Service based API

Restructuring the DSpace API

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OVERVIEW

- Introduction
- How it works
- What it does
- What it doesn't do
- Implications
- Current state

INTRODUCTION

- The DSpace API is in need of a restructure
  - No structural changes were made since the beginning of DSpace
  - Changes were focussed on plugins, UI, features, maven, …
  - But DatabaseManager, Context, Item, Bitstream, … classes still have a very similar signature compared to the earliest DSpace releases

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INTRODUCTION

- New design: split the API into three layers
  - *Service layer*: This layer would be our top layer, will be fully public and used by the CLI, JSPUI & XMLUI, ...
  - *Data access layer*: It contains no business logic and it's sole responsibility is to provide database access for each table (CRUD (create/retrieve/update/delete)). This layer is not exposed to the CLI, JSPUI & XMLUI, ...
  - *Database objects layer*: Each object in this layer is a single database table. This layer is exposed to the CLI, JSPUI & XMLUI so it can use its getters/setters

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INTRODUCTION

- New design: replace all custom database queries by Hibernate
  - DatabaseManager is completely dated
  - Hibernate can resolve all database specific quirks
  - Avoid any database queries outside the Data access layer

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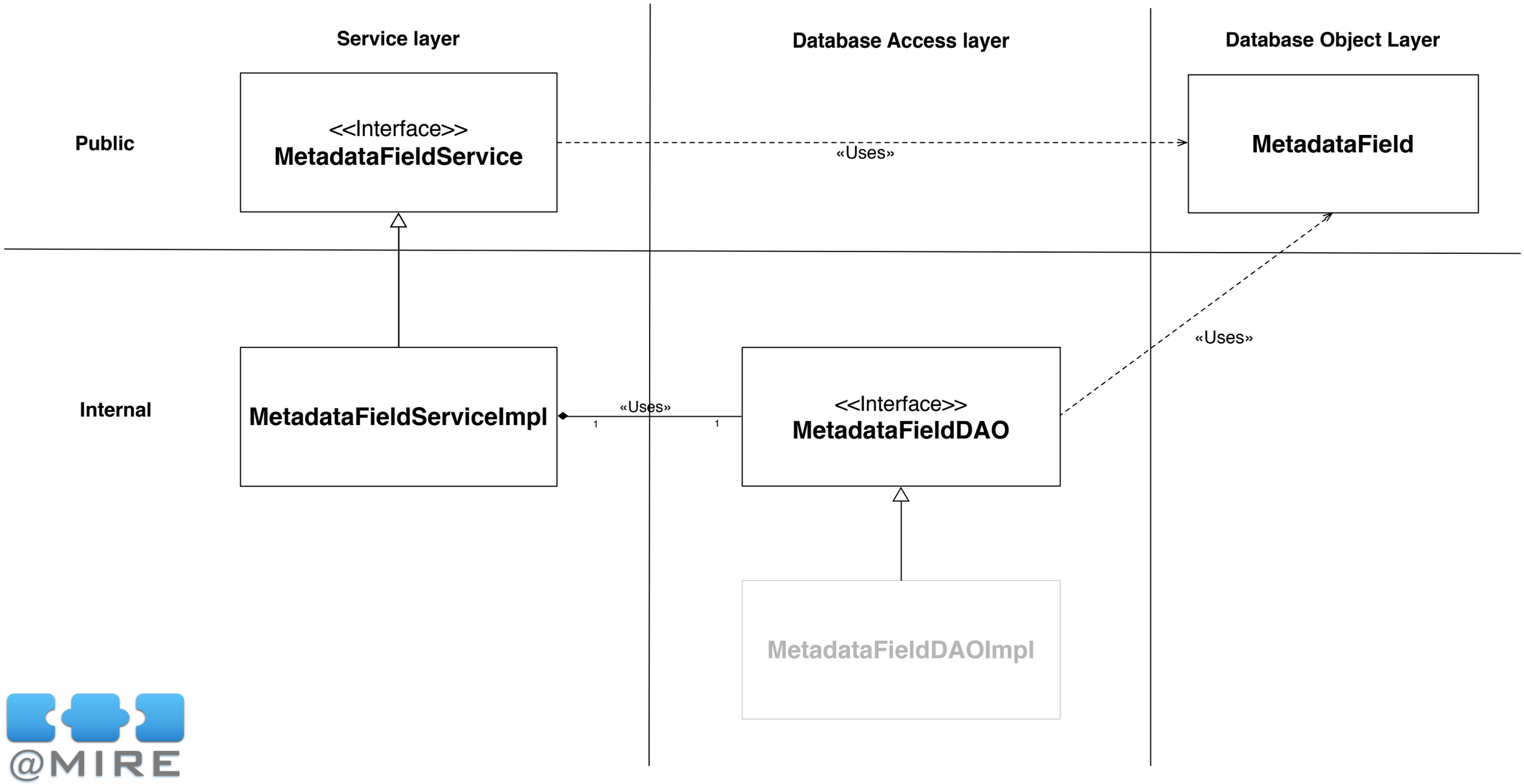
HOW IT WORKS



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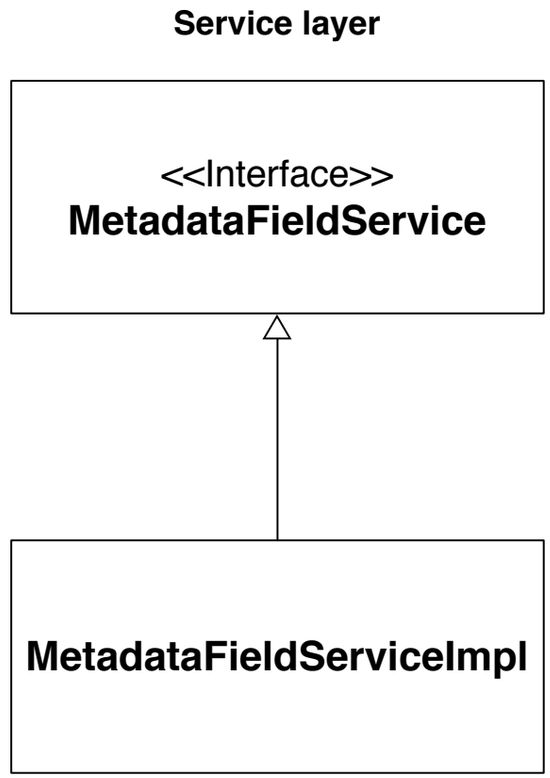
HOW IT WORKS: SERVICE LAYER

- Consists entirely out of interfaces which will receive their implementation from spring configuration
- Business logic block services
  - Replaces DSpace Manager classes
  - Contains business logic for other classes



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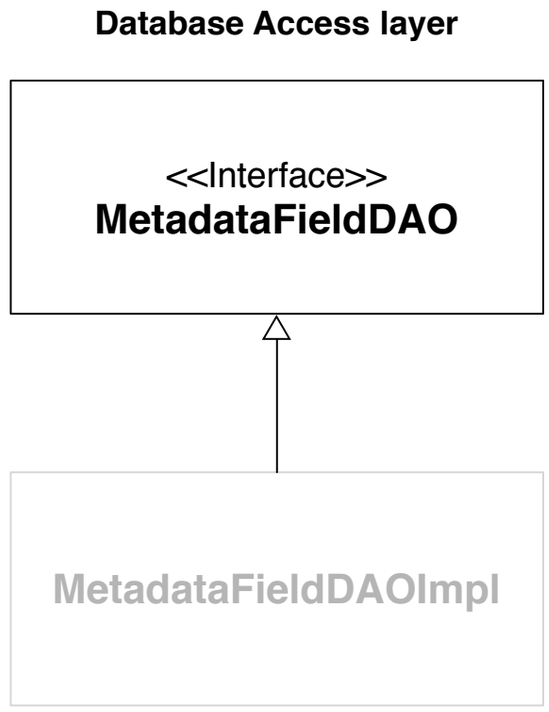
HOW IT WORKS: DATA ACCESS LAYER

- Database access layer is only accessed from service layer
- Consists entirely out of interfaces which will receive their implementation from spring configuration
- Database based services
  - Interact with the database
  - Business logic methods for the database objects
- Hibernate is chosen JPA implementation, but can be replaced easily



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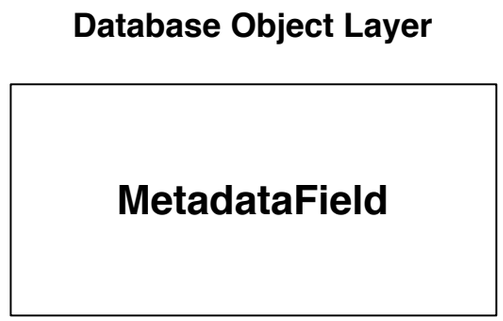
HOW IT WORKS: DATABASE OBJECTS LAYER

- Each object corresponds to a single database table
- No business logic
- No database queries
- Only getters & setters and JPA annotations to link the table & columns to the variables



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WHAT IT DOES

- *Separation of concerns*: Clear split between "business logic", "database access" & "database representation" of an object
- *Easier API adjustments*: Easier adjustments of DSpace api components (overwrite/add methods without altering existing classes)
- *Developers' Productivity*: Once you understand the hibernate principles, linking objects & writing queries requires considerably less time. No need to write all sql queries

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WHAT IT DOES

- *Modularization support*: Easily replace a service & put another in place without altering any existing code
- *Effective cross database portability*: No need to write "if postgres query X, if oracle query Y" anymore, hibernate takes care of all of this
- *Database access flexibility*: Easy replacement of the database layer (if hibernate ever becomes obsolete, just reimplement the DAO interfaces)

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WHAT IT DOES

- *Improved caching mechanism*: Hibernate auto caches queries (session based, configurable application wide). This will replace the caching in the Context
- *Performance*: Hibernate offers lazy loading to only retrieve certain linked objects at the moment they are requested. This can replace retrieving the bundle, bitstreams, bitstreamformat, file extensions, … at once

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WHAT IT DOESN'T DO

- *Refactor state-full classes*: Only stateless classes have been refactored into services. API classes containing a constructor with arguments which are required for the processing have not yet been turned into services.
- *Make modules from all features*: It becomes much easier to replace certain functionality, but not everything has been modularized in such a manner.
- *Change the DSpace business logic*: All concepts are unchanged, the item, bundle, bitstream, … concepts, the command line tools, … are all still present

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IMPLICATIONS

Changes made to the DSpace API:

- *Triple layer api* (for database objects): Every database object class representation has been split into multiple classes (this implies every class in DSpace using these objects will need to be adjusted)
- *Service class* that consists of all business logic (consists of an interface & an a default implementation)
- *Database Access Object* class that contains all our database access calls (consists of an interface & a default hibernate powered implementation)
- *Database Object* class that contains all the setters & getters for the database object

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IMPLICATIONS

- *Service based managers*: Each static “manager” (e.g. WorkflowManager, AuthorizeManager, ...) has been split into an interface and a default implementation, making it easier to make local changes & even to replace a "manager". The static methods have all been dropped
- *DSpace Object identifier change*: All DSpace objects main identifier has been changed from an integer to a UUID. These UUID's are stored in a main DSpaceObject tabel and the objects implementing it will reference this table (Hibernate doesn't support the "type + id" references)
- *Site is now a DSpaceObject*: It will now be possible to add metadata to the site object (but there is currently no code that makes use of this functionality)

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IMPLICATIONS

- *Bundle Bitstream linking*: Since the Bundle2Bitstream table contains an additional column order, a new object BundleBitstream was created. When requesting all bitstreams from a bundle, "BundleBitstream" objects will be returned (containing the bitstream)
- *Context no longer contains database connection*: Database connection is bound to a thread, at the moment the context is still passed along to every method (because it does contain other details).
- *Database browse removed*: Hibernate does not easily support "dynamic" database tables, therefore only discovery based browse is supported
- *Intermittent context commit no longer allowed*: When you commit a DB connection, all objects will be flushed from hibernate. The context.commit() method is gone, the database connection can only be completed

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CURRENT STATE

- dspace-api module:
  - completely refactored to work with the new service based api
  - code compiles
  - The unit test compile, and 99% succeeds
  - There is a complete list of all class/method modifications for each class (this will make the porting a lot easier).

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CURRENT STATE

Next actions:

- *6 unit tests* are still failing, this is still work in progress
- *Migration script* is only present for in memory DB and PostgreSQL
- *Add DSpace license* to all new files
- *Cleanup* some of the comments
- *Finish the XMLUI work* (flowscript)
- *Adjust the OAI, SWORD, JSPUI, …* to use the new DSpace api (This is the majority of the remaining work, few weeks of work)
- *Create tutorials* on how to port/adjust/create code in the new api
- *Automate the deployment*: make a local deployment as easy as other DSpace versions

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READ MORE

- https://wiki.duraspace.org/pages/viewpage.action?title=DSpace+Service+based+api&spaceKey=DSPACE

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Thank you

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