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Marlin – Broadband Shared Domain Topology Specification

Version 1.0
Final

Source
Date

Marlin Developer Community
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64

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1 Introduction

This document describes the Broadband Shared Domain Topology. This is an additional Node-Link topology for the Marlin Broadband Network Service Profile as specified in [MBNS].

The purpose of this additional topology is to enable:

- A user to setup a single domain that can be used across multiple Service Providers.
- Users to setup a single domain that can be used for multiple users, e.g for all members of a household. (see [Shared Spaces])
- Domain management by an end-user device. (see [New Device])

The basis for this functionality is present in [MCS] but it was not part of the subset of [MCS] used in [MBB] and [MBNS]. By defining a new topology for [MBNS], this specification enables this functionality with minimal changes to the existing server and client [MBNS] implementations. The additional topology also enables a gradual migration for existing services to take advantage of the new functionality.

1.1 Document Organization

This document is organized as follows:

- (This) introduction, including abbreviations, definitions and references.
- An overview
- Extensions to [MBNS]
- Extensions to [MBB]
- Extensions to [MUPnP]

1.2 Conformance Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this specification are to be interpreted as described in IETF RFC 2119 [RFC2119].

1.3 Namespaces and Identifiers

This specification defines schemas conforming to XML Schemas [Schema] and normative text to describe the syntax and semantics of XML-encoded objects and protocol messages. In cases of disagreement between the schema documents and the schema listings in this specification the schema documents take precedence. Note that in some cases the normative text of this specification imposes constraints beyond those indicated by the schema documents.

1.3.1 Namespaces and Notation

The table below summarizes the external schemas used in this specification:

Prefix	XML Namespace	Description
oct:	http://www.octopus-drm.com/profiles/base/1.0	[MCS]
bsa:	urn:marlin:broadband:1-2:nemo:services:action-token	[MBB]

Table 1: Supporting Namespaces

144 As a convention throughout this document we use the namespace prefixes described
 145 above to qualify XML elements and attributes which are specified elsewhere. That is
 146 the typographical convention is: <MarlinElement>, <ns:ForeignElement>,
 147 XMLAttribute, Datatype, OtherKeyword.

148 **1.4 Abbreviations**

CDS	Content Directory Service
CMS	Connection Manager Service
DMC	Digital Media Controller
DMP	Digital Media Player
DMR	Digital Media Renderer
DMS	Digital Media Server
PMP	Portable Media Player
UUID	Universally Unique Identifier
UPnP	Universal Plug and Play

150 **1.5 Terms and Definitions**

151 Please refer to the Terms and Definitions introduced in [MBB]. In addition, Marlin
 152 Broadband Shared Domain introduces the following:
 153

Broadband Shared Domain	A Marlin Device Domain whose members give access to licensed content from various Service Providers via various user accounts and complying with a certain policy
Broadband Shared Domain Manager	Entity that determines which Marlin DRM Clients are members of a Broadband Shared Domain and issues Domain Nodes and Links to Marlin DRM Clients. The Broadband Shared Domain Manager may take an active role in the distribution of the Service Provider Nodes and Links to the Marlin DRM Clients that are a member of the Broadband Shared Domain.
Domain Node	Octopus Node that represents the Broadband Shared Domain.
Domain Link	Octopus Link that links a Marlin DRM Clients' Octopus Personality Node to a Domain Node.
Service Provider	Entity that issues Marlin Licenses for Content. These Marlin Licenses are bound to Service Provider Nodes that are linked to the Domain Node.
Service Provider Nodes	Service Provider-specific Octopus Nodes linked to a Domain Node to which a Service Provider can bind its Marlin Licenses. These Octopus Nodes for example represent an account or a subscription a user has at the Service Provider.
Service Provider Links	Service Provider specific Octopus Links that link a Domain Node to Service Provider Nodes or a Service Provider Node to another Service Provider Node.
User ID	User ID of the user account at the Service Provider represented by the User Node.

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1.6 References

Normative References

[MBNS]	Marlin Broadband Network Service Profile Specification, Version 1.0
[MBB]	Marlin Broadband Delivery System Specification, Version 1.2
[MCS]	Marlin – Core System Specification, Version 1.3
[DLNA]	DLNA networked device interoperability guidelines, expanded October 2006, Volume 1: Architectures and Protocols, October 2006, www.dlna.org
[MUPnP]	Marlin UPnP Extension Specification, Version 1.0 Draft WD002
[MURIT10]	URI Templates for Marlin, Version 1.0
[MPAC]	Marlin – Profile and Capability Signaling, Version 1.0
[RFC2119]	S. Bradner, Key words for use in RFCs to Indicate Requirement Levels, IETF RFC 2119, March 1997. http://www.ietf.org/rfc/rfc2119.txt .
[Schema]	XML Schema Part 1: Structures. W3C Recommendation. D. Beech, M. Maloney, N. Mendelsohn, H. Thompson. May 2001. http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/

Informative Reference

[Shared Spaces]	http://www.marlin-community.com/benefits/use_cases/shared_spaces
[New Device]	http://www.marlin-community.com/benefits/use_cases/adding_a_new_device

2 Overview (Informative)

Figure 1 provides an overview of the Node-Link topologies and associated options for license binding and targeting that are added to the [MBNS] profile by this specification.

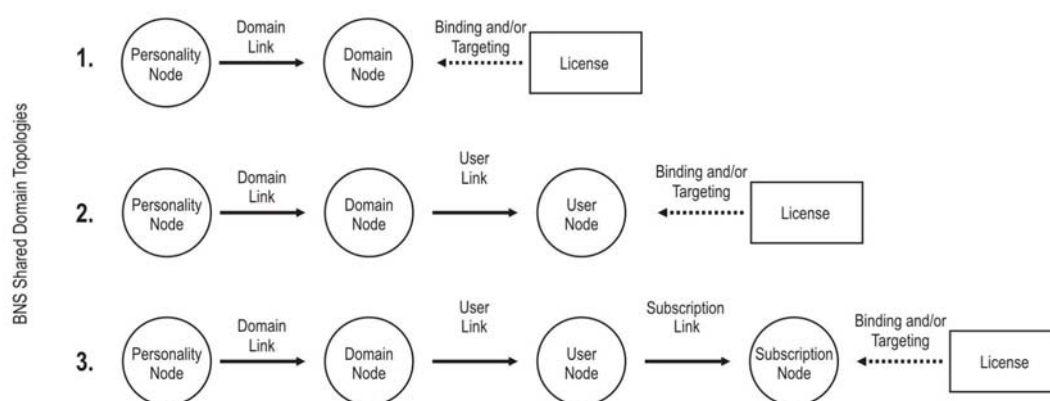
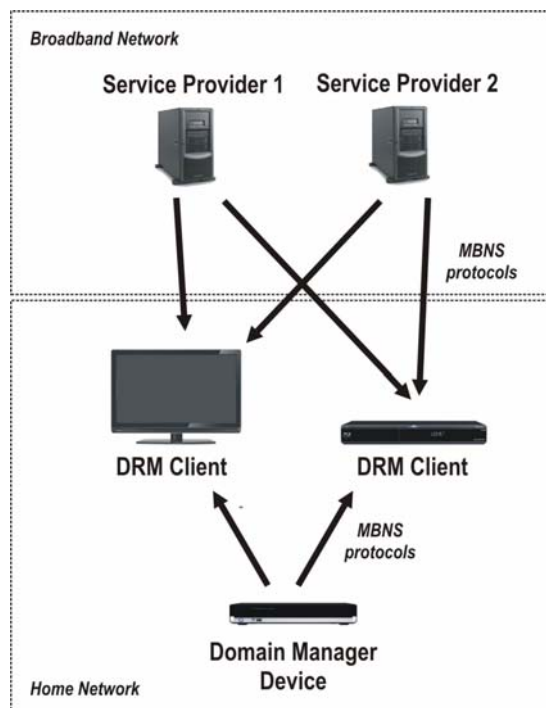


Figure 1: Supported Node Link Topologies

The Domain Node in these topologies is not necessarily issued by the same entity that issues the User Node, Subscription Node and/or Marlin Licenses. This enables a use case as depicted in Figure 2.

169



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Figure 2: Broadband Shared Domain use case indicating a different entity from the Service Provider that performs domain management

171 In this use case the user owns a device with a domain management feature and uses
 172 this device to setup and manage her/his domain but obtains content for this domain
 173 from two Service Providers.

174

175 As with [MBNS], the Service Provider that issues the Content also issues the Marlin
 176 Licenses and the Service Provider specific User Nodes and/or Subscriptions Nodes
 177 to which that Marlin License may be bound and/or targeted. From that point of view
 178 use of the Broadband Shared Domain Topology does not impact Service Providers. If
 179 however a user has indicated that he/she prefers a different party to manage his/her
 180 domain (a Broadband Shared Domain Manager device as in Figure 2 or simply
 181 another Service Provider), then a Service Provider may choose to support this
 182 domain that is preferred by the User and link its Service Provider specific User Nodes
 183 and/or Marlin Licenses to the Domain Node issued by the other party instead of
 184 directly to the Personality Nodes of the user's devices.

3 Extensions to the [MBNS] specification

A Marlin DRM Client that signals Broadband Shared Domain functionality using the signalling mechanism defined in [MPAC] and the URI as specified below MUST implement:

1. BNS Extended Topology as specified in [MBNS].
2. Broadband Shared Domain Topology.

3.1 *Broadband Shared Domain Topology*

This specification defines the following URI to signal the Broadband Shared Domain Topology.

Attribute Name	Attribute Value-space
topology	urn:marlin:bb:1-2:topology:bbsd:1-0

When this attribute is signaled, a Marlin DRM Client MUST implement the extensions to the [MBB] protocols as specified in chapter 4 and signal the Profile defined in [MBNS] Section 6.1.

If a device signals this attribute and also implements [MUPnP], then the device MUST implement the extensions to the [MUPnP] protocols as specified in chapter 5.

4 Extensions to the [MBB] specification

4.1 Extended License Acquisition request

The Client implementation SHALL be able to supply the public part of any Octopus Node types for the <oct:Bundle> parameter in the License Acquisition request.

4.2 Extended Link Acquisition request

The Client implementation SHALL be able to supply the public part of any Octopus Node types for the <oct:Bundle> parameter in the Link Acquisition request. If a Domain Node is supplied as the first <oct:Bundle> parameter, it is assumed that the Client already knows in advance prior to executing the Link Acquisition Protocol, the Domain Node to supply. Refer to Section 6 for an approach to perform selection of a Broadband Shared Domain.

4.3 Use of attributes

If issued as part of a Broadband Shared Domain Topology, a Domain Node SHALL include Domain ID and Domain Policy “urn:marlin:core:node:attribute:domain-policy-type” attributes, while a Domain Link SHALL include Domain ID “urn:marlin:link:attribute:domain-id” and Domain Policy “urn:marlin:link:attribute:domain-policy” as specified in [MCS],

- The Domain ID attribute value SHALL be the Domain Node ID
- The Domain Policy attribute value SHALL be: *urn:marlin:bbsd:domain-policy:organization:<orgid>**, where
 - <orgid> is the organization-specific identifier assigned from Marlin to the organization that manages the Domain Node. Note this identifier can include suborganization identifiers which are managed by the organization itself.
 - * is any specific string within the given <orgid>.

A Domain Node also includes the following attributes:

Attribute Identifier	Requirement	Type	Attribute Value
urn:marlin:core:node:attribute:friendly-name	REQUIRED	String	The human-readable friendly name for the Broadband Shared Domain, encoded as a UTF-8 string.
urn:marlin:bbsd:node:attribute:domain-manager-alias	REQUIRED	String	User friendly name for the Broadband Shared Domain Manager device / service
urn:marlin:bbsd:node:attribute:upnp-uuid	OPTIONAL	String	UPnP UUID found in the UPnP Device description of the Broadband Shared Domain Manager device.
urn:marlin:bbsd:node:attribute:domain-url	OPTIONAL	String	A URI Template that can be transformed into an HTTP URL

A device MAY use these aliases to communicate to the user which Broadband Shared Domain must be joined in order to access content bound to it. If the Broadband Shared Domain Manager is local, the attribute

“urn:marlin:bbsd:node:attribute:upnp-uuid” SHALL be specified and the attribute is used to look up the address of the Broadband Shared Domain Manager. Each UPnP device has a UDN which is a Universally Unique Identifier (UUID) in its device description. The Broadband Shared Domain Manager can then be contacted by sending a HTTP GET request to the URL obtained from the <presentationURL> of the respective UPnP Description. Additionally, Marlin specific method calls as specified in Section 5 can be invoked in order to join the Broadband Shared Domain.

If the Broadband Shared Domain Manager is located in the Internet, the attribute “urn:marlin:bbsd:node:attribute:domain-url” SHALL be present and this attribute contains a URI template (as specified in [MURIT10]) that can be transformed into an HTTP URL referencing an Action Token document containing the information needed by a client to engage in a Registration Service interaction as specified in [MBB]. A client that supports and understands this attribute MUST convert the URI template into a URL as specified in [MURIT10] and perform an HTTP GET request for that URL to acquire a document. The document obtained by the HTTP GET request MUST have a MIME type signaled in the Content-Type HTTP response header. If the document obtained as a response to this request contains an Action Token, the MIME type MUST be application/vnd.marlin.drm.actiontoken+xml as specified in [MBB]. If the response to the request is an error, or is a document with a different MIME type, the client’s behavior is unspecified (for example, if the server cannot respond with an Action Token document, it MAY respond with an HTML document which the client MAY display in its user interface).

If a service supports the Broadband Shared Domain Topology, then all Service Provider Nodes, Service Provider Links and Marlin License objects it issues SHALL include a “ContextTag” attribute as specified in [MCS]. The value of the ContextTag attribute SHALL be:

1. equal for all service specific objects that relate to the instance of a Broadband Shared Domain Topology.
2. *urn:marlin:bbsd:user-account:organization:<orgid>.**, where:
 - <orgid> is the organization-specific identifier assigned from Marlin to the organization that manages the service. Note this identifier can include suborganization identifiers which are managed by the organization itself.
 - * is any specific string within the given <orgid>.

If issued as part of a Broadband Shared Domain Topology, a User Link:

1. SHALL include the [MCS] Domain ID attribute with the Attribute Value equal to the Domain Node ID.
 2. MAY NOT include a [MCS] Domain Policy Attribute.
- (These requirement overrule similar requirements in [MBB])

If issued as part of Broadband Shared Domain Topology, the User Node SHALL also include the following attributes:

Attribute Identifier	Type	Attribute Value
urn:marlin:bbsd:node:attribute:url	String	A URI Template that can be transformed into an HTTP URL
urn:marlin:core:node:attribute:friendly-name	String	The human-readable friendly name or User ID for the user account, encoded as a UTF-8 string.
urn:marlin:bbsd:node:attribute:service-friendly-name	String	User friendly name for the service.

A device MAY use these aliases to communicate with the Service Provider to indicate the Broadband Shared Domain that must be linked to the User Node, thus enabling devices that are members of the Broadband Shared Domain to access content bound to the User Node.

The “urn:marlin:bbsd:node:attribute:url” attribute, when present indicates the URI template (as specified in [MURIT10]) that can be transformed into an HTTP URL to enable a device to contact the Service Provider. A client that supports and understands this attribute MUST convert the URI template into a URL as specified in [MURIT10] and perform an HTTP GET request for that URL to acquire a document.

The “urn:marlin:core:node:attribute:friendly-name” attribute, when present indicates the human-readable friendly name or the User ID of the user account with the Service Provider represented by the User Node.

The use of attributes is illustrated below:

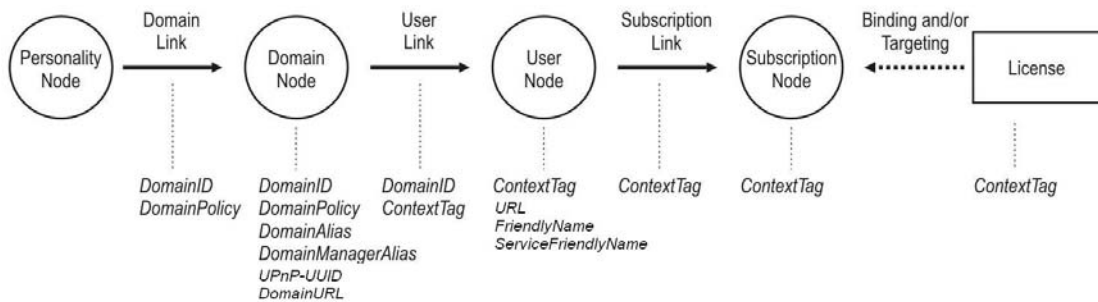


Figure 3: Use of attributes

5 Extensions to the [MUPnP] specification

DMS that support Broadband Shared Domain Topology SHALL implement in its CDS:

- Broadband Shared Domain specific attributes in <res> elements.
- X_GetMarlinNodeLinks() action
- X_PutMarlinNodeLinks() action

DMS that support Broadband Shared Domain Topology SHALL implement in its CMS:

- X_GetMarlinActionToken() action
- X_PutMarlinActionToken() action

DMR and DMP that support Broadband Shared Domain Topology SHALL implement in its CMS:

- X_JoinDomain() action
- X_PutMarlinActionToken() action

The invocation of X_JoinDomain() action on the DMR SHALL trigger the X_GetMarlinActionToken() action on the DMS in which the input parameter of X_JoinDomain() action also serves as the input parameter for X_GetMarlinActionToken() action.

The additions to the <res> elements enable DMP and DMR devices to retrieve the required Octopus Node and Links in addition to the Marlin License and the Content.

The non-standard actions enable a Broadband Shared Domain Manager device to proactively join devices to a Broadband Shared Domain and provide them with the user account information they will require.

5.1 *Broadband Shared Domain specific attributes in <res> elements*

Marlin specific attributes for <res> element are defined to expose Marlin License related information.

5.1.1 **res@marlin:nodeLinksURI**

Namespace: marlin

Property Data Type: xsd:anyURI

Multi-Valued: NO

Description: The marlin:nodeLinksURI attribute in <res> element is introduced to indicate the location of Octopus Nodes and Links that are needed for the Marlin License that is applicable to the content objects this <res> element is referring to. When a res@marlin:licenseFileURI is exposed as specified in [MUPnP], then also the res@marlin:nodeLinksURI MUST be exposed to indicate the URI from which User, Domain and Subscription Nodes and Links can be downloaded.

In this case, the HTTP response SHALL be an Octopus bundle with:

1. all the Octopus Nodes and Links that carry the same "ContextTag" as the Marlin License objects

2. all the Domain Nodes that are referenced by a Domain ID attribute in one of the Octopus Links in point 1.

The response SHALL use the appropriate MIME type (for Octopus Nodes and Links, this is "application/vnd.marlin.drm.nodelink+xml".)

Note that URI value for the res@marlin:nodeLinksURI MUST follow the guideline defined in [DLNA] §7.3.24.

Default Value: None

5.1.2 res@marlin:importNodeLinksURI

Namespace: marlin

Property Data Type: xsd:anyURI

Multi-Valued: NO

Description: The marlin:importNodeLinksURI attribute in a <res> element is introduced to indicate the location of Octopus Nodes and Links to be uploaded. It is used as a return parameter in the content object's metadata when invoking the createObject() call to upload content to the media server. When a res@marlin:importLicenseFileURI is exposed as specified in [MUPnP] for Broadband Shared Domain, then also a res@marlin:importNodeLinksURI MUST be used to indicate the location of the Octopus Nodes and Links to be uploaded using HTTP POST. The Octopus Nodes and Links are uploaded as an Octopus bundle. A copy of the Octopus Nodes and Links is created in the media server. After the transfer has finished successfully, the Octopus Nodes and Links are automatically associated with the content and Marlin License as specified in the <res> element, where the res@marlin:nodeLinksURI is set, which MAY or MAY NOT be the same URI as the one specified in the res@importNodeLinksURI property depending on the CDS implementation.

Note that the URI value for the res@marlin:importNodeLinksURI MUST follow the guideline defined in [DLNA] §7.3.24.

Default Value: None

5.2 X_GetMarlinActionToken() action

This is a non standard function to allow a content access device to initiate the registration process of joining a Broadband Shared Domain. The content access device discovers all Broadband Shared Domains that have been created in the home network via UPnP by invoking X_GetMarlinNodeLinks() with the "ContextTag" value equals to "*" as specified in Section 5.5. Based on the attributes of the Domain Nodes returned from the X_GetMarlinNodeLinks() call, the content access device can determine all the Broadband Shared Domains in the home network and the corresponding UUID of their respective Broadband Shared Domain Manager. This allows the content access device to invoke the method X_GetMarlinActionToken() on the designated Broadband Shared Domain Manager in order to obtain an Action Token. This Action Token triggers a series of actions on the content access device to join the designated Broadband Shared Domain and obtain the corresponding Domain Nodes and Domain Links.

5.2.1 Arguments

Argument	Direction
Domain ID (String)	IN
actionToken (bsa:ActionToken)	OUT

5.3 *X_JoinDomain()* action

This is a non standard function to allow a DMC to trigger a content access device to join a Broadband Shared Domain. The *X_JoinDomain()* method should be implemented by the content access device, such as a DMR. The content access device discovers all Broadband Shared Domains that have been created in the home network via UPnP by invoking *X_GetMarlinNodeLinks()* with the "ContextTag" value equals to "*" as specified in Section 5.5. Based on the attributes of the Domain Nodes returned from the *X_GetMarlinNodeLinks()* call, the content access device can determine all Broadband Shared Domains in the home network. The DMC then selects the Broadband Shared Domain in which the content access device is instructed to join.

5.3.1 Arguments

Argument	Direction
Domain ID (String)	IN

5.4 *X_PutMarlinActionToken()* action

This is a non standard function to allow the Broadband Shared Domain Manager to trigger the registration of content access devices into a Broadband Shared Domain. When the Broadband Shared Domain Manager discovers a new device in the home network, it prompts the user to which Broadband Shared Domain this new device should be added. The Broadband Shared Domain Manager then uses *X_PutMarlinActionToken()* to trigger a series of actions on the new device to join the designated Broadband Shared Domain and obtain the corresponding Domain Nodes and Domain Links.

5.4.1 Arguments

Argument	Direction
actionToken (bsa:ActionToken)	IN

5.5 *X_GetMarlinNodeLinks()* action

This is a non standard function that enables devices such as a PMP to obtain the required Octopus Nodes and Octopus Links that carry the same "ContextTag" from the DMS, domain manager or other devices before it attempts to play the content. When a new device is added to the Broadband Shared Domain, it will need the required User Nodes and User Links for playing content which have already been shared in the Broadband Shared Domain.

5.5.1 Arguments

Argument	Direction
contextTag (string)	IN
nodeLinks (oct:Bundle)	OUT

The returned nodeLinks oct:Bundle MUST include:

1. all the Octopus Nodes and Links that carry a "ContextTag" attribute of which the value is equal to the value of the contextTag attribute in the request. If the value of the contextTag attribute in the request is "*", then all Octopus Nodes and Links that carry a "ContextTag" attribute SHALL be included in the response.
2. all the Domain Nodes that are referenced by a Domain ID attribute in one of the Octopus Links in point 1.

5.6 X_PutMarlinNodeLinks() action

This is a non standard function that enables the Broadband Shared Domain Manager to proactively push the Octopus Nodes and Links to the devices such as PMP when it first joins the Broadband Shared Domain, thus ensuring that they have the required Octopus Nodes and Links when playing content. Additionally, when the Octopus Nodes and Links have been updated, e.g., a new user account has been associated with the domain (a new User Node and User Link to the Domain Node is acquired), the Broadband Shared Domain Manager may use this function to update the Octopus Nodes and Links in the devices.

5.6.1 Arguments

Argument	Direction
nodeLinks (oct:Bundle)	IN

The parameter nodeLinks oct:Bundle contains all Octopus Nodes and Links that have the same "ContextTag" attribute. This "ContextTag" is used to identify the required Octopus Nodes and Links to be updated.

6 Selection of a Broadband Shared Domain (Informative)

A Marlin DRM Client can be a member of multiple Broadband Shared Domains and each domain is governed by a domain policy. However, only one Broadband Shared Domain Node can be supplied in the Link Acquisition Request and then linked to a User Node. Therefore, one Broadband Shared Domain must be selected and communicated to the Service Provider in order to establish the link. This can be achieved as follows:

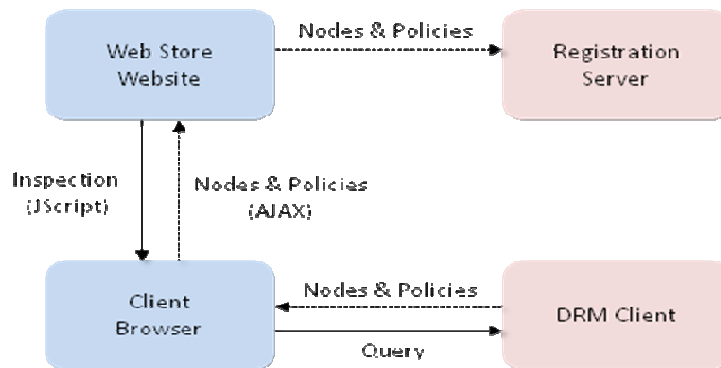


Figure 4: Selection of a Broadband Shared Domain

Application level tools can be developed to facilitate the selection of a Broadband Shared Domain. The selection of a Broadband Shared Domain occurs as part of the browsing session with the Service Provider, and not in the existing [MBB] protocols. When the user has decided to buy content from a web store, the tool is used to perform an inspection on the client browser to query the Marlin DRM Client for all the Broadband Shared Domain Nodes in which it is a member of and their corresponding domain policies. The Domain Nodes together with their domain policies are returned and then forwarded to the Registration Server to check for compliancy of their domain policies. A list of compliant Broadband Shared Domains is shown to the user on the browser; this enables the user to select a Broadband Shared Domain to be associated with the user account at the Service Provider.

The selected Broadband Shared Domain is communicated to the Registration Server. A Link Acquisition Action Token is then issued by the Registration Server and delivered to the Marlin DRM Client. As the Registration Server has information about the selected Domain Node, the <uid>s of the Domain Node and User Node are specified in the License Acquisition Action Token. The Marlin DRM Client then uses the Action Token to trigger Link Acquisition process. Based on the <uid> in the Action Token, the Marlin DRM Client knows which Domain Node should be sent to the Registration Server in the Link Acquisition Request.

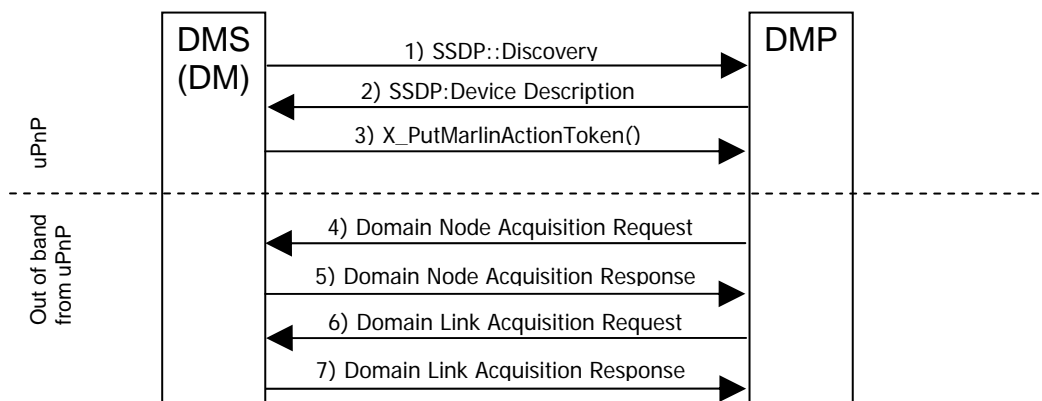
7 System Usage of Local Domain Management (Informative)

This section describes the use of UPnP extensions defined in Section 5 in the context of local domain management in which a Broadband Shared Domain Manager is present in a local network. In Section 7.1, we describe the use of UPnP extensions to enable devices to join a Broadband Shared Domain, while Section 7.2 describes the distribution of Service Provider Nodes and Links in the local network.

7.1 Joining a Broadband Shared Domain

7.1.1 Domain Manager discovers new devices

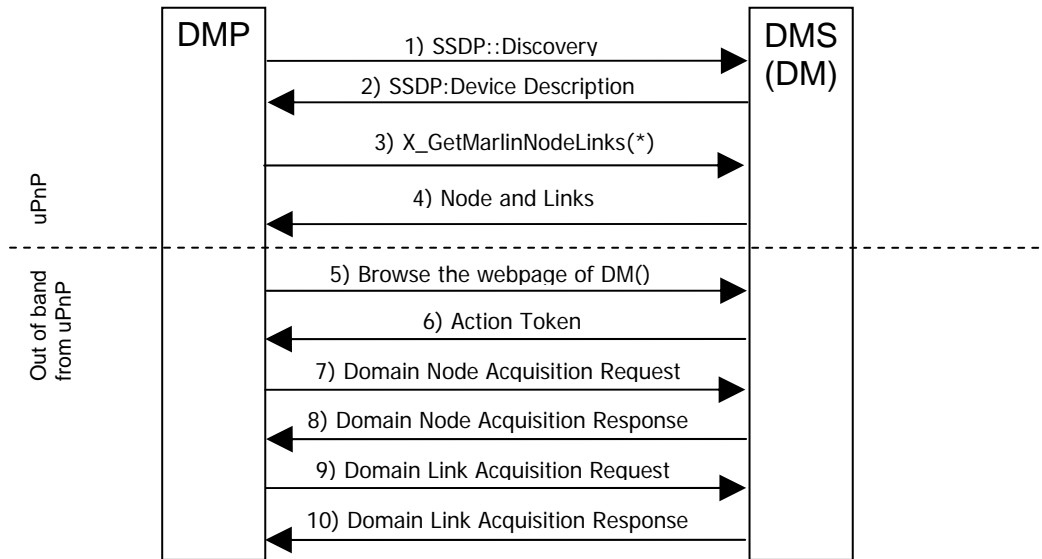
This section describes the use of UPnP extensions to enable a Broadband Shared Domain Manager in the home network to add new devices into the Broadband Shared Domain upon device discovery.



1. The DMS (Broadband Shared Domain Manager) discovers the DMP using Simple Service Discovery Protocol (SSDP) of UPnP.
2. The DMP sends its UPnP device description to the DMS. Based on the DMP's device description and its service description, the DMS can examine a list of Marlin Broadband Shared Domain specific actions implemented by the DMP, thus knowing that the DMP is a Marlin device supporting Broadband Shared Domain Topology.
3. In order to add the DMP into the Broadband Shared Domain, the DMS can invoke `X_PutMarlinActionToken()` to deliver an Action Token to the DMP.
4. Using the Action Token, the DMP triggers the Node Acquisition and Link Acquisition protocols (as illustrated in Step 4 to Step 7).

7.1.2 Devices discover Domain Manager

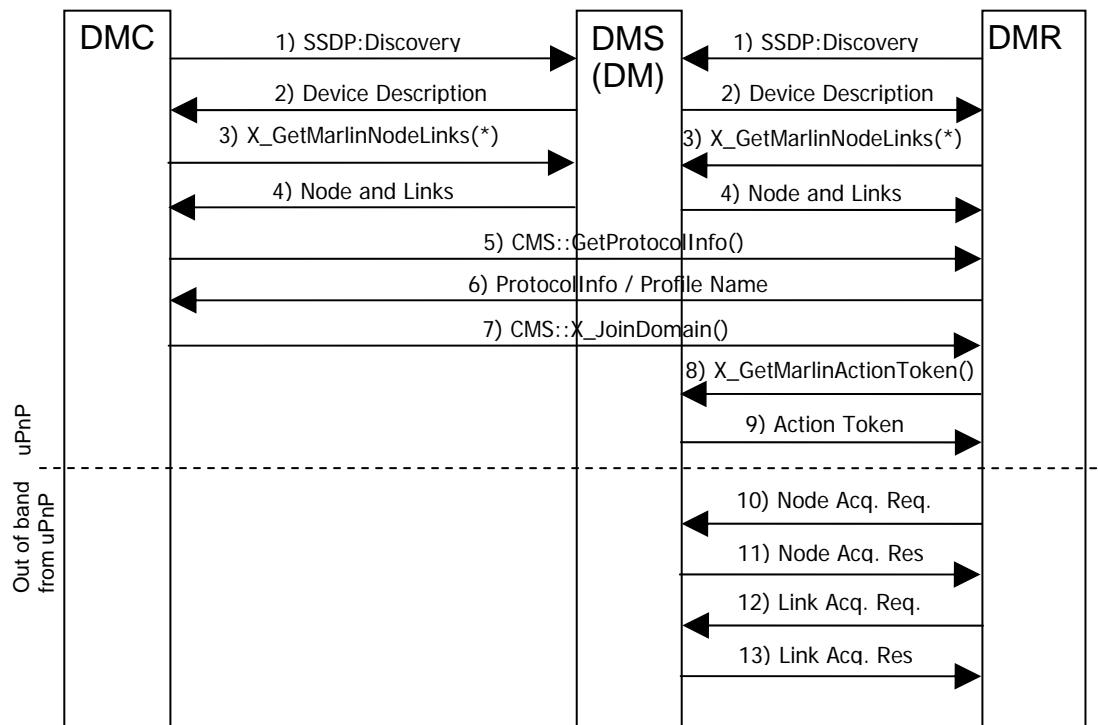
This section describes a use case where a DMP discovers a Broadband Shared Domain Manager in a local area network, and it requests to join a Broadband Shared Domain managed by the Domain Manager.



1. DMP discovers the DMS (Broadband Shared Domain Manager) using Simple Service Discovery Protocol (SSDP) of UPnP.
2. The DMS sends its device description and service description to the DMP. Based on the device description, the DMP can examine a list of Marlin Broadband Shared Domain specific actions implemented by the DMS, thus knowing that the DMS is a Marlin device.
3. The DMP invokes X_GetMarlinNodeLinks() with "*" as the parameter to all devices in the local area network.
4. All Octopus Nodes and Links are returned to the DMP, thus enabling the DMP to check the attributes of Domain Nodes, and construct a mapping of Domain ID and the corresponding Broadband Shared Domain Manager's UUID, which can be used to obtain the address of the Domain Manager.
5. The DMP obtains the <presentationURL> of the Domain Manager's device description and sends a HTTP GET to it. On the web interface, the user can select the Broadband Shared Domain to join.
6. An Action Token is then sent to the DMP to enable it to join the Broadband Shared Domain. Step 7 to Step 10 indicates the Node and Link Acquisition protocols.

7.1.3 DMC instructs a DMR to join Broadband Shared Domain

This use case illustrates a 3-box scenario, where the DMC can add a DMR to the Broadband Shared Domain.



1. The DMC and DMR discover the DMS (Broadband Shared Domain Manager) using Simple Service Discovery Protocol (SSDP) of UPnP.
2. The DMS sends the device description and service description to the DMC and DMR. Based on the device description, the DMC and DMR can examine a list of Marlin Broadband Shared Domain specific actions implemented by the DMS, thus knowing that the DMS is a Marlin device.
3. The DMC and DMR invoke X_GetMarlinNodeLinks(*) on all devices in the local area network.
4. In response to X_GetMarlinNodeLinks(*), all Octopus Nodes and Links are sent back to the DMC and DMR. By checking the attributes of Domain Nodes, the DMR can construct a mapping of Domain ID and the corresponding Broadband Shared Domain Manager's UUID which can be used to obtain the address of the Domain Manager.
5. The DMC invokes CMS:GetProtocolInfo to retrieve supported protocols and PN (Profile Name) from DMR.
6. DMR sends the <res@protocolInfo> to DMC, indicating the supported Marlin protocols.
7. Once the user has selected the Broadband Shared Domain to join, the DMC invokes X_JoinDomain() on the DMR by using the Domain ID as its parameter.

8. The DMR then invokes the `X_GetMarlinActionToken()` on the DMS by specifying the given Domain ID from DMC in order to obtain an Action Token to join the designated Broadband Shared Domain.
9. An Action Token is delivered to the DMR and this enables the DMR to acquire the corresponding Domain Node and Domain Link as shown in Step 10 to Step 13.

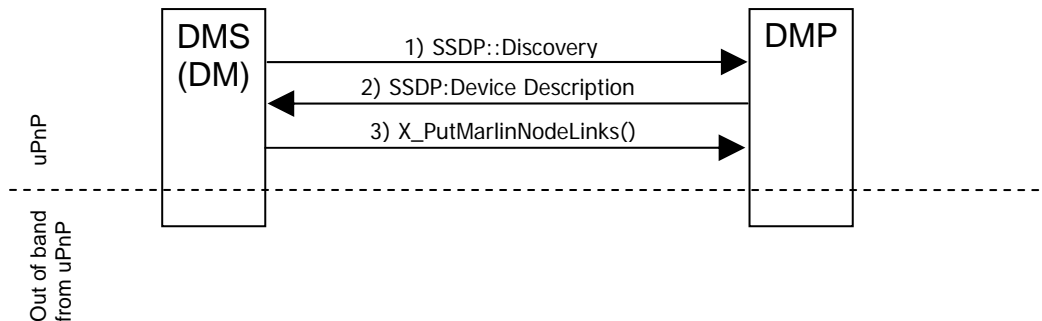
7.2 Distribution of Nodes and Links

7.2.1 Push nodes and links after joining the Shared Domain

This use case describes the need for the Broadband Shared Domain Manager to pro-actively push Service Provider Nodes and Links to a new Marlin device that has joined the Broadband Shared Domain. Assuming that the use case of joining the Broadband Shared Domain as illustrated in Section 7.1.1 has occurred. After successful completion of the Domain Node and Link Acquisition protocols, the Broadband Shared Domain Manager can invoke `X_PutMarlinNodeLinks()` to pro-actively push Service Provider Nodes and Links to the newly joined Marlin device if the Domain Manager has stored the Service Provider Nodes and Links locally.

7.2.2 Push nodes and links

This use case describes the need to update the Service Provider Links when the user account has been renewed, thus obtaining a renewed User Link. Assuming that the user account with a Service Provider has expired, the DMS using its browser visit the webpage of the Service Provider and renew its account. Thus, the User Link which has expired is updated with a new User Link. This User Link must be conveyed to other devices in the local area network.



1. The DMS (Broadband Shared Domain Manager) discovers the devices in the local area network using Simple Service Discovery Protocol (SSDP) of UPnP.
2. The DMP sends its device description and service description to the DMS. Based on the device description, the DMS can examine a list of Marlin Broadband Shared Domain specific actions implemented by the DMP, thus knowing that the DMP is a Marlin device that implements Broadband Shared Domain.
3. New User Links have been obtained by the DMS and it needs to pro-actively push them to the Marlin devices supporting Broadband Shared Domain in the local area network. DMS invokes `X_PutMarlinNodeLinks()` on the DMP (assuming that the DMP is also a DMS that stores the Service Provider Nodes and Links).