2010 Esri 中国区域用户大会

Geodatabase10 新技术介绍

刘宇

esri China BEIJING

内容概要

- Geodatabase简介
- Geodatabase10新功能
- 小结

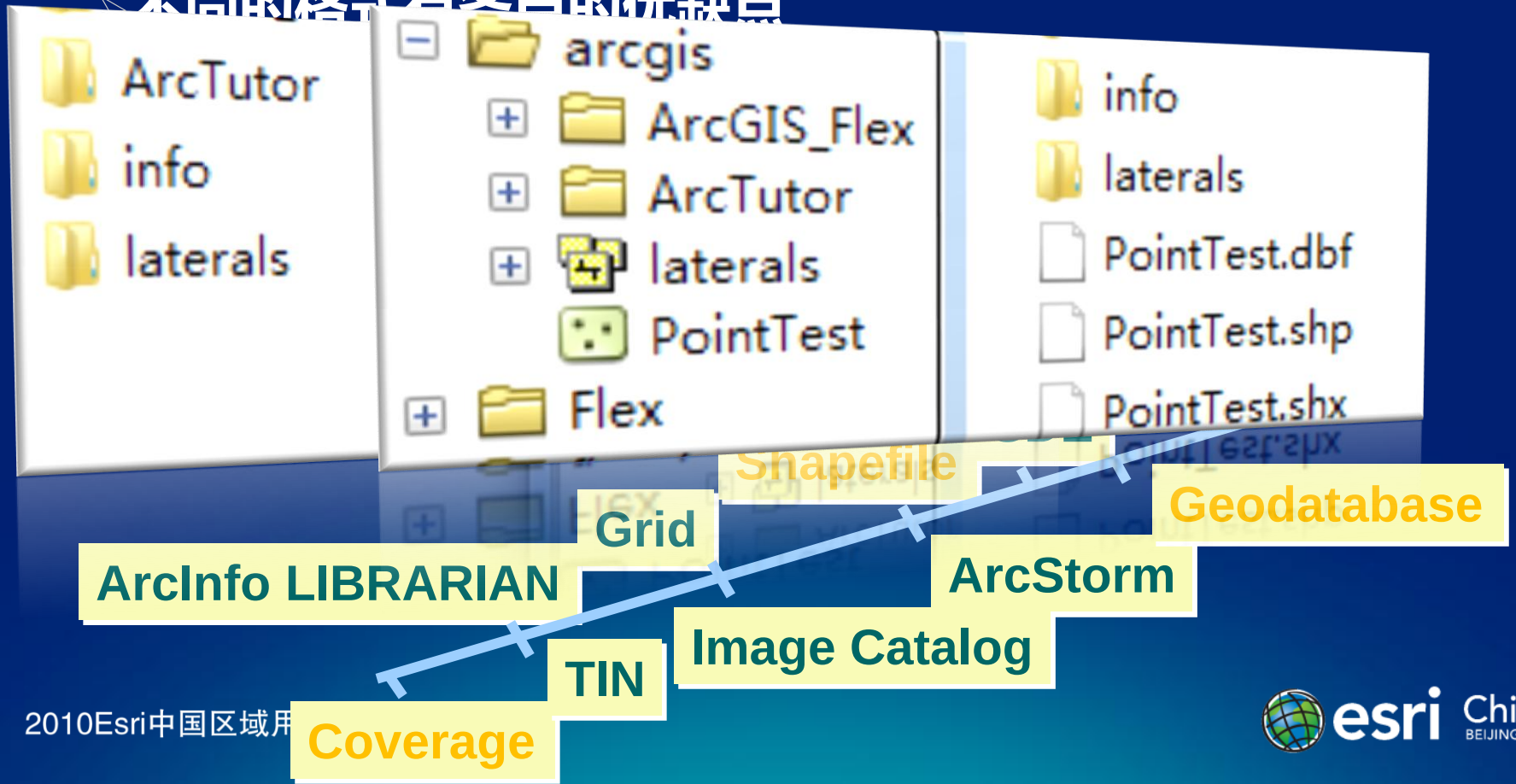
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Geodatabase简介

Esri的空间数据格式

- 空间数据的存储结构和方式随着时间和技术的发展在不断的改变
- 各种数据格式的空间数据用来表现真实世界里的对象
- 不同的格式有各自的优缺点



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什么是Geodatabase？

ArcGIS的核心数据模型

面向对象

表达和管理GIS数据

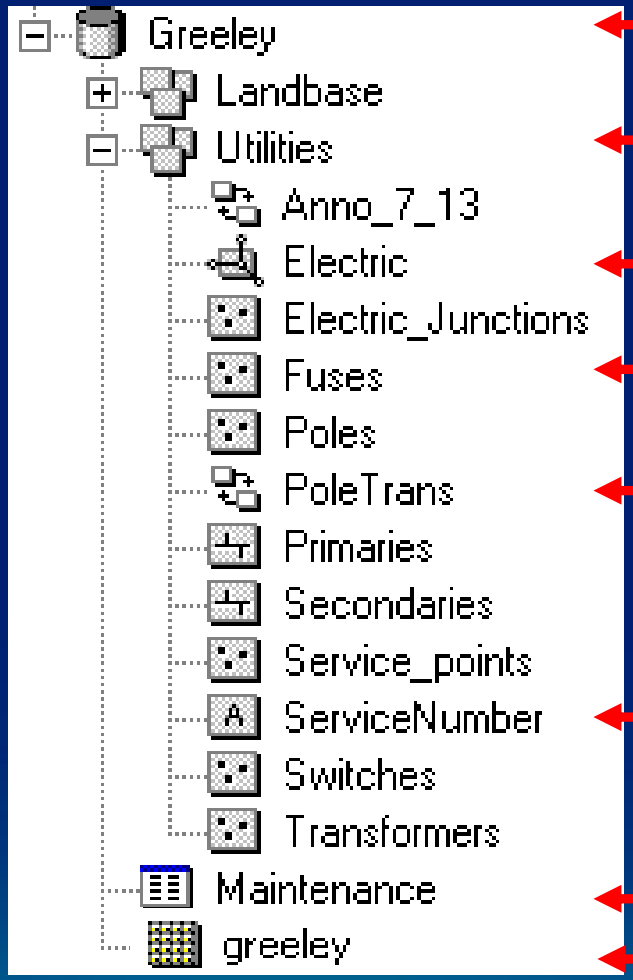
地理数据统一的存储仓库

要素类 ,栅格数据……

关系类,拓扑

支持不同的平台

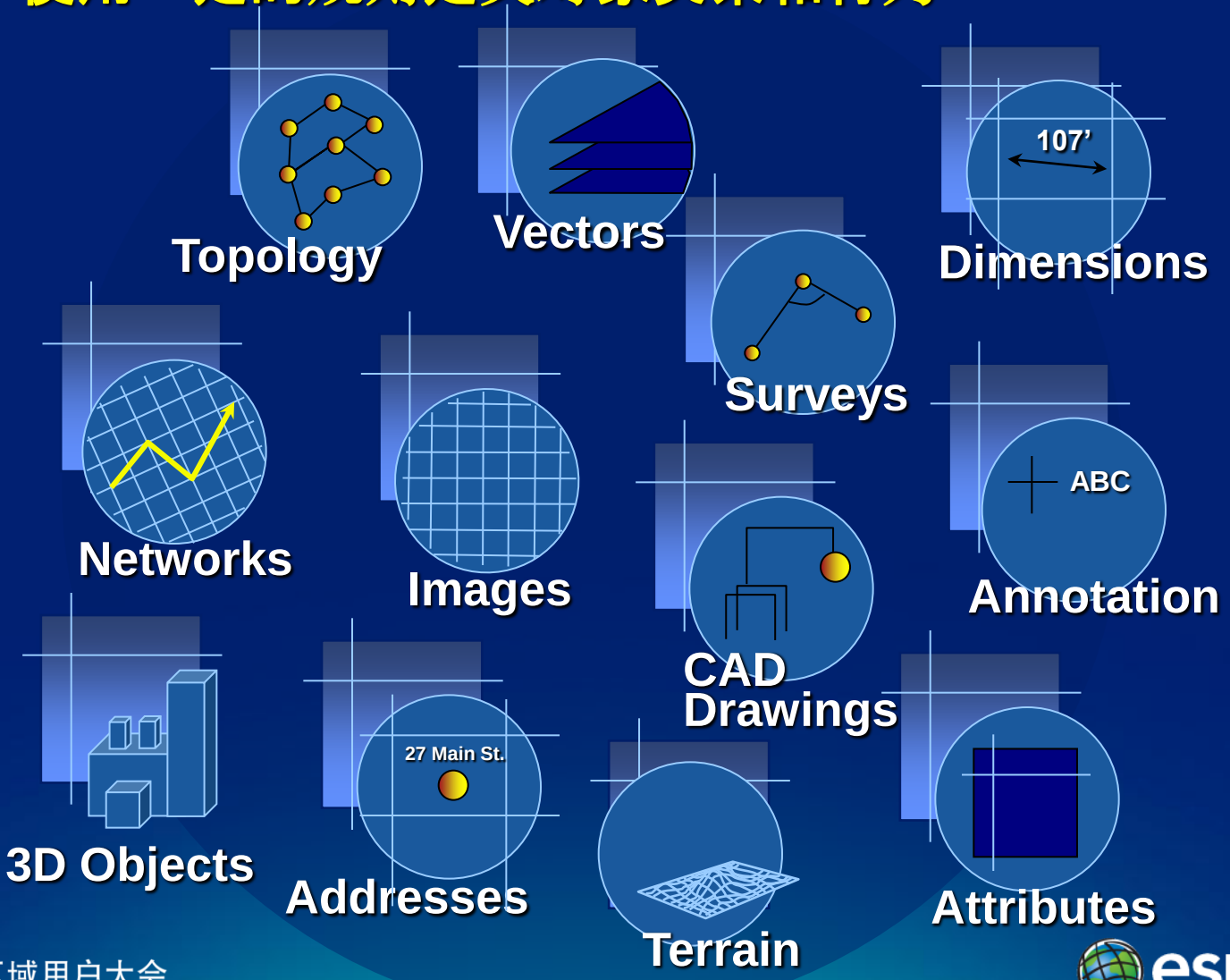
可伸缩性



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Geodatabase支持所有的一般空间数据类型

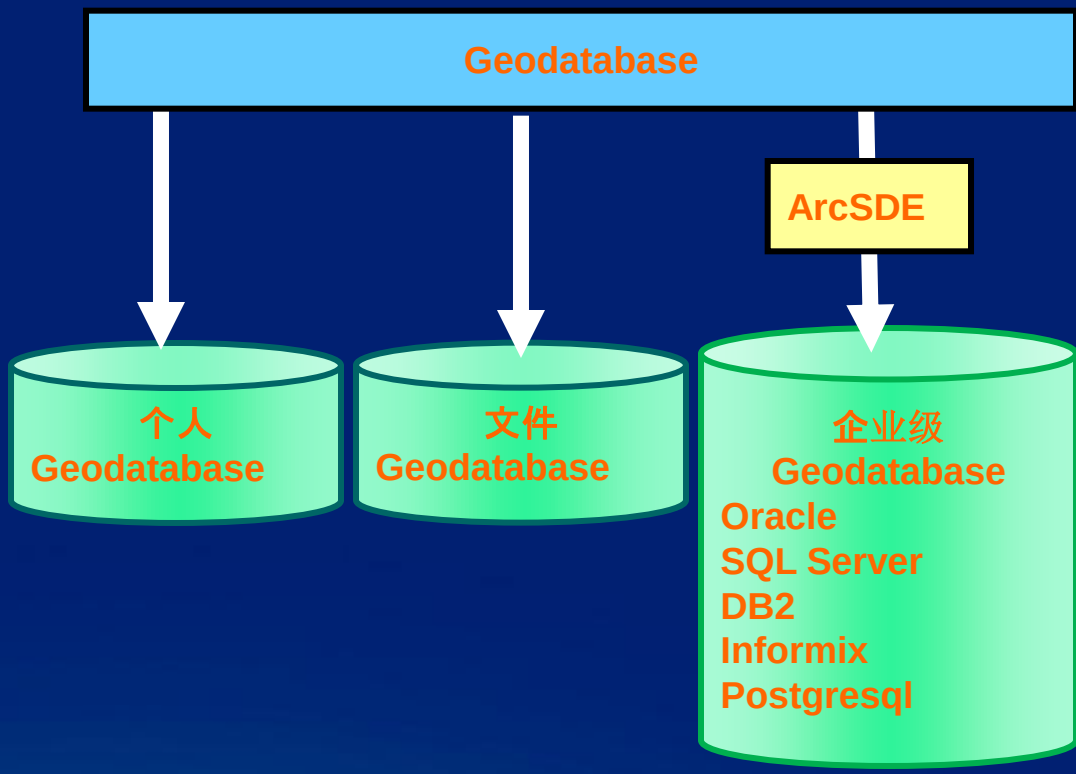
使用一定的规则定义对象关系和行为



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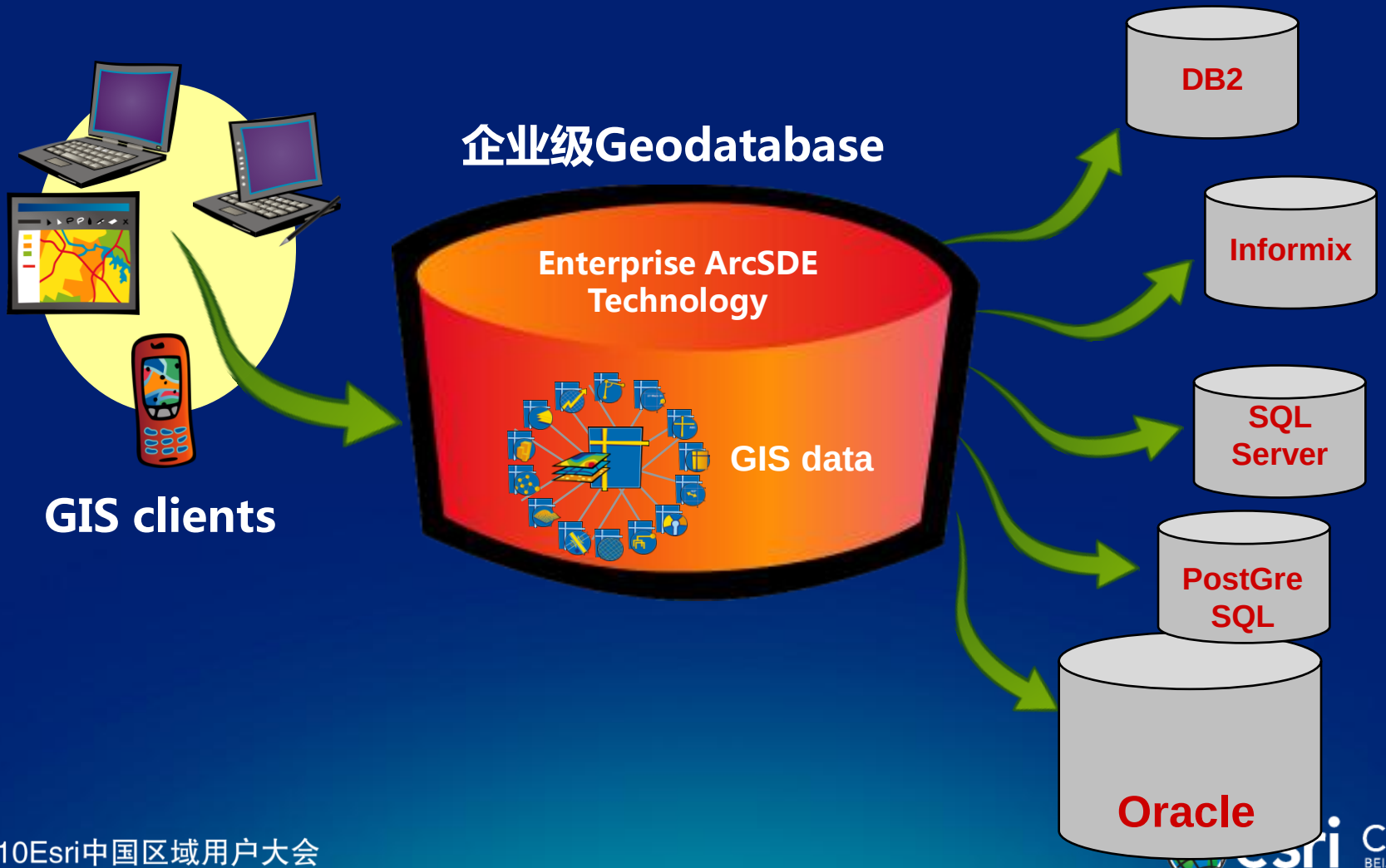
Geodatabase的三种类型

- 个人Geodatabase
  - 存储在 MS Access
  - 最大不超过 2 GB
- 文件Geodatabase
  - 存储在文件系统
  - 单张表限制1TB
- 企业级Geodatabase
  - 存储在 RDBMS
  - 需要ArcSDE
  - 支持多用户并发编辑
  - 支持存储全部的数据类型 (如, 栅格)



ArcSDE整体架构

站在DBMS的肩膀上，让我们更方便的管理空间数据



GIS–让人类认知世界



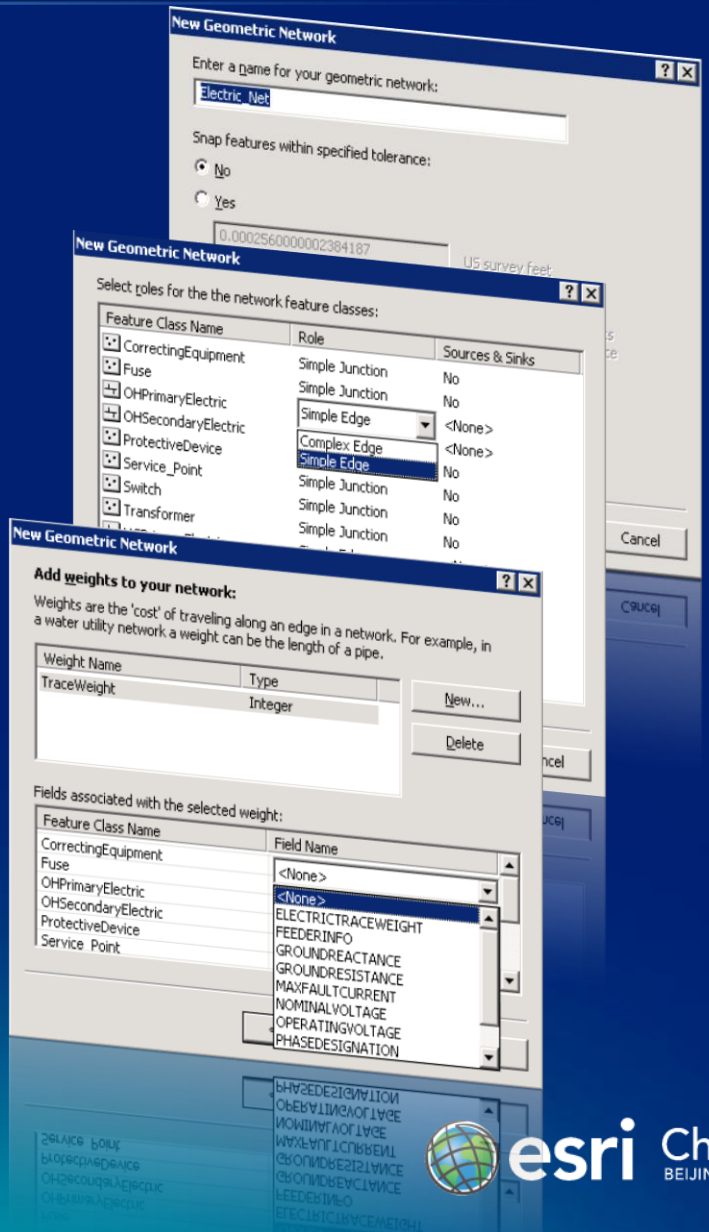
Geodatabase10新功能

Geodatabase10新功能

- 增强Geodatabase的信息模型
- 提高Geodatabase复制的灵活性和易用性
- 提供开放和直接的数据访问
- 访问标准空间数据集
- 系统表简化
- 其他增强功能

增强Geodatabase数据模型- 几何网络

- 改进新建要素和装载数据效率
- 支持大规模几何网络建立
- 提供精简几何网络向导
- 提供专门的工具可以向已经存在的几何网络中添加新的要素。



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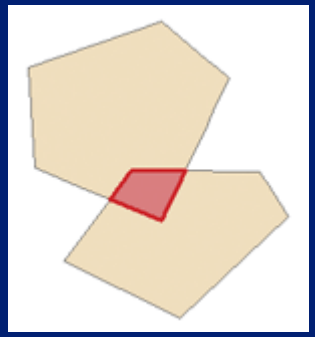
增强Geodatabase数据模型- Topology?

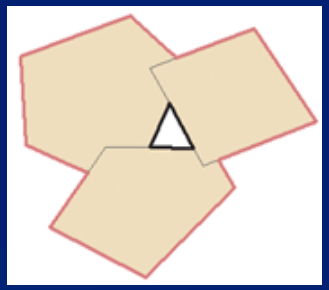
- ArcGIS中的拓扑是一组规则和关系的集合，加上一系列的编辑工具和管理技术。
- 主要反映了空间数据的一致性、相邻性、联通性等
- 是用来保证空间数据质量的完整性规则
- 使地理数据库能更精确地模拟现实世界中可以发现的几何关系。

拓扑的一个例子

- –比如图斑不能相互压盖
- –测量石油管道的时候不能自相交
- –宗地和宗地间不能有缝隙
- –路灯必须落在马路上

……





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ArcGIS® Geodatabase Topology Rules

Topology in ESRI® ArcGIS® allows you to model spatial relationships between feature classes in a feature dataset. Topology rules allow you to define those relationships between features in a single feature class or subtype or between two feature classes or subtypes. Topology rules allow you to define the spatial relationships that meet the needs of your data model. Topology errors are violations of the rules that you can easily find and manage using the editing tools found in ArcMap™.

ArcGIS

How to read these diagrams:



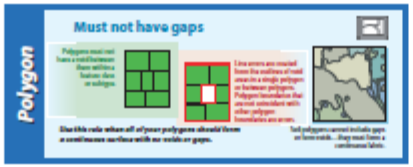
Polygon

Must not overlap



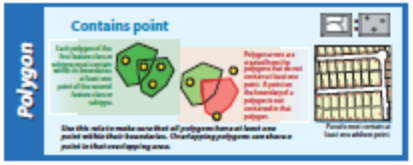
Use this rule to make sure that no polygon overlaps another polygon in the same feature class or subtype.

Must not have gaps



Use this rule when all of your polygons should form a continuous surface with no voids or gaps.

Contains point



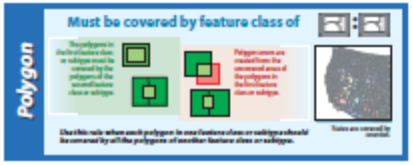
Use this rule to make sure that all polygons have at least one point within their boundaries. Overlapping polygons can share a point in that overlapping area.

Must be covered by boundary of



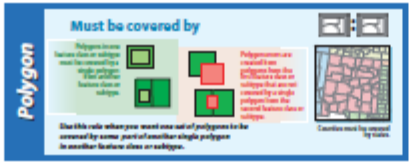
Use this rule when polygon boundaries should be coincident with another line feature class or subtype.

Must be covered by feature class of



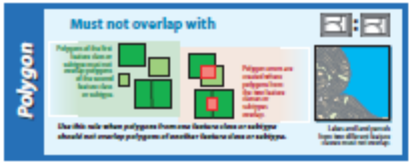
Use this rule when each polygon in one feature class or subtype should be covered by all the polygons of another feature class or subtype.

Must be covered by



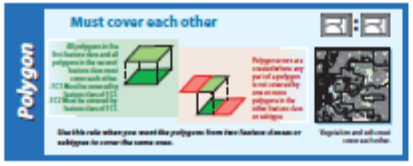
Use this rule when you want one set of polygons to be covered by some part of another single polygon in another feature class or subtype.

Must not overlap with



Use this rule when polygons from one feature class or subtype should not overlap polygons of another feature class or subtype.

Must cover each other



Use this rule when you want the polygons from two feature classes or subtypes to cover the same area.

Area boundary must be covered by boundary of



Use this rule when the boundaries of polygons in one feature class or subtype should align with the boundaries of polygons in another feature class or subtype.

Line or Polygon

Must be larger than cluster tolerance



This rule is applied to all line and polygon feature classes that participate in the topology.

Point

Must be properly inside polygons



Use this rule when you want points to be completely within the boundaries of polygons.

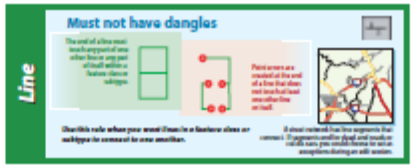
Must be covered by boundary of



Use this rule when you want points to align with the boundaries of polygons.

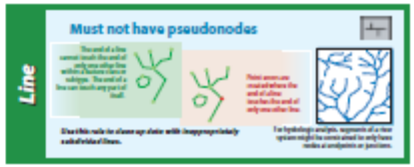
Line

Must not have dangles



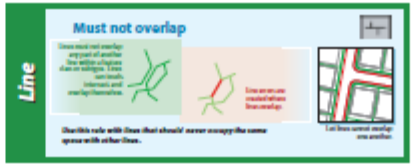
Use this rule when you want lines in a feature class or subtype to connect to one another.

Must not have pseudonodes



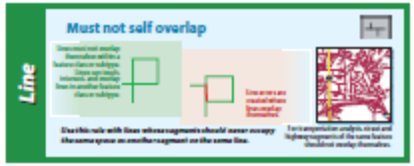
Use this rule to clean up slivers with inappropriately subdivided lines.

Must not overlap



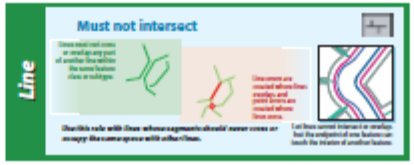
Use this rule with lines that should never occupy the same space with other lines.

Must not self overlap



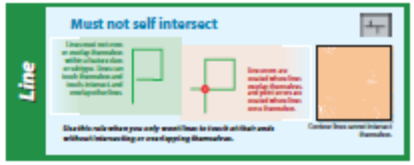
Use this rule with lines whose segments should never occupy the same space as another segment or the same line.

Must not intersect



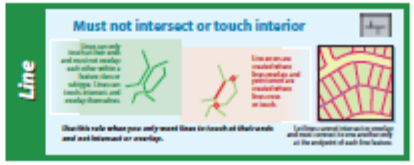
Use this rule with lines whose segments should never cross or occupy the same space with other lines.

Must not self intersect



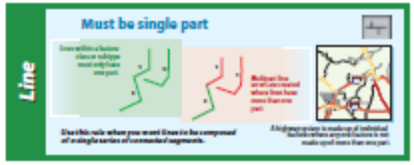
Use this rule when you only want lines to touch at their ends without intersecting or overlapping themselves.

Must not intersect or touch interior



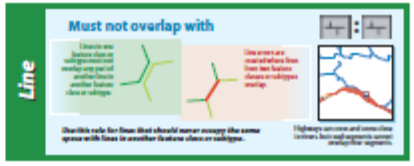
Use this rule when you only want lines to touch at their ends and not intersect or overlap.

Must be single part



Use this rule when you want lines to be composed of a single series of connected segments.

Must not overlap with



Use this rule for lines that should never occupy the same space with lines in another feature class or subtype.

Must be covered by feature class of



Use this rule when you have multiple groups of lines describing the same geography.

Must be larger than cluster tolerance

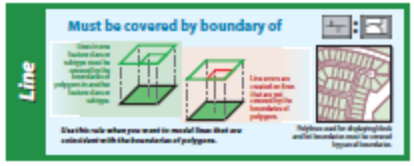
This rule is applied to all line and polygon feature classes that participate in the topology.

Endpoint must be covered by



Use this rule when you want to model the ends of lines in one feature class or subtype that are coincident with point features in another feature class.

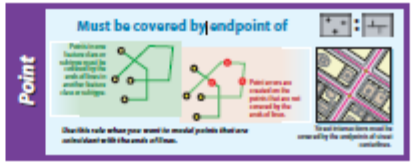
Must be covered by boundary of



Use this rule when you want to model lines that are coincident with the boundaries of polygons.

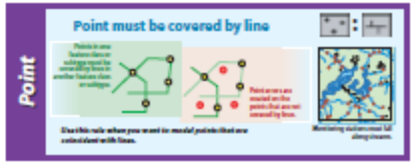
Point

Must be covered by endpoint of



Use this rule when you want to model points that are coincident with the ends of lines.

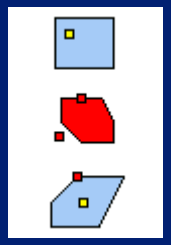
Point must be covered by line



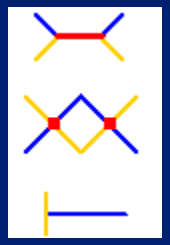
Use this rule when you want to model points that are coincident with lines.

增强Geodatabase数据模型- Topology

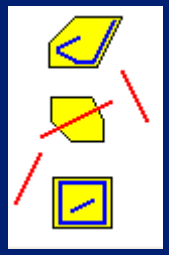
更完善



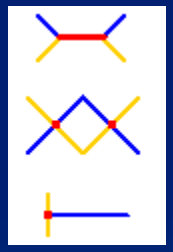
- Area must contain one point



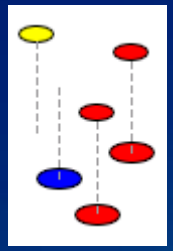
- Line must not intersect with line



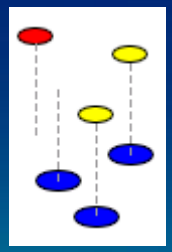
- Line must be inside area



- Line must not intersect line or touch interior



- Point must be disjoint



- Point must be coincident with point

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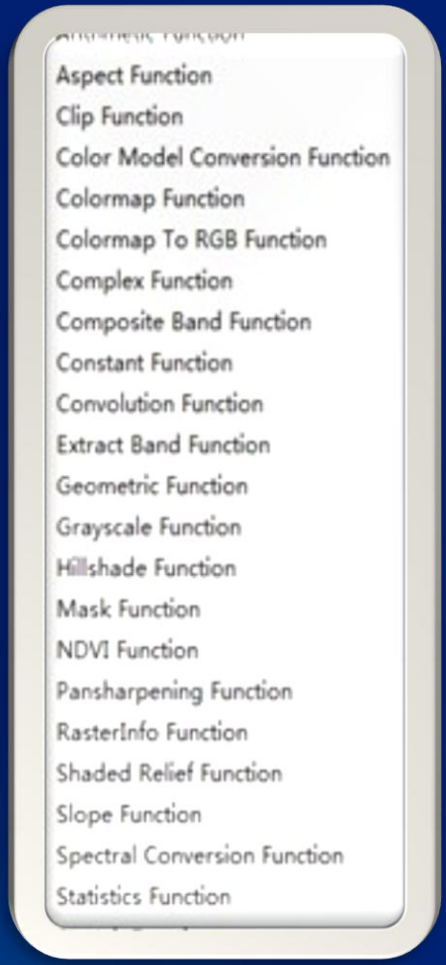
Geodatabase影像管理模型

- Raster Dataset
- Raster Catalog
- Mosaic Dataset（*New*）

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Mosaic Dataset

- 新的栅格数据模型，用于管理和发布海量多分辨率、多传感器影像
- raster catalog和raster dataset的混合技术
  – Mosaic Dataset的存储方式和raster catalog类似，但是浏览和使用的时候和普通Raster Dataset无异
- 间接管理影像像素
  – 栅格数据可以以其原始格式存储在文件系统中或是加载到Geodatabase中
- 影像大小无限制
- 提供动态镶嵌（dynamic mosaicking）和实时处理（on-the-fly processing）技术



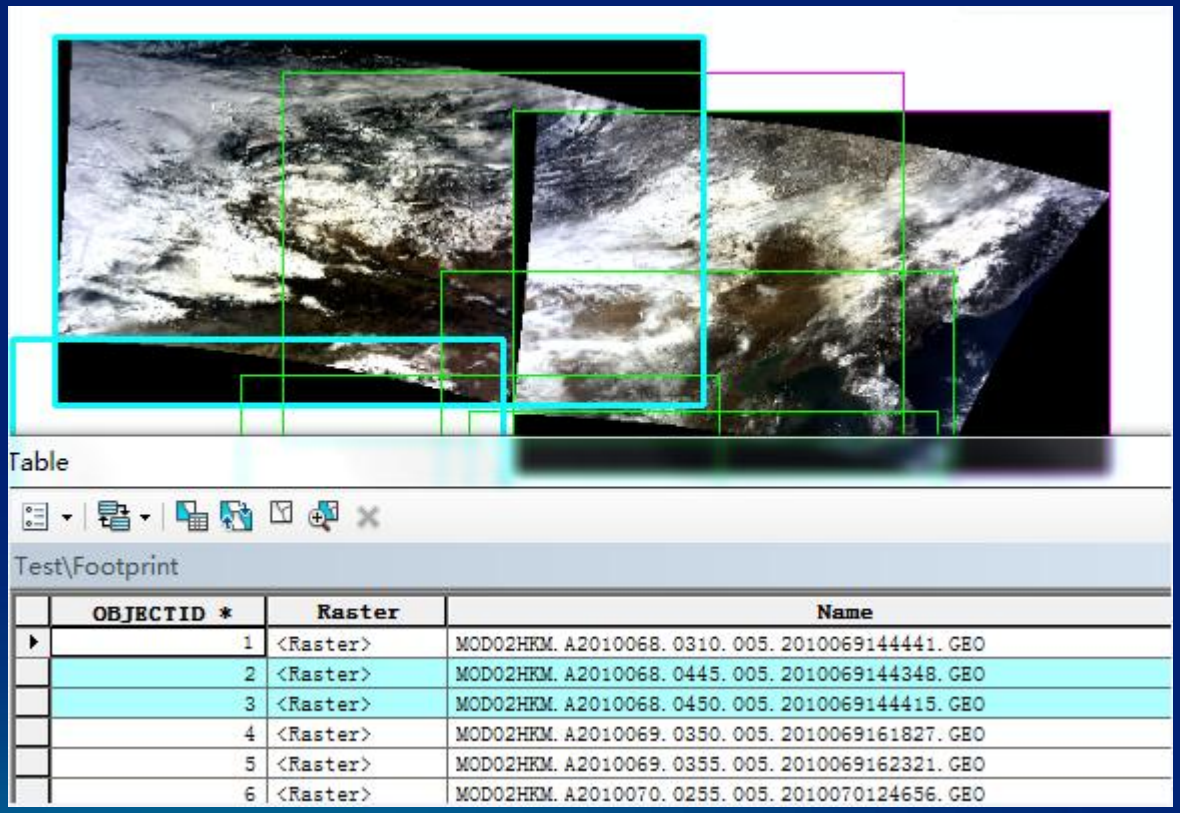
在Desktop中编辑Mosaic Dataset

在ArcMap以一组数据层出现

- Boundary
- Footprint
- Image

每条记录定义

- 对应一个栅格数据集
- Footprint
- Metadata



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4	<Raster>	MOD02HKM.A2010069.0350.005.2010069161827.GEO
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6	<Raster>	MOD02HKM.A2010070.0255.005.2010070124656.GEO

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Mosaic Dataset

1. Demo演示NDVI指数提取

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敬请关注

9月16日	二号会议厅-201A　　遥感技术新进展
14:30-15:20	《基于ArcGIS的影像管理发布解决方案与实践》	董平
15:30-16:20	《影像动态处理与快速发布》 |余叔同

Geodatabase10新功能

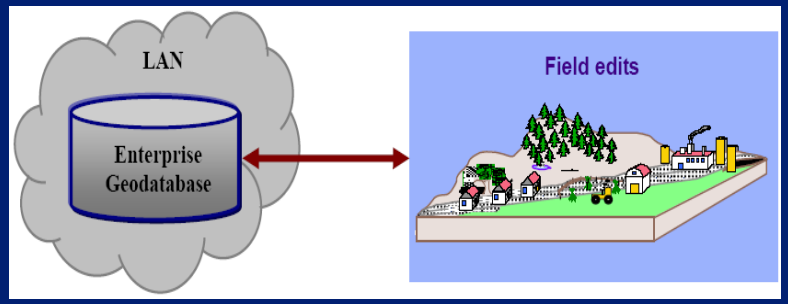
- 增强Geodatabase的信息模型
- 提高Geodatabase复制的灵活性和易用性
- 提供开放和直接的数据访问
- 访问标准空间数据集
- 系统表简化
- 其他增强功能

什么是Geodatabase复制（Replication）

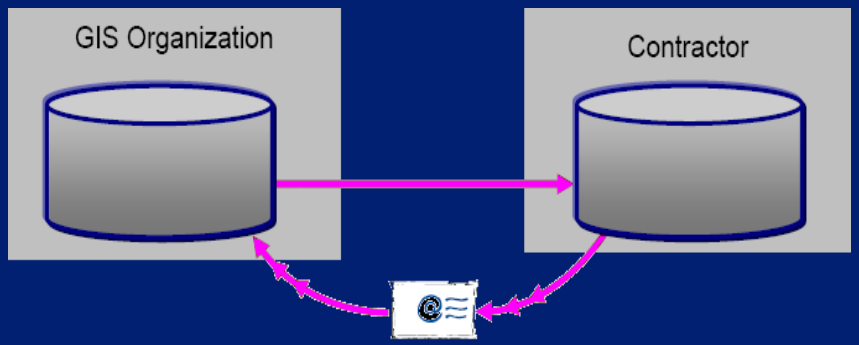
- ArcGIS提供的建立在版本机制之上的数据分发的方法
  - 可以在2个或者更多的GDB中分布式地管理和应用数据的拷贝
- 支持所有的Geodatabase数据模型，包括拓扑和几何网络
- 松散耦合的同步机制
  - 可以独立地编辑各个GDB, 在需要的时候对它们实施数据同步
- 跨数据库平台之间可以实现复制

谁？何时？使用Geodatabase复制

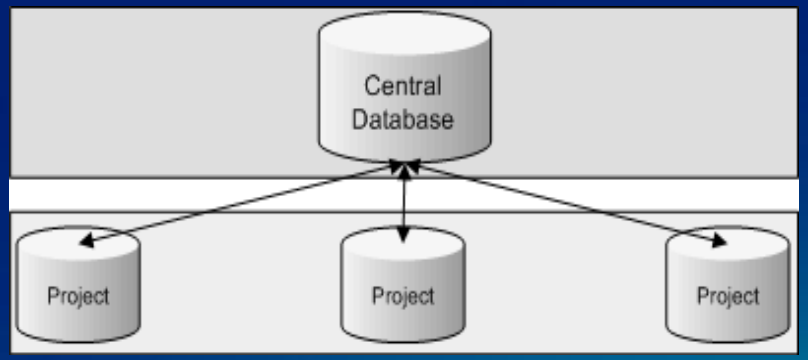
用例场景1：移动/野外用户



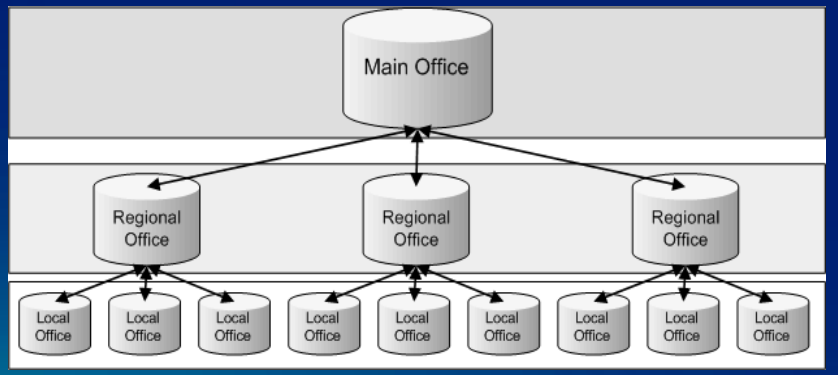
用例场景2：数据维护承包商



用例场景3：多项目组数据管理



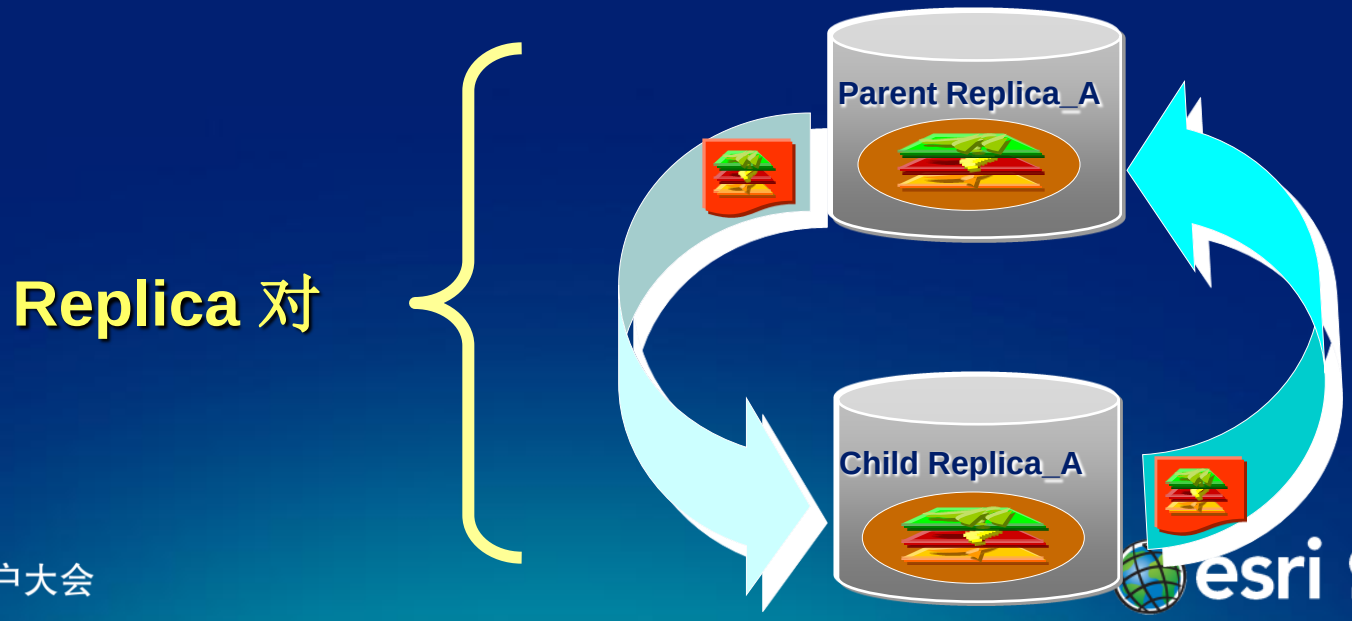
用例场景4：多级应用，数据分布式维护



Geodatabase复制 —— 概念

Replica (复本)

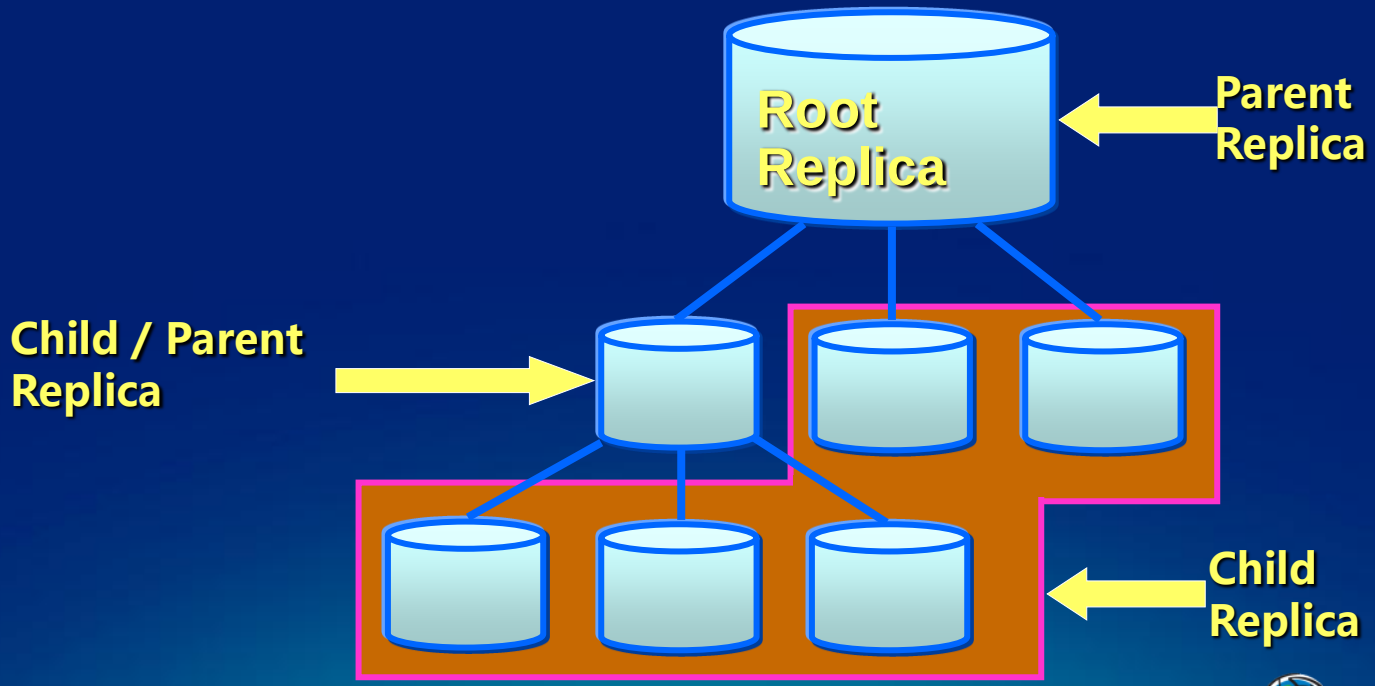
- 每个参与复制的geodatabase都称为Replica
- 一个子replica由一个父replica创建成
- 一个父replica与一个子replica构成一个“replica对”，彼此称为对方的“相对应的replica”



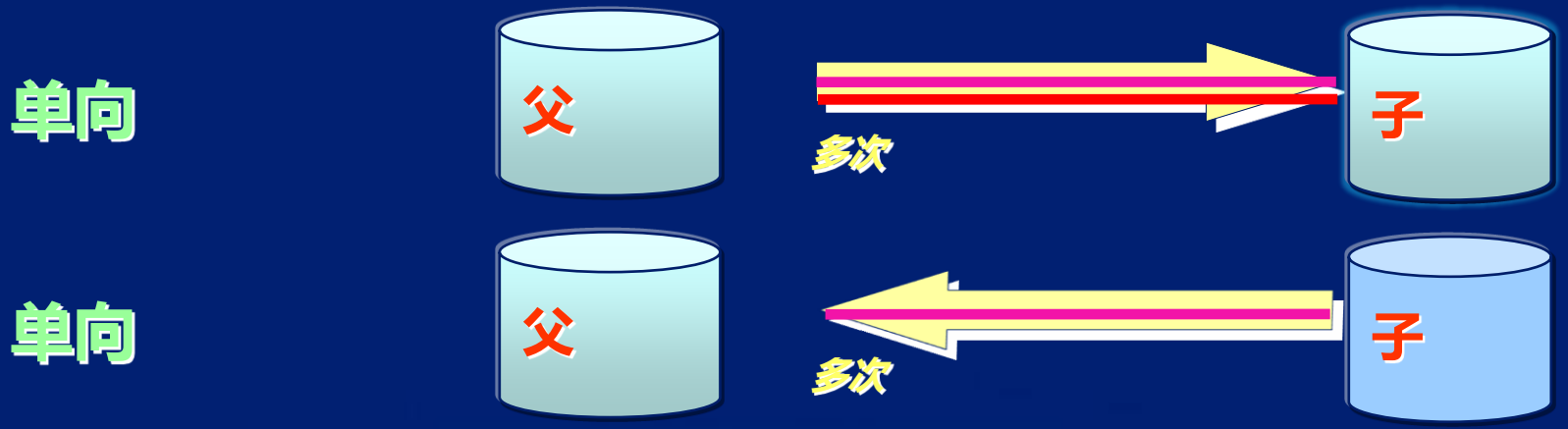
Geodatabase复制 —— 概念

Replica树

- 以层次的方式组织的replicas称为 “replica树”
- 一个父replica可以有多个子replica，一个子replica仅能有一个父replica
- 一个geodatabase既能充当父replica也能充当子replica



单向同步增加子-父

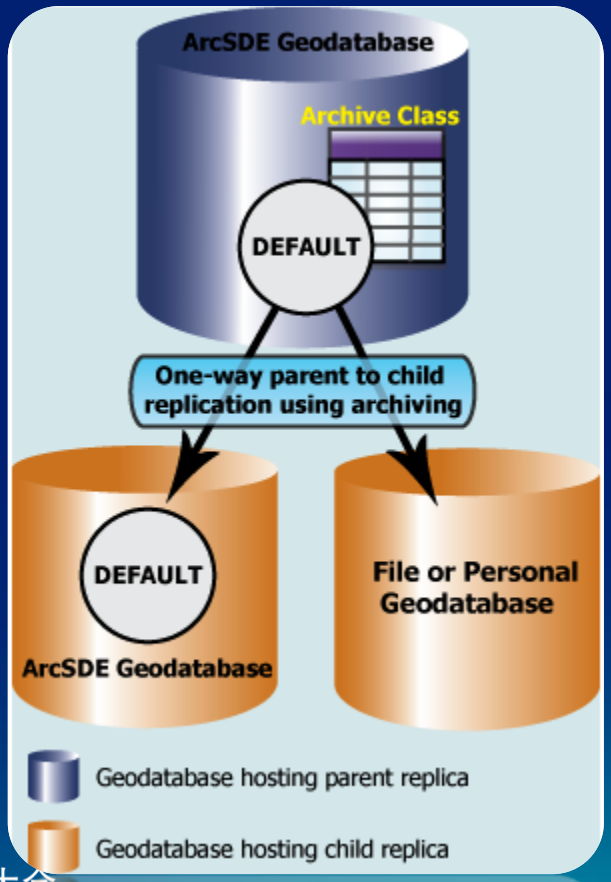


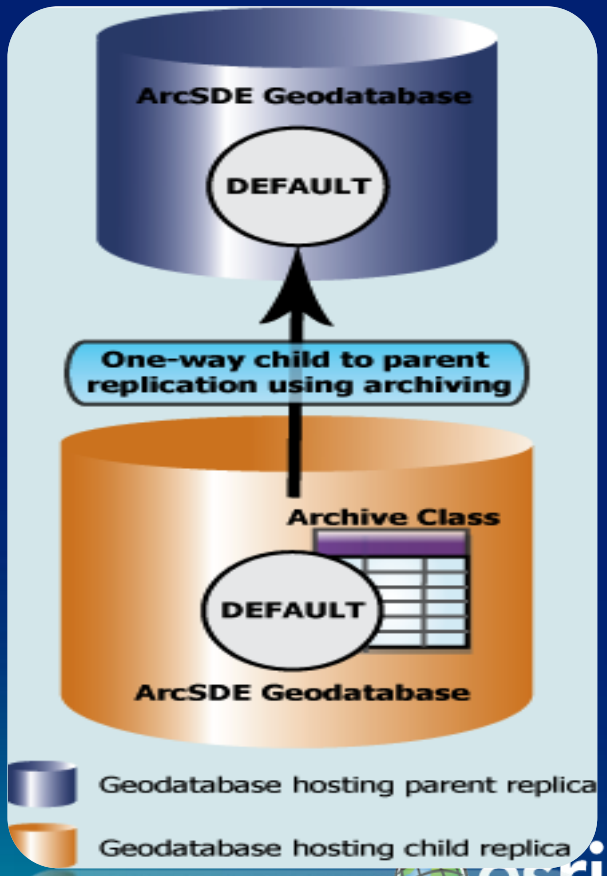
ArcGIS10

ArcGIS10以前

用归档数据获取数据变化

- 只对One-way replication 有效，并且父replication的版本为默认版本。
- 父库不创建复制版本，因此协调 、提交、压缩版本不受影响。





2. Demo演示子-父的归档

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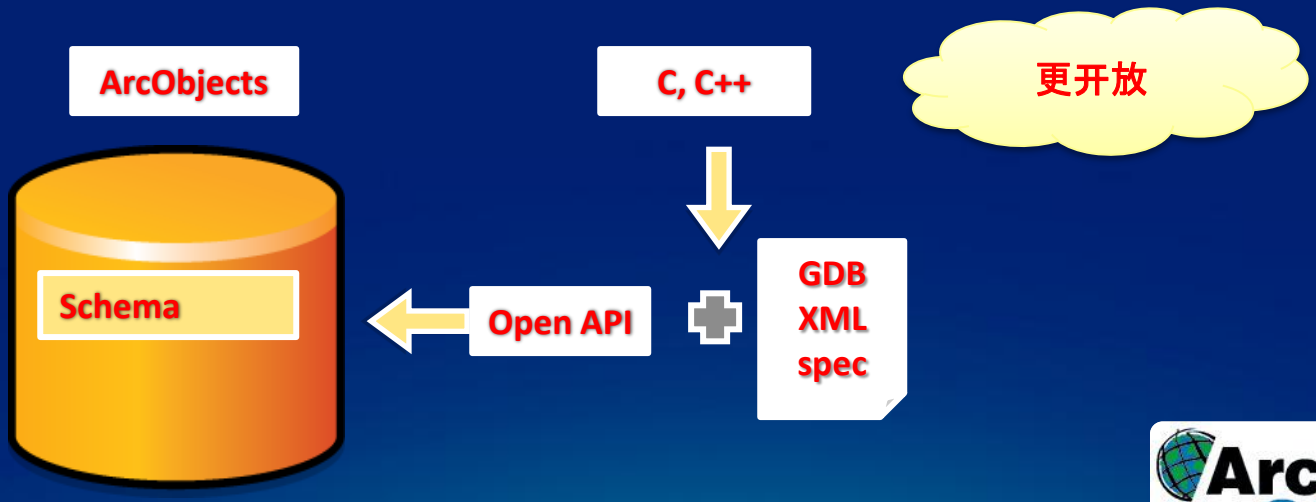
Geodatabase10新功能

- 增强Geodatabase的信息模型
- 提高Geodatabase复制的灵活性和易用性
- **提供开放和直接的数据访问**
- 访问标准空间数据集
- 系统表简化
- 其他增强功能

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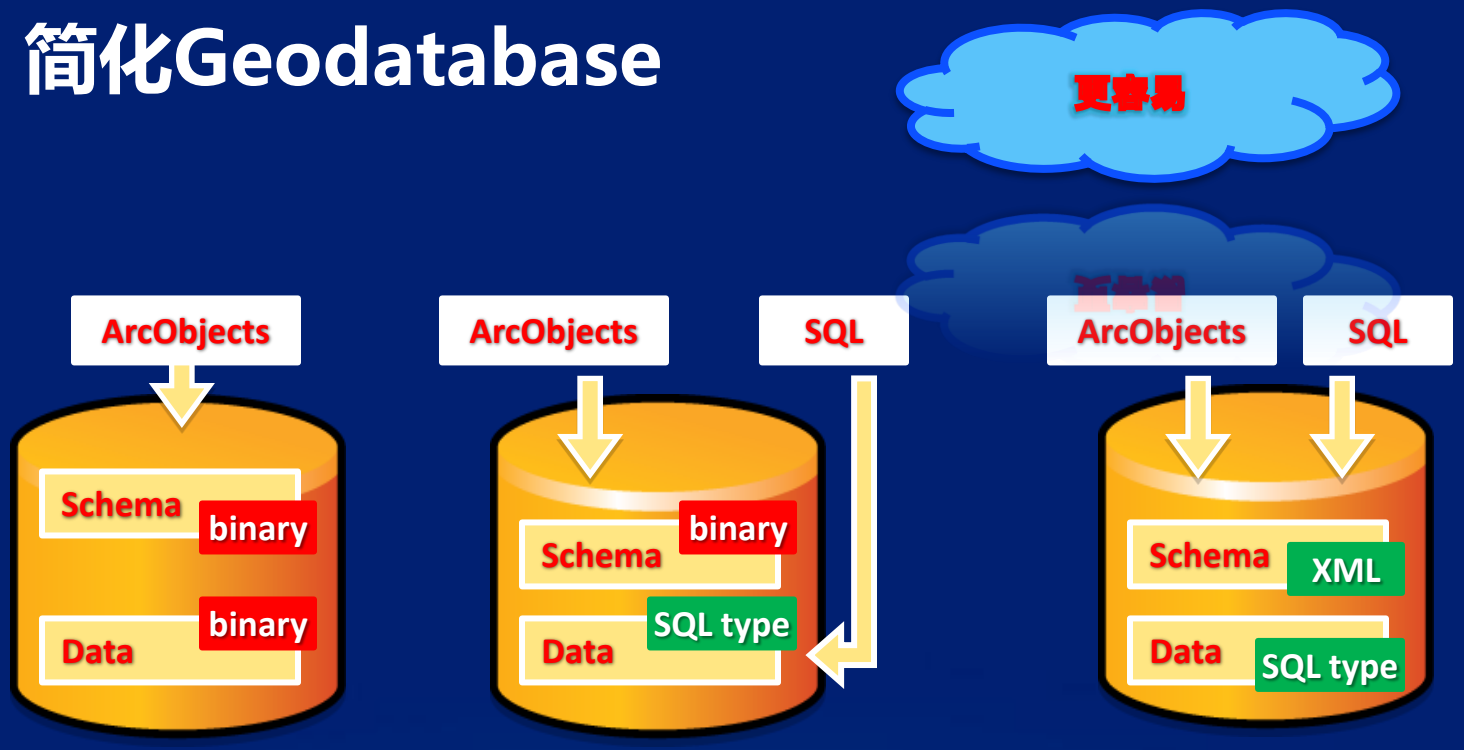
提供开放的直连数据方式

- 开放File Geodatabase API
  - 读取全部数据
  - 不需要AO
- 支持更多的SQL功能
  - ORDER BY 和SELECT DISTINCT
- 用XML描述Geodatabase的Schema



提供开放的直连数据方式

简化Geodatabase



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Geodatabase10新功能

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- 其他增强功能

新的图层-Query layer

对本地数据库空间数据类型的增强

- 查询图层-由SQL查询定义的图层（包含空间数据）或是单独表（不包含空间数据）
  - 使空间和非空间信息存储在数据库中并方便地集成到ArcGIS Desktop和 Server
- 利用数据库的SQL查询
- 直接访问存储在任何地方的空间数据
  - 可以不是ArcSDE或Geodatabse模型的数据
- 扩展了ArcGIS的数据源
  - 使用更简单的方法从数据库中获取数据
  - 使集成不同数据平台变得更容易

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Query layer

- 在快速的把存储在DBMS中的数据集成到ArcMap 中
- 图层显示实时更新
- 只读

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Query layer

Query layer目前支持所有ArcGIS支持的数据库，包括oracle，sql server，informix，db2，postgresql等。

- Oracle : ST_Geometry， SDO_Geometry.
- Sql server(2008) : Microsoft Geometry and Geography
- DB2 :ST_Geometry
- Informix: ST_Geometry
- postgresql :ST_Geometry and PostGIS geometry



Query layer

- 使用Query layer可以代替DBMS中的视图
- Query layer和Featurelayer以及单独表（stand-alone table）有相同的行为和动作，因此可以用来显示数据，或者作为GP的输入以及使用API去访问。
- Query layer可以被保存成图层文件(.lyr) 或者创建成图层包(.lpk），方便与其他的应用程序，地图文档或者其他用户分享。



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Query layer

3. Demo 演示Query layer



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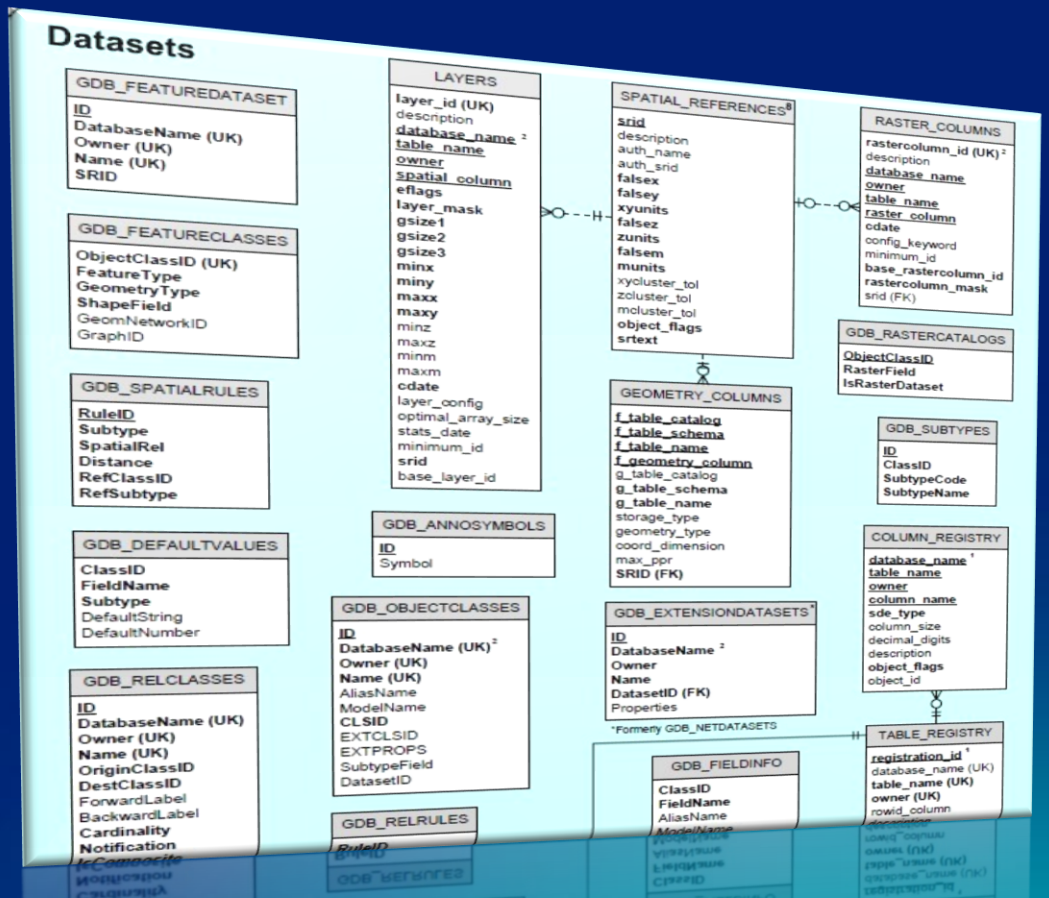
Geodatabase10新功能

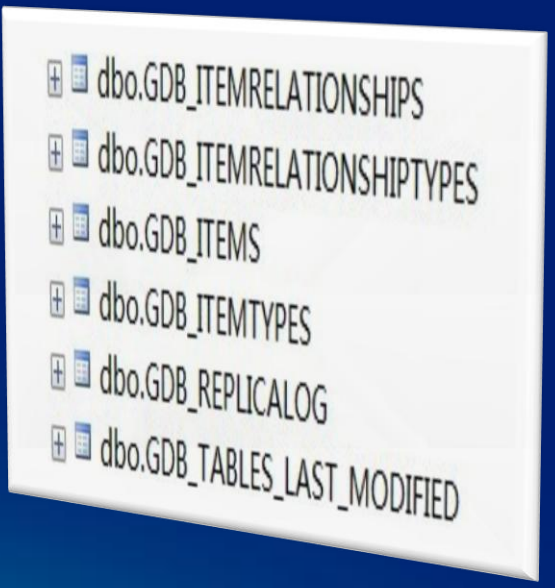
- 增强Geodatabase的信息模型
- 提高Geodatabase复制的灵活性和易用性
- 提供开放和直接的数据访问
- 访问标准空间数据集
- 系统表简化
- 其他增强功能

系统表简化

- 系统表（GDB开头）由原来的30+张表压缩到6张
- 使用XML存储
- 支持File GDB，personal GDB与ArcSDE GDB

更快





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系统表简化

构成：

- GDB_ITEMS
- GDB_ITEMTYPES
- GDB_ITEMRELATIONSHIPTYPES
- GDB_ITEMRELATIONSHIPS

优点：

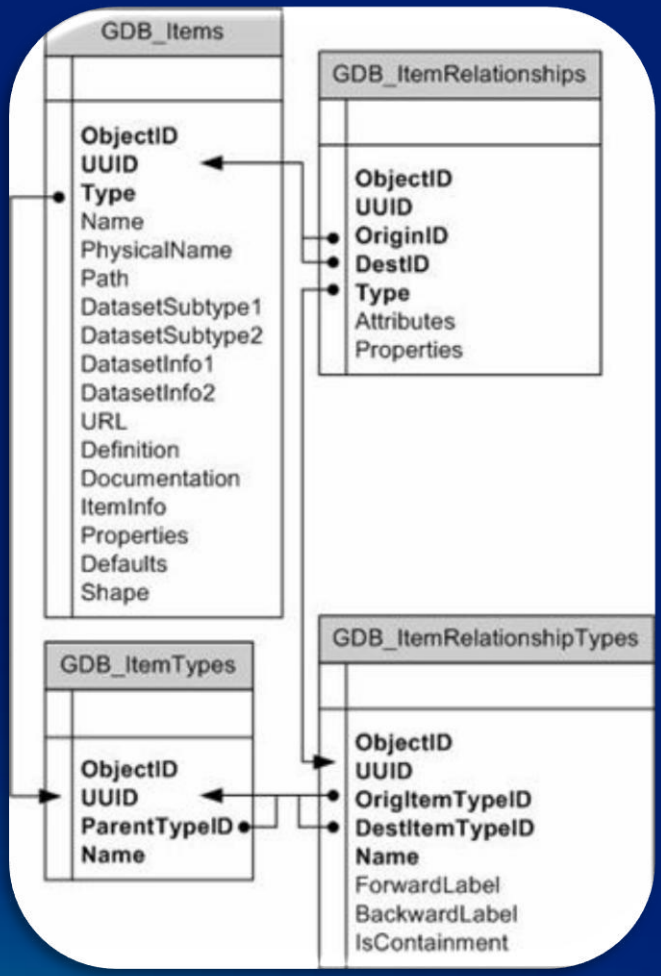
1 通过使用xml可以更容易访问

2 File GDB API的基础

3 更容易扩展

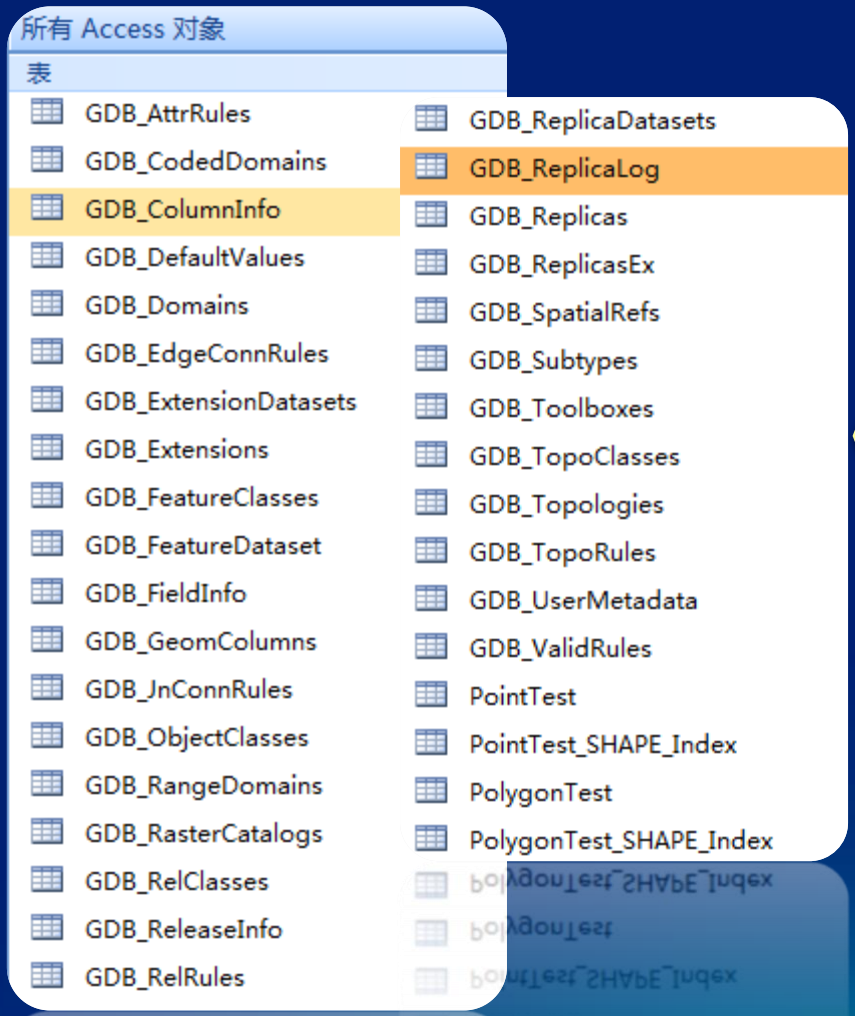
4 提高访问速度

5 可以使用SQL直接操作

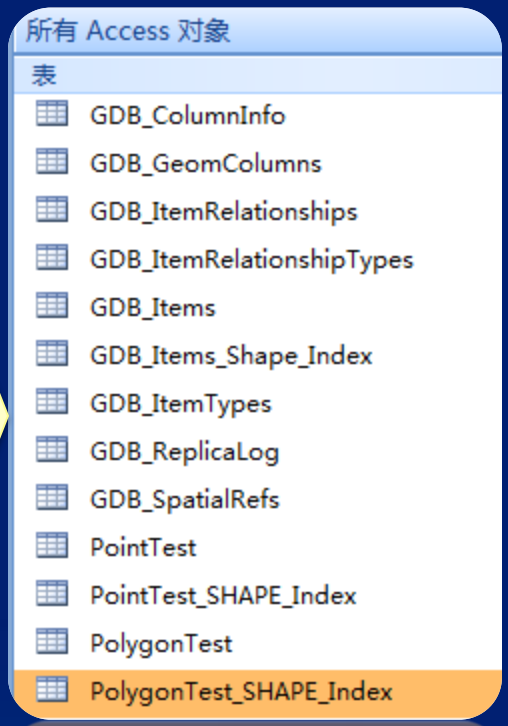


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表结构对照



VS



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4. Demo通过SQL语句直接查看系统表



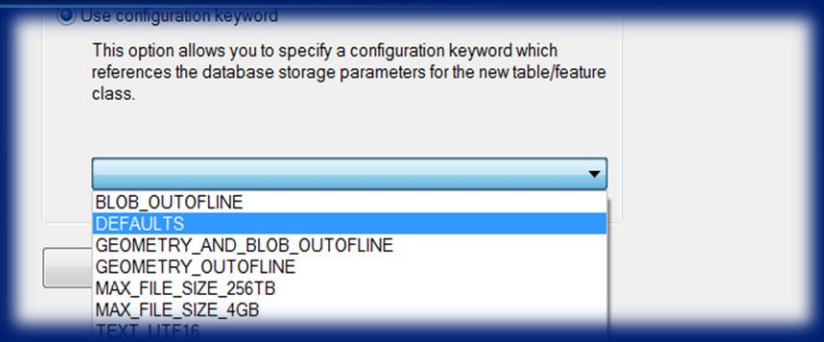
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Geodatabase10新功能

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1. File GDB存储控制keyword增加新的选项



- GEOMETRY_OUTOFLINE
- BLOB_OUTOFLINE
- GEOMETRY_AND_BLOB_OUTOFLINE
- Inline 和outofline的区别：
  - Inline – 在File GDB中所有的属性都在相同的文件或者虚拟表中
  - Outofline在File GDB中属性可以存储在不同的文件或者虚拟表中。

2. 新增的数据类型（ST_Raster）

- ST_Raster是用户自定义类型，类似与ST_Geometry
- SQL 语句可以直接访问
- 支持的数据库
  - Oracle, PostgreSQL, and SQL Server(~~Express~~)

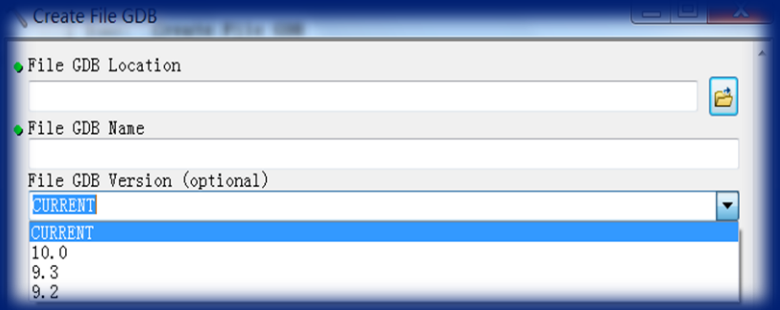
```
INSERT INTO NOVA (image)
 VALUES (sde.st_raster('nova.tif','compression=lz77'));
```

```
UPDATE NOVA
SET image = image.buildPyramid('bilinear');
```

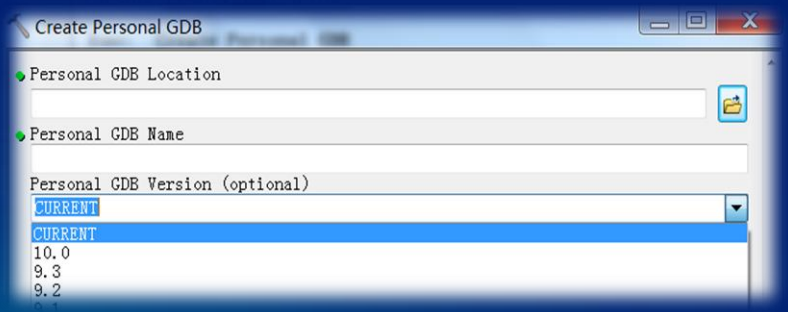

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3. 早期版本的File GDB和Personal GDB

- Create File GDB 工具
  - 创建的版本v10.0 ，v9.3 ，v9.2



- Create Personal GDB 工具
  - 创建的版本v10.0 ，v9.3 ，v9.2，v9.1



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4. 已有数据类型的增强

- XML 类型支持
  - DB2, Oracle, PostgreSQL, and SQL Server
- Varbinary(max) and datetime2 类型
  - SQL Server



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5. 支持参数化的圆和椭圆

- ST_Geometry 类型存储
  - Oracle ,PostgreSQL
- 可以使用ArcSDE C or Java APIs or SQL命令创建
- 更精确
- 存储空间更小
- 创建圆
  - sde.st_geometry (x,y,z,m,radius,numPts,srid)　oracle
- 创建椭圆
  - sde.st_geometry (x,y,z,m,semiMajor,semiMinor,angle,numPts,srid)　oracle

6. 支持附件

- 允许为要素添加一些文件信息
- 支持多种格式
  - PDF,JPEG,TXT……

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5.Demo-上传和下载附件



小结

小结

- 增强Geodatabase的信息模型
- 提高Geodatabase复制的灵活性和易用性
- 提供开放和直接的数据访问
- 访问标准空间数据集
- 系统表简化
- 其他增强功能

Q&A

16日 10:00-11:00	刘宇

基于Geodatabase构建空间数据模型 霍跃天

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谢 谢！

