Acme Gourmet Meals Business Cases Using Neo4j, MongoDB & Redis

University of California, Berkeley | School of Information

DATASCI 205 Data Engineering - Summer 2022

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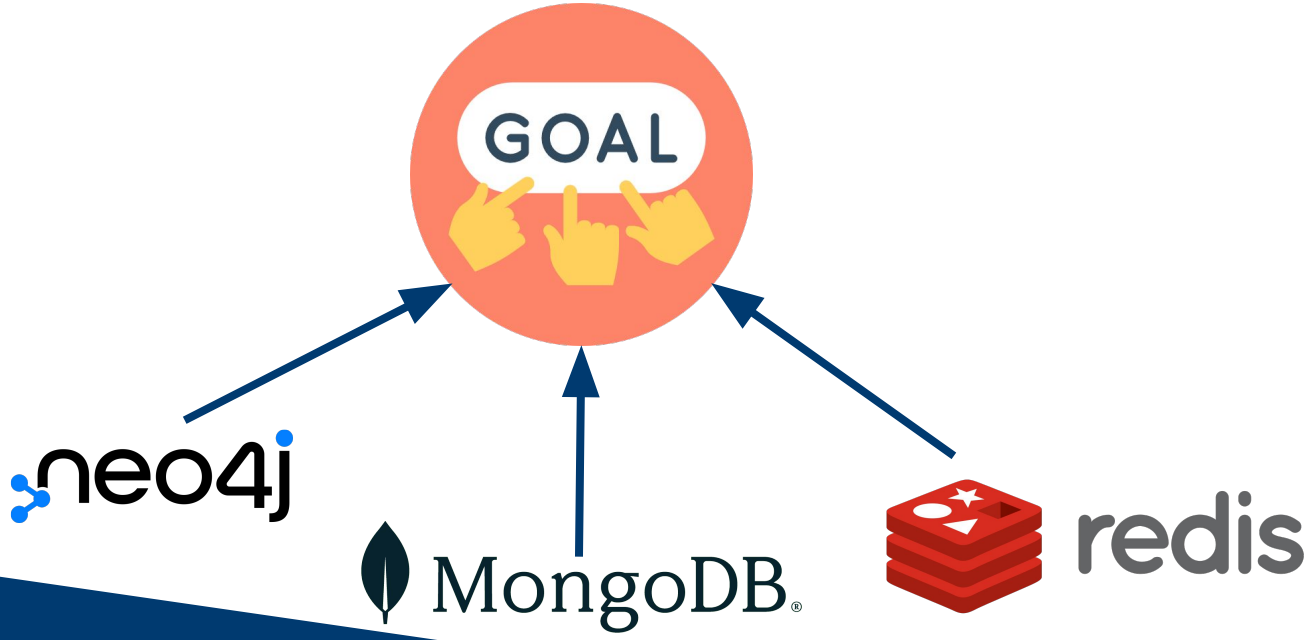
Overview & Goal



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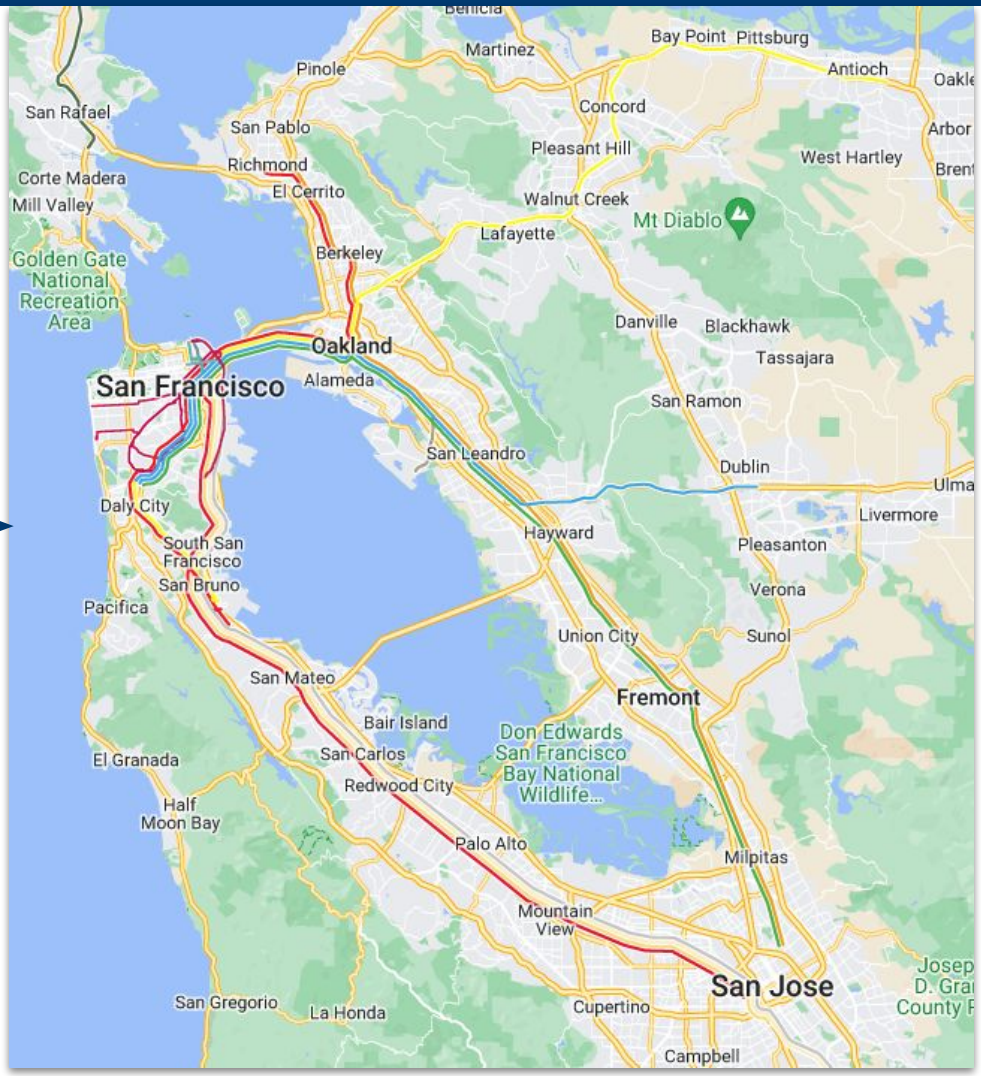
Bay Area Rapid Transit (BART) System



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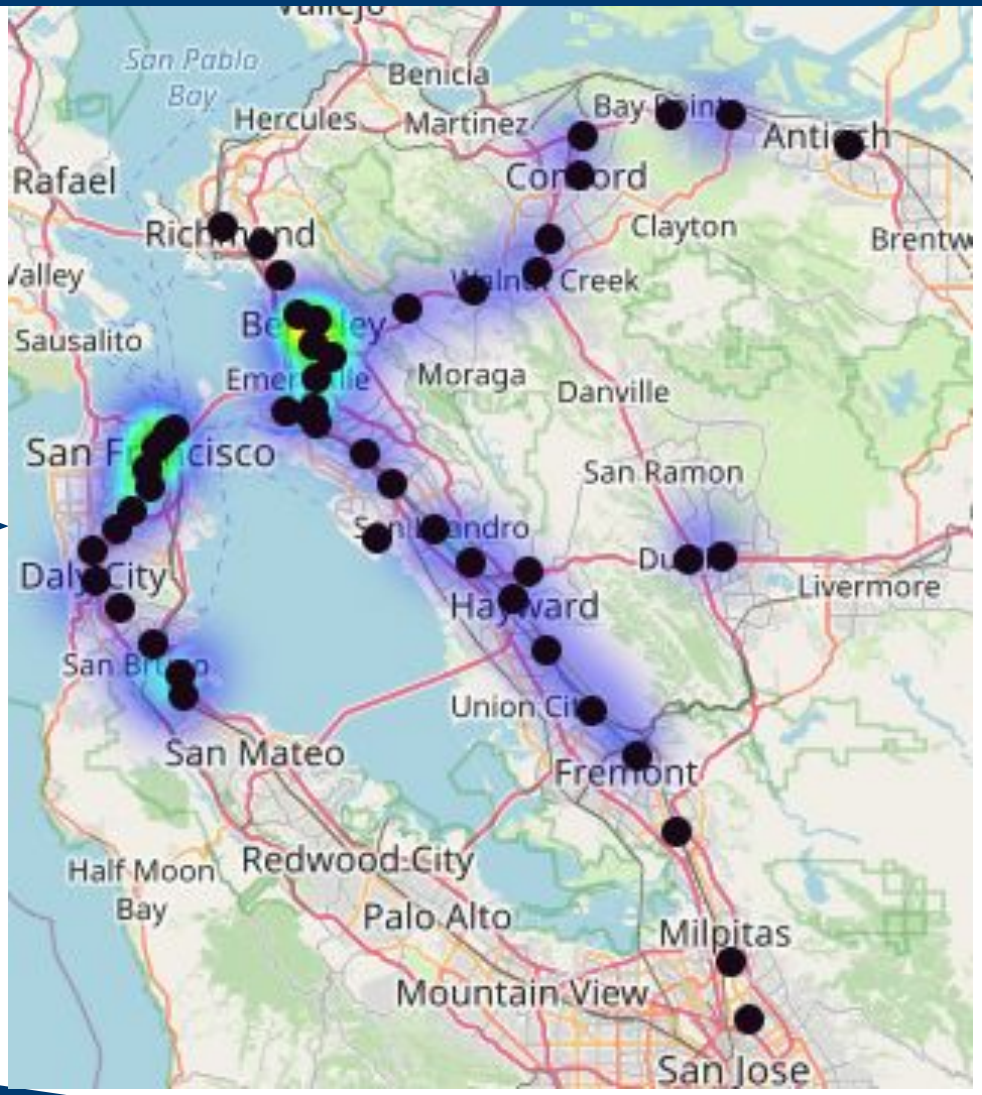
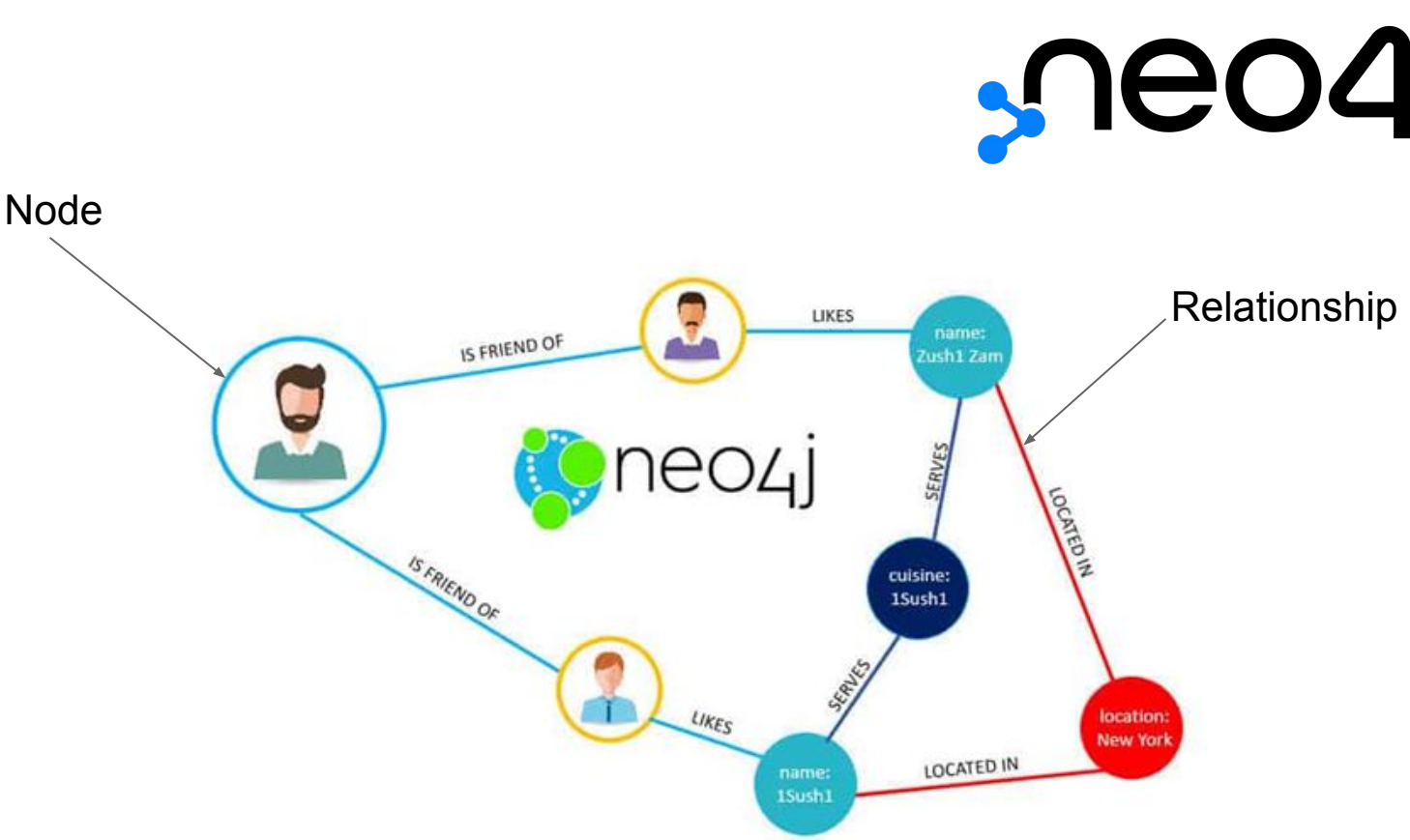
BART Stations and Closest Customer Zips



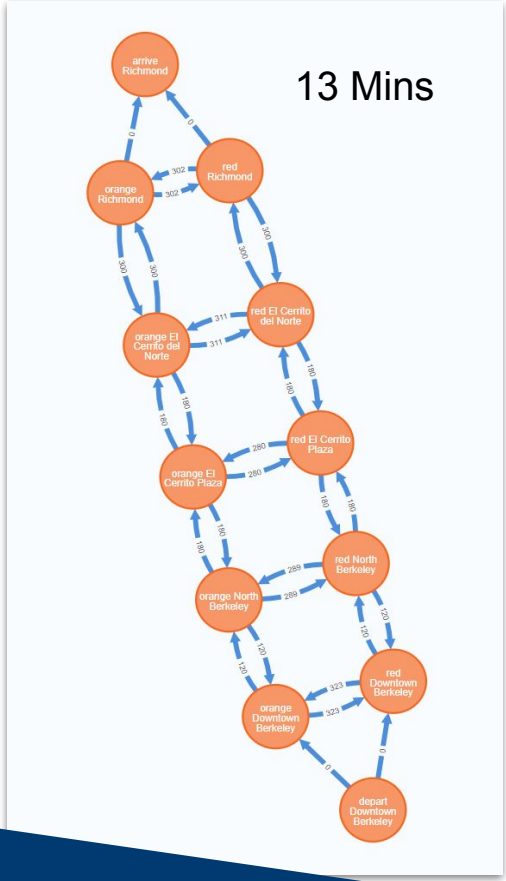
Graph Database - Neo4j

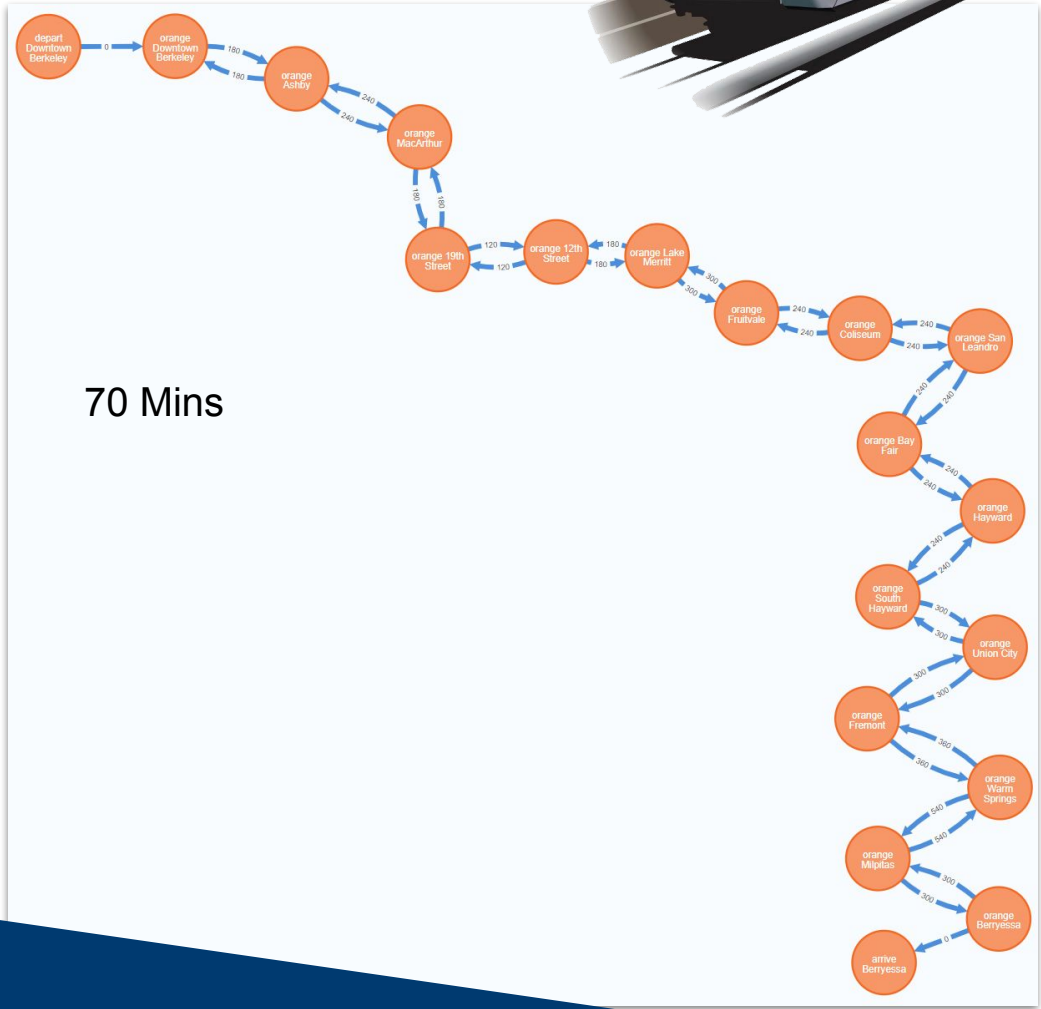
Graph Databases



Neo4j for Shortest Delivery Route

Dijkstra's algorithm





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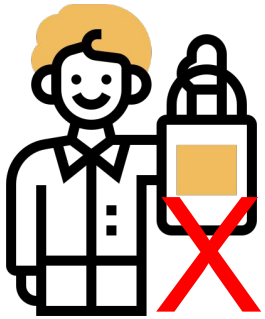
Neo4j for Most Opportunistic Pickup Locations

High Traffic Station

OR

High Population



Low Customers

Distance From Store

Weighted Degree Centrality Algorithm

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Top 10 Most Opportunistic Pickup Stations

Top 10 Stations
Bay Fair
Orinda
Civic Center
Embarcadero
South Hayward
San Leandro
Downtown Berkeley
Glen Park
SFO
MacArthur

Any combination of

High Population

Low Customer

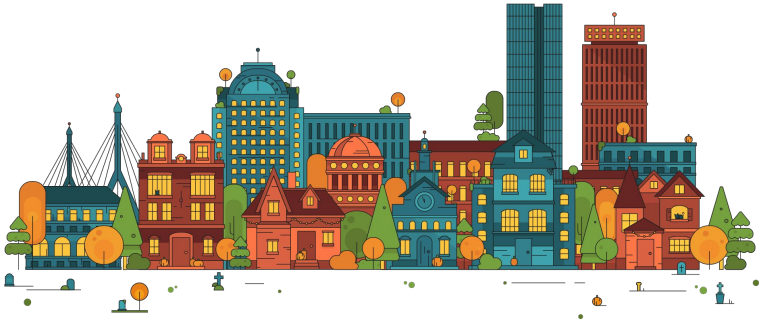
Far From Store

High Traffic Station

Neo4j for Delivery to Customers' Homes

Page Rank

Top 3 Stations
MacArthur
West Oakland
12th Street



1 mile or less to the BART

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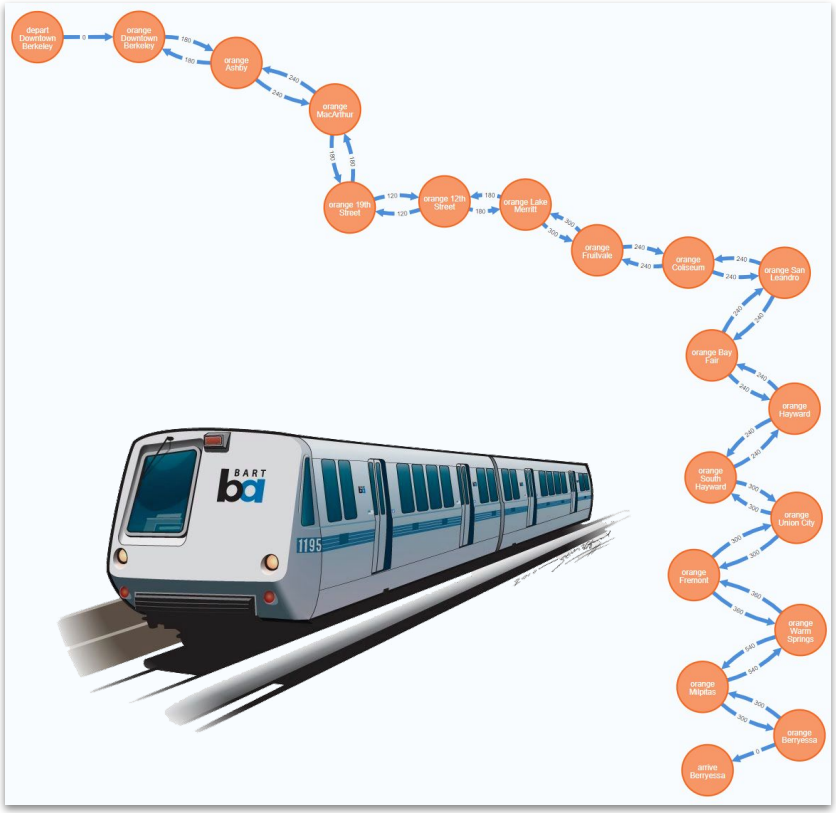
Hybrid: BART Transport and then Delivery

Dijkstra's algorithm



Top 3 Stations Using Page Rank
MacArthur
West Oakland
12th Street

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Neo4j vs. Relational Database

neo4j	
• Stations are represented in nodes • Relationships can be weighted	• Data are stored in tables with rows and columns
• Graphs to show shapes, characteristics, density, & k-partile	• Table relationships are established using foreign keys between tables
• Graph algorithms to identify graph data; no need to join	• Table joins must be setup; join process is expensive
• Fast speed	• Slow speed

Document Database - MongoDB

Document Databases

Point of View (POV)

```
{
  "_id": "5cf0029caff5056591b0ce7d",
  "firstname": "Jane",
  "lastname": "Wu",
  "address": {
    "street": "1 Circle Rd",
    "city": "Los Angeles",
    "state": "CA",
    "zip": "90404"
  }
  "hobbies": ["surfing", "coding"]
}
```

Level 1

Level 2

MongoDB®

MongoDB POVs: Items and Locations

Pick-Up Location #1:
Meal A → 4 Available
Meal B → Out of Stock
Meal C → 3 Available

Individual Store Sales

Individual Meal Sales

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MongoDB vs. Relational Database

MongoDB	
• Supports duplicate data for analysis	• Optimal form for an analytical database is denormalized • Difficult to scale up; can only store data in one location
• Supports hierarchical structure	• Does not have a hierarchical structure
• Fast speed	• Slow speed

Key-Value Database - Redis

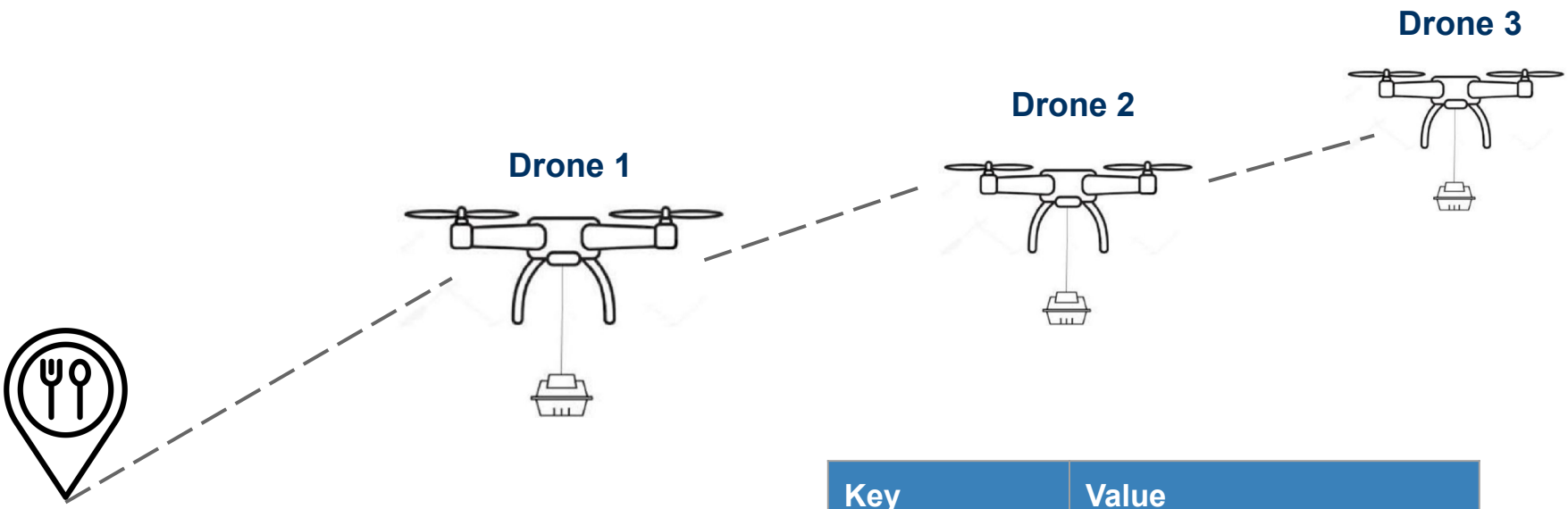
Key-Value Databases

Phone directory

Key	Value
Paul	(091) 9786453778
Greg	(091) 9686154559
Marco	(091) 9868564334

In-Memory for Real-Time Data Updates

Redis for Real Time Tracking - Drones & Robots



Closest to Pick-up Location →

Key	Value
Drone 1	36.871666, -123.272781
Drone 2	37.716162, -122.212987
Drone 3	38.145633, -122.922963

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Redis vs. Relational Database

redis	
• Stores data in key-value pair	• Stores data in tables with rows and columns
• Very quick and easy to look up	• Must join tables with foreign keys • Slow speed

THANK YOU

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