

# CMSE: A Network Element for Assistive Media Steaming

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## Abstract

The emergence of broadband wireless networks and computationally powerful mobile devices has increased the demand for high quality media streaming while roaming between heterogeneous domains. This requires vertical handover, which compels the device to discard the current session with the media server, and in the new domain to initiate IP address allocation and stream server reauthorization. Taken together with stream re-routing latency, this can cause noticeable degradation of user perceived stream quality. This poster offers a Centralized Media Streaming Element (CMSE), which is located within each domain and provides IP pre-authorization, temporary inter-domain stream re-routing and reduced delay in stream session reconnection. CMSE can leverage the benefits of adaptive media streaming for dealing with bandwidth heterogeneity as well as take advantage of a stable connection to the media server to reduce latency. This work is currently at the concept stage

**Keywords:** Media Streaming, Vertical Handover, Heterogeneous Wireless Network

## 1 Motivation and Related Work

The portable and ubiquitous nature of mobile media streaming requires additional management structures that never existed for wired Internet access, these include location, mobility and handover management. Mobile IP has been offered as a solution to some of these issues, but one of the underlying problems with Mobile IP, is the inherent loss/delay when packets are re-routed from the media server (Corresponding Node - CN) to the home agent and then to the foreign agent. Several published papers have been offered as a means of reducing mobile media streaming complexity, see for example [1] and [2]. In this poster we introduce a new approach based on a network element, called the Centralized Media Streaming Element (CMSE), that removes the need for home re-routing by communicating directly with the CN while utilizing stream re-routing and IP pre-authorization between the domains.

## 2 CMSE Architecture

The aim of a CMSE is to increase the availability and reliability of high quality video delivery for Mobile Terminals (MTs). The concept of a centralized element, available locally within each domain, being able to monitor and adapt stream availability within a wireless domain is the basis of this work. The CMSE framework consists of two components: the CMSE nodes themselves and a client feedback mechanism called Application-Layer Network Aware (ANA) that is utilized to transparently provide device metrics, network conditions and stream selection to the local CMSE.

Figure 1 provides an overview of the CMSE data flows in a media streaming Vertical Handover (VHO) scenario. Figure 1a illustrates direct streaming between CN - CMSE - MT (dotted line). In Figure 1b the MT informs ANA (or ANA infers), that VHO is approaching, such that ANA instructs the local CMSE

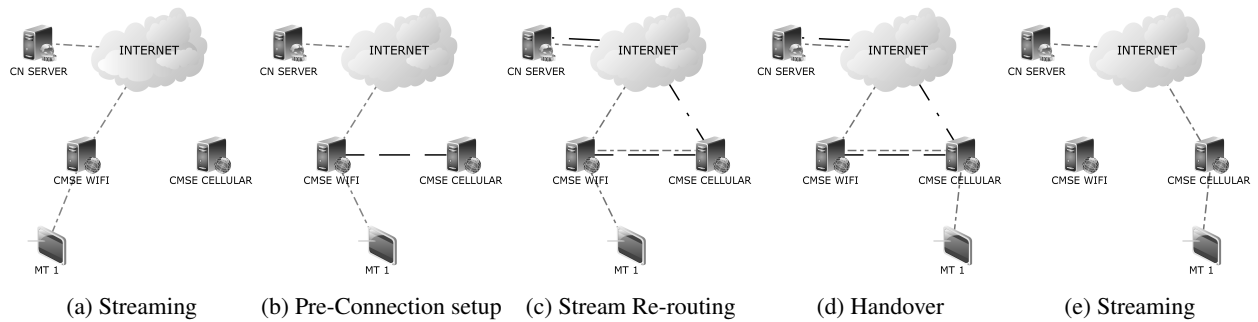


Figure 1: Overview of Pre-Authentication, Stream Re-routing and Handover between different domains.

to initiate pre-connection setup with the neighboring CMSE (larger dotted line - a direct connection is illustrated but of course it may be indirect via the Internet for example). This setup includes IP pre-authorization (DHCP lease allocation) and a query to determine the availability of the current stream on the neighboring CMSE. Figure 1c, highlights the option where the stream is not currently available in the next domain and temporary stream re-routing is required. Simultaneously the neighboring CMSE initiates authorization with the CN for the current stream (dotted line from neighboring CMSE to CN). In Figure 1d, the MT has initiated VHO and by utilizing the pre-authorized IP details, connection is immediately available from the new access point. The CMSE can now transmit the re-routed stream, while it awaits the CN transmitted stream to arrive. Once the requested stream arrives from the CN, the re-routed stream from the previous CMSE can be terminated and the pre-connection link can be closed, this is illustrated in Figure 1e. This is just an example of some of the proposed functionality for the CMSE and as can be seen, the IP pre-authorization and immediate stream availability can greatly reduce the likelihood of degradation of user perceived stream quality

The benefits of CMSE are greatly enhanced by the inclusion of adaptive streaming mechanisms [3], such that stream re-routing is optimized for the heterogeneous wireless networks and their diverse data rates, such that different quality streams can be made available. A CMSE provides a symbiotic relationship between the network and the devices, which provides benefits to both. It offers dynamic bandwidth management (based on local optimization of scalable media), increase perceived Quality of Experience (based on local client feedback and network management) and reduce delay during handover (local CMSE to remote CMSE optimization). This work is currently at concept stage, while future work will include the comparative evaluation of CMSE in both a simulated and real media testbed.

### 3 Acknowledgement

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