
**Information technology — UPnP
Device Architecture —**
Part 30-10:
**IoT management and control device
control protocol — Data store service**

Technologies de l'information — Architecture de dispositif UPnP —

*Partie 30-10: Protocole de contrôle de dispositif de gestion et de
contrôle de l'Internet des objets — Service de stockage des données*



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ISO/IEC 29341-30-10 was prepared by UPnP Forum and adopted, under the PAS procedure, by joint technical committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

The list of all currently available parts of ISO/IEC 29341 series, under the general title *Information technology — UPnP Device Architecture*, can be found on the [ISO web site](#).

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UPnP Document Title	ISO/IEC 29341 Part
UPnP Device Architecture 1.0	ISO/IEC 29341-1:2008
UPnP Device Architecture Version 1.0	ISO/IEC 29341-1:2011
UPnP Device Architecture 1.1	ISO/IEC 29341-1-1:2011
UPnP Device Architecture 2.0	ISO/IEC 29341-1-2
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1:2008
UPnP AV Architecture:1	ISO/IEC 29341-3-1:2011
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:1 Device	ISO/IEC 29341-3-2
UPnP MediaRenderer:2 Device	ISO/IEC 29341-3-2:2011
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10:2008
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10:2011
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11:2008
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11:2011
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13:2008
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13:2011
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
UPnP ScheduledRecording:2	ISO/IEC 29341-4-14:2011
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 29341-4-4:2008
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4:2011
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 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 HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2

UPnP BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
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
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UPnP WANCableLinkConfig:1 Service	ISO/IEC 29341-8-14
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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
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UPnP WANConnectionDevice:1 Device	ISO/IEC 29341-8-4
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UPnP QosManager:1 Service	ISO/IEC 29341-10-11
UPnP QosPolicyHolder:1 Service	ISO/IEC 29341-10-12
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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 QOS v2 Schema Files	ISO/IEC 29341-11-2
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UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11
UPnP ContentDirectory:3 Service	ISO/IEC 29341-14-12:2011
UPnP MediaServer:3 Device	ISO/IEC 29341-14-3:2011
UPnP ContentSync:1	ISO/IEC 29341-15-10:2011
UPnP Low Power Architecture:1	ISO/IEC 29341-16-1:2011
UPnP LowPowerProxy:1 Service	ISO/IEC 29341-16-10:2011

UPnP LowPowerDevice:1 Service	ISO/IEC 29341-16-11:2011
UPnP QoS Architecture:3	ISO/IEC 29341-17-1:2011
UPnP QoSDevice:3 Service	ISO/IEC 29341-17-10:2011
UPnP QoSManager:3 Service	ISO/IEC 29341-17-11:2011
UPnP QoSPolicyHolder:3 Service	ISO/IEC 29341-17-12:2011
UPnP QoSDevice:3 Addendum	ISO/IEC 29341-17-13:2011
UPnP RemoteAccessArchitecture:1	ISO/IEC 29341-18-1:2011
UPnP InboundConnectionConfig:1 Service	ISO/IEC 29341-18-10:2011
UPnP RADACfg:1 Service	ISO/IEC 29341-18-11:2011
UPnP RADASync:1 Service	ISO/IEC 29341-18-12:2011
UPnP RATAConfig:1 Service	ISO/IEC 29341-18-13:2011
UPnP RAClient:1 Device	ISO/IEC 29341-18-2:2011
UPnP RAServer:1 Device	ISO/IEC 29341-18-3:2011
UPnP RADiscoveryAgent:1 Device	ISO/IEC 29341-18-4:2011
UPnP SolarProtectionBlind:1 Device	ISO/IEC 29341-19-1:2011
UPnP TwoWayMotionMotor:1 Service	ISO/IEC 29341-19-10:2011
UPnP AV Architecture:2	ISO/IEC 29341-20-1
UPnP AVTransport:3 Service	ISO/IEC 29341-20-10
UPnP ConnectionManager:3 Service	ISO/IEC 29341-20-11
UPnP ContentDirectory:4 Device	ISO/IEC 29341-20-12
UPnP RenderingControl:3 Service	ISO/IEC 29341-20-13
UPnP ScheduledRecording:2 Service	ISO/IEC 29341-20-14
UPnP MediaRenderer:3 Service	ISO/IEC 29341-20-2
UPnP MediaServer:4 Device	ISO/IEC 29341-20-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-20-4
UPnP InternetGatewayDevice:2 Device	ISO/IEC 29341-24-1
UPnP WANIPConnection:2 Service	ISO/IEC 29341-24-10
UPnP WANIPv6FirewallControl:1 Service	ISO/IEC 29341-24-11
UPnP WANConnectionDevice:2 Service	ISO/IEC 29341-24-2
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UPnP MediaManagement:2 Service	ISO/IEC 29341-26-11
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UPnP TelephonyServer:2 Device	ISO/IEC 29341-26-3
UPnP Friendly Info Update:1 Service	ISO/IEC 29341-27-1
UPnP MultiScreen MultiScreen Architecture:1	ISO/IEC 29341-28-1
UPnP MultiScreen Application Management:1 Service	ISO/IEC 29341-28-10
UPnP MultiScreen Screen:1 Device	ISO/IEC 29341-28-2
UPnP MultiScreen Application Management:2 Service	ISO/IEC 29341-29-10
UPnP MultiScreen Screen:2 Device	ISO/IEC 29341-29-2
UPnP IoT Management and Control Architecture Overview:1	ISO/IEC 29341-30-1

ISO/IEC 29341-30-10:2017(E)

UPnP DataStore:1 Service	ISO/IEC 29341-30-10
UPnP IoT Management and Control Data Model:1 Service	ISO/IEC 29341-30-11
UPnP IoT Management and Control Transport Generic:1 Service	ISO/IEC 29341-30-12
UPnP IoT Management and Control:1 Device	ISO/IEC 29341-30-2
UPnP Energy Management:1 Service	ISO/IEC 29341-31-1

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1 Scope

1.1 Introduction

This document defines the service DataStore:1, which identifies Version 1 of the service named DataStore. This Publicly Available Specification is applicable to Standardized DCPs of the UPnP Forum which include this service.

This service definition is compliant with the UPnP Device Architecture, version 1.0.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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- [14] UPnP ConfigurationManagement:2 Service, UPnP Forum, February 16, 2012. Available at: <http://www.upnp.org/specs/dm/UPnP-dm-ConfigurationManagement-v2-Service-20120216.pdf>. Latest version available at: <http://www.upnp.org/specs/dm/UPnP-dm-ConfigurationManagement-v2-Service.pdf>.
- [15] XML Schema DataStore LastChange Eventing, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/dsevent-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/dsevent.xsd>.
- [16] XML Schema UPnP DataStore DataStoreInfo, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/dsinfo-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/dsinfo.xsd>.
- [17] XML Schema UPnP DataStore DataTableInfo, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/dtinfo-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/dtinfo.xsd>.
- [18] XML Schema UPnP DataStore DataStoreGroups, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/dsgroups-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/dsgroups.xsd>.
- [19] XML Schema UPnP DataStore DataRecord, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/drecs-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/drecs.xsd>.
- [20] XML Schema UPnP DataStore DataRecordFilter, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/drecfilter-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/drecfilter.xsd>.
- [21] XML Schema UPnP DataStore DataRecord Status, UPnP Forum, July 1, 2013. Available at: <http://www.upnp.org/schemas/ds/drecstatus-v1-20130701.xsd>. Latest version available at: <http://www.upnp.org/schemas/ds/drecstatus.xsd>.

3 Terms, Definitions and Abbreviations

For the purposes of this document, the terms and definitions given in [1] and [8] apply.

4 Notations and conventions

4.1 Notation

- 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.

4.2 Data Types

This specification uses data type definitions from two different sources. The UPnP Device Architecture defined data types are used to define state variable and action argument data types UPnP Device Architecture, version 1.0 [1]. The XML Schema namespace is used to define property data types XML Schema Part 2: Data Types, Second Edition [7].

For UPnP Device Architecture defined Boolean data types, it is strongly RECOMMENDED to use the value "0" for false, and the value "1" for true. The values "true", "yes", "false" or "no" MAY also be used but are NOT RECOMMENDED. The values "yes" and "no" are deprecated and MUST NOT be sent out by devices but MUST be accepted on input.

For XML Schema defined Boolean data types, it is strongly RECOMMENDED to use the value "0" for false, and the value "1" for true. The values "true", "yes", "false", or "no" MAY also be used but are NOT RECOMMENDED. The values "yes" and "no" are deprecated and MUST NOT be sent out by devices but MUST be accepted on input.

4.3 Vendor-defined Extensions

Whenever vendors create additional vendor-defined state variables, actions or properties, their assigned names and XML representation MUST follow the naming conventions and XML rules as specified in UPnP Device Architecture, version 1.0 [1], Clause 2.5, "Description: Non-standard vendor extensions".

5 Service Modelling Definitions

5.1 Service Type

The following URN identifies a service that is compliant with this specification:

urn:schemas-upnp-org:service:DataStore:1

DataStore service is used herein to refer to this service type.

5.2 DataStore Service Architecture

The DataStore service provides the ability to acquire and persistently store information for later access. This service allows UPnP devices such as mobile phones and sensors to make information available for subsequent retrieval. This increases the flexibility of the UPnP ecosystem by eliminating requirements to have an immediate nexus between information sources and sinks on the UPnP network. The DataStore service additionally allows UPnP devices with limited or temporary storage capabilities to persist information for subsequent retrieval. The DataStore service constructs are intended to be modelled after and compatible with well-established database models.

The service defined herein provides the following functionality:

- Methods to define, create and delete tables of data records.
- Methods to define and identify the contents a data records.
- Methods to accept data records from both streaming and programmed sources.
- Methods to select and retrieve data record contents.

5.3 Key Concepts

The DataStore service supports a DataStore which is organized as a set of DataTables. Each DataTable consists of a series of DataRecords and a DataTable Dictionary. This section discusses various DataStore constructs and topics to assist the reader in understanding the DataStore service's actions and state variables.

5.3.1 DataTables

A DataTable consists of identifying metadata, a set of DataRecords and a Dictionary. The DataStore service is allowed to provide access control to DataTables via the UPnP DeviceProtection service.

5.3.2 DataTable Dictionary

Each DataTable has an associated Dictionary. The Dictionary is organized as key-value data structure. The values stored in the Dictionary are always of type string, although the string values may contain encoded data types such as XML, Base64. The Dictionary does not provide encoding or type information for key-value pairs stored. The semantics of Dictionary keys are included with the definition of the corresponding DataTable URN. See DataTable URN.

DataTable record fields can refer to key(s) in the DataTable's Dictionary. When a DataTable record is read the DataStore service can automatically resolve Dictionary references by substituting the corresponding the Dictionary value for the Dictionary key contained in the stored DataRecord.

5.3.3 DataTables GUID

Each DataTable is uniquely identified by a GUID. The format of a DataTable's records is defined by an XML document (see XML Schema UPnP DataStore DataTableInfo [17]) which describes DataTable's record contents at the time of DataTable creation. Additional ecosystem specific requirements associated with a DataTable are identified by a URN value associated with the DataTable.

5.3.4 DataTable URN

Each DataTable has an associated URN. This URN value assists DataStore clients in determining DataTable contents and to identify sets of related DataTables. The UPnP DataStore service [11] defines a uniform template for generating these normative identifiers.

Two types of DataTable URNs are defined by this specification:

- Sensor Specific

The DataTable contains recorded output of a Sensor. The URN for this DataTable is identical to the URN (Identifier-Type: smgt-surn) of the Sensor providing DataItems recorded in this DataTable. See the SensorTransportGeneric service [10], section 5.2.6 "Sensor Normative Type Identifiers" for further details.

- Application Specific

The DataTable contains data generated by home-network application(s) as well as sensor data. The contents of DataRecords for this type of DataTable is determined by the underlying application and the DataTable URN serves to identify the generating application. The following format shall be used for application specific DataTable URNs.

```
DataTableURN ::= urn ":" upnp-org ":" ds-aurn ":" [generic-application-type] ":"
[application-vendor-identifier] ":" [application-identifier] ":"
[application-user-identifier] ":" [application-table-identifier]
```

The [generic-application-type] field is descriptive and provides an informative classification for the application. For example:

- Health_and_Wellness
- Home_Energy_Management
- Home_Security

The [application-vendor-identifier] shall contain the ICANN domain-name of the organization or vendor which provides the application.

The [application-identifier] shall identify the specific application or family of applications which define the expected DataTable formats.

The [application-user-identifier] field may contain information relating the DataTable to a specific user of an application. This field may be left empty if no such identification is necessary.

The [application-table-identifier] may contain information identifying a specific type of DataTable within a set of related DataTables. This field may be left empty if no such identification is necessary.

5.3.5 DataTable DataRecords

When a DataTable is created (or pre-defined) a DataRecord format is established for the table. Information about each DataTable is conveyed by an XML document including identifying information, DeviceProtection roles, and DataRecord contents (see XML schema UPnP DataStore DataTableInfo [17]). DataRecord(s) consist of fields each defining a DataItem with an associated name and type (see XML schema UPnP DataStore DataRecord [19]).

5.3.6 DataTable DataItems

Each DataTable record consist of a set of DataItem(s). DataItems may include simple scalars, CSVs, abstract data types or XML documents. Each DataItem is characterized by four components: name, type, encoding and an allowed DataItem Description document (see IoTManagementAndControl Architecture Overview [8], subclause 4.3, "DataItem Semantics" for a detailed description of DataItems).

5.3.7 DataItem Description Documents

A DataItem may be described by an accompanying XML document (see IoTManagementAndControl Architecture Overview [8], subclause 4.4, "DataItem Description XML Document"). A DataStore client should store DataItem Description Documents (if available) in the DataTable Dictionary. When storing these documents in a DataTable Dictionary, the following template shall be used for generating DataTable Dictionary key names:

DictionaryKey ::= ItemDescription "-" [DataItem Prefix] DataItem Name

For example:

Dictionary KeyName	ItemDescription-[Garage]FreezerTempSetting
Dictionary KeyValue	<pre><?xml version="1.0" encoding="UTF-8"?> <DataItemDescription xmlns="urn:schemas-upnp-org:sensors:dataitemdescription" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=" urn:schemas-upnp-org:sensors:did.xsd http://www.upnp.org/schemas/sensors/did.xsd" itemName="FreezerTempSetting" access="rw"> <description> Freezer Temperature Control </description> <measurement units="degC" treatment="average" accumulation="interval" /> <limit units="degC" limittype="low" /> <limit units="degC" limittype="high" /> </DataItemDescription></pre>

5.3.8 DataItem formats

The DataStore service always conveys stored DataItem(s) as strings. However, the contents of the stored strings may be XML documents, integer(s) or binary content conveyed as Base64 strings and the DataRecord format indicates the allowable data types that may be conveyed by these strings. It should be noted that the DataStore service may convert representations. For example an field with type "uda:r4" may be correctly conveyed as either 1.001E2 and 100.1. In addition, a DataRecord type may be abstract such as a UPnP A_ARG_TYPE state variable or an "mds:IEEE_11073-ATTR" type representing IEEE-11073 Object Attributes.

5.3.9 DataTables Operations

DataTables are created and deleted via SOAP actions. In addition to DataTable creation, SOAP clients may either directly write DataTable records via SOAP actions or may arrange transport connections via the DataStore service [11] GetDataStoreTransportURL() action allowing asynchronous writing of DataTable records. DataTable records are retrieved via SOAP actions. DataTable Dictionary keys are read and written via SOAP actions.

5.3.10 DataTable HTTP/HTTPS Transport Protocol

DataTable connections to URLs provided by the GetDataStoreTransportURL() action shall support the HTTP/HTTPS Transport model as follows:

- 1) When the DataTable transport endpoint has data available, the transport client shall issue an HTTP/HTTPS POST request to the DataStore transport endpoint provided by the TransportURL provided GetDataStoreTransportURL() action.
- 2) The request shall contain any HTTP entity-headers as required by RFC-2616.
- 3) The entity-body shall contain a DataRecords XML document as described for the A_ARG_TYPE DataRecords state variable.
- 4) If all <datarecord> elements contained within the POST request are acceptable, then the transport endpoint shall generate a HTTP-response with HTTP status 200 and an empty entity-body.
- 5) If DataStore transport endpoint does not accept all of the POST(ed) <datarecord> elements, the transport endpoint shall return a HTTP-response with HTTP status 200 with an entity-body containing an XML document conforming to XML Schema DataStore DataRecord Status [21].

Note: This schema is shared with the SensorTransportGeneric service [10].

```
<?xml version="1.0" encoding="utf-8"?>
<DataRecordsStatus
  xmlns="urn:schemas-upnp-org:ds:drecstatus"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:drecstatus
    http://www.upnp.org/schemas/ds/drecstatus-v1.xsd">
  <!-- For each <datarecord> element in the POST request -->
    <datarecordstatus accepted="0|1" />

    ... Additional <datarecordstatus> elements ...
</DataRecordsStatus>
```

<?xml>

Required. Case Sensitive.

<DataRecordsStatus>

Required. Shall include the namespace declaration for the DataStore service DataRecordStatus Schema (urn:schema-upnp-org:ds:drecstatus). Shall include the following elements and attributes:

<datarecordstatus>

Required. XML. For each <datarecord> element in the original HTTP-POST request, a corresponding <datarecordstatus> element shall be included.

accepted

Required. Boolean. This attribute shall be set to ("1") if the corresponding <datarecord> element was accepted by the transport server and to ("0") if the corresponding <datarecord> was rejected.

5.3.11 DataStore Groups

DataTable(s) within a DataStore shall be a member of (reference) zero or more DataStore groups. DataTable membership in a group indicates the subject DataTable(s) are related. The DataStore service can apply access controls to DataStore groups which are applied to any DataTable(s) referencing these groups. The DataStore service [11], however, only defines membership in a group; additional ecosystem specific requirements may further define additional rules and meaning attached to group membership.

5.3.12 DataStore Events

The DataStore service [11] can notify its clients of state changes via the evented LastChange state variable. The LastChange state variable includes a summary of events including the creation and deletion of DataTable(s), modifications to DataTable(s) and corresponding Dictionary(s) in addition to the creation of DataStore groups.

5.3.13 DataTable Permissions

The DataStore service [11] may implement the allowed DeviceProtection service [13]. If this feature is implemented, DataStore groups may be assigned permissions. DataTable(s) may allow or restrict access by using the default DeviceProtection roles: Public and/or Basic or by DataStore group permissions which include: Master (Create/Update/Delete), Read, and Write. The DataStore service [11] defines the syntax for DeviceProtection roles by combining a DataStore group permission component with a DataStore group name (see subclause 5.4, "Device Protection" for a detailed discussion of DataStore group permissions).

5.3.14 DataTable Actions

While no grouping of DataStore actions is defined by this specification, it can be helpful to the reader to consider related DataStore actions together:

- DataTableGroup Management
 - CreateDataStoreGroups()
 - GetDataStoreGroups()
 - DeleteDataStoreGroups()
- DataTable Management
 - CreateDataStoreTable()
 - DeleteDataStoreTable()
 - ResetDataStoreTable()
- DataTable Information
 - GetDataStoreInfo()
 - GetDataStoreTableInfo()
 - ModifyDataStoreTable()
- DataTable Read/Write
 - ReadDataStoreTableRecords()
 - WriteDataStoreTableRecords()
- DataTable Properties

- [CreateDataStoreTableKeyValue\(\)](#)
- [GetDataStoreTableKeyValue\(\)](#)
- [RemoveDataStoreTableKeyValue\(\)](#)
- DataTable Transport Connection
 - [GetDataStoreTransportURL\(\)](#)

5.4 Device Protection

The DataStore service [11] is allowed to restrict control point access to DataTable(s) using the DeviceProtection service [13]. When the DeviceProtection feature is implemented the DataStore service [11] shall support the following roles:

- **Admin** – A control point with the **Admin** role can create/read/write/delete any DataStore Table and can create or remove any DataStore group.
- **Public** – A control point with the **Public** role can read or write specific DataStore tables which permit this access.
- **Basic** – A control point with the **Basic** role can read or write specific DataStore tables which permit this access.

In addition the DataStore service [11] which implements the DeviceProtection feature shall support the following group roles:

- **ds:Master#[GroupName]** - A control point with a **ds:Master#[GroupName]** identity for the indicated DataStore group may create or delete the corresponding group and may create or delete DataTable(s) belonging to that DataStore group. If a created or deleted DataTable participates in multiple DataStore groups, then the control point is required to have corresponding **ds:Master** identities for all groups the target DataTable references.
- **ds:Reader#[GroupName]** - A control point with a **ds:Reader#[GroupName]** identity for the indicated DataStore group may read DataTable(s) which are a member of the identified group.
- **ds:Writer#[GroupName]** - A control point with a **ds:Writer#[GroupName]** identity for the indicated DataStore group may write DataTable(s) which are a member of the identified group.

5.5 State Variables

Note: For first-time reader, it may be more insightful to read the theory of operations first and then the action definitions before reading the state variable definitions.

5.5.1 State Variable Overview

Table 1 — State Variables

| Variable Name | R/A ^a | Data Type | Allowed Value | Default Value | Eng. Units |
|---|------------------|----------------|---------------|---------------|------------|
| <u>LastChange</u> | <u>R</u> | <u>string</u> | See 5.5.2 | | |
| <u>A_ARG_TYPE_DataRecordCount</u> | <u>R</u> | <u>ui4</u> | See 5.5.3 | | |
| <u>A_ARG_TYPE_DataRecordIndex</u> | <u>R</u> | <u>string</u> | See 5.5.4 | | |
| <u>A_ARG_TYPE_DataRecordFilter</u> | <u>R</u> | <u>string</u> | See 5.5.5 | | |
| <u>A_ARG_TYPE_DataTableID</u> | <u>R</u> | <u>string</u> | See 5.5.6 | | |
| <u>A_ARG_TYPE_DataTableInfoFragment</u> | <u>CR</u> | <u>string</u> | See 5.5.7 | | |
| <u>A_ARG_TYPE_DataTableKeyName</u> | <u>R</u> | <u>string</u> | See 5.5.8 | | |
| <u>A_ARG_TYPE_DataTableKeyValue</u> | <u>R</u> | <u>string</u> | See 5.5.9 | | |
| <u>A_ARG_TYPE_DataStoreInfo</u> | <u>R</u> | <u>string</u> | See 5.5.11 | | |
| <u>A_ARG_TYPE_DataTableInfo</u> | <u>R</u> | <u>string</u> | See 5.5.12 | | |
| <u>A_ARG_TYPE_DataTableResetReq</u> | <u>R</u> | <u>boolean</u> | See 5.5.13 | | |
| <u>A_ARG_TYPE_DataStoreGroups</u> | <u>R</u> | <u>string</u> | See 5.5.10 | | |
| <u>A_ARG_TYPE_DataRecordPropResolve</u> | <u>R</u> | <u>boolean</u> | See 5.5.14 | | |
| <u>A_ARG_TYPE_DataRecords</u> | <u>R</u> | <u>string</u> | See 5.5.15 | | |
| <u>A_ARG_TYPE_DataRecordsStatus</u> | <u>R</u> | <u>string</u> | See 5.5.15 | | |
| <u>A_ARG_TYPE_DataTransportURL</u> | <u>R</u> | <u>string</u> | See 5.5.17 | | |
| <i>Non-standard state variables implemented by a UPnP vendor go here</i> | <u>X</u> | <i>TBD</i> | <i>TBD</i> | <i>TBD</i> | <i>TBD</i> |
| NOTES: | | | | | |
| <p>^a For a device this column indicates whether the state variable shall be implemented or not, where <u>R</u> = required, <u>A</u> = allowed, <u>CR</u> = conditionally required, <u>CA</u> = conditionally allowed, <u>X</u> = Non-standard, add <u>-D</u> when deprecated (e.g., <u>R-D</u>, <u>A-D</u>).</p> <p>^b CSV stands for Comma-Separated Value list. The type between brackets denotes the UPnP data type used for the elements inside the list. The CSV list concept is defined more formally in the ContentDirectory service template.</p> <p>^c See referenced subclause for conditions under which the implementation of this state variable is required.</p> | | | | | |

5.5.2 LastChange

This required state variable shall contain an XML document which conforms to the XML Schema DataStore LastChange Eventing [15]. This state variable is intended to report events on the DataStore service to clients which have subscribed to the service.

```
<?xml version="1.0" encoding="UTF-8"?>
<StateEvent xmlns="urn:schemas-upnp-org:ds:dsevent"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:dsevent
    http://www.upnp.org/schemas/ds/dsevent.xsd">

  <create>
    <datastoretable
      tableGUID="Created DataTable ID"
      tableURN="Created DataTable URN"
      updateID="Created DataTable UpdateID (0)" />
    <datastoregroup
      groupName="Created DataStore Group Name" />
  </create>
</StateEvent>
```

```

    ...Additional DataStoreTable or DataStoreGroup creates ...

</create>

<update>
  <datastoretable
    tableGUID="Updated DataTable ID"
    tableURN="Updated DataTable URN"
    updateType="R|P|G|X|O - Update Type"
    updateID="DataTable Update ID"/>

    ... Additional DataStoreTable updates ...

  </update>

<delete>
  <datastoretable
    tableGUID="Deleted DataTable ID"
    tableURN="Deleted DataTable URN"
    updateID="Deleted DataTable UpdateID (last)"/>
  <datastoregroup
    groupName="Deleted DataStore Group Name" />

    ... Additional DataStoreTable or DataStoreGroup deletes ...

</delete>

</StateEvent>

```

<?xml>

Allowed. Case sensitive.

<StateEvent>

Required. Shall include a namespace declaration for the XML Schema DataStore LastChange Eventing ("urn:schemas-upnp-org:ds:dsevent"). Shall include zero or more of the following elements. This namespace defines the following elements and attributes:

<create>

Allowed. Indicates creation of a DataTable or DataStore group. Includes one or more of the following elements and attributes for DataTable(s) managed by this DataStore service:

<datastoretable>

Conditionally Required. Identifies the DataStore table created. This element shall be included when a new DataTable is created.

tableGUID

Required. Identifies GUID of the DataStore table created.

tableURN

Required. Identifies the URN of the DataStore table created.

updateID

Required. Identifies the initial updateID for the DataStore table.

<datastoregroup>

Conditionally Required. Identifies the DataStore group created. This element shall be included when a new DataStoreGroup is created.

groupName

Required. Identifies DataStore group name being created.

<update>

Allowed. Indicates update to a DataTable. Includes one or more of the following elements and attributes for DataTable(s) managed by this DataStore service:

<datastoretable>

Conditionally Required. Identifies the DataStore table updated. This element shall be included when DataTable updates occur.

tableGUID

Required. Identifies GUID of the DataStore table updated.

tableURN

Required. Identifies the URN of the DataStore table updated.

updateType

Required. Identifies the type(s) of DataTable updates. CSV of allowed values: "R" – Records, "P" – Properties, "G" – Groups or Permissions, "X" – DataTable reset or "O" – Other DataTable attributes.

updateID

Required. Identifies the updateID for the DataTable. (See discussion below).

<delete>

Allowed. Indicates removal of a DataTable. Includes one or more of the following elements and attributes for DataTable(s) managed by this DataStore service.

<datastoretable>

Conditionally Required. Identifies the DataStore table deleted. This element shall be included when a DataTable is deleted.

tableGUID

Required. Identifies GUID of the DataStore table deleted.

tableURN

Required. Identifies the URN of the DataStore table deleted.

updateID

Required. Identifies the final updateID for the DataStore table.

<datastoregroup>

Conditionally Required. Identifies the DataStore group deleted. This element shall be included when a DataStoreGroup is deleted.

groupName

Required. Identifies DataStore group name being deleted.

The LastChange state variable is subject to event moderation. Updates to the DataStore LastChange Eventing Document are appended to the document in order of occurrence. To reduce the size of the LastChange state variable document, consecutive `update` elements to the same DataTable should be combined. In this case the value of the `updateID` element shall reflect the most recent DataTable update. Once the LastChange state variable is transmitted to subscribed clients, its contents are reset to contain only the <StateEvent> element.

5.5.3 A ARG TYPE DataRecordCount

This required state variable shall contain an unsigned integer (ui4) which shall indicate a count of DataRecord(s).

5.5.4 A ARG TYPE DataRecordIndex

This required state variable shall provide a string argument that identifies a position within a DataTable. A value of ("0") indicates first available record in the DataTable. The syntax and semantics of other DataTable index values are determined by the implementation.

5.5.5 **A ARG TYPE DataRecordFilter**

This required state variable shall define a **string** argument that contains an XML document which conforms to the XML Schema UPnP DataStore DataRecordFilter [20]. This defines criteria to qualify for DataRecord(s) for inclusion in the associated action result.

```
<?xml version="1.0" encoding="UTF-8"?>
<DataRecordFilter xmlns="urn:schemas-upnp-org:ds:dsfilter"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:dsfilter
    http://www.upnp.org/schemas/ds/dsfilter.xsd">

  <filterset>
    <filter
      condition="Filter condition expression" />

    ... Additional <filter> elements ...

  </filterset>

  ... Additional <filterset> elements ...

</DataRecordFilter>
```

<?xml>

Allowed. Case sensitive.

<DataRecordFilter>

Required. Shall include a namespace declaration for the XML Schema UPnP DataStore DataRecordFilter ("urn:schemas-upnp-org:ds:dsfilter"). Shall include the following elements.

<filterset>

Allowed. This element may be specified zero or more times. If all of the <filter> element conditions specified within the scope of any <filterset> element are met, then the DataRecord shall be included in the corresponding action result. This element shall include one or more of the following elements:

<filter>

Required. Defines a condition which shall be met to include a DataRecord the corresponding action result.

condition

Required. xsd:string. A string defining a test condition. See Table 2 for allowed values.

Table 2 — Allowed filter condition attribute values

| Dataltem | Condition | Value |
|----------------------------|----------------------|------------------------------|
| ReceiveTimeStamp | >, <, = | xsd:dateTime |
| ReceiveTimeStamp | > | xsd:duration |
| ObservationTimeStamp | >, <, = | xsd:dateTime |
| ObservationTimeStamp | > | xsd:duration |
| ClientID | = | string |
| <<Any supported Dataltem>> | IS NULL, IS NOT NULL | none |

Examples:

Obtain DataRecords received during April 9, 2013:

```
<DataRecordFilter>
  <filterset>
    <filter condition="ReceiveTimeStamp > 2013-04-09T00:00:00" />
    <filter condition="ReceiveTimeStamp < 2013-04-09T23:59:59" />
```

```
<filterset>
</DataRecordFilter>
```

Obtain DataRecords received during from one hour ago:

```
<DataRecordFilter>
  <filterset>
    <filter condition="ReceiveTimeStamp > "P1D" />
  </filterset>
</DataRecordFilter>
```

Obtain DataRecords containing Medical Device (Handle 1) observations recorded within the last hour:

```
<DataRecordFilter>
  <filterset>
    <filter condition="$1-Obs IS NOT NULL" />
    <filter condition="ObservationTimeStamp > "PT1H" />
  </filterset>
</DataRecordFilter>
```

5.5.6 **A ARG TYPE DataTableID**

This required state variable shall define a **string** argument which identifies an instance of a DataTable within a DataStore. This argument shall be identical to the `tableGUID` attribute value in the UPnP DataStore DataStoreInfo XML document returned by the [GetDataStoreInfo\(\)](#) action for the corresponding DataTable.

5.5.7 **A ARG TYPE DataTableInfoFragment**

This conditionally required state variable shall be implemented if the [ModifyDataTableInfo\(\)](#) action is implemented. This state variable defines a **string** argument that contains an XML fragment from the XML Schema UPnP DataStore DataTableInfo [17]. See the [ModifyDataTableInfo\(\)](#) action description for specific XML top level elements which are allowed.

5.5.8 **A ARG TYPE DataTableKeyName**

This required state variable shall define a **string** argument that identifies a DataTable Dictionary key.

5.5.9 **A ARG TYPE DataTableKeyValue**

This required state variable shall define a **string** argument that provides the value of a DataTable Dictionary entry corresponding to a DataTable Dictionary key.

5.5.10 **A ARG TYPE DataStoreGroups**

This conditionally required state variable shall be implemented if the DataStore group actions [CreateDataStoreGroup\(\)](#), [DeleteDataStoreGroups\(\)](#) are implemented. This state variable shall define a **string** argument that contains an XML document which conforms to the XML Schema UPnP DataStore DataStoreGroups [18].

```
<?xml version="1.0" encoding="UTF-8"?>
<DataStoreGroups xmlns="urn:schemas-upnp-org:ds:dsgroups"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:dsgroups
    http://www.upnp.org/schemas/ds/dsgroups.xsd">

  <datastoregroup
    groupName="Name of DataStore group" />

  ... Additional <datastoregroup> elements ...

</DataStoreGroups>
```

<?xml>

Allowed. Case sensitive.

<DataStoreGroups>

Required. XML. Shall include a namespace declaration for the XML Schema UPnP DataStore DataStoreGroups ("urn:schemas-upnp-org:ds:dsgroups"). Shall include zero or more of the following element:

<datastoregroup>

Allowed. XML. Each element shall provide a single DataStore group. See `groupName` attribute.

`groupName`

Required. xsd:string. The value of this attribute is an existing DataStore group name.

5.5.11 **A ARG TYPE DataStoreInfo**

This required state variable shall define a **string** argument that contains an XML document which conforms to the XML Schema UPnP DataStore DataStoreInfo [16]. This document is used to identify DataStore names and associated DataTable(s) managed by the DataStore service.

```
<?xml version="1.0" encoding="UTF-8"?>
<DataStoreInfo xmlns="urn:schemas-upnp-org:ds:dsinfo"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:dsinfo
    http://www.upnp.org/schemas/ds/dsinfo.xsd">

  <datastoretables>

    <datastoretable
      tableGUID="DataTable ID"
      tableURN="DataTable URN"
      updateID="DataTable Update ID">
    </datastoretable>

    ... Additional DataStoreTable(s) ...

  </datastoretables>
</DataStoreInfo>
```

<?xml>

Allowed. Case sensitive.

<DataStoreInfo>

Required. Shall include a namespace declaration for the XML Schema UPnP DataStore DataStoreInfo ("urn:schemas-upnp-org:ds:dsinfo"). Shall include the following elements.

<datastoretables>

Allowed. XML. Includes one or more of the following elements listing DataTable(s) managed by this DataStore service:

<datastoretable>

Allowed. XML. This element defines the properties of a DataTable supported by this DataStore service. Contains the following attributes:

`tableGUID`

Required. xsd:string. Each DataTable within a DataStore shall have a unique tableGUID value as indicated by this attribute.

`tableURN`

Required. xsd:string. Each DataTable is allowed to specify a URN value as indicated by this attribute. See subclause 5.3.4, "DataTable URN" for permissible URN contents. This URN value shall identify the format of all DataRecord(s) contained in the corresponding DataTable. Separate

DataTable(s) are permitted to use the same URN values which indicates that the DataTable(s) share a common DataRecord format.

updateID

Required. xsd:unsignedInt. Identifies the current update ID for the DataTable.

5.5.12 **A ARG TYPE DataTableInfo**

This required state variable shall define a **string** argument that contains an XML document which conforms to the XML Schema UPnP DataStore DataTableInfo [17]. This document is used to identify and define the properties of a DataTable within a DataStore.

```
<?xml version="1.0" encoding="UTF-8"?>
<DataTableInfo xmlns="urn:schemas-upnp-org:ds:dtinfo"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:dtinfo
    http://www.upnp.org/schemas/ds/dtinfo.xsd"

  tableGUID="ID of DataTable"
  tableURN="URN of DataTable"
  updateID="UpdateID of DataTable"
>

  <datatablegroups>
    <datastoregroup groupName="Name of DataStore group" />

    ... Additional <datastoregroup> elements ...

  </datatablegroups>

  <datatableroles>
    <datatablerole name="Public | Basic - Dev Protection builtin roles">
      Read, Write - CSV of DataStore table permissions
    </datatablerole>

    ... Additional <datatablerole> elements ...

  </datatableroles>

  <datatableretain count="Max DataRecord Count"
    duration="Max DataRecord Duration" />

  <datarecord>
    <field name="Name of DataItem"
      type="Type of DataItem"
      encoding="Encoding of DataItem"
      required="0|1 1 = DataItem is mandatory"
      namespace="namespace (For XML-based DataItem)"
      tableprop="0|1 1 = DataItem refers to DataTable Dictionary"
    />

    ... Additional <field> elements ...

  </datarecord>

</DataTableInfo>
```

<?xml>

Allowed. Case sensitive.

<DataTableInfo>

Required. XML. Shall include a namespace declaration for the DataStore service DataTableInfo Schema [17] ("urn:schemas-upnp-org:ds:dtinfo"). Shall include the following elements.

tableGUID

Required. xsd:string. Each DataTable within a DataStore shall have a unique tableGUID value as indicated by this attribute. When a DataTable is being created, the tableGUID attribute shall be empty.

tableURN

Required. xsd:string. Each DataTable is allowed to specify a URN value as indicated by this attribute. See subclause 5.3.4, "DataTable URN" for permissible URN contents. This URN value shall identify the format of all DataRecord(s) contained in the corresponding DataTable. Separate DataTable(s) are permitted to use the same URN values which indicates that the DataTable(s) share a common DataRecord format.

updateID

Required. xsd:unsignedInteger. Identifies the current updateID for the DataTable. When a DataTable is being created, the updateID attribute shall be ("0").

<datatablegroups>

Allowed. XML. Contains zero or more elements indicating DataStore groups this DataTable is a member of. Contains the following elements:

<datastoregroup>

Allowed. xsd:string. Each element shall provide a single DataStore group the DataTable is a member of. See groupName attribute.

groupName

Required xsd:string. The value of this attribute is an existing DataStore group which this table is (to be) a member of.

<datatableroles>

Allowed. XML. Contains zero or more elements indicating access privileges for non-group specific control point roles. Contains the following elements:

<datatablerole>

Allowed. xsd:string. The value of this element is a CSV list of allowable actions for the control point role indicated by the name attribute. The allowed values of this element are: "Read", "Write".

name

Required. xsd:string. The value of this attribute a control point device protection role. The allowed values for this attribute are: "Public" or "Basic".

<datatableretain>

Allowed. XML. Defines the properties of a DataTable supported by this DataStore service. Contains the following attributes:

count

Required. xsd:integer. This attribute specifies the maximum number of DataRecord(s) to be retained in the DataTable. When this count is exceeded, the oldest DataRecord(s) present in the indicated DataTable shall be discarded. A value of 0 for the count attribute indicates that the number of retained DataRecord(s) is not limited. In order to facilitate efficient implementation of this requirement, a DataTable is permitted to exceed the indicated number of DataRecord(s) for a period not to exceed 60s.

duration

Required. xsd:duration. specifies the maximum age for a given DataRecord. DataRecord(s) present in the DataTable which have exceeded the indicated duration shall be discarded. In order to facilitate efficient implementation of this requirement, a DataTable is permitted to retain otherwise expired DataRecord(s) for a period not to exceed 600s.

<datarecord>

Allowed. XML. This element defines the format for all DataRecord(s) contained in a given DataTable. The format of a DataRecord is specified by following included <field> elements which define individual DataItem(s) in a DataRecord.:

<field>

Required. XML. This element defines an individual Dataltem(s) in a DataRecord. Contains the following attributes:

name

Required. xsd:string. This attribute shall provide a unique name for each Dataltem within a DataRecord

type

Required. xsd:string. This attribute shall provide data type information for each Dataltem within a DataRecord. See *IoTManagementAndControl Architecture Overview* [8], subclause 4.3.3 "Dataltem Type" for further information.

encoding

Required. xsd:string. This attribute shall provide the encoding for this Dataltem. Allowable values for this attribute are either "ascii", "utf-8" or "base64". See *IoTManagementAndControl Architecture Overview* [8], subclause 4.3.4 "Dataltem Encoding" for further information.

required

Allowed. xsd:boolean. This attribute shall indicate whether a field element corresponding to a Dataltem must be present in DataRecord submitted to a DataStoreTable. An attribute value of ("1") indicates that a DataRecord shall contain a field element for the corresponding Dataltem. An attribute value of ("0") indicates that a DataRecord is permitted to omit the corresponding Dataltem.

namespace

Allowed. xsd:string. This attribute is permitted for Dataltems consisting of strings containing XML compliant documents. This attribute shall provide the expected namespace for the encoded document root element. If this attribute is present, implementations shall validate that the corresponding Dataltem is a valid XML document encoded following XML escaping rules. Implementations are permitted to perform further validate to insure consistency of the Dataltem with the XML namespace indicated by this attribute.

tableprop

Allowed. xsd:boolean. This attribute shall indicate that the corresponding Dataltem value contains to a DataTable Dictionary key. The DataStore service can be requested to automatically resolve this DataTable Dictionary key reference by using the Dataltem value to lookup the corresponding DataTable Dictionary entry. The value of this Dictionary entry is then returned as the Dataltem value when the corresponding DataRecord is read.

5.5.13 **A ARG TYPE DataTableResetReq**

This required state variable shall define a boolean value which enables various DataTable reset operations for the ResetDataStoreTable() action.

5.5.14 **A ARG TYPE DataRecordPropResolve**

This required state variable shall define a boolean value. If this argument is ("1") then the DataStore service shall attempt to resolve any DataRecord fields defined with the `tableprop` attribute by using the corresponding Dataltem value as a DataTable Dictionary key. The returned DataTable record shall contain the corresponding DataTable Dictionary key value. If the named DataTable Dictionary Key is missing the corresponding returned Dataltem shall be "null". If this argument is ("0") then the unresolved DataTable Dictionary key is returned for DataRecord fields defined with the `tableprop` attribute.

5.5.15 **A ARG TYPE DataRecords**

This required state variable shall define a string argument that contains an XML document which conforms to the XML Schema UPnP DataStore DataRecord [19]. This document is used to submit and retrieve DataRecord(s) from a DataStore service.

```

<?xml version="1.0" encoding="UTF-8"?>
<DataRecords xmlns="urn:schemas-upnp-org:ds:drecs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:drecs
    http://www.upnp.org/schemas/ds/drecs.xsd">

  <datarecord>
    <field name="Name of DataItem"
      type="Type of DataItem"
      encoding="Encoding of DataItem"
      namespace="namespace(For XML-based DataItem)">
      Value of DataItem
    </field>

    ...Additional <field> elements for DataItems in this record...

  </datarecord>

  ...Additional <datarecord> elements ...

</DataRecords>

```

<?xml>

Allowed. Case sensitive.

<DataRecords>

Required. XML. The `datarecords` element shall contain one or more `datarecord` child elements; each `datarecord` element providing the contents of an individual `DataRecord`. Shall include the following elements. Shall include a namespace declaration for the XML Schema UPnP DataStore `DataRecord` ("urn:schemas-upnp-org:ds:drecs").

<datarecord>

Required. XML. Each `<datarecord>` element shall contain zero or more `<field>` elements.

<field>

Required. xsd:string. Each `<datarecord>` element shall contain zero or more `field` elements. The value of this element carries the value of the corresponding named `Dataltem` as indicated by the field element's `name` attribute.

`name`

Required. xsd:string. Each `<field>` element shall designate a corresponding `Dataltem` by specifying its name as the value this attribute. A `<datarecord>` element is prohibited from containing multiple `<field>` elements with identical `name` attribute values. See `lotManagementAndControl Architecture Overview [8]`, subclause 4.3.1, "Dataltem Name" for encoding of the `name` attribute.

`type`

Allowed. xsd:string. This attribute shall provide data type information for each `Dataltem` within a `DataRecord`. See `lotManagementAndControl Architecture Overview [8]`, subclause 4.3.3, "Dataltem Type" for encoding of the `type` attribute.

Note: `Dataltem` type information is conveyed when transport connections are established rather than as part of each `DataRecord`. This information is provided for testing and diagnostic purposes.

`encoding`

Required. xsd:string. This attribute shall provide the encoding for this `Dataltem`. Allowable values for this attribute are either "[ascii](#)", "[utf-8](#)" or "[base64](#)". See `lotManagementAndControl Architecture Overview [8]`, subclause 4.3.4, "Dataltem Encoding" for encoding of the `encoding` attribute.

Note: `Dataltem` encoding information is conveyed when transport connections are established rather than as part of each `DataRecord`. This information is provided for testing and diagnostic purposes.

namespace

Allowed. xsd:string. This attribute is permitted for DataItems consisting of strings containing XML compliant documents. This attribute shall provide the expected namespace for the encoded document. If this attribute is present, implementations shall validate that the corresponding DataItem is a valid XML document encoded following XML escaping rules. Implementations are permitted to perform further validate to insure consistency of the DataItem with the XML namespace indicated by this attribute

Note: DataItem namespace information is conveyed when transport connections are established rather than as part of each DataRecord. This information is provided for testing and diagnostic purposes.

5.5.16 **A ARG TYPE DataRecordsStatus**

This required state variable shall define a string argument that contains an XML document which conforms to the XML Schema UPnP DataStore DataRecord Status [21] or an empty string. This document shall be generated when one or more DataRecords were not accepted. If all DataRecords were accepted, then an empty string shall be returned by this argument.

```
<?xml version="1.0" encoding="utf-8"?>
<DataRecordsStatus
  xmlns="urn:schemas-upnp-org:ds:drecstatus"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:schemas-upnp-org:ds:drecstatus
    http://www.upnp.org/schemas/ds/drecstatus-v1.xsd">

  <!-- For each input <datarecord> provided -->
  <datarecordstatus accepted="0|1" />

  ... Additional <datarecordstatus> elements ...

</DataRecordsStatus>
```

<?xml>

Required. Case Sensitive.

<DataRecordsStatus>

Required. Shall include the namespace declaration for the DataStore service DataRecordStatus Schema (urn:schema-upnp-org:ds:drecstatus). Shall include the following elements and attributes:

<datarecordstatus>

Required. XML. For each <datarecord> element in the original request, a corresponding <datarecordstatus> element shall be included.

accepted

Required. Boolean. This attribute shall be set to ("1") if the corresponding <datarecord> element was accepted by the transport server and to ("0") if the corresponding <datarecord> was rejected.

5.5.17 **A ARG TYPE DataTransportURL**

This required state variable shall define a **string** argument that conforms to Uniform Resource Locator syntax (see HyperText Transport Protocol – HTTP/1.1 [4]). The purpose of this URL is to enable clients of the DataStore service to submit asynchronous updates to a DataTable that is associated with the indicated URL value. See [GetDataStoreTransportURL\(\)](#) action for further protocol requirements.

5.6 Eventing and Moderation

Table 3 — Eventing and Moderation

| Variable Name | Evented | Moderation | |
|---------------|---------|-------------|----------|
| | | Moderated a | Criteria |

| Variable Name | Evented | Moderation | |
|---|------------|-------------|--------------------------------|
| | | Moderated a | Criteria |
| <u>LastChange</u> | <u>YES</u> | <u>YES</u> | Min 0.2 seconds between events |
| a <u>YES</u> = The state variable MUST be moderated with the criteria | | | |

5.6.1 Eventing of LastChange

The LastChange state variable is evented and moderated according to the GENA eventing mechanism as defined by the UPnP Device Architecture, version 1.0 [1]. When multiple object modifications occur within the same moderation period (as determined by the implementation), each change shall be accumulated in the LastChange state variable and shall be evented as a single event notification message after the current moderation period expires. After the event notification message has been sent to all subscribed control points, the value of the LastChange state variable is reset when an update to the LastChange state variable becomes necessary; that is: when the next event occurs. The resulting value is a fresh LastChange XML Document that contains a single element that represents the update (that is: it contains the first update event following the distribution of the previous event message to all subscribers). Subsequently, additional update elements are added to the LastChange XML Document until the current moderation period ends and the current value of the LastChange state variable (i.e. the current event message) is propagated to all event subscribers.

The LastChange state variable is not required to accumulate changes when the DataStore service is *off-line* nor when the DataStore service has no subscribers for events. When the DataStore service comes *on-line*, the LastChange state variable may be empty. It is not required to event changes that had been accumulated but not evented when the DataStore service last went *off-line*.

5.7 Actions

Table 4 — Actions

| Name | Device R/A ^a | Control Point R/A ^b |
|--|-------------------------|--------------------------------|
| <u>CreateDataStoreGroups()</u> | CA | A |
| <u>CreateDataStoreTable()</u> | CA | A |
| <u>DeleteDataStoreGroups()</u> | CR | A |
| <u>DeleteDataStoreTable()</u> | CR | A |
| <u>GetDataStoreTableKeyValue()</u> | R | A |
| <u>GetDataStoreGroups()</u> | R | A |
| <u>GetDataStoreInfo()</u> | R | R |
| <u>GetDataStoreTableInfo()</u> | R | R |
| <u>GetDataStoreTransportURL()</u> | R | A |
| <u>ModifyDataStoreTable()</u> | A | A |
| <u>ReadDataStoreTableRecords()</u> | R | A |
| <u>RemoveDataStoreTableKeyValue()</u> | CR | A |
| <u>ResetDataStoreTable()</u> | R | A |
| <u>SetDataStoreTableKeyValue()</u> | CA | A |
| <u>WriteDataStoreTableRecords()</u> | R | A |
| <p>a For a device this column indicates whether the action MUST be implemented or not, where <u>R</u> = REQUIRED, <u>O</u> = ALLOWED, <u>CR</u> = CONDITIONALLY REQUIRED, <u>CA</u> = CONDITIONALLY ALLOWED, <u>X</u> = Non-standard, add <u>-D</u> when deprecated (e.g., <u>R-D</u>, <u>O-D</u>).</p> <p>b For a control point this column indicates whether a control point MUST be capable of invoking this action, where <u>R</u> = REQUIRED, <u>A</u> = ALLOWED, <u>CR</u> = CONDITIONALLY REQUIRED, <u>CA</u> = CONDITIONALLY ALLOWED, <u>X</u> = Non-standard, add <u>-D</u> when deprecated (e.g., <u>R-D</u>, <u>O-D</u>).</p> | | |

5.7.1 CreateDataStoreGroups()

This conditionally allowed action declares new DataStore group name(s). A DataStore implementation may only employ predefined DataStore groups in which case this action shall not be implemented.

5.7.1.1 Arguments

Table 5 — Arguments for CreateDataStoreGroups()

| Argument | Direction | relatedStateVariable |
|---------------------------|-----------|-----------------------------------|
| <u>DataStoreGroupList</u> | <u>IN</u> | <u>A_ARG_TYPE_DataStoreGroups</u> |

5.7.1.2 Argument Descriptions

DataStoreGroupList: Provides an XML document [18] describing listing DataStore group identifiers to be declared.

5.7.1.3 Service Requirements

The DataStore service shall return error 704 if a declared group identifier already exists. Additionally, the DataStore service may reserve group names or group name prefixes based on external ecosystem requirements in which case error 715 shall be returned. This action shall make no changes to the DataStore unless all requested DataStore groups can be created.

5.7.1.4 Control Point Requirements When Calling The Action

A control point identity invoking this action must have sufficient privileges to create DataStore groups.

5.7.1.5 Dependency on Device State

None.

5.7.1.6 Effect on Device State

A LastChange event notification shall be generated due to this action. See LastChange state variable.

5.7.1.7 Errors

Table 6 — Error Codes for CreateDataStoreGroups()

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 701 | Invalid XML argument | The (DataStoreGroupList) argument XML document is not valid. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 704 | Invalid group(s). | The DataStore group(s) already exist or are reserved by the implementation. |
| 715 | Reserved group name. | The DataStore group name has been reserved for use by the implementation. |

5.7.2 CreateDataStoreTable()

This conditionally allowed action creates a new DataTable. A DataStore implementation may only employ predefined DataStore tables in which case this action shall not be implemented.

5.7.2.1 Arguments

Table 7 — Arguments for **CreateDataStoreTable()**

| Argument | Direction | relatedStateVariable |
|----------------------|------------|---------------------------------|
| <u>DataTableInfo</u> | <u>IN</u> | <u>A_ARG_TYPE DataTableInfo</u> |
| <u>DataTableID</u> | <u>OUT</u> | <u>A_ARG_TYPE DataTableID</u> |

5.7.2.2 Argument Descriptions

DataTableInfo: Provides a UPnP DataStore DataTableInfo XML document [17] describing the DataTable to be created in the indicated DataStore.

DataTableID: Returns a unique GUID assigned to the newly created DataTable. This GUID value shall also be identical to the `tableGUID` attribute value in the UPnP DataStore DataStoreInfo XML document returned by the GetDataStoreInfo() action.

5.7.2.3 Service Requirements

If this action is implemented, then the DeleteDataStoreTable() action shall also be implemented.

5.7.2.4 Control Point Requirements When Calling The Action

A control point identity invoking this action must have sufficient privileges to create a DataTable in the target DataStore. A control point identity with an Admin role may create any DataTable subject to any additional device ecosystem constraints. Otherwise, the control point must have a ds:Master#[GroupName] role for any DataStore groups indicated in the `<datatablegroups>` element of the UPnP DataStore DataTableInfo XML document.

5.7.2.5 Dependency on Device State

None.

5.7.2.6 Effect on Device State

A LastChange event notification shall be generated due to this action. See LastChange state variable.

5.7.2.7 Errors

Table 8 — Error Codes for **CreateDataStoreTable()**

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 701 | Invalid XML argument | The (DataTableInfo) argument XML document is not valid. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 704 | Invalid group(s). | The DataStore group(s) do not exist. |
| 705 | Invalid role(s) or permission(s). | The DataTable Role(s) or Permission(s) do not exist. |
| | | |

5.7.3 DeleteDataStoreGroups()

This conditionally required action deletes DataStore groups. This action shall be implemented if the CreateDataStoreGroups() action is supported.

5.7.3.1 Arguments

Table 9 — Arguments for DeleteDataStoreGroups()

| Argument | Direction | relatedStateVariable |
|---------------------------|-----------|-----------------------------------|
| <u>DataStoreGroupList</u> | <u>IN</u> | <u>A_ARG_TYPE_DataStoreGroups</u> |

5.7.3.2 Argument Descriptions

DataStoreGroupList: Provides a UPnP DataStore DataStoreGroups XML document [18] listing DataStore groups to be deleted.

5.7.3.3 Service Requirements

A control point identity invoking this action must have sufficient privileges to create DataStore groups. This action shall fail with error code 710 if the DataStore contains any DataTable(s) which reference any of the DataStore groups to be deleted.

5.7.3.4 Control Point Requirements When Calling The Action

A control point identity invoking this action must have sufficient privileges to create a DataTable in the target DataStore. A control point identity with an Admin role may delete any DataStore group subject to any additional device ecosystem constraints.

5.7.3.5 Dependency on Device State

None.

5.7.3.6 Effect on Device State

A LastChange event notification shall be generated due to this action. See LastChange state variable.

5.7.3.7 Errors

Table 10 — Error Codes for DeleteDataStoreGroups()

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 701 | Invalid XML argument | The (DataStoreGroupList) argument XML document is not valid. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 704 | Invalid group(s). | The DataStore group(s) do not exist. |
| 710 | Groups in use | The DataStore group(s) cannot be modified or deleted since they are currently referenced by DataTable(s). |
| | | |

5.7.4 DeleteDataStoreTable()

This conditionally required action deletes tables an existing DataTable. This action shall be implemented if the CreateDataStoreTable() action is supported.

5.7.4.1 Arguments

Table 11 — Arguments for DeleteDataStoreTable()

| Argument | Direction | relatedStateVariable |
|----------|-----------|----------------------|
|----------|-----------|----------------------|

| Argument | Direction | relatedStateVariable |
|------------------------------------|---------------------------|---|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableID</u> |

5.7.4.2 Argument Descriptions

[DataTableID](#): This argument shall provide an identifier associated with the target DataTable.

5.7.4.3 Service Requirements

A control point identity invoking this action must have sufficient privileges to delete a DataTable in the target DataStore. A control point identity with an [Admin](#) role may delete any DataTable subject to any additional device ecosystem constraints. Otherwise, the control point must have a [ds:Master#\[GroupName\]](#) role for any DataStore groups indicated in the `<datatablegroups>` element of the DataTable. The DataStore service shall insure that any existing DataTable connections are correctly terminated. Specifically, transport connections associated with the deleted DataTable shall be closed after returning status for any pending operations. Previously issued transport URLs associated with the DataTable shall be invalidated.

5.7.4.4 Control Point Requirements When Calling The Action

A control point identity invoking this action shall have sufficient privileges to delete the indicated DataTable.

5.7.4.5 Dependency on Device State

None.

5.7.4.6 Effect on Device State

A LastChange event notification shall be generated due to this action. See LastChange state variable.

5.7.4.7 Errors

Table 12 — Error Codes for [DeleteDataStoreTable\(\)](#)

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| | | |

5.7.5 [GetDataStoreTableKeyValue\(\)](#)

This required action returns the requested DataTable Dictionary key value for the indicated DataTable.

5.7.5.1 Arguments

Table 13 — Arguments for [GetDataStoreTableKeyValue\(\)](#)

| Argument | Direction | relatedStateVariable |
|----------|-----------|----------------------|
|----------|-----------|----------------------|

| Argument | Direction | relatedStateVariable |
|--------------------------|------------|-------------------------------------|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableID</u> |
| <u>DataTableKeyName</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableKeyName</u> |
| <u>DataTableKeyValue</u> | <u>OUT</u> | <u>A_ARG_TYPE_DataTableKeyValue</u> |

5.7.5.2 Argument Descriptions

DataTableID: This argument shall provide an identifier associated with the target DataTable.

DataTableKeyName: This argument identifies the DataTable Dictionary key value to be returned.

DataTableKeyValue: This argument returns the value of the requested DataTable Dictionary key.

5.7.5.3 Service Requirements

The DataStore service shall verify that the requesting control point identity has sufficient privileges to read the referenced DataTable.

5.7.5.4 Control Point Requirements When Calling The Action

A control point identity invoking this action shall have sufficient privileges to read the indicated DataTable.

5.7.5.5 Dependency on Device State

None.

5.7.5.6 Effect on Device State

None.

5.7.5.7 Errors

Table 14 — Error Codes for GetDataStoreTableKeyValue()

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 707 | Key name not found | The indicated DataTable Dictionary KeyName was not found. |
| | | |

5.7.6 GetDataStoreGroups()

This required action returns an XML document [18] listing currently defined DataStore group identifiers.

5.7.6.1 Arguments

Table 15 — Arguments for GetDataStoreGroups()

| Argument | Direction | relatedStateVariable |
|---------------------------|------------|-----------------------------------|
| <u>DataStoreGroupList</u> | <u>OUT</u> | <u>A_ARG_TYPE_DataStoreGroups</u> |

5.7.6.2 Argument Descriptions

DataStoreGroupList: This argument returns a UPnP DataStore DataStoreGroups XML document [18] containing DataStore groups.

5.7.6.3 Service Requirements

If DeviceProtection is implemented, then this action shall only include DataStore group identifiers the invoking control point identity can access. Otherwise, this action shall return all available DataStore group identifiers currently declared.

5.7.6.4 Control Point Requirements When Calling The Action

None.

5.7.6.5 Dependency on Device State

None.

5.7.6.6 Effect on Device State

None.

5.7.6.7 Errors

Table 16 — Error Codes for GetDataStoreGroups()

| ErrorCode | errorDescription | Description |
|-----------|------------------|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| | | |

5.7.7 GetDataStoreInfo()

This required action returns information about DataStore DataTable(s) currently supported by this DataStore service.

5.7.7.1 Arguments

Table 17 — Arguments for GetDataStoreInfo()

| Argument | Direction | relatedStateVariable |
|----------------------|------------|---------------------------------|
| <u>DataStoreInfo</u> | <u>OUT</u> | <u>A_ARG_TYPE_DataStoreInfo</u> |

5.7.7.2 Argument Descriptions

DataStoreInfo: This argument returns a UPnP DataStore DataStoreInfo XML document [16] describing DataTable(s) supported by this DataStore service.

5.7.7.3 Service Requirements

If DeviceProtection is supported, then the DataStore service shall only return information about DataTable(s) which the invoking control point identity has access to.

5.7.7.4 Control Point Requirements When Calling The Action

None.

5.7.7.5 Dependency on Device State

None.

5.7.7.6 Effect on Device State

None.

5.7.7.7 Errors

Table 18 — Error Codes for GetDataStoreInfo()

| ErrorCode | errorDescription | Description |
|-----------|------------------|-------------|
|-----------|------------------|-------------|

| ErrorCode | errorDescription | Description |
|-----------|------------------|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| | | |

5.7.8 **GetDataStoreTableInfo()**

This required action shall return an XML document containing information about the DataTable associated the DataTableID argument.

5.7.8.1 Arguments

Table 19 — Arguments for **GetDataStoreTableInfo()**

| Argument | Direction | relatedStateVariable |
|----------------------|------------|---------------------------------|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE DataTableID</u> |
| <u>DataTableInfo</u> | <u>OUT</u> | <u>A_ARG_TYPE DataTableInfo</u> |

5.7.8.2 Argument Descriptions

DataTableID: This argument shall identify a DataTable associated with the value of this argument

DataTableInfo: This argument shall return a UPnP DataStore DataTableInfo XML document [17] describing the DataTable identified by the DataTableID argument.

5.7.8.3 Service Requirements

If DeviceProtection is supported, this action shall only succeed if the invoking control point identity has sufficient access privileges.

5.7.8.4 Control Point Requirements When Calling The Action

None.

5.7.8.5 Dependency on Device State

None.

5.7.8.6 Effect on Device State

None.

5.7.8.7 Errors

Table 20 — Error Codes for **GetDataStoreTableInfo()**

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| | | |

5.7.9 **GetDataStoreTransportURL()**

This required action shall return a URL which provides streaming write access to the identified DataTable.

5.7.9.1 Arguments**Table 21 — Arguments for GetDataStoreTransportURL()**

| Argument | Direction | relatedStateVariable |
|-------------------------|------------|------------------------------------|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableID</u> |
| <u>DataTransportURL</u> | <u>OUT</u> | <u>A_ARG_TYPE_DataTransportURL</u> |

5.7.9.2 Argument Descriptions

DataTableID: This argument shall provide an identifier associated with the target DataTable.

DataTransportURL: This argument shall return a URL which can support HTTP-POST requests to the DataTable identified by the DataTableID argument.

5.7.9.3 Service Requirements

If DeviceProtection is supported, this action shall only succeed if the invoking control point identity has sufficient access privileges. The DataStore service shall accept a HTTP-POST request to the URL provided by this action. The *request-body* of this HTTP-POST shall consist of a <DataRecords> element containing zero or more <dataRecord> elements. The DataStore service shall respond to this HTTP-POST request with HTTP status 200. If an error is encountered during updating of the DataTable, the DataStore service shall respond to the HTTP-POST with a <DataRecordsStatus> element indicating which DataRecord(s) were successfully written. See subclause 5.3.10, "DataTable HTTP/HTTPS Transport Protocol" for further information.

5.7.9.4 Control Point Requirements When Calling The Action

None.

5.7.9.5 Dependency on Device State

None.

5.7.9.6 Effect on Device State

None.

5.7.9.7 Errors**Table 22 — Error Codes for GetDataStoreTransportURL()**

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 706 | No transport URLs available. | All available TransportURLs for the indicated DataTable have been allocated. |
| | | |

5.7.10 ModifyDataStoreTableInfo()

This allowed action supports modification of selected elements of an existing DataTable indicated by the DataTableID argument.

5.7.10.1 Arguments

Table 23 — Arguments for **ModifyDataStoreTableInfo()**

| Argument | Direction | relatedStateVariable |
|---------------------------------|-----------|---|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableID</u> |
| <u>DataTableInfoElementOrig</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableInfoFragment</u> |
| <u>DataTableInfoElementNew</u> | <u>IN</u> | <u>A_ARG_TYPE_DataTableInfoFragment</u> |

5.7.10.2 Argument Descriptions

DataTableID: This argument shall provide an identifier associated with the target DataTable.

DataTableInfoElementOrig: This argument contain shall provide an XML fragment from the target DataTable's UPnP DataStore DataTableInfo XML document [17]. If a new element is being added to the target DataTable, then an empty top-level element shall be provided. The XML fragment provided shall start with one of the following DataTable XML elements:

- <datatableretain>
- <datatableroles>
- <datatablegroups>

The contents of this argument shall be consistent with the current DataTable state except as noted above for new elements.

DataTableInfoElementNew: This argument shall contain an updated copy of the XML fragment from to be replaced or added in the target DataTable.

5.7.10.3 Service Requirements

If DeviceProtection is supported, this action shall only succeed if the invoking control point identity has sufficient access privileges. A control point with an Admin role may modify any of the DataTable elements listed above. Otherwise, if the control point is modifying the <datatablegroups> or <datatableretain> elements, then the control point shall have ds:Master#[GroupName] roles for all existing groups the DataTable currently references and also ds:Master#[GroupName] roles for any additional groups to be added. If the control point is modifying or adding a <datatablesroles> element, then the control point shall either have an Admin role or shall have ds:Master#[GroupName] roles for all existing groups the DataTable currently references.

There are a number of semantic conditions that may cause an implementation to reject a DataTable modification request. These include: attempts to modify DataTable elements other than listed in the action description; a DataTableInfoElementOrig argument which is not consistent with the current DataTable state; a DataTableInfoElementNew argument missing elements specified by the DataTableInfoElementOrig argument. For modifications which are not rejected due to incorrect group or device protection issues, error code 714 shall be returned. However, it is recommended that implementation(s) provide additional supporting diagnostics to assist in identifying the causes of rejected modification requests.

5.7.10.4 Control Point Requirements When Calling The Action

None.

5.7.10.5 Dependency on Device State

None.

5.7.10.6 Effect on Device State

A LastChange event notification (updateType attribute values: "G" or "O") shall be generated due to this action. See LastChange state variable.

5.7.10.7 Errors

Table 24 — Error Codes for [ModifyDataStoreTableInfo\(\)](#)

| ErrorCode | errorDescription | Description |
|-----------|--|--|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 701 | Invalid XML argument | The (<u>DataTableInfoElementOrig</u> or <u>DataTableInfoElementNew</u>) argument XML elements are not valid. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 704 | Invalid group(s). | The DataStore group(s) do not exist. |
| 705 | Invalid role(s) or permission(s). | The DataTable Role(s) or Permission(s) do not exist. |
| 714 | DataTable modification not acceptable | The DataTable modification requested is not acceptable due to semantic errors. |

5.7.11 [ReadDataStoreTableRecords\(\)](#)

This required action shall return DataRecord(s) from the DataTable indicated by the [DataTableID](#) argument. The [DataRecordFilter](#) argument may specify a string to indicate which DataRecord(s) shall be returned.

5.7.11.1 Arguments

Table 25 — Arguments for [ReadDataStoreTableRecords\(\)](#)

| Argument | Direction | relatedStateVariable |
|--|----------------------------|---|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE DataTableID</u> |
| <u>DataRecordFilter</u> | <u>IN</u> | <u>A_ARG_TYPE DataRecordFilter</u> |
| <u>DataRecordStart</u> | <u>IN</u> | <u>A_ARG_TYPE DataRecordIndex</u> |
| <u>DataRecordCount</u> | <u>IN</u> | <u>A_ARG_TYPE DataRecordCount</u> |
| <u>DataRecordPropResolve</u> | <u>IN</u> | <u>A_ARG_TYPE DataRecordPropResolve</u> |
| <u>DataRecords</u> | <u>OUT</u> | <u>A_ARG_TYPE DataRecords</u> |
| <u>DataRecordContinue</u> | <u>OUT</u> | <u>A_ARG_TYPE DataRecordIndex</u> |

5.7.11.2 Argument Descriptions

[DataTableID](#): This argument shall provide an identifier associated with the target *DataTable*.

[DataRecordFilter](#): This argument shall contain a string used to qualify *DataRecord(s)* to be returned by this action. This argument shall either be the empty string indicating no filter is to be applied or a string containing an *DataRecordFilter* XML document [20]. See [A_ARG_TYPE DataRecordFilter](#) for additional details.

[DataRecordStart](#): This argument shall contain the starting point if multiple invocations of this action are required to return all matching *DataRecord(s)*. A value of ("[0](#)") indicates that the first available *DataRecord* shall be considered. See the [DataRecordContinue](#) argument for additional details

[DataRecordCount](#): This argument shall indicate the maximum number of matching *DataRecord(s)* to be returned by this invocation. A value of ("[0](#)") indicates that no limit on the number of *DataRecord(s)* returned.

DataRecordPropResolve: If this argument is ("1") then the DataStore service shall attempt to resolve any DataRecord fields defined with the `tableprop` attribute value of ("1") by using the corresponding Dataltem value as a DataTable Dictionary key. The returned DataTable record Dataltem shall contain the corresponding DataTable Dictionary key's value. If the named DataTable Dictionary key is missing, the corresponding returned Dataltem shall be empty. If this argument is ("0") then the unresolved DataTable key is returned for the Dataltem value.

DataRecords: This argument shall return a UPnP DataStore DataRecord XML document containing DataRecord(s).

DataRecordContinue: This argument provides a value to be provided by the **DataRecordStart** argument to continue reading DataRecord(s) from the point at which a prior **ReadDataStoreTableRecords()** action had stopped. The previous **ReadDataStoreTableRecords()** action may have stopped due to satisfying the number of records specified by the **DataRecordCount** argument or due to a lack of available DataRecord(s). Note: The meaning of **DataRecordStart** and **DataRecordContinue** argument values other than ("0") are implementation specific.

5.7.11.3 Service Requirements

If DeviceProtection is supported, this action shall only succeed if the invoking control point identity has sufficient access privileges.

When specifying **DataRecordStart** values based on a prior **DataRecordContinue** value, the implementation may determine that the DataRecord being referred to no longer exist in the DataTable due to DataRecord retention criteria. In this case error code 711 shall be returned.

5.7.11.4 Control Point Requirements When Calling The Action

None.

5.7.11.5 Dependency on Device State

None.

5.7.11.6 Effect on Device State

None.

5.7.11.7 Errors

Table 26 — Error Codes for **ReadDataStoreTableRecords()**

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 701 | Invalid XML argument | The (<u>DataRecordFilter</u>) argument XML elements are not valid. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 709 | Invalid filter | The filter argument (DataRecordFilter) is not valid. |
| 711 | Invalid record index | The record index argument (DataRecordStart) is no longer valid. |
| | | |

5.7.12 RemoveDataStoreTableKeyValue()

This conditionally required action removes the indicated DataTable Dictionary Key. This action shall be implemented if the SetDataStoreTableKeyValue() action is supported.

5.7.12.1 Arguments**Table 27 — Arguments for RemoveDataStoreTableKeyValue()**

| Argument | Direction | relatedStateVariable |
|-------------------------|-----------|------------------------------------|
| <u>DataTableID</u> | <u>IN</u> | <u>A_ARG_TYPE DataTableID</u> |
| <u>DataTableKeyName</u> | <u>IN</u> | <u>A_ARG_TYPE DataTableKeyName</u> |

5.7.12.2 Argument Descriptions

DataTableID: This argument shall provide an identifier associated with the target DataTable.

DataTableKeyName: This argument identifies the *DataTable* Dictionary key to be removed.

5.7.12.3 Service Requirements

The DataStore service shall verify that the requesting control point identity has sufficient privileges to write the referenced DataTable.

5.7.12.4 Control Point Requirements When Calling The Action

A control point identity invoking this action shall have sufficient privileges to write the indicated DataTable.

5.7.12.5 Dependency on Device State

None.

5.7.12.6 Effect on Device State

A LastChange event notification (updateType attribute values: "P") shall be generated due to this action. See LastChange state variable.

5.7.12.7 Errors**Table 28 — Error Codes for RemoveDataStoreTableKeyValue()**

| ErrorCode | errorDescription | Description |
|-----------|--|---|
| 400-499 | TBD | See UPnP Device Architecture clause on Control. |
| 500-599 | TBD | See UPnP Device Architecture clause on Control. |
| 600-699 | TBD | See UPnP Device Architecture clause on Control. |
| 702 | DataTable not found | The DataTable indicated by DataTableID cannot be found. |
| 703 | Insufficient role(s) or permission(s). | The control point does not have sufficient roles to perform the requested action. |
| 707 | Key name not found | The indicated DataTable Dictionary KeyName was not found. |
| 708 | Key name invalid | The key name provided is invalid (ex: empty string) |
| | | |

5.7.13 ResetDataStoreTable ()

This required action supports clearing all DataRecord(s), DataTable Dictionary entries and Transport URLs for the DataTable indicated by the DataTableID argument.

5.7.13.1 Arguments**Table 29 — Arguments for ResetDataStoreTable()**

| Argument | Direction | relatedStateVariable |
|----------|-----------|----------------------|
|----------|-----------|----------------------|