

New York City's Spatial Service-Oriented Architecture: An Overview



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Presentation Roadmap

- Objectives
- DoITT/NYC GIS Background
- Service Offerings
- Current Applications
- Infrastructure
 - Internet
 - Intranet
- Issues with Current SDLC Model
- Why SOA? A strategic decision
- Where we are
- What is next? Upcoming Projects (CityMap)

Objectives

To share New York City's experience in establishing a high availability ArcIMS Hosting infrastructure, developing and hosting GIS applications for City Agencies and the process of moving towards a Spatial Service-Oriented Architecture

DoITT/NYC GIS Background

- DoITT has more than 700 employees
- Manages:
 - 311 call center (largest in the country)
 - Citywide GIS
 - NYC.GOV portal
 - Other strategic initiatives
- NYC GIS is a relatively new organization



Staff

- GIS Analysts
- Software Developers
- Database Administrator
- Project Managers
- Administrative Support
- 24x7 Shared Services operations
- 24x7 Help Desk

NYC GIS

- The Citywide GIS provides services to:
 - Other New York City Agencies
 - General public via:
 - NYC.GOV
 - 311
 - DoITT

Service Offerings

Data Creation

Data Distribution

Data Licensing

Data Cleanup

Metadata
Maintenance

Web Application
Development

Project Management

Quality
Assurance

NYCMAP
Updates

Service Offerings

Performance Tests

Stress Tests

High-Availability
Application Hosting

Security Scans

Automated
Application
Deployment

Functional Tests

Map creation

Data Management

More

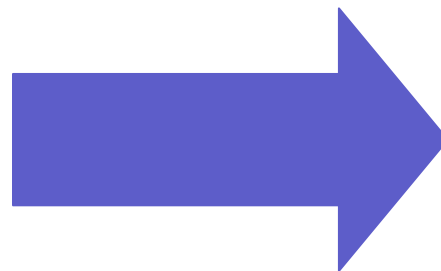
Goals

- To reduce errors and defects
- Reduce delivery time (data, software)
- Increase quality
- Increase availability
- Increase performance
- Reduce application development time
- Reduce costs
- Constant improvement

Goals

To move
away from

Manual
Processes



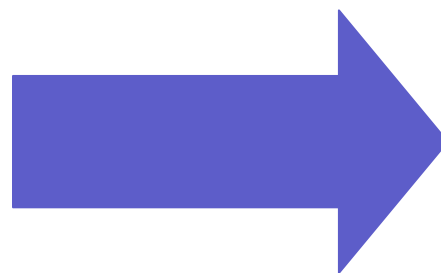
To

Automated
Processes

Goals

To move
away from

Undocumented
Processes



To

Documented and
Repeatable
Processes

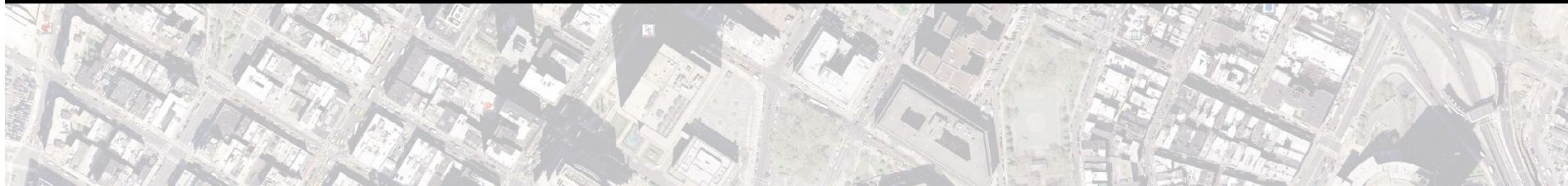
How?

- By reducing variability
- Sources of variability:
 - Poor Design
 - Skills and Behaviors
 - Unstable products/systems
 - Insufficient process capability

Internet applications

- DoITT - My Neighborhood
- DoITT - Poletop Manager
- DoITT - Map Portal
- OPS - My Neighborhood Statistics
- OEM - EMOLS
 - Hurricane Evacuation
 - Cooling Centers
- DSNY - Collection Schedule
- DCP - Census Fact Finder
- DCP - Address Translator
- News & Events
- Contact OEM
 - [CERT - Community](#)
 - [Emergency Response Team](#)
- DPR - Wood Debris
- DPR - Parks Locator
- NYCHA - Internet Mapping
- BOE – Pole site Locator





Census FactFinder - NYC Department of City Planning - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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NYC .gov
always open
NEW YORK CITY
DEPARTMENT OF CITY PLANNING
NYC.gov/planning

Search DCP > Go

Department of City Planning - "Shaping the City's Future"

City Planning: Home, About Us, Zoning, Land Use Process, Projects/Proposals, Reference, Products

Take me to... Commission Meetings, Commission Reports, Contact the Chair, Map & Bookstore, Job Opportunities, Press Releases, DCP Site Map, DCP Directory

Reference > New York City Census FactFinder

New York City Census FactFinder
2000 Census Profiles for New York City

Select a new location [Show Profile for Community District](#)

59 MAIDEN LANE, MANHATTAN

Census Tracts: Manhattan 7, 9, 13, 15.01, 15.02, 21, 29, 31, 319

0.3 mile buffer

Demographic | Socio-Economic | Age | Income in 1999 | Labor | Education | Housing Characteristics | Housing Costs

NYCHA GIS - Microsoft Internet Explorer

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Residents | Business | Visitors | Government | Office of the Mayor

NEW YORK CITY HOUSING AUTHORITY

Home | About NYCHA | Public Housing Assistance | NYCHA Housing Developments | Section 8 Assistance | Residents' Corner | Community Programs & Services | Doing Business With NYCHA | News, Events And Publications | FAQs | Contact NYCHA

SEARCH

SIGN-UP FOR NYCHA JOURNAL

NYCHA Housing Developments

ZOOM MOVE

New Search Legend

Search by street address or by borough. Click the SUBMIT button to map your location.

- Developments
- Selected Developments
- Searched Address
- Community Centers
- Day Care Center
- Libraries
- Subways
- Universities
- Schools
- Senior Centers
- Police
- Fire

Reset

Intranet applications

- Department of Finance – PARM
- Department of City Planning – GOAT
- NYC GIS Data Download Portal
 - Metadata Explorer
 - SharePoint portal
- 311 – Pseudo-web service to broker address validation and geocoding requests

Data Download/Metadata

NYC GIS - Microsoft Internet Explorer

Address: http://gis-prd-ft1.nycnet/nycgis/Transform.do?m=data&c=VECTOR&d=Planimetrics

home > data

Spatial Data

- Download
- Metadata Explorer
- Data Request
- Share your data

Download

Most of the data in this site is compressed, you will need a software such as WinZip to uncompress them.

Legend: Not available: [download](#) available: [download](#)

Dataset	Format	Size	Availability
Planimetrics (All)	SHP	199,581,662 KB	download
Planimetrics (All)	TAB	68,432,354 KB	download
billboard_toll	SHP	221,252 KB	download
billboard_toll	TAB	137,091 KB	download
elevation	SHP	28,788,015 KB	download
elevation	TAB	17,710,158 KB	download
hydro_centrelines	SHP	934,988 KB	download
hydro_centrelines	TAB	325,801 KB	download
hydrography	SHP	5,063,760 KB	download
hydrography	TAB	1,765,566 KB	download
hydrography_structure	SHP	1,378,645 KB	download
hydrography_structure	TAB	1,001,983 KB	download
open_space	SHP	2,781,139 KB	download
open_space	TAB	1,001,983 KB	download
railroad	SHP	1,947,203 KB	download
railroad	TAB	837,648 KB	download
railroad_hidden_structure	SHP	10,950 KB	download
railroad_hidden_structure	TAB	6,083 KB	download
railroad_structure	SHP	831,277 KB	download
railroad_structure	TAB	428,522 KB	download
street_centerline	SHP	13,117,831 KB	download
street_centerline	TAB	7,082,827 KB	download
survey_control_point	SHP	194,051 KB	download
survey_control_point	TAB	86,241 KB	download
transportation_line	SHP	140,397.653 KB	download

metadata explorer - Microsoft Internet Explorer

Address: http://gis-prd-ft1.nycnet/gis/explorer.jsp

SEARCH BROWSE

1 Draw search area:

2 Choose content type: Downloadable Data

Choose content theme: <All Content Themes>

Optional Keyword (e.g. river):

3 Start Search

Records Found: 15

Publisher: New York City Department of Information Technology and Telecommunications
Content Title: Hydrography
Map Scale: 1:0.75 foot for 2001/2002 Orthophotographs - 1 foot for 1996 Orthophotographs

Publisher: New York City Department of Information Technology and Telecommunications
Content Title: Transportation Line
Map Scale: 1:0.75 foot for orthophotographs from 2001 - 2002 and 1 foot for orthophotographs from 1996

Publisher: New York City Department of Information Technology and Telecommunications
Content Title: Street Centerline
Map Scale: 1:0.75 foot for orthophotographs from 2001 - 2002 and 1 foot for orthophotographs from 1996

Publisher: New York City Department of Information Technology and Telecommunications
Content Title: Elevation
Map Scale: 1:0.75 foot for orthophotographs from 2001 - 2002 and 1 foot for orthophotographs from 1996

Software Development Life-Cycle

Development

Test

Staging

Production

Disaster Recovery

Sample App. Dev. Scenario

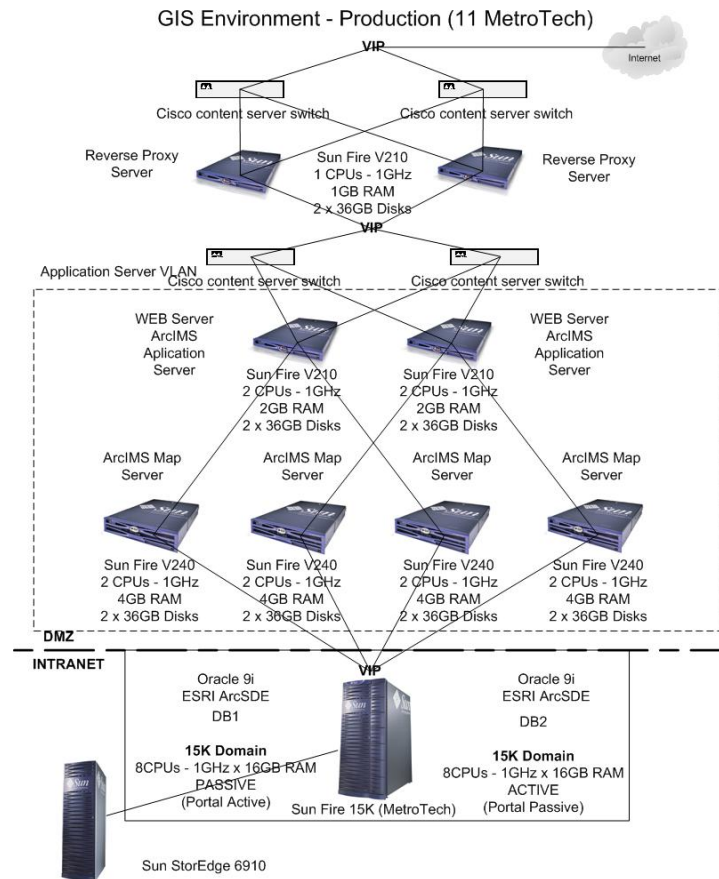


Infrastructure - Internet

25 Sun Servers

DEV, TST, STG,
PRD and DR

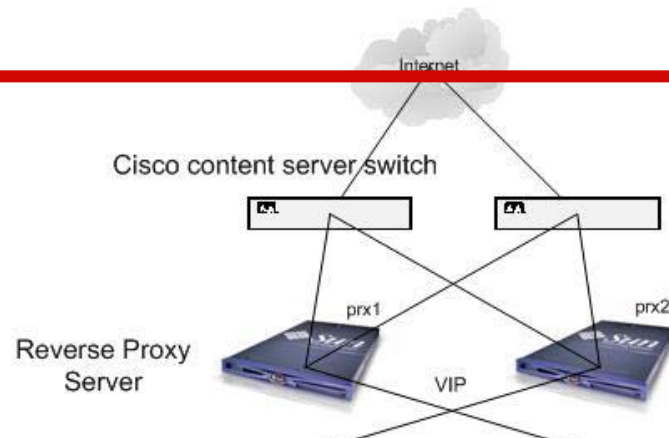
24x7 Operation



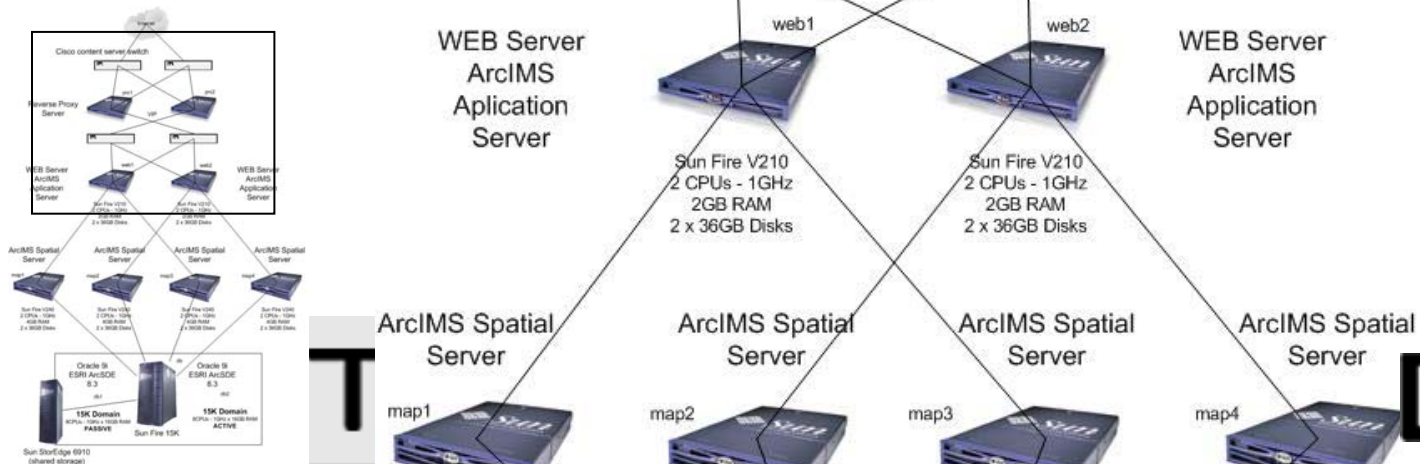
Shared Unix Services

Reverse Proxy

Only allows requests to specific URLs to pass through

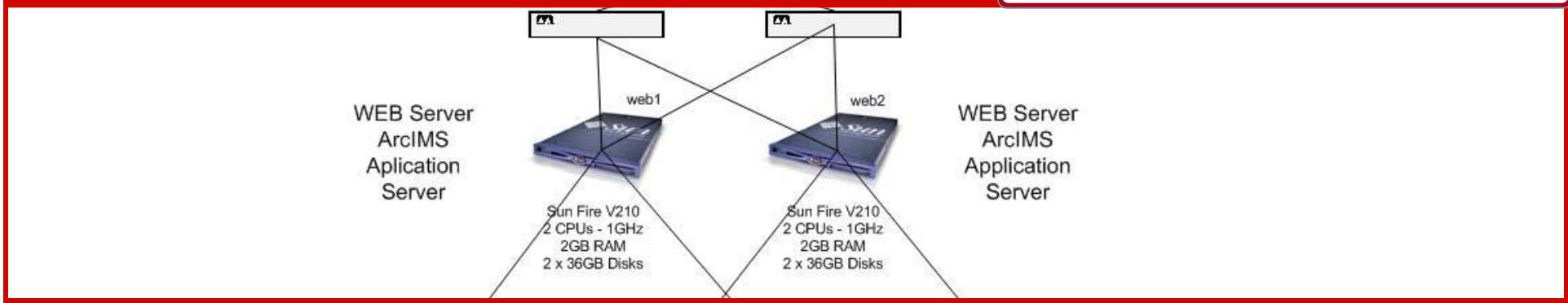


Tier #1

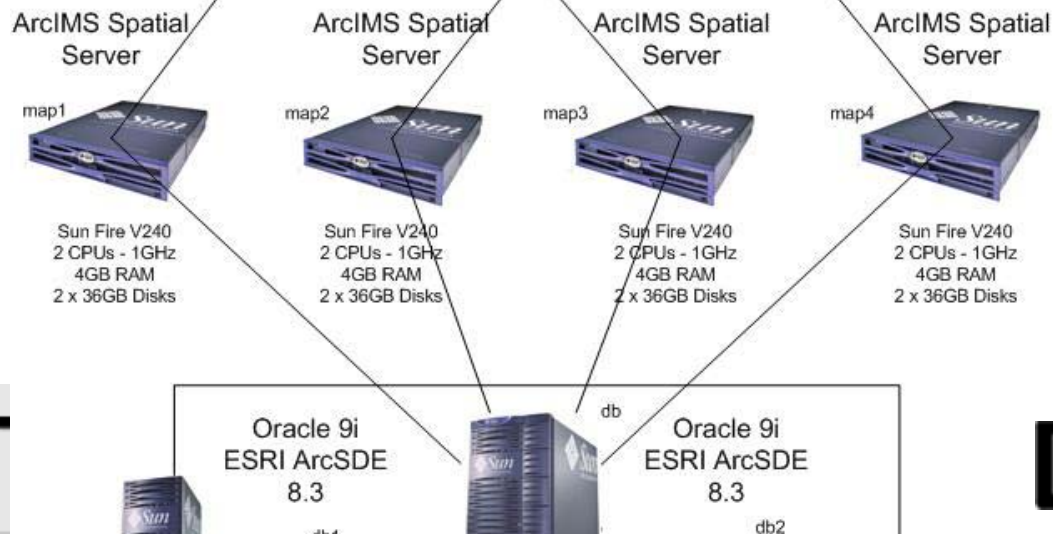
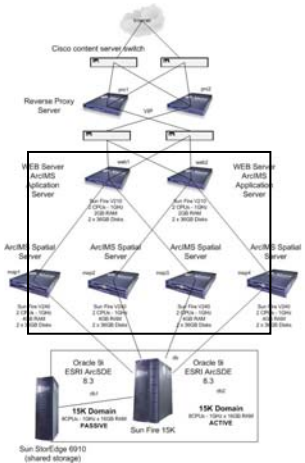


Web/ArcIMS App Server

ArcIMS load balancing
Java Connector,
App. logic (Servlet, JSPs)

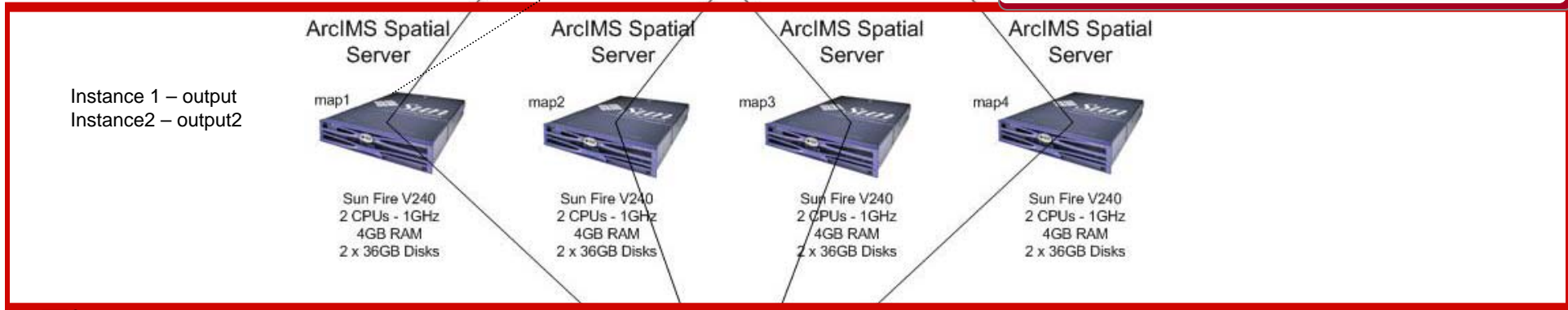


Tier #2

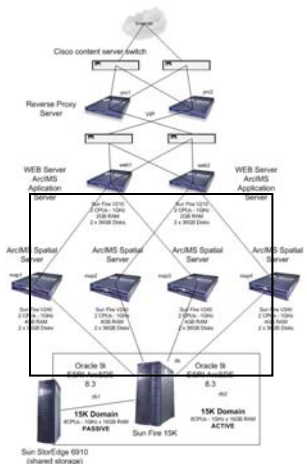
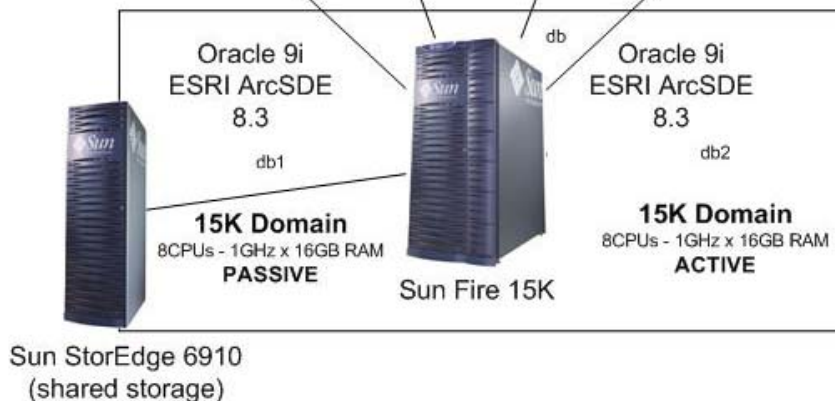


Spatial Servers

Most CPU intensive components
Two ArcIMS instances per server
2 CPU servers

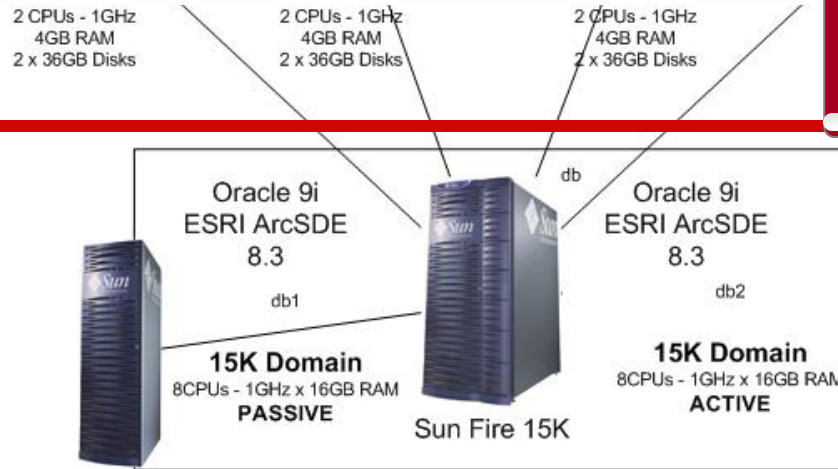


Tier #3



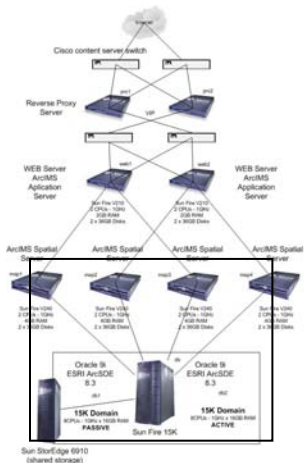
Database/SDE Servers

Active/Passive
Veritas Cluster Server



Sun StorEdge 6910
(shared storage)

Tier #4

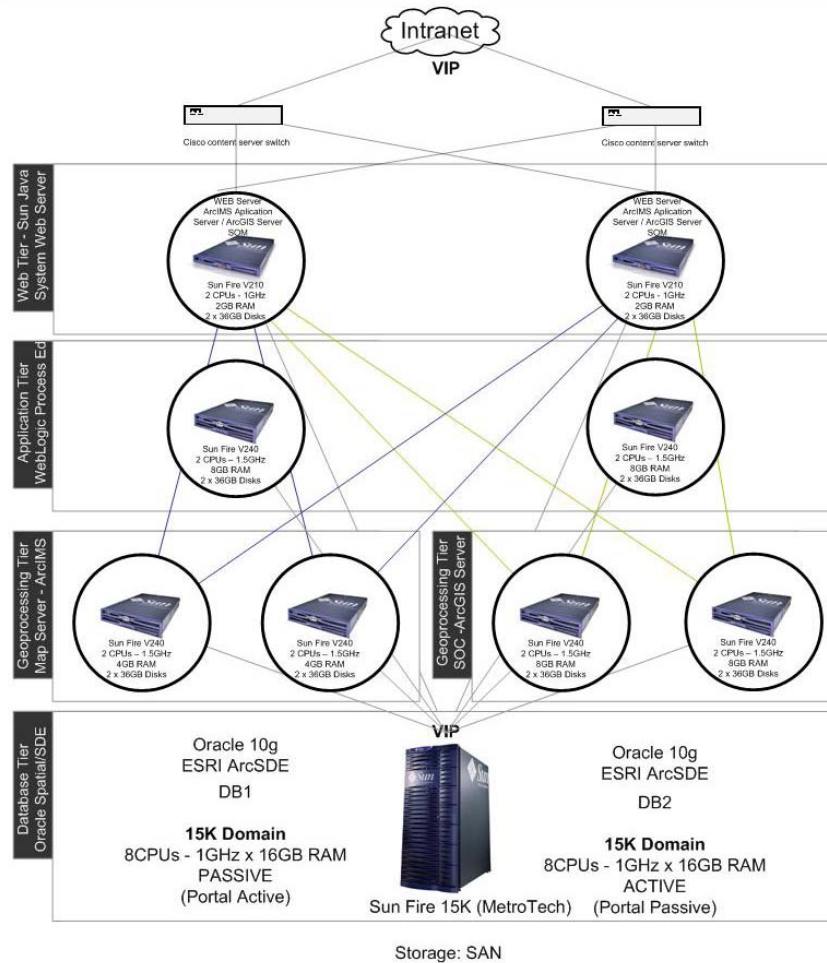


Infrastructure - intranet

19 new Sun Servers

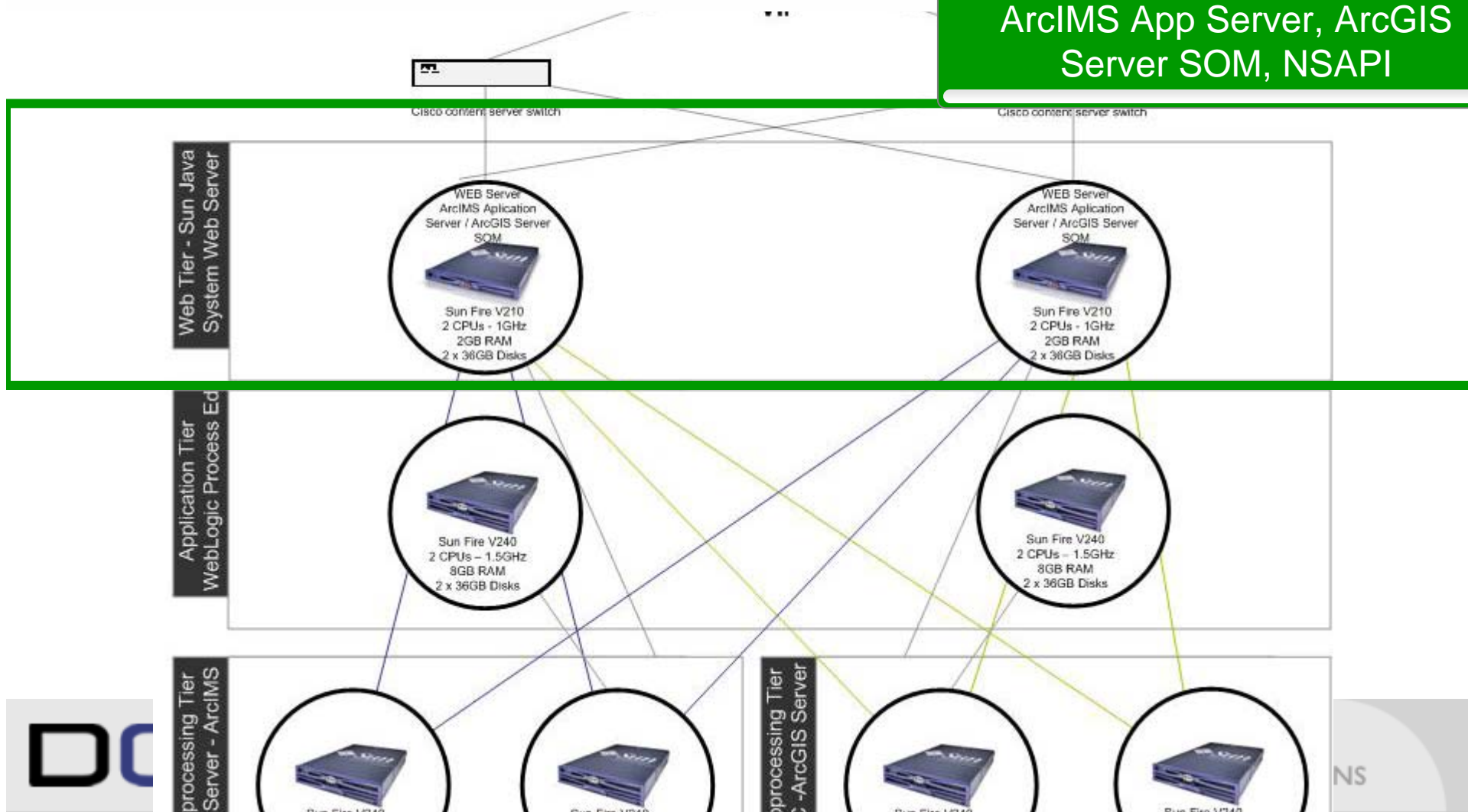
new
PRD and DR
environments

Shared DEV, TST,
STG environments



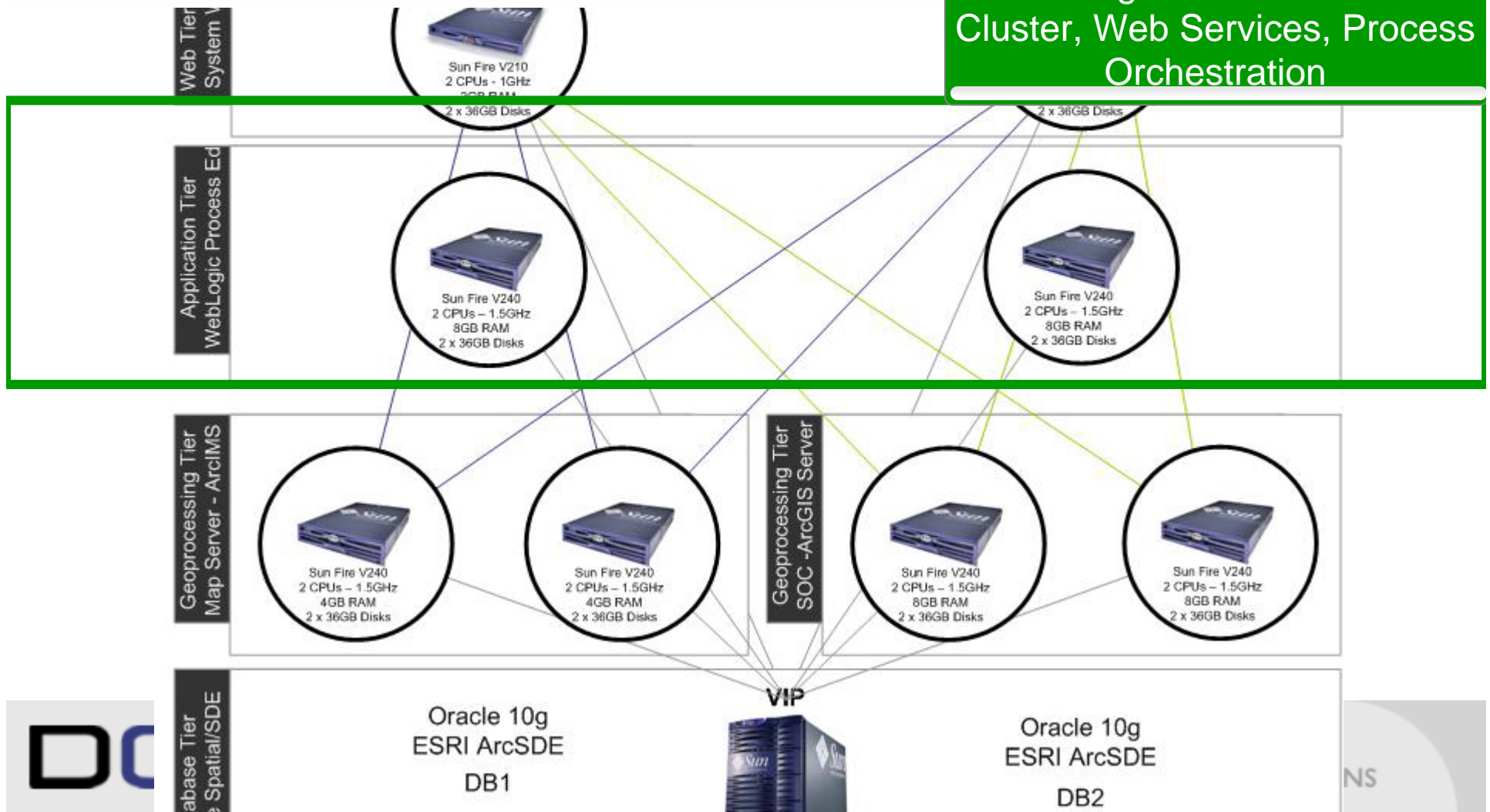
Web tier

Static content, Simple apps, ArcIMS App Server, ArcGIS Server SOM, NSAPI



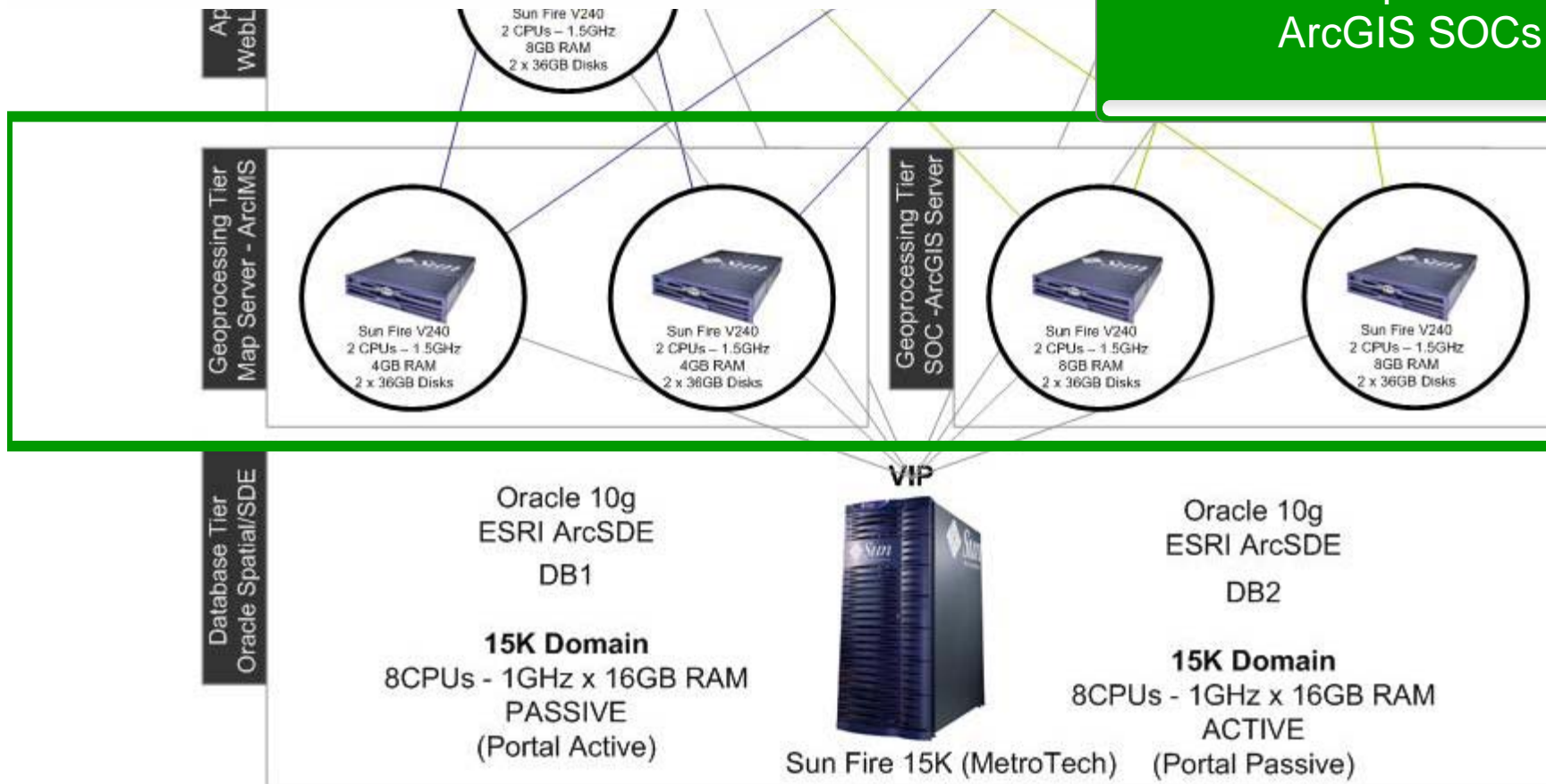
Application Server (J2EE)

WebLogic Process Edition
Cluster, Web Services, Process
Orchestration



Map and Geoprocessing Tier

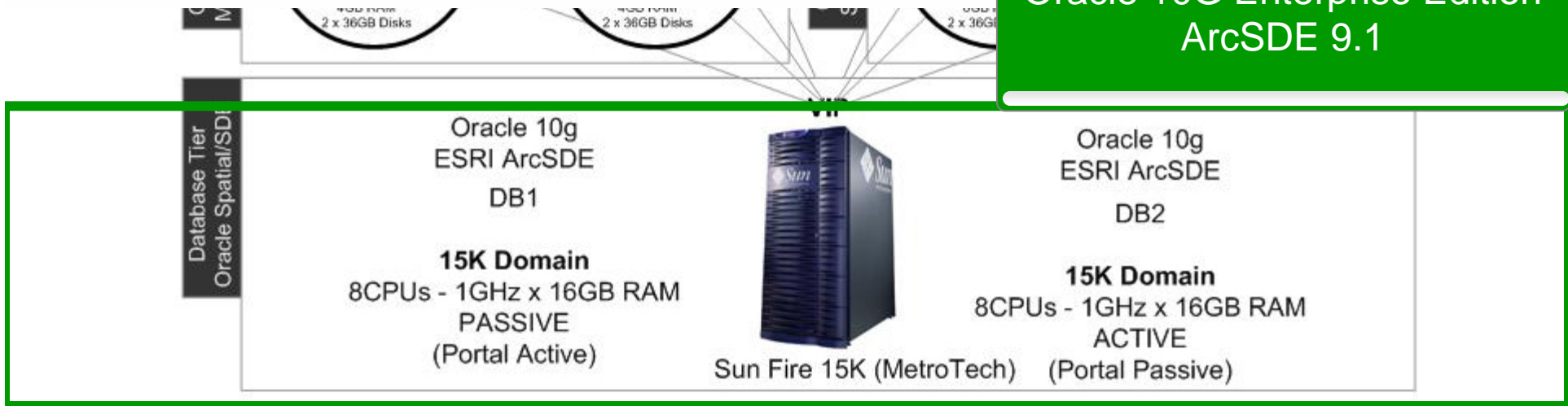
ArcIMS Map Servers and ArcGIS SOCs



Storage: SAN

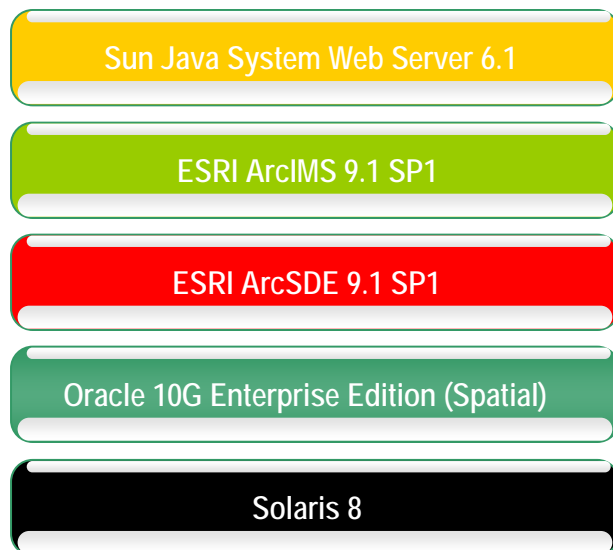
Database Tier

Oracle 10G Enterprise Edition
ArcSDE 9.1



Infrastructure Software

- Internet:



- Intranet:



Software Development Tools

- IDEs:
 - Eclipse (WTP),
 - BEA Workshop (BPM – JPDs)
- Data Management
 - ArcCatalog,
 - TOAD,
 - Oracle SQL Developer
- Testing
 - Mercury Load Runner
 - Mercury Quick Test Professional
 - Junit
- Misc tools and frameworks: Ant, Tomcat, CVS, Spring, Struts, Hibernate, Ibatis

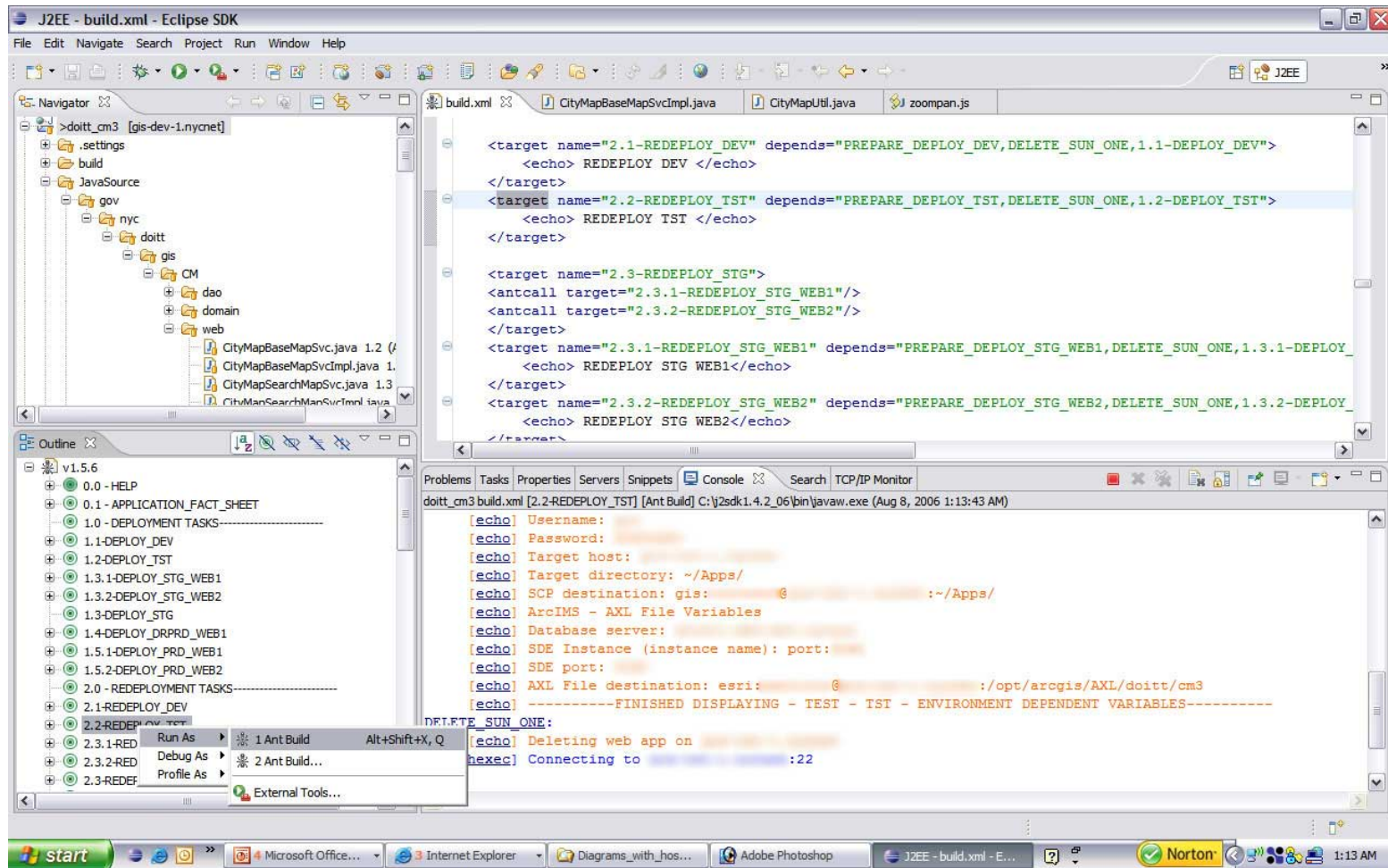
Issues with Current SDLC Model

- Hosting multiple application silos
- Data duplication – maintenance issues
- Duplication of efforts
- Cost, project duration
- Proprietary APIs
- Point-to-Point integration
- Change Management: change is slow

Issues with Current SDLC Model

- Increasing demand for services: City Agencies want new applications built that are better, faster
- Increasing Complexity, 44 servers to manage
- Islands of information: multiple versions of same data
- Code reuse: disparate versions of code base
- Time to deployment
- Learning Curve
- Change Management: change is slow

Automated Deployment Scripts



AXL deployment

The screenshot displays the Eclipse IDE interface with the following components:

- Navigator:** Shows a project structure for 'doitt_cm3' with sub-projects like 'gis' and 'CM'. The 'CityMapBaseMapSvcImpl.java' file is selected.
- Outline:** Lists various Ant targets such as '2.1-REDEPLOY_DEV', '3.0 - ArcIMS ADD AXL TASKS', and '3.2-AIMS_ADD_AXL_TST'.
- Editor:** Displays the 'build.xml' file with the following XML content:


```

      <antcall target="AIMS_CREATE_MAP_SERVICE"/>
      </target>

      <target name="3.2-AIMS_ADD_AXL_TST" depends="PREPARE_DEPLOY_TST">
        <var name="build_action" value="AIMS_ADD_AXL_TST"/>
        <var name="build_changerequest" value="not needed"/>
        <antcall target="AIMS_CREATE_MAP_SERVICE"/>
        <echo> Added AXL TO TST</echo>
      </target>

      <target name="3.3.1-AIMS_ADD_AXL_STG_WEB1" depends="PREPARE_DEPLOY_STG_WEB1">
        <input message="Are you sure you add the AXL to STG-WEB1???" validargs="y,n" addproperty="do.continuation" type="checkbox"/>
        <condition property="do.abort">
          <equals arg1="n" arg2="\${do.continuation}"/>
        </condition>
        <fail if="do.abort">Build aborted.</fail>
      </target>
      
```
- Console:** Shows the output of the Ant build process:


```

      <terminated> doitt_cm3 build.xml [2.2-REDEPLOY_TST] [Ant Build] C:\j2sdk1.4.2_06\bin\javaw.exe (Aug 8, 2006 1:13:43 AM)

      [echo] ArcIMS Map Service Name: DOITT_CM3
      [echo] Database Connection Variables
      [echo] Database Connection:
      [echo] JNDI name:
      [echo] Sun ONE Web Server Wdeploy variables
      [echo] Target Instance:
      [echo] Application WDEPLOY URL: /doitt/cm3
      [echo] -----FINISHED COMMON VARIABLES-----

      PREPARE_DEPLOY_TST:
      [echo] Environment: TEST - IST

      DISPLAY_ENV_DEP_VAR:
      [echo] -----TEST - IST - ENVIRONMENT DEPENDENT VARIABLES-----
      [echo] GeoSupport Variables
      [echo] GeoSupport URL: gcois://
      [echo] SCP Variables
      
```

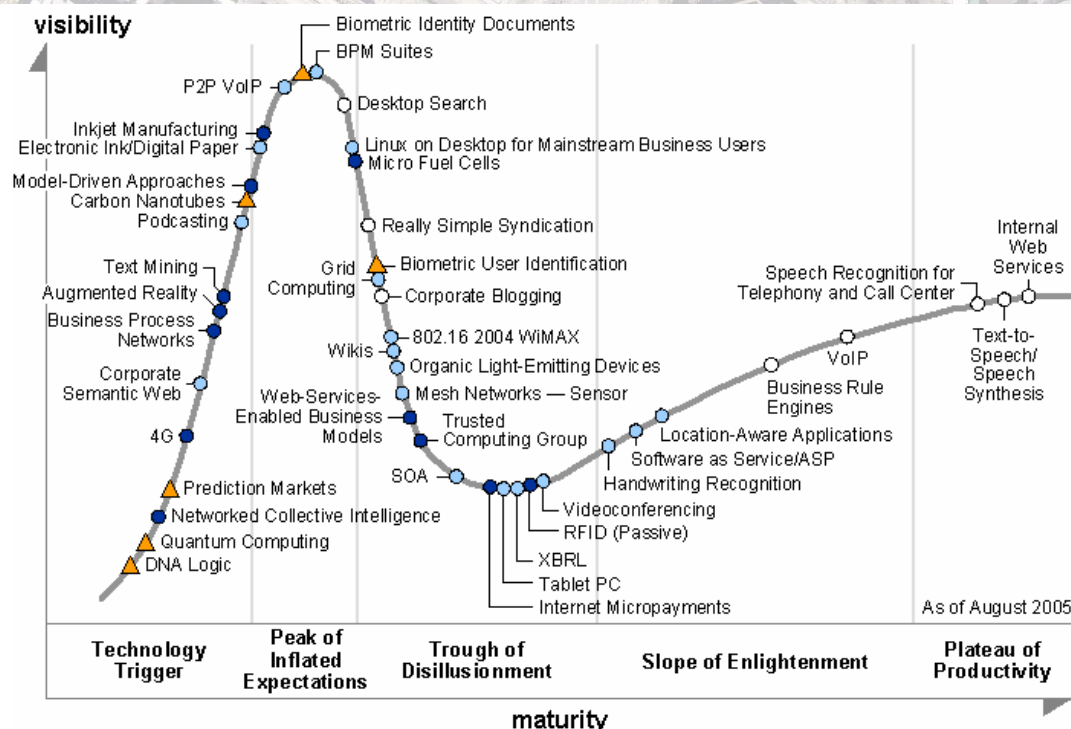
Why SOA? A Strategic Decision

- Agility
- Flexibility
- Enables innovation
- Exposes GIS functionality to non-GIS users

Benefits of SOA

- Reduce time to market for new services
 - Focus on delivering unique business logic
 - Enable the creation of composite applications by integrating one or more services
 - Allow services to be choreographed using BPM
- Reduce total cost of ownership of IT infrastructure and business services
 - Shared service infrastructure
- Business driven application development

SOA Gartner's Hype Cycle



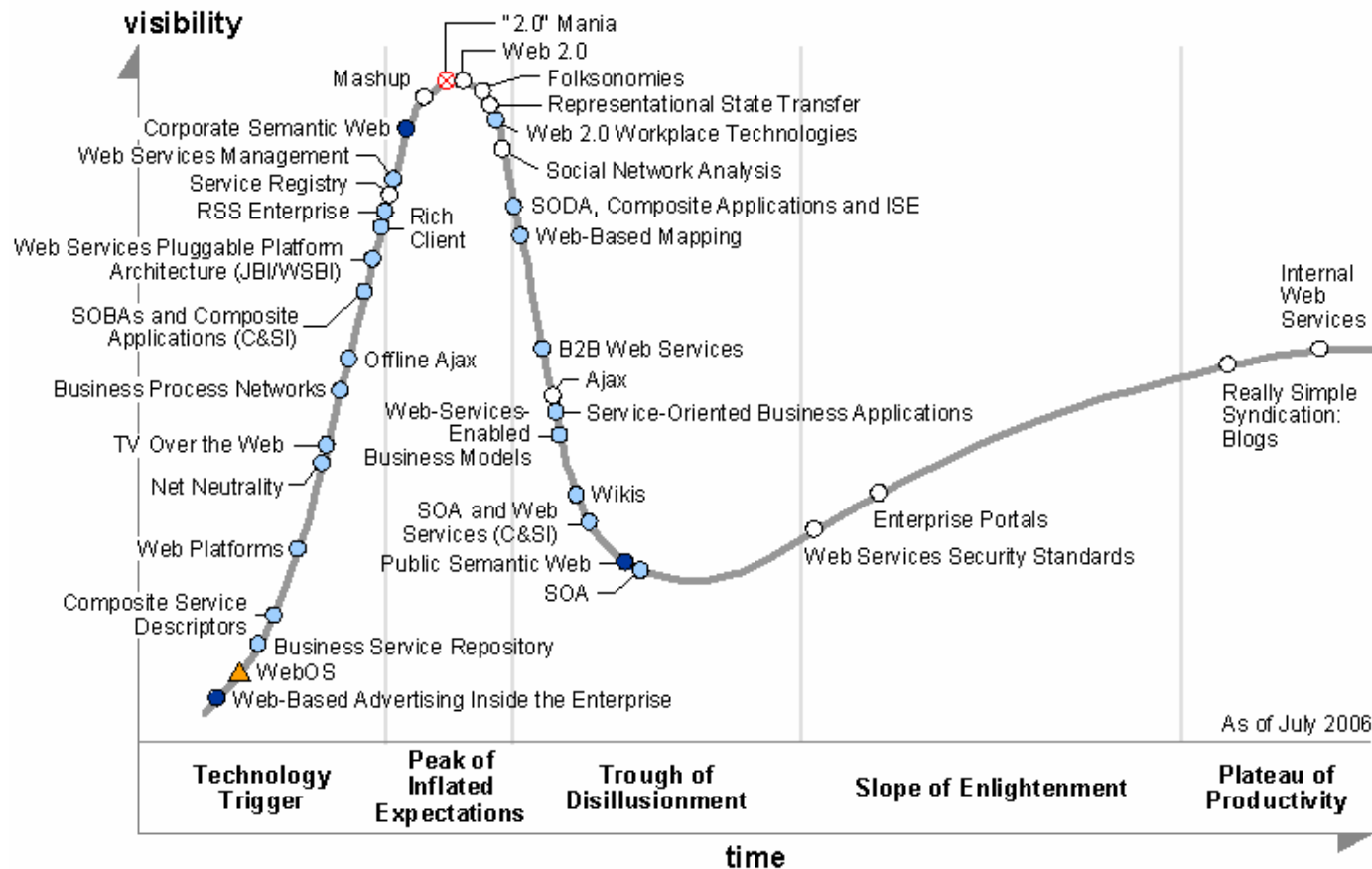
Plateau will be reached in:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

Acronym Key

- | | |
|--|--|
| 4G fourth generation | SOA service-oriented architecture |
| ASP application service provider | VoIP voice over Internet Protocol |
| BPM business process management | WiMAX Worldwide Interoperability for Microwave Access |
| P2P peer to peer | XBRL Extensible Business Reporting Language |
| RFID radio frequency identification | |

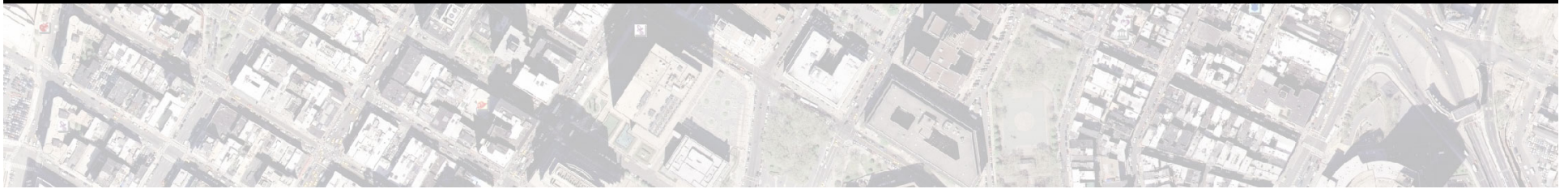
SOA Gartner's Hype Cycle



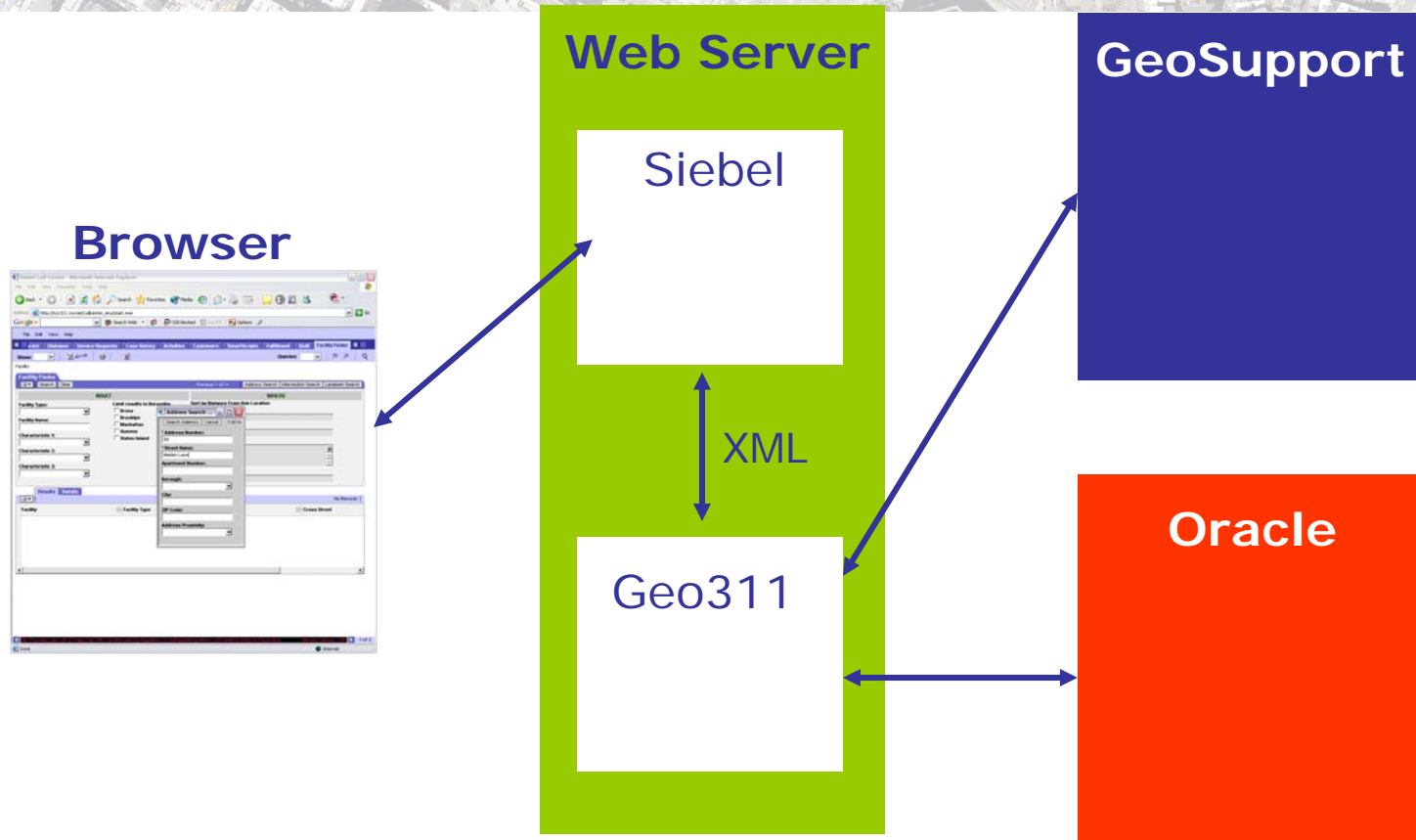
Source: Gartner (July 2006)

311 Citizen Service Center

- 311 provides a single point of contact for all non-emergency City services, and is available to residents, City businesses, and visitors.
- The list of services and information 311 provides is constantly expanding, and includes information on hundreds of services, agencies, and events. People call 311 for:
 - Recycling schedule and information requests
 - Missed garbage collection complaints
 - Alternate Street Parking Rules
 - Noise complaints
 - Blocked driveway complaints
 - CFC/Freon pickup requests
 - 311 Call Taker compliments
 - Landlord-related complaints
 - Information about health insurance options for small businesses and individual



Geocoding Service



XML Based Request/Response over http

Sample XML Request

IDENTIFY ADDRESS request:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<geo311 version="2.0">
```

```
  <request type="identify">
```

```
    <ADDRESS>
```

```
      <BOROUGH> </BOROUGH>
```

```
      <ADDRESSNUM>23</ADDRESSNUM>
```

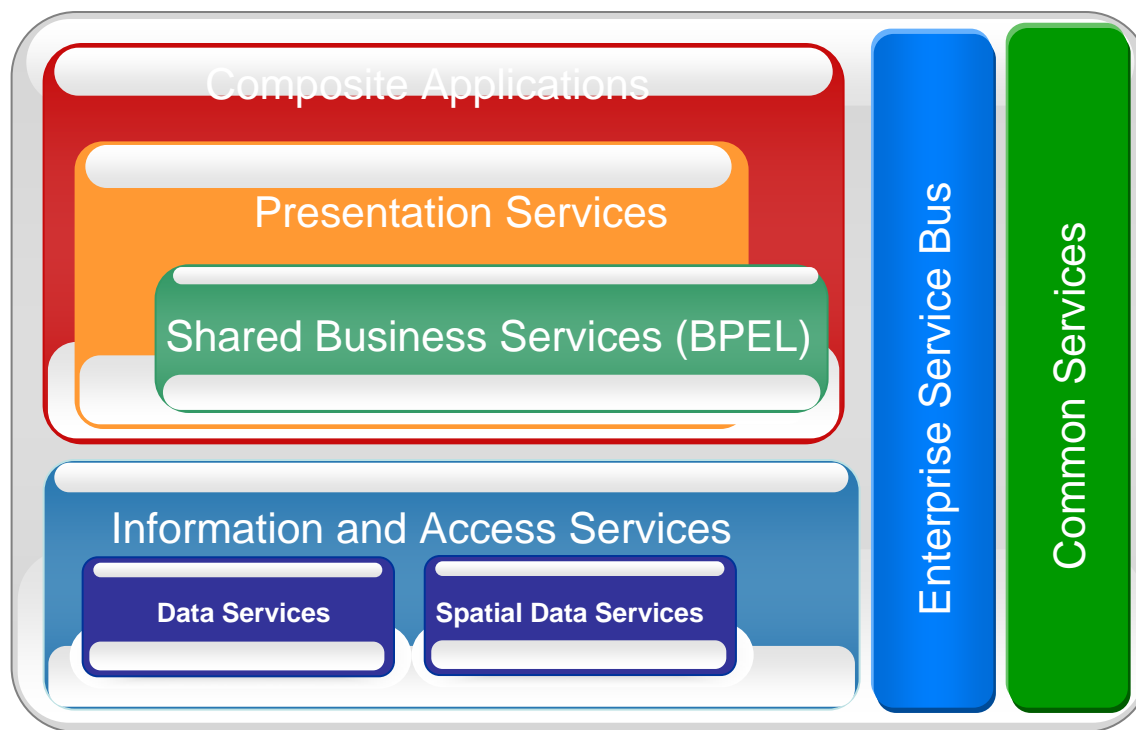
```
      <STREETNAME>2nd Ave</STREETNAME>
```

```
    </ADDRESS>
```

```
  </request>
```

```
</geo311>
```

SOA



Based on slide by BEA

Current Status

- Project approved
- System architecture reviewed
- Intranet infrastructure built
 - Undergoing security scans
- Goes live: August 2006

Next Steps

- Develop granular APIs/web services:
 - Address validation/Geocoding
 - Building information
 - Geopolitical data (geospatial data services)
- Expose them as web services
- Create composite services
- Use on internal applications
- Publish on Citywide UDDI directory (when available)

Questions?

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