

# **DIM Server Overview**

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# UCD Energy Research Institute

To deliver world-class energy research and to make a significant contribution to the optimisation, integration and deployment of low carbon energy involving in particular:

- Closing the research to industrial deployment gap.
- Influencing energy policy implementation at Irish and EU level.
- Strengthening our positive international profile.
- Impacting constructively on economic growth.
- Developing a talent pipeline and graduate training for the Irish energy sector.



# UCD Energy Research Institute

- Specific interests of our group:
  - Energy modelling and simulation, with focus on deriving results to support decision making in retrofit
  - Transforming and managing data to handle building, district and up to regional level information as input to our simulations.

# The NewTrend Project

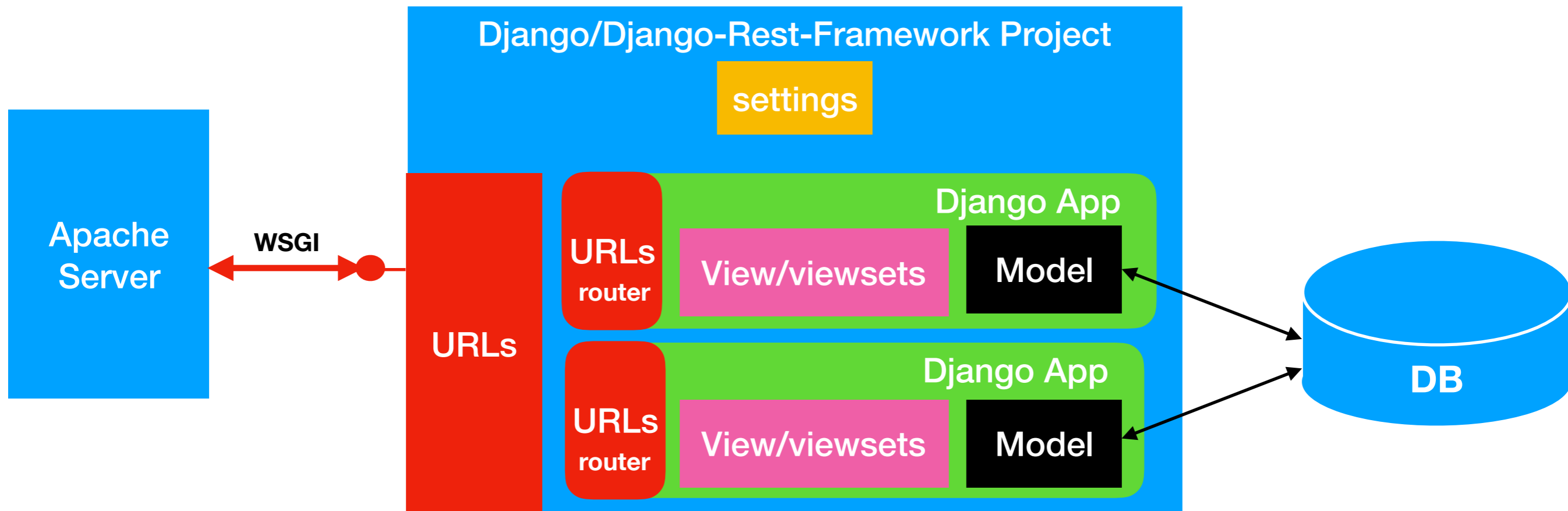
- **Integrated Design Methodology** - Including a guided process through all steps of refurbishment from concept to operation and a decision process for the selection, design and optimisation of retrofitting solution for buildings in their neighbourhood context
- **Collaborative Design Platform** - Ensuring the correct implementation of the Integrated Design Methodology through a project management infrastructure, a user friendly GUI customised to the stakeholders, including visualisation and participation options
- **Data Manager** - Enabling a structured, standardized crowdsourced data collection approach through a web-based tool accessible from tablets and smartphones, supporting design teams in on-site inspections and direct data entry in the DIM
- **Simulation and Design Hub** - Cloud-based platform to evaluate retrofitting needs, guide the decision makers to select the best energy retrofitting strategy, balance the building in its district, through Dynamic Simulation Modelling, GIS, KPI and optimisation tools
- **District Information Model** - Interoperable, distributed, multi-model data exchange server to store information on energy efficient design and integration with neighbourhood energy systems, linking existing data model formats at building and district levels



# Databases and Data Stores

- DIM Server has several data stores:
  - A PostGIS database - supports DIM Server's own data and also contains the 3DCityDB CityGML implementation provided by TUM/VirtualCitySystems to handle district information
  - An instance of the OpenBimServer - supports Building IFC information. It is interfaced to through an API exposed by the implementation
  - Other data sources, add on Django Apps, external sources, MVDs and ADEs
  - A set of files associated with entities in the district and building models

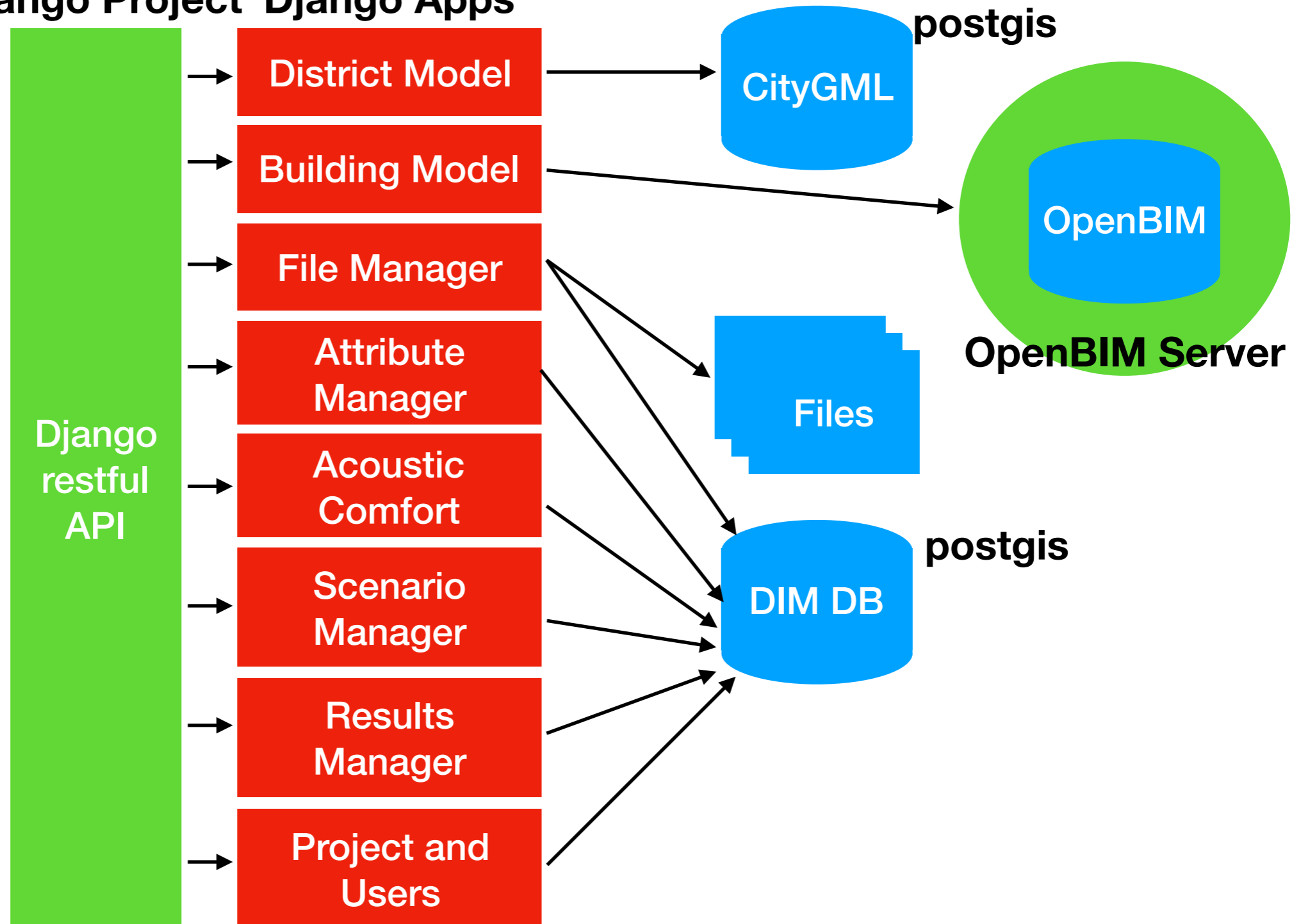
# Structure of a Django RESTful Framework Project



**Python based, Apache WSGI, supports wide range of database types,  
multiple 3rd party applications**

# Architecture of DIM Server

Django Project Django Apps



# Turn Key, Cloud Hosted

- The DIM server runs as a cloud based service.
  - Up to know on Bitnami managed AWS instances
  - But compatible with Azure and other services
- The server is turn key, and requires little setup beyond creating users and adding data to populate the core data store



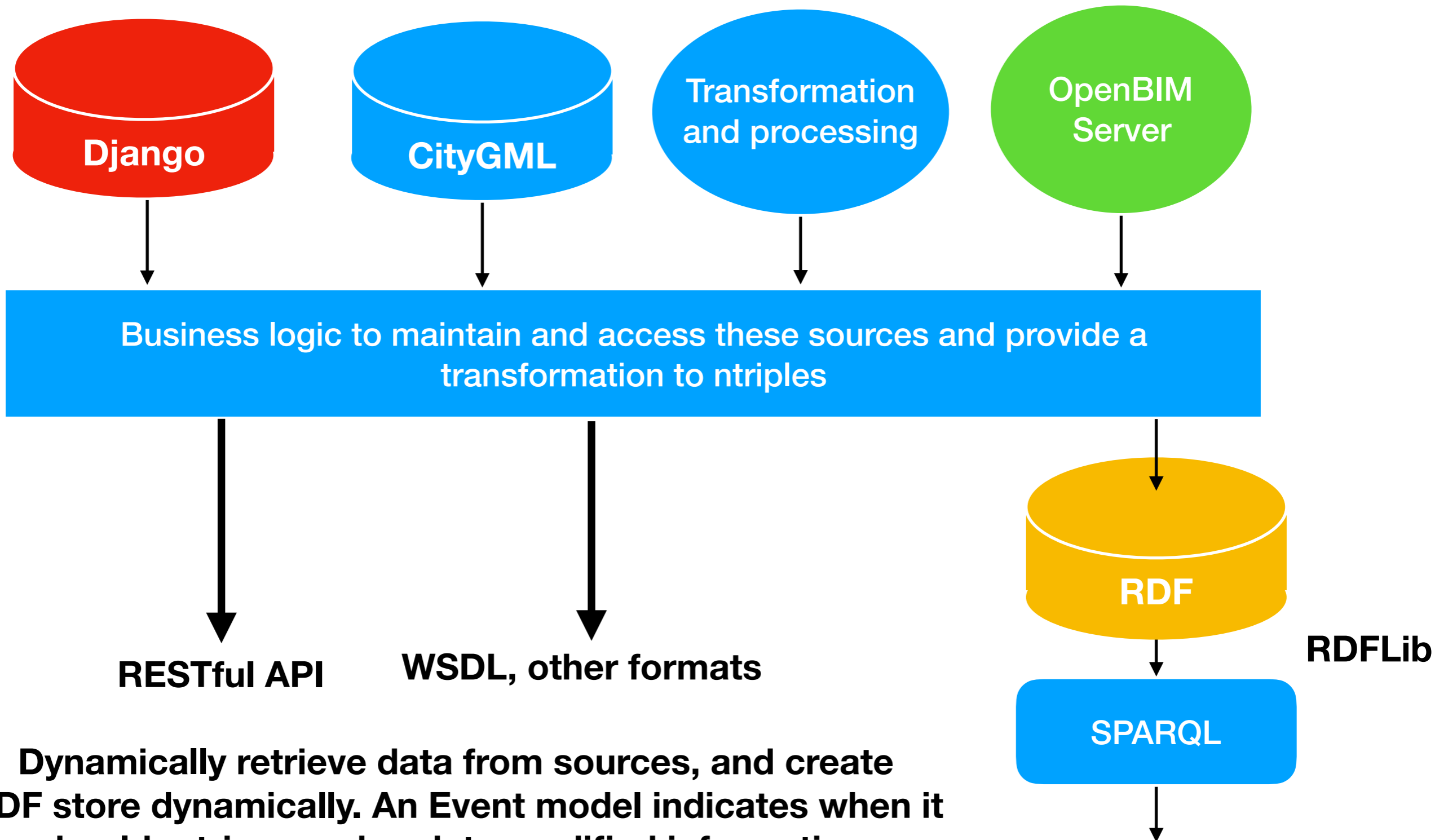
# Connecting Data in NewTrend

- For NewTrend, the DIM Server manages a connection between the District and Building levels:
  - The association occurred vertically and was at a single point - buildings
  - A table associating CityGML entities with each IFC project is maintained by BIM allowing association of entities in different representations

# Going forward

- A new version of the DIM server leverages linked data to a much greater degree
- Issues:
  - Multiple datastores - some of which can only be accessed via an API
  - A desire to maintain just a single copy of each data set
    - E.G. IFC managed by Open BIM Server - and not have a separate IFC file.
    - BIM is managing reasonably dynamic data, and IFC extensions defined in MVDs - we have a maintenance problem for our RDF store

# Going forward



**Dynamically retrieve data from sources, and create RDF store dynamically. An Event model indicates when it should retrieve and update modified information.**

# Other future work

- Currently, one server supports one project - extend to handle several projects on a single server.
- Dynamic definition of data stores:
  - Ability to dynamically add and integrate logic to handle MVDs to RDF (currently developing bespoke parsing solutions :( )
  - Ability to dynamically define and instantiate Django data stores and similarly integrate
- Extend from District to Region - development of a cellular structure to create a federated cloud structure to manage data distributed over larger areas.