Domain Title Service for Future Internet Networks

Flávio de O. Silva[1], João H. S. Pereira[1], Sérgio T. Kofuji[1], Pedro Frosi Rosa[2]

[1]Escola Politécnica da USP (EPSUP – PSI – Universidade de São Paulo (USP)
Caixa Postal 61.548 – 05.424-970 – São Paulo – SP – Brazil

[2]Faculdade de Computação (FACOM) – Universidade Federal de Uberlândia (UFU)
Caixa Postal 593 – 38.400-902 – Uberlândia – MG – Brazil

{flavio,kofuji}@pad.lsi.usp.br, joaohs@usp.br, frosi@facom.ufu.br

Abstract. *The basic principles of the core protocols of Internet remain since they were established. The Internet allowed a revolution on communications and this lead to a complete set of communication requirements. The evolution of the Internet is limited by its vision, so different research groups are designing a future Internet. This work presents a contribution to this research area by describing the DTS (Domain Title Service), a distributed system responsible for the communication requirements of an entity over time and its horizontal addressing. Using OpenFlow, DTS will be experimentally deployed over production networks, collaborating with the design of future networks.*

Resumo. *Os princípios básicos dos protocolos da Internet permanecem os mesmos desde a sua proposição. A Internet promoveu uma revolução nas comunicações que conduziram a um novo conjunto de requisitos de comunicação. A evolução da Internet está limitada por sua visão, e desta forma, diferentes grupos de pesquisa estão projetando a Internet do futuro. Este trabalho apresenta uma contribuição para esta área de pesquisa descrevendo o DTS (Domain Title Service), um sistema distribuído responsável pelos requisitos de comunicação de uma entidade ao longo do tempo bem como o seu endereçamento horizontal. Utilizando OpenFlow, o DTS será experimentalmente implantado nas redes atuais, colaborando com o projeto das futuras redes.*

1. Introduction

The ideas and the basic principles regarding the core protocols of the Internet were established at the beginning of the seventies by Cerf; Kahn (1974). Internet on its turn is generating a revolution on communications and the way people, data, services and contents interacts each other.

The stability of these protocols, as presented by De Souza Pereira; Kofuji, S. T; Rosa, P. F (2010a), lead to the dissemination of the Internet and this lead to a new set of requirements, among others: security; privacy; quality of service; mobility; support of real time contents such as voice and video; Web Services; support for new devices like smartphones and sensors; autonomic management; support to virtualization and policies. A totally new scenario considers as well the energy consumption, social and economic needs as exposed by Tselentis et al. (2009).

At the present researchers all over the world are engaged in clean-slate design of a new Internet as related by Roberts (2009). European Union, FIA (Future Internet Assembly) aggregates more than one hundred different projects related with different aspects of networks as discussed by Tselentis et al. (2010). At United States FIND (Future Internet Design) program aggregates different projects as presented by Fisher (2007). At Brazil, among others, projects like Horizon described by Moreira et al. (2009) and Web Science introduced by Maculan et al. (2009), are involved with the development of novel networks. The research is experimentally oriented based on test beds like: PlanetLab introduced by Peterson; Roscoe (2006); Geni; OneLAB and initiatives like FIRE related by Gavras, A. et al. (2007), are dealing with the promotion of this experimental approach. At Brazil, RNP under project GIGA is enabling the use of OpenFlow and is federating Brazilian test beds with experimental facilities outside Brazil, as exposed by Stanton (2010).

In this paper, section 2 presents the DTS (Domain Title Service), a distributed system responsible for the communication requirements of an entity over time and section 3 shows some concluding remarks and future work.

2. DTS (Domain Title Service)

Actually at Internet, applications are addressed using an IP address, related with the Network Layer, and a port, related with the Transport Layer. So the addressing is based on two distinct concepts, defined at different layers which results in a tight coupling between them. But, at the user point of view, a name is still used and needs to be translated by a name service, the DNS (Domain Name System). The need of a name service shows that a network user is not interested at these aspects of the address but in content, service, or some data available by the network.

The DTS (Domain Title Service), shown at Figure 1, introduced by De Souza Pereira; Kofuji, S.T.; Rosa, P.F. (2010b) consists of a distributed system over the network elements responsible for maintaining the Entity Titles, as defined by Pereira et al. (2011), available in that domain and their communication requirements over time. Besides that, DTS will be responsible for handling QoS and QoE parameters.

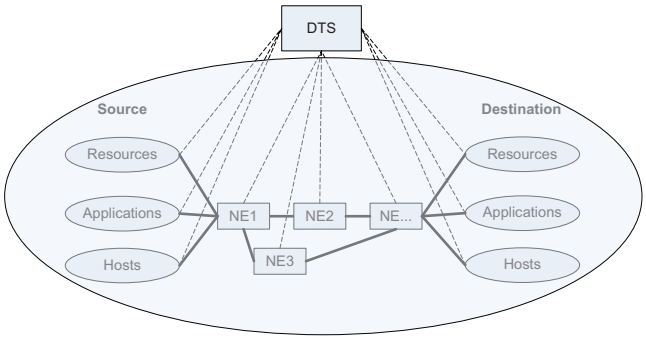

Figure 1 – DTS Topology

DTS plays an important role at basic aspects of the networking like routing and addressing and is responsible for handling the QoS and security parameters provided by the application to the lower layers of the protocol stack. One of its goals is to guarantee

that the communications requirements will be handled appropriately not only on an end-to-end view but also at point-to-point view.

Over the network, DTA (Domain Title Agents) are distributed on that domain and being deployed at servers and network elements (switches, routers and so on). The DTS interacts with protocol entities providing a cross layer support in order to propagate communication needs, as shown on Figure 2.

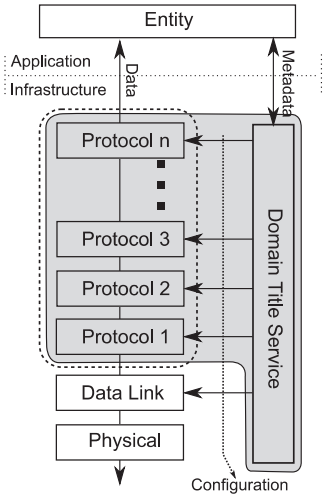

Figure 2 – DTS interaction with the protocol stack

A DTA can be implemented as an OpenFlow Controller. Based on this approach, each network will have a DTA responsible for the configuration of network elements based on the communication requirements.

5. Concluding Remarks and Future Work

Considering the new set of requirements, Internet architecture must be reviewed. This process of revision using a clean-slate can free researchers of current shortcomings, providing a rich environment for experimentations. The evolution, provided by this process, might be deployed at current Internet, modifying its structures resulting in a new Internet.

This paper shows our contribution to this research area by presenting the DTS, a distributed system responsible for handling communications needs over time and a horizontal addressing of the entities playing a important role with networks aspects like routing and addressing and features like an intelligent use of unicast and multicast in a end-to-end communication.

As a future work, DTS approach and the concepts will be deployed at a production network using OpenFlow in order to experiment and test the horizontal addressing by title.

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