

A complex network diagram with numerous nodes and connecting lines, rendered in a light gray color, serving as a background for the slide.

Describing and Simulating Internet Routes

Jérémie Leguay

Université Pierre et Marie Curie (LIP6 /CNRS)

Collaboration with: Matthieu Latapy, Timur Friedman, Kavé Salamatian



Contribution

- Simulating internet routes, avoiding:
 - Shortest path model
 - Simulating routing algorithms
- Because
 - Shortest path model not realistic
 - Simulating routing algorithms costly



Outline

- Characteristics of internet routes
- Route models
- Model evaluation



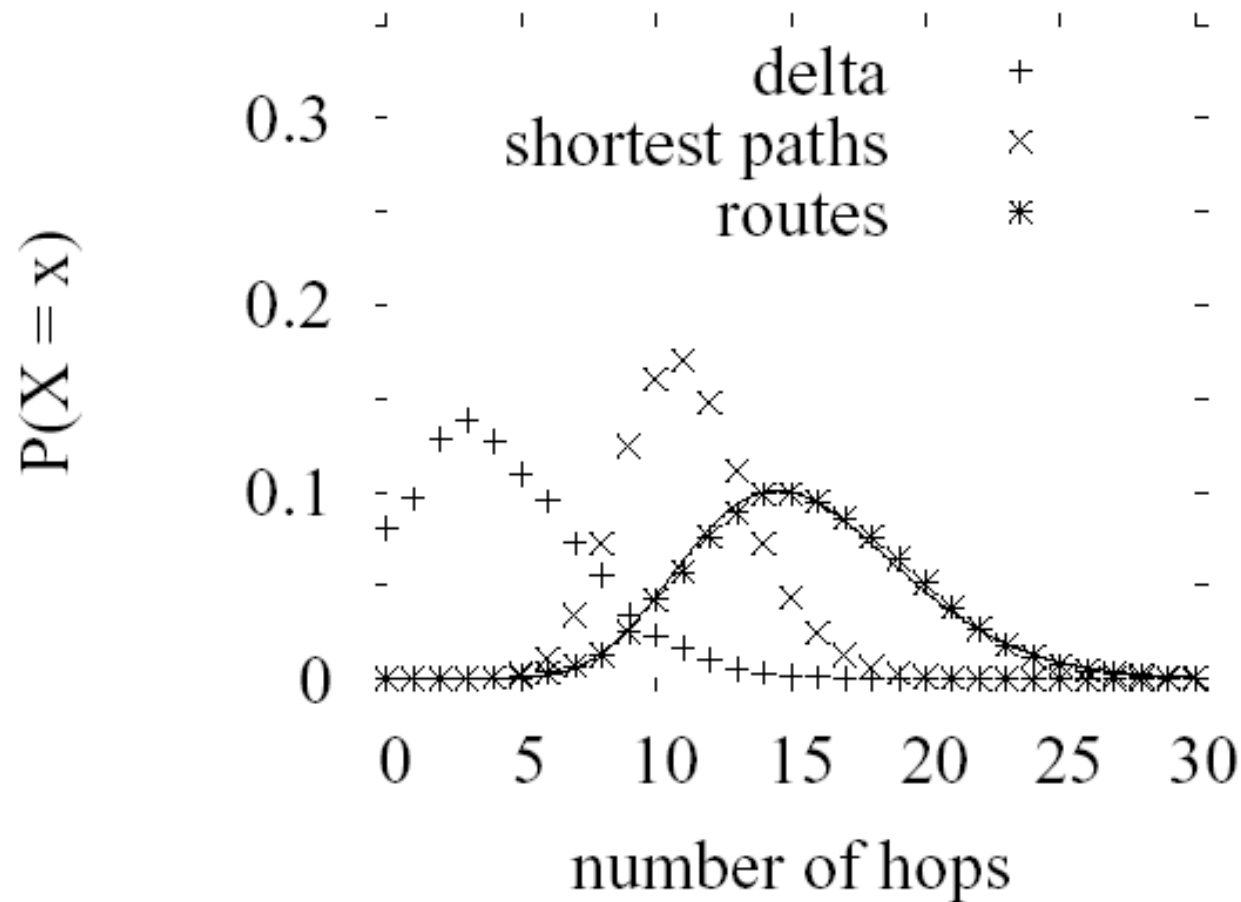
Characteristics of internet routes

- Relevant characteristics
 - Route lengths
 - Node degree evolution
 - Hop direction

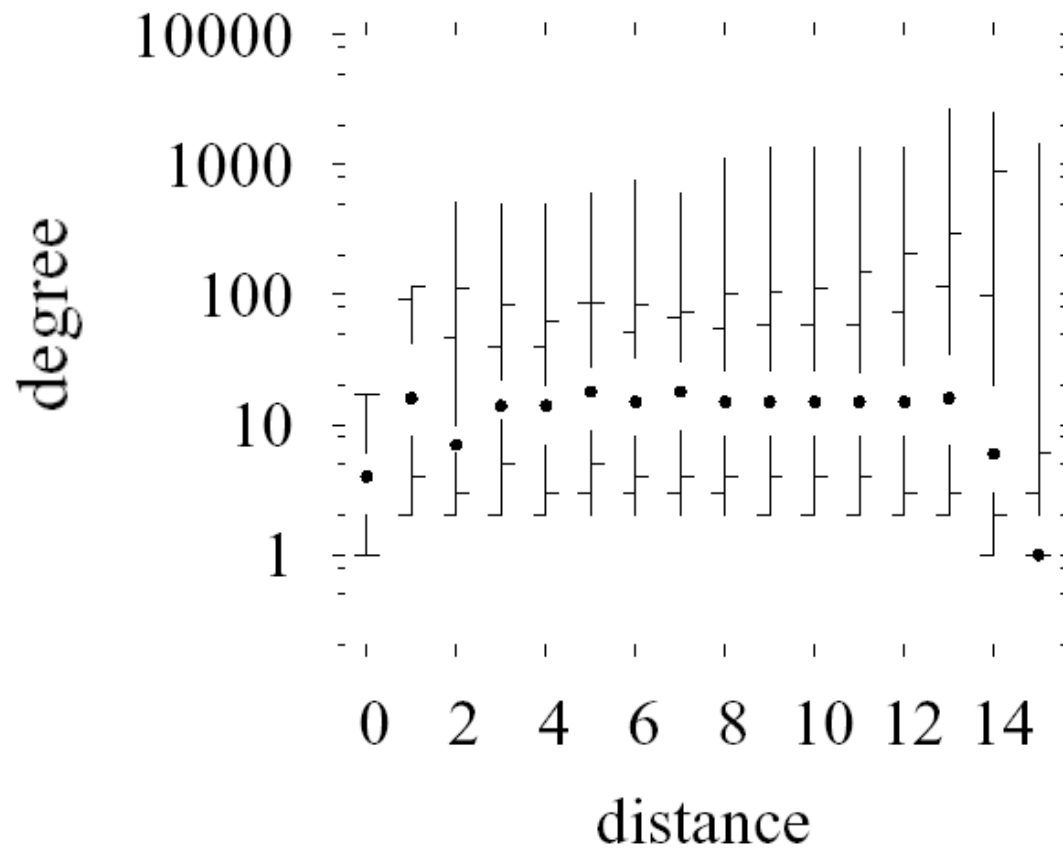
- Data
 - from CAIDA's skitter project
 - 7 million traceroutes



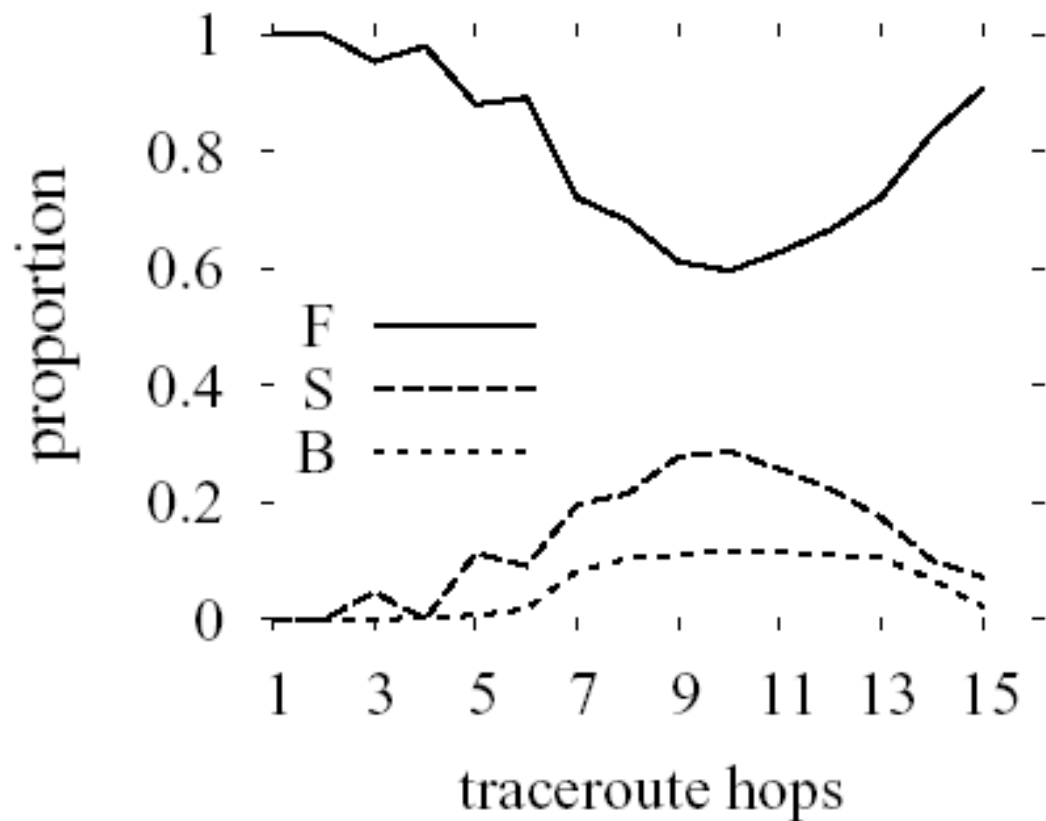
Route lengths



Node degree evolution



Hop direction



Forward	Stable	Backward
87.3%	8.1%	4.6%

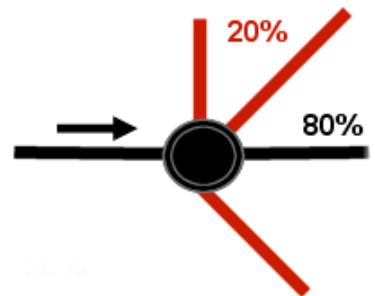
Outline

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Random deviation model

- Idea:
 - Routes usually follow shortest paths.
 - Occasionally they deviate.
- Implementation:
 - At each hop, route deviates from shortest path with a probability p

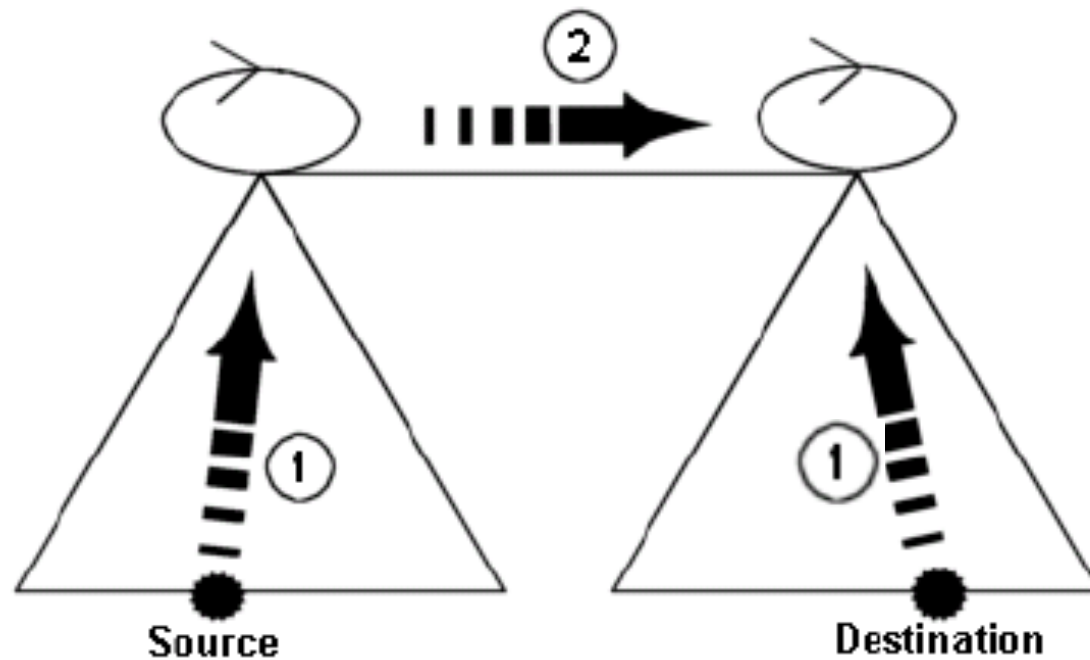


Node degree model

- Idea:
 - routes tend towards higher degree nodes
- Implementation:
 - Start simultaneously at the source and at the destination
 - At each hop choose the highest degree neighbour
 - The two paths would either meet or end in loops
 - If they end in loops, join the two loops with a shortest path



Node degree model

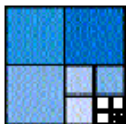
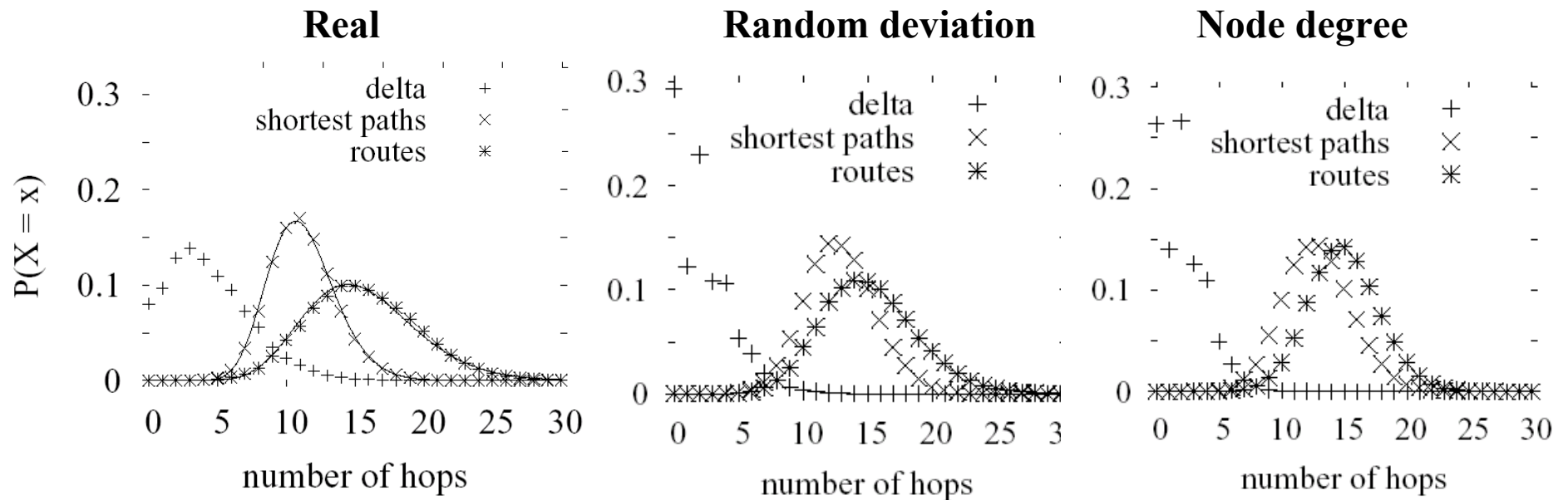


Outline

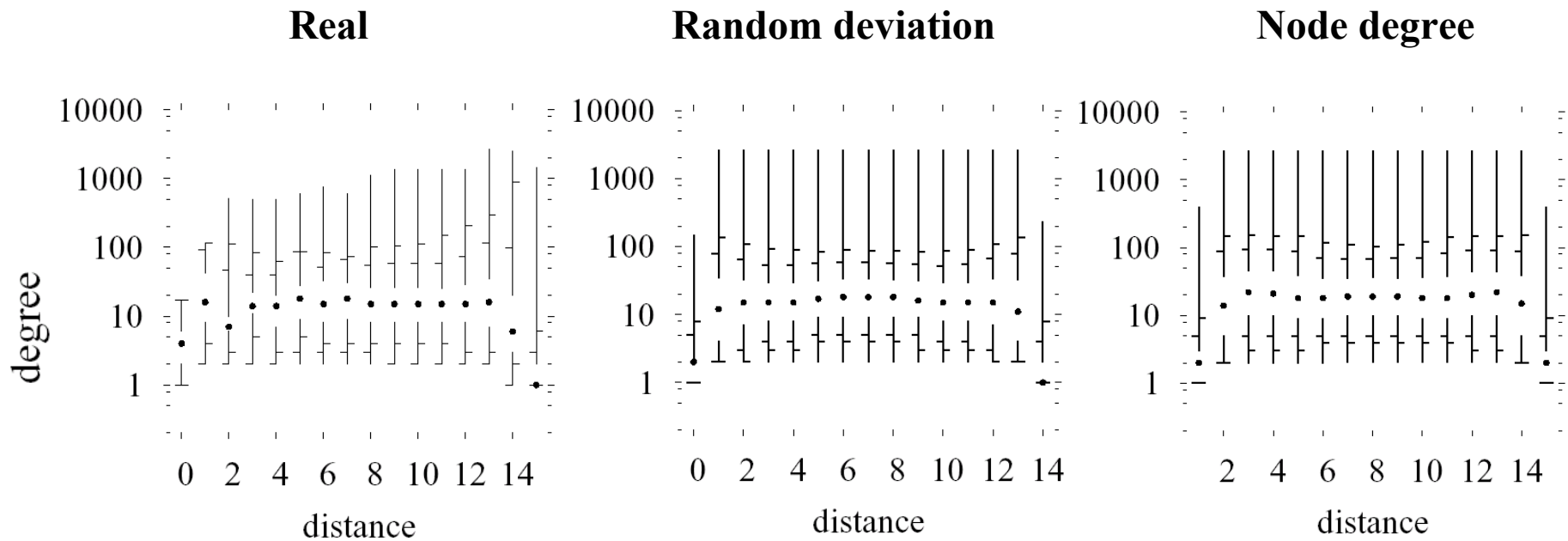
- Characteristics of internet routes
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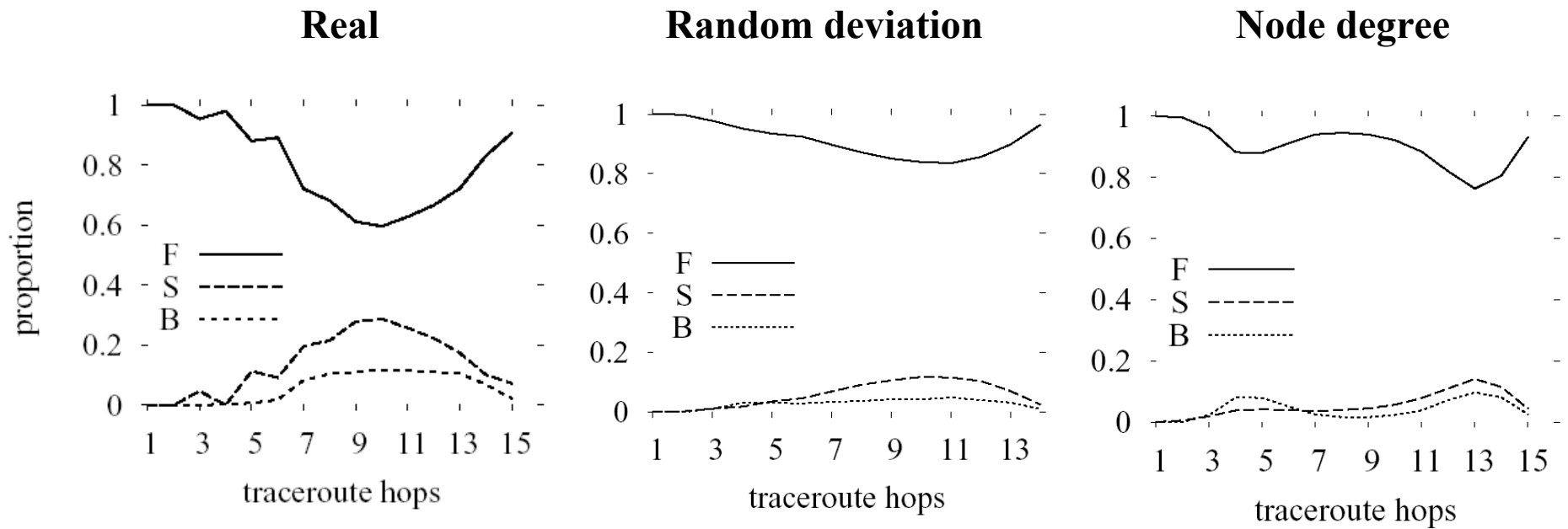
Route lengths



Node degree evolution



Hop direction



Conclusion

- New alternatives for simulation of routes.
 - Simple to implement
 - Capture essential characteristics

Future work

- Capture route dynamics
- Capture other properties. E.g.: coefficient of clustering

