

Introduction to MRB (Map Request Broker)

8

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일본 NTTDATA



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Introduction to MRB

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Introduction

- Who/What is NTT Data?
 - http://www.nttdata.co.jp/index_e.html
- What is MRB?
 - Abbr. of MapRequestBroker (not ORB)
 - Core Technology
 - Distributed computing on the Internet
 - XML (eXtensible Markup Language)

Table of Contents

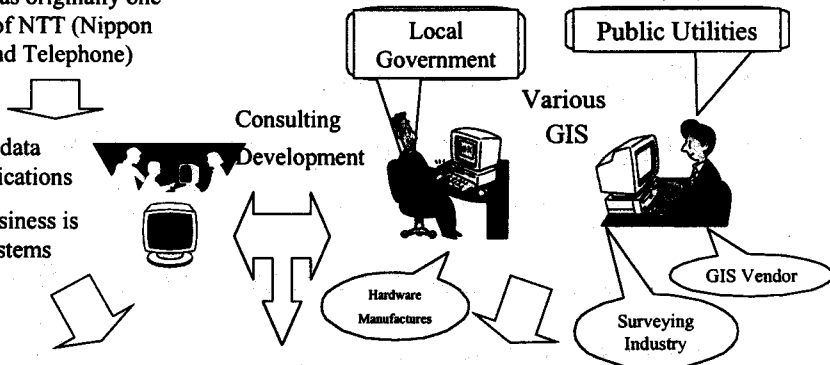
1. Overview
2. Background
3. Objectives
4. Service Architecture
5. Specifications
6. XML
7. Model
8. Demonstration
9. Systems
10. Review

1. Overview

NTT Data was originally one department of NTT (Nippon Telegraph and Telephone)

In charge of data telecommunications

Now main business is computer systems integration



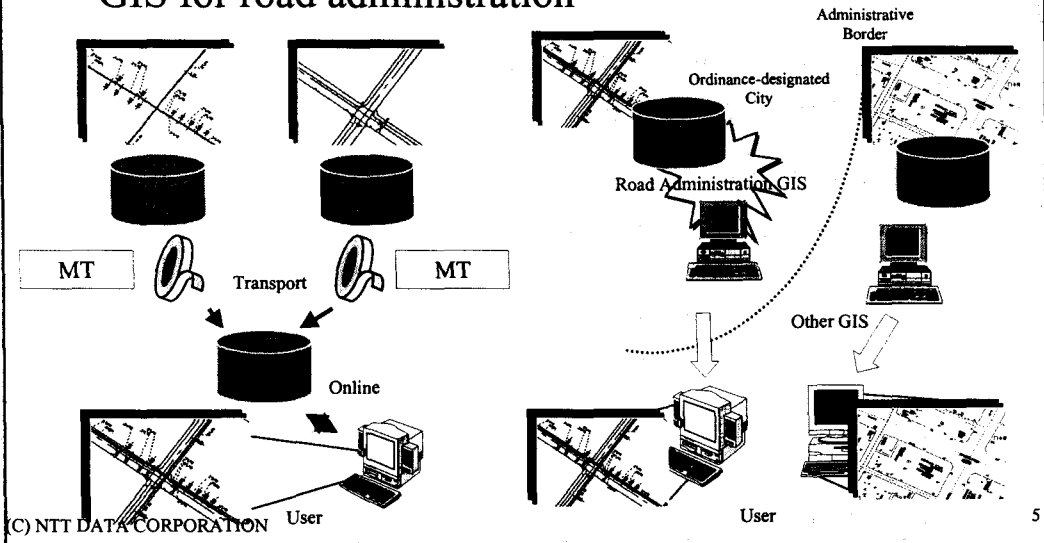
MRB enables interoperability of GIS

- Naming service of distributed GIS resources
- To search, edit and upload GIS data
- Remote control of GIS applications

2.1 Background

Why we need MRB ?

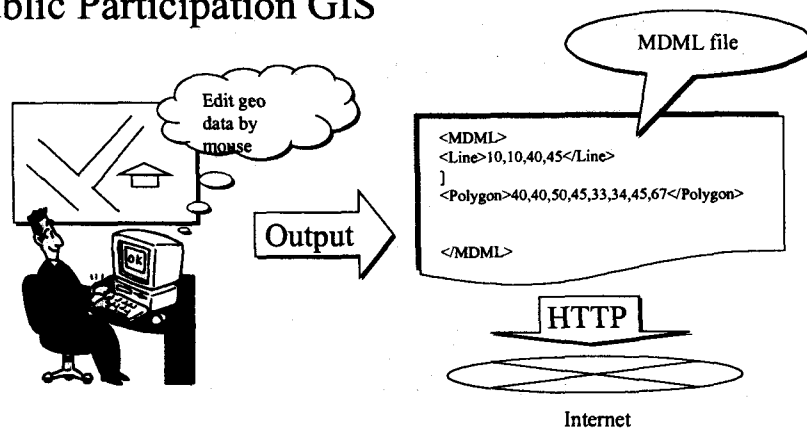
- GIS for road administration



2.2 Background

What we want to do?

- Public Participation GIS



2.3 Background

How to develop?

- Original development policy
 - CORBA, ORB, IIOP, OTS
- New concept
 - Lightweight & Easiness
 - Not necessary to buy expensive software
 - Use XML as an interface
 - Extensible and Easy
 - Adopt HTTP
 - Well-known port on the Internet

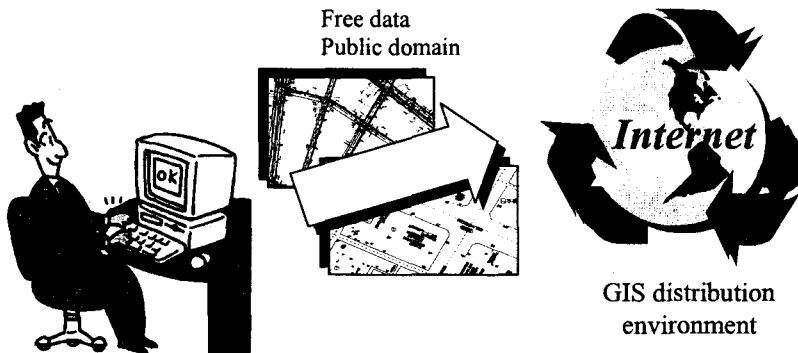
3.1. MRB Objective (1)

- Want to use heterogeneous, distributed GIS resources (both of data and applications)



3.2. MRB Objective (2)

- Want to upload and distribute geo content on the Internet (anyone, anytime, anywhere)

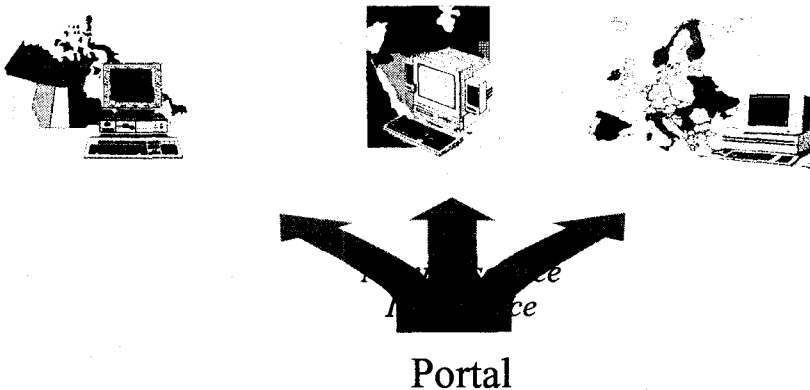


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9

3.3. MRB Objective (3)

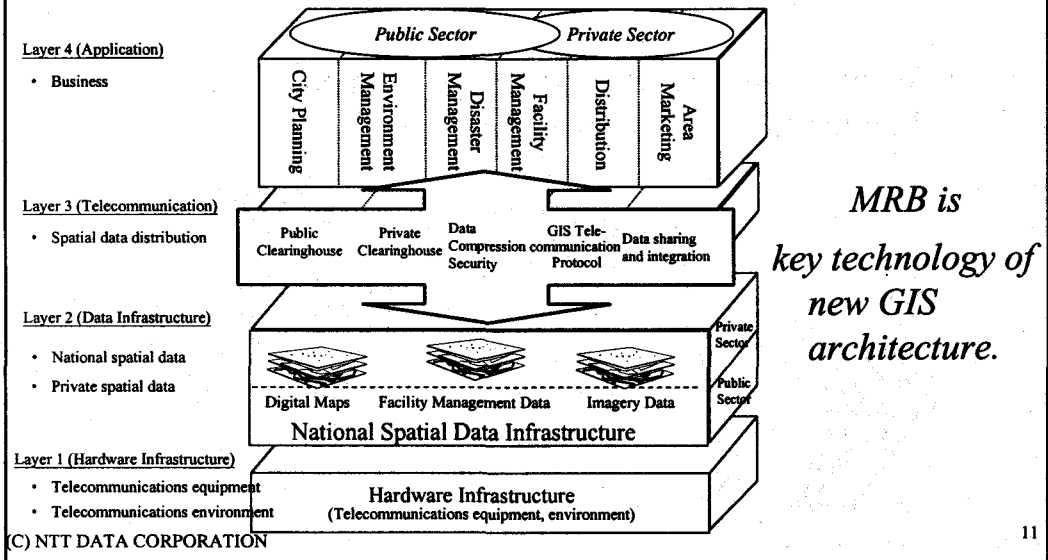
- Want to find GIS resources distributed on the Internet and get necessary resources easily (Portal site)



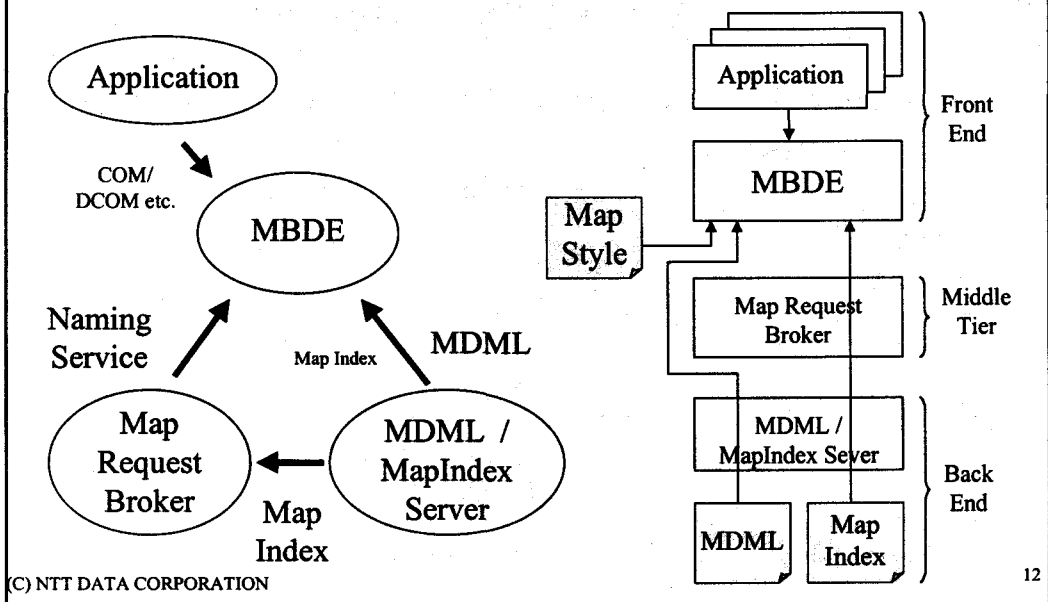
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10

3.4. MRB Objective (4)

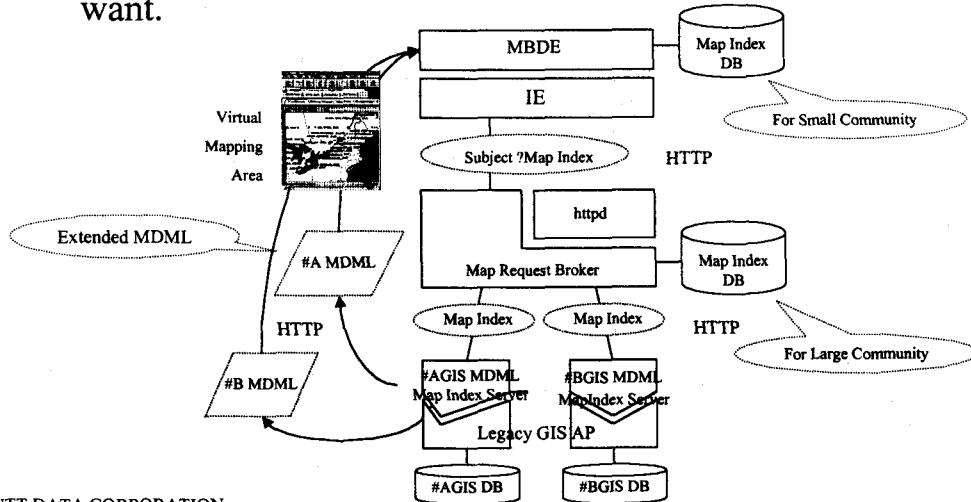


4.1. Overview of MRB Service Architecture



4.2. MRB Service Architecture (Dynamic Model of MRB)

- Use case 1: Users have an access to geo data they want.

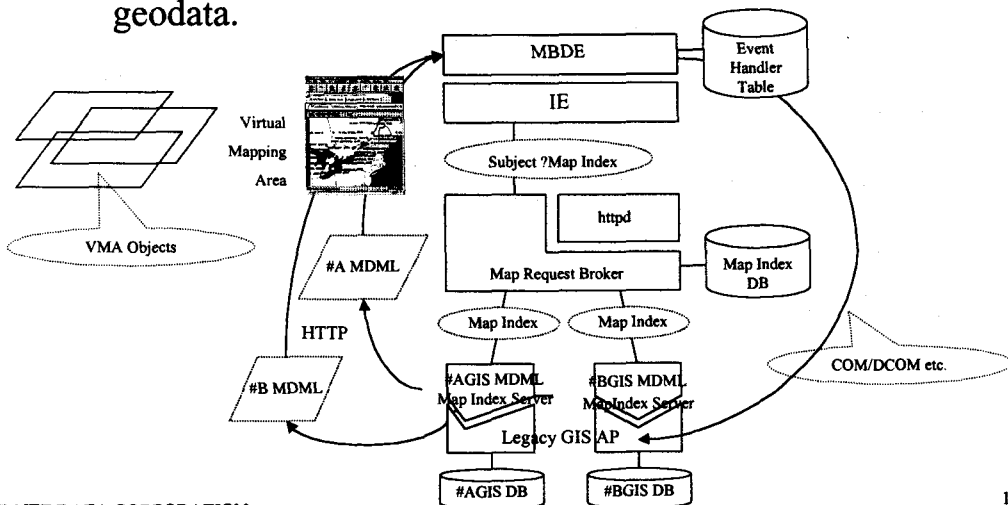


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13

4.3. MRB Service Architecture (Dynamic Model of MRB)

- Use case 2: To use applications suitable for each geodata.

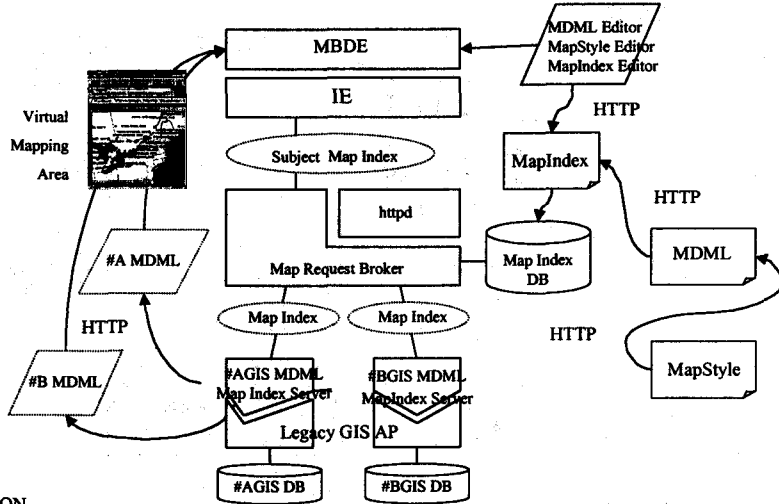


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14

4.4. MRB Service Architecture (Dynamic Model of MRB)

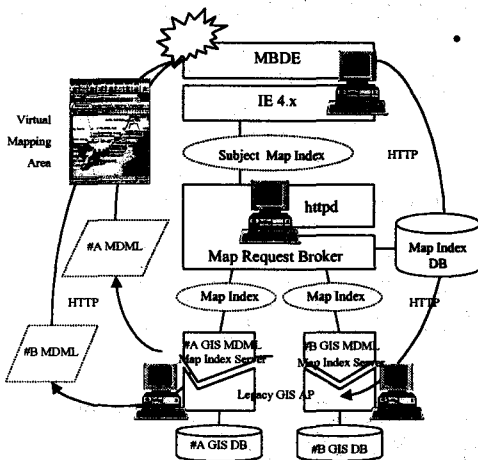
- Use case 3: To upload geodata on the Internet.



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15

5.1. Detailed Spec. of Front End Components

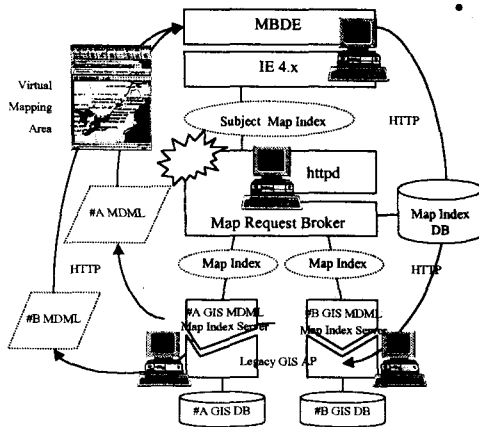


- MBDE(Map Based Desktop Environment)
 - Portrayal of VMA(Virtual Mapping Area)
 - Input Query Conditions of GIS Resources
 - by Coordinates
 - by Address Matching Tables
 - by Key Words of Meta-Data
 - Lightweight Clearing Functions
 - MBDE stocks MapIndex by CDF
 - Physical / Logical Navigation on VMA
 - Scroll, Zooming, Rotation, Theme Change
 - Scenarist for hyperlinking to GIS Resources
 - Applications suitable for VMA Objects
 - MDML Editor, Various EventHandlers, etc.

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16

5.2. Detailed Spec. of Middle Tier Components



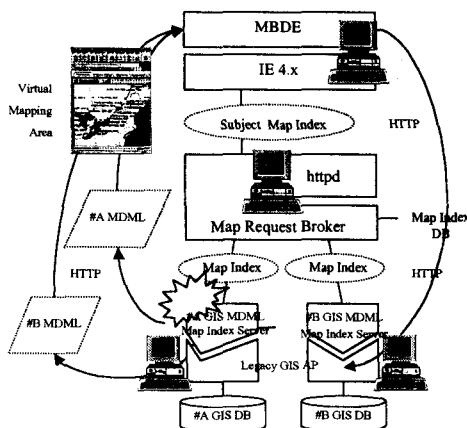
- MRB(Map Request Broker)

- Naming Repository
 - Stock MapIndex pushed from Back Ended GIS DB
- Single Clearinghouse
 - Hub for Small GIS Community
- Combined Clearinghouses
 - Propagation of MapIndexes
 - All users have to know is a portal URL of Map Request Broker

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17

5.3. Detailed Spec. of Back End Components



- MapIndex Server

- Distribute Meta Data of Geo Data with httpd
- Distribute CDF with httpd to push automatically

- MDML Server

- Distribute Geo Data with httpd
- For Dynamic Distribution from Legacy GIS DB, You need Wrapper by Legacy GIS API

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18

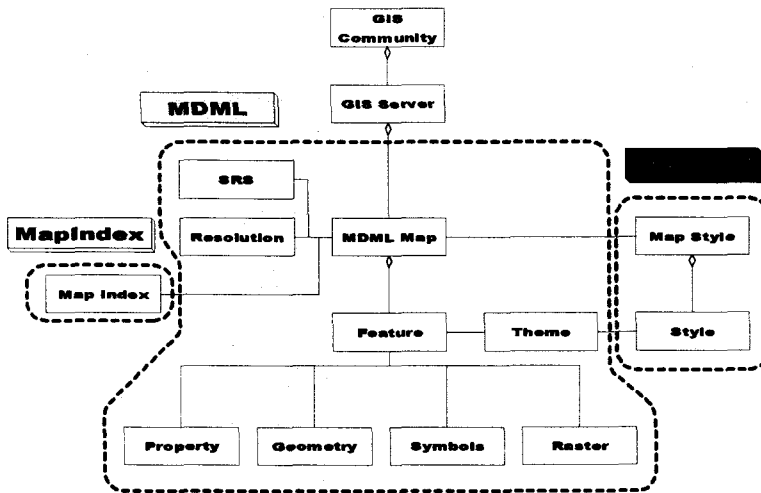
5.4. Detailed Spec. of Application Components

- MDML Editor
 - Edit MDML
- MapStyle Editor
 - Edit MapStyle
- MapIndex Editor
 - Edit MapIndex
- Attribute Browser
 - Browse Attribute DB with FeatureID
- EventHandler Register
 - Register Callback Procedure
correspond to Various Events on VMA
Objects
- PostScript Exporter
 - Export PostScript File for Plotting
Maps
- VMAScenarist
 - Authoring Tool for Logical Navigation on
VMA
 - Build Hyperlinks to GIS Resources
 - Replay of various Subject Maps
- VMA Adjsuter
 - Adjust Spatial Positioning of VMA Objects
through Tin Patches

6. Encoding Data by XML

- MDML (Map Definition Markup Language)
 - Geography, by the Feature
 - Shape, Model
- MapStyle
 - Portray Attribute
 - Style, View
- MapIndex
 - Meta Data (ISO TC211)
 - Location
- VMAScenario
 - Hyperlinks to GIS Resources
- UserProfile
 - Personal Handling Conditions
- DOM
- NameSpace
 - Module for Each XML Subset

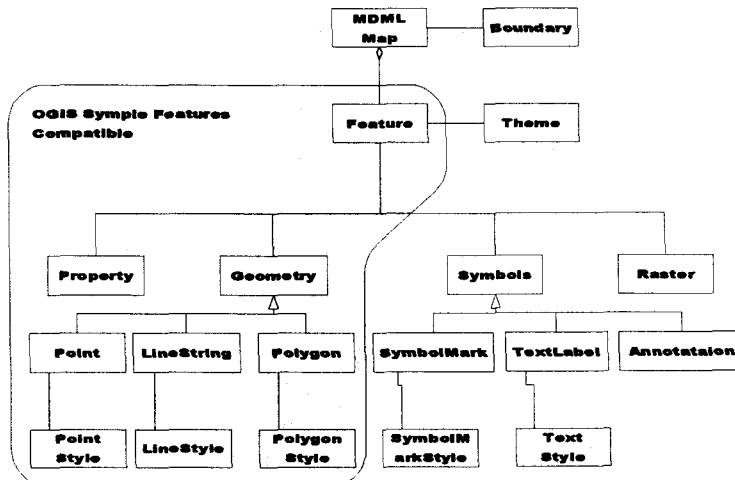
7.1. MDML, MapIndex, MapStyle



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21

7.2. MDML for Modeling Geography



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22

7.3. MDML Instance

```
<MDML
version="1.0"
mapstyle="http://mapis/NRM/MDML/MapStyle10.xml"
SRS="??" resolution="10">
```

```
<!-- Boundary -->
```

```
<Boundary
northbc="16800000" westbc="14800000"
southbc="16200000" eastbc="15600000" />
```

```
<!-- Point Feature -->
```

```
<Feature Fid="1" Theme="Telephone pole">
<Point>
<Coordinate>15050000, 16450000</Coordinate>
</Point>
</Feature>
```

```
<!-- LineString -->
```

```
<Feature Fid="5" Theme="Road">
<LineString>
<Coordinate>14800000, 16500000</Coordinate>
<Coordinate>15100000, 16500000</Coordinate>
<Coordinate>15100000, 16200000</Coordinate>
</LineString>
</Feature>
```

```
<!-- Polygon -->
```

```
<Feature Fid="9" Theme="House">
<Polygon>
<Coordinate>15300000, 16350000</Coordinate>
<Coordinate>15380000, 16350000</Coordinate>
<Coordinate>15380000, 16400000</Coordinate>
<Coordinate>15300000, 16400000</Coordinate>
</Polygon>
</Feature>
```

```
<!-- TextLabel -->
```

```
<Feature Fid="12" Theme="Householder">
<TextLabel>
<Coordinate>15310000, 16390000</Coordinate>
<Size>20000</Size>
<Caption>John Elway</Caption>
</TextLabel>
</Feature>
```

```
<!-- SymbolMark -->
```

```
<Feature Fid="13" Theme="Road symbol">
<SymbolMark symbolname="To entry">
<Coordinate>15200000, 16550000</Coordinate>
<Size>20000</Size>
</SymbolMark>
</Feature>
```

```
</MDML>
```

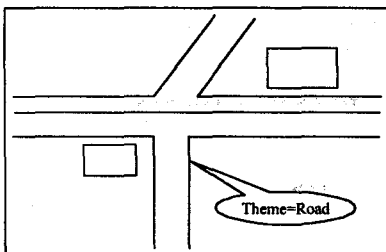
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23

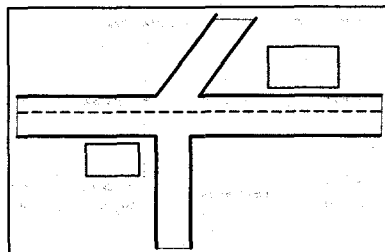
7.4. MapStyle for Graphical View

- Separate Geometry and Style
 - Like Relation of HTML and CSS, XML and XSL
- Define Portrayal Style for Every Theme
- Each Style has GeometryStyle for Every Geometry
 - PointStyle, LineStyle, etc.

MDML



Applying a MapStyle



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24

7.5. MapStyle Instance

```
<MapStyle
version="1.0" name="test1"
abstract=MapStyle Ver.1 for tests">
```

```
<Style name="elephone pole">
<PointStyle
pcolor="GRAY?psize="20" />
</Style>
```

```
<Style name="road">
<LineStyle
icolor="DIMGRAY?lwidth="10" />
<PolygonStyle
pcolor="DIMGRAY?pffgcolor="DARKGRAY"
plwidth="8?pfstyle="HS_FDIAGONAL" />
</Style>
```

```
<Style name="householder">
<TextStyle
tfgcolor="0000FF" tbaseangle="0"
tdisplayerlimit="20" tfontface="Times New Roman"
tfontstyle="Normal" />
</Style>
```

```
<DefaultStyle>
<PointStyle
pcolor="BLACK" psize="5" />
<LineStyle
icolor="BLACK" lwidth="5"
lstyle="Solid" />
<PolygonStyle
pcolor="BLACK?pffgcolor="BLACK"
pfbgcolor="WHITE" plwidth="5"
plstyle="Solid" pfstyle="HS_NONE" />
<SymbolMarkStyle
srotation="0" sdisplayerlimit="15"
scolor="BLACK"/>
<TextStyle
tfgcolor="BLACK?tbgcolor="WHITE"
tbaseangle="0?tdisplayerlimit="20"
tfontface="Century?tfontstyle="Normal" />
</DefaultStyle>
</MapStyle>
```

7.6. MapIndex for Meta Data of Geography

- Subset of ISO TC/211
- Separation of MapIndex from MDML enables clearing function independent
 - Push Technology (CDF, etc.)
 - MapIndexes collection by Agents on Map Request Broker

7.7. MapIndex Instance

```
<MapIndex version="1.0">
  <meta_file_id>1</meta_file_id>
  <title>MDMLv1testdata1</title>
  <edition>1.0</edition>
  <refdate>19981130</refdate>
  <party>
    <party_org>NTT DATA CORPORATION</party_org>
    <address>3-3-3, Toyosu, Koto-ku</address>
    <city>Tokyo</city>
    <postal_code>1356033</postal_code>
    <country>JPN</country>
    <resource_url>http://www.nttdata.co.jp</resource_url>
    <email>kamihigashit@noanet.nttdata.co.jp</email>
    <phone>03-5546-8526</phone>
  </party>
  <extent>
    <coordinates>
      <westbc>14800000</westbc>
      <eastbc>15600000</eastbc>
      <northbc>16800000</northbc>
      <southbc>16200000</southbc>
    </coordinates>
  </extent>
  <lang_data_code>ja</lang_data_code>
  <data_charset>Shift_JIS</data_charset>

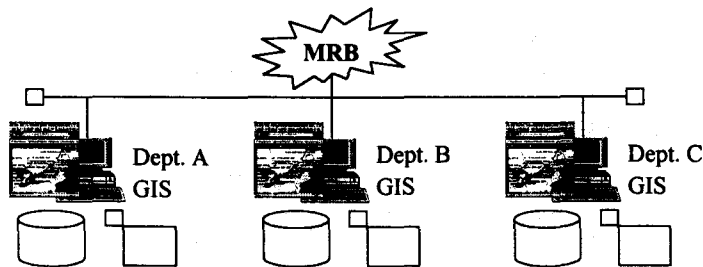
  <abstract>MDML Ver.1 sample file</abstract>
  <purpose>MRB Ver.1 tests of each subsystem</purpose>
  <category>
    <keyword_info>
      <keywords>telephone pole</keywords>
      <keyword_type_code>2</keyword_type_code>
    </keyword_info>
    <keyword_info>
      <keywords>road</keywords>
      <keyword_type_code>2</keyword_type_code>
    </keyword_info>
  </category>
  <format_name>mdmlv1</format_name>
  <media>electric network</media>
  <meta_date>19981130</meta_date>
  <mdml_url>"http://mapis/NRM/MDML/mdml10.xml"</mdml_url>
  <resolution>10</resolution>
  <SRS_code>7</SRS_code>
</MapIndex>
```

8. Trial Version Demonstration

- MBDE Trial Version
 - ActiveX Control : Clearing and VMA Builder
- XML Parser
 - MS-XML ActiveX Control Ver1.0 with I.E4.0

9.1. Developing Systems based on MRB

- Develop MDML/MapIndex server which creates dynamic MDML and MapIndex out of heterogeneous GIS databases by plugging-in wrapper based on legacy GIS API
- Develop Event Handler based on legacy GIS API to start proper applications for VMA objects on MBDE

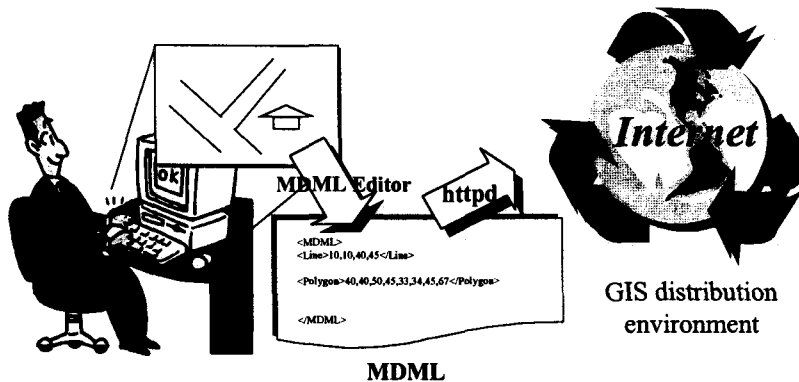


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29

9.2. Developing Systems based on MRB

- Create geo content using MDML Editor on PC at home
- Upload the geo content saved as MDML by httpd on home PC

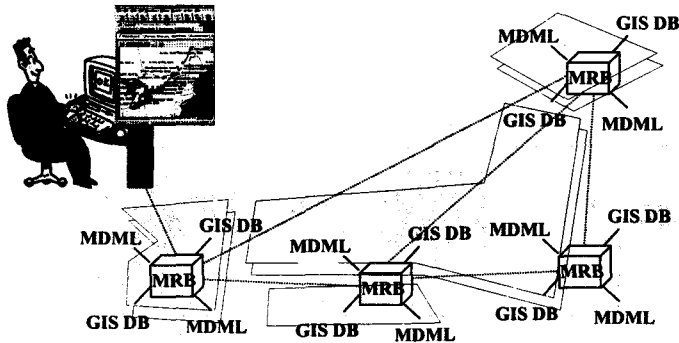


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30

9.3. Developing Systems based on MRB

- Connect GIS communities on the network by chain clearinghouse
- Establish national geo content distribution infrastructure
- Use geo information as a portal to various IT services



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31

10.1. Review of Present Implementations

- Platform compatibility
 - ActiveX vs. Java
- DOM
 - limit of tree structure
 - vs. CORBA IDL etc.
- Performance
 - data expansion; narrow band of WAN

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32

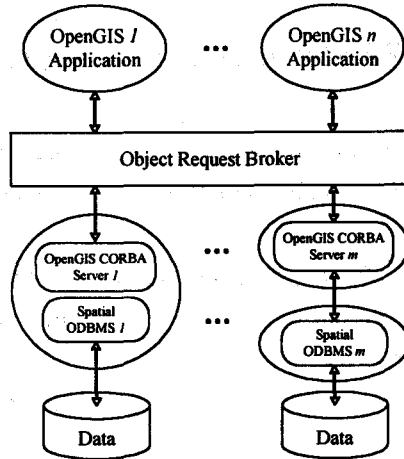
10.2. Related Matters

- OGC movement
- XML at W3C, WWW technology of Web agent
- XML
 - SVG: Scalable Vector Graphics graphics
 - RDF:Resource Description Framework meta data
 - Xlink spatial index
 - P3P: Platform for Privacy Preferences Project security
 - Fragment transaction service
 - Data compression
 - Xpointer to avoid data expansion

10.3. Future Vision of MRB

- Adjustment to OpenGIS specifications
- adoption of XML technology
- Improvement of spatial compensation
 - VMA Adjuster, VMA Scenarist
- Improvement of semantics compensation
 - Reconsideration of MapIndex, Research for Intelligent agent
- Replication, high-speed index
- Dynamic MDML, Dynamic MapStyle
- MTS : MRB Transaction Service

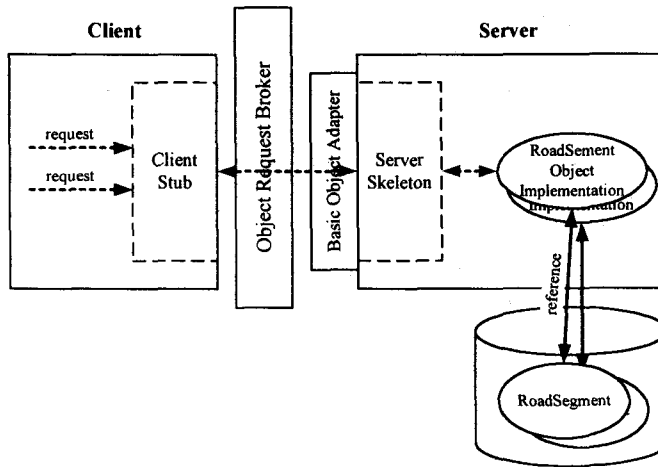
OpenGIS ODBMS Binding



Features

- Schema를 동적으로 바꾸는 것을 허용하지 않는다.
- Feature interface를 통해서 는 사용자가 정의한 method를 호출할 수 없으며 property만 접근할 수 있다.
- 하나의 request가 transaction 단위이다.
- ContainerFeatureCollection이 하나의 database에 해당한다.

Run-time View



Feature Impl. (C++)

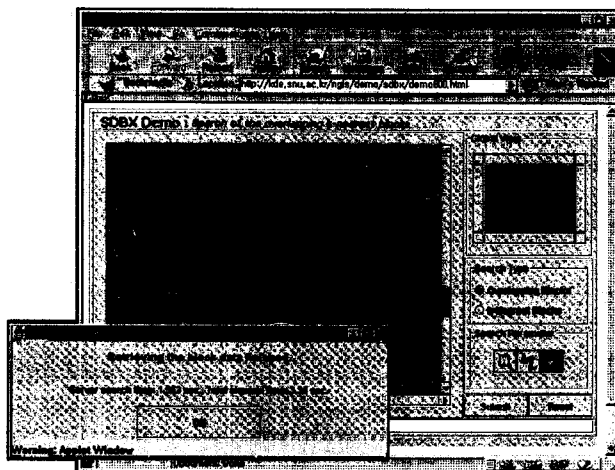
```
class Feature_i : public FeatureBOAImpl {
public:
    Feature_i(d_Ref<d_Persistent_Object>&);
    OGIS::FeatureType_ptr feature_type();
    OGIS::Geometry_ptr get_geometry(...);
    CORBA::any* get_property(char* name);
    void set_property(char* name, CORBA::any& value);
    OGIS::FeaturePropertySetIterator_ptr get_property_iterator();
    ...
protected:
    d_Ref<d_persistent_Object> reference;
};
```

RoadSegment IDL

```
interface LineString { ... };
interface Intersection { ... };
typedef sequence<Intersection,2> IntersectionSeq;

interface RoadSegment : OGIS::Feature {
    attribute double length;
    attribute OGIS::LineString shape;
    attribute IntersectionSeq nodes;
    ...
};
```

Java Application



CORBA/COM

- Orbix COMet

