Modeling Mobility 2025

Data-Driven Transit Planning: Identifying High-Demand Corridors

Building Better Networks

09/15/2025

Prepared by:

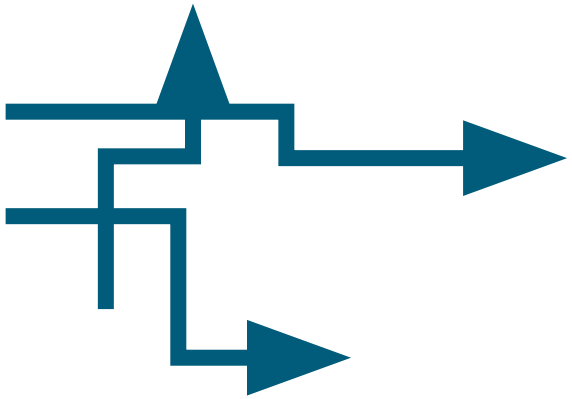
Foursquare ITP

High Demand Corridor Identification (HDCI)

Identifying corridors capturing high shares of travel within an area

Identifying Corridors with High Travel Demand

- A corridor is a continuous path in a study area that connects origin and destination pairs together



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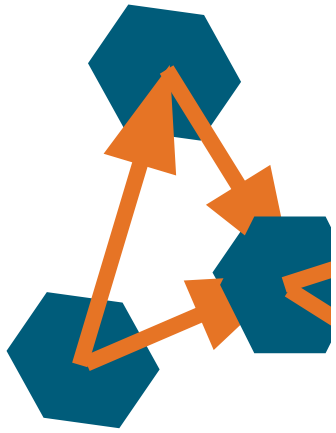
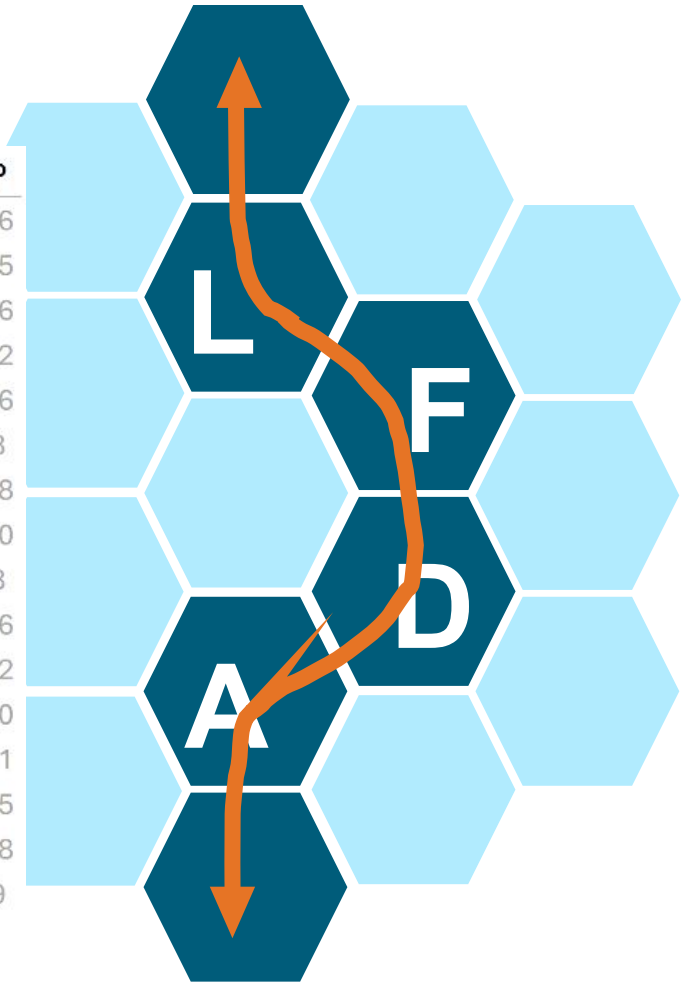


Origin ↓ Dest →	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
A	6	17	17	2	20	20	11	17	11	5	7	5	6	3	15	16
B	19	13	9	10	3	3	6	3	16	8	4	16	4	18	10	15
C	17	11	20	12	1	4	13	19	18	4	19	6	4	7	18	16
D	15	2	13	20	4	12	4	11	8	17	3	14	14	7	18	12
E	3	3	16	10	16	11	10	3	15	14	1	13	2	17	12	16
F	12	17	17	3	20	4	12	18	6	15	6	13	13	1	7	8
G	3	20	3	6	5	18	14	3	3	13	9	11	1	3	20	18
H	7	18	12	3	3	7	5	13	18	17	12	18	20	19	6	10
I	11	1	1	19	11	6	8	19	13	11	10	1	7	3	16	8
J	18	10	1	10	9	14	7	1	9	3	10	6	13	13	2	16
K	15	11	17	20	13	10	7	10	16	13	13	12	18	3	6	12
L	6	18	6	11	12	19	1	4	7	20	15	15	2	5	6	20
M	7	20	8	5	7	11	17	17	5	10	7	9	3	12	7	11
N	7	18	7	13	5	18	12	8	10	17	16	15	1	16	19	15
O	6	2	8	18	12	5	9	16	18	11	8	15	2	20	9	18
P	5	5	13	4	8	11	11	8	19	4	17	6	8	1	9	9



Identifying Corridors with High Travel Demand

Finding ***a*** corridor is easy!

- There are many (very many) corridors that can be drawn in an area
  - Numerous lengths
  - Numerous start/end points
  - Numerous shapes

Finding ***the*** corridor is difficult!

- Good corridors for transit have desirable, transit characteristics
  - Serves bigger chunks of demand for travel (i.e., high volume OD flows)
  - Trip types compatible with transit

Identifying Corridors with High Travel Demand

- A desirable corridor for potential high frequency transit services has the following characteristics:
  - Captures as many travel flows in the area as it can
  - Not too short and not too long
  - Reasonably direct and convenient
    - Low Circuity
  - Includes trips likely to be made on transit (e.g., trips made by people without cars)

Identifying Corridors with High Travel Demand

We define and solve optimization problems (MILP) to find high demand corridors for our clients and our service planning efforts

Integer variables:

$$z_{ik} = \begin{cases} 1 \\ 0 \end{cases}$$

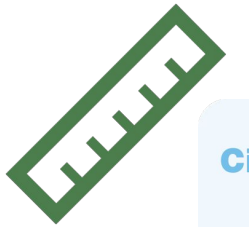
$$s_{ik} = \begin{cases} 1 \\ 0 \end{cases} \quad , \quad e_{ik} = \begin{cases} 1 \\ 0 \end{cases}$$

$$w_{ijk} = \begin{cases} 1 & if\ AND\ (z_{ik}, z_{jk}) \\ 0 & o.w. \end{cases}$$

Linear variables:

Length,

Circuity



Objective:

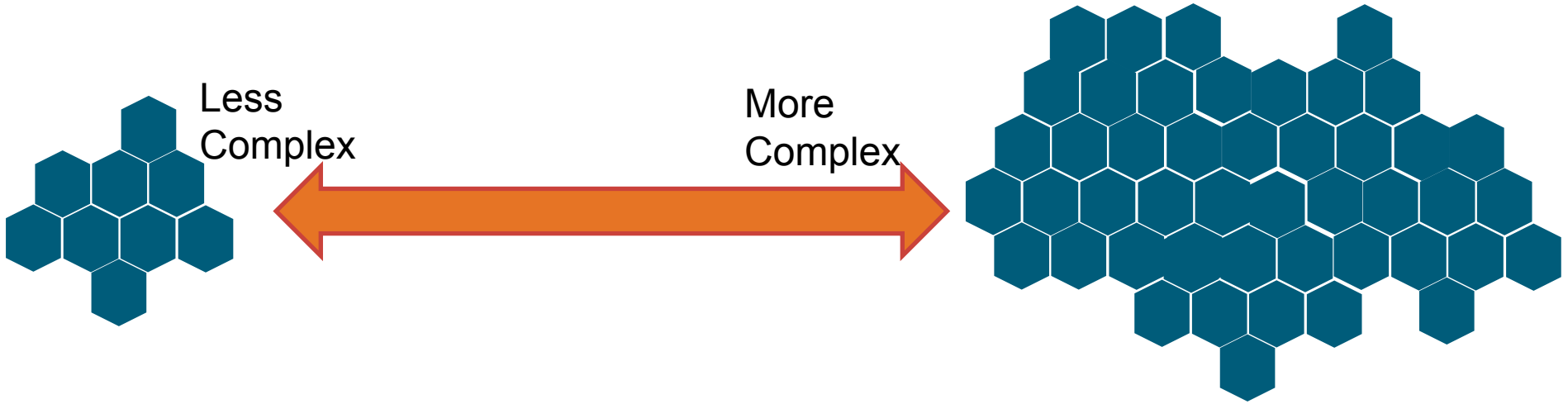
Maximize flows served and meet constraints

$$\text{Maximize} \sum_i \sum_j (y_{ij} \times d_{ij})$$

Identifying Corridors with High Travel Demand

High demand corridor identification is an **NP-hard** problem

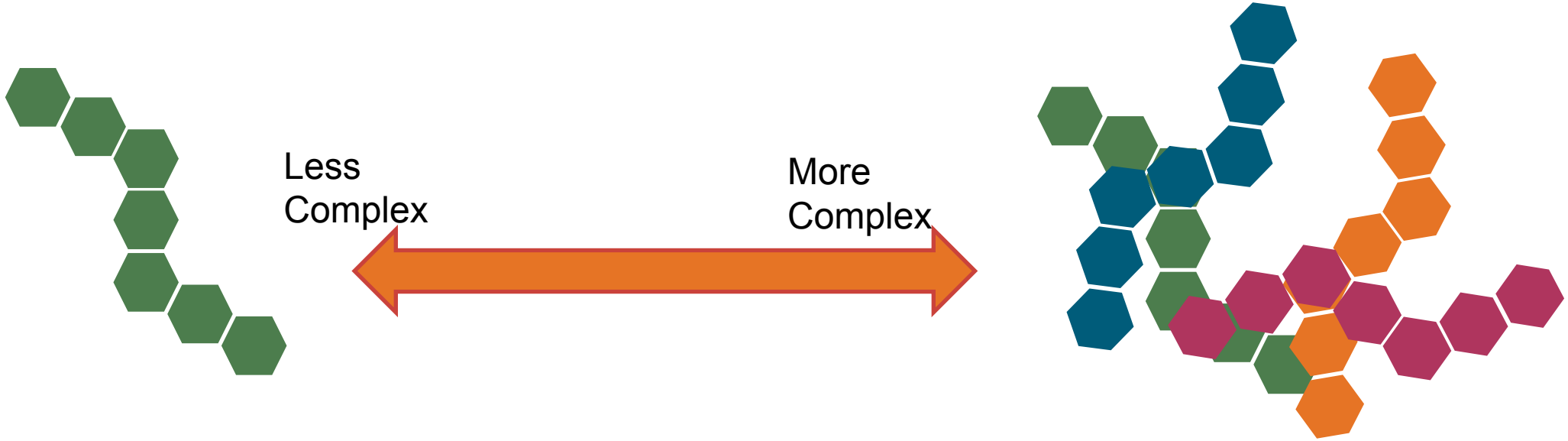
- Complexity increases when the number of zones in the area increases



Identifying Corridors with High Travel Demand

High demand corridor identification is an **NP-hard** problem

- Complexity increases when the number of desired corridors increase



Identifying Corridors with High Travel Demand

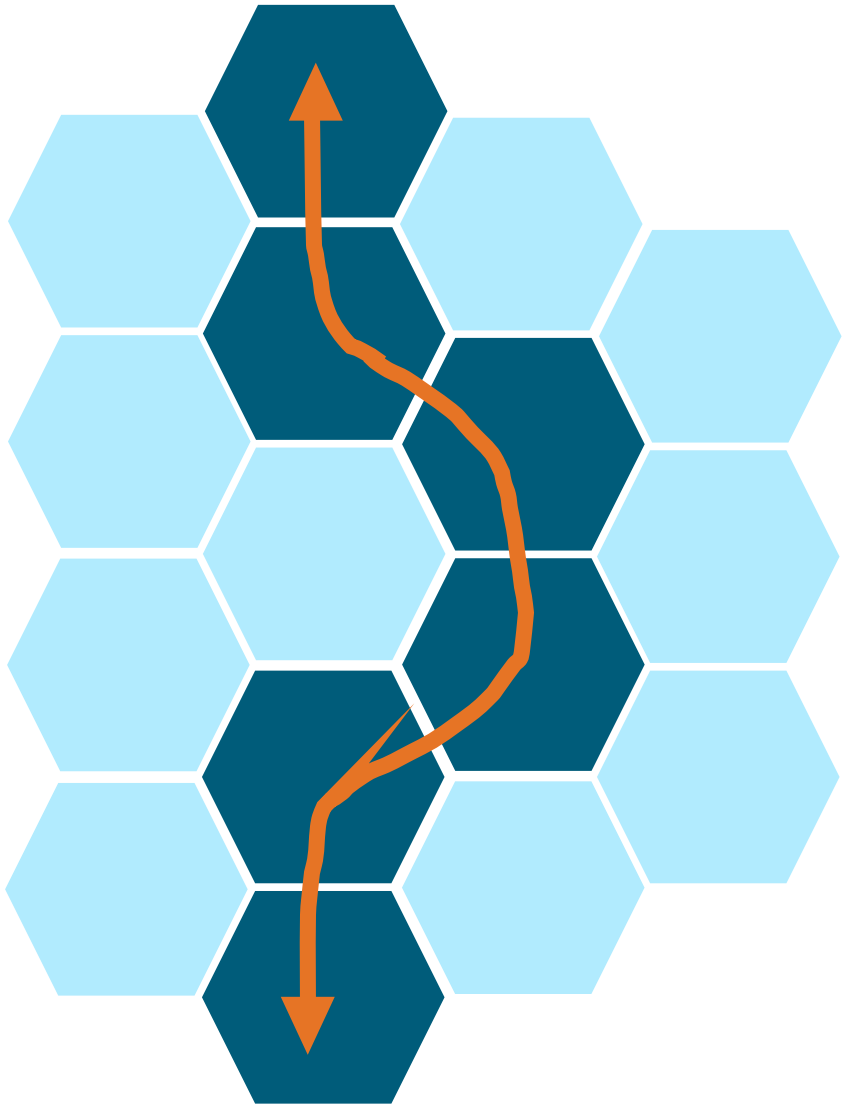
High demand corridor identification is an **NP-hard** problem

- Complexity increases when:
  - Number of zones in the area increases (**Z**)
  - Number of desired corridors increase (**K**)

$$2^{Z*K}$$

How does it work?

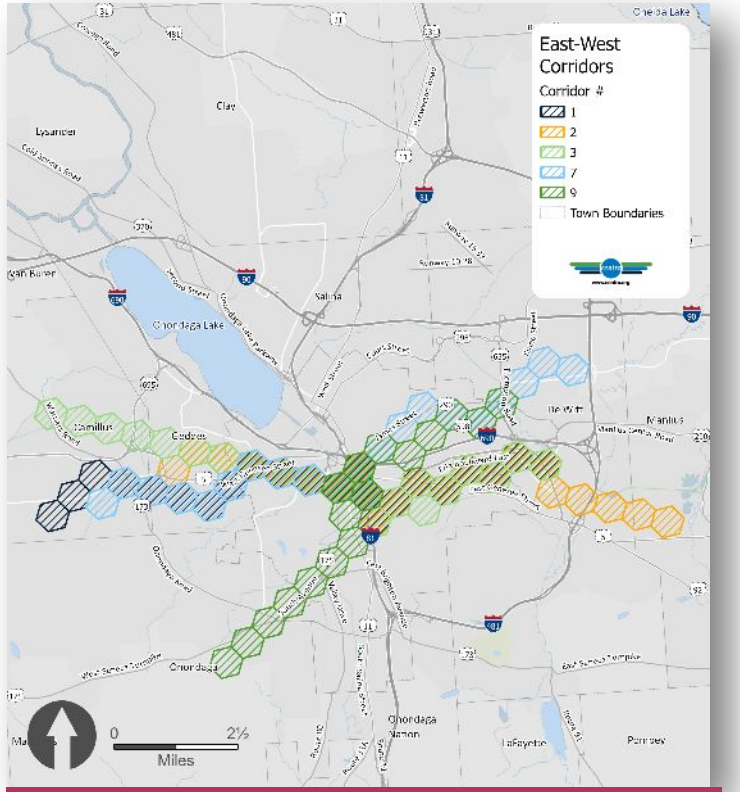
- Input geographies
- Input OD travel flows (typically all trips)
- Run algorithm to identify adjacent polygons that serve highest number of trips while staying within thresholds
- Remove served demand from generated polygons and re-run algorithm.
- Repeat for as many corridors as you want to identify



High Demand Corridor Identification in Action

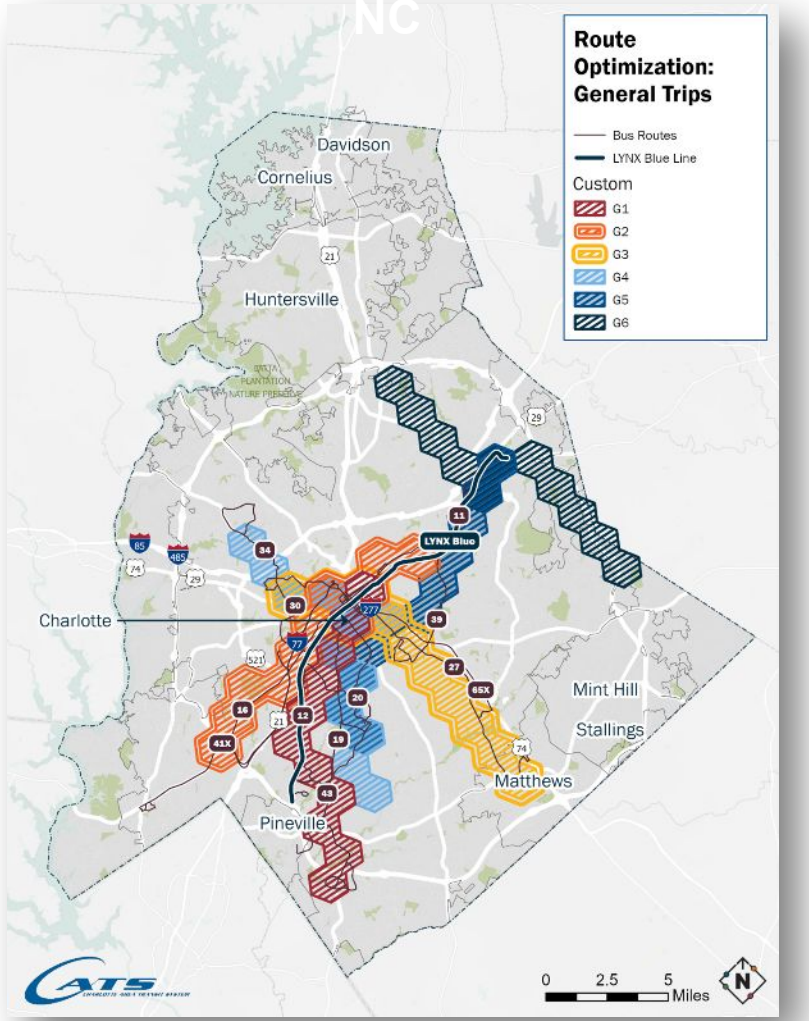
Case Studies from Bus Network Redesigns

Examples



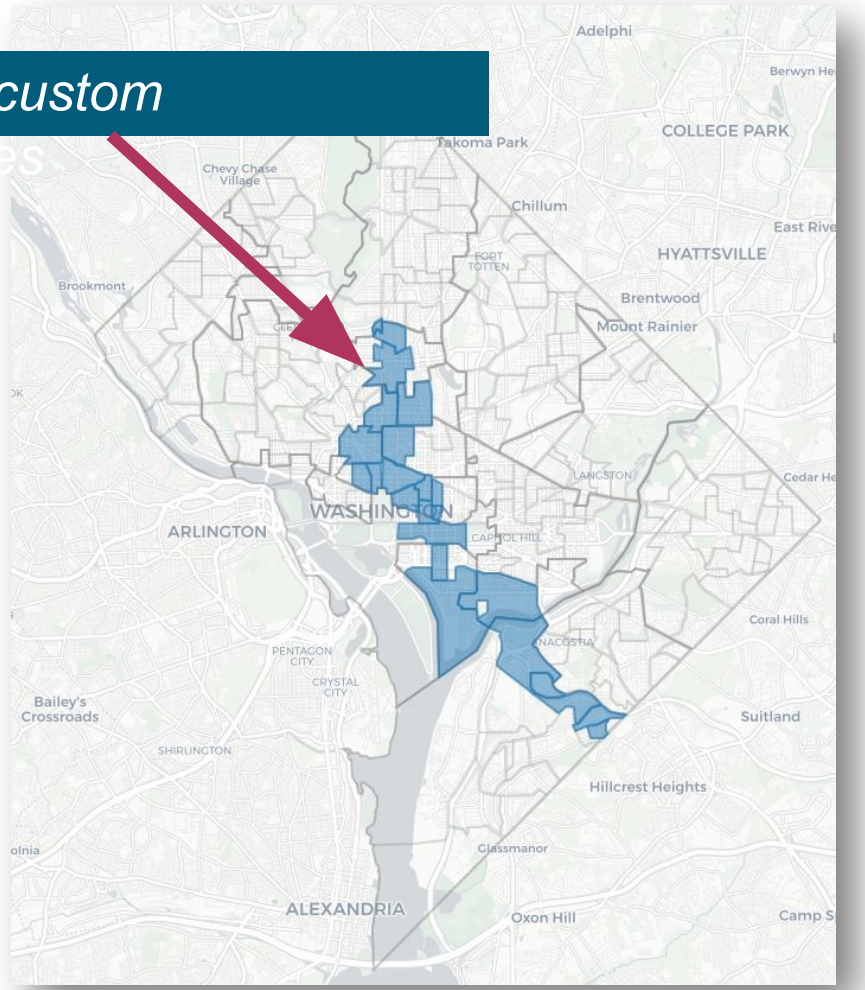
Centro Network Redesign – Syracuse, NY

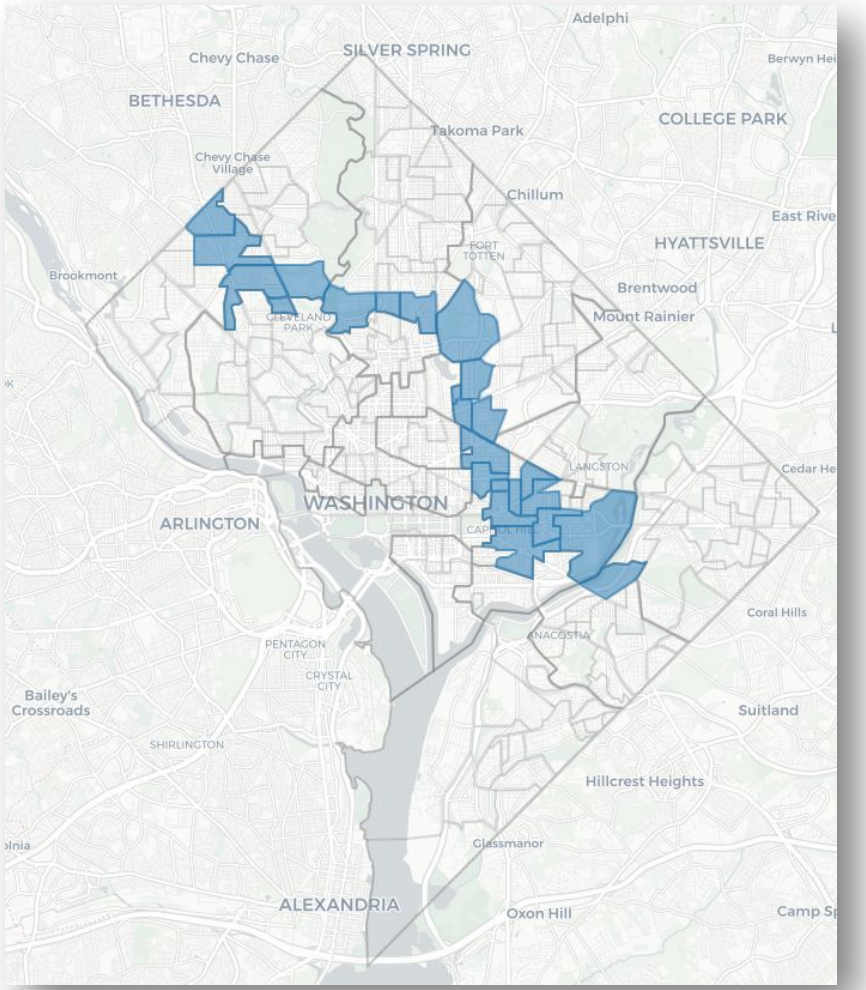
CATS Better Bus – Charlotte, NC



WMATA Better Bus – Washington, DC

WMATA's custom

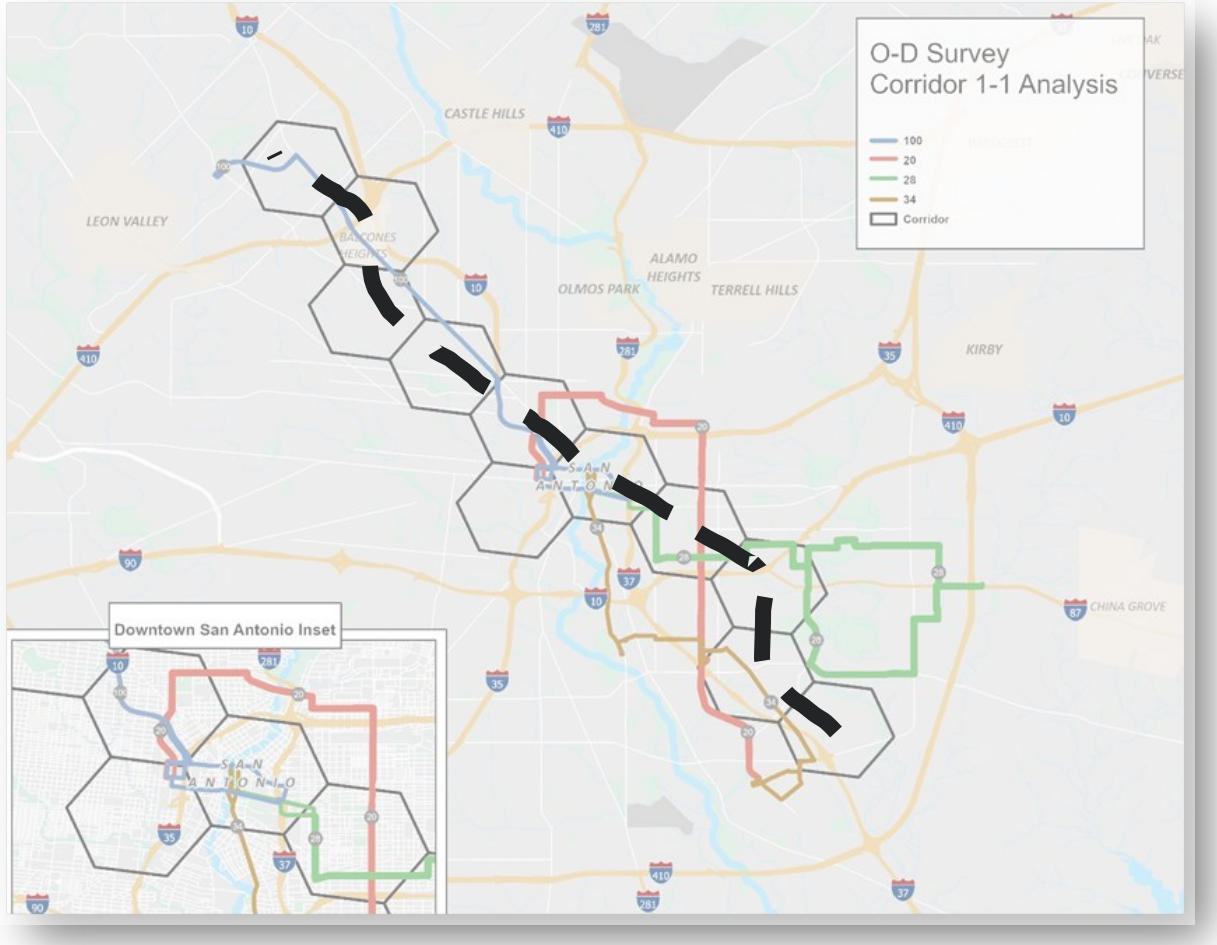




Insights

- Adjust high frequency routes to better match demand
- Plan BRT corridors
- Combine routes/segments to minimize transfers
- Identify and plan new routes, particularly crosstown routes

VIA Better Bus – San Antonio, TX



Thank you!

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