

[MS-DPWSRP]: Devices Profile for Web Services (DPWS): Shared Resource Publishing Data Structure

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Contents

1	Introduction	4
1.1	Glossary	4
1.2	References.....	4
1.2.1	Normative References.....	4
1.2.2	Informative References	5
1.3	Overview	5
1.4	Relationship to Protocols and Other Structures	5
1.5	Applicability Statement.....	5
1.6	Versioning and Localization	5
1.7	Vendor-Extensible Fields.....	6
2	Structures	7
2.1	The Shell Publishing Data Structure	7
2.1.1	Namespaces	7
2.1.2	Complex Types	7
2.1.2.1	pi	8
2.1.2.2	usersFilesDescription.....	8
2.1.2.3	o	8
2.1.2.4	il	9
2.1.2.5	i9	
2.1.3	Simple Types.....	10
2.1.3.1	serializedType	10
2.1.4	Encryption Rules	10
2.1.4.1	Data Signing	10
2.1.4.2	Data Encoding.....	10
2.1.4.2.1	Alphabet	10
2.1.4.2.2	Encoding	11
3	Structure Examples	13
3.1	Shell Publishing Data Structure Example.....	13
3.2	Signed XML Data	13
3.3	Base-64-Encoded Shell Publishing Data Structure Example	14
4	Security.....	17
4.1	Security Considerations for Implementers.....	17
4.2	Index of Security Fields	17
5	Appendix A: Product Behavior	18
6	Change Tracking.....	19
7	Index	21

1 Introduction

The Devices Profile for Web Services (DPWS): Shared Resource Publishing Data Structure describes the Shell Publishing data structure. This data structure is used by the HomeGroup Protocol to advertise shared files and folders in a HomeGroup peer-to-peer network environment.

1.1 Glossary

The following terms are defined in [\[MS-GLOS\]](#):

alias object
security identifier (SID)
SOAP
Universal Naming Convention (UNC)
XML
XML namespace
XML schema (XSD)

The following terms are specific to this document:

item ID list (ID list): A data structure that refers to a location. An **item ID list** is a multi-segment data structure. Each segment contains content defined by a data source that is responsible for a particular location in the namespace referred to by preceding segments.

HomeGroup: A group of one or more computers joined together through the HomeGroup Protocol, which are able to share resources (files, printers, and so on) with each other.

HomeGroup user: A user account on the **HomeGroup machine** where files are being shared.

HomeGroup machine: The machine where files are being shared, and that creates the Shell Publishing data structure.

Web Services on Devices (WSD): A function-discovery protocol used to discover and transfer Shell Publishing data structure in a HomeGroup network environment. Implementation details are specified in [\[DPWS\]](#).

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as described in [\[RFC2119\]](#). All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

References to Microsoft Open Specification documents do not include a publishing year because links are to the latest version of the documents, which are updated frequently. References to other documents include a publishing year when one is available.

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information. Please check the archive site, <http://msdn2.microsoft.com/en-us/library/E4BD6494-06AD-4aed-9823-445E921C9624>, as an additional source.

[DPWS] Chans, S., Conti, D., Schlimmer, J., et al., "Devices Profile for Web Services", February 2006, <http://specs.xmlsoap.org/ws/2006/02/devprof/devicesprofile.pdf>

[MS-SHLLINK] Microsoft Corporation, "[Shell Link \(.LNK\) Binary File Format](#)".

[MS-HGRP] Microsoft Corporation, "[HomeGroup Protocol Specification](#)".

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <http://www.rfc-editor.org/rfc/rfc2119.txt>

[RFC3548] Josefsson, S., Ed., "The Base16, Base32, and Base64 Data Encodings", RFC 3548, July 2003, <http://www.ietf.org/rfc/rfc3548.txt>

1.2.2 Informative References

[XMLNS] World Wide Web Consortium, "Namespaces in XML 1.0 (Second Edition)", August 2006, <http://www.w3.org/TR/2006/REC-xml-names-20060816/>

[MS-GLOS] Microsoft Corporation, "[Windows Protocols Master Glossary](#)".

1.3 Overview

This specification extends DPWS [\[DPWS\]](#) by adding the Shell Publishing data structure. The Shell Publishing data structure describes shared files and folders by each **HomeGroup user** on each **HomeGroup machine** in a **HomeGroup** network environment.

1.4 Relationship to Protocols and Other Structures

The Shell Publishing data structure is a data structure format made available to HomeGroup networked environment by a DPWS provider.

Shell Publishing Extension	This extension
DPWS	Industry standard
SOAP	Industry standard

1.5 Applicability Statement

Use of the Shell Publishing data structure is suitable when machines in a HomeGroup network environment share files and folders among HomeGroup members.

1.6 Versioning and Localization

This document covers versioning issues in the following areas:

- **Supported Transports:** This data structure uses the DPWS provider as the only transport.
- **Protocol Versions:** This data structure is not versioned.
- **Security and Authentication Methods:** This data structure does not support authentication. The data structure is signed using a HomeGroup public key (see [\[MS-HGRP\]](#) section 3.1.4.5).
- **Localization:** This data structure does not support localization.
- **Capability Negotiation:** This data structure does not support explicit capability negotiation.

1.7 Vendor-Extensible Fields

There are no vendor-extensible fields. The **XML schema** of the data structure is not validated, making it possible for vendors to extend the Shell Publishing data structure by adding additional elements and/or attributes. The extended data will not be interpreted unless consumed by the vendor who added it.

2 Structures

2.1 The Shell Publishing Data Structure

The Shell Publishing data structure describes a method of publishing and discovering shared files and folders in a HomeGroup configured network environment.

The Shell Publishing data structure MUST be transported using **WSD**. The WSD type MUST be ShellPublishing.

This structure uses SID structures as specified in [\[MS-DTYP\]](#) section 2.4.2.

An individual HomeGroup member MUST publish certain data about his or her shared files and folders as specified in section [2.1.2.1](#), in order to participate in the HomeGroup sharing.

The Shell Publishing XML data structure is defined as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
attributeFormDefault="unqualified">
  <xs:simpleType name="serializedType">
    <xs:restriction base="xs:string">
      <xs:pattern value="\{[A-Za-z0-9+/*\}]" />
    </xs:restriction>
  </xs:simpleType>
  <xs:element name="pi" type="pi" />
</xs:schema>
```

pi: A **pi** complex type, as specified in section [2.1.2.1](#). Published items. Serves as an envelope for descriptions of a HomeGroup user's shared files.

2.1.1 Namespaces

XML Namespace	Reference
http://www.w3.org/2001/XMLSchema	[XMLNS]

2.1.2 Complex Types

The following table summarizes the set of common XML schema complex types defined by this specification.

Complex Type	Description
pi	Published Items. The envelope for the description of shared files and folders.
usersFilesDescription	Describes shared files and folders per HomeGroup user, per HomeGroup machine in the HomeGroup.
o	Owner. Describes a HomeGroup user in the HomeGroup machine that is sharing the files and folders on the HomeGroup.
il	Items List. Describes a list of items that are being shared by a HomeGroup user in a HomeGroup machine on the HomeGroup.

Complex Type	Description
i	Item. This type describes a file or folder that is being shared by a HomeGroup user in a HomeGroup machine on the HomeGroup.

2.1.2.1 pi

```
<xs:element name="pi">
  <xs:complexType>
    <xs:element name="usersFilesDescription" type="usersFilesDescription" />
  </xs:complexType>
</xs:element>
```

usersFilesDescription: A description of the HomeGroup user's files. Defines the resources shared by a HomeGroup user on a HomeGroup machine.

2.1.2.2 usersFilesDescription

```
<xs:element name="usersFilesDescription">
  <xs:complexType>
    <xs:all>
      <xs:element name="o" type="o" />
      <xs:element name="il" type="il" />
    </xs:all>
  </xs:complexType>
</xs:element>
```

o: The owner of the shared resource. The owner is typically the HomeGroup user who designates a resource for sharing.

il: Contains a sequence of one or more items (the item list).

2.1.2.3 o

```
<xs:element name="o">
  <xs:complexType>
    <xs:annotation>
      <xs:documentation>owner information, attributes are user name, alias and
SID</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:attribute name="un" type="xs:string" />
      <xs:attribute name="a" type="xs:string" />
      <xs:attribute name="s" type="xs:string" />
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

un: The owner's user name (display name). This is the display name for the HomeGroup user on the HomeGroup machine sharing the files and folders on the HomeGroup.

a: The owner's alias. Describes the **alias object** of the HomeGroup user on the HomeGroup machine sharing the files and folders on the HomeGroup. This value MAY be used by the implementation as a hint for the HomeGroup user identity.

s: The SID (security identifier) of the account sharing the files on the HomeGroup machine. Describes the security identifier for the HomeGroup user on the HomeGroup machine that is sharing the files and folders on the HomeGroup.

2.1.2.4 il

```
<xs:element name="il">
  <xs:complexType>
    <xs:annotation>
      <xs:documentation>item list</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="i" minOccurs="1" maxOccurs="unbounded" type="i" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

i: An item in the item list. Contains a description of shared files and folders for the HomeGroup user on the HomeGroup machine.

2.1.2.5 i

```
<xs:element name="i" minOccurs="1" maxOccurs="unbounded">
  <xs:complexType>
    <xs:annotation>
      <xs:documentation>item, sub elements are path (absolute UNC or machine relative),
display name and BASE-64 encoded serialized shell link</xs:documentation>
    </xs:annotation>
    <xs:element name="p" type="xs:anyURI"/>
    <xs:element name="dn" type="xs:string"/>
    <xs:element name="sl" type="serializedType" minOccurs="0"/>
  </xs:complexType>
</xs:element>
```

i.p: An absolute **UNC** path or a relative machine path to the shared file or folder. If the path begins with a "\" then it is a machine-relative path. Relative paths are related to the HomeGroup machine where the message originated. The machine name is taken from the WSD Shell Publishing message that is transporting this data structure.

This element is used to access the shared resource if the shell link element **pi.usersFilesDescription.il.i.sl** is not present or if the HomeGroup machine originating the message has changed since the link was created.

dn: The display name of the item. The display name is sent so that if the message client implementation uses the display name, it is unnecessary to use additional protocols to retrieve the display name.

sl: A base-64-encoded binary stream representing a serialized shell link. The shell link references a file or folder shared by the HomeGroup user on the machine and contains the associated **item ID**

list. This information is sent so that if the implementation uses the item ID list, it is unnecessary to use additional protocols to retrieve the ID list. Shell Links are specified in [\[MS-SHLLINK\]](#).

This field uses nonstandard base-64 encoding as specified in section [2.1.4.2](#).

2.1.3 Simple Types

The following table summarizes the set of common XML schema simple type definitions defined by this specification.

Simple type	Description
serializedType	This is a base-64-encoded binary stream

2.1.3.1 serializedType

```
<xs:simpleType name="serializedType">
  <xs:restriction base="xs:string">
    <xs:pattern value="\{[A-Za-z0-9+/*]\}"/>
  </xs:restriction>
</xs:simpleType>
```

pattern: This value describes base-64 encoding using the following pattern: [\[A-Za-z0-9+/*\]](#)*

This field uses non-standard base-64 encoding as specified in section [2.1.4.2](#).

2.1.4 Encryption Rules

2.1.4.1 Data Signing

The Shell Publishing data structure MUST be signed using a HomeGroup public key ([\[MS-HGRP\]](#) section 3.1.4.5) prior to being encoded. To create the signature, the data structure is hashed and the hash value is encrypted using HomeGroup public key. This signature is then appended to the data structure.

2.1.4.2 Data Encoding

This data structure MUST be base-64 encoded after being signed and before being transported in a WSD message. The base-64 encoding used by this data structure is a modification on the standard encoding specified by [\[RFC3548\]](#). The alphabet used is the same, but the encoding algorithm is different (see [2.1.4.2.2](#)).

2.1.4.2.1 Alphabet

The base-64 alphabet used by this data structure is the following:

Value	Encoding	Value	Encoding	Value	Encoding	Value	Encoding
0	A	17	R	34	i	51	z
1	B	18	S	35	j	52	0
2	C	19	T	36	k	53	1

Value	Encoding	Value	Encoding	Value	Encoding	Value	Encoding
3	D	20	U	37	l	54	2
4	E	21	V	38	m	55	3
5	F	22	W	39	n	56	4
6	G	23	X	40	o	57	5
7	H	24	Y	41	p	58	6
8	I	25	Z	42	q	59	7
9	J	26	a	43	r	60	8
10	K	27	b	44	s	61	9
11	L	28	c	45	t	62	+
12	M	29	d	46	u	63	/
13	N	30	e	47	v		
14	O	31	f	48	w		
15	P	32	g	49	x		
16	Q	33	h	50	y		

2.1.4.2.2 Encoding

The data being encoded is manipulated at the 8-bit chunk (octet) borders. The lowest 6 bits are converted to an appropriate alphabet character. (The value represented by these 6 bits is converted to a corresponding character, shown in the table in [2.1.4.2.1](#)). The remaining 2 bits are combined with the next octet by making them the lowest 2 bits. And the process is repeated, with each step having 2 more extra bits until 6 bits remain, which are then converted to a character without the use of the next octet. The following diagram illustrates this process:

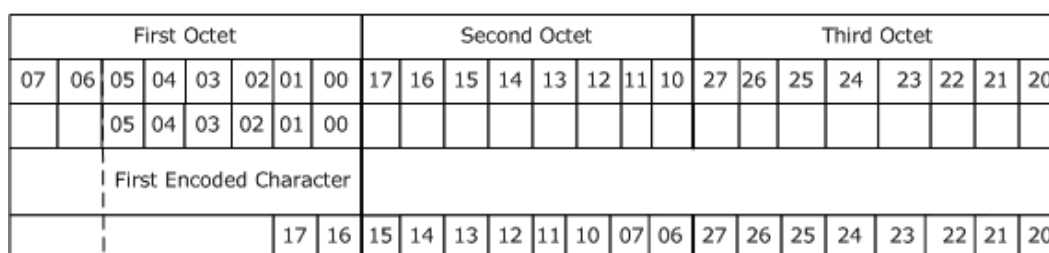


Figure 1: Data encoding at the 8-bit (octet) level

The lowest 6 bits of the second octet are converted to the next character, and the remaining 4 bits are moved to be the lowest 4 bits of the next octet.

First Octet								Second Octet								Third Octet							
						17	16	15	14	13	12	11	10	07	06	27	26	25	24	23	22	21	20
										13	12	11	10	07	06								
								Second Encoded Character															
												27	26	25	24	23	22	21	20	17	16	15	14
																		Third Encoded Character					
																		27	26	25	24	23	22
																		Fourth Encoded Character					

Figure 2: Data encoding of the lowest 6 bits and remaining 4 bits


```

0x0000: 01 00 00 9d 21 49 20 76
0x0008: ff 72 31 7f 31 5f 57 ef-22 ae 08 92 8e 08 29 5d
0x0028: cd 54 ab 8f 7e 9a 42 ea-a4 c1 03 07 41 38 62 77
0x0048: de 33 cb 83 c2 4f eb b2-cb 10 84 02 8b 22 4f d0
0x0068: 74 e2 04 c6 af 3c 23 8a-5d e3 7c c0 5b b1 84 c2
0x0088: 2c 95 67 aa ff 17 08 7a-48 52 0f 30 2b 6c cd 3d
0x00A8: 3a 24 97 67 0a 68 5d b2-8c 3c a9 d6 90 cf 18 3b
0x00C8: 69 c8 58 de 94 57 e8 39-30 98 0a 79 ac 44 85 02
0x00E8: 21 5e 5e cf 96 24 64 27-59 0a 98 cb 88 68 a5 66
0x0108: 14 1e e6 4a 7d ab e0 15-8e 5b 57 08 3d 7f 0c c3
0x0128: f3 d9 dc 68 95 48 8d 5d-e3 1d 42 3b d0 a1 33 ed
0x0148: f0 30 ea 0e 5c de ca 93-a5 c2 fe a5 72 0c c6 3b
0x0168: c6 aa dd 38 99 dd 44 22-f5 e0 d4 df 74 2a f3 4b
0x0188: 32 c5 55 59 c4 a1 a6 52-3f 9f a2 39 24 33 38 c5
0x01A8: 45 3b 9c f1 24 de be af-41 c0 6d 28 0e 5a 75 4c
0x01C8: 4a 64 5d b0 b0 6d d1 d2-39 2f 1c f3 64 f3 0c 3a
0x01E8: df 9f 00 ec 48 37 01 24-f7 a4 9a

```

3.3 Base-64-Encoded Shell Publishing Data Structure Example

This section contains a signed, base-64-encoded version of the Shell Publishing data structure example provided in section [3.1](#). The base-64 encoding has been applied to the structure after appending the signature given in section [3.2](#).

```

0x0000: TxAAAwzP4lGbgYXZyNXav5WPiEjLwICI
0x0020: l52YvRWaudWPiUFVG1COi8jPNoAPwlmP
0x0040: NoAIgwTdzVmczZUasV2cEV2cjJXawRXa
0x0060: v5mPNoAIGACI88GI15WPI4War9GbhJCI
0x0080: h1jIul2avxWYiAyc9IyUtETL10iMx0iM
0x00A0: lUTN3EDM4YzMtMDMyQjM2QTM2ETLxYjM
0x00C0: xITMxADM30SMwATMiAyL+OgCgACIgwTa
0x00E0: s5TDKACIGACIgwTa+0gCgACIGACIGACP
0x0100: w5DXVNXYyNHXul2avxWYcFEcwRUY0FGX
0x0120: S9WYt1mbnxVTPnmcvN3bmRHXx1mbk92d
0x0140: zxFTpJmchJXa1NHXNV3cpNmLslmYyFmc
0x0160: 51SbzzLw5TDKACIGACIGACI8MHb+0kQ
0x0180: BFUQFFkRDFUQBFUQBFUQBFUQBFUQBFUW
0x01A0: rdWQBRkQnFUQBFUVPV0Snh3YXB3YBZkM
0x01C0: K50TP5mVLhUUoR2UqpmeaxWeC1EdIFUQ
0x01E0: BFUQBFUQCFUQBFUQBFUQBFUQBFUQBFUQ
0x0200: BFUQZLUQBFUQIFUQBF0QBFUQBFUQBFUQ
0x0220: BFUQBFUQjFUQBFUSFFUQBdmSBFUQBNUQ
0x0240: BFUQRJUQBFUQBFUQBFUQBdWQbdnRY9Eb
0x0260: wMFU4VVU0FUMRNmVxU1RKFTVBRzVhJXO
0x0280: HJGa4ZVU3JESShmUYl1YKFjYoFzVhVHZ
0x02A0: Hh1TsJTW51jMjZnWHR2YkZVY1JlMinjT
0x02C0: IhVTs1WW5ZUbjBnVyM2YxUFZ6xmMZV3d
0x02E0: XFWaKhVW5xGWMRnTIFERPFBdXQBFBFUQ
0x0300: LZUQ4I0VO9mQMdHSpZXUOVUa390MahjY
0x0320: 1cDONxUQBFUyF0c3IHV1pnbBFVQBFUQ
0x0340: BFUQFVUQBFUUNRlQxU1dFZmSzsYKSFwQ
0x0360: SBHeMFUWNZTN2M3VDFUQBd2QBFUQBFE0
0x0380: CFUQBd2QBFUQBvNQRFWQzdUQ2JUQiFUR
0x03A0: HFEDBFUVB1URBFUQBFUQBFUQ0FUQBFBUR
0x03C0: 6VUU0x2TrJjczoxZ6dGRGVTFhGcyAXV

```

15 / 22

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0x0B40: BFUY0p3QjNkQBjKQINWRGdEzoJUQQF0Z
0x0B60: BFURBd3NrEXMPx0dwd1NzFkbfuQBF0Y
0x0B80: 3ATQBFUQB1UQBFUQBFBF0ZBFUQ
0x0BA0: BFUQBFBVUBFESBdnQBJVQFdUQwIUUZFUQ
0x0BC0: BF0VBdWVBVERBFBF0BFUQvFzTTdnSFFUS
0x0BE0: xIGaxcVY1R2RBhTQBNUQRFUQ2djcxDzc
0x0C00: B5WY0pWRjF3QBFUQBHVHVEFUQBFB0ZBFUQ
0x0C20: BFUQBFBF0BFUQBFBF0BFUQBTJ0diFUR
0x0C40: HFEdCFVYBRzRB5mQBFUQZJUQZJUUNFUQ
0x0C60: BFUQBd2V3AjQuFVQRR1SotWVQ5EbmhXQ
0x0C80: BFUQCF0QBFBVQBZ3Nyd1NzFkbhRHVINWc
0x0CA0: DFUQBFBVdURUQBFBF0BFUQBFBF0BFUQ
0x0CC0: BFUQBFBF0BFUQB5kQRFWQNdUQ5J0diFUT
0x0CE0: IFkdCdmWBFFSBFUQBdUQJZUQ4FUQBFBF0
0x0D00: BFUY0pnRjNkQBhFbtJ2a5IDZ6JUQQF0Z
0x0D20: BFURBd3NrEXMPx0dwd1NjJkbfuQBF0b
0x0D40: 3ATQBFUQB1UQBFUQBFBF0BFUQBFBF0
0x0D60: BFUQBdnVBt2RBVnQBpVQ4cUQzI0djFUQ
0x0D80: BF0VBF0VBVERBFBF0BFUQvFzTElnWFF0d
0x0DA0: VN1QKZVUTVDWNFUQBFBF0BFUQFF0d3sSc
0x0DC0: x8EW3B3V30USuFXQBFBF0BFUQV0LBFUQBFBUT
0x0DE0: BFUQBFBF0BFUQBFBF0BFUQBFBF0BFUQF0a
0x0E00: HFUaCd2YBV0RB1nQRFWQVdUQ6JUQBFB0Z
0x0E20: CFUUDdWTB1EdIFUQnd1NN1kbnFUUUZ1T
0x0E40: WNFR1gVT1dXVTNkQnRWQnFUQFF0d3sSc
0x0E60: x8EW3B3V30USuFXQBFBF0QRZzQCFUQBFBUS
0x0E80: BFUQBFBF0BFUQBFBF0BRVQBFBF0BFUUFUV
0x0EA0: IFkeCFVYB10RBVXQBJWQrdUQpJ0ZjFUR
0x0EC0: HFUeCFVZBBzQBRnQ3NWQBFBF0BJ0djF0Z
0x0EE0: HFEbCFkYBd3RBpXQn1UQ0MUQrJUQiF0d
0x0F00: HF0cBFFTB1ERBBTQR5UQnRUQwEUQBFB0b
0x0F20: CFUQBFBF0BFUUIFUQBFB0BFUQBFBF0TFUQ
0x0F40: BFkeU9ETXF3dPJWMww2ZvhTew90a5RDR
0x0F60: BFUQBFBF0BFUQBdmQBFBF0NFUQBFB0SXFUQ
0x0F80: BFUQBFBF0BRzVhJXOHJGaxM0YqJUQBFBF0
0x0FA0: BFUQBdGZNpFWBNHOz8iSWJXYvV1Txz1M
0x0FC0: y0EZPFTYjtyQ3VGSCJ3ZEF0QVFTOXRvY
0x0FE0: IR1MGFETvkjZTFTcHtEbqFGb05EVuRfd
0x1000: H5mdBN3MSd3S0E0ZBZF2FzaBFUQBFBF0
0x1020: 88yCs5TDKACIgACIgwzLp5TDKACIgACP
0x1040: vkGb+0gCgACpVU3clJ3cG1GblNHRlN3Y
0x1060: y1Gc012bu5TDKwzLwlmPAEAAA0ZIJBid
0x1080: /LXM/FzXX9uIuigkOiQKd1Mvr+ofaKk6
0x10A0: kG8AHEEOidn3zs8gC/06yuMEEKwii8E0
0x10C0: 0JOBG/KPjoYXjzHwbFLhCzSlnp6/Xgge
0x10E0: IJ1DwsCbN3jOkc5ZKgWXyyIPpaNkPjxO
0x1100: phMWeT5VondMYqQesSUhCEiXe9slkQ2J
0x1120: ZpAmLjIalaGFeYuS9tK4V4WXhQP/xww
0x1140: znN3oVJSN214dI0OQH6MtDPMq7AXer8k
0x1160: lKs/lKHdGvjxq2NOZ2NRiUP4U/NdQM/S
0x1180: yUcVZRcomK1PfKaOkMDOFX0OcGPJe77r
0x11A0: BBcbo4gW1xkSk1Fsw2W0SnzLcMPZzzgO
0x11C0: f/JAsj0NBQy9kqJ

4 Security

4.1 Security Considerations for Implementers

The Shell Publishing data structure relies on HomeGroup key signing to validate authenticity of the data.

4.2 Index of Security Fields

Security parameter	Section
HomeGroup public key	2.1.4.1

5 Appendix A: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include released service packs:

- Windows® 7 operating system
- Windows® Home Server 2011 server software

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior also applies to subsequent service packs of the product unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms SHOULD or SHOULD NOT implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that the product does not follow the prescription.

6 Change Tracking

This section identifies changes that were made to the [MS-DPWSRP] protocol document between the May 2011 and June 2011 releases. Changes are classified as New, Major, Minor, Editorial, or No change.

The revision class **New** means that a new document is being released.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements or functionality.
- An extensive rewrite, addition, or deletion of major portions of content.
- The removal of a document from the documentation set.
- Changes made for template compliance.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **Editorial** means that the language and formatting in the technical content was changed. Editorial changes apply to grammatical, formatting, and style issues.

The revision class **No change** means that no new technical or language changes were introduced. The technical content of the document is identical to the last released version, but minor editorial and formatting changes, as well as updates to the header and footer information, and to the revision summary, may have been made.

Major and minor changes can be described further using the following change types:

- New content added.
- Content updated.
- Content removed.
- New product behavior note added.
- Product behavior note updated.
- Product behavior note removed.
- New protocol syntax added.
- Protocol syntax updated.
- Protocol syntax removed.
- New content added due to protocol revision.
- Content updated due to protocol revision.
- Content removed due to protocol revision.
- New protocol syntax added due to protocol revision.

- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.
- New content added for template compliance.
- Content updated for template compliance.
- Content removed for template compliance.
- Obsolete document removed.

Editorial changes are always classified with the change type **Editorially updated**.

Some important terms used in the change type descriptions are defined as follows:

- **Protocol syntax** refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.
- **Protocol revision** refers to changes made to a protocol that affect the bits that are sent over the wire.

The changes made to this document are listed in the following table. For more information, please contact protocol@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
1.2 References	Added explanatory statement regarding the removal of the publishing year from Microsoft Open Specification document references.	N	Content updated.

7 Index

A

[Applicability](#) 5

B

[Base-64-encoded shell publishing data structure example](#) 14

C

[Change tracking](#) 19

Complex types

[i](#) 9

[il](#) 9

[o](#) 8

[overview](#) 7

[pi](#) 8

[usersFilesDescription](#) 8

D

Data

[encoding encryption rules](#) 10

[signing encryption rules](#) 10

[Data structures Shell Publishing](#) 7

Details

[complex types](#) 7

data

[encoding encryption rules](#) 10

[signing encryption rules](#) 10

[i complex type](#) 9

[il complex type](#) 9

[namespaces](#) 7

[o complex type](#) 8

[pi complex type](#) 8

[serializedType simple type](#) 10

[Shell Publishing data structure](#) 7

[simple types](#) 10

[usersFilesDescription complex type](#) 8

E

Encryption rules

data

[encoding](#) 10

[signing](#) 10

Examples

[base-64-encoded shell publishing data structure](#) 14

[shell publishing data structure](#) 13

[signed XML data](#) 13

F

[Fields - security index](#) 17

[Fields - vendor-extensible](#) 6

G

[Glossary](#) 4

I

[i complex type](#) 9

[il complex type](#) 9

[Implementer - security considerations](#) 17

[Index of security fields](#) 17

[Informative references](#) 5

[Introduction](#) 4

L

[Localization](#) 5

N

[Namespaces](#) 7

[Normative references](#) 4

O

[o complex type](#) 8

[Overview \(synopsis\)](#) 5

P

[pi complex type](#) 8

[Product behavior](#) 18

R

References

[informative](#) 5

[normative](#) 4

[Relationship to protocols and other structures](#) 5

S

Security

[field index](#) 17

[implementer considerations](#) 17

[serializedType simple type](#) 10

[Shell Publishing data structure](#) 7

[Shell publishing data structure example](#) 13

[Signed XML data example](#) 13

Simple types

[overview](#) 10

[serializedType](#) 10

Structures

[Shell Publishing](#) 7

[simple types](#) 10

T

[Tracking changes](#) 19

Types

[complex](#) 7

[simple](#) 10

U

[usersFilesDescription complex type](#) 8

V

[Vendor-extensible fields](#) 6

[Versioning](#) 5