Media Resource Brokering – Unleashing the potential of IMS

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The Media Resource Broker (MRB) has definitely arrived and its existence is no longer questioned. You might remember NS-Technologies introducing the MRB concept in the first of a series of articles titled 'Introduction to Media Resource Brokering'. The second article in the series, titled 'Media Resource Broker Revealed', provided more detail related to the MRB entity and its role in Next Generation Networks (NGN). This article is the third in that series and will take a look at the role of an MRB in the IP Multimedia Subsystem (IMS) architecture being defined by the 3rd Generation Partnership Project (3GPP).

IMS is an architecture intended to provide a unified framework for deploying and delivering new Internet Protocol (IP) based services. IMS has been evolving for a number of years and until recently only seen relatively slow take up in the industry due to large capital expenditure costs for the kit required. It is also fair to assume that in general, IP-based communications networks were not sufficiently mature enough to justify the expensive switch to an IMS solution. This has in turn stunted the evolution of next generation fixed and mobile services as backbone networks play catchup, and confidence grows in IP communication technology. There is certainly a change in the air as major service providers are increasingly looking to IMS as the blueprint for their next generation architecture in conjunction with core network upgrades.

The IMS architecture places a large emphasis on media resources in its network as a major component for deploying IP based services. Media resources in IMS are more generally known as Media Resource Functions (MRF) and can be decomposed into component parts known as a Media Resource Function Controller (MRFC) and a Media Resource Function Processor (MRFP). Figure 1[1] provides a familiar illustration of the IMS subsystem and the usual core components, including the Serving Call Session Control Function (S-CSCF) and MRF components (MRFC and MRFP). The S-CSCF traditionally interacts with the MRF using the 'Mr' interface which utilises the Session Initiation Protocol (SIP)[2]. Until recently the 'Mr' interface has been relatively light in its specification for use in media resource processing scenarios. This has led to a number of popular proprietary solutions evolving that allow Application Servers to control media resources using SIP. They include the Media Server Markup Language (MSML) and Media Server Control Markup Language (MSCML). A new suite of media server control standards have been developed by the Media Control (MediaCtrl) work group of the Internet Engineering Task Force (IETF) to consolidate the situation. The MediaCtrl work includes an official standard for the Media Resource Broker (MRB) network entity. The red arrow in Figure 1 shows the introduction of the Media Resource Broker element into the IMS architecture. It is positioned with a SIP interface (ISC interface from Figure 1) from the S-CSCF and also a direct interface from an Application Server ('Rc' interface from Figure 1). The two interfaces are used to provide IP based applications and services deployed in an IMS environment with the ability to request an appropriate MRF depending on various requirements and characteristics. We will now delve a little deeper into the current definition of the MRB's role within an IMS, then look at how current standardisation efforts are meeting such requirements, and finally look at the benefits gained from deploying an MRB in an IMS environment.

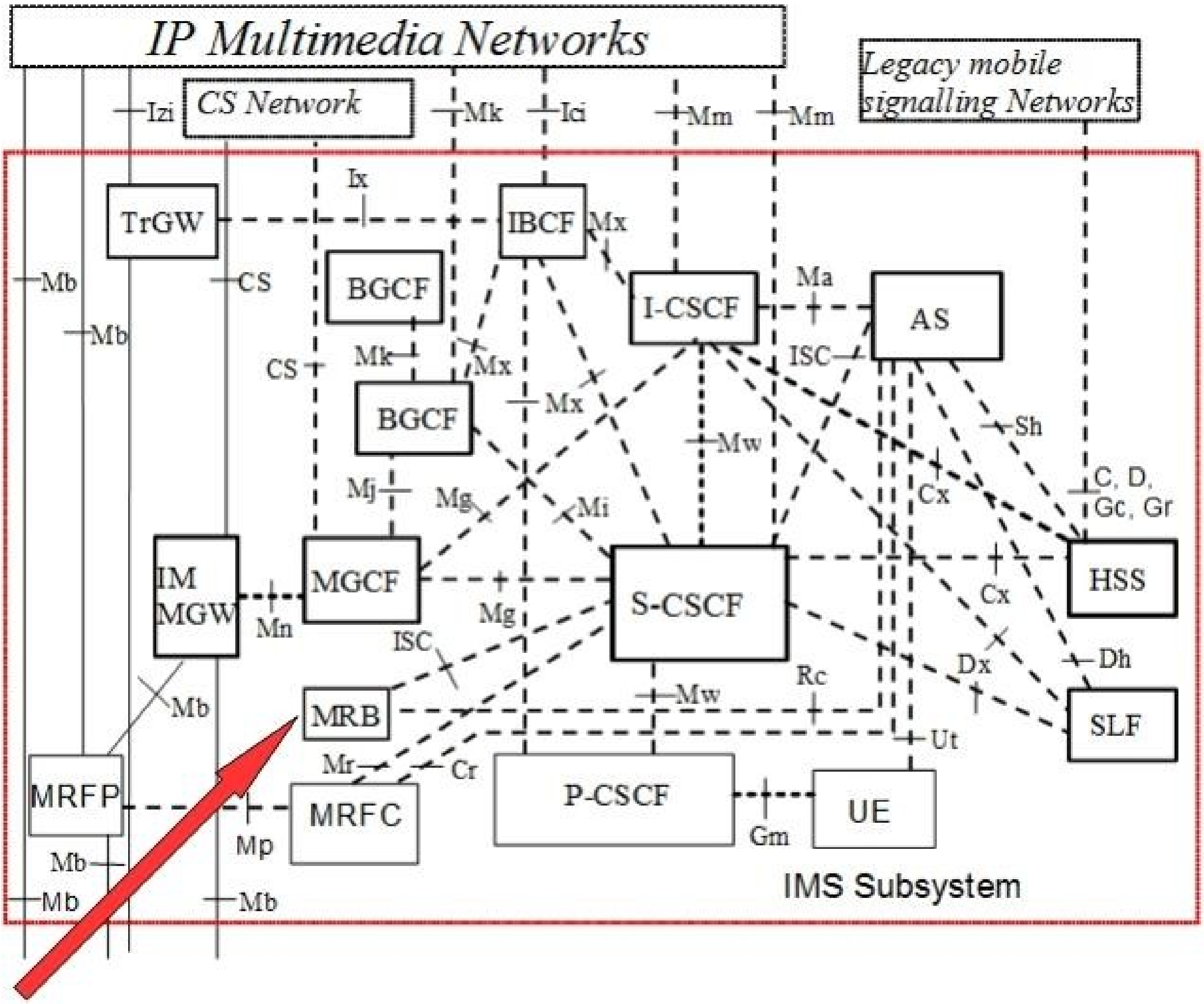

Figure 1 – Media Resource Function (MRF) in IMS

<u>Media Resource Broker (MRB) role within IMS</u>

The MRB made its first appearance in release 8 of IMS. Two clear roles are defined that enable an MRB to adapt to the requirements of the network and the applications/services that are deployed. A new interface was also defined to enable appropriate Application Server to MRB interactions. The 'Rc' interface is currently a place-holder and described as 'not yet specified'[1] in the appropriate 3GPP documentation. The current standardisation effort in this area will be discussed later in this article. We will now take a closer look at the two roles an MRB can play in IMS, In-Line and Query mode.

In-Line mode is illustrated in figure 2[1]. The new 'Rc' interface uses the Session Initiation Protocol (SIP) [2] as the transport protocol between the Application Server and MRB. The Application Server issues requests using SIP to the MRB which sits directly in the signalling path acting as an intermediary. On receiving a SIP request, the MRB inspects and uses its knowledge of Media Resource Functions (MRF) available in the IMS network to select the most appropriate one to complete the media resource request. The selection decision includes capacity and capability data relating to the MRF as well as any other available external information. Once the MRB has made the media resource selection decision, the SIP request is routed to the appropriate MRF using the ISC interface via the S-CSCF. The Application Server then uses the MRF as it would have without the help of the MRB using the selected control protocol – such as those being defined by the IETF MediaCtrl work group, MSML or MSCML.

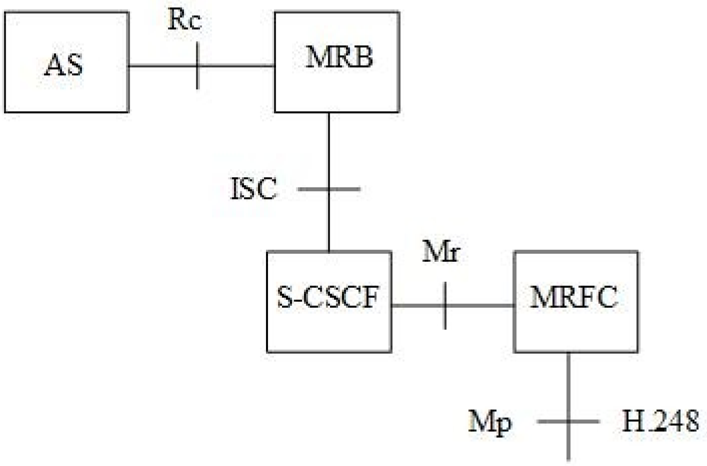

Figure 2 – In-Line Mode MRB in IMS

Query mode is represented in figure 3[1]. The Application Server (AS) uses the new 'Rc' interface to the MRB to request an appropriate MRF. The protocol is based on HTTP [3] which enables a simple request and response interaction between the AS and the MRB. This differs from the 'In-Line' mode of operation previously discussed in that the MRB supplies an MRF to the AS instead of acting on the AS behalf using SIP.

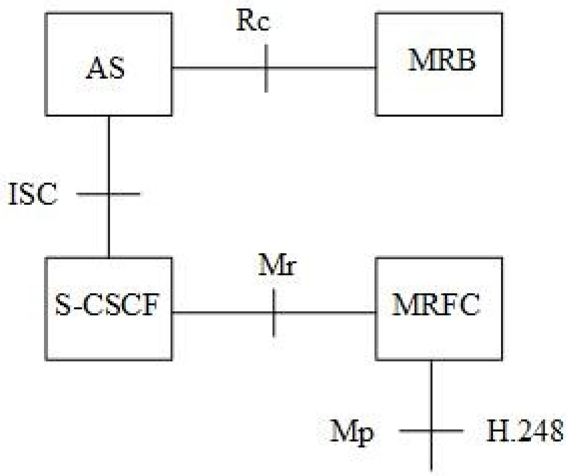

Figure 3 – Query Mode MRB in IMS

The AS constructs a request which is sent to the MRB using the 'Rc' interface. The HTTP request will contain MRF capacity and capability information required by the AS to fulfil the request for the IMS service/application. The MRB uses the same selection algorithms and information as discussed previously for 'In-Line' mode of operation when choosing a media resource. Once the most appropriate MRF has been selected, it is returned to the AS in a HTTP response. The AS is then able to use the information provided in the HTTP response to construct and send a SIP request to the S-CSCF, targeted directly at the MRF. An appropriate control language such as those being defined by the IETF MediaCtrl work group, MSML or MSCML is then used.

MediaCtrl Standards for Media Resource Broker (MRB)

The MediaCtrl work group of the Internet Engineering Task Force (IETF) has been working on a suite of standards intended to consolidate interactions with media resources. IMS has embraced the work being produced by the IETF MediaCtrl group related to media resource control which includes the specification for an MRB. The IETF MRB solution aligns perfectly with the requirements of IMS and provides appropriate interfaces for both Query and In-Line modes of operation.

The IETF MRB solution defines a new interface that allows media resources to publish their current status, including capability and capacity information. Figure 4 provides an illustration of the publishing interface.

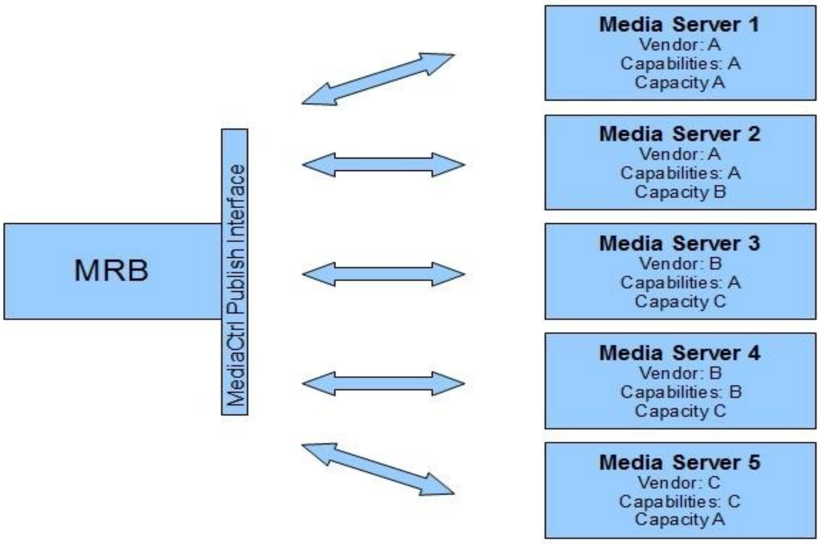

Figure 4 – Publish Interface

The MRB uses the Media Control Channel Framework, a core technology produced by the MediaCtrl work group, to connect and monitor allocated media resources. This interface enables the MRB to check the health of media resources as well as forming an accurate picture of available capacity and capabilities. The MRB collates all data relating to media resources for use when making selection decisions in conjunction with both In-Line and Query interfaces.

The IETF MRB standard defines an XML schema that is used by both Query and In-Line MRB interfaces from the Application Server to the MRB. For In-Line mode of operation, the Application Server's requirements for a media resource, in the form of XML, are carried as part of the payload in the SIP protocol message. On receiving the SIP message, the MRB extracts the information and selects an appropriate media resource on behalf of the Application Server. The MRB then routes the SIP message appropriately. For Query mode of operation, the XML payload representing the Application Server's media resource requirements are carried in a HTTP request. On receiving the HTTP request, the MRB extracts the information and selects an appropriate media resource on behalf of the Application Server. The MRB returns the selected media resource in a HTTP response to be subsequently used by the Application Server.

The IETF MRB standard also includes a useful mechanism for leasing appropriate media resources. This allows an Application Server to reserve future capacity as required, for example, to host a large conference call. The media resources are reserved for the Application Server as requested, and have a fixed expiry time. If the Application Server does not renew the lease in time, they are returned to the pool of available media resources. Both the In-Line and Query mode of operation support the leasing mechanism discussed.

Benefits of an IMS Media Resource Broker (MRB)

The benefits of an MRB in an IMS architecture are identical to those discussed for general next generation networks. The growth and adoption of IMS is very much reliant on confidence that the large financial investment in infrastructure will enable substantial revenue in the future. Unfortunately, this confidence in next generation applications and services has not been evident in early deployments and trials. This has resulted in the progress of IMS technology stuttering in the current financial crisis. In conjunction with this situation, the endpoint market has flourished due to the popularity of devices such as the iPhone and Blackberry. Applications have become more endpoint centric which has resulted in increased functionality, and thus associated revenue, being enjoyed increasingly at the consumer device. This has left major network vendors fighting for diminishing margins and the ultimate threat of being marginalised to just providing a connectivity pipe. It is for this reason that Service Providers need to be bold with their infrastructure decisions if they are to compete in next generation networks and attempt to pull value, and revenue, back to the core. IMS will be increasingly used to upgrade infrastructure and provide a flexible architecture capable of rapidly deploying new services. Creating an efficient IMS environment is key to reducing capital expenditure costs and fully utilising the investment made. Media resources form a crucial and expensive part of any IMS deployment and are currently under utilised due to historic capacity planning approaches and methodologies. Introducing an MRB to your IMS environment virtualizes existing and new media resources so that they can be used as required and on demand by existing and new services. Media resources are no longer tied in a silo fashion to services and can be better managed & utilised through quiet and busy traffic periods. This increases the availability of idle media resources which in turn fosters innovation and deployment of new services in your IMS network. Using an MRB in an IMS deployment also provides a centralised monitoring point that is able to intelligently balance traffic to appropriate heterogeneous media resources. It also creates a centralised management and provisioning point for adding & removing media resources as required.

The Media Resource Broker is emerging as a crucial piece of technology that can unlock the potential of next generation networks. The MRB maintains and enhances the paradigm at the core of IMS by maximising the usage of media resources, reducing overall costs, and encouraging the rapid deployment of new services. Ultimately, the MRB is a key piece in the IMS jigsaw that will drag revenue back to the core of the next generation network.

References

[1] 3GPP TS 23.218 v8.4.0 – IP Multimedia (IM) session handling; IM call model; Stage 2; Release 8 (http://www.3gpp.org/ftp/Specs/archive/23_series/23.218/23218-840.zip).
[2] SIP: Session Initiation Protocol – RFC 3261 (http://www.ietf.org/rfc/rfc3261.txt?number=3261).
[3] Hypertext Transfer Protocol – HTTP/1.1 (http://www.ietf.org/rfc/rfc2616.txt).