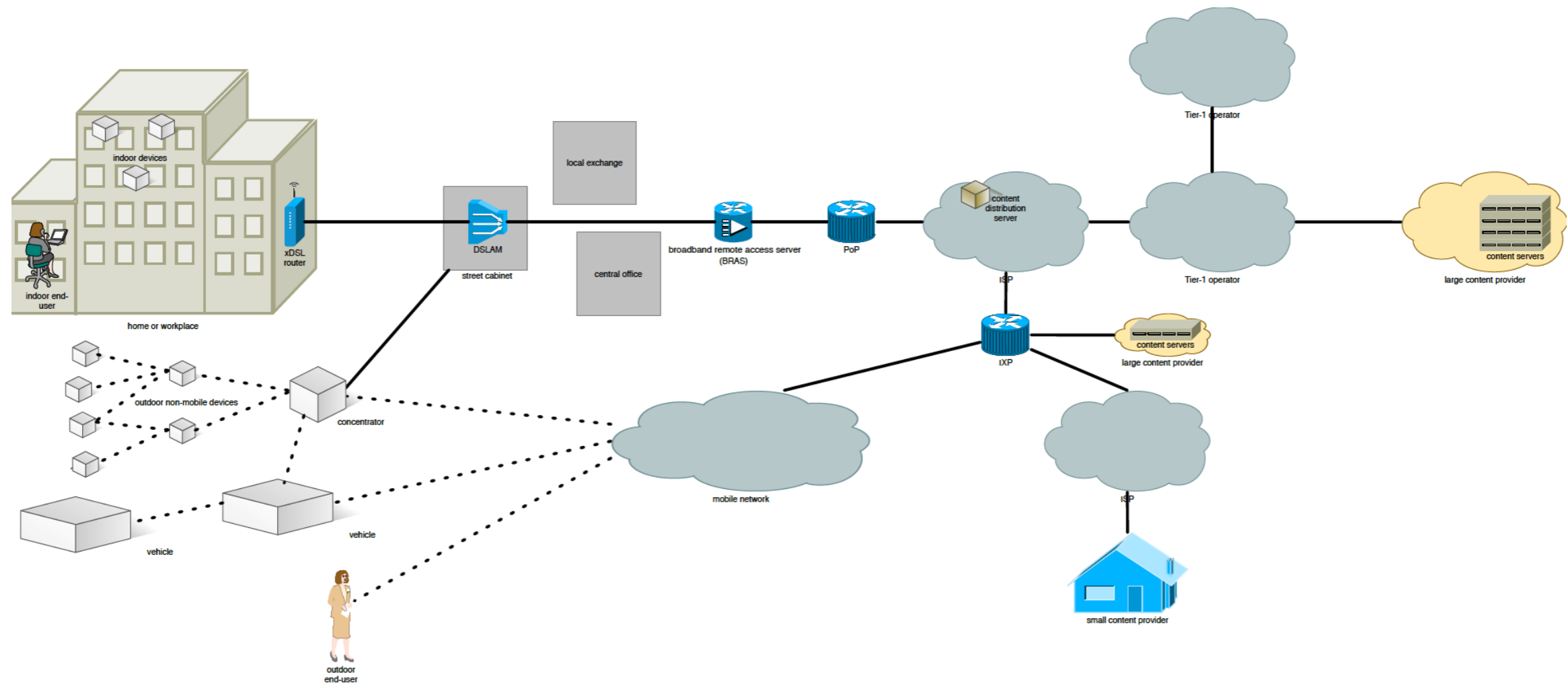# SMART 2012/0046
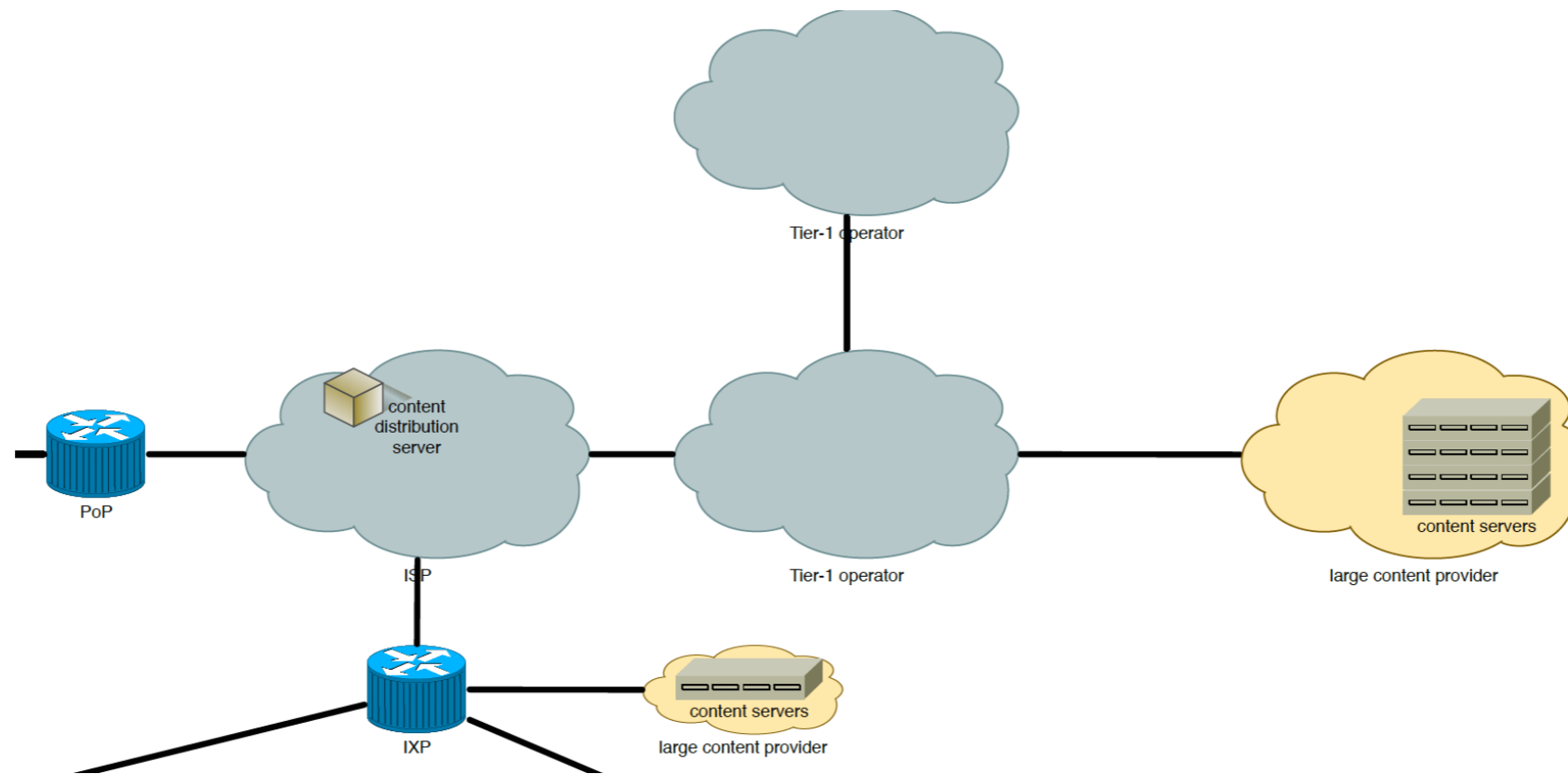# Study on European Internet Traffic and Analysis

Draft
Conclusions and Recommendations
April 22, 2015
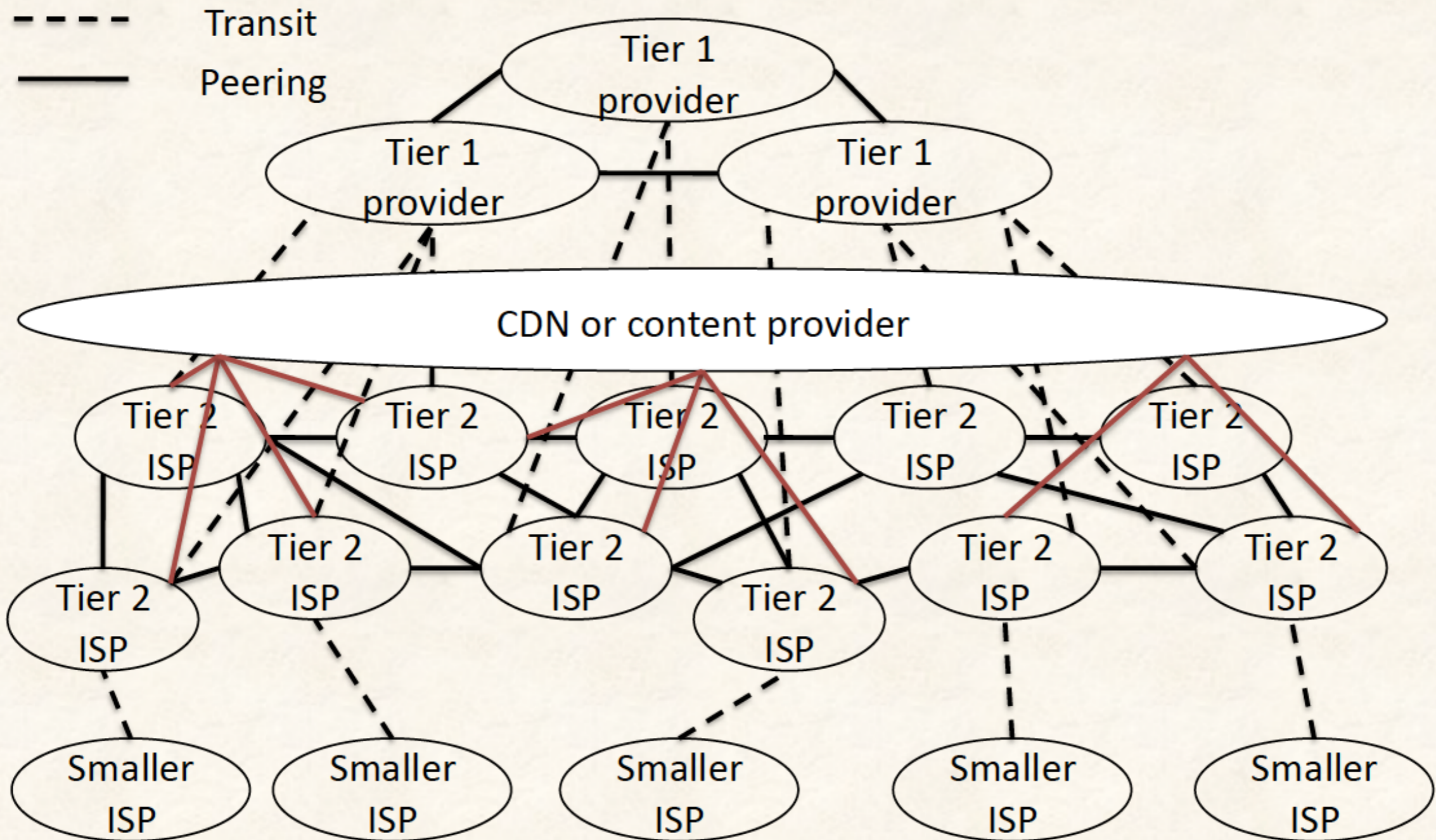
The Internet is a complicated, heterodox world

Best current and comprehensive survey:
V. Bajpai and J. Schoenwaelder, to appear in
IEEE Communications Surveys and Tutorials, 2015

Tier-1, Large and Small TSPs,IXPs,CDNs…

Traditional hierarchical picture breaking down
Internet "flattening" requires sharing, heterogeneous monitoring

Interconnection of CDN

Transparency:
Seeing into the net
End-to-end problem resolution?

- AKAMAI, and other widely dispersed CDNs, see what they need, but the information is proprietary

- PerfSONAR is public, several 100 core nodes with active and passive measurement tools, but confined to the scientific data pathways

- CAIDA/RIPE approach gives topology, and near-far RTT comparisons to carefully selected AS-AS links

- MLab profiling cross-checks throughput between carefully selected pairs of ISPs and TSPs, one layer from the end-user

# Home, Office and Small Business
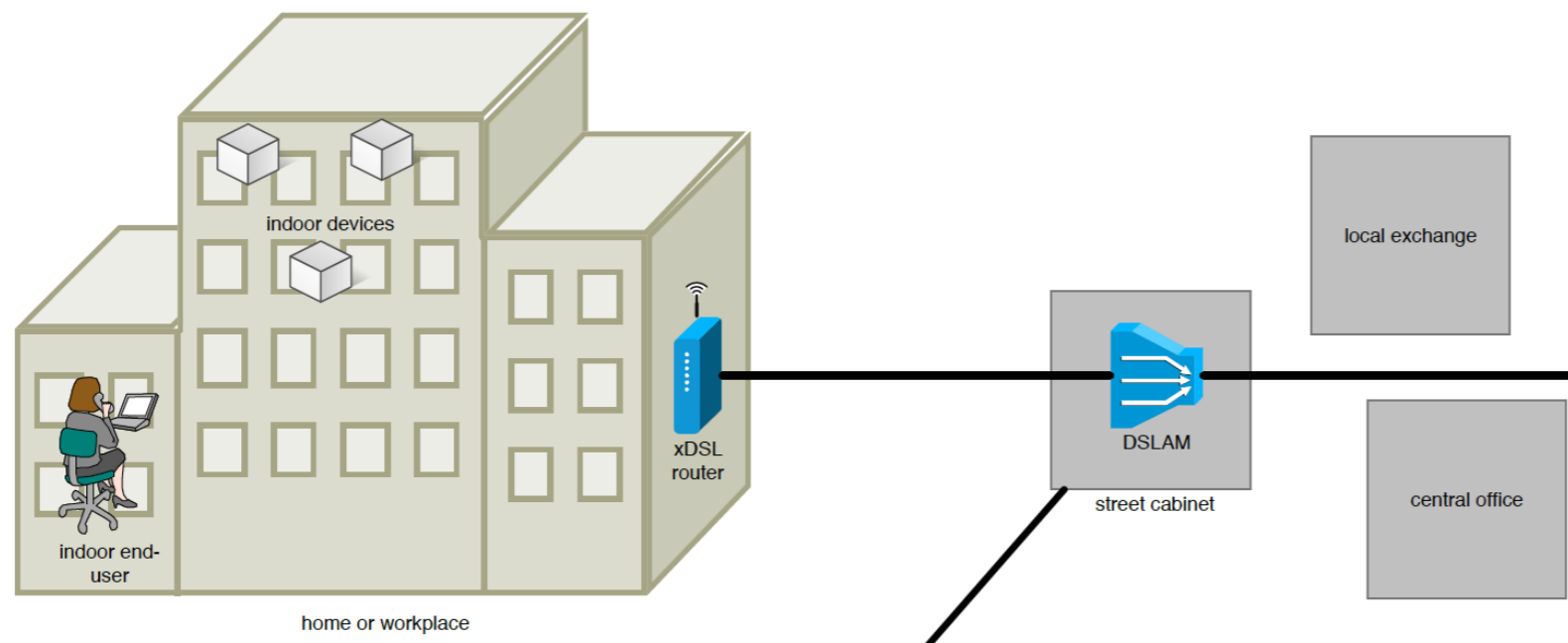
User-initiated performance monitors

Edge and always-on monitors

Monitoring from the home and office

- Issues in where to measure from, to reduce contention

- Issues in how to measure —

  - user-initiated or background

  - software in the home network, or firmware at the edge

- Solutions now fairly widely deployed (10-100K units worldwide) and easier to keep active than in the past

- Public awareness and feedback is positive

- But still seen only as keeping the access ISPs honest and competing

Wireless: Mobile and IoT
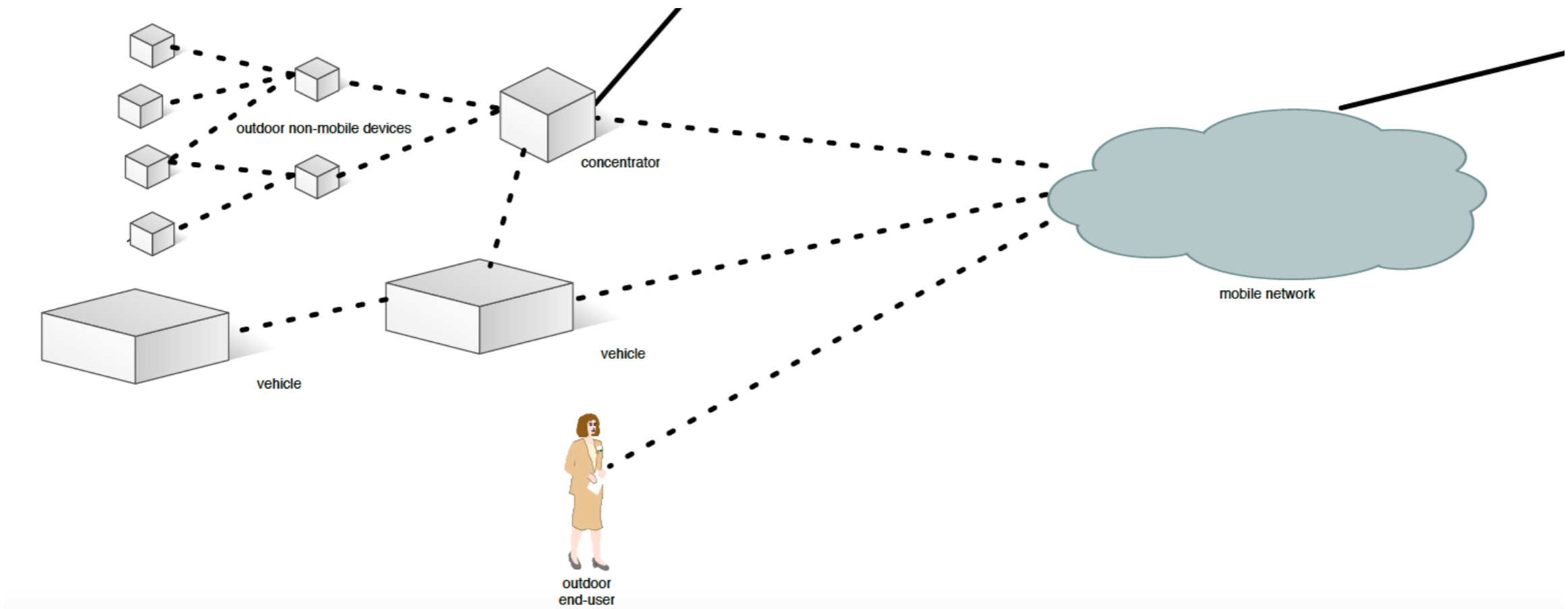
Wireless monitors are extensive, ubiquitous
— they are every cellphone

IoT growing fast, but in separate "silos,"
 measuring mostly power consumption

Mobile networking studies

- Mobile defines the greatest population of end-users

- Extensive use for human mobility and social impact studies

- SamKnows now deployed "altruistically" in the US

- WeFi deployed "cooperatively" in EU, US

- Potential to see paths to all present and popular web services with highly distributed workload.

Standards Efforts

- Vendor-specific tools have evolved incompatibly

  - Have not addressed end-to-end information sharing, debugging

  - Several parallel efforts in progress to alleviate

    - IETF, ITU

- Regulators need QOS, QOE, KPI quantifications of characteristics that end-users will care about

- Layer 2 and emerging networks (IoT) not addressed

Recommendations

- Interoperability, standards required for end-to-end transparency

- Certification of measurements for regulators, SLAs to become effective

- Privacy issues

- Observers should be everywhere

  - Automation, scheduling, archiving and analysis

  - Overcome the dense jungle of the interior of the internet by maximizing observability across all paths that end-users care about.