

A Novel Route

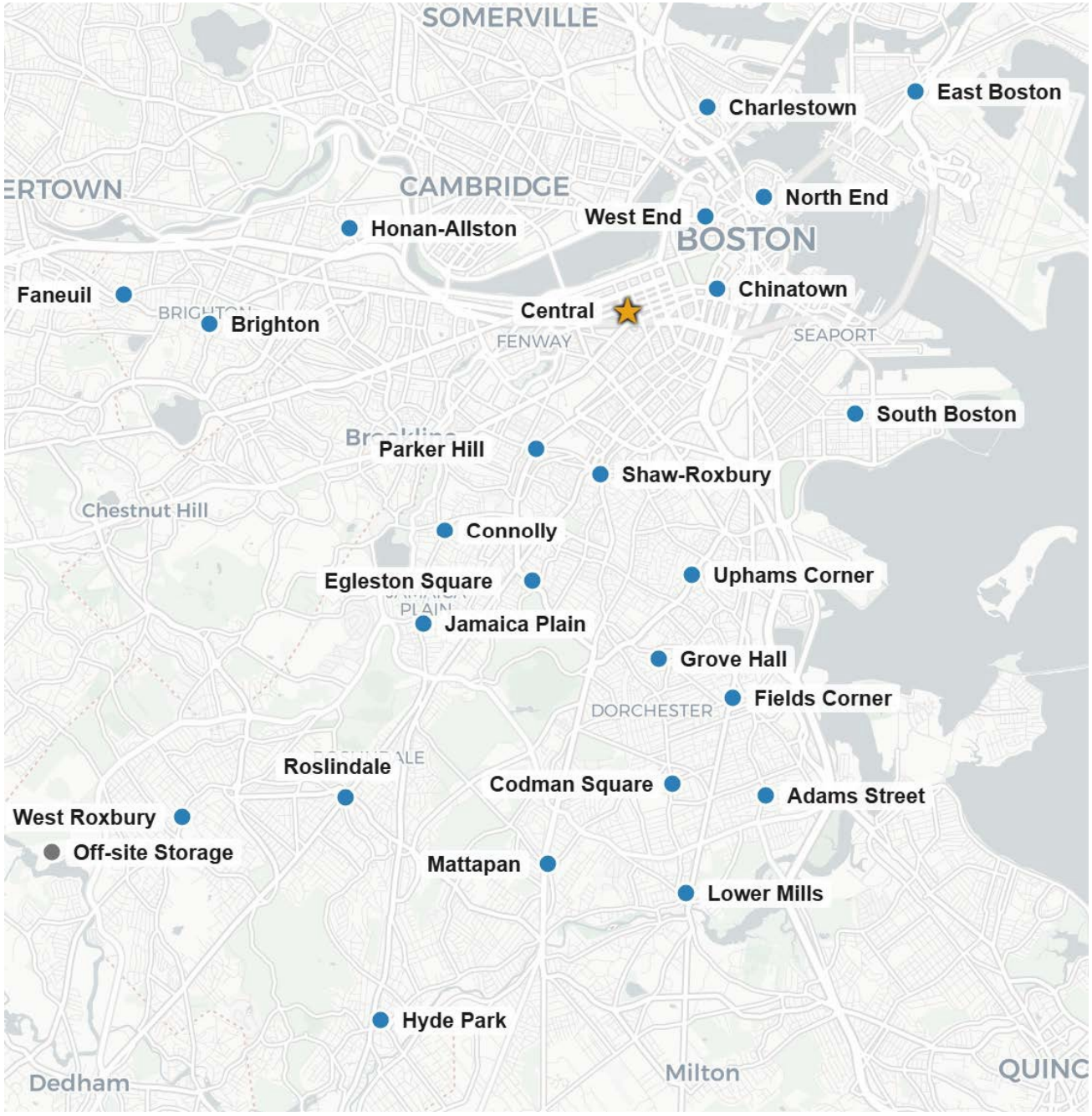
Optimizing Hold Fulfillment for the Boston Public Library

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1 THE BPL SYSTEM



In-person browsers
Walk in and borrow off the shelf: **≈ 1M a year.**

Holds ← our focus
Order any title to your branch: **≈ 800K a year.**

6M items · 25 locations
Inventory is dispersed: only **~30%** of holds can be filled by the pickup branch itself.

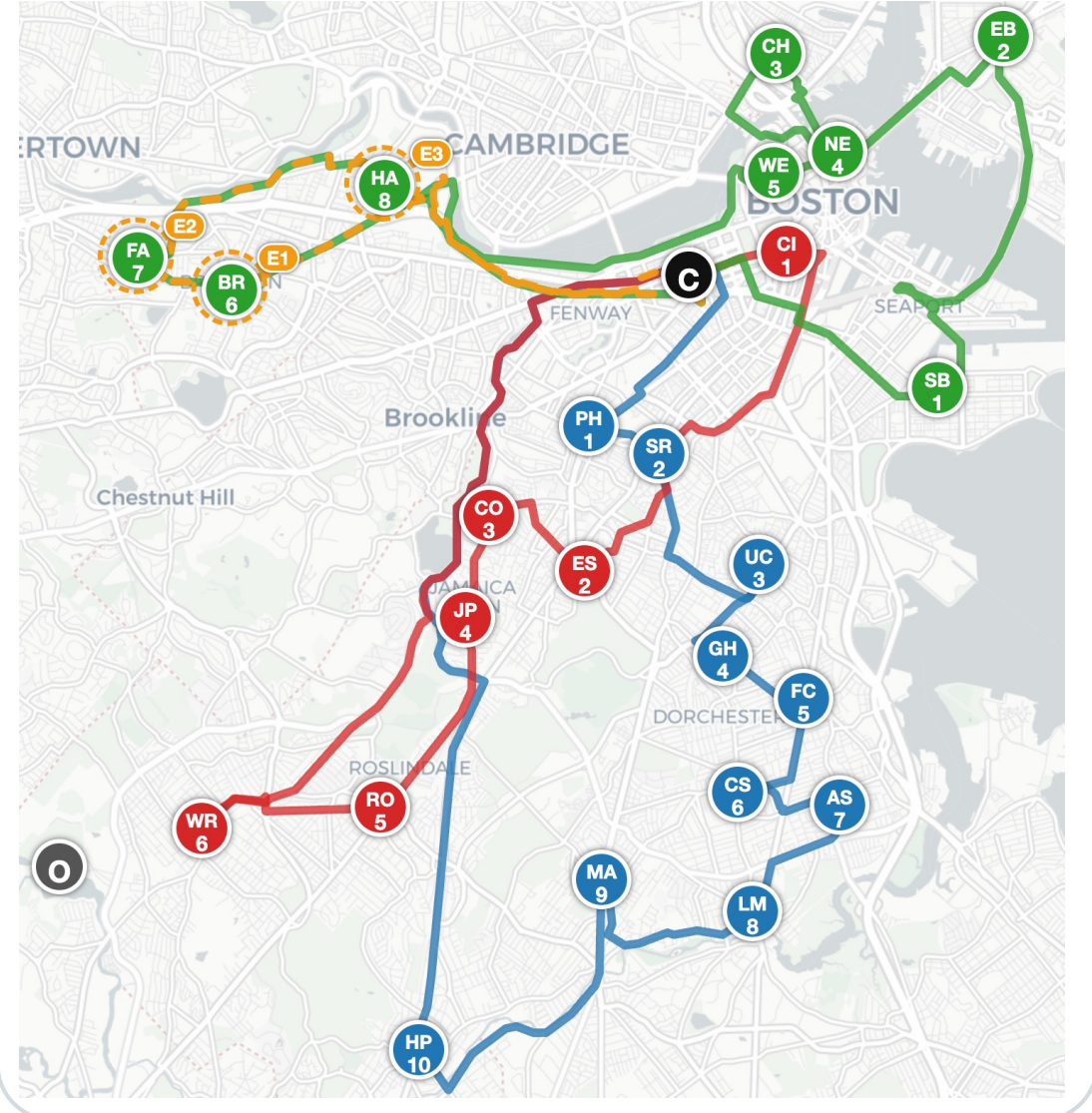
2 HOW HOLDS WORK TODAY

1 ITEM HOMING
Every copy has a fixed home branch it returns to.

2 STATIC SOURCING LISTS
Branches are asked in a fixed order, e.g., Jamaica Plain's:
1 Jamaica Plain (local)
2 West Roxbury
3 Brighton
⋮
25 Chinatown

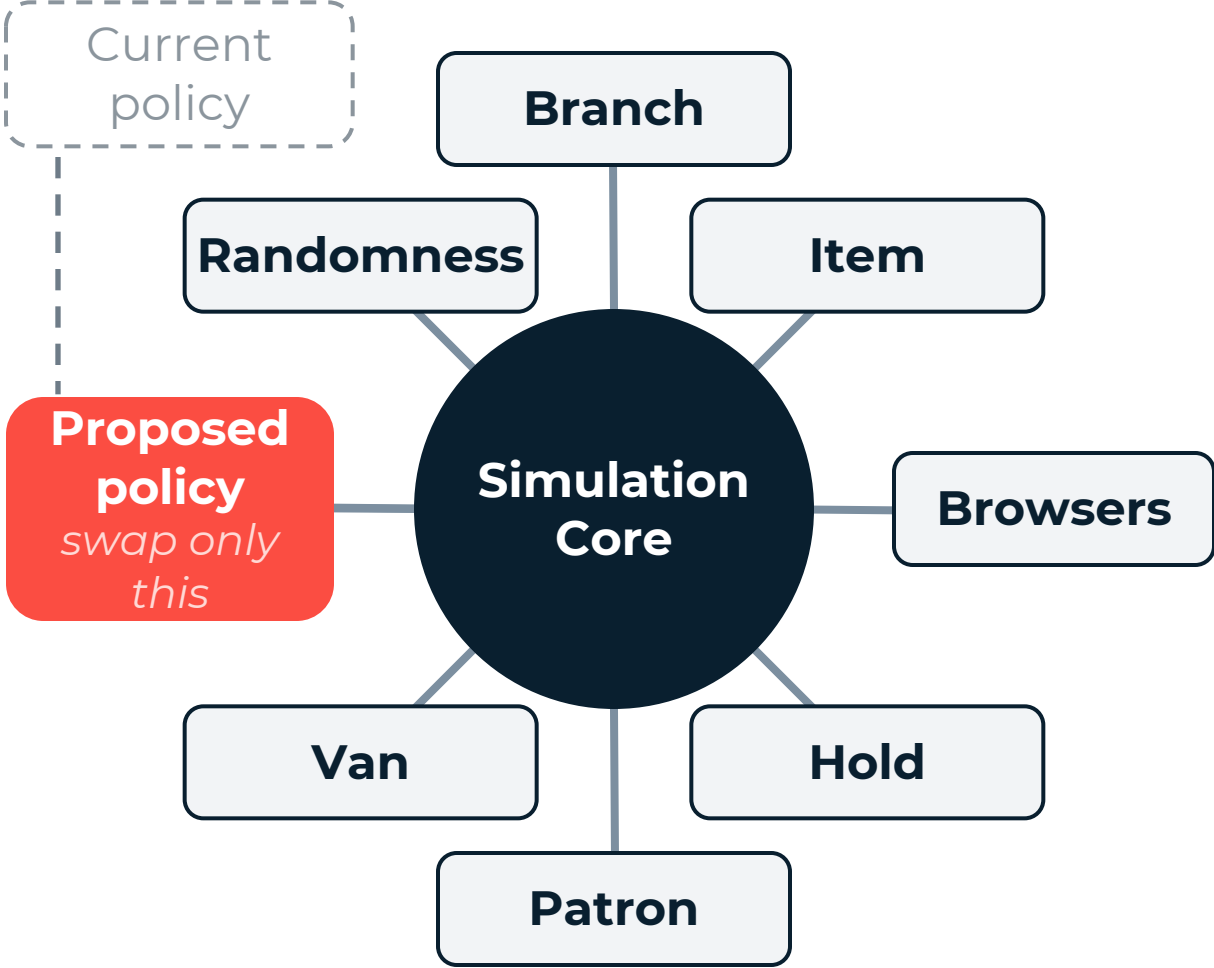
4.5× average logistics lead time:
local hold: **0.8 days**
shipped hold: **3.6 days**
logistics tax for shipped holds

3 HUB-AND-SPOKE NETWORK
3 vans · 4 fixed weekday routes



3 A DIGITAL TWIN OF THE BPL

Simulation modeling allows us to test proposed policies on a digital replica of the BPL before any pilot.

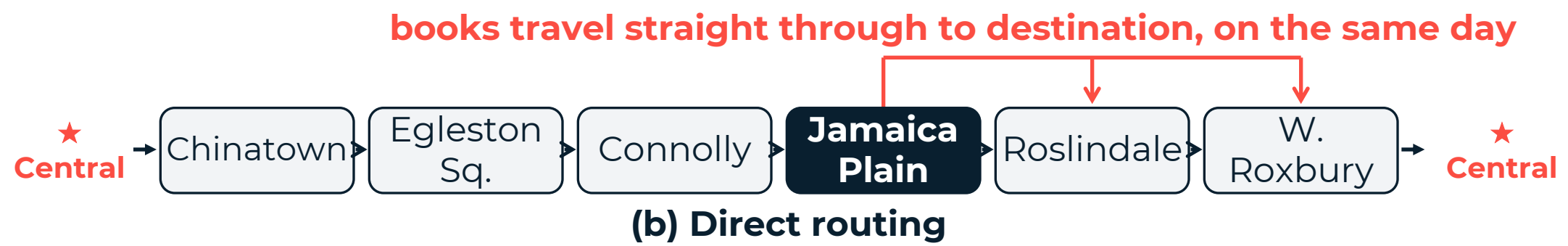
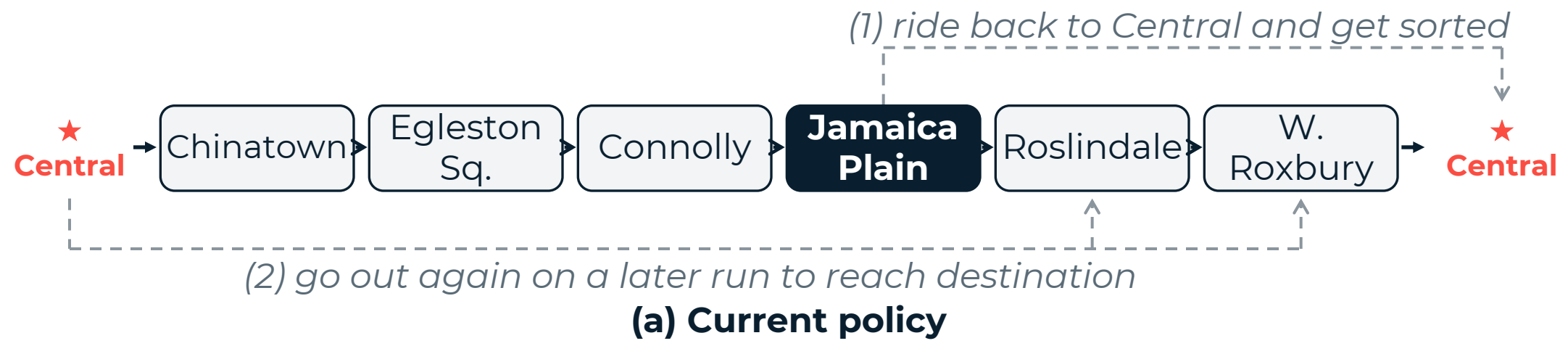


AN APPLES-TO-APPLES COMPARISON
• The same 32 months, run twice
• Luck held identical in both universes
• Difference is the policy's causal effect

Simulation approach inspired by Liu, Zhu, Rankin & Garg (2025), a study of the NYPL system [1]

4 THE IDEA: DIRECT ROUTING

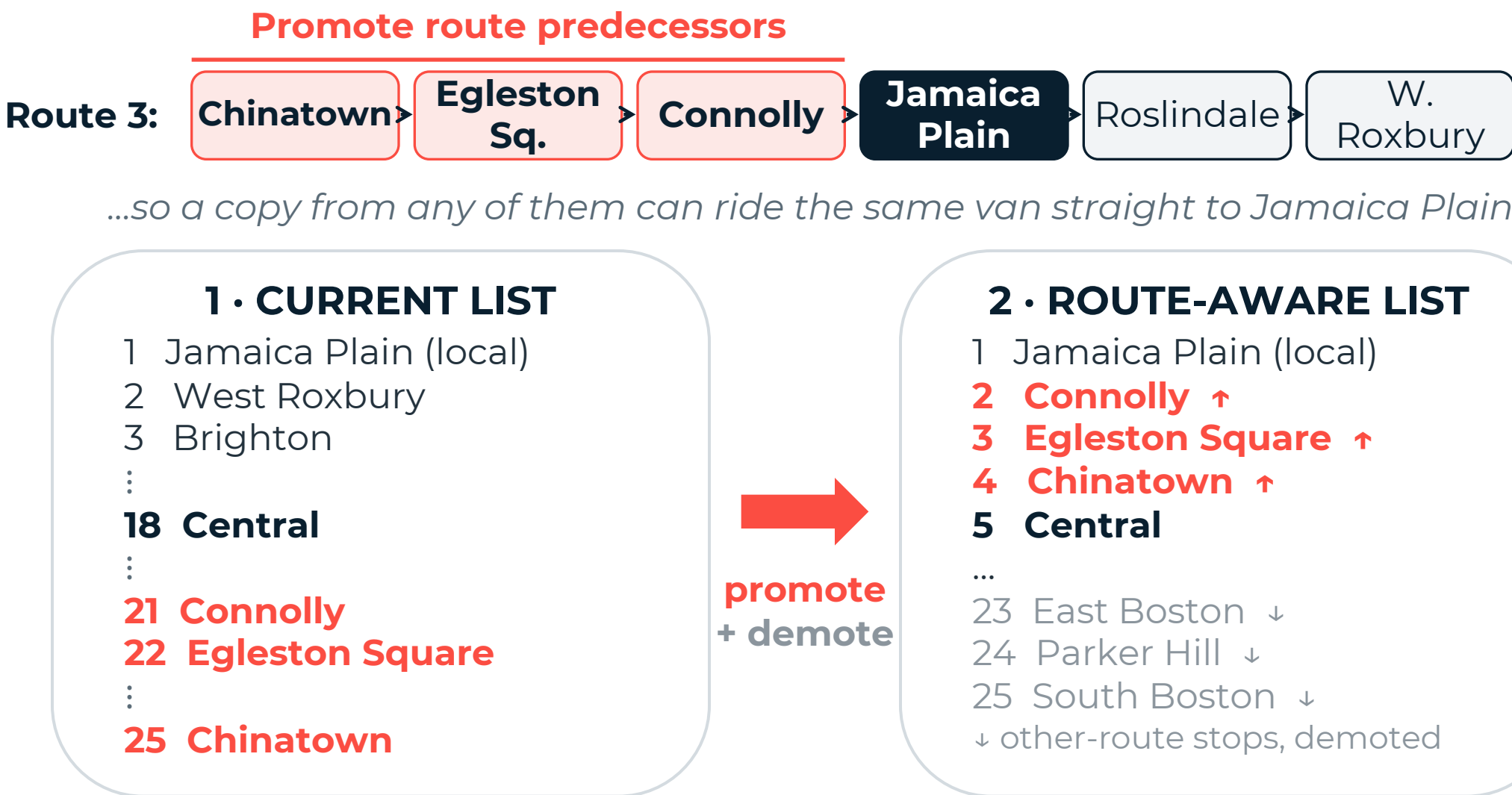
Each branch pre-bags items for later stops on its own route: the van drops them off directly, skipping the Central sort.



ONLY 6.6% of shipped holds end up using the option.
Why: the sourcing lists/routes are unaware of it.

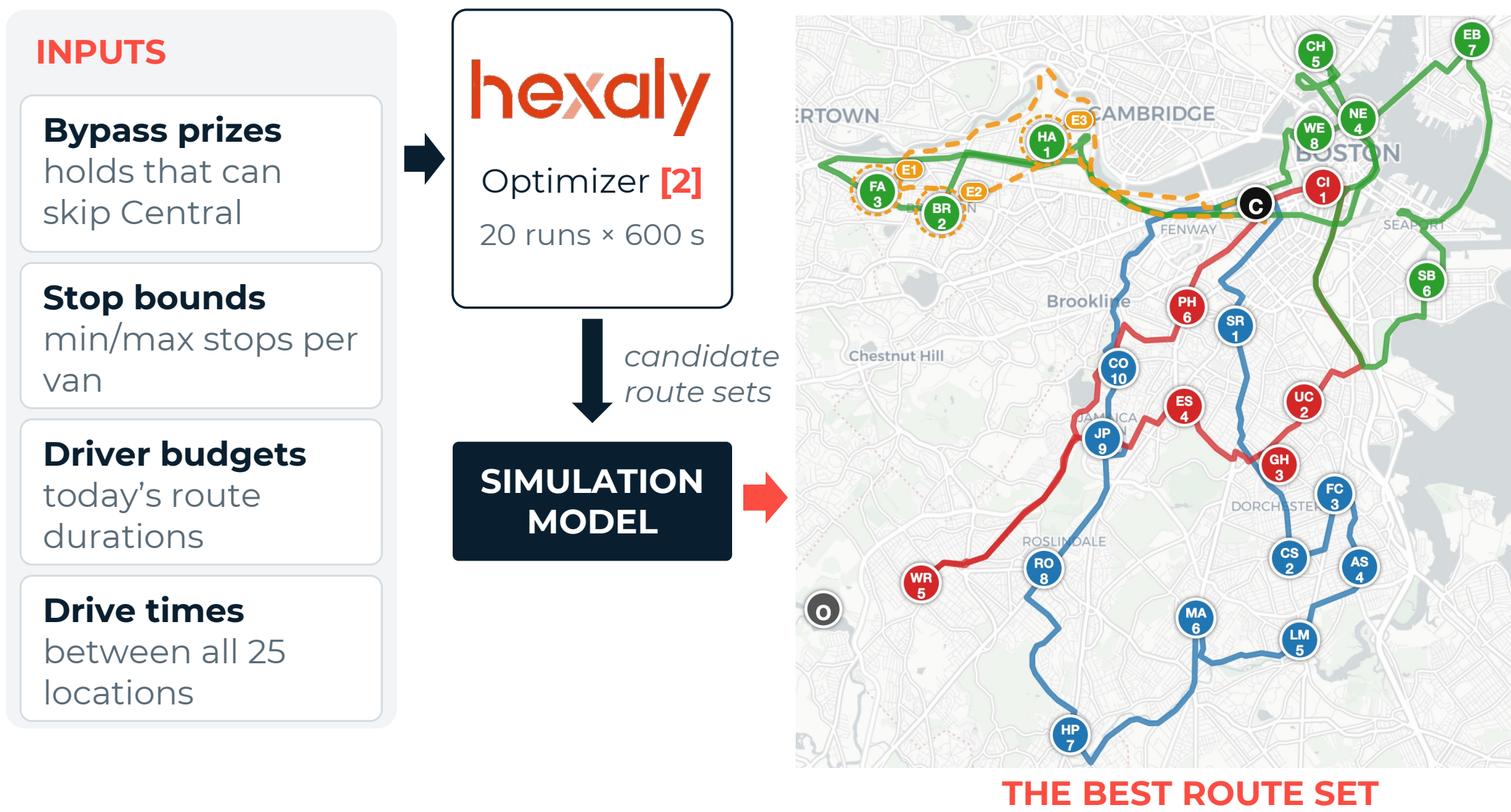
5 FIX #1: ROUTE-AWARE SOURCING

Rewrite each branch's static list around its own route: prioritize stops that appear before it on the same route.

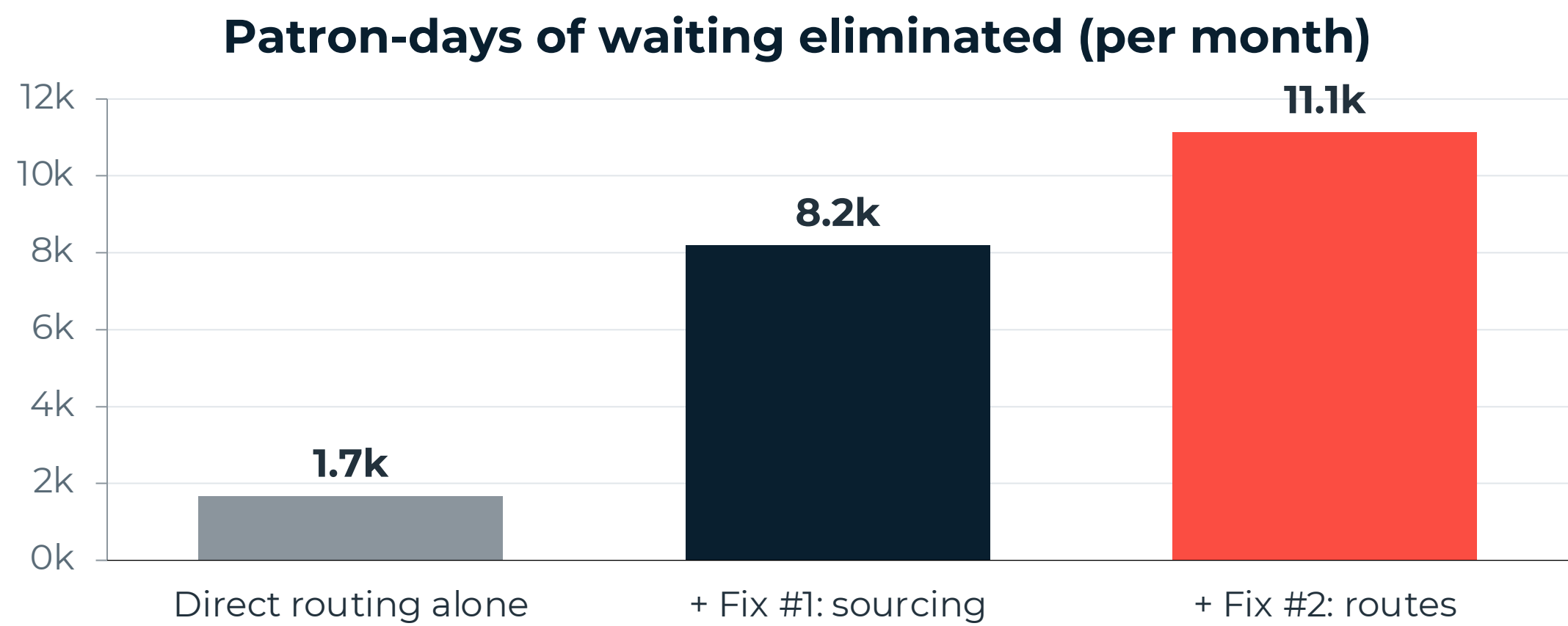


6 FIX #2: DEMAND-AWARE ROUTES

Today's routes are a clean geographic split, but unaware of which branches hold the titles others request. So we let the demand redesign the stop order:



7 THE COMBINED POLICY: WHAT THE SIMULATION SHOWS OVER 32 MONTHS



-9.5%
avg. hold fulfillment time

-17.0%
avg. shipped lead time

2.1x
shipped holds transported in one day or less

31.4%
of shipped holds use direct routing

NEXT

BPL prepares staff for implementation
Pilot tentatively targeted for **October 2026**

REFERENCES

[1] Zhi Liu, Wenchang Zhu, Sarah Rankin, and Nikhil Garg. Optimizing library usage and browser experience: Application to the New York Public Library, 2025.
[2] Hexaly. Hexaly Optimizer 14.5.
<https://www.hexaly.com/hexaly-product-updates>, 2026.

