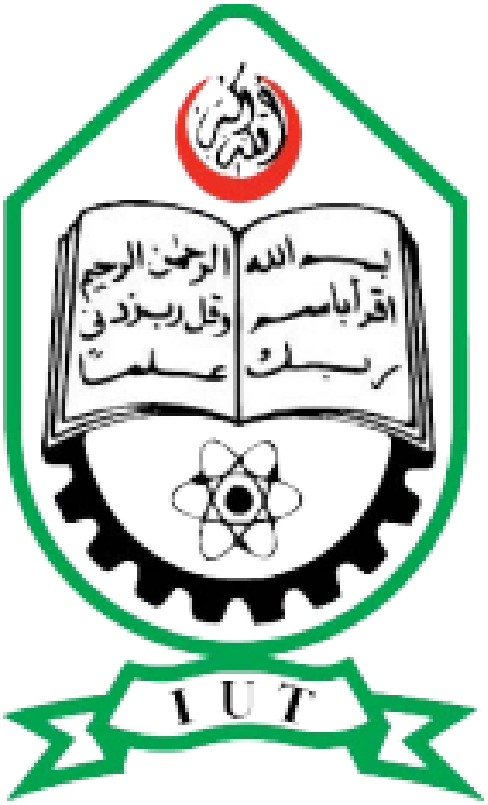

Islamic University of Technology

CSE 4840

Internetworking Protocols Lab

Lab 4

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Introduction

Using the ns-3 network simulator, the report explores various routing protocols in great detail. It describes in great detail the precise configurations that were used, the minute details of how each protocol was put into practice, and it performs a thorough analysis to compare how well each protocol performed in the simulated environment under controlled conditions.

`Ns3` “routing” directory’s routing protocols

The following files are located in the ns3/examples/routing/ folder; each demon- com- paring the various routing protocols that are employed in NS-3 simulations:

1. Dynamic Global Routing
   - dynamic-global-routing.cc
2. Global Routing:
   - global-injection-slash32.cc
   - global-routing-multi-switch-plus-router.cc
   - global-routing-slash32.cc
   - mixed-global-routing.cc
   - simple-global-routing.cc
3. RIP/RIPng (Routing Information Protocol/next generation):
   - rip-simple-network.cc
   - ripng-simple-network.cc
4. Simple Alternate Routing
   - simple-alternate-routing.cc
5. Static Routing:
   - static-routing-slash32.cc
6. MANET (Mobile Ad-hoc Network) Routing:
   - manet-routing-compare.cc
7. Multicast Routing:
   - simple-multicast-flooding.cc
8. IPv6 Routing:
   - simple-routing-ping6.cc
   - simple-routing-ping6.py

For Comparison, we will choose: rip-simple-network.cc, ripng-simple-network.cc, simple- global-routing.cc, static-routing-slash32.cc, dynamic-global-routing.cc and manet-comparison.cc

Exploring Routing Protocols

Proactive Routing with Global Insight

Overview: This approach leverages a global understanding of the network to proactively manage and update routing tables, typically employing algorithms like Shortest Path First (SPF).

Applicability: Effective in stable, wired networks with infrequent changes.

Advantages: Efficient for networks with static or seldom changing topologies.

Drawbacks: Not suited for dynamic or large-scale networks due to scalability and adaptability limitations.

Distance-Vector Routing: The Essence of RIP

Overview: RIP utilizes a Distance-Vector algorithm to determine the shortest path to each network node based on hop count, capped at 15 hops.

Suitability: Ideal for smaller, less complex networks requiring straightforward rout- ing solutions.

Strengths: Easy to configure and understand.

Weaknesses: Limited scalability due to the 15-hop constraint and slow convergence in dynamic environments

RIPng: Navigating IPv6 Networks

Overview: Tailored for IPv6 networks, RIPng employs a Distance-Vector algorithm with a 15-hop limit.

Use Cases: Well-suited for small to medium-sized IPv6 networks requiring simple routing solutions.

Advantages: Offers straightforward configuration, easy comprehension, and IPv6 compatibility.

Limitations: Restricted scalability is due to the 15-hop constraint and slow convergence times, making it less suitable for larger or highly dynamic networks.

Performance Analysis

Medium-sized to Small-sized Networks For modestly sized to medium-sized networks with generally stable topologies and RIP, RIPng, or traffic could all be good choices. They provide easy configuration. RIPng is chosen for IPv6 networks due to its superior stability, robustness, and measures of performance. Five Huge Networks Dynamic Global Scalability is important in larger networks where it It might be better to use routing. Even though its throughput might be lower, its capacity to routing paths can be optimized by dynamically adjusting to shifting network conditions. and strengthen resilience. Consistent Wirenet Systems Robust wired networks have Simple Global Routing as a serious competitor. It is It is perfect in situations where there is an efficient throughput and consistent performance. The topology of a network seldom changes. Differentiated Network Environments In the case of networks with diverse requirements spanning various segments or regions, The use of mixed global routing could offer a compromise between dynamic flexibility. Nonetheless, cautious setup and administration are required. in order to reduce any potential complexity. Particular Uses In particular applications where very consistent performance and minimal latency are needed, Industrial control networks or real-time communication systems, for instance, Low latency and simplicity are two advantages of static routing. Still, though, it Perhaps not suitable for large-scale or dynamic deployments.

Routing Protocol	Average Delay (s)	Throughput (Kbps)
RIP	0.0056 - 0.015	47.85 - 187.56
RIPng	0.0023 - 0.0119	Up to 828.607
Simple Global	0.0158	Approx. 482
Dynamic Global	0.0021 - 0.015	1.74 - 3.43
Mixed Global	0.0168	0.56
Static Routing	0.0057	6.85

Table 1: Routing Protocol Performance

Conclusion

Performance assessment in ns-3 highlights the various aspects and trade-offs present in various routing protocols. Understanding these nuances is crucial to selecting the best protocol for a given network scenario, considering variables like network size, stability, scalability, and performance requirements. With the help of these insights, network engineers and administrators can create robust and efficient communication frameworks by making informed decisions.