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An Improved Evolutionary Algorithm for Effective Optimized Network Design Using Tabu Search

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Abstract

Network nodes to estimate and characterize the impact of traffic engineering and load balancing over centralized and decentralized networks. This considers the network maximum utilization with load balancing over different nodes and links. In order to improve the network utilization and performance, the source node analyzes the paths and its Tabu search flow splitting process. To overcome traffic allocation problem the system performs every transmissions analysis and experiment over each link. Each link must be estimated and relayed with that set of conditions and rules. In proposed system used in efficiently for evolutionary algorithm using tabu search. It presented methods for each network node to probabilistically characterize the local impact of a dynamic traffic allocation and for data sources to incorporate this information into the routing algorithm using a different protocol which is CA-FSP (cost aware- flow splitting protocol).

Keywords: Network nodes, tabu search, load balancing, dynamic traffic allocation.

Introduction

It proposes techniques for the network nodes to estimate and characterize the impact of traffic engineering and load balancing [6] over centralized and decentralized networks. This considers the network maximum utilization [1] with load balancing over different nodes and links. This includes the estimation of per flow splitting and multi flow splitting [3] and analysis of traffic allocation. In order to improve the network utilization and performance, the source node analyzes the paths and its flow splitting process to incorporate the traffic engineering approaches.

To overcome traffic allocation problem, the effect of traffic distribution and flow splitting is enhanced based on certain elements [7]. The system performs every transmissions analysis and experiment over each link. Each link must be estimated and relayed with that set of conditions and rules [9]. However, to enhance the traffic engineering with load distribution of data's and the dynamic effects of the congestion [8], the local estimates need to be continually updated. The proposed thesis provides a solution against the problem of traffic allocation in multiple-path routing algorithms in the presence of congestion whose effect can only be characterized statistically. It presented methods for each network node to probabilistically characterize the local impact of a dynamic traffic allocation and for data sources to incorporate this information into the routing algorithm using a different protocol which is CA-FSP [10] (cost aware- flow splitting protocol).

Each time a new routing path is analyzed or an existing routing path info and current information's which are updated; the responding nodes along the path will relay the necessary parameters to the source node as part of the reply message about the routing path [2]. It formulates the centralized traffic allocation problem for multiple source nodes as a convex optimization problem [2] [4]. The proposed system overcomes those issues by analyzing the link state and splitting by using propagation delay, queuing delay and transmission delay [5]. Finally the proposed system shows the efficiency and contribution differences from the existing systems.

Related Concepts

The purpose of this chapter is to discuss the basic and related concepts and issues of traffic engineering and data centers.

A. Routing information protocol

It is supported by low-end routers commonly used for broadband connections. Rip sends broadcasts of its routing table to neighboring devices. This is done quite often (the default is every 30 seconds). This protocol also uses metrics. However, its metric values are calculated using only

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the "hop count". Rip will route data based upon the lowest hop count regardless of bandwidth limitations. If a hop count is greater than 15, the data is discarded. This becomes inefficient in large networks that use multiple routers. Rip is a good protocol for small networks.

Disadvantages of rip have no idea about the topology of the network beyond the neighboring router to which it can forward packets. Also, routing updates do not include information about the additional topology. Rip would pick route with the shortest vector- the route with the smallest metric (hop count).

B. Open shortest path first (OSPF) protocol

The OSPF protocol allows the administrator to assign a cost called a metric, to each route. Each OSPF router maintains an identical database describing the Autonomous System's topology. From this database, a routing table is calculated by constructing a shortest- path tree. OSPF recalculates routes quickly in the face of topological changes, utilizing a minimum of routing protocol traffic. OSPF provides support for equal-cost multi-path. In addition, all OSPF routing protocol exchanges are authenticated.

C. Routing algorithms for dc topology

The routing protocols implement the routing algorithms. The algorithms are distance vector algorithm, and link-state algorithm. That is two type distance vector algorithm and the link state algorithm. This algorithm advertises information about the entire topology. Link-state routing works by having the routers tell every router on the network about its closest neighbors. Link state

D. Network model

To overcome the above limitations which are stated in chapter 2, have developed the reliable flow splitting. CA-FS applies on-demand routing techniques to avoid traffic overhead and improve scalability. The presented is a reliable multipath routing protocol CA-FS based on flow splitting mechanism in network. This set up multi-level hierarchical cluster so that the traffic can be allocated reasonably in cluster head and acknowledged distributed to procure the congestion avoidance. It is equal to the bandwidth if there is no protocol. However, in most practical cases the throughput is less than the bandwidth for two reasons: **Protocol overhead:** protocols use some bytes to transmit protocol information. This reduces the throughput **Protocol waiting times:** some protocols may force you to wait for some event. Delay in data networks is generally the round trip delay (also called round trip time - rtt) for a packet within the network.

System Architecture

A. Tabu search

The tabu search proceeds according to the supposition that there is no point in accepting a new (poor) solution. Unless it is to avoid a path already investigated. This insures new regions of a problems solution space will be investigated in with the goal of avoiding local minima. Tabu search is based on introducing flexible memory structures in conjunction with strategic restrictions and aspiration levels as a means for exploiting search spaces. Meta-heuristic that guides a local heuristic search procedure to explore the solution space beyond local optimum by use of a Tabu list. Tabu Search Strategy has classifies three main strategies Forbidding strategy, Freeing strategy, freeing strategy.

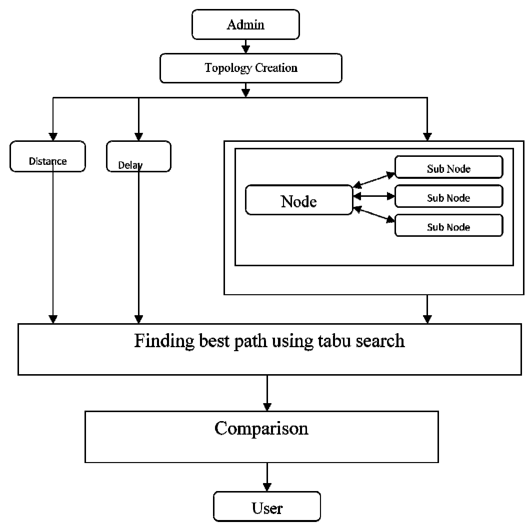

Fig 1. Components of a Data Forest

B. Basic Tabu Search Algorithm

- Step 1: Choose an initial solution i in S. Set i* = i and k=0.
- Step 2: Set k=k+1 and generate a subset V of solution in N(i,k) such that either one of the Tabu conditions is violated or at least one of the aspiration conditions holds.
- Step 3: Choose a best j in V and set i = j.
- Step 4: If f(i) < f(i*) then set i* = i.
- Step 5: Update Tabu and aspiration conditions.
- Step 6: If a stopping condition is met then stop. Else go to Step 2.

Tabu Search Stopping Conditions

Some immediate stopping conditions could be the following:

1. N(i, K+1) = 0. (no feasible solution in the neighborhood of solution i)
2. K is larger than the maximum number of iterations allowed.

3. The number of iterations since the last improvement of i* is larger than a specified number.
4. Evidence can be given than an optimum solution has been obtained.

Stopping criterion can, for example, use a fixed number of iterations, a fixed amount of CPU time, or a fixed number of consecutive iterations without an improvement in the best objective function value. Also stop at any iteration where there are no

C. Bottleneck calculation

Here the thesis proposes techniques for the network nodes to estimate and characterize the impact of congestion and for a source node to incorporate these estimates into its traffic allocation. In order for a source node to incorporate the congestion impact in the traffic allocation problem, the effect of congestion on transmissions over each link must be estimated.

D. Traffic scheduling

An ideal approach must coordinate the scheduling of traffic across the available network paths. This requires using information from the global view of the network. Failure to do this will lead to suboptimal scheduling of flows by network elements - network devices may choose locally optimal paths which could inadvertently create globally sub-optimal paths that lead to congestion.

E. Congestion aware traffic allocation

In this section, this presents an optimization framework for jamming-aware traffic allocation to multiple routing paths for each source nodes! This develops a set of constraints imposed on traffic allocation solutions and then formulates a utility function for optimal traffic allocation by mapping the problem to that of portfolio selection in cost. The risk of the asset corresponds to the variance in the value of the asset and measures the degree of variation or uncertainty in the investment's growth.

Result Analysis

A. Network Construction

Client-server computing or networking is a distributed application architecture that partitions tasks or workloads between service providers (servers) and service requesters, called clients. Often clients and servers operate over a computer network on separate hardware. A server machine is a high-performance host that is running one or more server programs which share its resources with clients. A client also shares any of its resources; Clients therefore initiate communication sessions with servers which await (listen to) incoming requests. The followings are the parameters to construct a network.

- Node Name
- Host Number
- IP Address

The node name is nothing but the system name, which can be given by the user. The next value is host number which can be get from our network configuration details. The next one is the IP address of the system.

These can be identified by a simple command on DOS environment. The command 'netstat' helps to get all details about the network configuration.

B. Topology Construction

For successive nodes, the node to which it should be connected is also accepted from the user. While adding nodes, comparison will be done so that there would be no node duplication. Then it identifies the source and the destinations. The node information consists of node names and the weight between them.

C. Routing Scheme

Routing protocols used in traditional wired and wireless networks are based on shortest path algorithms such as the Bellman-Ford algorithm and Dijkstra's algorithm. But the enhancement of the proposed system should also includes the the following considerations to calculate the delay.

a. **Delay calculation:**

The analysis module deals with the following parameters.

- Processing delay - time routers take to process the packet header.
- Queuing delay - time the packet sits in routing queues.
- Transmission delay - time it takes to push the packet's bits onto the link
- Propagation delay - the time taken by the front of a signal to reach the destination.

D. Link-State Routing

The proposed protocol gathers link state information from available routers and constructs a topology map of the network. The topology determines the routing table which makes routing decisions. it detects changes in the topology, such as link failures, very quickly and converges on a new loop-free routing structure within seconds. It computes the shortest path tree for each route using a method based on Dijkstra's algorithm, a shortest path first algorithm.

E. Message Transmission

It will take minimum node cost an account to find the path between a source and destination. The shortest path is updated in the routing table. The source obtains the shortest path from the routing table itself. After receiving a message the destination will send an acknowledgement to the corresponding source.

a. Uniform Spreading

Spreading messages over all shortest paths will be called Uniform Spreading. This is a straightforward strategy where the source, as well as each intermediate node along every path in the contour, sends successive messages in a round-robin fashion to all its immediate neighbors in the contour.

b. Optimal Distribution

An algorithm has proposed for spreading the messages, so that all the available paths are effectively utilized. Recall that a row is a collection of nodes in the contour that are at the same distance from the source.

Experimental Result

The node is a computer or a host which sends and receives the data. The nodes are connected to a router to route the data to host which is in another area. There are 12 nodes in the implementation infrastructure which are connected and route the message via the router. Routers perform forwarding logic based on the destination IP address of a packet. Routers are the best networking device to connect to a WAN (Wide Area Network). Routers were designed to allow interconnection of Local Area Network. The proposed system consists of four routers which are interconnected and formed the complete wired mesh topology.

Conclusion

The network nodes to estimate and characterize the impact of traffic engineering and load balancing over centralized and decentralized networks. The tabu search proceeds according to the supposition that there is no point in accepting a new (poor) solution. This insures new regions of a problems solution space will be investigated in with the goal of avoiding local minima. Meta-heuristic that guides a local heuristic search procedure to explore the solution space beyond local optimum by use of a tabu list. the proposed system overcomes those issues by analyzing the link state and splitting by using propagation delay, queuing delay and transmission delay. Finally the proposed system shows the efficiency and contribution differences from the existing systems.

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