TURBOGEARS

[2]

FUDCon 2008, Boston

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[Overview]

- What is TurboGears2
- TurboGears1 vs. Pylons
- Changes since 1.0
- Why not merge with Pylons?
- SQLAlchemy vs. SQLObject
- Genshi vs. Kid
- WSGI & Middleware
- DBSprockets & DBMechanic
- Testing
- Diving in...

[whoami]

- Software Engineer at Red Hat, Inc.
- Member of the Fedora Infrastructure, Release Engineering, and Security Response Teams
- Maintain ~50 packages for Fedora and EPEL
  - Including the TurboGears stack
- Hack on various projects: bodhi, liveusb-creator, PackageKit, yum, TurboGears, func, myfedora, etc...

[What is TurboGears2 ?]

- A complete reinvention of TurboGears
- Reimplementation of the TG1.0 API on top of Pylons/Paste
- Provides a fully customizable WSGI stack
- Takes advantage of many new pre-existing components

[TurboGears1 vs. Pylons]

- Both support SQLAlchemy & SQLObject
- Both support a wide variety of templating engines, but each have their own preferences. (Kid/Genshi in TG and Mako/Myghty in Pylons)
- Both use FormEncode for validation
- Both will be using ToscaWidgets in the future
- Many other similarities...

[TurboGears1 vs. Pylons]

- Different dispatching mechanisms
  - TG uses CherryPy's object dispatching
    - Each path segment becomes an attribute lookup
  - Pylons uses Routes pattern matching against the full URL
  - TG dispatches to a function that is invoked by CherryPy
  - Pylons dispatches to a WSGI application

[TurboGears1 vs. Pylons]

- Different controllers
  - TG uses decorators to alter the functionality of your methods
  - In Pylons, you create subclasses to implement controller-specific logic
- Framework Features
  - Pylons: Implemented as WSGI middleware
  - TG: Function decorators
- TG1.0 is heavily tied into CherryPy

[What has changed since 1.0 ?]

- Deciding to work very closely with Pylons
  - Built the TG1.0 on top of Pylons & Paste
- Using paster instead of the tg-admin wrapper
- Uses the Genshi templating engine by default, instead of Kid
- Uses SQLAlchemy instead of SQLObject by default
- ToscaWidgets

[Why not merge with Pylons ?]

- Different philosophies
  - Pylons
    - Defaults are chosen for performance and flexibility
    - Gives loose recommendations, but is committed to staying ORM and template agnostic
  - TurboGears
    - Wants to provide a “full stack” out of the box

- “TG is to Pylons as Ubuntu is to Debian”

[SQLAlchemy > SQLObject]

- Much more efficient SQL queries
- Supports composite keys
- Amazing documentation
- Very active upstream community

[Genshi > Kid]

- Genshi is an intentional re-write of kid
- APIs are almost identical
- Internally, Genshi is much simpler and faster
- Provides full XPath support
- Provides useful error messages!
- Much larger and more active community

[WSGI]

- Web Server Gateway Interface (PEP #333)
- A framework independent specification for how web servers can interact with Python callables
- A standard way for web applications to talk to web servers
- "*Think of it as the servlet spec for the Python world*" -- Jason Briggs
- "*WSGI is a series of tubes*" --Ian Bicking

[Hello WSGI World!]

```
def wsgi_app(environ, start_response):
    ''' Hello world WSGI application.

    :environ: The WSGI environment.  Allows us to
       get at all kinds of request information.
    :start_response: A callable used to set the
       server response status and headers.

    Returns an iterable.  This allows us to send
    chunked responses back to the user as they
    become available.
    '''
    start_response('200 OK', [('content-type', 'text/html')])
    return ['Hello world!']
```

[environ]

```
{'HTTP_HOST': 'localhost',
 'PATH_INFO': '/',
 'QUERY_STRING': '',
 'REQUEST_METHOD': 'GET',
 'SCRIPT_NAME': '',
 'SERVER_NAME': 'localhost',
 'SERVER_PORT': '80',
 'SERVER_PROTOCOL': 'HTTP/1.0',
 ...
```

[WSGI Middleware]

- It's just a WSGI application
- Doesn't do anything alone, but works in between the request and your application
- Essentially the WSGI equivalent of a Python decorator
  - Instead of wrapping one method in another, you're wrapping one web-app in another

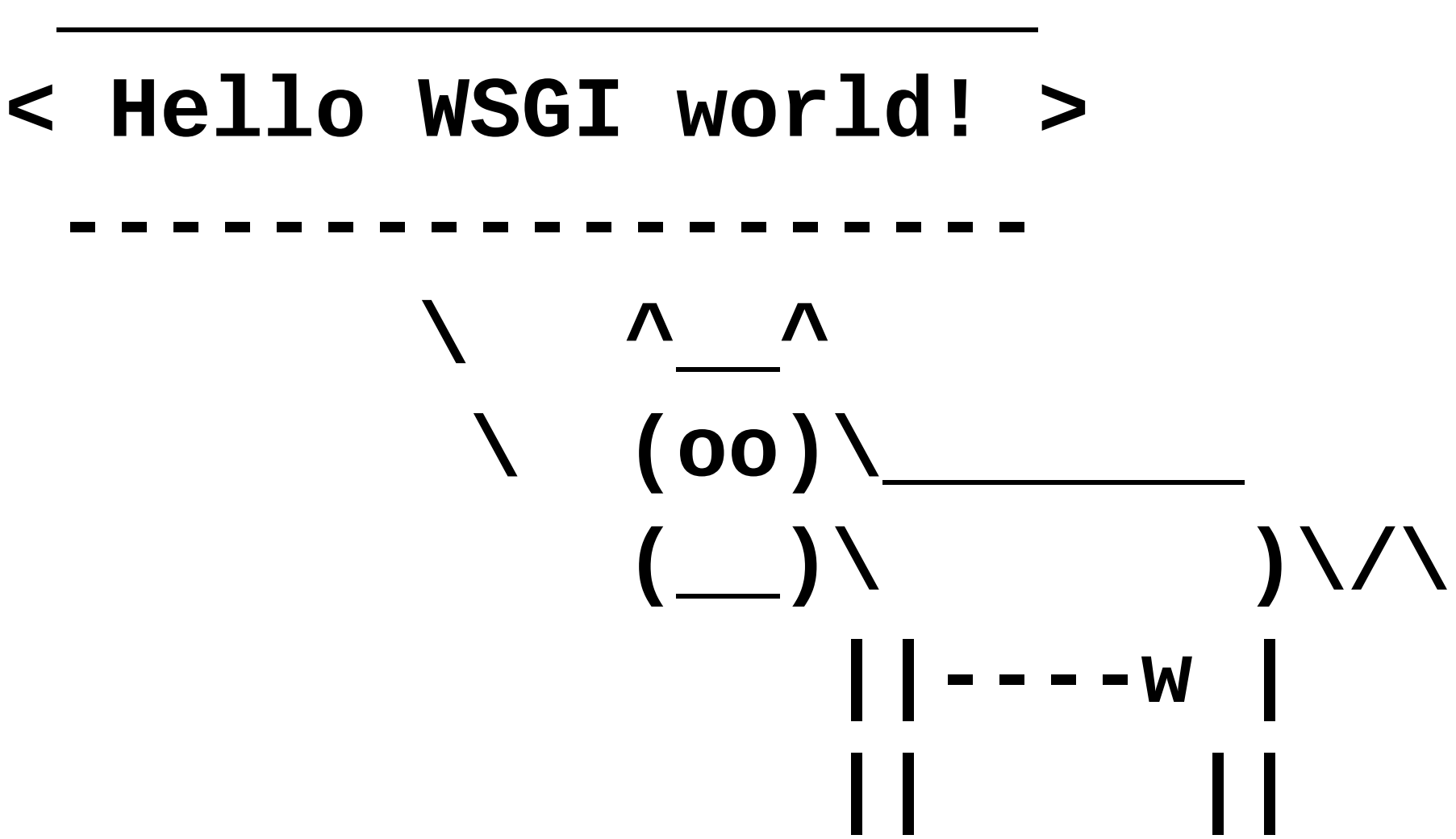
[WSGI Middleware]

```
from subprocess import Popen, PIPE

class CowsayMiddleware(object):

    def __init__(self, app):
        self.app = app

    def __call__(self, environ, start_response):
        for response in self.app(environ, start_response):
            out, err = Popen(['cowsay', response],
                             stdout=PIPE).communicate()
            yield '<pre>%s</pre>' % out
```

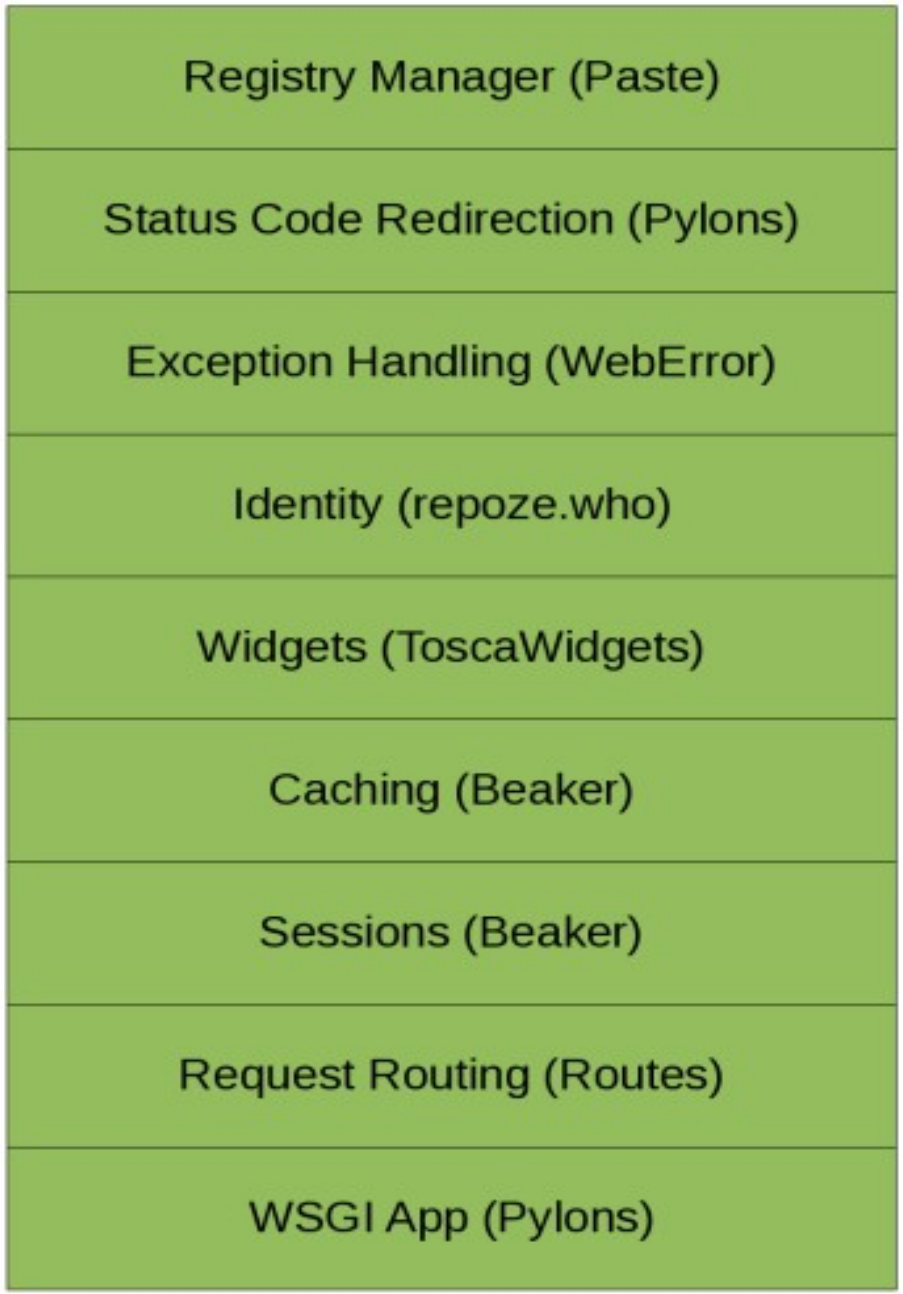
[WSGI Middleware]

```
class HelloWSGIWorldApp(object):

    def __call__(self, environ, start_response):
        start_response('200 OK', [('content-type',
                                   'text/html')])
        return ['Hello WSGI world!']



if __name__ == '__main__':
    from wsgiref.simple_server import make_server

    app = HelloWSGIWorldApp()
    app = CowsayMiddleware(app)

    httpd = make_server('', 8000, app)
    httpd.serve_forever()
```

[WSGI Middleware]



[TurboGears2 Middleware Stack]



[Paste Registry]

- Registry for handling request-local module globals sanely
- Manages thread-local request-specific objects
- Ensures that your module global is always properly set depending on the current request
- Provides a StackedObjectProxy which is popped/pushed during the request cycle so that it properly represents the object that should be active for the current request

[Paste Registry]

```
from paste.registry import RegistryManager, StackedObjectProxy

# WSGI app stack (setup for you by TurboGears2)
app = RegistryManager(yourapp)

# Inside your wsgi app
myglobal = StackedObjectProxy()
class YourApp(object):
    def __call__(self, environ, start_response):
        obj = someobject  # The request-local object you want to access
                          # via yourpackage.myglobal
        environ['paste.registry'].register(myglobal, obj)
```

- This allows you to import your package anywhere in your WSGI app or in the calling stack below it and be assured that it is using the object that you registered with the RegistryManager

[WebError]

Traceback | Extra Data | Template | Source

Error Traceback:

Exception: OMGEXCEPTION!!1 View as: Interactive | Text | XML (full)

URL: http://127.0.0.1:8080/explode

Module weberror.evalexception.middleware:**364** in respond ⊞ view

```
>>  app_iter = self.application(environ, detect_start_response)
```

Module repoze.who.middleware:**105** in __call__ ⊞ view

```
>>  app_iter = app(environ, wrapper.wrap_start_response)
```

Module tw.core.middleware:**30** in __call__ ⊞ view

```
>>  return self.wsgi_app(environ, start_response)
```

Module paste.registry:**334** in __call__ ⊞ view

```
>>  app_iter = self.application(environ, start_response)
```

Module tw.core.middleware:**48** in wsgi_app ⊞ view

```
>>  return req.get_response(self.application)(environ, start_response)
```

Module webob:**1228** in get_response ⊞ view

Module webob:**1196** in call_application ⊞ view

Module tw.core.resource_injector:**56** in _injector ⊞ view

```
>>  app_iter = app(environ, determine_response_type)
```

Module beaker.middleware:**75** in __call__ ⊞ view

```
>>  return self.app(environ, start_response)
```

Module beaker.middleware:**147** in __call__ ⊞ view

```
>>  return self.wrap_app(environ, session_start_response)
```

Module routes.middleware:**99** in __call__ ⊞ view

```
>>  response = self.app(environ, start_response)
```

Module pylons.wsgiapp:**117** in __call__ ⊞ view

```
>>  response = self.dispatch(controller, environ, start_response)
```

Module pylons.wsgiapp:**308** in dispatch ⊞ view

```
>>  return controller(environ, start_response)
```

Module fudcon.lib.base:**39** in __call__ ⊞ view

```
>>  return TGController.__call__(self, environ, start_response)
```

Module pylons.controllers.core:**198** in __call__ ⊞ view

```
>>  response = self._dispatch_call()
```

Module pylons.controllers.core:**153** in _dispatch_call ⊞ view

```
>>  response = self._inspect_call(func)
```

Module pylons.controllers.core:**92** in _inspect_call ⊞ view

```
>>  result = self._perform_call(func, args)
```

Module tg.controllers:**450** in _perform_call ⊞ view

```
>>  self, controller, params, remainder=remainder)
```

Module tg.controllers:**99** in _perform_call ⊞ view

```
>>  output = controller(*remainder, **dict(params))
```

Module fudcon.controllers.root:**21** in explode ⊞ view

```
>>  raise Exception, "OMGEXCEPTION!!1"
```

[WebError]

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Module paste.registry:**334** in __call__ ⊟

Execute | Expand

app_iter	None
e	Exception('OMGEXCEPTION!!1',)
environ	{'CONTENT_LENGTH': '0', 'CONTENT_TYPE': '', 'HTTP_ACCEPT': 'text/html,application/xhtml+xml,applicat...
expected	False
reg	<paste.registry.Registry object at 0x264f050>
self	<paste.registry.RegistryManager object at 0x256f590>
start_response	<bound method StartResponseWrapper.wrap_start_response of <repoze.who.middleware.StartResponse...

view

```
>>  app_iter = self.application(environ, start_response)
```

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```
>>  return req.get_response(self.application)(environ, start_response)
```

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```
>>  return self.wsgi_app(environ, start_response)
```

Module paste.registry:**334** in __call__ ⊟

```
>>> type(self)
<class 'paste.registry.RegistryManager'>
```

Execute | Expand

app_iter	None
e	Exception('OMGEXCEPTION!!1',)
environ	{'CONTENT_LENGTH': '0', 'CONTENT_TYPE': '', 'HTTP_ACCEPT': 'text/html,application/xhtml+xml,applicat…
expected	False
reg	<paste.registry.Registry object at 0x264f610>
self	<paste.registry.RegistryManager object at 0x256f590>
start_response	<bound method StartResponseWrapper.wrap_start_response of <repoze.who.middleware.StartResponse…

view

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[WebError]

```
314                 stacked._pop_object(obj)
315             self.reglist.pop()
316
317 class RegistryManager(object):
318     """Creates and maintains a Registry context
319
320     RegistryManager creates a new registry context for the registration of
321     StackedObjectProxy instances. Multiple RegistryManager's can be in a
322     WSGI stack and will manage the context so that the StackedObjectProxies
323     always proxy to the proper object.
324
325     The object being registered can be any object sub-class, list, or dict.
326
327     Registering objects is done inside a WSGI application under the
328     RegistryManager instance, using the ``environ['paste.registry']``
329     object which is a Registry instance.
330
331     """
332     def __init__(self, application):
333         self.application = application
334
335     def __call__(self, environ, start_response):
336         app_iter = None
337         reg = environ.setdefault('paste.registry', Registry())
338         reg.prepare()
339         try:
340             app_iter = self.application(environ, start_response)
341         except Exception, e:
342             # Regardless of if the content is an iterable, generator, list
343             # or tuple, we clean-up right now. If its an iterable/generator
344             # care should be used to ensure the generator has its own ref
345             # to the actual object
346             if environ.get('paste.evalexception'):
347                 # EvalException is present in the WSGI stack
348                 expected = False
349                 for expect in environ.get('paste.expected_exceptions', []):
350                     if isinstance(e, expect):
351                         expected = True
352                 if not expected:
353                     # An unexpected exception: save state for EvalException
354                     restorer.save_registry_state(environ)
355             reg.cleanup()
356             raise
357         except:
358             # Save state for EvalException if it's present
```

[Beaker]

- Web session and general caching library
- Handles storing for various times any Python object that can be pickled with optional backends on a fine-grained basis
  - Backends include file, dbm, memory, memcached, and database (SQLAlchemy)
- Signed cookie's to prevent session hijacking/spoofing
- Multiple reader/single writer lock system to avoid duplicate simultaneous cache creation
- Extremely customizable

[Beaker]

- Arbitrary caching

```
from tg import TGController, expose
from pylons import cache

class Example(TGController):
    def _expensive(self):
        # do something expensive
        return value

    @expose()
    def index(self):
        c = cache.get_cache("example_cache")
        x = c.get_value(key="my key",
                        createfunc=self._expensive,
                        type="memory",
                        expiretime=3600)
```

[Beaker]

- Caching decorator

```
from pylons.decorators.cache import beaker_cache
from tg import TGController, expose

class SampleController(TGController):

    # Cache this controller action forever (until the cache dir
    # is cleaned)
    @expose()
    @beaker_cache()
    def home(self):
        c.data = expensive_call()
        return "foo"

    # Cache this controller action by its GET args for 10 mins to memory
    @expose()
    @beaker_cache(expire=600, type='memory', query_args=True)
    def show(self, id):
        c.data = expensive_call(id)
        return "foo"
```

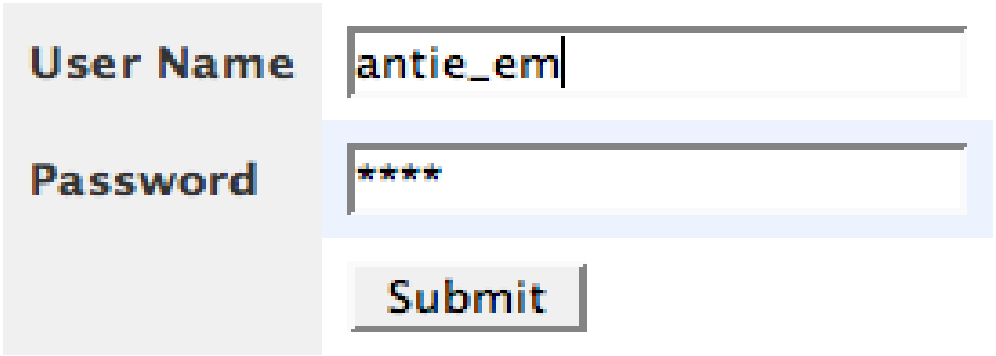
[Beyond Middleware]

- DBSprockets
  - Provides a simple way to generate web content from available database definitions
  - Utilizes ToscaWidgets and SQLAlchemy

[DBSprockets]

- Automatically create a ToscaWidget form based on an SQLAlchemy model

```
from dbsprockets.primitives import makeForm
from myProject.myModel import User
loginForm = makeForm(User,
                     identifier='myLoginForm',
                     action='/login',
                     limitFields=['user_name', 'password'])
```



[DBSprockets]

- Automatically create a ToscaWidget form based on an SQLAlchemy model

```
from dbsprockets.primitives
import makeTable, getTableValue
from myProject import User

value = getTableValue(User)
table = makeTable(User, '/',
                  omittedFields=['user_id','created','password'])
table(value=value)
```

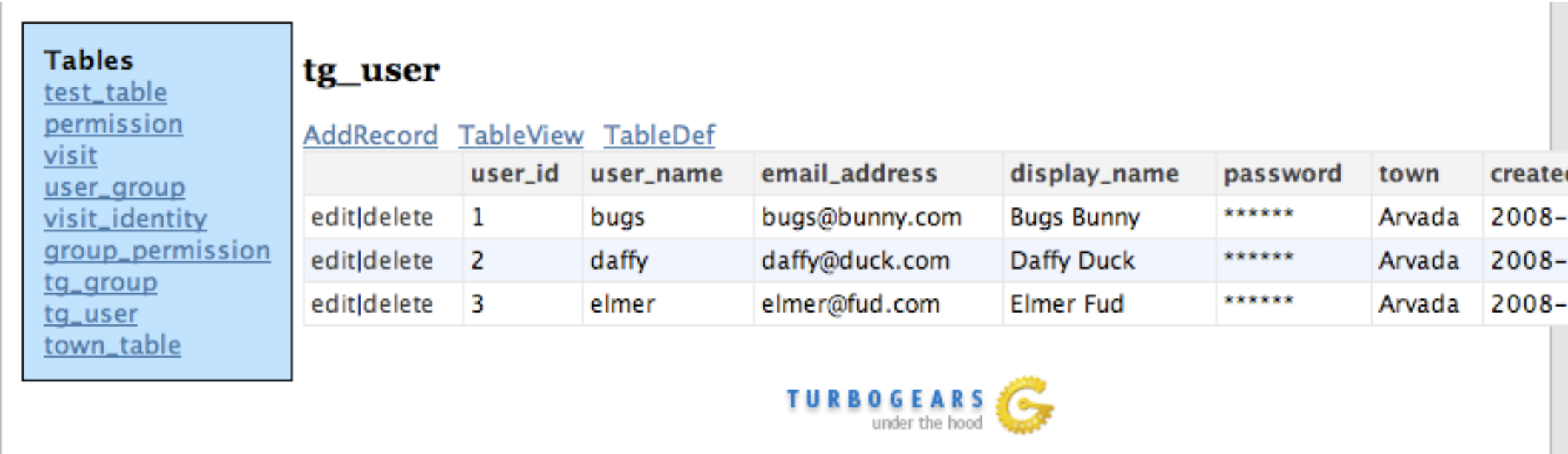
	user_name	email_address	display_name	town
edit|delete	asdf	asdf@asdf.com	asdf	Arvada

[DBMechanic]

- A stand-alone TurboGears controller for database administration

```
from model import metadata
from dbsprockets.dbmechanic.frameworks.tg2 import DBMechanic
from dbsprockets.saprovider import SAProvider

class RootController(TGController):
    dbmechanic = DBMechanic(SAProvider(metadata), '/dbmechanic')
```



[Testing]

```
from paste.fixture import TestApp
app = TestApp(config)

class TestTGController:
    def test_index(self):
        response = app.get('/')
        assert 'Hello WSGI World' in response
```

[Ok, lets dive in...]

[A community-driven brainstorming site]

ubuntu brainstorm

The Ubuntu community has contributed 9720 ideas, 43549 comments, 976330 votes

Brainstorming

- Most popular today
- Most popular this week
- Most popular this month
- Most popular ideas ever
- Latest ideas
- Latest comments
- Random ideas
- Ideas being worked upon
- Implemented ideas
- Search ideas

Categories

- Accessibility
- Brainstorm
- Documentation
- Education
- Gaming
- Graphics
- Hardware support
- Installation
- Internet & Networking
- Look and Feel
- Marketing
- Multimedia
- Office
- Programming
- Security

Most popular ideas

5462

Fix Suspend and Hibernate

Written by tighem the 28 Feb 08 at 17:22. Category: System. **New**

Suspend and hibernate still seems to be a big issue based on forum posts. Really focus on fixing it, even with proprietary drivers.

See the 218 comments >>

4798

Provide a simple graphical interface to manage _any_ type of network connection

Written by Alan Pope the 28 Feb 08 at 13:50. Category: Internet & Networking. **New**

At the moment it's possible to manage traditional wired and WiFi connections using Network Manager. To connect via a modem, a 3G/GPRS card, over bluetooth to a cell phone or via USB to another device requires that the user installs extra packages, and does a fair amount of configuration that isn't found in Network Manager.

A single unified tool should be provided which allows the user to connect to a network (or internet) via any supported method. It would also be useful to provide an extension to this tool to manage firewall rules and network connection sharing.

See the 99 comments >>

4414

Power Management

Written by jsmidt the 28 Feb 08 at 16:49. Category: Others. **In development**

Ubuntu needs to go green. Powertop, Lesswatts and other tools have finally hit the Linux scene to pave the way for better power management. It needs to be said, "if you want your battery to last longest, or have your energy bill be the lowest, you better use Ubuntu Linux."

See the 65 comments >>

[We can do better]

- Enter **Manas**
- Definition: *Intellect, part of the mind that thinks, source of all discrimination; ego-consciousness*
- Real-time comet widgets, powered by Orbited
- Uses jQuery for all of the javascripty ajaxy hotness
- Powered by TurboGears2

[The Model]

```
from model import metadata
from sqlalchemy import *
from sqlalchemy.types import *


idea_table = Table("idea", metadata,
       Column("id", Integer, primary_key=True),
       Column("title", UnicodeText, unique=True),
       Column("timestamp", DateTime, nullable=False, default=func.now()),
       Column("author", UnicodeText, nullable=False),
       Column("description", UnicodeText, nullable=False),
       Column("karma", Integer, default=0))

comment_table = Table("comment", metadata,
       Column("id", Integer, primary_key=True),
       Column("author", UnicodeText, nullable=False),
       Column("timestamp", DateTime, nullable=False, default=func.now()),
       Column("text", UnicodeText, nullable=False),
       Column("idea_id", Integer, ForeignKey('idea.id')))

tag_table = Table("tag", metadata,
       Column("id", Integer, primary_key=True),
       Column("name", UnicodeText, nullable=False, unique=True))

idea_tags = Table('idea_tags', metadata,
       Column('idea_id', Integer, ForeignKey('idea.id')),
       Column('tag_id', Integer, ForeignKey('tag.id'))
```

[The Model]

```
from sqlalchemy.orm import mapper, relation

class Idea(object): pass
class Comment(object): pass
class Tag(object): pass

mapper(Idea, idea_table, properties={
    'comments': relation(Comment, backref='idea'),
    'tags':     relation(Tag, secondary=idea_tags),
})
mapper(Comment, comment_table)
mapper(Tag, tag_table)
```

[Widgets]

```
from tw.api import Widget,JSLink,js_callback,WidgetsList
from tw.forms import TextField, TextArea
from tw.jquery.activeform import AjaxForm
from formencode.validators import NotEmpty


class NewIdeaForm(AjaxForm):
    success = js_callback('idea_success')
    class fields(WidgetsList):
        title = TextField('title', validator=NotEmpty)
        tags = TextField('tags', validator=NotEmpty)
        description = TextArea('description',
                               validator=NotEmpty)
        manas_js = JSLink(link='/javascript/manas.js')


class IdeaWidget(Widget):
    template = 'genshi:manas.templates.ideawidget'
    params = ['idea']
```

[Controller]

```
new_idea_form = NewIdeaForm('new_idea_form', action=url('/save'))


class RootController(BaseController):


    @expose('manas.templates.new')
    @authorize.require(authorize.not_anonymous())
     def new(self):
         pylons.tmpl_context.new_idea_form = new_idea_form
         return {}
```

[Template]

```
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:py="http://genshi.edgewall.org/">
  <head><title>Submit a new idea</title></head>
  <body>
    <h2 class="notice">Got an idea?</h2>
    ${tmpl_context.new_idea_form()}
  </body>
</html>
```

[/new]


Got an idea?
Title
Replace RPM with Conary
Tags
rpm, package management
Blah blah blah
Description
Submit

[Saving ideas]

```
@expose('json')
@validate(new_idea_form)
@authorize.require(authorize.not_anonymous())
def save(self, title, description, tags):
    if pylons.tmpl_context.form_errors:
        return dict(idea='fail')
    idea = Idea(title=title, description=description,
                author=pylons.tmpl_context.identity.user_name)
    DBSession.save(idea)
    for tag in tags.split(','):
        tag = Tag(name=tag)
        DBSession.save(tag)
        idea.tags.append(tag)
    DBSession.commit()
    flash("Your idea was successfully created!")
    return dict(idea=idea)
```

[Real-time widgets]

- Powered by Orbited
  - Web server designed for real-time applications
  - Allows for asynchronous server-push messages to be sent to clients
  - Cross browser compatible
  - Highly scalable

[Real-time Idea Displaying Widget]

```
from tw.api import Widget, js_function, JSLink
from tw.jquery import jquery_js
orbited_js = JSLink(link='http://localhost:8000/_/orbited.js')
manas_js = JSLink(link='/javascript/manas.js')

class LatestIdeas(Widget):
  params = ['id']
  template = 'genshi:manas.templates.latestideas'
  javascript=[orbited_js, jquery_js, manas_js]
  include_dynamic_js_calls = True
  def update_params(self, data):
    super(LatestIdeas, self).update_params(data)
    event_cb = js_callback("""function(data) {
      $.each(data, function(i, item) {
        $('<div/>').hide().append(
          $('<a/>')
            .attr('href', '#')
            .attr('onclick', '$("#main").load("/idea/'+item["id"]+'")')
            .text(item['title'])
       ).prependTo("#%s_data").slideDown();
       });
    }""" % data.id)
    self.add_call(js_function('connect')(event_cb, data.user, '/orbited', 0))
```

[Real-time Widgets]

```
from pyorbited.simple import Client
orbited = Client()
orbited.connect()

@expose()
def join(self, user):
    if (user, '0') not in self.users:
        self.users.append((user, '0'))

    # Throw the latest entries at the user
    for idea in DBSession.query(Idea).order_by('timestamp')[:10]:
        orbited.event(['%s, 0, /orbited' % user],
                      [{'id': idea.id, 'title': idea.title}])
    return 'ok'


def save(self, title, description, tags):
    # Save the idea
    # ...
    orbited.event(self._user_keys(),
                  [{'id': idea.id, 'title': idea.title}])
    return dict(idea=idea)

def _user_keys(self):
    return ["%s, %s, /orbited" % (user, session)
            for user, session in self.users]
```

Manas

Add a new idea
View Ideas

Got an idea?

Title

Tags

Description

Submit

Latest Ideas

Default to reiserfs instead of ext3
Deploy our own Bugzilla instance
Abolish SIGs
Migrate CVS to git
Use razor instead of rpm & yum

TURBOGEARS
under the hood

[Questions?]

[References]

- TurboGears2
  - http://turbogears.org/2.0/docs/index.html
- TurboGears and Pylons (A technical comparison)
  - http://blog.ianbicking.org/turbogears-and-pylons.html
- Paste
  - http://www.pythonpaste.org
- DBSprockets
  - http://code.google.com/p/dbsprockets/
- Orbited
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- ToscaWidgets
  - http://toscawidgets.org
- SQLAlchemy
  - http://www.sqlalchemy.org
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  - http://brainstorm.ubuntu.com