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Part 18-1: Remote Access Device Control Protocol — Remote Access
Architecture

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INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 18-1: Remote Access Device Control Protocol – Remote Access Architecture

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This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

¹ UPnP Forum Steering committee, UPnP Forum, 3855 SW 153rd Drive, Beaverton, Oregon 97006 USA. See also "Introduction".

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1 Overview and Scope

This document describes an architecture that provides the infrastructure that allows generic UPnP devices, services and control points deployed in remote physical devices to interact with the corresponding UPnP devices, services and control points physically attached to the home network. The mechanisms defined in this architecture will allow to extend the home network so that it will logically include the remote devices so that all devices will be able to communicate among themselves using the UPnP Forum defined mechanisms, e.g. UDA. The desired behavior of the interactions between the remote device and home devices is envisioned to be similar with the one expected as if all devices are located in the same local area network.

In order to accommodate the above mentioned goals, the Remote Access Architecture will provide means to connect the two segments of the extended home network using established mechanisms. The architecture recognizes that there might be several possible alternative models to “bridge” the two segments and will provide an interface that will allow them to be plugged, while enforcing the same overall behavior of the whole system regardless of the model used.

The architecture does not describes any interfaces to “service” gateways that will enable non-UPnP entities to interact with the UPnP devices, services and control points physically attached to the home network.

1.1 Notation

- In this document, features are described as Required, Recommended, or Optional as follows:

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 [RFC 2119].

In addition, the following keywords are used in this specification:

PROHIBITED – The definition or behavior is an absolute prohibition of this specification. Opposite of **REQUIRED**.

CONDITIONALLY REQUIRED – The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is **REQUIRED**, otherwise it is **PROHIBITED**.

CONDITIONALLY OPTIONAL – The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is **OPTIONAL**, otherwise it is **PROHIBITED**.

These keywords are thus capitalized when used to unambiguously specify requirements over protocol and application features and behavior that affect the interoperability and security of implementations. When these words are not capitalized, they are meant in their natural-language sense.

- Strings that are to be taken literally are enclosed in “double quotes”.
- Words that are emphasized are printed in *italic*.
- Keywords that are defined by the UPnP Working Committee are printed using the *forum* character style.
- Keywords that are defined by the UPnP Device Architecture are printed using the *arch* character style.
- A double colon delimiter, “::”, signifies a hierarchical parent-child (parent::child) relationship between the two objects separated by the double colon. This delimiter is used in multiple contexts, for example: Service::Action(), Action()::Argument, parentProperty::childProperty.

1.2 References

1.2.1 Informative References

This clause lists the informative references that are provided as information in helping understand this specification:

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[ICC] – InboundConnectionConfig:1, UPnP Forum, Available at: <http://www.upnp.org/specs/ra/UPnP-ra-InboundConnectionConfig-v1-Service-20090930.pdf>. Latest version available at: <http://www.upnp.org/specs/ra/UPnP-ra-InboundConnectionConfig-v1-Service.pdf>.

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[RFC 1889] – IETF RFC 1889, RTP: A Transport Protocol for Real-Time Applications, H. Schulzrinne, S. Casner, R. Frederick, V. Jacobson, January 1996. Available at: <http://www.ietf.org/rfc/rfc1889.txt>.

[RFC 1918] – IETF RFC 1918, *Address Allocation for Private Internets*, Y. Rekhter, et. Al, February 1996 Available at: <http://www.ietf.org/rfc/rfc1918.txt>

[RFC 2119] – IETF RFC 2119, Key words for use in RFCs to Indicate Requirement Levels, S. Bradner, March 1997. Available at: <http://www.ietf.org/rfc/rfc2119.txt>.

[RFC 2131] – IETF RFC 2131, *Dynamic Host Configuration Protocol*, R. Droms, March 1997 Available at: <http://www.ietf.org/rfc/rfc2131.txt>

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[RFC 3056] – IETF RFC 3056, *Connection of IPv6 Domains via IPv4 Clouds*, B. Carpenter, K. Moore, February 2001 Available at: <http://www.ietf.org/rfc/rfc3056.txt>

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[RFC 4380] – IETF RFC 4380, *Teredo: Tunneling IPv6 over UDP through Network Address Translations (NATs)*, C. Huitema, February 2006 Available at: <http://www.ietf.org/rfc/rfc4380.txt>

[RFC 3986] – IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, Tim Berners-Lee, et. Al, January 2005. Available at: <http://www.ietf.org/rfc/rfc3986.txt>

1.3 Terms and Abbreviations

1.3.1 Abbreviations

Table 1-1 — Abbreviations

Definition	Description
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
FQDN	Fully Qualified Domain Name
ICC	Inbound Connection Config
IGD	Internet Gateway Device
IPsec	IP Security
NAT	Network Address Translation
RAC	Remote Access Client
RADA	Remote Access Discovery Agent
RAS	Remote Access Server
RATA	Remote Access Transport Agent
STUN	Simple Traversal of UDP Through NATs
TLS	Transport Layer Security

1.3.2 Terms

1.3.2.1 Credentials

The term credentials refer to certificates, shared secrets or other means of authentication used in the RATA context.

1.3.2.2 IPv6 Support in Transport Agents

A Transport Agent is said to have IPv6 support if it allows the local and remote devices to interact according to the UPnP Device Architecture over IPv6 [DEVICE-IPv6].

1.3.2.3 Local Device

A local device is a UPnP device that is attached to the physical network where the RADA is located.

1.3.2.4 Management Console

The collection of control points that are used to setup, manage and monitor the operations related to Remote Access.

1.3.2.5 RADAListener

The RADAListener is a logical support function of RADA and incorporates control point and device functionality for facilitating the SSDP offloading:

- a) The RADAListener establishes the initial state of its local network by performing an M-SEARCH to detect all devices on the local network and notifies the RADA of those devices.
- b) The RADAListener monitors the local SSDP traffic and notifies the RADA when devices are joining and leaving the UPnP network as described in the UPnP Device Architecture.

1.3.2.6 RADARelay

The RADARelay is a logical support function of RADA and incorporates control point and device functionality for facilitating the SSDP offloading:

- a) For each device in the remote synchronization tree of the RADA, the RADARelay will send periodic SSDP announcements (e.g. ssdp:alive) onto the local network according to the UPnP Device Architecture.
- b) Whenever a device is removed from the remote synchronization tree, the RADARelay will send an SSDP expiration (e.g. ssdp:byebye) onto the local network according to the UPnP Device Architecture.
- c) Whenever a RADARelay receives an SSDP Search request (e.g. ssdp M-SEARCH) for a device or service that is contained in the remote synchronization tree, it will answer the search request on behalf of the device in the remote synchronization tree according to the UPnP Device Architecture.
- d) When the remote connection is broken, the RADARelay will send an SSDP expiration (i.e. ssdp:byebye) on the local network for each remote device.

1.3.2.7 Remote Access Client

The Remote Access Client (RAC) is the peer physical device that is not part of the physical home network. The RAC is exposing only the UPnP devices and services that are embedded in the physical device.

1.3.2.8 Remote Access Network Interface

The RA network interface is the network interface that is created by the Remote Access Transport Agent. The settings for this interface are contained in a RATA profile.

1.3.2.9 Remote Access Server

The Remote Access Server (RAS) is the peer physical device located in the home network. RAS is exposing to the RAC the UPnP devices and services available in the physical home network as well as any embedded in the physical RAS device. The Remote Access Server can be the residential router, a personal computer or any 3rd party dedicated device.