Deployment of Application-tailored Protocols in Future Networks (Demo Abstract)

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I. Introduction

When the Internet was designed and standardized, its main purpose was the transmission of files from one node to another in a reasonable amount of time. This, however, does not conform with today's usage pattern. Although the Internet is still used to transfer files between nodes, new applications, such as VoIP, video streaming and real-time gaming/transfers have emerged and become a dominant factor. In contrast to the early days, not only some research facilities are interconnected. Instead, many businesses heavily rely on the Internet. This development is driving today's general purpose Internet architecture to its limits.

Research on the design of a Future Internet within the G-Lab project [1], therefore, focuses on providing multiple virtual networks instead of a single multi purpose one [2]. Each of these networks is optimized for the requirements of a different use case or a certain application. In these virtual networks, communication is provided by application-tailored protocols encapsulated in so-called Netlets. These Netlets are explicitly designed for the respective networks and applications. Protocol composition constitutes a feasible approach to support a network designer in the development of such protocols. During protocol composition, new Netlets are created by combining reusable building blocks, which in turn provide individual protocol functionalities.

An application-tailored network is offered by a virtual network provider (VNP), which uses the infrastructure provided by traditional Internet service providers. After composing a set of Netlets for a novel virtual network, the VNP is in charge of deploying them to network nodes. The VNP could distribute the Netlets onto nodes inside the network when the VNP instantiates the virtual network. This scheme, however, is rather impracticable. An arbitrary amount of end nodes may join virtual networks at arbitrary points in time. Thus, a VNP cannot deploy Netlets to end nodes in advance. Furthermore, a VNP could be overstrained with requests and would be required to provide his own load balance solution for protocol distribution.

In this demo, the Netlet distribution over the HiiMap Next Generation Internet (NGI) architecture is shown. The HiiMap architecture [3] follows the locator/identifier separation paradigm and introduces a hierarchical mapping system. This mapping system is used to store information about the virtual networks and to distribute the storage location of the Netlets. Furthermore, the NGI architecture is used as the underlying basic control network to exchange Netlets between nodes.

In the following, the architecture and visualization of the proposed demo is described.

II. Demonstrator Description

Figure 1 gives an overview of the demo setup.

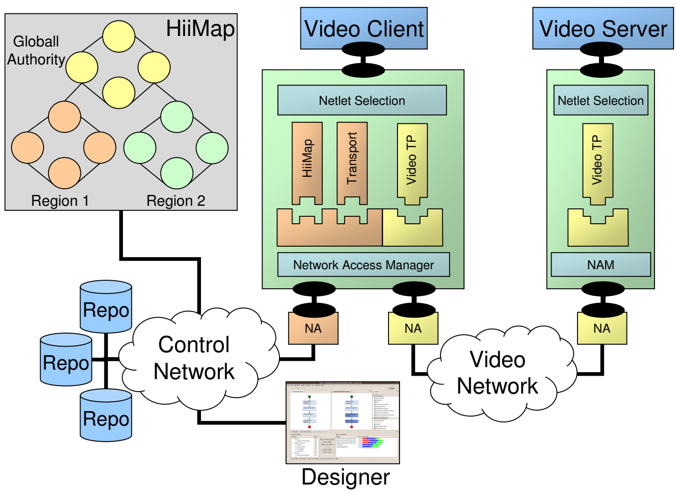

Fig. 1. Demo overview

In the demo there is a virtual network which is optimized for an online video store. This means, the network is optimized for on-demand video streaming and personalization of videos during transmission.

In order to achieve this optimization, the Designer creates a video streaming Netlet (*Video TP*) and deploys it using a design tool. In order to deploy this Netlet to network nodes, the Designer uploads the Netlet to repositories in the basic network. Additionally, the Designer adds the Netlet to the List of Netlets used inside the video network. This list is stored in the video network's entry in the HiiMap mapping system also located in the basic control network. Furthermore, the Designer adds an entry in the mapping system for the video Netlet that contains the locators of the repositories on which the Netlet is stored.

Inside the video network, the video store owner—in this case the VNP—operates a video streaming server *Video Server*, that streams videos to customers of the video store. This server is already connected to the video network and already possesses the video streaming Netlet.

In the demo scenario a new customer (*Video Client*) wants to join the network and watch a video. In order to achieve this, the customer's node is required to perform the following steps. First, the node must establish a connection to the video network. This means, a virtual link from the customer's node to the video network is created. In a next step, the node must acquire the video streaming Netlet to be able to receive the video over the virtual link. To this end, the customer's node relies on the services provided by the basic control network. The node requests the virtual network's entry in the HiiMap mapping system. This entry contains a list of Netlets used inside the video network—in this case the name and ID of the video transport Netlet. Then the node resolves the video Netlets ID and thus acquires the list of repository locators. The node downloads the Netlet from one of these repositories. Finally, it loads the Netlet in the NENA framework [2] and utilizes it to receive the video.

For the HiiMap mapping system, a topology monitor is provided (Figure 2). It shows the activity in all regions which are represented by the different sites of the G-Lab experimental facility.

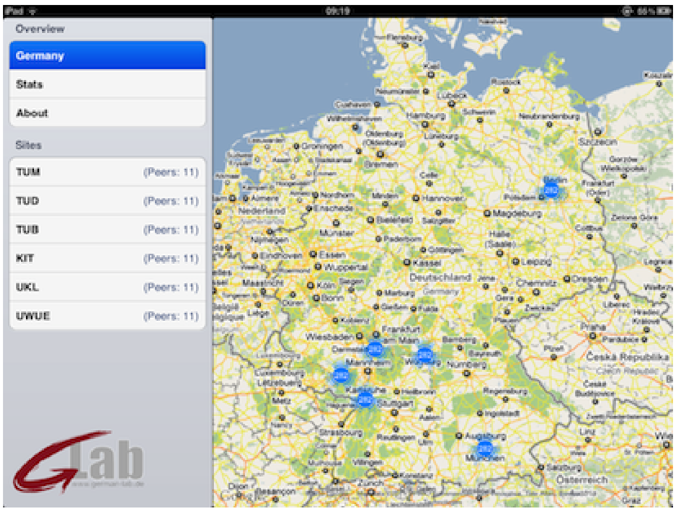

Fig. 2. HiiMap topology view - all regions

A detailed view shows which nodes currently are active and receive any requests or updates (Figure 3). The requests and updates in this demo are generated by the NENA framework during the deployment process. Additionally, clients within the Seattle testbed [4] also utilize the mapping service and cause further traffic.

Fig. 3. HiiMap topology view - detail view

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