A DISTRIBUTED SOURCE LOCATOR MODEL FOR NAME RESOLUTION IN NAMED DATA NETWORK

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Abstrak

Kebelakangan ini terdapat peningkatan dari segi jumlah peranti yang dihubungkan dengan Internet dan jumlah ini dijangka meningkat pada masa hadapan. ICN merupakan satu konsep baru untuk Internet pada masa hadapan. Banyak projek yang terangkum dalam ICN telah diselidiki dan satu daripada projek ini ialah NDN. Kajian ini bermatlamat untuk mereka bentuk pelokasi sumber agihan untuk Sistem Resolusi Nama (NRS) untuk mengelak daripada berlakunya titik kegagalan apabila hanya satu sistem berpusat yang beroperasi. Model baru ini dilaksanakan dalam seni bina NDN untuk memastikan penemuan sebarang objek dalam rangkaian tanpa perlu mencari data secara hop by hop. Kajian ini mengupayakan Kaedah Penyelidikan Reka Bentuk (DRM) dan memperkenalkan tahap utama berdasarkan sifat kajian. Model konsep untuk kajian ini dibina berasaskan kajian lampau NRS dalam projek ICN yang lain dan juga bersandarkan model Chord dalam jadual cincangan teragih (DHT). Kuantiti data yang sangat besar serta kepanjangan nama yang tidak tetap perlu diambil kira dalam penghasilan NRS yang berkesan untuk NDN. Selain itu, sistem sebegini memudahkan lagi agihan data yang sejajar. NDN yang juga projek baru di bawah konsep ICN masih kurang diselidiki dan mempunyai pelbagai masalah yang perlu diselesaikan. Tambahan pula, setakat ini komponen nyata untuk NDN masih belum ada dan kebanyakan operasi dikendalikan dalam bentuk simulasi. Memandangkan kajian ini tertumpu kepada agihan pelokasi sumber untuk NRS, sumbangan kajian lebih terarah kepada usaha yang lebih terjamin untuk mencari objek data dalam seni bina NDN dan menambah baik masalah boleh skala yang wujud dalam rangkaian. Perkara ini boleh menyokong penghalaan data dan pemindahan antara nod serta mengurangkan lalu lintas pertukaran secara keseluruhan. Ini membolehkan penyelesaian satu masalah terbuka yang besar dalam seni bina NDN dan seterusnya merancah letak atur asas konsep Internet yang baru dalam rangkaian ICN. Pengguna juga boleh memindahkan data dengan lebih pasti dan lebih berkesan. Sumbangan utama kajian ini, termasuklah reka bentuk Pelokasi Sumber Teragih (DSL) untuk Resolusi Nama. Kajian ini turut menyumbang dari segi agihan jadual cincangan untuk carian data yang lebih baik dan lebih pantas. Agihan ini juga bermanfaat kepada pengguna kerana pengguna boleh menentukan aras data serta meningkatkan lagi keselamatan rangkaian data. Hal ini boleh memaksimumkan penggunaan sumber rangkaian.

Kata kunci: ICN, NDN, Sistem Resolusi Nama, Jadual Cincangan Teragih, Strategi Ajuan

Abstract

Recently, the number of devices that are connected to the Internet had been significantly increased with much more expected increment in the future. ICN is a new concept for future Internet that has been developed, many projects within the ICN concept are being researched and NDN in one of them. The purpose of this research is to design distribution source locator for Name Resolution System to avoid the point of failure that may occur if there is only a central system and implemented this new model in NDN architecture to guarantee findings of any object in the network instead of looking for data hop by hop. This research employs the Design Research Methodology (DRM) and introduces its main stages according to the nature of this research. The conceptual model had been designed based on the previous study of NRS in other ICN projects, and according to Chord model in the distributed hash table (DHT). The huge amount of data and unfixed name length in NDN architecture are the main points that must be taken into consideration in order to produce an efficient NRS for NDN. Furthermore, such system simplifies the distributing of the data that correspond to it. NDN is a new project under ICN concept and it is still under research with many issues that is needed to be solved, also there is no real component to work on NDN and all work had been done based on simulation environment. Since the present research focuses on distributing the source locator for NRS, the major contribution of this study is to provide a guaranteed way to find the data object in NDN architecture and to improve the scalability issues in the network. This will support the data routing and transfer between the node and reduce the overall exchanged traffic. This permits the development of solving one of the major open issues in NDN architecture and thus aids in supporting the deployment of the new Internet concept base on the ICN networks. It will thus help users to transfer data reliably and more efficiently. The major contributions of this study include the design of a new Distributed Source Locator (DSL) for Name Resolution. Other contributions are the way of distributing the hash tables for better and faster data lookup, on the other hand, this distribution gives the users the privilege to specify the data levels which results in an increment in the data security of the network. All these would contribute toward the maximized utilization of network resources.

Keywords: ICN, NDN, Name Resolution System, Distributed Hash Table, Forwarding Strategies

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List of Abbreviations

EB	Exa Byte
P2P	Peer to Peer
IP	Internet Protocol
ICN	Information Centric Network
CCN	Content Centric Network
NDN	Named Data Network
NDO	Named Data Object
NRS	Name Resolution System
MDHT	Multi-level Distributed Hash Table
NR	Name Resolution
OSPF	Open Short Path First
ISIS	Intermediate System-to-Intermediate System
BGP	Border Gateway Protocol
DSL	Distributed Source Locator
ODHT	Overlay Distributed Hash Table
DRM	Design Research Methodology
IRTF	Internet Research Task Force
ICNRG	Information Centric Network Research Group
DNS	Domain Name Sysyem
TCP/IP	Transmission Control Protocol/ Internet Protocol

CDN	Content Delivery Network
DONN	Data Oriented Network Architecture
PURSUIT	Publish Subscribe Internet Technology
NetInf	Network Information
COMET	COntent Mediator
ANR	National Research Agency
NBR	Name Based Routing
URL	Uniform Resource Locator
PKI	Public Key Infrastructure
OI	Object Identifier
AS	Autonomous System
RH	Resolution Handler
PARC	Palo Alto Research Center
CR	Content Router
FIB	Forwarding Information Base
PIT	Pending Interest Table
CS	Content Store
LPM	Longest Prefix Match
EU	European Union
RN	Rendezvous Nodes
RENE	REndezvous NEtwork
DHT	Distributed Hash Table
TM	Topology Management

FN	Forwarding Node
SAIL	Scalable and Adaptive Internet SoLutions
CMP	Content Mediation Plan
CURLINC	Content Ubiquitous Resolution and Delivery Infrastructure for Next Generation Services
CRS	Content Resolution System
PC	Path Configurator
VDI	Versatile Digital Item
BN	Border Node
IN	Internet Node
GUID	Globally Unique IDentifier
GNRS	Global Name Resolution System
LLC	Late Locator Construction
RC	Research Classification
DS-I	Descriptive Study-I
PS	Prescriptive Study

CHAPTER ONE
INTRODUCTION

In the last 50 years since the packet network creation, computer systems and their component had become cost effective and available everywhere. The numerous communication methods that the Internet offer and low cost of data storage, allow the access for a huge of new content " in 2008 alone 500EB (Exa Byte) of data were created" [3]. Users keep looking for content in term to the value of the Internet, but in the other hand, communication still looking for the place of the content in term of communication, the incompatibility of the two models led to a number of issues. Availability is one of these issues, fast and reliable content access requires awkward mechanisms, especially for some application in some mechanisms like P2P networks. Another issues is security like content trust, which is easily unavailable and depending on untrustworthy connection information and location. Location dependence from the other hand is also have several problems in aspect of mapping the content to a host location, which put complications in configuration and implementation of network services [4].

As a result of these problems, and after years of experimental researches and increment in the attentiveness of unsolved problems in contemporaneous Internet architectures like IP, the Information Centric Network (ICN) concept has been created and followed by many approaches and the idea of the Content-Centric Network (CCN) had been created, then the Named Data Networking (NDN) (which is related to the CCN) was appeared and can be considered as one of the future of the Internet architectures [5]. As per any new project, several issues had been identified with the NDN architecture. One of them is data finding, or how to name the data and organize it to ensure fast data lookup and delivery. One idea to name the content in a scalable and easy way to retrieve can be done by depending on hierarchical naming "name tree". One more open issue is the scaling of NDN. In term of data transmission, NDN depend on the name based

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