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Information technology – UPnP Device Architecture – Part 13-11: Device Security Device Control Protocol – Security Console Service

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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.

ORIGINAL UPNP DOCUMENTS
(informative)

Reference may be made in this document to original UPnP documents. These references are retained in order to maintain consistency between the specifications as published by ISO/IEC and by UPnP Implementers Corporation. The following table indicates the original UPnP document titles and the corresponding part of ISO/IEC 29341:

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UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1
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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
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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
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1. Overview and Scope

This service is offered by a Security Console (SC). The Security Console offers a user interface for administration of access control on security-aware UPnP devices. [See DeviceSecurity:1 for a description of the actions used in the creation and editing of Access Control Lists (ACLs) and in taking security ownership of Devices.] As a device the Security Console is self-owned. If it has any access controlled actions, then those are to be administered by the human user and not by some other Security Console. Therefore, a Security Console does not need to include a DeviceSecurity service. It does have a certificate cache, but it is an outgoing cache, rather than an incoming cache.

A network built of the user's own components with no connection to anything outside the user's personal domain and with no control points belonging to anyone other than the user ever attached to the network would not require the features of UPnP Security. Network isolation would already have achieved a level of physical security. We are concerned in UPnP Security with networks in which more than the user's own Control Points are present on the physical network and able to reach the user's Devices with control messages. These situations can include:

1. use of wireless, power-line networking or cable modem without a firewall, allowing an attacker to join the network without the user's knowledge or permission
2. shared infrastructure networks, such as a college dorm or a condominium building wired for Ethernet as one network segment serving more than one person's residence
3. households of multiple adults or teens, in which each individual wants to establish a private security domain, in addition to any domain of devices or control points shared among them, while using a shared network domain
4. connections to the Internet via devices or services that create single network segments of multiple subscribers as a side effect of offering network connectivity (such as some cable modems and some ISP connections)
5. households in which guests might bring mobile devices or control points into the network temporarily

In such networks of intentional or accidental sharing, one cannot rely on physical network security to protect devices or on discovery methods (e.g., multicast SSDP) to compile a list of "My Devices" or "My Control Points". This leaves it up to the user manually to select from physically accessible devices and control points, choosing those of interest to that user. One primary function of the SC is to enable the user to make that selection. This process requires two operations that were not anticipated in the original design of UPnP:

1. discovery of control points; and
2. naming of devices and control points on a per-user basis.

The actions provided in this service allow the SC to perform those two functions.

In addition, the sharing of devices across security domains sometimes calls for the use of authorization certificates, as described in sections 1.1.3 and 3.3. This service provides actions for the delivery of such certificates (or certificate chains) (see 2.5.3) and for the revocation (via renewal) of certificates (see 2.5.4).

1.1. Security Console Actions

When the Security Console interacts with a security-aware device, it does so through actions offered by that device. However, the Security Console must also interact with control points (CPs). Instead of forcing CPs to become devices as well, in order to support these interactions, we define actions that a SC offers. The actions of this service fall in three functional categories:

1. discovery of control points
2. communication of dictionaries of local names
3. processing of certificates

1.1.1. Control Point Discovery

UPnP Device Architecture 1.0 includes a protocol, SSDP, for discovery of devices by control points. However, there is no protocol for discovery of control points by other control points or devices.

The Security Console needs to discover control points so that it can identify those that should receive access rights on devices in the local security domain. We achieve this discovery by reversing the logic of UPnP discovery. A security-aware control point will discover a SC that offers the PresentKey action and will then invoke that action to announce itself to the SC. Since a CP might act within multiple security domains, it should announce itself to every SC it detects. The mere act of announcing itself does not imply that it will receive any rights, since the assignment of rights is an expression of a user's decision. However, a CP cannot know ahead of time whether a particular SC will choose to grant it some rights and must therefore announce itself to all SCs.

1.1.2. Local Dictionary Communication

One primary function of the SC is to identify devices and control points in the user's local network. In at least one implementation of the SC, this process includes permitting the user to assign names of the user's own choosing (local names) to those devices and control points. Since devices and control points might be visible to (and therefore named within) different security domains operated by different users, a single device or control point could have different local names. Therefore, these names remain the property of the user (specifically the SC) rather than the named device or control point itself. Normally, they would reside within and not be released from the SC.

For example, consider two roommates, Joe and Sue, sharing a network in their Cambridge apartment. Each has a personal domain of UPnP devices and control points, but some components are shared between them. One shared device is Joe's archive of digital photos. Joe refers to it by the name "pix", while Sue names it "Joe's Snapshot Archive". Neither name fits the preferences of the other user; therefore, neither name is appropriate as the sole friendly name for the shared device. Meanwhile, the archive device is known on the network by a unique name such as `DE7Z-GVGK-QTYR-TWPO-YF54-GB4M-OGFH-XJYM` that neither user wants to deal with. The mapping from friendly name to unique name is the function of each user's user interface (the Security Console, in this case). That mapping is referred to here as a "local dictionary".

It is possible that this local dictionary of "My Devices and Control Points" might be useful to other components within the user's domain. For example, Joe might have two computers on the network, on one of which he named his personal devices, but on the second computer he would prefer just to import all names from the first computer, rather than go to all the work of manually assigning names again to each of his devices. To support such cases, we provide for access to that dictionary, via the GetNameList action, and we also provide for an event notification whenever that name list changes.

1.1.3. Certificate Processing

The Security Console is responsible for granting access rights to devices under its control. If a device is shared among multiple domains, there will be multiple Security Consoles that need to grant rights on that device. This sharing of the right to grant access can be achieved through co-ownership (see GrantOwnership, in DeviceSecurity:1), but a co-owner has total access to a device and is, among other things, capable of removing all access rights of the first owner including its ownership status. If that is too much power to share with some other SC, that other SC can be granted permissions via the device's Access Control List, just like any control point. In that case, that SC will grant rights to CPs (or still other SCs) not by adding ACL entries, since it does not have the right to edit the ACL, but rather via authorization certificates. (See DeviceSecurity:1 for a definition of authorization certificates.)

It is possible that a Security Console that does have ownership of a device might also grant rights by certificate, for example if that device has too little storage for a detailed ACL or if the device is offline at the time the access right needs to be granted.

The authorization certificate is like an ACL entry, but it is digitally signed and includes an issuer and specification of the device(s) to which it applies. It will probably also include at least an expiration date and time.

There are two actions provided here to facilitate the processing of certificates:

1. **GetMyCertificates:** which serves as a post office mechanism to allow a control point or other security console to fetch certificates that have been issued to it by this SC (This action is backed up by an evented variable, PendingCPList, by which the CP or other SC can learn that there are certificates waiting.); and

2. **RenewCertificate:** by which a control point can request an updated copy of an expired (or soon to expire) certificate. For more details about renewal, see section 3, Theory of Operation.

Although GetMyCertificates provides a communication mechanism for certificates, that does not preclude other communication mechanisms to be implemented by Security Console applications. For example, one might use e-mail, sneaker-net, some directory service or HTTP for this communication function. In a truly complex network with a large number of certificates, one might have an intelligent directory service that returns to a CP precisely the certificate chain it needs to access a particular action on a particular device. These are application design issues and out of scope of this protocol specification. GetMyCertificates stands as a common denominator, to insure interoperability (assuming components that share a network at least occasionally).