esri | THE SCIENCE OF WHERE

Administering Your PostgreSQL Geodatabase

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GIS INSPIRING WHAT'S NEXT

Intended Audience

You are…..

- A geodatabase administrator
- A deliberate DBA
- An accidental DBA
- Not sure what DBA means

And you…

- Store your data in a PostgreSQL database
- Are thinking about using PostgreSQL

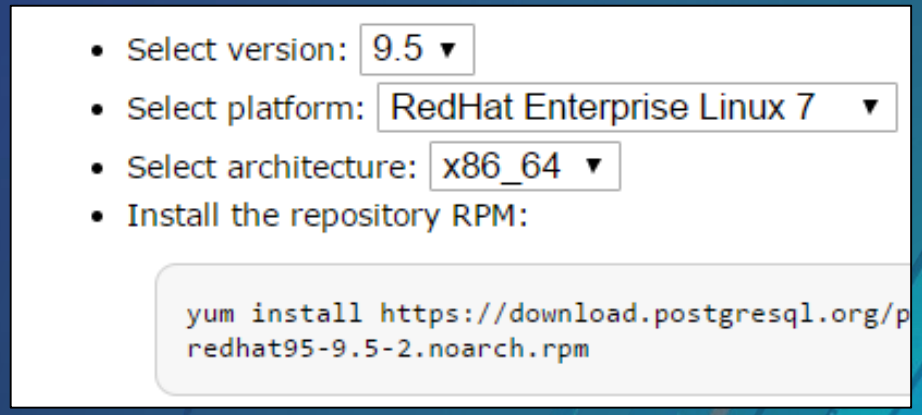
This is your session!

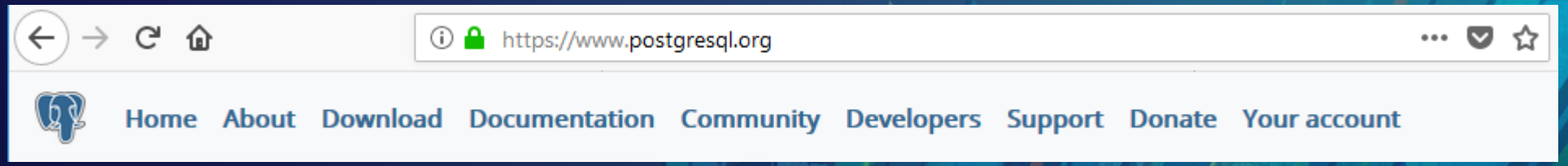
Agenda

- How do I …
  - Configure PostgreSQL to support geodatabases?
  - Create a geodatabase?
  - Control access to my data?
  - Keep my data safe?
  - Upgrade?
  - Maintain performance?
- News since the last UC

PostgreSQL Installation

- Locations
  - My Esri
  - Postgresql.org
  - Other open source distributions
- Installation
  - Refer to PostgreSQL documentation
  - Multiple methods for Linux
    - Rpms, yum, from source





PostgreSQL Configuration

- PostgreSQL configuration file for initialization parameters (postgres.conf)
  - Located in PostgreSQL\9.#\data
    - Memory parameters
      - Different settings for Windows and Linux
    - Logging parameters
    - Vacuum parameters
  - Connection parameters
  - Restart the PostgreSQL instance

```
listen_addresses = '*'
port = 5432
max_connections = 100
shared_buffers = 25% Ram, 512MB
work_mem = 128MB
maintenance_work_mem = 64MB
checkpoint_segments = 64
effective_cache_size = 2/3* RAM, 4GB
log_line_prefix = '%m [p=%p, d=%d, u=%u, x=%x]'
log_statement = 'all'
```

PostgreSQL Configuration

- PostgreSQL configuration file for connections (pg_hba.conf)
  - Located in PostgreSQL\9.#\data
  - May need entries for both:
    - IPv4 and IPv6 Addresses

```
# TYPE  DATABASE        USER            ADDRESS                 METHOD

# IPv4 local connections:
host    all             all             127.0.0.1/32            md5
host    all             all             10.11.0.0/16            md5


# IPv6 local connections:
host    all             all             ::1/128                 md5
```

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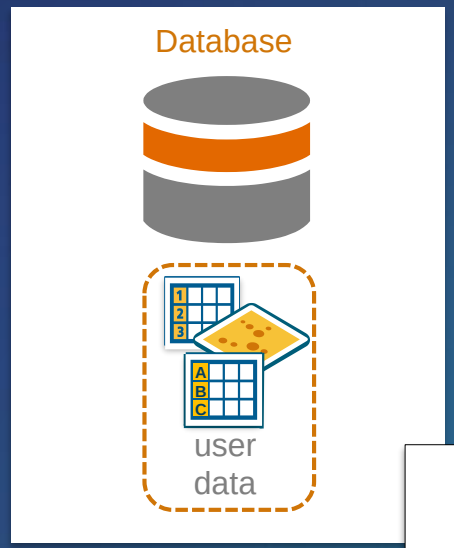
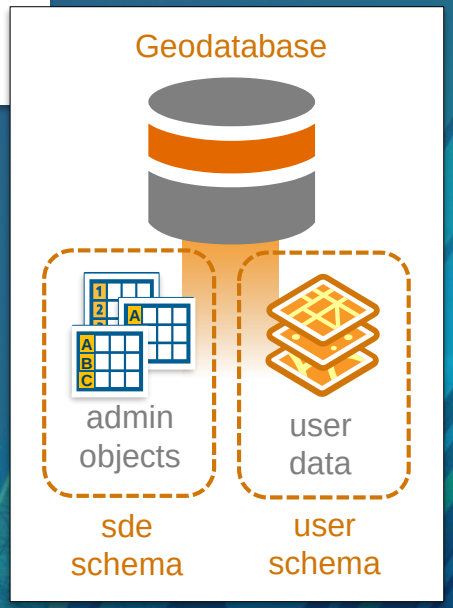
Database vs. Geodatabase

- Database provides:
  - Transaction management
  - Authorization/Security
  - Backup
- Geodatabase is a database
  - Sde user
  - Administrative schema
- Geodatabase additionally provides:
  - Behaviors (domains, subtypes)
  - Complex features (e.g., topologies, networks, parcel fabrics)
  - Versioning (long transactions) and Archiving





Geodatabase Creation

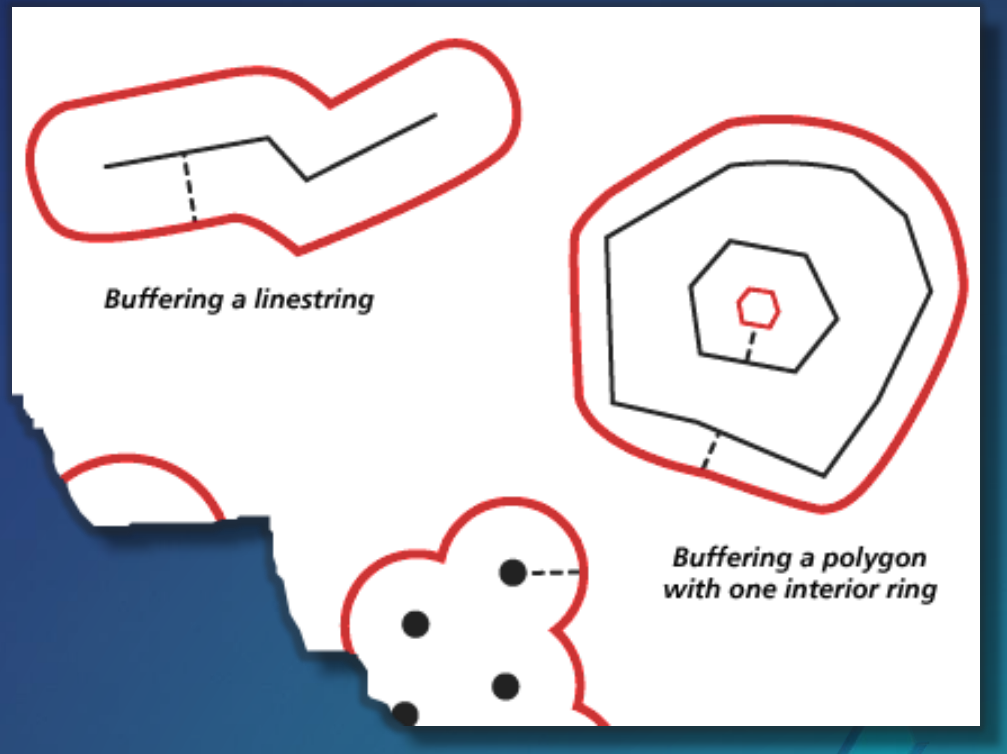
- General Prerequisites
  - ST_Geometry
  - Visual C++ Redistributable Package
- Create Enterprise Geodatabase GP tool
  - Requires postgres credentials
  - Metadata tables loaded into sde and public schema
- Enable Enterprise Geodatabase GP tool
  - Sde login pre-exists
  - Metadata tables loaded into sde and public schema
- Are DBA and geodatabase administrators the same person?
- Database name is unique per PostgreSQL instance
  - Do not change database name

Case Sensitivity

- PostgreSQL is case sensitive
- It stores all object identifiers in lower case
  - Names of: databases, schemas, users, tables, indexes, columns
  - Geodatabase also stores all identifiers in lower case in PostgreSQL
  - User data (attributes) can be in any case
- Do not use quotation marks to force different casing
  - ArcGIS does not quote strings; objects with upper or mixed case names will not be found
  - Be aware that pgAdmin quotes strings automatically

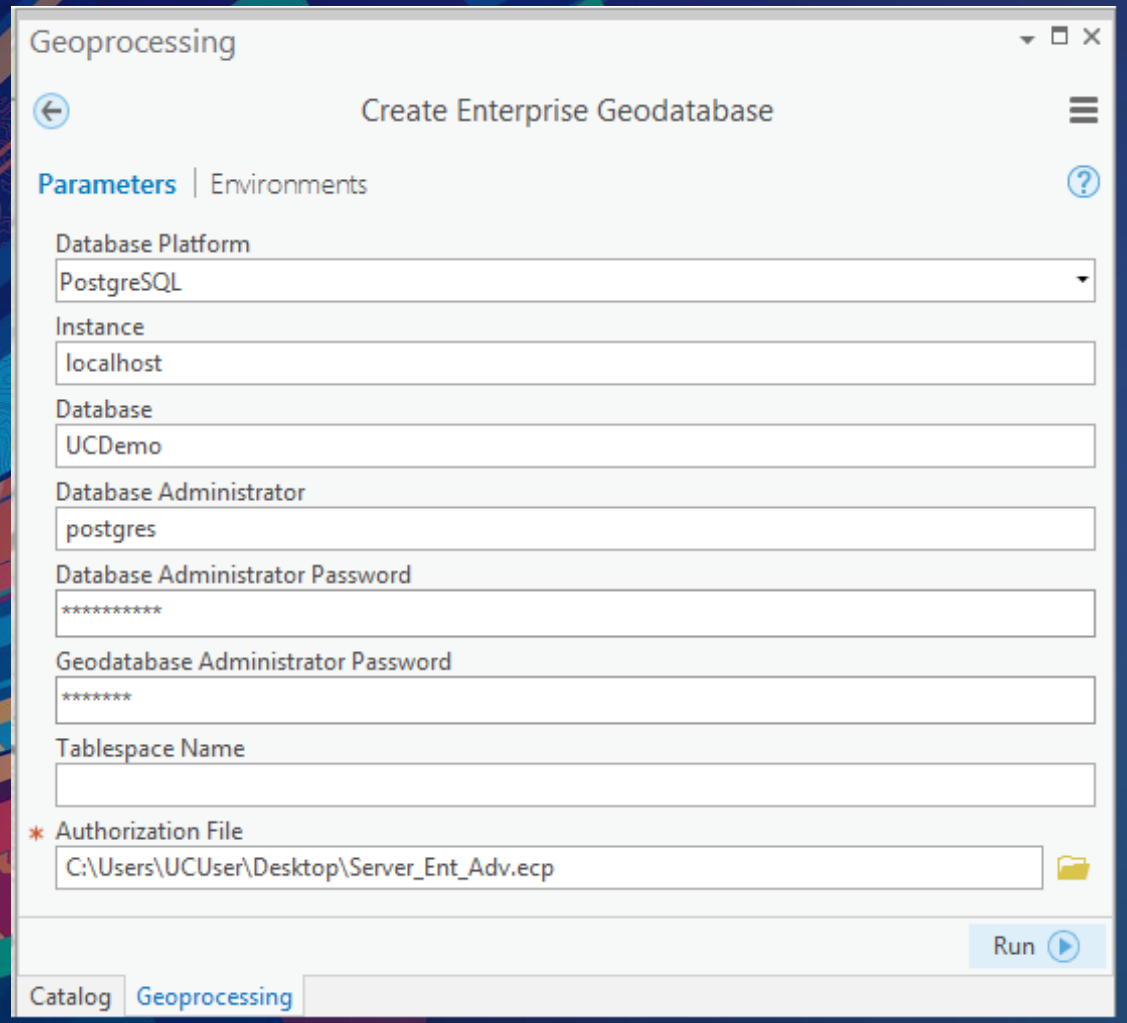
SQL Support

- Creation of Features
- Analysis through SQL
- Geodatabase behavior not supported
- SQL Types:
  - ST_Geometry (default)
  - PostGIS
- Example:
  - sde.st_intersects *(geometry1 sde.st_geometry, geometry2 sde.st_geometry)*



Geodatabase Considerations

- Which spatial type to use
  - ST_Geometry or PostGIS
- Environments – Development, Staging, Production
  - Multiple geodatabases in instance or multiple instances
  - Service Level Agreement (SLA)
  - Number of users
  - Workload separation
- Editing and data management workflows
  - ArcGIS and other tools
  - Best to use one tool for editing of data for publication to many tools



Creating a Geodatabase

Justin Muise

Remember

- Create Enterprise Geodatabase
  - Requires the postgres superuser credentials
  - Creates a database and required geodatabase objects
  - Useful for new databases
  - Used when permissions are accessible, and/or database defaults are okay
- Enable Enterprise Geodatabase
  - Requires the database & sde user
  - Creates geodatabase objects in existing database
  - Useful for databases with existing data
  - Used when permissions are strict, and/or custom database configuration is required

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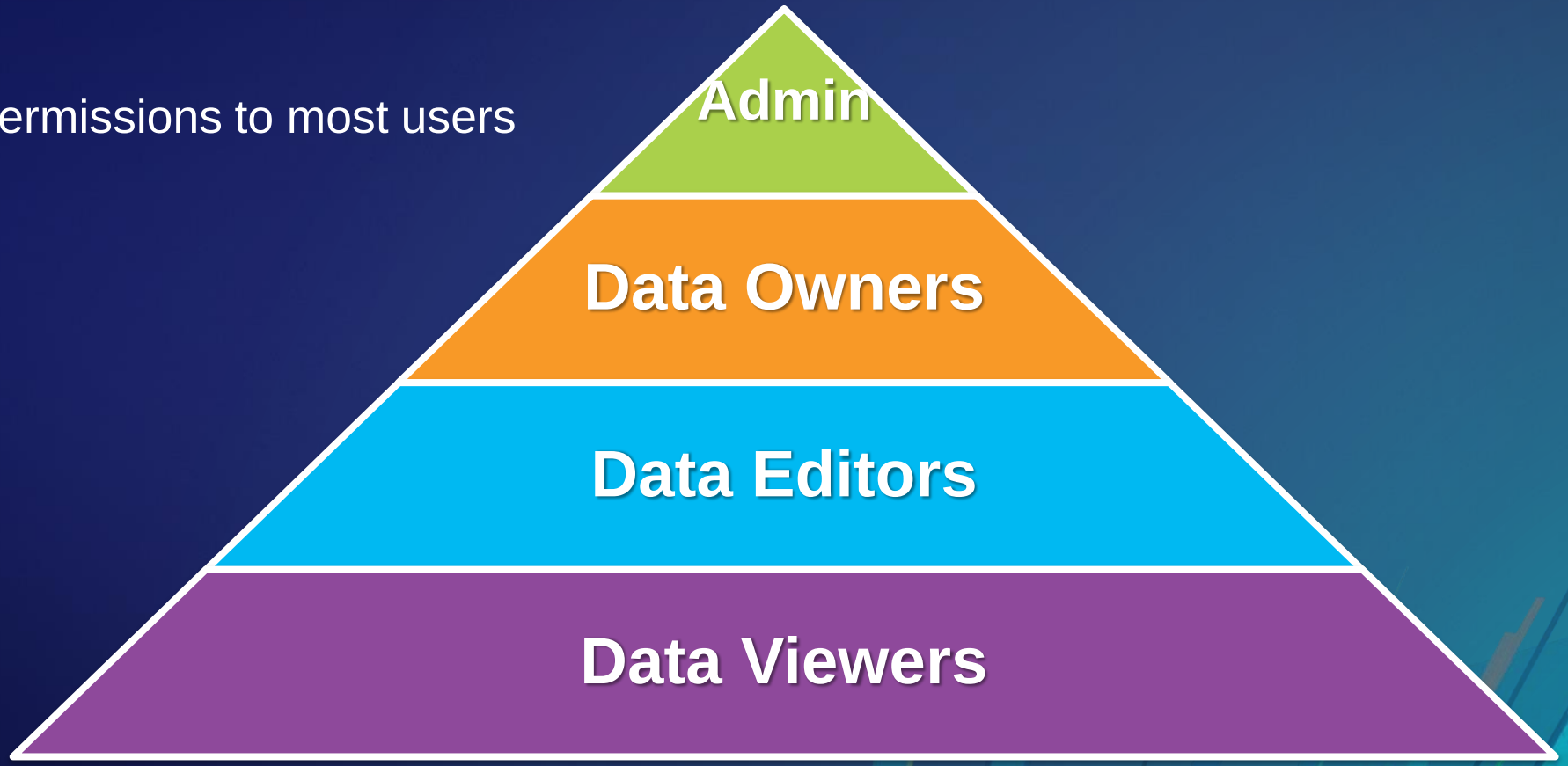
Users

- Limit permissions to most users

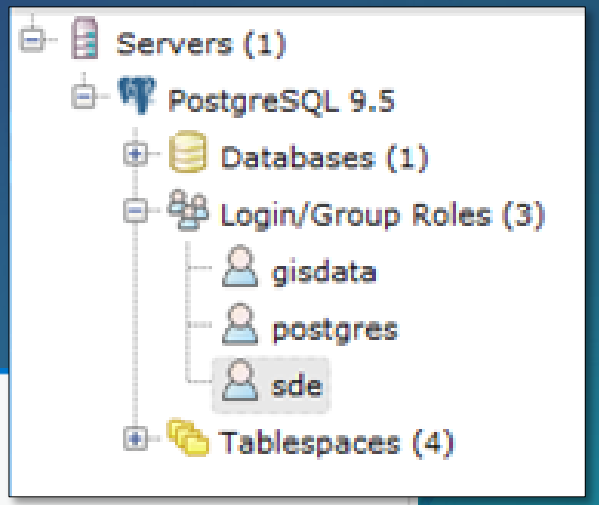


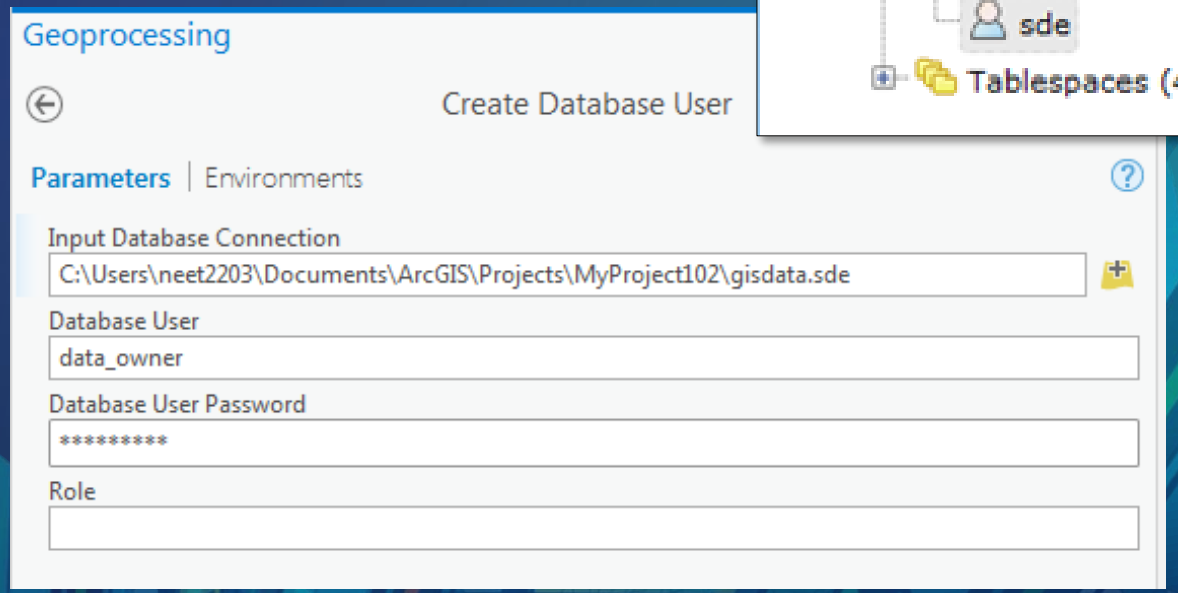
PostgreSQL Users - Roles

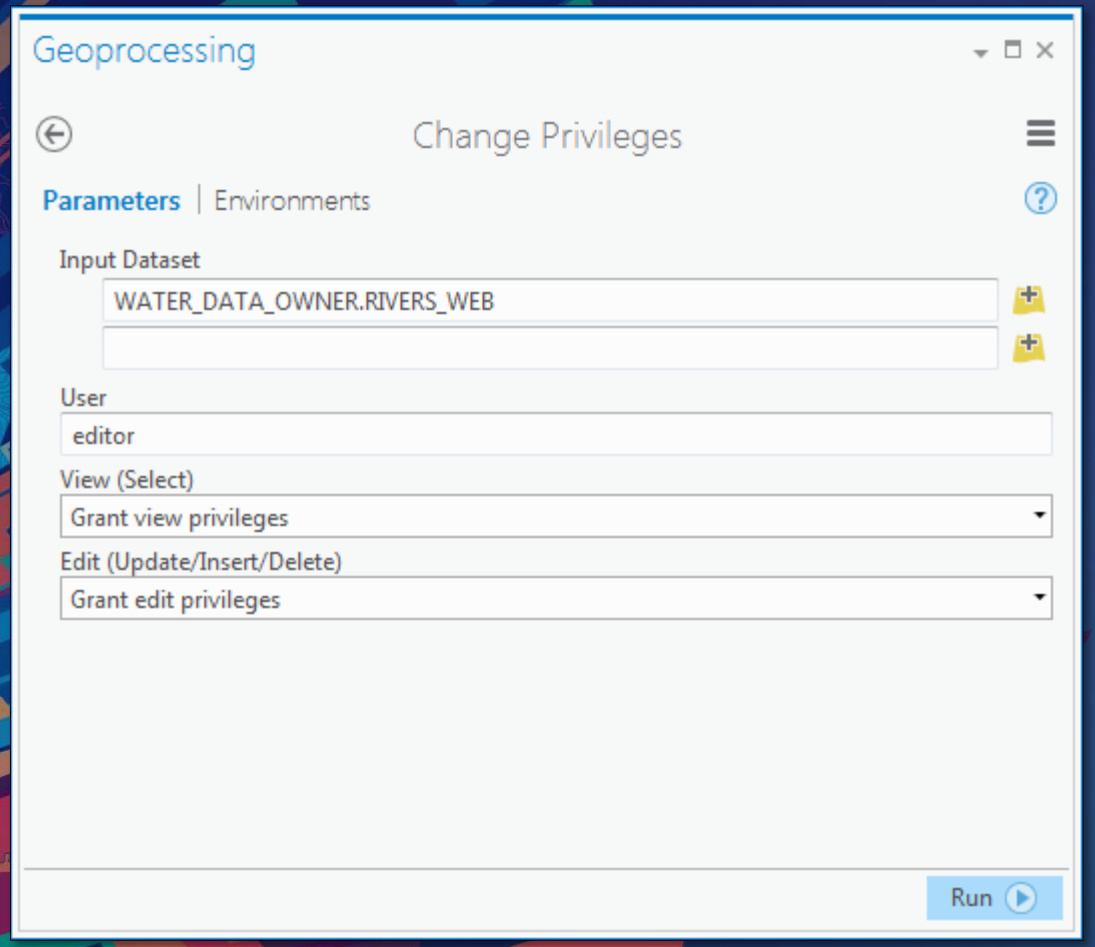
- Roles are used to log into database cluster and databases
- Individual users called login roles
- Roles can also represent groups of users
- Create different types of users
- Data owner login roles must own a schema with same name
  - Data owner group role would still need individual data owner schemas

PostgreSQL Users - Roles

- Data Owners
  - Create Database User Tool
  - Creates a login role and a matching schema
  - Grants USAGE privileges on the new schema to public
- Data Editors / Viewers
  - Change Privileges tool
  - Grant usage on owner schema(s)







Managing Permissions

Justin Muise

Remember

- Data Owners
  - Create Database User geoprocessing tool
    - Creates Data Owners Only
  - Responsible for granting object permissions
- Data Editors/Viewers
  - Created manually
- ArcGIS tools manage permissions on all parts of a feature class

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BACKUP YOUR DATA NOW !!!

(and practice restoring it)

Frequency of Backup

- How often should you take a backup?
  - How often does the data change?
  - How much time/data can you afford to lose?
  - How fast does the recovery need to be?
- Test the back up and restore procedure on production worthy hardware
- Consider:
  - PostgreSQL replication
  - Point in time recovery with Write-Ahead Logging (WAL)
  - Cloud solutions

Backup

- Typical backup methods
  - Database – pg_dump (typical method)

```
pg_dump -h localhost -p 5432 -U postgres  -F c -v -f
E:\backups\prod_090616.bak prod
```

- Some other backup methods
  - File based (cold) backup
  - VM backup

Restore

- Database - pg_restore
  - Restore schemas in this order: public, sde, data owners
  - If sde and remaining schemas are restored together, spatial indexes will be missing on user data

```
pg_restore -n public  -p 5432 -U postgres -d
db_name –c -v E:\backups\db_060716.bak
```

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Geodatabase Upgrade

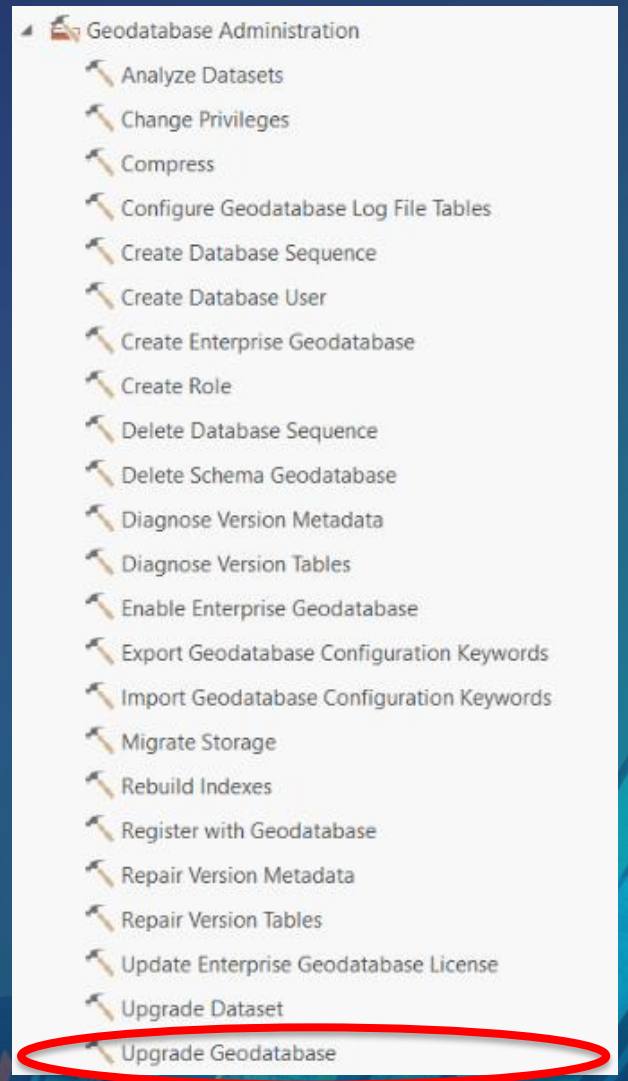
- Review Pre-requisites and Requirements
- Test first, staging or test environment
- Place new st_geometry in pg/lib location
- Order of operations when upgrading both geodatabase and PostgreSQL
  - One at a time
  - PostgreSQL needs to be at supported release for upgraded version
    - Applies to geodatabase AND ALL connecting clients

Upgrade Order

- ArcGIS client
- PostgreSQL database cluster
- Geodatabase (or spatial type in a database)
- Save configuration files for reference
  - postgresql.conf
  - pg_hba.conf
- Test it!

Upgrade Geodatabase

- Run Upgrade Geodatabase from ArcGIS
  - Right-click database connection,
  - Run the geoprocessing tool, or
  - Call the tool from Python



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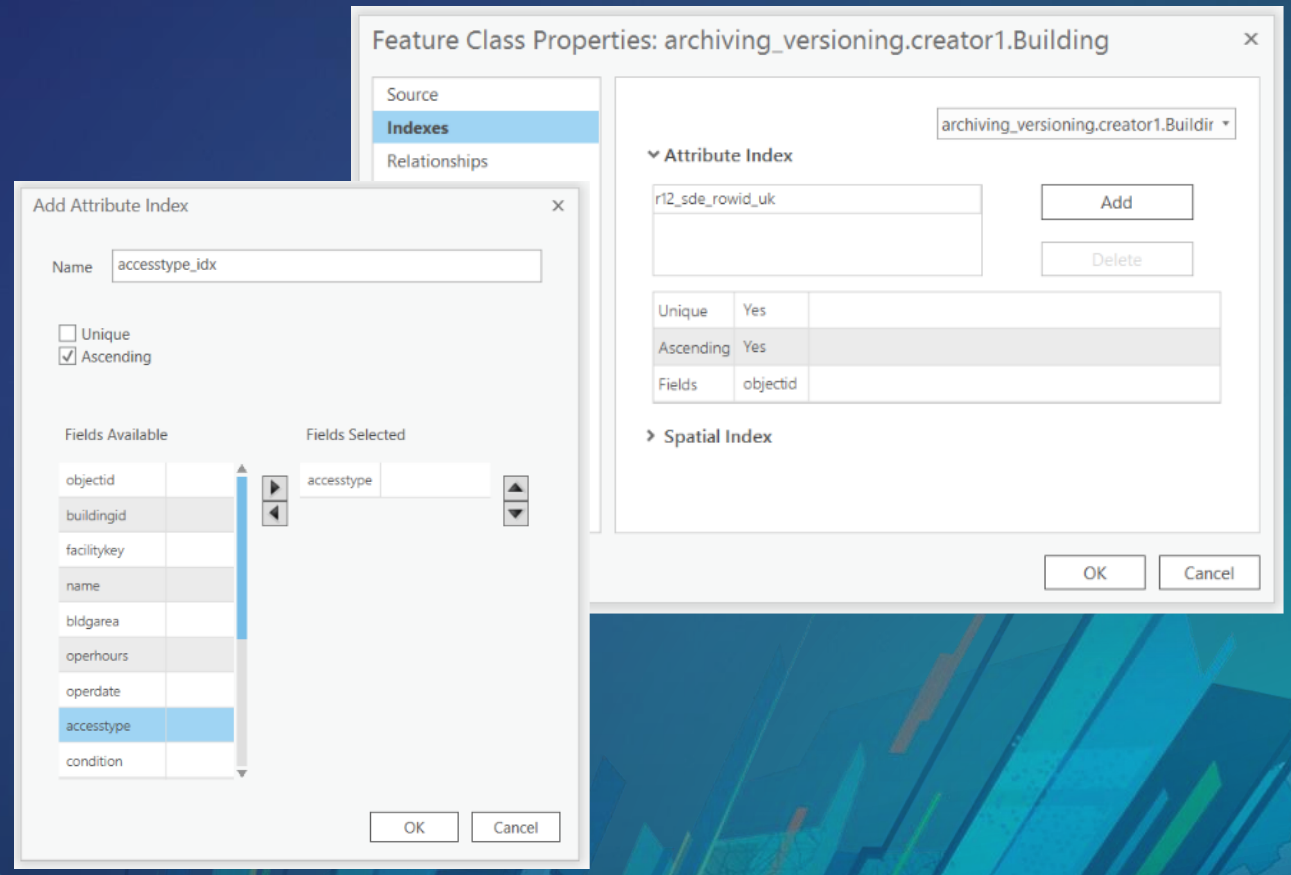
Daily maintenance

- Vacuum
  - Runs by default
  - Highly configurable
- Consider re-indexing
  - If high volume of change occurred to a table
- Connections
- Memory allocation
  - postgres.log will give suggestions

Geodatabase Maintenance

- If using traditional versioning
  - Reconcile/Post/Compress
- Rebuild attribute indexes
  - Analyze
  - No need to rebuild spatial indexes
    - GIST index, self correcting



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What's New in ArcGIS?

- Applies to:
  - ArcGIS 10.6 and 10.6.1
  - Pro 2.1 and 2.2
- Improved ArcSDE Logfile Implementation
- Support of PostgreSQL 9.6 at 10.6 and PostgreSQL 10 at 10.6.1
- Support for Microsoft Azure for PostgreSQL
- Improved data loading performance
- Third party spatial type performance
  - The purpose of this project is to improve ArcGIS draw/query performance of non-esri spatial types.

What's New in ArcGIS?

- Parallel queries supported with ST_Geometry
- PostGIS Geography support
- Support of SSL
- Supported PostgreSQL & OS Versions
  - 10.3 (64 bit)
  - 9.6.8 (64 bit)
  - 9.5.12 (64 bit)
  - PostGIS 2.4 (optional)

Conclusion

- How do I...
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  - Upgrade my geodatabase?
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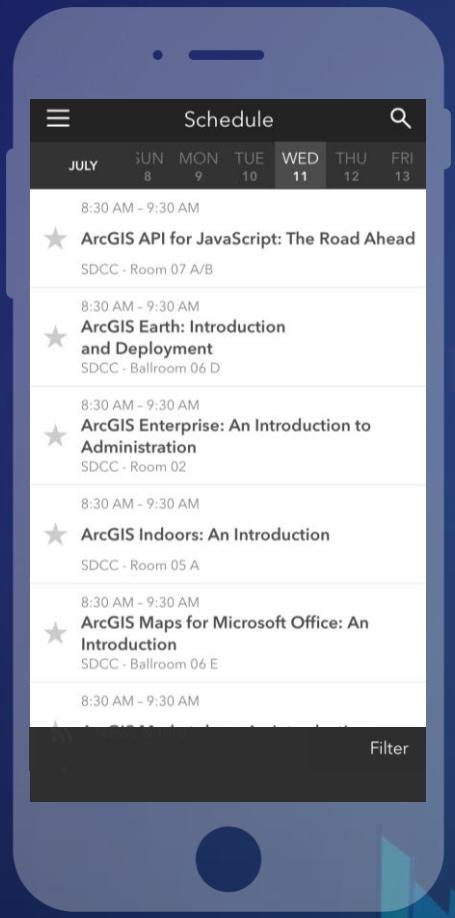
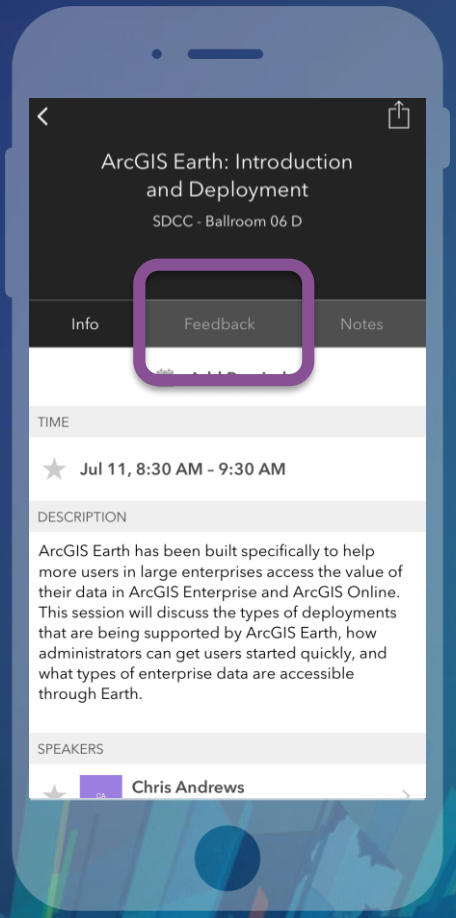
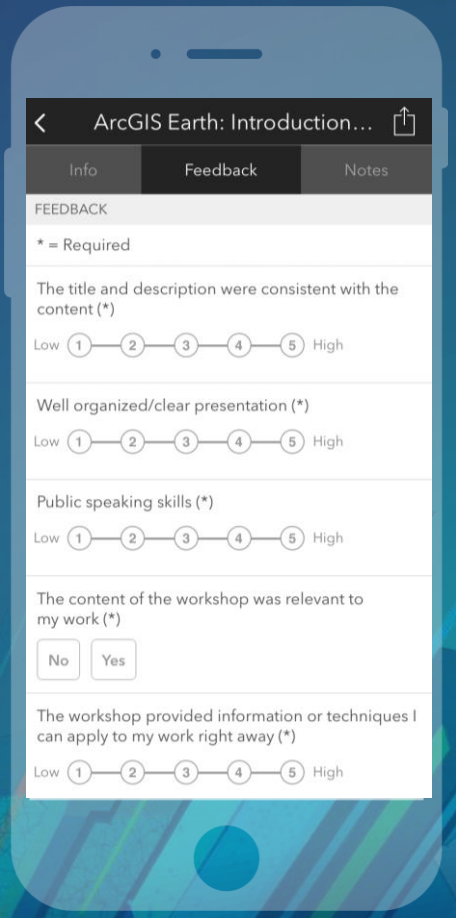
Select the session you attended



Select the Feedback tab



Complete answers and select “Submit”



See Us Here

WORKSHOP	LOCATION	TIME FRAME
• Esri Best Practices: Implementing an Enterprise Geodatabase	• SDCC - Room 17 B SDCC – Room 05 B	• Wednesday 8:30-9:30 Thursday 10:00-11:00
• Geodatabase Administration: An Introduction	• SDCC - Room 15 A SDCC – Room 15A	• Wednesday 1:00-2:00 Thursday 4:00-5:00
• ArcGIS Enterprise: Cloud Operations using Microsoft Azure	• SDCC - Room 31 A	• Thursday 8:30-9:30
• Enterprise Geodatabase: Performance Troubleshooting	• SDCC - Room 09	• Thursday 10:00-11:00
• Geodata Best Practices	• SDCC – Room 04	• Thursday 2:30-3:30

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