Intelligent Middleware for Understanding Neighborhood Markets

An Urban Markets Initiative Project by MIT-MAPC-DND-TBF [1]

Presented by

Prof. Joseph Ferreira, MIT

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This Brookings Institution-sponsored Urban Markets Initiative project is prototyping and testing an 'intelligent middleware' approach for sharing data within a metropolitan area in a manner that is intended to be more effective, scalable, and sustainable than the traditional 'data center' approach. The proposed tools and methods provide a mechanism for accumulating and utilizing local knowledge about neighborhood-scale land use, ownership, and market potential.

The basic idea is to isolate and codify the local knowledge from both the official datasets and from the definition of maps and reports that build useful community indicators. The local knowledge is codified as 'business **rules**' that produce virtual tables (called **facades**) when applied to the read-only official data (called **basetables**). **Reports** and Thematic **maps** that use these facades can be defined and saved as if the facades were permanent tables. However, the facade rules can be changed independently of running the maps and reports, or swapping in new versions of the basetables. For example, facades can be used with parcel data to standardize owner spellings, recategorize land use, or annotate properties of interest.

This system prototype is implemented using web services and open source software on a Linux server with access control for users and groups at the level of individual facades and reports. A suite of management tools allows users to create, edit, and share their facades, reports, and maps. Use of web services with XML messaging and Open Geospatial Consortium protocols enables distributed access from a variety of desktop applications including MS-Excel, Google maps, ArcGIS, and ordinary browsers.

Intelligent Middleware Concepts

(1) Sharing data within a metropolitan area

- Avoid 'data center' limitations as small geographies and large/changing datasets explode data needs
- Provide mechanism for **accumulating** and **utilizing** *local knowledge* about level land use, ownership, and market potential (independently of official datasets)

(2) Loose coupling of data, interpretive rules, and indicators (or analyses)

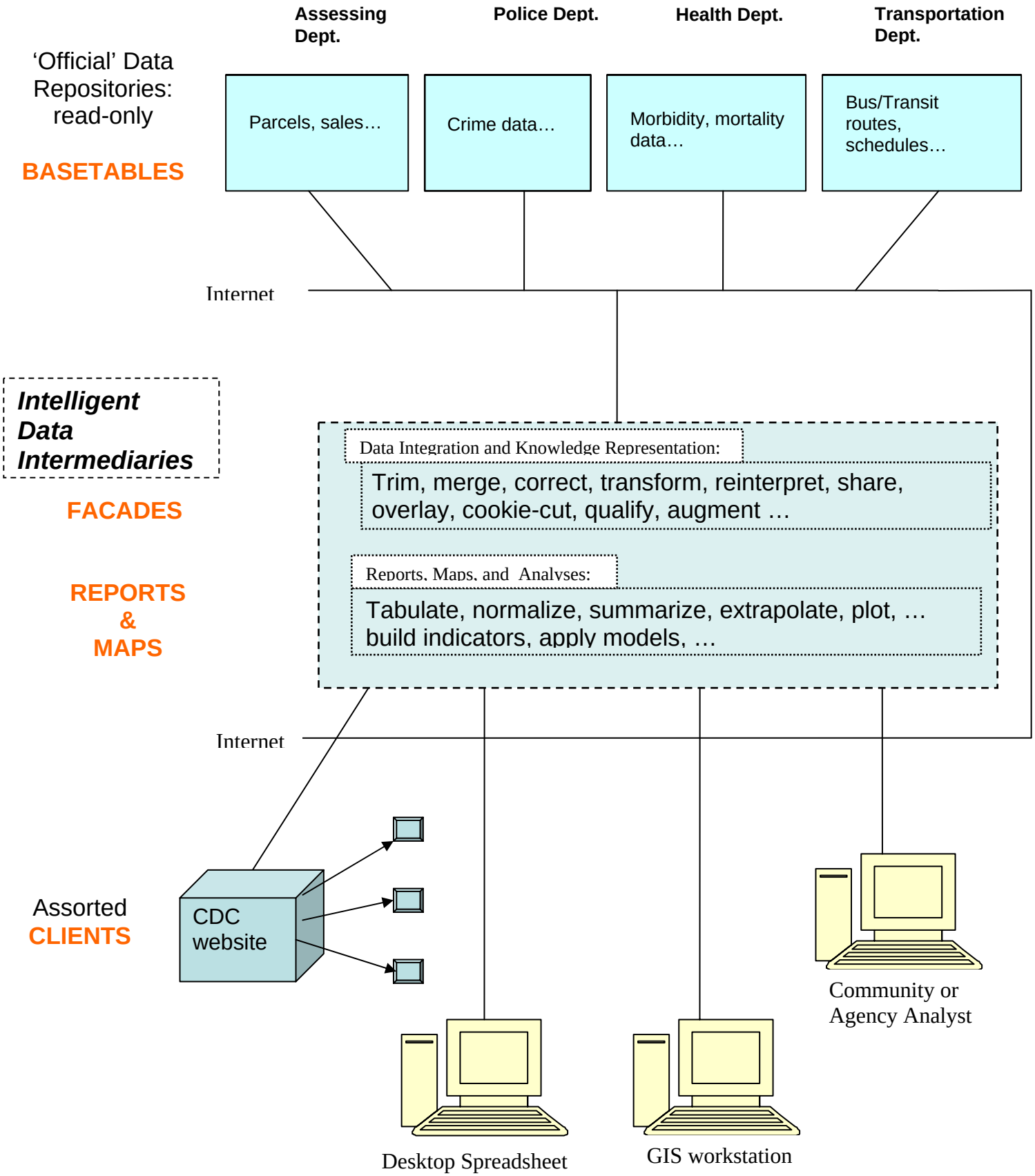
- Repository data (BASETABLES) are read-only
- Codify local knowledge using 'business RULES' that create 'virtual tables' (FACADES) when applied to the basetables
- Define REPORTS and THEMATIC MAPS in terms of the facades
- Updating basetables or changing/improving rules does not break reports and maps

(3) Modular design with interoperability, distributed access and user/group control

- Open source software on linux server (Apache, Postgres/PostGIS, MapServer, PHP)
- Web services with XML messaging and OGC protocols
- User accounts with group-level sharing
- Browser tools (javascript – AJAX) for managing middleware [using software written by Traverse Technologies, Inc.)
- Usable from many clients (Excel, Google Maps, ArcGIS, ordinary browser

[1] A collaborative effort by the Urban Information Systems Group (UIS) in the Urban Studies and Planning Department at the Massachusetts Institute of Technology (MIT), the Boston Metropolitan Area Planning Council (MAPC), Boston's Department of Neighborhood Development, and The Boston Foundation (TBF) with support from the Urban Markets Initiative of The Brookings Institution.

Intelligent Middleware Alternative to Traditional Data Centers



Concept	Example	Data
Thematic MAPs	• Parcels owned by larges landowners in DSNI area • Build new ones after viewing reports	top_lotsize_dm_parcel05
REPORT	Top 10 landowners before and after spelling fixes Owner names most frequently changed selected_land_uses	top20_different_by_lotsize_land Locations of fire stations
FACADES	Boston parcels with and without spelling fixes and owner types DNI properties Examine/edit Rules in rule editor (R)	own05_land_before own05_land_after own05_mixed_before own05_mixed_after
Base FACADES	starting points with ground parcels (land) and multiunits added in (mixed)	parcel_bos05_land parcel_bos05_mixed
Study Area	See pick list in Excel spreadsheet	dsni, triangle, roxbury, …

TOP Landowners in Boston Neighborhoods

(For Dudley Street Neighborhood Initiative study area)

Results AFTER Standardizing Owner Names:

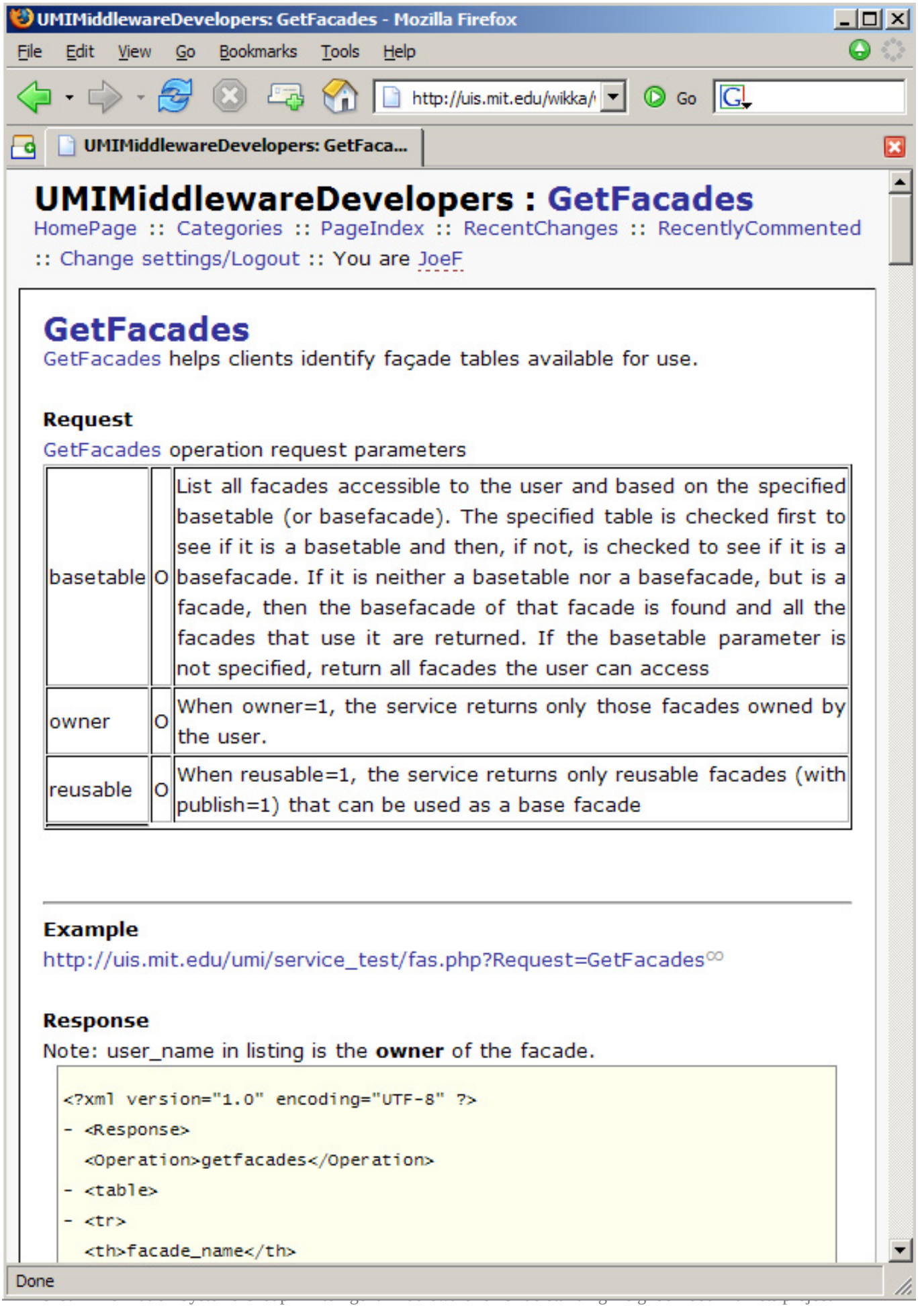
Using Façade: own_mixed_after

owner_fy05	parcels	acres
CITY OF BOSTON	339	50.12
DUDLEY NEIGHBORS INC	145	14.06
COTTAGE BROOK HOUSING LP	48	2.38
KEPNES EDWARD N TS	44	4.02
ALEXANDER MAGNOLIA LP	39	3.21
BOSTON HOUSING AUTHORITY	36	2.27
RAIMONDI ROBERT A SR TS	19	0.51
ORCHARD PK REVITALIZATION	18	0.81
HOWARD DACIA LLC	16	1.43
ORCHARD PARK REVITALIZATION	16	2.92
Total Parcels/Acres owned by largest owners	**720**	**81.7**

Results BEFORE Standardizing Owner Names

Using Façade: own_mixed_before

owner_fy05	parcels	acres
CITY OF BOSTON	182	37.85
CITY OF BOSTON BY FCL	123	9.76
DUDLEY NEIGHBORS INC	121	12.14
COTTAGE BROOK HOUSING LP	48	2.38
KEPNES EDWARD N TS	44	4.02
ALEXANDER MAGNOLIA LP	39	3.21
BOSTON HOUSING AUTHORITY	36	2.27
CITY OF BOSTON FCL	27	1.82
DUDLEY_NEIGHBORS_INC	21	1.68
RAIMONDI ROBERT A SR TS	19	0.51
Total Parcels/Acres owned by largest owners	**660**	**75.6**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UMIMiddlewareDevelopers : GetFacades
HomePage :: Categories :: PageIndex :: RecentChanges :: RecentlyCommented
:: Change settings/Logout :: You are JoeF
GetFacades
GetFacades helps clients identify façade tables available for use.
Request
GetFacades operation request parameters
basetable O List all facades accessible to the user and based on the specified basetable (or basefacade). The specified table is checked first to see if it is a basetable and then, if not, is checked to see if it is a basefacade. If it is neither a basetable nor a basefacade, but is a facade, then the basefacade of that facade is found and all the facades that use it are returned. If the basetable parameter is not specified, return all facades the user can access
owner O When owner=1, the service returns only those facades owned by the user.
reusable O When reusable=1, the service returns only reusable facades (with publish=1) that can be used as a base facade
Example
http://uis.mit.edu/umi/service_test/fas.php?Request=GetFacades
Response
Note: user_name in listing is the owner of the facade.
<?xml version="1.0" encoding="UTF-8" ?>
- <Response>
<Operation>getfacades</Operation>
- <table>
- <tr>
<th>facade_name</th>
Done