

H \forall Mcast: A Showcase on Universal Group Communication in the Future Internet

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Abstract—In this demo showcase we present a full featured prototype implementation of the H \forall Mcast architecture including a large scale deployment in the German-Lab. The prototype transparently utilizes heterogeneous multicast technologies to enable a universal group communication service. The demo illustrates usage of the common multicast API and H \forall Mcast middleware exemplified by a video streaming group application. A mobile node running H \forall Mcast can seamlessly switch networks and utilize the available multicast technologies without changes to configuration or the group application. We also present a revised version of our monitoring framework for hybrid multicast networks that we use to visualize node and group state changes during the demo.

I. INTRODUCTION

Today many Internet applications such as IPTV, on-line social networks and MMORGs rely on some form of group communication that is best implemented using multicast schemes. Multicast as a network service simplifies application development and minimizes network load when implemented on the lowest possible layer. However, the overall deployment of group services remains restricted to edge networks, regional ‘walled gardens’ and link layers. Network applications that are built to run globally have to implement a group communication independent of the network conditions at runtime. Hybrid multicast is a promising approach to bridge the deployment gap and has been recently fostered in several characteristics.

We proposed the H \forall Mcast system architecture, a hybrid adaptive multicast solution to enable a universal group communication service in the Future Internet. Combined with a common API, applications can simply rely on a system library that dynamically selects the most beneficial communication service available at runtime. This approach enables ‘write-once-run-everywhere’ solutions that take full advantage of network capabilities.

The rest of this work is structured as follows: In section II we give an overview on the H \forall Mcast prototype implementation. Afterwards we describe the showcase of our demo presentation in section III. And section IV outlines the demo setup and components.

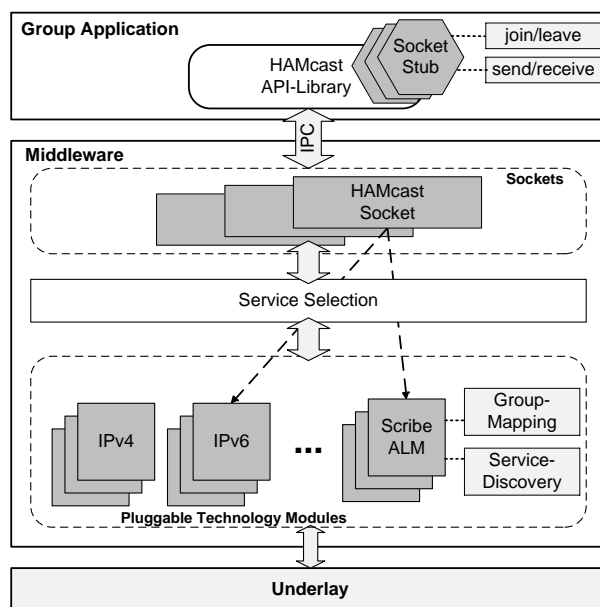


Fig. 1. Overview on the H \forall Mcast prototype architecture.

II. H \forall Mcast PROTOTYPE

We implemented a software prototype of the H \forall Mcast system architecture [1]. Fig. 1 gives an overview on the architecture of the H \forall Mcast prototype. It is released as an open source package licensed under LGPLv3 and is available for download on our developers websites, on-line at: <http://hamcast.realmv6.org/developers>. The prototype implementation currently runs on Linux as well as MacOS X and it consists of the following components:

- an adaptive middleware for endsystems that is written in C/C++ including the boost libraries,
- and a realization of the common multicast API [2] that is available as C++ library and Java package.

Furthermore, we implemented a lightweight version of H \forall Mcast in Objective C for mobile devices running Apple iOS. The H \forall Mcast middleware currently supports a variety

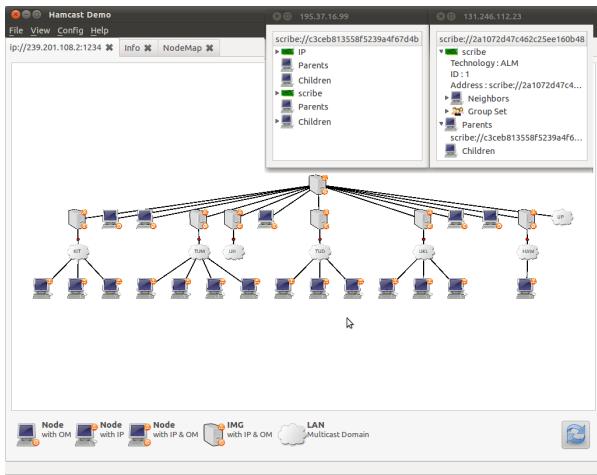


Fig. 2. Screenshot of the HVMcast monitoring framework.

of multicast technologies, including native IP multicast [3], as well as overlay multicast based on Scribe [4] and the Ariba framework [5]. Each multicast technology is implemented as a shared library module that is dynamically loaded if the corresponding technology is available at runtime.

III. DEMONSTRATION

The demo showcase illustrates usages of our reference implementation of the common multicast API. It allows to transparently use heterogeneous multicast technologies and provides API calls for multicast monitoring. We implemented a group application to receive a video stream via multicast using the HVMcast prototype. When the mobile node is connected to a standard network the group application receives video data through overlay multicast. After movement and switching to a HVMcast-enabled network (see Fig. 3) the video stream is received using IP multicast. Note, this handover is seamless and does neither require changes to node configuration nor any setting of the group application.

Further, we also present a revised version of our monitoring framework for hybrid multicast networks. This software allows us to observe group state changes, such as join/leave and their effects on data distribution in the demo network. For that purpose we setup two distinct video sources to allow clients to join and receive data from different groups. The framework consist of three components:

- a monitoring daemon deployed on all HVMcast nodes,
- a collector aggregating information from all daemons,
- and a QT-based GUI to visualize hybrid multicast group trees, as well as detailed group and node information.

All components exchange control and data messages through a RESTful web interface. Fig. 2 shows a screenshot of the monitoring framework GUI.

IV. SETUP & COMPONENTS

For our demo presentation we deploy the HVMcast prototype in the German-Lab (Glab) [6] testbed environment to setup a distributed hybrid multicast topology. At each Glab

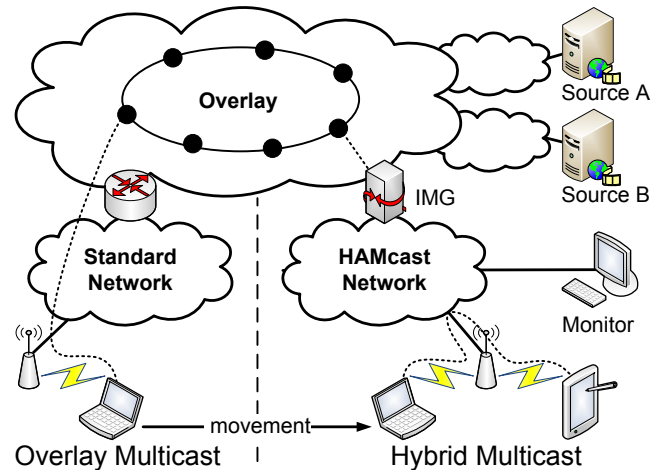


Fig. 3. Overview on setup and components of the demo presentation.

site one node is configured as an IMG and all other nodes as multicast clients to send or receive group data. The IMGs interconnect all Glab sites by a Scribe overlay and forward group data between multicast domains as required. At the demo site we set up two distinct (wireless) networks as shown in Fig. 3. The standard network has no native multicast support, while the other (HVMcast enabled) network offers IP multicast and is connected to the Glab Scribe domain by a local IMG.

The demo setup consists of the following hardware components: 2x wireless access points, 1x IMG node, 1x monitor node, 2x mobile group clients (laptop and tablet). The software components of our demo are: the HVMcast prototype, a dynamic IMG daemon, the monitoring framework, and a group application for video streaming.

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