Evolution of core-periphery structure in Internet's AS-level topologies

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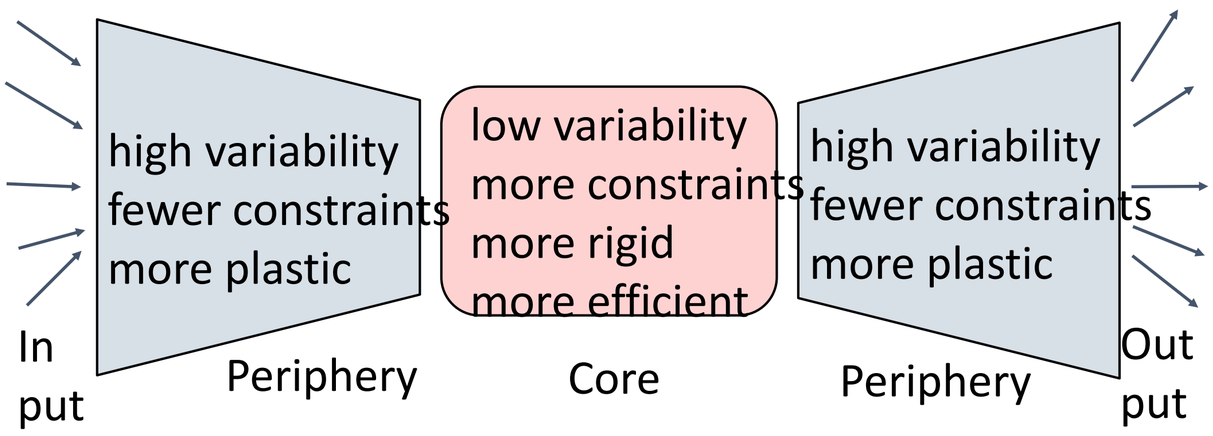
Introduction

- **Complex behavior on the connectivity of the Internet.**
  - The Internet is becoming larger against the increase of traffic.
  - Each of Autonomous Systems (ASes) selfishly selects a set of ASes to connect.
- **Many studies investigate changes of several graph metrics.**
  - It is important because they characterize a networking performance.
  - But it won't contribute to understand the complex behavior of way of the information exchange.
- **We extract the core of the Internet through "Core-Periphery" model.**
  - the core is defined as ASes that play a central role for information exchange.

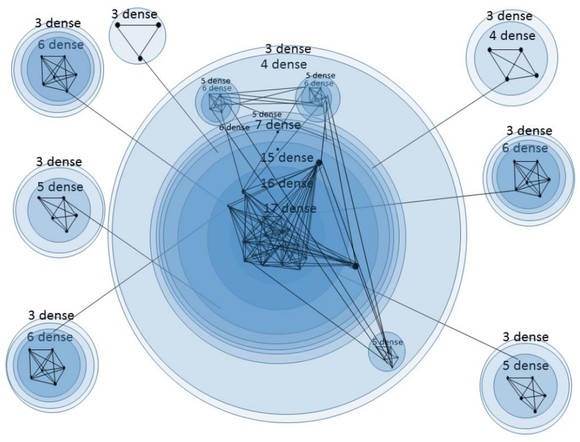
Core-periphery model

- **The core-periphery model distinguishes a system into a core part.**
  - Core has lower variability and is efficient.
  - Periphery has higher variability to absorb environmental changes.
- **Our focus is to reveal the core ASes.**
  - They are rigid during the evolution of the Internet.

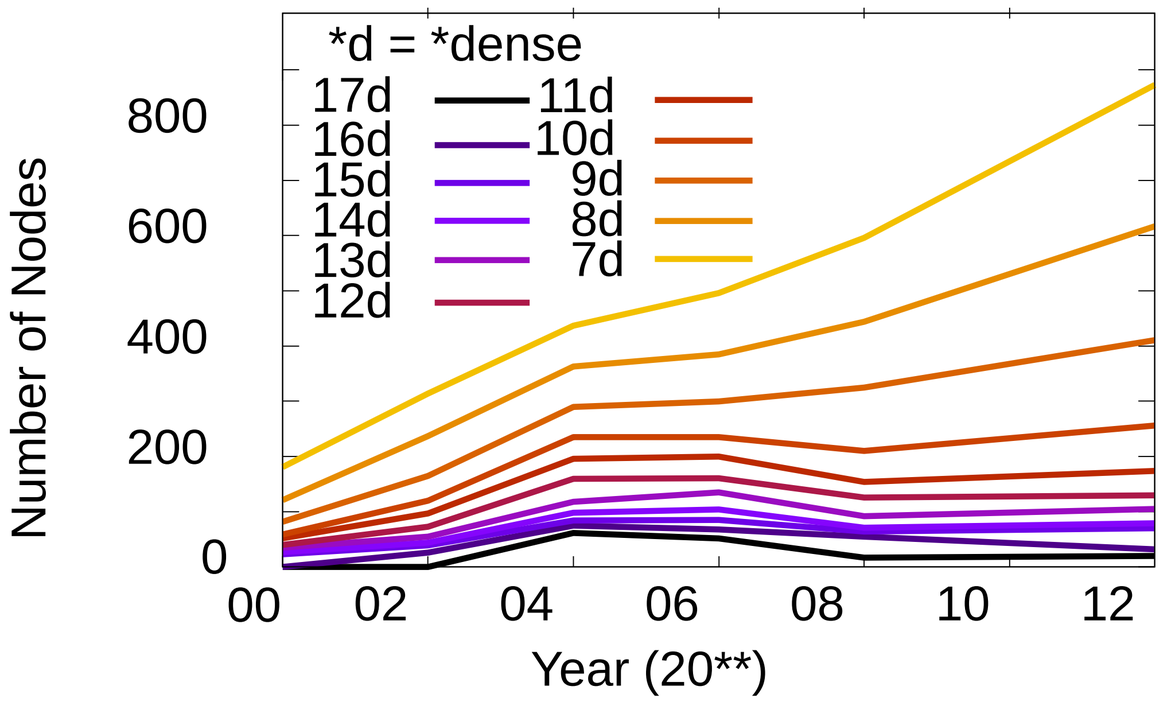


Core-periphery structure in Internet

- **Hierarchically nested structure.**
  - 875 out of 41909 ASes compose hierarchical nested structure.
  - The remaining ASes are attached to the bottom of the hierarchy.



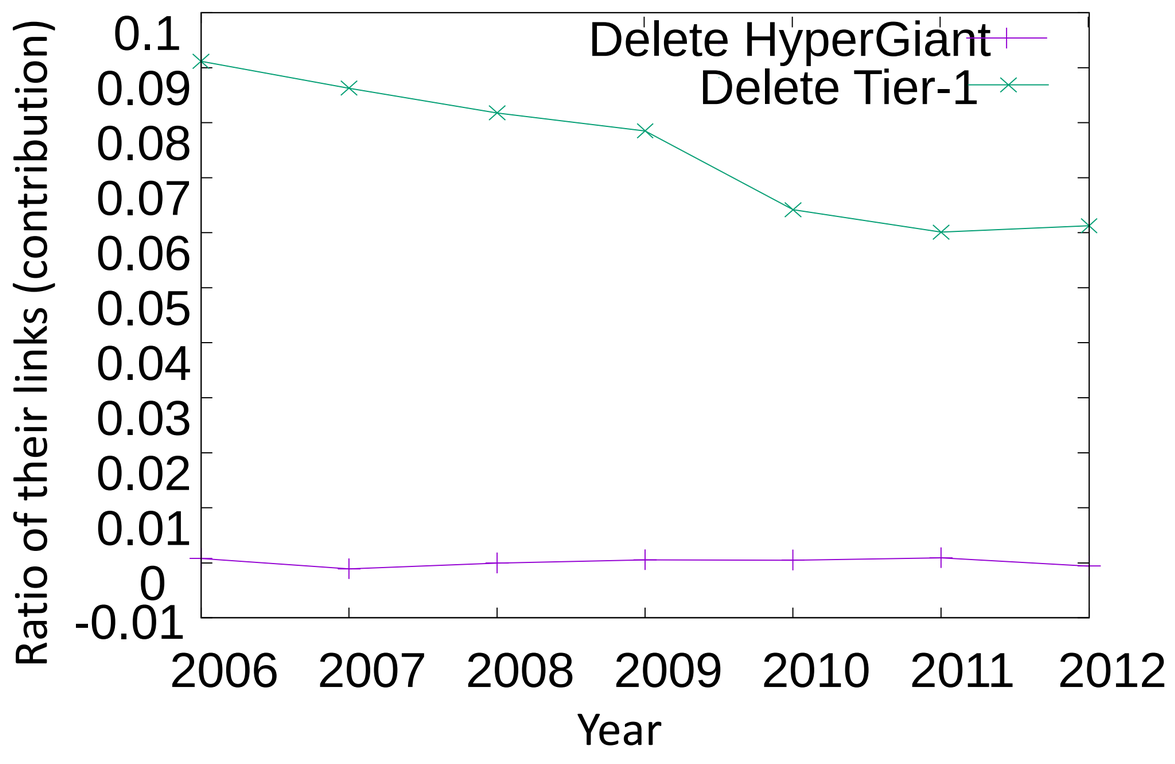
- **The higher level the ASes belong, the drastically the ASes change.**
  - ASes in more than 12 dense are rigid during the evolution.



- **A few Ases form the core part rigid during the evolution.**
  - Our analysis shows that 159 ASes out of 642 ASes form a core part.
  - The other ASes are varied greatly. they are increased in response to the growth of traffic.

Evolution of Ases in the core part

- **Contribution for information exchange.**
  - Tier-1 and HyperGiant mainly form the core.
  - We investigate their contribution for information exchange.
- **Tier-1 ASes in the core part play a central role during the evolution.**
  - Tier-1's contribution has been decreasing, but is still more significant than Hyper-Giant's.
  - Ratio of links mean contribution.



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