



EFFECT OF INTERNET PATH SELECTION IN CONGESTED NETWORK FOR HIGH LEVEL DATA TRANSMISSION

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Abstract:

This Paper presents the Effect of internet path selection in congested Network. And increase the Delivery Ratio of High-Priority Data. To provide more importance to the high priority data by degrading the performance of low priority data. Internet Path selection work is a best-effort packet delivery model. Address differentiated data delivery in the presence of congestion in wireless networks. Congestion-Aware Adaptive Routing (CAR) schemes only use channel-based information to identify the congestion status. Propose a class of algorithms that enforce differentiated routing based on the congested areas of a data priority network. We propose Path congestion-aware adaptive routing (PCAR). This routing method based on following techniques. 1) Path-congestion-aware selection strategy that concurrently considers switch congestion and channel congestion 2) Increase the switching device buffer size. 3) Assign the high level priority to important data .4) Choose the alternate virtual path. The proposed result PCAR scheme can achieve a high saturation throughput with a development of 20.4%–50.7% compares to existing routing schemes. The PCAR method also includes VLSI architecture; it has higher area efficiency with a development of compared with the existing router designs. We deployed SIFR on Planet Lab nodes and compared the performance of SIFR to the default Internet routing. SIFR outperforms IP-path selection by providing higher on-screen perceptual video quality.

Index Terms: Adaptive Routing, Congestion Prediction, Video QoE & Path Selection

1. INTRODUCTION:

MULTIMEDIA streaming over IP networks is poised to be the dominant Internet traffic in the coming decade. Industry forecasts that the sum of all forms of video [TV, video on demand, Internet, and peer-to-peer (P2P)] will be approximately 86% of global consumer traffic by 2016. As multimedia service providers deploy services on top of packet-switched networks that compete with cable-based content providers, there is an ever-growing need to provide superior quality of experience (QoE). There are various reasons to expect current Internet path selection policies to be suboptimal in assuring superior QoE. Current wide area routing protocols choose paths solely based. On hop count and autonomous system (AS) connectivity and are, as such, not optimized for QoE. For reasons of scalability, connectivity information between AS is further filtered during routing advertisements. As a result, a video source has limited routing options when sending its packets, especially during times of an outage. However, the Internet itself comprises billions of interconnections, and the probability that there are alternate paths that can perform better is high. An empirical understanding of QoE degradations

along an Internet path, and simple alternative path selection strategies that go beyond default IP-routing, would help us overcome some of these limitations.

This paper presents a large-scale measurement-based study on the effects of Internet path selection on video-QoE and investigates ways to improve it using application-specific policies and redundant Internet paths. We seek answers to the following questions: 1) what degrades video QoE in the Internet, and where in the path do these outages frequent? 2) How does an Internet outage affect video-QoE? 3) What fraction of these outages is solvable by using redundant alternative Internet paths? 4) How can a source select the right alternative path to improve Internet video-QoE without having to perform any prior path quality measurements? To measure the perceptual degradation resulting from these outages, we reconstructed a variety of MPEG video samples using the IP-traces collected from every destination set. Network anomalies typically manifest as a video artefact, which is a visible distortion during payout that persists for certain duration. These artefacts could range from slicing to freezing to extreme pixilation. These artifacts and their on-screen duration depend on the type of frame impacted, the motion complexity inherent in the clip (low versus high), and encoding bit rate. Using subjective surveys, we outline application-specific policies that can improve perceptual quality.



Fig-1: (a) QoE versus QoS: While both clips experienced the same loss rate (QoS), (b) perceived quality can be very different depending upon what frame was impacted.

Finally, we design and implement a prototype forwarding module in Planet Lab called source initiated frame restoration (SIFR). We evaluate the effectiveness of SIFR in improving video-QoE against the default IP-path. We show that we can minimize and recover quickly from perceptual degradations and preserve interactivity, thereby raising perceptual quality on top of the best effort Internet

2. INNERNET PATH SELECTION:

The Internet is organized as an interconnection of thousands of ASs. Each AS is under the purview of an Internet service provider (ISP), and neighbouring ASs use the Border Gateway Protocol (BGP) to exchange reach ability information. ASs apply individual policies in advertising and propagating reach ability information to neighboring ASs. In reality, reach ability information advertised by an AS is often the result of various provider-customer relationships between the governing ISP and other ISPs. Typically, ISPs are arranged in various tiers, where tier-1 ISPs sell connectivity to

other ISPs, while tier-3 ISPs buy connectivity from ISPs in higher tiers while charging consumers. Though the model we present here is overly simplistic, it offers a basic overview of how Internet routing works. ISP-ISP relationships are not limited to provider-consumer relationships: The emergence of Internet exchange points (IXPs) allows peer ISPs to interconnect with each other, essentially “flattening” the Internet hierarchy. Peering can also happen outside IXP, and IXPs can serve to connect provider-customer relationships. Other complex relationships are also possible. Note also that not every AS is necessarily an ISP; an AS could be owned by an enterprise, government agency, or educational institution. The end result of this process is that a typical Internet route often (not always) traverses lower-tier ISPs to reach a higher tier ISP (“up” the valley), followed by a journey down to another lower-tier ISP (“down” the valley) to reach a destination.

3. PROBING INTERNET DESTINATIONS:

Streaming content on the Internet today is most commonly disseminated by VoD/IPTV service providers or by P2P streaming (e.g., Joost, BBC iPlayer, PPLive, etc.). Hence, we begin by measuring the round-trip path to these destinations from geographically diverse client locations. We analyze outages on these paths, their recurring frequency, as well as their location along the path. We provide upper bounds on the fraction of outages that occur on the last hop, which cannot be recovered by using alternate paths. Overall, results presented in this section are crucial to understanding paths used to disseminate streaming content from popular sites/hosts all over the Internet.

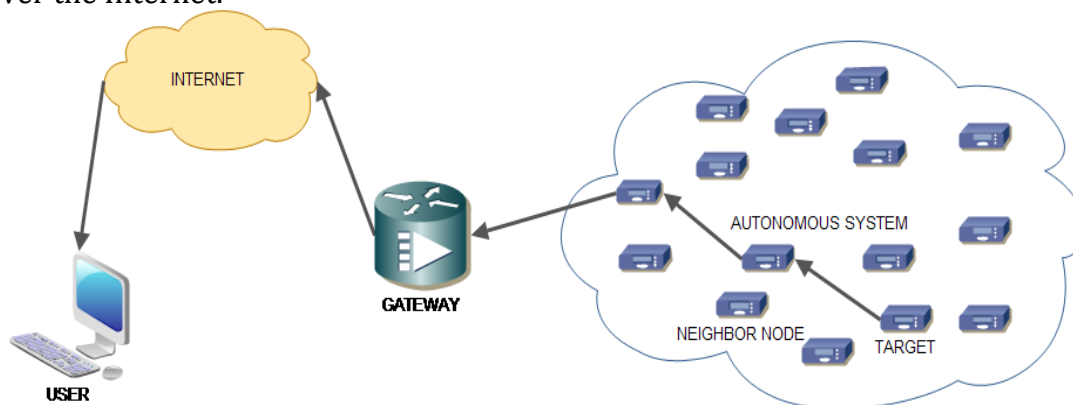


Fig-2: Neighbour node selection

4. METHODOLOGY

A. Congestion-Aware Adaptive Routing

Congestion-aware adaptive routing selects an output channel based on various types of network congestion information. Congestion must be then discovered from that neighborhood to the sink for the delivery of HP data. Consequently, these selection functions can adjust path selection based on a time-variant congestion status. Critical are nodes broadcast “discover Congestion to sink” (To_Sink) messages. This message includes the ID of the source and its depth and is sent to all neighbors. Local routing information considers local information such as the downstream buffer count and available flit slot to assess the traffic status. For example, the output buffer length (OBL) selection function chooses the output channel buffer with the maximum number of available flit slots. This flit slot information can be exchanged between two neighboring routers.

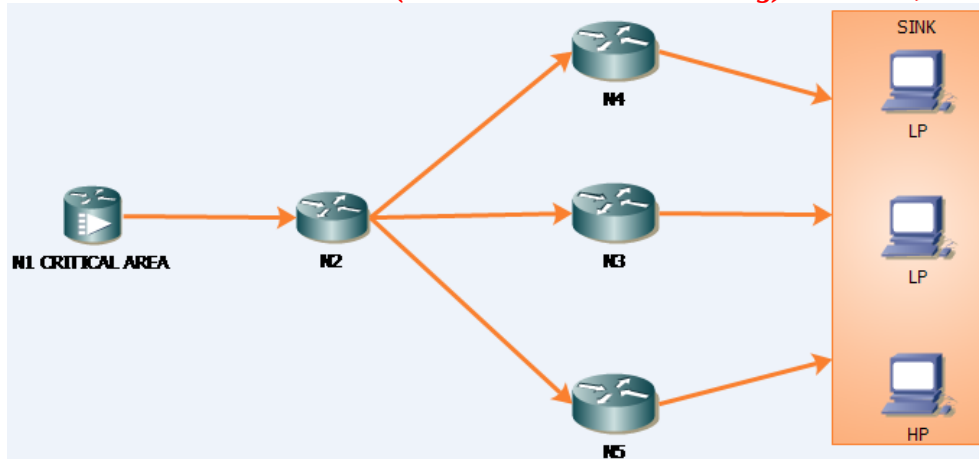


Fig-3: Network formation in car

Node N1 is considered as a critical area node. Node N1 is connected to N2; N2 is connected to N3, N4 and N5. Nodes N3, N4 and N5 are connected to Sink. CAR forms a HP network, nodes forwarding HP data forms HP network, by dividing nodes in the network as congestion zone nodes and off-Congestion nodes. Only on-Congestion nodes will forward the HP data. LP data generated inside the Congestion is routed out of the Congestion.

B. Problem of Congestion-Aware Routing

All of these mentioned routing schemes monitor traffic status according to channel-based information only. As the system size increases, using channel-based information to make routing decisions becomes inefficient for balanced traffic.

1. **Lack of Switch-Based Information:** Channel-based information does not completely show the real status of path congestion. Due to the lack of considering the switch congestion, adaptive routing cannot accurately detect path congestion, much less switch contention.
2. **In determination of Congestion:** When candidate output channels have the same congestion status, conventional selection functions cannot make decisions. In this case, they randomly choose an output channel. This lack of awareness may lead to a bad distribution of the traffic load over the network. In resource-constrained, this problem is particularly frequent when the buffer space is small, for example, it occurs from 30.05% to 67.43% of the time in different types of traffics when the buffer size is four.

These problems result in high-congestion traffic distribution and adversely affect network performance. Therefore, to improve the accuracy of congestion prediction, the proposed routing scheme additionally considers the influence of switch contention on the process of packet transmission.

5. PROPOSED PATH-CONGESTION-AWARE ADAPTIVE ROUTING SCHEME

The PCAR scheme consists of a deadlock-free routing function and path-congestion-aware selection function. This section presents the path-congestion-aware selection function, which consists of two techniques: 1) PCAS strategy, which is based on channel congestion and switch congestion information, and 2) CPT, which uses the rate of change in an input buffer usage of next-hop router to determine whether adjacent paths are congested. In this section, for convenience, we use the term output buffer to refer the input buffer of the next-hop router.

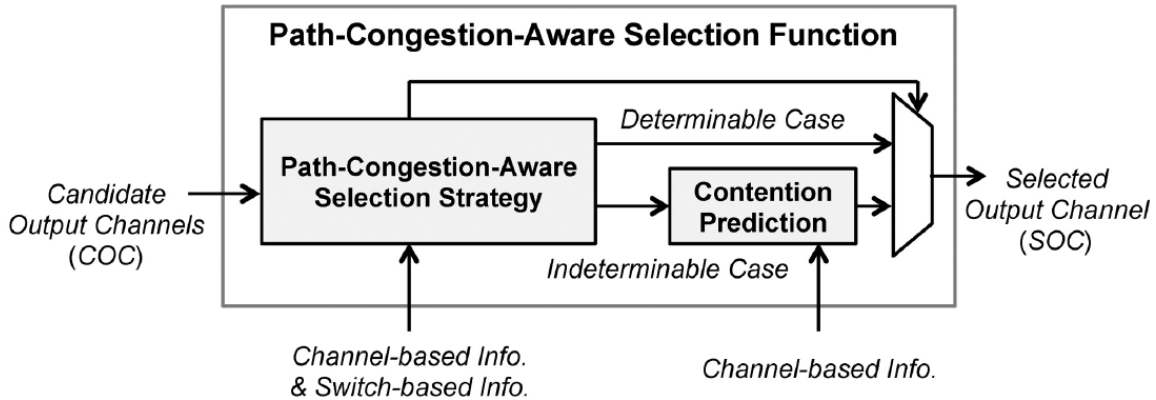


Fig-4: Path congestion aware selection function

A. Selection Criterion: To reduce the packet delay along

The routing path, the proposed PCAS adopts the path congestion information to make routing decisions. Therefore, the goal of PCAS is to minimize downstream router delay $L(o)$ by avoiding the cases of possible congestion in routing paths, which is given by

$$\min L(o) = \min [(BCT + CL_{ch}(o) \cdot RST) + (RST + CL_{sw}(o) \cdot RST)]$$

Where the variable represents the output direction in the local router. Due to the constant delays of BCT and RST.

B. Parameter Setting of Contention Weight

The two approaches of weight settings adjust competing weights: 1) the equal weight settings approach (EWSA), and 2) the direction based weight settings approach (DWSA). In this paper, we adopt a round-robin policy for NoC systems. In the long run, it can give equal chance to all input channels for requesting the shared output port. In the network formation all the nodes are connected and depth is assigned to all nodes. Unlike CAR, PCAR does not form an HP network instead HP paths are dynamically created, since the sources or sinks are expected to be network. In setting modes each node in a network can be in one of the three modes: LP mode, HP mode or shadow mode. A node dynamically changes its state and route the appropriate data.

- **LP Mode:** In this mode, nodes forward LP data. All nodes in the network are initially in the LP mode. Upon receiving an LP data, nodes remain in the LP mode and forwards LP data, if a node in the LP mode receives an HP data, it transitions to the HP mode and forwards HP data.
- **HP Mode:** Nodes in the path of HP data are in the HP mode. Node that forward HP data would change as HP mode. If a node in this mode receives an HP data it stays in the same mode and forwards HP data. If a node in this mode receives an LP data either it changes to LP mode and forwards LP data or it changes to shadow mode and drops the LP data.
- **Shadow Mode:** In this mode if node receives HP data it transitions to the HP mode and forwards HP data. If a node receives LP data it drops the LP data. The drawback of PCAR is it neglects the service provided to LP data when the node turns to shadow mode it drops the LP data.

6. RESULT ANALYSIS:

A. SIFR: Source Initiated Frame Restoration

Based on random-k path recovery, we design and implement a system (SIFR), Destination reports an outage when key frame corrupt. Source retries subsequent

frames using k randomly chosen intermediaries. Deployed SIFR on three source nodes, one each in US, EU and AP, Compared against default-IP at three co-located nodes. Ran experiment for little more than 48 hours.

Table-1: Result between SIFR and Default IP-Path

Performance Metric	SIFR	Default IP-Path
Total # of GOP degradations	303	779
# of degradation “episodes”	251	293
Mean # of corrupt GOP per episode	1.167	2.65
% of the times episode were Limited to one GOP	96%	82%
Mean time to restore quality	<1 sec	5.23 sec

B. SIFR is better able to restore perceptual degradations

To better estimate recovery using SIFR, we measure the percentage of times the degradation episode was limited to one GOP. Our results indicate that 96% of the time, SIFR could restore playout following a degradation using alternate paths. For default IP-paths, this is around 82%, which in a way reflects on the IP-path in self healing itself. In effect, the availability of higher on-screen perceptual quality benefits by 14% with SIFR. We believe our work compliments much of prior Internet based measurement studies and directions toward improving Internet video-QoE. Our measurements of popular Internet destinations and the benefits of using alternative routes can provide valuable insights to service providers and ISPs with major commercial and technical implications.



Fig-5: In (Left) Default IP-path In (Right) SIFR redirection

7. CONCLUSION:

This paper presented large-scale Internet measurements to understand the effects of Internet path selection on perceptual quality of MPEG-2 video and investigated ways to improve it. We addressed data delivery issues in the presence of congestion in large Networks. We proposed CAR, which is a differentiated routing protocol and uses data prioritization. We also developed PCAR, which deals with mobility and dynamics in the sources of HP data. To understand the benefits of using alternate paths, we collected week-long measurements from five different datasets that both confine to and span multiple continents with a dominant presence of online streaming services. We presented large scale Internet path measurements effects of Internet path selection on video-QoE ways to improve video QoE. First empirical measurement based characterization of Internet paths from a multimedia-quality standpoint. Overhead free selection of alternate Internet paths. We believe this technique has potential to build large scale routing overlays to alleviate many problems. In future we plan to work focus on deploying large scale overlays based on random load allocation. Investigate latency reduction overlays. Investigate specific properties of Path Selection. To ensure quality of Service (QoS) for video streams, PCAR can be used as a

routing protocol. Our future work looks at the effectiveness of such techniques in large scale Network Environments.

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