

Efficient Power Management and Data Intensive Computer Systems in Computer Networks

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Abstract

Network Optimization techniques are generally used for e data transfer quickly and without loss. Network Optimization is also applied on the power consumption in whole network system. Thus the efficient network system concentrates on Power Utilization, Deadlock Lock avoidance and Error Recovery process. In the Dynamic Power Management System contains Power utilization and its management. In the network consist of various nodes that to be used. The Power consumption takes place high if all nodes are in active state. To manage the Power Consumption in the network, Link Node Heuristic Algorithm is applied as the optimization technique. The Algorithms work with the optimization module that nodes are not used for particular time period means switched to idle state; when the node becomes active to transfer the data then it is changed to awaken state. During data transmission, the router is set all node values either as on or off state. In the proposed module the efficient power consumption network is focused only on energy utilization. Consider for a good power consumption network is only focused in power means the network may get chances for error and deadlock occurrence. During the data transfer some packets is dropped means on that time Autonomous Network Reconfiguration System is used to recover the data. This ARS technique is mainly focused on the error recovery and to avoid the deadlock. Every node is maintained and monitored by the Router in this technique. If the data transmission is takes place for sender and receiver means router allocates the path, make the nodes available and rest of the nodes make in disabled state.

Keywords: ARS Technique, Deadlock Avoidance, ECONET Consortium, Error Recovery, Network Construction, Power Management

1. Introduction

In this modern network packet transfer contains more effective with the process of the power management. The network can be monitored and respected algorithms are implemented on the stage to avoid unwanted power to the particular node.

Deadlock and Error Recovery is the another major problem in the large network. Initially path can be allocated to transfer, based on the bandwidth of the particular. Sometimes threshold limit exceeds means the packets can be dropped and the operation failed. If we consider 90% data is transferred and 10% data is dropped by some node means the 90% work also fails. The time and working progress also affects because of this type of operation

To manage these types of complication only some optimization algorithm is implemented in the network. These optimizations can be implemented in both hardware and software level. The primary aim is to reduce the gap to identify the data transfer belongs to the network traffic. Some optimization algorithms deal that in the off state in the network state is not in use. That problem can be dealt with both WAN and LAN.

1.1 Power Management

In this paper two techniques can be used for the power management in the dynamic environment over energy aware networks, Smart Stand By and Dynamic Power Scaling¹. Smart Stand By being the standard technique that for idle mode capabilities, that working based on the

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state transformation on or off. Dynamic Power Scaling is based on the power consumption capacity. Two major processes belong to the Dynamic Power Scaling technical implementation, low power idle techniques and adaptive rate. Adaptive rate is the term that's based on the utilization and demand on the network². The Low Power Idle technique is based on the component in the idle mode capabilities. The process is to allocate the correct ON state nodes that to pass the packets when some nodes are in OFF state.

1.2 ECONET Consortium

For the energy efficient mechanism those ECONET Consortium can be used for Power management in the network and computer systems³. The optimization algorithms are calculating the energy utilization in the central dispatcher. The drawback is that it has to be processed energy aware state of the network.

1.3 Multiprotocol Label Switching and Resource Reservation Protocol

In the network some heuristic algorithm is used to find the best energy efficient to manage the real time networks. Some Control schemes can be also used to validate the real time networks^{4,5}. Multiprotocol Label Switching and Resource Reservation Protocol is used for the some routing specifications. Multi-Protocol Label Switching is the technique that used for directs the data from one node to another to long network addresses to avoid the complex lookup routing table. A resource reservation protocol is a rule that used for the multicast transmission for high bandwidth messages.

1.4 Control Frame for Energy Aware Networks

To manage dynamic power management in the large intensive network some control mechanisms and optimization algorithms are used. In the energy aware states the network and its components can be operated that belongs to its usage only. Some devices may use 100% utilization; some of the network devices are rare to use. Those categories are: Operation Administration and Monitoring and Management, Network Control Policy, Local Control Policy, and Green Abstraction Layer.

1.5 Network Optimization Energy Saving Problem

The network energy problem can be worked with the Mixed Index Programming formulation and calculate the routing path⁴⁻⁶. Based on the energy optimization on a network level we can define four classifications. The formulations can be based on the problem that deals with the calculation and simplification of the link.

1.6 Link Node Problem and Link Path Problem

LNpb – Link Node Problem deals with the binary variables to assume complete routing calculation and state energy to all devices

LPpb – Link Path Problem deals with the binary variables assumed paths of the network.

LNpc – It's a complete network control strategies to path routing calculation

LNpc – It's a formulation based on the predefined paths.

The major process is to deal with the network traffic and reduce the energy consumption in the whole network. Those LNpb and LPpb fall in to the NP whole problems. The Network difficulty is increased when the dimensions of the network also increases. The link path problem is efficient to solve for the small size networks. If the network size increases the link path problem becomes complicated in solving process.

2. Architecture

Router only manages all the operations and calculations performed in the network. If group formation is processed means to process the particular node OFF means the connection establishment can be processed like hierarchical. More than one Cluster head is processed means for each group at least one node is need to be an active to maintain a network. The problem that occurs is Power issue. If the Router only processes all nodes and maintain the system means the Router only initiates the operation to make all nodes in OFF State when not in use. Figure 1 shows that Router manages the all nodes.

The basic operation performed in the network contains Sender node send request to Router that to transfer the data. After receiving the request router monitor the nodes and allocate the paths that to transfer. Figure 2 shows that Router sends the Path id to sender and makes

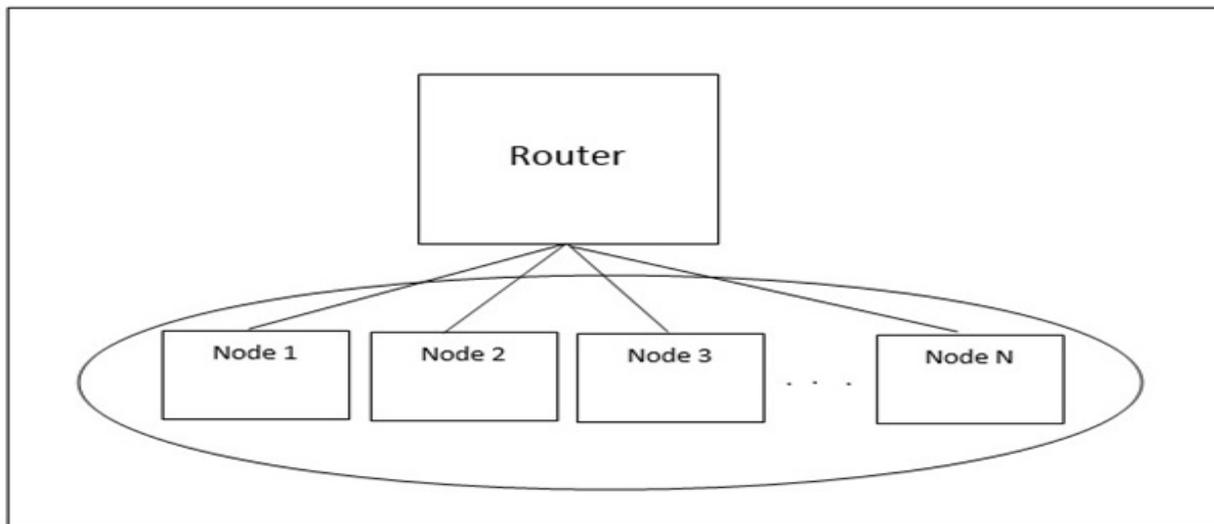


Figure 1. Network construction.

all the node OFF during this operation.

If data loss is occurred during this operation means that particular node sends request to the Router and intimates the data loss. Router initiates the data recovery process through neighboring nodes for data transfer. After monitoring the

number of router. Similarly Line cards mention as $c1 = 1, \dots, c$ and Communication ports mention as $p1 = 1, \dots, p$. That individual router can be worked with the number of line cards which communicates through communication ports. Those different cards can be worked with links ($e1 = 1, \dots, e$). Those network components can be worked

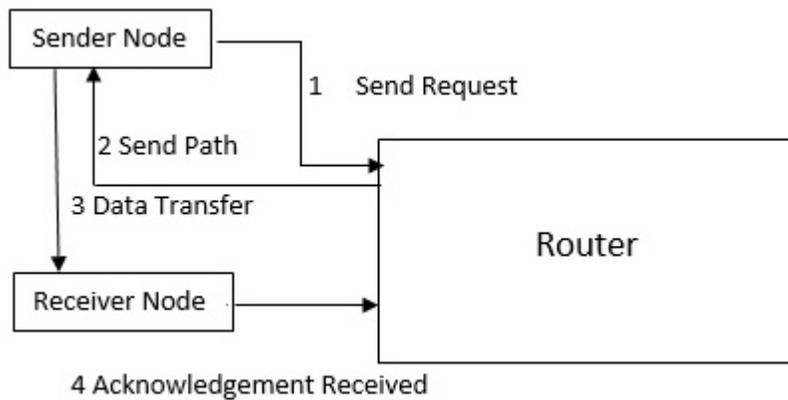


Figure 2. Router and Node Operation.

nodes, make that node only active and other nodes are in the earlier stage only. After transmitting to all nodes, receiver sends acknowledgement to router. For data recovery process unique id can be added to the each packet for to identify loss data.

with energy aware process. $M_{\{ek\}}$ is the throughput of the link $e1$ in state $k1$ and $E_{\{ek\}}$ is the power consumption of the link $e1$ in state $k1$. Wc and Tr is denote the fixed power levels based on the card and router based on the demands. $Td1$ and $Sd1$ is the ports for source and destination⁷.

3. Network Description

Routers can be referred as $r1 = 1, \dots, r$ as r is the maximum

3.1 Link Node Challenge

The primary goal for reducing minimal power utilization

through network components operates on the end to end QOS. The complete network management stated with the binary value that based on the routers, link cards and communication ports in the networks^{8,9}. $Z_r = 1$ that specifies router mainly for data transmission, $X_c = 1$ specifies line card mainly for data broadcast, Y_{ek} is link e in state k . L_{cp} = port p comes under card c . U_{ed} = path d comes under link e . A_{ep} = link in the outgoing port p . B_{ep} = link in the incoming port p . R_{rc} is the card c comes under router r . The link node problem is complete challenging optimization task that does not process with the large size networks. The link node problem can be processed with the medium size networks and small size networks only.

3.2 Link Host Flexible Challenge

This link host flexible challenge is based on power acquirement and utilization belongs its incremental model. The values throughput and energy consumption can be calculated as $E_{ek} = \text{pow}(k) - \text{pow}(k-1)$ and $M_{ek} = \text{load}(k) - \text{load}(k-1)$. The Link node Relaxation problem is process with more than one energy aware state¹⁰.

4. Link-Node Heuristic Algorithm

The heuristic algorithm is to employ with two stage process, the first stage is processed with the linear solver and the second stage is processed with the calculation and formulation. The decision and the values can be taken as the binary 0 or 1. Both the Link Node problem and Link path problem can be used for energy saving optimization that supports Network Control Policy strategies. Figure 3 shows Link Node Heuristic algorithm.

4.1 Performance Evaluation

Two Optimization problems Link Path Problem and Link Path Relaxed Problem can be formulated in the various networks like Small Size Networks, Medium Size Networks and Huge Size Networks. Those Linear solver are used for the binary values terms to find the appropriate result.

4.1.1 Small Size Networks

The performance evaluation can be initially taken by small size networks. Link Node Problem and Link Node Relaxed Problem can be used for the energy saving mechanism. From the results of the two approaches optimization formulation gives same results only.

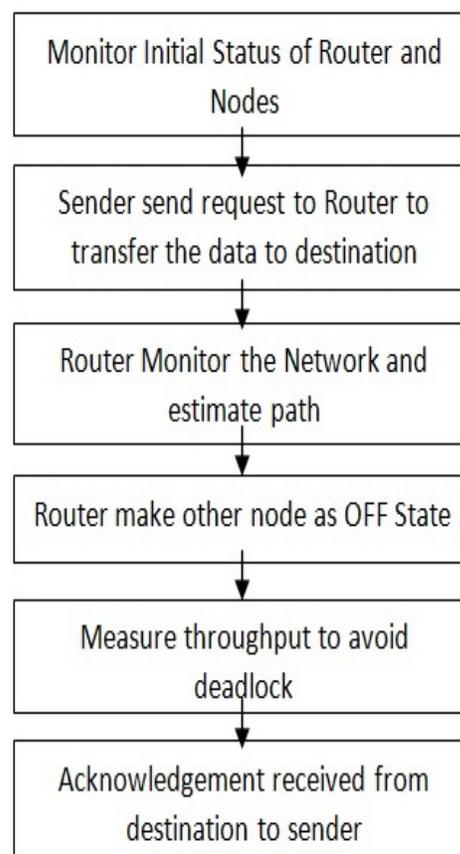


Figure 3. Link node heuristic algorithm – flow of execution.

But Compared with the cost Link Node Problem is good for the small size networks. So for the small size networks follow only link node problem. The complexity of the problem is deals with the demands on its basis. For Example small size network, we assume that the demands up to thirteen.

4.1.2 Medium Size Networks

For medium size networks those link node problem and link node relaxed problem is formulated in branch and bound problem. The results can be calculated by both problems, but the link node problem hasn't given the result with appropriate time. In the medium size networks, to get exact output in the reasonable period means the link host flexibility challenge is taken. The Link Host Flexibility Challenge is costly compared with the link path problem. Link path problem gives the correct result that same as given in the Link Host Flexibility Challenge

but waiting time is more compared with it. For Example we assume for the medium size networks can be deal with max twenty one demands.

4.1.3 Large Size Networks

For the Large size networks those experiments can be taken in the real time environment. Those demands also increased when we go to the real time networks. In the Network Wide optimization technique the link node problem is critical to process the values because the number of demands is very high in the real time environment. So the Link node problem is failing in the large size networks. Link Node Relaxed Problem is the States is given the most effective algorithm used for the medium size and large size networks.

5. Autonomous Network Reconfiguration System

Autonomous Network Reconfiguration should have process with various stages that can be used to make a network performance effective¹². Initial Process of the ARS technique is to monitor the all nodes that to identify the bandwidth and threshold limit. Second Stage of the ARS Technique is to enhance with Estimate the Path based on the Threshold value^{13,14}. After route is identifies process can be monitored to identify any data loss can occur or not. If data loss is occurred means on that time Autonomous Network Reconfiguration System is implemented on that time. Failure node is intimate the router head to allocate another path to transfer the data. Through the unique id only the data loss can be identified. After that the remaining data can be processed and sent to the router. Figure 4 shows the working procedure of Autonomous Network Reconfiguration System.

6. Simulation Experiments

In the optimization algorithms and the control mechanisms can be validated with the computer simulation. So the Energy aware computer networks can be validated through simulation for our convenience. The demands can be taken by in terms of the Network Simulator 2. The simulation experiment can be processed in the various types of network strategies^{15,16}. The algorithm can be adopt that design can be specified with a number of demands.

The efficiency can be measured with the consumption and the Quality of service. The based on the knowledge only the demands can be solved using the linear solver and its optimization problem. The test forecast can be performed with three series and its process.

- Power consumption in normal mode
- Power Consumption after implementing Link Node Heuristic algorithm
- Power Consumption during Error Recovery

These three quality forecasts can be performed based on the demands and its performance. The series of its performance can be processed its mechanism. The network control policy is proposed to perform the negotiation with the power acquirement and effectiveness of the network. In the initial stage the power consumption can be measured and that to be processed with all individual nodes. The techniques like Link NH Algorithm and ARS Technique can be processed to become an efficient network management. Link NH Algorithm shows for the power consumption only. ARS Technique is based for the Error Recovery and Deadlock avoidance in the network. The three series of process can be deal that to varies with the utilization of the power.

7. Conclusion

We reported the energy concerned with the design and development of the network management. The paper is only focused in power means that doesn't to consider as an efficient network. The efficient network must be an error recovery control and to avoid the deadlock. The initial route management only deals all process like to aware of the error recovery and deadlock avoidance. The control framework can be processed and operate in two variants such as centralized and hierarchical. If the control framework deals with local units means the local mechanism is to be used. The link node problems deal efficiently with the small size networks and may not be suitable for large size. So the good value can be used to the link host flexibility challenge. The Link host flexibility challenge can be processed with the good efficient result with the reasonable time period. Link NH Algorithm deals with the power management that to process for all nodes to make as active or inactive as and when needed. The final process is Link NH Algorithm which deals the power consumption and ARS technique is managed for the Error Recovery for the network.

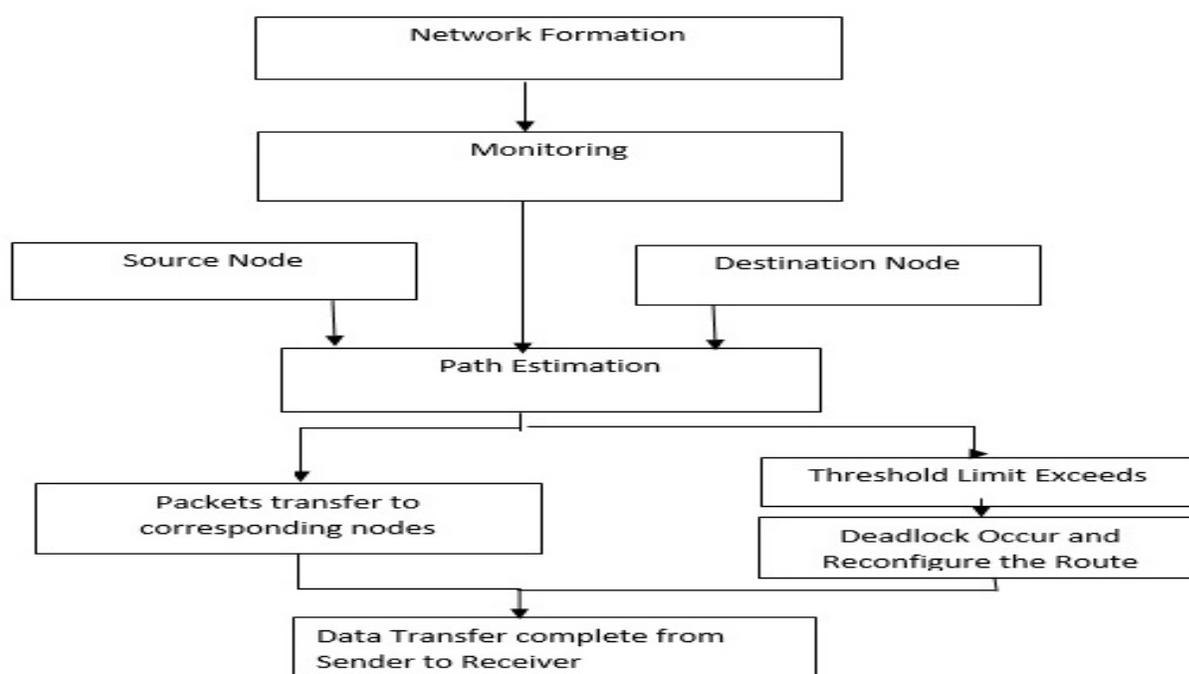


Figure 4. Autonomous network reconfiguration system.

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