A Survey on Perfect Difference Network

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Abstract:- In this paper, we aim to show that the next best value to that of the complete network, and proceeding to somewhat larger (constant) values leading to more economical networks. We show that perfect difference networks (PDNs), which are based on the mathematical notion of perfect difference sets, offer a diameter of 2 in an asymptotically optimal manner. In other words, PDNs allow O (d2) nodes when nodes are of degree d, or, equivalently, have a node degree that grows as the square-root of the network size.The symmetry and made property of PDNs cause balanced communication traffic and smart fault tolerance.

Keywords *-PDN,PDS, network.*

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I. INTRODUCTION

Interconnection networks have been studied by needs of applications on one side and capabilities mathematicians, computer designers and computer and limitations inherent in each architecture on the scientists intensively because of their applicability in other large number of areas. Study of the interconnections particular network architecture for a given number of is of particular interest when a computer network is terminals and its ease of implementation also plays a implemented as low latency, high bandwidth, energy major role in choosing which type of network efficiency, and robustness are some of the properties interconnection should be implemented. It is easy to that are sought in networks for parallel and consider complete graph connectivity but it suffers distributed network some major limitations when it is considered for performance parameters depend not only on the large systems that are of practical interest, due to network architecture but also on a number of factors both relating to applications and their data exchange communication channels and lack of scalability for characteristics, the challenge in interconnection system growth. Hence, it is obvious that under the network design is circumstances when we cannot implement acomputing.Optimizing links in interconnections network is extremely vital for contemporary computer, electronic, and communication systems. The most popular architecture i.e. N complete Network (Full Mesh) in which each node is link to every other node. An implementation of this architecture can't be possible in practically because size of network increased with this architecture can't be possible. New architecture introduces Perfect Difference Network (PDN), it is an asymptotically optimal method for connecting a set of nodes into a Perfect Difference Network (PDN) with diameter 2, and any node is connected to any other node in 1 or 2 hops. Routing performance of PDN is almost same to N Complete Network. Cost Implementation of PDN is low as compared to N Complete Network

II. LITERATURE REVIEW

Interconnection Network has been studied before many a time by many Mathematicians, Computer Designers and Computer Scientists intensively for it is applicable to both parallel and distributed computer systems. [1] As a result today we have an array of good, better and best interconnection networks competing in the market for providing connection. Bus, Ring, Star, Hypercube, Pancake, Complete are some of the example from the long array and more are being added every day. PDN is a new name added to the array. The work started way before 1980's and still the work is in process to make it a better network. The following paragraphs states some pieces of work done on PDN formerly by researcher an asymptotically optimal method for connecting a set of nodes into a perfect difference network (PDN) with diameter 2, so that any node is reachable from any other node in one or two hops. PDNs offer optimal performance and fault tolerance relative to their complexity or implementation cost. The network architecture in its basic and bipartite forms and shows how the related multidimensional PDNs can be derived. [2] Perfect difference sets were first discussed in 1938 by "singer"

The paper "Perfect Difference Network for Network-on-Chip Architecture," by Dr Mahendra Gaikwad [6] states that System-on Chips (SoCs) are designed as a tightly interconnected set of cores, where all components share the same system clock. There is a need to treat SoCs as Network-on-Chip where the interconnections are designed using an adaptation of the protocol stack. Network-on-Chip (NoC) is a new paradigm for designing core based system on chip, where various Intellectual Property (IP) resource nodes are connected to the router-based square network of switches using resource network interface. NoC supports high degree of reusability and is scalable. Energy consumption of a VLSI system became one of the most important factors to optimize in most of the designs due to factors such as the expanding market for mobile products, the increasing cooling cost, etc. Though the technology in computer network is well developed, a direct adaptation of network protocols to NoCs is impossible, due to different communication requirements, cost considerations and architectural constraints. The design goals for NoCs can be described as platform based design, separation between communication and computing resources and minimization in energy. The paper summarizes the concept of Perfect Difference Network to minimize the communication energy by proposing the energy model for NoC architecture for Intertile geometry in comparison with PDN Circular geometry. In their yet another paper [2], they have proposed an asymptotically optimal method for connecting a set of nodes into a perfect difference network PDN) with diameter 2, so that any node is reachable from any other node in one or two hops. They have shown that PDN interconnection heme is optimal in the sense that it can accommodate an asymptotically maximal number of nodes with smallest possible node degree under the constraint of the network diameter being 2. In the companion paper to the above paper [3], they have compared PDNs and some of their derivatives to interconnection networks with similar cost/performance. Additionally, they have also discuss the performance of PDN with the n complete network.additionally they show that PDNs are quite robust, both with regard to node and link failures that can be tolerated and in terms of blandeness.paper [6] Dr. Sudhir G. Akojwar implemented PDN in Wireless Sensor Networks .proposed simulated result of the data transmission in PDN and the bandwidth and latency explained by a graph using NS2. This paper give introduction of NS2 and how to run tcl file in NS2. Perfect Difference Network deigns for =2 and node is 7. PDNs have a diameter of 2 and node degree of approximately 2, which place them close to complete networks in terms of routing performance and much lower with respect to implementation cost. The paper in [8] Give brief introduction of Perfect Difference Network (PDN) and done simulation of PDN by using NS2. A simulated result of the data transmission in PDN for δ value 2 & 3 for wired network and later analysis of trace file to find the Throughput.again some disturbance created in the network to to check the performanceof network The paper [9] have shown some properties of hypercube and compared them with corresponding .properties of PDN. This paper gives some brief introduction of Perfect difference network and hypercube network. Some topological properties of hypercube make them attractive. hypercube degree and diameter are equal so it achieves good balance between the communication speed and complexity. This paper show broadcasting of packet in perfect difference Network for PDS {0,1,3} , n=7 and hypercube network. PDN provides a large advantage over the hypercube architecture. PDN exist every prime power but hypercube exist only for the power by 2.Hypercube have large gaps in size of system than PDN .Diameter of hypercube is n and the diameter of PDN is 2. Hypercube contain 2n node and n links, but PDN has $2+$+1 nodes.

III. APPLICATIONS OF PERFECT DIFFERENCE NETWORK

PDN can be used for Network-on-Chip (NoC). NoC is a technique based on System-on-Chip , soc provide high performance nanoscale architectures .Using PDN based on PDS, an energy aware model for NoC can be obtained which saves significant energy as compared to inter-tile geometry of NoC architecture . PDN can be used in designing the Wireless Sensor Networks (WSN). Wireless Sensor Nodes are battery powered and thus optimizing their energy consumption is a major issue. Wireless Sensor Nodes have 3 units: sensing, computation and communnication. If the Wirelesssensor nodes are deployed using PDS-Networks then all the nodes in the network knows their relative as well absolute position this removes the need of Location finding system in the Wireless Sensor Node and hence simplifies the routing technique. The PDN topology and its various derivatives are well suited to meet the" graph search" challenge. "Graph search" initiative underway at Facebook, which seeks to find and harvest the hidden information originating in its own network in the billions of interconnections among more than a billion nodes.

IV. SIMULATION ENVIRONMENT

Network Simulator (Version 2), widely known as NS2, is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviors. Due to its flexibility and modular nature, NS2 has gained constant popularity in the networking research community since its birth in 1989. Ever since, several revolutions and revisions have marked the growing maturity of the tool, thanks to substantial contributions from the players in the field. Among these are the University of California and Cornell University who developed the REAL network simulator,1 the foundation which NS is based on. Since 1995 the Defense Advanced Research Projects Agency (DARPA) supported development of NS through the Virtual InterNetwork Testbed (VINT) project [9]. Currently the National Science Foundation (NSF) has joined the ride in development. Last but not the least, the group of researchers and developers in the community are constantly working to keep NS2 strong and versatile.NS2 consists of two key languages: C++ and Objectoriented Tool Command Language (OTcl). While the C++ defines the internal mechanism (i.e., a backend) of the simulation objects, the OTcl sets up simulation by assembling and configuring the objects as well as scheduling discrete events (i.e., afrontend). The C++ and the OTcl are linked together using TclCL. Mapped to a C++ object, variables in the OTcl domains are sometimes referred to as handles. Conceptually, a handle (e.g., n as a Node handle) is just a string (e.g.,o10) in the OTcl domain, and does not contain any functionality. Instead, the functionality (e.g., receiving a packet) is defined in the mapped C++ object (e.g., of class Connector). In the OTcl domain, a handle acts as a frontend which interacts with users and other OTcl objects. It may defines its own procedures and variables to facilitate the interaction. Note that the member procedures and variables in the OTcl domain are called instance procedures (instprocs) and instance variables (instvars), respectively. NS2 provides a large number of built-in C++ objects. It is advisable to use these C++ objects to set up a simulation using a Tcl simulation script. However, advance users may find these objects insufficient. They need to develop their own C++ objects, and use a OTcl configuration interface to put together these objects. After simulation, NS2 outputs either text-based or animation based simulation results. To interpret these results graphically and interactively, tools such as NAM (Network AniMator) and XGraph are used. To analyze a particular behaviour of the network, users can extract a relevant subset of text-based data and transform it to a more conceivable presentation. Which place them close to complete networks in terms of routing performance and much lower cost.

V. CONCLUSION

This paper describes perfect difference Network is an asymptotically optimal method for connecting a set of nodes into a Perfect Difference Network (PDN) with diameter 2, so that any node is reachable from any other node in one or two hops utmost. It is mainly based on the mathematical notion “the Perfect Difference Sets” given by “Singer”. Perfect difference network is a robust, high-performance interconnection network for parallel and distributed computation. PDNs have a diameter of 2 and a node degree of approximately 2.

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