



Building a Stable Transportation Model for Minnesota



Background...

- Mn/DOT provides statewide data to users on all transportation features
 - Roadway - all 138,000+ miles and 450,000+ segments
 - Different business areas contacting LGAs for same info
- Several existing methods for transportation information
 - TIS, GIS BaseMap, AASHTO wares, other apps to use data
 - Distributed throughout
- History has been to capture info by linear location methods
- Linear location serves as the common thread for integration of transportation data



The need for a new model...

- New Challenges
- Legacy systems
- Redundancy
- Need to integrate data sets together
 - Current environment difficult to use data sets together
- History
- Stabilization
- Multiplicity
- Translation
- Graphic vs. tabular
- Cost

Translation - Location Expressions

LX = (**LRM**, **LE**, **DX**)

LX₁ = (**MilePoint**, *Route: I-95*, **2.5 mi.**)

LX₂ = (**KilometerPoint**, *Route: I-95*, **4 km**)

LX₃ = (**Percentage**, *Link: Link 1034*, **50%**)

LX₄ = (**MilePost**, *Route: I-95*, **2 + .50 mi.**)

LX₅ = (**ReferencePost**, *Route: I-95*, **2 + .400**)

LX₆ = (**County MilePost**, *Route: I-95*, **©+1.8 mi**)

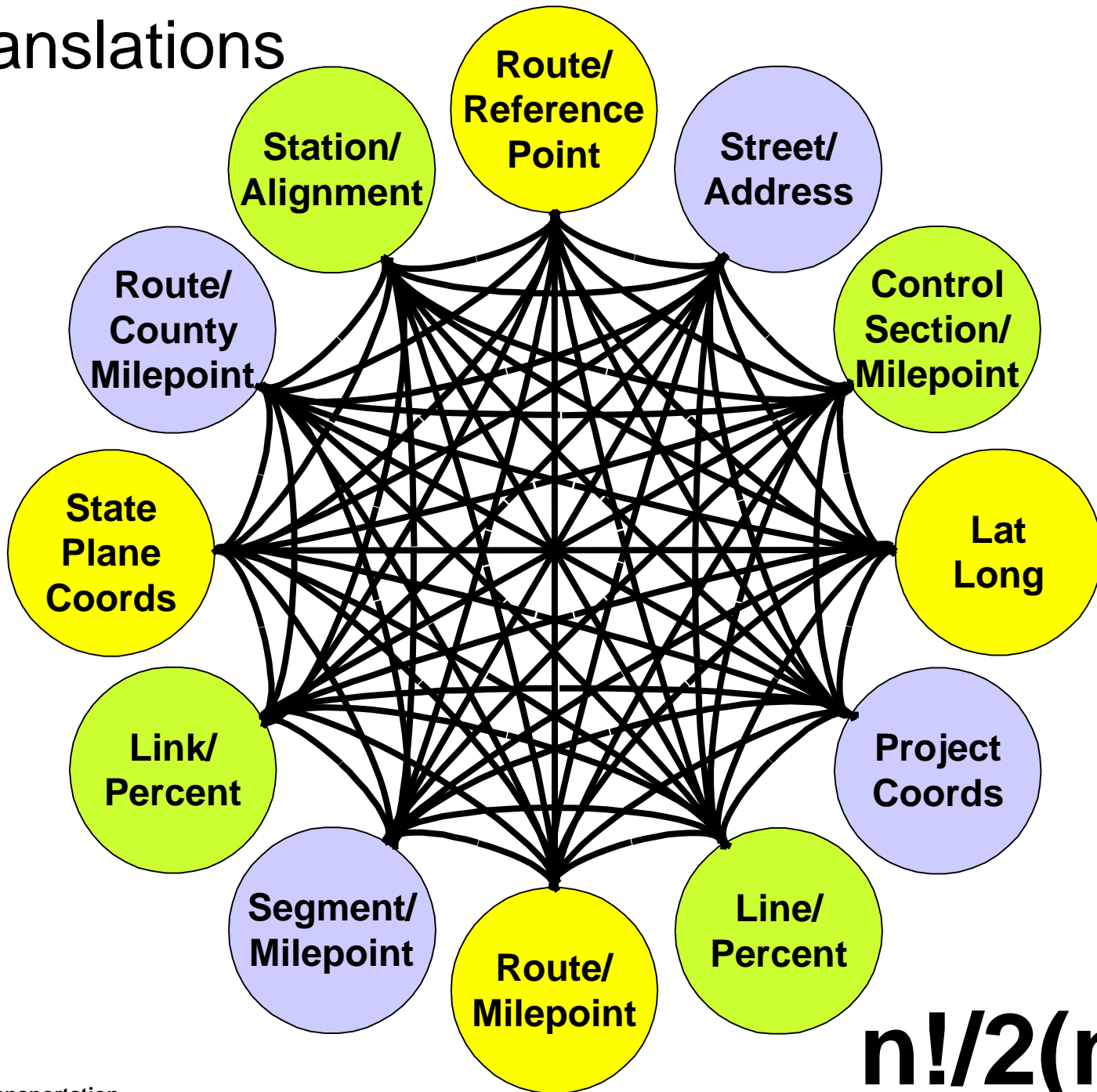
LX₇ = (**Station**, *Alignment: Project 42*, **132+00**)

LX₈ = (**Station**, *Alignment: Smith Rd.*, **'A' 89+20**)

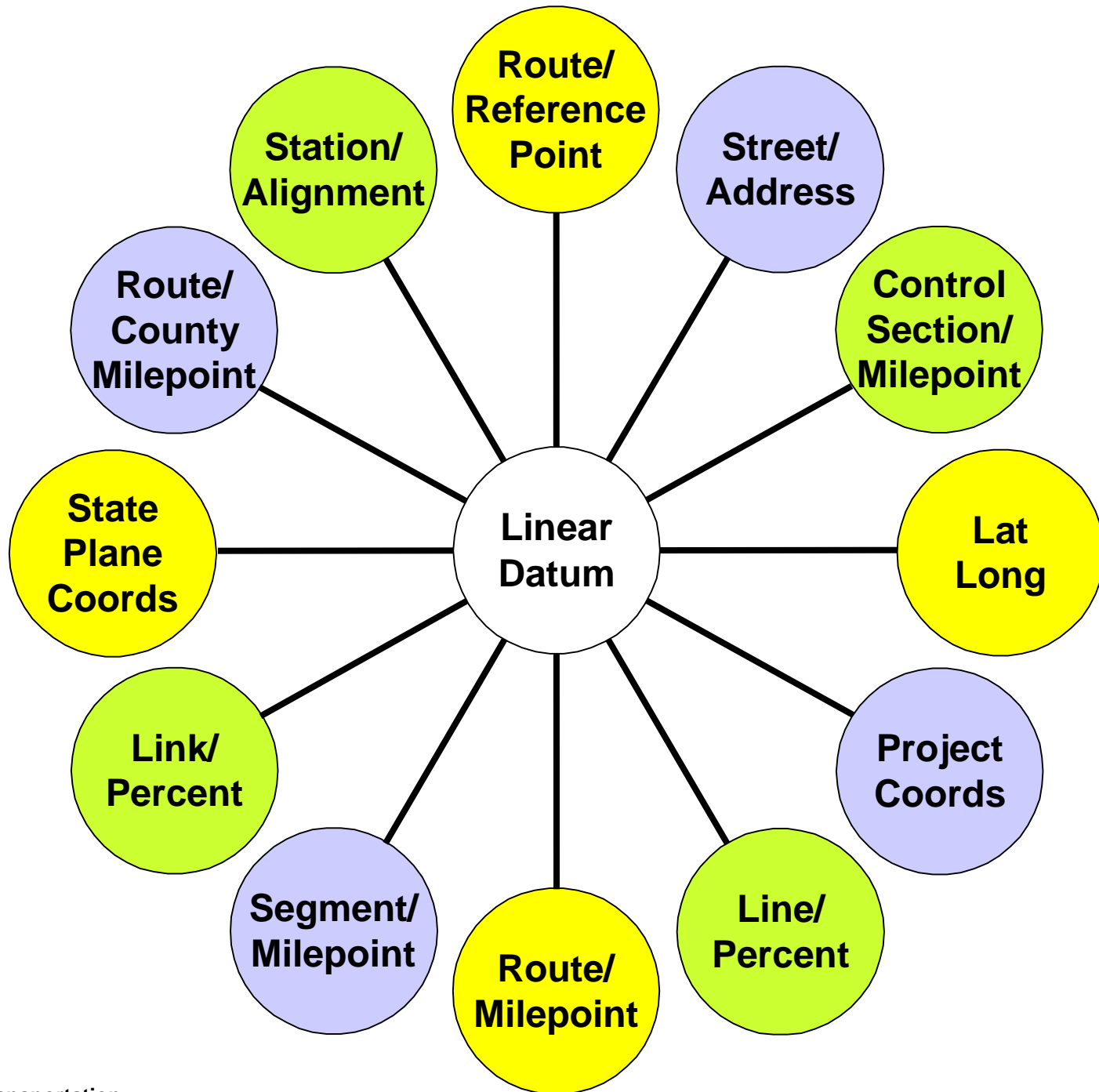
LX₉ = (**Address**, *Street: Smith Rd.*, **55**)

LX

Translations



$$n!/2(n-2)!$$





History of the model at Mn/DOT

- **Unified Transportation System**
- **Participated in putting National Models together**
- **TRB - NCHRP 20-27**
- **National Spatial Data Infrastructure (NSDI) Transportation Framework (features)**
- **American National Standards Institute(ANSI) Data Content Standards geographic locations, interconnectedness, and characteristics of the transportation system)**
- **Build the Location Data Manager**

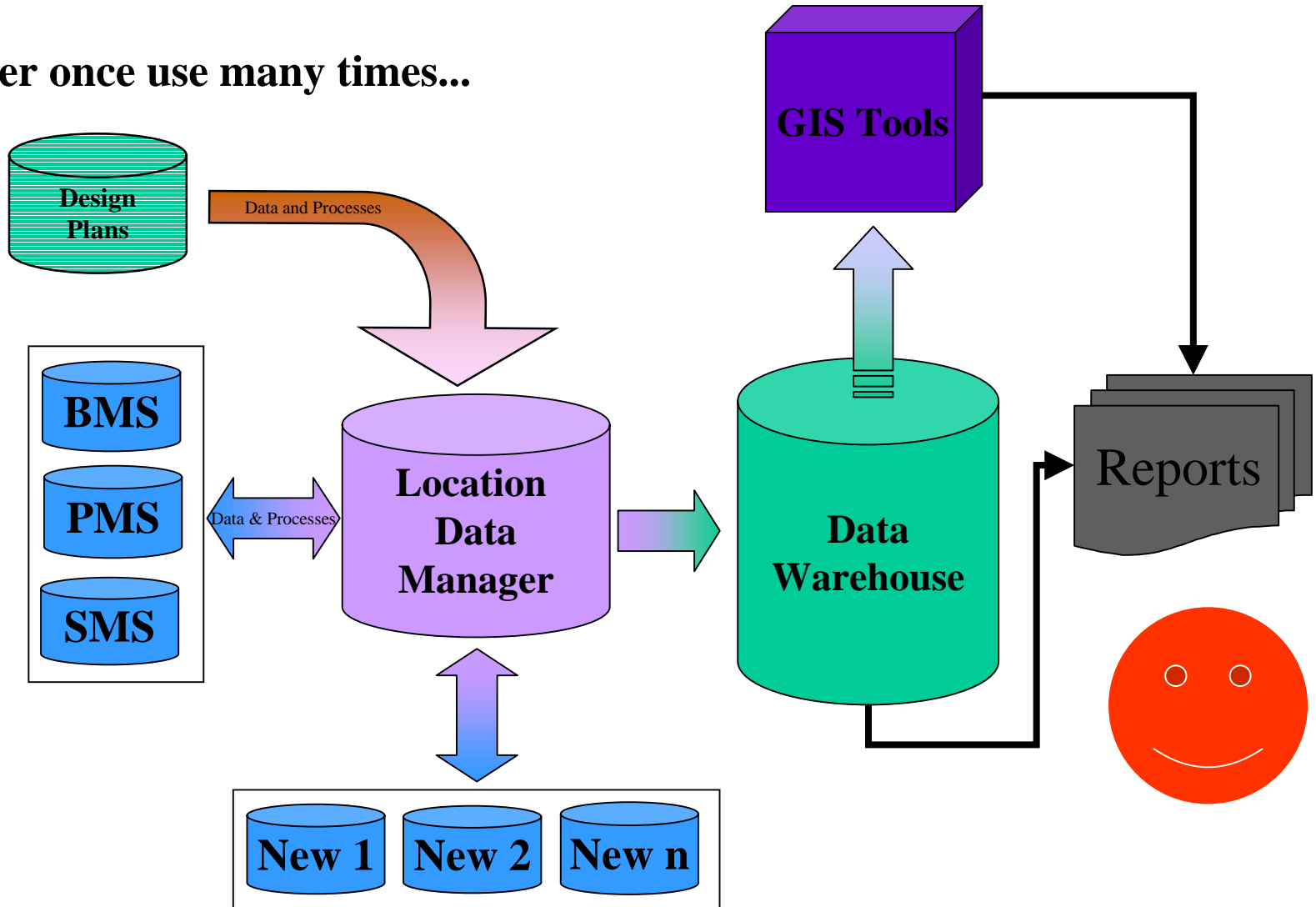


What is the Mn/DOT model?

- **Tools**
- **Processes/Methods**
- **Standard definitions**
- **Core Data**

The Mn/DOT Model

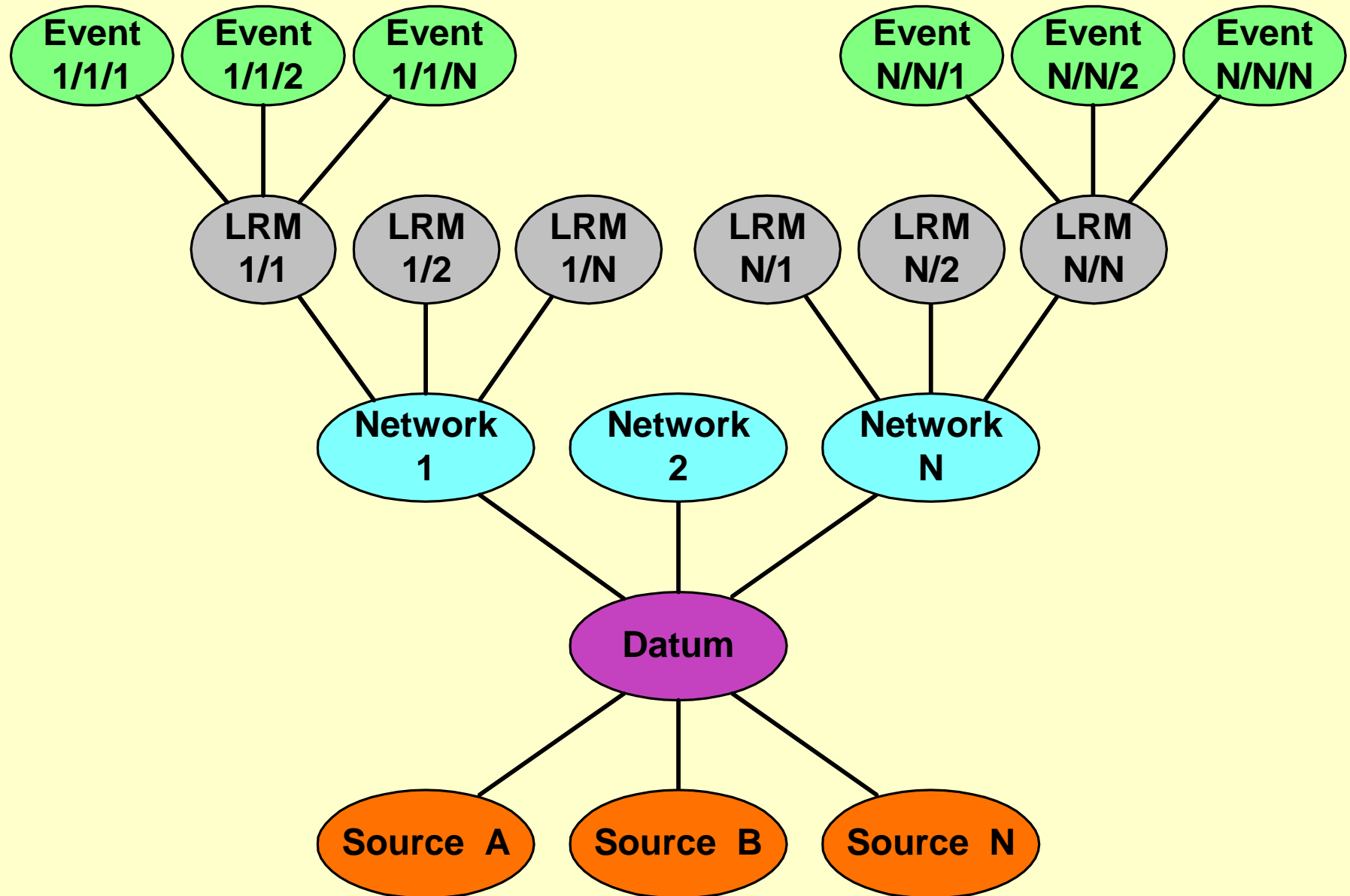
Enter once use many times...





We started with the National
Model....

NCHRP Conceptual Data Model





NCHRP says:

- **Linear Datum**
 - collection of objects which serve as the basis for locating the LRS in the real world
 - relates the data representation to the real world
 - enables transformations among cartographic reps



NCHRP says:

- **Anchor Point**
 - zero-dimensional location
 - can be uniquely identified in the real world
 - position can be determined and recovered in the field from its quantitative or descriptive “location description”

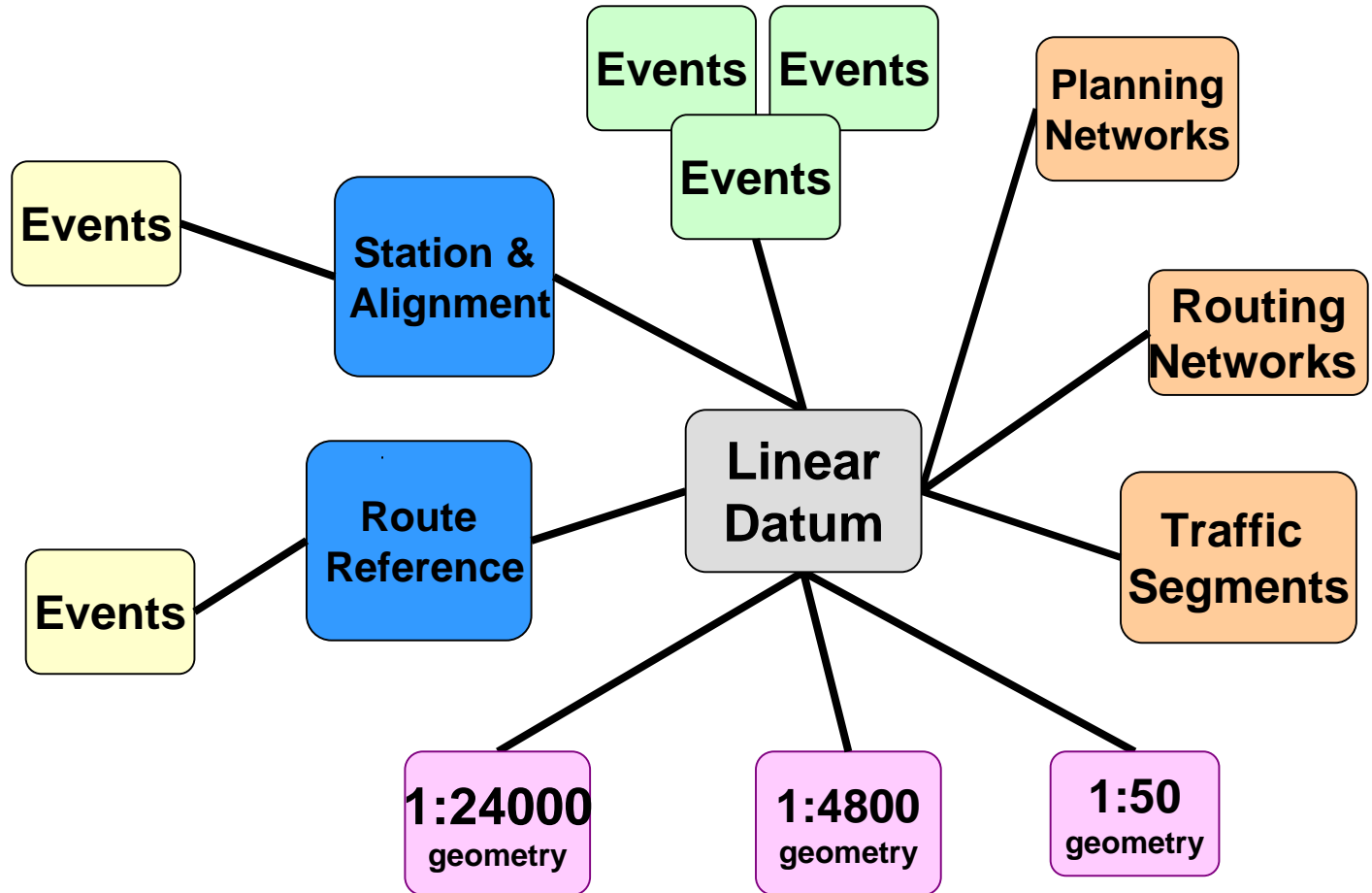


NCHRP says:

- **Anchor Section**
 - **continuous, directed, non-branching linear feature**
 - **connects two anchor points**
 - **real world length can be determined in the field**
 - **directed by “from” and “to” APs**
 - **length is measured on the ground**



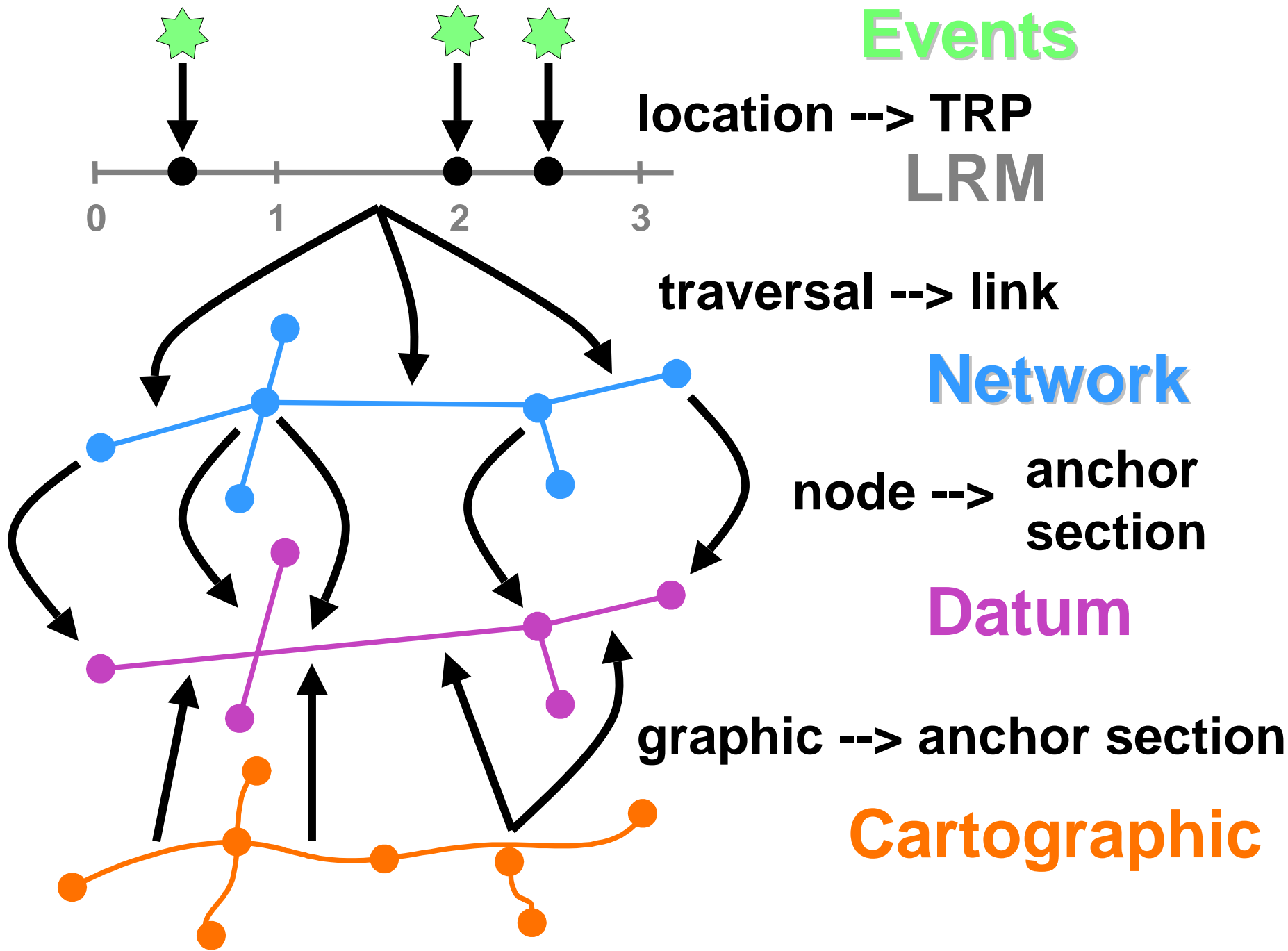
Mn/DOT Linear Model





Differences in the models...

- Mn/DOT no NETWORK LAYER
 - Located data associated directly to AS
 - Does not preclude us from having a network layer
- Anchor sections run intersection to intersection in Mn/DOT model
 - National models suggest longer segments
 - Larger number of records in database
 - Topologically correct
 - Match graphic reps





Where are we at now?

- Phase 1- Location Data Manager (LDM) has been delivered
 - Editing tools and GUIs available for users
 - Common set of processes and methods for editing transportation data
- Testing final release of initial project
- Data matching and loading between systems
- Contract and design for integration of additional data sets
- Looking at opportunities for partnering
- Working on Phase 2



The Location Data Manager (LDM)

- **An n-tier pure JAVA GIS system that provides...**
 - A stable method for location and located data
 - Transparent to users - (they can use current methods)
 - A central storefront for location/located data
 - Tools for easy display and editing of map and tabular data
 - Import and conversion of various formats of data
 - Conversion between different linear reference methods
 - Conversion between coordinate systems
 - Conversion between spatial and linear reference
 - Shareable/Reusable tools and components



Benefits of the new model

- **Scaleable**
 - Many graphic reps per AS
 - Can attach external data sets to AS
 - Reusable components
- **Promotes integration and sharing**
 - Traffic data on TLG data
 - Rolls up to the National Model
- **Common standard and method for doing so**
- **Provides partner opportunities and all levels**
- **Other states implementing similar models**



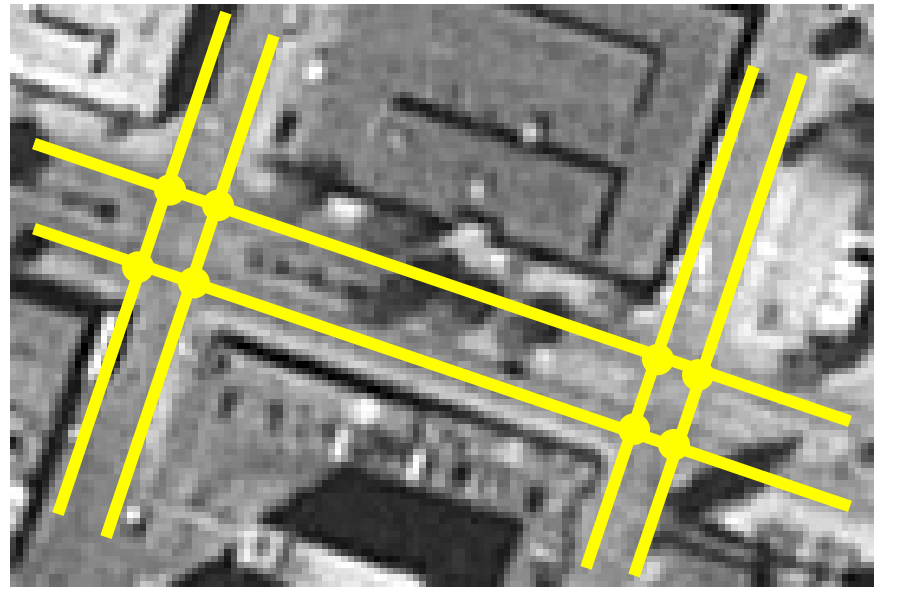
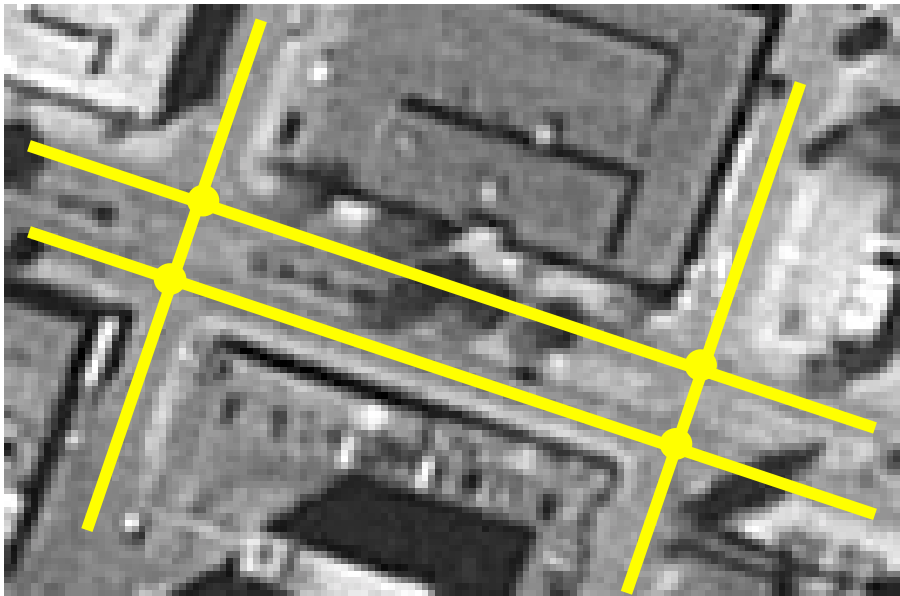
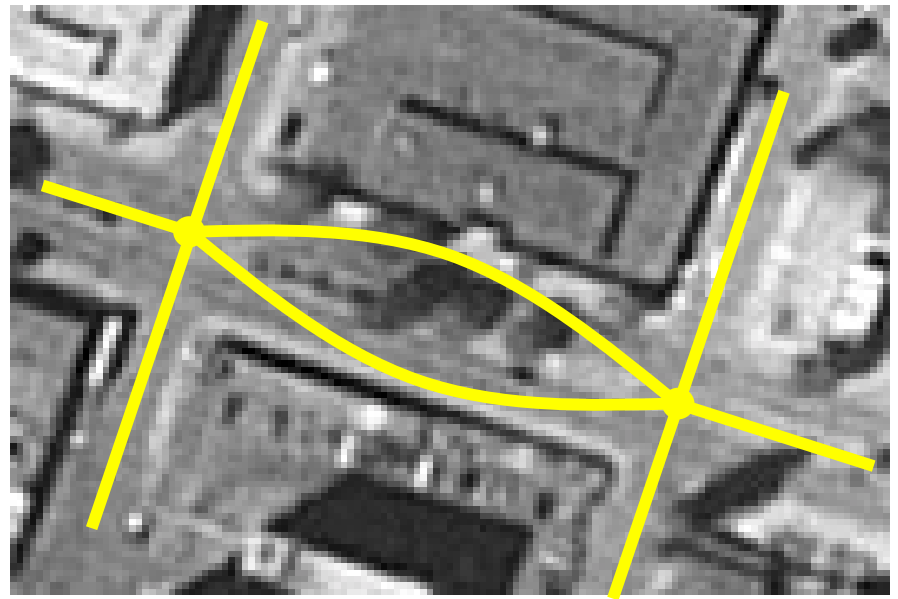
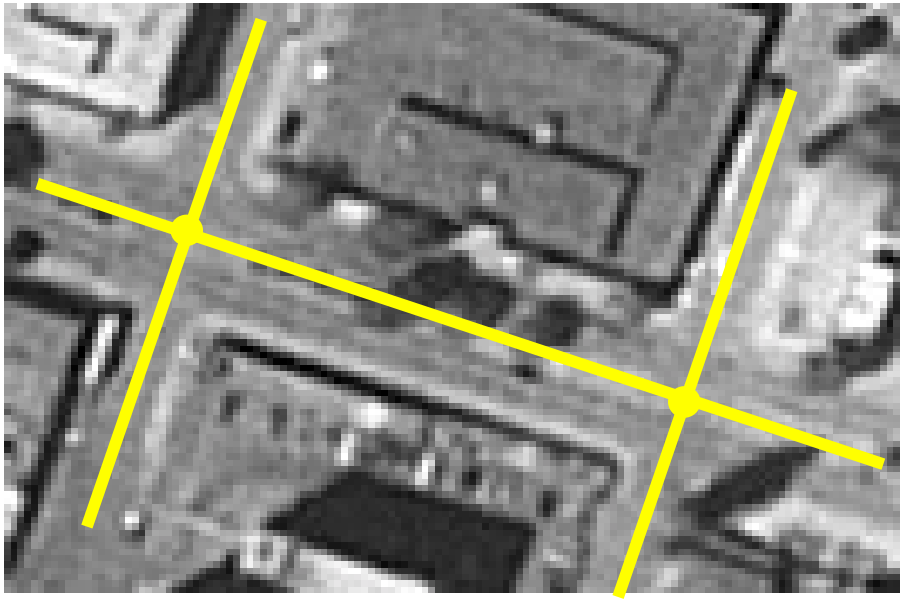
Partnering with Local Government

- Our goal: Enable LGAs to share information for roads within their jurisdiction and integrate data from other sources
 - Geometry
 - Road Characteristics
 - ???
- The web-based, n-tier structure of the LDM enables access for external partners



Opportunities for participation

- Sharing data
 - LGA's know local data better
 - LGA submit changes to features and attributes
 - Changes audited, and posted to the “geodata store”
 - LGA's access as necessary to obtain updated data
- Sharing tools
 - Promotes standardization
- Help develop
 - Standard definitions (What is a divided highway?) and processes
 - Core attributes
 - Access strategies





Some of the core attributes available through the LDM

- AS attribute name
- left shoulder width
- right shoulder width
- left shoulder type
- right shoulder type
- surface width
- surface type
- median width
- median type
- number of lanes
- forward flow
- number of lanes
- reverse flow
- number of lanes
- turning lanes
- forward flow turning lanes
- reverse flow turning lanes
- additional lanes
- curbs
- control section number
- functional classification
- design speed
- alternate functional classification
- alternate federal aid system
- National Highway System
- corridor
- county
- city
- access control
- patrol station
- patrol district
- maintenance area
- construction district
- township
- district



Project Explorer

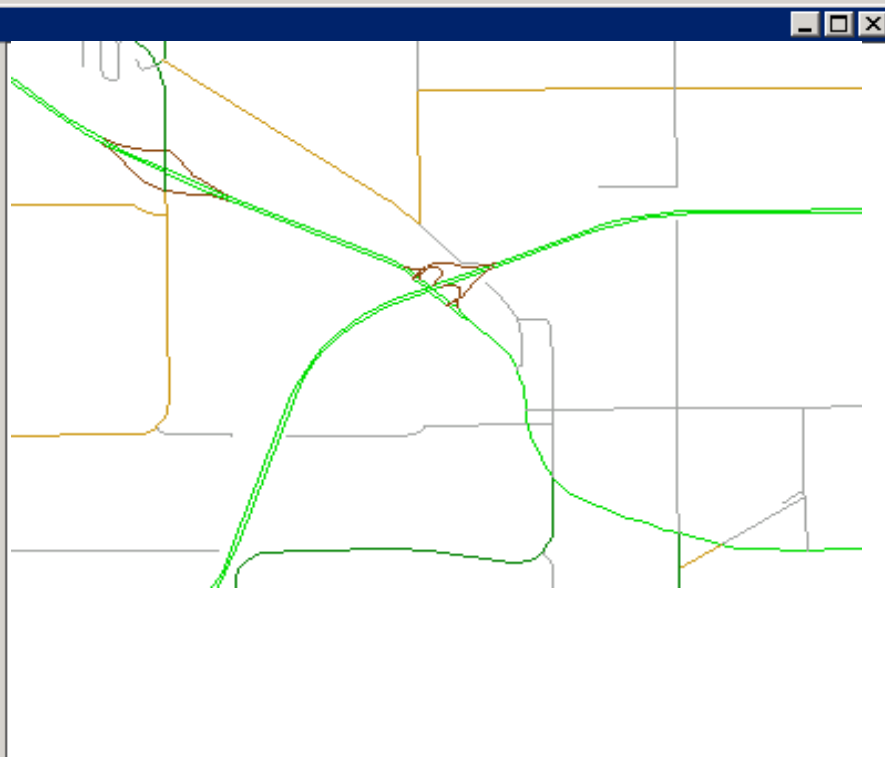
- Project
 - Views
 - Albert Lea City

Location Data Manager

Albert Lea City

Content

- Anchor section : all active
- Anchor point : all active
- U.S. trunk highway : all active
- Minnesota trunk highway : all active
- Interstate trunk highway : all active

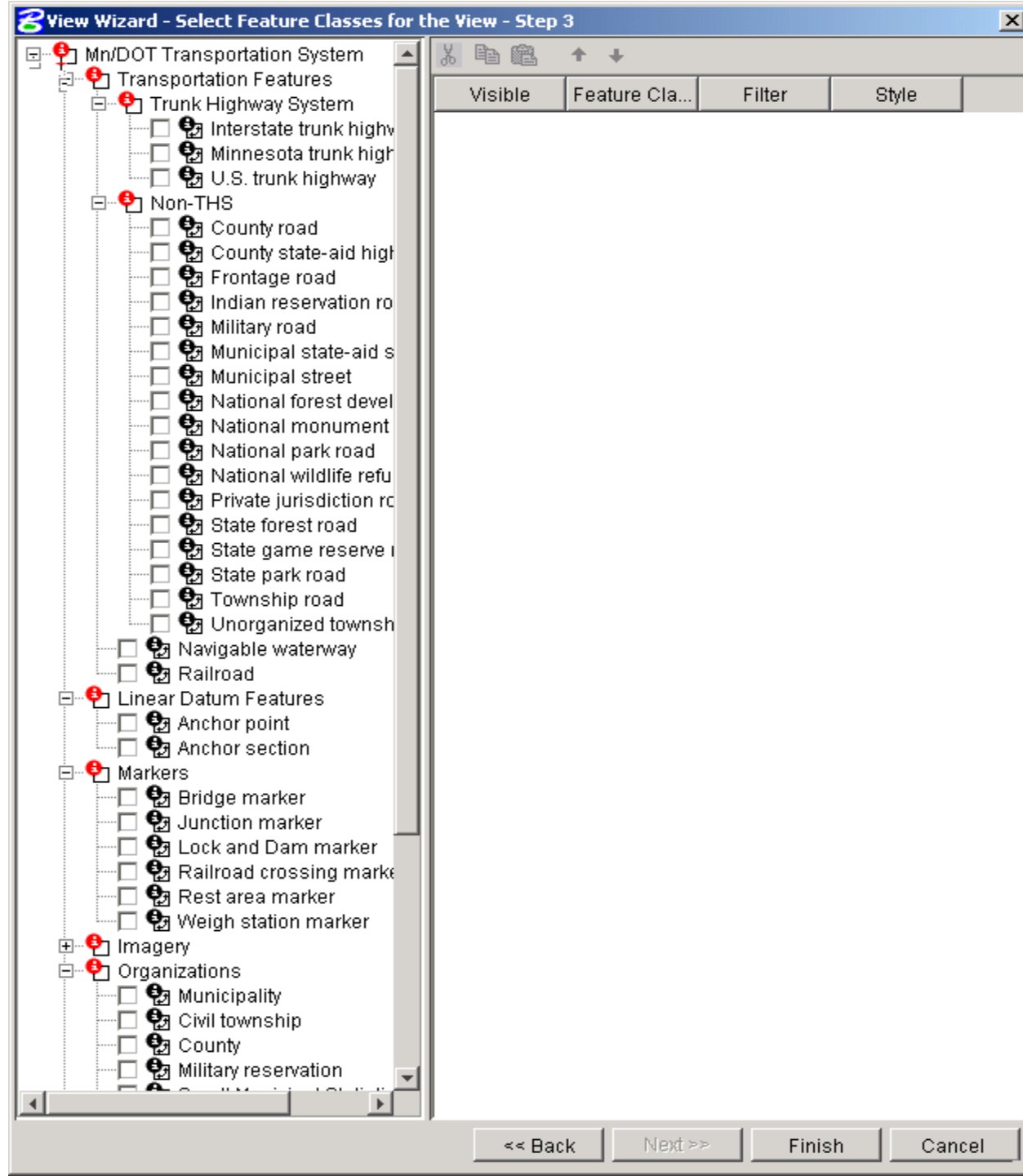


All states for 00000001171 (Anchor section)

Attribute	Value
Access symbol	None
Architects on 1988	None
Adoption Date	Feb 7, 2002
Additional lanes	None
Alternate federal aid system	None
Alternate functional classification	None
Carriageway design	None
Carriageway divided	None
Carriageway number	None
Carriageway	None
County	None
Cover	None
Default graphic file	00000001171
Design speed	None
District	None
Federal aid route number	None
Federal functional code	None
Forecast flow number of lanes	None
Forecast flow turning lanes	None
From anchor point	00000001171
Functional classification	None
Geometry	SCD Geometry
Last edited by	AC/PL/PLC
Last posted time	Feb 7, 2002
Left shoulder type	None
Left shoulder width	None
Legislative route number	None
Length	5.471
Maintenance area	None
Median type	None
Median width	None
Route	RD
National highway system	None
Number of lanes	None
Project district	None
...	...

**Location Data Server (P075)
Client GUI**

Feature Classes





Attributes

Attribute	Value
DefaultLength	2.488
ProposedActiveDate	
RetiredDate	
LastPostedTime	Nov 21, 2000
DefaultGraphicRep	000000031492
ActiveDate	Nov 21, 2000
LastEditedBy	BREE1KIR
Status	A
ToAnchorPoint	000000022311
Mode	RD
ProposalID	
TrafficDirection	M
FromAnchorPoint	ap/000000022521
1998Accidents	

Attribute	Value
Status	A
LastPostedTime	Nov 30, 2000
ActiveDate	Dec 6, 2000
ProposedActiveDate	
RetiredDate	
LastEditedBy	BREE1KIR
Source	BASEMAP
ProposalID	

Attribute	Value
SRS	UTM ZONE e15 NAD83
Type	DIGITIZED
Scale	1:24000
Accuracy	+50 FT



Questions?

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