Research Problems in Future-is-Here Networking

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UMKC

International Activities

- US-Japan Networking Research Collaboration
  - Started in 2008 (as far as I know, this was the first one by National Science Foundation)
  - A number of Workshops over the next few years
  - Two joint US-Japan project solicitations
    - 2009/2010: DCL (Dear Colleague Letter)
    - 2013/2014: An Open Solicitation JUNO 13-574
      - http://www.nsf.gov/pubs/2013/nsf13574/nsf13574.htm
  - Funded Project with Osaka City University
- Brazil's Science Without Borders Program, 2013-2015
  - Host institution: University of Campinas
  - Additional Collaborations: UFRGS, UFPR
- France: Université Pierre et Marie Curie (UPMC), 2014-current
  - NSF SAVI travel Grant
- iMinds – University of Ghent, University of Antwerp, Belgium
- India: Indian Institute of Technology-Guwahati, India

On-going Efforts

- Software Defined Networking Scalability
- Software Defined Networking Availability
- Cloud Auditability: storing and mining event logs
- Resource allocation in multi-location, multi-location data center networks
  - Time-Dependent
  - Security-Enabled Traffic Engineering
- IoT and Cloud and how it impacts on Core Networks
- Hadoop in a hybrid cloud
- Resilient Networking for Massive Failures
- US Collaborations:
  - US: University of Kansas, Arizona State University, Duke University

End-to-end Resource Management for Highly Demanding Applications in Federated Wide-Area Environment

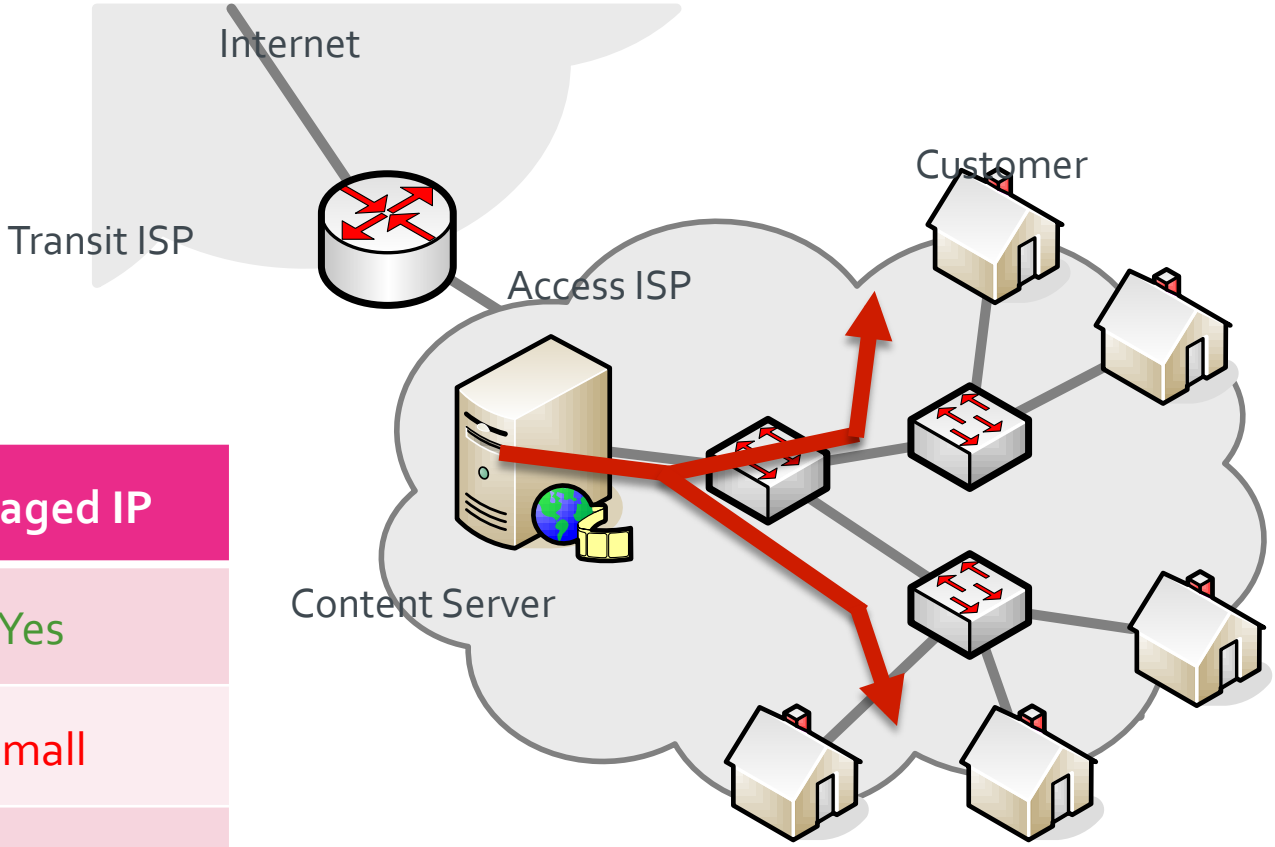
Collaborations:

University of Antwerp, Belgium: Steven Latre

Federal University of Rio Grande do Sol (UFRGS), Porto Alegre, Brazil: Lisandro Z. Granville

University of Missouri-Kansas City (UMKC), USA

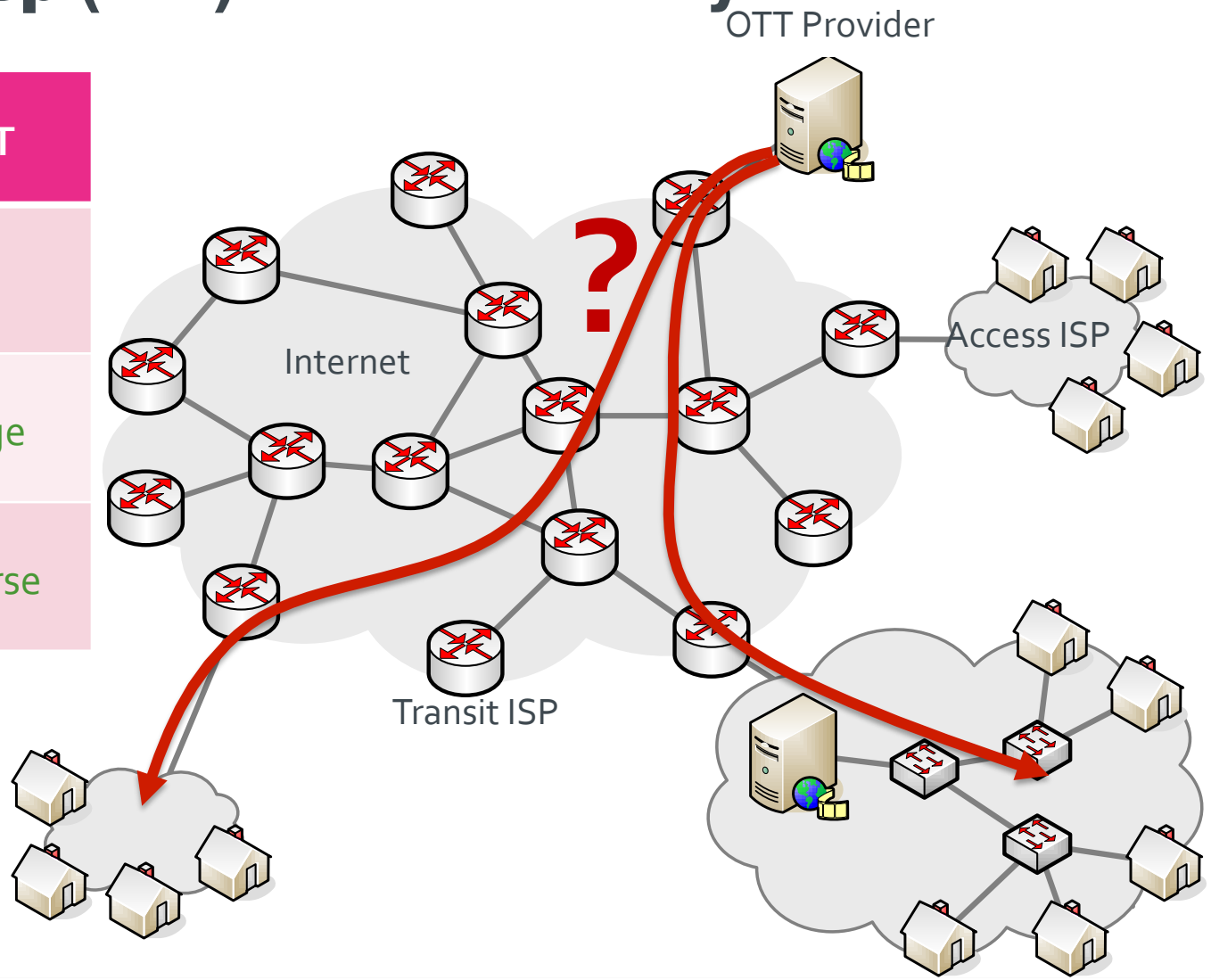
Delivering content over a Managed IP network



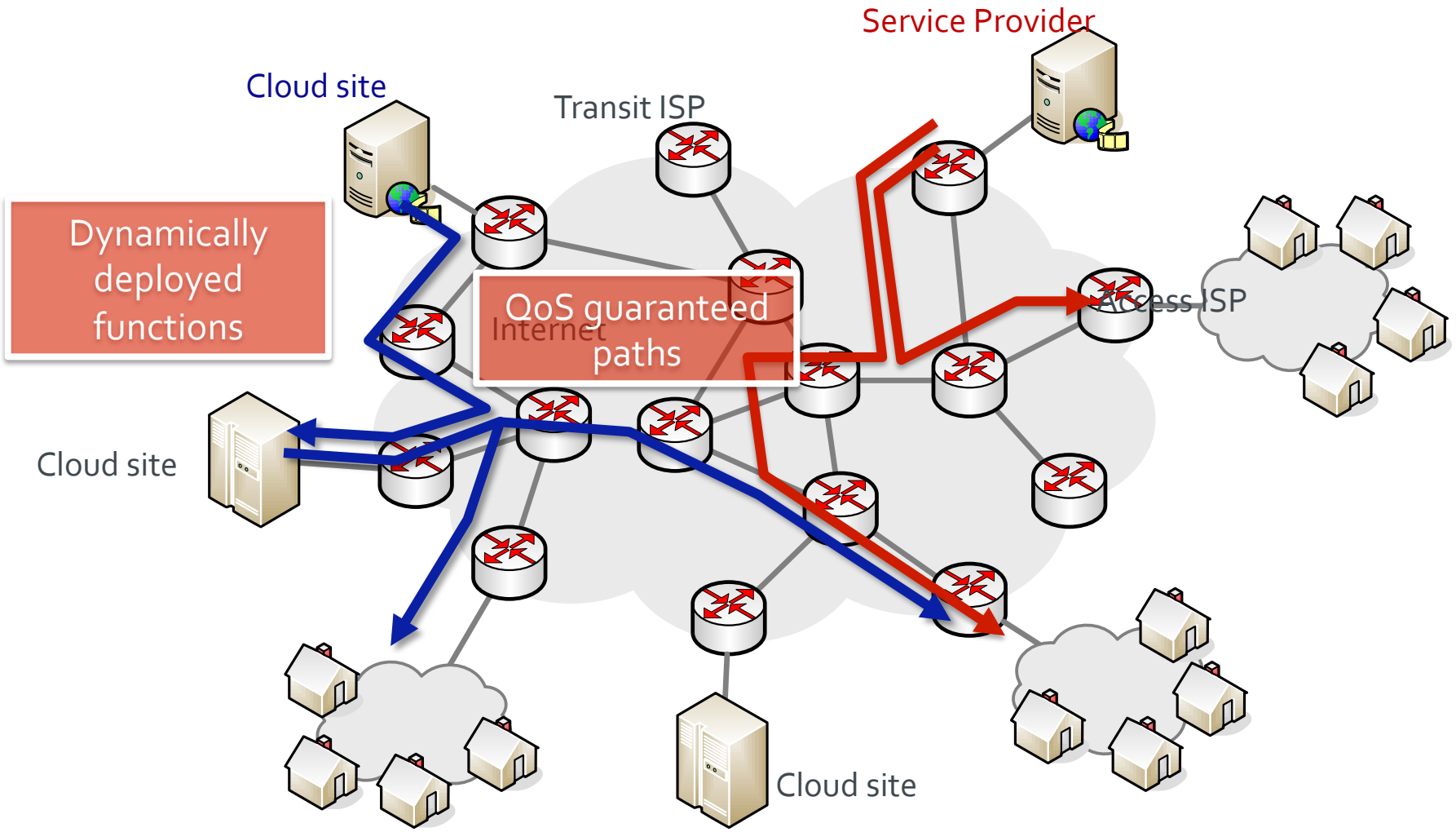
	Managed IP
QoS Guarantees	Yes
Customer Base	Small
Service Types	Limited

Over-the-top (OTT) content delivery

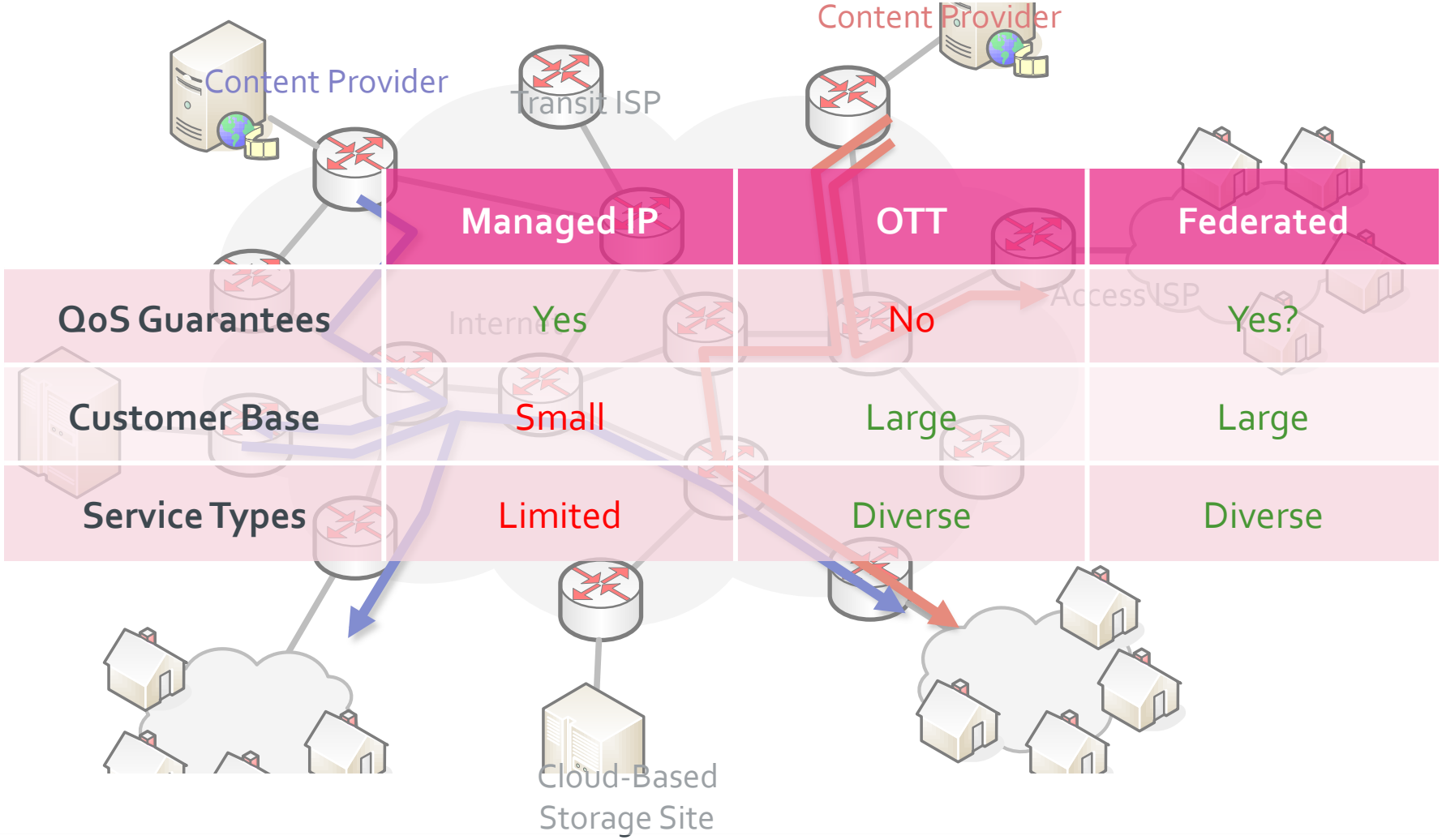
	OTT
QoS Guarantees	No
Customer Base	Large
Service Types	Diverse



Federated managed service delivery

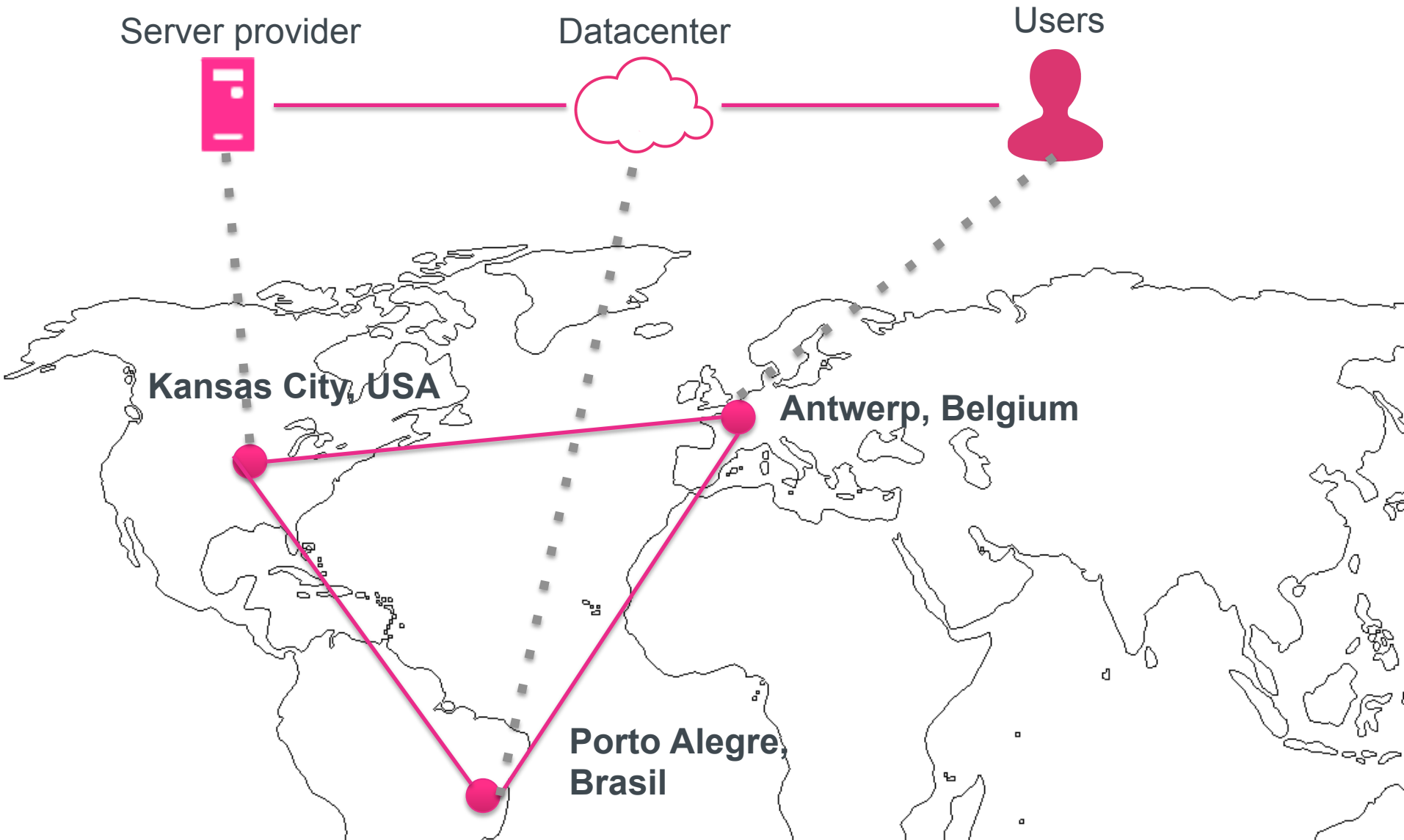


Federated vs. Traditional



	Managed IP	OTT	Federated
QoS Guarantees	Yes	No	Yes?
Customer Base	Small	Large	Large
Service Types	Limited	Diverse	Diverse

Prototype: worldwide deployment using GENI, FIRE, etc.



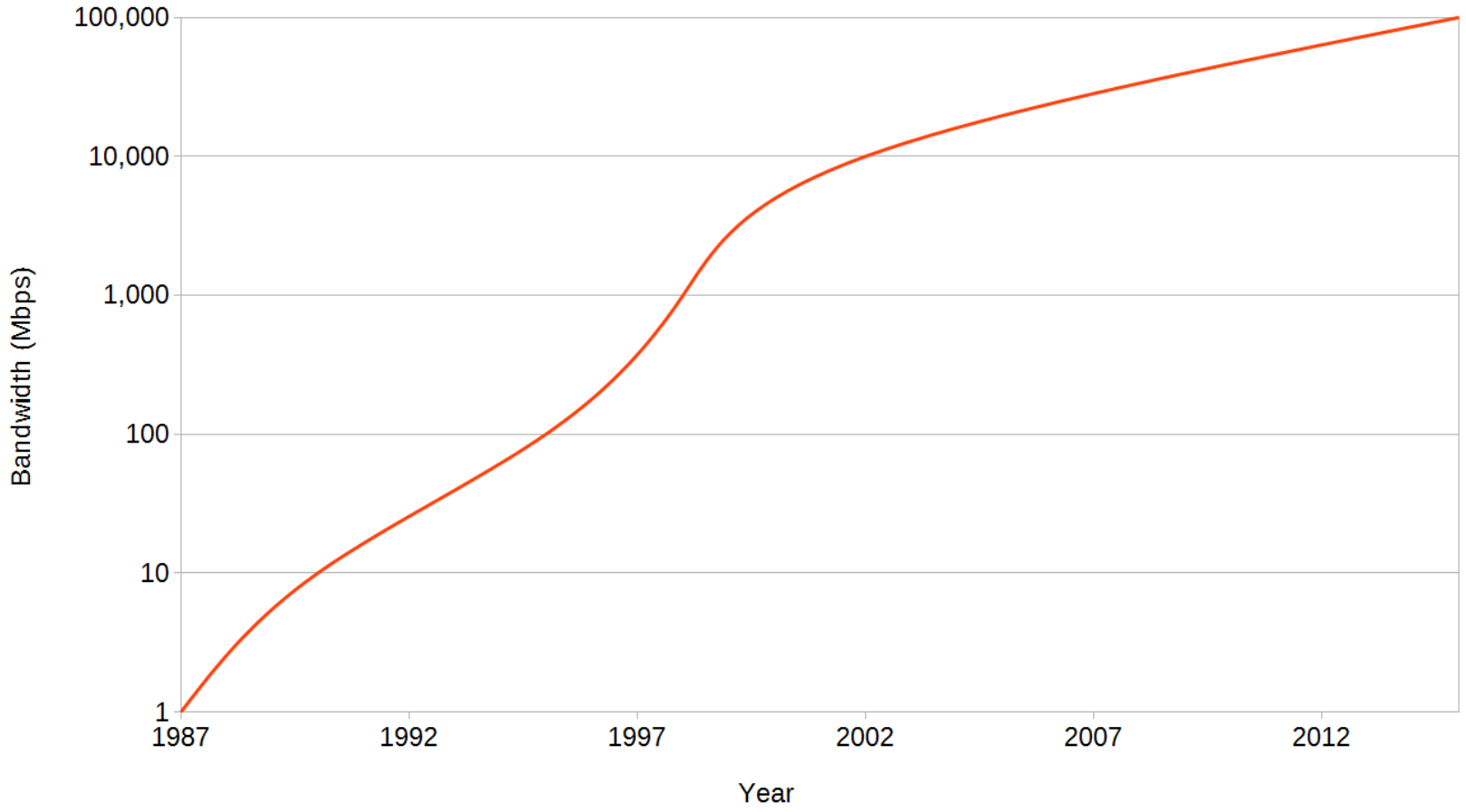
Issues:

- Understand the implication in really-wide area network, across continents.
- Application impact and rerouting: Lower level impact such as AS graph
- Federated Environment, where we have more control over each of the environment
  - Understand coordination
- Network-aware Networking (NaN)
- Application Level characteristics for highly demanding applications
- Testbed setup

Network Bandwidth Speed in a Data Center and its Impact

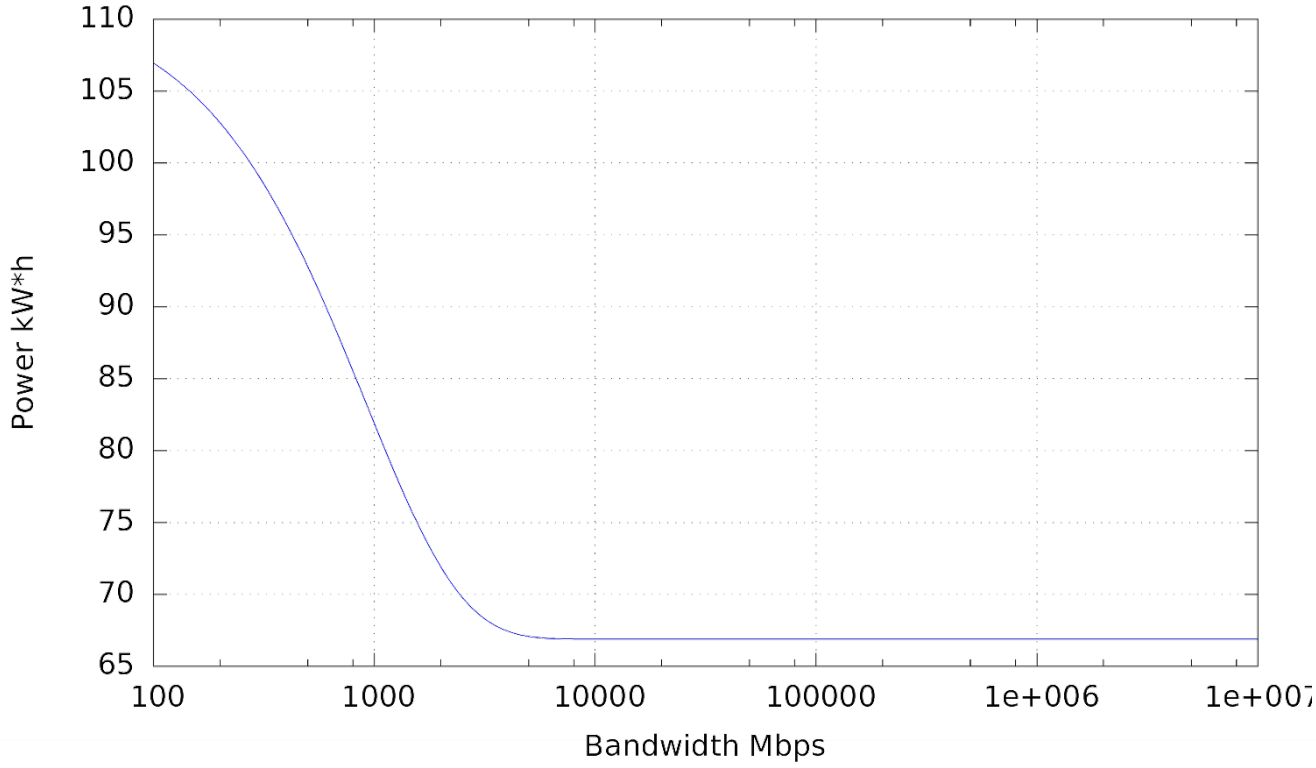
Collaboration:
University of Campinas, Brazil: Edmundo Madeira
University of Missouri-Kansas City, USA

IEEE 802.3: Bandwidth evolution (log scale)



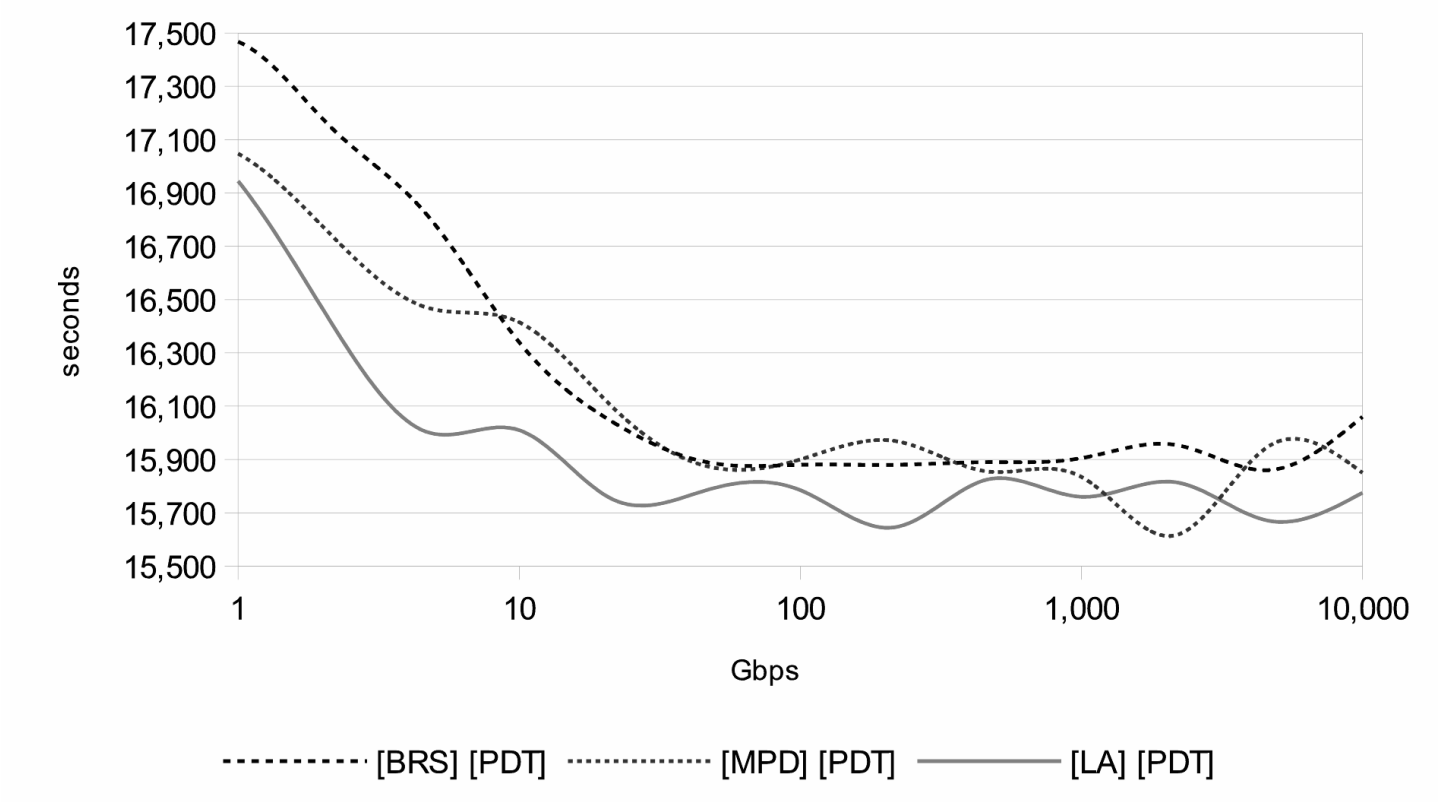
Green Computing with Bw Evolution

- Increased Network Speed = Faster VM Migrations' Times -> can reduce power consumption

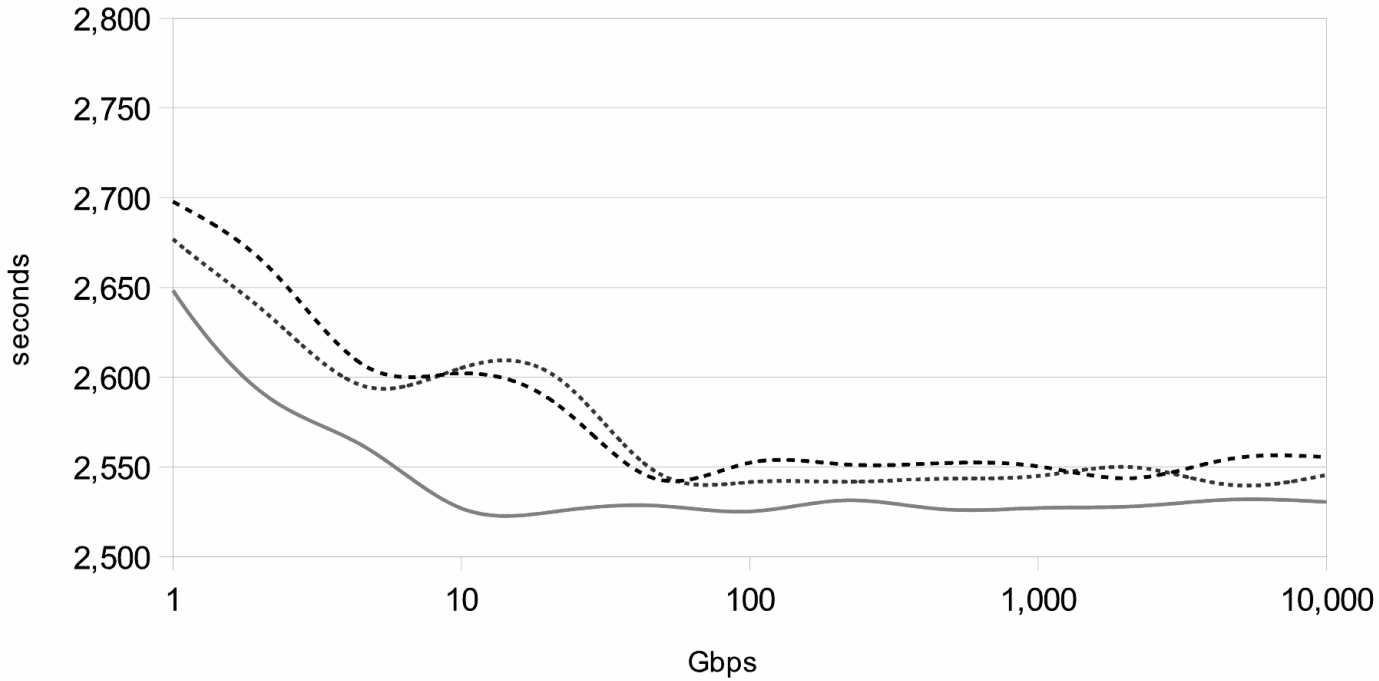


Impact on Makespan due to different scheduling algorithms

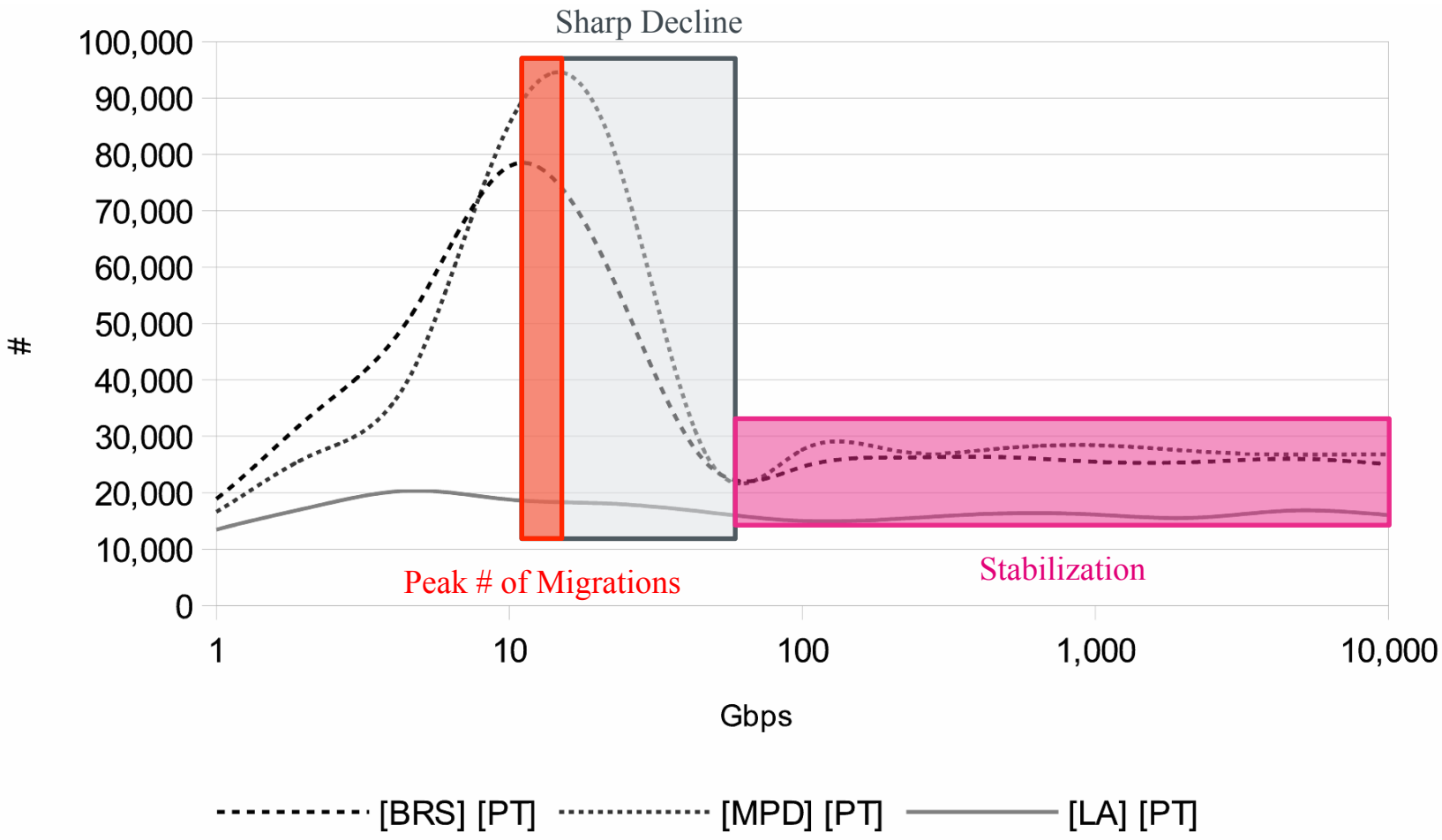
- Impacts of Increased Network Speeds in Migrations, due to different scheduling algorithms



Impacts on Workloads with different scheduling algoritms



Impact on VM migration



- Obtain further insight on the upper limit of the impact of increased bandwidth consumption of energy
  - And find the factors that determine where this upper limit is
- Bandwidth-Aware VMs' Scheduling Algorithms
- Topology-Aware Schemes
- Data Center Federation

Acknowledgement

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  - Federated Networking: Pedro Isolani, Shuai (Jack) Zhao, Jeroen Famaey, Niels Soetens, Johan Bergs
  - Network Speed and its impact: Daniel Lago (UNICAMP)

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