



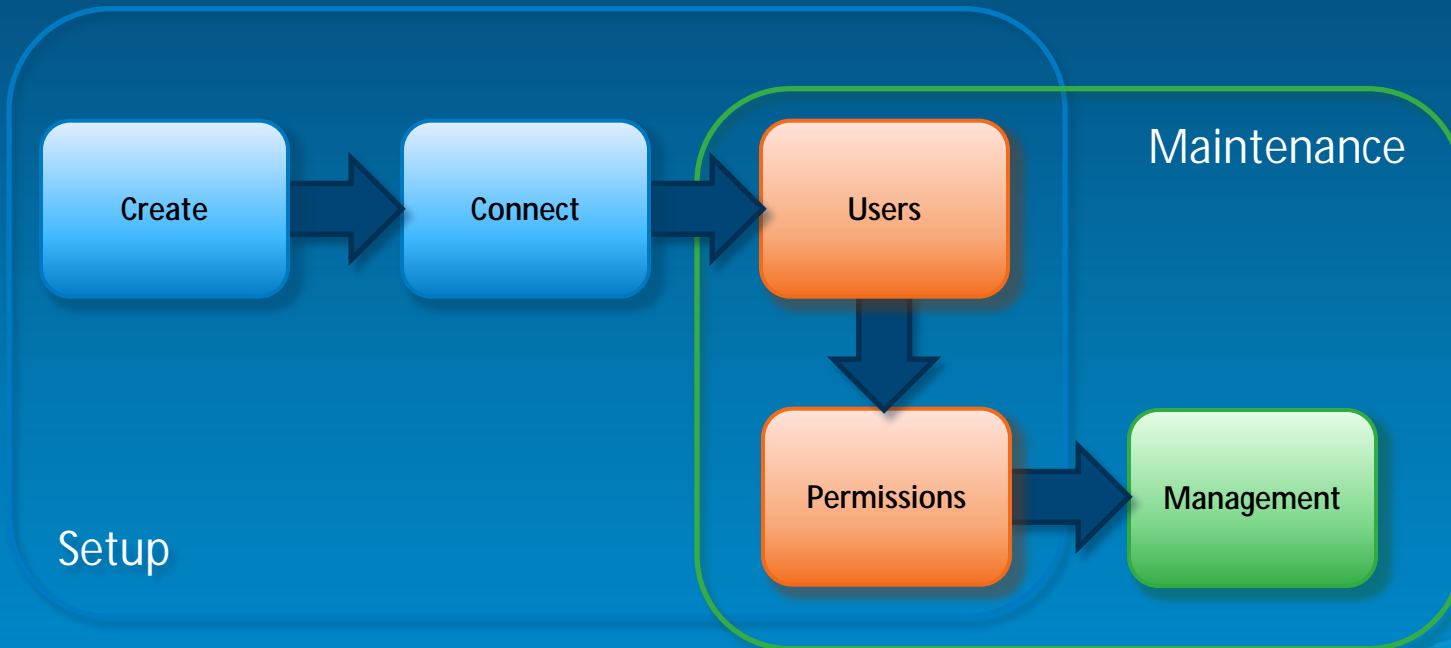
Esri International User Conference
San Diego, California

Technical Workshops | July 25, 2012

Administering your PostgreSQL Geodatabase

Kasia Tuszynska
James Gough

Presentation flow – Create

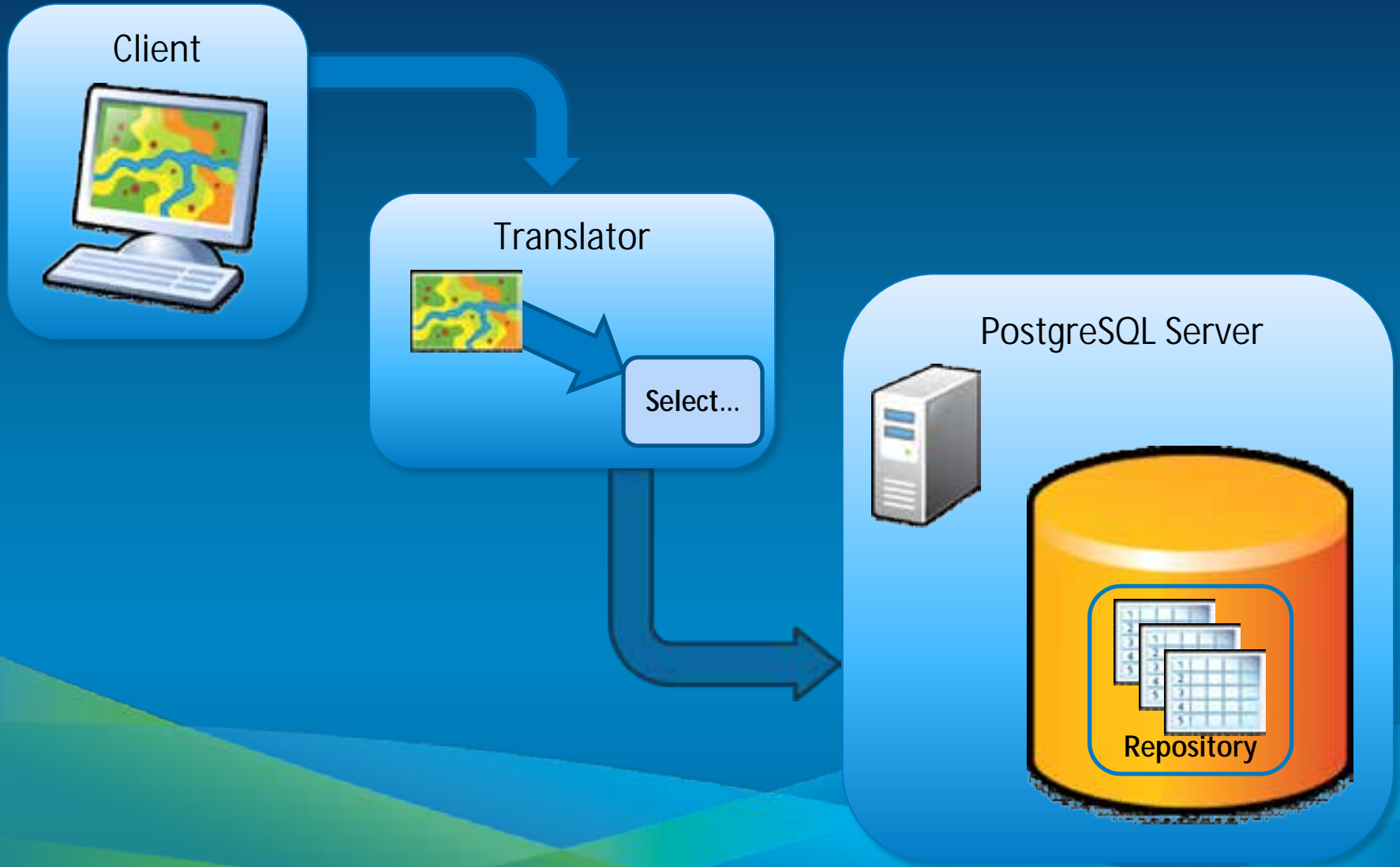


PostgreSQL

- Introduction to PostgreSQL
 - <http://www.postgresql.org/>
 - Open Source
 - Enterprise level RDBMS
 - Free, distributed with bsd license
 - Supported by an active online development community
- Learn more:
 - PGCON: <http://www.pgcon.org/2012/>



Components



Where to get Software?

- System requirements page:
 - http://resources.arcgis.com/en/help/system-requirements/10.1/#/PostgreSQL_Database_Requirements/0151000007500000/
- Customer Care Portal: customers.esri.com
 - PostgreSQL Installation
 - PostgreSQL Client Libraries
 - ArcSDE Installation
 - st_geometry library
 - In all ArcGIS clients



Windows Support

- **Windows 2003, 2008, 2008 R2**
 - **Installation of PostgreSQL 9.0.5 64bit**
 - One Click Installer
 - St_geometry.dll distributed with: ArcGIS Desktop, Server, Engine
 - **32bit Client Libraries: zip**
 - **64bit Client Libraries: zip**
 - **Installation of ArcSDE 64bit for Windows**



postgresql-9.0.5-1-windows-x64.exe

Linux Support

- **Red Hat 5.6, 5.7.1, 6.0**
 - **Installation of PostgreSQL 9.0.5 64bit**
 - One Click Installer
 - St_geometry.so distributed with: ArcGIS Desktop, Server, Engine
 - **32bit Client Libraries: rpm**
 - **64bit Client Libraries: rpm**
 - **Installation of ArcSDE 64bit for Linux**
 - Certified on Suse 11sp1
 - Suse based installations not distributed



postgresql-9.0.5-1-linux-x64.bin

PostGIS

- Refrations Research
 - <http://www.refrations.net/>
- PostGIS 1.5.x
- No 64bit postgis windows build
- 64bit postgis linux build
- Do not support GEOGRAPHY

PostGIS



An OpenGIS standard open source spatial database that provides high performance and enterprise reliability.

Esri Amazon Machine Images

- Amazon presentation?

- 10.0 spx

- AGS ami on windows
 - EGDB ami on windows

- 10.1 Cloud Builder Solution

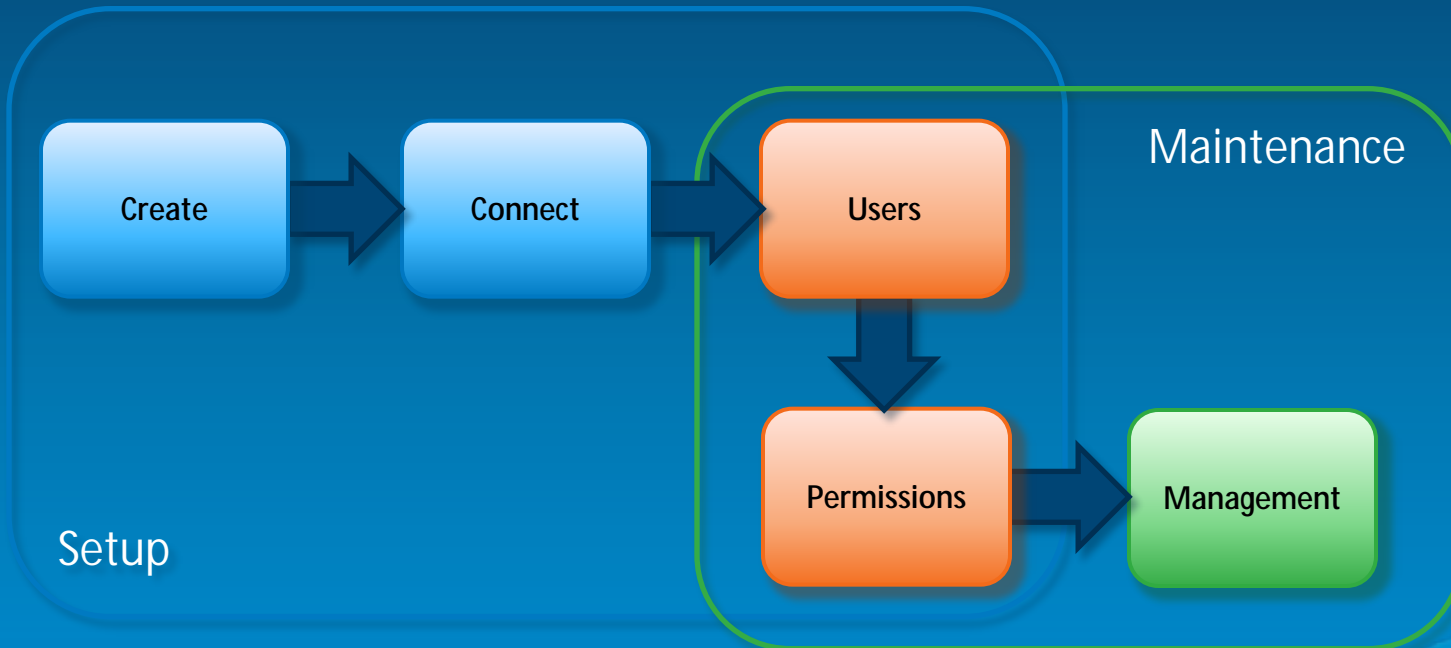
- Win: AGS + sql server express workgroup or enterprise depending on your license
 - Win: AGS + sql server enterprise
 - Ubuntu: AGS + PostgreSQL



Supported for 10.1 sp1

- **What do we plan to support for 10.1 sp1:**
 - PostgreSQL 9.0.5
 - PostgreSQL 9.1.3
 - PostGIS 2.0
 - The currently supported functionality
 - Do not plan to support: raster, 3d/4d indexing, etc...

Presentation flow – Connect



ArcSDE

- **ArcSDE:**
 - **Command line tools**
 - **ArcSDE Service**
- **No more post installer**
- **A lot of functionality shifted to gp tools**
- **No longer required to install a geodatabase**
- **Some things are still only possible with the cmd**
 - **DBTUNE maintenance**
 - **Sde service creation and maintenance**



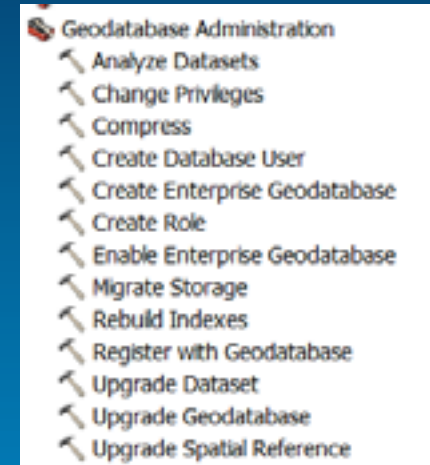
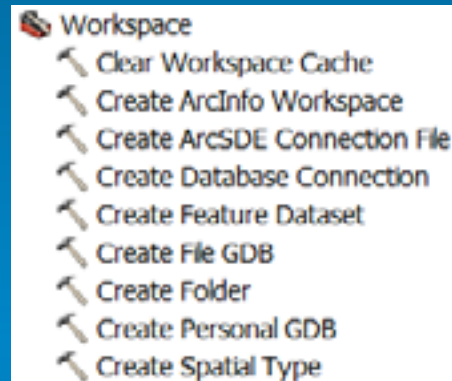
New Approach

NEW in 10.1

- **ArcGIS 10.1 introduced a new approach to working with data:**
 - **Populate the ArcGIS with database client libraries**
 - **Populate the Postgres lib location with the shape library**
 - **Connect to databases as well as Geodatabases**
 - **Extensive Geoprocessing environment**
 - **Use a Geoprocessing tool to obtain a Geodatabase**
 - **Use a simplified connection dialog**

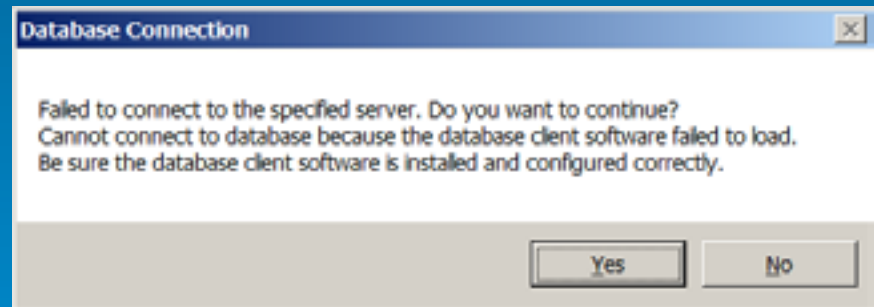
New Geoprocessing Tools

- Create Enterprise Geodatabase
- Enable Enterprise Geodatabase
- Create ArcSDE Connection File
- Create Database User
- Create Role
- Create Spatial Type
- Upgrade Geodatabase



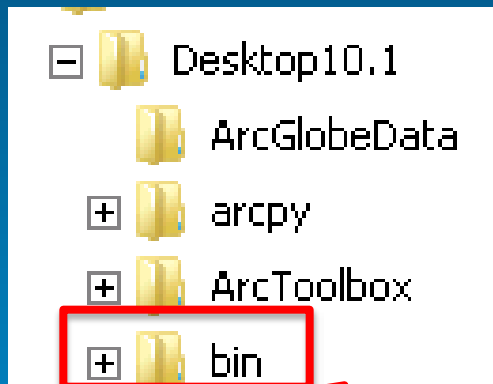
PostgreSQL Client Libraries

- Place PostgreSQL client libraries in the Geodatabase Clients
- Available on the Customer Service Site
- Place in the “Bin“
 - 32bit Clients:
 - ArcGIS Desktop
 - ArcGIS Engine
 - ArcGIS Runtime
 - 64bit Clients:
 - ArcGIS Server
 - ArcGIS Runtime

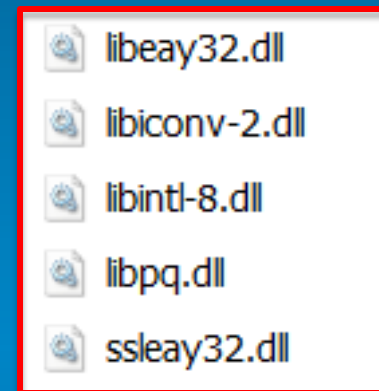


PostgreSQL Client Libraries: Windows

- Copy the PostgreSQL client libraries into Desktop\bin



Coming in from the
Customer Site



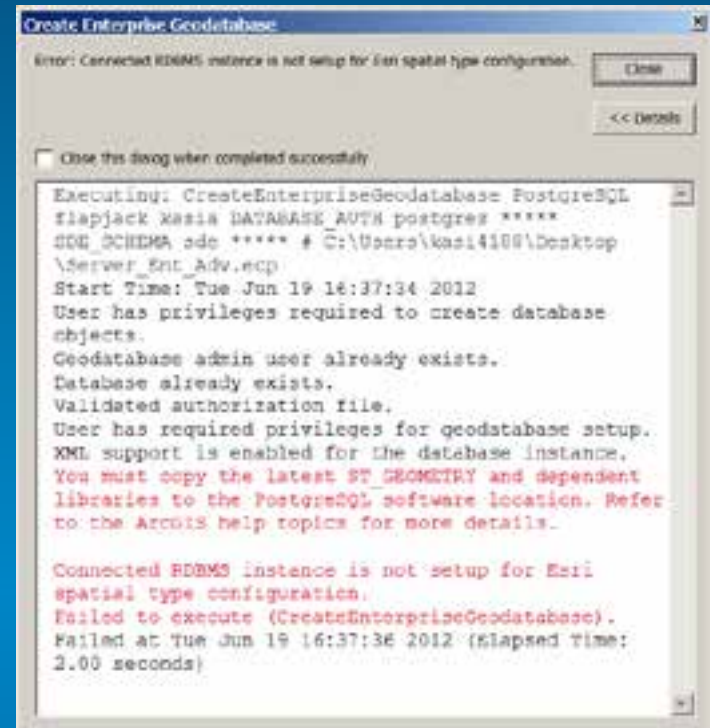
PostgreSQL Client Libraries: Linux

- ArcGIS Server needs to be aware of the client libraries
- /home/ags/arccgis/server/usr
- Init_user_param.sh
 - Has sections to specify environment variables for each db
 - PostgreSQL Section:

```
# For Direct Connect with PostgreSQL
#
export PGHOME=/opt/PostgreSQL/9.0
export PATH=$PGHOME/bin:$PATH
export LD_LIBRARY_PATH=$PGHOME/lib:$LD_LIBRARY_PATH
```

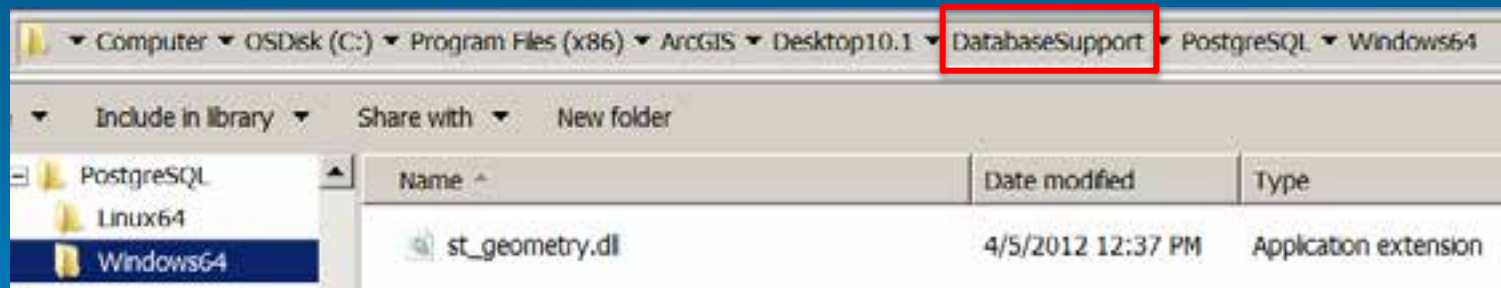
St_Geometry library

- St_geometry library is built by Esri
 - Contains the st_geometry type
 - Necessary for
 - Geodatabase Creation
 - Geodatabase Upgrade
 - Installation of the st_geometry type into a PostgreSQL db
 - Interaction with data of st_geometry type



Distributed with every client

- Distributed with every ArcGIS client in Database Support
 - Folder:



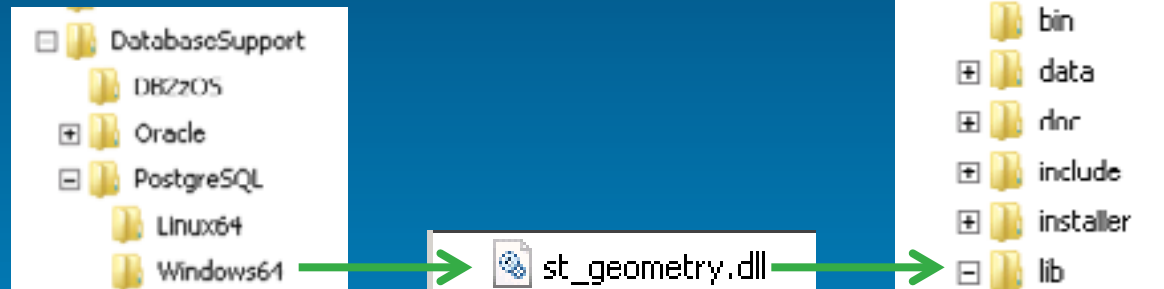
- Directory:

```
[ags@nurta server]$ pwd
/home/ags/arccgis/server
[ags@nurta server]$ ls
arcpy          Geocode       PackageTemplates  Templates
ArcToolbox    geronimo      PDFL              TilingSchemes
bin           GridTemplates pedata            TimeZones
ColorProfiles help          plotters         tools
com          lib           Routing           uninstall_ArcGISServer
DatabaseSupport License      startServer.sh   usr
Documentation locale      stopServer.sh    XslSchema
fonts        Locators     Styles
framework   NetworkAnalyst Support
```

Copy st_geometry to PostgreSQL lib location

- Windows Environment

- C:\Program Files\PostgreSQL\9.0\lib



- Linux Environment

- Look up lib location:

- `pg_config`
 - As postgres user
- Copy as root
- make executable

```
PKGLIBDIR=/opt/PostgreSQL/9.0/lib/postgresql
```

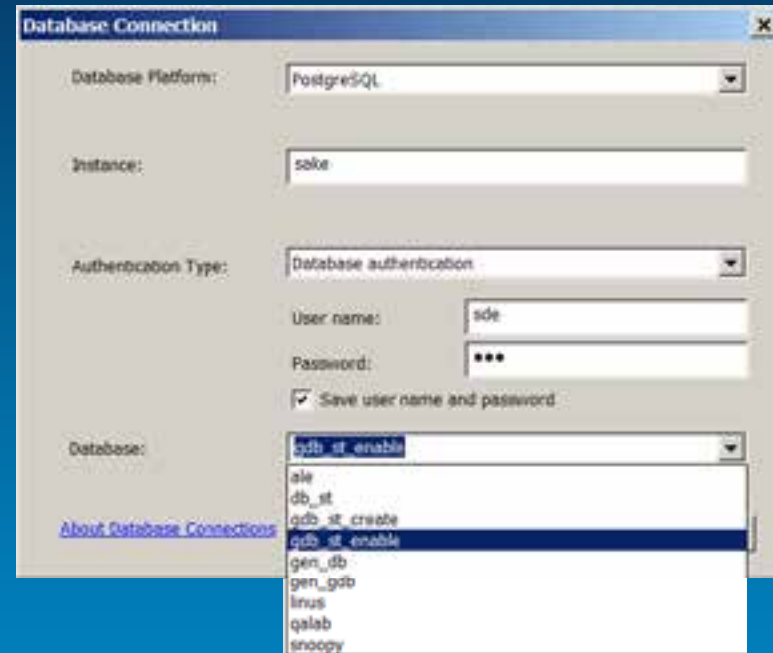
New Connection Dialog

- The connection dialog as been simplified:
 - Direct Connection is default
 - Application Connection:
 - Create a connection file with a gp tool
 - Drop down list of available databases
 - Upper case characters are not supported



Connect to Database or Geodatabase

- **Geodatabase Connections**
 - St_geometry type
 - St_geometry and Geometry types
- **Database Connections**
 - St_geometry type
 - Geometry type
 - St_geometry and Geometry types
- **Geodatabase – an Introduction**
 - Tuesday 3:15pm – Ballroom 6A
 - Wednesday 8:30am – Ballroom 6B



Geodatabase Connections

- **Geodatabase with St_Geometry**
 - **In ArcGIS:**
 - **Create Enterprise Geodatabase**
 - Creates the database
 - Creates the sde user/schema
 - Installs the st_geometry
 - Installs GDB/SDE repository in sde schema



Create Enterprise Geodatabase

Create Enterprise Geodatabase

Database Platform
PostgreSQL

Instance
flapjack

Database (optional)
kasia

Operating System Authentication (optional)

Database Administrator (optional)
postgres

Database Administrator Password (optional)

Sde Owned Schema (optional)

Geodatabase Administrator (optional)
sde

Geodatabase Administrator Password (optional)

Tablespace Name (optional)

Authorization File
C:\Users\kasi4188\Desktop\Server_Ent_Adv.ecp

Geodatabase Connections

- **Geodatabase with st_geometry and geometry**

- **In PostgreSQL:**

- Create a database
 - With postgis_template

- **In ArcGIS:**

- Make a connection
- Enable Enterprise Geodatabase
 - Creates the sde user/schema
 - Installs the st_geometry
 - Installs GDB/SDE repository in sde schema



Enable Enterprise Geodatabase

Database Connections

NEW in 10.1

- **Database Connections:**
 - **Postgresql Database with St_Geometry**
 - **PostgreSQL Database with Geometry**
 - **PostgreSQL Database with St_Geometry and Geometry**
- **Direct Connection Only**
- **Use with Query Layers**
 - **Accessing Spatial Databases in ArcGIS**
 - Thursday 1:55pm
- **Use for Spatial Data Server**
 - **Accessing Spatial Databases in ArcGIS**
 - Thursday 1:55pm

Database Connections

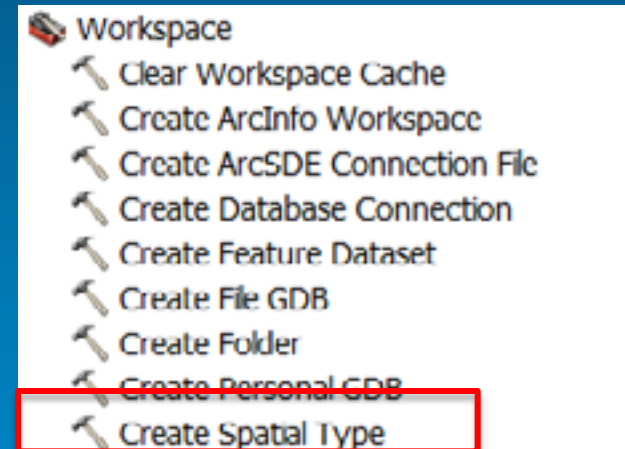
- PostgreSQL Database with St_Geometry

- In PostgreSQL:

- Create a database

- In ArcGIS:

- Make a connection
- Execute “Create Spatial Type”
 - Creates the sde user/schema
 - Installs the st_geometry



Database Connections

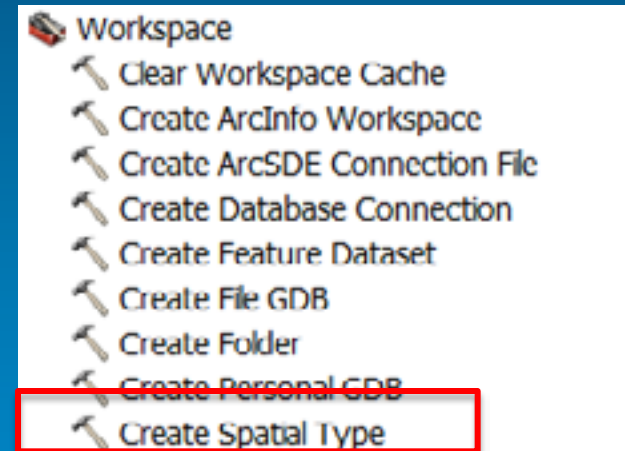
- PostgreSQL Database with St_Geometry and Geometry

- In PostgreSQL:

- Create a database
 - With postgis_template

- In ArcGIS:

- Make a connection
- Execute “Create Spatial Type”
 - Creates the sde user/schema
 - Installs the st_geometry



Only on Linux

Database Connections

- **PostgreSQL Database with Geometry**

- **In PostgreSQL:**

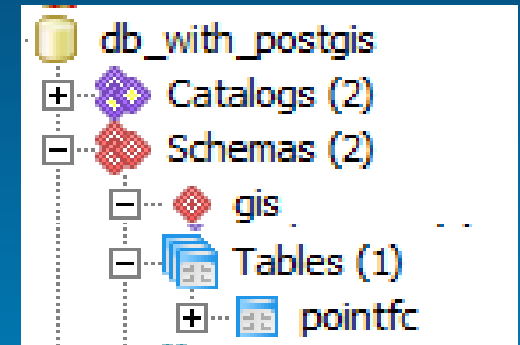
- Create a database
 - With postgis_template

- No st_geometry library necessary

- No sde user necessary

- **Data Storage:**

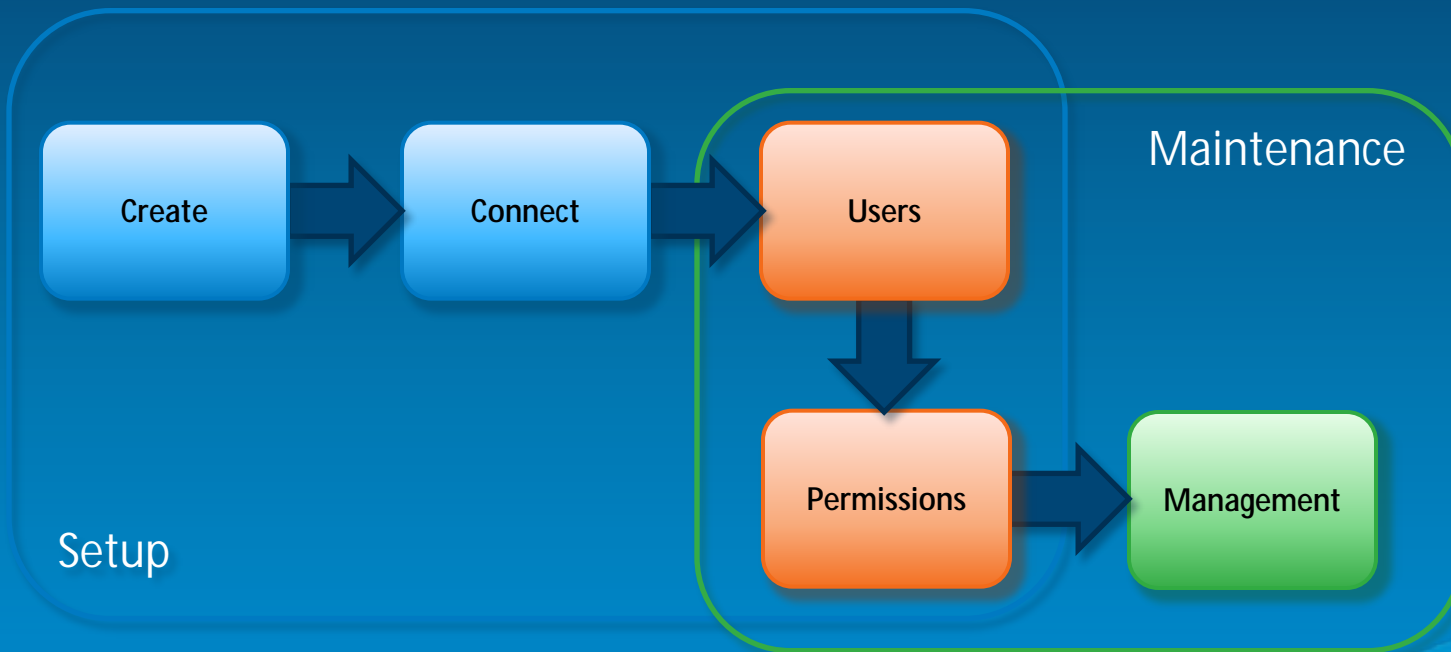
- Create a login/schema for data ownership
 - ArcGIS can load data to schema with name same as login
 - Ex: map/map
 - Do not use public user
 - Do not user postgres user



Datatype Mapping

- PostgreSQL supports almost 100 datatypes
- ArcGIS has 8
- Some PostgreSQL datatypes are mapped to one ArcGIS datatype
- Some datatypes are not supported
 - Error: “invalid column datatype”
 - Documented:
http://resources.arcgis.com/en/help/main/10.1/#/PostgreSQL_data_types_supported_in_ArcGIS/002p0000006p000000/

Presentation flow – Users and Permissions



Create Database User

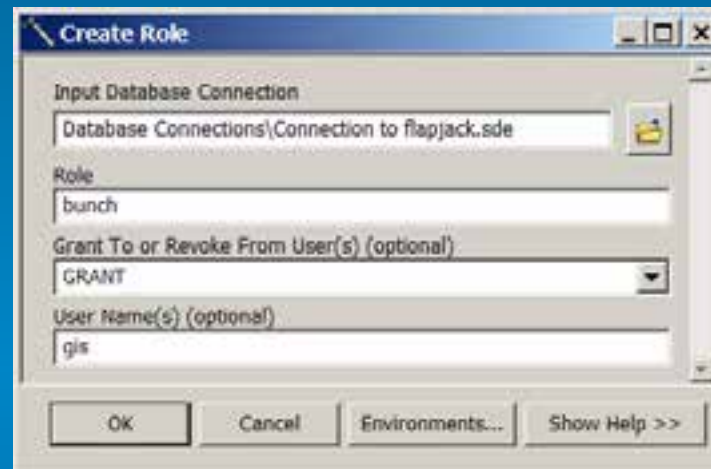
- Creates a login
- Creates a schema in specified database
- Can rerun tool to create a schema in a second database



Create Role

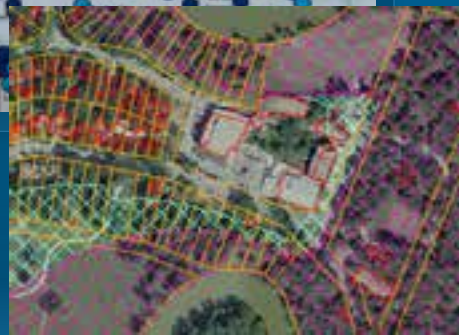
- Creates a PostgreSQL Group role
- The GP tool does the same as the sql:

```
CREATE ROLE gis LOGIN ENCRYPTED PASSWORD 'gis' INHERIT;  
CREATE ROLE bunch VALID UNTIL 'infinity';  
GRANT bunch to gis;
```

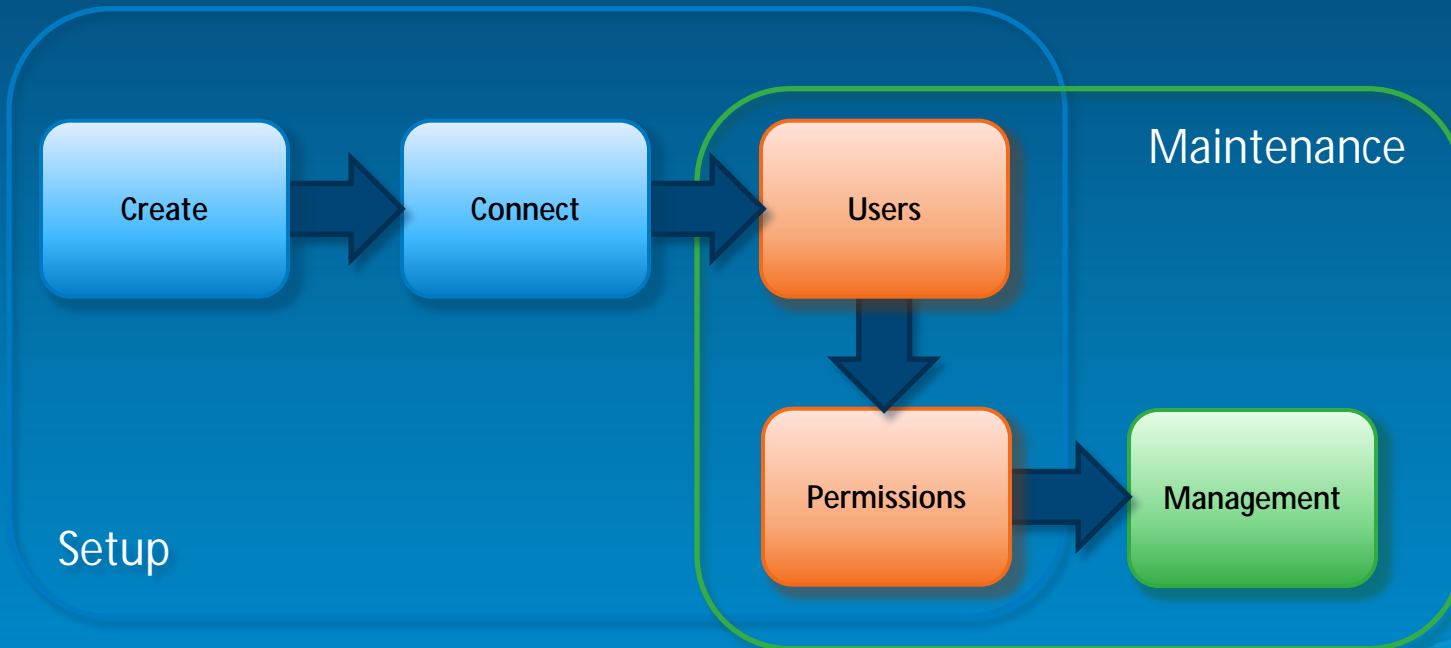


Setting up an Enterprise Geodatabase on PostgreSQL

James Gough

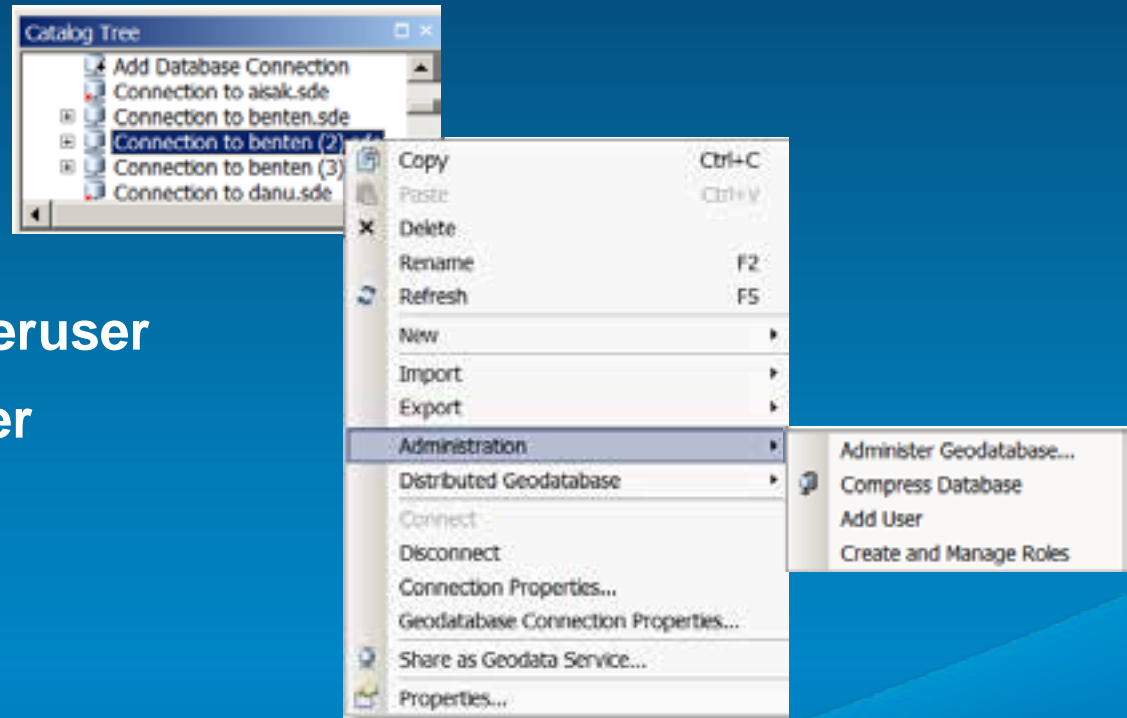


Presentation flow – Management



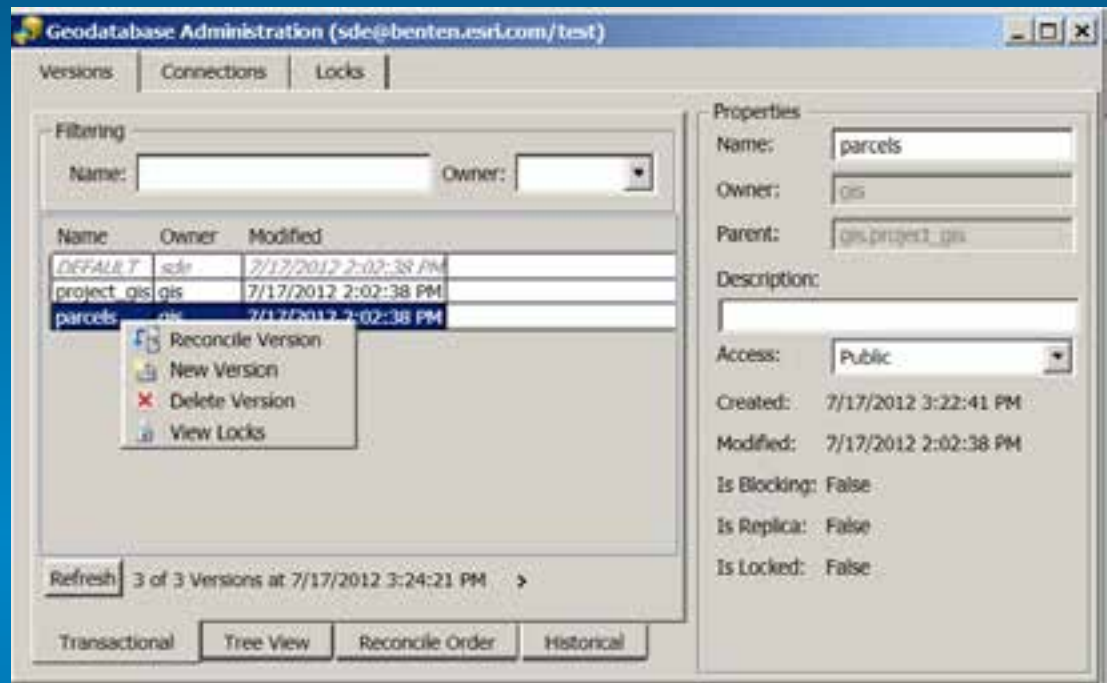
Administrative tools in ArcGIS

- **Monitor:**
 - Versions
 - Connections
 - Locks
- **Manage as superuser**
- **View as any user**



Monitor Versions in ArcGIS

- Monitor: **Versions**
 - See all versions in the Geodatabase
 - Properties
 - Relationships
 - Manage Versions



Monitor Connections in ArcGIS

- Monitor : **Connections**
 - Superuser connections
 - “kill” connections
 - Direct Connections
 - Application Connections

Geodatabase Administration (sde@benten.esri.com/test)

Versions | **Connections** | Locks

Filtering
User Name: Client Machine:

User Name	Session ID	Connection Type	Client Machine	Date
map	4	Direct Connect	FLAPJACK	7/17/2012 2:35:41 PM
sde	6	Direct Connect	FLAPJACK	7/17/2012 2:36:08 PM
gis	8	Direct Connect	FLAPJACK	7/17/2012 3:06:47 PM

View Locks
✘ Disconnect

Monitor Locks in ArcGIS

- Monitor: Locks
 - Check type of lock
 - Disconnect a user

The screenshot shows the 'Geodatabase Administration' window with the 'Locks' tab selected. The window title is 'Geodatabase Administration (sde@benten.esri.com/test)'. Below the title bar are tabs for 'Versions', 'Connections', and 'Locks'. A 'Filtering' section contains three dropdown menus: 'Object Name', 'Lock Type', and 'Lock Owner'. The main area is a table with the following columns: Object Name, Object Type, Lock Type, Lock Owner, Lock State, and Date Acquired. The table lists 11 locks, all of which are 'schema' locks owned by 'gis' and are in a 'shared' state. A context menu is open over the row for 'test.gis.Parcels', showing 'View User' and 'Disconnect User' options. Two red circles highlight the 'Lock State' column header and the 'Disconnect User' option.

Object Name	Object Type	Lock Type	Lock Owner	Lock State	Date Acquired
test.gis.Buildings	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Fuses	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Gas_lines	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Gas_points	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Parcels	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Poles	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Primaryaries	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Secondaries	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Service_points	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Switches	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM
test.gis.Transformers	Feature Class	schema	gis	shared	7/17/2012 3:08:04 PM

Refresh 11 of 11 Locks at 7/17/2012 3:56:52 PM

Backup and Restore

- **Backup**

- Backup an entire database
 - Single table backup are not supported

- **Restore**

- Create a database of the same name
- If using PostGIS, use `template_postgis`
- Do not use a geodatabase as a template
- Restore contents of the Public schema first
- Restore the entire database

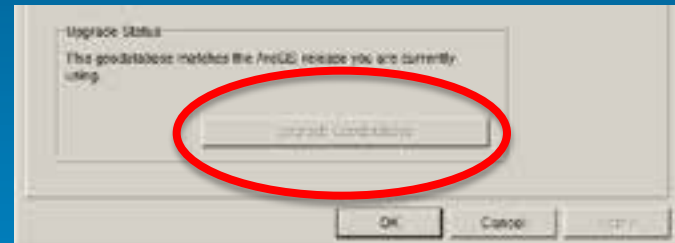
```
pg_dump -U postgres -Fc db_name > db_name.dump  
pg_restore -n public -v "c:\db_name.dump.backup"  
pg_restore -v "c:\db_name.dump.backup"
```

Upgrade / Migrate

- Place new st_geometry lib in postgres lib location
- The upgrade button might not light up
 - If tables or stored procedures in the GDB/SDE tables changed
 - Databases and Geodatabases

- **Upgrade**

- With python script
- With gp tool
- Right click in ArcGIS



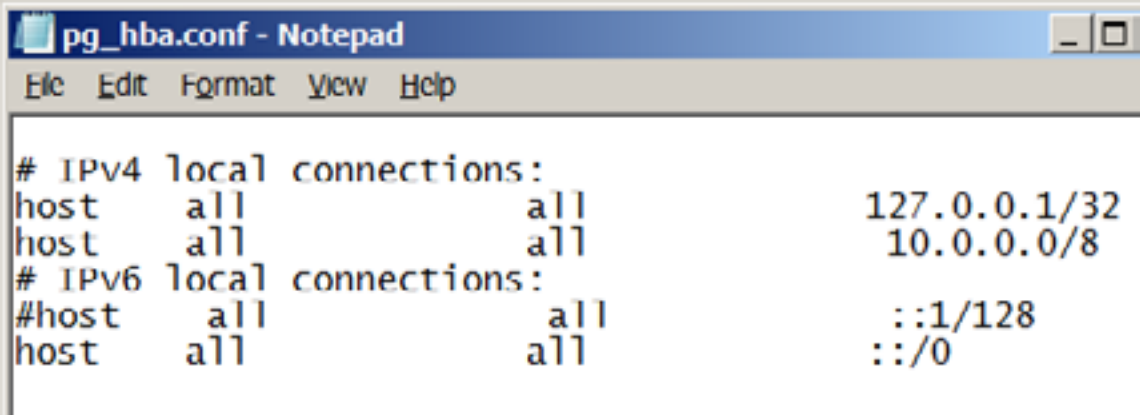
- Support Direct Connections three versions back

- **Upgrading to ArcGIS 10 Geodatabases**

- Thursday 11:05am – Room 3

Pg_hba.conf

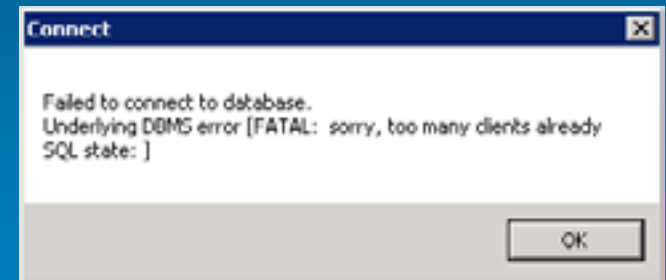
- PostgreSQL configuration file for connections
 - Depending on your network , entries for both types of addresses may be needed
- IPV 4 Addresses
- IPV 6 Addresses



```
pg_hba.conf - Notepad
File Edit Format View Help
# IPv4 local connections:
host all all 127.0.0.1/32
host all all 10.0.0.0/8
# IPv6 local connections:
#host all all ::1/128
host all all ::/0
```

Postgres Initialization Parameters

- Performance
 - #shared_buffers=32MB ...
 - Wack-a-mole presentation from Josh Berkus
- Connections
 - #max_connections=100
 - #superuser_reserved_connections=3
- Logging
 - #log_statement = 'none'
- Vacuum/ Analyze
 - #autovacuum = on



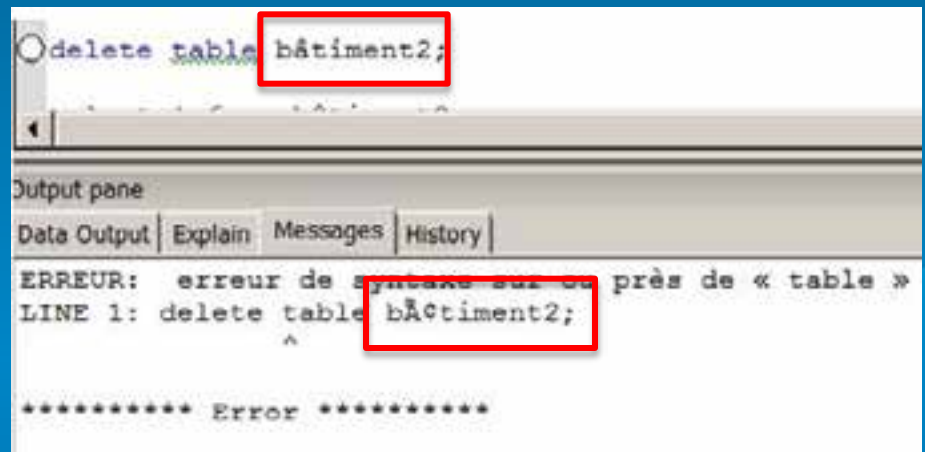
Upper Case Database Identifiers

- PostgreSQL is case sensitive
 - It stores all of its object identifiers in lower case
 - Names of: Databases, Tables, Indexes, Column
 - SDE/GDB also stores all identifiers in lower case
 - User data can be in any case
 - To use identifiers in upper case, they need to be quoted
 - PgAdminIII quotes them automatically
 - ArcGIS does not look for quoted strings
 - Identifiers with upper case names are not found

```
CREATE DATABASE "KASIA"  
WITH ENCODING='UTF8'  
OWNER=postgres  
CONNECTION LIMIT=-1;
```

Observation: Multibyte characters

- Working with customers we have observed a difficulty working with certain letters.
- Not an issue officially recognized by Postgres
- Seen only on diacritic marks in Latin based alphabets
 - German umlauts: Ä, Ö, Ü
 - Spanish: Ñ
 - French: a, o, u



```
delete table bâtiment2;
```

Output pane

Data Output | Explain | Messages | History

```
ERREUR: erreur de syntaxe sur ce près de « table »
LINE 1: delete table bâtiment2;
                   ^
***** Error *****
```

Performance Considerations

- **Excessive normalization**
 - Too many indexes
 - No optimizer hints, index use can not be forced
 - Need not worry about the Spatial Index
 - GIST index used, self correcting
- **Can change Postgresql.conf initialization parameters**
- **Issue with long running ArcGIS edit sessions**
 - The larger the number of states
 - The larger the bloat in indexing belonging to the Feature Class

Technical Workshops

- **Editing Tips and Tricks**
 - Wednesday 3:15pm – Ballroom 6B
 - Thursday 1:30pm – Ballroom 6B
- **Editing Versioned Geodatabases: An Introduction**
 - Thursday 1:30 – Ballroom 6F
- **Geodatabase – an Introduction**
 - Tuesday 3:15pm – Ballroom 6A
 - Wednesday 8:30am – Ballroom 6B
- **Upgrading to ArcGIS 10 Geodatabases**
 - Thursday 11:05am – Room 3
- **Spatial Data Server: An Introduction**
 - Thursday 1:30pm – Room 3
- **Accessing Spatial Databases in ArcGIS**
 - Thursday 1:55pm



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Questions?

Thank you

Please complete the survey. Your comments are important

[Esri.com/ucsessionsurveys](https://www.esri.com/ucsessionsurveys)

Session offering ID: **746**