Geocoding
&
Dynamic Segmentation

Basic GIS Feature Types

- Point
  - Cities, control points (BM), weather stations
  - Location, distance (buffer), point pattern, interpolation
- Polygon
  - States, land-use (zoning), land-cover, eco-region
  - Location (area coverage), distance, shape metrics, overlay
- Line
  - Roads, streams, utility lines, path
  - Location (linear referencing), distance, shape metrics (e.g., sinuosity), connectivity

Linear Feature Analysis

- Linear referencing – location
  - Geocoding (e.g., address matching)
  - Dynamic segmentation
- Network connectivity - connectivity
  - Path analysis (e.g., shortest path)
  - Location allocation
  - Tracing (e.g., up stream area)

Geocoding & Dynamic Segmentation

- Dynamic segmentation
  - Sections and routes (for linear referencing)
  - Events

- Network
  - Line (coverage)
  - Edge + junctions (geodatabase)
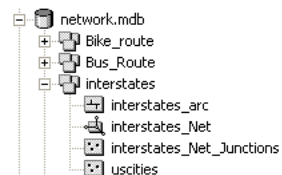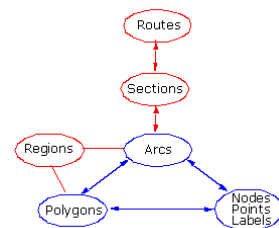
Types of Geocoding

- Address matching
- Corner (intersection) matching
- ZIP code geocoding
- Reverse geocoding

Geocoding Applications

- Location-based services (GPS, e911)
- Geodemographic analysis
- Public health
- Crime analysis

Geocoding

- Input: street addresses in text format

- Reference database: street map (e.g., TIGER)
  - Street name, prefix/suffix, and type
  - Beginning and end address numbers (left, right)
  - ZIP code (left, right)

- Process: Geocoding engine (linear interpolation)
  - Side offset, end offset

- Output: address points in GIS format

RLIS Streets
## (Tiger line file - Dual ranges)

Attributes of streets

PREFIX *	STREETNAME *	FTYPE *	DIRECTION	LEFTADD1	LEFTADD2	RGTADD1	RGTADD2	LEFTZIP	RIGHTZIP	TYPE *	LCOUNTY	RCOUNTY	LCITY	RCITY
	COLUMBIA RIVER	RAMP	EB	0	0	0	0	97010	97010	1121	MULT	MULT	MULT	MULT
	I84	FWY	EB	0	0	0	0	97010	97010	1110	MULT	MULT	MULT	MULT
	I84-COLUMBIA RIV	RAMP	EB	0	0	0	0	97010	97010	1122	MULT	MULT	MULT	MULT
	I84	FWY	WB	0	0	0	0	97010	97010	1110	MULT	MULT	MULT	MULT
NE	TUMALT	RD		60001	60249	60000	60248	97010	97010	1500	MULT	MULT	MULT	MULT
NE	FRONTAGE	RD		60331	60399	60330	60398	97010	97010	1400	MULT	MULT	MULT	MULT
	I84-COLUMBIA RIV	RAMP	EB	0	0	0	0	97010	97010	1122	MULT	MULT	MULT	MULT
	I84	FWY	EB	0	0	0	0	97010	97010	1110	MULT	MULT	MULT	MULT
NE	TUMALT	RD		59991	59999	59990	59998	97010	97010	1500	MULT	MULT	MULT	MULT
NE	FRONTAGE	RD		60301	60329	60300	60328	97010	97010	1400	MULT	MULT	MULT	MULT
	I84-COLUMBIA RIV	RAMP	EB	0	0	0	0	97010	97010	1122	MULT	MULT	MULT	MULT
NE	TUMALT	RD		59801	59989	59800	59988	97010	97010	1500	MULT	MULT	MULT	MULT
E	COLUMBIA RIVER	HWY		59811	60299	59810	60298	97010	97010	1400	MULT	MULT	MULT	MULT
E	COLUMBIA RIVER	HWY		59801	59809	0	0	97010	97010	1400	MULT	MULT	MULT	MULT

Record: 1251   Show: All | Selected   Records (0 out of 101988 Selected)   Options
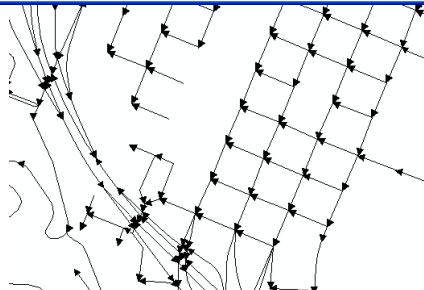
Causes of Geocodeing Errors

- Misspelling of address
- Incorrect address number
- Incorrect street prefix/suffix
- Incorrect street type
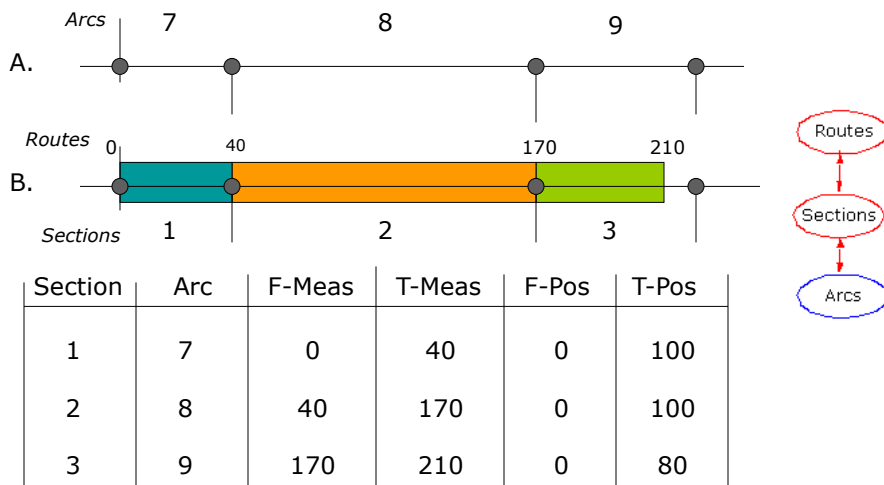- Abbreviations
- Matching scoring system

ArcGIS Geocoding Tools
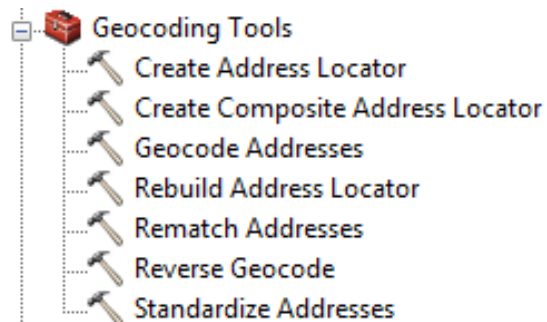
Dynamic Segmentation

- DS is the process of computing the location of events along a route.
- Routes ((multipart) polylines – M-Aware)
- Sections (polylines)
- Events

Routes in Coverage Data Model

Section	Arc	F-Meas	T-Meas	F-Pos	T-Pos
1	7	0	40	0	100
2	8	40	170	0	100
3	9	170	210	0	80

Section 3 To measure = 170 + (length of arc 9) x 0.8, or 210

Routes in Geodatabase Data Model

| Point	X	Y	M
1	X1	Y1	1
2	X2	Y2	40
3	X3	Y3	170
4	X4	Y4	220

Creating Routes

- Create route geometric objects
  - Polylines or multipart polylines

- Linear Referencing Tools (ArcToolBox)
  - Create Routes: enable route measures on routes (i.e., create measured polylines)
  - Calibrate Routes: recalculate route measures using points.

- Types of routes
  - Simple
  - Combined
  - Split route
  - Looping route
  - Hierarchical route

ArcGIS Linear Referencing Tools
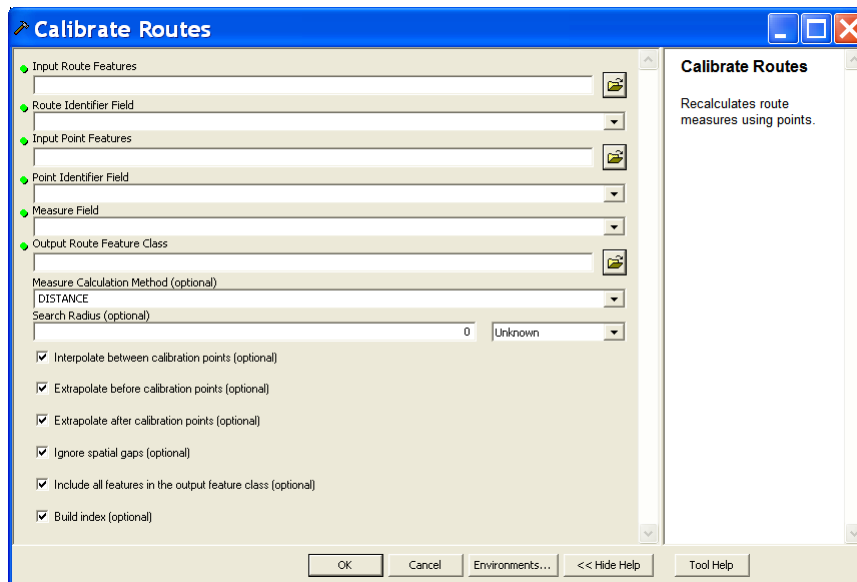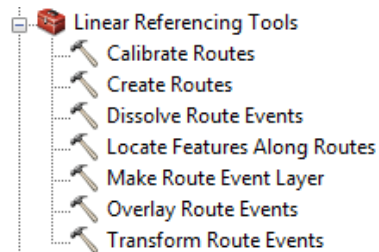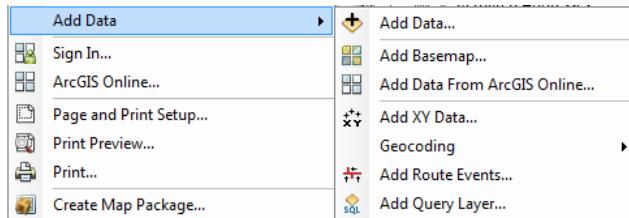
Calibrate Routes
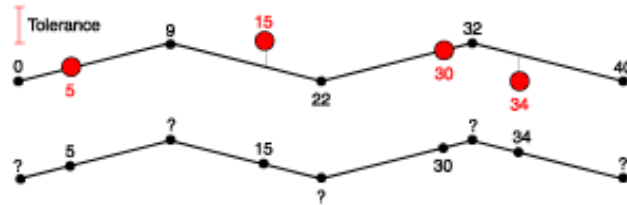
- Interpolation / extrapolation
- Spatial gaps

Create Routes in ArcInfo

- Interactive
  - Arcedit: MAKEROUTE, REMEASURE
  - Network: PATH
- Bulk
  - Arc: ARCROUTE, MEASUREROUTE

Event Tables

- Types of events
  - Point events: mileposts, traffic accidents, dams
  - Linear events: speed limits, stream reaches

- Event tables creation and analysis (linear referencing tools in ArcToolBox)
  - Locate events along routes: create route event tables by intersection overlay
  - Overlay route events: union or intersect route event tables.
  - Transform route reference: transforms the measures of events from one route reference to another.

usstations#	bus#	measure
1	1	899.930
2	1	2359.145
3	1	2476.239
4	1	2849.655
5	1	3163.485
6	1	4173.557
7	1	5446.844
8	1	6451.580
9	1	9368.944
10	1	8509.497
11	1	10002.686
12	1	10412.696
13	1	11728.987

Table 16.5 A point event table showing bus stops along the bus route

inter-id	from	to	year
1	44700	90000	1995
1	123648	180000	1989
1	239375	270000	1992
2	74024	78000	1988
2	154873	180000	1993
2	356992	400000	1987
3	78065	90000	1988
4	40000	72033	1986

Table 16.7 A linear event table showing year of pavement re-
surfacing on the interstate highway route system