Leveraging a Rules Based Approach to Solving Transportation Data Management Issues
Cost of Poor Quality Data

$3.1 Trillion a Year

- **Time Waste**: users validating and correcting data themselves, without feeding corrections back
- **Lost of Revenue**: misdirected sales, marketing and service efforts
- **Resources wasted** through acting on decisions built on bad data
- **Lives put at risk** through the inaccurate plotting of utility networks or the misrouting of emergency services.
Make your data fit for purpose

Data Quality can be effectively managed when you know…

- **Where you are** (the current state of your data)
- **Where you need be** (the desired state of your data)

The key is to determine the **exact business requirements** to define quantitative quality metrics

Which rules are mandatory\optional with acceptable conformance levels for each rule
Defining Business Rules for what data should be

Using Rulespeak

“A set of best-practice guidelines for writing business rules in a concise and business-friendly format”

- Enable business people (SME) to express and understand rules
  - Decouple rule specification from software implementation
- Eliminate ambiguity
  - If 10 people read 1 rule, they all interpret it the same way
- Maximize consistency
  - Business terms, rules and style can be reused
Writing Rules Exercise

Business Rules: Good rule / bad rule?

- The door must be kept closed at all times
- The door must be closed when not in use
- Children under 10 should wear a seatbelt
- A child under 10 years of age must wear a seatbelt
- Voting is not aloud if you are 17
- Number 17 must vote silently (???)
- A person under the age of 18 may not vote
- The display colour of a sinkhole must be blue if the sinkhole is within an ice polygon
What about routable network?

Our route must be routable

- Road Name must be populated
- Road Geometry must not have Kickbacks or Spikes
- Road Geometry must be connected to other geometries within 5 meters
- Road Geometry must only connect at the start or end of another geometry
- Road Address Range must not overlap or have gaps

Undershoot – 7 Feet

Overshoot – 24 Feet
What about LRS?

Routes must support Linear Reference Systems

- Route ID’s must be equal to ....
- Route geometries must not have Kickbacks or Spikes
- Route Geometry must be connected to other geometries within 5 meters
- Routes must not overlap other routes
- Routes must not have **bifurcation**
- A Route must have increasing Measure values (Monotonic)
Data Validation
Automate manual, time-consuming, subjective QA tasks. Certification required for proof of data quality (SLA’s, legislation)

Data Integration
Maximize ROI through re-use, integration of data across the enterprise

Data Enhancement
Automate cleaning tasks, create new data, construct repeatable, non-subjective corrective actions.
1Spatial Transportation Community

Automated QA/QC
Validation & Cleanup

Change Detection
Conflation

Master Data Mgt
1. Fact – Pattern – Action
2. Given some facts, if they meet any of the patterns/rules, perform the defined action
3. Declarative – rule separated from processing - Positive Declarative Approach
4. Pluggable actions – reporting/reconciliation
Transportation Validation Rules at Arizona DOT

ARIZONA GEODATA SUPPLY CHAIN VALIDATION SYSTEM

- Road Geometry must not have Kickbacks or Spikes
- Road Checks
  - Road Segments must be larger than 3 meters
  - Road Segments must not be closed lines
  - Road Segments must not overlap
    - If overlapping roads have same road name: Critical
  - Roads must not have overshoots/undershoots (aka Dangles)
  - Road Segments must not intersect itself (Loop)
- LRS Checks
  - Routes must not have bifurcation
Transportation Validation Rules at Kansas DOT

Validating LRS Network for Roads and Highways

- Road Geometry must not have Kickbacks or Spikes
- Road Checks
  - Road Segments must be larger than 3 meters
  - Road Segments must not be closed lines
  - Routes must not have overshoots/undershoots if route is of certain type
- LRS Checks
  - Routes must not have bifurcation
  - A Route must have increasing Measure values (Monotonic)

Stay Tuned for the presentation in 40 min
Transportation Validation Rules at FHWA

HPMS Validations

- Essential Geometry Checks
  - Routes must not have kickbacks or spikes
- LRS Checks
  - Routes must not have bifurcation
  - A Route must have increasing Measure values (Monotonic)
  - Routes must not overlap other routes
  - Routes must not have overshoots\undershoots
- Domain Checks
  - AADT Must be an Integer between 0 and 50000
- Coverage Checks
  - A Route Segment must have a F-System if there is a Facility_Type with values 1 through 6 but not 3
Sharing Rules between organization - Demonstration
Q & A With Arizona DOT, Kansas DOT, Federal Highways
THANK YOU