GridStat on GENI
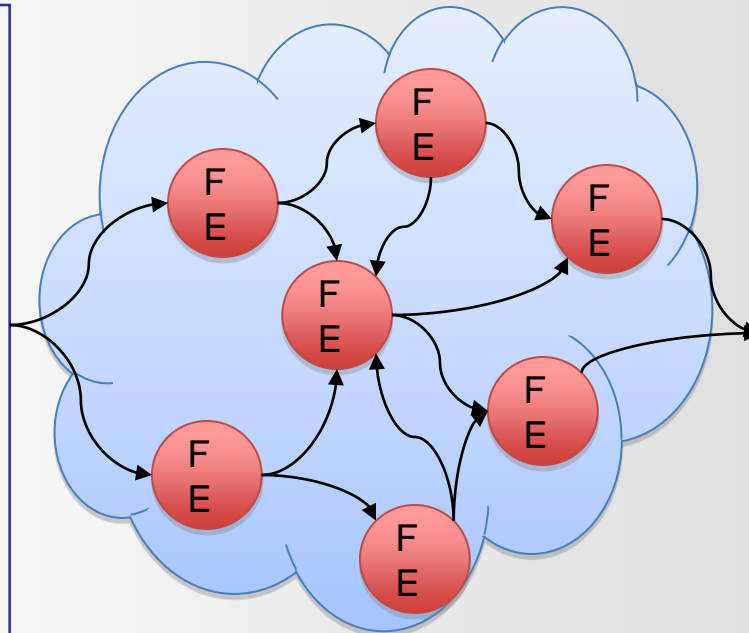## (Simulating a Smart Power Grid Infrastructure over GENI)

Ruma Paul, Divya Giri, Haiqin Liu, Victor Valgenti, Carl Hauser & Min Sik Kim

Power Grid & GridStat

- Precise and Frequent measurement of state of the Power Grid.

- GridStat: An efficient low latency data forwarding framework.

- Insufficient control infrastructure for forwarding of information.


Publisher

GridStat Network

Subscriber

Our Experiment

- Using GENI infrastructure, to test GridStat at scale and identify problems with current framework.
  - GridStat on GENI.
  - GridStat Survivability.
  - Instrumenting and Security for GridStat on GENI.

- Current GridStat prototypes have not been tested outside local clusters.

Evaluating GridStat on GENI

- PlanetLab as our platform.

- Recreate GridStat framework.
  - Build forwarding engine on PlanetLab Nodes.
 - Dynamic routing to detect and change routes when latency boundaries are exceeded.
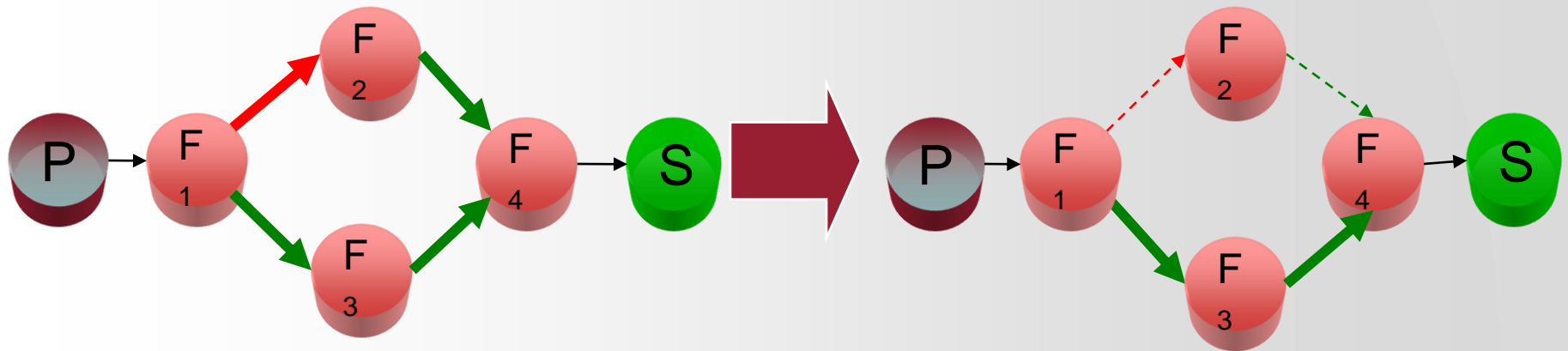
Forwarding under two routes F_1,F_2 and F_1,F_3. Route F_1,F_2 is experiencing high delay causing packets to miss QoS bounds.

Dynamically and gradually reroute traffic from F1,F2 to F1,F3, which is maintaining QoS bounds

Detecting Attacks

- Node Collects data about all arriving packets.

- Data is periodically transmitted to TrustGuard monitor.

- Monitor detects attacks.
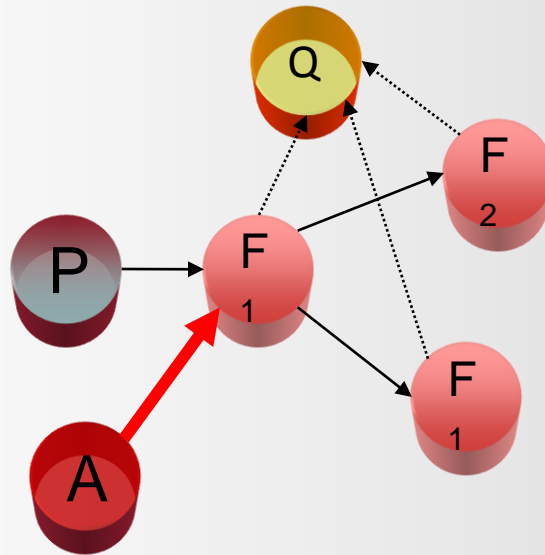
Maintaining Stability and Security in GridStat

- Distributed collaborative detection scheme.

- Identify anomaly or attack attempts and react to ensure power system remains functional.

- Local Detectors, deployed at edge router.
  - Gather Statistics.
  - Update Global Detector.
  - Allows restricted action.

- Global Detectors
  - Construct a global view
  - Learn
  - Make Decisions to preserve
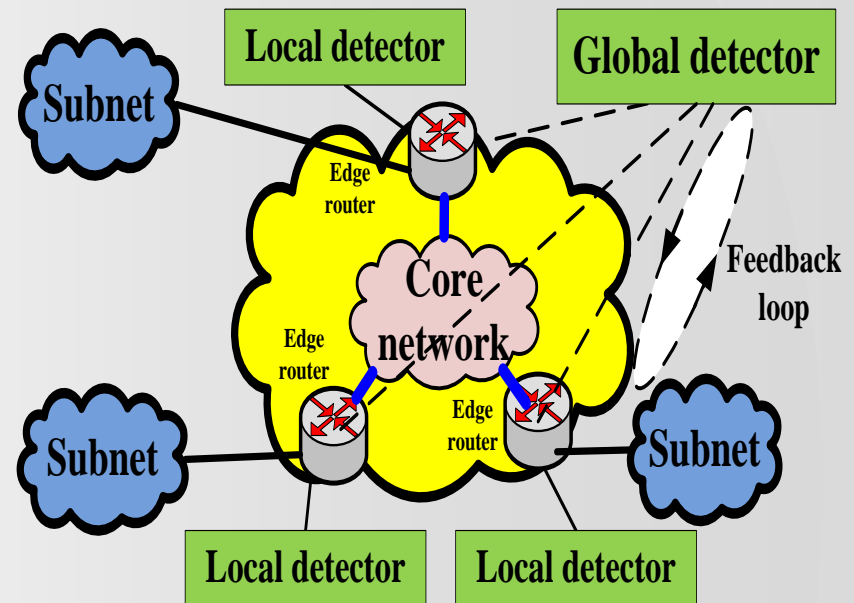
Use of Glab/GENI Infrastructure

- Forwarding Engines (FE) run as applications on PlanetLab nodes.

- FE forward power measurements to subscribers.

- A QoS layer monitors routes and suggests new routes if needed.
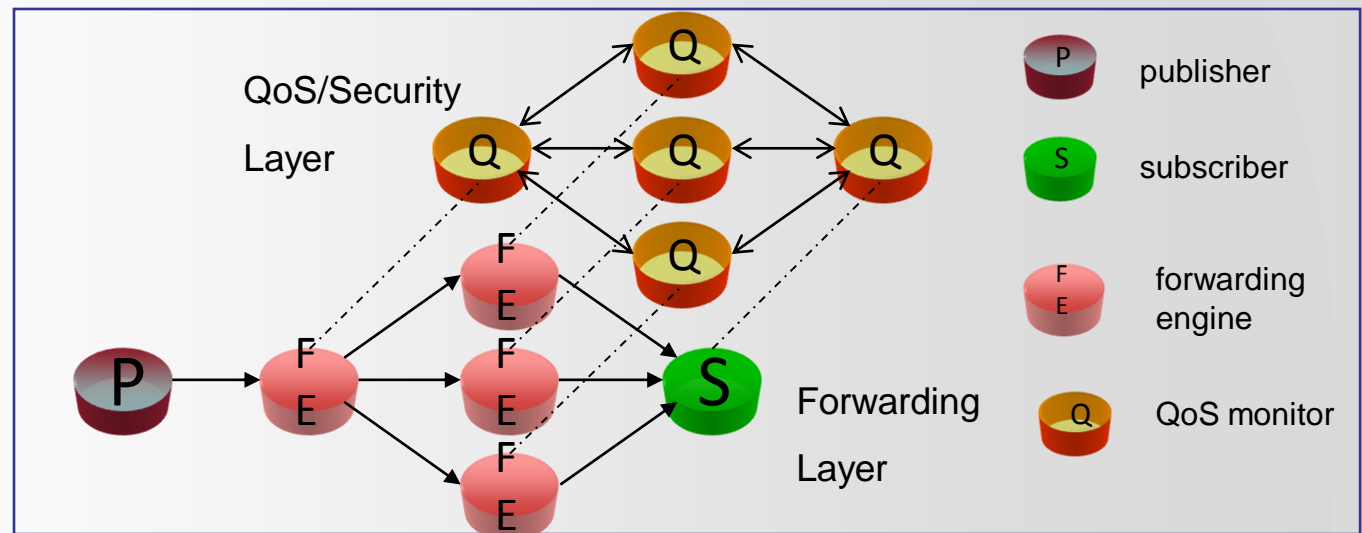
Basic utilization of PlanetLab nodes

PlanetLab & GridStat

- Our Preliminary result about dynamic routing indicates the viability of PlanetLab as a platform for implementation of GridStat.

- Desired scalability of GridStat perfectly matches with that of PlanetLab.

- Sharing of Resources.
  - Keep it transparent to users.

- PlanetLab does not provide QoS guarantees.

- Issue about stability of PlanetLab Nodes.

- Impact on creating a stable test-bed for experimenters.

- Difficulty to deploy and collect statistics about running application on a particular node.

  - Resourceful tutorials offered at GEC's offer opportunity to exchange ideas among experimenters of GENI.

- No Tool to generate Background and Attack Traffic.

References

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- H. Liu, Y. Sun, V. Valgenti, and M. Kim, "Trustguard: A Flow-level Reputation-based DDoS Defense System," Workshop on Personalized Networks, January 2011.

- H. Liu, and M. Kim, Real-time Detection of Stealthy DDoS Attacks using Time-Series Decomposition," ICC 2010.

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Thank You for listening!!