

Information Centric Networking : Solution To The Future Internet

Prof. Naveen Hemrajani
HOD CSE Department, JECRC
University, Jaipur

Mamta Choudhary
Research Scholar in Computer Science in information security
JECRC University, Jaipur

Abstract - Previously, the aim was to connect the two systems, but now the internet has changed from mere a connection to a greater perspective so for coping with the usage of internet we need to give more emphasis on the information retrieval and hence this new concept emerges as a solution. ICN is an approach which is been developed by great efforts for last one decade various approaches are proposed like CCN, NDN, SDN, internet of things and many despite what they call it the main approach is same. The main aim of this approach is giving the data the additional information to play central role. But there are still major challenges that are to be overcome. Hence currently it is being tried on small scenarios like media distribution where it is performing outstandingly. So this paper will focus on what is the present state of this approach and its limitations and challenges.

keywords: ICN, Challenges , Architecture

I. INTRODUCTION

Information-Centric Networking (ICN) also known as NDN, CCN, etc targets general infrastructure that provides in-network caching so that content is distributed in a scalable, cost-efficient & secure manner.[1] Content-Centric Networking (CCN) is a novel networking paradigm centered around content distribution rather than host-to-host connectivity[2]. The information-centric approach to the network of the future has recently been and is being explored by a number of research projects, both in Europe (PSIRP [3], 4WARD [4], PURSUIT[5]and SAIL[6]) and in the US (CCN [7], DONA [8] and NDN[9]). While these approaches differ with respect to their specific architecture, they share some assumptions, objectives and certain structuring architectural properties. In general, the aim of developing a network architectures that are better suited for content distribution (the currently prevailing usage of communication networks) and that better cope with disconnections, disruptions, and ash-crowd effects in the communication service. However overall they work on a common basic architecture which is shown below fig 1. features that are considered in ICN are in-network caching, self securing data objects or packet, name based routing. The main differences between the original network and ICN can be described by the below table

Table 1: [1]Concepts of information-oriented networking versus the original Internet design. Rethinking fundamentals.

Original Internet	Information Oriented/ Content centric Networking
Sender	Content producer(publisher)
Receiver	Content consumer(subscriber)
Sender based control	Receiver based control
Client/Server communication	Publish/Subscribe Sender receiver uncoupled
Host-to-Host	Service access/ Information Retrieval
Topology/Domain	Information Scope
Unicast	Unified uni- multi-and anycast
Explicit destination	Implicit destination
End to End	End to Data
Host name(look up oriented)	Data/Content name (Search activity)
Secure channels, host authentication	Integrity and trustderived from the data

II. ARCHITECTURE OF ICN

Subsequently, different approaches are proposed so there are various architectures of ICN according to their approach, but below given is one of the commonly used architecture of ICN.

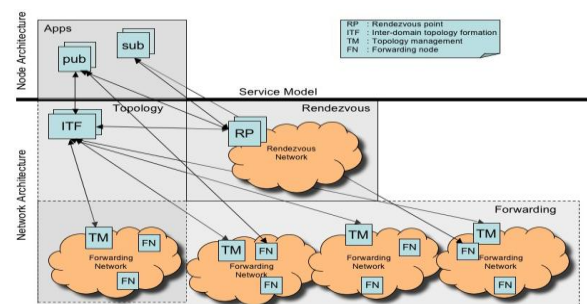


Fig. Basic Conceptual Architecture of ICN

figure 1 shows the basic components of the conceptual architecture. At the application level the basic services of publish-subscribe model is implemented by PUB SUB. Whereas in the network architecture there are three main tasks are considered, namely rendezvous, topology and forwarding. Rendezvous component does the masking between publisher and subscriber with the help of specific identifiers. Once matching is done the forwarding topology is created dynamically similar to BGP. The main objective of the architecture to provide the required mapping of these concepts onto concrete forwarding relations between endpoints, producing and consuming information[10]. Various researches are working on forming the required efficient matching algorithm and routing and forwarding tables. Despite of this there are still few major challenges in this approach which are of a great importance and have a great impact in this research..... Hence in the next part we will discuss few major challenges in the Information centric networking approach.

III. MAJOR RESEARCH CHALLENGES

ICN approach is a latest approach developed by the researchers and still only a decade old resulting in great attention of researchers due to reason that there is a big part of this area which is still needed to be solved .ICN is proposed to take place of the approximately 50 year old legacy networking paradigm which is a client server approach and challenging it by proving a more flexible and reliable approach. Henceforth these are the few research challenges ICN is currently facing whose solution plays a vital role in the development of this new promising approach.

A Scalability and deployment:

This is a major issue as we have to decide on where this new approach will meet the original internet because it is practically not feasible to design the complete internet from the scratch. Although we came upon with a solution CCNxServ which allows for dynamic services and service scalability on top of the CCNx content centric networking framework. but still it lacks the implementation.

B Mobility:

Consumer mobility is a well handled phenomenon due to the consumer-driven nature of most ICN designs. However, a larger challenge is maintaining routing consistency during provider mobility. This is because when- ever a provider re-locates, it is clearly necessary to update (global) locator information [11]and for that an efficient naming resolution and inter domain routing is the need.

C Information centricism:

As stated by Van Jacobson in [12] about 99% of the current network is used to acquire the named chunks of data which is confirmed by services like world wide web, Akamai etc. and these chunks will kept on increasing. In addition, more and more new applications appear that focus on the

provisioning of information without requiring any unique endpoint addressing of the underlying IP protocol.[13]

So information centricism being the core heart of this approach it is among the chief issue that needed to be solved that how on what bases it will be achieved.

D Security:

This is one of the aces that draws this approach into existence as security was the one of the chief factors responsible for this approach. day by day, increasing threats and dos attacks lead us to this approach so it's a big challenge how we ensure the security of data as here information is playing the center part of the complete approach. Few attacks that can be possible in ICN are

1. *Attacks Related to Resource Exhaustion*
 - i. *Remotely Initiated Overload*
 - ii. *Piling Requests due to a Slow Source*
 - iii. *Mobile Blockade*
2. *Attacks Related to State Decorrelation*
 - i. *Infringing Content States*
 - ii. *Timeout Attack*
 - iii. *Jamming Attack*
3. *Attacks Related to Path and Name Infiltration*
 - i. *Route Hijacking*
 - ii. *Route Interception*

Some threats are easy to anticipate (e.g., resource exhaustion), others are more intricate due to the complex interplay of distributed states (e.g., state decorrelation).[14]

This paper reviewed all possible security threats which are challenge to the ICN approach.

E Routing scalability:

Since the data in ICN are routed based on their names, the data-plane forwarding speed must be fast enough to handle lookups from a vast name space, which is several orders of magnitude greater than the IP address space [2]to solve this, researchers proposed few promising routing table forms and also few new dynamic routing algorithm but their applicability and efficiency is still on a doubt.

IV. CONCLUSION AND FURTHER WORK

We have discussed the major challenges which are being faced by this paradigm and are first and foremost needed to be overcome the promises this paradigm has made. As it has to meet the ever evolving new scenarios and advancements in the area of computers and technology.

The future scope of this area of research is very vast and there is a lot more to research in this area, as it just a beginning of a new era of the modern ever evolving and dynamic networking approach which can be effectively deployed over the present legacy host centric internet setup as it is very important because the host centric approach roots are deeply grounded in our internet.

Further, more deep research is needed to be carried out in terms of scalability, security, and name resolution for addressing, forwarding and routing in information centric networking keeping the deployment criteria in mind. So before that we cannot conclude to a sure conclusion about

whether it will meet the promises it has made. It has to prove its efficiency and applicability starting from a small scenario like media distribution and then aiming at the bigger scenario. Overall, this approach have much more to give and have drawn great attention from researchers.

REFERENCES:

1. Prof. George Pavlou, a keynote speech on "Information-Centric Networking and In Network Cache Management: Overview, Trends and Challenges " in IFIP/IEEE CNSM 2013
2. D. Perino and M. Varvello, A Reality Check for Content Centric Networking," in Proc. of the ACM SIGCOMM WS on Information-centric Networking (ICN '11). Toronto, Canada:ACM, August 2011, pp. 44-49.
3. P. Jokela, A. Zahemszky, C. E. Rothenberg, S. Arianfar, and P. Nikander, "LIPSIN: Line Speed Publish/Subscribe Inter-networking," in Proceedings of the ACM SIGCOMM 2009 conference on Data communication. New York, NY, USA: ACM, 2009, pp. 195{206. [Online].
4. 4ward project, <http://www.4ward-project.eu/>.
5. PURSUIT, <http://www.fp7-pursuit.eu/>
6. SAIL, <http://www.sail-project.eu/>
7. V. Jacobson, D. K. Smetters, J. D. Thornton, M. F. Plass, N. H. Briggs, and R. L. Braynard, "Networking named content," in Proceedings of the 5th international conference on Emerging networking experiments and technologies, ser. CoNEXT '09. New York, NY, USA: ACM, 2009, pp.1-12.
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. named data networking <http://www.named-data.net/>
10. D Trossen, M Särelä and K Sollins "Arguments for an Information-Centric Internetworking Architecture" in Proc. of the ACM SIGCOMM WS on Information-centric Networking (ICN'10). April 2010 volume 40 number2 pp.26-33
11. 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
12. Van Jacobson, "A new way to look at networking", video available online at Google Tech Talks, 2006.
13. Dirk Trossen, Mikko Särelä , and Karen Sollins "Arguments for an information-centric networking architecture" ACM SIGCOMM Computer Communication Review Volume 40, Number 2, April 2010 pp 26-33
14. M. Wahlisch, T. C. Schmidt, and M. Vahlenkamp, "Backscatter from the Data Plane – Threats to Stability and Security in Information-Centric Networking"
15. 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.

TABLE REFERENCE

1. Dirk Trossen, Mikko Särelä , and Karen Sollins "Towards a new generation of information-oriented internetworking architectures " ACM SIGCOMM Computer Communication Review Volume 40, Number 2, April 2010 pp 26-33