Using Randomness to Reduce Inter-domain Forwarding State

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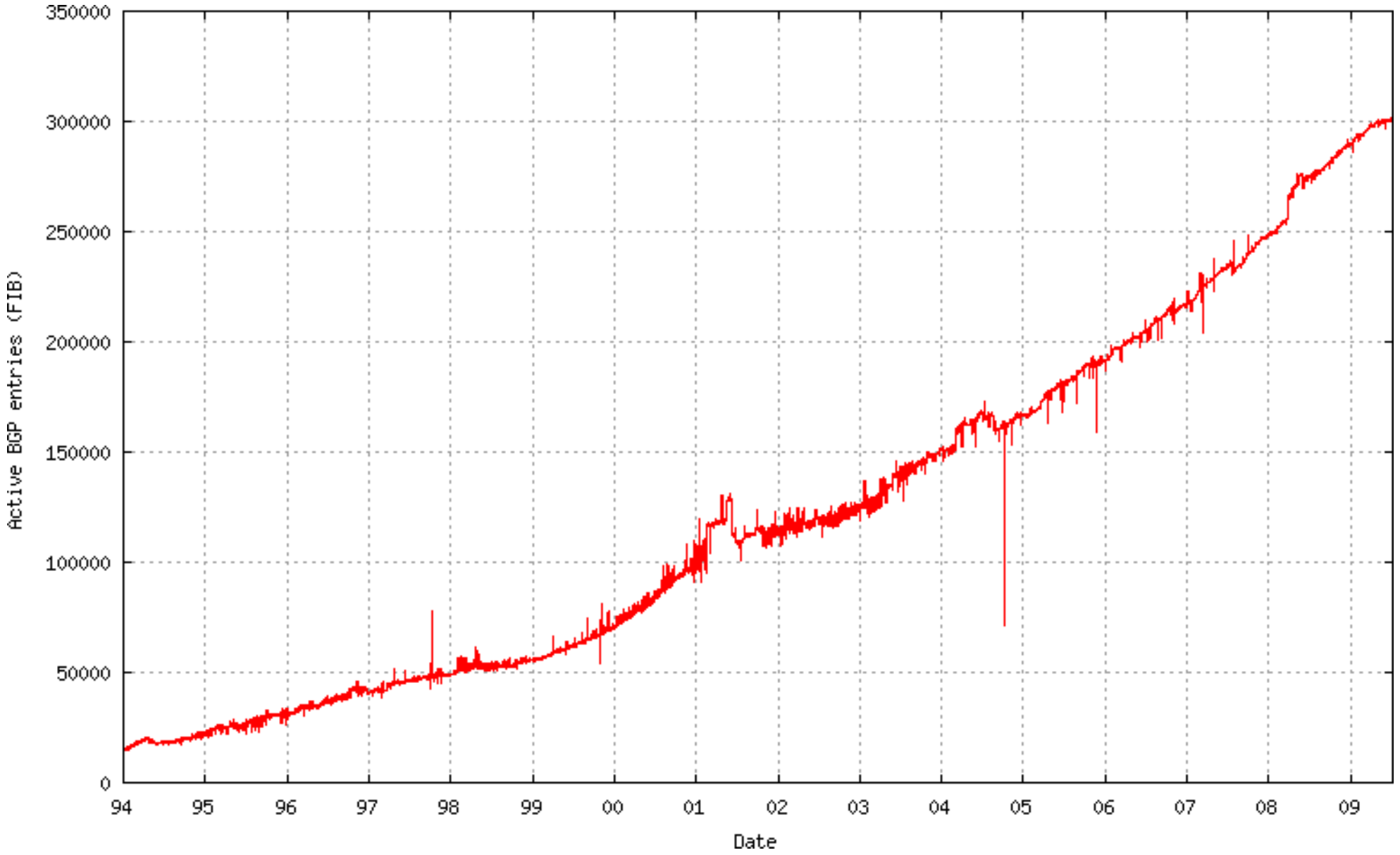


Image source: http://bgp.potaroo.net/as6447/

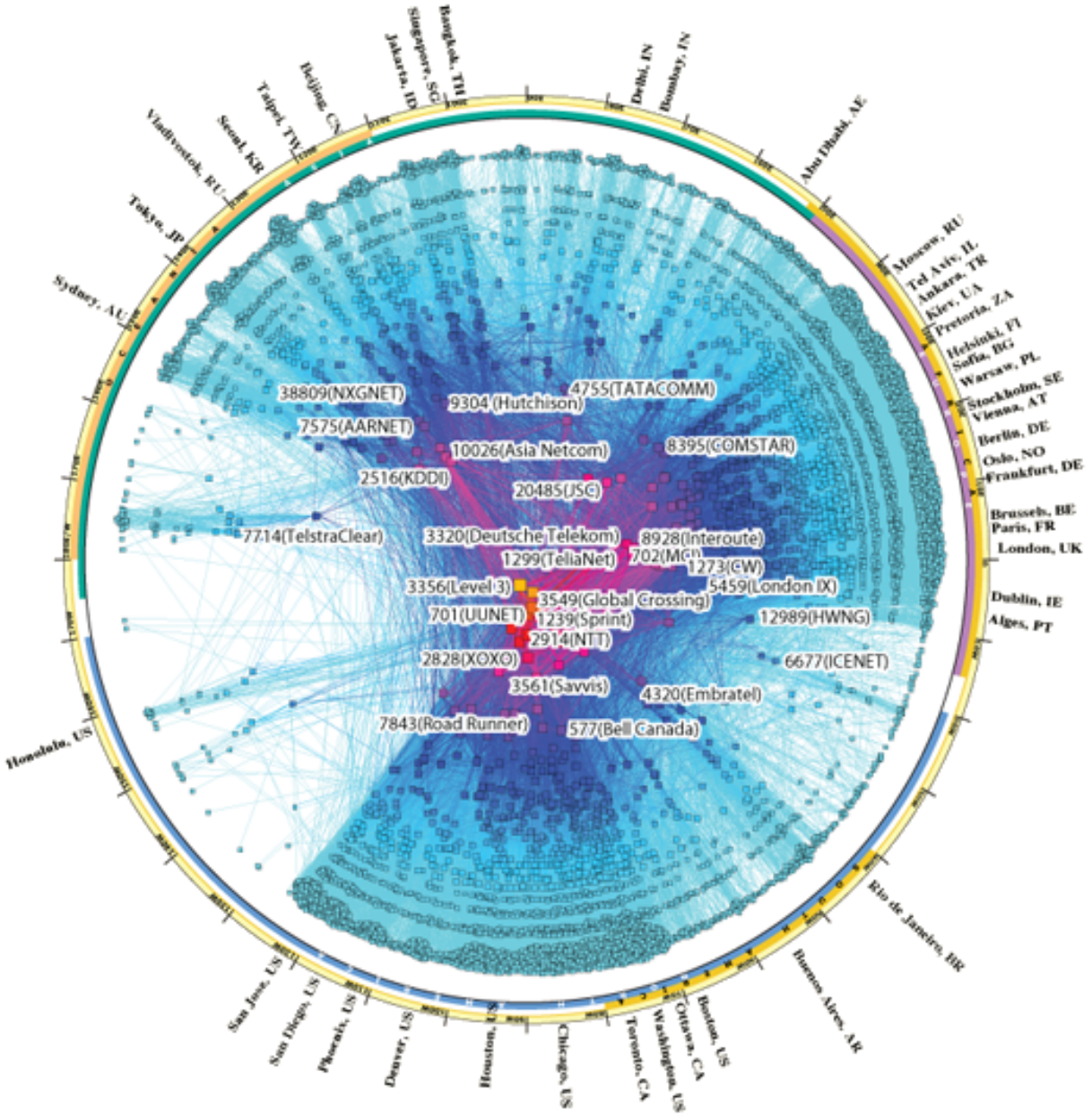
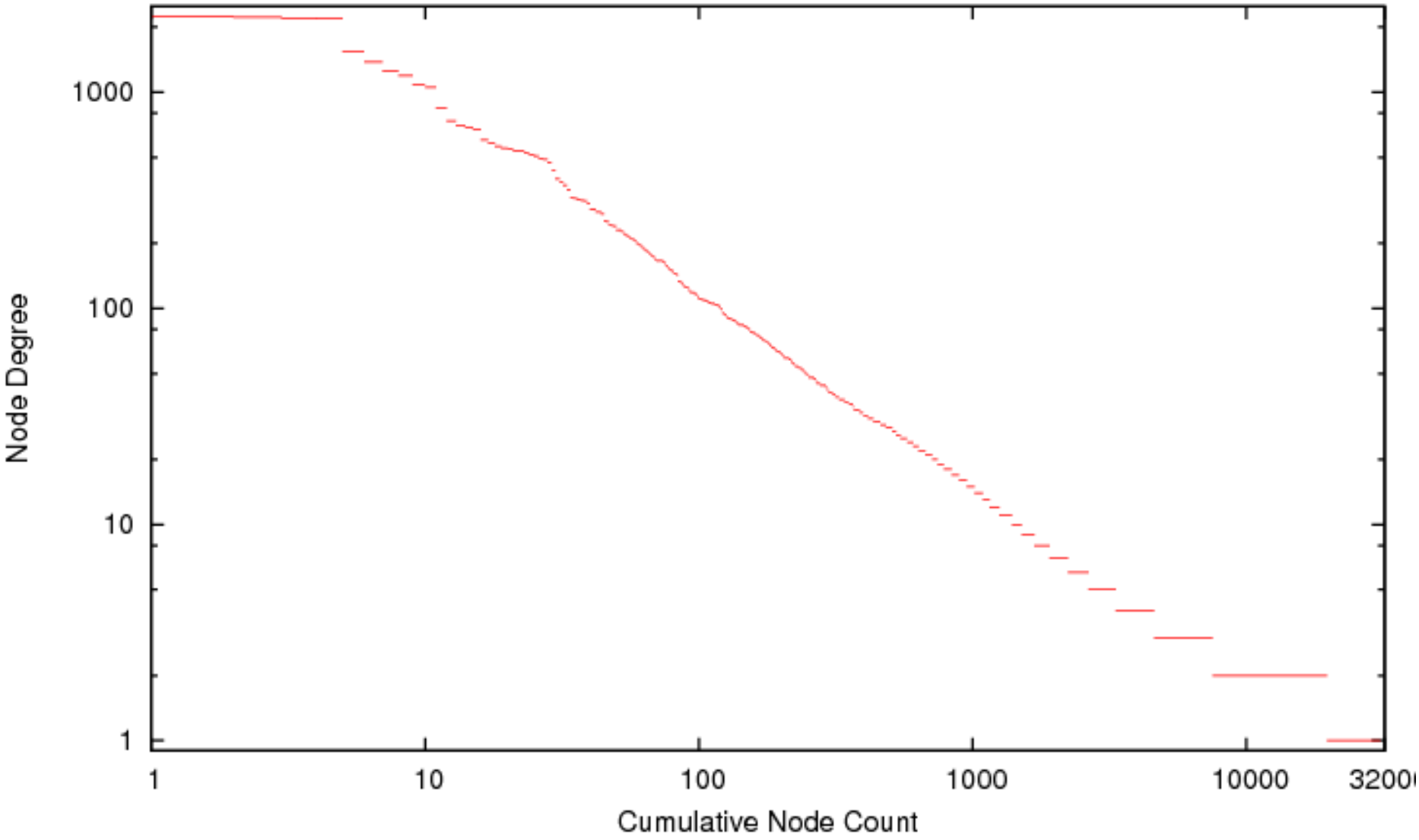
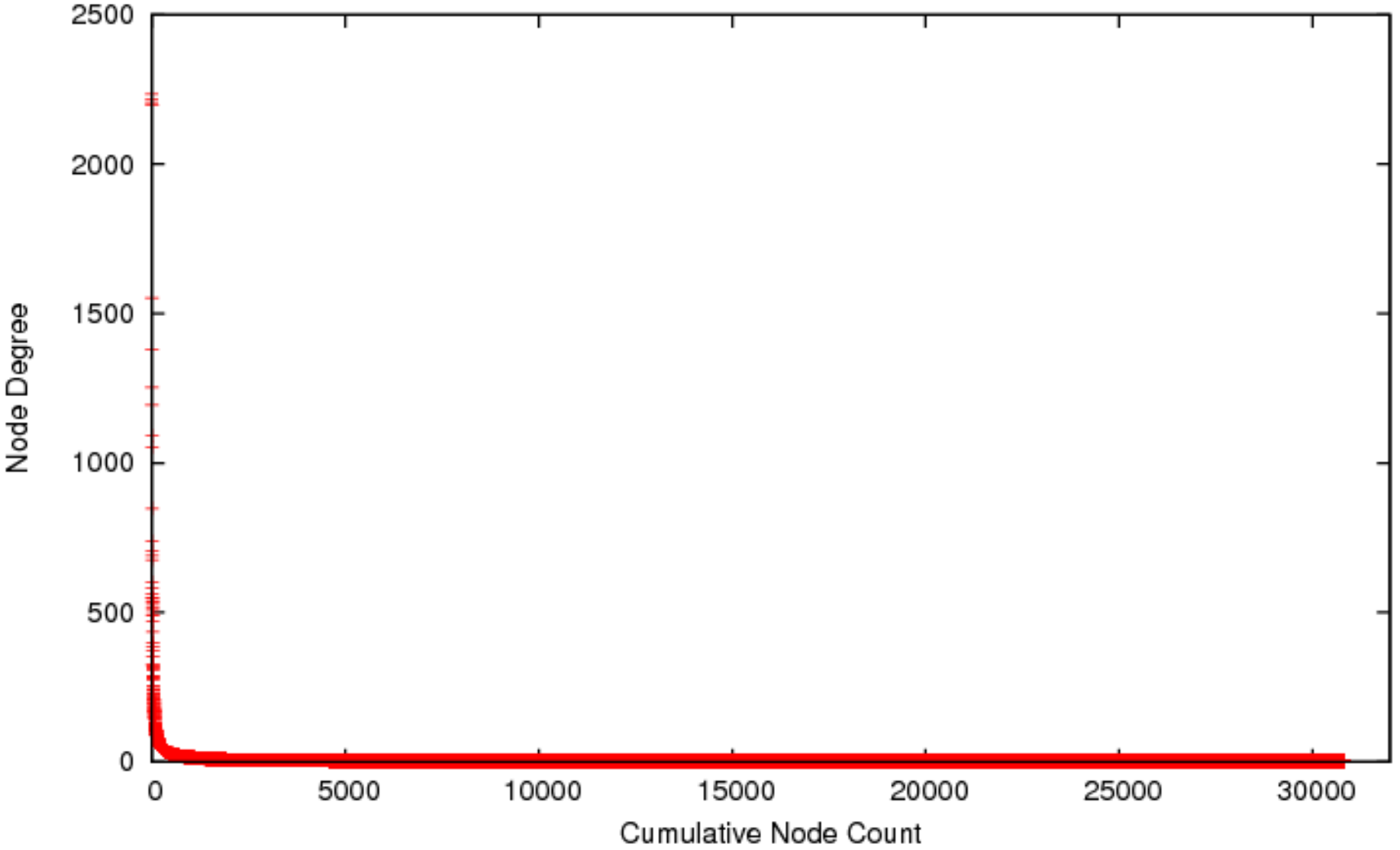


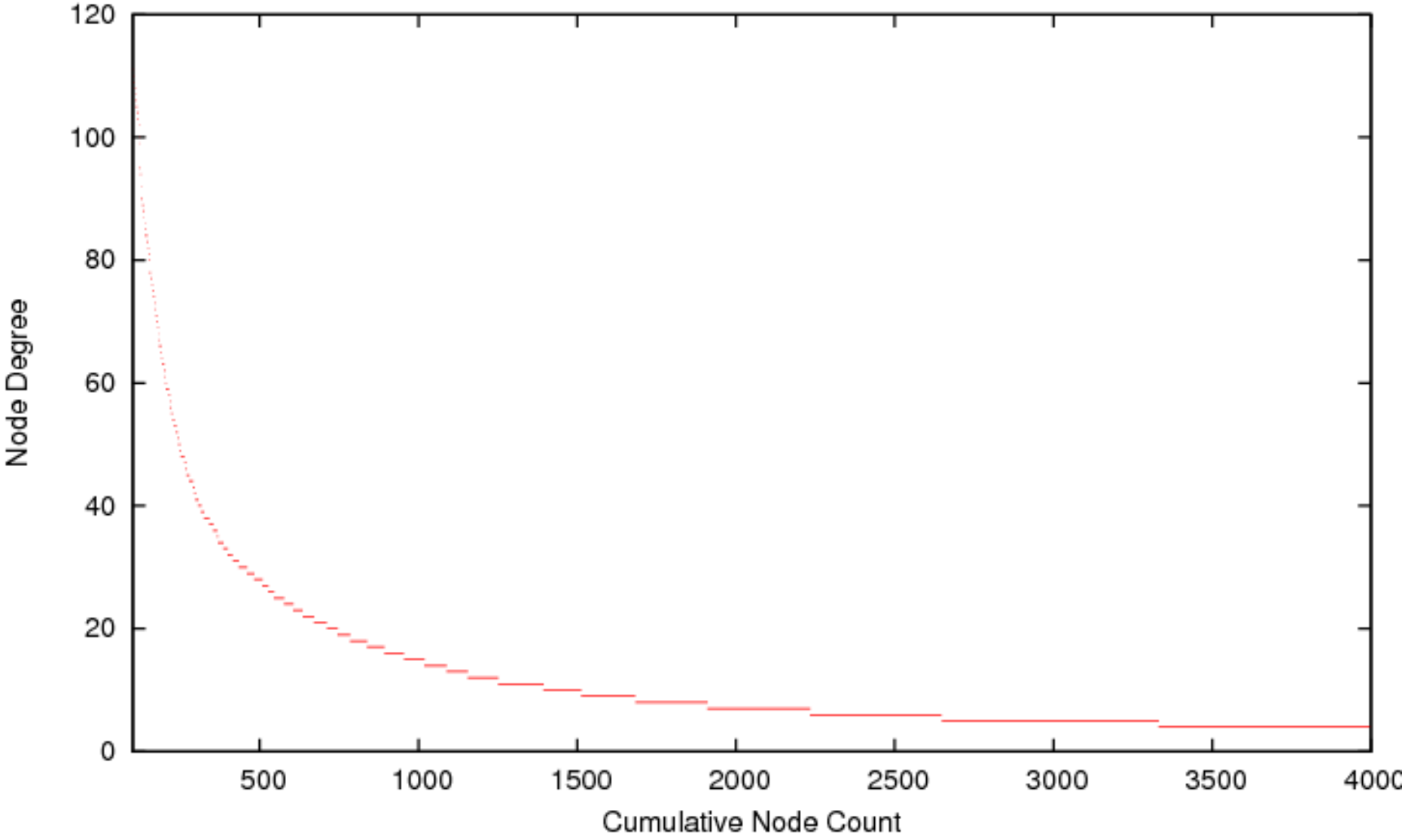
Image source: http://www.caida.org/

Suggests

- To maintain this, the level of connectivity must be increasing
  - i.e., the number of interconnections between ASes must be rising


Node Degree
1000
100
10
1
1
10
100
1000
10000
Cumulative Node Count


2500
2000
1500
1000
500
0
Node Degree
0
5000
10000
15000
20000
25000
30000
Cumulative Node Count


120
100
80
60
40
20
0
Node Degree
500
1000
1500
2000
2500
3000
3500
4000
Cumulative Node Count

Intuition

- Lots of connections between transit networks...
- Network might function surprisingly well with a deliberately-reduced volume of forwarding state in these ASes?

Proposition

- Randomise (some) forwarding decisions to reduce forwarding table size...

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- On receiving a BGP update
  - if path length > 1, make a decision re: whether to include route in FIB

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- On receiving packet, perform longest prefix matching
  - If match found, forward as normal
  - Else, choose random output port (!incoming)

Theory

- Forwarding table size and network path length are two opposing constraints
  - If you remove some state, you affect mean path length between pairs of points.

Ongoing

- Investigation of the effects on network path stretch w.r.t. the volume of state deliberately removed from the routing system using real data
  - AS relationships graph
  - Prefix-to-AS mappings
- Currently: Building a highly distributed simulator to experiment and analyse these algorithms using real models

Problem?

- This isn't immediately compatible with policy-based routing...

Questions?

- Contact: sds@dcs.gla.ac.uk
- Plenty of background if you google Geoff Huston or Dimitri Krioukov
- Lots of other related stuff: ID/Loc; LISP; Compact Routing; esoteric ideas like routing on flat labels, etc...