Mesh Networking Experience: **qMp** case

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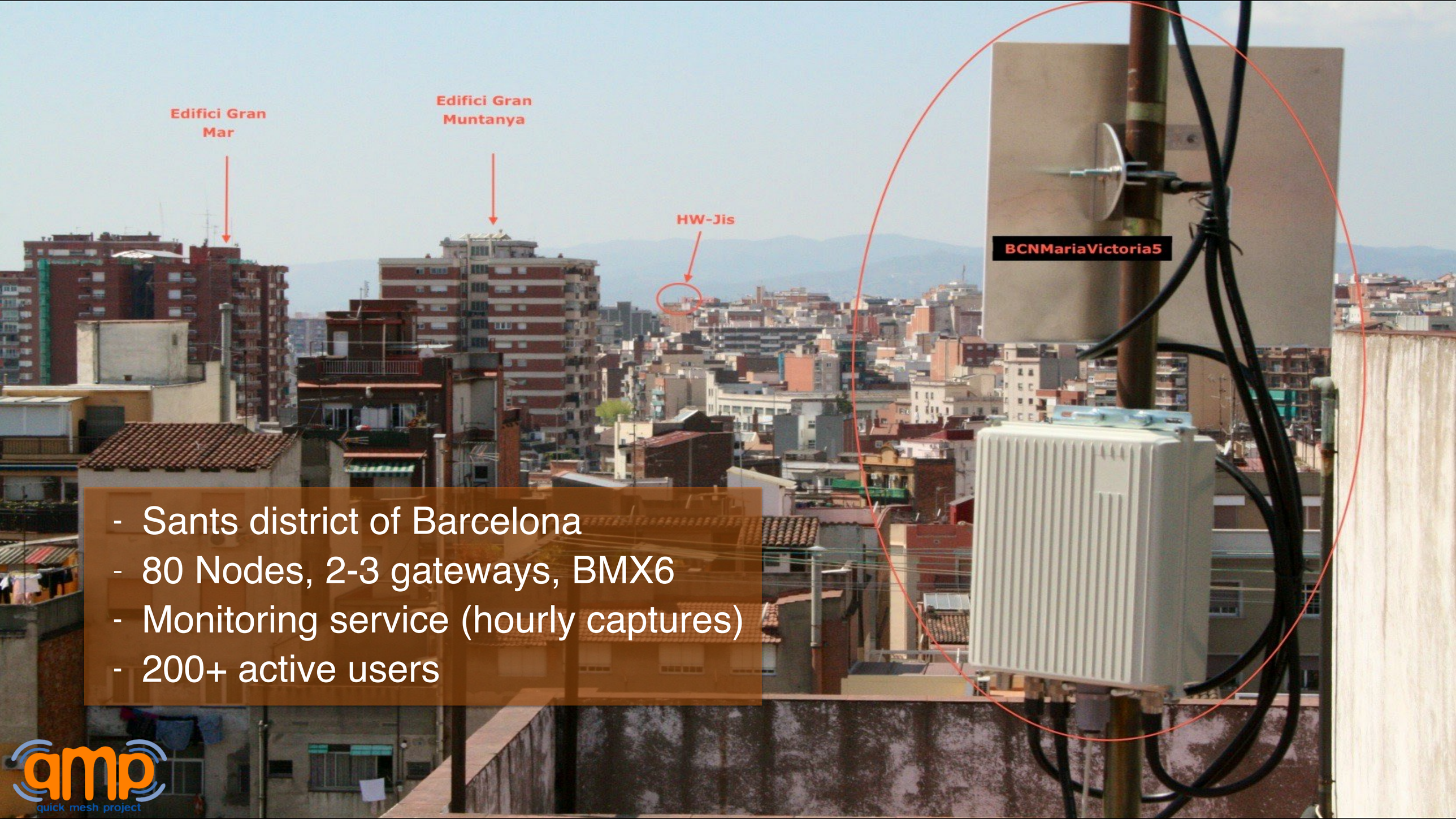
GAIA Meeting, IETF 101 London

March 2018



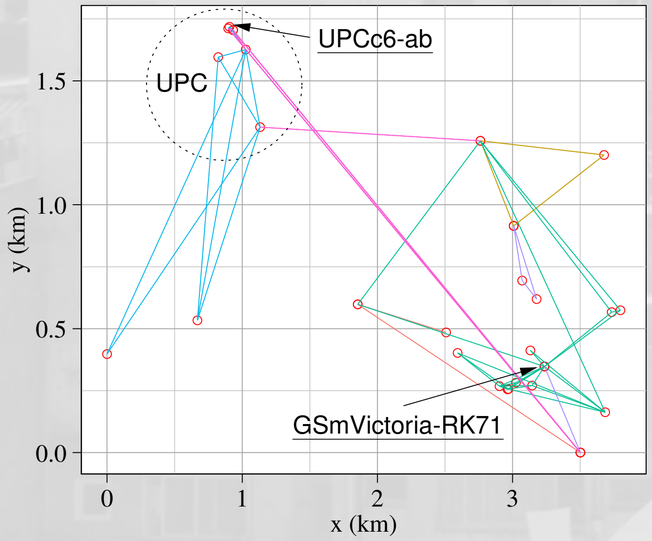
- Sants district of Barcelona
- 80 Nodes, 2-3 gateways, BMX6
- Monitoring service (hourly captures)
- 200+ active users

amp
quick mesh project

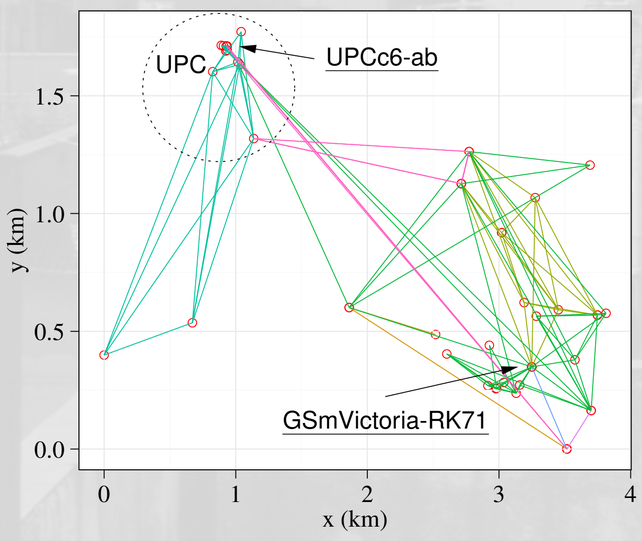
Topology

- growth is unplanned
- nodes often at **non-optimal locations**
- well connected and adaptive
- **mesh topology** (urban areas)
- star topology (rural areas)

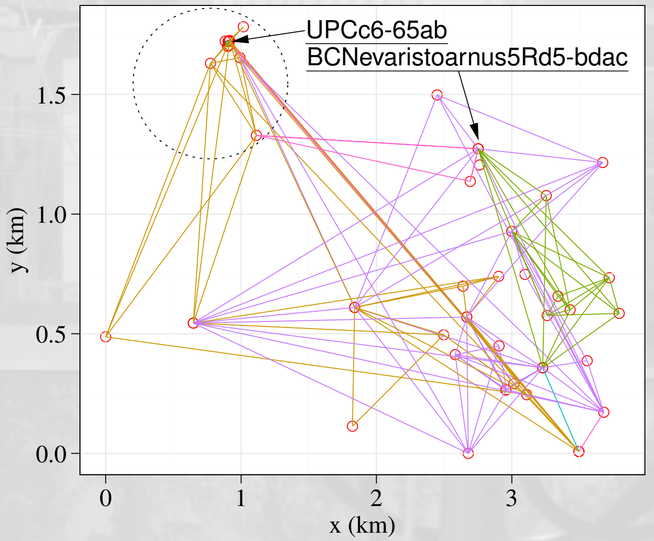
Dec 2015



Dec 2016

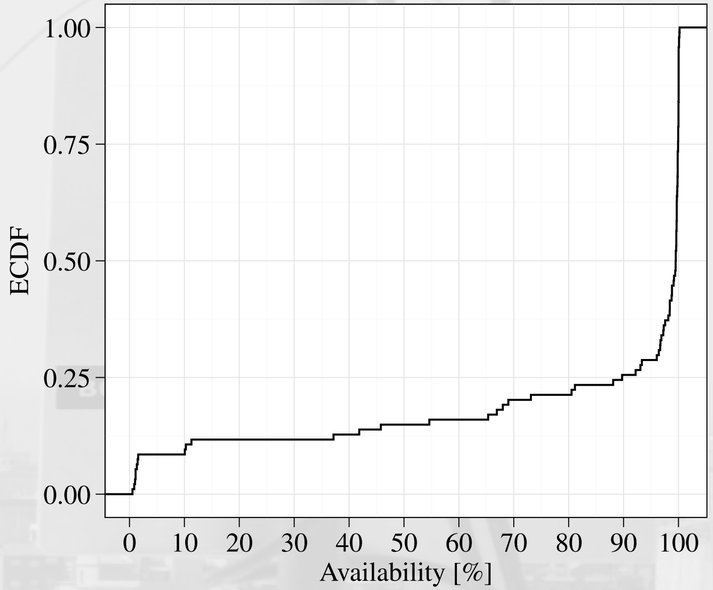


Dec 2017

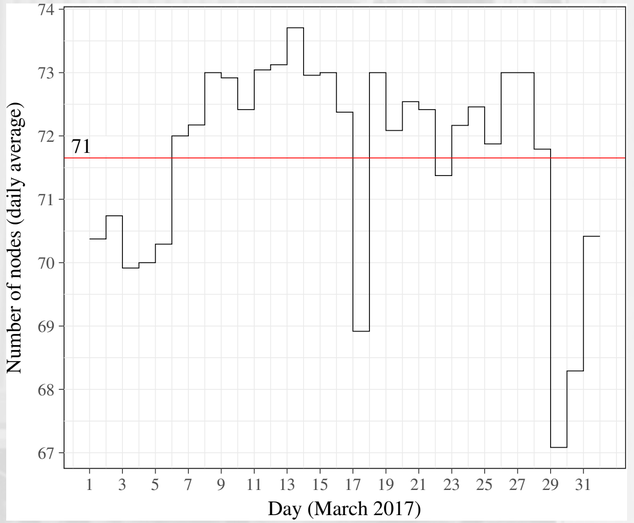


Node availability

- **availability:** percentage of times the node appears in a capture (hourly snapshot)
- 25% of the nodes, less than **90% availability**
- unreachable nodes due to **electric cuts**, node upgrades and node misconfigurations
- **175** of links are bidirectional and **34** are unidirectional



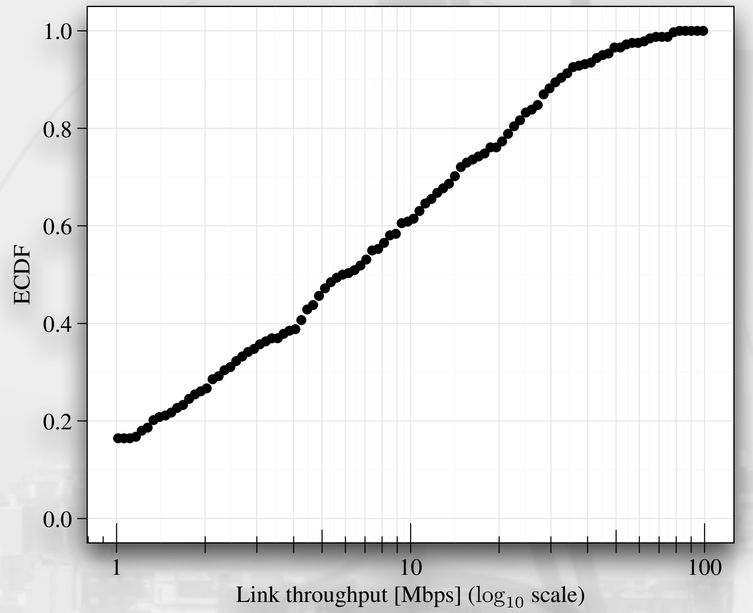
Node availability



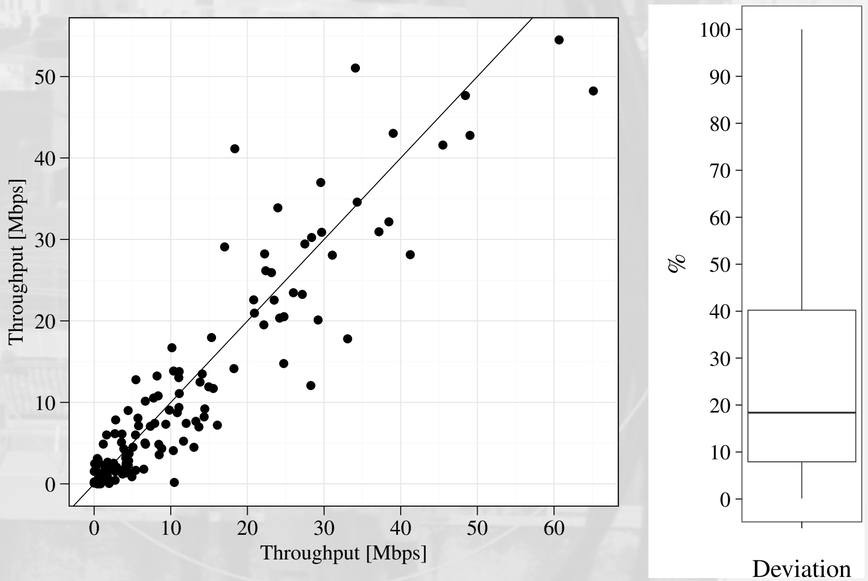
Number of nodes (March 2017)

Bandwidth characterization

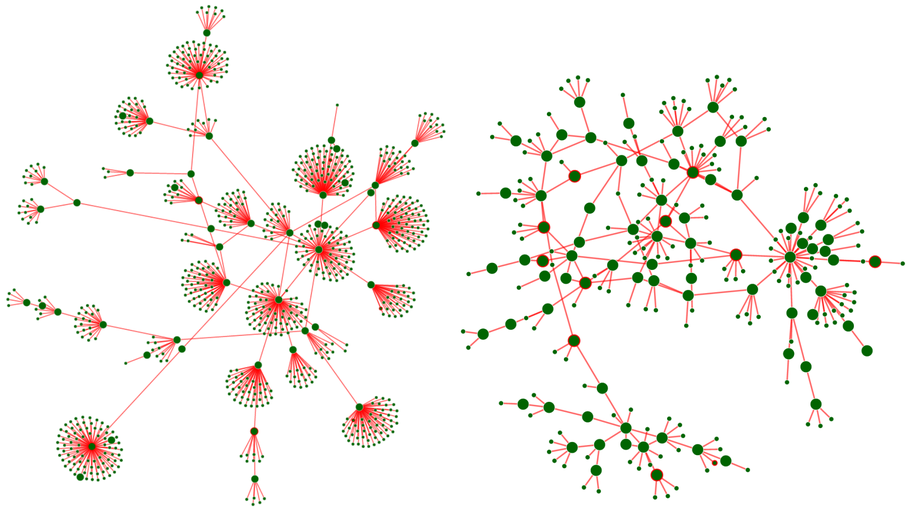
- bandwidth-intensive services
- average bandwidth observed **21.8 Mbps**
- **highly** skewed bandwidth distribution
- link asymmetry: 25% of links have a deviation higher than **40%**
- **re-tuning radios** by members



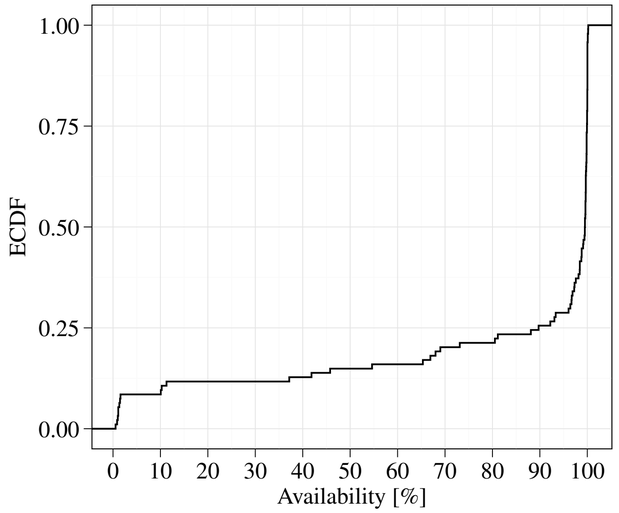
Bandwidth ECDF



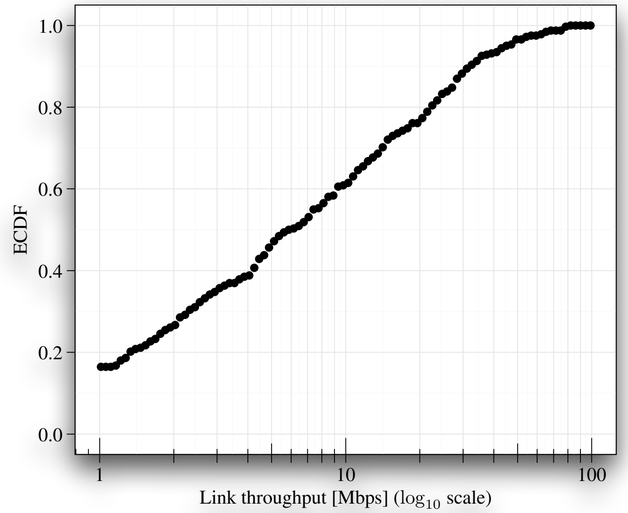
Bandwidth asymmetry



dynamic topology



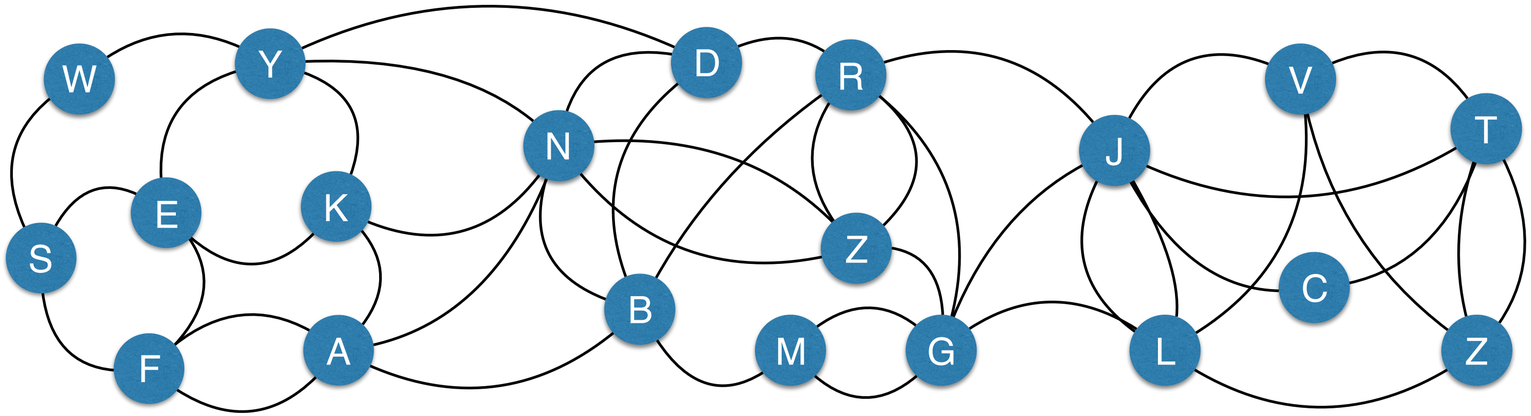
not reachable nodes



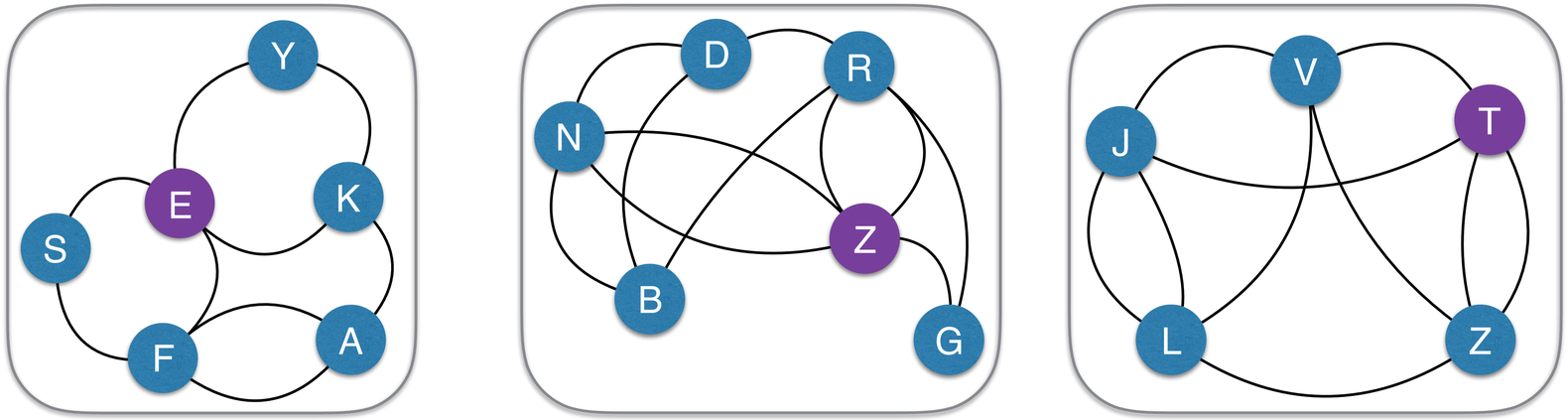
non-uniform resource distribution

Given a community network infrastructure, what is an **effective** and **low-complexity** service placement solution that maximizes end-to-end performance (e.g., bandwidth) ?

Bandwidth and Availability-aware Service Placement (BASP)



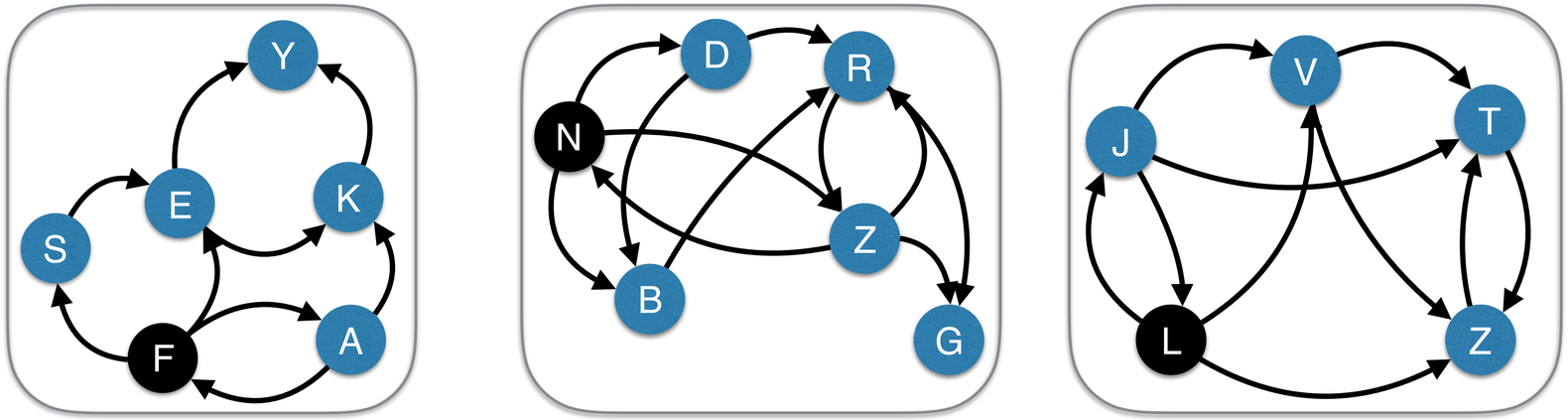
Bandwidth and Availability-aware Service Placement (BASP)



Phase 1: K-Means

- filter out nodes based on availability threshold (λ)
- *k* out of N nodes are selected randomly as cluster centroids
- each of remaining nodes decides its cluster (based on geo-location)

Bandwidth and Availability-aware Service Placement (BASP)

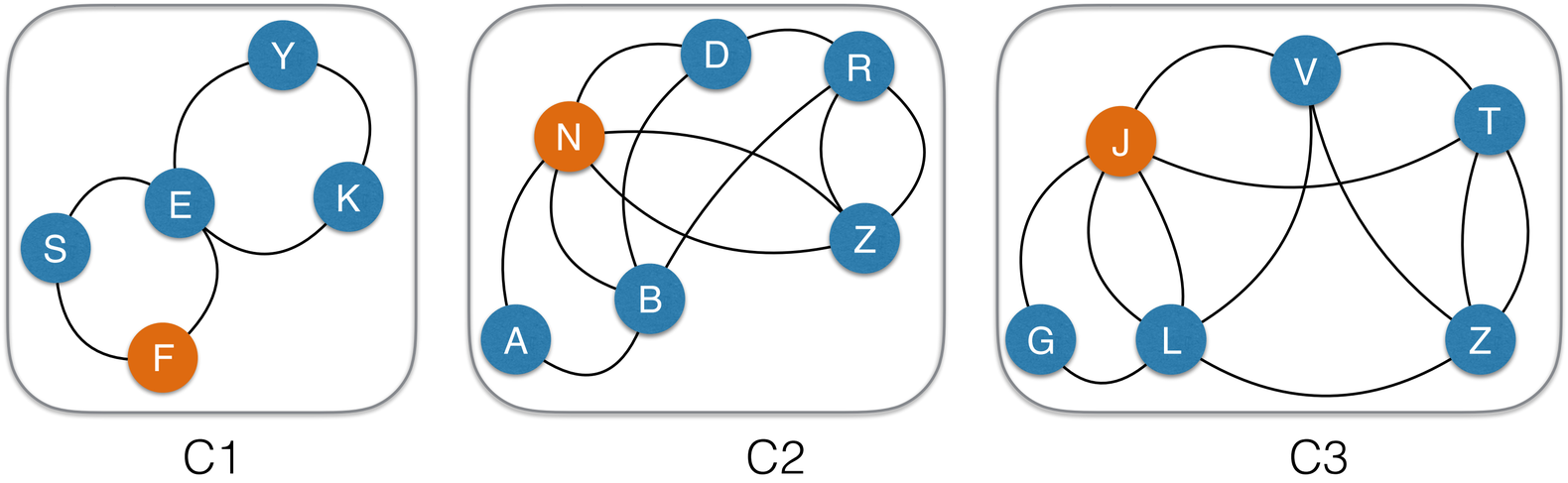


C1 C2 C3

Phase 2: Aggregate Bandwidth Maximization

- bandwidth estimation: min bandwidth in the shortest path
- maximize the bandwidth between the cluster head and other nodes
- assign scores to the nodes, node with max score, cluster head

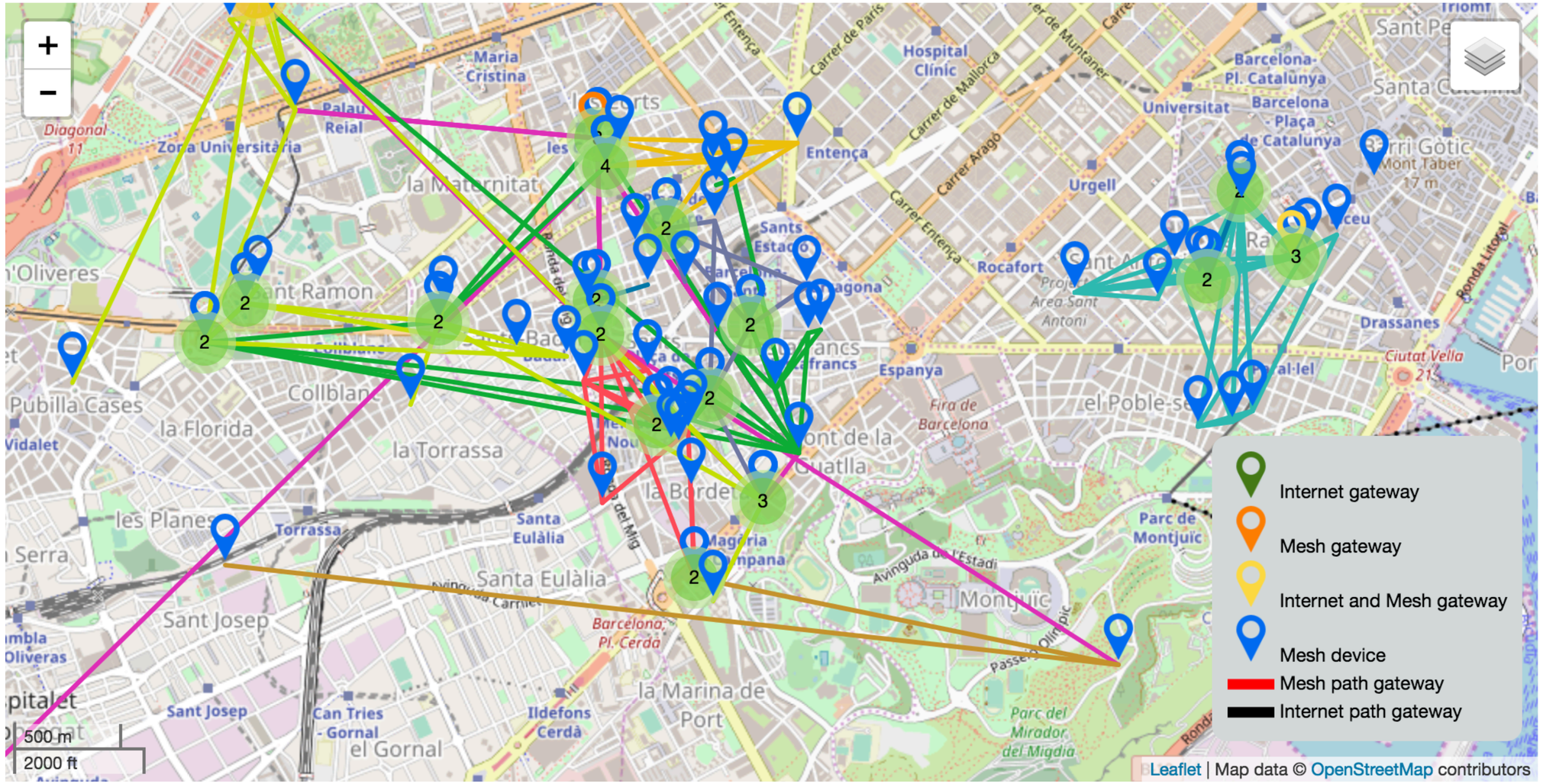
Bandwidth and Availability-aware Service Placement (BASP)



Phase 3: Cluster Re-computation

- geo-location of the nodes not always correlated with their bandwidth
- re-assign the nodes to the cluster heads having the max bandwidth
- re-compute the cluster heads

Deployment Testbed: qMp Network



Thank you !

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