An Upgrade Project of Very Large and Complex Enterprise GIS

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Agenda

- Corporate Profile
- About the Project
- Former System overview
- Key Points of the Project
- Project Operation Summary
- Reviews
- Conclusion

Corporate profile

Corporate Profile

Our Customer

- Osaka Gas Co. , Ltd.
  - Started business operations in 1905
  - Serving 6.9 million natural gas customers in the Kansai Region (25% of all gas sold in Japan)
  - total pipeline length: 58,600km

Corporate Profile

Ourselves

- OGIS-RI Co. , Ltd.
  - Started business operations in 1983
  - Subsidiary company of Osaka Gas
  - Business contents
    - IT Consulting
    - Information Strategy Drafting
    - Systems Integration
    - Systems Development
    - Network Construction
    - Support Services
    - Systems Operation/Maintenance

Osaka Gas and GIS

1983

- Start GIS Project

1986

- The first mapping system launched
- Mainframe with an Exclusive Graphic Display Terminal

1995

- Migrate to UNIX & PC

2003

- Migrate to ArcGIS

System History of the Architecture side

IBM GFIS

- 1986 - 2002

ESRI
ArcGIS 8.2

- 2003 - 2005

ArcGIS9.0

- 2006 - 2007

ArcGIS9.2

- 2008 -

History of ArcGIS in Osaka Gas (2003 - 2005)

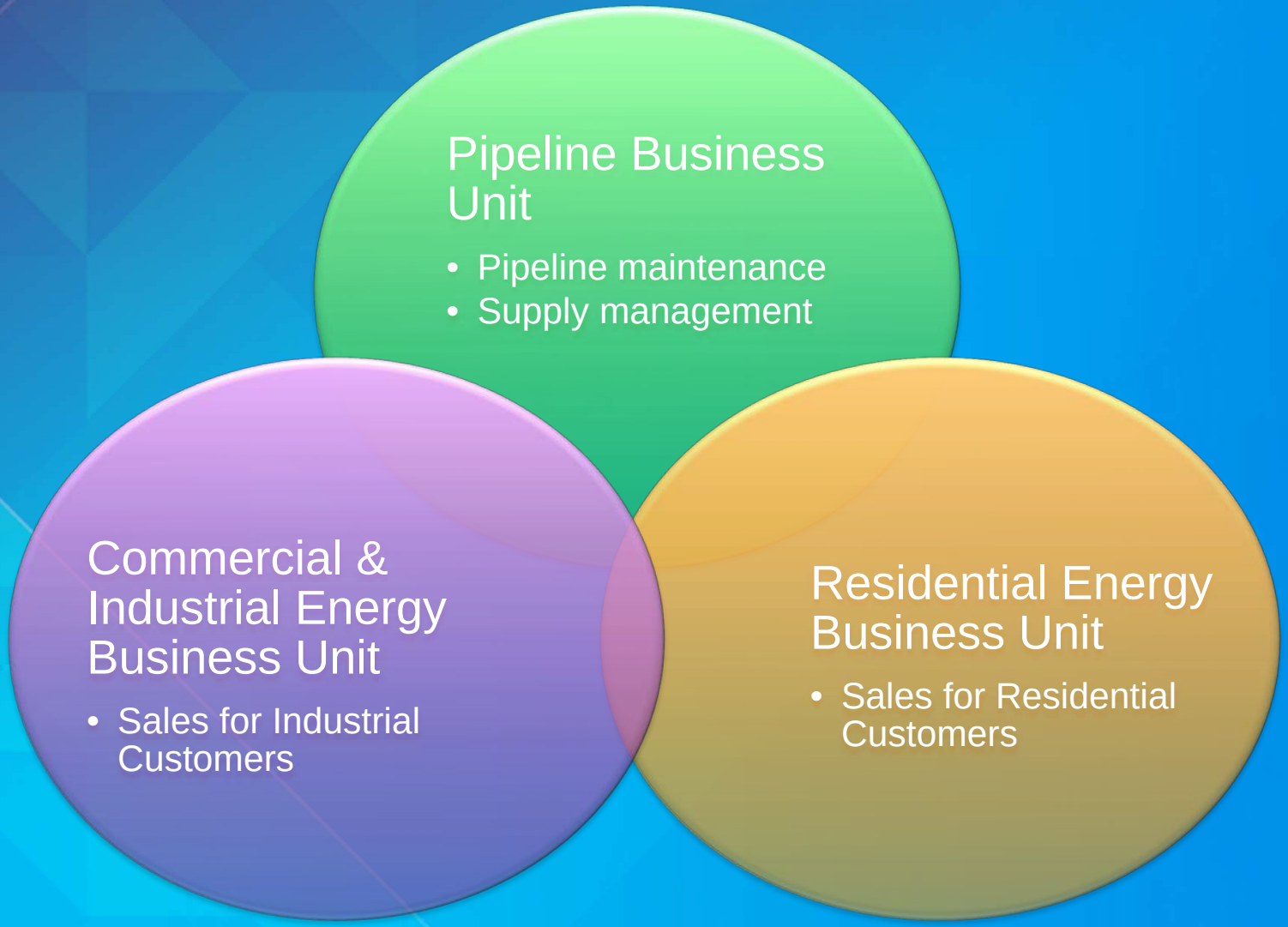
- ArcGIS 8.2
  - The 1st Generation
  - Since 2003 -
  - Migrate from IBM's GFIS
  - Desktop & ArcIMS apps
  - For the Pipeline Business Unit
- ArcGIS 9.0
  - 1.5th Generation
  - Since 2005 -
  - Launch ArcGIS Server apps
  - Desktop, ArcIMS, and ArcGIS Server
  - Start providing for the Residential Energy Business Unit

2004 SAG Award Winner

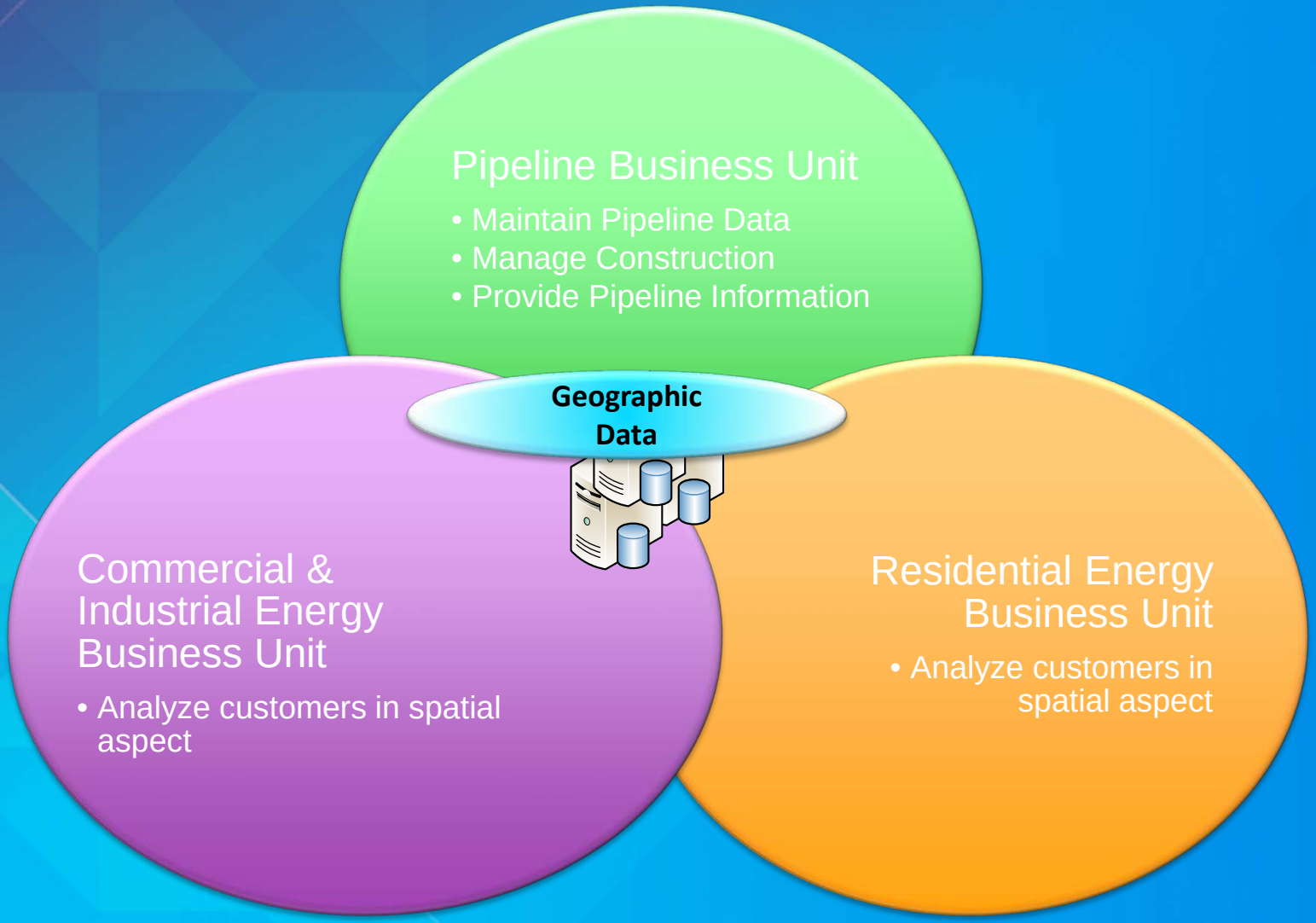
History of ArcGIS in Osaka Gas (2008 - 2014)

- ArcGIS 9.2
  - 2nd Generation
  - Since 2008 -
  - Migrate from ArcIMS to ArcGIS Server
  - Desktop, Server, Engine apps
- ArcGIS 9.3.1&10.0
  - 2.5th Generation
  - Since 2009 -
  - Mash up with GoogleMaps API
  - Start providing for the Commercial & Industrial Energy Business Unit
  - Disaster management system has Launched

Business portfolio in Osaka Gas



Use case of GIS in Osaka Gas



About the Project

Goal of this Project

- Upgrade all GIS Applications / geodatabases to ArcGIS 10.2

- Improve performance
- Reduce operation cost
- Build up the Business Continuity Environment

Critical factors

- Hardware/software support expiration
  - Hardware
    - Windows Servers
    - UNIX(AIX) Servers
  - Operating system, Software
    - Citrix CPS4.5(Mar, 2013)
    - MS Windows Server 2003(Jul, 2015)
    - ArcGIS 9.2 (Oct, 2012)

User Requirements

- Improve performance
  - Display maps
  - Identify features
- Support business continuity and disaster recovery management
  - Prepare for the tsunami that caused by the predicted Tokai earthquake and Tonankai earthquake
  - Utilize the Secondary Data Center at Kyoto

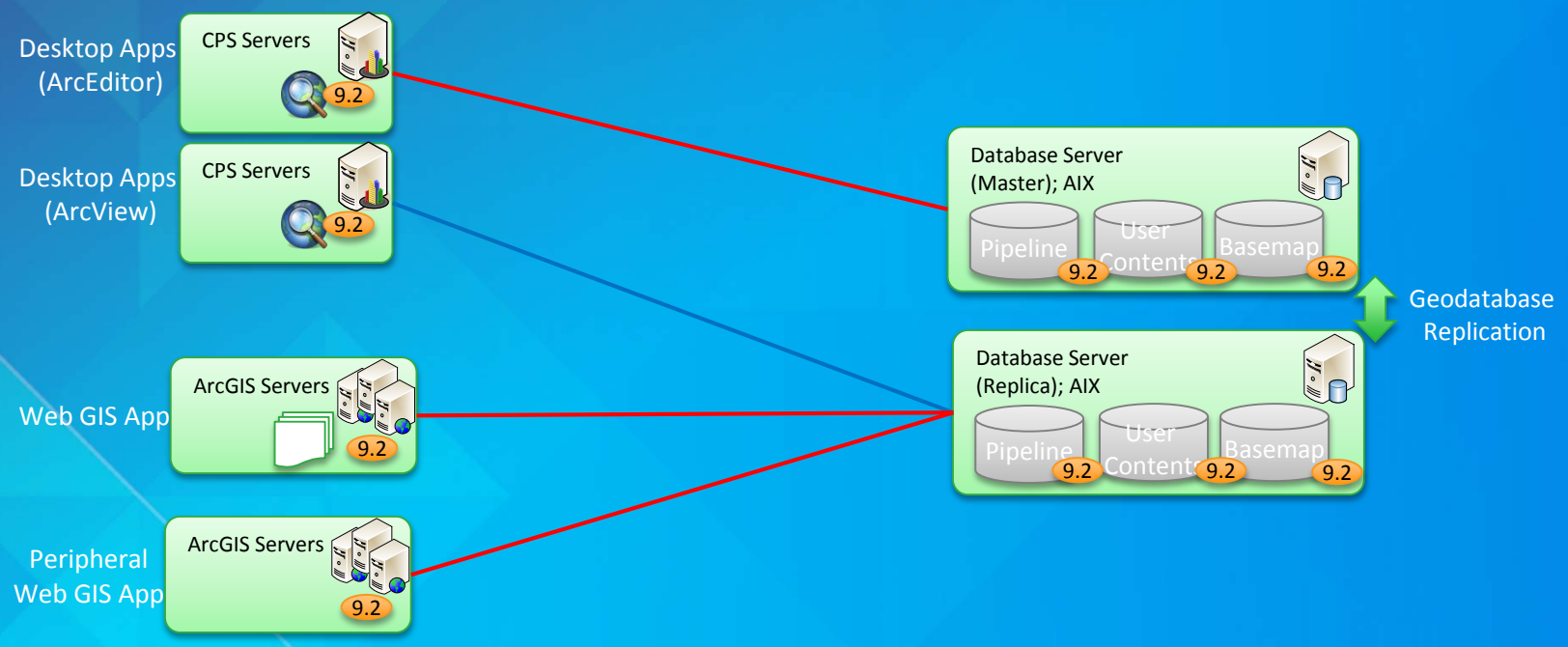
User Requirements(cont'd)

- Cost Reduction
  - Initial purchase cost
  - Operational cost
    - UNIX and Windows Servers
    - Data maintenance

Former System Overview

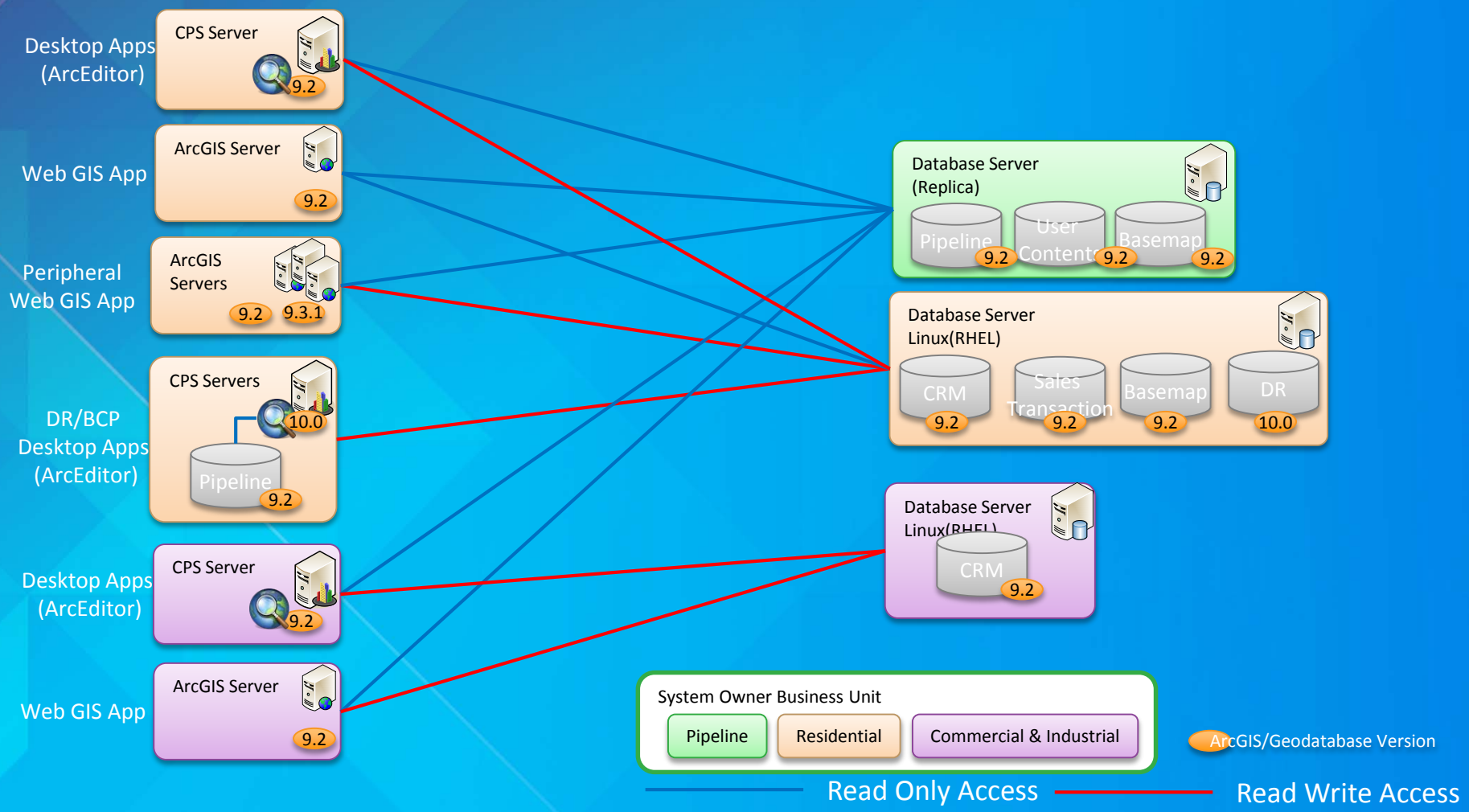
System Diagram (Overview)

Pipeline Business Unit's systems



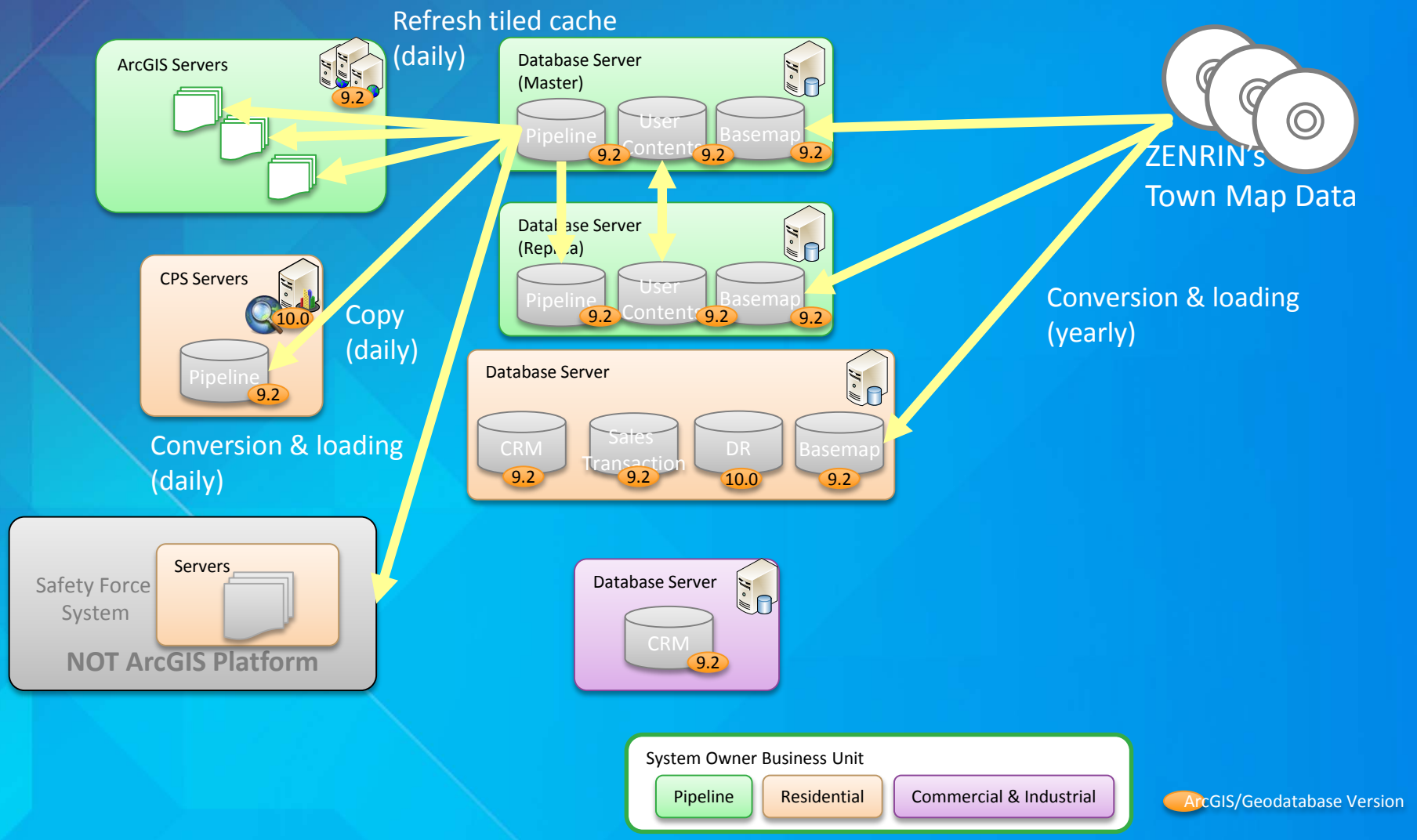
System Diagram (Overview) – cont'd

Residential Energy Business Unit and Commercial & Industrial Energy Business Unit's systems



System Diagram (Overview) – cont'd

Data Distribution



Problems to be solved

- Data duplication
  - Basemap data(ZENRIN's Town map data)
    - Annual data conversion costs double or more.
  - Pipeline data
    - Many copies in several servers
      - For "safety force team", for "residential sales team"…
      - Some systems GIS engine is *not ArcGIS family*, data must convert daily.
- No fault tolerability
  - Database server has been the single point of failure.
  - only rely on server's fault tolerability

Problems to be solved (cont'd)

- Too many applications, Too many physical servers…

Business Unit	Applications					Amount of Physical Servers
	Architecture Variation				Total	
	Desktop	Web	Other	Batch		
Pipeline	7	12	2	141	162	43
Residential Energy	5	7	3	132	147	16
Commercial & Industrial Energy	1	1	0	16	18	4
Total	13	20	5	289	**327**	**63**

Problems to be solved (cont'd)

- Application Performance improvement
  - Displaying map
  - Stability of tiled map cache refreshing
  - Identifying features performance
  - Printing map

Key points of the project

Key Points of upgrading

- Reduce running cost
  - Aggregate the duplicated geodatabases
  - Reduce the amount of physical servers
- Define our BCP policy
  - Decide the necessary and sufficient apps and database
  - Build up fault tolerant server & storage system
- Reduce rebuilding cost
  - Classify application's rebuild plan
    - Full rebuilding, Minimum migration, Recompilation only
- Performance improvement
  - Hybrid Map Cache Service
  - Load Balancing of Map services
  - Change user action for "Identify Feature" Command

Aggregation of the databases & servers

- Aggregate databases that referenced by multiple business units
  - Pipeline database
  - Basemap database
- Introduce the hardware virtualization technology
  - Microsoft Hyper-V technology

Business Continuity Plan

- BCP Policy
  - Prepare for the tsunami caused by the predicted Tokai earthquake and Tonankai earthquake.
  - Choose target database and applications efficiently.
  - Utilize Kyoto Backup Center
- Fault Tolerability
  - Active/Cold stand-by Server
  - Data transportation by Storage level replication (IBM's DS8000 functionality)

Classify rebuild plan of applications

Desktop apps & batch apps

- Former apps
  - Visual BASIC 6.0 or .NET framework 2.0
    - Visual studio 2005 or 2008
  - VBA customization style
  - ArcObjects batch program

- 10.2 apps
  - .NET Framework 3.5 SP1 or higher
    - Visual Studio 2010(C#)
  - “Add-in” customization style
  - Python batch scripting

- **Complete rebuild of applications**
- **But with specifications unchanged basically**
  - ✓ functionality
  - ✓ Usability

Classify rebuild plan of applications(cont'd)

Web GIS apps

- Former apps
  - Use custom JavaScript libraries
  - Use application-specified tiled cache files

- 10.2 apps.
  - Using ArcGIS API for JavaScript
  - Share tiled cache files

Application's specifications have not changed basically

✓ functionality

✓ Usability

Only performance issues are fixed.

Classify rebuild plan of applications(cont'd)

Custom SOAP web services & subscribing apps

- Former apps
  - .NET framework 2.0
  - Visual studio 2005 or 2008

- 10.2 apps
  - .NET Framework 3.5 SP1 or higher
  - Visual Studio 2010(C#)

APIs of the SOAP web services have not changed.

✓ Signature
✓ Arguments
✓ Return value

Minimize modification of service subscriber side.

Performance Improvement

- Hybrid Cache Service
  - Making Custom ArcGIS Map Service
    - Tiled-Cache service in smaller scale range(<=1:500)
    - Dynamic Map Service in bigger scale range(>1:500)
- Introduce NLB appliance
  - Check the appropriate amount of servers
    - GIS Server/Service
    - Print Server/Service
  - Load balancing ArcGIS REST Services with Network Load Balancer
- Change user action for “identify feature”
  - Former: Command “identify…” -> pick -> Search all layers
  - Now: Command “identify…” -> Choose “Target Layer” -> pick -> Search single layer

Project Operation Summary

Schedule Overview

Apr. 2013

Start Project

Mar. 2014

Partial Service-In

- Residential Energy Business Unit
- Commercial & Industrial Energy Business Unit

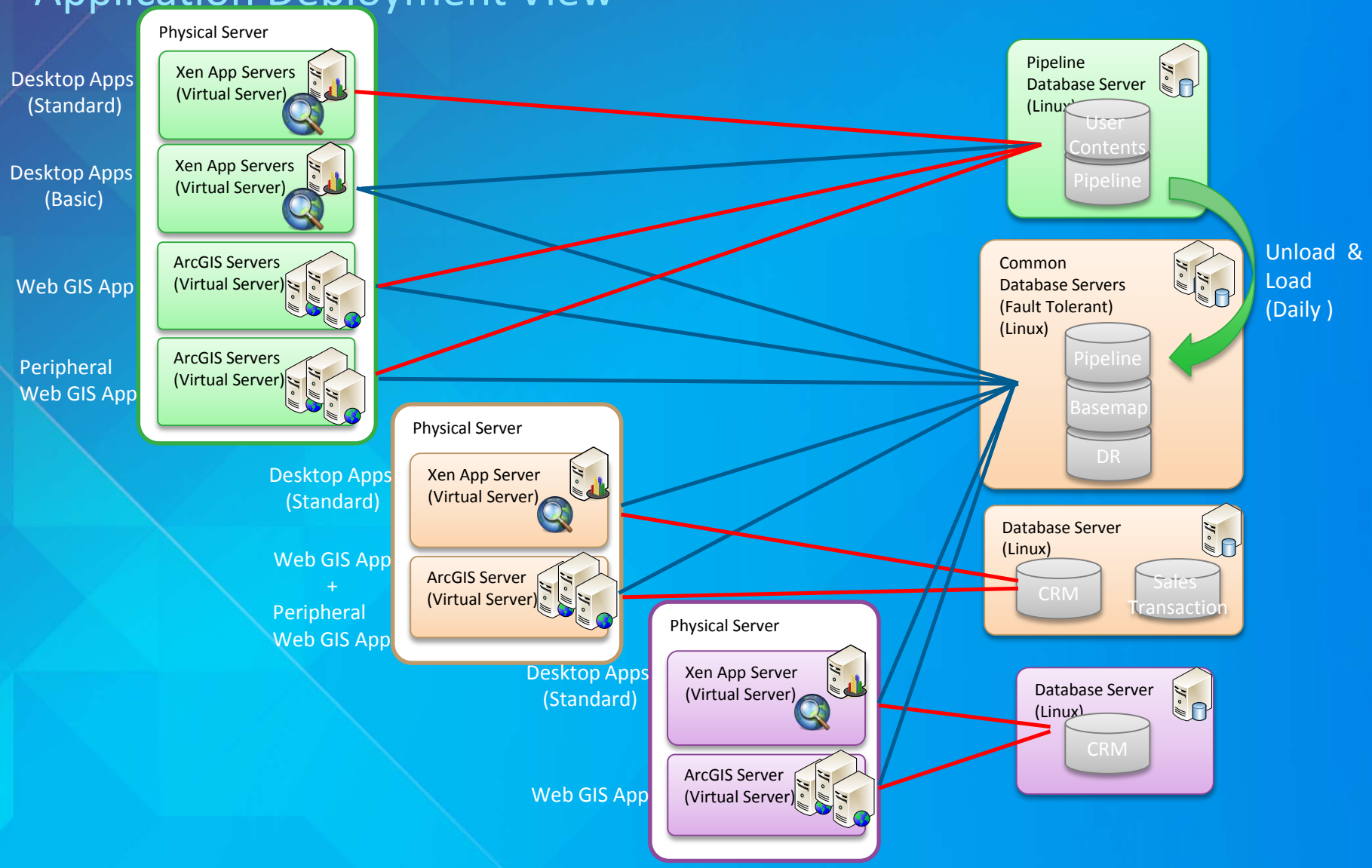
Jul. 2014

Finish project

- Pipeline Business Unit
- Fault tolerant & full-aggregated Databases

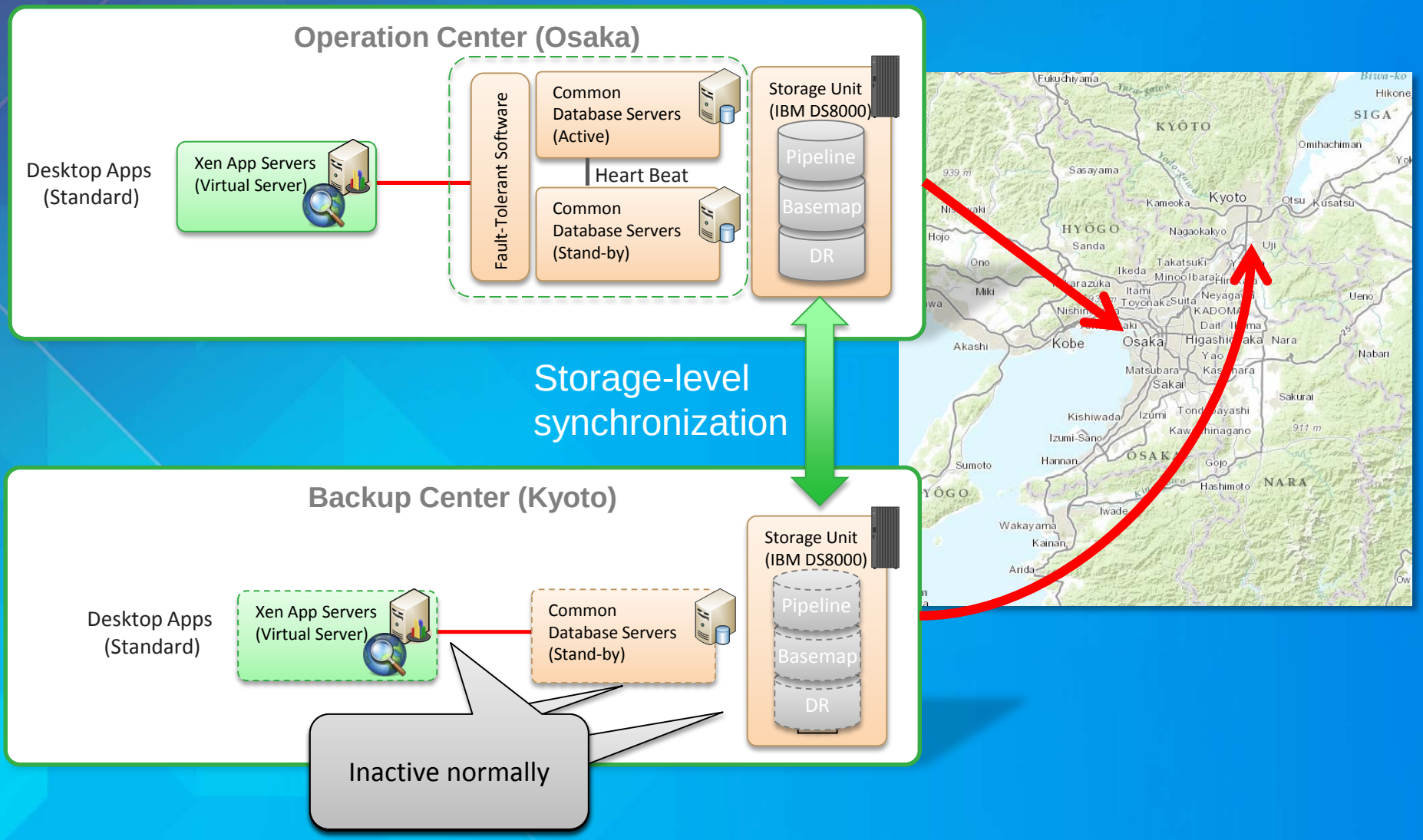
Current System Diagram

Application Deployment View



Current System Diagram(cont'd)

Hardware Fault Tolerability & Disaster Tolerability View



reviews

Cost

- Initial cost
  - Suppress amount of physical servers.(**27 -> 13**)
  - Adopt hardware virtualization technology.
    - Microsoft Hyper-V technology
  - Suppress rebuilding cost
    - Minimize amount of complete-rebuilt systems
- Operation cost
  - Reduce operating cost by migrating operating system from IBM’s AIX to Linux (RHEL).

Data management

- Aggregation of databases over the business Units
- Satisfy the fault tolerability.
  - 24/7 available databases(pipeline database, basemap database)
  - Distributed database safekeeping between Osaka and Kyoto

Conclusion

- **Success** for the making of the business continuity environment by realization of the distributed safekeeping of databases.
- **Suppress** the operating cost by the aggregation of GIS data and migration of the OS.
- **Improve** performance of the WebGIS apps in the point of responsiveness and stability.

Questions & Answers