# Demo Abstract: A Showcase on Live Video Lecturing Using the H∀Mcast-Architecture

Sebastian Meiling, Thomas C. Schmidt, Sebastian Zagaria
{sebastian.meiling, sebastian.zagaria}@haw-hamburg.de, t.schmidt@ieee.org
Internet Technologies Research Group – Department Informatik
Hamburg University of Applied Sciences
Berliner Tor 7, 20099 Hamburg, Germany

Matthias Wählisch
waehlisch@ieee.org
Institut für Informatik
Freie Universität Berlin
Takustr. 9, 14195 Berlin, Germany

***Abstract*—The H∀Mcast-architecture provides a universal group-communication service, its concept combines an abstract naming scheme for multicast groups, a common multicast API and a service-middleware for endsystems. In our demo showcase we present the prototype of the H∀Mcast-middleware and API using the G-Lab testbed environment. We developed a live-lecturing software that uses H∀Mcast to send and receive a video-stream and group-chat via multicast. Further, we introduce a monitoring framework to visualize multicast trees and node information.**

## I. Introduction

Group communication is a paradigm found in many popular Internet applications, such as IPTV, MMORGs and instant messaging. Data distribution within a group of multiple senders and receivers is most efficiently done using multicast. Nevertheless, despite the variety of existing multicast technologies, these application often rely on proprietary techniques based on IP-unicast, such as proxies or cache-servers. The two key problems are: (a) incompatible application interfaces between different multicast technologies (e.g. IPv4/IPv6 and ASM/SSM), and (b) divergent deployment states of multicast services. This forces developers and programmers of group applications to choose a multicast-technology at compile-time, unaware of the availability at run-time. Often the result is, that multicast is not used at all. However, multicast is often available in campus and enterprise networks. Unfortunately, there is no general interconnection of these edge-networks over the Internet, thus they remain isolated.

The H∀Mcast-architecture overcomes these obstacles and provides concepts to enable a universal multicast service , i.e. an abstract naming scheme, a common multicast API and system-centric middleware component as well as gateways (IMGs) to cross administrative or technological borders. In our demonstration we present a showcase on the H∀Mcast-prototype, including the usage of the multicast API and the IMGs concept.

## II. The H∀Mcast-Middleware Prototype

H∀Mcast-architecture [1] aims to provide a universal group communication service based on a hybrid approach. The concept is independent of the availability of a certain multicast technology, such as IP-multicast or overlay-multicast, and does not rely on a complete deployment of the H∀Mcast-middleware on every endsystem. On the contrary it allows for an incremental deployment within networks and attached nodes.

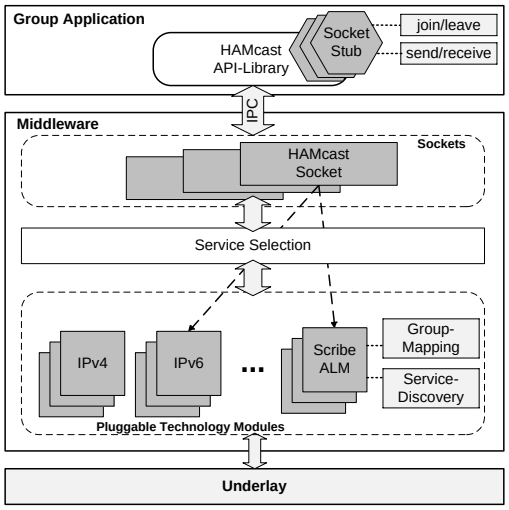
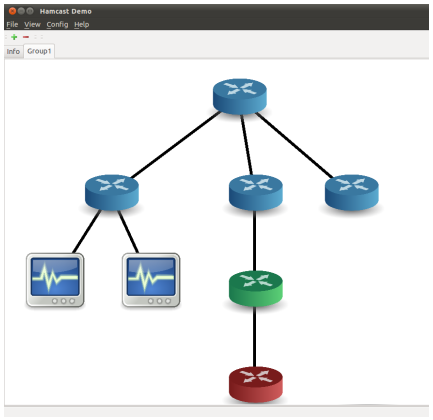



Fig. 1. H∀Mcast-Architecture Overview

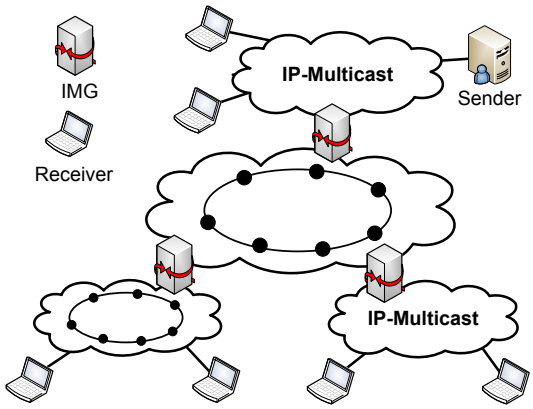
We implemented the H∀Mcast-middleware prototype in C++. Fig. 1 gives an overview on the design of our software prototype, that consists of three core components:

- a common API, for transparent multicast access
- a user-space middleware, running once per host
- dynamic loadable multicast technology modules

The H∀Mcastmulticast API is provided as a library in C++ and is in full conformance with the IRTF draft [2]. The H∀Mcast-middleware provides an abstraction from the available multicast-technologies and connects via a selfdeveloped, lightweight IPC protocol with the client application, that uses the transparent multicast API. At the moment, there are two multicast technology modules available for H∀Mcast, a module for IP-multicast [3] (H∀Mcast-IP) and one for overlay-multicast based on Scribe [4] (H∀Mcast-OM). The H∀Mcast-prototype is available for download on http://hamcast.realmv6.org.




(a) Screenshot of the Monitoring Software




(b) Demo Setup Example

## III. Demo Presentation

Our demo presentation consists of two parts. First, we present a live-lecturing software as a sample use-case of the H∀Mcast-architecture. The software allows to send and receive a video-stream via multicast utilizing the common multicast API for group communication provided by H∀Mcast. Further, it offers a multicast chat to pose and answer question in the group of participants.

Second, we demonstrate a framework to monitor multicast nodes and visualize the distribution tree of multicast groups. The framework consists of a monitoring viewer and a daemon for endhosts. The latter is a small probe, that sends node specific information, e.g. joined groups, to the monitoring viewer. Fig. 2a shows a screenshot of the monitoring viewer with the visualization of small group tree. To run our demo, we deploy our prototype of the H∀Mcast-middleware within the G-Lab testbed. Fig. 2b shows an example of our demo setup.

## IV. Demo Setup & Components

For our demo setup we create an overlay-multicast domain in the G-Lab testbed to interconnect multicast-enabled edge-networks, namely the sender site at HAW Hamburg and a receiver at the demo site. Further we make use of the following software tools:

- H∀Mcast-middleware – runs on all nodes, to enable universal multicast service
- IMG daemon – to connect sender/receiver domain with overlay-multicast domain
- VideoStreamer – uses the H∀Mcast-API to send/receive video stream and chat messages
- Monitoring dameon – a small probe, that runs on endhosts to discover multicast distribution tree and node information
- Monitoring viewer – a software to collect and visualize data from monitoring daemons

## Acknowledgment

The authors would like to thank Dominik Charousset, Fabian Holler and Sebastian Wölke for their supporting work. This work is funded by the Federal Ministry of Education and Research (BMBF) of Germany within the project H∀Mcast and the G-Lab initiative, see http://hamcast.realmv6.org.

## References

[1] S. Meiling, D. Charousset, T. C. Schmidt, and M. Wählisch, "System-assisted Service Evolution for a Future Internet – The HAMcast Approach to Pervasive Multicast," in *Proc. of IEEE GLOBECOM 2010, Workshop MCS 2010*. Piscataway, NJ, USA: IEEE Press, Dec. 2010.

[2] M. Waehlisch, T. Schmidt, and S. Venaas, "A Common API for Transparent Hybrid Multicast," IETF, Internet-Draft – work in progress 01, March 2011.

[3] S. E. Deering and D. R. Cheriton, "Multicast Routing in Datagram Internetworks and Extended LANs," *ACM Trans. Comput. Syst.*, vol. 8, no. 2, pp. 85–110, 1990.

[4] M. Castro, P. Druschel, A.-M. Kermarrec, and A. Rowstron, "SCRIBE: A large-scale and decentralized application-level multicast infrastructure," *IEEE Journal on Selected Areas in Communications*, vol. 20, no. 8, pp. 100–110, 2002.