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Development of an Enhanced Adaptive Energy Saving Scheme for Green Optical Networking

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ABSTRACT*:* Global IP traffic is predicted to reach 63.9 exabytes per month in2014. This growth rate has not only driven up demand for bandwidth from the Internet backbone infrastructure but has also presented providers with new challenges such as Enormous Energy Consumption, which causes Global Warming. To address these issues, Load adaptive energy saving schemes were proposed which is for backboneIP networks use dynamic transport circuit services to adapt the active network resources to the current traffic demand in order to reduce the network's energy consumption. Recently, several approaches, categorized as Switch-Off schemes, have been proposed which attempt to reduce the energy consumption of already existing networks by switching-off IP ports and links during periods of low traffic. Although it has been shown that these schemes can notably decrease the network's energy consumption, they are prone to instabilities in the IP routing service and decreased resilience due to reduced connectivity. To address these challenges, Switch-On scheme in an IP-over-WDM network was proposed, where the network is designed so that the essential IP connectivity is maintained during low traffic periods while dynamic circuits are switched on in the optical layer to boost network capacity during periods of high traffic demand. The Wavelength Division Multiplexed (WDM) layer is provided with the traffic management flexibility and the engineering simplicity of digital transport systems (significant operational expenditures reduction) and with the network cost savings of large-scale photonic integration(capital expenditures reduction).However, from our experimental results, it is revealed that the proposed Improved Load Adaptive Energy Saving Scheme which is integrated with Switch-On Technique for Saving Energy in Optical Networks causes considerable computational complexity. This could be minimized, if we are designing new mechanism which reduces the packet processing period. It combines packet and WDM switching technologies where appropriate, with the ability to offload pass-through traffic from the packet layer to the lowest possible layer, so as to reduce costs and power consumption by eliminating unnecessary packet processing, which will reduce the computational complexity, it also further improve the performance of Optical Network in terms of Power Consumption, Throughput, Router Utilization and Bandwidth Utilization.

Keywords: Cross-layer design, minimum energy control, networks, optical communication equipment, traffic grooming, energy efficiency, IP-over-WDM, load adaptive, network optimization, routing stability, Packet switching, Packet–optical integration

I.INTRODUCTION

In this chapter discuss about Increase in internet traffic brings a significant issue of the energy consumption problem as well as the network capacity problem. Network equipment consumes 22 GW globally which is equivalent to 14 percent of energy consumption of the information and communication technology (ICT) sector in 2007. If internet traffic increases as predicted, the problem of energy consumption of networks will be the most critical issue that requires significant research effort for the energy-aware solution. In order to cope with such rapid increase in energy consumption in networks, a lot of research efforts are dedicated to solve the problem recently. Energy consumption analyses for network equipment have been also reported for understandings of the energy consumption of networks. Traffic grooming technique is one of the prime candidates to save energy consumption of networks, because it can maximally utilize a WDM optical layer that consumes relatively very little energy. Optical networks are a relevant part of transport infrastructure, because of their high capacity and effective low cost if compared with digital networks. Benefits of packet–opto integration could be summarized just by considering the ability of offloading pass-through traffic from the packet layer down to the WDM layer, so as to reduce the cost and power consumption, by eliminating unnecessary packet processing.

II.LITERATURE SURVEY

Chankyunlee [1, 2] says that Energy consumption measurement of network equipment has been studied in order to accurately model energy consumption of network equipment. Energy consumption of network equipment in an idle state is reportedly huge according to the energy proportionality index (EPI) of network equipment is proposed to model

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how much network equipment consumes energy proportionally to a network load. In addition to that energy savings impact by traffic grooming technique in network provisioning, and the equipment cost, operation cost, and energy consumption of networks Provisioning for dynamic traffic and investigates energy consumption by ILP with algorithm. Marce Caria has proposed load adaptive energy efficiency schemes are mechanisms to dynamically adapt the network's capacity to the actual traffic demand in order to shutdown idle Equipment so that electrical power can be saved [2]. Benefits of packet–opto integration could be summarized just by considering the ability of offloading pass-through traffic from the packet layer down to the WDM layer, so as to reduce the cost and power consumption, by eliminating unnecessary packet processing [3].The analyze of the relationship between reliability, performance, and power consumption, with the result that using power consumption as the foremost parameter in network planning creates networks with concentrated connections, leading to reliability problems. The performance of IP link Switch-Off schemes was analyzed where not only idle links but also certain nodes can be completely switched off, since the authors assume that zero traffic is generated or terminated at some nodes. For the Switch-Off scheme, it is assumed that the network links consist of multiple cables whose capacities are aggregated and that individual cables can be powered down to save energy.

III.PROPOSED SYSTEM

In this paper, our proposed new algorithm is the discussed which provides better performance than that of the existing algorithm. However, from the literature survey, this work realized that current network equipment consume energy inefficiently due to poor energy-load proportionality of network equipment which causes a vast amount of energy consumption even in an idle state. To address this issue, this work is planned to introduce an efficient Traffic Grooming Framework called energy proportionality index (EPI) with Switch-On approach, which could optimize the energy consumption of IP/WDM but causes considerable computational complexity. This could be minimized, In our proposed system, if we are designing new mechanism which reduces the packet processing period. which will reduce the computational complexity, it also further improve the performance of Optical Network in terms of Power Consumption, Throughput, Router Utilization and Bandwidth Utilization.

A**.** *System architecture design*

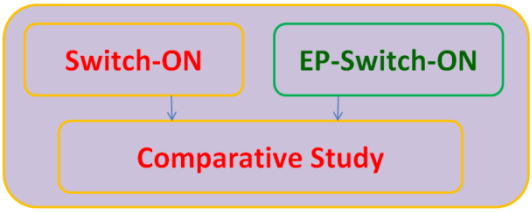

Fig. 1 Architecture diagram

B. *Switch-On*

However, the Switch-On scheme is not without challenges: the newly established circuits can also destabilize the IP routing, are often inadequate in size due to the established standards on circuit capacity, and require advanced planning and reconfiguration methods. In this architecture diagram represented a comparative study of Switch on and EP-Switch On scheme as shown in Fig.1 Switch off scheme Proposed load adaptive energy efficiency schemes are mechanisms to dynamically adapt the network's capacity to the actual traffic demand in order to shutdown idle Equipment so that electrical power can be saved.

C**.** *EP switch-On*

Energy consumption measurement of network equipment has been studied in order to accurately model energy consumption of network equipment. Energy consumption of network equipment in an idle state is reportedly huge according to the energy proportionality index (EPI) of network equipment is proposed to model how much network equipment consumes energy proportionally to a network load. In addition to that energy savings impact by traffic grooming technique in network provisioning, and the equipment cost, operation cost, and energy consumption of networks Provisioning for dynamic traffic and investigates energy consumption by ILP with algorithm. In our EP SWITCH-ON system, the Load balancing concept is used to reduce the energy consumption by the network.

D. *Proposed Technique Used*

The objective of our algorithm is to optimize routing and to adapt the logical topology of IP layer to the variations of traffic in network. Different routing configurations lead to different logical topologies and different level of utilization in network links and channels. Based on the router utilization we have designed an algorithm for improving the energy consumption which is given below,

1. If U_R<=15% Make Router to

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Sleep State
(Switch-OFF)

2. Else If 60%< =U_R<=80% Call Router From
Sleep State (If Exist)
(Switch-ON)

3. If U_R>80% Restrict New
Connection
(Admission Control Mechanism)

IV.IMPLEMENTATION AND RESULTS

Our implementation is based on Boson NetSim Network Simulator which are discussed as shown in Fig.2. To evaluate our Independent Energy Saving Scheme design with Packet switching and WDM technology to save energy consumption of optical networks.

A.*Execution*

The execution consists of four stages: setting the nodes, fixing the type of the network, creating infrastructure and running the tool.

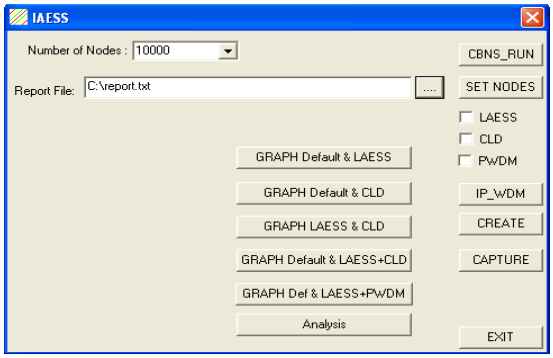

Fig. 2 Initial Window

B. *Report*

After completing the execution, the report can be generated for Default, Combine with Load Adaptive Energy and Cross Layer Design system, combine with packet switching technology and WDM technology for proposed system. The report can be shown in the Fig.3 contains Power in percentage (%), Throughput in mbps, Number of router, Router utilization in percentage (%).

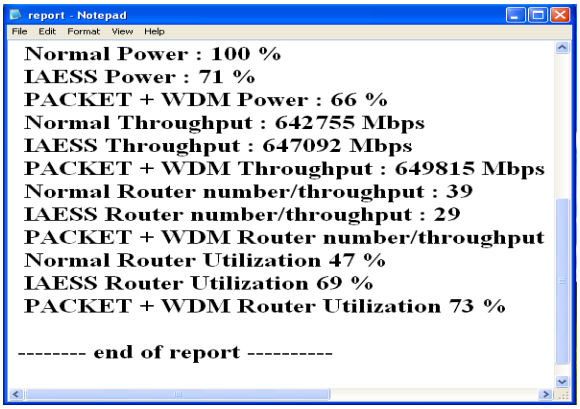

Fig. 3 Report Creation

From the report window it shows that Indepentent energy saving scheme with packet and WDM switching technology outperforms in terms of power consumption, throughput, and router utilization.

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V.PERFORMANCE ANALYSIS

The result comparisons with existing and proposed graph representations are shown as following sections.

A. *Power Consumption*

The power consumption comparison is shown in Fig. 4. It shows that the power consumption for combines with WDM and PS (66%) which is less than the Default power consumption (100%) and LAE+CLD (71%), as to be the get reduced power in proposed system.

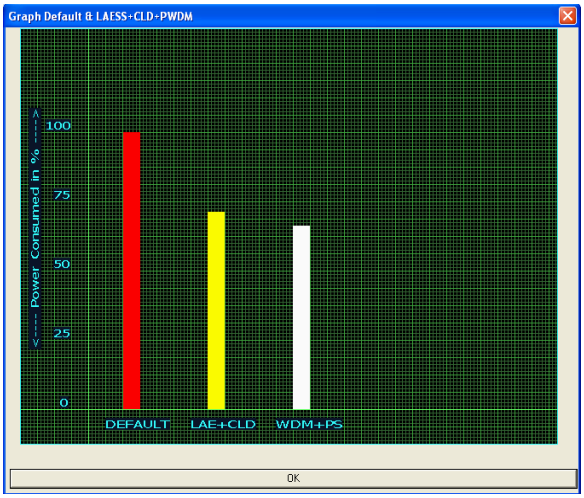

Fig. 4 Power Consumption Comparison

B. *Throughput*

The throughput comparison is shown in Fig. 5. It Shows that the throughput for combines with WDM and PS (649815 mbps) which is higher than the Default throughput (642755 mbps) and LAE+CLD (647092 mbps), as to be get increased throughput in proposed system.

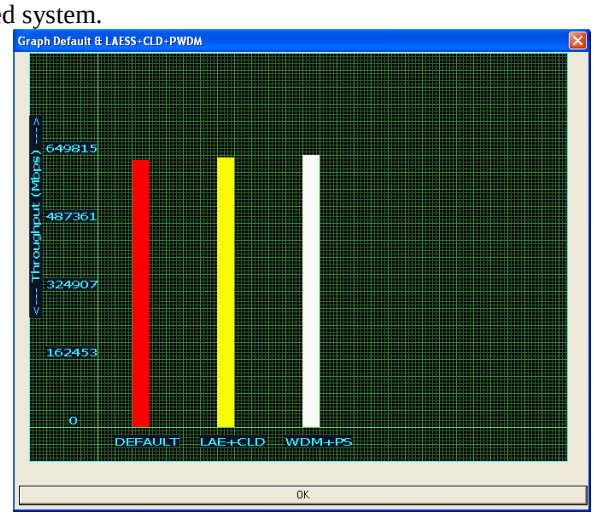

Fig. 5 Throughput Comparison

C. *Router Utilization*

The Router Utilization comparison is shown in Fig. 6. It Shows that the Router Utilization for combines with WDM and PS (73%) which is higher than the Default Router Utilization (47%) and LAE+CLD (52%), as to be get increased Router Utilization in proposed system.

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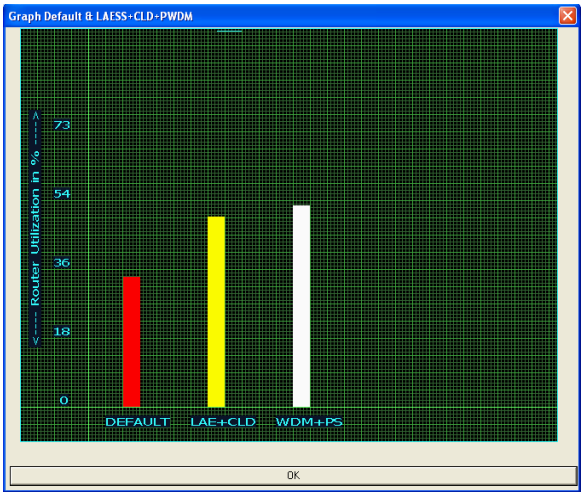

Fig. 6 Router Utilization Comparison

VI.CONCLUSION

This tremendous growth rate of Internet faces a few challenges such as Enormous Energy Consumption, Communication Delay, Throughput and Bandwidth Requirement. The Enormous Energy Consumption causes Global Warming. To address this major issue, were Proposed and designed an Intelligent Adaptive Energy Saving Scheme (IAESS) for saving energy in Optical Networks but causes considerable computational complexity. This could be minimized, if we are designing an independent Energy Saving Scheme, which will reduce the computational complexity, which will further improve the performance of Optical Network in terms of Power Consumption, Throughput, Router Utilization and Bandwidth Utilization.

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