Integrating Esri Roads & Highways with dTIMS

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Agenda

• Company Overview – Deighton, Arcadis
• Product description
• Legacy situation
• Solution Overview – Case Study
• Questions
Introductions

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Deighton is world leader in providing asset management systems and asset management expertise at the strategic, tactical, and operational levels for agencies around the world. Recognized as the premier software product for infrastructure asset management, dTIMS® is used to manage large infrastructure networks in Africa, Asia, Australia, Canada, Europe, New Zealand, and the United States.
dTIMS Asset Management Journey

dTIMS® allows you to incorporate all of your agency’s infrastructure assets into one common platform for data management, strategic, tactical and operational asset management.

Pavements - Manage the largest single class of assets in transportation and public works agencies. Features level of service, performance and risk based analysis.

Sidewalks - Manage sidewalk inventory and condition data including sidewalk treatments.

Culverts - Use risk-based analysis to manage culverts, and ensure high consequences of failure locations are inspected, repaired and replaced before it’s too late.

Facilities - Organize and view your facilities in an intuitive hierarchy. Connect the facility to its component assets and manage every piece of data together in one platform including roofing, plumbing, lighting, HVAC, and more.

Water - Robust asset management and analysis tools to manage your water assets. Model pipe decay, plan and prioritize inspection and renewal programs and provide long term analysis of collection costs, system renewal costs and replacements costs.

Bridges - Supports component level and element level analysis of your agency’s bridges to optimize the bridge program using the health index, risk, asset value or any combination.

Cross-Asset Optimization - Strategic analysis tools to help make resource allocation decisions across assets. Risk-based tools show the impacts of moving funding between assets. True cross asset analysis and optimization allows projects to be prioritized and optimized across asset classes.

Guide Rails - Manage as a new standalone asset group or as an ancillary asset referenced to the Highway Location Reference System (HLRS).

Curb | Gutters - Manage curb and gutter assets as stand-alone assets independent of any other asset or include those assets as ancillary assets in conjunction with or in advance of any pavement / infrastructure project.

Signs - Work programs can be based on corridors or individual sign replacement strategies. Reactive work can be scheduled based on crash damage and or vandalism.

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ARCADIS at a glance

**PROPOSITIONS**
- Program & Project Management
- Master Planning & Architecture
- Design & Engineering
- Implementation

**BUSINESS LINES** (gross revenues)
- Infrastructure
  - *25%
- Water
  - *14%
- Environment
  - *24%
- Buildings
  - *37%

*Q1 2015 incl. Hyder and Callison

**GEOGRAPHY**
- Emerging markets 43%
- Europe 33%
- North America 24%

**KEY STATISTICS**
- >€3 BILLION gross revenue
- 28 THOUSAND people worldwide

Leading global natural and built asset design & consultancy firm working in partnership with our clients to deliver exceptional and sustainable outcomes through the application of design, consultancy, engineering, project and management services.

#6 WORLDWIDE ranking
Our Global Reach

Our global network enables us to seamlessly bring our knowledge and experience of projects worldwide and apply that expertise to specific local needs and situations.

28,000 people | 400+ offices | 40+ countries | 30,000+ projects

Australia
Abu Dhabi – UAE
Bahrain
Belgium
Brazil
Brunei
Canada
Chile
China
Czech Republic
Dubai – UAE
France
Germany
Hong Kong
India
Indonesia
Italy
Jordan
Kazakhstan
Korea
Macau
Malaysia
Mexico
Mozambique
Netherlands
Oman
Peru
Philippines
Poland
Qatar
Romania
Russia
Saudi Arabia
Serbia
Singapore
Slovakia
Spain
Switzerland
Taiwan
Thailand
United Kingdom
United States
Vietnam

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Product Description – dTIMS BA
Interoperability
Authoritative LRS
Interoperability - is the ability for dTIMS to work with other systems or products without special effort on the part of the user.
dTIMS has the ability to seamlessly connect to an agency’s authoritative LRS and GIS system.
Legacy Situation
 pleaded

GIS & Linear referencing Issues
Move to the Enterprise
Standardized Enterprise Reference
Integrated Business Records
Manage Change
GIS & Linear Referencing Issues

- Mix of Route ID-ing
- Different Measures/Calibration
- GIS Keeps Changing
- Temporality/History
- Different Underlying Networks (Disconnected)
- Delete/Replace Alters Analysis

- Multiple Networks, Multiple Representation
Standardized Enterprise Reference

- Route ID (Agency Naming Standard)
- Multiple Linear Measuring/Referencing System (LRS)
- Geographic Length/Calibrated Length
- Beginning and Ending Referents & Offsets

• 1 Road, 1 Representation
Gap Analysis

- Update State Log or create “all roads network”
- Automated updates or edited concurrently
- Turn Travel Overs into continuous routes
- Translate events to new network (LRM to LRM)
- Identical geometry to County Log
Integration Profile (Ideal Condition)

- Consume network natively
- Centerlines = Chunks
- Centerline Sequence = Sequence
- Routes = Routes (calibration/definition/geometry)
- Deighton network matches R&H
- Deighton event data seamlessly integrates back into R&H (same routes/measures)
Existing Condition

- 2 route networks
- Differing coverage (ramps, local roads, etc)
- Travel Over event class (TOIDs)
- Networks edited independently
- Events stored on County Log
Ideal Condition

- 1 complete network (all roads)
- Continuous routes (not broken by county)
- Travel Over routes included
- Events located on continuous network
- Calibrated to geometric length
Integrated Business Records (Events)

Established Business Data

• Pavement
• Traffic
• Assets
• Characteristics

Assigned Event Behaviors

Business Data Tied Together
Manage Change

• What happens to business data when the underlying route network/LRS is changed?
  • Change in route measures
  • Change in route geometry (shape)
  • Retired portions of / complete routes

• Features
  • Maintain All Transactions
  • Maintain Temporality of Transactions
  • Time-Slicing History
  • Configure Event Behavior

Integrate not Replicate
Better Data Management

Seamless User Experience
Better Data Management

- Automated Procedures/Batch Processes
- More Frequent Execution/Updates
- Web Services – Thin Client
- Distributed Data Ownership – Reduced Maintenance
- Access to Other Systems Data

Integrate not Replicate
Seamless User Experience

Before

1. Export
2. Transform
3. Load

Roads & Highways®
The current authoritative LRS

R&H®

dTIMS®
To get data to R&H, repeat 3 steps in reverse

After

R&H®

dTIMS®

Data Analysis

Edit LRS
Data Analysis
Solution Overview
Integration Profile

Roads & Highways Basic Concepts

R&H External System Integration
1. Routes are modified
2. Notification to external system
3. External asset system calls Relocate Events Service
4. Service returns measure updates
5. External System makes updates

R&H External System Integration

Process

1. Routes are modified
2. Notification to external system
3. External asset system calls Relocate Events Service
4. Service returns measure updates
5. External System makes updates

Asset System Pulls Updates
Asset System Updates DB

R&H Desktop Updates GDB
R&H Desktop Updates GDB
R&H REST Services

ArcGIS REST Services Directory

Home > services > RCE1021 (MapServer) > LRSServer

JSON | SCHEMA

LRSServer

currentVersion: 10.21

capabilities:

networkLayers: (1)

- ATIS Routes

eventLayers: (6)

- Alias
- Functional Class
- Speed Limit
- Lanes
- MMS Org Segments
- Count Stations ADOT

Supported Operations: geometryToMeasure, measureToGeometry, queryAttributeSet, checkEvents
R&H External System Integration
Integrating Change

• **Option:** Configure event behaviors
  • Consider the most appropriate event behavior for route editing activity *per data type*
Indiana Dept of Transportation

Case Study
Indiana Department of Transportation

Challenges

Enterprise Integration Service
INDOT Case Study - Overview

The case study consists of two main components: services and software.

**Services:**

1. Develop integration path between R&H and dTIMS so both applications use the same LRS.

2. Build on the LRS integration to allow dTIMS to consume data directly from R&H or any other external data warehouse built on the same LRS. This reduces the need to import data directly into dTIMS.

3. Allow dTIMS to push data directly back to R&H reducing the need to export data directly from dTIMS.

**Software:**

1. Integration service (workflows and execution requests).

2. dTIMS Business Analytics
Challenges

1. Data Size
   • Number or records
   • One Location

2. Time
   • Import and export
   • Load then error check

3. System of Record
   • Multiple copies of same data
   • Updating data
   • How do you update in other systems

4. Working with External Data
   • Spatial vs Linear
   • Dynamic Segmentation

5. Temporal Network Definition
   • Same network at different times
   • Same storage for spatial and linear data

6. Enterprise Integration
   • Need dTIMS features
   • Central Data Repository
   • Need better reporting
Proposed Data Flow for INDOT dTIMS / Roads & Highways Integration

INDOT Data Workflow

- **Pavement Events:**
  - Inventory
  - Condition
  - Surface Contracts
  - SPMS
  - Intersections
  - Etc.

- **Bridge Locations:**
  - Route
  - County Log as point
  - NBI

- **Roads and Highways**
  - Reference Posts
  - County Routes
  - INDOT Routes

- **dTIMS**

- **BIAS:**
  - NBI
  - NBE (Element Data)

- **Bridge Work History**
  - NBI Data View
  - NBE Data View
  - Work History View

- **INDOT Data Warehouse**
  - Transformations
  - Bridge Program Recommendations
  - Pavement Program Recommendations

- **NBI Data from Pavement Events:**
  - AADT
  - Func. Class
  - Etc.
Enterprise Integration Service
Data Processing Workflow
Enterprise Integration Service – Execution Requests
Enterprise Integration Service – Event Configuration
Enterprise Integration Service – Event Field Mapping
Moving Forward

• Deighton is currently actively working to integrate dTIMS with Esri R&H at:
  • Indiana DOT
  • Arizona DOT
  • Louisiana DOT

• Approximately 18 other State DOT agencies in US plus several Cities and other agencies worldwide (e.g. Australia)
Thank You!