ISO/IEC 29341-12-1

Edition 1.0 2008-11

INTERNATIONAL STANDARD

Information technology – UPnP Device Architecture – Part 12-1: Remote User Interface Device Control Protocol – Remote User Interface Client Device



ISO/IEC 29341-12-1:2008(E)

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ISO/IEC 29341-12-1

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Information technology – UPnP Device Architecture – Part 12-1: Remote User Interface Device Control Protocol – Remote User Interface Client Device

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE E

ICS 35.200

ISBN 2-8318-1012-4

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CONTENTS

FOREWORD 3
ORIGINAL UPNP DOCUMENTS (informative) 5
1. Overview and Scope 7
2. Device Definitions 8
2.1. Device Type 8
2.2. Device Model 8
2.2.1. Description of Device Requirements 8
2.2.2. Relationships Between Services 10
2.3. Theory of Operation 10
2.3.1. Secure Remote UI Clients (if *DeviceSecurity* implemented in Remote UI client device) . 10
3. XML Device Description 11
4. Test 12
Annex A (normative) **Access Control Definitions (if *DeviceSecurity* service is implemented) 13**
A.1 Permissions 13
A.2 Profiles 14
A.3 Access Control List (ACL) entry 15

LIST OF TABLES

Table 1: *RemoteUIClientDevice* Service Descriptions 8
Table 2: Device Requirements for stand-alone *RemoteUIClientDevice* 8
Table 3: Device Requirements for embedded *RemoteUIClientDevice* 9
Table 4: Defined permissions for *RemoteUIClient* Service 13

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INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 12-1: Remote User Interface Device Control Protocol – Remote User Interface Client Device

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The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Universal plug and play (UPnP) architecture*, can be found on the IEC web site.

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.

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ORIGINAL UPNP DOCUMENTS
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UPnP Document Title	**ISO/IEC 29341 Part**
UPnP Device Architecture 1.0	ISO/IEC 29341-1
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1
UPnP MediaRenderer:1 Device	ISO/IEC 29341-3-2
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
UPnP AVTransport:1 Service	ISO/IEC 29341-3-10
UPnP ConnectionManager:1 Service	ISO/IEC 29341-3-11
UPnP ContentDirectory:1 Service	ISO/IEC 29341-3-12
UPnP RenderingControl:1 Service	ISO/IEC 29341-3-13
UPnP MediaRenderer:2 Device	ISO/IEC 29341-4-2
UPnP MediaServer:2 Device	ISO/IEC 29341-4-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
UPnP DigitalSecurityCamera:1 Device	ISO/IEC 29341-5-1
UPnP DigitalSecurityCameraMotionImage:1 Service	ISO/IEC 29341-5-10
UPnP DigitalSecurityCameraSettings:1 Service	ISO/IEC 29341-5-11
UPnP DigitalSecurityCameraStillImage:1 Service	ISO/IEC 29341-5-12
UPnP HVAC_System:1 Device	ISO/IEC 29341-6-1
UPnP HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2
UPnP ControlValve:1 Service	ISO/IEC 29341-6-10
UPnP HVAC_FanOperatingMode:1 Service	ISO/IEC 29341-6-11
UPnP FanSpeed:1 Service	ISO/IEC 29341-6-12
UPnP HouseStatus:1 Service	ISO/IEC 29341-6-13
UPnP HVAC_SetpointSchedule:1 Service	ISO/IEC 29341-6-14
UPnP TemperatureSensor:1 Service	ISO/IEC 29341-6-15
UPnP TemperatureSetpoint:1 Service	ISO/IEC 29341-6-16
UPnP HVAC_UserOperatingMode:1 Service	ISO/IEC 29341-6-17
UPnP BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
UPnP LANDevice:1 Device	ISO/IEC 29341-8-2
UPnP WANDevice:1 Device	ISO/IEC 29341-8-3
UPnP WANConnectionDevice:1 Device	ISO/IEC 29341-8-4
UPnP WLANAccessPointDevice:1 Device	ISO/IEC 29341-8-5
UPnP LANHostConfigManagement:1 Service	ISO/IEC 29341-8-10
UPnP Layer3Forwarding:1 Service	ISO/IEC 29341-8-11
UPnP LinkAuthentication:1 Service	ISO/IEC 29341-8-12
UPnP RadiusClient:1 Service	ISO/IEC 29341-8-13
UPnP WANCableLinkConfig:1 Service	ISO/IEC 29341-8-14
UPnP WANCommonInterfaceConfig:1 Service	ISO/IEC 29341-8-15
UPnP WANDSLLinkConfig:1 Service	ISO/IEC 29341-8-16
UPnP WANEthernetLinkConfig:1 Service	ISO/IEC 29341-8-17
UPnP WANIPConnection:1 Service	ISO/IEC 29341-8-18
UPnP WANPOTSLinkConfig:1 Service	ISO/IEC 29341-8-19
UPnP WANPPPConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
UPnP Printer:1 Device	ISO/IEC 29341-9-1
UPnP Scanner:1.0 Device	ISO/IEC 29341-9-2
UPnP ExternalActivity:1 Service	ISO/IEC 29341-9-10
UPnP Feeder:1.0 Service	ISO/IEC 29341-9-11
UPnP PrintBasic:1 Service	ISO/IEC 29341-9-12
UPnP Scan:1 Service	ISO/IEC 29341-9-13
UPnP QoS Architecture:1.0	ISO/IEC 29341-10-1
UPnP QosDevice:1 Service	ISO/IEC 29341-10-10
UPnP QosManager:1 Service	ISO/IEC 29341-10-11
UPnP QosPolicyHolder:1 Service	ISO/IEC 29341-10-12
UPnP QoS Architecture:2	ISO/IEC 29341-11-1
UPnP QOS v2 Schema Files	ISO/IEC 29341-11-2

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UPnP Document Title	ISO/IEC 29341 Part
UPnP QosDevice:2 Service	ISO/IEC 29341-11-10
UPnP QosManager:2 Service	ISO/IEC 29341-11-11
UPnP QosPolicyHolder:2 Service	ISO/IEC 29341-11-12
UPnP RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11

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1. Overview and Scope

This device template is compliant with the UPnP Device Architecture, Version 1.0.

This document defines the device
urn:schemas-upnp-org:device:*RemoteUIClientDevice:1*.

This device can be a UPnP root device, or embedded within a different device.

The *RemoteUIClientDevice* encapsulates all services for the Remote UI Client Device Control Protocol (DCP).

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2. Device Definitions

2.1. Device Type

The following device type identifies a device that is compliant with this template:

urn:schemas-upnp-org:device:*RemoteUIClientDevice:1*

2.2. Device Model

It is recommended that *RemoteUIClientDevice* be implemented with support for securing UPnP actions. It is also recommended that securing of UPnP action is done using the *DeviceSecurity* service as defined by the UPnP security working committee. If implemented, the *DeviceSecurity* service must be contained either inside *RemoteUIClientDevice* implementation or in a device that encompasses the *RemoteUIClientDevice*. These two models are described below.

2.2.1. Description of Device Requirements

The following table briefly describes the services used in *RemoteUIClientDevice*.

Table 1: *RemoteUIClientDevice* Service Descriptions

Service Name	Service Description
RemoteUIClient	Allows for basic operations on a Remote UI client including: user interface connection management, optionally user interface availability management and optionally basic user interaction.
DeviceSecurity	Actions for taking ownership, configuring access control, establishing secure sessions, and invoking secure actions.

2.2.1.1. DeviceSecurity within RemoteUIClientDevice

This model is typically applicable to physical devices that need *DeviceSecurity* functionality (including device ownership and access control) to be used only by the *RemoteUIClientDevice*. In this case, products that expose devices of the type **urn:schemas-upnp-org:device:***RemoteUIClientDevice:1* must implement minimum version numbers of the required service specified in the table below.

Table 2: Device Requirements for stand-alone *RemoteUIClientDevice*

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
RemoteUIClientDevice:1	*Yes*	*R*	*RemoteUIClient:1*	*R*	*RemoteUIClient*
			DeviceSecuirty:1	*O*	*DeviceSecurity*
			Non-standard services embedded by an UPnP vendor go here.	*X*	*To be defined by vendor*

[1] R = Required, O = Optional, X = Non-standard.
[2] Prefixed by urn:**upnp-org**:**serviceId**: .

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Relationship between Services

Figure 1 shows the logical structure of the device and services defined by the working group for UPnP technology enabled Remote UI clients.

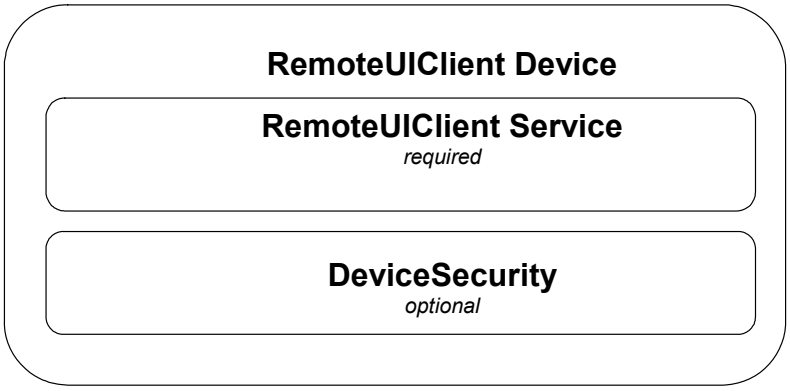

Figure 1: *DeviceSecurity* within *RemoteUIClientDevice*

2.2.1.2. DeviceSecurity outside RemoteUIClientDevice

This model is typically applicable to physical devices that implement Remote UI Client functionality, but the *RemoteUIClientDevice* may use *DeviceSecurity* that is already part of another device. An example of this would be where **urn:schemas-upnp-org:device:** *RemoteUIClientDevice:1* is implemented inside a device of the type **urn:schemas-upnp-org:device:** *BasicDevice:1*. The *BasicDevice* in this case contains the *DeviceSecurity* service that may be used by another UPnP device e.g., *MediaRenderer*. The implementation of *RemoteUIClientDevice* must contain the minimum version number of the service specified in the table below.

Table 3: Device Requirements for embedded *RemoteUIClientDevice*

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
RemoteUIClientDevice:1	*Yes*	*R*	*RemoteUIClient:1*	*R*	*RemoteUIClient*
			Non-standard services embedded by an UPnP vendor go here.	*X*	*To be defined by vendor*

[1] R = Required, O = Optional, X = Non-standard.
[2] Prefixed by urn:**upnp-org**:**serviceId**: .

Relationships between Services

Figure 2 shows the logical structure of the device and services defined by the working group for UPnP technology enabled Remote UI clients that may use the *DeviceSecurity* service for other UPnP devices contained in the same physical device. *RemoteUIClient* service may be dependent on the *DeviceSecurity* service for providing access control to the actions defined in the services.

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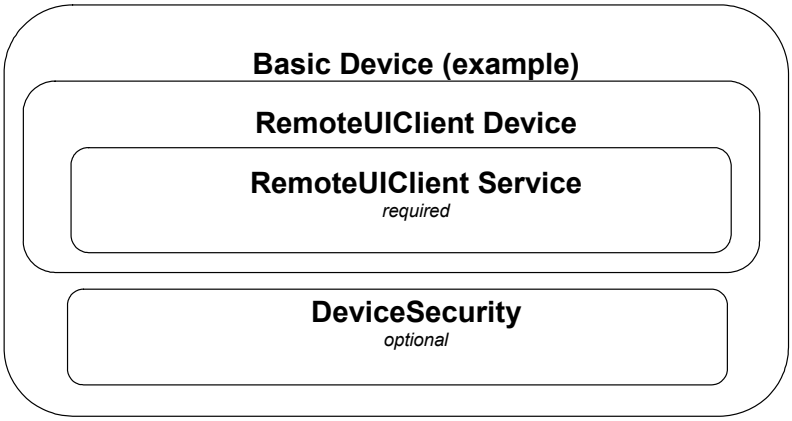

Figure 2: Example of *DeviceSecurity* outside *RemoteUIClientDevice*

2.2.2. Relationships Between Services

The dependencies between the services are listed in the above section under the possible models of implementing services in *RemoteUIClientDevice*.

2.3. Theory of Operation

A Remote UI client can be a fully autonomous device that runs its own user interface in addition to executing remoted UIs, or it may be a fully remoted device with no local UI capability. In both cases, the *RemoteUIClientDevice:1* UPnP device is implemented, allowing anyone on the network to discover and control the Remote UI client. Since many different types of user interaction device exist with many different form factors and usages, the behavior of the Remote UI client device may change.
In any case, it is highly recommended for the Remote UI client to employ the *DeviceSecurity* service to secure specific UPnP Remote UI client actions. This section assumes that the reader has an overall understanding of UPnP Security. Please refer to the *DeviceSecurity*:1 Service Control Specification for detailed description of a secure UPnP device.

2.3.1. Secure Remote UI Clients (if *DeviceSecurity* implemented in Remote UI client device)

RemoteUIClient service provides a set of actions to manage remote connections and process user's input data. The actions in this service that change the device state should be authenticated via UPnP Security. Some actions in *RemoteUIClient* service can carry critical information such as password in their argument field. By using D*ecryptAndExecute* action defined in *DeviceSecurity* service, security sensitive information can be protected . A control point that accesses the secure actions on the service has to be initially authenticated via a Security Console application as described in UPnP Security DCP. Access control definitions such as Permissions, Profiles and Access Control List(ACL) for Remote UI client device are described in Appendix A.

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3. XML Device Description

```
<?xml version="1.0" encoding="UTF-8"?>
<root xmlns="urn:schemas-upnp-org:device-1-0">
    <specVersion>
        <major>1</major>
        <minor>0</minor>
    </specVersion>
    <URLBase>base URL for all relative URLs</URLBase>
    <device>
        <deviceType>urn:schemas-upnp-org:device:RemoteUIClientDevice:1
</deviceType>
        <friendlyName>short user-friendly title</friendlyName>
        <manufacturer>manufacturer name</manufacturer>
        <manufacturerURL>URL to manufacturer site</manufacturerURL>
        <modelDescription>long user-friendly title</modelDescription>
        <modelName>model name</modelName>
        <modelNumber>model number</modelNumber>
        <modelURL>URL to model site</modelURL>
        <serialNumber>manufacturer's serial number</serialNumber>
        <UDN>uuid:UUID</UDN>
        <UPC>Universal Product Code</UPC>
        <iconList>
            <icon>
                <mimetype>image/format</mimetype>
                <width>horizontal pixels</width>
                <height>vertical pixels</height>
                <depth>color depth</depth>
                <url>URL to icon</url>
            </icon>
        </iconList>
        <serviceList>
            <service>
                <serviceType>urn:schemas-upnp-org:service:RemoteUIClient:1</serviceType>
                <serviceId>urn:upnp-org:serviceId:RemoteUIClient1</serviceId>
                <SCPDURL>URL to service description</SCPDURL>
                <controlURL>URL for control</controlURL>
                <eventSubURL>URL for eventing</eventSubURL>
            </service>
        </serviceList>
        <presentationURL>URL for presentation</presentationURL>
    </device>
</root>
```

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4. Test

No semantic tests are defined for this device.

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Annex A
(normative)

Access Control Definitions
(if *DeviceSecurity* service is implemented)

This section specifies the Permissions, Profiles and Access Control List (ACL) entry to be implemented in the *DeviceSecurity* service that can optionally be used by the *RemoteUIClientDevice*. This is used by the Security Console to assign access control of secure actions on the Remote UI client device to control point applications. Please refer to the *DeviceSecurity1.0* service specification for more details about Security Console, Permissions, Profiles and ACLs.

A.1 Permissions

The following table describes the permissions to perform access control to the secure actions of the services embedded in the Remote UI client device. The *RUICDeviceAll* is a required permission which can securely access all the actions in the *RemoteUIClient* service. The other permissions are optional. Vendors may define additional set of permissions to perform access control on the Remote UI client device. For example, they may provide separate master and guest permissions for finer granularity of access. However for maximum interoperability, vendors should use the optional permissions presented in this document rather than implementing their own security permissions.

Table 4: Defined permissions for *RemoteUIClient* Service

Permission	Allowed Actions
RUICDeviceAll[1]	*All actions in RemoteUIClient Service.*
RUICDeviceInfo	*GetCurrentConnections, GetDeviceProfile, GetUIListing*
RUICDeviceChangeConnection	*Connect, Disconnect*
RUICDeviceChangeStatus	*AddUIListing, RemoveUIListing, DisplayMessage, ProcessInput*

[1] *RUICDeviceAll* must be implemented.

When implementing only the required *RUICDeviceAll* permission, the following XML format is used:

```
<Permission>
        <UIname>RUICDeviceControl</UIname>
        <ACLEntry>
                <RUIWG:RUICDeviceAll/>
        </ACLEntry>
        <FullDescriptionURL></FullDescriptionURL>
        <ShortDescription>
                This permission allows the control point to set and get all secure actions
                of all the services of the Remote UI client device.
        </ShortDescription>
</Permission>
```

XML element tags UIname, ACLEntry, FullDescription, ShortDescription and Permission are defined in the *DeviceSecurity1*.0 service specification.

The above defined permission is returned by the Remote UI client device in the "DefinedPermissions" argument of *DeviceSecurity*'s GetDefinedPermission action

If the *DeviceSecurity* service resides **inside** the *RemoteUIClientDevice,* it will contain only the defined permissions of the Remote UI client device (as mentioned above). The "DefinedPermissions" argument of GetDefinedPermission action returned by the *DeviceSecurity* in this case would be:

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```
<DefinedPermissions>
        <Permission>
                <UIname>RUICDeviceControl</UIname>
                <ACLEntry>
                        <RUIWG:RUICDeviceAll/>
                </ACLEntry>
                <FullDescriptionURL></FullDescriptionURL>
                <ShortDescription>
                        Allow this application to complete control of the Remote UI client device.
                </ShortDescription>
        </Permission>
</DefinedPermissions>
```

If the *DeviceSecurity* service resides **outside** of the *RemoteUIClientDevice* and the *RemoteUIClientDevice* is embedded in a container device with other devices such as MediaRenderer, the "DefinedPermissions" argument of GetDefinedPermission action returned by the *DeviceSecurity* service in this case would be:

```
<DefinedPermissions>
        <Permission>
                <UIname>RUICDeviceControl</UIname>
                <ACLEntry>
                        <RUIWG:RUICDeviceAll/>
                </ACLEntry>
                <FullDescriptionURL></FullDescriptionURL>
                <ShortDescription>
                        Allow this application to complete control of the Remote UI client device.
                </ShortDescription>
        </Permission>
        <Permission>
                e.g., Permission defined by MediaRenderer Device
        </Permission>
…
</DefinedPermissions>
```

A.2 Profiles

There is no profile specified to be used for the Remote UI client device. However, vendors may define profiles of their own. Please refer to *DeviceSecurity*1.0 service specification for more details.

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A.3 Access Control List (ACL) entry

If DeviceSecurity service is implemented in the UPnP Remote UI client device, *RemoteUIClient* would have the "<RUIWG:RUICDeviceAll>" defined permission for access control. Following XML shows an example ACL entry granting this defined permission to the control point specified in the subject element**.** The string value "dRDPBgZz…" under the <hash> tag denotes the public key hash of the control point for which this ACL is defined as an example.

```
<acl>
        <entry>
                <subject>
                        <hash>
                                <algorithm>SHA1</algorithm>
                                <value>dRDPBgZzTFq7Jl2Q2N/YNghcfj8=</value>
                        </hash>
                </subject>
                <access>
                        <RUIWG:RUICDeviceAll/>
                </access>
                <valid>
                        <not-before>2002-10-23_05:17:32</not-before>
                        <not-after>2004-12-31_23:59:59</not-after>
                </valid>
        </entry>
</acl>
```

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