ISSN (ONLINE): 2395-695X
ISSN (PRINT): 2395-695X

International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST)
Vol.3, Special Issue.24, March 2017

HOP BY HOP MECHANISM IN NETWORKS

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ABSTRACT:
Hop-by-hop mechanism is a principle of controlling the flow of data in a network. With hop-by-hop transport, chunks of data are forwarded from node to node in a store-and-forward manner. As, the Internet, routers and switches account for the majority of energy consumption, more and more high performance routers are developed and deployed currently.This may degrade network resistance against failuresand also the traffic of different paths collectively increases the utilization ratio of links, and leads to greater energy consumption. So the "green" routing is used where Internet topology is not pruned and the observation for the energy consumption for packet delivery can be different in different traffic volumes. Therefore, we can select paths that consume less power while delivering traffic. So the hop by hop approach in networks with MPLS is used. Where each router compute next hops by the Dijkstra .and also the hops can be incorporated by the routing algorithm into OSPF protocol .By Dijkstra the Qos performance of the network can be adjusted naturally. In the paper, timing will be used for transferring packet from one node to another node. So we can get efficient information from client side.

INTRODUCTION

Energy conservation is a global concern nowadays and energy cost is expected to increase for the forthcoming future. As a consequence, energy has become an important issue in the designs of such area as data centers, building management, to name but a few. There are emerging studies for saving energy for the Internet. In general, these studies turn the network components such as line cards or routers into sleeping modes. The network components to be turned off are carefully chosen and trade-offs are investigated to balance network performance and energy conservation. Internet routing is then conducted in the residual topology or realized by MPLS assistance, etc. In this paper, we study "green" routing in the sense that we deliver traffic by selecting paths that can consume less power. This fundamentally differs from previous schemes, though our approach is orthogonal and can be jointly applied with them.

At the very beginning of the Internet routing designs, shortest path routing was adopted in the hope to save such critical resources as router computing capacity, bandwidth, etc. Energy conservation was not listed in the design space. A commonly accepted vision nowadays, however, is that computing and information are becoming cheaper and energy is becoming more expensive and we may trade computing capacity for energy saving opportunities. In-line with such vision, we may want to search a path that is "greener", even though longer. A key observation that makes this possible is that even if we do not turn off a network component, the energy consumption for packet delivery can be different under different traffic volume. Intrinsically, this is due to such technologies as trucking (or bundled links) and adaptive link rates (ALR). Trucking, standardized in IEEE 802.1AX, refers to the fact that a logical link in the Internet often reflects multiple physical links, e.g., a 40Gbps link may consist of four 10Gbps links; and when traffic volume is less, less physical links can be used and less energy is consumed.

ALR is an Ethernet technology where link rate and power dynamically scales with traffic volume. Such observation leads us to think to incorporate energy conservation into Internet routing designs. One way to generalize the above example and maximize energy conservation is to formulate the problem into an optimization problem; analyze the problem complexity and design a centralized routing algorithm. Such approach requires developing a separate protocol to establish the routing paths. In this paper, we instead choose a hop-by-hop approach. More specifically, each router can separately compute next hops, the same as what they do in Dijkstra today.

We can then easily incorporate the routing algorithm into OSPF protocol. Under this hop-by-hop design decision, we face three main challenges: 1) we need to clarify an appropriate power model; 2) to be

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practical, the computation complexity should be comparable to shortest path routing (i.e., Dijkstra) and loop-free; 3) hop-by-hop computing should maximize energy conservation; and 4) important QoS performance of the network such as path stretch may be coconsidered, and can be naturally adjusted. In this paper, we present a comprehensive study. We first develop a power model and we validate our packet model using real experiments.

RELATED WORK

Together with the world-wide objective to build a greener globe, more and more computing systems put energy conservation into their design principles There are efforts to develop a greener Internet as well. Some studies save energy of specific network devices. Green TE is proposed to use MPLS tunnels to aggregate traffic so as to turn the underutilized network components into sleeping modes to save energy. Response is proposed to offline identify energycritical paths and on demand paths. The packets are online delivered also with the objective to effectively aggregate traffic to turn more network components into sleeping modes. Green TE and Response are both centralized schemes. Greenup is proposed to aggregate traffic in a distributed fashion and turn the network components into sleeping modes. However, to achieve a good performance, a centralized algorithm is still needed to assign sleeping links. ESACON is proposed to collaboratively select sleeping links with special connectivity properties. Routing paths are then computed after removing these links. A fully distributed approach is proposed which collects global traffic information and aggregates traffic to turn appropriate network components into sleeping mode. Our approach differs from all the aforementioned schemes as follows. First, all previous proposals set network devices or links into sleeping modes. Our design is based on the observation that different traffic volume also has different energy consumption. Internet routing algorithm may take this into consideration. To the best of our knowledge, we are the first to propose such scheme. Second, though some previous schemes compute the network components to be shut down in a distributed fashion, large changes to current routing protocols are still needed. Our routing computation is hop-by-hop and

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Dijkstra-oriented. We believe this is easier to be incorporated into current routing architecture. We may consider green as one

different approaches in Internet QoS support beyond shortest path routing. One is centralized computation. The benefit is that since different types of services usually introduce conflictions, a centralized scheme can compute optimal or near optimal solutions. The disadvantage is that centralized computation requires additional protocols, which is a non-trivial overhead. The other is to maintain hop-by-hop computation by managing different types of services into a singular link weight. A seminal paper shows that to make hop-by-hop computation loop-free requires the link weight to have certain is tonicity properties and a routing algebra model is developed. In this paper, we also leverage the algebra model to develop hopby-hop computing for green Internet routing that is loop free. We have a set of algorithms where we gradually improve the energy conservation performance. The results show that our algorithms may save more than 50% energy on line cards

POWER MODEL

type of service that the Internet should be provisioned. There are many studies on Internet Quality of Service. There were two

The relationship between the power consumption and the traffic volume. The first present the router operation backgrounds and our modeling details. thenthen use simulations and experiments to validate our modeling.

A. Router Operation Backgrounds and Power Modeling

A link between two routers is physically connected by two line cards; and the line cards consume the majority power of the routers. We thus use link power consumption to abstract the power consumption of the line cards. We can divide the power consumption into two different categories: 1) power consumed by line card CPU processor; this is super-linear to the traffic volume and 2) power consumed by such operations as buffer I/O, packet lookup, etc; this is usually linear to the traffic volume. There are many components in a line card. With advanced technologies, many components can individually change to low-power states or be turned off after the traffic volume is reduced under different levels of thresholds.

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For instance, an Intel processor has active state C0, auto halt state C1, stop clock state C2, deep sleep state C3 and deeper sleep state C4, all with different power consumption. Similarly a PCIe bus which connects the chips has the states of D0, D1, D2, D3hot and D3cold. Since turning on-off of these components are discrete, we can generally see a discrete stair-like behavior in power consumption (see Fig. 2(a)). With these backgrounds, we can classify two types of links: 1) trunk-links (i.e., adaptive link rate) where advanced technologies are adopted and components can be individually turned off, resulting a stair-like behavior in power consumption and 2) non-trunk-links. Today, nontrunk-links are still the majority, yet trunk and ALR technologies are under fast development. We first model the non-trunk-links and then we model the trunk-links by revising the non-trunk-link model to include the stair-like behavior. Our objective is to model the relationship between link power consumption and traffic volume.

EXISTING SYSTEM:

- In the Internet, routers and switches account for the majority of energy consumption. More and more high performance routers are developed and deployed currently.
- For example, a Cisco CRS-1 router can draw about one Megawatt under full configuration, 10,000 times more than a PC. By 2010, 5,000 Cisco CRS-1 routers were deployed. Facing such high energy consumption, there are many studies for energy conservation of the Internet.
- In general, these studies switch network components, such as line cards and routers, into sleep mode. As such, these studies compute a topology with less nodes and links.

DISADVANTAGES OF EXISTING SYSTEM:

- It may degrade network resistance against failures.
- The network components to be turned off are care-fully chosen and tradeoffs are investigated to balance network performance and energy conservation.
- The traffic of different paths collectively increases the utilization ratio of links, and leads to greater energy consumption. This is a standard local vs. global optimal problem.
- Direct measurements to populate a traffic matrix is typically prohibitively expensive.
- The procedure to estimate a traffic matrix from partial data is of high complexity, since

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the associated optimization problem is non-convex.

- The problem of maximizing the power saving with trunk links using MPLS-like routing has been shown to be NP-hard.

PROPOSED SYSTEM:

The study "green" routing where we do not prune the Internet topology. A key observation that makes this possible is that the energy consumption for packet delivery can be different in different traffic volumes. Therefore, we can select paths that consume less power while delivering traffic.

- In this paper, we instead choose a hop-by-hop approach. Such an approach is suitable for the networks without MPLS deployed. More specifically, each router can separately compute next hops, the same as what they do in Dijkstra today.Thus can then easily incorporate the routing algorithm into the OSPF protocol.

ADVANTAGES OF PROPOSED SYSTEM:

- Intrinsically, our work shows that there can be more refined control than an on-off (0-1) control of the routers in energy conservation.
- We still see a 65 percent of energy saving when the utilization is low and Dijkstra-Green can save more than 20 percent of the energy when the utilization is as high as 70 percent.
- We further develop an advanced algorithm that substantially improves the baseline algorithm in energy conservation. We also develop an algorithm that concurrently considers energy conservation and path stretch
- We now study hop-by-hop green routing (Green-HR).We then study some intrinsic relationships between link weights and power consumption, and develop an advanced algorithm DijkstraGreen-Adv that improves energy conservation.
- Important QoS performance of the network such as path stretch may be considered concurrently, and can be naturally adjusted.

CONCLUSION

The paper, incorporate energy conservation into Internet routing design. We presented a power model to quantify the relation between traffic volume and power consumption; and validated our model using real experiments. We proposed a hop-by-hop approach and developed algorithms that guarantee loop-freeness and substantially reduce energy footprint in the Internet. As a

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very first work, we admit that there are many unanswered questions. First, we believe our algorithms have much room to be improved on interested to further investigate a centralized scheme; this is useful when MPLS can be applied, and also provide theoretical bounding on the maximum possible power conservation.

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