WHY STORING FILES FOR THE WEB IS NOT AS STRAIGHTFORWARD AS YOU MIGHT THINK

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Who am I

- CTO @ AXANT.it, mostly Python company
- TurboGears2 core team member
- Contributions to web world python libraries
    - MING MongoDB ODM
    - Beaker
    - ToscaWidgets2
    - Formencode

Background

- Everything starts from a project which was just a POT with budget constraint.
- Obviously it became the final product.
- It saved and updated a lot of files, mostly images.

Technologies.

- Short on budget: cloud storage was not an available choice
- Short on time: developers choose to just store everything on disk and rely on nginx to serve them in a good enough manner

The Technical Consultant

- Customer had a technical leader that enforced deployment decisions.
- Customer decided production environment three days before the "go live"
- Due to limited budget he decided they were not going to rent a server.

The product owner choice

Murphy Law

- They went for Heroku free plan as PaaS
- Heroku doesn’t support storing files on disk
- The whole software did store files on disk

Ooops

Panic

- The day before launch, team rewrote 30% of the software to switch saving files from disk to GridFS (app was mongodb based)
- It was an huge hack based on monkeypatching the attachment classes
- It went online with practically no testing on the field.

The day after

- After emergency has been solved it was clear that we needed a better way to handle such issues.
- We decided to create a tool to solve the issue independently from the web development framekwork in use

DEPOT

File Storage made easy, for the Web World

Lessons learnt by working on TurboGears2 for the past years:

- Web Apps are an unstable environment when designing a framework:
  - Their infrastructure might expand, dowscale or change during their lifetime.
  - The technologies you relied on can change or even disappear during their lifetime.
  - Automatic testing should be easy to implement
  - Easily usable wins over features, people will build features themselves over a solid foundation.

Allow for Infrastructure changes

- Permit to choose between multiple storage engines just by changing a configuration file
- Permit switching storage engine at runtime without breaking past files
- Permit to concurrently use multiple storages

Have your choice

I DON'T ALWAYS STORE FILES ON THIRD PARTY STORAGES
BUT WHEN I DO I USE AT LEAST 4 OF THEM
memegenerator.net

Multiple Storages

- One "default" storage, any other storage can be promoted to default, anytime.
- When uploading a file it goes to the default storage unless otherwise specified.
- Each storage has a name, files can be uniquely identified among storages by storage_name/fileid.

DepotManager

- The DepotManager is the single interface to DEPOT.
- It tracks the active storages, the default one, and the WSGI middleware.
- To work on a storage just get it from the DepotManager.

Easy to Use

- Simple things should be simple

```python
from depot.manager import DepotManager

# Configure a *default* depot to store files on MongoDB
DepotManager.configure('default', {
    'depot.backend': 'depot.io.gridfs.GridFSStorage',
    'depot.mongouri': 'mongodb://localhost/db'
})

depot = DepotManager.get()

# Save the file and get the fileid
fileid = depot.create(open('/tmp/file.png'))

# Get the file back
stored_file = depot.get(fileid)
print stored_file.filename
print stored_file.content_type
```

With Batteries

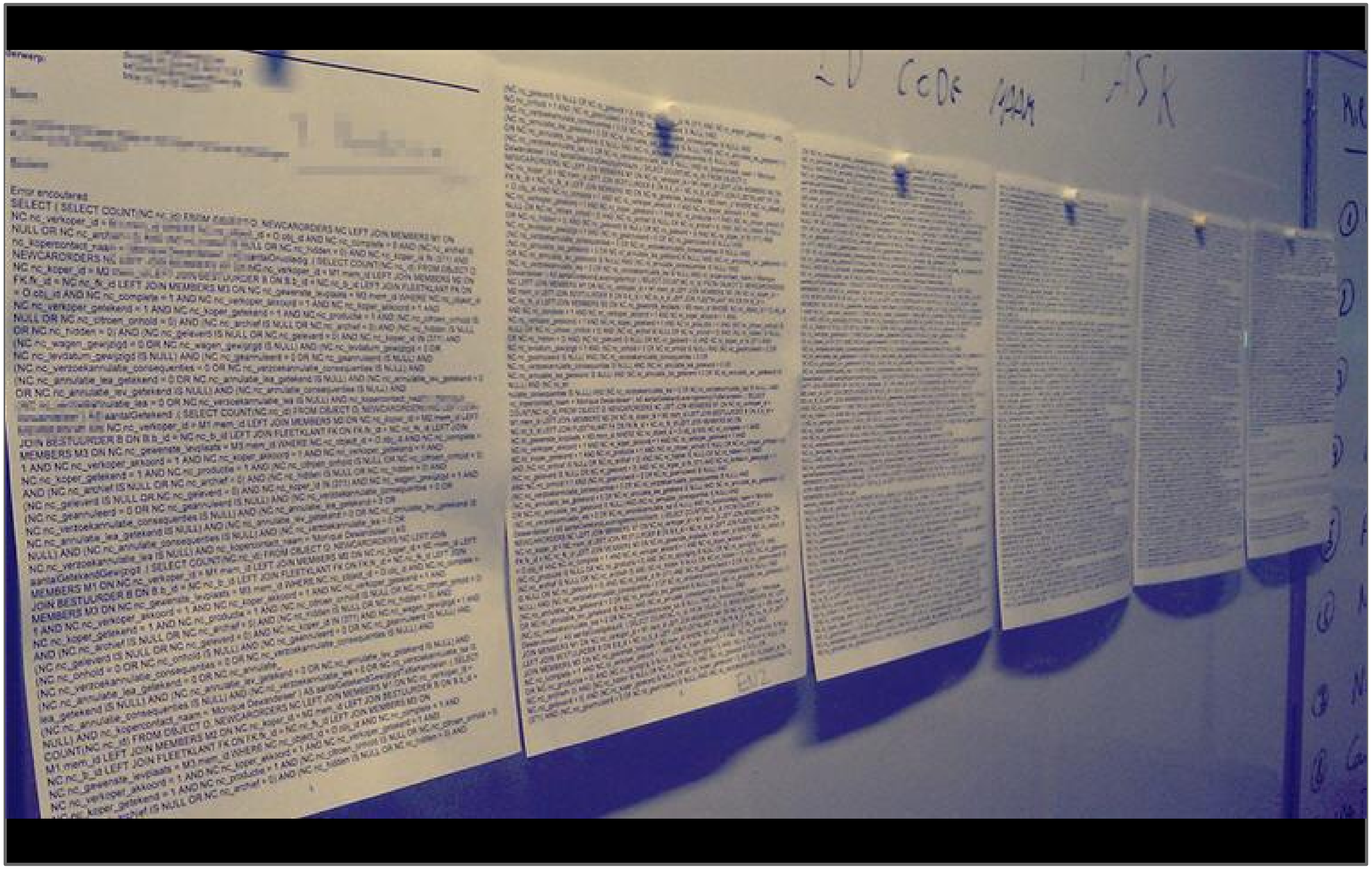
- Complex things should be straightforward

```python
from depot.fields.sqlalchemy import UploadedFileField
from depot.fields.specialized.image import UploadedImageWithThumb


class Document(Base):
    __tablename__ = 'document'

    uid = Column(Integer, autoincrement=True, primary_key=True)
    name = Column(Unicode(16), unique=True)

    # photo field will automatically generate thumbnail
    photo = Column(UploadedFileField(upload_type=UploadedImageWithThumb))


# Store documents with attached files, the source can be a file or bytes
doc = Document(name=u'Foo',
               content=b'TEXT CONTENT STORED AS FILE',
               photo=open('/tmp/file.png'))
```

Allow for technology changes

- Attachment field for SQLAlchemy
- Attachment field for MongoDB
- Bultin support for S3, LocalFiles and GridFS
- Easily pluggable custom Backends
- Delivering files uses a WSGI middleware compatible with any web framework.

Empowers your loved queries!



Copes with Database

- Transactions rollback should delete newly uploaded files and recover the previous ones.
- Deleting an item deletes attached files (unless rollback happens)

Easy to Extend

- Custom attachments can be easily created

```
UploadedFileField(upload_type=UploadedImageWithMaxSize)
```

- Filters can be applied to attachments

```
UploadedFileField(filters=[WithThumbnailFilter()])
```

- Multiple filters can be applied (rescale image and create thumbnails)

Custom Attachments

- Attachment Classes are in charge of storing the actually uploaded file
- They can change the file before it's uploaded.
- They can add additional data and even behaviours to the file.

Writing a Custom Attachment

```python
class UploadedImageWithMaxSize(UploadedFile):
    max_size = 1024

    def process_content(self, content, filename=None, content_type=None):
        # As we are replacing the main file, we need to explicitly pass
        # the filanem and content_type, so get them from the old content.
        __, filename, content_type = FileStorage.fileinfo(content)

        # Get a file object even if content was bytes
        content = utils.file_from_content(content)

        uploaded_image = Image.open(content)
        if max(uploaded_image.size) >= self.max_size:
            uploaded_image.thumbnail((self.max_size, self.max_size),
                                     Image.BILINEAR)
            content = SpooledTemporaryFile(INMEMORY_FILESIZE)
            uploaded_image.save(content, uploaded_image.format)

        content.seek(0)
        super(UploadedImageWithMaxSize, self).process_content(content,
                                                              filename,
                                                              content_type)
```

Filters

- Each attachment can have multiple filters
- They run after upload, so they can add metadata or generate new files but not replace the original one.
- They can store additional metadata with the file, but not behaviours (methods).

Writing a Filter

```python
class WithThumbnailFilter(FileFilter):
    def __init__(self, size=(128,128), format='PNG'):
        self.thumbnail_size, self.thumbnail_format = (size, format)

    def on_save(self, uploaded_file):
        content = utils.file_from_content(uploaded_file.original_content)

        thumbnail = Image.open(content)
        thumbnail.thumbnail(self.thumbnail_size, Image.BILINEAR)
        thumbnail = thumbnail.convert('RGBA')
        thumbnail.format = self.thumbnail_format

        output = BytesIO()
        thumbnail.save(output, self.thumbnail_format)
        output.seek(0)

        thumb_file_name = 'thumb.%s' % self.thumbnail_format.lower()
        thumb_path, thumb_id = uploaded_file.store_content(output, thumb_file_name)
        thumb_url = DepotManager.get_middleware().url_for(thumb_path)

        uploaded_file.update({'thumb_id': thumb_id, 'thumb_path': thumb_path,
                              'thumb_url': thumb_url})
```

Store what you need in metadata

```
>>> d = DBSession.query(Document).filter_by(name='Foo').first()
>>> print d.photo.thumb_url
/depot/default/5b1a489e-0d33-11e4-8e2a-0800277ee230
```

And it’s WebScale™!

Made for the Web

- Storage backends can provide public url for any CDN
- File information common in HTTP are provided as properties out of the box
    - content_type
    - last_modified
    - content_length
    - filename

Web Application Friendly

- Need to serve stored files? Just mount DepotManager.make_middleware around your app and start serving them.
- If files are stored on a backend that supports HTTP, the user will be permanently redirected there by the middleware instead of serving files itself.

Feel free to try it!

- Python 2.6, 2.7, 3.2, 3.3 and 3.4
- pip install filedepot
- Fully Documented

  https://depot.readthedocs.org
- Tested with 100% coverage

  https://travis-ci.org/amol-/depot

Questions?