

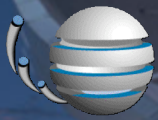


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# **Titan Transformational Services Division**

**U.S. Air Force: Integrating Secure Web and  
Mobile Applications into the Enterprise for the  
Management of Communications Infrastructure**



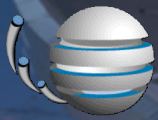
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# Overview

- Current Situation
- Transformation – From the old practices to new business-driven processes
- CIPS/GCM
- What kind of items make up a communications infrastructure?
- Oracle Spatial Supporting the Process
- Summary



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# Overview

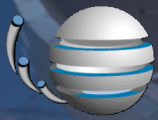
## Transformation – From the old practices to new business-driven processes

### – OLD

- Computer Aided Paper Process
- Disconnected “Data”
- Many Stovepipes – no integration or System
- Expensive, Wasteful, Inefficient

### – NEW

- Functionally Driven Business Processes
- Integrated Data (one source)
- Mass Reduction in Stovepipes
- Affordable, Good Steward, Efficient



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# Overview

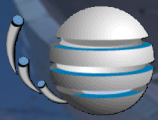
## External Drivers and Requirements

- GeoBase HAF Requirements
- DISDI / GIG Support
- NSDI Interaction
- SDSFIE Data Standards
- Information Assurance (Security Requirements)
- DoD SSO Initiatives (CAC Cards)
- AF Portal Integration



AF Portal Integration





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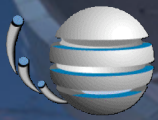
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## **Overview**

### ***The USAF 'Vision'***

- “So here’s the emerging difference, Interoperability is all about what capabilities I have that can make your operations better. Interdependence is all about what you need done that you can’t live without, (and) my capability is the only capability you have.” – Lt. General Keys, ACC
- To reach the needed level of interdependence, the U.S. military must first solve a host of problems. Some of the issues that need fixing include finding ways to have compatible systems, training, collaborative and predictive tools and Web-based networks
- In other words – make ‘the network’ - ‘the computer’



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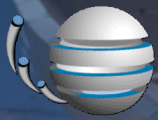
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# Overview

## What is required to support these processes

- Requirement Driven – Not automation of paper processes!
- Easy to Learn and Use System
- Responsive
- Dependable
- Secure
- Available where the user is
- Available on whatever they have



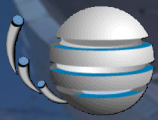
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## **Current Situation – Broken Processes**

- **Cable Management Business Processes are not well defined**
  - USAF has Tech. Orders, Air Force Instructions
    - MAJCOMS individually add to TO's and AFI's
    - Installations further customize TO's and AFI's
    - Projects not standardized
  
- **Result: Every installation's Business Processes are different!**
  
- **They must be well defined before any system can be created**



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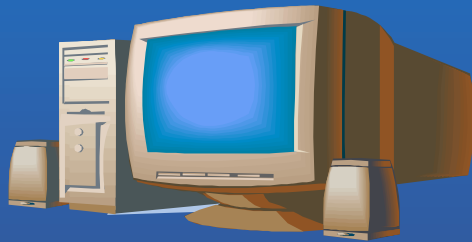
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## **Current Situation – Restrictive Computing Environment**

### **No Application and Data Mobility:**

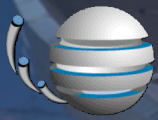
- Computer specific fat-client application environment
- OS version, patch, and binary CPU type dependant



AKA “FAT” Client



Service Pack 1	x86
Service Pack 1a	x86-64
Service Pack 2	



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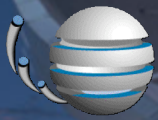
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## **Current Situation – Restrictive Computing Environment**

### **Resource Usage:**

- Expensive per-CPU or per-installation software licensing
- High-overhead per-site DBA and software support
- Software version control: everyone must upgrade all client applications to the same version at the same time to avoid data usage issues
- System configuration: will current versions continue to work as X applications or OS patches are applied? No one can certify any system with millions of possible combinations!
- Data control: local, easy data proliferation outside the controlled database environment



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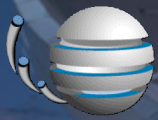
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## **Current Situation – Restrictive Computing Environment**

### **Security**

- Identity Management
  - Proprietary - Username/Password based identity management (Microsoft AD).
  - Per-MAJCOM identity management (not global)
- Application Security
  - Limited – based on OS registry settings
  - Viewer/Editor software accessible by any user with a network login
- Data Security
  - Limited – based on application with limited database support.
  - History – usually none (other than by daily backups)



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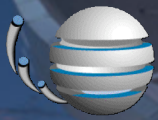
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## **Transformation – Virtual Computing Environment**

### **Application and Data Mobility:**

- Anywhere (where the user is now)
  - Not location dependant for application or data
- On anything (a desktop, laptop, or thin-client device)
  - Whatever is available
- At anytime (24/7)
  - World-wide support (USAFE to PACAF)



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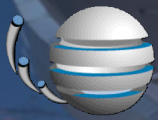
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## **Transformation – Virtual Computing Environment**

### **Resource Usage: Good steward**

- Centralized license sites = minimal cost
- Dedicated team for DBA and applications = great support
- Software version control = everyone automatically on the latest version
- Repeatability: Container-controlled system environment = minimal amount of dependencies (browser / JRE)
- Data control: centralized - users do not have direct access to data, only the use of it



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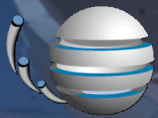
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# Transformation – Virtual Computing Environment

## Security

- *Identity Mgt.*
  - Single-Sign-On ID based on (FIPS) 141 Level 2 certified Java-based Common Access Cards and pins
  - Reduced-Sign-On with username and password for sites or clients without CAC card readers
  
- *Application Security*
  - Encrypted streams
  - Thin – central distribution and updates.
  - Viewer only accessible by authorized users
  - Editor limited to select data owners



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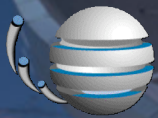
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# Transformation – Virtual Computing Environment

## Security

### – *Data Security*

- FIPS certified access control based on security levels, operational compartments, and permission hierarchy implemented with Oracle Label Security
- History – who changed what, when provided by Oracle Workspace Manager
- Who saw what, and when



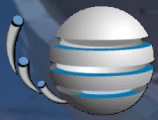
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## **Our Project: CIPS/GCM**

- CIPS – C4ISR (Command, Control, Computers, Communications, Intelligence, Surveillance, and Reconnaissance) Infrastructure Planning System
- GCM – GeoBase Communications Module (the spatially enabled items in CIPS)
- GCMDS – GeoSpatial Communications Mission Data Set
- CIPS/GCM = How the Air Force (and potentially the DoD) manages and plans changes of the communications infrastructure
- Will be utilized by >800 locations worldwide via the AF Portal



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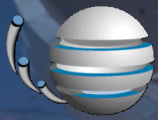
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# CIPS/GCM

## General Requirements:

- Support the USAF direction for Portal Based Virtual Computing Environment
- Support the USAF GeoBase Program
- Utilize a robust security model enforced at the database layer, to handle multiple levels, locations, and types of users
- Alleviate data aggregation concerns
- “Thin” architecture required for all editing
- Ability to replicate data for contingency access
- Support for non-live data such as projects, and what-if scenarios



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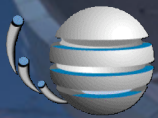
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## **The GeoBase model as implemented today**

### **What we didn't follow because...**

#### **■ Hundreds of installations**

- Each must maintain a Database, Application Server, and Data – how many DBAs can each location afford?
- USAF must pay for maintenance of licenses that are only being used for a portion of the day – very expensive!
- Data is unique – the base Geo Integration Officer sets the policy on what is populated and how



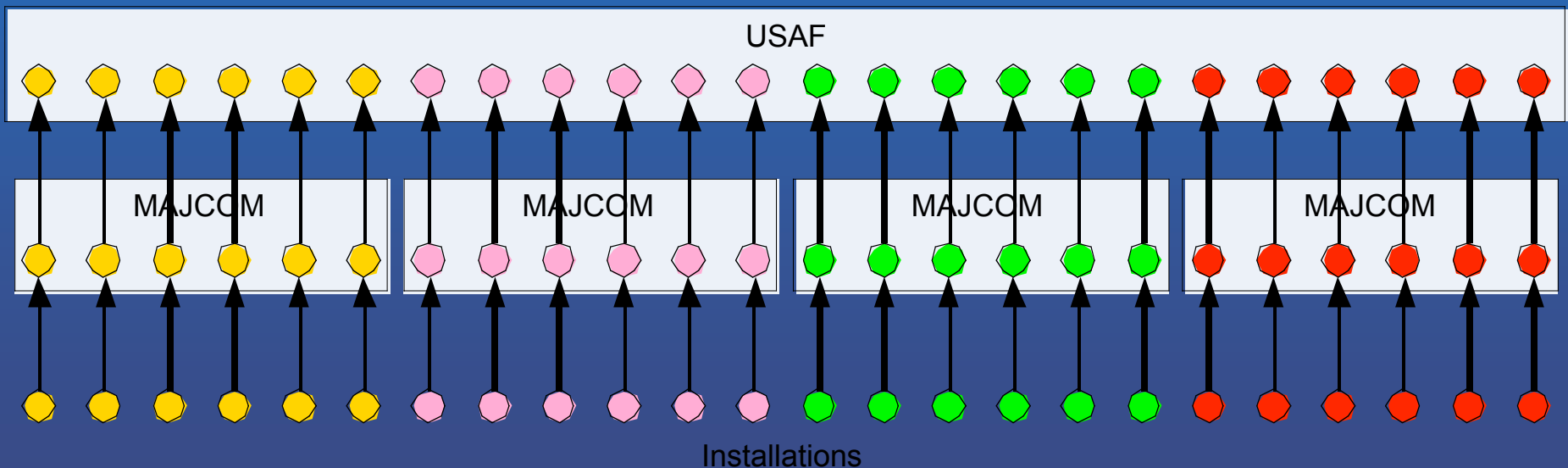
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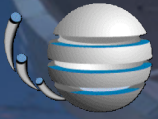
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# GeoBase Data Aggregation

Currently if you roll up installation spatial data you get 200+ silos of spatial data in various “projections” using multiple SDSFIE interpretations with differing amounts of attribution and additional attributes...





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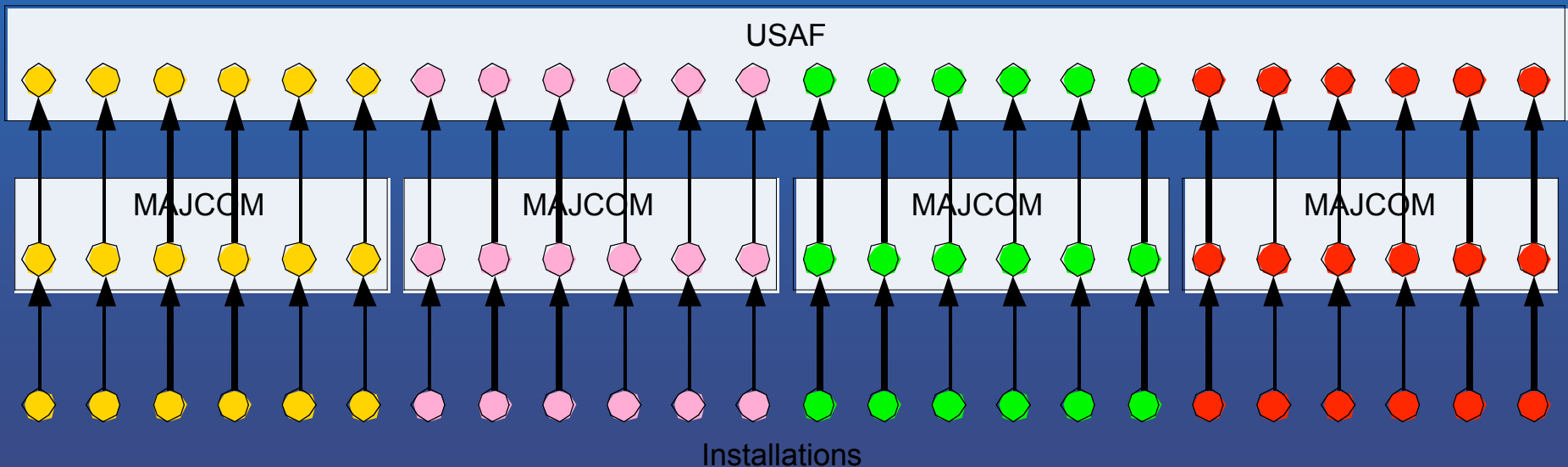
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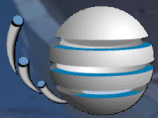
# GeoBase Data Aggregation

Q: Using this present form of “data call” aggregation (manual), how would AF Comm. determine how much lead-covered cable there is at each base, in feet?

Open 200+ databases, re-project the data into a common format, and search each adding up the data and recalculating the results?

Ouch!





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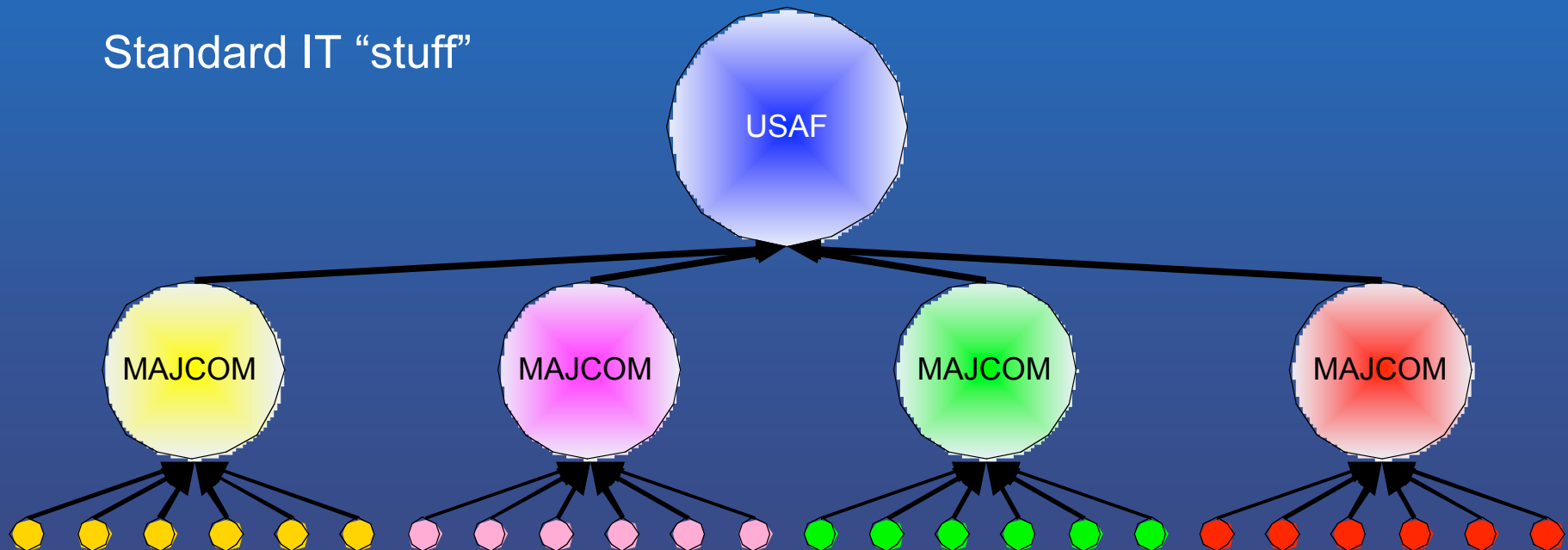
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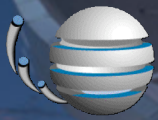
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# Better Idea: Data Aggregation using Oracle Spatial for CIPS/GCM

Better idea: aggregate the spatial databases using the built-in functions of a spatial database to transform “projections”, standardize naming conventions, and filter attributes so you can achieve the goal of ONE spatial database to answer MAJCOM or AF-Wide questions

Standard IT “stuff”





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## What CIPS/GCM Encompasses

CIPS  
3.0

### ■ Outside plant

- COMM-PATH (Manholes, Handholes, Pullboxes, Pedestals, Vaults, Ductbanks), Terminals, Navigational-Aids, Cables, etc.

### ■ Wireless

- Geostationary Satellites, Point-to-Point, WiFi , etc.

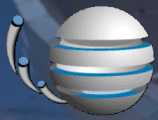
CIPS  
4.0

### ■ Inside plant

- Video Distribution, Voice Switch, LAN, End Equipment, etc.

### ■ Circuits

- Satellite, Modem, POTS, ATM/SONET, Ethernet, etc.



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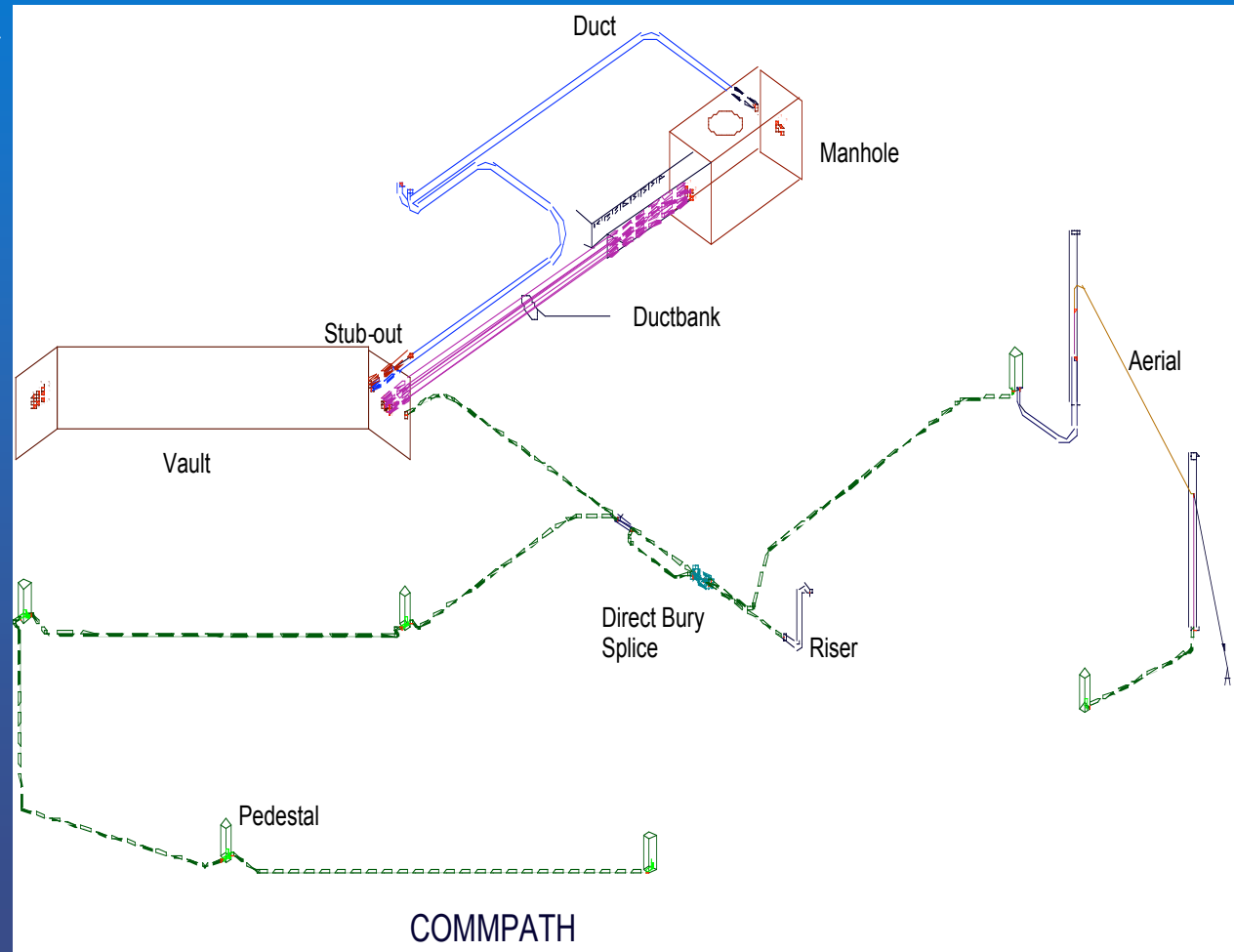
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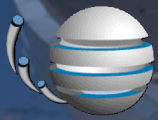
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## The CIPS/GCM Comm-Path

Comm-Path is simply the basic items that describe the path of “wired” communications, without including any cable, splice, or circuit information

This includes items such as Manholes, Ducts, Pedestals, Vaults and Risers





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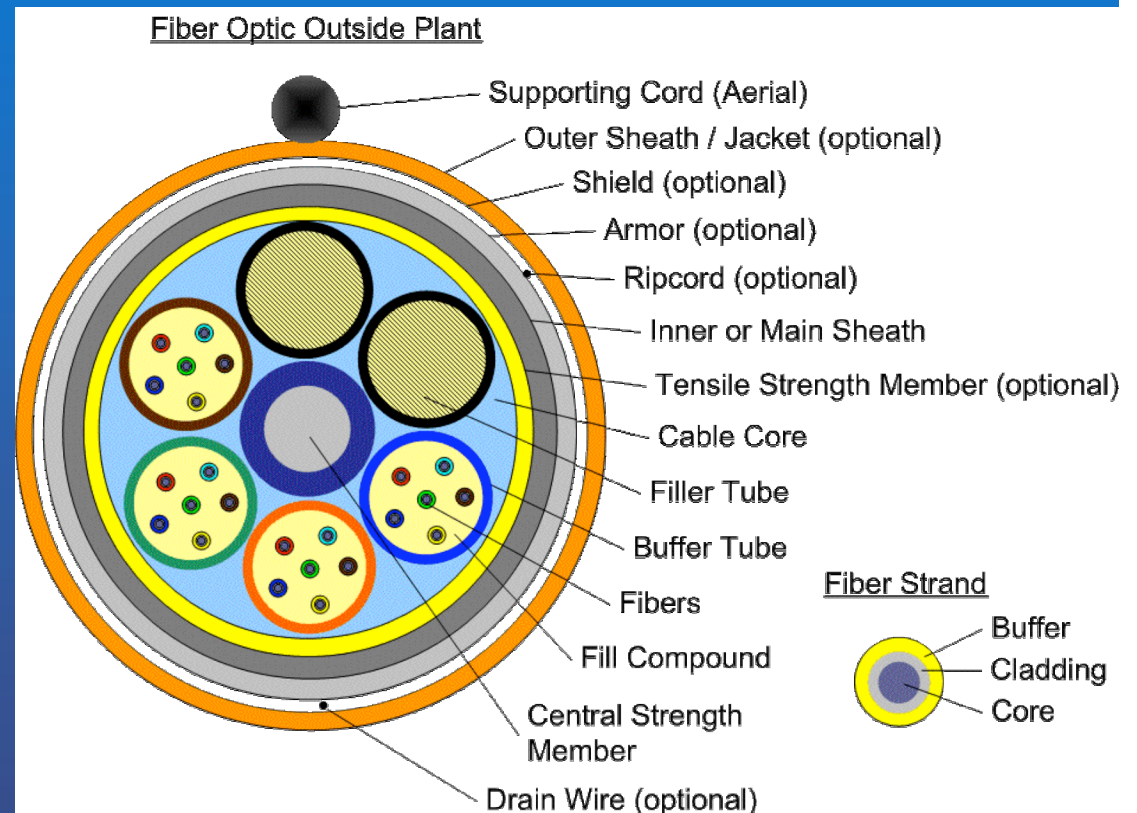
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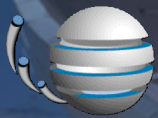
# The Details: GCM Attributes

## Cable Data

Cable Data includes sheath and bundle information

Made up of Segmented Cables, and Sheath type and range data





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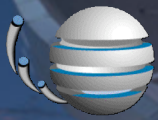
# **GCM: Making the Connections**

## *Splice Information*

Splice information is contained within the model to describe the connection relation between cable sheaths

Includes information down to the individual strand or pair connection including attenuation information





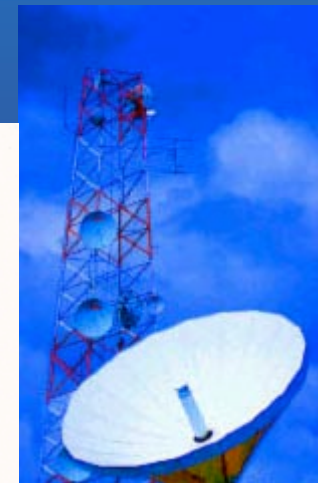
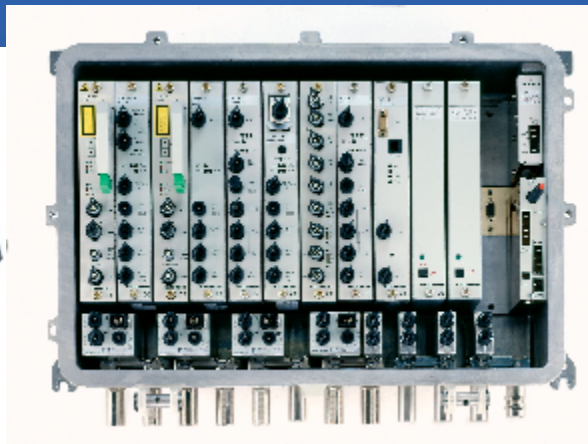
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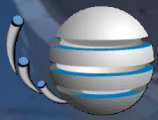
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# End Equipment in GCM

End equipment includes items such as antennas, amplifiers, phones, etc. This section of the GCMDS is under active development.





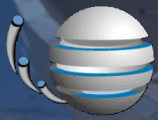
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## **How will CIPS/GCM be used?**

- **Answer: It depends.**
- **For an 38 EIG engineer, it is used to plan and justify new comm. projects**
- **For a base O&M user, it is used to maintain existing infrastructure**
- **For a Civil Engineer it is used to show the path of comm. in the ground for digging permits**



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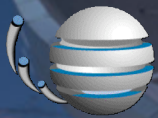
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# Getting There: Current CSIR Process

## Computer-Aided Paper

- Drawings in Microstation v7 format
- 52,000+ drawings
- Representing ~800 locations world wide
- 21 different types of drawings
  - One for each required view of the data

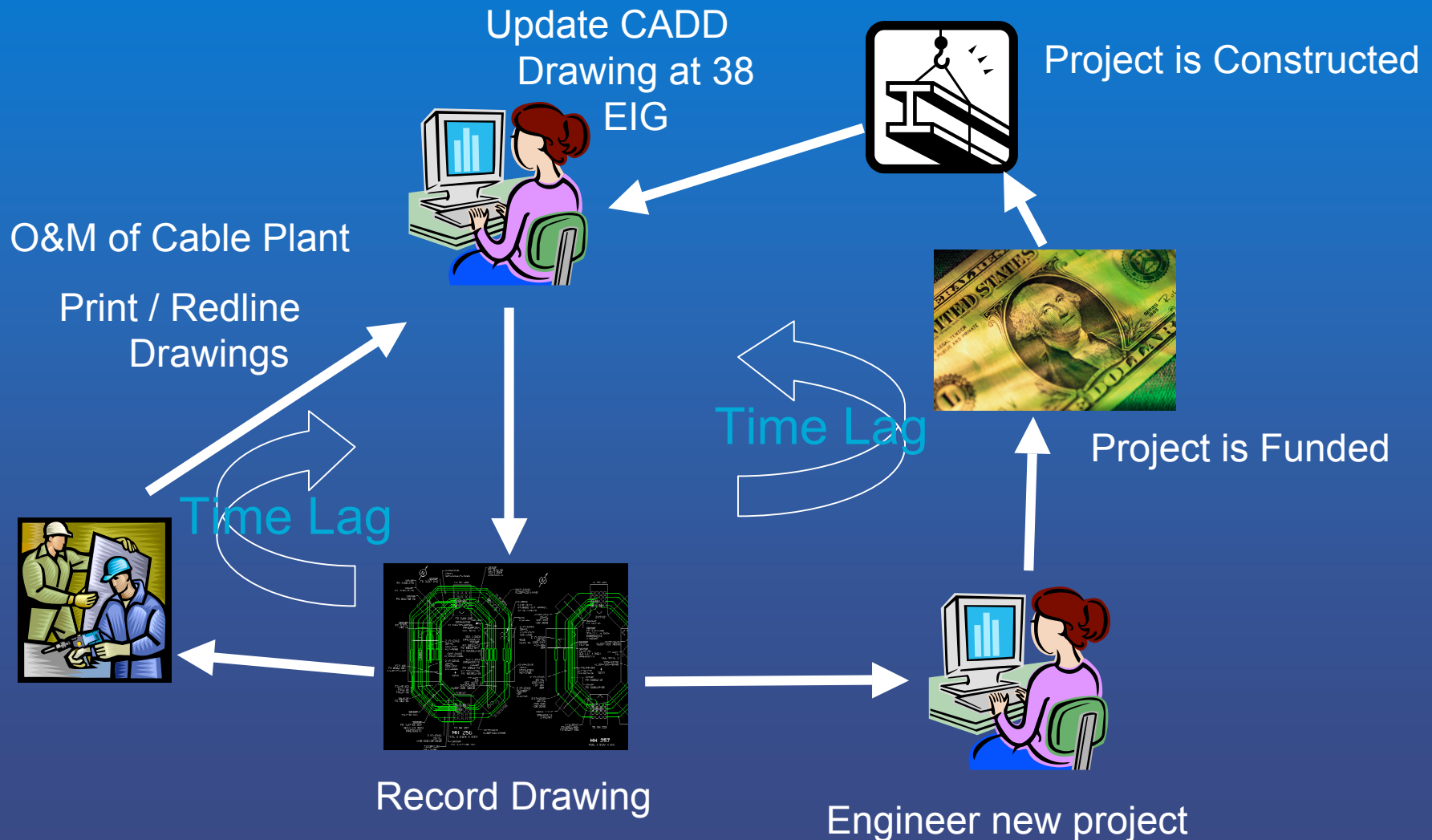


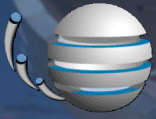
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## Getting There: Current CSIR Process





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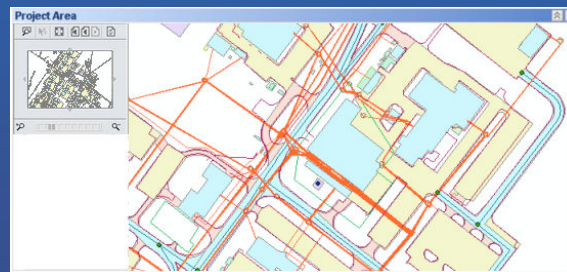
## New GCM (CSIR) Business Processes

GCM Integrated Spatially-Enabled Web-Based Applications

O&M of Cable Plant  
Data Updated Onsite



**NO LAG!**  
Real-Time Data



Record Drawing Database

ONE Dataset



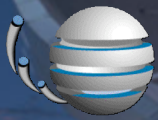
Project is Constructed



Project is Funded



Engineer new project



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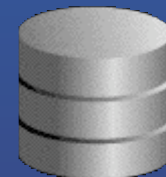
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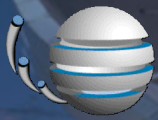
## Products used in CIPS/GCM

### Foundation: Oracle

- 10g Database
  - One instance, > 800 locations (data in one place)
  - Oracle Label Security
  - Oracle Workspace Manager
  - Data-Purity Logic via Stored Procedures / Triggers
    - Enforced in the Database, last line of protection
  - Oracle Spatial
    - Network Functionality



**ORACLE** 10<sup>g</sup>  
DATABASE



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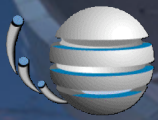
## Products used in CIPS/GCM

### Label Security:

- Enforces access and updates for all data by three keys:
  1. Security level (FOUO, SBU, Secret)
    - Does the user have at least this high of level?
  2. Compartment (Financial, Contract Sensitive, Use Zones)
    - Does the user have all the compartments listed?
  3. Hierarchical (MAJCOM, Installation, Wing, Group, Squadron, Office Symbol)
    - Rights assigned at higher level flow downward
- Enforced equally by the database for all applications that access the data



ORACLE  
DATABASE 10<sup>g</sup>



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## Products used in CIPS/GCM

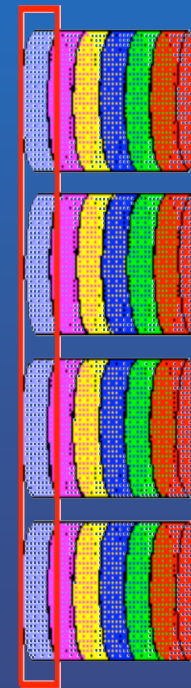
### Label Security:

- Segments data access by location (GEOLOC code in all tables)

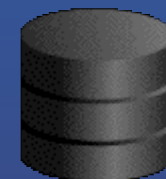
Geoloc Name

```
-----  
AAWZ  ACC PROGRAM MANAGEMENT SQUADRON ADM  
ABAA  ABSTON ANG STATION  
ABQB  ADANA WATER SYSTEM ANNEX  
ACBF  ST LOUIS AIR FORCE STATION
```

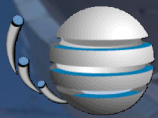
- GEOLOC code allows data partitioning by location or MAJCOM for performance if or when it becomes necessary



Access Segmented  
by GEOLOC



ORACLE  
DATABASE 10<sup>g</sup>



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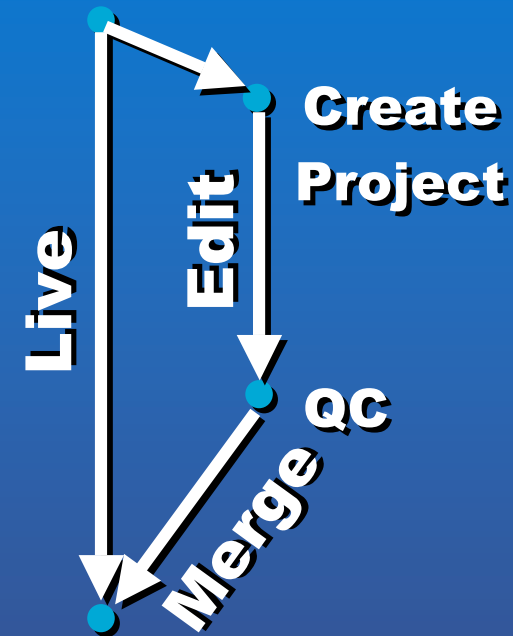
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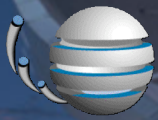
## Products used in CIPS/GCM

### Oracle Workspace Manager:

- Permits a project-based work environment.
  - Editors work on projects, and cannot check work into the live data stream
  - QC personnel certify work of editors, and check accepted work back into the live data stream
- Allows for very long transactions while maintaining a consistent view of approved data



ORACLE  
DATABASE **10<sup>g</sup>**



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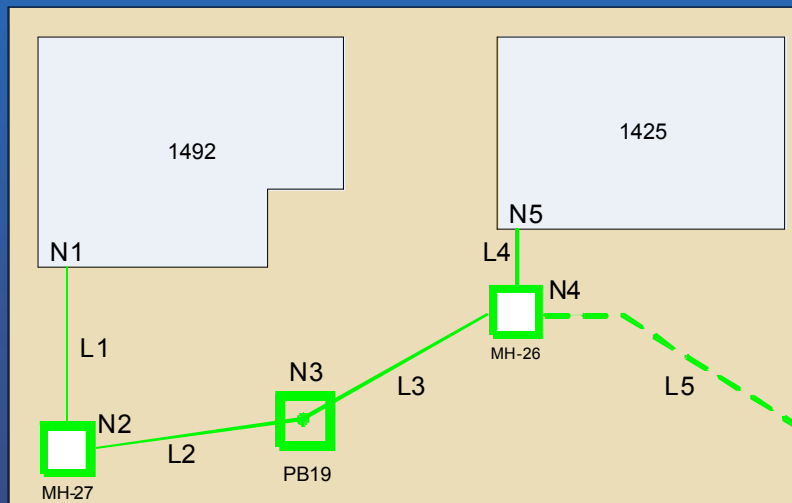
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# Product use in CIPS/GCM

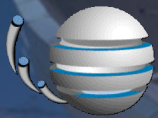
## 10g “Spatial” Network:

- A model of nodes (Manholes, Pedestals, Vaults, Splice Cases, CP Nodes) and links (Comm-Path)
- Answers: Can I get there from here using existing ductwork?
- No custom code required, callable from SQL



Link	Node1	Node2
1	1	2
2	2	3
3	3	4
4	4	5
5	4	6





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## Product use in CIPS/GCM

### Spatial Features:

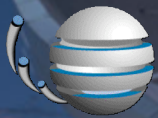
- All data stored in the Global WGS84 geodetic format (lat/long)
  - On-the-fly projection of Comm-Path data into UTM or State-Plane by site, for GeoBase users

```
CREATE VIEW &&LOCALGEOLOC..COPATHN
AS SELECT
    (COPATHN_ID-trunc(COPATHN_ID,-9)) COPATHN_ID,
    SDO_CS.TRANSFORM(GEOMETRY_P, &&LOCALSRID) GEOMETRY_P,
    META_ID,
    USER_FLAG,
    CAST(TO_CHAR(RECUPDATE, 'YYYYMMDD') AS NUMBER(10,0)) RECUPDATE,
    GEOLOC
FROM GCM.COMM_PATH_NODE
WHERE GEOLOC = '&&LOCALGEOLOC';
```

- All data stored with Z values, indexed 2D
- Geometry accuracy as high as 25mm for small features (such as innerducts) to allow good visual representation



**ORACLE** 10<sup>g</sup>  
DATABASE



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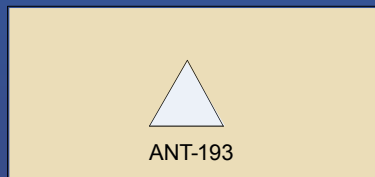
# Product use in CIPS/GCM

## Spatial Features:

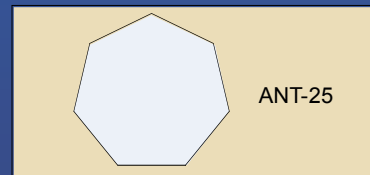
- Multiple geometry columns per row enable different visual representations of the same type of objects as required

Name	Null?	Type
ANTENNA_ID	NOT NULL	NUMBER(18)
GEOMETRY_P		MDSYS.SDO_GEOMETRY
GEOMETRY_L		MDSYS.SDO_GEOMETRY
GEOMETRY_A		MDSYS.SDO_GEOMETRY

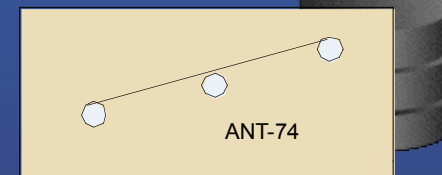
Dipole Antenna  
Single Point (Symbolized)

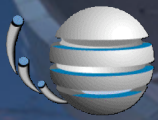


Dish Antenna  
Polygon



Long-Wave Antenna  
Polyline (on poles)





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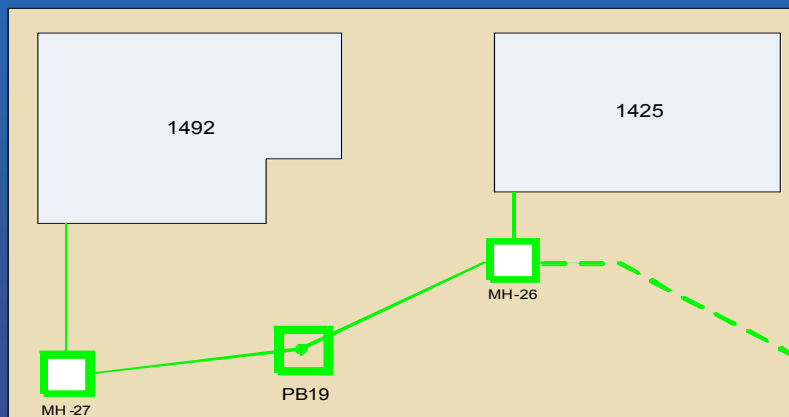
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## Product use in CIPS/GCM

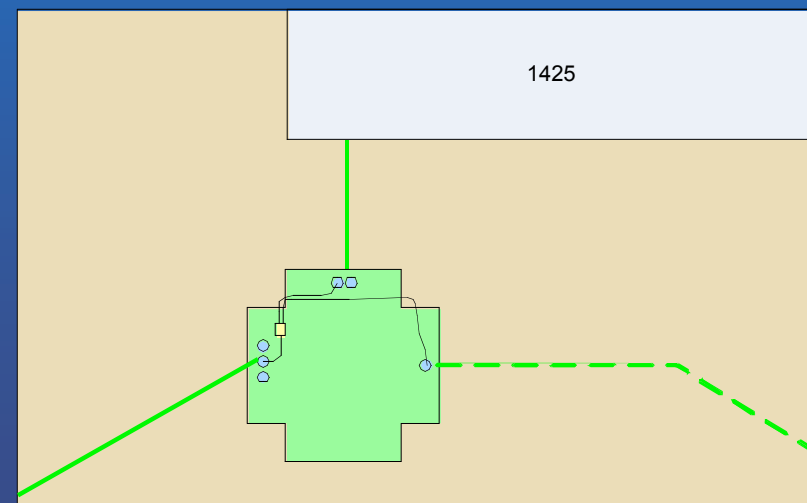
### Spatial Features:

- Take advantage of multiple geometry columns per row to enable different visual representations of the same object to support different zoom scales

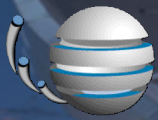
Cable Diagram View  
Symbolized Points



Manhole Diagram View  
Actual Size Polygons



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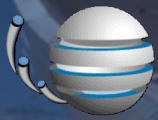
# Product use in CIPS/GCM

## Metadata

- Descriptive attributes are stored as table and column comments within Oracle, and can be viewed and edited by any Oracle management application
- COMMENT ON TABLE gcm.comm\_manhole IS  
'<descript><abstract>Coestmhl (Comm Manhole)</abstract>  
<purpose>It represents a manhole or handhole enclosed structure. For manholes, a butterfly layout is used that shows the manhole floor and walls flattened out so that duct openings can be drawn on the walls. This must be represented as one polygon (one row in the table).</purpose> <supplinf>What links to it: None</supplinf> <supplinf>Special Rules: Deletion of a manhole should not be allowed unless all of the contained items are deleted first.</supplinf><supplinf>Geometry Type: Point and Polygon</supplinf></descript>';



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# Product use in CIPS/GCM

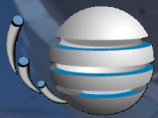
## Metadata

- Dynamic attributes are retrieved from Oracle Spatial metadata tables and from the datasets

```
SELECT sdo_srid, sdo_diminfo, sdo_column_name
       INTO sdo_srid, msdo_diminfo, msdo_col_name
FROM
    (SELECT sdo_srid, sdo_diminfo, sdo_column_name
      FROM MDSYS.sdo_geom_metadata_table
      WHERE sdo_owner = DECODE(is_view, 1,org_schname,
                                0,schname)
      AND sdo_table_name = DECODE(is_view, 1,org_tabname,
                                   0,DECODE(is_wm, 0,tabname,
                                             1,substr(tabname,1,INSTR(tabname,'_','-
1)-1))))
WHERE rownum = 1;
```



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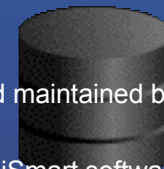
## Product use in CIPS/GCM

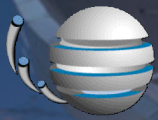
### Metadata

#### – Simple Retrieval

- FGDC XML format for USAF GeoBase use
- DDMS format for DoD Global Information Grid Use
- GET\_METADATA (gcm, comm\_manhole); Results in:

```
<?xml version="1.0" encoding="UTF-8"?><?xml-stylesheet type="text/xsl" href="fgdc_classic.xsl"?>
<metadata><idinfo><citation><citeinfo><origin>USAF: CIPS: 38
EIG/GF</origin><pubdate>20041101</pubdate><pubtime>07585990-0600</pubtime><title>Comm
Manhole</title><geoform>Vector</geoform><pubinfo><pubplace>Tinker AFB, Oklahoma, USA</pubplace> <publish>USAF 38
EIG/GF</publish></pubinfo></citeinfo></citation><descript><abstract>Coestmhl (Comm_Manhole)</abstract><purpose>It
represents a manhole, handhole, or pullbox enclosed structure. For manholes, a butterfly layout is used that shows the manhole
floor and walls flattened out so that duct openings can be drawn on the walls. This must be represented as one polygon (one row
in the table).</purpose> <supplinf>What links to it: None (*) Special Rules: Deletion of a manhole should not be allowed unless
all of the accompanying duct openings are deleted first. (*) Geometry Types: Point and Polygon</supplinf></descript>
<timeperd><timeinfo><rngdates><begdate>20041028</begdate>
<enddate>20041028</enddate></rngdates></timeinfo><current>Primary
Source</current></timeperd><status><progress>Complete</progress><update>Irregular</update>
</status><spdom><bounding><westbc>-180</westbc><eastbc>180</eastbc><northbc>90</northbc><southbc>-
90</southbc></bounding></spdom><keywords><theme>
<themekt>None</themekt><themekey>Communications</themekey></theme></keywords><accconst>none</accconst><useco
nst>FOUO</useconst><ptcontac><cntinfo><cntorgp><cntorg>USAF 38
EIG/GF</cntorg></cntorgp><cntaddr><addrtype>mailing address</addrtype> <address>4064 HILLTOP RD, 38
EIG/GF</address><city>Tinker</city><state>OK</state><postal>73145-2713</postal>
<country>USA</country></cntaddr><cntvoice>(405) 734-9335</cntvoice><cntfax>(405) 734-588</cntfax>
<cntemail>38EIG.GIO@TINKER.AF.MIL</cntemail></cntinfo></ptcontac><datacred>This data set is owned and maintained by
the respective Air Force Communications squadron at the location from which this data set was
selected.</datacred><secinfo><secsys>Dept. of Defense - DITSCAP Levels</secsys><secclass>Sensitive But
Unclassified</secclass><sechandl>None.</sechandl></secinfo><native>The data set is maintained by eSpatial iSmart software
using a native Oracle SDO_GEOMETRY format starting with the Oracle 10g release on Sun Microsystem servers running
Solaris 9.</native></idinfo>.... ETC.
```





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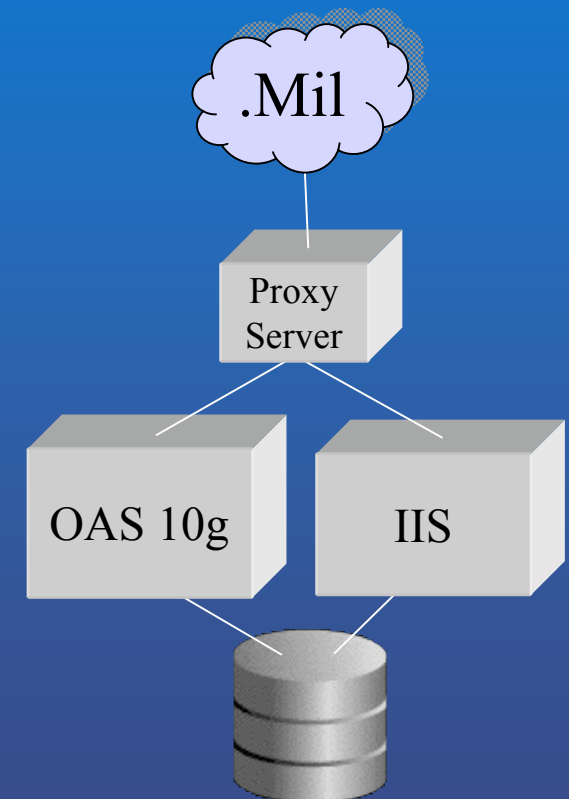
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## Products used in CIPS/GCM

### Web/Application Servers

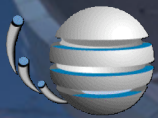
- Oracle Application Server 10g
  - Apache Web Front-End
  - J2EE Engine
  - Houses the Spatial applications in CIPS
- Microsoft IIS
  - Web Server and .Net Engine
  - Houses the Form-based applications in CIPS



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DATABASE

ORACLE 10g  
APPLICATION SERVER

Java™



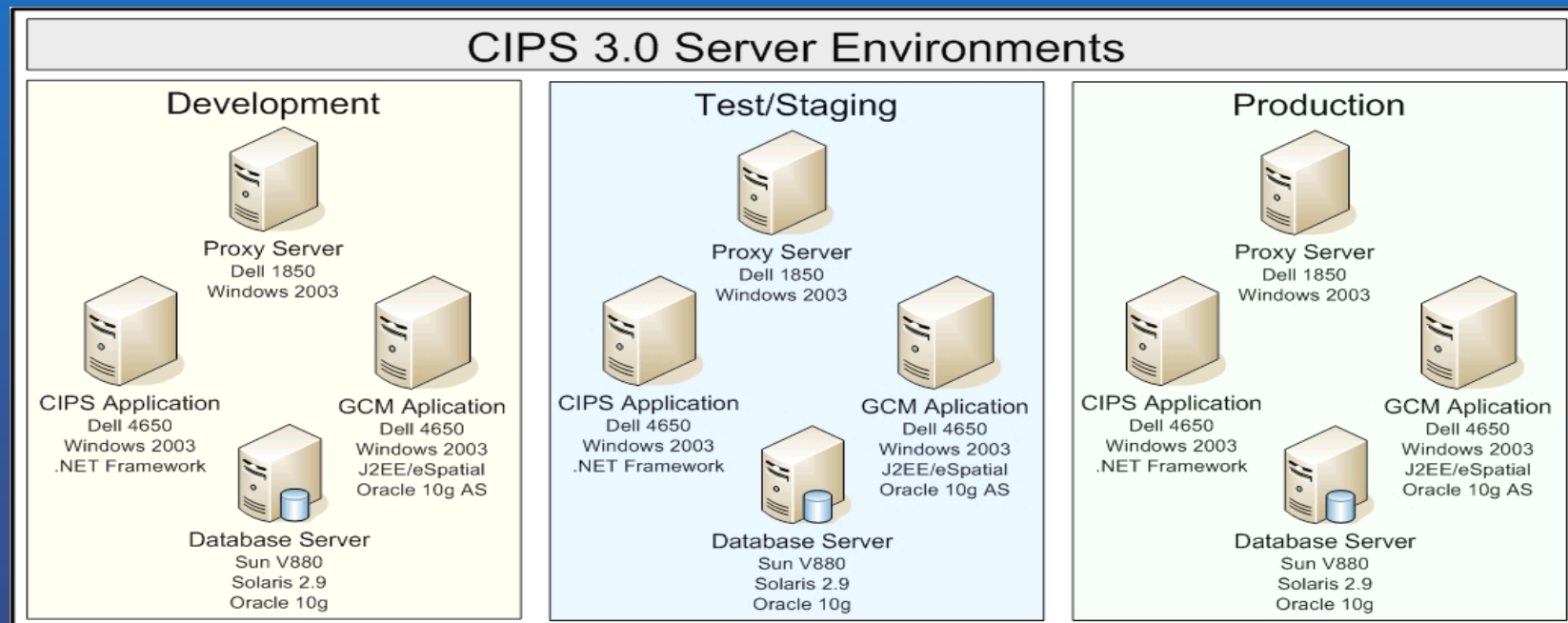
**TITAN**

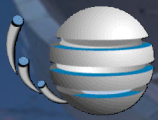
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## Products used in CIPS/GCM

- Portlet Framework is .Net based
- GCM Applications are J2EE based





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## Products used in CIPS/GCM

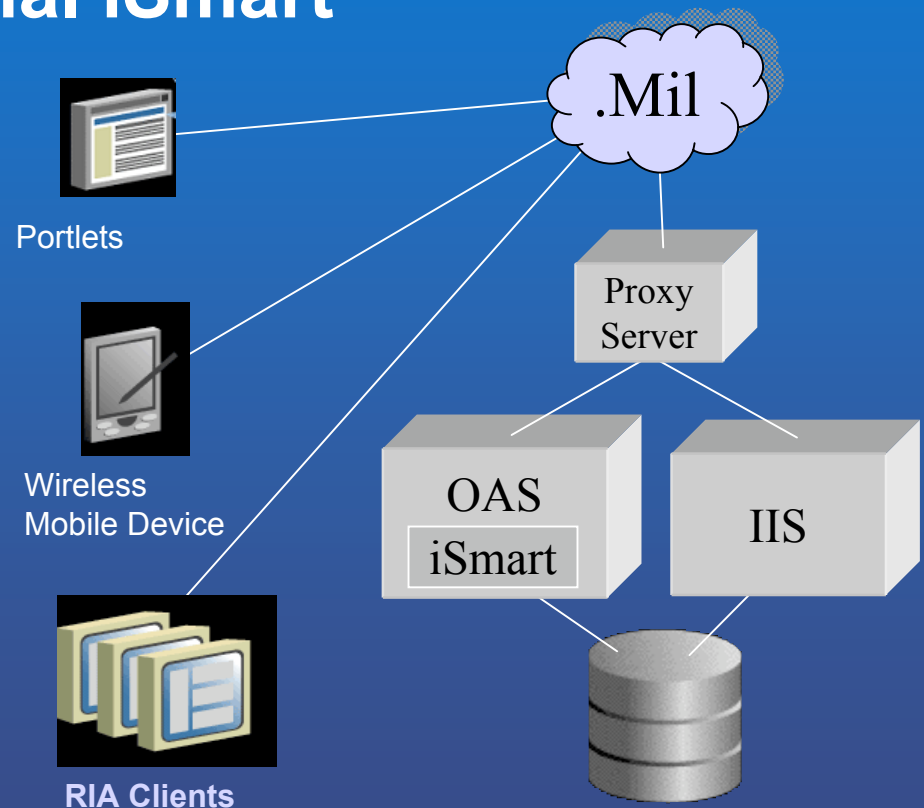
### Spatial Services: eSpatial iSmart

- Viewing tools via portlets
- Web Services via wfs
- Editing tools via Java Rich Internet Applications
- Offline use – Packaged Java RIA tool

Estimated Peak Load:

400 viewers

50 editors

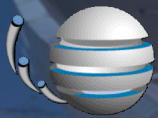


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ORACLE APPLICATION SERVER 10g



Java eSpatial  
spatially enabling business



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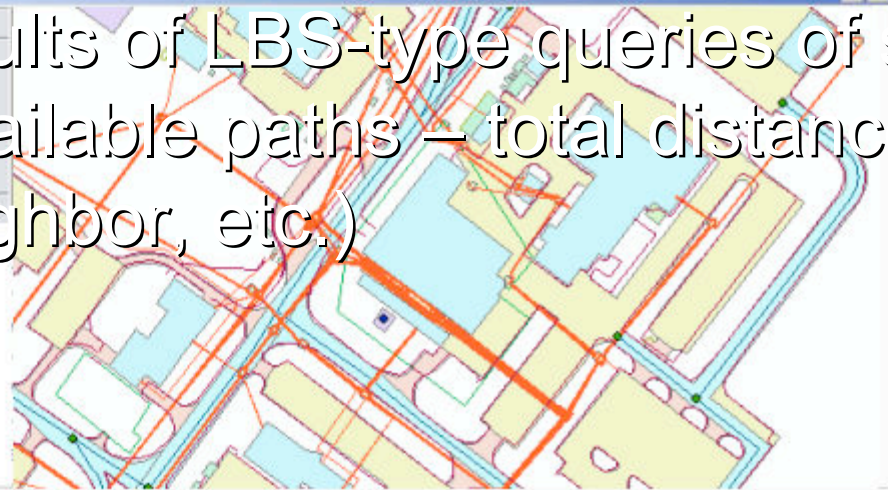
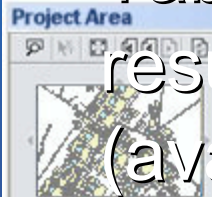
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# Viewing - Web service based portlets

└ Generate views of spatial data based on AOI, scale, type of user, and specific data requirements

Commodity	FY02	FY03	FY04	FY05	FY06	FY07	FY08
Distribution Systems	\$12,295,593	\$5,597,456	\$2,417,022	\$1,428,548	\$466,934	\$393,000	\$1,428,548
Radio Systems	\$1,296,727	\$455,002	\$864,316	\$1,990,490	0	0	\$1,990,490
Voice Switching Systems	\$741,125	\$4,485,600	\$1,163,300	\$1,562,800	\$212,800	\$1,562,800	\$1,562,800
<b>Total</b>	<b>\$18,265,587</b>	<b>\$13,263,199</b>	<b>\$6,328,463</b>	<b>\$7,049,491</b>	<b>\$2,444,934</b>	<b>\$2,464,000</b>	<b>\$7,049,491</b>

└ Tabular and Graph data is generated from results of LBS-type queries of spatial data (available paths – total distances, nearest neighbor, etc.)



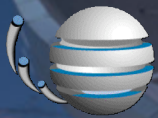
FOR OFFICIAL USE ONLY. Source Selection Information...

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# Editing – eSpatial iSmart based applications

└ **GOAL:** Provide a Rich Internet Application interactive editing environment that looks, feels, and acts like a “fat-client” tool, with all the benefits of a web-enabled tool

└ **REUSE:** Use the same code set to produce a portable “off-line” environment to allow checkout and editing of data for an AOI

The screenshot shows a web application interface. At the top right, it displays the date 'Monday, March 07, 2005' and the location 'TINKER AFB'. Below the title bar, there is a navigation menu with 'Location', 'Process', 'Tools', 'Manage', 'References', and 'Help'. The main content area is divided into two sections. The top section is a table titled 'mcp' with columns for 'Commodity', 'FY02', 'FY03', 'FY04', 'FY05', 'FY06', 'FY07', and 'FY08'. The bottom section is titled 'Project Area' and features a map with various colored overlays and a gauge chart on the right. The gauge chart has a scale from 0 to 100 and is divided into three segments: 'Danger' (red, 0-30), 'On Track' (green, 30-100), and a yellow segment (30-60). A needle points to approximately 45 on the scale.

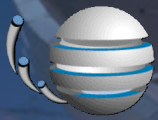
Commodity	FY02	FY03	FY04	FY05	FY06	FY07	FY08
Distribution Systems	\$12,295,593	\$5,597,456	\$2,417,022	\$1,428,548	\$466,934	\$393,000	\$1,428,548
Radio Systems	\$1,296,727	\$155,002	\$864,216	\$1,990,499	0	0	\$1,990,499
Voice Switching Systems	\$741,125	\$4,485,600	\$1,163,300	\$1,562,800	\$212,800	\$1,562,800	\$1,562,800
Total	\$18,295,593	\$13,223,108	\$4,328,153	\$4,981,847	\$679,734	\$955,800	\$4,981,847

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ORACLE APPLICATION SERVER 10g



Java eSpatial spatially enabling business



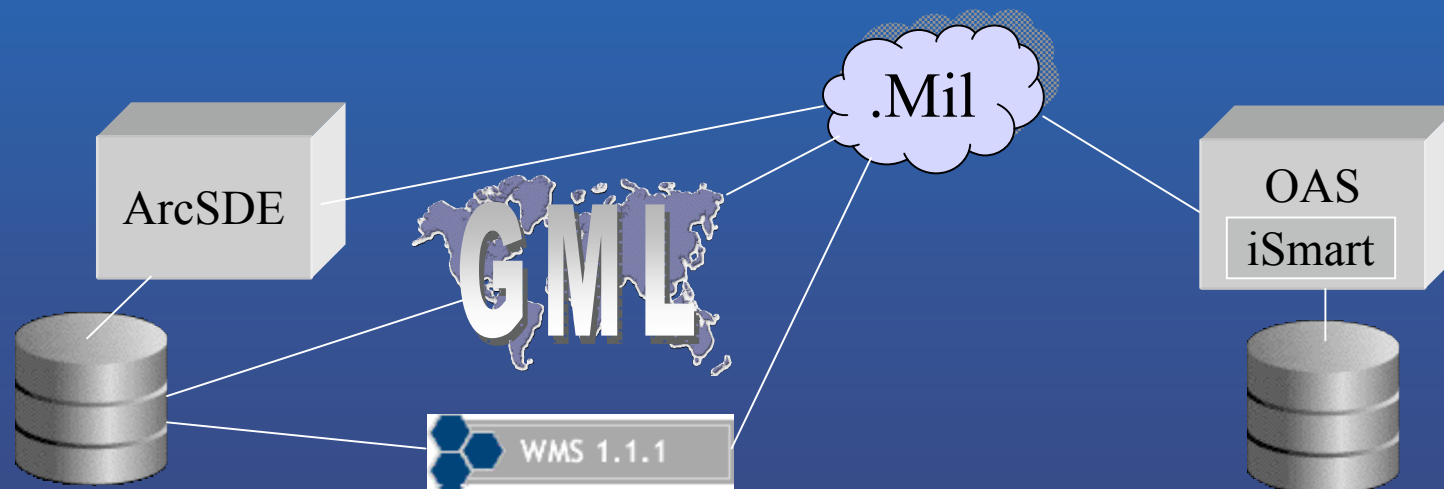
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## Data Exposure – web services and db links

- Optimally, data will be accessed on-demand with WMS and GML as appropriate
- Alternate replication method available to GeoBase sites via an ArcSDE connector API

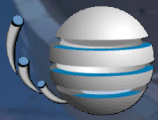


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DATABASE 10<sup>g</sup>

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APPLICATION SERVER 10<sup>g</sup>



Java™ e|spatial  
spatially enabling business



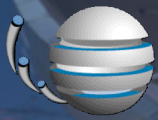
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## **Summary**

- Our hardest task has been to get the USAF to define and agree on a single business process, USAF-wide
- “Thin” Portal Web-Based applications will replace desktop apps for most processes
- Oracle spatial is an outstanding enabler for enterprise systems, not because of the features it includes (although impressive), but in the way other Oracle products integrate with it to provide security, versioning, and consolidated management



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# For More Information

## ■ Contact Information



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