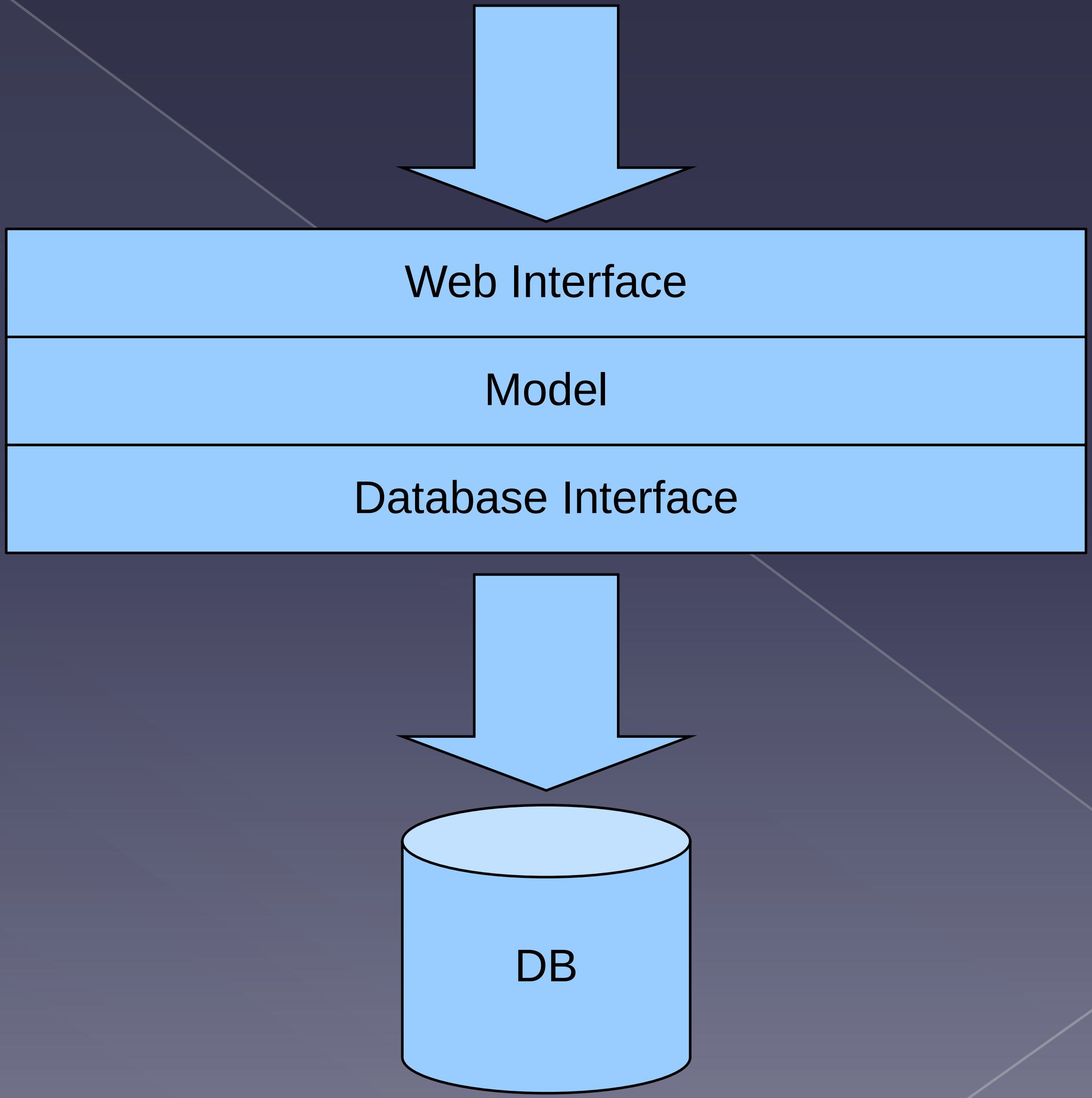
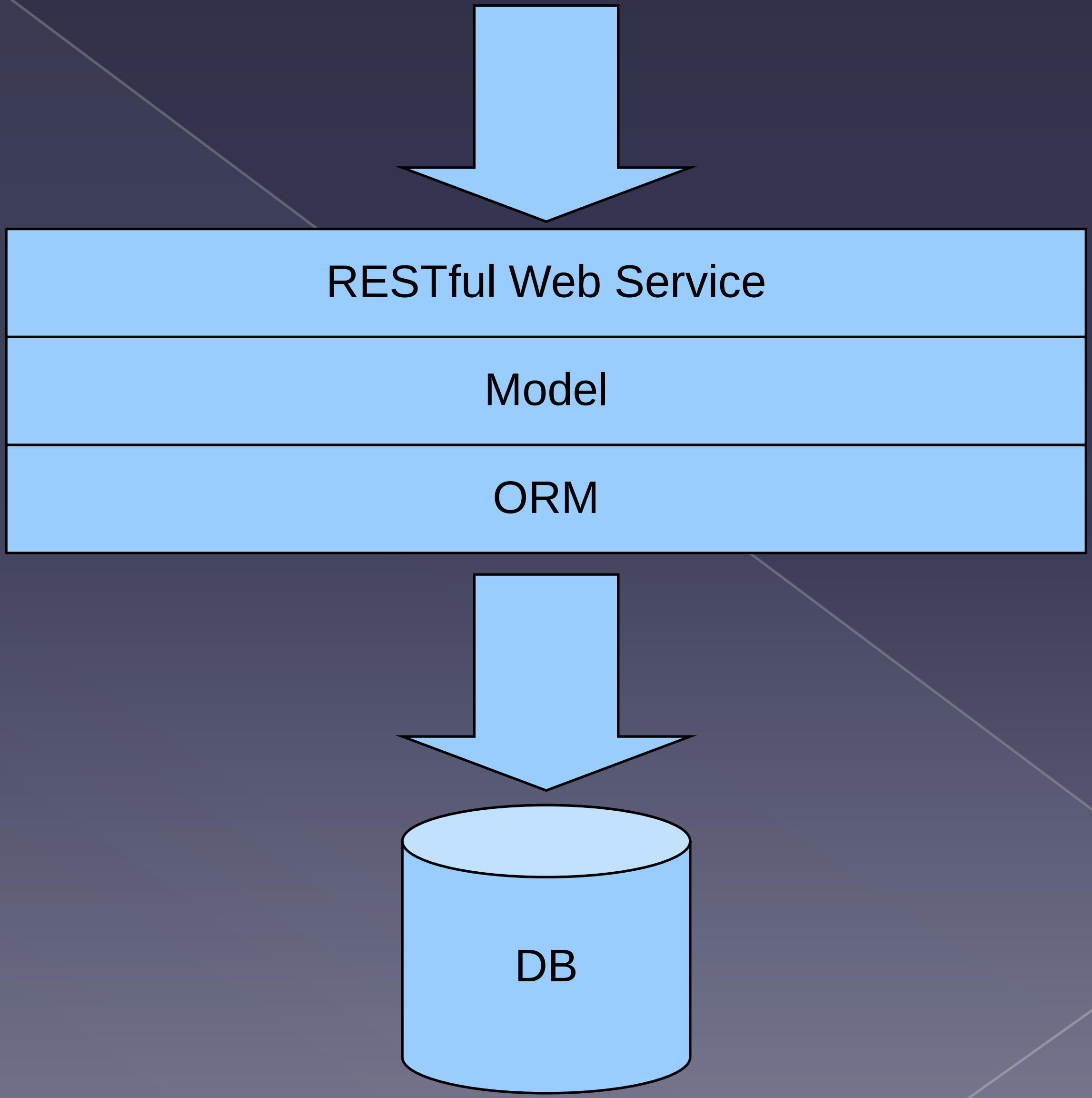
REST & Object Relational Mapping

Rory Tulk
Mohammad Jalali

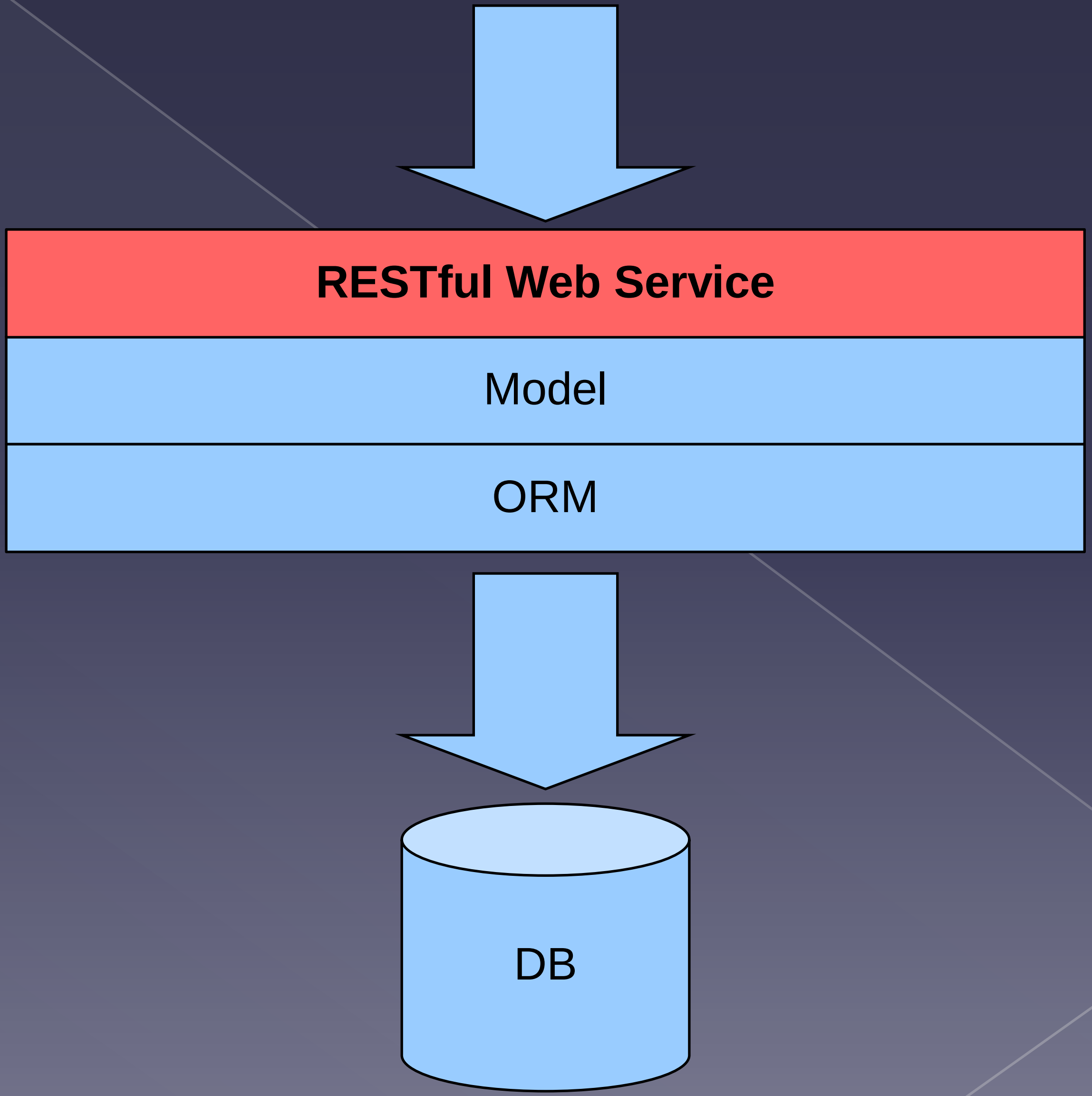
Architecture of a Service



Architecture of a Service



Architecture of a Service



RESTful Web Service

Model

ORM

DB

REST: Representational State Transfer

- REST is a software structure mainly used to produce machine readable contents using the natural way the Internet works
  - HTTP protocol
  - Hypermedia formats
- HTTP commands POST, GET, PUT and DELETE are used to create, delete or update resources (Similar to CRUD in database systems)

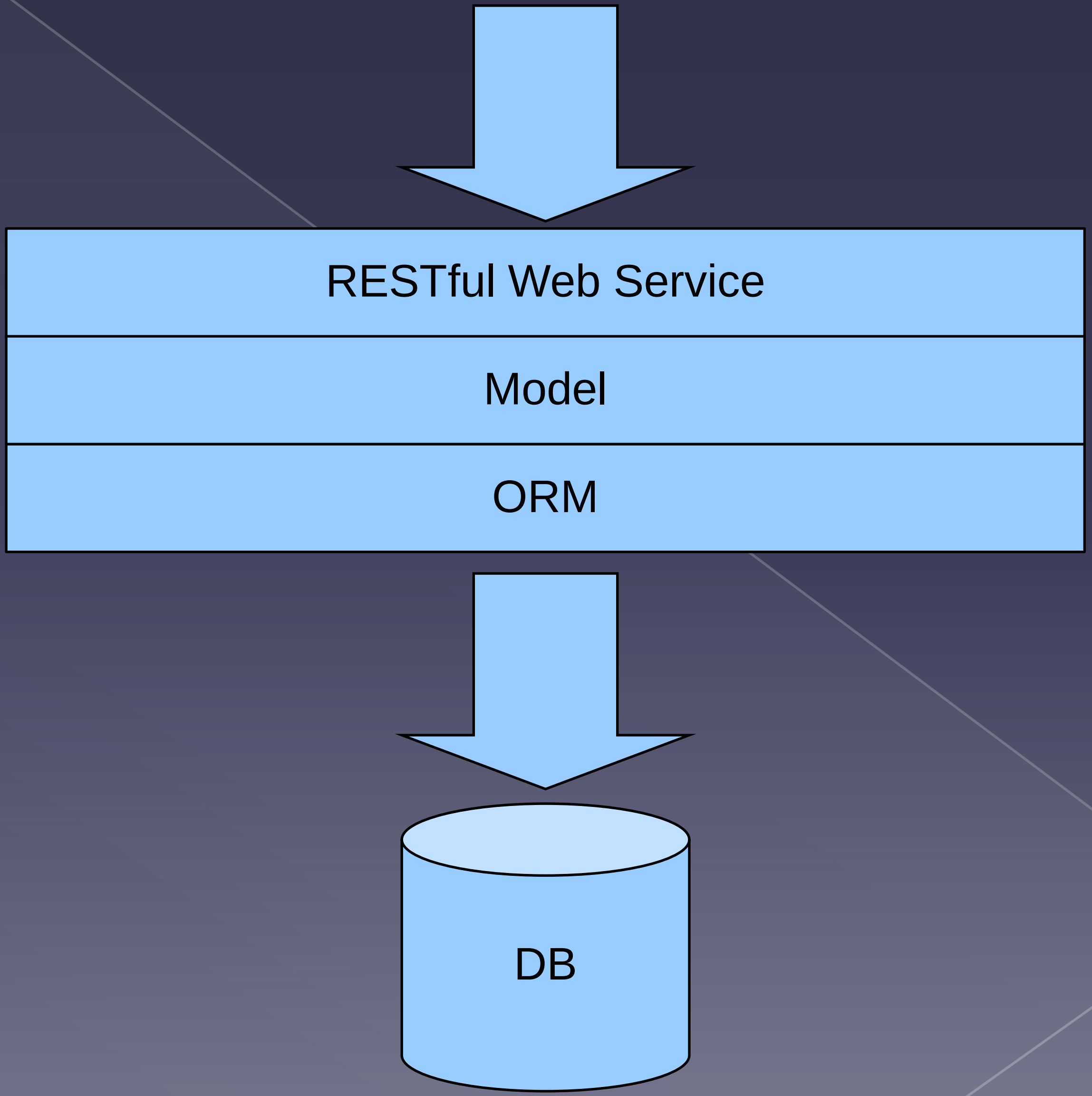
REST: Representational State Transfer

- Main REST concepts
  - Addressibility – resources uniquely identified by URI
  - Statelessness – resource is the same, regardless of the chain of navigation to get to it
  - Connectedness – every resource should be linked to by another resource
  - Uniform interface – same set of methods to operate on all resources
- Data is represented as resources
- Resources are addressed with a URI
- Many MIME types such as XML, JSON and YAML are supported
- **http://www.bla.com/users/johnsmith**

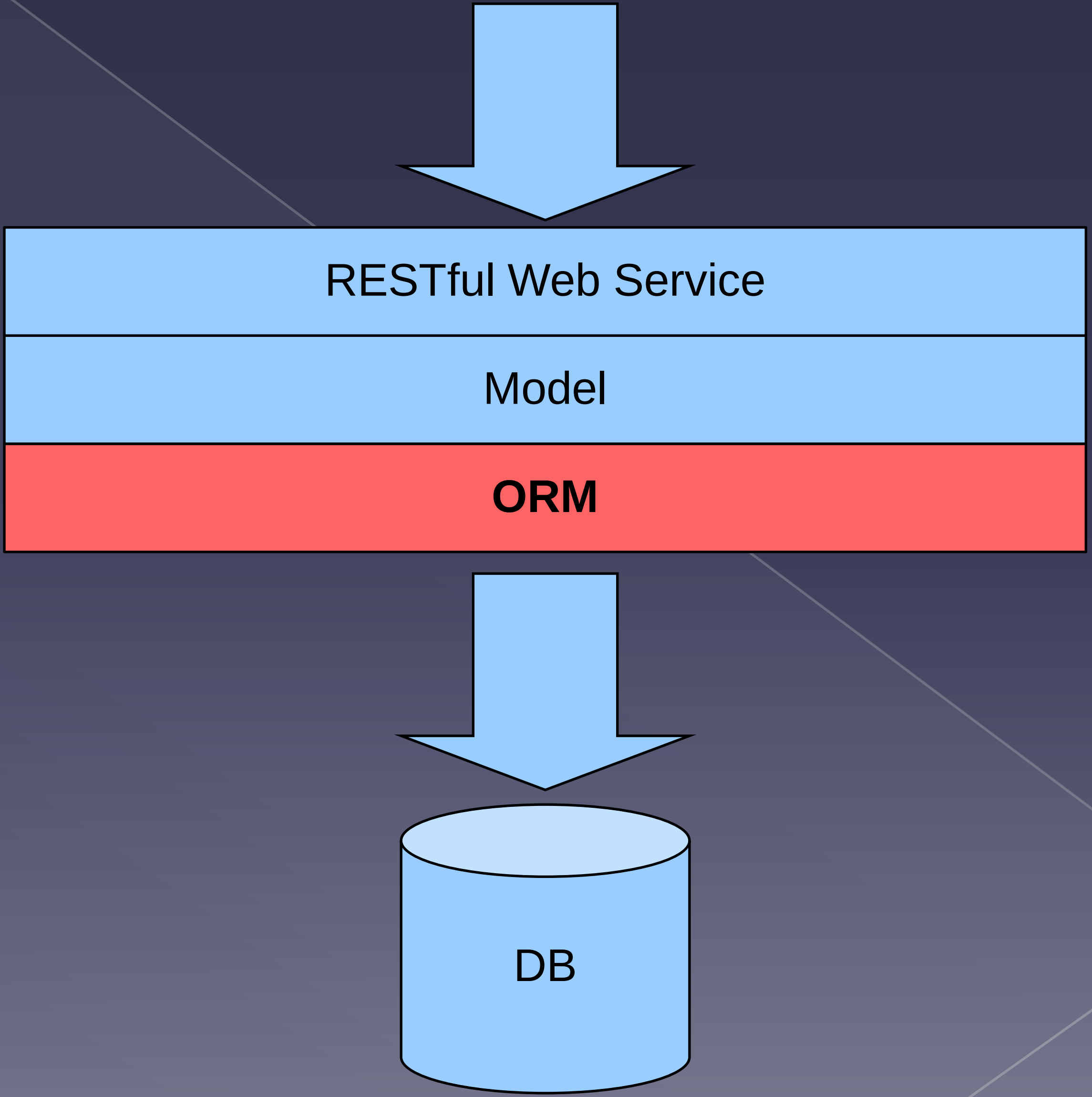
REST advantages over RPC web services

- Resources can be expressed using hyperlinks (URI: Unique resource Identifiers)
- No need to keep track of sessions
- Reduced server workload and response time due to caching
- Allows users to bookmark resources (the query to access the resources)

Architecture of a Service



Architecture of a Service



Object Relational Mapping

- Store and load data from an RDBMS into an Object Oriented Data Model
  - Object Oriented Database

- Application programmer no longer needs to solve the Object-Relational Impedance Mismatch

Object Relational Mapping

```
#Save to Database
Session = sessionmaker()
session = Session()

newgroup = Group()
newgroup.group_name = 'Reactor Workers'
session.save(newgroup)

#Load from Database
query = session.query(Group).filter(Group.group_name=='Reactor Workers')
```

Object Relational Mapping

```
#Save to Database
Session = sessionmaker()
session = Session()

newgroup = Group()
newgroup.group_name = 'Reactor Workers'
session.save(newgroup)

#Load from Database
query = session.query(Group).filter(Group.group_name=='Reactor Workers')
```

Isn't that nicer than writing SQL?

Object Relational Mapping

- Mappings between Classes and Tables are defined by the application/database programmer
  - XML
  - Programmatically
- In general
  - Classes -> Tables
  - Properties -> Fields

Object Relational Mapping

```
class User
{
        private String name;
        private String phone;
}

class Group
{
        private String name;
        private List<User> members;
}
```

Code

```
CREATE TABLE User (“Name” char(256)
      PRIMARY KEY, “Phone” char(20));

CREATE TABLE Group (“Name”
      char(256) PRIMARY KEY);

CREATE TABLE User_Group (“userid”,
      char(256) PRIMARY KEY references
      User(Name), “groupid” char(256)
      PRIMARY KEY references
      Group(Name));
```

SQL

Object Relational Mapping

```
#define a table to hold Group instances
group_table = Table('groups', metadata,
    Column('id', Integer, primary_key=True),
    Column('group_name', String(16), unique=True, nullable=False),
    Column('created', DateTime, default=datetime.now)
)

#create the table
metadata.create_all()

#bind the two together
mapper(Group,group_table)
```

Similarities between REST and ORM

- Map classes of objects into addressable, flattened space
- Have two separate parts, mapper and retrieval
  - Hide complexity of getting data
- Used in same environment

Goals

- Ideal Goal
  - Automatically define REST API and relational database tables from data models, creating 'persistent web objects' in a single click/operation
  - Client layer which exposes web API as a set of shared objects – the same set that make up the data model on the server

Goals

- A more realistic goal:
  - Define REST APIs in the same way as ORM tables, with as little effort as possible, leveraging similarities/redundancies wherever they exist

What have we done?

- Create prototypes using various existing frameworks
  - ORM
    - SQLAlchemy
    - Hibernate
    - Django
  - REST
    - POPO
    - CherryPy
    - Django

What is next?

- Choose elements from competing Python REST frameworks, and attempt to integrate them into the Django Web Platform
- Continue investigation into useful features in this field

Questions?