Thrifty Tracking

Online GPS Tracking with Low Data Uplink Usage

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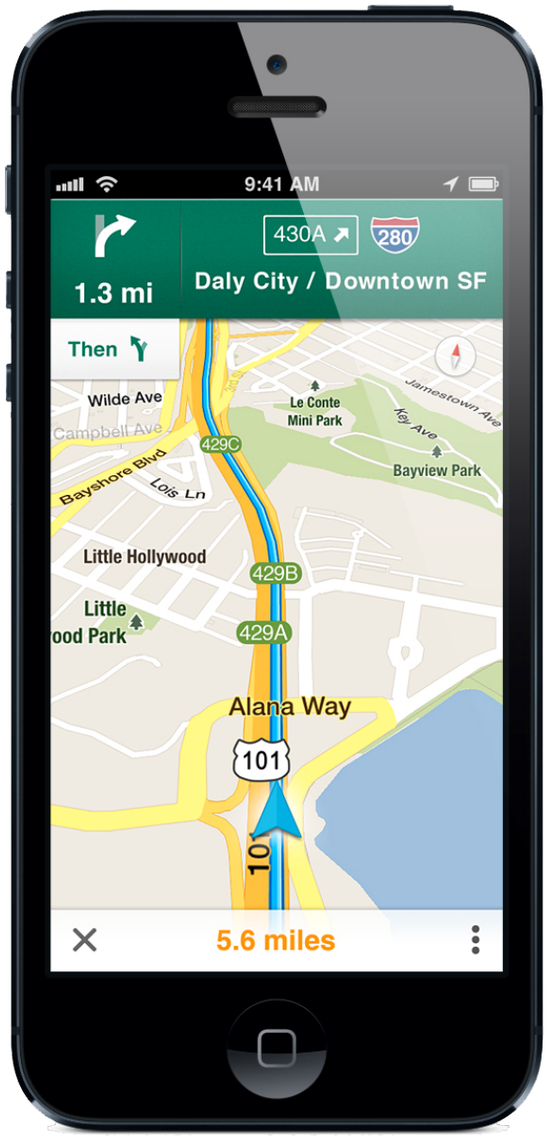
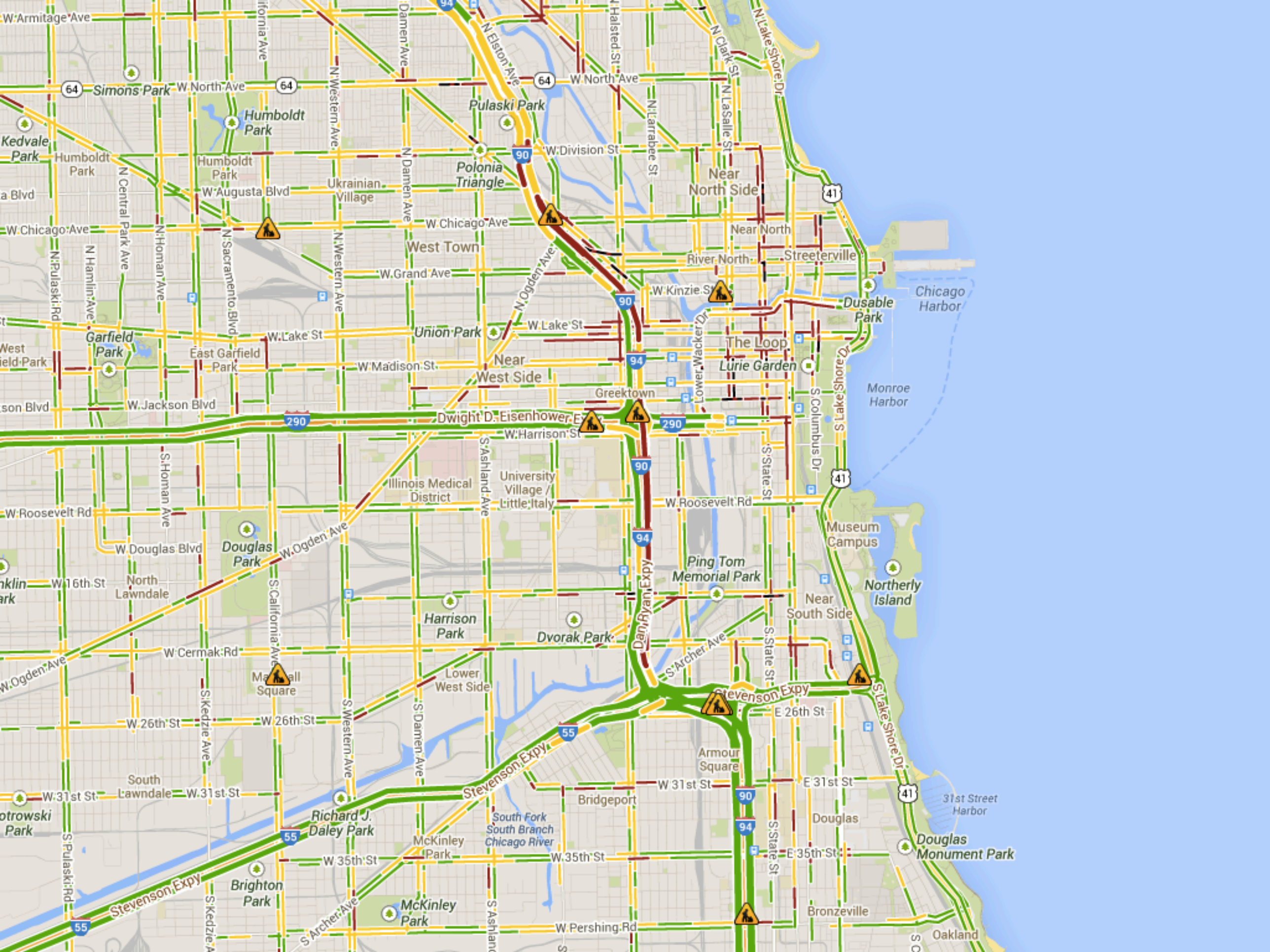
Bits Networked Systems Laboratory
COLLEGE OF ENGINEERING

Online GPS Tracking




FedEx
118575
FedEx
Ground
FedEx
Ground


60 Cicero/24th Pl
14 Stony Islnd/103rd
20 Austin
124 Ogilvie & Union Stations
cta arrival times


W Armitage Ave
Simons Park
W North Ave
Humboldt Park
Kedvale Park
Humboldt Park
N Central Park Ave
Humboldt Park
W Augusta Blvd
Ukrainian Village
N Western Ave
N Damen Ave
Pulaski Park
N Elston Ave
Polonia Triangle
W Division St
N Larrabee St
N Halsted St
N Clark St
N LaSalle St
Near North Side
N Lake Shore Dr
W Chicago Ave
West Town
Near North
River North
Streeterville
W Grand Ave
N Ogden Ave
W Kinzie St
Chicago Harbor
Dusable Park
N Pulaski Rd
N Hamlin Ave
N Homan Ave
N Sacramento Blvd
Garfield Park
W Lake St
Union Park
W Lake St
The Loop
Lurie Garden
Lower Wacker Dr
S Lake Shore Dr
East Garfield Park
W Madison St
Near West Side
Greektown
Monroe Harbor
W Jackson Blvd
Dwight D. Eisenhower Expy
W Harrison St
S Columbus Dr
S Ashland Ave
Illinois Medical District
University Village / Little Italy
W Roosevelt Rd
S State St
S Homan Ave
Museum Campus
W Douglas Blvd
Douglas Park
W Ogden Ave
Ping Tom Memorial Park
Northerly Island
W 16th St
North Lawndale
S California Ave
Harrison Park
Dvorak Park
Dan Ryan Expy
Near South Side
W Cermak Rd
S Archer Ave
Lower West Side
Stevenson Expy
S Lake Shore Dr
S Kedzie Ave
W 26th St
E 26th St
Armour Square
South Lawndale
W 31st St
E 31st St
Bridgeport
31st Street Harbor
Richard J. Daley Park
South Fork South Branch Chicago River
Douglas
Douglas Monument Park
McKinley Park
W 35th St
E 35th St
Brighton Park
McKinley Park
W Pershing Rd
Bronzeville
Oakland

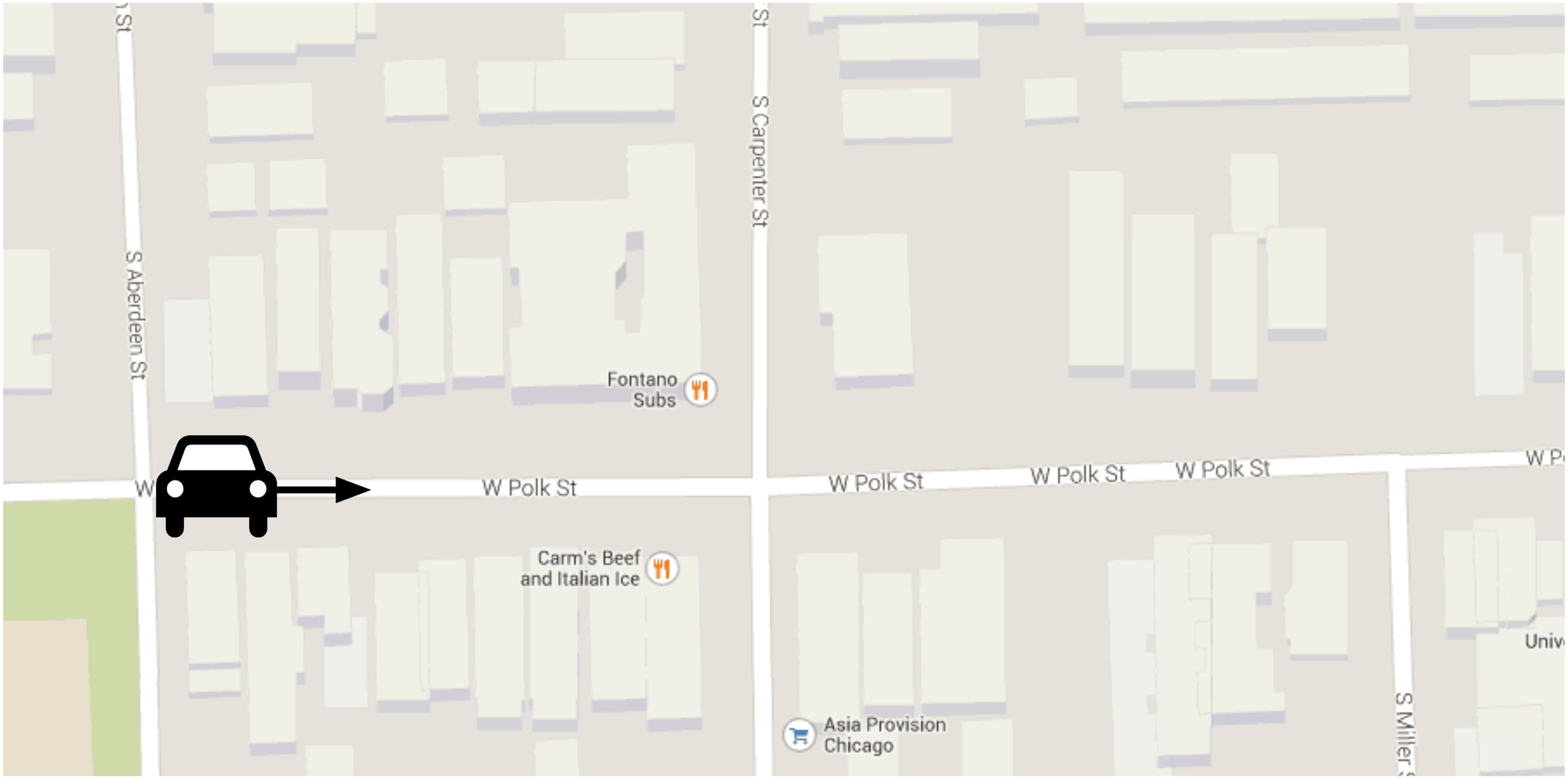

AUTO
A/C
P
R
N
D
From My location
To ¿Por Que No?
18 min (5.9 mi)
Light traffic via N Willamet...
Start

Our focus is on the **uplink**

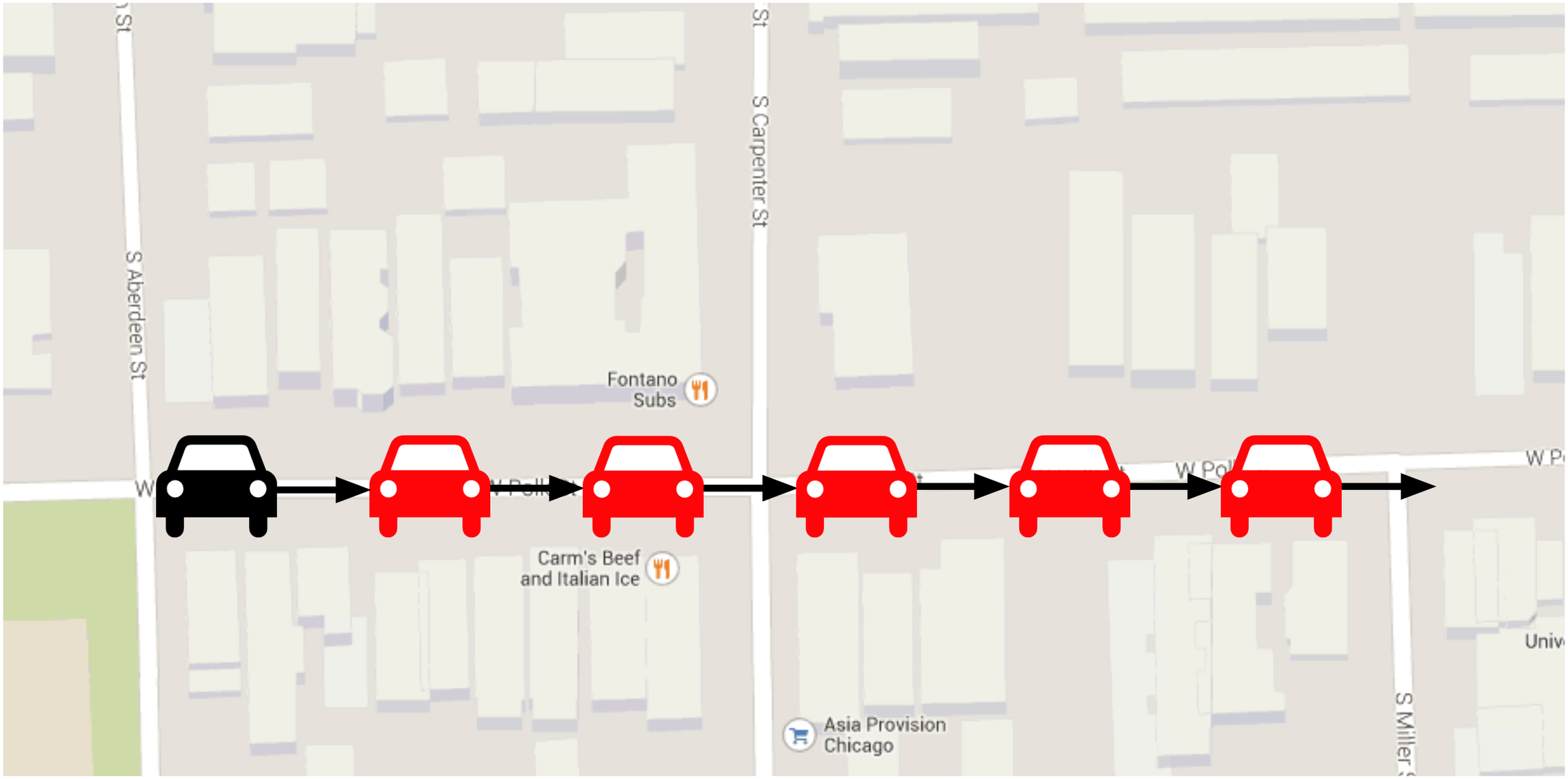
at&t

Protocol	Data Usage per Update	Data Usage per Day
UDP	84 bytes	7 MB
TCP	168 bytes	14 MB
HTTP/REST	1218 bytes	100 MB

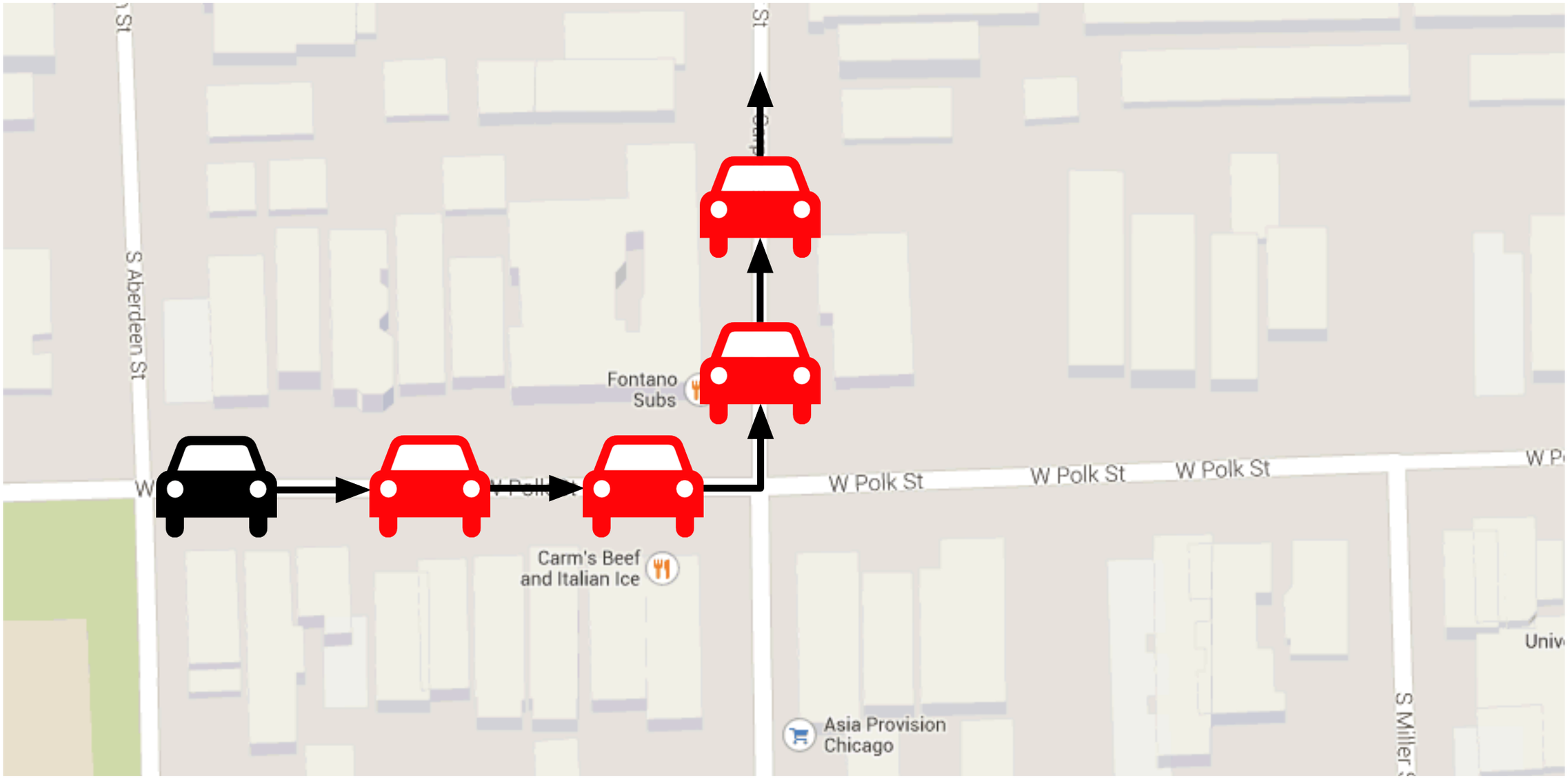
Extrapolation



Constant velocity

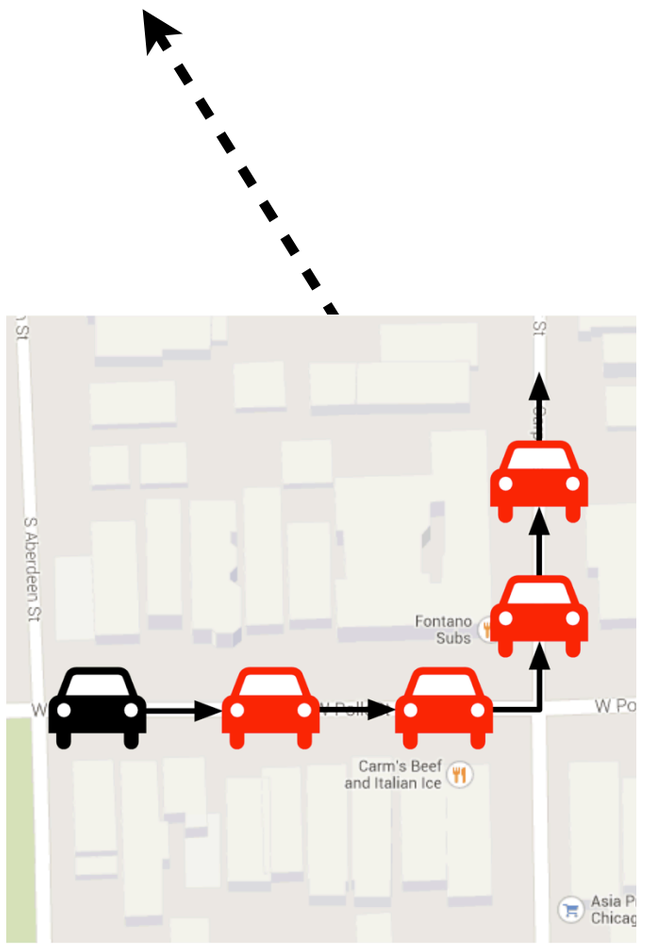


Map-based


S Aberdeen St
Fontano Subs
W Polk St
W Polk St
W Polk St
Carm's Beef and Italian Ice
Asia Provision Chicago

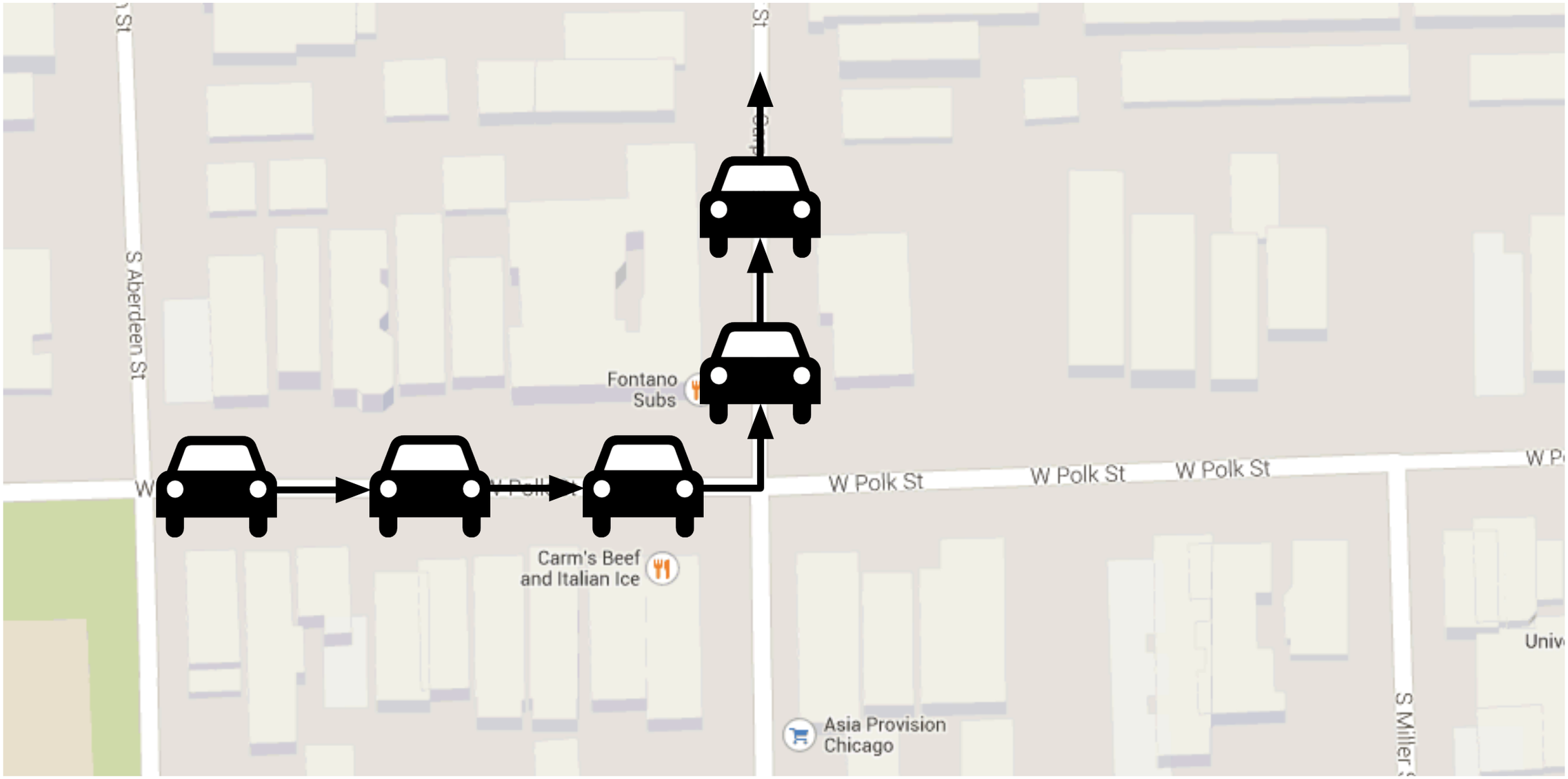
Unified extrapolator

constant velocity

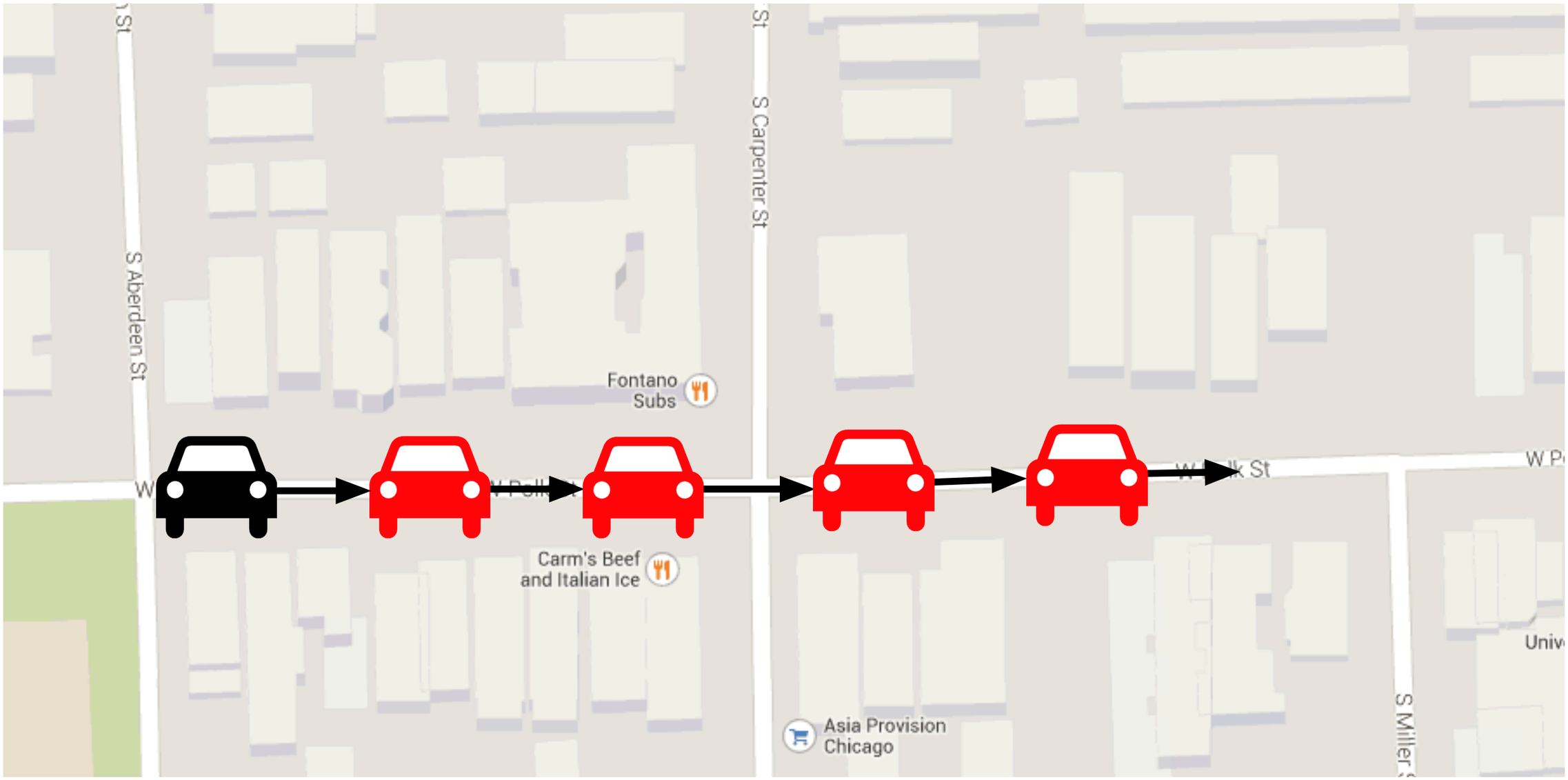


map-based

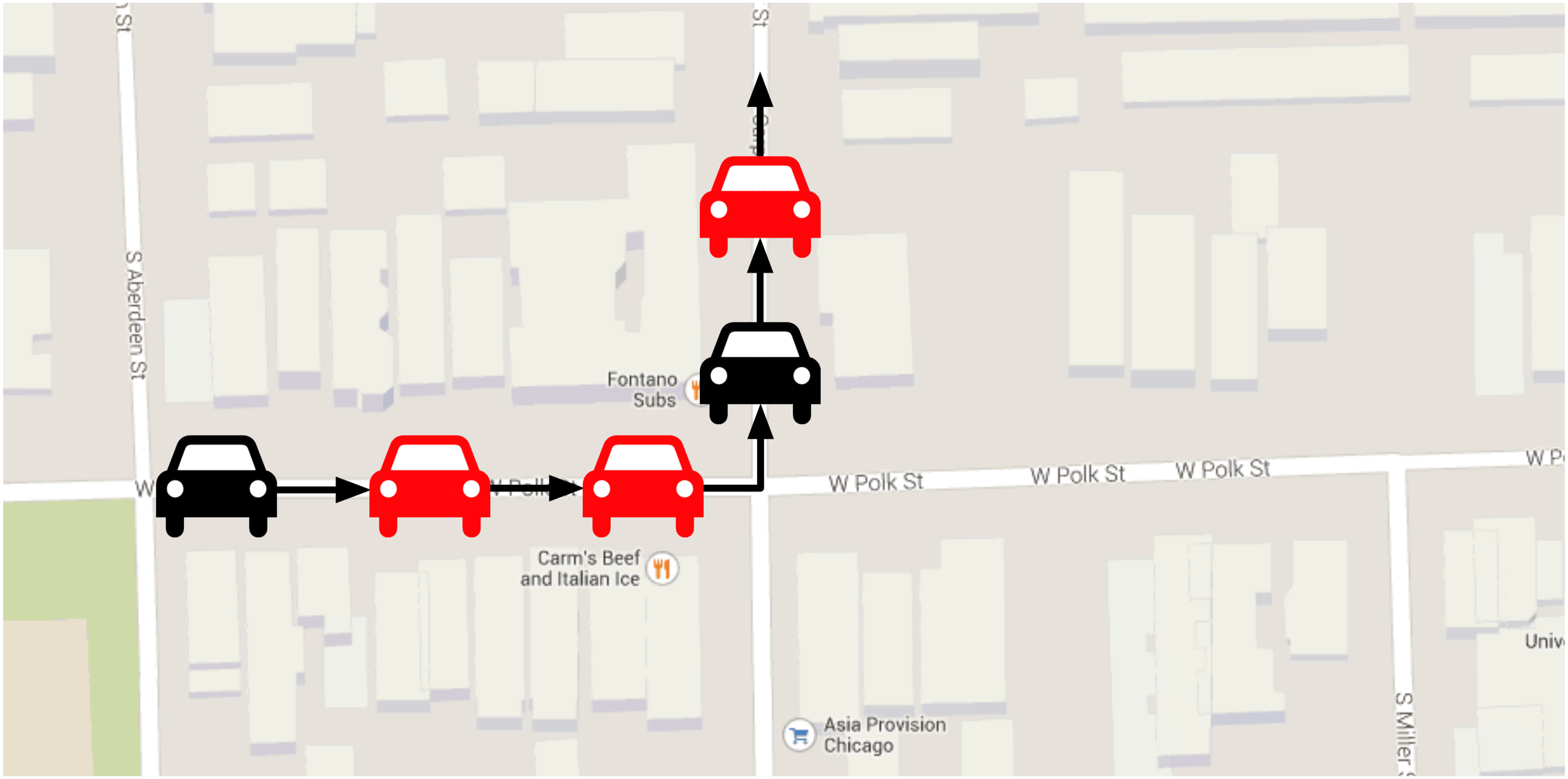
Adaptive sampling



Extrapolation gone astray



Path update


S Aberdeen St
Fontano Subs
W Polk St
W Polk St
W Polk St
Carm's Beef and Italian Ice
Asia Provision Chicago

Error-bound

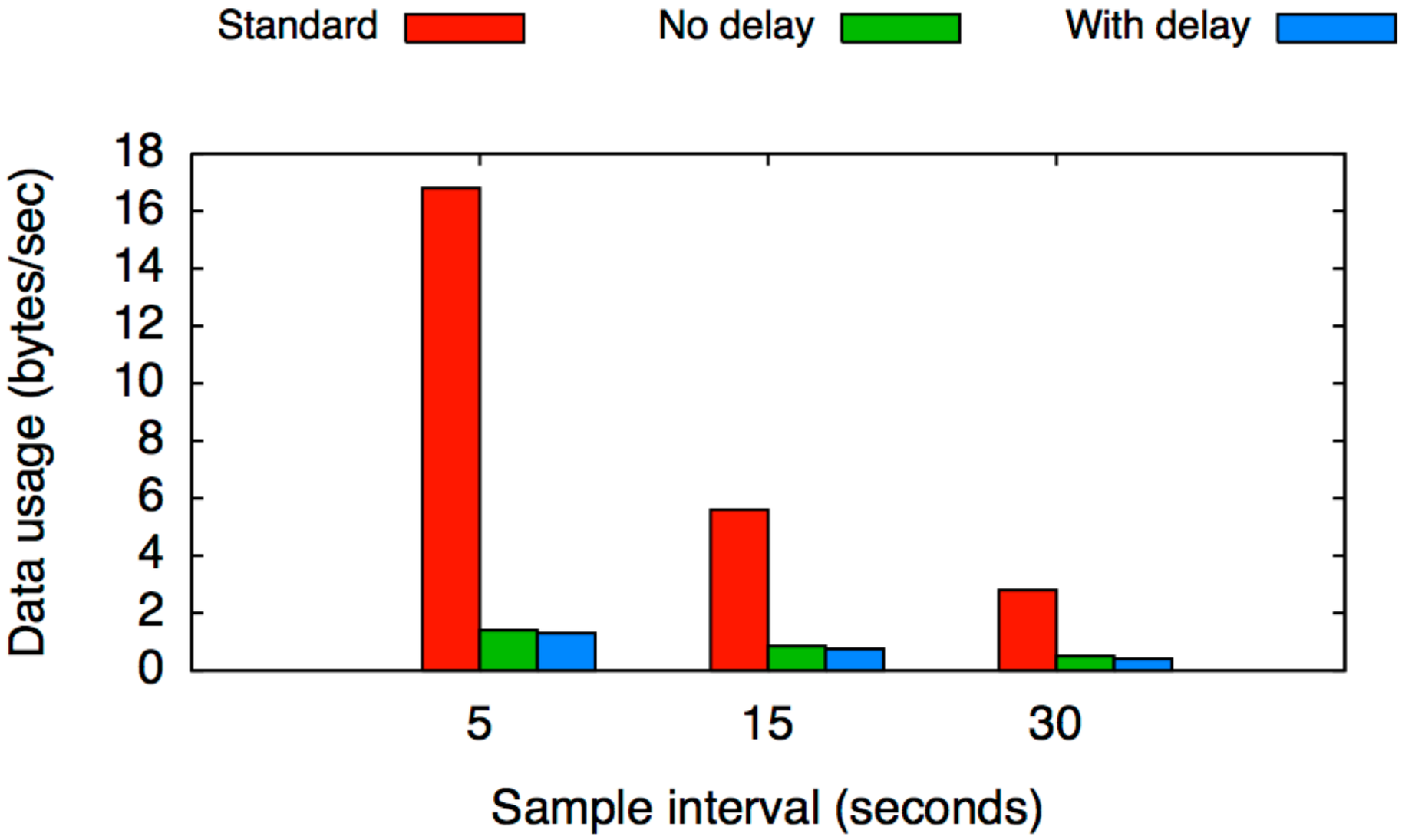
(with budget optimization)

or

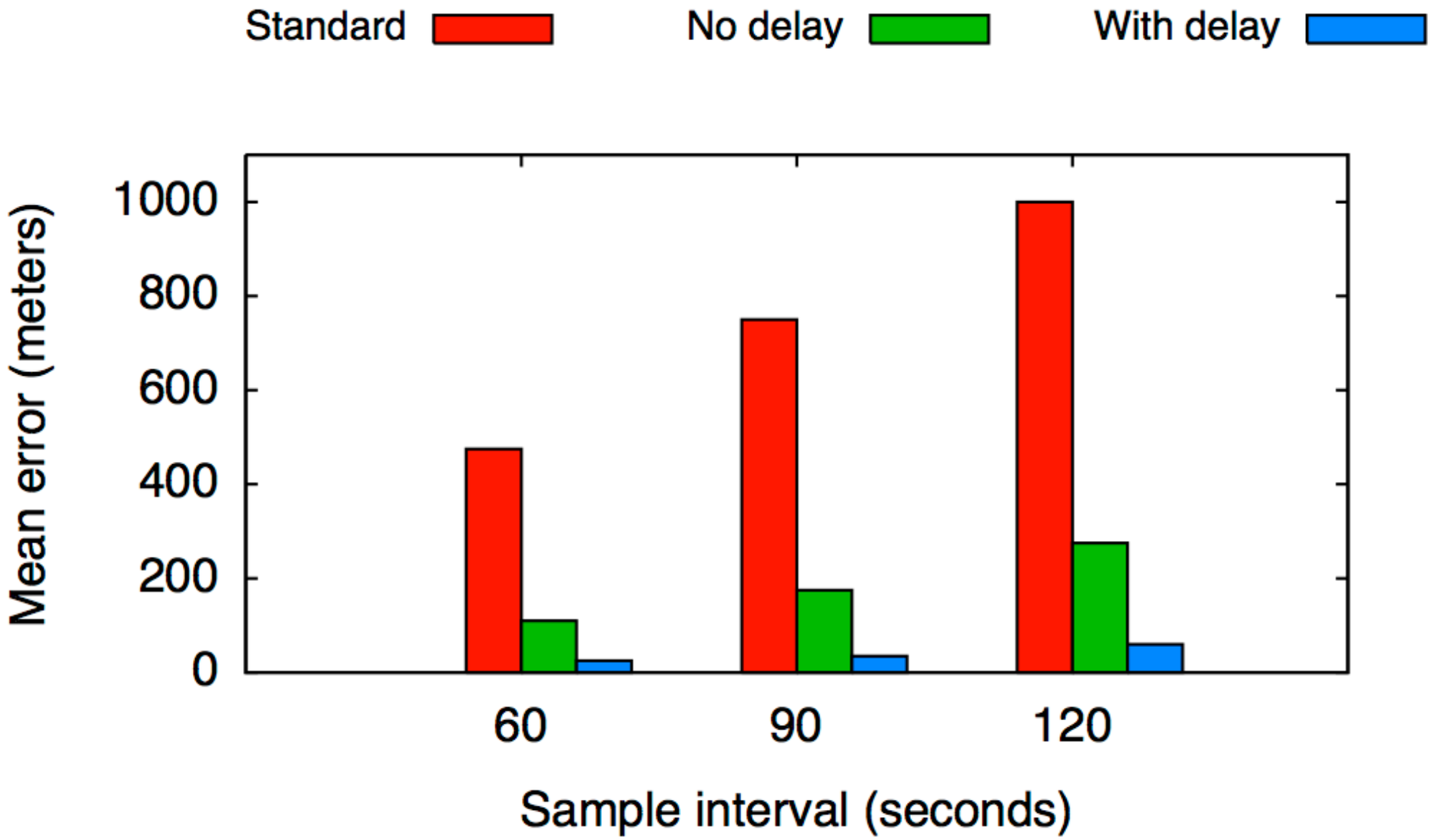
Budget-bound

(with error optimization)

Data usage reduction



Error reduction



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