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Survey

Named Data Networking: A survey

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ABSTRACT

Internet was developed as a packet data network where users and data sources (server) with specific IP addresses interacted over a pre-established communication channel. This model of client–server data communication has evolved into a peer-to-peer mode of data sharing in recent times. Applications like, YouTube, Bit Torrent, social networks have revolutionized the idea of user generated contents. Modern users care only for specific data items irrespective of their sources. So, the idea of using IP addresses to identify servers hosting a particular content is losing its importance. Moreover, want of IP addresses is a challenging issue haunting the Internet community since long. The need of the time is a content-centric networking platform where data hosts are of less importance, and Named Data Networking (NDN) has been proposed to that end. NDN allows users to float a data request without any knowledge about the hosting entity. NDN can handle user mobility, security issues more efficiently than the current Internet. Although NDN has been proposed in 2010, so far, there is no survey paper studying its architecture and various schemes proposed for its different characteristic features, like, naming, adaptive forwarding and routing, caching, security, mobility, etc. In this paper, we introduce a novel taxonomy to study NDN features in depth. We have also covered several NDN applications. We conclude our survey by identifying a set of open challenges which should be addressed by researchers in due course.

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1. Introduction

Internet was designed more than thirty years ago as a point-to-point conversation between two end hosts which allowed the users to fetch data from well-known servers. After TCP/IP protocol stack was introduced [1], packet switching allowed users to transfer text, audio, and video packets over the Internet.

Though, the Internet has shown great resilience over the years, more recently, changes in the nature of applications, user requirements, and usage patterns have significantly strained it. Recently evolving content-centric applications, like, social networking, e-commerce, YouTube [2], Netflix [3], Amazon [4], iTunes [5], etc., allow users to share texts, images, audios, and videos and have become the source of half of the world's Internet traffic. Recent surge on production and consumption of user generated contents (UGCs) are failing the Internet because it was not designed to support the newly evolving content distribution model [6–8]. Today, most of the application data delivery model is concerned about *what* data is needed irrespective of their locations. Moreover, support for mobility and security is not in-built in Internet, but offered as multiple patches or add-on features which may fail at times.

The aforementioned reasons urged researchers to find an efficient alternative architecture to the Internet, which will inherently support content-centric communication. Among several funded projects for designing content-based future Internet paradigms, *Named Data Networking* (NDN) came up as the promising candidate [6–9] which directly deals with application generated variable-length, location-independent names to search and pull contents for a requesting user, irrespective of their hosting entity.

The basic design principles of NDN are based on the Internet. NDN can directly use major IP services like, Domain Name Service (DNS) and inter-domain routing policies. IP routing protocols like, BGP and OSPF can be adapted to NDN with little modifications. However, NDN offers certain enhanced features as explained below. It uses data packets with content names [6] instead of source and destination addresses. The use of *unique content names* for communication