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ICN: Towards The Future Of The Internet

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Abstract: A rapid increase in the content over the internet and a growing need of efficient and quick dissemination of the content securely has lead to a new area of research i.e. a new network paradigm where our main emphasis is on information or content rather than the end to end connectivity. So this paper will give the detail about the various main paradigms that are successfully worked upon by the researchers and have the potential to meet the requirements despite of the fact that still a lot of challenges and design issues are needed to be solved . So this paper will give the look onto few of the famous future internet paradigm. Few of them are PURSUIT,SAIL,NDN,CCN 4WARD namely.

Keywords:CCN,PURSUIT,ICN,NDN,4WARD,SAIL

I. INTRODUCTION

The Internet has been treated as a network of clients and servers for the last 40 years and so. But now it is becoming an Internet of Things (devices , appliances etc.) which shifted the center of the paradigm from host to Information . Information Centric Networking(ICN) proposes a future Internet architecture that revolves about the contents being exchanged rather than the communication of hosts and network devices. Inspired by the fact that the Internet is increasingly used for information dissemination, rather than for pairwise communication between end hosts, ICN aims to reflect current and future needs better than the existing Internet architecture. By naming information at the network layer, ICN favors the deployment of in-network caching (or storage, more generally) and multicast mechanisms, thus facilitating the efficient and timely delivery of information to the users.[1] .The main actors of this approach is shifted from client server to publisher and subscriber where Publisher publishes any information object it has and subscriber sends the request for any needed information object. So here in this paper we are going to discuss one by one the main approaches namely NDN[2], PSIRP[3], PURSUIT[4],CCN[5], SAIL[6],4WARD[7] and DONA[8] with respect to their architecture and current state .Also in last segment we will study the commonalities and differences between these. But before that we will check few basic components and concept of ICN in our next segment.

II. OVERVIEW OF ICN ARCHITECTURE

ICN Concepts and Components
Here we will overview the general description of the ICN Components which are Naming Scheme, Routing Mechanism , Caching and Security
Naming Schemes
Naming the information objects plays a very important role in the ICN approach as know we are accessing the information directly so it should use a unique and ubiquitous naming scheme various approaches proposed various ways for that like using identifiers or a simple hierarchical way of naming . In ICN naming is directly related to the security of the information at whatever we do on information so a very secure and efficient naming scheme is the building block of successful ICN approach. The ICN approach fundamentally decouples information from its sources, by means of a clear location-identity split[1] The objective of naming is not only to uniquely identify content objects in the network, but also to include important properties such as pertinence, usability, scalability and security [9]-[10] . Hence a good naming scheme is key to a good base for an efficient networking architecture.
Routing and forwarding Mechanism
The routing and forwarding in ICN is chiefly done by two main methods in all the approaches 1). Named Resolution Routing and 2).Name-Based routing.

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Name Resolution approach: The first approach uses a Name Resolution Service (NRS) that stores bindings from object IDs to topology-based locators pointing to corresponding storage locations in the network, i.e., the NRS translates the object IDs into corresponding topology-based addresses.[11]

In this the routing is done in three phases A) first route the message of request to the NRS node which is connected and there object ID is converted into multiple source address B) then the request message is sent to all these source addresses and lastly C) route the data from the source connected to the requester.

<u>*Name Based Routing*</u>: In this approach nothing like the previous approach is done it does not perform any type of name resolution so it directly route the request message to all the data sources from the requester so here routing algorithm is completely dependable on the namespace

Caching

To ensure efficient network utilization and improve data availability, several ICN architectures make heavy usage of data caching. There are two major caching approaches: caching at the network edge and in-network caching.[11].In in-network caching the caching is done in the internal part of internet like on the routers whereas in the network edge routing the caching is done at the end node. Apart from that the caching have three levels i.e. object level, chunk level, and packet level. So various ICN approaches are working on different level of caching which completely depends on the design. Overall, caching helps reducing the request traffic towards the source. It also enhances the response time of Named data requests.

Security

This is the very important aspect of all the various approaches as this is the main component of the internet architecture as information objects are worked upon in this architecture .so various

approaches proposed various ways to ensure the security of the information like trust based certificate to publisher and subscriber. This aspect will be learned approach wise in the next segment also this is one of the major challenges still researchers are overcoming with it.
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III. RELATED WORK

In this segment we will know about the main outperforming architectures for future internet that are recently being developed. Few approaches are follow up of previous version so

they will be studied together for example CCN is the result of NDN and PURSUIT is the next phase of PSIRP. So let learn about these future architectures:

1. PSIRP to PURSUIT: PSIRP stands for Publisher/Subscribe Internet Routing Paradigm and PURSUIT stands for Publish-Subscribe Internet Technologies both of them were EU European Union funded projects . First PSIRP was developed and then PURSUIT is refining the previous work and trying to explore more. The Publish-Subscribe paradigm is an alternative to the commonly used Send-Receive paradigm. The communication architectures that are build based on this paradigm are composed of three basic elements: publishers, subscribers, and a network of brokers [12]The overview of PSIRP is shown in fig1. in it the main actor is termed as IO InformationObject.
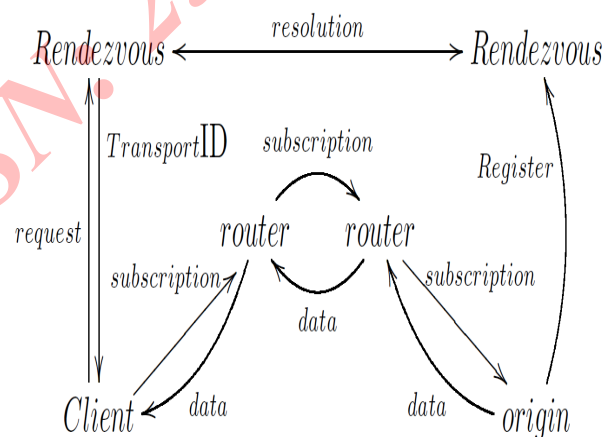

FIG1. PSIRP OVERVIEW

In PURSUIT they added identifiers to each information object i.e. Scope ID (SId) and Rendezvous ID (RId). SID gives the scope information which means to which information this object is related to and RID is the unique identifier for each information item. The three main function dealt in PURSUIT architecture are

a.) Rendezvous Function :It provides the name resolution by mapping subscriber to publisher so this node is named as RN.

b.) TOPLOGY function: It does the global routing at node named as TN where the deployment of two different topology occurs.

c.) Forwarding function: It is the last forwarding node fn which connects information to the client.

Therefore, (PSIRP) project , has developed a clean-slate information-centric architecture for the future Internet, based on publish-subscribe (rather than send-receive) primitives, and now a follow-on project, PURSUIT (Publish-Subscribe Internet Technologies), will further refine and expand PSIRP's technologies, eventually leading to a more complete architecture and protocol suite and more extensive performance evaluation and investigation of scalability[13].

2. 4WARD/SAIL(NetInf): This was another European Union project for designing a new futuristic internet architecture. the main aim of this project was to create a new architecture i.e. "network of information" or we can say" network of things". It is also famous by the name " network of information" NetInf. NetInf proposes the use of a Name Resolution (NR) service rather than the routing-based approach taken by CCNx. As such, providers publish Information Objects (IOs) alongside their locator(s) to the NR service for later discovery by consumers; this is clearly another example of early-binding.[14] In 4Ward - NetInf the Information objects used to get published in the network by the use of Name Resolution Service The overview is shown in fig below
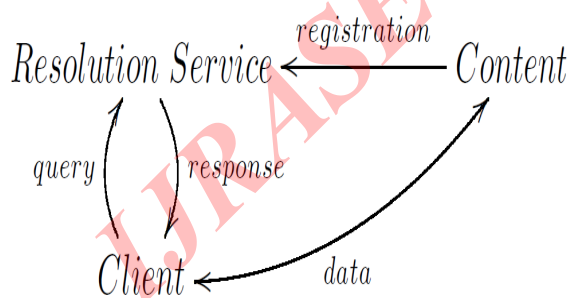
The SAIL Network of Information is based on three main foundations: 1) the idea of unique naming of information objects without imposing a hierarchical naming structure (similar to the approaches developed by 4WARD and DONA); 2) receiver-oriented transport as in CCN; and 3) a multi-technology/multi-domain approach than can leverage different underlying network services and employ different name resolution/name-based routing and transport mechanisms.[15]

3. Named Data Networking NDN:

This is another very famous approach currently simulator and testbeds are also formed in this . This project is lead by University of California . The main concept lie on the content centric approach to the internet. Named Data Networking (NDN) [16] proposed an architecture that is shifted from the current IP model to the data oriented communication. NDN was developed from the proposed Content-Centric Networking (CCN) The main idea of CCN is that a request for an information object is routed towards the location in the network where that information object (IO) has been published. At the nodes traversed on the way towards the source the caches of the nodes are checked for copies of the requested IO. As soon as an instance of IO is found (a cached copy or the source IO) it is returned to the requester along the path the request came from.[11]

It provides three main modules which are

1. Forwarding: For forwarding they used the concept of table main table is known as FIB i.e. forward information base consisting of forwarding information .it uses help of named based routing protocol.

2. Routing packet: They maintain a table of pending interest table whenever new interest for any information is requested it gets updated .

Table I: Summary of Different ICN Approaches

Figure 2. 4Ward - NetInf Overview

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| Approach	Predecessor	Naming		Routing
SAIL (NetInf)	4WRAD	Flat		Name Resolution (Using NRS and Multilevel DHT) Name-Based Routing
NDN	CCN	Hierarchical		Name-Based Routing (Using FIB and PIT)
PURSUIT (Publish-Subscribe)	PSIRP	Flat		Name Resolution (Using Rendezvous Function) Name-Based Routing (Using Topology and Forwarding Functions)
COMET	--	-		Name Resolution (Using CMSs provided by CMP) Name-Based Routing (Using CARs provided by CMF)
CONVERGENCE	CoNet	Hierarchical		Name-Based Routing (Using FIB and RIB)
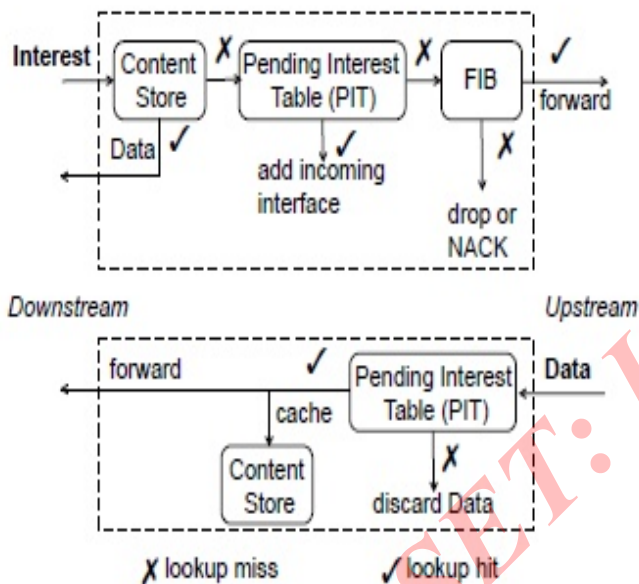
Figure 3: Forwarding Process at an NDN Node.

IV. RESULT AND DISCUSSION

Various researchers have written paper to compare these approaches and check for the commonalities of the approach and which of them is better. A table[1] below is one of them. The researchers related to any of these approaches are serving the same motive to get a future flexible and efficient Information Centric or Content Driven networking paradigm. The Resulting paradigm will reduce the denial of service attacks . Also it may lead to a server free paradigm where the optimal use of the internet source will be possible. Despite of all this there are few main features still need a great attention and need to be worked upon like deployment which means where at what point this architecture will meet the client server network as complete replacement of an old paradigm which is continuously increasing for 40 years is not possible. The major part will be played by the security mechanism followed by these paradigm on which various proceedings are constantly going on great in small applications like media distribution, content dissemination

V. CONCLUSION AND FUTURE WORK

. Hence within few more years the results will be in front of all the user. Currently these are performing

This paper shows the future Networking approach which can be the promising one because due to the regular increase in the innovations like cloud , big data etc the need of optimal usage of the internet is needed. also our attention shifted from mere connection of nodes to the information retrieval and content dissemination. Hence the 40 years old network paradigm is now not meeting the requirements of the current usage also it is getting problematic to use the internet as denial of service attacks and insecure data is making it really hard for people to rely on it. This approach may prove as a relief to all the users. For future researchers have a lot more scope in this area as still a great deal of work is needed to work in this field in the name of mobility, scalability, security, interoperability etc. This approach opened a new solution for the current internet architecture. soon we will be able to see this architecture in large scale scenario after they prove their efficiency and reliability in the small scenarios.

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REFERENCES

1. A Survey of Information-Centric Networking Research George Xylomenos, Christopher N. Ververidis, Vasilios

2. NDN named data networking http://www.named-data.net/

3.PSIRP http:*www.psirp.org/*

4. PURSUIT http://www.fp7-pursuit.eu/

5.CCN http://www.ccnx.org/documentation

6.SAIL, http://www.sail-project.eu/

7.4WARD, http://www.4ward-project.eu/

8. T. Koponen, M. Chawla, B.-G. Chun, A. Ermolinskiy, K. H. Kim, S. Shenker, and I. Stoica, \A data-oriented (and beyond) network architecture," in Proceedings of SIGCOMM'07, Kyoto, Japan, Aug. 27-31, 2007.

9. W, Wong and P. Nikander, "Secure naming in Information-centric networks", in Proceedings of ACM CoNEXT, pp. 121-126, 2010.

10. X. Zhang, K. Chang, H. Xiong, Y. Wen, G. Shi and G. Wang, "Towards name-based trust and security for content-centric network", in Proceedings of 19th IEEE International Conference on Network Protocols (ICNP), pp. 1-6, 2011.

11 B. Ahlgren, C. Dannewitz, C. Imbrenda, D. Kutscher, and B. Ohlman. "A Survey of Information-Centric Networking (Draft)." in Dagstuhl Seminar Proceedings, Dagstuhl, Germany, 2011.

12. Eugster, P.T., Felber, P.A., Guerraoui, R., Kermarrec, A.M.: The many faces of publish/subscribe. ACM Comput. Surv. 35(2), 114–131 (2003)

13 Developing Information Networking Further: From PSIRP to PURSUIT

14. G Tyson, N Sastry, I Rimac, R Cuevas and A Mauthe "A Survey of Mobility in Information-Centric Networks: Challenges and Research Directions" Proceedings of the 1st ACM workshop on Emerging Name oriented Mobile Networking Design Architecture, Algorithms, and Applications.ACM,2012, pp. 1-6

15. Dirk Kutscher, "The Network of Information: Architecture and Applications" in the annual report of SAIL july 2011

16. Named Data Networking (NDN) Project2012 - 2013 Annual Report

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