Network-wide Protocol Monitoring (NPM): Use Cases

draft-chen-npm-use-cases-00

Huainan Chen (China Telecom)
Zhenqiang Li (China Mobile)
Feng Xu (Tencent)
Yunan Gu, Zhenbin Li (Huawei)

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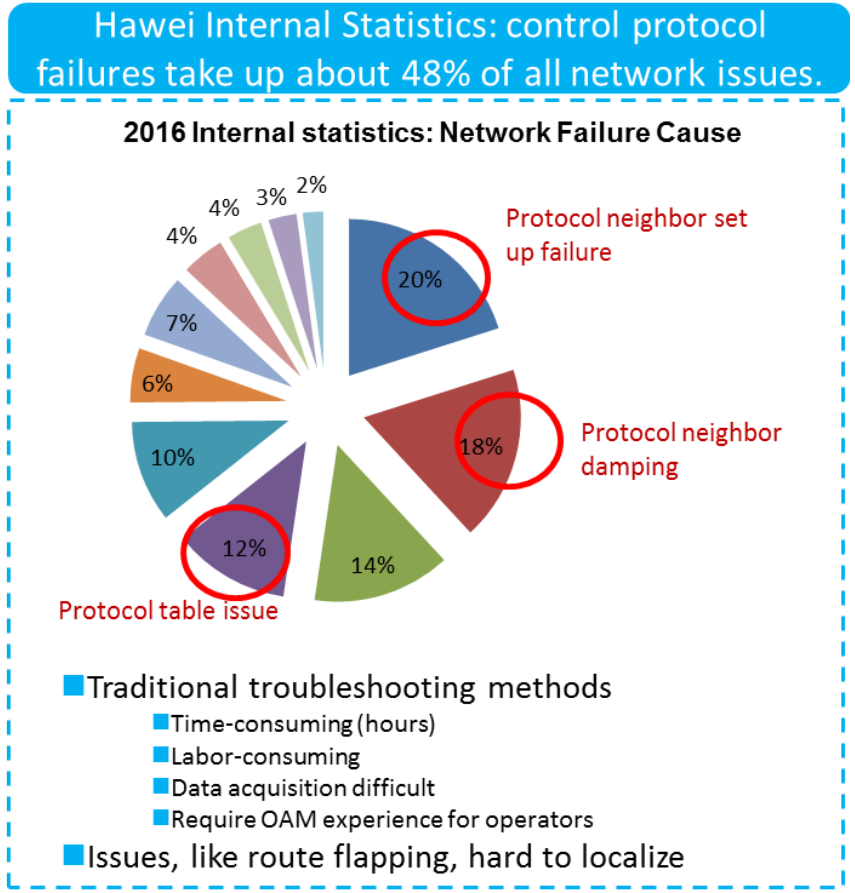
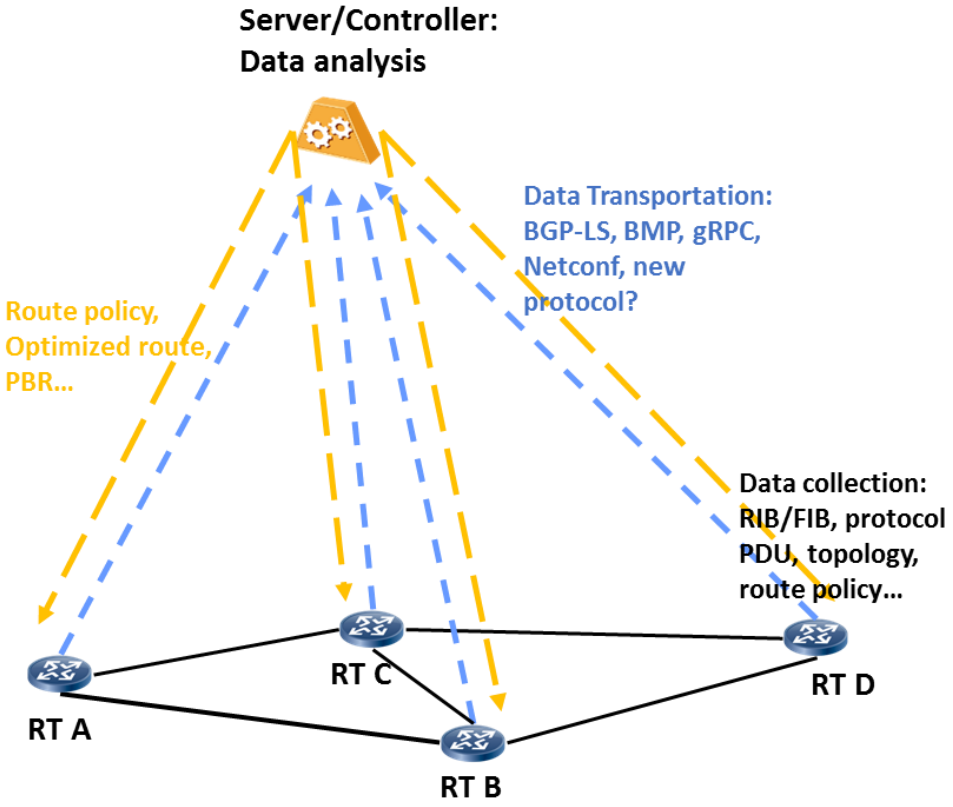
Control Plane Telemetry

- Management/control/data plane telemetry
  - **Management plane telemetry:** network operational state retrieval and configuration management
  - **Control plane telemetry:** routing protocol monitoring and routing related data retrieval, e.g., topology, route policy, RIB…
  - **Data plane telemetry:** traffic performance measurement and traffic related data retrieval
- Role of control plane telemetry:
  - **Network troubleshooting**
    - 48% of the problems are based on protocol errors or misconfiguration impact both tracking of operational and provisioning
  - **Network planning**
    - No effective route policy/configuration validation approach, and lacks route-traffic correlation insight
    - Real time applications of 5G require real-time TE optimization, and accurate what-if simulation for network planning

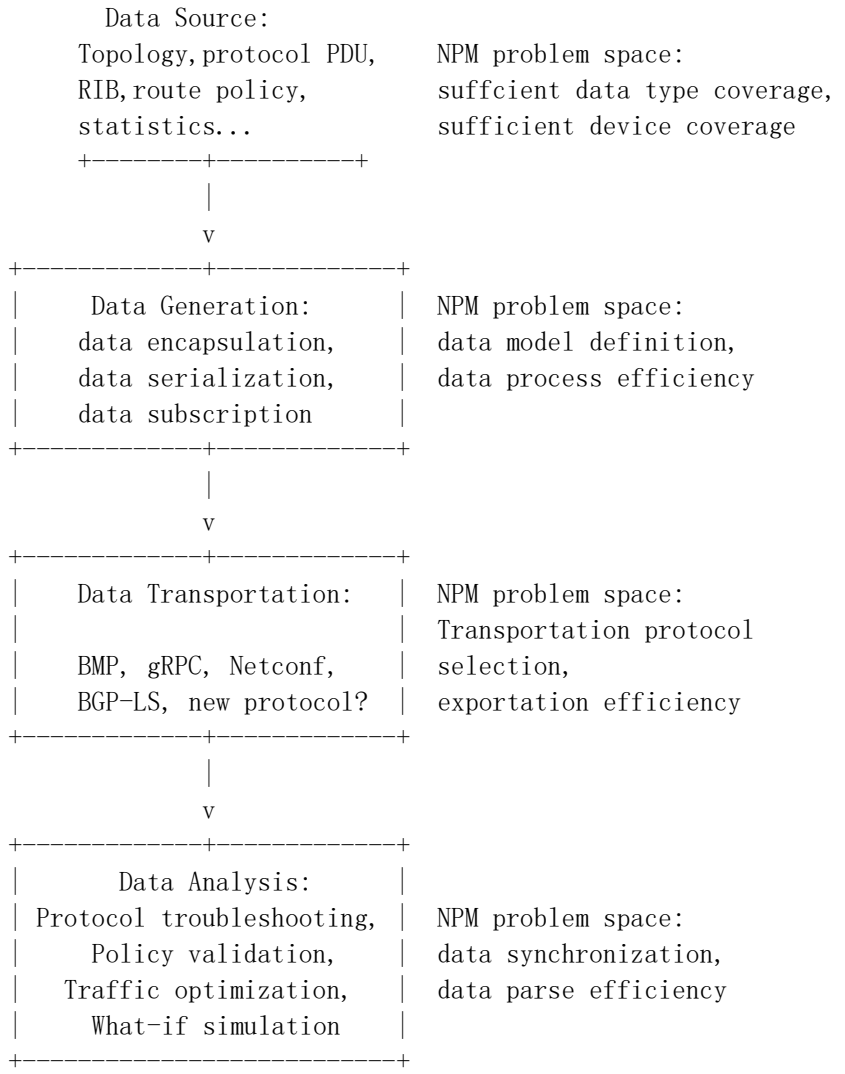
Hawei Internal Statistics: control protocol failures take up about 48% of all network issues.



Network-wide Protocol Monitoring (NPM) Framework

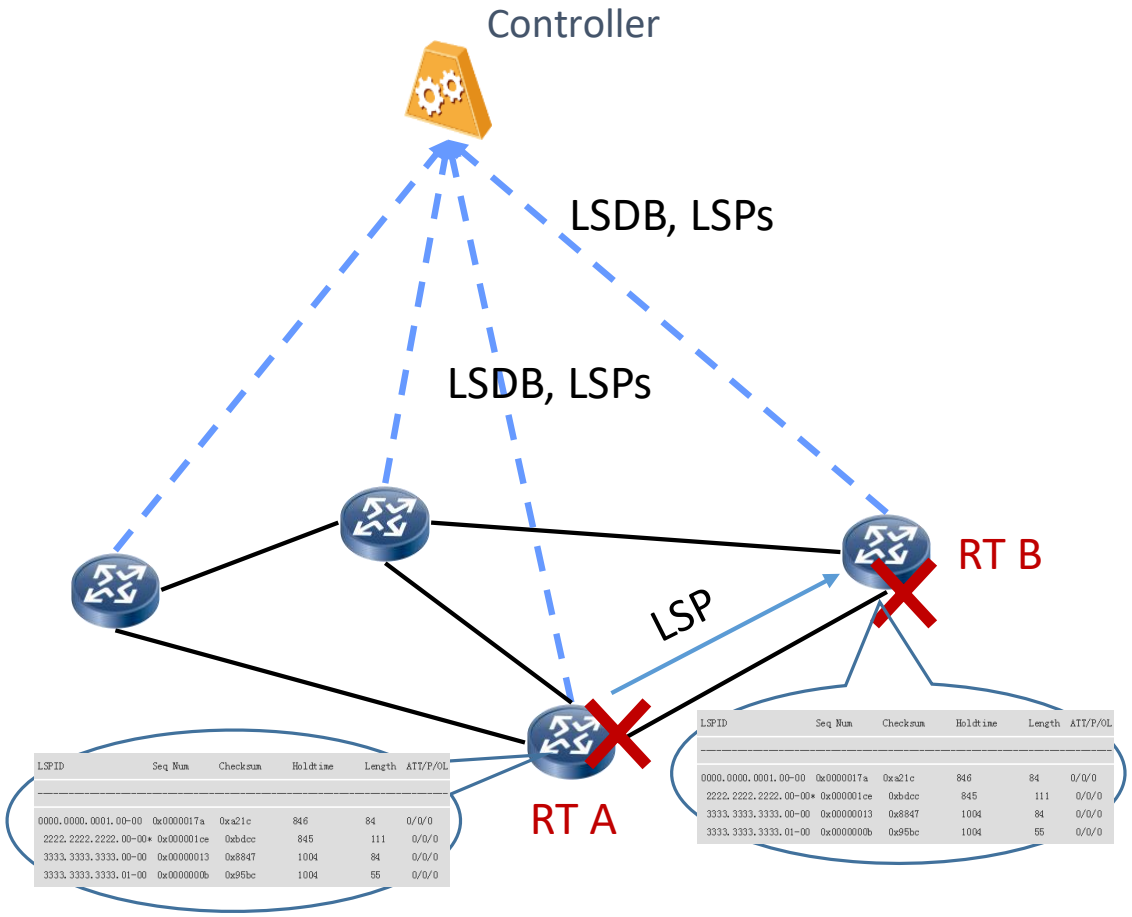


NPM Framework



Use case 1: LSDB Synchronization Failure

- Cause 1: LSP authentication error
  - E.g., L1 LSP with area authentication
  - Algorithm mismatch, key mismatch due to misconfigurations or synchronization issue
- Cause 2: LSP too large to propagate
  - LSP fail to be sent due to too many link states in one LSP for the configured MTU
- Cause 3: Logic bugs
  - Logic bug leads to PDU not sent
  - Logic bug leads to PDU discarded when received
- Improvement with NPM
  - Reason code
  - LSDB and LSP comparison



Use case 2: Route Policy Validation

- Existing route policy validation:
  - Lacks the vision of how policy impacts the route attributes
- Route policy pre-check simulation:
  - Simulation based on device configurations: not 100% mirroring of on-going network
- Possible improvements with NPM
  - **Policy/Route correlation:** Real-time track of how policy changes route attributes
  - **Control plane snapshots:** as the simulation input: topology, protocol neighbor state, RIB… to improve the simulation accuracy

Prefix	Route event	Route policy	Time stamp	Next hop	Cost
172.17.0.0 /16	1	ISIS: Route-policy r1 : permit/permit : cost 100	xx:xx:xx	192.168.2.2/24	100
	2	RM: Route-policy r2 : permit/deny : next-hop	xx:xx:xx	192.168.1.1/24	100
	3	RM: Route-policy r3 : permit/deny : cost 200	xx:xx:xx	192.168.1.1/24	200

More Use Cases

- More use cases to be found in the draft
  - IS-IS Route Flapping
  - Route Loop
  - Tunnel Set up Failure

Summary

- General Requirements from above use cases
  1. A "tunnel" for the control plane data export:
     - Performance guarantee for: data modeling, encapsulation, serialization, exportation, transportation performance
  2. Adequate protocol data collection:
     - The data type coverage:
       - Protocol PDUs (LSP, LSA, Hello, Open, Update…)
       - Network-wide RIBs
       - Correlated policy and route attributes…
     - The network coverage: network-wide data collection
- Next step
  - Want to get feedbacks on the use cases
  - Identify and tease the requirements and gaps