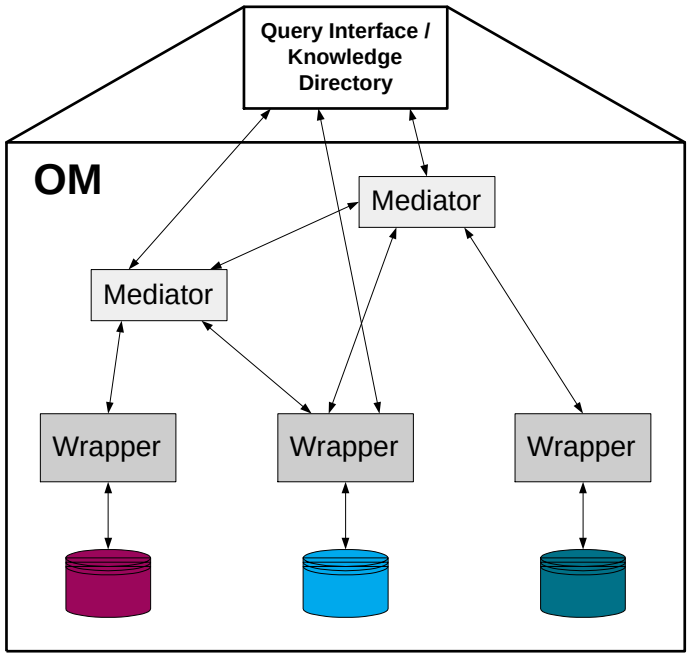
2.3 Wrappers and Mediators



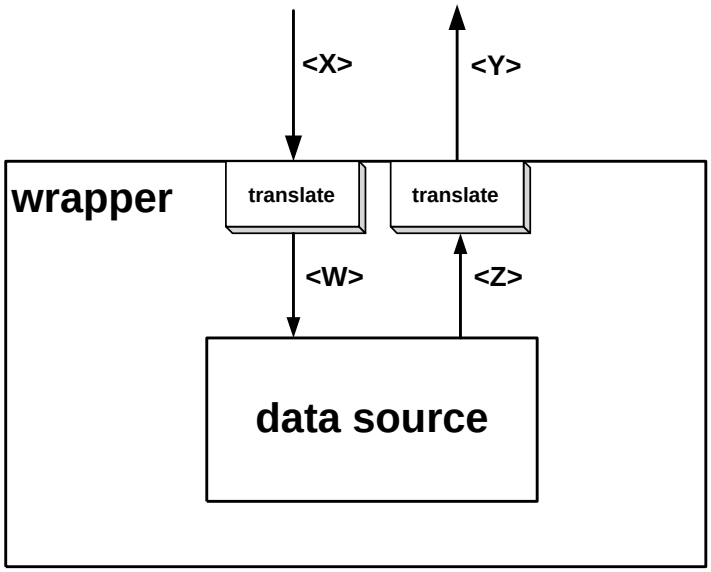
Definition:

A *wrapper* encapsulates a single data (knowledge) source to make it usable in a more convenient fashion than the original unwrapped source.

This might be to present a common interface, to add functionality to the data source, or to expose some of the data source's internal interfaces.

(see: www.objs.com/survey/wrap.htm)

A wrapper translates the query language and the language for delivering query results between a data source and the "outside world":



Example:

Query1: all CDs with artist = 'Prince'

Query2: all CDs with category = 'folk' and price < $20

Query3: all CDs with category = 'folk' and year < 1980

Knowledge Source 1:

cd(cd-id, artist, title, price)

index(cd-id, category)

Knowledge Source 2:

cd(cd-id, title, price, year)

performer(cd-id, artist)

A wrapper specification is mainly a set of templates associated with action rules.

Example query:

```
<hrin-person {<name N> <role R>}>
:- <person {<dept ‘HR’> <project ‘intranet’>}>
```

A matching template:

```
Q :- <person {<dept D> <project P>}>
```

with the associated action

```
‘‘select name, role from person, projects
where person.dept =’’ D ‘‘and project =’’ P
‘‘and person.pnr = projects.pnr;’’
```


Definition:

A *mediator* is a software module that exploits encoded knowledge about certain sets or subsets of data (knowledge) to create information for a higher level of applications.

(see: G. Wiederhold: Mediators in the Architecture of Future Information Systems. In: IEEE Computer, Vol.25, No.3, 1992, pp.38–49.)

Information mediation consists of

- a search for mediation services / knowledge sources
- construction of a mediation (query) plan
- execution of the query plan

Knowledge Source *org* delivers

```
<&1, external, set, {&11, &12, &13, &14}>
    <&11, firstname, string, ‘Miles’>
    <&11, lastname, string, ‘Miller’>
    <&12, dept, string, ‘HR’>
    <&14, reports-to, string, ‘Frank Global’>

<&1, employee, set, {&11, &12, &13, &14, &15}>
    <&11, firstname, string, ‘John’>
    <&12, lastname, string, ‘Smith’>
    <&13, dept, string, ‘HR’>
    <&14, reports-to, string, ‘Miles Miller’>
    <&15, part-time, integer, 80>
```

etc.

Knowledge Source *projects* delivers

```
<&1, person, set, {&11, &12, &13}>
    <&11, name, string, ‘Anna Angel’>
    <&12, role, string, ‘external’>
    <&13, works-in-projects, set, {&131}>
        <&131, project, set, {&1311, &1312}>
            <&1311, pname, string, ‘call center’>
            <&1312, status, string, ‘on-time’>

<&1, person, set, {&11, &12, &13}>
    <&11, name, string, ‘John Smith’>
    <&12, role, string, ‘employee’>
    <&13, works-in-projects, set, {&131, &132}>
        <&131, project, string, ‘Intranet’>
        <&132, project, string, ‘skills management’>
```

etc.

Mediator specification using MSL[1]

Mediator *pp* answers queries about which people in a given department dept work in which projects that are on time:

```
<pperson {<name N> <role R> {<pname PN>} Rest1 Rest2}>
:- <R {<firstname FN> <lastname LN> <dept dept> | Rest1}>@org
    AND decompose-name(N, LN, FN)
    AND <person {<name N> <role R>
            {<project {<pname PN> <status 'on-time'>}>}
                                                | Rest2}>@projects
```

[1] see: Y. Papakonstantinou, H. Garcia-Molina, J. Ullman: MedMaker: A Mediation System Based on Declarative Specifications. In: IEEE 12th Int. Conf on Data Engineering, 1996, pp.132–141.

Capabilities of knowledge sources:[1]
Each attribute has a status from one of the following:

- *f*ree: the attribute may or may not be given in the query
- *u*nspecifiable: the attribute cannot be given in a query
- *b*ound: the attribute must be specified
- *c*onstant[s]: the attribute must be specified and must have a value from one of the given constants s
- *o*ptional[s]: the attribute may or may not be specified, but if specified it must have a value from the set of constants s

[1] see: R. Yerneni, C. Li, H. Garcia-Molina, J. Ullman: Computing Capabilities of Mediators. In: Proc. 1999 ACM SIGMOD Int. Conf. on Management of Data, 1999, pp.443–454.

Mediators

- select knowledge sources (mediators) according to their contents
- may select sources according to their query answering capabilities
- may make their own query answering capabilities known
- may give a lower bound to their query capabilities (what is always answered), and an upper bound (what will never be answered)