Building a Module

> ⚠ **Warning**
> This tutorial requires **having installed Odoo (../setup/install.html#setup-install)**

Start/Stop the Odoo server

Odoo uses a client/server architecture in which clients are web browsers accessing the Odoo server via RPC.
Business logic and extension is generally performed on the server side, although supporting client features (e.g. new data representation such as interactive maps) can be added to the client.
In order to start the server, simply invoke the command odoo-bin (../reference/cmdline.html#reference-cmdline) in the shell, adding the full path to the file if necessary:

```
odoo-bin
```

The server is stopped by hitting `Ctrl-C` twice from the terminal, or by killing the corresponding OS process.

Build an Odoo module

Both server and client extensions are packaged as *modules* which are optionally loaded in a *database*.
Odoo modules can either add brand new business logic to an Odoo system, or alter and extend existing business logic: a module can be created to add your country's accounting rules to Odoo's generic accounting support, while the next module adds support for real-time visualisation of a bus fleet.
Everything in Odoo thus starts and ends with modules.

Composition of a module

An Odoo module can contain a number of elements:

Business objects

Declared as Python classes, these resources are automatically persisted by Odoo based on their configuration

Object views (../reference/views.html#reference-views)

Definition of business objects UI display

Data files (../reference/data.html#reference-data)

XML or CSV files declaring the model metadata :

- views (../reference/views.html#reference-views) or reports (../reference/reports.html#reference-reports),
- configuration data (modules parametrization, security rules (../reference/security.html#reference-security)),
- demonstration data
- and more

Web controllers (../reference/http.html#reference-controllers)

Handle requests from web browsers

Static web data

Images, CSS or javascript files used by the web interface or website

Module structure

Each module is a directory within a *module directory*. Module directories are specified by using the `--addons-path` (../reference/cmdline.html#cmdoption-odoo-bin-addons-path) option.

> most command-line options can also be set using **a configuration file (../reference/cmdline.html#reference-cmdline-config)**

An Odoo module is declared by its manifest (../reference/module.html#reference-module-manifest).

A module is also a Python package (http://docs.python.org/2/tutorial/modules.html#packages) with a `__init__.py` file, containing import instructions for various Python files in the module.

For instance, if the module has a single `mymodule.py` file `__init__.py` might contain:

```
from . import mymodule
```

Odoo provides a mechanism to help set up a new module, odoo-bin (../reference/cmdline.html#reference-cmdline-server) has a subcommand scaffold (../reference/cmdline.html#reference-cmdline-scaffold) to create an empty module:

```
$ odoo-bin scaffold <module name> <where to put it>
```

The command creates a subdirectory for your module, and automatically creates a bunch of standard files for a module. Most of them simply contain commented code or XML. The usage of most of those files will be explained along this tutorial.

> ✎ **Exercise**
>
> Module creation

> Use the command line above to create an empty module Open Academy, and install it in Odoo.

Object-Relational Mapping

A key component of Odoo is the ORM (Object-Relational Mapping) layer. This layer avoids having to write most SQL (Structured Query Language) by hand and provides extensibility and security services[2].

Business objects are declared as Python classes extending **`Model`** (../reference/orm.html#odoo.models.Model) which integrates them into the automated persistence system.

Models can be configured by setting a number of attributes at their definition. The most important attribute is `_name` which is required and defines the name for the model in the Odoo system. Here is a minimally complete definition of a model:

```
from odoo import models
class MinimalModel(models.Model):
    _name = 'test.model'
```

Model fields

Fields are used to define what the model can store and where. Fields are defined as attributes on the model class:

```
from odoo import models, fields

class LessMinimalModel(models.Model):
    _name = 'test.model2'

    name = fields.Char()
```

Common Attributes

Much like the model itself, its fields can be configured, by passing configuration attributes as parameters:

```
name = field.Char(required=True)
```

Some attributes are available on all fields, here are the most common ones:

`string` (`unicode` , default: field’s name)
The label of the field in UI (visible by users).

`required` (`bool` , default: `False`)
If `True` , the field can not be empty, it must either have a default value or always be given a value when creating a record.

`help` (`unicode` , default: `''`)
Long-form, provides a help tooltip to users in the UI.

`index` (`bool` , default: `False`)
Requests that Odoo create a database index (http://use-the-index-luke.com/sql/preface) on the column.

Simple fields

There are two broad categories of fields: “simple” fields which are atomic values stored directly in the model’s table and “relational” fields linking records (of the same model or of different models).

Example of simple fields are `Boolean` (../reference/orm.html#odoo.fields.Boolean), `Date` (../reference/orm.html#odoo.fields.Date), `Char` (../reference/orm.html#odoo.fields.Char).

Reserved fields

Odoo creates a few fields in all models[1]. These fields are managed by the system and shouldn’t be written to. They can be read if useful or necessary:

`id` (`Id`)
The unique identifier for a record in its model.

`create_date` (`Datetime` (../reference/orm.html#odoo.fields.Datetime))
Creation date of the record.

`create_uid` (`Many2one` (../reference/orm.html#odoo.fields.Many2one))
User who created the record.

`write_date` (`Datetime` (../reference/orm.html#odoo.fields.Datetime))
Last modification date of the record.

`write_uid` (`Many2one` (../reference/orm.html#odoo.fields.Many2one))
user who last modified the record.

Special fields

By default, Odoo also requires a `name` field on all models for various display and search behaviors. The field used for these purposes can be overridden by setting `_rec_name` .

> **Exercise**
>
> Define a model
>
> Define a new data model *Course* in the *openacademy* module. A course has a title and a description. Courses must have a title.

Data files

Odoo is a highly data driven system. Although behavior is customized using Python (http://python.org) code part of a module’s value is in the data it sets up when loaded.

> some modules exist solely to add data into Odoo

Module data is declared via data files (../reference/data.html#reference-data), XML files with `<record>` elements. Each `<record>` element creates or updates a database record.

```
<odoo>

        <record model="{model name}" id="{record identifier}">
            <field name="{a field name}">{a value}</field>
        </record>

</odoo>
```

- `model` is the name of the Odoo model for the record.
- `id` is an external identifier (../glossary.html#term-external-identifier), it allows referring to the record (without having to know its in-database identifier).
- `<field>` elements have a `name` which is the name of the field in the model (e.g. `description`). Their body is the field’s value.

Data files have to be declared in the manifest file to be loaded, they can be declared in the `'data'` list (always loaded) or in the `'demo'` list (only loaded in demonstration mode).

> ✎ **Exercise**
>
> Define demonstration data
>
> Create demonstration data filling the *Courses* model with a few demonstration courses.

> The content of the data files is only loaded when a module is installed or updated.
>
> After making some changes, do not forget to use **odoo-bin -u openacademy (../reference/cmdline.html#reference-cmdline)** to save the changes to your database.

Actions and Menus

Actions and menus are regular records in database, usually declared through data files. Actions can be triggered in three ways:

1. by clicking on menu items (linked to specific actions)
2. by clicking on buttons in views (if these are connected to actions)
3. as contextual actions on object

Because menus are somewhat complex to declare there is a `<menuitem>` shortcut to declare an `ir.ui.menu` and connect it to the corresponding action more easily.

```
<record model="ir.actions.act_window" id="action_list_ideas">
    <field name="name">Ideas</field>
    <field name="res_model">idea.idea</field>
    <field name="view_mode">tree,form</field>
</record>
<menuitem id="menu_ideas" parent="menu_root" name="Ideas" sequence="10"
          action="action_list_ideas"/>
```

> **⚠ Danger**
>
> The action must be declared before its corresponding menu in the XML file.
>
> Data files are executed sequentially, the action’s **`id`** must be present in the database before the menu can be created.

> **✎ Exercise**
>
> Define new menu entries
>
> Define new menu entries to access courses under the OpenAcademy menu entry. A user should be able to :
>
> display a list of all the courses
>
> create/modify courses

Basic views

Views define the way the records of a model are displayed. Each type of view represents a mode of visualization (a list of records, a graph of their aggregation, …). Views can either be requested generically via their type (e.g. *a list of partners*) or specifically via their id. For generic requests, the view with the correct type and the lowest priority will be used (so the lowest-priority view of each type is the default view for that type).

View inheritance (../reference/views.html#reference-views-inheritance) allows altering views declared elsewhere (adding or removing content).

Generic view declaration

A view is declared as a record of the model **`ir.ui.view`**. The view type is implied by the root element of the **`arch`** field:

```
<record model="ir.ui.view" id="view_id">
    <field name="name">view.name</field>
    <field name="model">object_name</field>
    <field name="priority" eval="16"/>
    <field name="arch" type="xml">
        <!-- view content: <form>, <tree>, <graph>, ... -->
    </field>
</record>
```

> **⚠ Danger**

> The view’s content is XML.
>
> The **arch** field must thus be declared as **type="xml"** to be parsed correctly.

Tree views

Tree views, also called list views, display records in a tabular form.

Their root element is `<tree>`. The simplest form of the tree view simply lists all the fields to display in the table (each field as a column):

```
<tree string="Idea list">
    <field name="name"/>
    <field name="inventor_id"/>
</tree>
```

Form views

Forms are used to create and edit single records.

Their root element is `<form>`. They are composed of high-level structure elements (groups, notebooks) and interactive elements (buttons and fields):

```
<form string="Idea form">
    <group colspan="4">
        <group colspan="2" col="2">
            <separator string="General stuff" colspan="2"/>
            <field name="name"/>
            <field name="inventor_id"/>
        </group>

        <group colspan="2" col="2">
            <separator string="Dates" colspan="2"/>
            <field name="active"/>
            <field name="invent_date" readonly="1"/>
        </group>

        <notebook colspan="4">
            <page string="Description">
                <field name="description" nolabel="1"/>
            </page>
        </notebook>

        <field name="state"/>
    </group>
</form>
```

> ### ✎ Exercise
>
> Customise form view using XML
>
> Create your own form view for the Course object. Data displayed should be: the name and the description of the course.
>
> ### ✎ Exercise

> Notebooks
>
> In the Course form view, put the description field under a tab, such that it will be easier to add other tabs later, containing additional information.

Form views can also use plain HTML for more flexible layouts:

```
<form string="Idea Form">
    <header>
        <button string="Confirm" type="object" name="action_confirm"
                states="draft" class="oe_highlight" />
        <button string="Mark as done" type="object" name="action_done"
                states="confirmed" class="oe_highlight"/>
        <button string="Reset to draft" type="object" name="action_draft"
                states="confirmed,done" />
        <field name="state" widget="statusbar"/>
    </header>
    <sheet>
        <div class="oe_title">
            <label for="name" class="oe_edit_only" string="Idea Name" />
            <h1><field name="name" /></h1>
        </div>
        <separator string="General" colspan="2" />
        <group colspan="2" col="2">
            <field name="description" placeholder="Idea description..." />
        </group>
    </sheet>
</form>
```

Search views

Search views customize the search field associated with the list view (and other aggregated views). Their root element is `<search>` and they're composed of fields defining which fields can be searched on:

```
<search>
    <field name="name"/>
    <field name="inventor_id"/>
</search>
```

If no search view exists for the model, Odoo generates one which only allows searching on the `name` field.

> **Exercise**
>
> Search courses
>
> Allow searching for courses based on their title or their description.

Relations between models

A record from a model may be related to a record from another model. For instance, a sale order record is related to a client record that contains the client data; it is also related to its sale order line records.

> ✎ **Exercise**
>
> Create a session model
>
> For the module Open Academy, we consider a model for *sessions*: a session is an occurrence of a course taught at a given time for a given audience.
>
> Create a model for *sessions*. A session has a name, a start date, a duration and a number of seats. Add an action and a menu item to display them. Make the new model visible via a menu item.

Relational fields

Relational fields link records, either of the same model (hierarchies) or between different models.

Relational field types are:

`Many2one(other_model, ondelete='set null')` (../reference/orm.html#odoo.fields.Many2one)

A simple link to an other object:

```
print foo.other_id.name
```

> ➡ **See also**
>
> foreign keys (http://www.postgresql.org/docs/9.3/static/tutorial-fk.html)

`One2many(other_model, related_field)` (../reference/orm.html#odoo.fields.One2many)

A virtual relationship, inverse of a `Many2one` (../reference/orm.html#odoo.fields.Many2one). A `One2many` (../reference/orm.html#odoo.fields.One2many) behaves as a container of records, accessing it results in a (possibly empty) set of records:

```
for other in foo.other_ids:
    print other.name
```

> ⚠ **Danger**
>
> Because a `One2many` **(../reference/orm.html#odoo.fields.One2many)** is a virtual relationship, there *must* be a `Many2one` **(../reference/orm.html#odoo.fields.Many2one)** field in the `other_model` , and its name *must* be `related_field`

`Many2many(other_model)` (../reference/orm.html#odoo.fields.Many2many)

Bidirectional multiple relationship, any record on one side can be related to any number of records on the other side. Behaves as a container of records, accessing it also results in a possibly empty set of records:

```
for other in foo.other_ids:
    print other.name
```

> ✎ **Exercise**
>
> Many2one relations
>
> Using a many2one, modify the *Course* and *Session* models to reflect their relation with other models:
>
> A course has a *responsible* user; the value of that field is a record of the built-in model `res.users`.
>
> A session has an *instructor*; the value of that field is a record of the built-in model `res.partner`.
>
> A session is related to a *course*; the value of that field is a record of the model `openacademy.course` and is required.
>
> Adapt the views.
>
> ✎ **Exercise**
>
> Inverse one2many relations
>
> Using the inverse relational field one2many, modify the models to reflect the relation between courses and sessions.
>
> ✎ **Exercise**
>
> Multiple many2many relations
>
> Using the relational field many2many, modify the *Session* model to relate every session to a set of *attendees*. Attendees will be represented by partner records, so we will relate to the built-in model `res.partner`. Adapt the views accordingly.

Inheritance

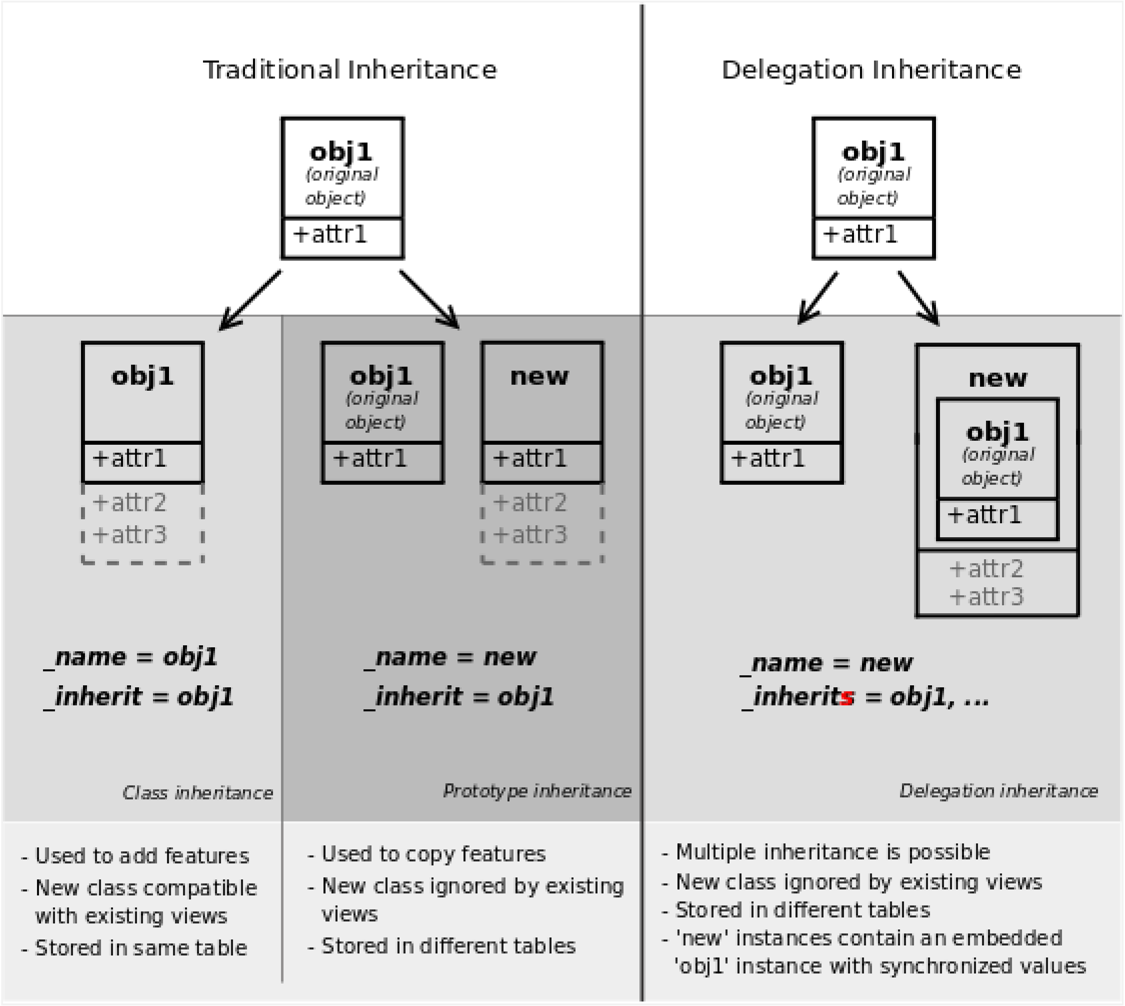
Model inheritance

Odoo provides two *inheritance* mechanisms to extend an existing model in a modular way.

The first inheritance mechanism allows a module to modify the behavior of a model defined in another module:

- add fields to a model,
- override the definition of fields on a model,
- add constraints to a model,
- add methods to a model,
- override existing methods on a model.

The second inheritance mechanism (delegation) allows to link every record of a model to a record in a parent model, and provides transparent access to the fields of the parent record.



> ➡ **See also**
>
> **`_inherit`**
>
> **`_inherits`**

View inheritance

Instead of modifying existing views in place (by overwriting them), Odoo provides view inheritance where children "extension" views are applied on top of root views, and can add or remove content from their parent.

An extension view references its parent using the `inherit_id` field, and instead of a single view its `arch` field is composed of any number of `xpath` elements selecting and altering the content of their parent view:

```
<!-- improved idea categories list -->
<record id="idea_category_list2" model="ir.ui.view">
    <field name="name">id.category.list2</field>
    <field name="model">idea.category</field>
    <field name="inherit_id" ref="id_category_list"/>
    <field name="arch" type="xml">
        <!-- find field description and add the field
             idea_ids after it -->
        <xpath expr="//field[@name='description']" position="after">
          <field name="idea_ids" string="Number of ideas"/>
        </xpath>
    </field>
</record>
```

`expr`

An XPath (http://w3.org/TR/xpath) expression selecting a single element in the parent view. Raises an error if it matches no element or more than one

`position`

Operation to apply to the matched element:

`inside`

appends `xpath` 's body at the end of the matched element

`replace`

replaces the matched element with the `xpath` 's body, replacing any `$0` node occurrence in the new body with the original element

`before`

inserts the `xpath` 's body as a sibling before the matched element

`after`

inserts the `xpaths` 's body as a sibling after the matched element

`attributes`

alters the attributes of the matched element using special `attribute` elements in the `xpath` 's body

> When matching a single element, the `position` attribute can be set directly on the element to be found. Both inheritances below will give the same result.
>
> ```
> <xpath expr="//field[@name='description']" position="after">
>     <field name="idea_ids" />
> </xpath>
>
> <field name="description" position="after">
>     <field name="idea_ids" />
> </field>
> ```

Exercise

Alter existing content

> Using model inheritance, modify the existing *Partner* model to add an **`instructor`** boolean field, and a many2many field that corresponds to the session-partner relation
> Using view inheritance, display this fields in the partner form view

Domains

In Odoo, Search domains (../reference/orm.html#reference-orm-domains) are values that encode conditions on records. A domain is a list of criteria used to select a subset of a model's records. Each criteria is a triple with a field name, an operator and a value.

For instance, when used on the *Product* model the following domain selects all *services* with a unit price over *1000*:

```
[('product_type', '=', 'service'), ('unit_price', '>', 1000)]
```

By default criteria are combined with an implicit AND. The logical operators **`&`** (AND), **`|`** (OR) and **`!`** (NOT) can be used to explicitly combine criteria. They are used in prefix position (the operator is inserted before its arguments rather than between). For instance to select products "which are services *OR* have a unit price which is *NOT* between 1000 and 2000":

```
['|',
    ('product_type', '=', 'service'),
    '!', '&',
        ('unit_price', '>=', 1000),
        ('unit_price', '<', 2000)]
```

A **`domain`** parameter can be added to relational fields to limit valid records for the relation when trying to select records in the client interface.

> **Exercise**
>
> Domains on relational fields
>
> When selecting the instructor for a *Session*, only instructors (partners with **`instructor`** set to **`True`**) should be visible.
>
> **Exercise**
>
> More complex domains
>
> Create new partner categories *Teacher / Level 1* and *Teacher / Level 2*. The instructor for a session can be either an instructor or a teacher (of any level).

Computed fields and default values

So far fields have been stored directly in and retrieved directly from the database. Fields can also be *computed*. In that case, the field's value is not retrieved from the database but computed on-the-fly by calling a method of the model.

To create a computed field, create a field and set its attribute `compute` to the name of a method. The computation method should simply set the value of the field to compute on every record in `self`.

> ⚠ **Danger**
>
> `self` is a collection
>
> The object `self` is a *recordset*, i.e., an ordered collection of records. It supports the standard Python operations on collections, like `len(self)` and `iter(self)`, plus extra set operations like `recs1 + recs2`.
>
> Iterating over `self` gives the records one by one, where each record is itself a collection of size 1. You can access/assign fields on single records by using the dot notation, like `record.name`.

```
import random
from odoo import models, fields, api

class ComputedModel(models.Model):
    _name = 'test.computed'

    name = fields.Char(compute='_compute_name')

    def _compute_name(self):
        for record in self:
            record.name = str(random.randint(1, 1e6))
```

Dependencies

The value of a computed field usually depends on the values of other fields on the computed record. The ORM expects the developer to specify those dependencies on the compute method with the decorator `depends()` (../reference/orm.html#odoo.api.depends). The given dependencies are used by the ORM to trigger the recomputation of the field whenever some of its dependencies have been modified:

```
from odoo import models, fields, api

class ComputedModel(models.Model):
    _name = 'test.computed'

    name = fields.Char(compute='_compute_name')
    value = fields.Integer()

    @api.depends('value')
    def _compute_name(self):
        for record in self:
            record.name = "Record with value %s" % record.value
```

> ✎ **Exercise**
>
> Computed fields
>
> Add the percentage of taken seats to the *Session* model
>
> Display that field in the tree and form views

> Display the field as a progress bar

Default values

Any field can be given a default value. In the field definition, add the option **`default=X`** where **`X`** is either a Python literal value (boolean, integer, float, string), or a function taking a recordset and returning a value:

```
name = fields.Char(default="Unknown")
user_id = fields.Many2one('res.users', default=lambda self: self.env.user)
```

> The object `self.env` gives access to request parameters and other useful things:
>
> `self.env.cr` or `self._cr` is the database *cursor* object; it is used for querying the database
>
> `self.env.uid` or `self._uid` is the current user's database id
>
> `self.env.user` is the current user's record
>
> `self.env.context` or `self._context` is the context dictionary
>
> `self.env.ref(xml_id)` returns the record corresponding to an XML id
>
> `self.env[model_name]` returns an instance of the given model

> **Exercise**
>
> Active objects – Default values
>
> Define the start_date default value as today (see **`Date`** **(../reference/orm.html#odoo.fields.Date)**).
>
> Add a field `active` in the class Session, and set sessions as active by default.

Onchange

The "onchange" mechanism provides a way for the client interface to update a form whenever the user has filled in a value in a field, without saving anything to the database.

For instance, suppose a model has three fields `amount`, `unit_price` and `price`, and you want to update the price on the form when any of the other fields is modified. To achieve this, define a method where `self` represents the record in the form view, and decorate it with `onchange()` (../reference/orm.html#odoo.api.onchange) to specify on which field it has to be triggered. Any change you make on `self` will be reflected on the form.

```
<!-- content of form view -->
<field name="amount"/>
<field name="unit_price"/>
<field name="price" readonly="1"/>
```

```
# onchange handler
@api.onchange('amount', 'unit_price')
def _onchange_price(self):
    # set auto-changing field
    self.price = self.amount * self.unit_price
    # Can optionally return a warning and domains
    return {
        'warning': {
            'title': "Something bad happened",
            'message': "It was very bad indeed",
        }
    }
```

For computed fields, valued `onchange` behavior is built-in as can be seen by playing with the *Session* form: change the number of seats or participants, and the `taken_seats` progressbar is automatically updated.

> ✎ **Exercise**
>
> Warning
>
> Add an explicit onchange to warn about invalid values, like a negative number of seats, or more participants than seats.

Model constraints

Odoo provides two ways to set up automatically verified invariants: `Python constraints` (../reference/orm.html#odoo.api.constrains) and `SQL constraints`.

A Python constraint is defined as a method decorated with `constrains()` (../reference/orm.html#odoo.api.constrains), and invoked on a recordset. The decorator specifies which fields are involved in the constraint, so that the constraint is automatically evaluated when one of them is modified. The method is expected to raise an exception if its invariant is not satisfied:

```
from odoo.exceptions import ValidationError

@api.constrains('age')
def _check_something(self):
    for record in self:
        if record.age > 20:
            raise ValidationError("Your record is too old: %s" % record.age)
    # all records passed the test, don't return anything
```

> ✎ **Exercise**
>
> Add Python constraints
>
> Add a constraint that checks that the instructor is not present in the attendees of his/her own session.

SQL constraints are defined through the model attribute `_sql_constraints`. The latter is assigned to a list of triples of strings `(name, sql_definition, message)`, where `name` is a valid SQL constraint name, `sql_definition` is a table constraint (http://www.postgresql.org/docs/9.3/static/ddl-constraints.html) expression, and `message` is the error message.

> **Exercise**
>
> Add SQL constraints
>
> With the help of **PostgreSQL's documentation (http://www.postgresql.org/docs/9.3/static/ddl-constraints.html)**, add the following constraints:
>
> 1. CHECK that the course description and the course title are different
> 2. Make the Course's name UNIQUE
>
> **Exercise**
>
> Exercise 6 - Add a duplicate option
>
> Since we added a constraint for the Course name uniqueness, it is not possible to use the "duplicate" function anymore (**Form ▸ Duplicate**).
>
> Re-implement your own "copy" method which allows to duplicate the Course object, changing the original name into "Copy of [original name]".

Advanced Views

Tree views

Tree views can take supplementary attributes to further customize their behavior:

`decoration-{$name}`

allow changing the style of a row's text based on the corresponding record's attributes.

Values are Python expressions. For each record, the expression is evaluated with the record's attributes as context values and if `true`, the corresponding style is applied to the row. Here are some of the other values available in the context:

- `uid`: the id of the current user,
- `today`: the current local date as a string of the form `YYYY-MM-DD`,
- `now`: same as `today` with the addition of the current time. This value is formatted as `YYYY-MM-DD hh:mm:ss`.

`{$name}` can be `bf` (`font-weight: bold`), `it` (`font-style: italic`), or any bootstrap contextual color (https://getbootstrap.com/docs/3.3/components/#available-variations) (`danger`, `info`, `muted`, `primary`, `success` or `warning`).

```
<tree string="Idea Categories" decoration-info="state=='draft'"
    decoration-danger="state=='trashed'">
    <field name="name"/>
    <field name="state"/>
</tree>
```

`editable`

Either `"top"` or `"bottom"`. Makes the tree view editable in-place (rather than having to go through the form view), the value is the position where new rows appear.

> ✎ **Exercise**
>
> List coloring
>
> Modify the Session tree view in such a way that sessions lasting less than 5 days are colored blue, and the ones lasting more than 15 days are colored red.

Calendars

Displays records as calendar events. Their root element is `<calendar>` and their most common attributes are:

`color`

The name of the field used for *color segmentation*. Colors are automatically distributed to events, but events in the same color segment (records which have the same value for their `@color` field) will be given the same color.

`date_start`

record’s field holding the start date/time for the event

`date_stop` (optional)

record’s field holding the end date/time for the event

`string`

record’s field to define the label for each calendar event

```
<calendar string="Ideas" date_start="invent_date" color="inventor_id">
    <field name="name"/>
</calendar>
```

> ✎ **Exercise**
>
> Calendar view
>
> Add a Calendar view to the *Session* model enabling the user to view the events associated to the Open Academy.

Search views

Search view `<field>` elements can have a `@filter_domain` that overrides the domain generated for searching on the given field. In the given domain, `self` represents the value entered by the user. In the example below, it is used to search on both fields `name` and `description`.

Search views can also contain `<filter>` elements, which act as toggles for predefined searches. Filters must have one of the following attributes:

`domain`
: add the given domain to the current search

`context`
: add some context to the current search; use the key `group_by` to group results on the given field name

```
<search string="Ideas">
    <field name="name"/>
    <field name="description" string="Name and description"
           filter_domain="['|', ('name', 'ilike', self), ('description', 'ilike', self)]
    <field name="inventor_id"/>
    <field name="country_id" widget="selection"/>

    <filter name="my_ideas" string="My Ideas"
            domain="[('inventor_id', '=', uid)]"/>
    <group string="Group By">
        <filter name="group_by_inventor" string="Inventor"
                context="{'group_by': 'inventor_id'}"/>
    </group>
</search>
```

To use a non-default search view in an action, it should be linked using the `search_view_id` field of the action record.

The action can also set default values for search fields through its `context` field: context keys of the form `search_default_`*`field_name`* will initialize *field_name* with the provided value. Search filters must have an optional `@name` to have a default and behave as booleans (they can only be enabled by default).

> ✎ **Exercise**
>
> Search views
>
> 1. Add a button to filter the courses for which the current user is the responsible in the course search view. Make it selected by default.
> 2. Add a button to group courses by responsible user.

Gantt

> ⚠ **Warning**

> The gantt view requires the web_gantt module which is present in **the enterprise edition (../setup/install.html#setup-install-editions)** version.

Horizontal bar charts typically used to show project planning and advancement, their root element is `<gantt>`.

```
<gantt string="Ideas"
       date_start="invent_date"
       date_stop="date_finished"
       progress="progress"
       default_group_by="inventor_id" />
```

> ✎ **Exercise**
>
> Gantt charts
>
> Add a Gantt Chart enabling the user to view the sessions scheduling linked to the Open Academy module. The sessions should be grouped by instructor.

Graph views

Graph views allow aggregated overview and analysis of models, their root element is `<graph>`.

> Pivot views (element `<pivot>`) a multidimensional table, allows the selection of filers and dimensions to get the right aggregated dataset before moving to a more graphical overview. The pivot view shares the same content definition as graph views.

Graph views have 4 display modes, the default mode is selected using the `@type` attribute.

Bar (default)

a bar chart, the first dimension is used to define groups on the horizontal axis, other dimensions define aggregated bars within each group.

By default bars are side-by-side, they can be stacked by using `@stacked="True"` on the `<graph>`

Line

2-dimensional line chart

Pie

2-dimensional pie

Graph views contain `<field>` with a mandatory `@type` attribute taking the values:

`row` (default)

the field should be aggregated by default

`measure`

the field should be aggregated rather than grouped on

```
<graph string="Total idea score by Inventor">
    <field name="inventor_id"/>
    <field name="score" type="measure"/>
</graph>
```

> ⚠ **Warning**
>
> Graph views perform aggregations on database values, they do not work with non-stored computed fields.

> ✎ **Exercise**
>
> Graph view
>
> Add a Graph view in the Session object that displays, for each course, the number of attendees under the form of a bar chart.

Kanban

Used to organize tasks, production processes, etc… their root element is `<kanban>` .

A kanban view shows a set of cards possibly grouped in columns. Each card represents a record, and each column the values of an aggregation field.

For instance, project tasks may be organized by stage (each column is a stage), or by responsible (each column is a user), and so on.

Kanban views define the structure of each card as a mix of form elements (including basic HTML) and QWeb (../reference/qweb.html#reference-qweb).

> ✎ **Exercise**
>
> Kanban view
>
> Add a Kanban view that displays sessions grouped by course (columns are thus courses).

Security

Access control mechanisms must be configured to achieve a coherent security policy.

Group-based access control mechanisms

Groups are created as normal records on the model `res.groups` , and granted menu access via menu definitions. However even without a menu, objects may still be accessible indirectly, so actual object-level permissions (read, write, create, unlink) must be defined for groups. They are usually inserted via CSV files inside modules. It is also possible to restrict access to specific fields on a view or object using the field's groups attribute.

Access rights

Access rights are defined as records of the model `ir.model.access` . Each access right is associated to a model, a group (or no group for global access), and a set of permissions: read, write, create, unlink. Such access rights are usually created by a CSV file named after its model: `ir.model.access.csv` .

```
id,name,model_id/id,group_id/id,perm_read,perm_write,perm_create,perm_unlink
access_idea_idea,idea.idea,model_idea_idea,base.group_user,1,1,1,0
access_idea_vote,idea.vote,model_idea_vote,base.group_user,1,1,1,0
```

> ✎ **Exercise**
>
> Add access control through the Odoo interface
>
> Create a new user "John Smith". Then create a group "OpenAcademy / Session Read" with read access to the *Session* model.

> ✎ **Exercise**
>
> Add access control through data files in your module
>
> Using data files,
>
> Create a group *OpenAcademy / Manager* with full access to all OpenAcademy models
>
> Make *Session* and *Course* readable by all users

Record rules

A record rule restricts the access rights to a subset of records of the given model. A rule is a record of the model `ir.rule`, and is associated to a model, a number of groups (many2many field), permissions to which the restriction applies, and a domain. The domain specifies to which records the access rights are limited.

Here is an example of a rule that prevents the deletion of leads that are not in state `cancel`. Notice that the value of the field `groups` must follow the same convention as the method `write()` (../reference/orm.html#odoo.models.Model.write) of the ORM.

```
<record id="delete_cancelled_only" model="ir.rule">
    <field name="name">Only cancelled leads may be deleted</field>
    <field name="model_id" ref="crm.model_crm_lead"/>
    <field name="groups" eval="[(4, ref('sales_team.group_sale_manager'))]"/>
    <field name="perm_read" eval="0"/>
    <field name="perm_write" eval="0"/>
    <field name="perm_create" eval="0"/>
    <field name="perm_unlink" eval="1" />
    <field name="domain_force">[('state','=','cancel')]</field>
</record>
```

> ✎ **Exercise**
>
> Record rule
>
> Add a record rule for the model Course and the group "OpenAcademy / Manager", that restricts `write` and `unlink` accesses to the responsible of a course. If a course has no responsible, all users of the group must be able to modify it.

Wizards

Wizards describe interactive sessions with the user (or dialog boxes) through dynamic forms. A wizard is simply a model that extends the class **`TransientModel`** (../reference/orm.html#odoo.models.TransientModel) instead of **`Model`** (../reference/orm.html#odoo.models.Model). The class **`TransientModel`** (../reference/orm.html#odoo.models.TransientModel) extends **`Model`** (../reference/orm.html#odoo.models.Model) and reuse all its existing mechanisms, with the following particularities:

> Wizard records are not meant to be persistent; they are automatically deleted from the database after a certain time. This is why they are called *transient*.
>
> Wizard records may refer to regular records or wizard records through relational fields(many2one or many2many), but regular records *cannot* refer to wizard records through a many2one field.

We want to create a wizard that allow users to create attendees for a particular session, or for a list of sessions at once.

> **Exercise**
>
> Define the wizard
>
> Create a wizard model with a many2one relationship with the *Session* model and a many2many relationship with the *Partner* model.

Launching wizards

Wizards are simply window actions with a **`target`** field set to the value **`new`**, which opens the view (usually a form) in a separate dialog. The action may be triggered via a menu item, but is more generally triggered by a button.

An other way to launch wizards is through the **Action** menu of a tree or form view. This is done through the **`binding_model_id`** field of the action. Setting this field will make the action appear on the views of the model the action is “bound” to.

```
<record id="launch_the_wizard" model="ir.actions.act_window">
    <field name="name">Launch the Wizard</field>
    <field name="model">wizard.model.name</field>
    <field name="view_mode">form</field>
    <field name="target">new<field>
    <field name="binding_model_id" ref="model_context_model_ref"/>
</record>
```

> While wizards use regular views and buttons, normally clicking any button in a form would first save the form then close the dialog. Because this is often undesirable in wizards, a special attribute **`special="cancel"`** is available which immediately closes the wizard without saving the form.

> **Exercise**
>
> Launch the wizard
>
> 1 Define a form view for the wizard.

2. Add the action to launch it in the context of the *Session* model.
3. Define a default value for the session field in the wizard; use the context parameter `self._context` to retrieve the current session.

Exercise

Register attendees

Add buttons to the wizard, and implement the corresponding method for adding the attendees to the given session.

Exercise

Register attendees to multiple sessions

Modify the wizard model so that attendees can be registered to multiple sessions.

Internationalization

Each module can provide its own translations within the i18n directory, by having files named LANG.po where LANG is the locale code for the language, or the language and country combination when they differ (e.g. pt.po or pt_BR.po). Translations will be loaded automatically by Odoo for all enabled languages. Developers always use English when creating a module, then export the module terms using Odoo’s gettext POT export feature (**Settings ‣ Translations ‣ Import/Export ‣ Export Translation** without specifying a language), to create the module template POT file, and then derive the translated PO files. Many IDE’s have plugins or modes for editing and merging PO/POT files.

> The Portable Object files generated by Odoo are published on **Transifex (https://www.transifex.com/odoo/public/)**, making it easy to translate the software.

```
|- idea/ # The module directory
   |- i18n/ # Translation files
      | - idea.pot # Translation Template (exported from Odoo)
      | - fr.po # French translation
      | - pt_BR.po # Brazilian Portuguese translation
      | (...)
```

> By default Odoo’s POT export only extracts labels inside XML files or inside field definitions in Python code, but any Python string can be translated this way by surrounding it with the function `odoo._()` (e.g. `_("Label")`)

Exercise

Translate a module

Choose a second language for your Odoo installation. Translate your module using the facilities provided by Odoo.

Reporting

Printed reports

Odoo uses a report engine based on QWeb (../reference/qweb.html#reference-qweb), Twitter Bootstrap (http://getbootstrap.com) and Wkhtmltopdf (http://wkhtmltopdf.org).

A report is a combination two elements:

an **ir.actions.report** which configures various basic parameters for the report (default type, whether the report should be saved to the database after generation,…)

```
<record id="account_invoices" model="ir.actions.report">
    <field name="name">Invoices</field>
    <field name="model">account.invoice</field>
    <field name="report_type">qweb-pdf</field>
    <field name="report_name">account.report_invoice</field>
    <field name="report_file">account.report_invoice</field>
    <field name="attachment_use" eval="True"/>
    <field name="attachment">(object.state in ('open','paid')) and
        ('INV'+(object.number or '').replace('/','')+'.pdf')</field>
    <field name="binding_model_id" ref="model_account_invoice"/>
    <field name="binding_type">report</field>
</record>
```

> Because it largerly a standard action, as with **Wizards** it is generally useful to add the report as a *contextual item* on the tree and / or form views of the model being reported on via the **binding_model_id** field.
> Here we are also using **binding_type** in order for the report to be in the *report* contextual menu rather than the *action* one. There is no technical difference but putting elements in the right place helps users.

A standard QWeb view (../reference/views.html#reference-views-qweb) for the actual report:

```
<t t-call="web.html_container">
    <t t-foreach="docs" t-as="o">
        <t t-call="web.external_layout">
            <div class="page">
                <h2>Report title</h2>
            </div>
        </t>
    </t>
</t>
```

the standard rendering context provides a number of elements, the most important being:

docs
the records for which the report is printed

user
the user printing the report

Because reports are standard web pages, they are available through a URL and output parameters can be manipulated through this URL, for instance the HTML version of the *Invoice* report is available through http://localhost:8069/report/html/account.report_invoice/1 (http://localhost:8069/report/html/account.report_invoice/1) (if `account` is installed) and the PDF version through http://localhost:8069/report/pdf/account.report_invoice/1 (http://localhost:8069/report/pdf/account.report_invoice/1).

> ⚠ **Danger**
>
> If it appears that your PDF report is missing the styles (i.e. the text appears but the style/layout is different from the html version), probably your **wkhtmltopdf (http://wkhtmltopdf.org)** process cannot reach your web server to download them.
>
> If you check your server logs and see that the CSS styles are not being downloaded when generating a PDF report, most surely this is the problem.
>
> The **wkhtmltopdf (http://wkhtmltopdf.org)** process will use the `web.base.url` system parameter as the *root path* to all linked files, but this parameter is automatically updated each time the Administrator is logged in. If your server resides behind some kind of proxy, that could not be reachable. You can fix this by adding one of these system parameters:
>
> - `report.url`, pointing to an URL reachable from your server (probably `http://localhost:8069` or something similar). It will be used for this particular purpose only.
> - `web.base.url.freeze`, when set to `True`, will stop the automatic updates to `web.base.url`.

> ✎ **Exercise**
>
> Create a report for the Session model
>
> For each session, it should display session’s name, its start and end, and list the session’s attendees.

Dashboards

> ✎ **Exercise**
>
> Define a Dashboard
>
> Define a dashboard containing the graph view you created, the sessions calendar view and a list view of the courses (switchable to a form view). This dashboard should be available through a menuitem in the menu, and automatically displayed in the web client when the OpenAcademy main menu is selected.

WebServices

The web-service module offer a common interface for all web-services :

- XML-RPC
- JSON-RPC

Business objects can also be accessed via the distributed object mechanism. They can all be modified via the client interface with contextual views.
Odoo is accessible through XML-RPC/JSON-RPC interfaces, for which libraries exist in many languages.

XML-RPC Library

The following example is a Python 3 program that interacts with an Odoo server with the library `xmlrpc.client` :

```
import xmlrpc.client

root = 'http://%s:%d/xmlrpc/' % (HOST, PORT)

uid = xmlrpc.client.ServerProxy(root + 'common').login(DB, USER, PASS)
print("Logged in as %s (uid: %d)" % (USER, uid))

# Create a new note
sock = xmlrpc.client.ServerProxy(root + 'object')
args = {
    'color' : 8,
    'memo' : 'This is a note',
    'create_uid': uid,
}
note_id = sock.execute(DB, uid, PASS, 'note.note', 'create', args)
```

> **Exercise**
>
> Add a new service to the client
>
> Write a Python program able to send XML-RPC requests to a PC running Odoo (yours, or your instructor’s). This program should display all the sessions, and their corresponding number of seats. It should also create a new session for one of the courses.

JSON-RPC Library

The following example is a Python 3 program that interacts with an Odoo server with the standard Python libraries `urllib.request` and `json` . This example assumes the **Productivity** app (`note`) is installed:

```
import json
import random
import urllib.request

HOST = 'localhost'
PORT = 8069
DB = 'openacademy'
USER = 'admin'
PASS = 'admin'

def json_rpc(url, method, params):
    data = {
        "jsonrpc": "2.0",
        "method": method,
        "params": params,
        "id": random.randint(0, 1000000000),
    }
    req = urllib.request.Request(url=url, data=json.dumps(data).encode(), headers={
        "Content-Type":"application/json",
    })
    reply = json.loads(urllib.request.urlopen(req).read().decode('UTF-8'))
    if reply.get("error"):
        raise Exception(reply["error"])
    return reply["result"]

def call(url, service, method, *args):
    return json_rpc(url, "call", {"service": service, "method": method, "args": args})

# log in the given database
url = "http://%s:%s/jsonrpc" % (HOST, PORT)
uid = call(url, "common", "login", DB, USER, PASS)

# create a new note
args = {
    'color': 8,
    'memo': 'This is another note',
    'create_uid': uid,
}
note_id = call(url, "object", "execute", DB, uid, PASS, 'note.note', 'create', args)
```

Examples can be easily adapted from XML-RPC to JSON-RPC.

> There are a number of high-level APIs in various languages to access Odoo systems without *explicitly* going through XML-RPC or JSON-RPC, such as:
>
> - https://github.com/akretion/ooor (https://github.com/akretion/ooor)
> - https://github.com/OCA/odoorpc (https://github.com/OCA/odoorpc)
> - https://github.com/nicolas-van/openerp-client-lib (https://github.com/nicolas-van/openerp-client-lib)
> - http://pythonhosted.org/OdooRPC (http://pythonhosted.org/OdooRPC)
> - https://github.com/abhishek-jaiswal/php-openerp-lib (https://github.com/abhishek-jaiswal/php-openerp-lib)

[1] it is possible to disable the automatic creation of some fields (../reference/orm.html#reference-fields-automatic-log-access)

[2] writing raw SQL queries is possible, but requires care as it bypasses all Odoo authentication and security mechanisms.