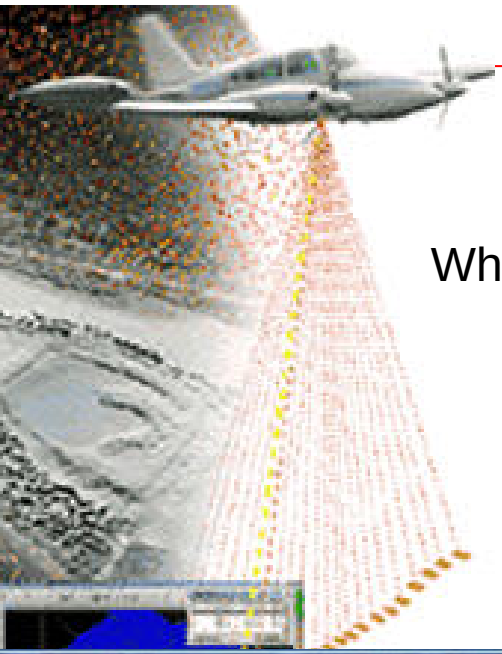
BAE SYSTEMS



BAE Systems

What's Current in GIS & Geospatial Technologies

November 18, 2009

Andy Pickford, Regional Manager

BAE Systems - Geospatial Products & Solutions

BAE SYSTEMS

Agenda

- Introduction

- Airborne Collection, Processing, and Dissemination
  - ICAROS
  - Low Altitude Mapping
  - LiDAR Uses

- Software Applications
  - SALINA / IncidentOS
  - ArcGIS Server Implementation (City of Tamarac, FL)

BAE SYSTEMS

Geospatial Products & Solutions Mission: *Provide highest quality of geospatial products and solutions in support of our national security at home and abroad*

Transform Data to Knowledge to Intelligence

Sensors | **Data** | **Information** | **Actionable Knowledge** | **Insight + Decision**

Airborne Collection, Processing, Dissemination

‘Traditional’ Airborne Tasking and Image Processing

- Various film cameras
  - Z/I Imaging DMC
  - Leica ADS40
  - Vexcel Ultracam
  - BuckEye
  - Pictometry
  - Satellite imagery

Airborne Collection, Processing, Dissemination

ICAROS Geosystems

- Adaptable, Quick, Inexpensive
- Any aircraft, anywhere
- Processing onboard
- Fully automated image environment
- 24 hr turn around
- Change detection
- On-the-fly route planning & line of sight
- Tactical Mapping on Demand

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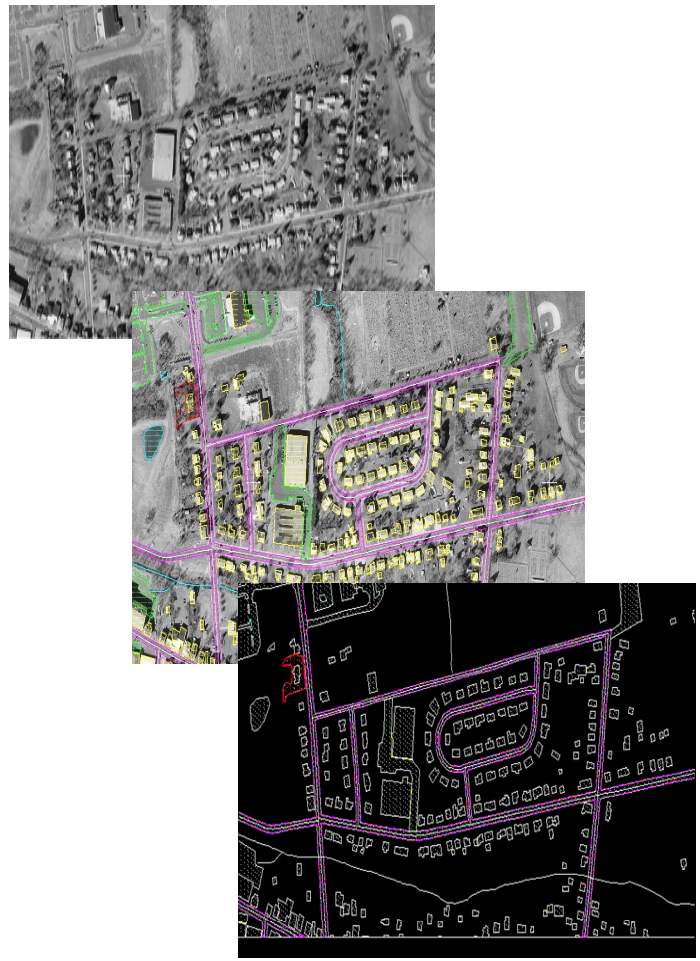
Low Altitude Mapping (General Overview)

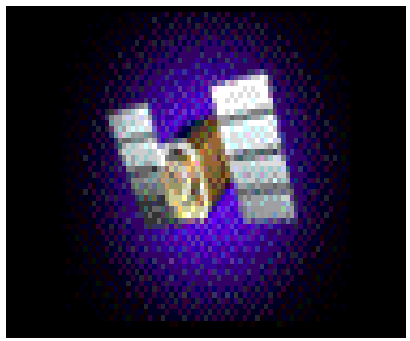
- Mostly Helicopter Imagery Acquisition
- Extreme Low Altitude Mapping
- Extremely Accurate (to 0.05’ vertical accuracy) mostly .5’ horizontal
- Ideal for strip, route, or corridor mapping

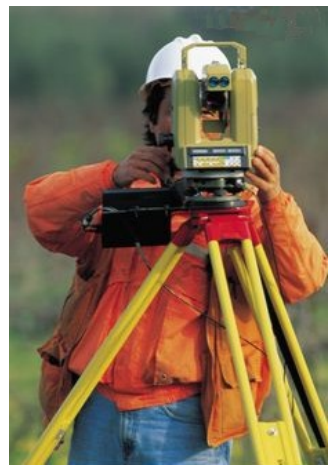
-Incorporates highly accurate geodetic control surveys, targets every 600’ either side; quick turn around, (7) miles of mapping in (7) weeks, safety reasons to utilize low altitude mapping



.15’ horizontal & vertical – project wide (GPS)

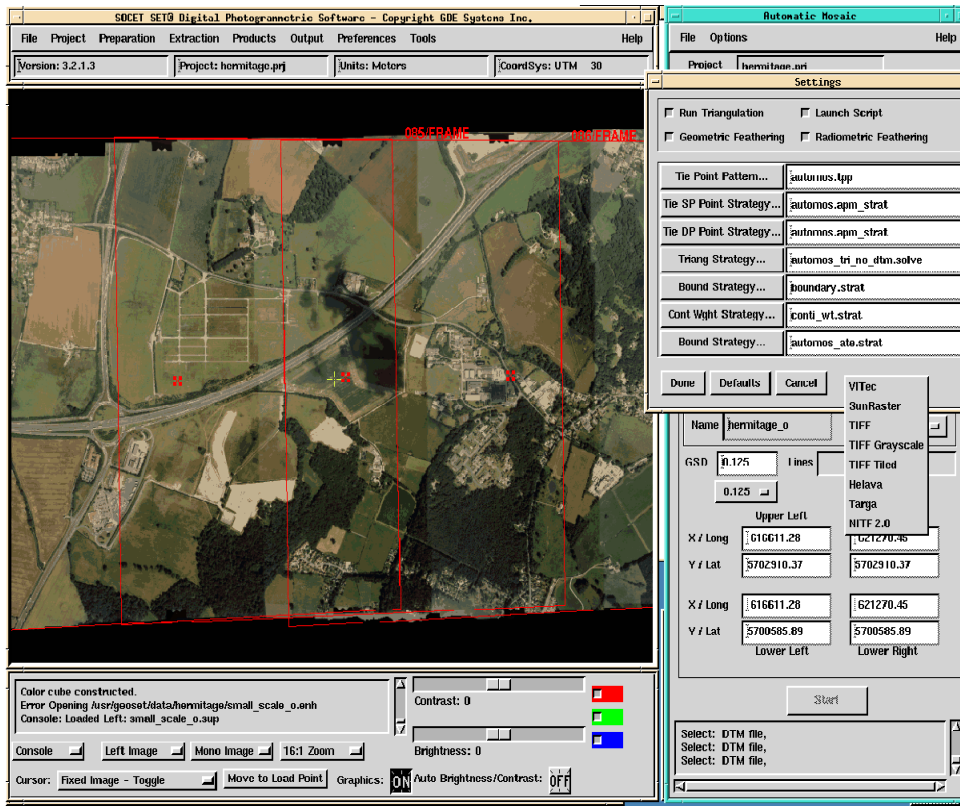
.03’ vertical on the shoulder targets (differential leveling)





Sample Project Uses

- Full construction realignment
- Widening of Roadway
- Performing storm water flow analysis
- Developing illicit discharge detection and elimination measures
- Supporting storm water construction plans

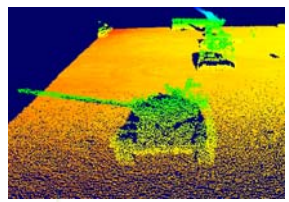


Airborne Collection, Processing, Dissemination

LiDAR

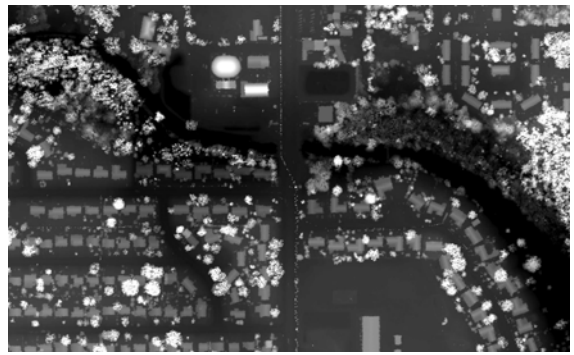
- Extensive production experience:
  - “Traditional” LiDAR bare earth processing, DTM, and contour generation

- Fusion with other sensors
- Data Exploitation
  - Extraction of Roads, Buildings, Infrastructure Features
  - Aerial and Ground Based LiDAR data
- Data Visualization
  - texture mapped 3D visual representations



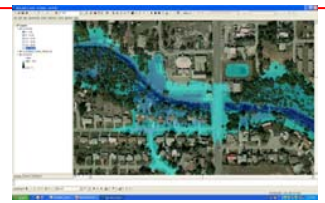
Standard LIDAR Products

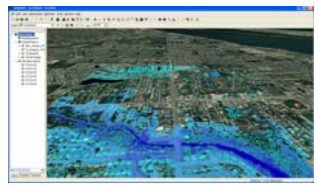
- High Resolution DEM (Digital Elevation Model)
- DTM (Digital Terrain Model)
- TIN (Triangulated Irregular Networks)
- Breaklines
- Contours
- Shaded Relief
- Slope
- Aspect
- Intensity Images
- Elevation Shade

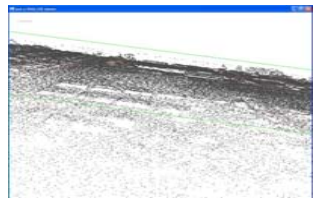


Examples of Tools for working with LIDAR

- ArcGIS
  - 3DAnalyst
  - LIDAR Analyst, LIDAR Explorer, LP360
- LASTools
- SocetSet
- Quick Terrain Modeler
- TerraScan by Terrasolid
- Autocad
- Erdas Imagine
- IDL by Research Systems Inc.
- MATLAB
- ER Mapper
- MapInfo Vertical Mapper
- Terrapoint Amber iQ

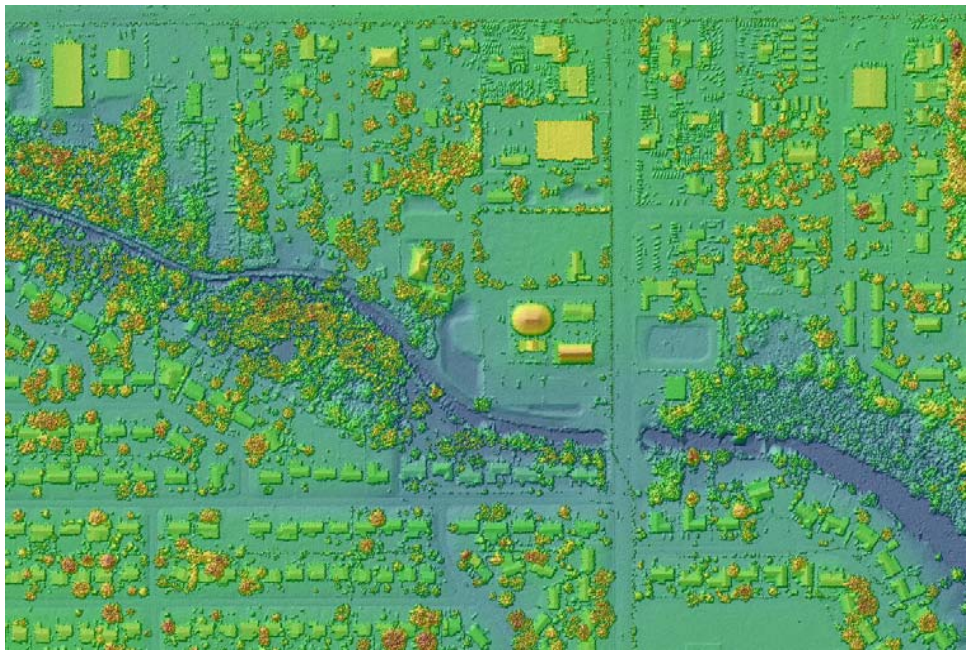






Spatial Analysis using LIDAR data

- Terrain Profile
- Line of Sight
- Watershed analysis



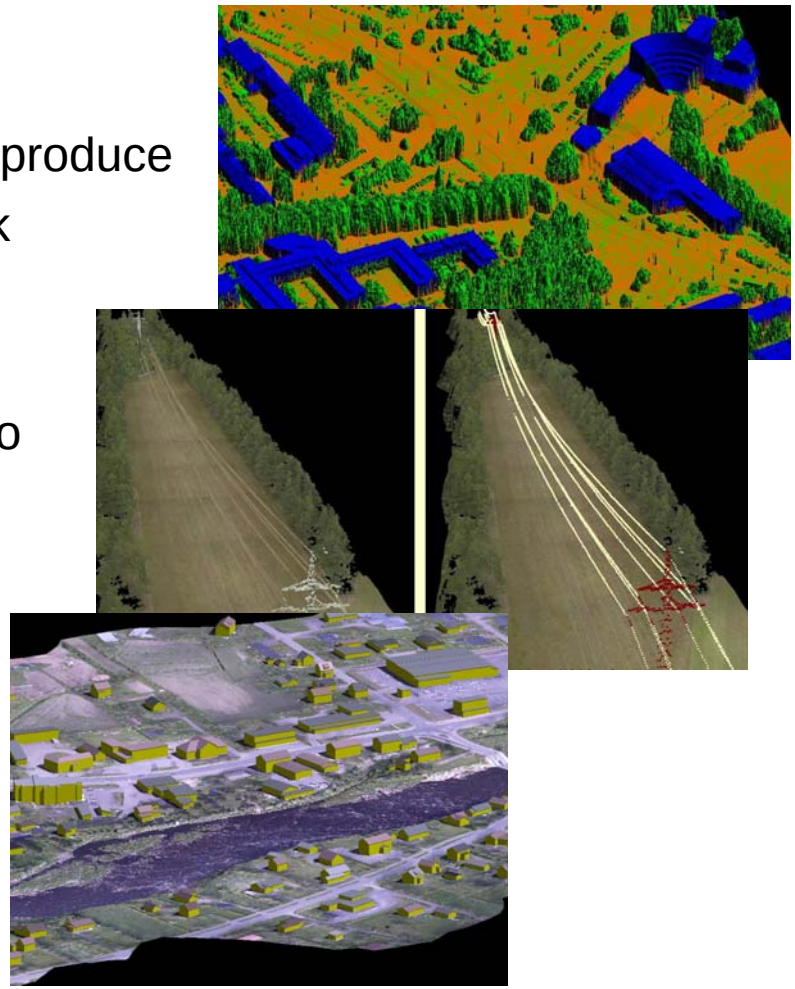
LIDAR in Emergency Planning and Response

- Flood Planning

  - quickest and most precise way to produce high-resolution DEMs for flood risk management

  - Allow Planners and Hydrologists to predict flood extents and plan for remedial strategies

  - Used to update State Flood Insurance Maps



LIDAR in Emergency Planning and Response (cont.)

- Topographic Modeling

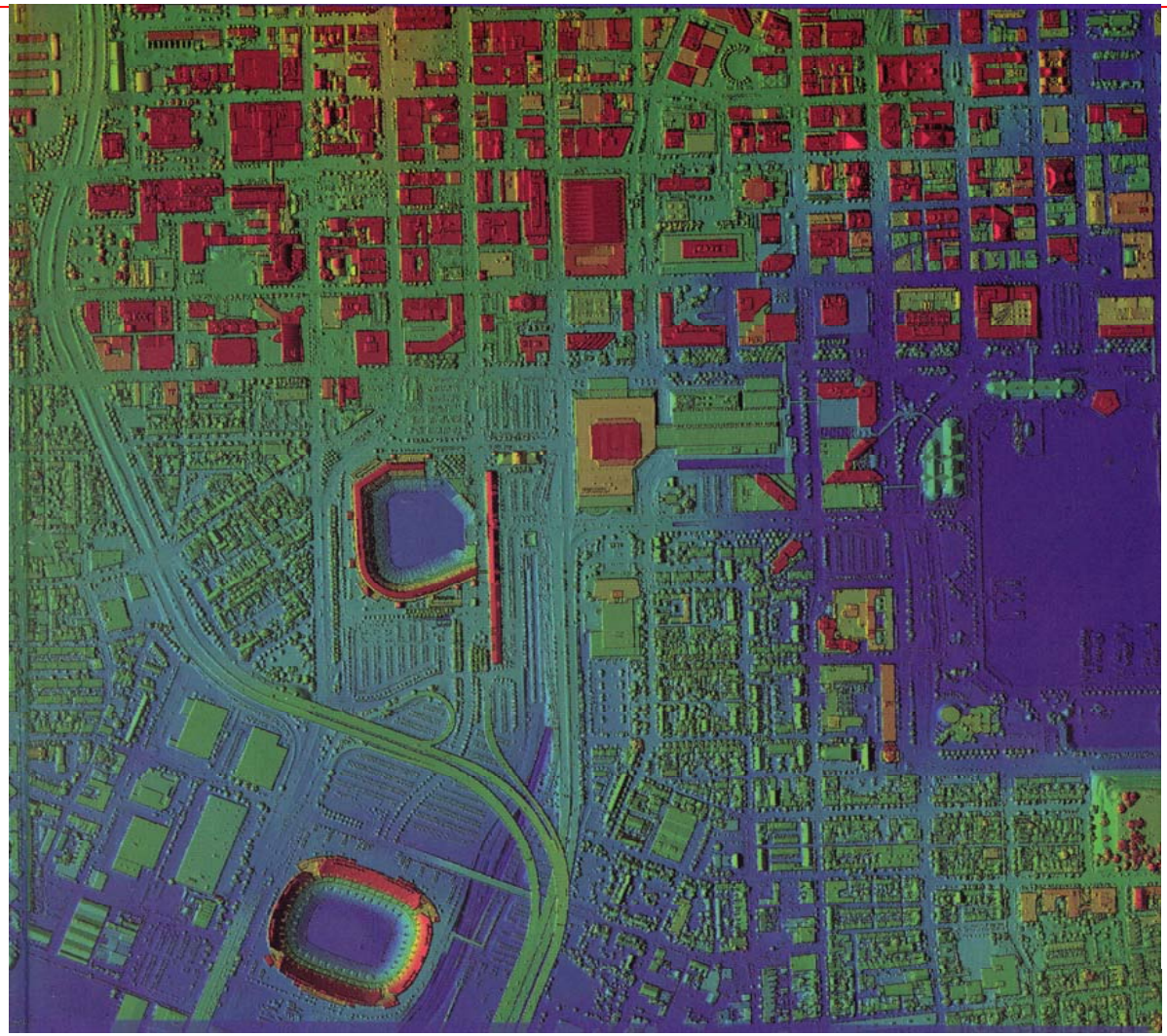
  - Bare Earth, Vegetation, Structures

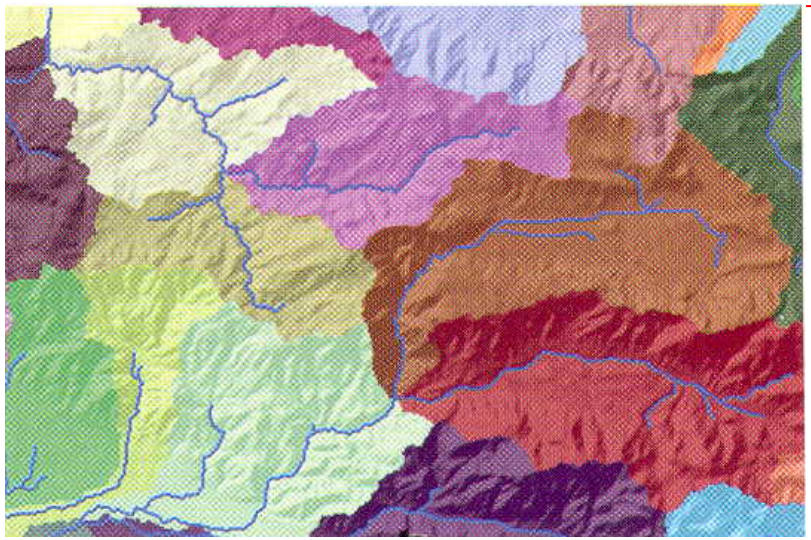
  - interpret surface morphology for better prediction of land slides and mass rock displacement

  - Change Detection (River Banks, shorelines)

- Monitoring of pipelines, transportation networks, utilities

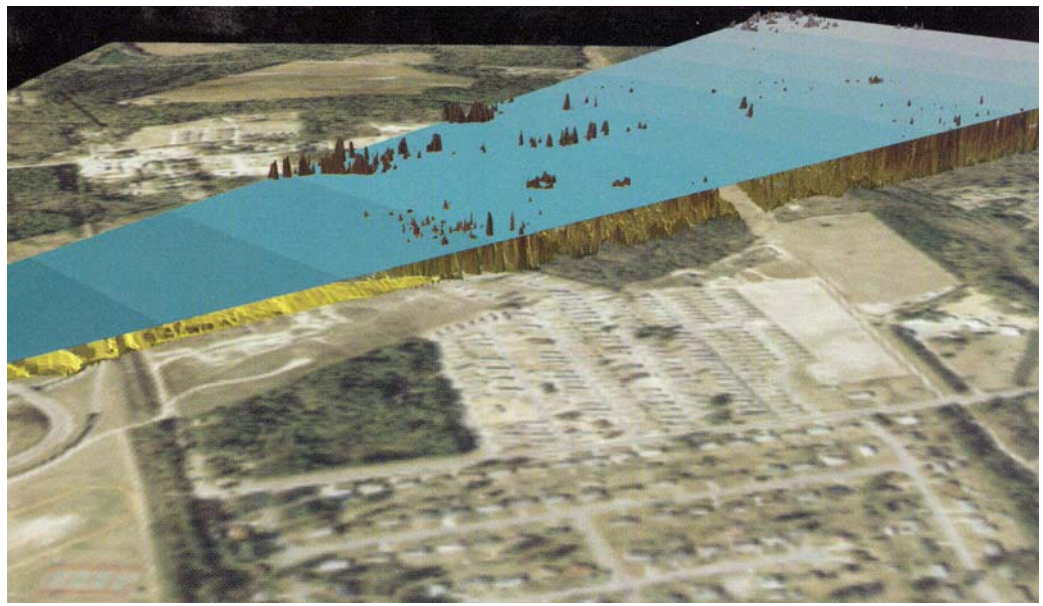
Applications – 3D City Modeling





Watersheds and streams network delineation and analysis

Airspace Obstruction Models



LiDAR Applications (cont.)

- **Environmental**
  - **Landslides**
    LiDAR has made it possible to monitor and predict slope failure by rapidly obtaining highly accurate and dense elevation data. In post-slide conditions rapid damage assessment and mapping can be realized using LiDAR.
  - **Forest mapping**
    The unique feature of LiDAR of producing multiple returns from the canopy top, understory, and the ground has attracted many to use it for estimating forest biomass, timber volume, and other parameters.
  - **Volcano monitoring**
    Subtle systematic changes (uplift of up to 4 cm per year) in volcano dome height can be monitored from time to time using LiDAR.

Applications (cont.)

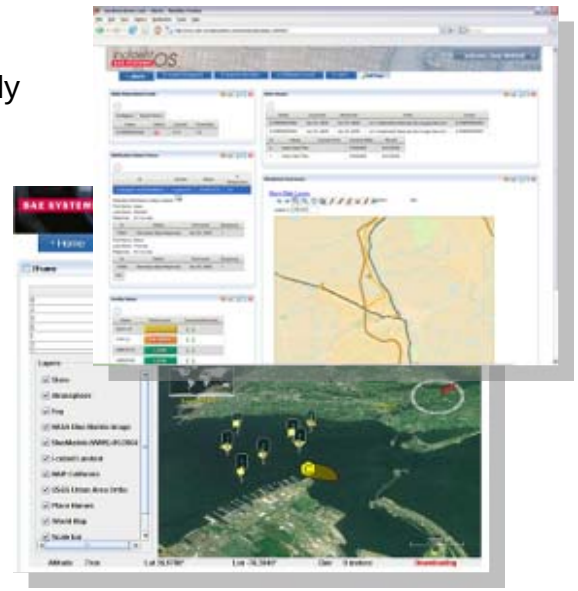
- **Infrastructure**
  - **Transmission lines**
    One such area is monitoring transmission lines. Long stretches of transmission lines can be mapped with speed to determine the exact location of the transmission towers, accurate topography of the corridor, and the encroachment by vegetation for modification and repair purposes.
  - **Route mapping**
    Highly dense data from LiDAR can be used to differentiate objects such as rails, mileposts, signals, switches, damage to road surface, accident sites, traffic density, and subtle changes in slope/grade on roadways and railways, without interrupting the services. LiDAR can as well be employed for corridor mapping to plan oil and gas pipelines and their post-commission maintenance.
  - **Cellular networks**
    Planning and managing cellular networks require terrain elevation, ground cover and building outlines. To ensure a clear line of sight and locate areas for development, accurate and detailed data sets containing information about natural and manmade obstructions, is highly important. LiDAR data have been found suitable for this purpose and increasing number of communication companies are relying on it.

BAE SYSTEMS

BAE Situational Awareness Bundle

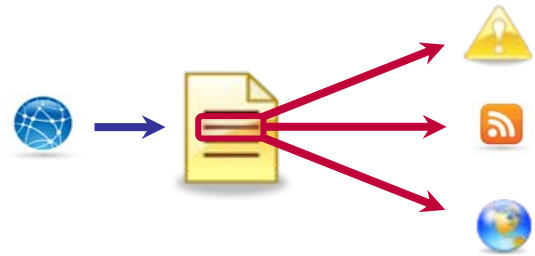
- Two separate components:
  - Platform (*Salina*)
  - User Interface (*incidentOS*)

- ***SALINA*** Feed Service Platform
  - Light-weight server based application
  - Quickly and efficiently connects to multiple information sources
  - Ingest all types of data input from multiple sources
  - Re-publishes information in multiple industry standard formats simultaneously
- ***incidentOS*** Display Engine
  - Cutting edge web based display
  - Role based access and presentation of information

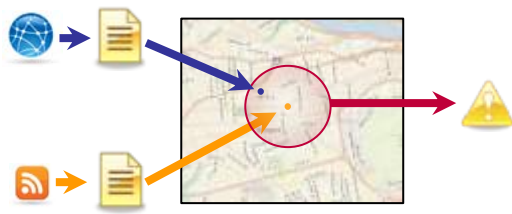


SALINA: Gathers, Fuses, Disseminates

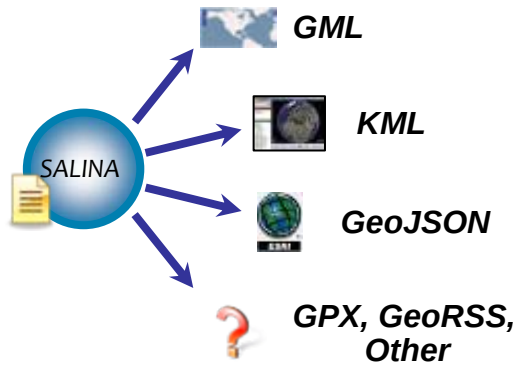
- Simplifies connecting to and evaluating individual data sources



- Provides cross-feed analysis between different data types and formats

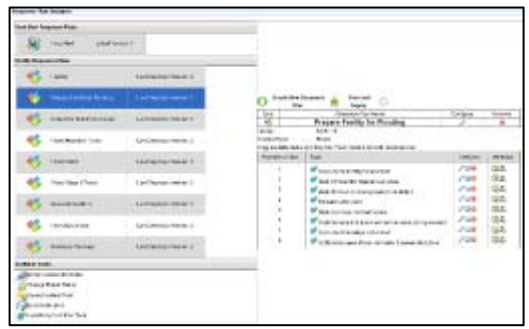


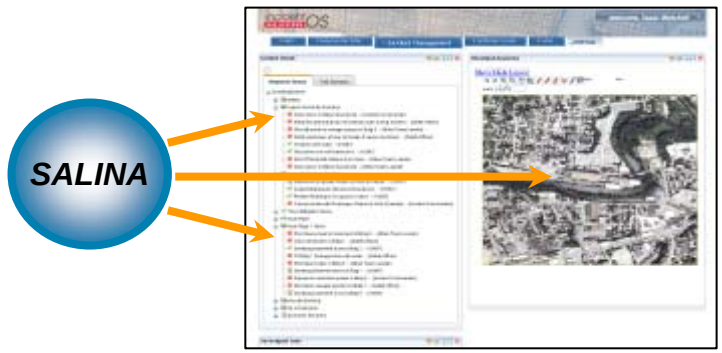
- Easily publishes new information in multiple formats simultaneously



incidentOS: Visualization and Collaboration

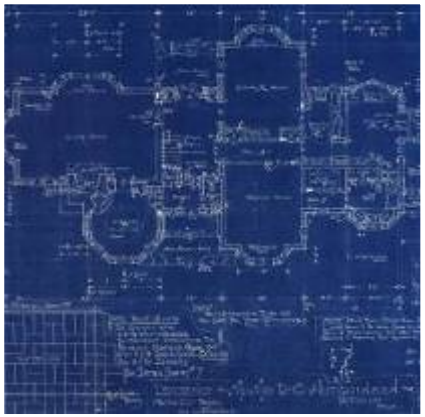
- Dissemination and sharing within a portal environment
- Embedded standard operating procedures, Checklists tied to system alerts or events
- Seamless updates through Web 2.0 technology





BAE SYSTEMS

Facility Emergency Management



Response Team

NIMS, ICS

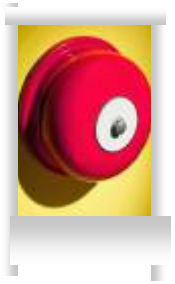
SALINA

incidentOS

Public, First Responders

BAE SYSTEMS

First Responder Community



On-scene Commander

SALINA

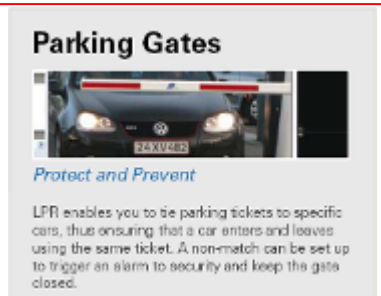
incidentOS

JOC / NOC

Personal Tracking Devices

BAE SYSTEMS

Critical Infrastructure Protection



On-Site Security

SALINA

incidentOS

CBP

State Fusion Centers

BAE SYSTEMS

Port Monitoring and Security

SALINA

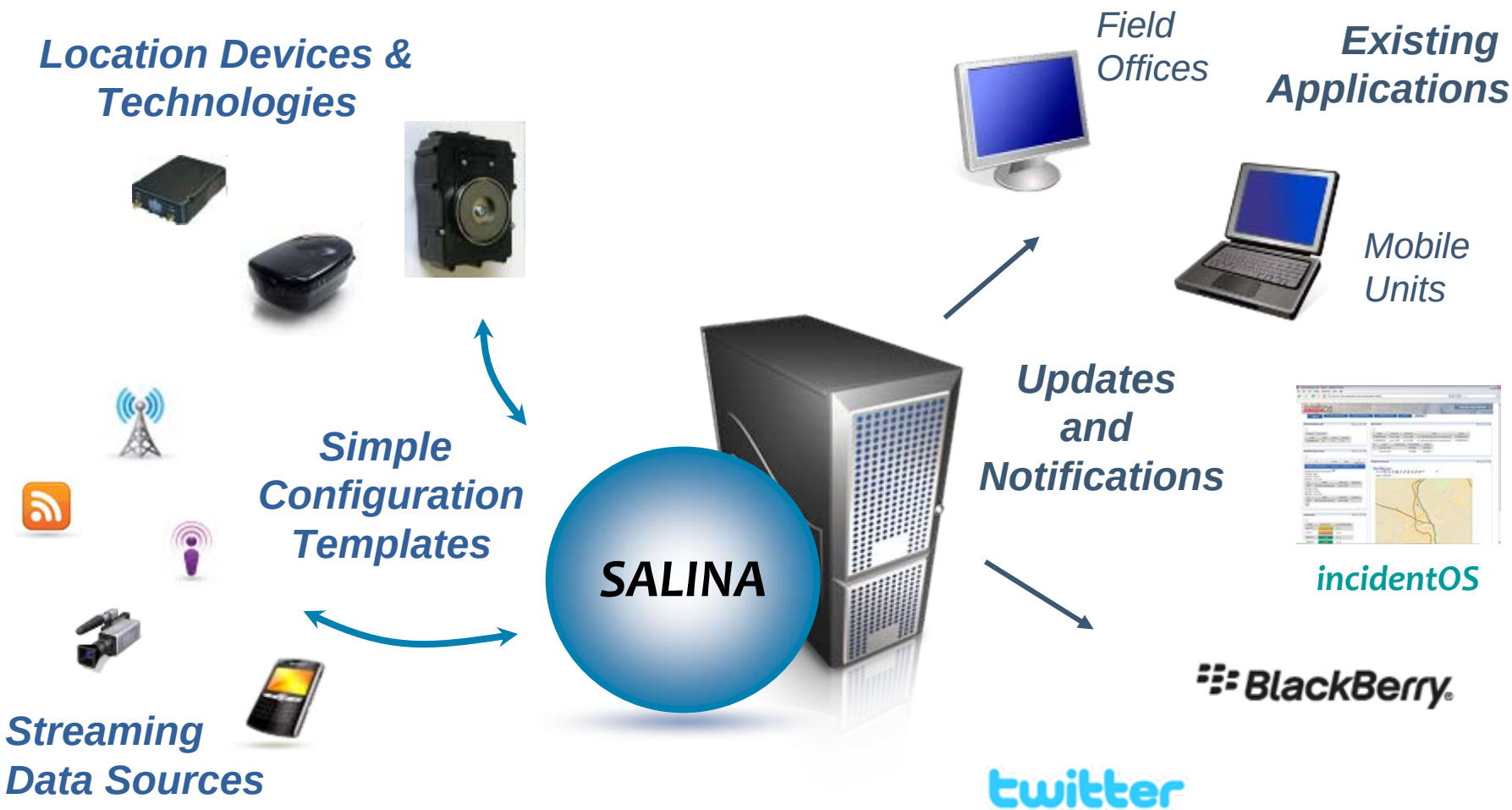
incidentOS

Boarding Party

DHS

Watch Commander

SALINA and *incidentOS*: An Integrated Approach



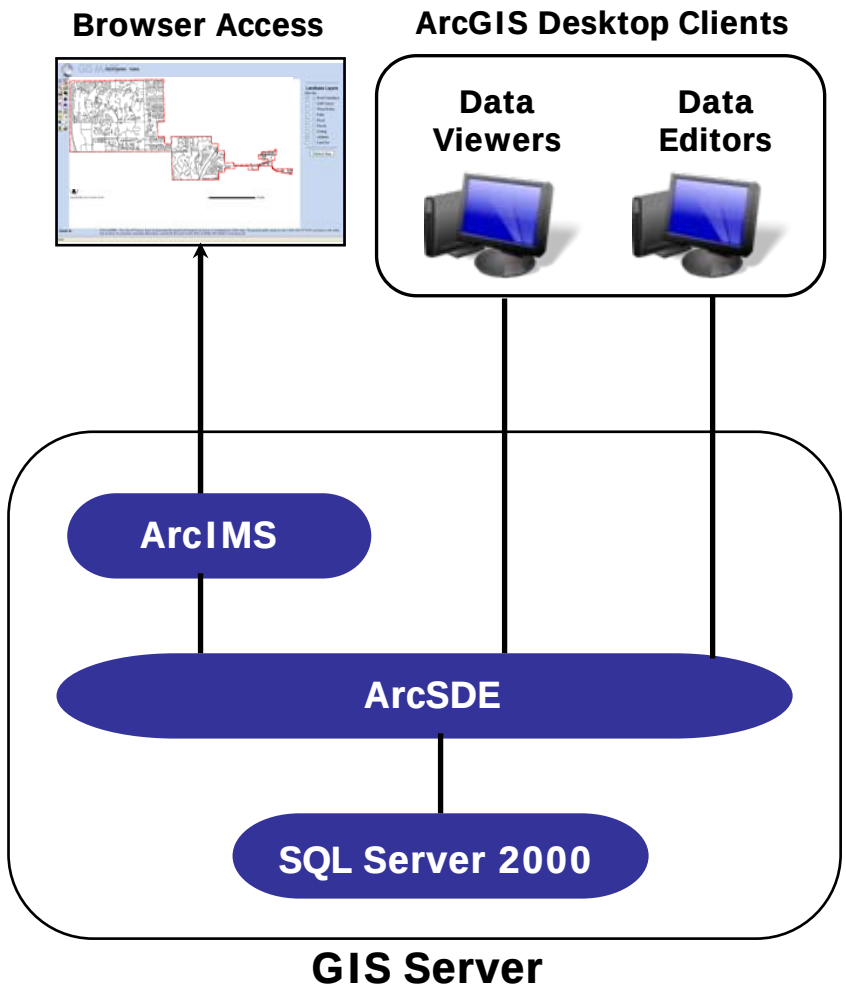
BAE SYSTEMS

ArcGIS Server Implementation / Integration

- IT Departments define GIS System Configuration
- Enterprise GIS Integrates with Existing Architectures
- Benefits of using ArcGIS Server System

Previous Tamarac Enterprise GIS

- Single Server Configuration
  - SQL Server 2000
  - ArcSDE
  - ArcIMS
- Data Access
  - ArcGIS Desktop Clients
  - SDE Services
  - Editing/Viewing Enterprise Database
  - SDE Login Accounts
- Public Access
  - ArcIMS
  - One web application to View All Layers



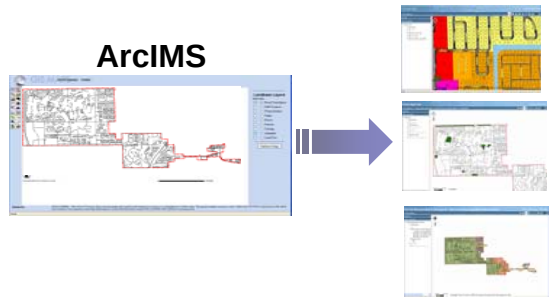
BAE SYSTEMS

Reasons for Upgrading

- Integrate with City IT Management Systems
- Migrate to ArcGIS Server 9.3
- Improve Data Management Workflow
- Leverage New Technology

Windows Logins

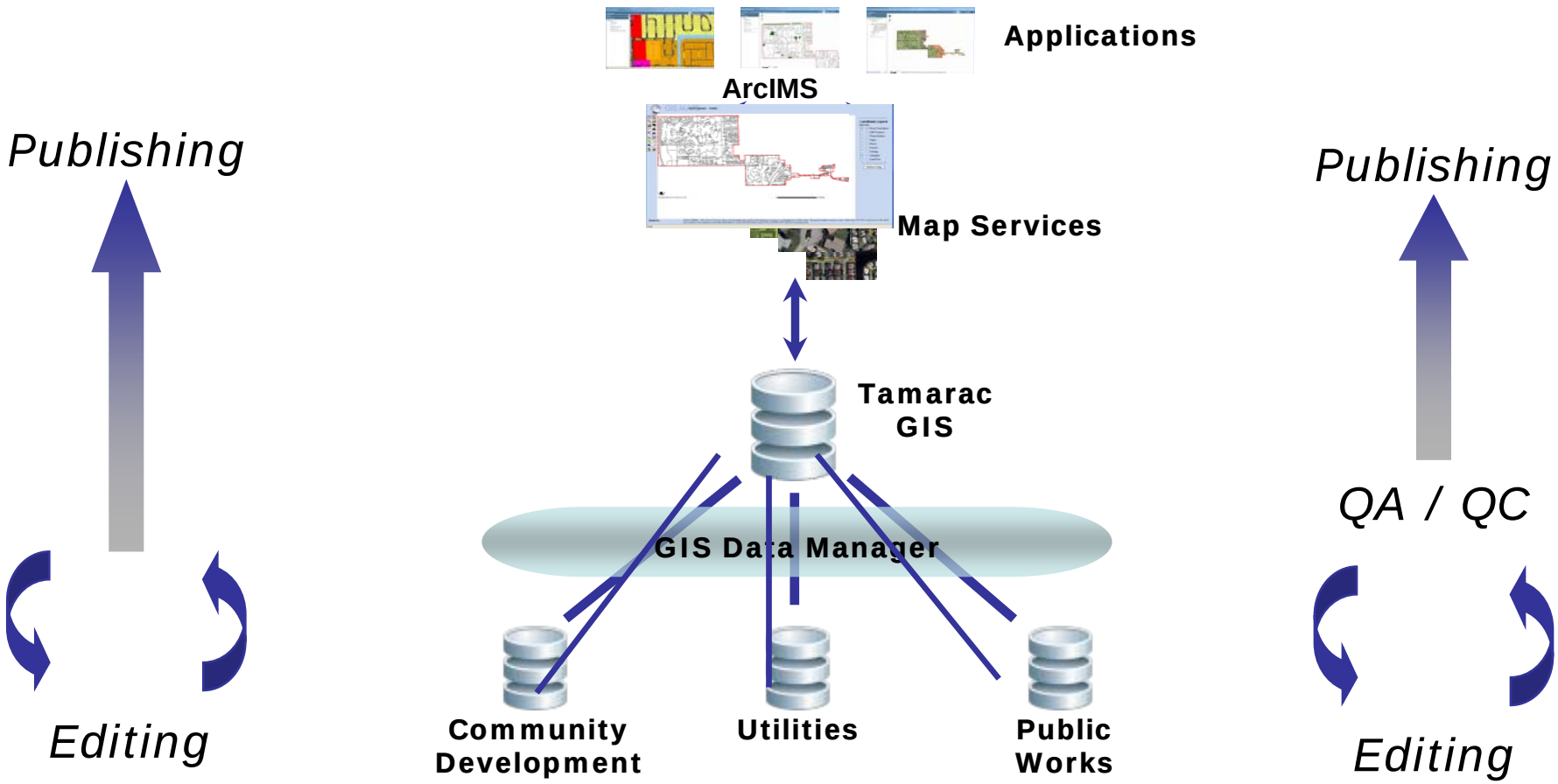
ArcIMS



Centralize Data

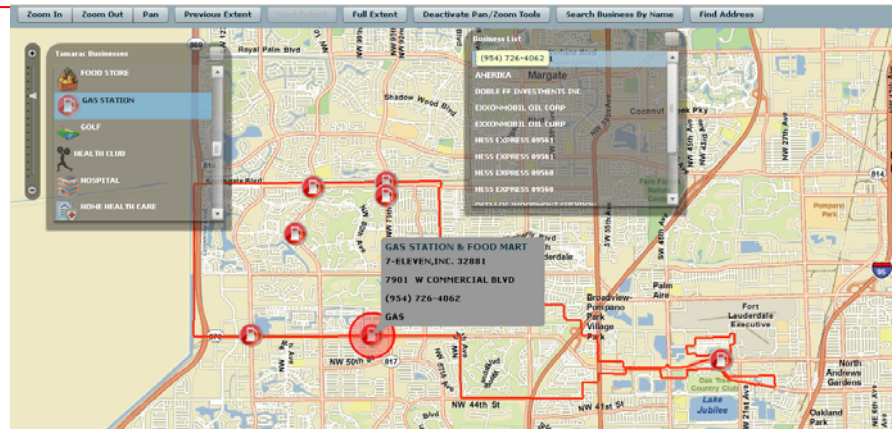
Custom Applications

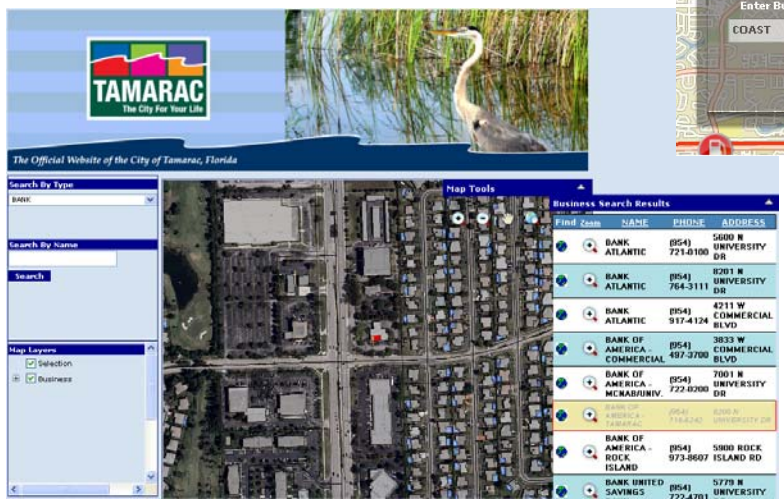
Data Editing Workflow



Custom Web Applications

- ArcGIS Flex API
- .Net Custom Web Applications
- Business Locator





BAE SYSTEMS

Post Upgrade Comparison

Previous	Current
Single Server	Multiple Servers
SQL 2000	SQL 2005
GIS Data Managed Separately	Centralized Data Management
SDE Services	Direct Connect
Separate SDE Login	Windows Authentication
SDE Versioning	Geodatabase Replication
Unable to Create New Web Applications	Easily Create New Web Applications
1 Web Application	14 Web Applications
	Custom Web Applications