IMPLEMENTATION OF WEB GEOSERVICES BY NATIONAL CARTOGRAPHIC CENTER

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Introduction

- In the recent years Web services
  - had a lot of development in commercial and industrial relationships.
  - Implemented using the required instructions released by W3C.
- Due to developments in Web especially Web 2.0 and Semantic Web, Web GIS
  - included in the research agenda of many academic and industrial institutions
  - are publicly being accessible by large companies such as Google, Yahoo and ESRI.
- significant amount of geographic information
  - has been produced by National Cartographic Center (NCC) of Iran
  - is an important national asset
  - provided with large amount of efforts and costs over the years.
  - are applicable in various governmental and public sector
- WWW
  - offers the best litter for extending use of such data.
  - Allow selection of what the customers or end users need from various data and products

Introduction

- buying and selling of information and or services on the Web is a high rates business, due to
  - the development of Web applications in business and commerce
  - extension of data security techniques,
- presence in this market has been included in NCC's agenda
- NCC prepared an appropriate bed to move towards the use of the Web by
  - Creating geospatial databases at scales 1:1000000 and 1:25000
    - according to OGC (Open Geospatial Consortium) instructions
    - operational and accessible to end users.
  - implementing a system for public browse of the topography datasets on the Network

Basic technologies for creating geospatial services

- The ultimate goal of NCC is
  - to prepare necessary foundations for initiating a system
    - with capabilities of complete Web GIS in the near future.
    - using the latest existence technologies on the Web such as Web Services and Web 2.0
- In this regard the following technologies are used in current projects
  - Three-layer systems
 - Web Services and
  - Web 2.0

Three-layer system

- since the beginning of 90th decade
  - traditional two-layer system (client-server) could not satisfy the need of information systems designers.
- Three-layer system
  - the customer layer (client)
    - has only the responsibility of displaying information to client and receiving data from him/her.
  - application layer
    - do activities related to the functionalities of system and
    - implement logic of operation and computations by installed programs
  - End layer
    - is made of the database and its related systems
    - is responsible for the task of data storage and retrieval independent of the application type

GIS with three-layer architecture

Presentation Layer	Application Layer	Data Layer
Customer or end user	Application Server	DBMS

Internet

geodatabase
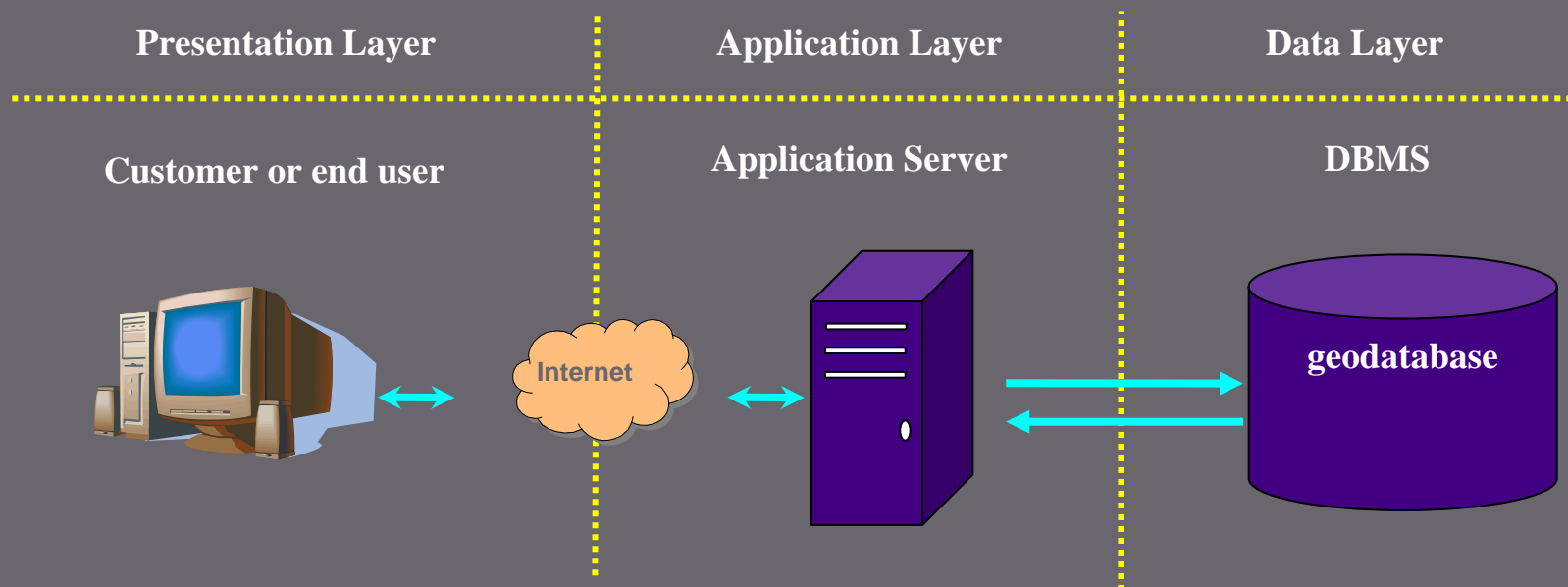
Three-layer systems

- There is no direct connection or data exchange between customer (presentation) layer and end (data) layer,
- the connection or data exchange is always performed through the application or middle layer.
- advantages of using three-layer architecture
  - Increment in efficiency and dynamism of systems
  - ease of its maintenance, support and development
- For example,
  - a change in the maintenance modeling and type of database
    - only affect the middle layer and the data layer will not be changed.

Three-layer systems

- the ESRI Company
  - presented ArcSDE software to the market.
  - ArcSDE software plays the role of middle layer
  - ArcGIS software operates as user layer without dependence on the type of database.

Web Services

- Web services proposed by W3C (WWW Consortium)
  - facilitate the interaction between the systems available on the Web.
  - are substantially software programs
  - have the following characteristics:
    - are used with a standard method (invocation),
    - a particular standard (usually XML) is used for
      - Representation and creation of data structure within the input and output
      - exchanged messages between the programs
    - The required description are available about
      - the performance
      - how to use the services
    - there is the ability to dynamically discover and execute these services by other programs
    - Existence of standard methods provide search for discovering other programs.
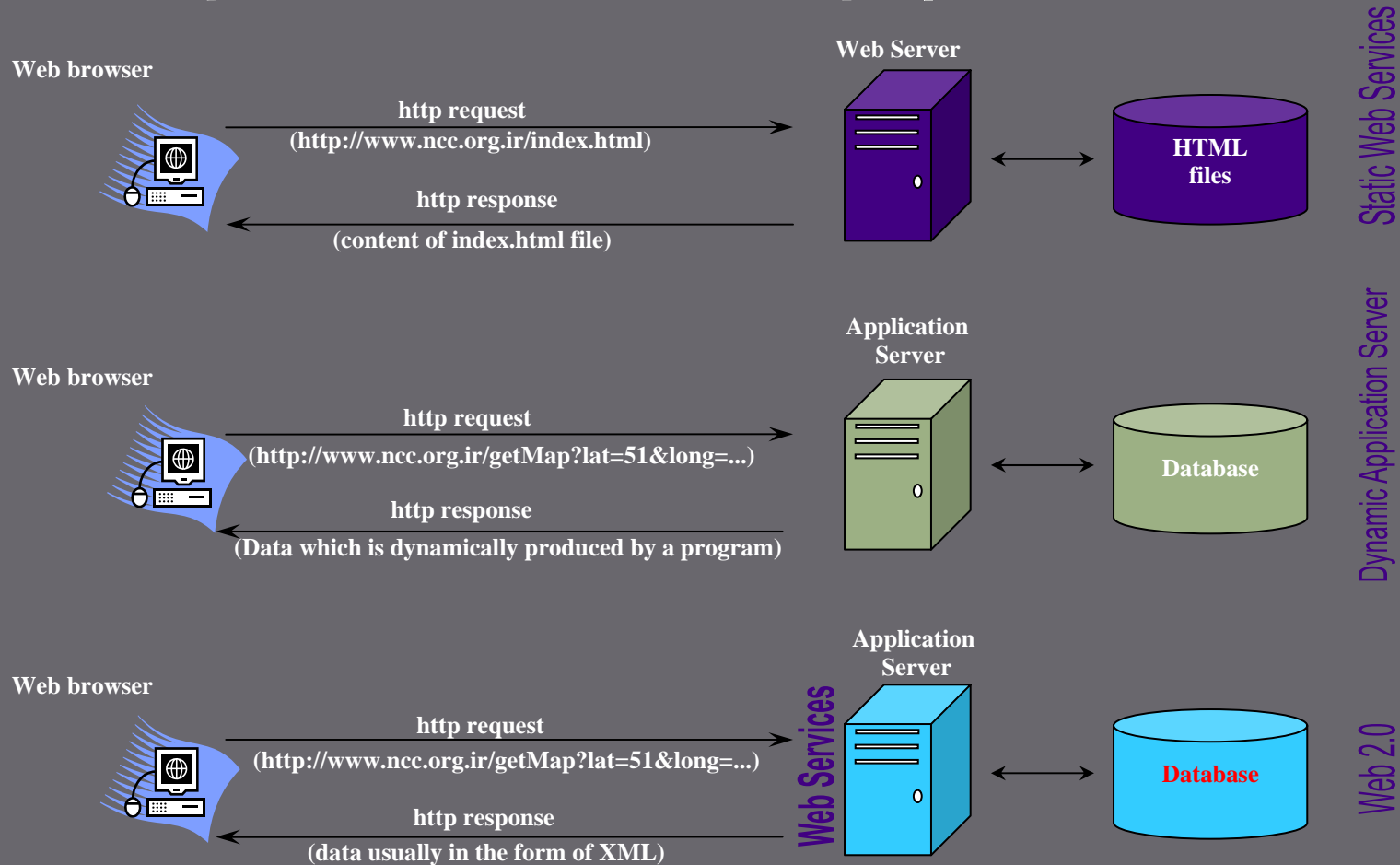
Web Services

- have no dependency to any particular programming language or technology
  - The only constraint is to follow the W3C standards.
- There is interoperability between services provided by different programming languages or technologies.

The evolution of using Web-based systems and http protocol

Web browser

Web Server

http request
(http://www.ncc.org.ir/index.html)

http response
(content of index.html file)

HTML files

Static Web Services

Web browser

Application Server

http request
(http://www.ncc.org.ir/getMap?lat=51&long=...)

http response
(Data which is dynamically produced by a program)

Database

Dynamic Application Server

Web browser

Application Server

http request
(http://www.ncc.org.ir/getMap?lat=51&long=...)

http response
(data usually in the form of XML)

Web Services

Database

Web 2.0

Static systems

- usually used for information and required data for users
  - which have already been provided in the form of html files.
- The content of html files
  - is recovered by Web Server based on the request of the Web browser and
  - sends to the Web browser

Dynamic systems

- can be implemented using evolved type of Web Server called Application Server.

- Web Server runs a program according to the received request.

- The program produces an output in html form and will be sent to the browser by the Application Server.

Drawbacks of Traditional Systems

- increasing the share of browser activity.
- browser is directly responsible for interpretation and display of the data.
- Presentation layer is composed of large volume software which must be installed on the computer of the user.
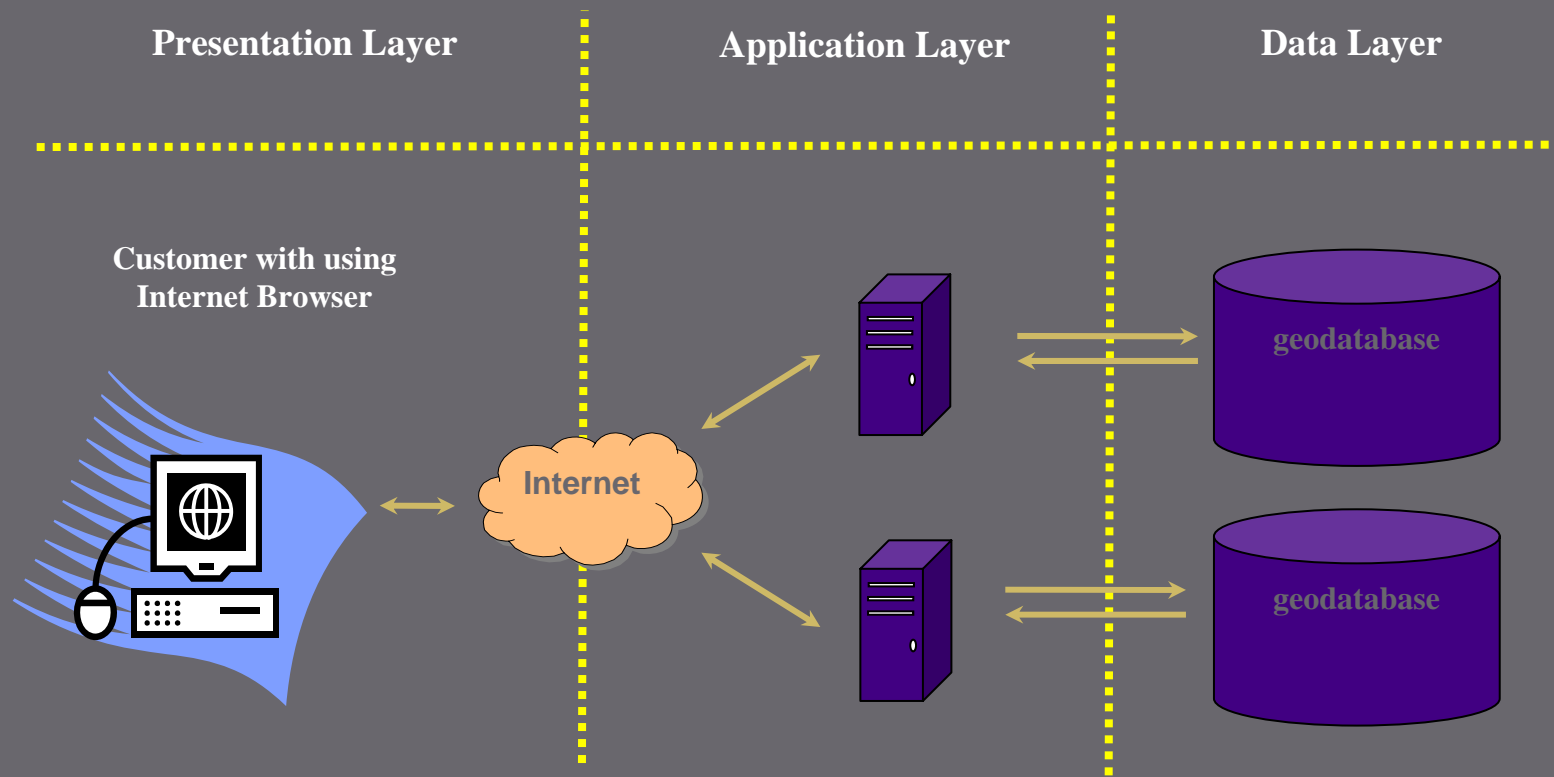- main calculations are performed in the presentation layer and the middle layer do not perform much of calculations

Web 2.0 Technology

- is based on using service.
- output of programs is in the XML form.
- only uses a Web browser (such as Internet Explorer, Netscape or Firefox) in the presentation layer.
- users do not need to install heavy software (like ArcGIS).
- the middle layer (Web servers) is responsible for a significant amount of processes or calculations.
- Companies producing GIS software (such as ESRI or Oracle) have now released their primary products for such systems based on OGC suggestions.

General illustration of Web 2.0 based systems

Presentation Layer   **Application Layer**   **Data Layer**

Customer with using Internet Browser

Internet

geodatabase

geodatabase

NCC's Services

- ◻ NCC
  - ▪ have produced extensive usable geospatial datasets
  - ▪ is going to deliver geoservices along with data to their users in the near future.
  - ▪ is now establishing, expanding and providing service on the Web.
  - ▪ Technical information needed to use these services will be published on the web as soon as possible;
  - ▪ however they are currently available on the NCC's network (Intranet) through the following address:

    http://ngdbi.ncc.org.ir/NccMapper/

How to use NCC's Services

- the getMap service
  - produces image map from data sets exist on the National Topographic Database
  - with .png format from the desired area
  - According to the latitude and longitude of the map center
- The following http sample invocate a getMap service:

http://ngdbi.ncc.org.ir/NccMapper/getMap?layers=HI WAY_L25:WRONG_LAYER&width=640&height = 480 & long = 54 & lat = 32 & size = 16

  - Long and lat Parameters specify coordinates of the map center.
  - Size parameter determines width of the map on the coordinate system of map.
  - Image size in term of pixel is specified by width and height parameters.
  - Layers parameter also determines the name of layers which appears on the image.

How to use NCC's Services

- With invocating the service a file is created on the server computer

- its address is sent for the invoker.

- An example output of this service:

<NccMapperResponse>
    <MapURL>http://ngdbi.ncc.org.ir/MapImage/xxxxx
    xxxxx.png</MapURL>
     <Warning>Theme: 'WRONG_LAYER' not
    found.</Warning>
</NccMapperResponse>

- The produced output is in the form of XML

- content of MapURL address produced from National Topographic Database is an image file

How to use NCC's Services

- In the case of a problem
  - a warning parameter will be sent which contains the description of the problem.
  - When no image map is produced, just the error parameter will be sent.
- Web browser tasks are
  - to provide and send an http request
  - to perform the interpretation of details of the http response
- If there is an image map the web browser displays it to the end user
- Important point in using these services is the freedom to use them.
  - that is other data centers on the Web can use and supply the images provided by these services on their pages.

Conclusion

- advantages of using geoservices based on Web 2.0 technology:
  - flexibility and distribution of processes in different layers
  - Geodatabase and geoservices providers can completely control
    - geospatial data and
    - use and process type of customers.
  - users
    - can access to the largest and most update geodatabase
    - only pay for data they use
    - their payment only depends on the amount of the processing on their data.
- in the long-term and with comprehending usage of geospatial services on the Web
  - NCC
    - will move toward sales of services instead of data.
    - prepare necessary foundations for initiating a system with capabilities of complete Web GIS,
  - In this way the latest technologies and specifications provided by the W3C and OGC are used

THANK YOU

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