 UserRequestedLoginList, 1 …	user/req_login_list/req_login
UserRequesterLogin	user/requester_login
UserRole	user/role
UserState	user/personal_info/address/state
UserStreetAddress	user/personal_info/address/str_address
UserStreetAddress2	user/personal_info/address/str_address2
UserTitle	user/personal_info/title
UserZip	user/personal_info/address/zip

---

[48] UserBusinessPhoneNumber is required if UserBusinessPhoneComment or UserBusinessPhoneExtension is present.

[49] UserHomePhoneNumber is required if UserHomePhoneComment or UserHomePhoneExtension is present.

[50] XML Boolean – value should be one(1) for true, zero(0) for false.

request_account_inactivate

tag …	path
Comment	comment
PersonID	person_id
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

request_account_reactivate

tag …	path
Comment	comment
PersonID	person_id
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource

request_person_merge

tag …	path
DeleteGlobalID	delete_global_id
DeletePersonID	delete_person_id
DeletePortalLogin	delete_portal_login
KeepGlobalID	keep_global_id
KeepPersonID	keep_person_id
KeepPortalLogin	keep_portal_login

request_project_create

tag …	path
Abstract	abstract

AcademicDegree,**Degree**,0
AcademicDegree,**Field**,0
 	
AcademicDegree,**Degree**,1
AcademicDegree,**Field**,1
 …
	academic_degree_list/
	    academic_degree/degree
	    academic_degree/field

AllocatedResource	alloc_resource
AllocationType	alloc_type
Applications	applications
Background	background
ChargeNumber	charge_num

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Comment	comment
Deliverables	deliverables
DiskSpace	diskspace
EndDate[51]	end_date
Facilities	facilities
GrantType	grant_type
GrantNumber	grant_num
Justification	justification
Languages	languages
Memory	memory
Methodologies	methodologies
Milestones	milestones
NsfStatusCode	nsf_status_code
OtherResources	other_resources
PfosAbbreviation	pfos/abbr
PfosDescription	pfos/description
PfosNumber	pfos/number
PiBusinessPhoneComment	pi/personal_info/business_phone/comment
PiBusinessPhoneExtension	pi/personal_info/business_phone/extension
PiBusinessPhoneNumber[52]	pi/personal_info/business_phone/number
PiCitizenship	pi/personal_info/citizenship
PiCity	pi/personal_info/city
PiCountry	pi/personal_info/country
PiCountryOfAccess	pi/personal_info/country_access
PiDepartment	pi/personal_info/dept
PiDnList, 0 PiDnList, 1 …	pi/dn_list/dn
PiEmail	pi/personal_info/email
PiEmpCode	pi/personal_info/emp_code
PiFax	pi/personal_info/fax
PiFirstName	pi/personal_info/first_name
PiGlobalID	pi/personal_info/global_id
PiHomePhoneComment	pi/personal_info/home_phone/comment
PiHomePhoneExtension	pi/personal_info/home_phone/extension
PiHomePhoneNumber[53]	pi/personal_info/home_phone/number
PiLastName	pi/personal_info/last_name
PiMiddleName	pi/personal_info/middle_name
PiOfficeAddress	pi/personal_info/address/off_address
PiOrganization	pi/personal_info/organization
PiOrgCode	pi/personal_info/org_code

---

[51] XML date format yyyy-mm-dd

[52] PiBusinessPhoneNumber is required if PiBusinessPhoneComment or PiBusinessPhoneExtension is present.

[53] PiHomePhoneNumber is required if PiHomePhoneComment or PiHomePhoneExtension is present.

PiPersonID	pi/personal_info/person_id
PiPosition	pi/personal_info/position
PiRemoteSiteID	pi/remote_site_id
PiRemoteSiteLogin	pi/remote_site_login
PiRequestedLoginList, 0 PiRequestedLoginList, 1 …	pi/req_login_list/req_login
PiRequesterLogin	pi/requester_login
PiState	pi/personal_info/address/state
PiStreetAddress	pi/personal_info/address/str_address
PiStreetAddress2	pi/personal_info/address/str_address2
PiTitle	pi/personal_info/title
PiZip	pi/personal_info/address/zip
Processors	processors
Progress	progress
ProjectID	project_id
ProjectTitle	project_title
ProposalNumber	proposal_num
Qualifications	qualifications
ResourceList, 0 ResourceList, 1 …	resource_list/resource
RoleList, 0 RoleList, 1 …	role_list/role
Sector	sector
ServiceUnitsAllocated	su_alloc

Sfos, Abbreviation, 0
Sfos, Description, 0
Sfos[54], **Number**, 0
 	
Sfos, Abbreviation, 1
Sfos, Description, 1
Sfos, **Number**, 1
…
	sfos_list/
	    sfos/abbr
	    sfos/description
	    sfos/number

SitePersonId, **Site**, 0
SitePersonId, **PersonID**, 0
 	
SitePersonId, **Site**, 1
SitePersonId, **PersonID**, 1
…
	site_person_id_list/
	    site_person_id/site
	    site_person_id/person_id

StartDate[55]	start_date
StatementOfWork	statement_work

---

[54] Sfos is not required. However, if an Sfos is specified, then the Number is required.
[55] XML date format yyyy-mm-dd

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Support	support

request_project_inactivate

tag …	*path*
AllocatedResource	alloc_resource
Comment	comment
EndDate	end_date
GrantNumber	grant_num
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource
ServiceUnitsAllocated	su_alloc
ServiceUnitsRemaining	su_remain
StartDate	start_date

request_project_modify

tag …	*path*
Abstract	abstract
ActionType[56]	action_type
Applications	applications
Background	background
Comment	comment
Deliverables	deliverables
DiskSpace	diskspace
Facilities	facilities
Justification	justification
Languages	languages
Memory	memory
Methodologies	methodologies
Milestones	milestones
OtherResources	other_resources
PfosAbbreviation	pfos/abbr
PfosDescription	pfos/description
PfosNumber[57]	pfos/number
PiPersonID	pi_person_id
Processors	processors
Progress	progress
ProjectID	project_id
Qualifications	qualifications

---

[56] ActionType must be one of **add**, **delete** or **replace**.

[57] PfosNumber is only required if PfosAbbreviation or PfosDescription is also present.

ResourceList, 0 ResourceList, 1 …	resource_list/resource
Sector	sector

Sfos, Abbreviation, 0
Sfos, Description, 0
Sfos[58], **Number**, 0
 	
Sfos, Abbreviation, 1
Sfos, Description, 1
Sfos, **Number**, 1
…
	sfos_list/
	  sfos/abbr
	   sfos/description
	   sfos/number

StatementOfWork	statement_work
Support	support

request_project_reactivate

tag …	*path*
AllocatedResource	alloc_resource
Comment	comment
EndDate	end_date
GrantNumber	grant_num
PersonID	person_id
ProjectID	project_id
ResourceList, 0 ResourceList, 1 …	resource_list/resource
ServiceUnitsAllocated	su_alloc
ServiceUnitsRemaining	su_remain
StartDate	start_date

request_project_resources

tag …	*path*
ChangedAllocationChange[59]	changed_field_option/su_alloc_info/alloc_change
ChangedEffectiveDate[60]	changed_field_option/su_alloc_info/effective_date
ChangedEndDate[61]	changed_field_option/end_date
ChangedServiceUnitsAllocated	changed_field_option/su_alloc_info/su_alloc
Comment	comment
ProjectID	project_id
ResourceList, 0	resource_list/resource

---

[58] Sfos is not required. However, if an Sfos is specified, then the Number is required.

[59] Value must be one of **set**, **increment**, or **decrement**.

[60] XML date format yyyy-mm-dd

[61] XML date format yyyy-mm-dd

ResourceList, 1 …	

request_user_create

tag …	*path*

SitePersonId, **Site**, 0
SitePersonId, **PersonID**, 0
 	
SitePersonId, **Site**, 1
SitePersonId, **PersonID**, 1
…
	site_person_id_list/
	   site_person_id/site
	   site_person_id/person_id

UserBusinessPhoneComment	user/personal_info/business_phone/comment
UserBusinessPhoneExtension	user/personal_info/business_phone/extension
UserBusinessPhoneNumber[62]	user/personal_info/business_phone/number
UserCitizenship	user/personal_info/citizenship
UserCity	user/personal_info/city
UserCountry	user/personal_info/country
UserCountryOfAccess	user/personal_info/country_access
UserDepartment	user/personal_info/dept
UserDnList, 0 UserDnList, 1 …	user/dn_list/dn
UserEmpCode	user/personal_info/emp_code
UserEmail	user/personal_info/email
UserFax	user/personal_info/fax
UserFirstName	user/personal_info/first_name
UserGlobalID	user/personal_info/global_id
UserHomePhoneComment	user/personal_info/home_phone/comment
UserHomePhoneExtension	user/personal_info/home_phone/extension
UserHomePhoneNumber[63]	user/personal_info/home_phone/number
UserLastName	user/personal_info/last_name
UserMiddleName	user/personal_info/middle_name
UserOfficeAddress	user/personal_info/address/off_address
UserOrganization	user/personal_info/organization
UserOrgCode	user/personal_info/org_code
UserPersonID	user/personal_info/person_id
UserPosition	user/personal_info/position
UserState	user/personal_info/address/state
UserStreetAddress	user/personal_info/address/str_address
UserStreetAddress2	user/personal_info/address/str_address2
UserTitle	user/personal_info/title

---

[62] UserBusinessPhoneNumber is required if UserBusinessPhoneComment or UserBusinessPhoneExtension is present.

[63] UserHomePhoneNumber is required if UserHomePhoneComment or UserHomePhoneExtension is present.

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UserZip	user/personal_info/address/zip
NsfStatusCode	nsf_status_code

request_user_modify

tag …	*path*
ActionType[64]	action_type

AcademicDegree,**Degree**,0
AcademicDegree,**Field**,0
 	
AcademicDegree,**Degree**,1
AcademicDegree,**Field**,1
…
	academic_degree_list/
	  academic_degree/degree
	  academic_degree/field

BusinessPhoneComment	business_phone/comment
BusinessPhoneExtension	business_phone/extension
BusinessPhoneNumber[65]	business_phone/number
Citizenship	citizenship
City	address/city
Comment	comment
Country	address/country
CountryOfAccess	country_access
Department	dept
DnList, 0 DnList, 1 …	dn_list/dn
Email	email
EmpCode	emp_code
Fax	fax
FirstName	first_name
HomePhoneComment	home_phone/comment
HomePhoneExtension	home_phone/extension
HomePhoneNumber[66]	home_phone/number
LastName	last_name
MiddleName	middle_name
NsfStatusCode	nsf_status_code
NewDn	new_dn
OfficeAddress	address/off_address
Organization	organization
OrgCode	org_code
Position	position
PersonID	person_id

---

[64] ActionType must be one of **add**, **delete** or **replace**.

[65] BusinessPhoneNumber is required if BusinessPhoneComment or BusinessPhoneExtension is present.

[66] HomePhoneNumber is required if HomePhoneComment or HomePhoneExtension is present.

RemoteSiteLogin	remote_site_login
RequestedLoginList, 0 RequestedLoginList, 1 …	req_login_list/req_login
RequesterLogin	requester_login
State	address/state
StreetAddress	address/str_address
StreetAddress2	address/str_address2
Title	title
ValidCert	valid_cert
Zip	address/zip

request_user_reactivate

tag …	Path
Comment	Comment
DnList, 0 DnList, 1 …	dn_list/dn
PersonID	person_id
ProjectID	project_id
ReasonCode	reason/reason_code
ReasonDescription	reason/description

request_user_suspend

tag …	path
Comment	comment
DnList, 0 DnList, 1 …	dn_list/dn
PersonID	person_id
ProjectID	project_id
ReasonCode	reason/reason_code
ReasonDescription	reason/description

inform_transaction_complete

tag …	path
DetailCode	detail_code
Message	message
StatusCode	status_code

This is a special packet. It must be sent as the final packet in a transaction. The *StatusCode* must be one of "Success" or "Failure". A "Success" can only be sent in reply to a packet that expects an

inform_transaction_complete reply. A "Failure" can be sent in reply to any packet. The *Message* should be reasonably informative, especially for a failure, since a person will need to understand it. *DetailCode* must be a positive integer, but specific values for the *DetailCode* are not specified by AMIE. Participating sites need to define the values and their meanings.

Creating a Transaction

This section sketches how to create a transaction with a *request_project_create* outgoing packet that expects a *notify_project_create* reply. It assumes that the local site is "X" and the remote site is "Y". In this example the transaction id is 99[67].

```
begin trans

# create the transaction record
insert transaction_tbl (originating_site_name, local_site_name, remote_site_name, transaction_id, state_id)
select "X", "X", "Y", 99, state_id
from state_des
where state_name = "in-progress"

# get the auto-generated trans_rec_id from the previous insert into a variable (@trid)
@trid = … this is implementation dependent …

# create the outgoing packet record
insert packet_tbl (trans_rec_id, type_id, packet_id, version, state_id, outgoing_flag)
select @trid, td.type_id, 1, "1.0", sd.state_id, 1
from type_des td, state_des sd
where td.type_name  = "request_project_create"
 and    sd.state_name = "in-progress"

# get the auto-generated packet_rec_id from the previous insert into a variable (@prid)
@prid = … this is implementation dependent …

# insert a notify_project_create expected reply
insert expected_reply_tbl (packet_rec_id, type_id, timeout)
select @prid, type_id, 36000
from type_des
where type_name = "notify_project_create"

# insert the data for a request_project_create packet
insert data_tbl (packet_rec_id, tag, subtag, seq, value)
                values (@prid, "Abstract", NULL, 0, "This project …")

 … additional inserts as specified by the request_project_create packet (above) …


commit trans
```

---

[67] The generation of the transaction id is not shown here as that is a local implementation issue.