Florida Department of Transportation’s

1) Virtual R/W Application Development
2) 3D Utility Mapping for 3D Design Update

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Virtual R/W Application Development

Virtual R/W Application Development - “CADD to GIS Interoperability”

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Background

The Florida Department of Transportation (FDOT) requires standardized electronic delivery of Design Plans through CADD.

With the advent of both an FDOT enterprise GIS framework (GEV) and our latest FDOT production CADD products supporting the interoperability between these environments, a path for sharing data has evolved so that users in both environments can benefit.
Goals and Initiatives

- In 2011 starting looking for a way to put everything R/W related into our new GEV looking backward to historic records.

- We had some success in manipulating the CADD line work for R/W acquisition lines to a GIS environment. Work was tedious and time consuming. Utilities would be even more tedious.

- Brought in Texas A&M Transportation Institute (TTI) to develop a process and working mock up. This research project is 99% complete.
TTI’s Research Overview

- Site visits and interviews with staff in Surveying and R/W Mapping, Right of Way Administration and Utilities in three FDOT Districts.
- Collected CADD Files and Documents with recorded work flows and product development routines.
TTI’s Research Overview

- Developed detailed lists of levels, cells, and attributes of our CADD mapping standards to include version releases and annual FDOT CADD standards changes. **EVOLUTION.**

- Developed database tables, routines, and menus, that extract CADD information that would be desired in the GIS.
GIS to CADD

- Focus during this presentation will be on the historical and future transposing of CADD data into our GIS (GEV).

- We anticipate that we will want the ability to reference all or some amount of historical layers such as Survey Control, Parcels, Aerials, R/W, Roadway, Easements, Utilities, and Permit Agreements.
GIS to CADD

- This information will be of great benefit in the “Virtual R/W Enterprise View” especially in areas of density and rapid development or that require a high amount of public records request.

- Both of our current CADD platforms (Bentley and AutoCAD) have functionality supporting direct referencing of GIS data into the CADD environment and visa versa.

- Dealing with these items in the future, in a “feature” based environment will be our standard business model.
CADD to GIS “Interoperability”

- How do we integrate CADD Survey/Engineering data that is or was symbolized specifically to create a set of design plans for construction so that elements of that design can be visualized/attributed and thereby successfully used in a Geographic Information System?
First, an understanding of what GIS requires in order to visualize and geospatially query information is needed.

- GIS uses relational tables of records that are geospatially aware,
- Along with linked attribute data.

We must therefore create outputs from the CADD data to meet these requirements.
CADD to GIS Interoperability Requirements

- By using FDOT setup software and incorporating GIS workspaces, the tools in our latest licensed CADD products, both MicroStation Power GeoPak/Map and AutoCAD Geospatial, have the ability to generate GIS compliant (geospatially aware) data, including capturing attributes.
CADD to GIS Interoperability Goals

- Use existing licensed products (both CADD and GIS).
- Reach out and determine all potential stakeholders to data. There may be some who traditionally were not interested or had a need to mine CADD data from design plans as they were not CADD users.
CADD to GIS Interoperability Goals

- User assessment to identify initial need and priority of GIS features.
- Build tools and workspaces in FDOT CADD platforms required for creating priority GIS features.
CADD to GIS Interoperability Implementation

- Prepare/document updates to FDOT electronic delivery to accommodate GIS components and standards.
- Pilot project and testing to verify process and workflow efficiency.
- Support design community/dataset owners on benefits and (how to) creation of GIS products.
CADD to GIS Interoperability Implementation

- Publish CADD to GIS data layers into FDOT GIS enterprise environment.
- Quality Assurance of current information used by management and others to make decisions and satisfy customer needs.
- Periodic updates to user assessments for identifying future data creation.
CADD to GIS Interoperability Tools

- Following are examples providing a display of basic maps and tools CADD designers will use to create GIS compliant features or to promote existing CADD elements to GIS features with associated attribute data. (Shown is Bentley platform, but AutoDesk has similar functionality.)
Note: Commands are categorized by discipline in this example, but could be categorized in other ways.
Parcels

Promote Existing to Parcel

[Image of a window titled Promote to Parcel with options for Single Element, Fence, Selection Set, and a checkbox for Delete existing element(s) after promote. Below, two dropdown menus labeled District and County are visible.]
Parcels

Place/Create

[Image of software interface with fields for District, County, FPID #, State Road Number, Parcel Type, etc., along with sections for Grantee, FDOT Parcel ID, Right of Way Management ID, Section, Township, Range, Apparent Access, Access Road, Category, Appraised Value, Encumbrances, Description, and Comments.]
CADD Components Exported as GIS Features
CADD Features Imported Into GIS Environment
CADD to GIS Interoperability Summary

- The Florida Department of Transportation is actively pursuing developing a process/workflow that will allow both our CADD and GIS environments to interchange and use each others data. Our customers in both environments will benefit and we see this information as:
  - One stop shopping for public records requests.
  - Better collaboration decision making tools with stakeholders. A Technical or the GIS/Thematic look....and overlaid onto a variety of base map scenarios.
  - Enhanced querying activities to quickly support FDOT’s consultants, partners, and customers.
  - Knowing what is in our R/W by going to 1 place.....links to, maps, aerials, documents and metadata.
  - Cost savings in records management, staff hours, and informed decision making.
FDOT is rapidly moving into 3D Design per the MAP-21 and EDC2 directives.

Plan to use all LiDAR platforms and photogrammetry to add density to the DTM as well as vertical objects for a full 3D product.

How do we add depth to provide the same density to the underground infrastructure? A true visual tool.
Radar Tomography (RT)

- Arrayed Ground Penetrating Radar offers continuous coverage of roadways in smooth terrain areas.
3D Underground Images and x, y, & z data

Depth = 0.70 m

Depth = 31 inches
FDOT’s Effort to Implement

- Combine RT, Designating with Depth, Test Hole, or other existing underground utility data for 3D mapping to be utilized in the design model. QL’s A,B,C, and D in 3D?
- We have recently issued 2 statewide RT Contracts to provide these professional services. 3 Projects moving forward.
- We are just getting started, many challenges lay ahead. We need to manage perceptions and ignorance to the product.
- The is in these issues by utilizing Feature Object Data with metadata that depicts the method and accuracy of the object in 3D space with a warning system for the designer and the contractor.
Questions:

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