Julius-Maximilians-
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Institute of Computer Science
Chair of Communication Networks
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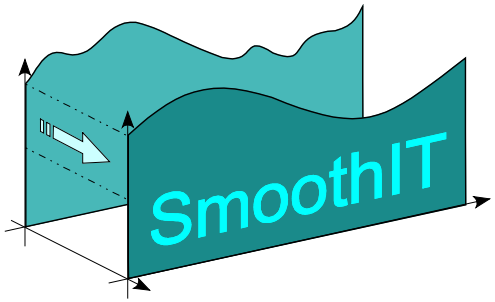
Locality-awareness in BitTorrent



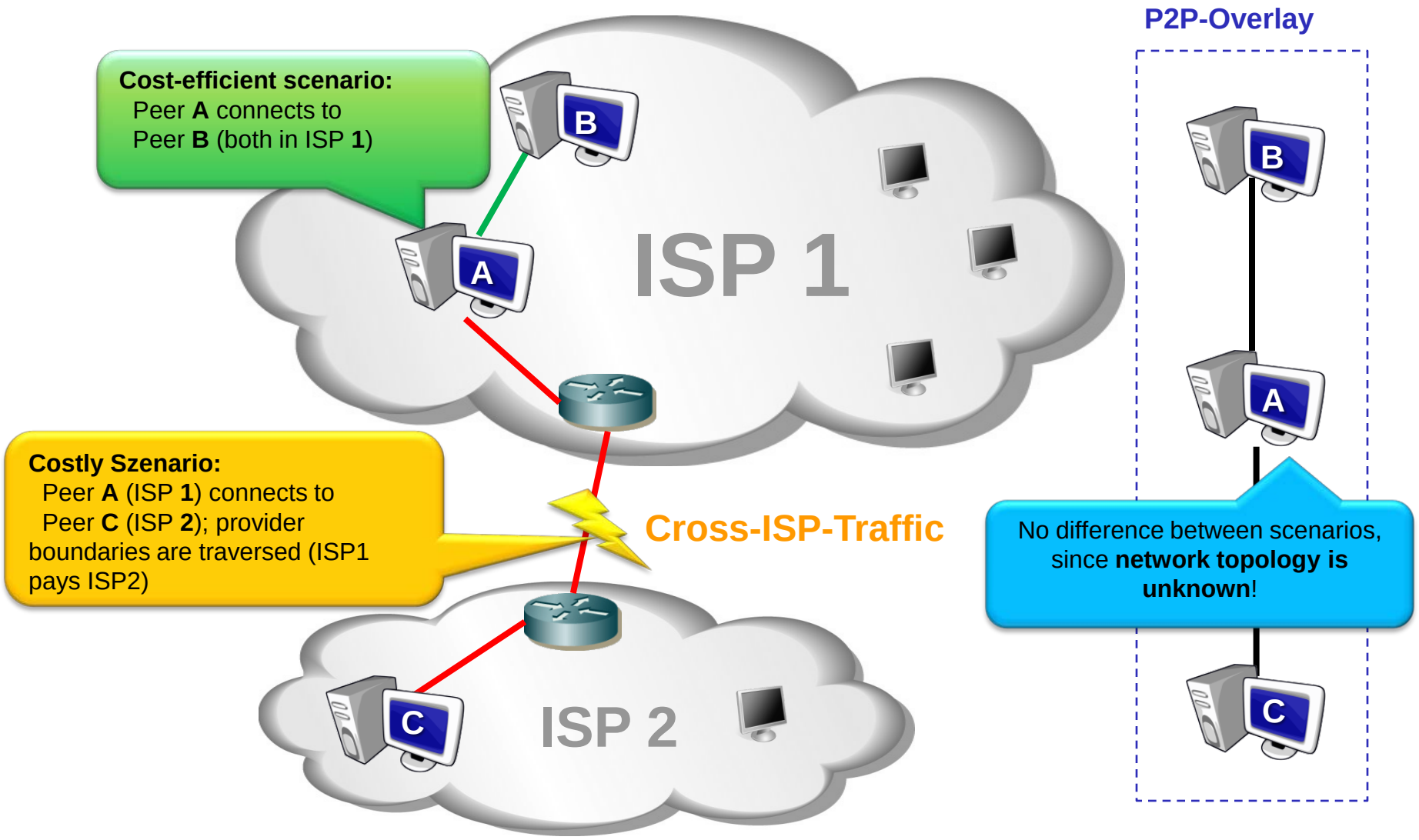
Simon Oechsner

24.11.2010

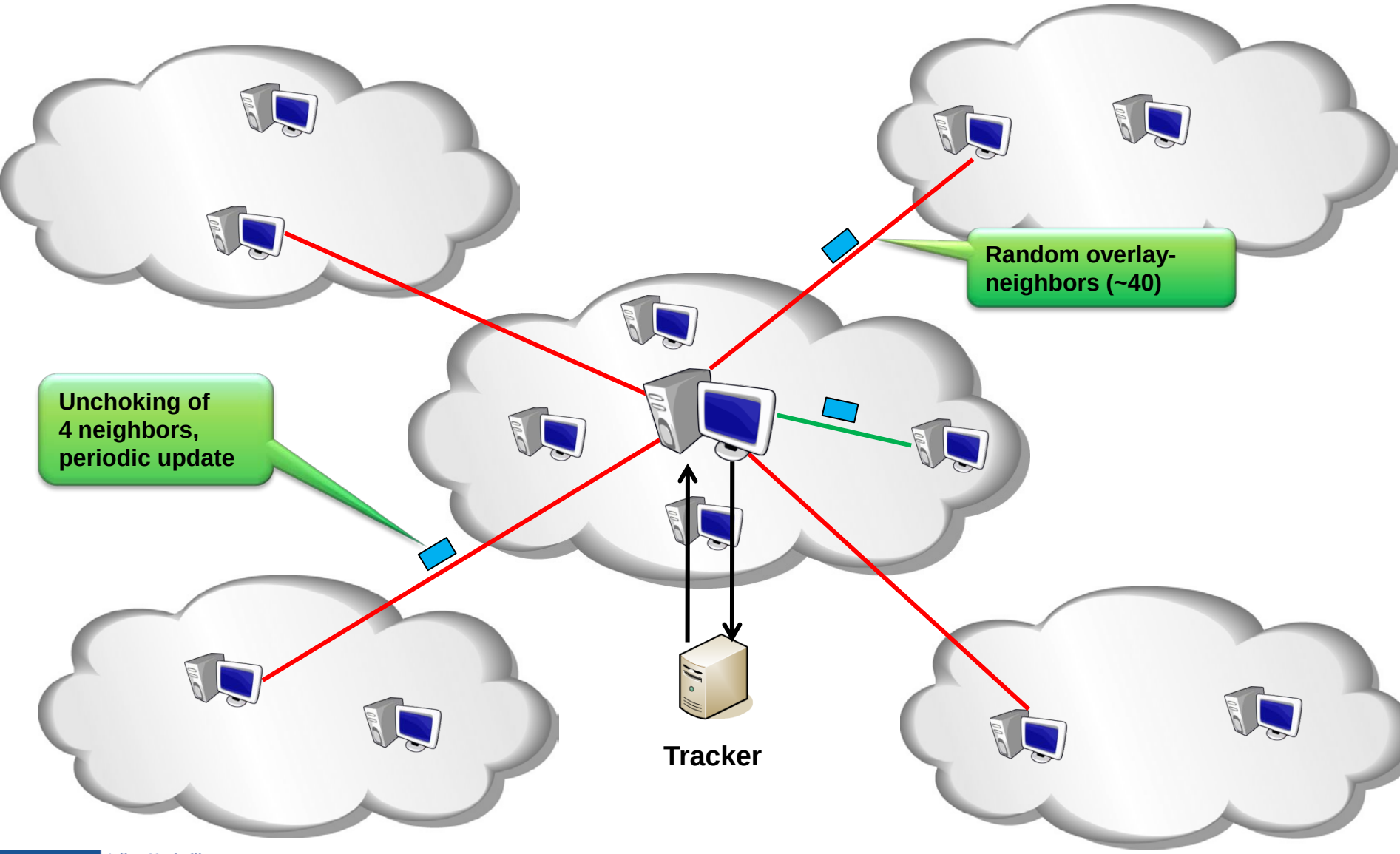
Agenda

- Problem statement: cross-ISP traffic
- Evaluated Application: BitTorrent
  - The most important mechanisms…
  - …and their adaptations for locality awareness
- Evaluation methodology
- Results for different scenarios
  - Homogeneous peer distribution
  - Heterogeneous peer distribution
  - Heterogeneous access bandwidth
- Summary & Conclusions

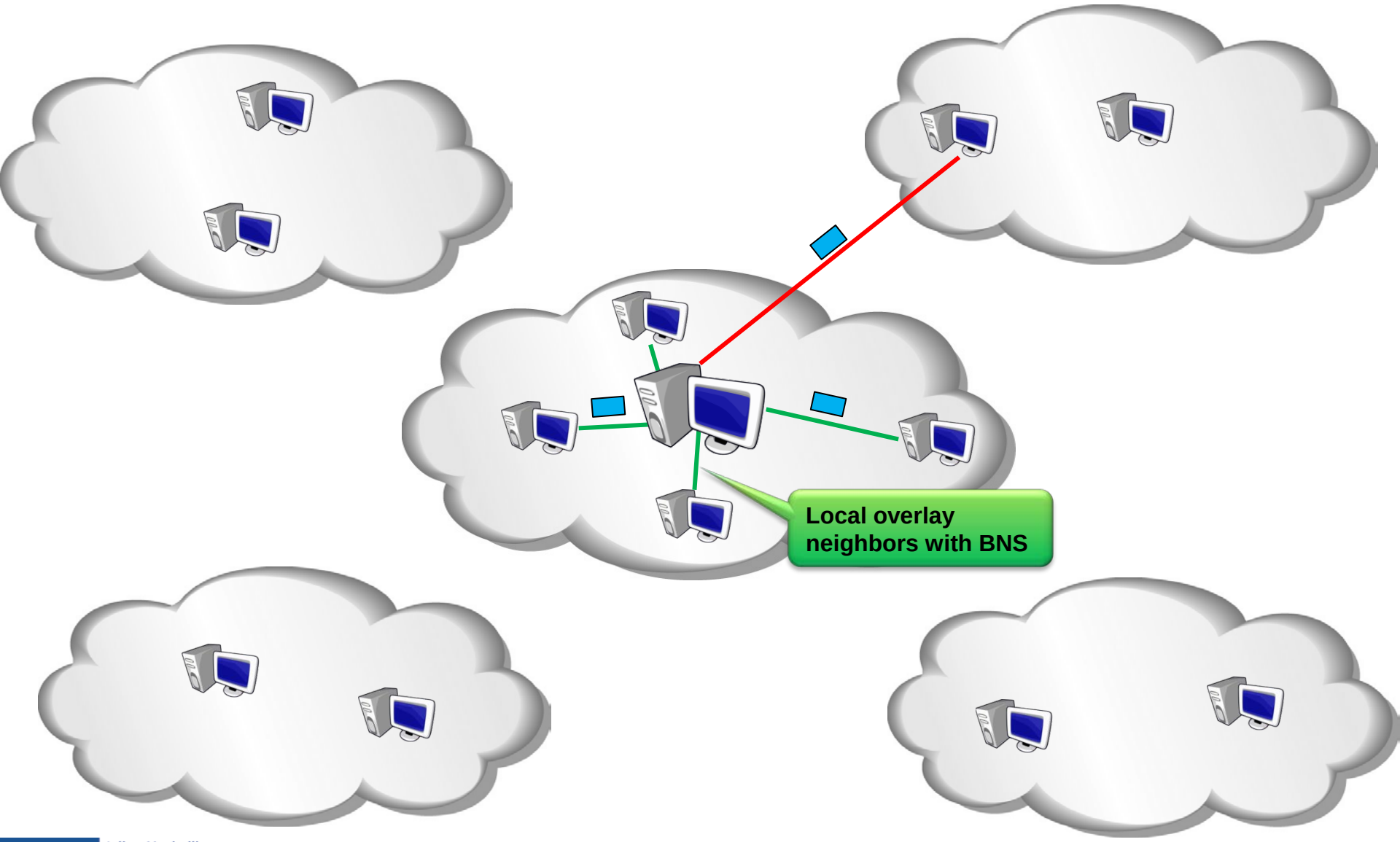
Problem Statement: Cross-ISP Traffic



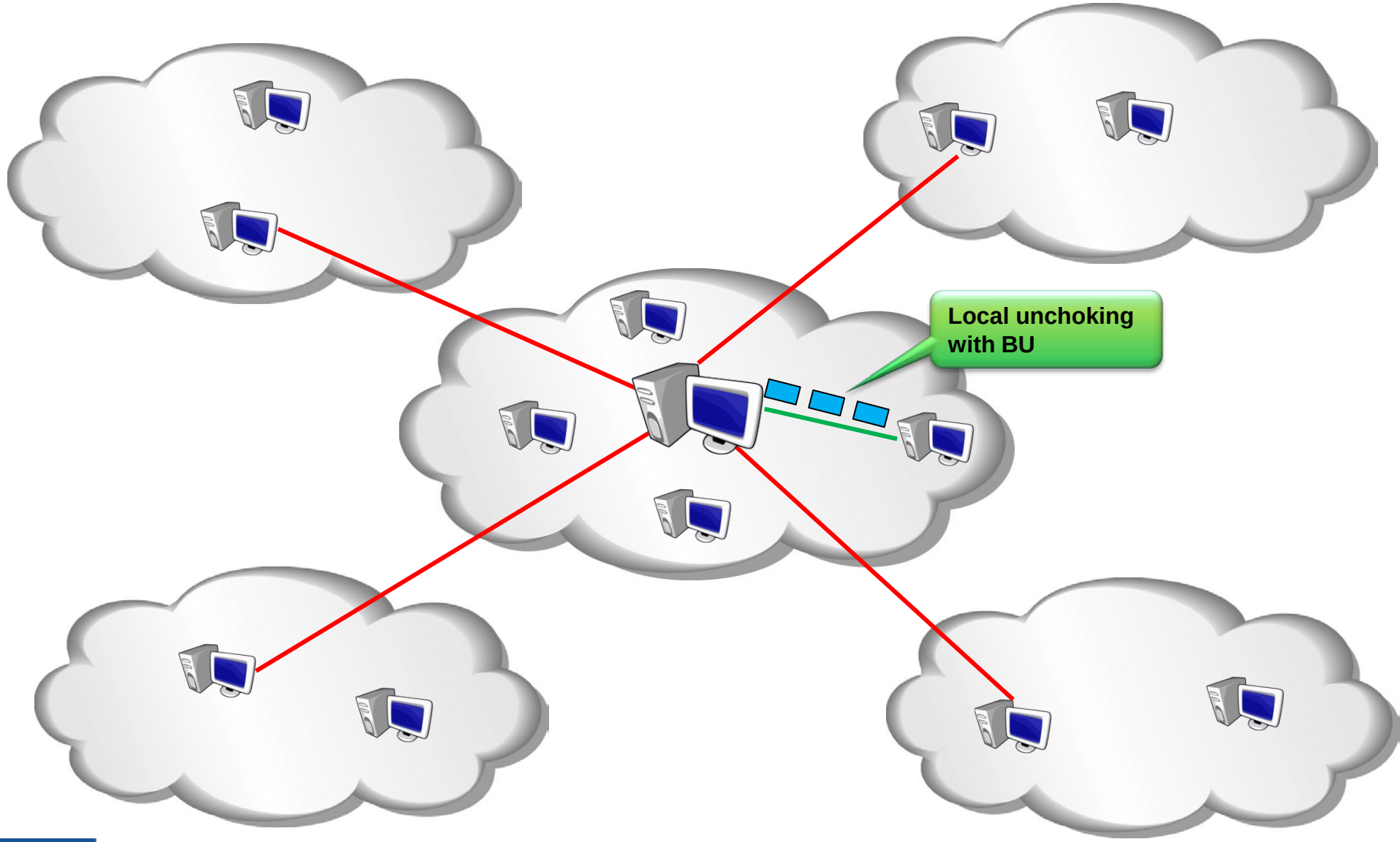
BitTorrent


Random overlay-neighbors (~40)
Unchoking of 4 neighbors, periodic update
Tracker

Biased Neighbor Selection

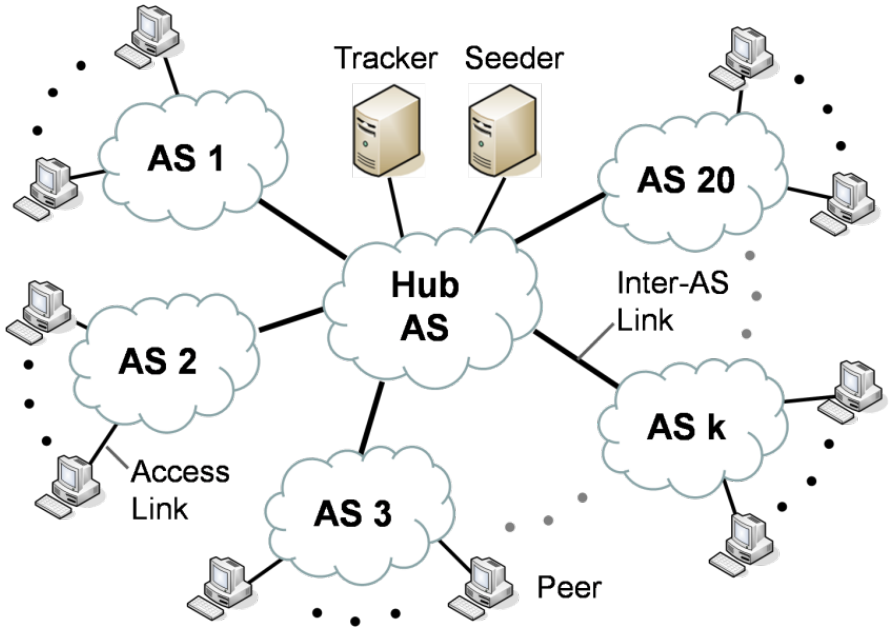


New Algorithm: Biased Unchoking



Evaluation Methodology

- Simulation study based on
  - ProtoPeer framework
  - BitTorrent library
- Simulated scenario
  - Single swarm
  - Shared file of size 150 MB
  - Access bandwidth of peers: 1 Mbit/s up-, 16 Mbit/s down
- Steady-state analysis
- Measurements
  - Download times
  - Inter-domain traffic
- Swarm size: around 120 to 200 peers concurrently online, approx. 2300 peers/simulation



Network topology with 20 autonomous systems (ASes)

Peer Distributions

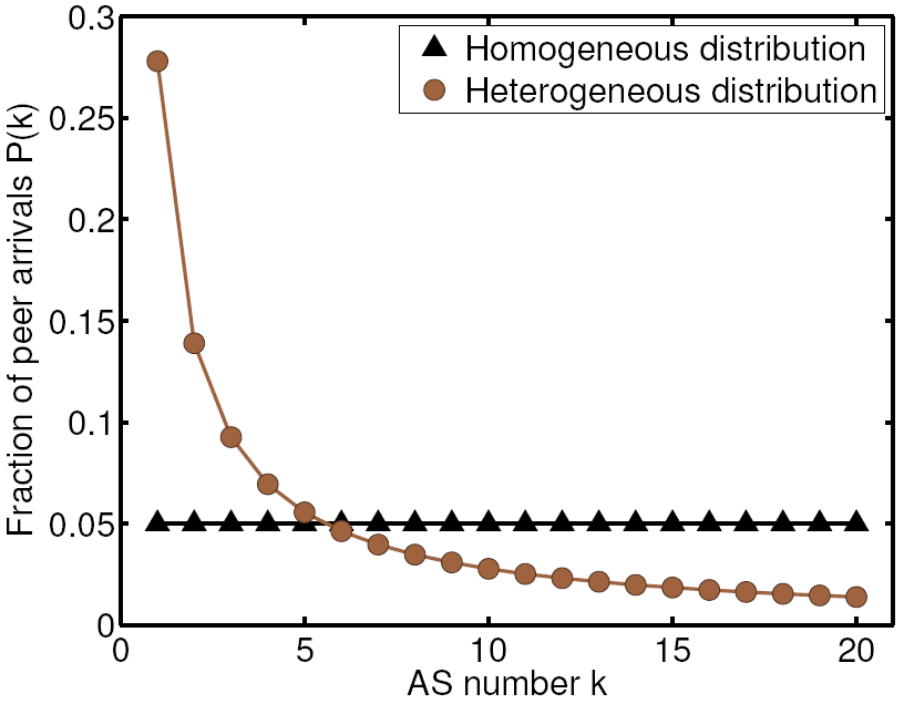
- Fraction of peer arrivals P(k) in the k-th largest AS of a swarm

- Homogeneous distribution
  - Used in most related studies
  - Leads to a win-no lose situation for ISPs and P2P users

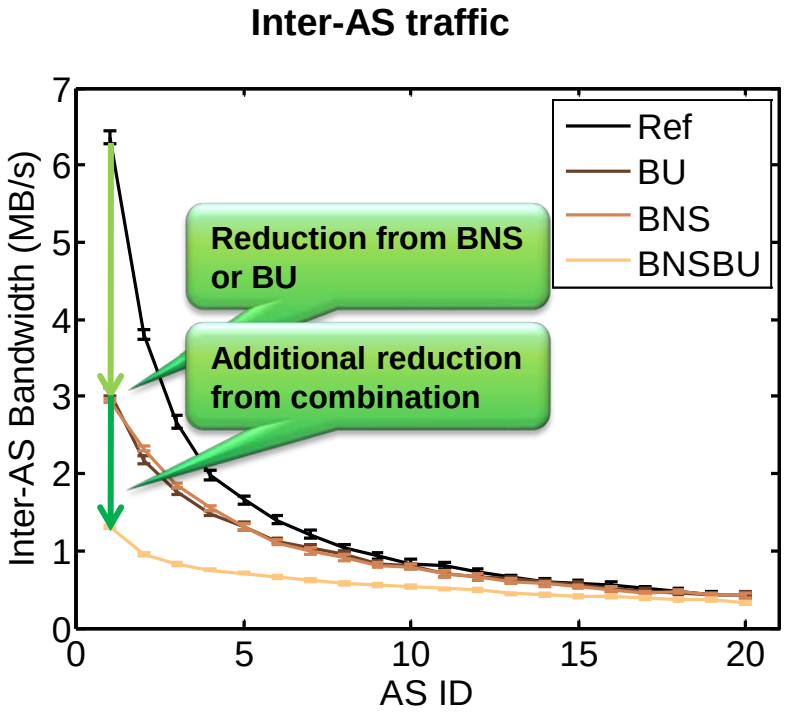
- Heterogeneous peer distribution
  - Measured in different studies (Hoßfeld et al., Wang et al.)
  - “Common denominator”:

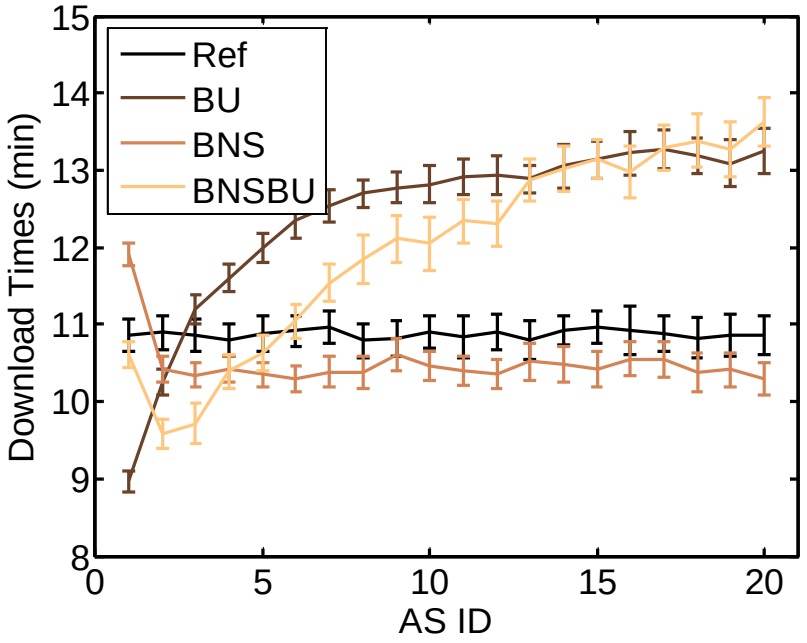
$$P(k) = \frac{1/k}{\sum_{i=1}^{n} 1/k}, k \in \{1, \ldots, n\}$$

  - Leads to different results



Results for Heterogeneous Peer Distributions

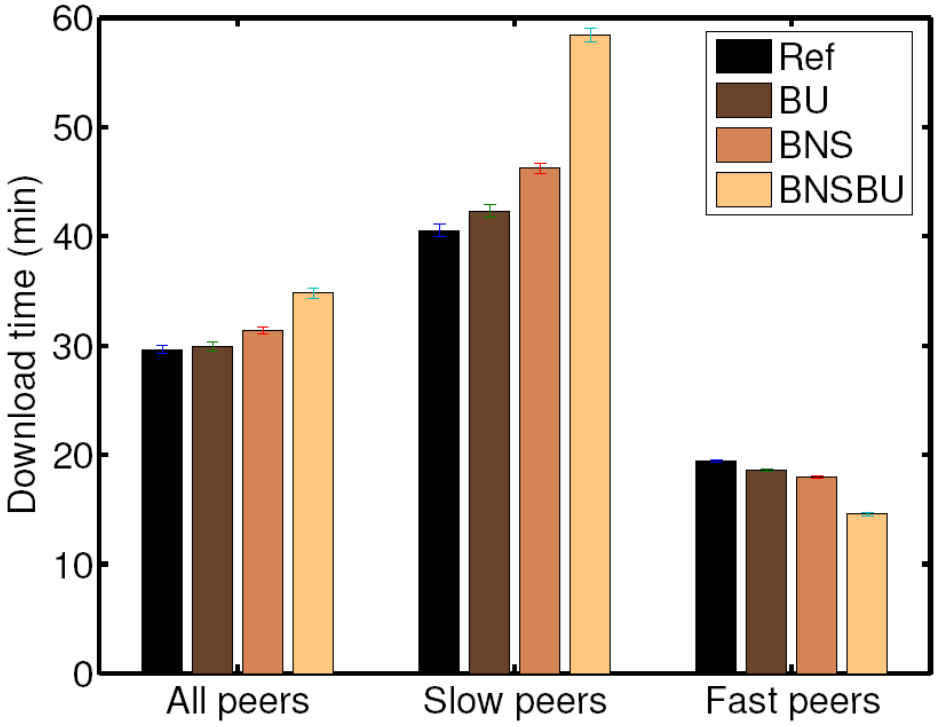




- High reduction of inter-AS traffic
  - Improvement on the effects from BNS with BU
- Pure locality-awareness leads to unfair download times

Impact of Heterogeneous Access Bandwidth

- Scenario
  - Homogeneous peer distribution over the 20 ASes
  - 10 ASes with fast peers (1 Mbit/s up, 16 Mbit/s down)
  - 10 ASes with slow peers (256 kbit/s up, 4 Mbit/s down)
- Locality-awareness
  - Increases the performance of the fast peers
  - Decreases the performance of the slow peers
  - Decreases the average performance of all peers



Average download times of all/slow/fast peers

Conclusions

- Inter-AS traffic is problematic due to its amount and cost impact
- Locality-awareness is one generally accepted solution for this
  - We developed BU in addition to the existing BNS
- The straightforward approaches lead to mixed results in heterogeneous scenarios
  - Result of a simulation study based on extensive BT measurements
- Countermeasures feasible without sacrificing too many benefits
  - Example: AS grouping