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Project Proposal

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Title: Resource Allocation in Distributed Content-Centric Networks (Project proposed by Kin Leung with Group 3)
Offered to:
530 - Software Engineering Practice and Group project

Description:
The world-famous network protocol, Transport Control Protocol (TCP), regulates traffic to be input by the data source into the Internet according to the network conditions along the communication path. The network resources include communication bandwidth, computation power and buffer memory. It has been shown that TCP in effect optimizes the allocation of these network resources to various TCP connections in order to maximize some objective function in a distributed way. That is, each TCP connection adjusts its congestion window by observing the network conditions, while millions of TCP connections can co-exist and share the resources in the Internet at the same time.

Today, the Internet mainly serves the purpose of transport data from place to place. URLs of data objects as requested by users are first mapped onto the IP addresses, indicating the locations of the data. In the future, data may be replicated in many routers in the content-centric networks where URLs will become the identifiers of the data objects. It is up to the future Internet to determine where to cache (store), find and transport the data to various users in some optimal way. Therefore, it is expected that there are significant trade-offs among usage of network resources, including bandwidth, processing power and memory, in the content-centric networks. For example, if one can use huge memory size to cache mostly referenced data on routers inside the network, it can significantly reduce the total amount of bandwidth needed for data transport via multiple hops of routers. On the other hand, having a huge volume of cached data does not only require a lot of memory, but needs much processing power to identify and retrieve the requested data among the cached data objects. Therefore, a balanced usage of resources, hopefully through distributed algorithms or protocols, will be needed to achieve a desirable performance.

The aims of this project are:
- To survey the current techniques for resource allocation and routing mechanisms that have been proposed for the content-centric networks in the literature.
- To evaluate the strengths and weaknesses of these techniques.
- To identify and synthesize an efficient approach (i.e., technique, algorithm, method or protocol) to allocating resources for achieving a desirable trade-off.
- To implement a simple prototype and simulate a network to test out the proposed approach for resource allocation in the content-centric networks.