SFR: Scalable Forwarding with RINA for Distributed Clouds

Fatma Hrizi, Anis Laouiti and Hakima Chaouchi
Telecom SudParis, France

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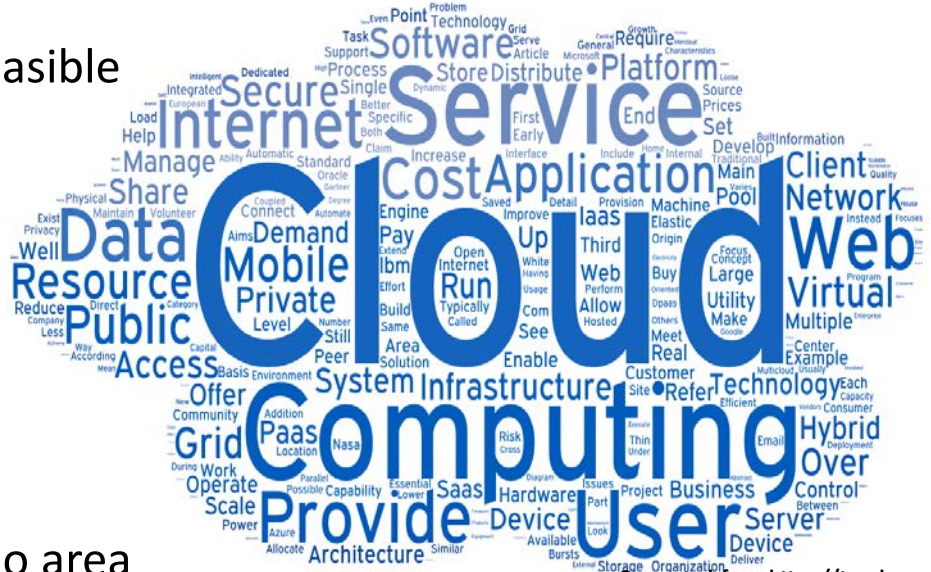
Outline

- Intro & Motivation
- VIFIB Distributed Clouds
- RINA: Recursive InterNetwork Architecture
- SFR: Scalable Forwarding with RINA
- Simulation Results
- Conclusion

Intro & Motivation

- **Cloud Computing**
  - Fast Emergence
    - Research, industries and standardizations
  - Enables ubiquitous and on-demand access to shared resources
  - Large scale applications become feasible
    - Big data, HPC..
  - Single central point

Scalability & **Availability** issues

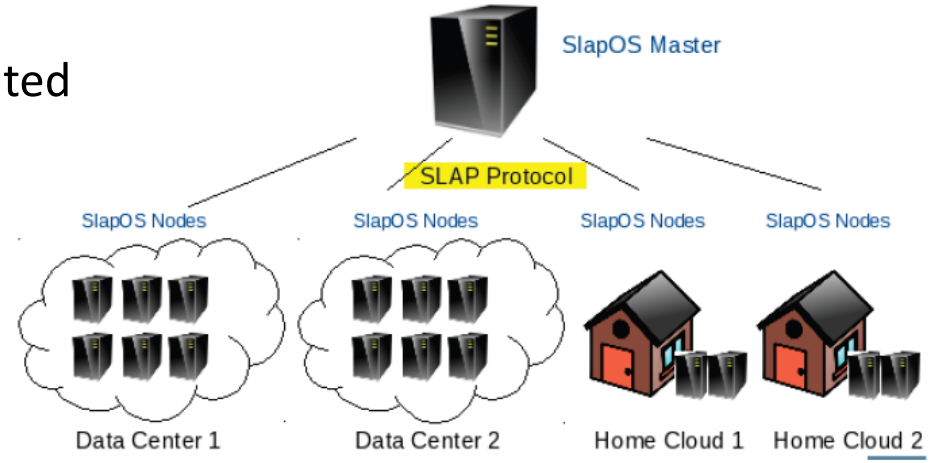


- **Distributed Clouds**
  - Decentralized management
  - Resources distributed in several geo area
  - “Volunteer” clouds
    - An example: VIFIB

VIFIB Distributed Clouds

- **VIFIB**: Resilient Computing
  - No data center architecture:
    - Micro servers located in homes, offices..
    - Distributed resources ➡ **More Availability: 99.99%!**
  - Master/Slave architecture
  - **Resiliency**
    - Data is encrypted and replicated in different locations
    - Overlay Network of Open VPN tunnels (re6st)

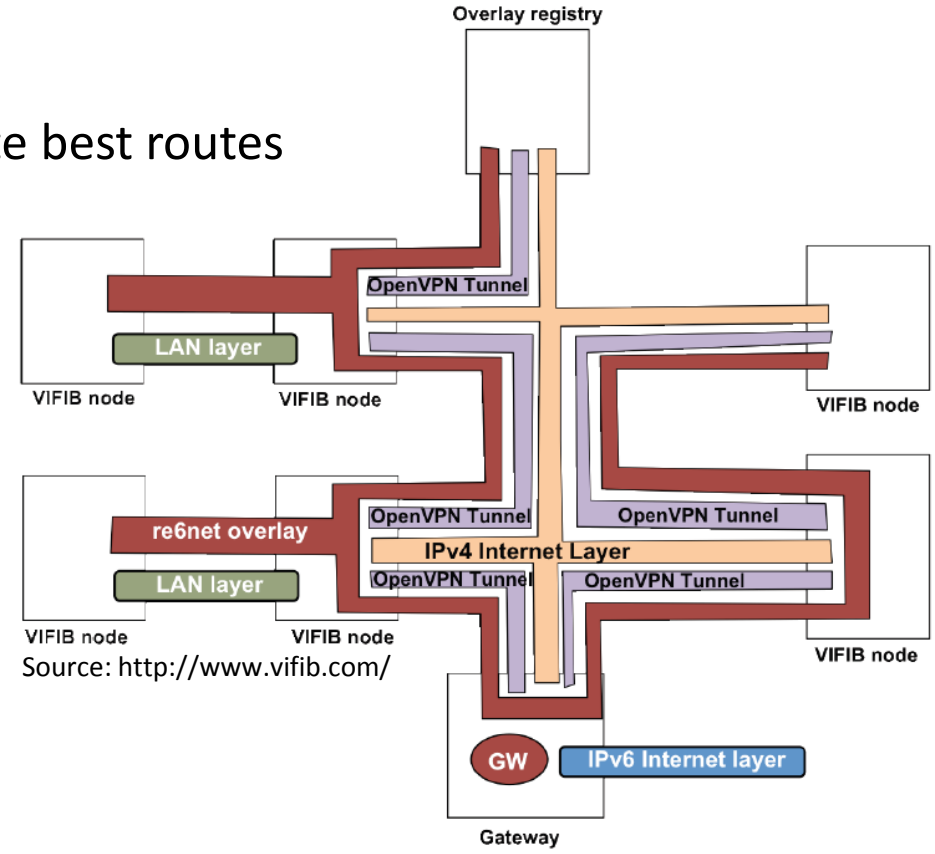
Source: http://www.vifib.com/



Source: http://www.vifib.com/

Re6st: Resilient Overlay Networking System

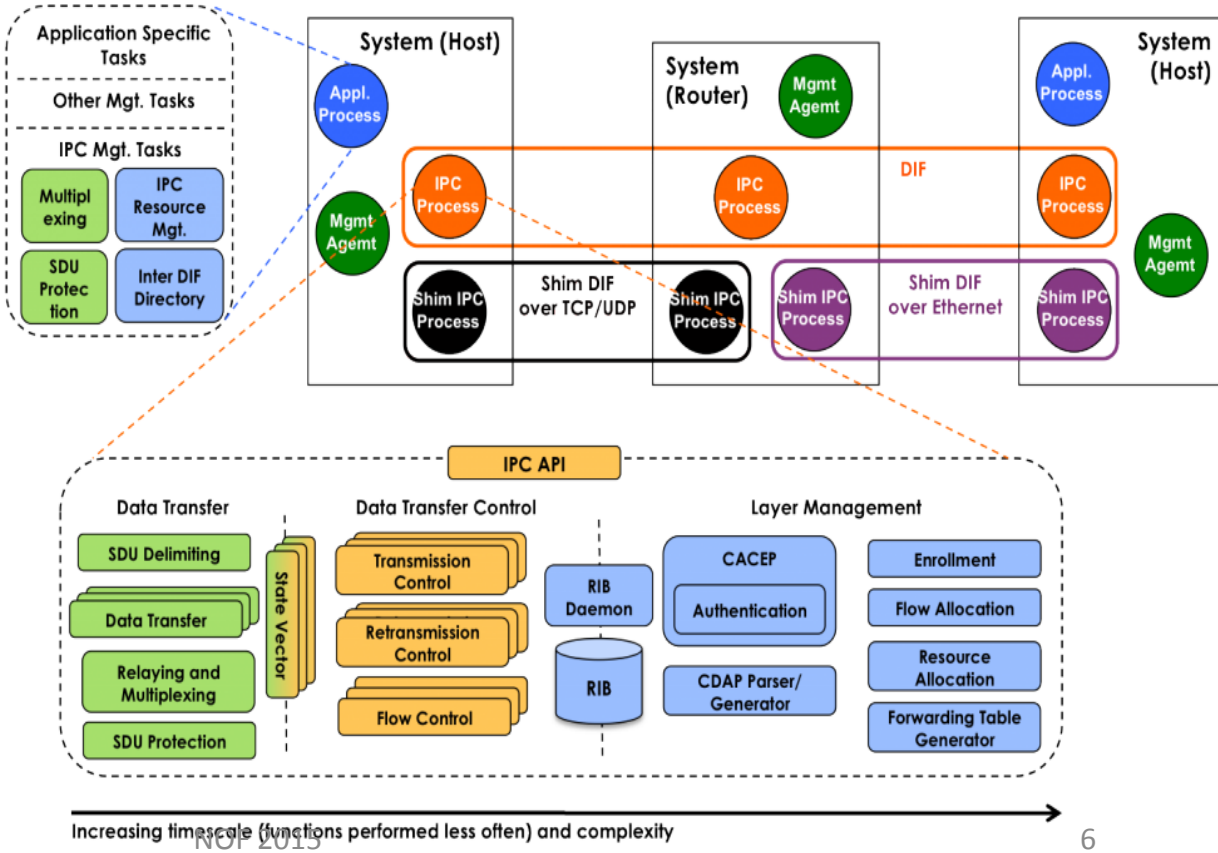
- Re6st
  - Mesh network of Open VPN
    - Flat and random graph
  - Babel Protocol used to calculate best routes
  - Fast recovery!
- Issues with Re6st 
  - Security issues
    - Bad routes flooding
  - Scalability issues
    - Flat topology does not scale
    - Tunnels might consume extensive resources



Source: http://www.vifib.com/

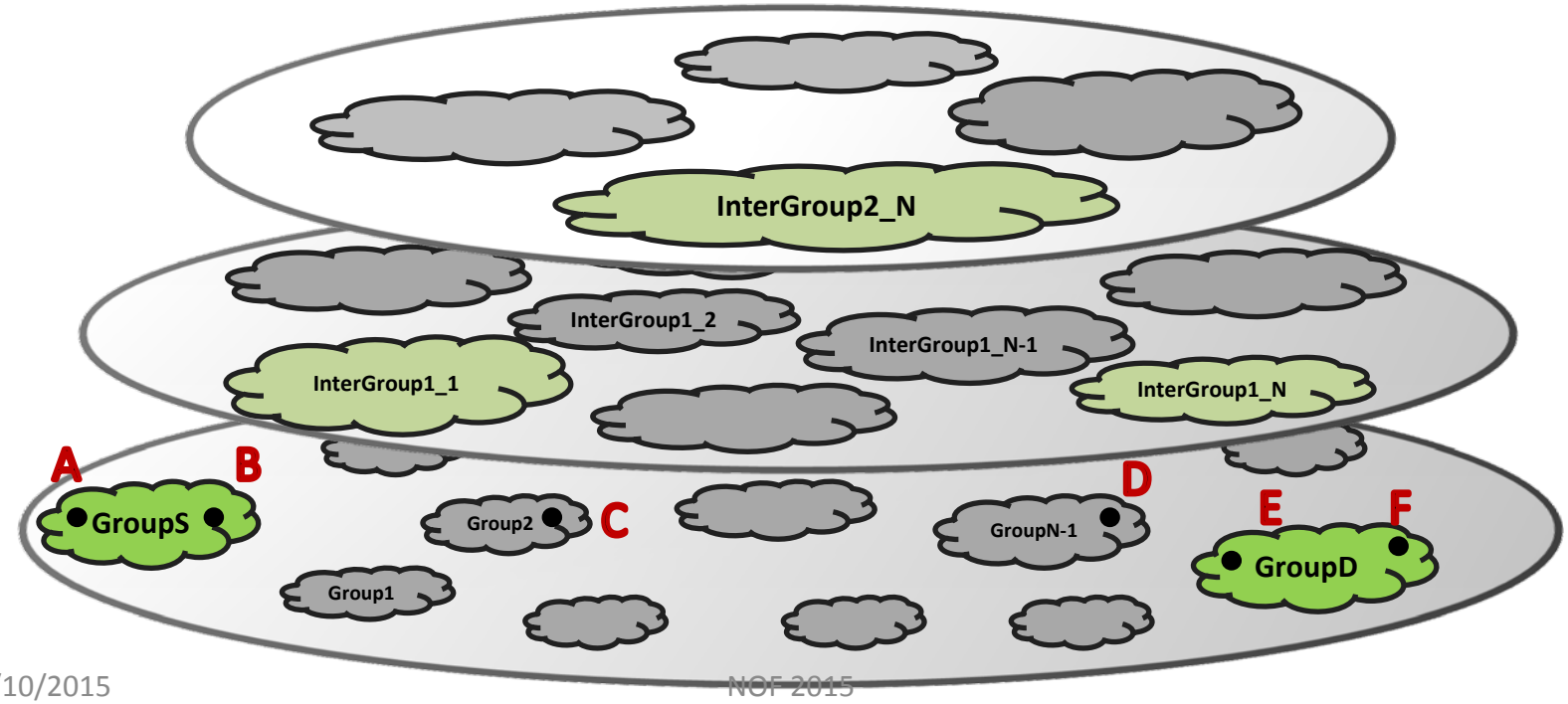
RINA: Recursive InterNetwork Architecture

- Inter-Process Communication (IPC) model
- Unlike TCP/IP, one single layer
  - that could be repeated recursively
- Clean separation between mechanism and policy
- Divide and Conquer
  - Scalability

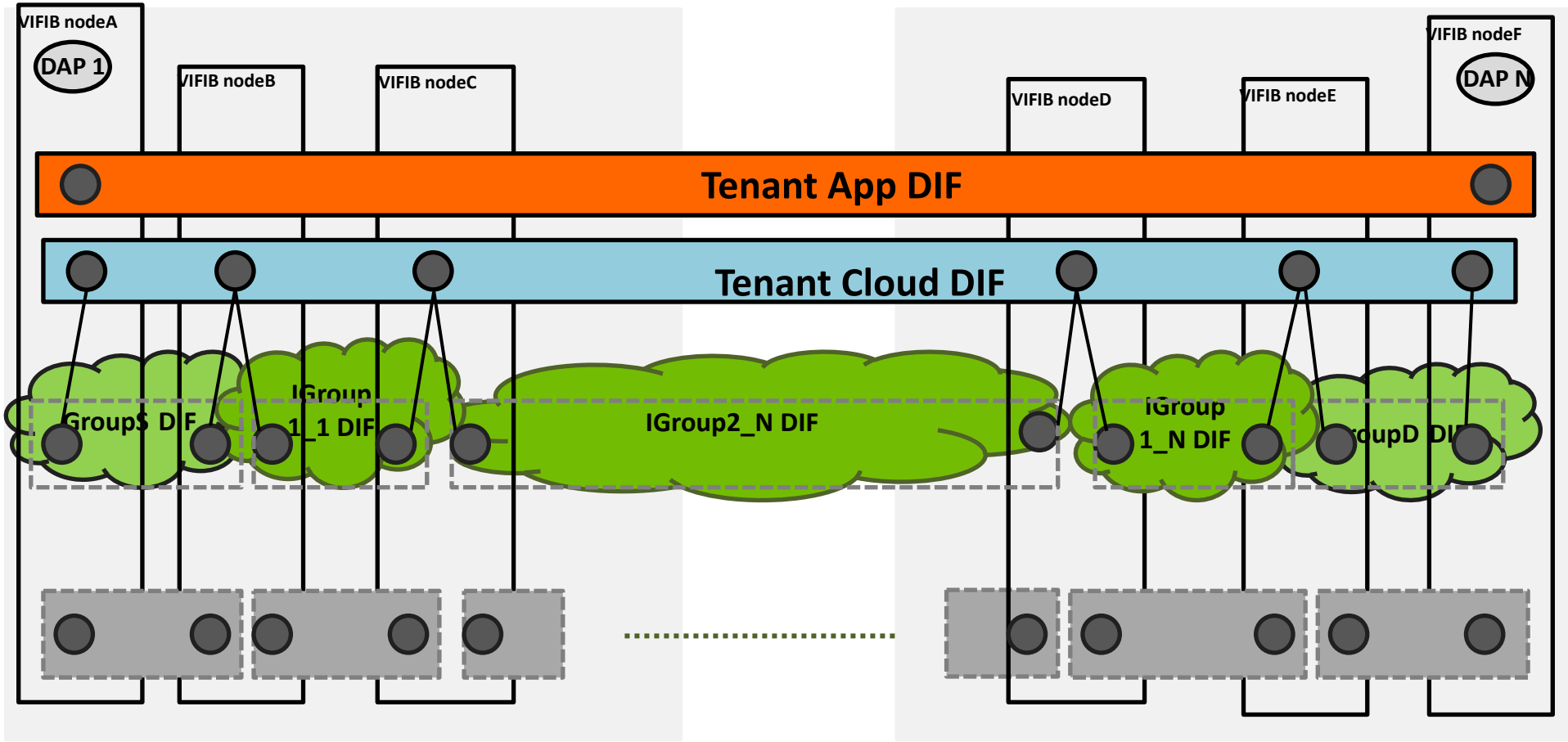


SFR: Scalable Forwarding with RINA

- The distributed clouds is divided into groups
- Group leaders are created to interconnect nodes from different groups and to form the inter groups
- To support scalability, multiple levels could be created



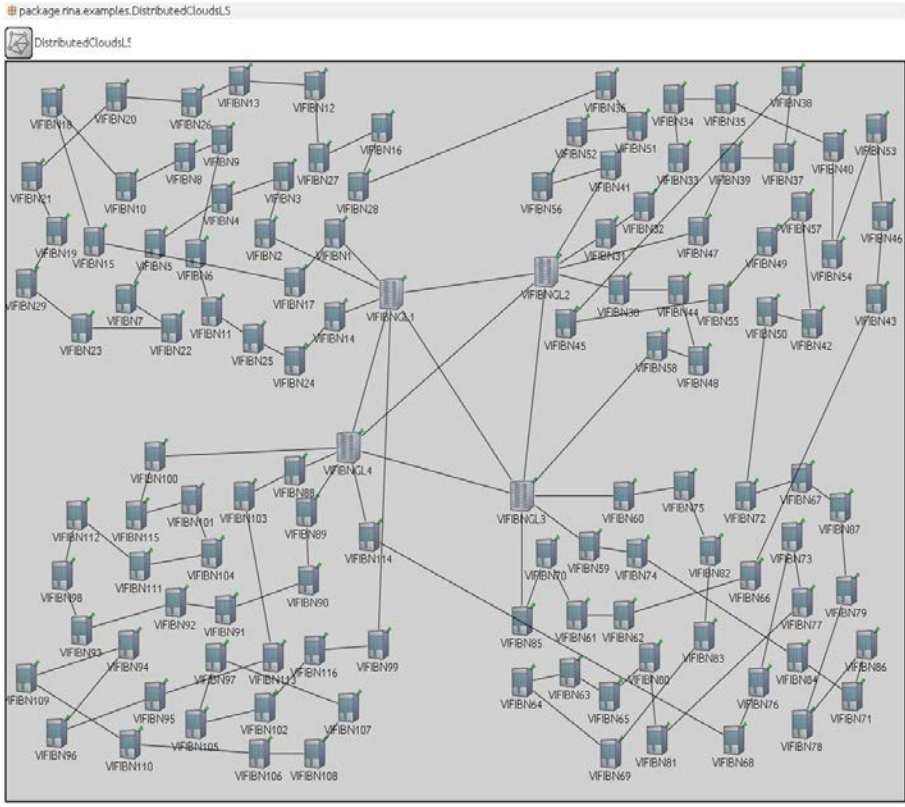
SFR: DIF Architecture



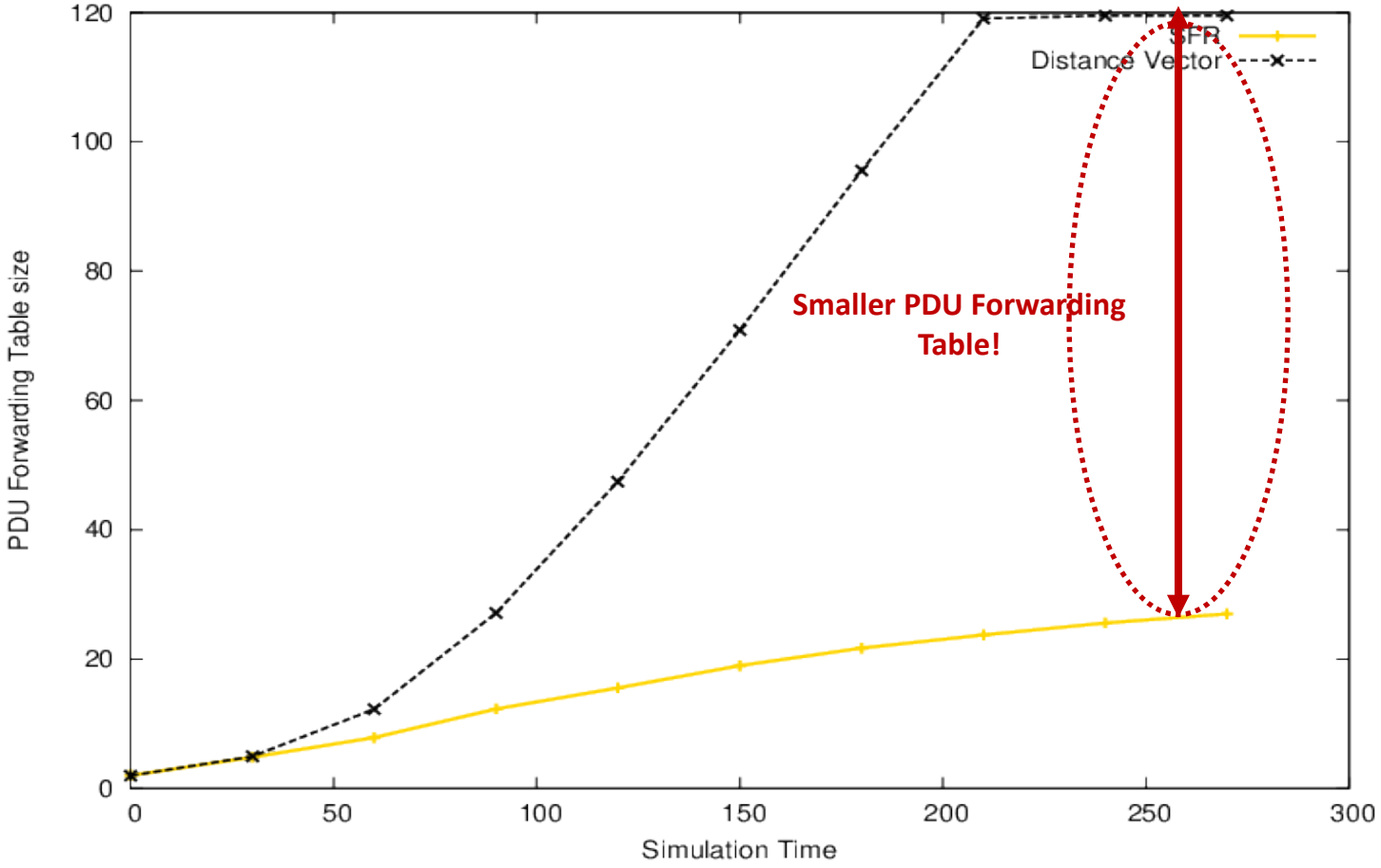
Performance Evaluation Scenario

- **RINASim** Simulator: Omnet++ based
- Medium scale distributed clouds scenario
- Performance indicator:
  - **Forwarding table size**

Parameter	Value
Number of VIFIB nodes	120
Number of regions	4
Number of VIFIB nodes per region	30
Application	Ping
Packet Size	1500 Bytes
Ping Starts at	140s
Ping rate	5
Simulation Time	300s for each run

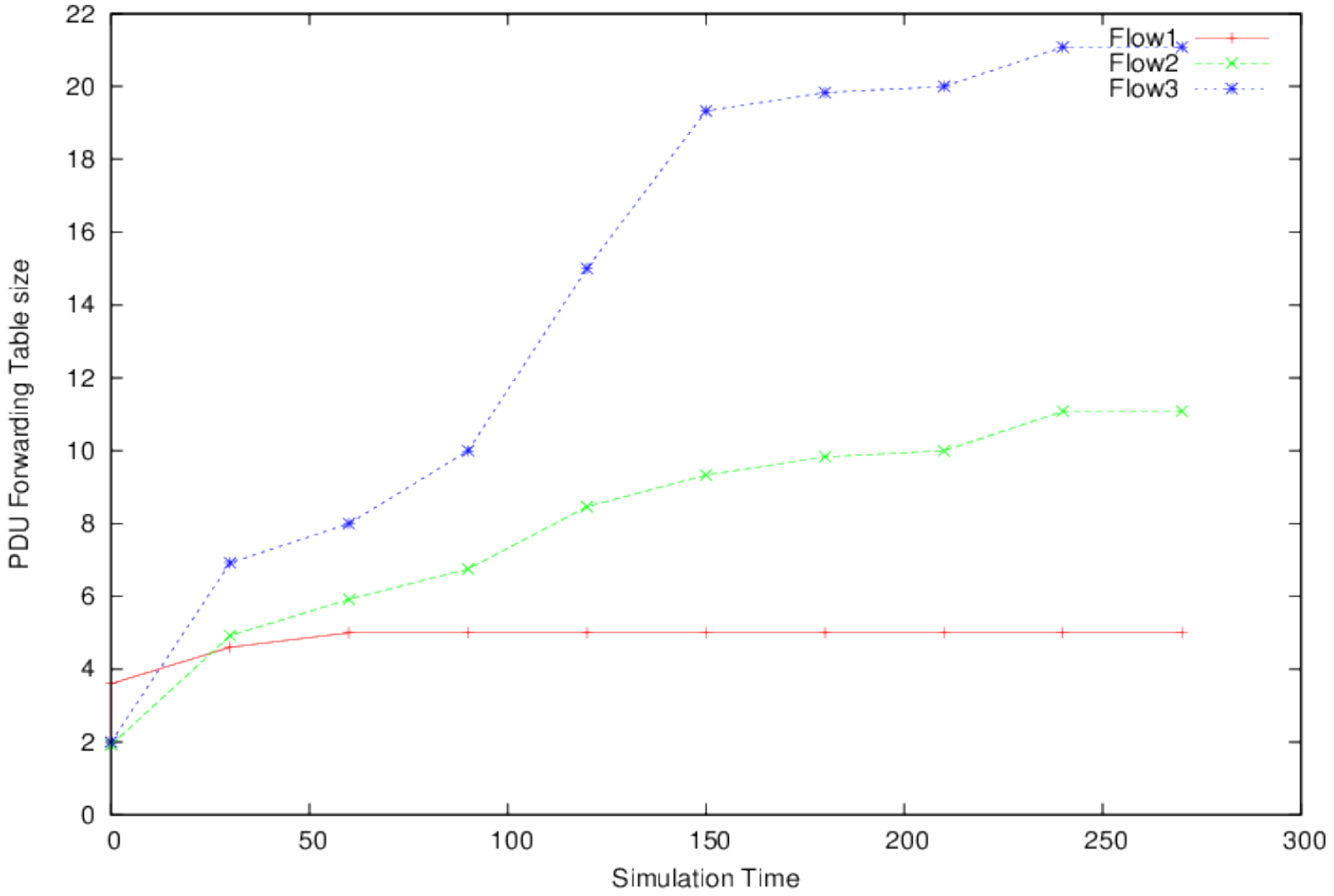


Simulation Results (1/2)



Variation of PDU forwarding table size / simulation time
Comparison between SFR and simple distance vector routing protocol

Simulation Results (2/2)



Variation of the PDU forwarding table size with regards the simulation time. Dynamic Tenant Cloud DIF management

Conclusion

- SFR: new and generic routing architecture for distributed clouds
  - Hierarchical DIF architecture
- SFR achieves better results compared to current distributed clouds networking solutions
  - The forwarding table size is drastically decreased
- In future works, we plan
  - Further evaluate the assets of applying RINA to distributed clouds
    - Consider more evaluation metrics: latency, throughput..
  - Deploy SFR within VIFIB infrastructure to compare it to re6st

Thank you for your attention!

Questions?