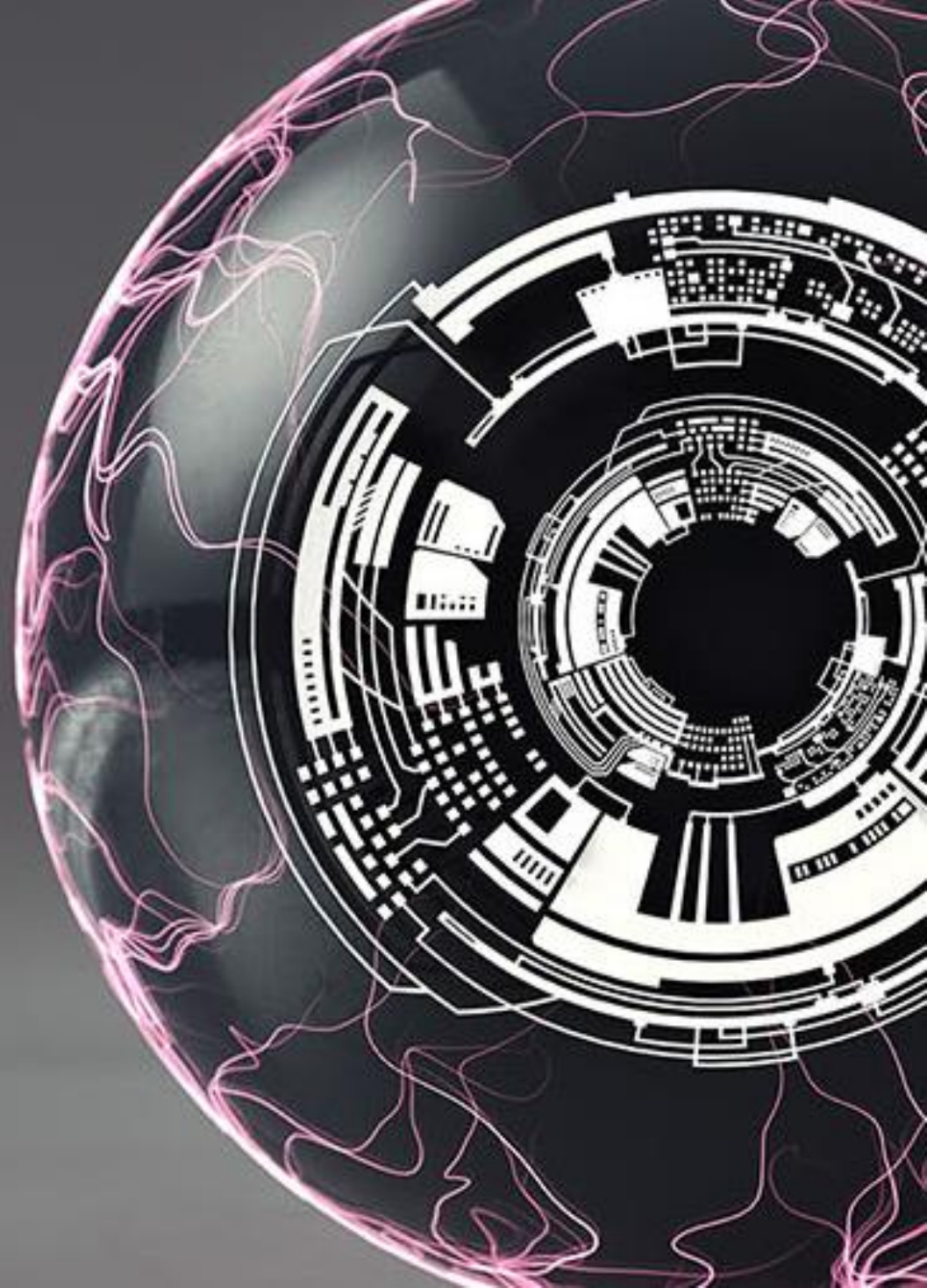




Low-cost, low-latency video analytics platform: System challenges

Peter Bodik
Microsoft Research



Cameras are everywhere!



Seattle Police Receive \$600,000 Federal Grant For Body Cameras

theguardian

You're being watched: there's one CCTV camera for every 32 people in UK

THE WALL STREET JOURNAL.

China's 100 Million Surveillance Cameras



NYPD expands surveillance net to fight crime as well as terrorism

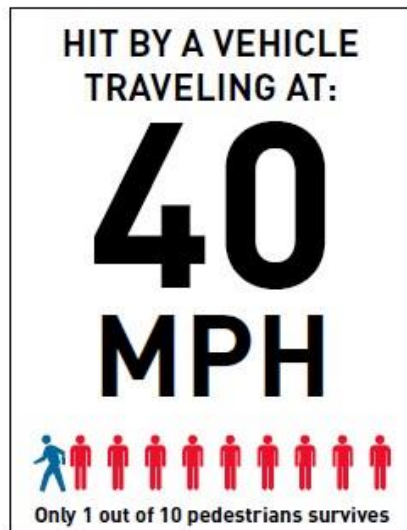
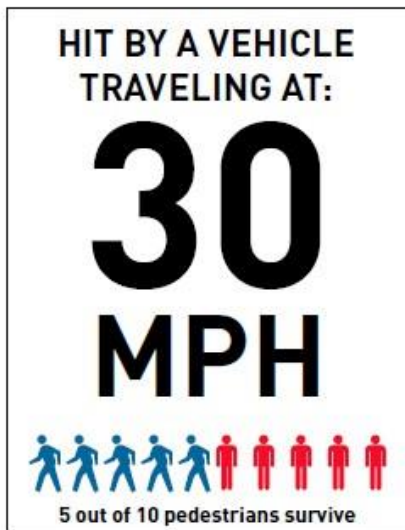
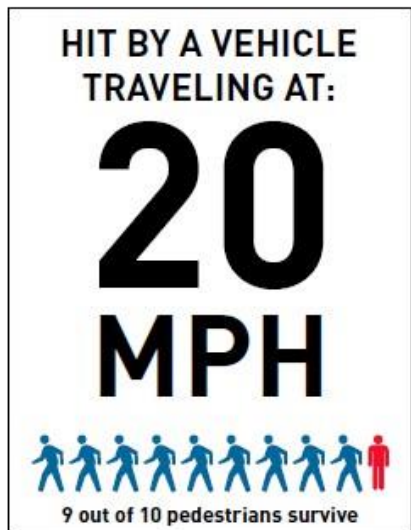


Vision Zero

Goal: eliminate traffic deaths and serious injuries

VISION ZERØ

SAFER STREETS FOR SEATTLE



Speed is especially lethal for vulnerable users like pedestrians and people biking. The risk of injury and death increases as speed increases.



Traffic analytics: Collaboration with City of Bellevue

Use widely deployed traffic cameras

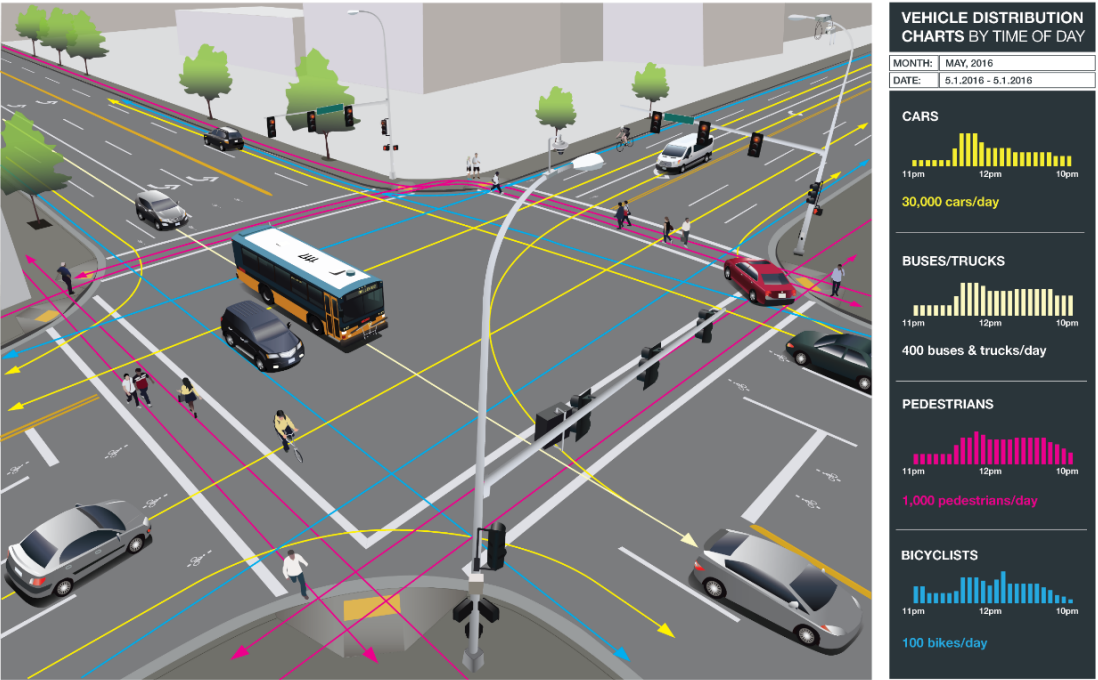
- Count cars/bikes/peds, detect near-collisions, anomalies

Next-generation traffic control



BELLEVUE
**PEDESTRIAN
& BICYCLE**
IMPLEMENTATION INITIATIVE

Making Bellevue a great place
to *walk* and *bike*.



Challenges of video analytics platform

Processing

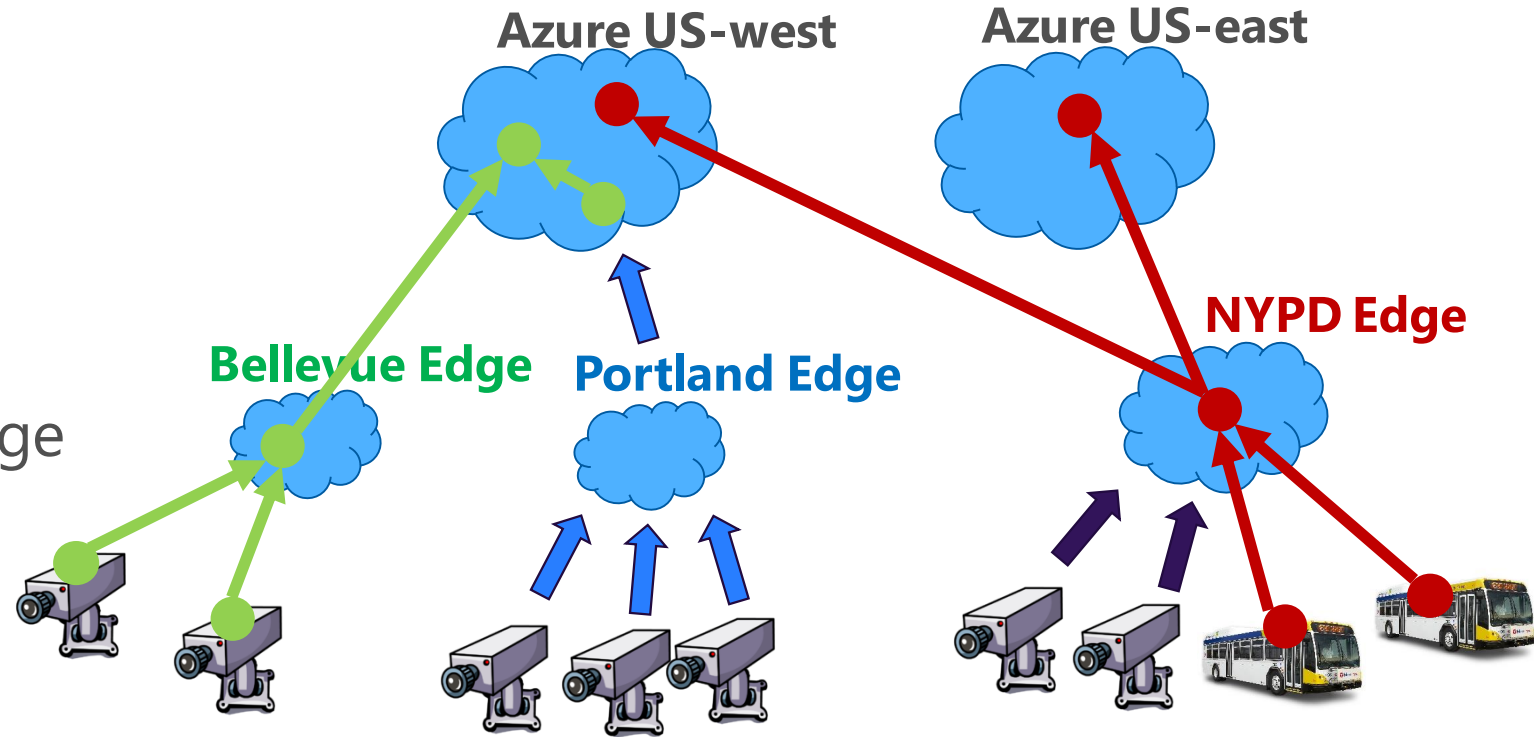
- Query optimization
- Declarative language

Storage

- Flexible, geo-distributed storage
- Secure sharing

Network

- Live video, low latency, high bandwidth



Processing

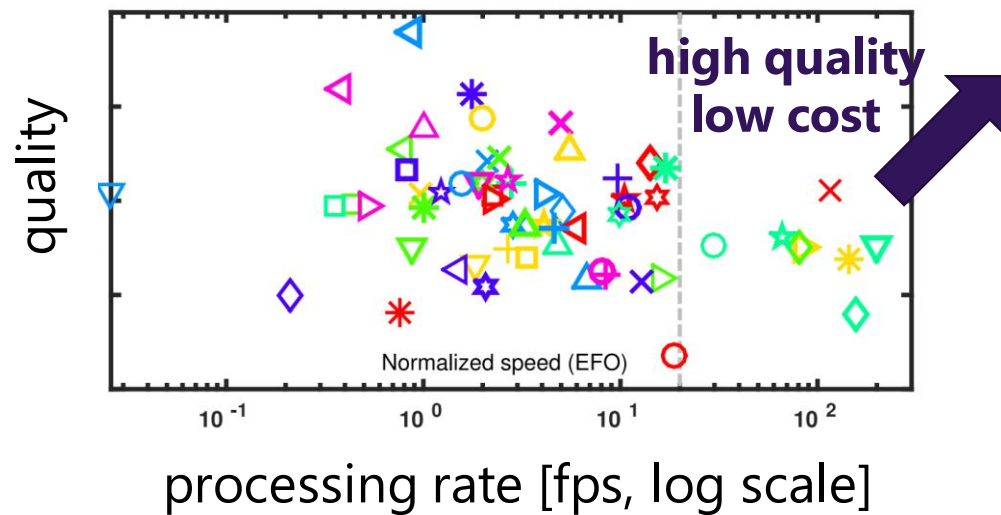
Computer vision can be expensive

Best tracker from VOT 2015 = 1fps @ 8-cores + GPU

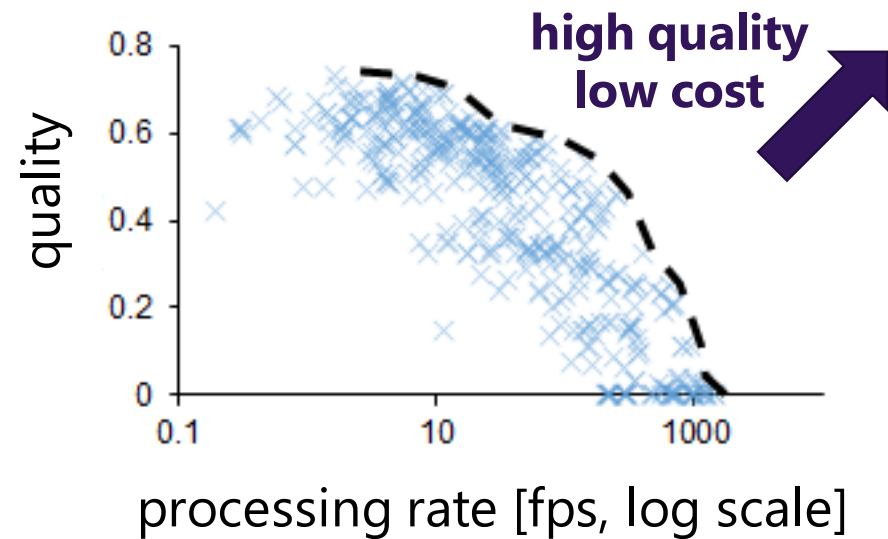
- compute cost in Azure = \$1.7M/camera/year



VOT 2015 trackers



OpenALPR (license plate recognition)



Declarative language for video processing

Today: “execute this DLL”

- Cannot optimize automatically

Instead: “track and count cars and pedestrians”

- Enables optimization of video processing modules



Storage

Video storage today: inflexible and expensive

Today, storage provided by the customer

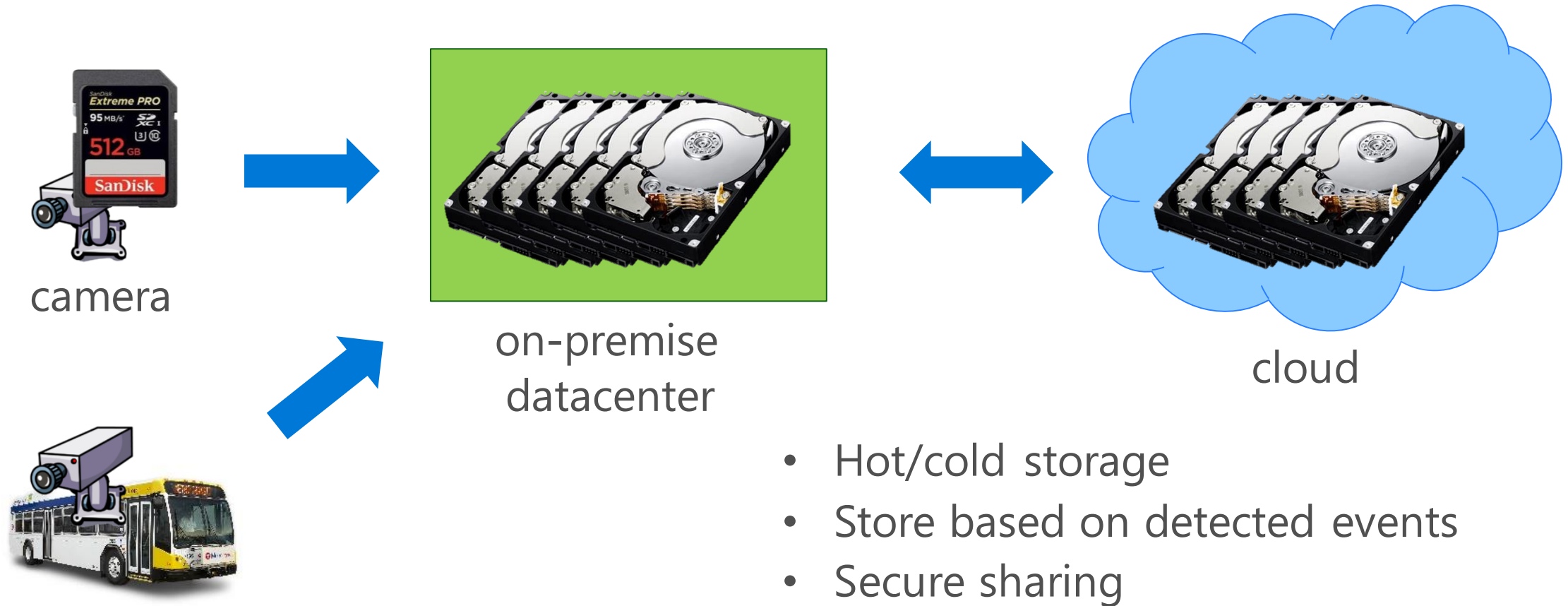
- Abstracted away, not managed

Expensive

- Storing 1 year of 2Mbps video in Azure = \$19k/year



Many options for storing video



Network

Networking at the core of video processing

Need high bandwidth

Some scenarios need low latency

Cameras connected over wireless/LTE/white spaces

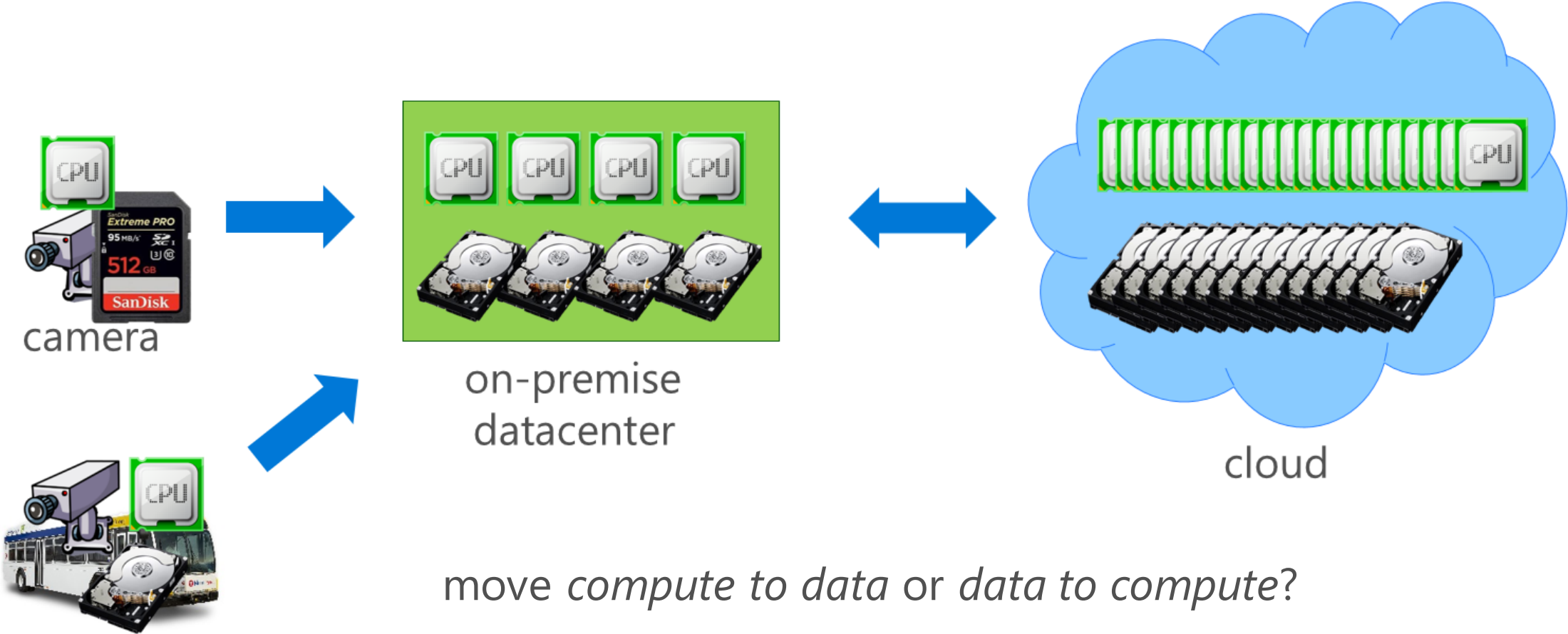
Cost

- Free upload to Azure, pay for download

Coupled with storage and compute placement



Orchestrating compute, storage, and transfer



move compute to data or data to compute?



Summary

High resource demand: CPU/GPU, storage, network

- Need to optimize and orchestrate resource usage

Bellevue Traffic Analytics Demo

- Thursday 12 – 2:30





