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How to Operate a Spatial Data Infrastructure Efficiently

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Topics for today

Challenges

- Multiple Datasources
- Separated GIS Data
- Support for Raster Data, 3D, LIDAR
- Online Services & Crowd Sourcing
- Sensor Technologies

Technologies

- Spatial Databases
- Cloud Computing
- Engineered Systems
- Process Management

Results

- Reduced Cost
- Faster Solutions
- Better Availability
- Higher Scalability

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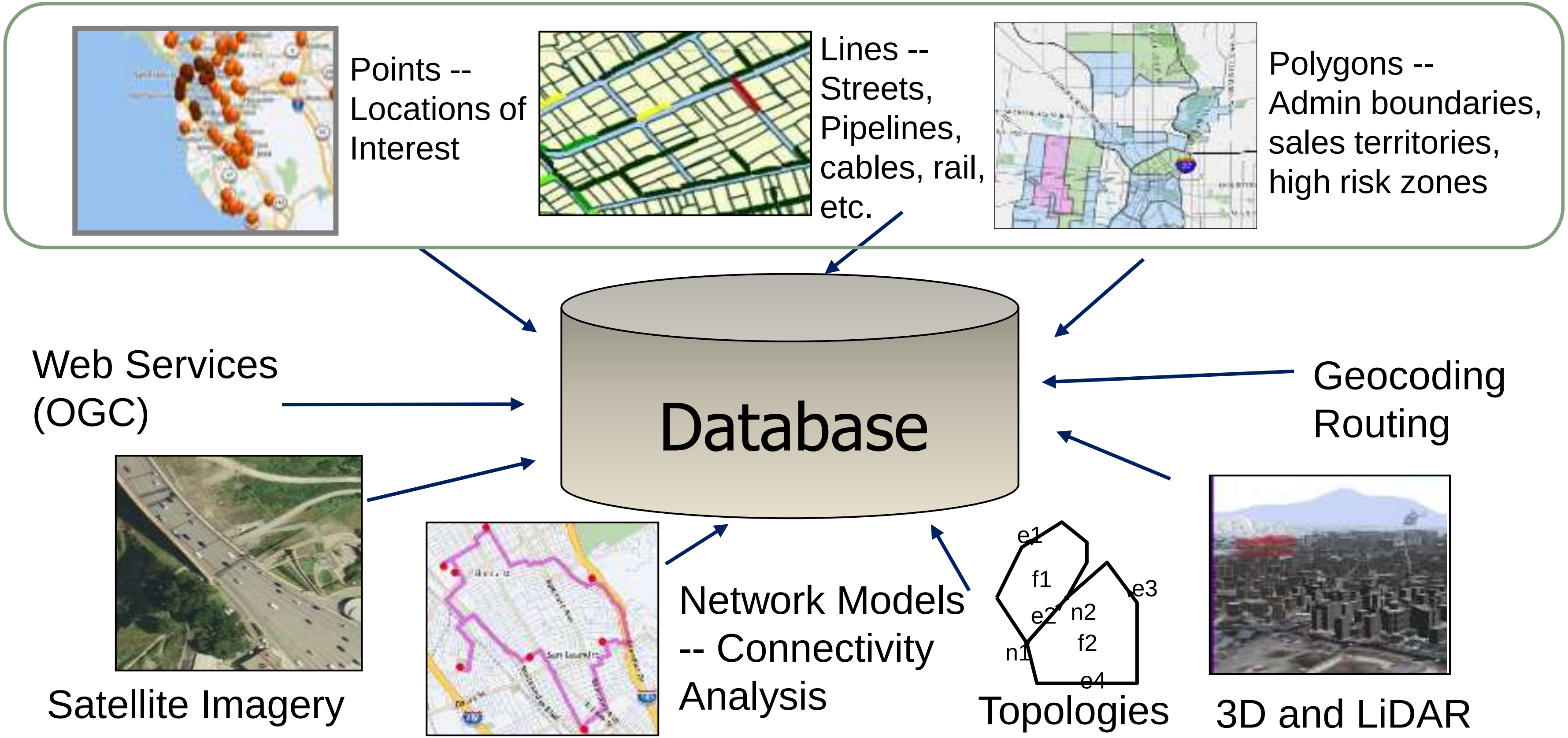
Integrate all spatial content



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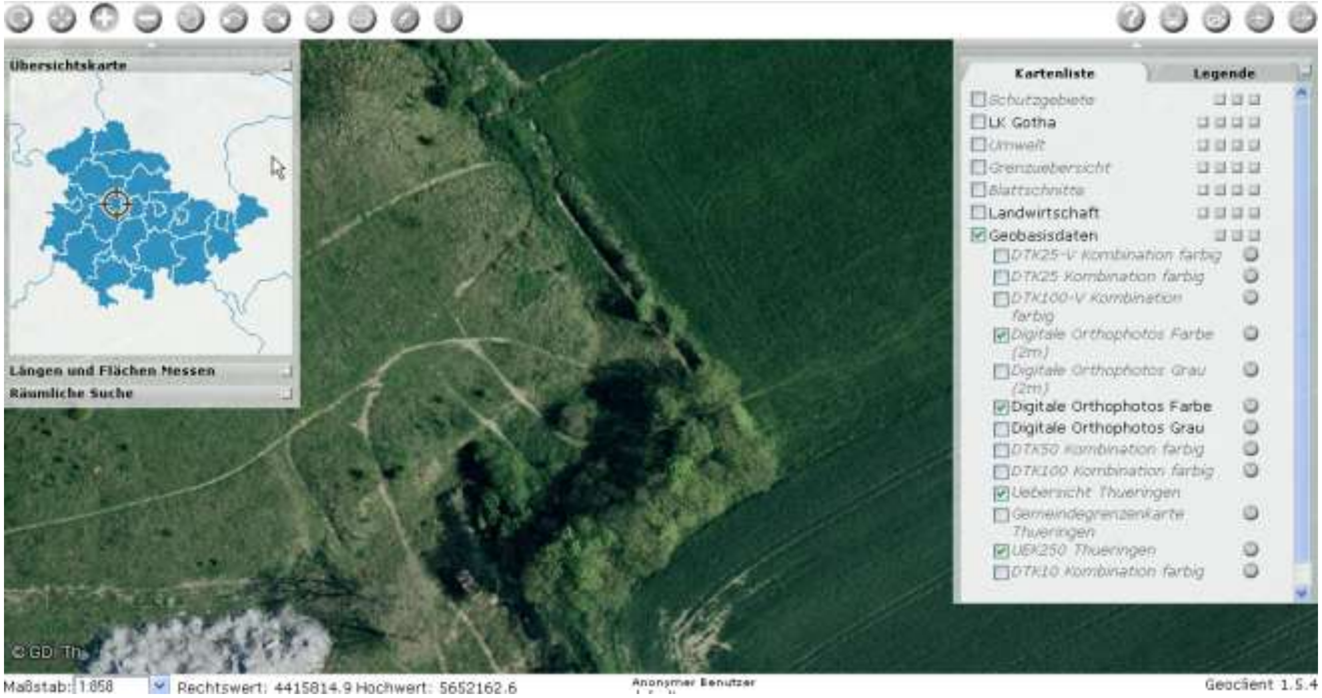
Customer Case

geoproxy Thuringia, INSPIRE-Services



implemented by

 | | http://www.oracle.com/lang/de/referenzen/profile/customer_snapshot_thueringen_geoproxy_de.pdf

Customer Case (3D)

Solaratlas Berlin

- 3D City Model of the City of Berlin, implemented by TU Berlin

Estimated Solar Potential

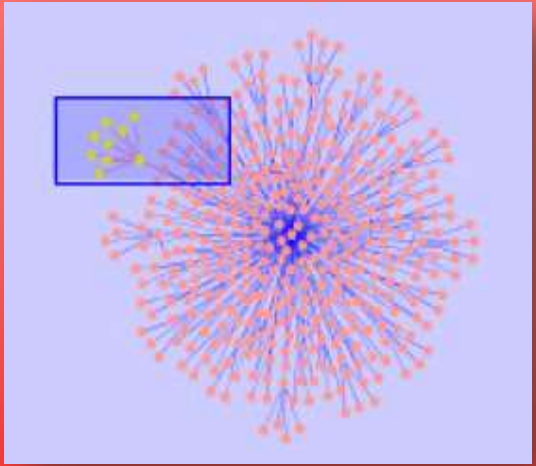
CityGML Standard in 3DCityDB

recognized with Oracle Spatial Excellence Award

Integrated Graph Analytics

Uncover Social Relationships:

```
SELECT c_id, relationship
FROM Customers
WHERE SEM_RELATED
(friends,
'rdfs:subClassOf',
'current_customer',
'Social_ontology' = 1)
AND SEM_DISTANCE() <= 2;
```



=> Broad user community and all BI tools can leverage Data Mining

=> Parallelism dramatically and transparently improves performance

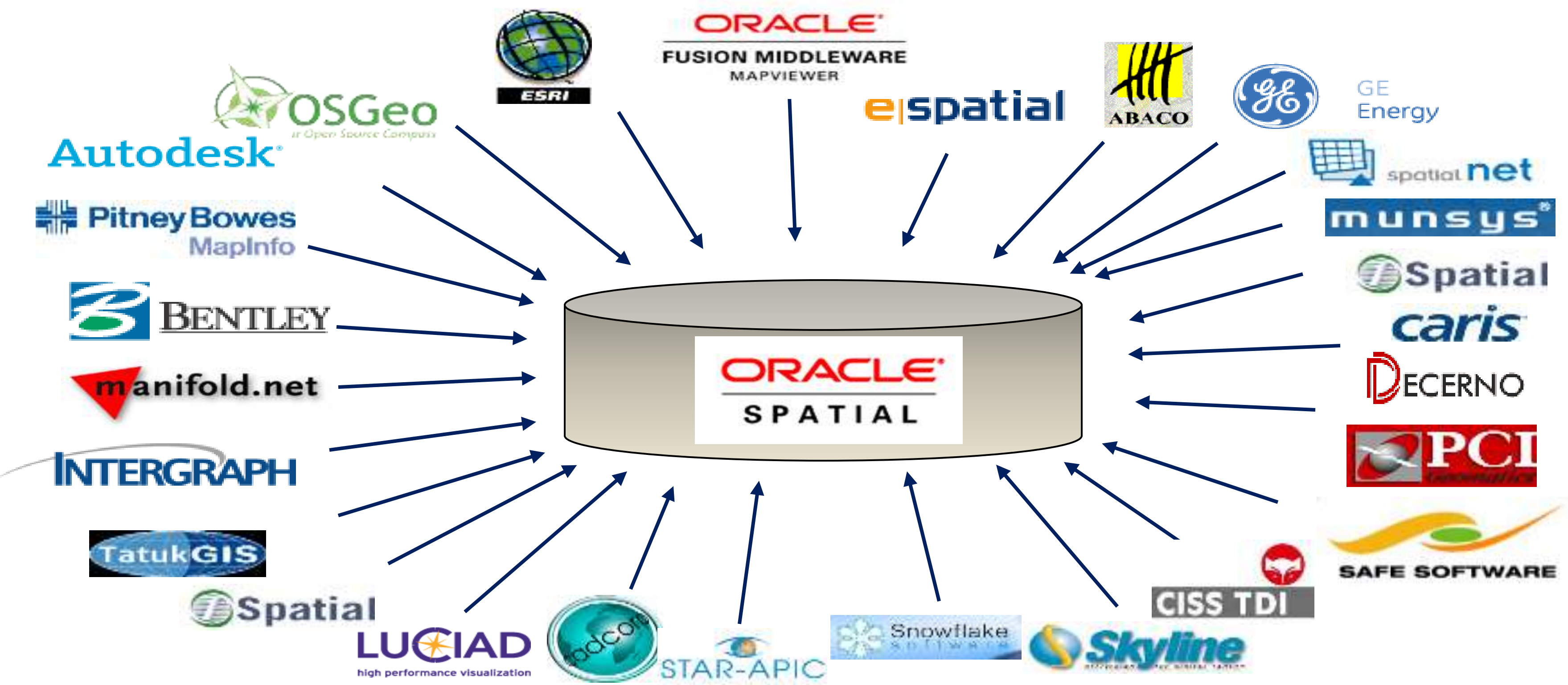
Seeking Order through Standards

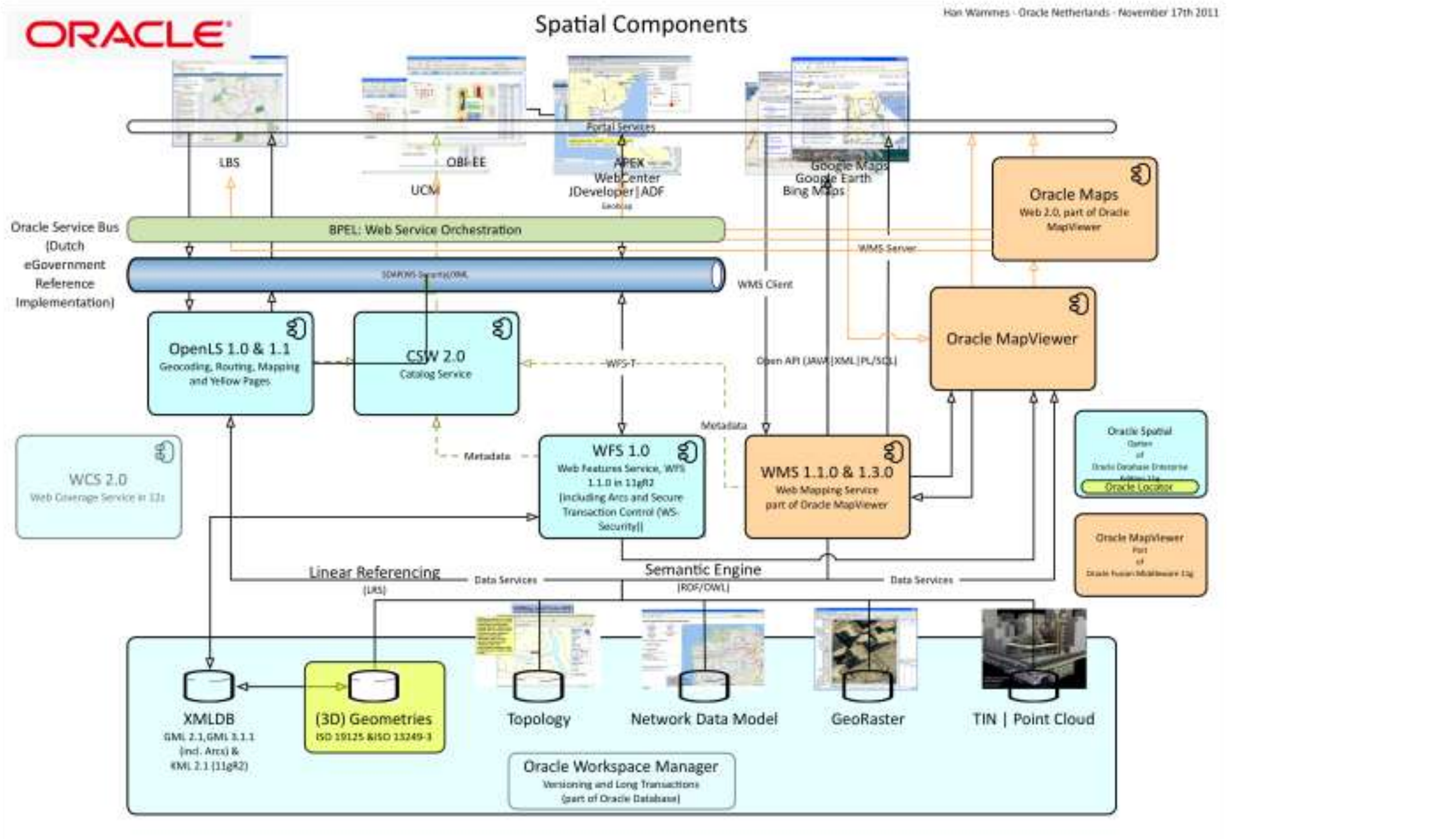
- ISO
  - TC 211
  - TC 204
- Open Geospatial Consortium
  - Simple Features
  - GML, KML
  - Web Services
- De-facto Standards
  - SHP, MGE, DXF
- Java, .NET, Flash

"We intend to complete development for a new suite of tools for developing the next generation of applications. And there are several interesting things with the next generation of tools, but perhaps the single most interesting thing about them is that for the first time a major application company is going to commit to an absolute standards-based development environment.“

– Larry Ellison

Open and Interoperable





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Spatial Components
Han Wammes - Oracle Netherlands - November 17th 2011
Portal Services
LBS
OBI EE
UCM
APEX
WebCenter
JDeveloper | ADF
Google Maps
Google Earth
Bing Maps
Oracle Service Bus (Dutch eGovernment Reference Implementation)
BPEL: Web Service Orchestration
WMS Server
WMS Client
Oracle Maps
Web 2.0, part of Oracle MapViewer
Oracle MapViewer
OpenLS 1.0 & 1.1
Geocoding, Routing, Mapping and Yellow Pages
CSW 2.0
Catalog Service
WFS-T
Open API (JAVA|XML|PL/SQL)
Metadata
WCS 2.0
Web Coverage Service in 12c
WFS 1.0
Web Features Service, WFS 1.1.0 in 11gR2 (including Arcs and Secure Transaction Control (WS-Security))
WMS 1.1.0 & 1.3.0
Web Mapping Service part of Oracle MapViewer
Oracle Spatial
Oracle Locator
Oracle MapViewer
Linear Referencing
(LRS)
Data Services
Semantic Engine
(RDF/OWL)
Data Services
XMLDB
GML 2.1, GML 3.1.1 (incl. Arcs) & KML 2.1 (11gR2)
(3D) Geometries
ISO 19125 &ISO 13249-3
Topology
Network Data Model
GeoRaster
TIN | Point Cloud
Oracle Workspace Manager
Versioning and Long Transactions (part of Oracle Database)
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Recommendations

- consolidate various kinds of Geospatial data sources into a consistent database and business process infrastructure
  - reduce operational cost, reduce training cost
  - leverage infrastructure capabilities – security, availability, ...
  - leverage existing IT tools and skills
  - use of Spatial data in business processes
  - simplify solution development
- design for scalability
  - anticipate increasing load from online services, crowd sourcing, ...
- use open standards
  - protect investment, use best-of-breed components

Next level: Cloud Computing for SDIs

- reduce management cost by using a central hosted platform
- reduce CapEx by using hosted services
- achieve elasticity to address variable load
- reduce time-to-market through self-service and higher degree of automation

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Running SDIs on a Cloud Infrastructure

Deployment Model

Private

Public

Hybrid

Service Model

Applications
(SaaS)

Platform
(PaaS)

Infrastructure
(IaaS)

Operating Model

Customer Owns
Customer Operates

Customer Owns
Provider Operates

Provider Owns
Provider Operates

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Customers Have a Choice of Clouds

Private, Public, Hybrid

Exclusive

Shared by multiple organizations

- CapEx & OpEx
- Lower total costs
- Control & visibility
- Multiple apps sharing resources

- Cloudbursting – overdraft for peak loads
- Dev/Test & production
- B2B integration

- OpEx
- Fast & inexpensive to start
- Outsourced services
- Multiple tenants sharing resources

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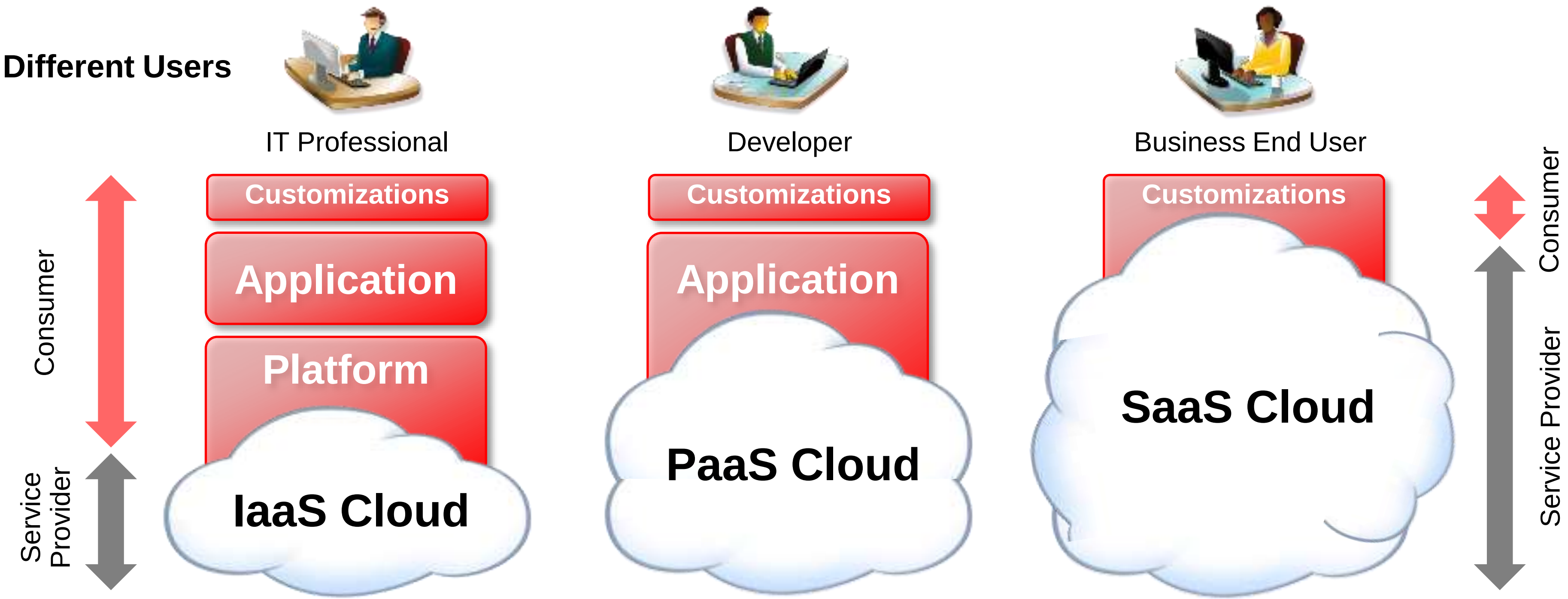
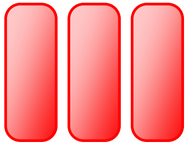
Customers Have a Choice of Clouds

IaaS, PaaS, SaaS

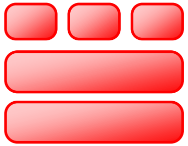


Flexible Adoption – Roadmap to Cloud



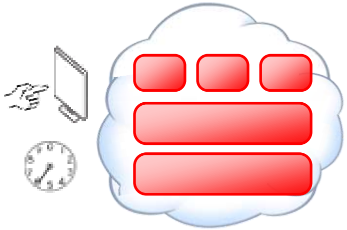
Traditional Silos

- Physical
- Dedicated
- Static
- Heterogeneous
- Disparate Spatial Data



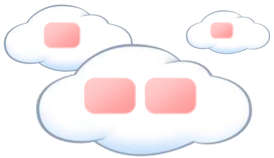
Consolidated

- Virtual
- Shared platform
- Dynamic
- Standardized platform & infrastructure
- Integrated Spatial Data



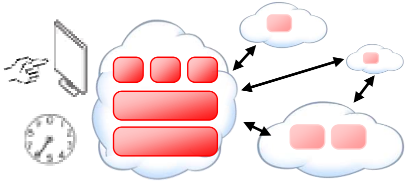
Private Cloud

- Self-service
- Auto-scaling
- Metering & chargeback
- Capacity planning



Public Cloud

- Specialized
- Shared
- Standardized



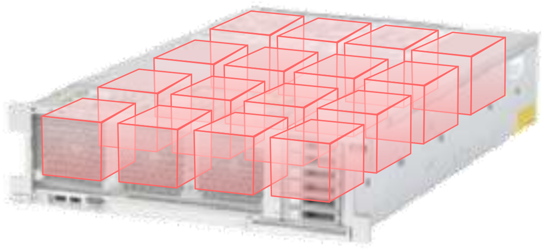
Hybrid Cloud

- Federation across public & private clouds
- Interoperability
- Cloudbursting

Start with consolidation • Extend to private cloud • Use public cloud where appropriate

Server Virtualization and Clustering Deliver Resource Pooling and Elastic Scalability

Server Virtualization
Make one physical resource look like many



Clustering
Make many physical resources look like one

Both server virtualization and clustering are key technologies for cloud

Exadata, Exalogic, SPARC SuperCluster

Extreme Performance, Engineered Systems

- Unmatched performance, simplified deployment, lower total cost
- Building blocks for consolidation and cloud computing

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Customer case: US Census Bureau

Exadata for Specialist Geospatial Applications

- US Census provide high quality data about US people and economy
- TIGER: digital map of US (and Puerto Rico & island areas)
- MAF: master address file including history
- MAF/TIGER are mission critical systems on Oracle Spatial supporting Census' statistical programs
- >500 users maintaining spatial data concurrently
- 1:1 migration from existing environment to Exadata
  – no further optimization on Exadata yet (as of May 2012)

Processing Constraints

- Complex Spatial Database, quite large, mission critical
- Growing at 10-15% annually
- Demands from user community for spatial and temporal accuracy and quality
- Stringent processing deadlines remain, so GEO is processing more data in shorter time
- Oracle database on >100 nodes, scores of applications
- Cache fusion

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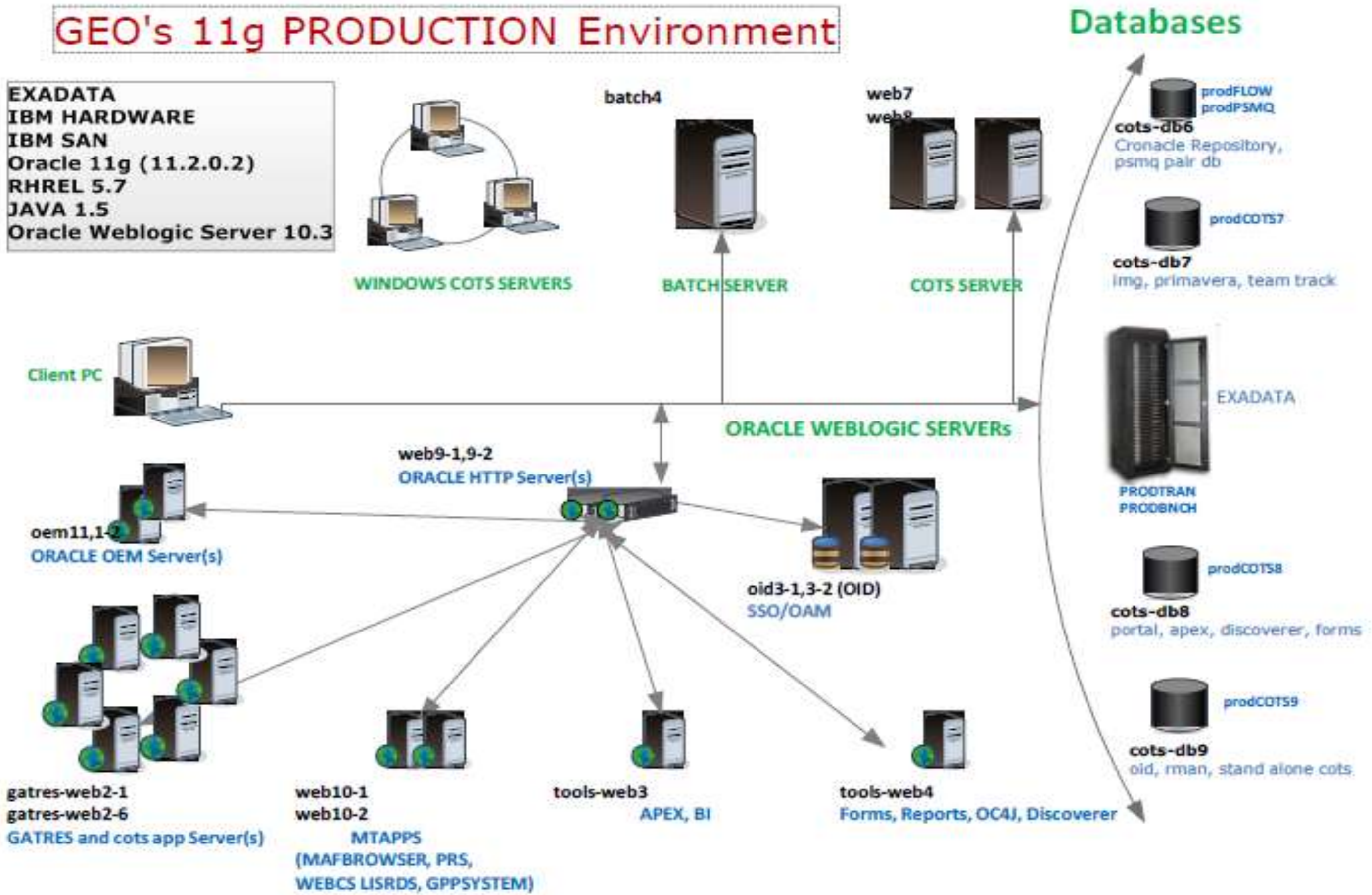
GEO's 11g PRODUCTION Environment
Databases
EXADATA
IBM HARDWARE
IBM SAN
Oracle 11g (11.2.0.2)
RHREL 5.7
JAVA 1.5
Oracle Weblogic Server 10.3
WINDOWS COTS SERVERS
batch4
BATCH SERVER
web7
COTS SERVER
Client PC
ORACLE WEBLOGIC SERVERs
web9-1,9-2
ORACLE HTTP Server(s)
oem11,1-2
ORACLE OEM Server(s)
oid3-1,3-2 (OID)
SSO/OAM
gatres-web2-1
gatres-web2-6
GATRES and cots app Server(s)
web10-1
web10-2
MTAPPS
(MAFBROWSER, PRS,
WEBCS LISRDS, GPPSYSTEM)
tools-web3
APEX, BI
tools-web4
Forms, Reports, OC4J, Discoverer
prodFLOW
prodPSMQ
cots-db6
Cronacle Repository,
psmq pair db
prodCOTS7
cots-db7
img, primavera, team track
EXADATA
PRODTRAN
PRODBNCH
prodCOTS8
cots-db8
portal, apex, discoverer, forms
prodCOTS9
cots-db9
oid, rman, stand alone cots

Benefits Realized so far

- Creation of a new data set – two times faster
- Indexing - over two times faster
- Partial product update – four to over six times faster
- Data cleansing – over twenty times faster
- Compression – over factor two to four times for data

- all results based on a 1:1 migration without further optimization
- processing time is total elapsed time, not only determined by database

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Benefits Realized so far

- Out of the box solution helped advance schedule by months
- One vendor, facilitated one comprehensive solution
- Larger queue sizes for batch jobs without cache fusion
- Reduction in overall calendar time for projects
- DSF Refresh: 98% completed in 6 days versus 3 weeks
- Benchmarking progressing at <50% legacy time

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Recommendations

- develop a vision to move to cloud computing
  - save operational cost, improve time-to-market
- start with file and database consolidation
  - reduce complexity, improve security & availability
- consider engineered systems for consolidation
  - save operational cost, reduce deployment time, improve scalability
- integrate geospatial data in all layers of the stack
  - simplify SW development, improve security & availability
- use standards wherever possible
  - protect investments, improve interoperability

Hardware and Software

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Engineered to Work Together

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“Oracle continues its remarkably consistent strategy of including spatial capabilities within its database and application deployment platform. … Oracle offers a wide range of spatial capabilities across its product line that provide foundation-level SIM capabilities for enterprise applications – including industry-specific applications.

Oracle maintains a dominant position as the spatial data repository for medium-sized and large spatial systems. …”

David Sonnen and Dan Vesset

IDC Analyze the Future

Source: IDC #224740. Worldwide Spatial Information Management 2010-2014 Forecast and 2009 Vendor Shares

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Oracle Strategy

Complete Stack

- Best-of-breed
- Open
- Vertical Integration
- Extreme Performance
- Engineered Systems

Complete Customer Choice

- On-premise
- Private Cloud
- Public Cloud
- Hybrid Cloud

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