Data Movement Patterns for The Internet of Things.

Or 40 Amazon DCs Ought To Be Enough For Anyone

About Me…

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What we'll cover

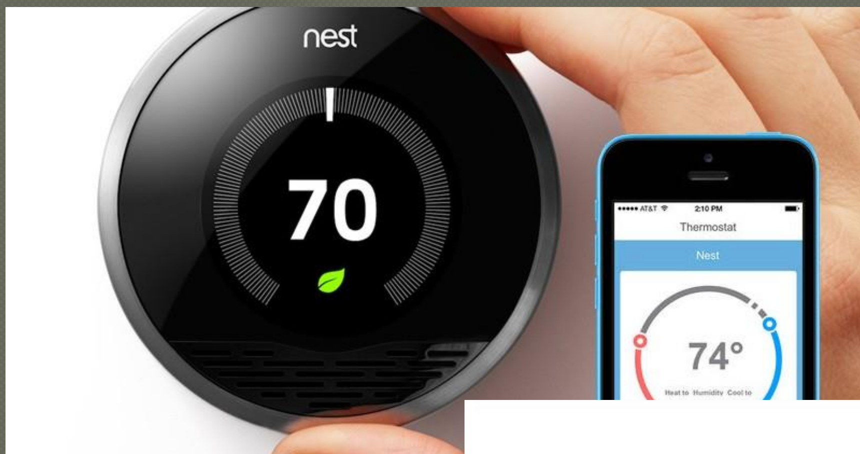
- A Brief History Lesson
- Some Examples
- Their Impact on Data Movement
- The Magic Tool

IoT v0.5


I-210+
1007150673
SmartMeter


1343
POWER NOW WATTS
12.9
18.6
23
ONZO

IoT v1.0


nest
70
Thermostat
Nest
74°


Record Your Journey
START
To help score accuracy we advise using a cradle. Be safe, never use your phone while driving.

Implications For Data Movement

1. Bi-directional data movement – but asymmetric
2. Secure with delegated authentication.
3. Massive scale.
    - Data rates
    - Termination
    - Elasticity
4. Predictable within small sub-ecosystems but *unpredictable at large.*
    - Requires multiple classes of service
    - Predictable behaviour under unpredictable load

Scale

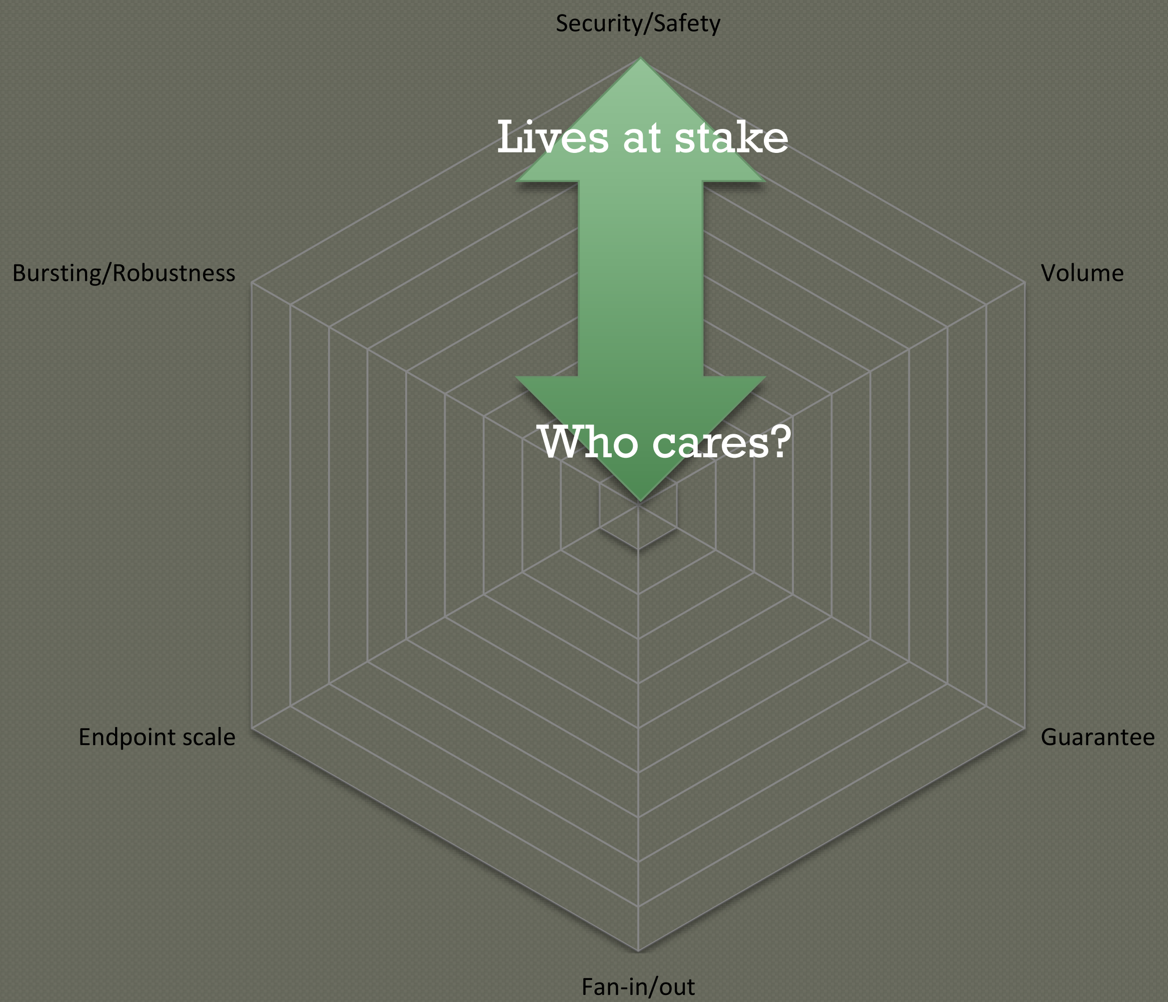
- 20B Things by 2020? (Gartner*)
- Cloud server terminating 10k devices
  - 2M servers *just for termination*
  - 40 Amazon DCs! (Currently ~12)

*http://www.gartner.com/newsroom/id/3165317

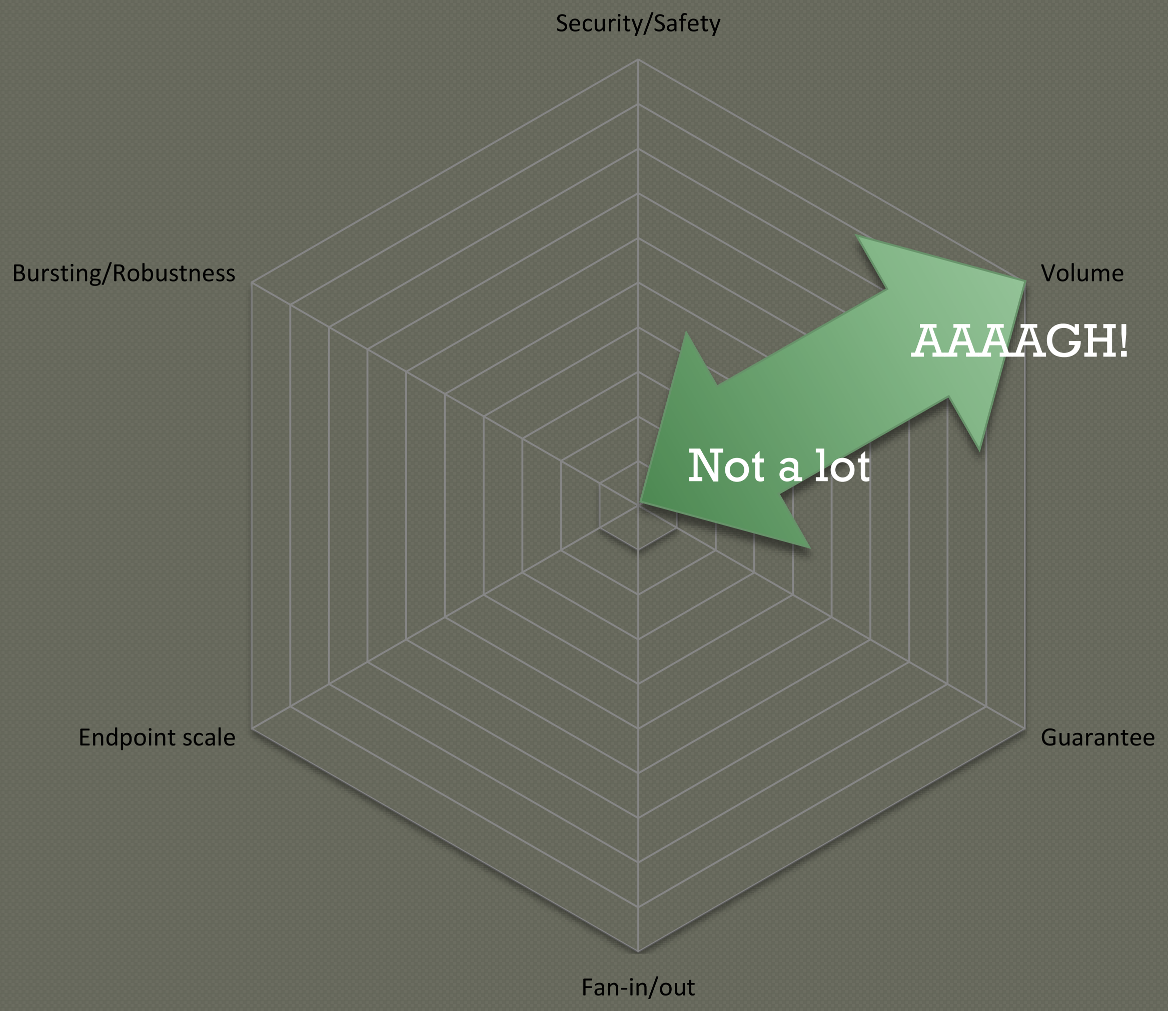
Data Movement Considerations

- Considerations
  - Security/Safety criticality
  - Volume
  - Loss tolerance
  - Fan-in/out
  - Endpoint scale
  - Bursting/Robustness

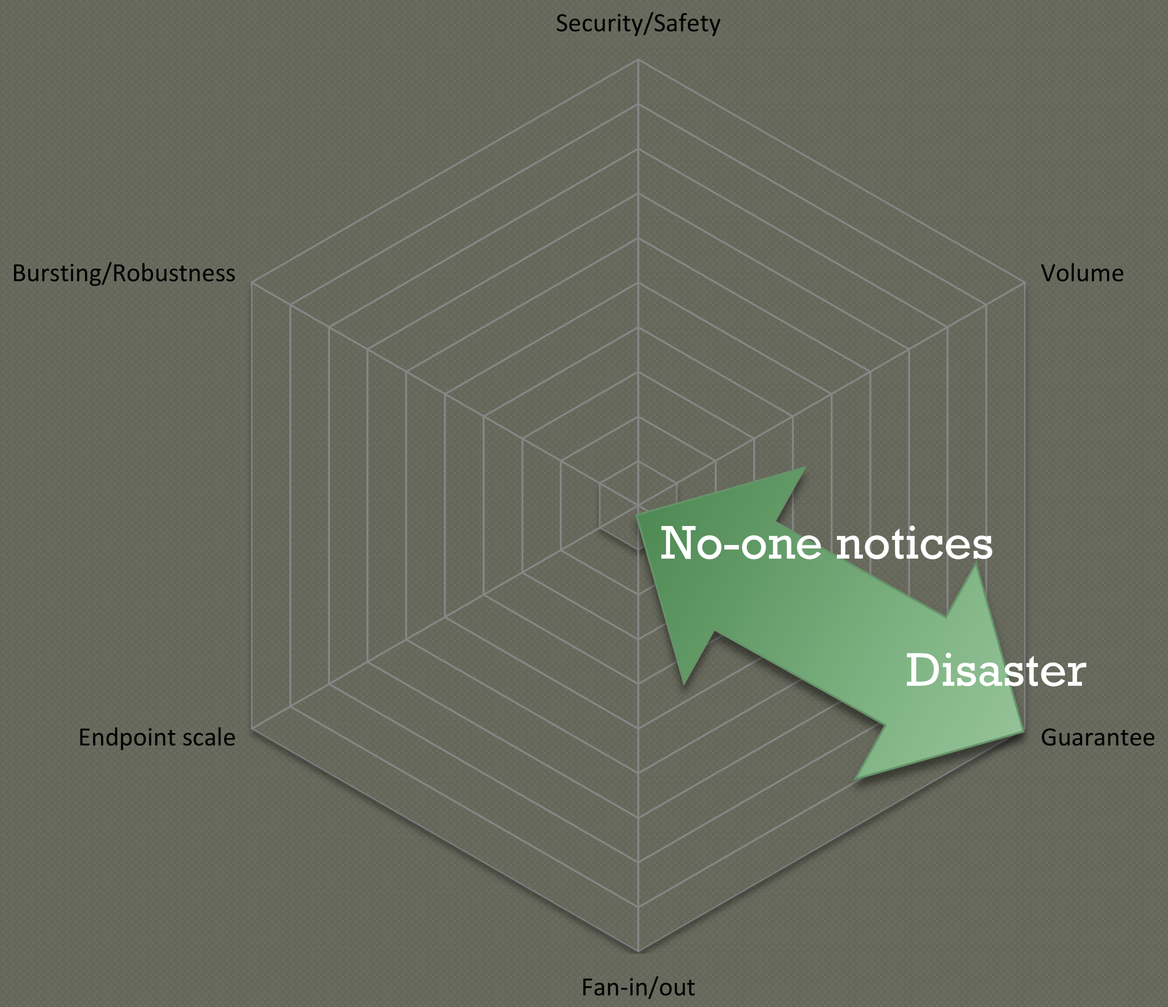
Visualising Data Movement Considerations



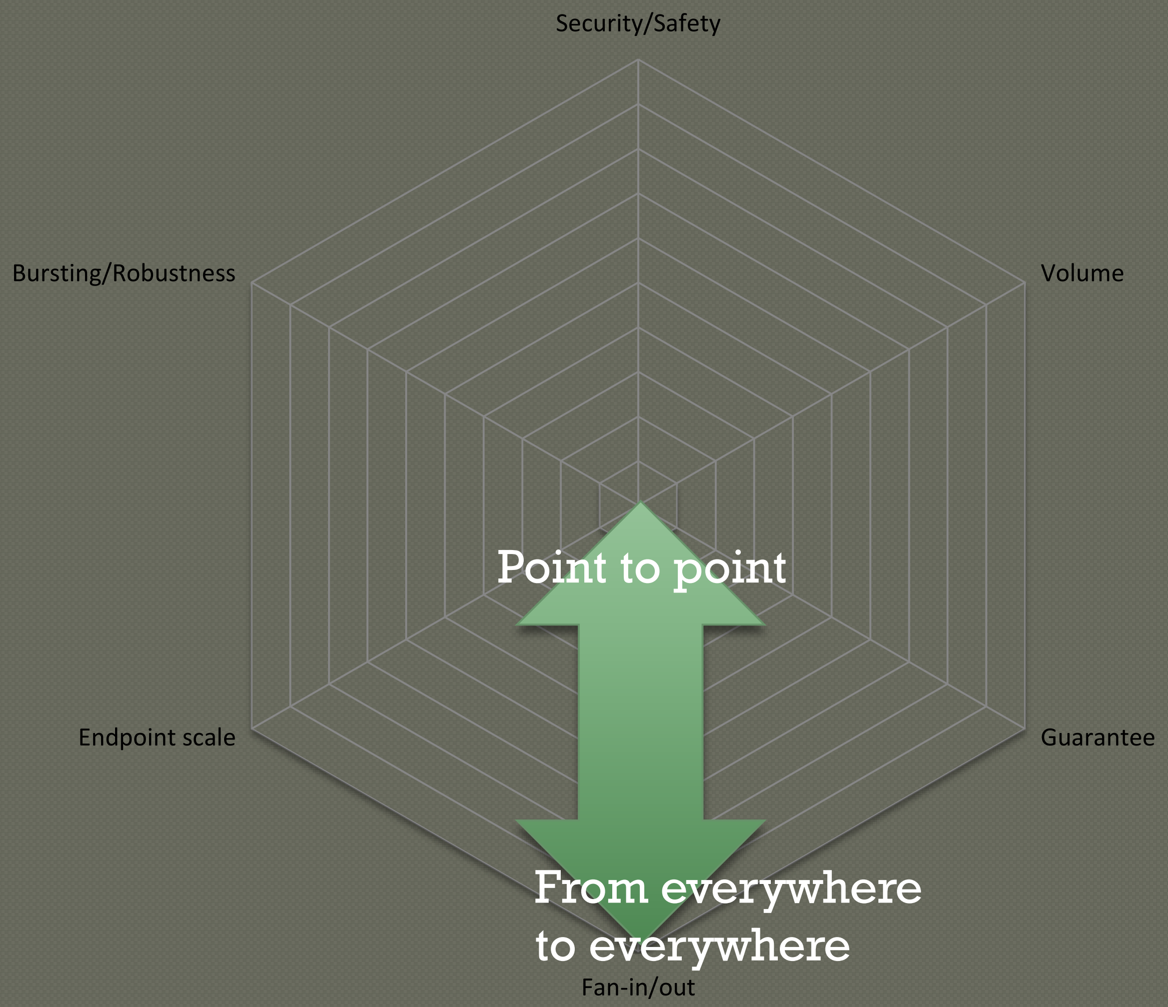
Visualising Data Movement Considerations



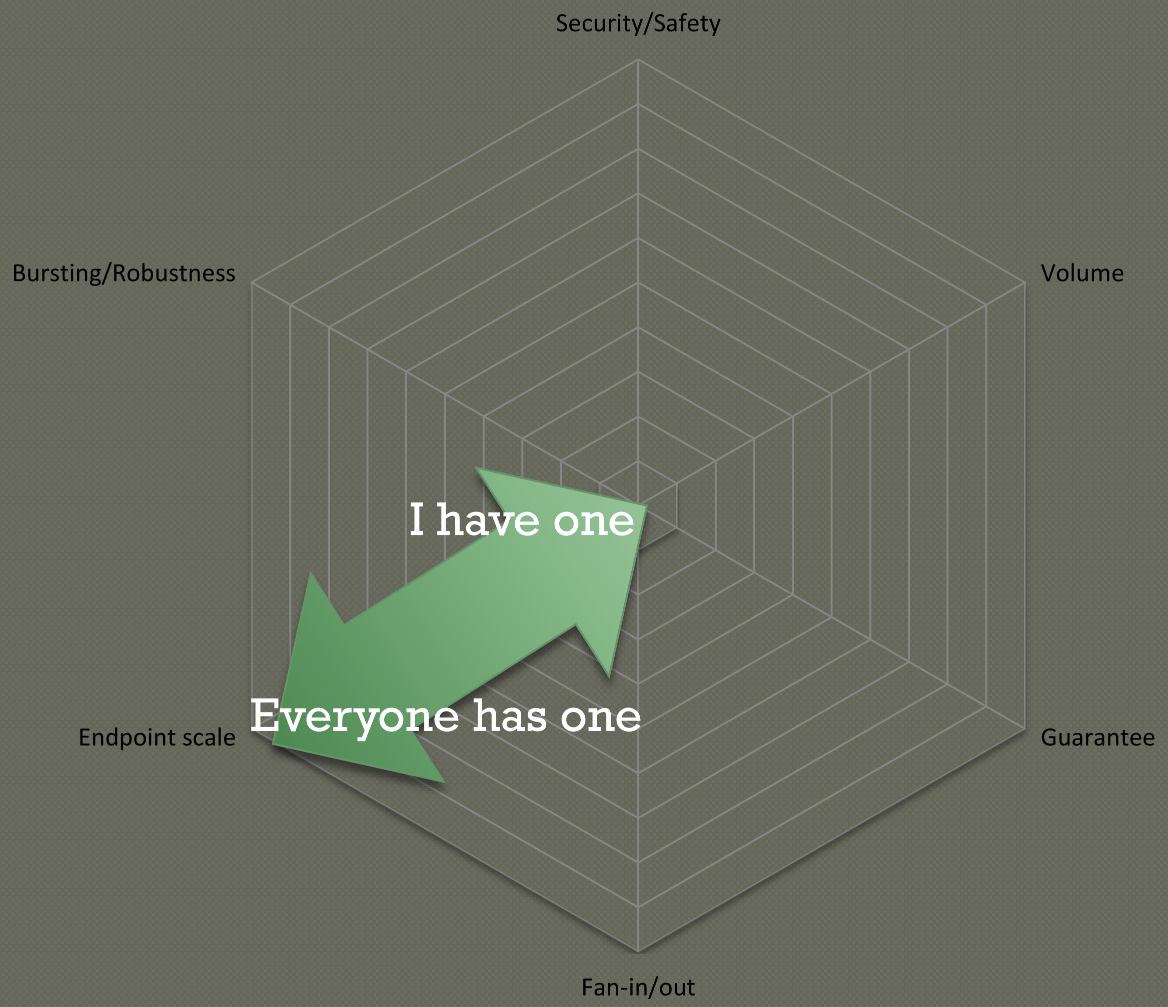
Visualising Data Movement Considerations



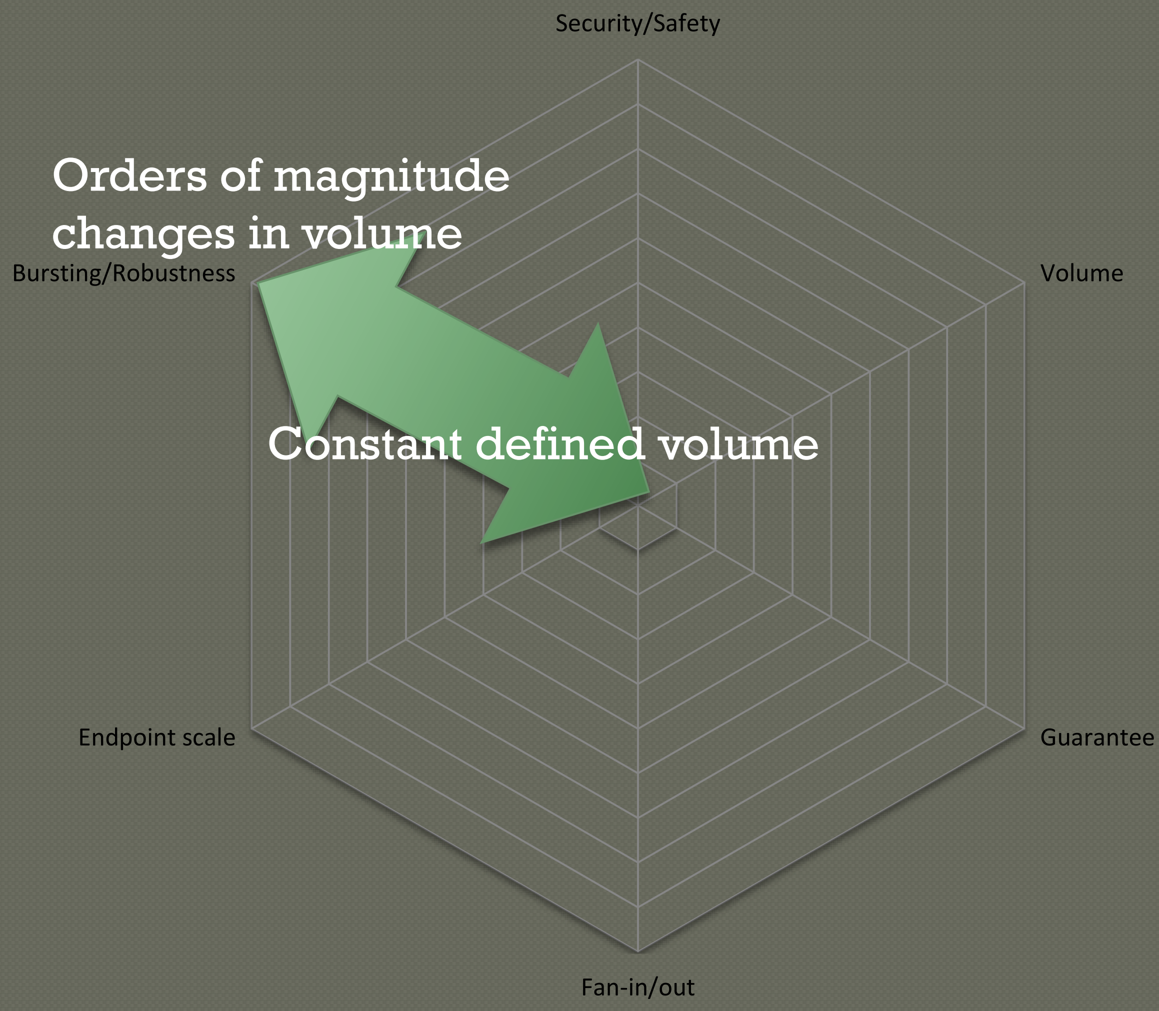
Visualising Data Movement Considerations



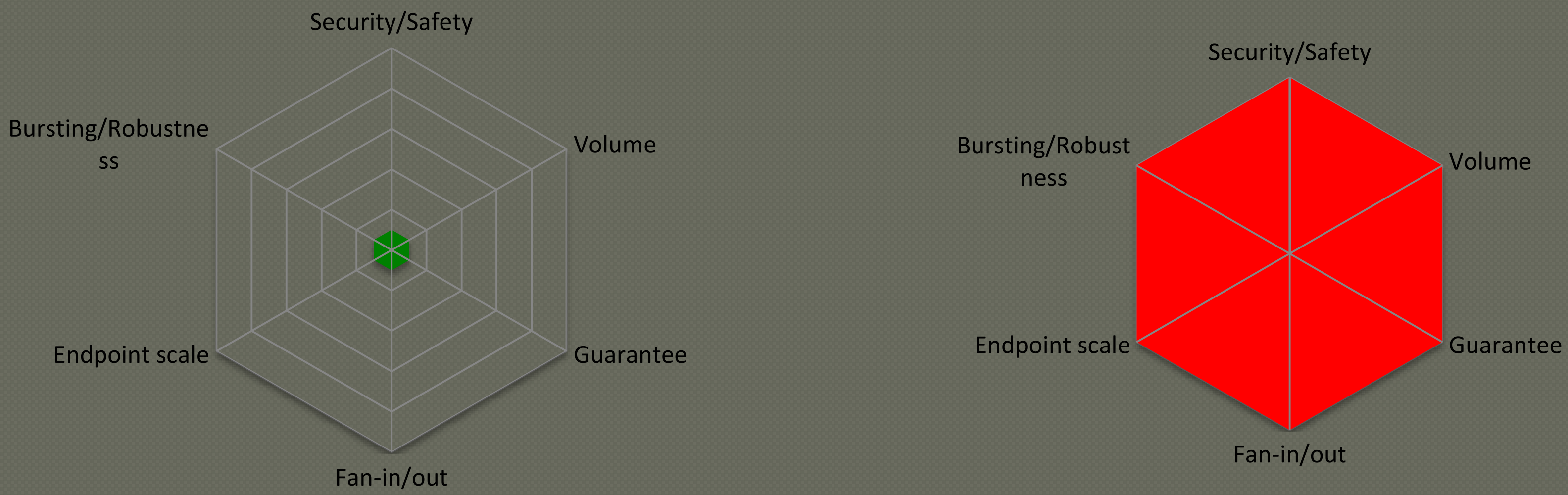
Visualising Data Movement Considerations



Visualising Data Movement Considerations



Difficulty



Easy: difficulty 1%

Difficult: difficulty 100%

- Simple, quick and dirty generic estimation of difficulty (area of plot!)
- Plot your proposed solution against requirements
- No work required for overlap ☺
- Concentrate on areas where requirement does not overlap capabilities
- Apply weighting for more sophistication

Use Case: Generation Margin

- How many "spare" power stations do we have?
  - 30%! 78GW vs 60GW*

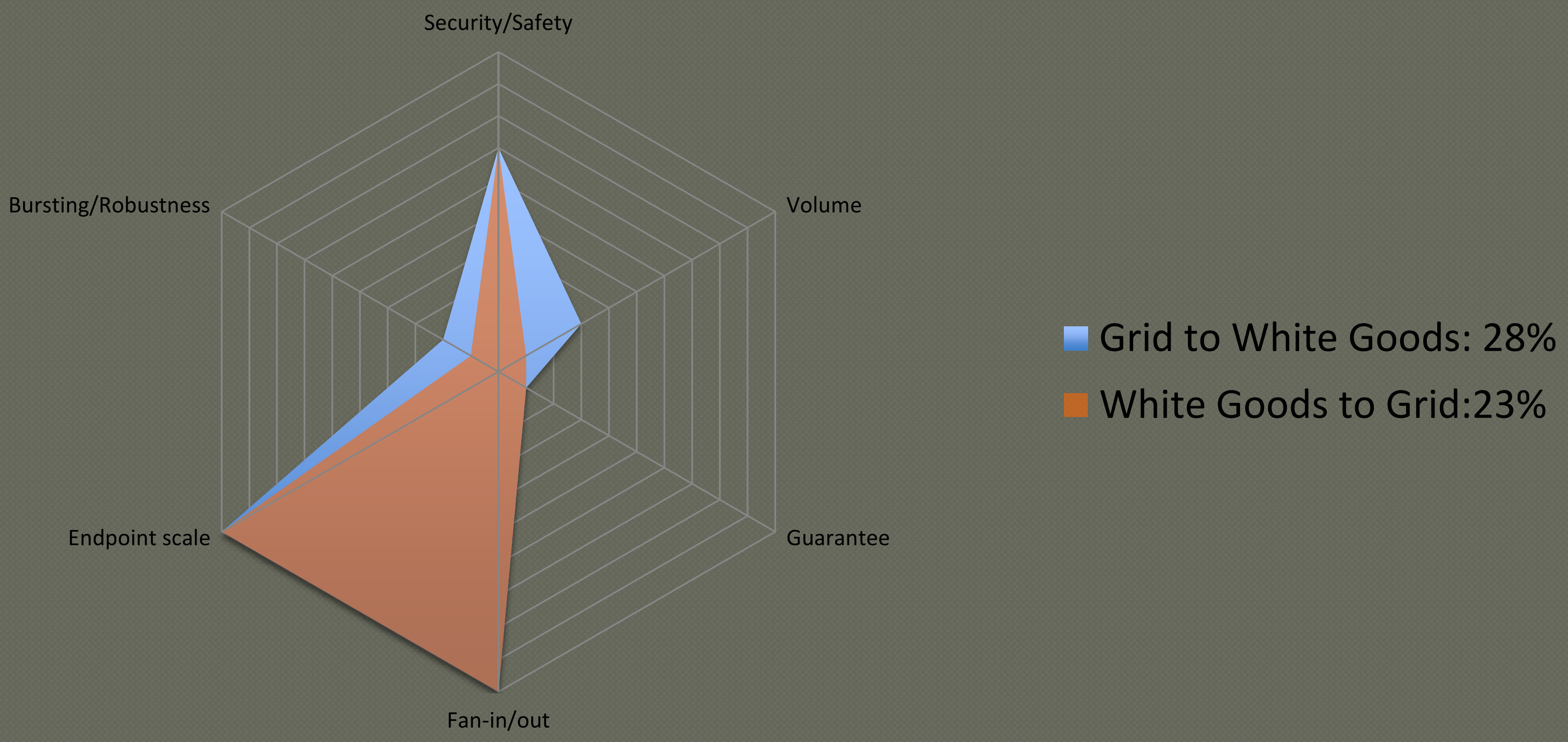
?

Source: http://www.raeng.org.uk/publications/reports/gb-electricity-capacity-margin

Generation Margin: demand side

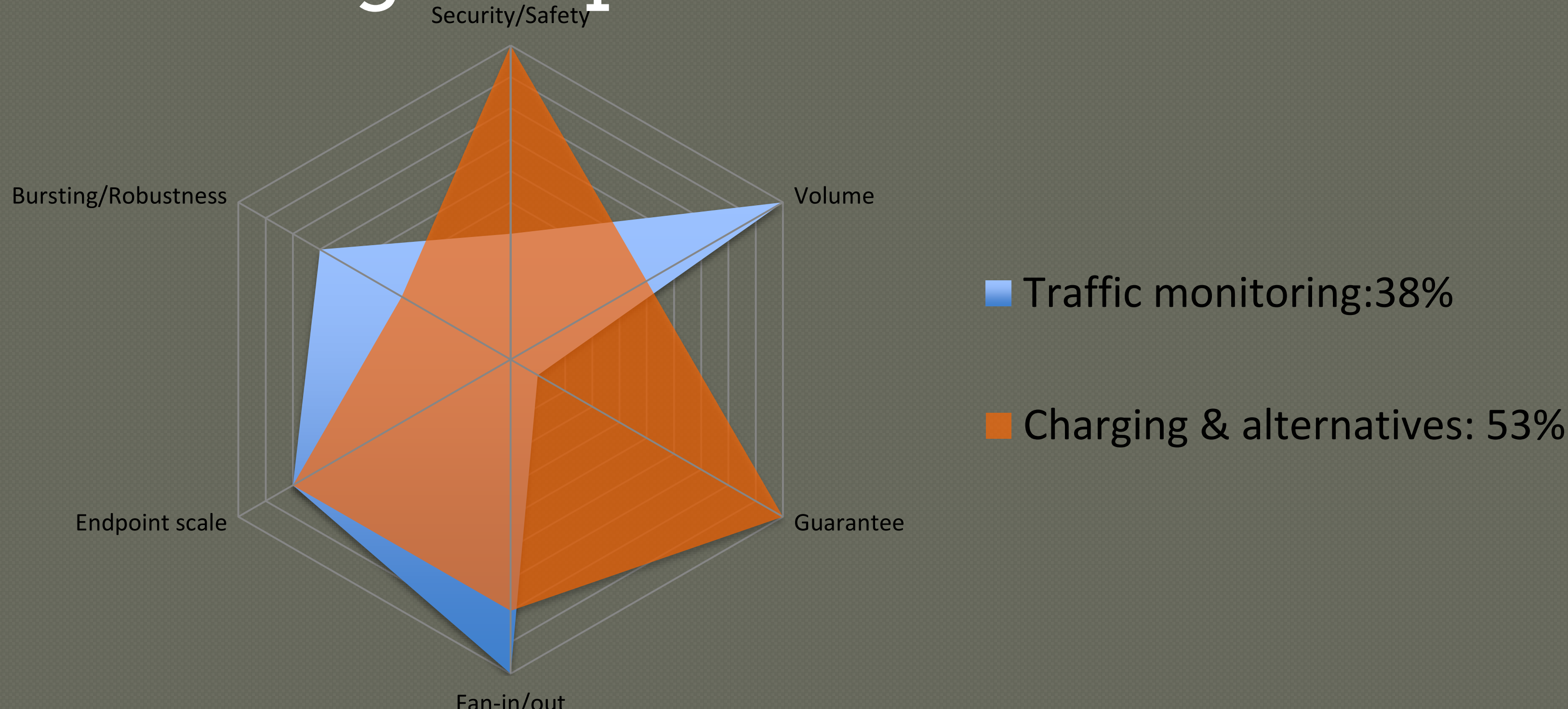
- Does your fridge/oven/air conditioner/electro-plater/smelter need power *now*?
  - Consumer signals likely demand
  - Producer signals likely cost
  - Equilibrium reached
- Lower Supply Margin (cheaper power)
- More tolerant of unreliable sources (wind, solar, tide)

Generation Margin

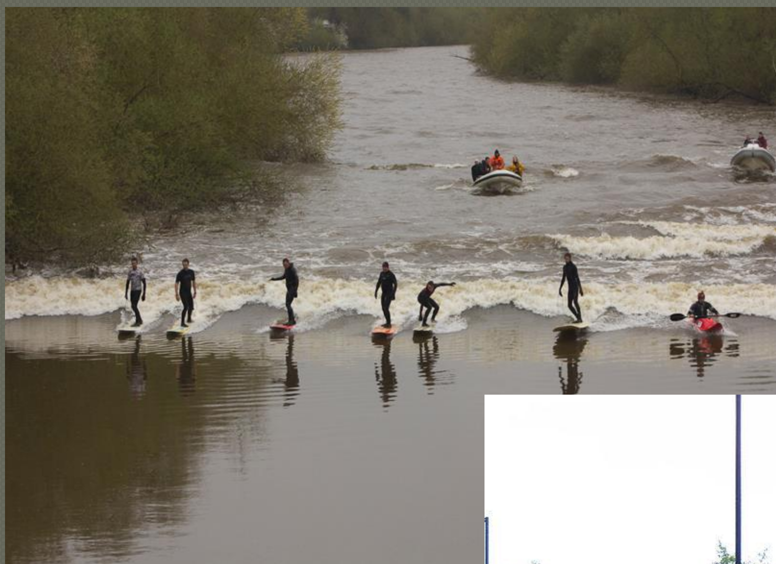


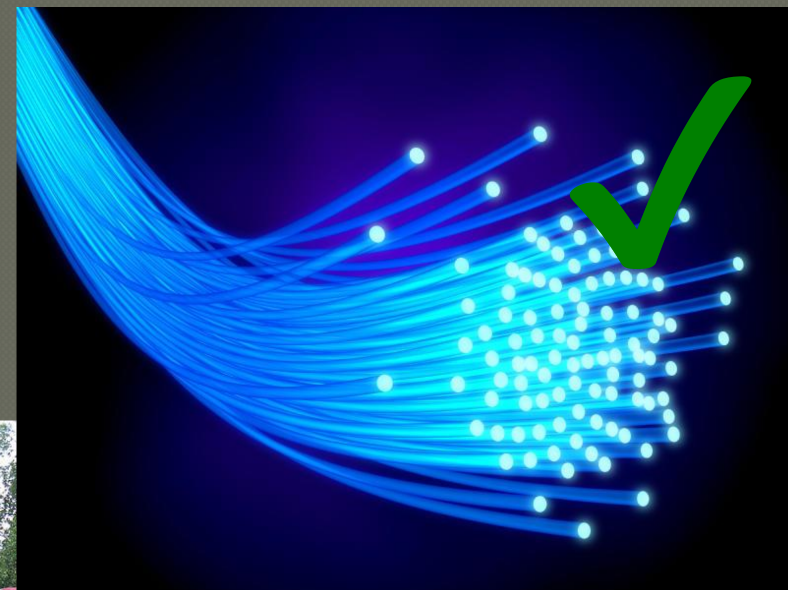
Use Case: Traffic Management

- Real time charging based on congestion
- Alternative travel planning
- Traffic signal optimisation



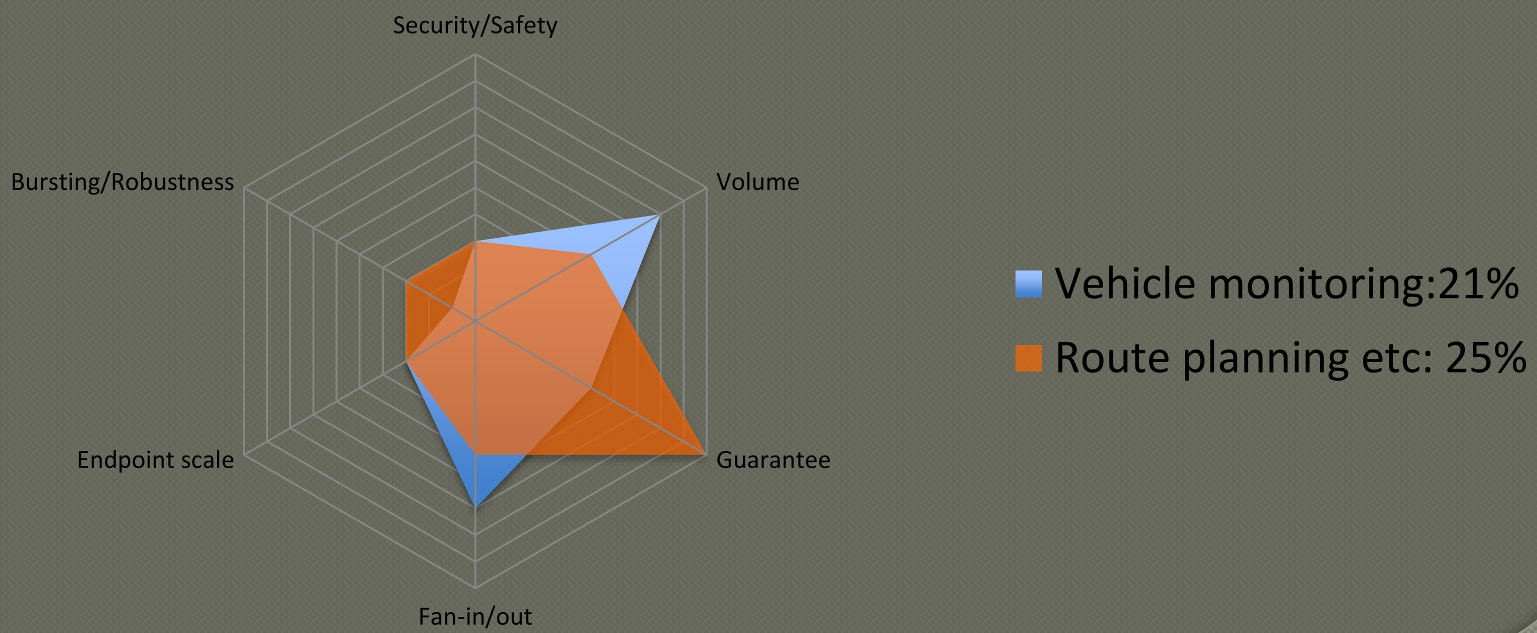
Soliton Waves and Buses



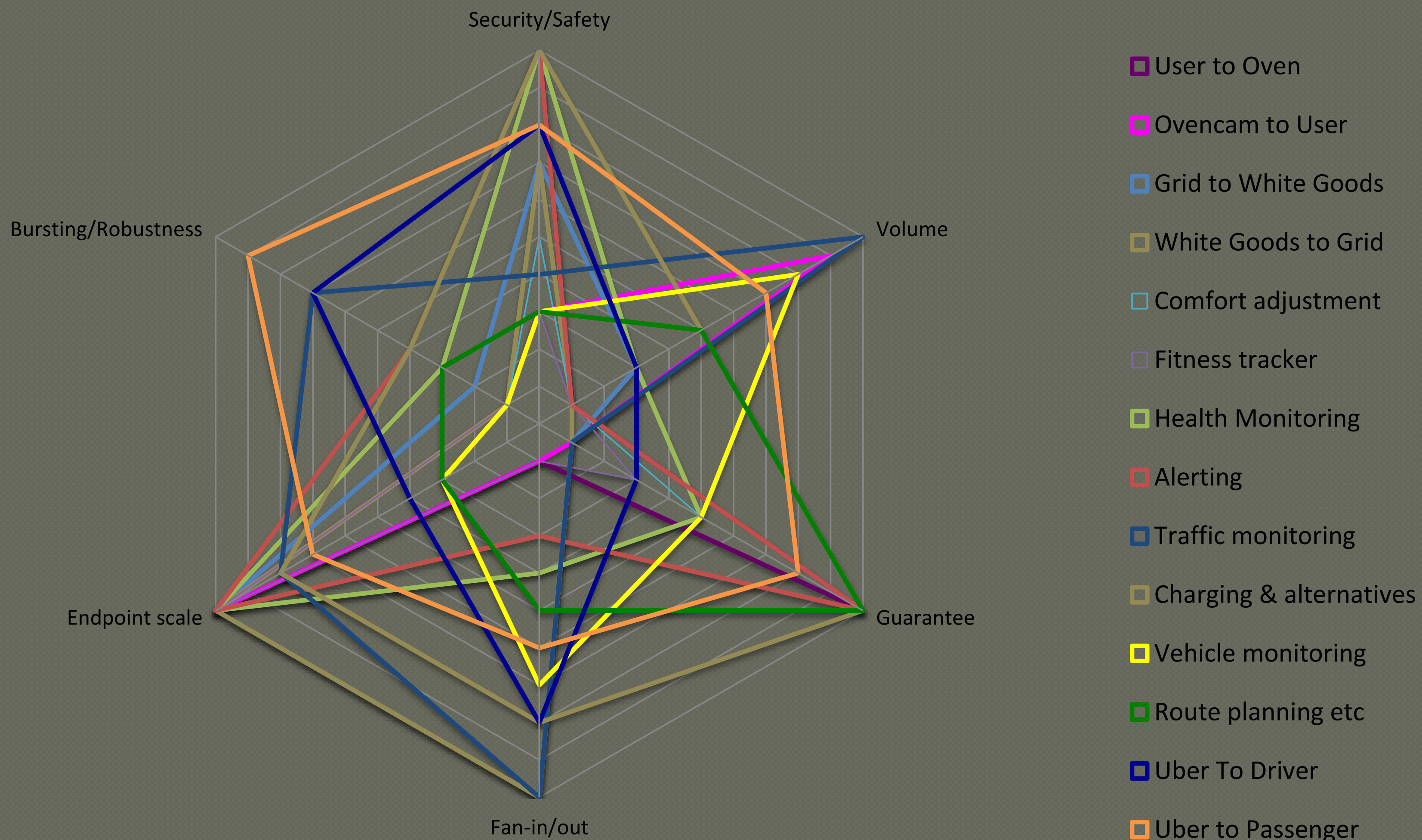


Use Case: Public Transport Optimisation

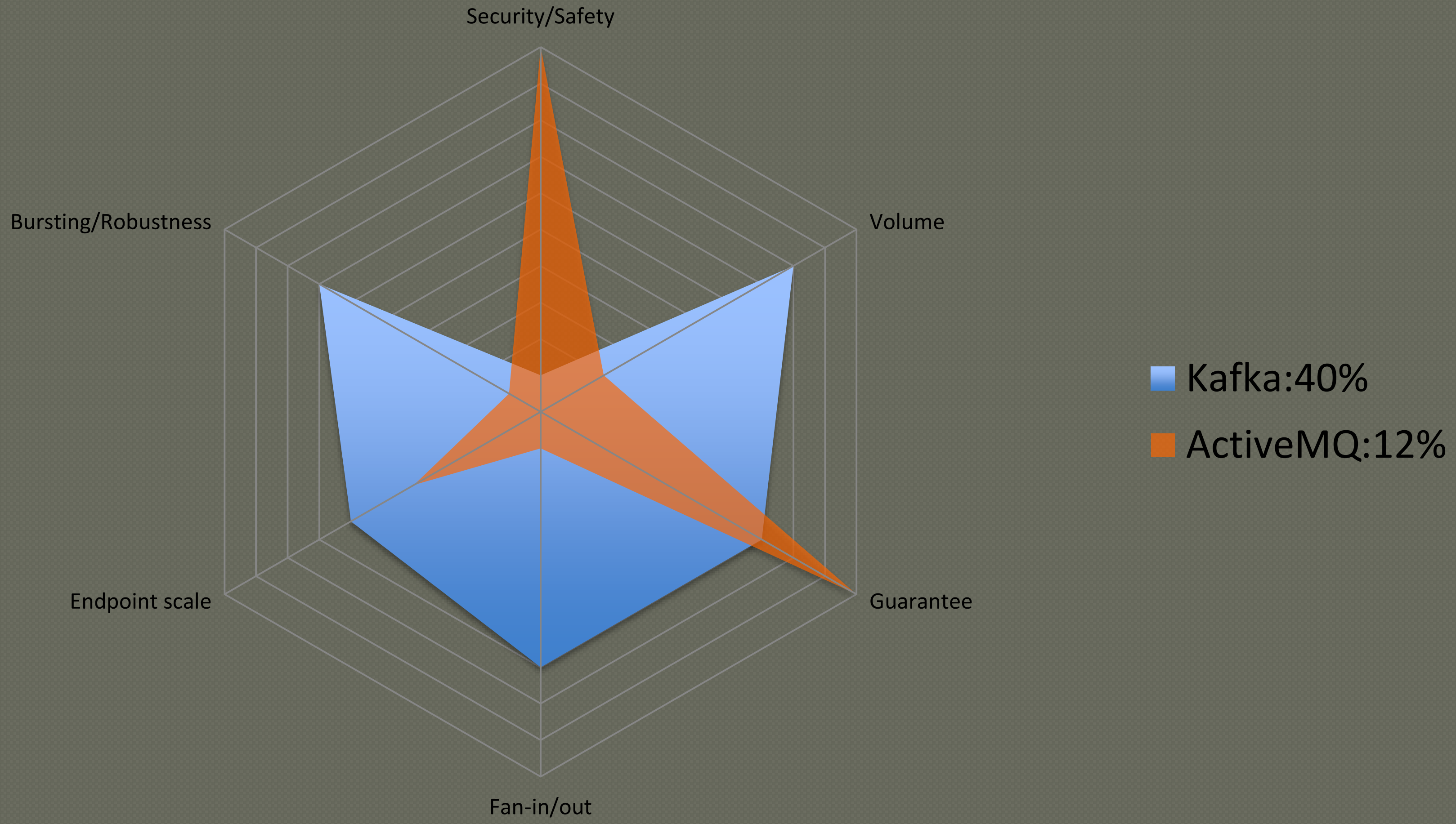
- Monitor Vehicle location, speed and occupancy (video feed)
- Traveller route planning, vehicle allocation, crime evidence



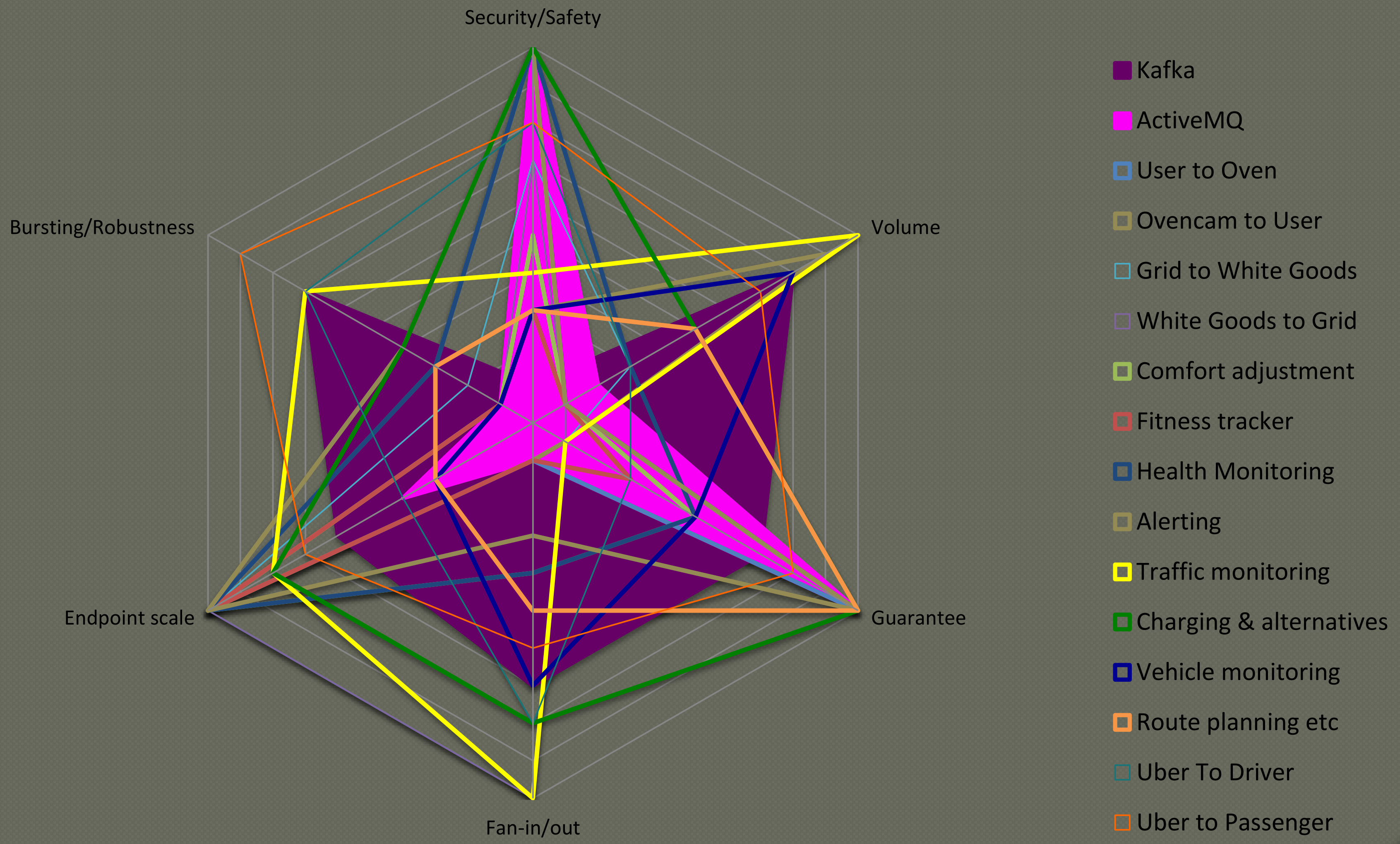
And some others



Evaluating Some Existing Data Movement Solutions



All In All



Security/Safety
Volume
Guarantee
Fan-in/out
Endpoint scale
Bursting/Robustness
Kafka
ActiveMQ
User to Oven
Ovencam to User
Grid to White Goods
White Goods to Grid
Comfort adjustment
Fitness tracker
Health Monitoring
Alerting
Traffic monitoring
Charging & alternatives
Vehicle monitoring
Route planning etc
Uber To Driver
Uber to Passenger

Wrapping up

- Every use case is different
  - Understand its data movement requirements
  - Map them to proposed solution
- Connection count!

Questions?