[MC-DPL4CS]:
DirectPlay 4 Protocol:
Core and Service Providers Specification

Revision Summary

Date	Revision History	Revision Class	Comments
08/10/2007	0.1	Major	Initial Availability
09/28/2007	0.2	Minor	Updated the technical content.
10/23/2007	0.2.1	Editorial	Revised and edited the technical content.
01/25/2008	0.3.1	Editorial	Revised and edited the technical content.

Date	Revision History	Revision Class	Comments
11/30/2007	1.0	Major	Updated and revised the technical content.
01/25/2008	2.0	Major	Updated and revised the technical content.

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1 Introduction

This document specifies the core protocol services of the DirectPlay 4 Protocol.

1.1 Glossary

The following terms are defined in [MS-GLOS]:

Globally Unique Identifier (GUID)
Group
Little-Endian
Maximum Transmission Unit (MTU)
Unicode

The following terms are specific to this document:

Application ID: A **GUID** that uniquely identifies the **game**.

DirectPlay 4: A programming library that implements the IDirectPlay4 programming interface. **DirectPlay4** provides peer-to-peer session-layer services to applications, including session lifetime management, data management, and media abstraction. **DirectPlay4** first shipped with the **DirectX** 4 multimedia toolkit. Improved versions continued to ship up to, and including, **DirectX** 9. **DirectPlay4** was subsequently deprecated. The **DirectPlay4** library continues to ship in current versions of Windows operating systems, but is no longer supported by Microsoft development tools.

DirectX: Microsoft **DirectX** is a collection of application programming interfaces for handling tasks related to multimedia, especially game programming and video, on Microsoft platforms.

Game: An application that uses the DirectPlay 4 Protocol to communicate between computers.

Game Session: The metadata associated with the collection of computers participating in a single **instance** of a computer **game**.

Group ID: A 32-bit integer that uniquely represents a **group**.

Host: The computer responsible for responding to **game session** enumeration requests and maintaining the master copy of all the **player** and **group** lists for the **game**. One computer is designated as the **host** of the **game**.

Instance: A specific occurrence of a **game** running in a **game session**. A **game** application process or module may be created more than one time on a single system, or on separate systems. Each time a **game** application process or module is created, the occurrence is considered to be a separate **instance**.

Instance ID: A **GUID** that uniquely identifies an **instance** of the **game** running in a **game session**.

Player: Represents a person that is playing a computer **game**. There may be multiple players on a computer participating in a given **game session**.

Player ID: A 32-bit integer that uniquely represents a player.

Service Provider: A module that abstracts details of underlying transports for generic DirectPlay message transmission. Each DirectPlay message is transmitted by a DirectPlay **service provider**.

Shortcut: The name given to a child group contained in a parent **group**.

System Player: A specially designated **player** in a **game session** that receives system messages, including single messages that should be redistributed to one or more standard **players** in the **game**. Each **game session** has exactly one **system player**.

Tick Count: The count, in milliseconds, from when the system was booted.

Transmission Control Protocol (TCP): A connection-oriented protocol used with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet. **TCP** handles keeping track of the individual units of data (called packets) into which a message is divided for efficient routing through the Internet.

User Datagram Protocol (UDP): A common connectionless, datagram-oriented protocol that is used with the Internet Protocol (IP).

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

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.

[FIPS46-2] National Institute of Standards and Technology, "Federal Information Processing Standards Publication 46-2: Data Encryption Standard (DES)", December 1993, http://www.itl.nist.gov/fipspubs/fip46-2.htm

[FIPS46-3] National Institute of Standards and Technology, "Federal Information Processing Standards Publication 46-3: Data Encryption Standard (DES)", October 1999, http://csrc.nist.gov/publications/fips/fips46-3/fips46-3.pdf

[FIPS197] National Institute of Standards and Technology, "Federal Information Processing Standards Publication 197: Advanced Encryption Standard (AES)", November 2001, http://www.csrc.nist.gov/publications/fips/fips197/fips-197.pdf

[IANAPORT] Internet Assigned Numbers Authority, "Port Numbers", November 2006, http://www.iana.org/assignments/port-numbers

[MC-DPL4R] Microsoft Corporation, "DirectPlay 4 Protocol: Reliable Specification" September 2007.

[MC-DPLVP] Microsoft Corporation, "DirectPlay Voice Protocol Specification" September 2007.

[MS-ERREF] Microsoft Corporation, "Windows Error Codes", January 2007.

[MS-GLOS] Microsoft Corporation, "Windows Protocols Master Glossary", March 2007.

[MS-NLMP] Microsoft Corporation, "NT LAN Manager (NTLM) Authentication Protocol Specification", June 2007.

[MSDN-CAPI] Microsoft Corporation, "Cryptography", http://msdn2.microsoft.com/en-us/library/aa380255.aspx

[MSDN-CRYPTO] Microsoft Corporation, "Cryptography Reference", http://msdn2.microsoft.com/en-us/library/aa380256.aspx

[RC4-CRYPTO] RSA Laboratories, "Crypto FAQ: Chapter 3 Techniques in Cryptography: 3.6 Other Cryptographic Techniques: 3.6.3 What Is RC4?", http://www.rsa.com/rsalabs/node.asp?id=2250

[RFC768] Postel, J., "User Datagram Protocol", STD 6, RFC 768, August 1980, http://www.ietf.org/rfc/rfc768.txt

[RFC791] Postel, J., "Internet Protocol", STD 5, RFC 791, September 1981, http://www.ietf.org/rfc/rfc791.txt

[RFC793] Postel, J., "Transmission Control Protocol: DARPA Internet Program Protocol Specification", RFC 793, September 1981, http://www.ietf.org/rfc/rfc0793.txt

[RFC1321] Rivest, R. "The MD5 Message-Digest Algorithm", RFC 1321, April 1992, http://www.ietf.org/rfc/rfc1321.txt

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

[RFC2268] Rivest, R., "A Description of the RC2(r) Encryption Algorithm", RFC 2268, March 1998, http://www.ietf.org/rfc/rfc2268.txt

[SSPI] Microsoft Corporation, "SSPI", http://msdn2.microsoft.com/en-us/library/aa380493.aspx

[TDEA] National Institute of Standards and Technology, "Recommendation for the Triple Data Encryption Algorithm (TDEA) Block Cipher", Special Publication 800-67, May 2004.

1.2.2 Informative References

[MSDN-ALG_ID] Microsoft Corporation, "ALG_ID Data Type", http://msdn2.microsoft.com/en-us/library/aa375549.aspx

[MSDN-DXSDK] Microsoft Corporation, "The DirectX Software Development Kit", http://msdn2.microsoft.com/en-us/library/bb219737.aspx

[SOCKADDR] Microsoft Corporation, "Sockaddr", http://msdn2.microsoft.com/en-us/library/ms740496.aspx

1.3 Protocol Overview (Synopsis)

The DirectPlay 4 Protocol is a peer-to-peer protocol intended to allow computer **games** to manage metadata associated with many multiplayer computer games. It provides functionality that allows the game to:

- Enumerate the hosted sessions of the game.
- Connect to a game hosted on another computer.
- Enumerate the players and groups of players in an established game instance.
- Send data from one established instance of the game to another established instance of the game.

- Add and remove players from the game.

Because this is a peer-to-peer protocol, applications that participate in the protocol are typically not clients or servers; instead, each application participating in the protocol maintains its own version of the state of the protocol.

The first computer that started the game is designated as the host computer. The host computer holds the master set of game metadata and responds to requests to enumerate the game sessions and add players and groups.

When a game application decides to host a game, it configures the DirectPlay4 session using the following options.

DirectPlay Flag	Behavior
DPSESSION_NEWPLAYERSDISABLED 0x00000001	The **DirectPlay4** Host disables the creation of new players. Groups can continue to be added and managed. **Note** This flag is dynamic.
DPSESSION_MIGRATEHOST 0x00000004	If the DirectPlay4 host computer fails, the DirectPlay 4 Protocol will migrate the host computer to another machine. See section 3.1.6.2 for more information.
DPSESSION_NOMESSAGEID 0x00000008	If this option is set, the DirectPlay protocol won't include the **PlayerTo** and **PlayerFrom** field in player management messages (DPSP_MSG_PLAYERMSG, DPSP_MSG_DELETEPLAYER, DPSP_MSG_DELETEGROUP, DPSP_MSG_ADDPLAYERTOGROUP, DPSP_MSG_DELETEPLAYERFROMGROUP).
DPSESSION_NOPLAYERMGMT 0x00000010	The DirectPlay4 client won't generate player management messages (DPSP_MSG_PLAYERMSG, DPSP_MSG_DELETEPLAYER, DPSP_MSG_DELETEGROUP, DPSP_MSG_ADDPLAYERTOGROUP, DPSP_MSG_DELETEPLAYERFROMGROUP).
DPSESSION_JOINDISABLED 0x00000020	The DirectPlay 4 Protocol will no longer allow computers to join the session. Players and groups can continue to be added by computers already in the session. **Note** This flag is dynamic.
DPSESSION_KEEPALIVE 0x00000040	The DirectPlay 4 Protocol will periodically send DPSP_MSG_PING (section 2.2.42) messages to ensure that all computers in the session are still functioning.
DPSESSION_NODATAMESSAGES 0x00000080	The DirectPlay 4 Protocol will not send DPSP_MSG_PLAYERDATACHANGED (section 2.2.44) messages.
DPSESSION_SECURESERVER 0x00000100	The DirectPlay4 host computer will require all DirectPlay4 clients connecting to the computer to authenticate, as specified in sections 3.1.5.1 and 3.2.5.7. Players in the session may then sign and/or encrypt application data. **Note** This option is incompatible with the DPSESSION_MIGRATEHOST option.
DPSESSION_PRIVATE 0x00000200	Established instances of the game that wish to join should ensure the user has entered the desired password prior to initiating the connection.

DirectPlay Flag	Behavior
DPSESSION_PASSWORDREQUIRED 0x00000400	The game host will only reply to DPSP_MSG_ENUMSESSIONS (section 2.2.29) messages whose password matches the password of the session.
DPSESSION_MULTICASTSERVER 0x00000800	The DirectPlay4 client will transmit all game messages through the game host, which will then retransmit them to the various game clients. **Note** This flag is incompatible with the DPSESSION_MIGRATEHOST option.
DPSESSION_CLIENTSERVER 0x00001000	When joining a session, the game host will only transmit information about the **system players** on all the joined machines, not the normal players. **Note** This flag is incompatible with the DPSESSION_MIGRATEHOST option.
DPSESSION_DIRECTPLAYPROTOCOL 0x00002000	The DirectPlay4 client will use the DirectPlay 4 Reliable Protocol [MC-DPL4R] for communication from the DirectPlay client to the game host and other DirectPlay4 clients.
DPSESSION_NOPRESERVEORDER 0x00004000	When this option is set, the DirectPlay4 client will not ensure that packets are passed to the higher-level protocol in the order in which they were received.
DPSESSION_OPTIMIZELATENCY 0x00008000	Tells the DirectPlay 4 Protocol to optimize for latency.
DPSESSION_NOSESSIONDESCMESSAGES 0x00020000	When a game on the DirectPlay4 host updates session information, the DirectPlay4 host will not send a DPSP_MSG_SESSIONDESCCHANGED (section 2.2.51) message.

As other nascent game instances start on other computers, these instances use the DirectPlay 4 Protocol to enumerate established game sessions on the local network (a nascent game instance MAY ask the user to specify a specific game host and enumerate the list of sessions explicitly from that host).

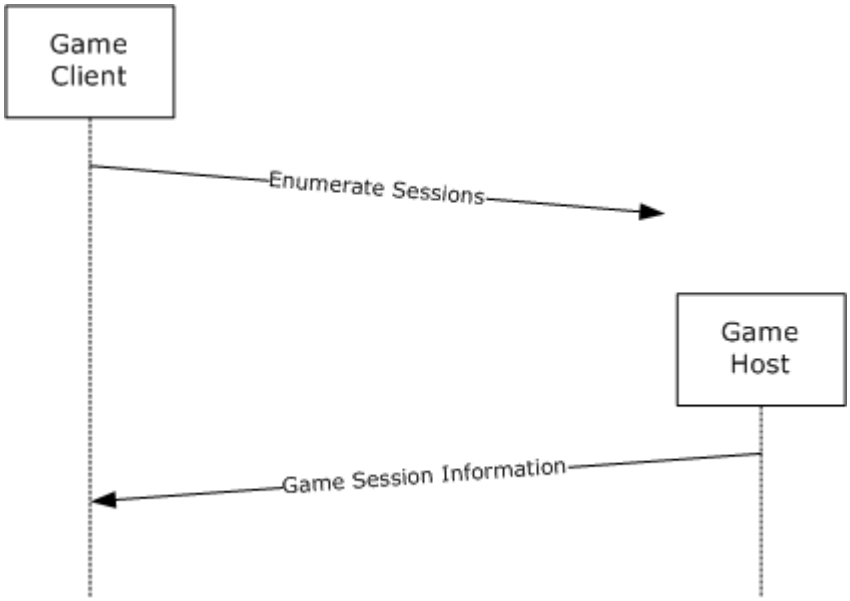


Figure 1: Diagram of session enumeration request and response

After enumerating the available sessions, the game may choose one session (typically after consulting with the user playing the game), and attempt to join the game session by requesting that the game host create a system player.

Once the system player for the client has been created, the game host will transmit the current set of game data to the joining nascent game instance, and will notify all established game instances about the nascent game instance.

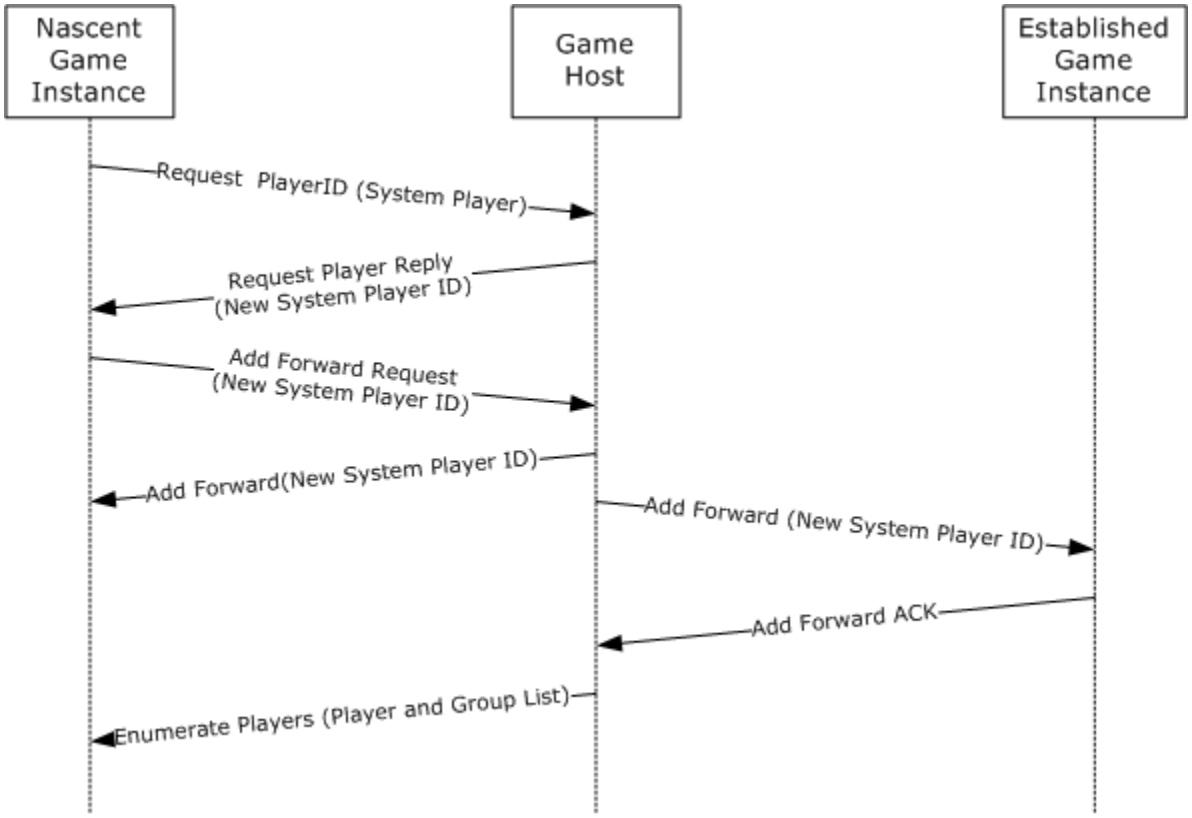


Figure 2: Diagram of a nascent game instance joining a game host and a third, established game instance

Once a nascent game instance has joined a session, it becomes an established game instance. Any established game instance can add players or groups by requesting a player ID from the game host, and transmitting information about the player to all of the established game instances, as shown in the following graphic.

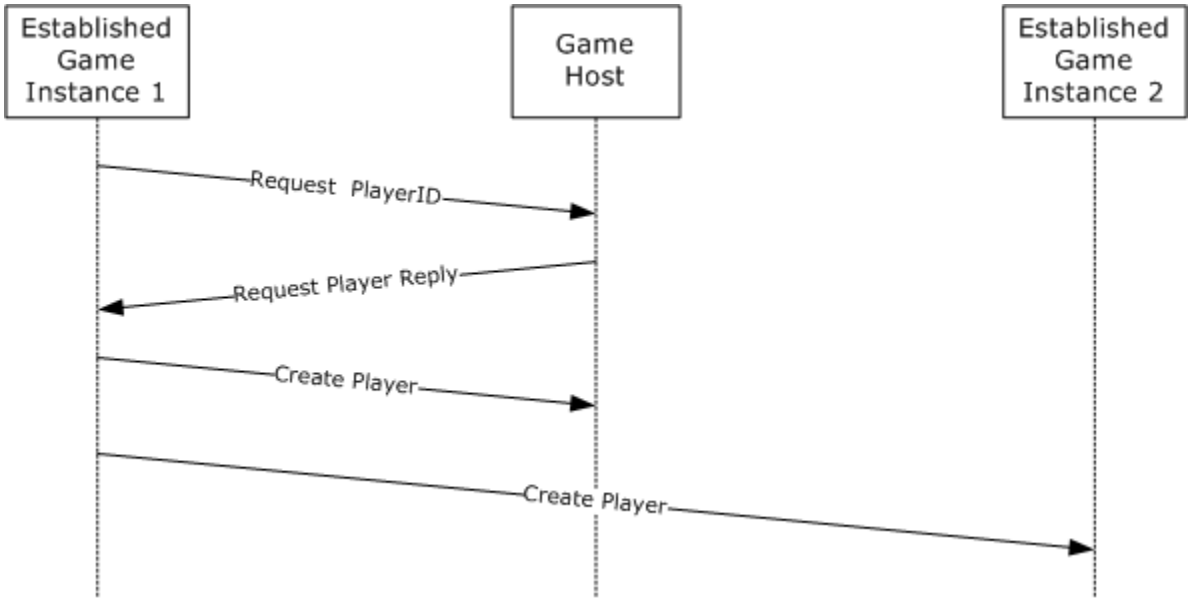


Figure 3: Diagram of an established game instance creating a non-system player

1.4 Relationship to Other Protocols

The DirectPlay 4 Core and Service Providers Protocol is transmitted via both the TCP and UDP protocols, as specified in [RFC791]. In addition, at the discretion of the game, all of the messages listed in this protocol may be transmitted via the DirectPlay 4 Reliable Protocol, as specified in [MC-DPL4R].

1.5 Prerequisites/Preconditions

The DirectPlay 4 Protocol requires the DirectX 6 runtime <1>.

1.6 Applicability Statement

The DirectPlay 4 Protocol is used when a game needs to communicate with other games. All of the functionality present in the DirectPlay 4 Protocol has been superseded by the DirectPlay 8 Protocol, and as such, the DirectPlay 4 Protocol should ONLY be used when the game has a requirement to interoperate with other DirectPlay4 games.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas.

- **Protocol Versions**: The DirectPlay 4 Core and Service Provider Protocol supports the following explicit dialects: "DX6VERSION", "DX61VERSION", "DX71VERSION", "DX8VERSION", "DX9VERSION". These dialects are defined in section 2.2.3 and are backward compatible.<2>
- **Capability Negotiation**: When joining a session, each client creates a "System Player" and reports the DirectPlay dialect supported by that client. The host MUST NOT ALLOW the connection of a client that does not have the capabilities of interoperating with the existing session.

1.8 Vendor-Extensible Fields

This protocol may be transmitted over network protocols other than the IP networking stack. The protocol includes a **Service Provider Data** field in the **DPLAYI_PACKEDPLAYER** structure (section 2.2.2) and the **DPLAYI_SUPERPACKEDPLAYER** structure (section 2.2.3) that can be used to transmit protocol-specific information.

Each game can also extend the protocol with per-player, per-group and per-game session data. The per-player and per-group data is specified in the **Player Data** field of the DPLAYI_PACKEDPLAYER structure (section 2.2.2) and the DPLAYI_SUPERPACKEDPLAYER structure (section 2.2.3). The per-game session data is contained in the **Application Defined 1** and **Application Defined 4** fields of the **DPSESSIONDESC2** structure (section 2.2.5).

This protocol uses HRESULT values as defined in [MS-ERREF] section 2.1. Vendors can define their own HRESULT values, provided they set the C bit (0x20000000) for each vendor-defined value, indicating the value is a customer code.

1.9 Standards Assignments

Parameter	Value	Reference
DirectPlay4 Port Number	47624	[IANAPORT]
DirectPlay4 Port Number (registered but unused)	2234	[IANAPORT]

2 Messages

2.1 Transport

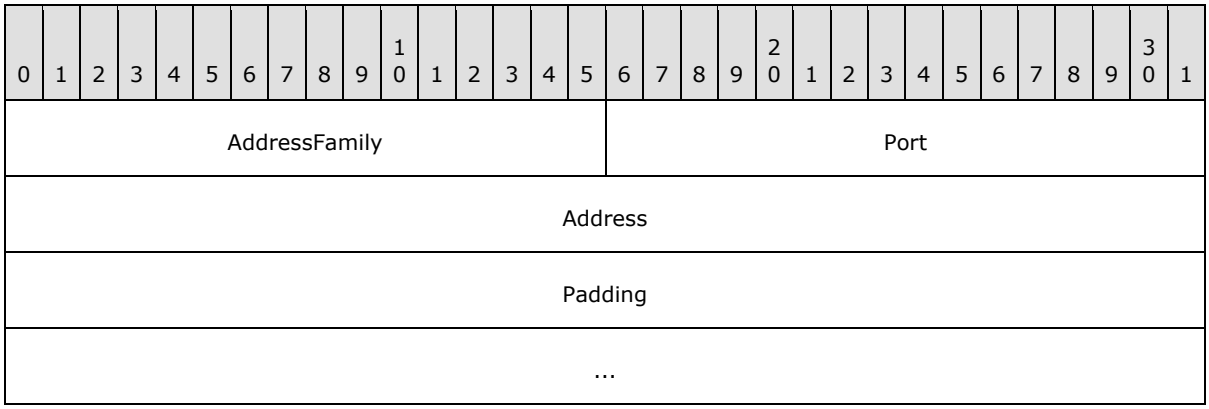
DirectPlay messages MAY be transmitted either by UDP or TCP depending on whether the destination of the protocol message is broadcast or unicast. Clients of the DirectPlay protocol MUST use TCP and UDP port numbers in the range from 2300 to 2400. Enumeration messages transmitted to the DirectPlay host computer MUST be transmitted to port 47624. Broadcast messages MUST be sent to the UDP broadcast address of 255.255.255.255.

2.2 Message Syntax

Note All multi-byte values transmitted by the DirectPlay protocol are transmitted in **little-endian** format unless otherwise specified.

2.2.1 SOCKADDR_IN

The SOCKADDR_IN structure is built as if it were on a little-endian machine and is treated as a byte array. For more information, see [SOCKADDR].



AddressFamily (2 bytes): Address family, MUST be 0x0002.

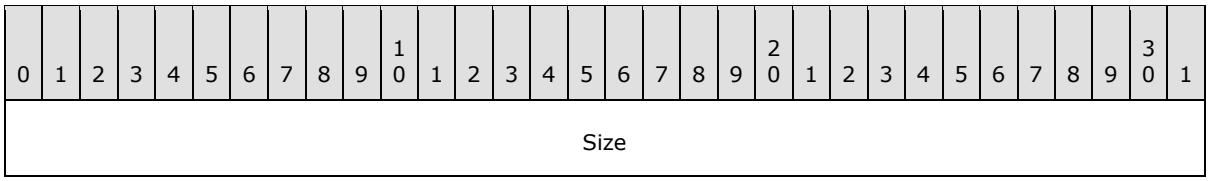
Port (2 bytes): Internet Protocol (IP) port.

Address (4 bytes): IP address, as specified in [RFC791].

Padding (8 bytes): Set to zero. MUST be ignored by the server.

2.2.2 DPLAYI_PACKEDPLAYER

The DPLAYI_PACKEDPLAYER structure contains data related to players or groups.



Flags
PlayerID
ShortNameLength
LongNameLength
ServiceProviderDataSize
PlayerDataSize
NumberOfPlayers
SystemPlayerID
FixedSize
PlayerVersion
ShortName (variable)
...
LongName (variable)
...
ServiceProviderData (variable)
...
PlayerData (variable)
...
PlayerIDs (variable)
...
ParentID

Size (4 bytes): MUST contain the total size of the DPLAYI_PACKEDPLAYER structure, plus the value of the **Short Name Length** and **LongNameLength** fields.

Flags (4 bytes): MUST contain 0 or more of the following player flags.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
SP	NS	PG	PL	X																											

SP (1 bit): The player is the system player.

NS (1 bit): The player is the name server (**host**). MUST be combined with **SP**.

PG (1 bit): The player belongs to a group. This flag MUST be set for system players, for other players that have been added to a group using DPSP_MSG_ADDPLAYERTOGROUP (section 2.2.12), or for groups that have been added to a group using DPSP_MSG_ADDSHORTCUTTOGROUP (section 2.2.13).

PL (1 bit): The player is on the sending machine. This flag does not have meaning on other machines and MUST be ignored.

X (28 bits): Unused. All bits that have this label SHOULD be set to 0 when sent and MUST be ignored when received.

PlayerID (4 bytes): The player identifier.

ShortNameLength (4 bytes): MUST contain the length of the player's short name, in octets. If there is no player short name, this field MUST be 0.

LongNameLength (4 bytes): MUST contain the length, in octets, of the player's long name. If there is no player long name, this field MUST be 0.

ServiceProviderDataSize (4 bytes): MUST contain the length, in octets, of the **ServiceProviderData** field. If there is no network service provider data, this field MUST be 0.

PlayerDataSize (4 bytes): MUST contain the length of the per-game player data, in octets. If there is no per-game player data, this field MUST be 0.

NumberOfPlayers (4 bytes): MUST contain the number of entries in the **PlayerIDs** field. If the player represented in the DPLAYI_PACKEDPLAYER structure is not a group, this field MUST be 0.

SystemPlayerID (4 bytes): MUST contain the ID of the system player for this session.

FixedSize (4 bytes): MUST contain the size, in octets, of the fixed portion of this structure. MUST be 44.

PlayerVersion (4 bytes): MUST contain the version of the current player or group. The version for system players MUST match the protocol dialect version used by the creating instance. The version for non-system players or groups SHOULD be the protocol dialect version used by the creating instance, and MUST be ignored by receivers. The DirectPlay4 Core and Service Provider Protocol supports the protocol dialect versions identified in the description of the **VersionOrSystemPlayerID** field in DPLAYI_SUPERPACKEDPLAYER (section 2.2.3).

ShortName (variable): If the **Short Name Length** field is non-0, this MUST contain the null-terminated Unicode string that contains the player's short name.

LongName (variable): If the **Long Name Length** field is non-0, this MUST contain the null-terminated Unicode string that contains the player's long name.

ServiceProviderData (variable): If **ServiceProviderDataSize** is nonzero, MUST be set to the data that is used by the DirectPlay Service Provider.<3>

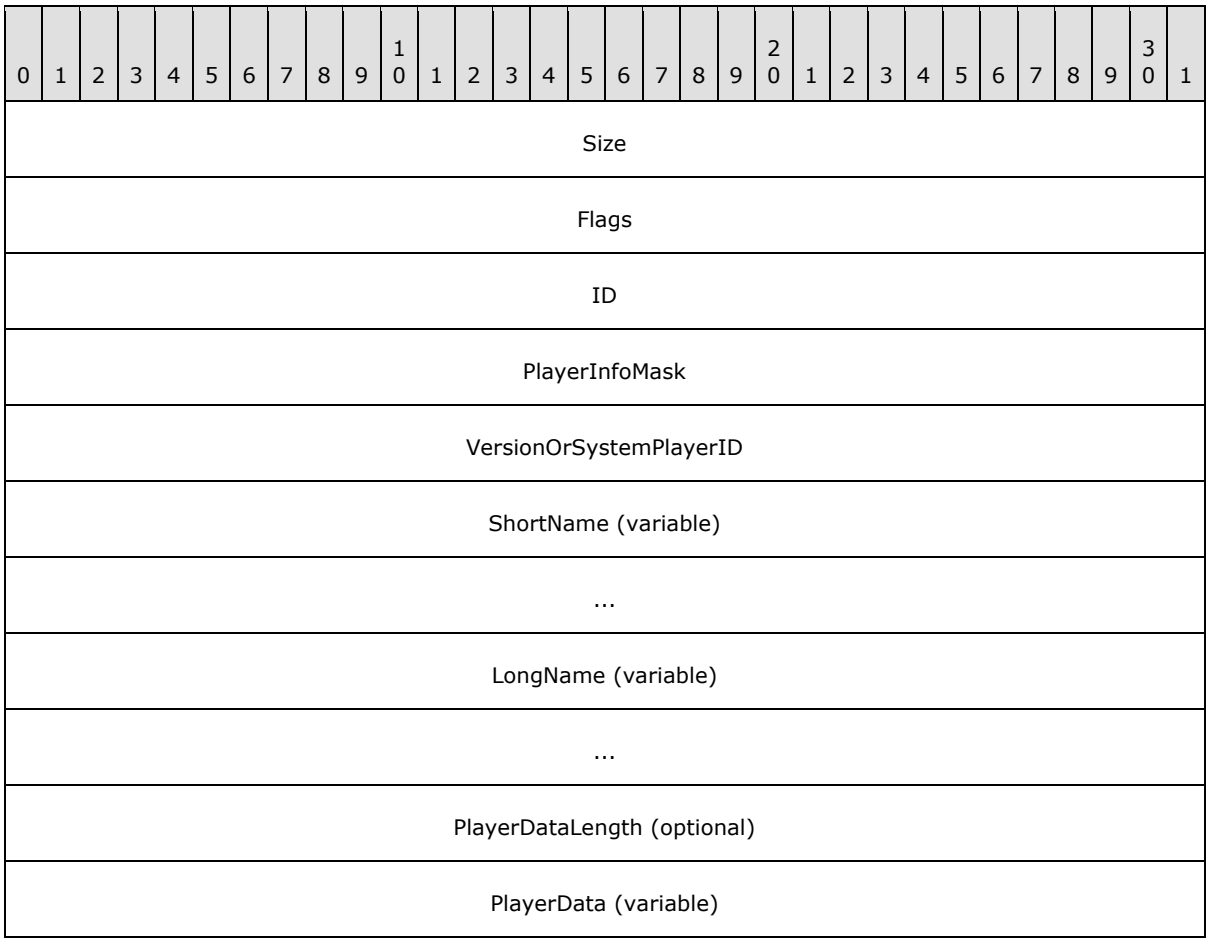
PlayerData (variable): The byte array that contains game specific per-player data.

PlayerIDs (variable): MUST contain an array of **PlayerIDs**, where the array size is specified in **NumberOfPlayers**. If **NumberOfPlayers** is 0, this field MUST NOT be present.

ParentID (4 bytes): MUST contain the identifier of the parent group. If this DPLAYI_PACKEDPLAYER structure represents a player, or if it is a group that is not contained in another group, this field MUST be 0.

2.2.3 DPLAYI_SUPERPACKEDPLAYER

The DPLAYI_SUPERPACKEDPLAYER structure is used to transmit player or group-related data. It is used only in DirectX version 5.0 or later.



...
ServiceProviderDataLength (optional)
ServiceProviderData (variable)
...
PlayerCount (optional)
PlayerIDs (optional)
ParentID (optional)
ShortcutIDCount (optional)
ShortcutIDs (optional)

Size (4 bytes): The size of the fixed player header, in bytes. This includes the **Size** field, as well as the **Flags**, **ID**, and **PlayerInfoMask** fields. MUST be 0x0010 (16).

Flags (4 bytes): Player flags. Player Flags MUST be 0 or more of the following values.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
SP	NS	PG	PL	X																											

SP (1 bit): The player is the system player.

NS (1 bit): The player is the name server (host). MUST be combined with **SP**.

PG (1 bit): The player belongs to a group. This flag MUST be set for system players, for other players that have been added to a group using DPSP_MSG_ADDPLAYERTOGROUP (section 2.2.12), or for groups that have been added to a group using DPSP_MSG_ADDSHORTCUTTOGROUP (section 2.2.13).

PL (1 bit): The player is on the sending machine. This flag does not have meaning on other machines and MUST be ignored.

X (28 bits): Unused. All bits that have this label SHOULD be set to 0 when sent and MUST be ignored when received.

ID (4 bytes): MUST contain the player ID of the player that is described in this structure.

PlayerInfoMask (4 bytes): A bit field that indicates which optional fields are present. The PlayerInfoMask field MUST be a bitmask that is composed of the following fields.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
SN	LN	SL		PD		PC		PI	SC		X																				

SN (1 bit): MUST be set if the **Short Name** field is present in the structure.

LN (1 bit): MUST be set if the **Long Name** field is present in the structure.

SL (2 bits): MUST be set if the **ServiceProviderDataLength** field is present in the structure. SL MUST be set to one of the following values.

Value	Meaning
0x01	If the ServiceProviderDataLength field occupies 1 byte.
0x02	If the ServiceProviderDataLength field occupies 2 bytes.
0x03	If the ServiceProviderDataLength field occupies 4 bytes.

PD (2 bits): MUST be set if the **PlayerDataLength** field is present in the structure. PD MUST be set to one of the following values.

Value	Meaning
0x01	If the PlayerDataLength field occupies 1 byte.
0x02	If the PlayerDataLength field occupies 2 bytes.
0x03	If the PlayerDataLength field occupies 4 bytes.

PC (2 bits): MUST be set if the **PlayerCount** field is present in the structure. PC MUST be set to one of the following values.

Value	Meaning
0x01	If the PlayerCount field occupies 1 byte.
0x02	If the PlayerCount field occupies 2 bytes.
0x03	If the PlayerCount field occupies 4 bytes.

PI (1 bit): MUST be set if the **ParentID** field is present in the structure.

SC (2 bits): MUST be set if the **ShortcutCount** field is present in the structure. SC MUST be set to one of the following values.

Value	Meaning
0x01	If the ShortcutCount field occupies 1 byte.
0x02	If the ShortcutCount field occupies 2 bytes.
0x03	If the ShortcutCount field occupies 4 bytes.

X (21 bits): Unused. All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

VersionOrSystemPlayerID (4 bytes): If the DPLAYI_PLAYER_SYSPLAYER flag is set in the **Flags** field, this field MUST contain the protocol version for the machine hosting the protocol. If the DPLAYI_PLAYER_SYSPLAYER flag is NOT set, this field MUST contain the ID of the system player for this game. When the protocol version is used for a system player, it will be one of the following values.

Version/Value	Meaning
DX6VERSION 9	First version documented.
DX61VERSION 10	New Hosts send DPSP_MSG_IAMNAMESERVER as first message when they become the new host.
DX61AVERSION 11	No Change.
DX71VERSION 12	The version in which DirectPlay Voice was introduced. Does not affect any of the core logic.
DX8VERSION 13	Added DPSP_MSG_CREATEPLAYERVERIFY message.
DX9VERSION 14	No Change.

ShortName (variable): If the **SN** bit in the **PlayerInfoMask** field is set, the Short Name field MUST contain a null-terminated Unicode string that contains the short name of the player.

LongName (variable): If the **LN** bit in the **PlayerInfoMask** field is set, the **Long Name** field MUST contain a null-terminated Unicode string that contains the long name of the player.

PlayerDataLength (4 bytes): If the **PD** bits are set in the **PlayerInfoMask**, this field MUST contain the size, in octets, of the **PlayerData** field.

PlayerData (variable): If PlayerDataSize is non-0, MUST be set to per-game player data.

ServiceProviderDataLength (4 bytes): If the **SP** bits are set in the **PlayerInfoMask**, this field MUST contain the size, in octets, of the **ServiceProviderData** field.<4>

ServiceProviderData (variable): If **ServiceProviderDataSize** is nonzero, MUST be set to the data that is used by the DirectPlay Service Provider.<5>

PlayerCount (4 bytes): If the **PC** bits are set in the **PlayerInfoMask**, this field MUST contain the number of **PlayerIDs** in the **Player IDs** field.

PlayerIDs (4 bytes): If the Player ID Count field is non-0, this MUST be set to a list of player IDs that are contained in the group.

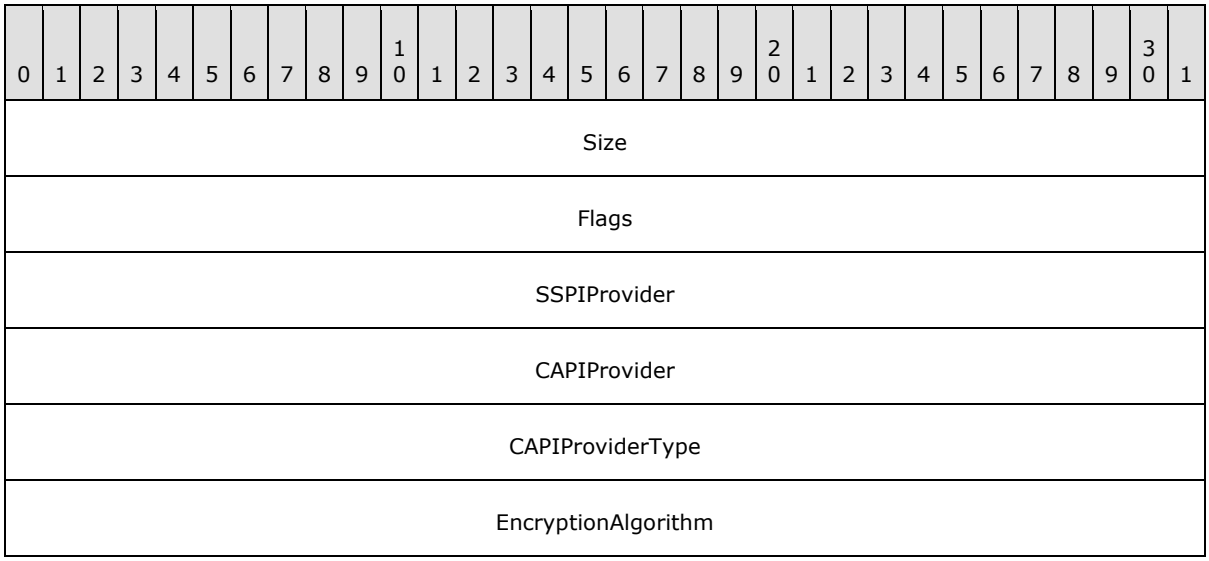
ParentID (4 bytes): If the **PI** field is set in the **PlayerInfoMask**, this field MUST be set to the ID of the parent for this group.

ShortcutIDCount (4 bytes): If the **SC** bits are set in the **PlayerInfoMask**, this field MUST contain the number of shortcut IDs in the **ShortcutIDs** field.

ShortcutIDs (4 bytes): If the **ShortcutIDCount** field is non-0, this MUST be set to a list of shortcut IDs.

2.2.4 DPSECURITYDESC

The DPSECURITYDESC structure describes the security properties of a DirectPlay session instance.



Size (4 bytes): MUST be set to the size of the structure, in octets.<6>

Flags (4 bytes): Session flags. Not used. MUST be set to 0 on transmission and MUST be ignored on reception.

SSPIProvider (4 bytes): MUST be ignored.

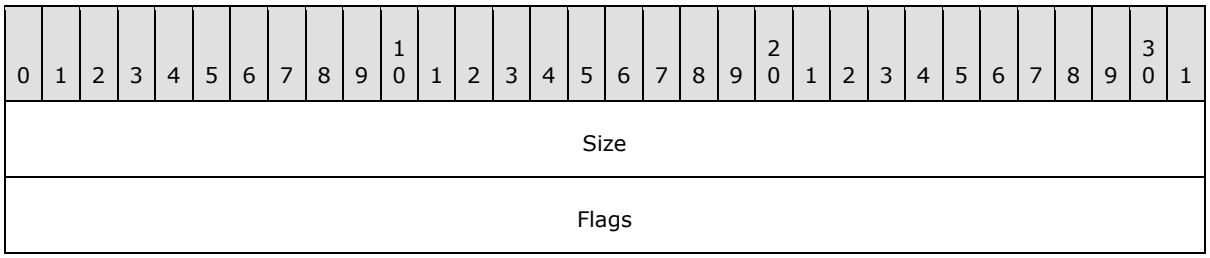
CAPIProvider (4 bytes): MUST be ignored.

CAPIProviderType (4 bytes): Crypto service provider type. If the application does not specify a value, the default value of PROV_RSA_FULL is used. For more information, see Cryptographic Provider Types.

EncryptionAlgorithm (4 bytes): Encryption algorithm type. If the application does not specify a value, the default value of CALG_RC4 is used.<7>

2.2.5 DPSESSIONDESC2

The DPSESSIONDESC2 structure contains DirectPlay session-related information. A session is an instance of a game.



InstanceGUID
...
...
...
ApplicationGUID
...
...
...
MaxPlayers
CurrentPlayerCount
SessionName
Password
Reserved1
Reserved2
ApplicationDefined1
ApplicationDefined2
ApplicationDefined3
ApplicationDefined4

Size (4 bytes): MUST be set to the size of the structure, in octets.

Flags (4 bytes): Session flags. Session flags are set by the game and allow the game to specify semantics for the DirectPlay protocol.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
NP	X	MH	NM	I	JD	KA	ND	SS	P	PR	MS	CS	RP	NO	OL	AV	NS	X													

NP (1 bit): Applications cannot create new players in this session, as specified in section 3.2.5.4.

X (1 bit): (Unused). All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

MH (1 bit): When the game host quits, the game host responsibilities migrate to another DirectPlay machine so that new players can continue to be created and nascent game instances can join the session as specified in section 3.1.6.2.

NM (1 bit): DirectPlay will not set the PlayerTo and PlayerFrom fields in player messages.

I (1 bit): (Ignored). All bits with this label MUST be ignored when received.

JD (1 bit): DirectPlay will not allow any new applications to join the session. Applications already in the session can still create new players, as specified in section 3.2.5.4.

KA (1 bit): DirectPlay will detect when remote players exit abnormally (for example, because their computer or modem got unplugged) through the use of the Ping Timer, as described in sections 3.1.2.5 and 3.2.2.2.

ND (1 bit): DirectPlay will not send a message to all players when a player's remote data changes.

SS (1 bit): Instructs the DirectPlay session establishment logic to use user authentication as specified in sections 3.1.5.1 and 3.2.5.7.

P (1 bit): Indicates that the session is private and requires a password for EnumSessions as well as Open.

PR (1 bit): Indicates that the session requires a password to join.

MS (1 bit): DirectPlay will route all messages through the game host, as specified in section 3.1.5.1.

CS (1 bit): DirectPlay will download information about the DPPLAYER_SERVERPLAYER only.

RP (1 bit): Instructs the DirectPlay client to always use DirectPlay Reliable Protocol [MC-DPL4R]. When this bit is set, only other sessions with the same bit set can join or be joined.

NO (1 bit): Instructs the DirectPlay client that, when using reliable delivery, preserving the order of received packets is not important. This allows messages to be indicated out of order if preceding messages have not yet arrived. If this flag is not set, DirectPlay waits for earlier messages to arrive before delivering later reliable messages.

OL (1 bit): DirectPlay will optimize communication for latency. Implementations SHOULD use the presence of the **OL** flag for guidance on how to send or process messages to optimize for latency rather than throughput; however, implementations MAY choose to

ignore this flag. The presence or absence of the **OL** flag MUST NOT affect the sequence or binary contents of DirectPlay 4 protocol messages.<8>

AV (1 bit): Allows lobby-launched games that are not voice-enabled to acquire voice capabilities.

NS (1 bit): Suppresses transmission of session description changes.

X (14 bits): (Unused). All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

InstanceGUID (16 bytes): Identifier for the session instance.

ApplicationGUID (16 bytes): MUST be set to the unique identifier of the DirectPlay game.

MaxPlayers (4 bytes): Maximum number of players allowed in the session.

CurrentPlayerCount (4 bytes): Current number of players in the session.

SessionName (4 bytes): Placeholder for a pointer to a Unicode string that contains the session name and the NULL terminating character. This field SHOULD be zeroed when sent and MUST be ignored upon receipt.<9>

Password (4 bytes): Placeholder for a pointer to a Unicode string that contains the session password and the NULL terminating character. This field SHOULD be zeroed when sent and MUST be ignored upon receipt<10>.

Note Secure **game sessions** should be differentiated from password protected game sessions. DirectPlay 4 allows for securing access to a game session with a user-specified cleartext password that is specified by the host and which MUST be provided by all clients. Although not very secure, this form of security provides a very lightweight alternative that does not require user accounts and associated management. It is used to casually restrict access to a particular instance of a game session.

Reserved1 (4 bytes): Reserved for future use.

Reserved2 (4 bytes): Reserved for future use.

ApplicationDefined1 (4 bytes): For use by the DirectPlay game.

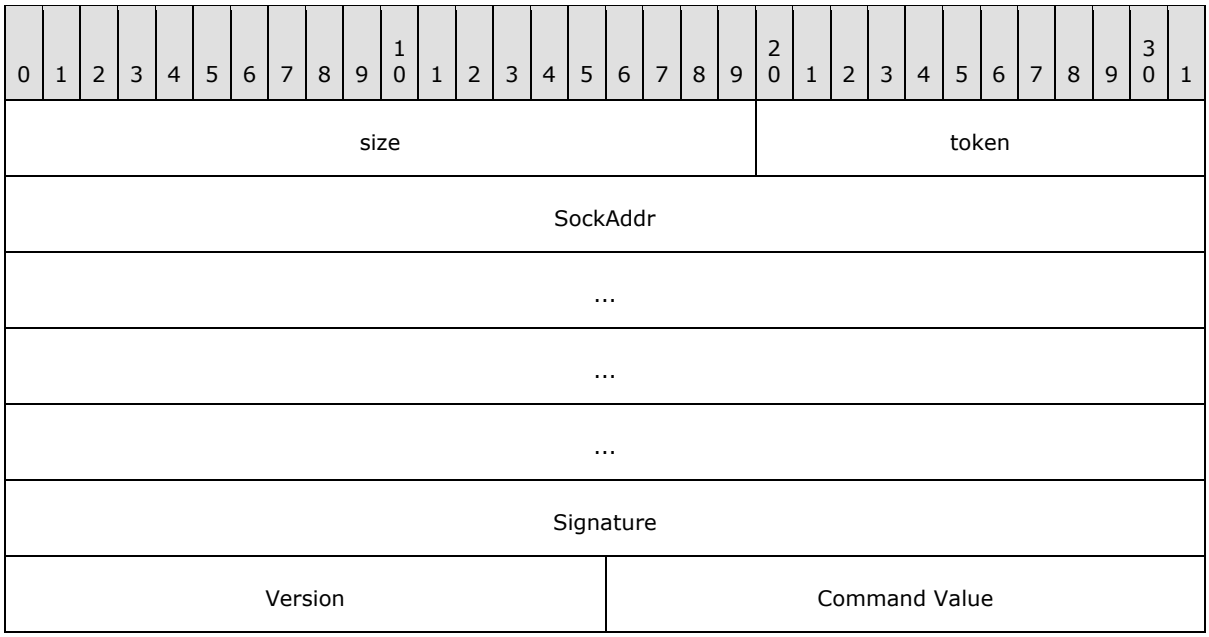
ApplicationDefined2 (4 bytes): For use by the DirectPlay game.

ApplicationDefined3 (4 bytes): For use by the DirectPlay game.

ApplicationDefined4 (4 bytes): For use by the DirectPlay game.

2.2.6 DPSP_MSG_HEADER

The DPSP_MSG_HEADER is prepended to all DirectPlay 4 Protocol messages and contains an identifier that describes each message structure.



size (20 bits): Indicates the size of the message (in octets). The value is obtained by performing a bitwise AND (&) operation with the **token** field and 0x000FFFFF.

token (12 bits): Describes high-level message characteristics. The value is obtained by performing a bitwise AND (&) operation with the **size** field and 0xFFF00000.

Value	Meaning
0xFAB	Indicates that the message was received from a remote DirectPlay machine.
0xCAB	Indicates that the message will be forwarded to all registered servers.
0xBAB	Indicates that the message was received from a DirectPlay server.

SockAddr (16 bytes): 64 bits of data containing a sockets **SOCKADDR_IN** (section 2.2.1) structure. If the machine is on the same network as the receiving machine, the Address field of this structure is set to 0.0.0.0.

Signature (4 bytes): MUST be set to the value 0x79616c70 (ASCII 'play').

Version (2 bytes): MUST be set to the version number of the protocol. The DirectPlay4 Core and Service Provider Protocol supports the protocol versions identified in the description of the **VersionOrSystemPlayerID** field in DPLAYI_SUPERPACKEDPLAYER (section 2.2.3).<11>

Command Value (2 bytes): MUST contain one of the following values.

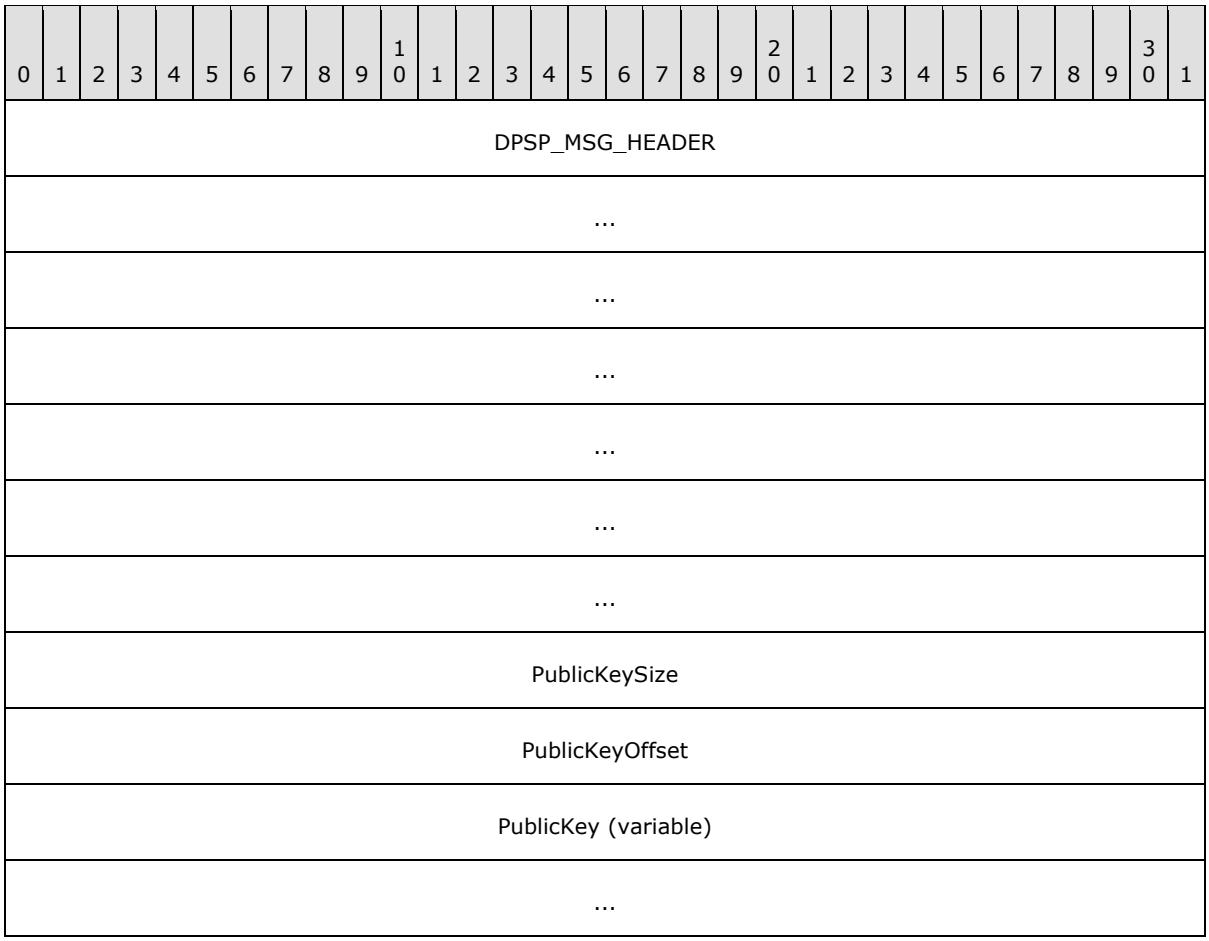
Name	Value
DPSP_MSG_ENUMSESSIONSREPLY	0x0001
DPSP_MSG_ENUMSESSIONS	0x0002
DPSP_MSG_ENUMPLAYERSREPLY	0x0003

Name	Value
DPSP_MSG_ENUMPLAYER	0x0004
DPSP_MSG_REQUESTPLAYERID	0x0005
DPSP_MSG_REQUESTGROUPID	0x0006
DPSP_MSG_REQUESTPLAYERREPLY	0x0007
DPSP_MSG_CREATEPLAYER	0x0008
DPSP_MSG_CREATEGROUP	0x0009
DPSP_MSG_PLAYERMESSAGE	0x000A
DPSP_MSG_DELETEPLAYER	0x000B
DPSP_MSG_DELETEGROUP	0x000C
DPSP_MSG_ADDPLAYERTOGROUP	0x000D
DPSP_MSG_DELETEPLAYERFROMGROUP	0x000E
DPSP_MSG_PLAYERDATACHANGED	0x000F
DPSP_MSG_PLAYERNAMECHANGED	0x0010
DPSP_MSG_GROUPDATACHANGED	0x0011
DPSP_MSG_GROUPNAMECHANGED	0x0012
DPSP_MSG_ADDFORWARDREQUEST	0x0013
DPSP_MSG_PACKET	0x0015
DPSP_MSG_PING	0x0016
DPSP_MSG_PINGREPLY	0x0017
DPSP_MSG_YOUAREDEAD	0x0018
DPSP_MSG_PLAYERWRAPPER	0x0019
DPSP_MSG_SESSIONDESCCHANGED	0x001A
DPSP_MSG_CHALLENGE	0x001C
DPSP_MSG_ACCESSGRANTED	0x001D
DPSP_MSG_LOGONDENIED	0x001E
DPSP_MSG_AUTHERROR	0x001F
DPSP_MSG_NEGOTIATE	0x0020
DPSP_MSG_CHALLENGERESPONSE	0x0021
DPSP_MSG_SIGNED	0x0022

Name	Value
DPSP_MSG_ADDFORWARDREPLY	0x0024
DPSP_MSG_ASK4MULTICAST	0x0025
DPSP_MSG_ASK4MULTICASTGUARANTEED	0x0026
DPSP_MSG_ADDSHORTCUTTOGROUP	0x0027
DPSP_MSG_DELETEGROUPFROMGROUP	0x0028
DPSP_MSG_SUPERENUMPLAYERSREPLY	0x0029
DPSP_MSG_KEYEXCHANGE	0x002B
DPSP_MSG_KEYEXCHANGEREPLY	0x002C
DPSP_MSG_CHAT	0x002D
DPSP_MSG_ADDFORWARD	0x002E
DPSP_MSG_ADDFORWARDACK	0x002F
DPSP_MSG_PACKET2_DATA	0x0030
DPSP_MSG_PACKET2_ACK	0x0031
DPSP_MSG_IAMNAMESERVER	0x0035
DPSP_MSG_VOICE	0x0036
DPSP_MSG_MULTICASTDELIVERY	0x0037
DPSP_MSG_CREATEPLAYERVERIFY	0x0038

2.2.7 DPSP_MSG_ACCESSGRANTED

The DPSP_MSG_ACCESSGRANTED packet is sent to a DirectPlay client after the client has successfully been authenticated as a member of the DirectPlay session.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 29.

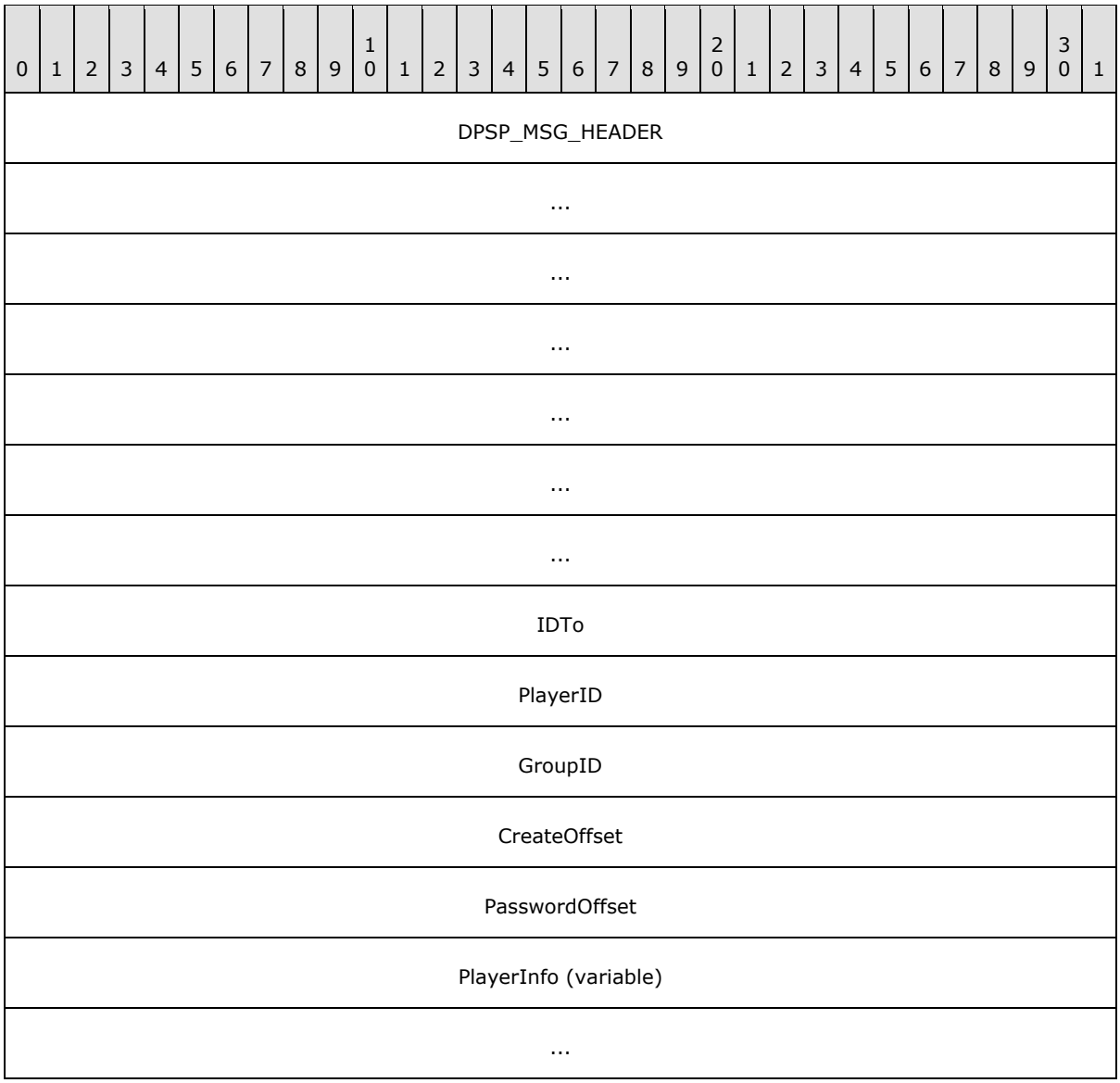
PublicKeySize (4 bytes): MUST be set to the size of the **PublicKey** field, in octets. MUST be set to 24 (0x0018).

PublicKeyOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the packet to the **PublicKey** field.

PublicKey (variable): Array of bytes that contains the sender's signed public key.

2.2.8 DPSP_MSG_ADDFORWARD

The DPSP_MSG_ADDFORWARD packet is sent to inform a game instance of the existence of other game instances.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 46.

IDTo (4 bytes): Identifier of the player to whom the message is being sent.

PlayerID (4 bytes): Identifier of the affected player.

GroupID (4 bytes): Identifier of the affected group.

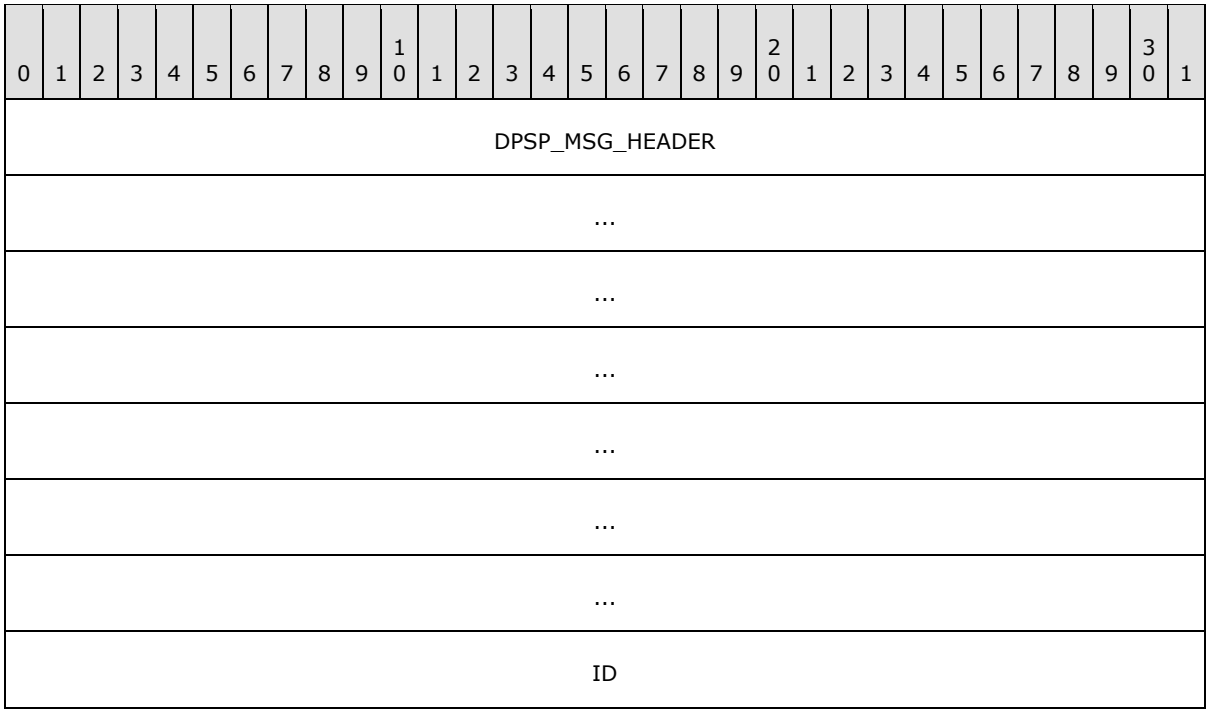
CreateOffset (4 bytes): Offset, in octets, of the **PlayerInfo** field. MUST be set to 28 (0x001C).

PasswordOffset (4 bytes): Not used. MUST be ignored.

PlayerInfo (variable): MUST be set to a **DPLAYI_PACKEDPLAYER** structure (section 2.2.2) that contains information about the system player on the newly added machine.

2.2.9 DPSP_MSG_ADDFORWARDACK

The DPSP_MSG_ADDFORWARDACK packet is sent in response to a DPSP_MSG_ADDFORWARD message.

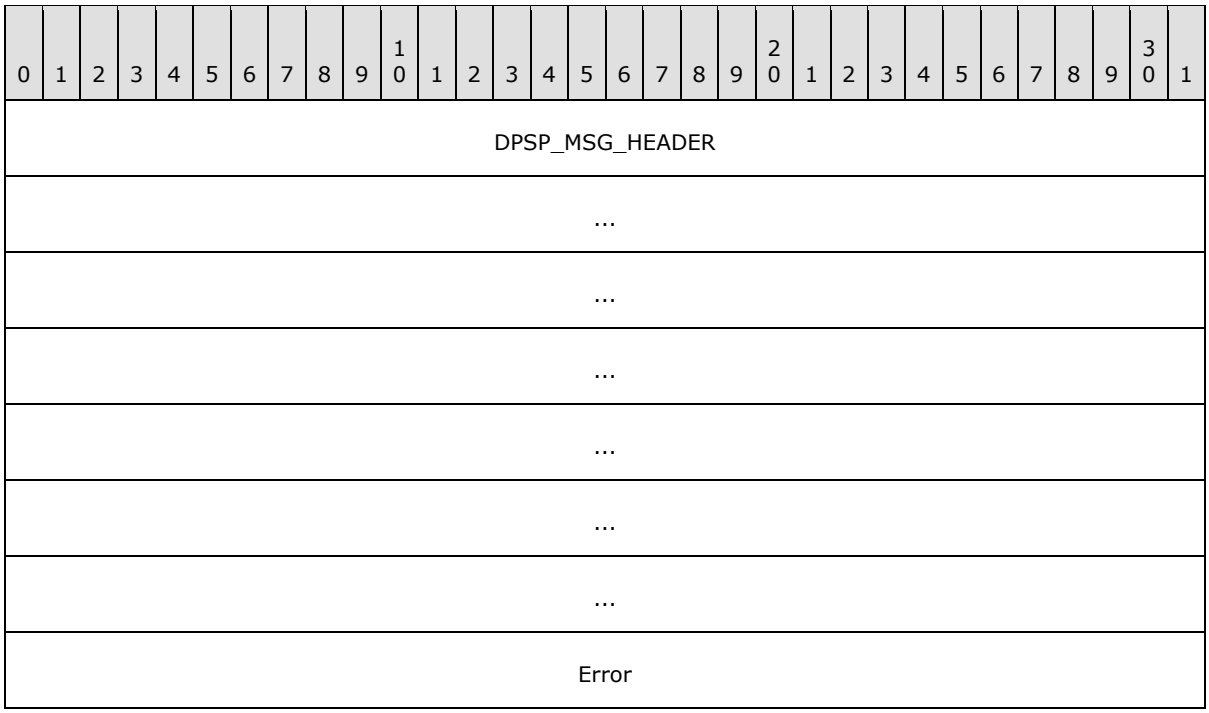


DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 47.

ID (4 bytes): Identifier of the player for whom a **DPSP_MSG_ADDFORWARD** message was sent.

2.2.10 DPSP_MSG_ADDFORWARDREPLY

The DPSP_MSG_ADDFORWARDREPLY packet is always sent in response to a DPSP_MSG_ADDFORWARDREQUEST message.

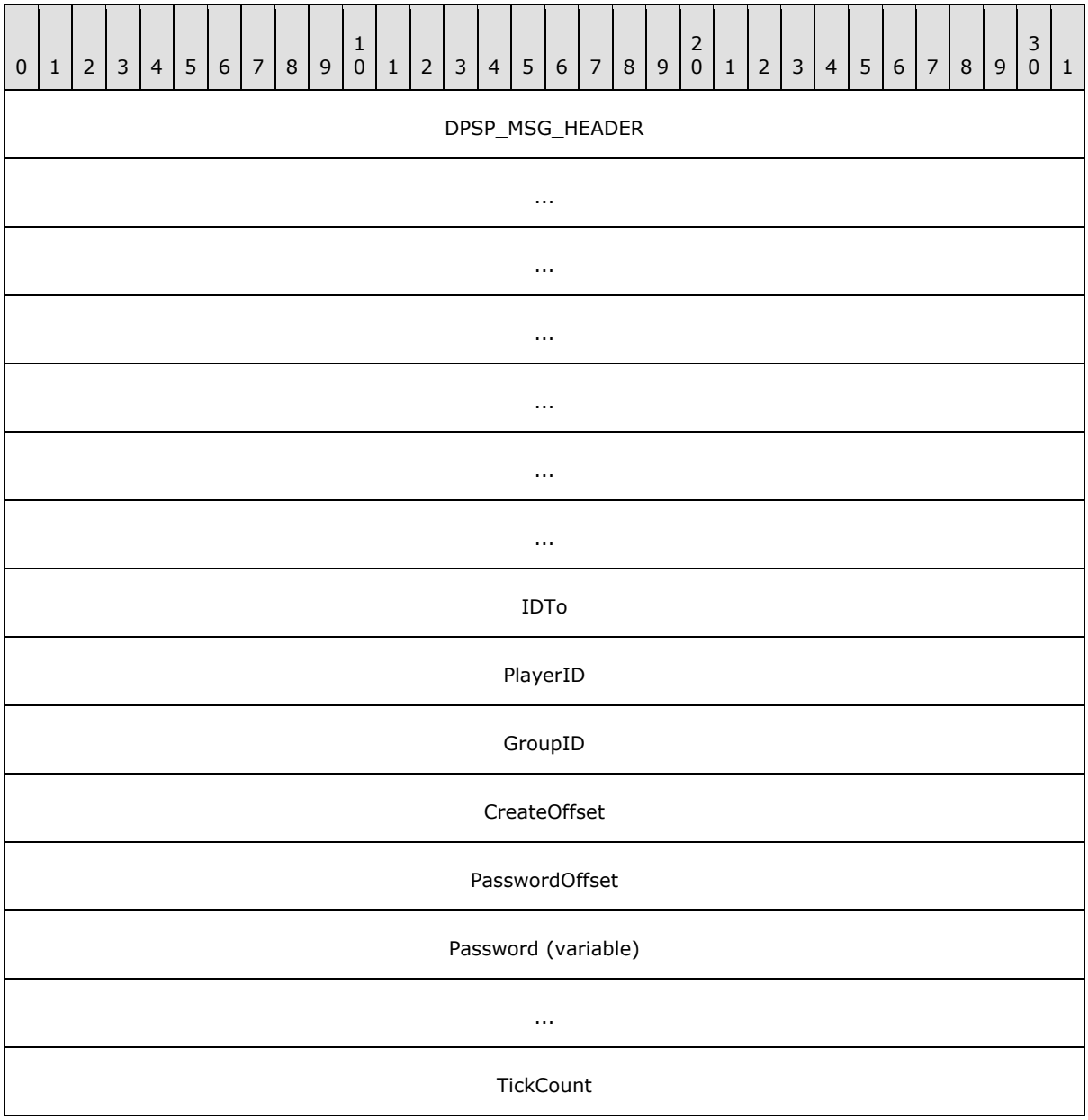


DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 36.

Error (4 bytes): Indicates the reason that the **DPSP_MSG_ADDFORWARD** (section 2.2.8) message failed. For a complete list of DirectPlay4 HRESULT codes, see [MS-ERREF].

2.2.11 DPSP_MSG_ADDFORWARDREQUEST

The DPSP_MSG_ADDFORWARDREQUEST packet is sent to forward a message to a downstream player.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 36.

IDTo (4 bytes): Identifier of the player to whom the message is being sent.

PlayerID (4 bytes): MUST be the identity of the player being added.

GroupID (4 bytes): SHOULD be 0 and MUST be ignored.

CreateOffset (4 bytes): Not used. MUST be ignored.

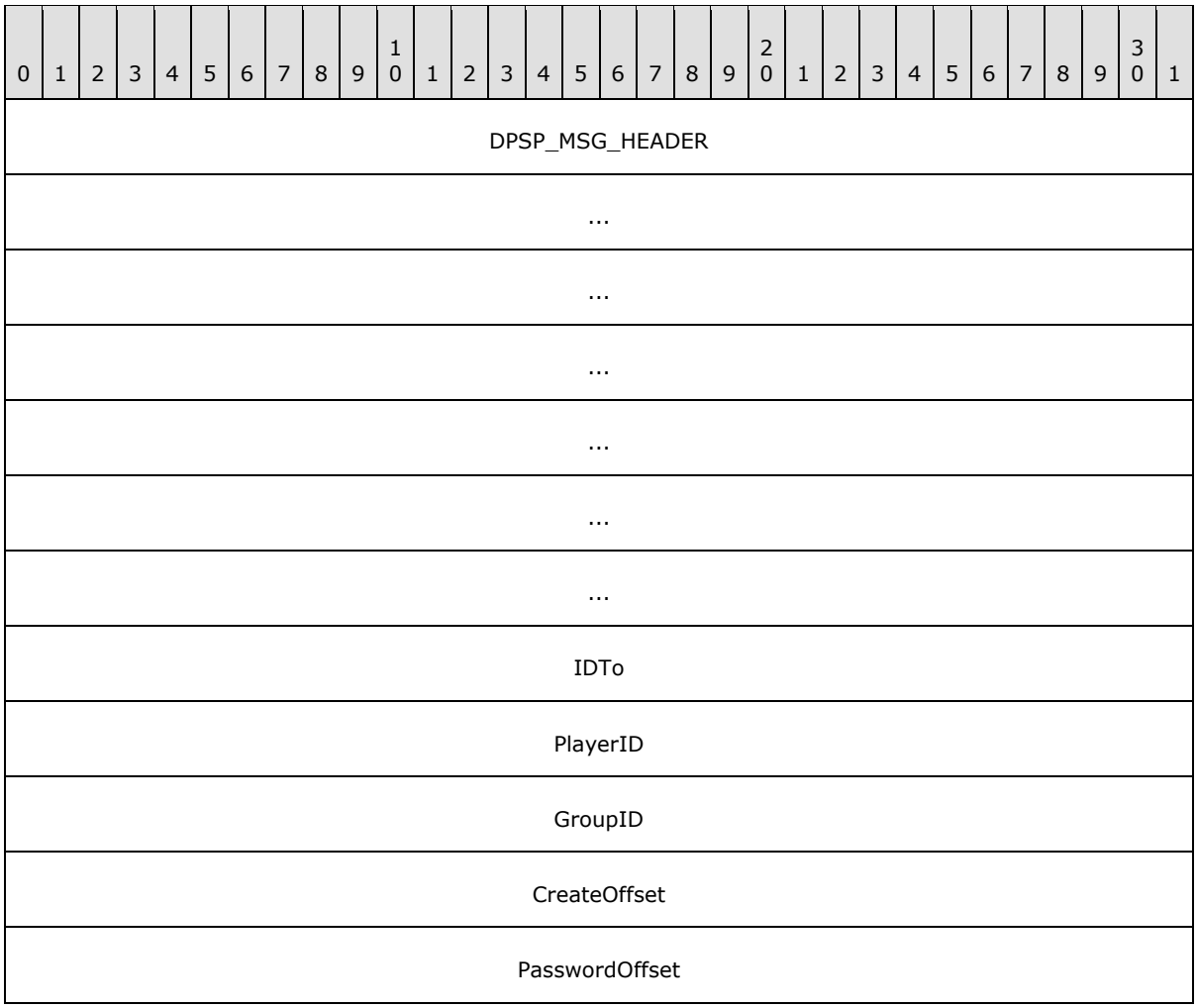
PasswordOffset (4 bytes): Offset, in bytes, of the **Password** field. MUST be set to 36 (0x24).

Password (variable): Null-terminated Unicode string that contains the session password.

TickCount (4 bytes): MUST contain the system tick count when the packet was generated.

2.2.12 DPSP_MSG_ADDPLAYERTOGROUP

The DPSP_MSG_ADDPLAYERTOGROUP packet is sent from the game host to game participants when a player is added to a group.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 13.

IDTo (4 bytes): Identifier of the player to whom the message is being sent. SHOULD be set to 0 on transmission, and MUST be ignored on reception.

PlayerID (4 bytes): Identifier of the player to add to the group specified by dwGroupID.

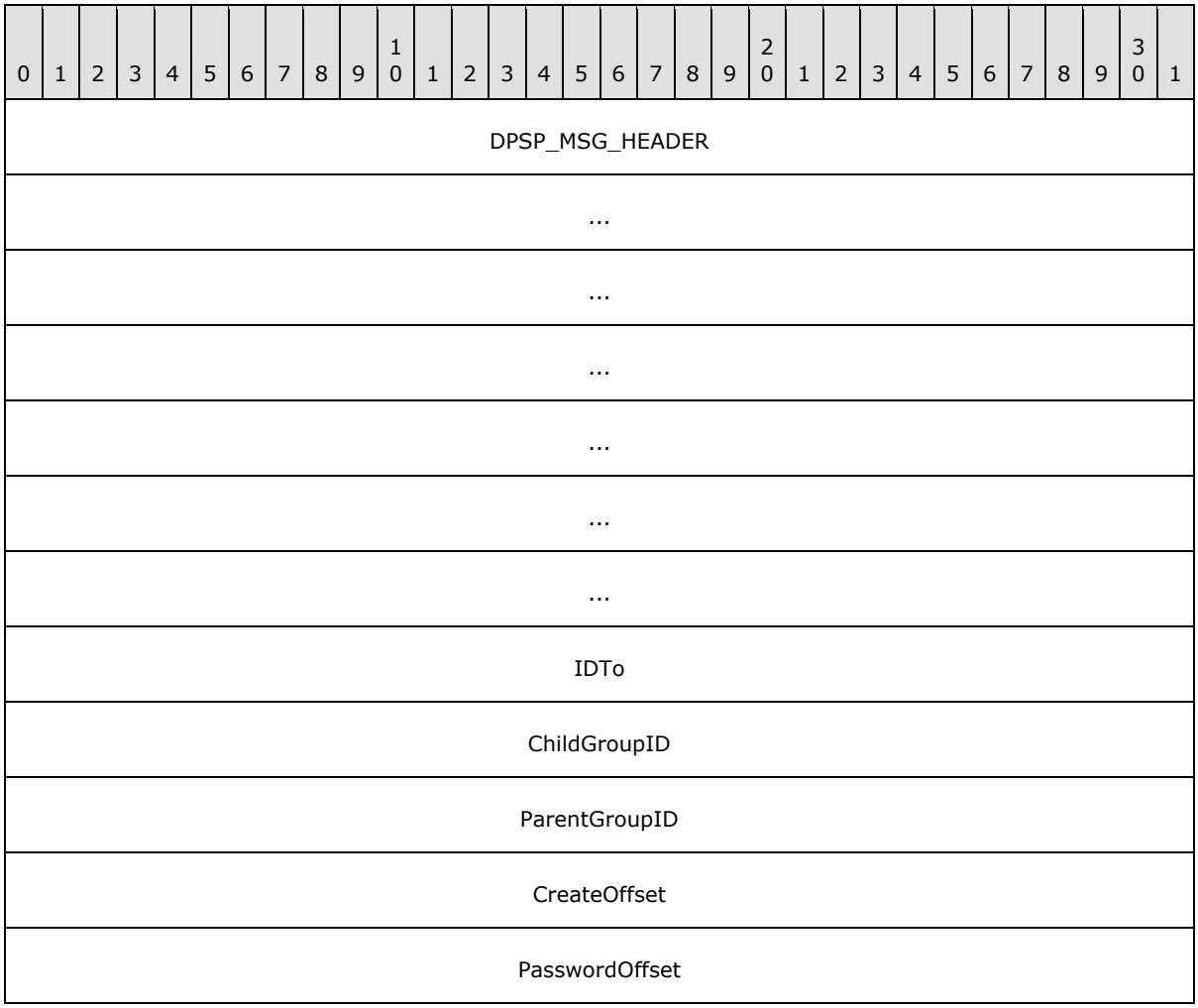
GroupID (4 bytes): Identifier of the group to which the player will be added.

CreateOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, and MUST be ignored on reception.

PasswordOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, and MUST be ignored on reception.

2.2.13 DPSP_MSG_ADDSHORTCUTTOGROUP

The DPSP_MSG_ADDSHORTCUTTOGROUP packet is sent to add a shortcut to a group.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 39.

IDTo (4 bytes): Identifier of the player to whom the message is being sent.

ChildGroupID (4 bytes): Identifier of the group to add to the group specified by **ParentGroupID**.

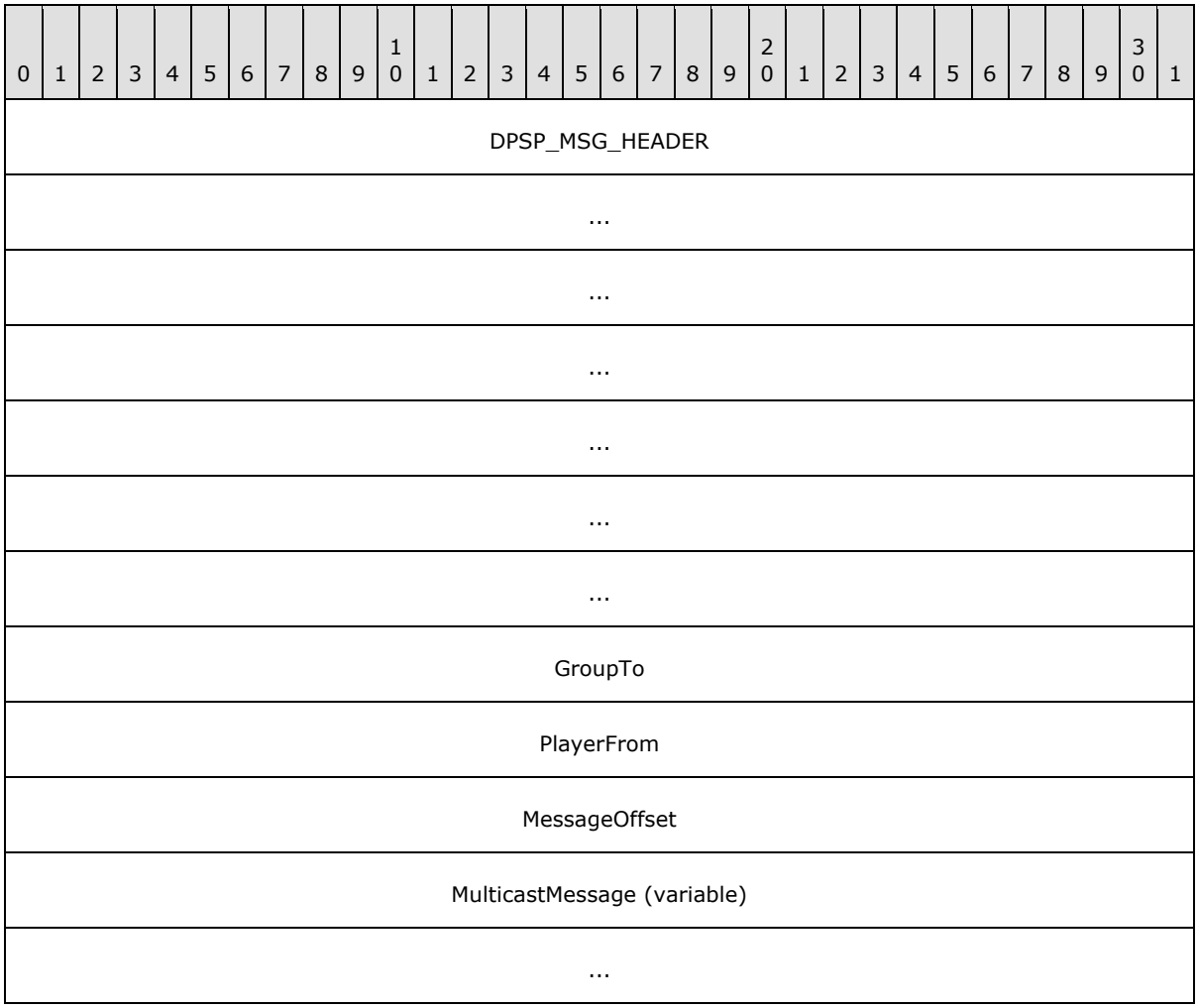
ParentGroupID (4 bytes): The containing group identifier.

CreateOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, MUST be ignored on reception.<12>

PasswordOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, MUST be ignored on reception.<13>

2.2.14 DPSP_MSG_ASK4MULTICAST

The DPSP_MSG_ASK4MULTICAST packet is sent to request that the server forward a message to players in a specified group.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 37.

GroupTo (4 bytes): Identifier of the group that is the target of the request.

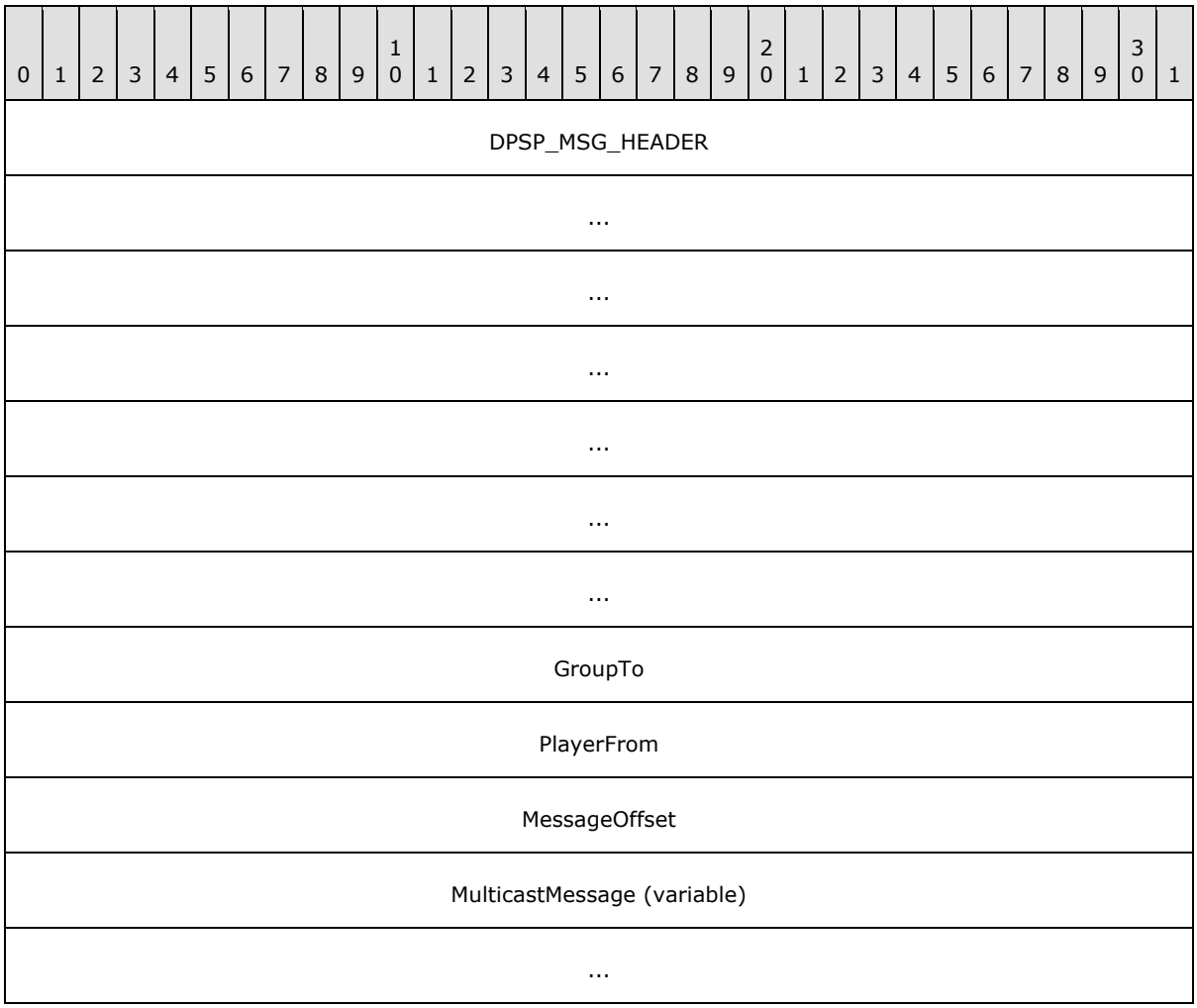
PlayerFrom (4 bytes): Identifier of the player that originated the request.

MessageOffset (4 bytes): Offset, in octets, from the beginning of the message to the **MulticastMessage** field.

MulticastMessage (variable): Array of octets that contain the message to forward. This field MUST contain a complete DirectPlay 4 Protocol message. However, the message MUST begin with the **Signature** field of the DPSP_MSG_HEADER (section 2.2.6) rather than the entire **DPSP_MSG_HEADER** structure.

2.2.15 DPSP_MSG_ASK4MULTICASTGUARANTEED

The DPSP_MSG_ASK4MULTICASTGUARANTEED packet is used to request that the server forward a message to players in a specified group using the guaranteed messaging mechanism.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 38.

GroupTo (4 bytes): MUST be set to the identifier of the group that is the target of the request.

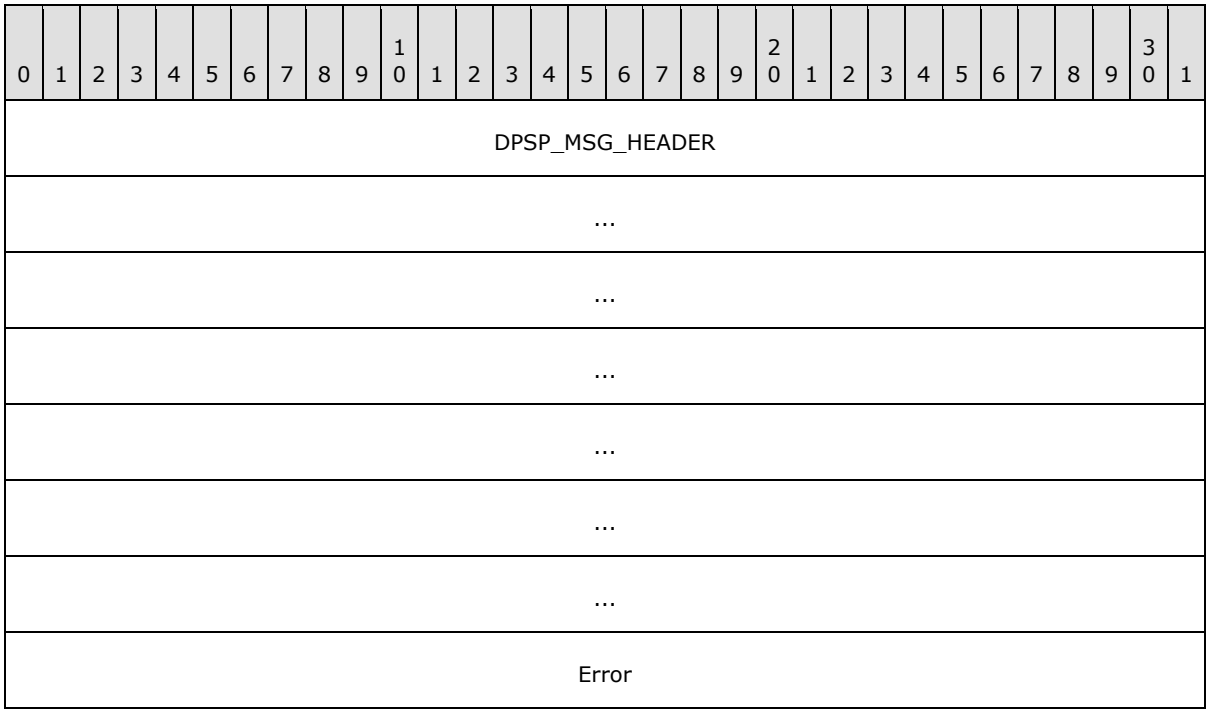
PlayerFrom (4 bytes): MUST be set to the identifier of the player that originated the request.

MessageOffset (4 bytes): Offset, in octets, from the beginning of the message to the **MulticastMessage** field.

MulticastMessage (variable): Array of octets that contain the message to forward. This field MUST contain a complete DirectPlay 4 Protocol message. However, the message MUST begin with the **Signature** field of the DPSP_MSG_HEADER (section 2.2.6) rather than the entire **DPSP_MSG_HEADER** structure.

2.2.16 DPSP_MSG_AUTHERROR

The DPSP_MSG_AUTHERROR packet is sent to indicate the reason that authentication failed.



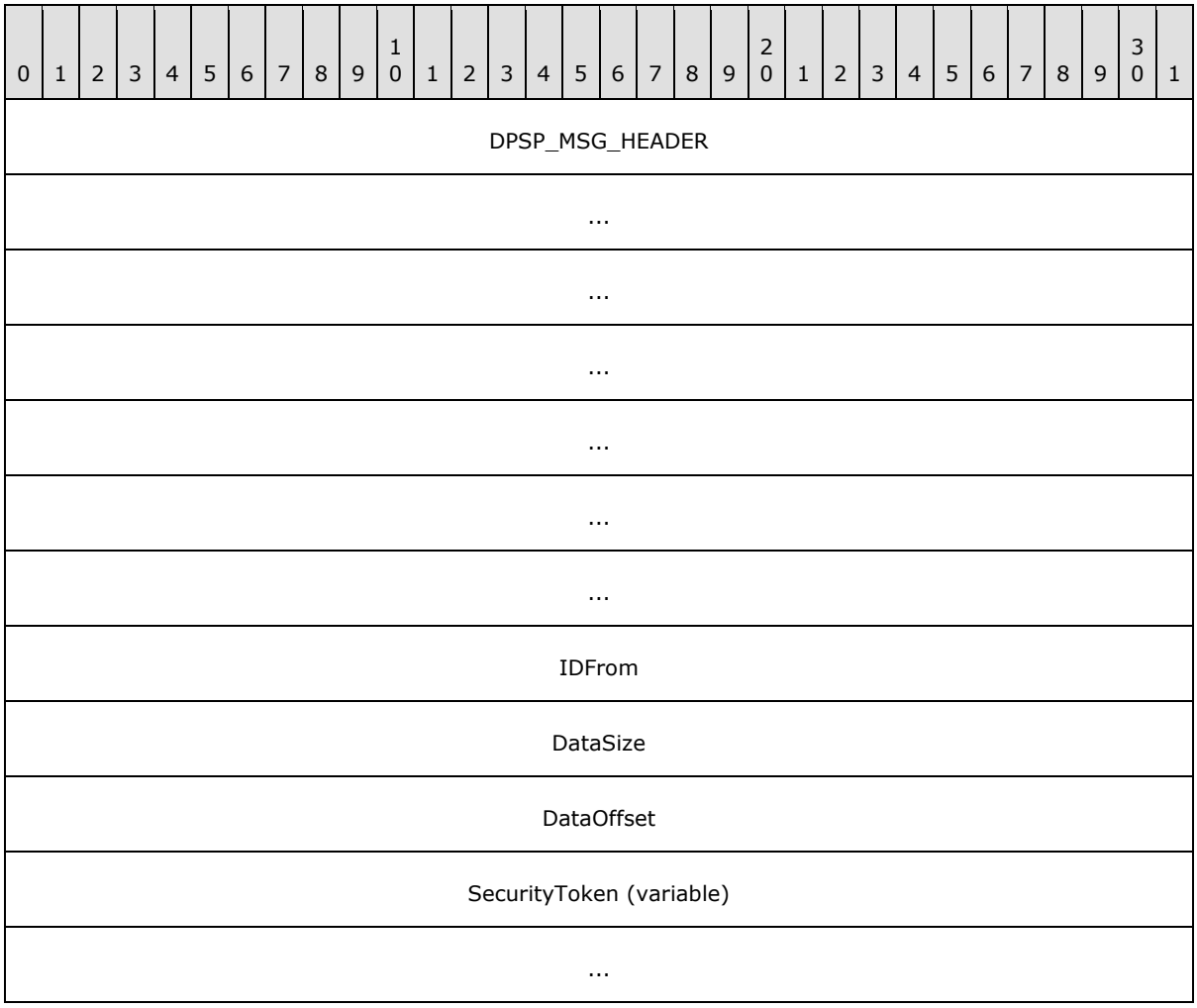
DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 31.

Error (4 bytes): MUST contain the reason authentication failed. The values associated with each error can be found in [MS-ERREF].

Value	Meaning
SEC_E_INVALID_TOKEN 0x80090308	The token passed is invalid.
SEC_E_INVALID_HANDLE 0x80090301	An internal handle is invalid.
SEC_E_INTERNAL_ERROR 0x80090304	The Local Security Authority could not be contacted.
SEC_E_NO_AUTHENTICATING_AUTHORITY 0x80090311	No authority could be contacted for authentication.

2.2.17 DPSP_MSG_CHALLENGE

The DPSP_MSG_CHALLENGE packet is used to request a security token.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 28.

IDFrom (4 bytes): MUST be set to the System Player ID on the sender's system.

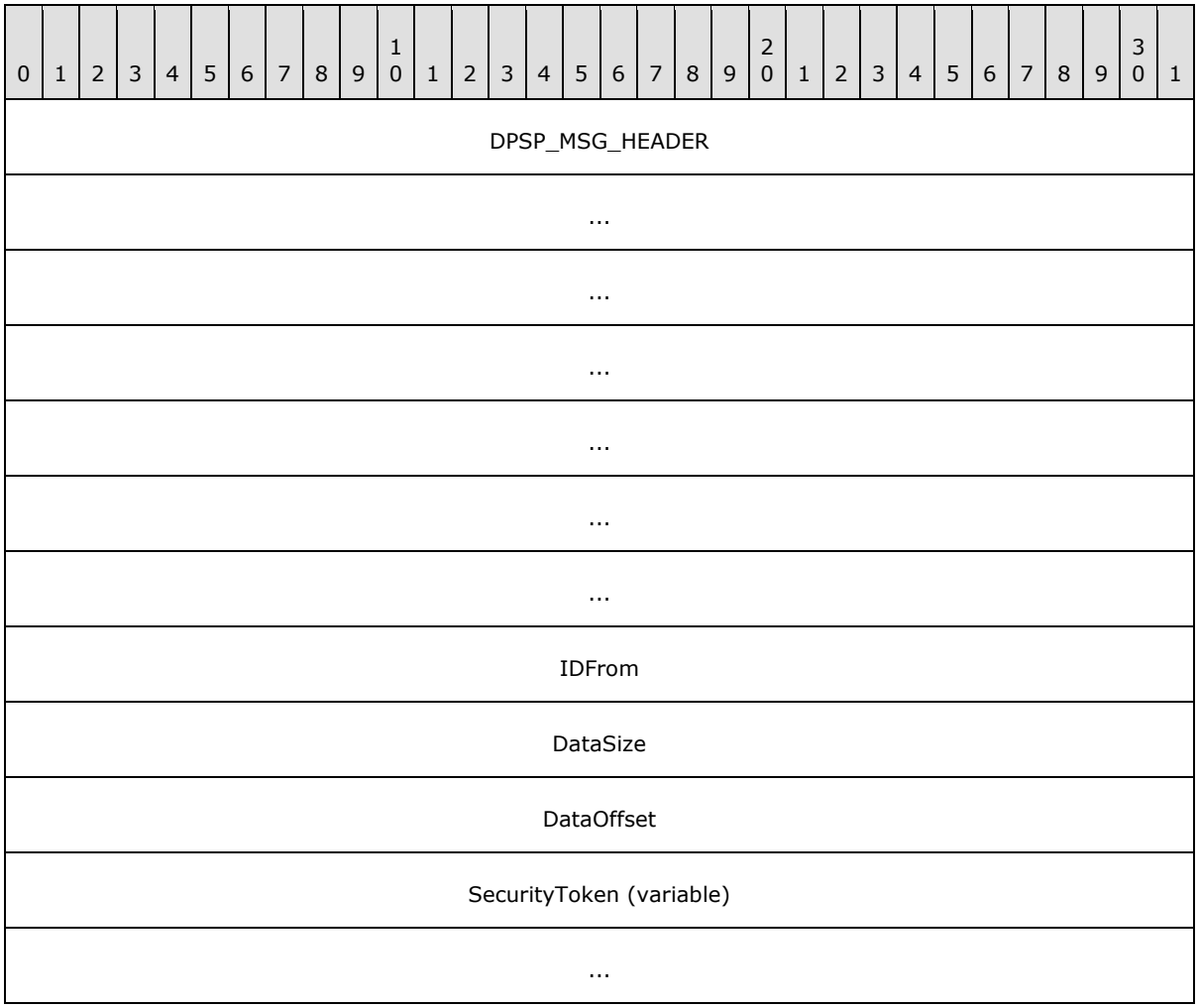
DataSize (4 bytes): MUST be set to the size, in octets, of the **SecurityToken** field.

DataOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **SecurityToken** field.

SecurityToken (variable): Opaque security token whose size is specified by the **DataSize** field.

2.2.18 DPSP_MSG_CHALLENGERESPONSE

The DPSP_MSG_CHALLENGERESPONSE packet is sent in response to a **DPSP_MSG_CHALLENGE** (section 2.2.17) message.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 33.

IDFrom (4 bytes): MUST be set to the system player identifier for the sender's system.

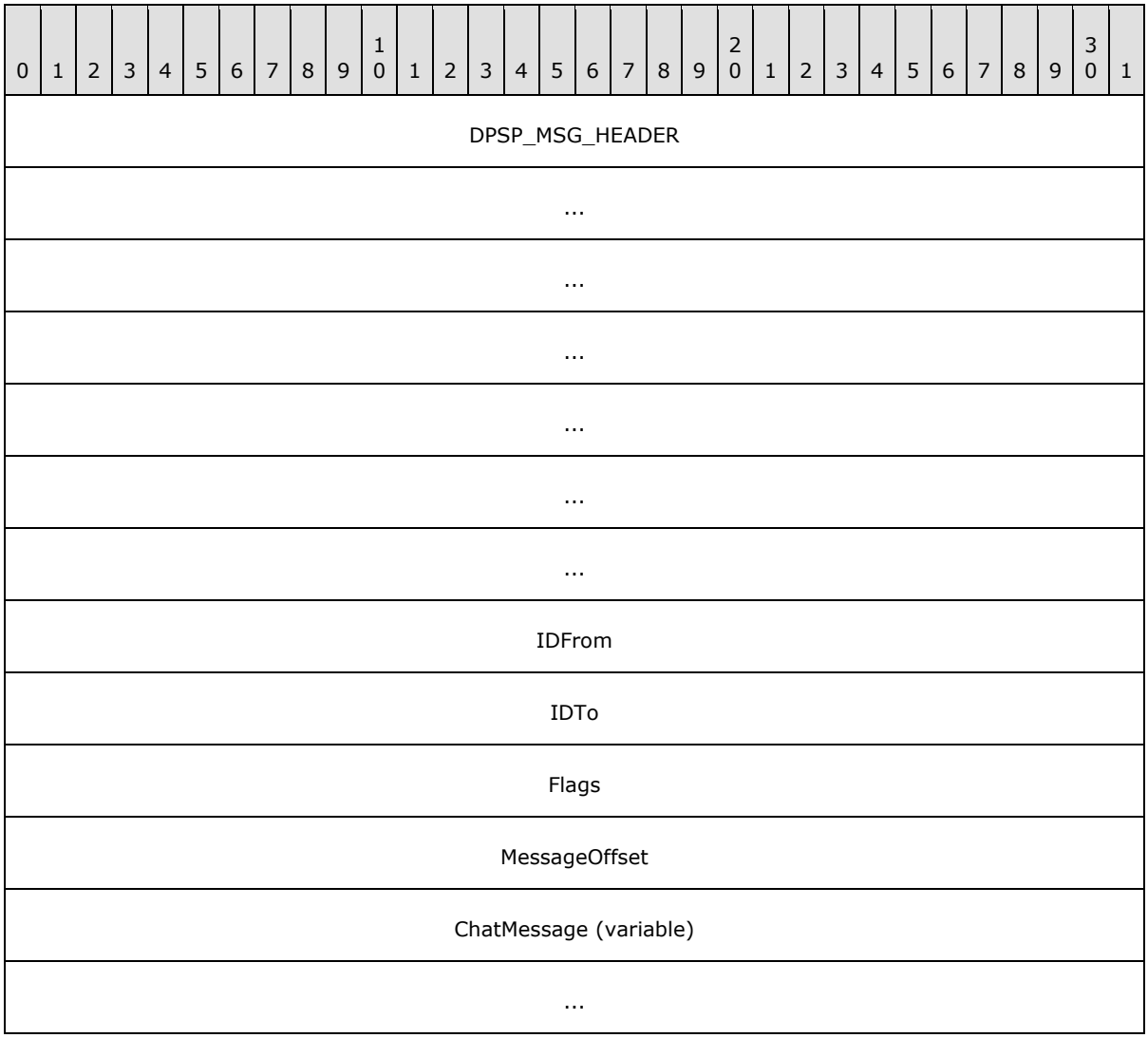
DataSize (4 bytes): MUST be set to the size, in octets, of the message in the **SecurityToken** field.

DataOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **SecurityToken** field.

SecurityToken (variable): Opaque security token whose size is specified by the **DataSize** field.

2.2.19 DPSP_MSG_CHAT

The DPSP_MSG_CHAT packet is used to exchange text between players.

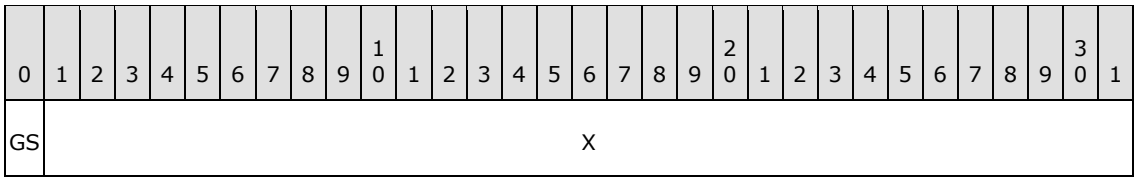


DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 45.

IDFrom (4 bytes): MUST be set to the identifier of the sending player.

IDTo (4 bytes): MUST be set to the identifier of the destination player or group.

Flags (4 bytes): Chat flags. MUST be set to one of the following values.



GS (1 bit): If this bit is set, send the message using a guaranteed send method. If this bit is clear, send the message using a non-guaranteed send method.

Note Determining whether to send the message guaranteed can be inferred from the **DPSP_MSG_HEADER** and the transport method. Use of the **GS** flag is not required.

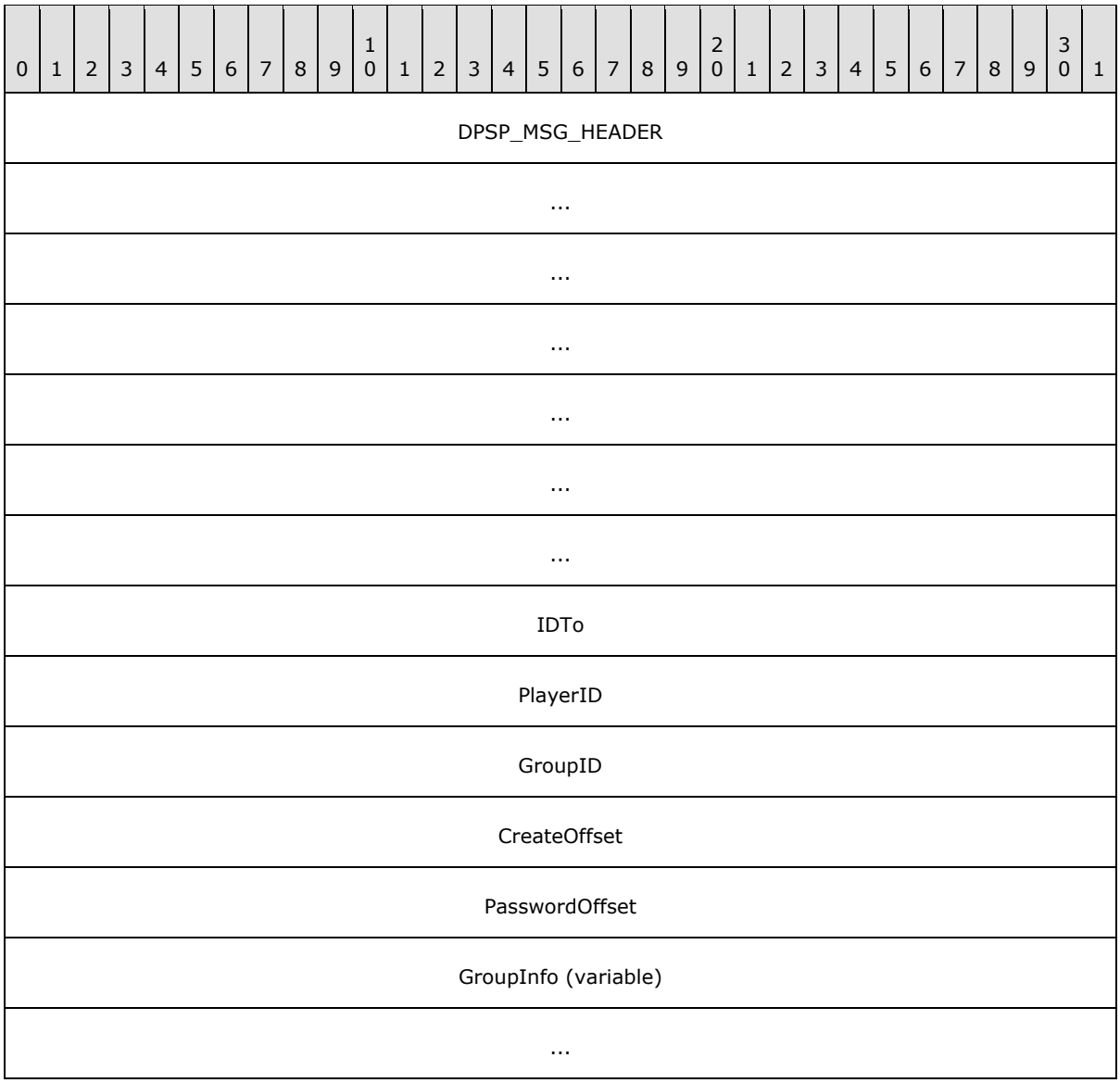
X (31 bits): Not used, SHOULD be zero on transmission and MUST be ignored on reception.

MessageOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **ChatMessage** field. Zero indicates a null message.

ChatMessage (variable): Null-terminated Unicode string that contains the contents of the chat message.

2.2.20 DPSP_MSG_CREATEGROUP

The DPSP_MSG_CREATEGROUP packet is sent to indicate that a new group has been created.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 9.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<14>

PlayerID (4 bytes): MUST be set to the group ID of the newly created group.

GroupID (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<15>

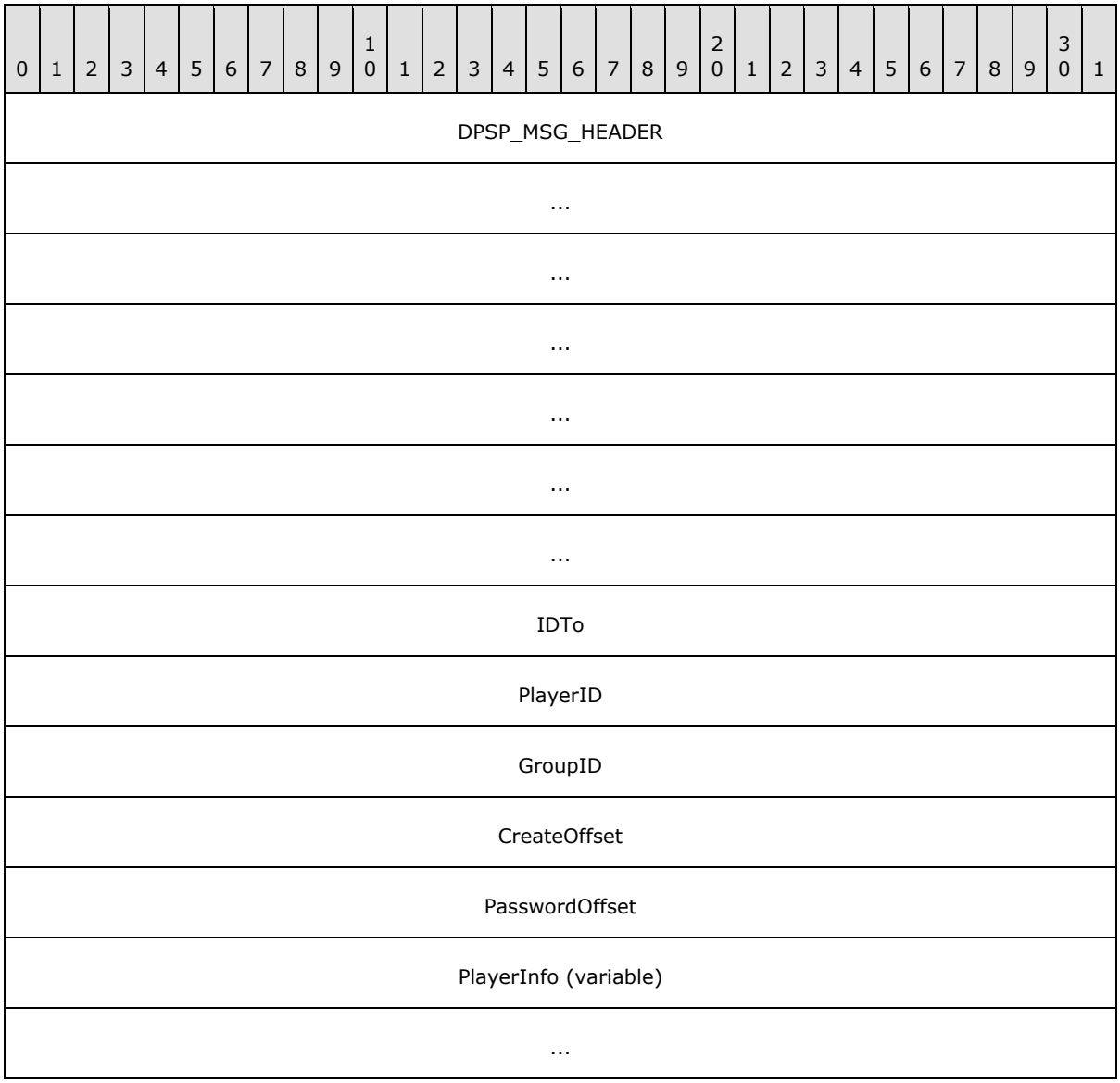
CreateOffset (4 bytes): MUST be set to the offset, in octets, of the **GroupInfo** field. MUST be set to 28 (0x1C).

PasswordOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<16>

GroupInfo (variable): MUST contain a **DPLAYI_PACKEDPLAYER** (section 2.2.2) structure that contains information about the group to be created.

2.2.21 DPSP_MSG_CREATEPLAYER

The DPSP_MSG_CREATEPLAYER packet is sent to indicate that a new player has been created.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 9.

IDTo (4 bytes): Player to whom the message is being sent. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<17>

PlayerID (4 bytes): MUST be set to the identifier of the newly created player.

GroupID (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<18>

CreateOffset (4 bytes): Offset, in octets, of the **PlayerInfo** field. MUST be set to 28 (0x001C).

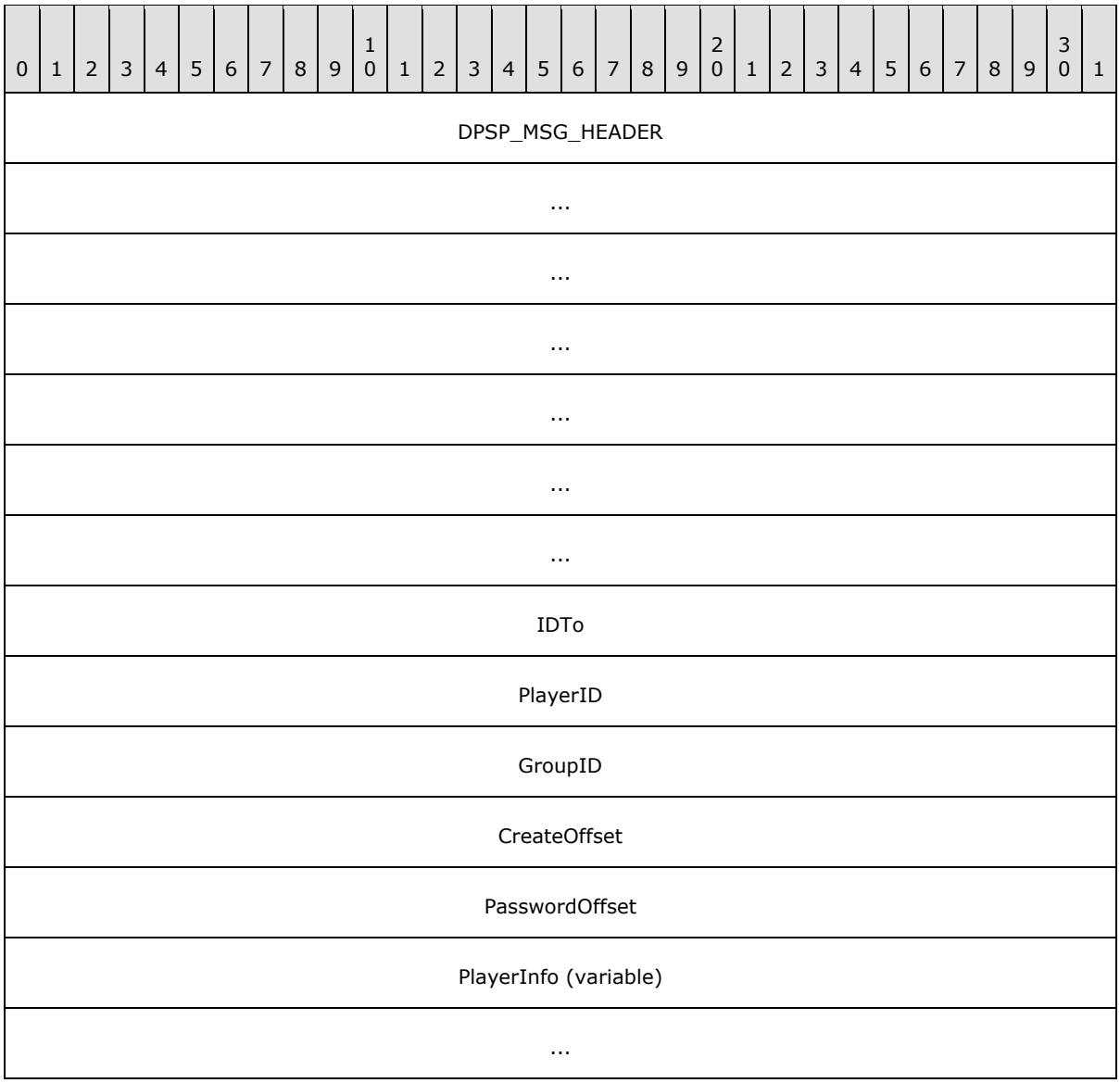
PasswordOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<19>

PlayerInfo (variable): MUST contain a **DPLAYI_PACKEDPLAYER** (section 2.2.2) structure containing the information about the newly created player.

2.2.22 DPSP_MSG_CREATEPLAYERVERIFY

A DPSP_MSG_CREATEPLAYERVERIFY message is sent as verification that a **player** was previously created. When all of the following conditions are met, one or more DPSP_MSG_CREATEPLAYERVERIFY messages are sent in response to a DPSP_MSG_CREATEPLAYER (section 2.2.21) message:

- The receiving system is not the host.
- The player referenced in the incoming DPSP_MSG_CREATEPLAYER message has not already been added to the nametable.
- The player referenced in the incoming DPSP_MSG_CREATEPLAYER message is not a system player.
- The value of the **Version** field of the received message's DPSP_MSG_HEADER (section 2.2.6) is 13 or higher.
- The receiving system created a local player that was not designated as a system player within the last 40 seconds. If more than one local player has been created within that time period, then a separate DPSP_MSG_CREATEPLAYERVERIFY message MUST be sent for each player.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The **Command Value** member of this field MUST be set to 9.

IDTo (4 bytes): The player to whom the message is being sent. SHOULD be set to 0 on transmission, and MUST be ignored upon receipt.<20>

PlayerID (4 bytes): MUST be set to the identifier of the previously created player.

GroupID (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored upon receipt.<21>

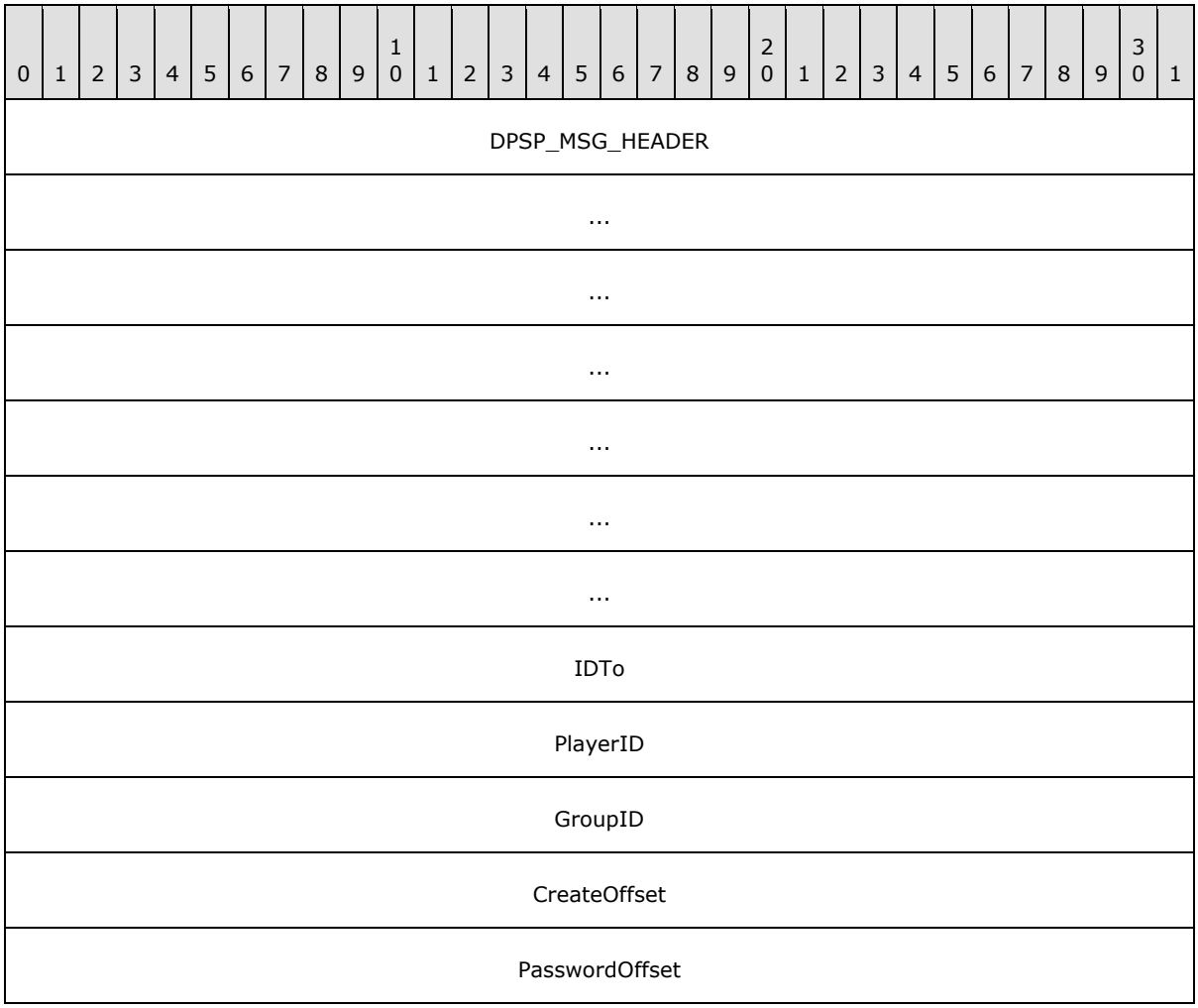
CreateOffset (4 bytes): Offset, in octets, of the **PlayerInfo** field. MUST be set to 28 (0x001C).

PasswordOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, and MUST be ignored upon receipt.<22>

PlayerInfo (variable): MUST contain a **DPLAYI_PACKEDPLAYER** (2.2.2) structure containing the information about the previously created player.

2.2.23 DPSP_MSG_DELETEGROUP

The DPSP_MSG_DELETEGROUP packet is sent when a group is deleted.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 12.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<23>

PlayerID (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<24>

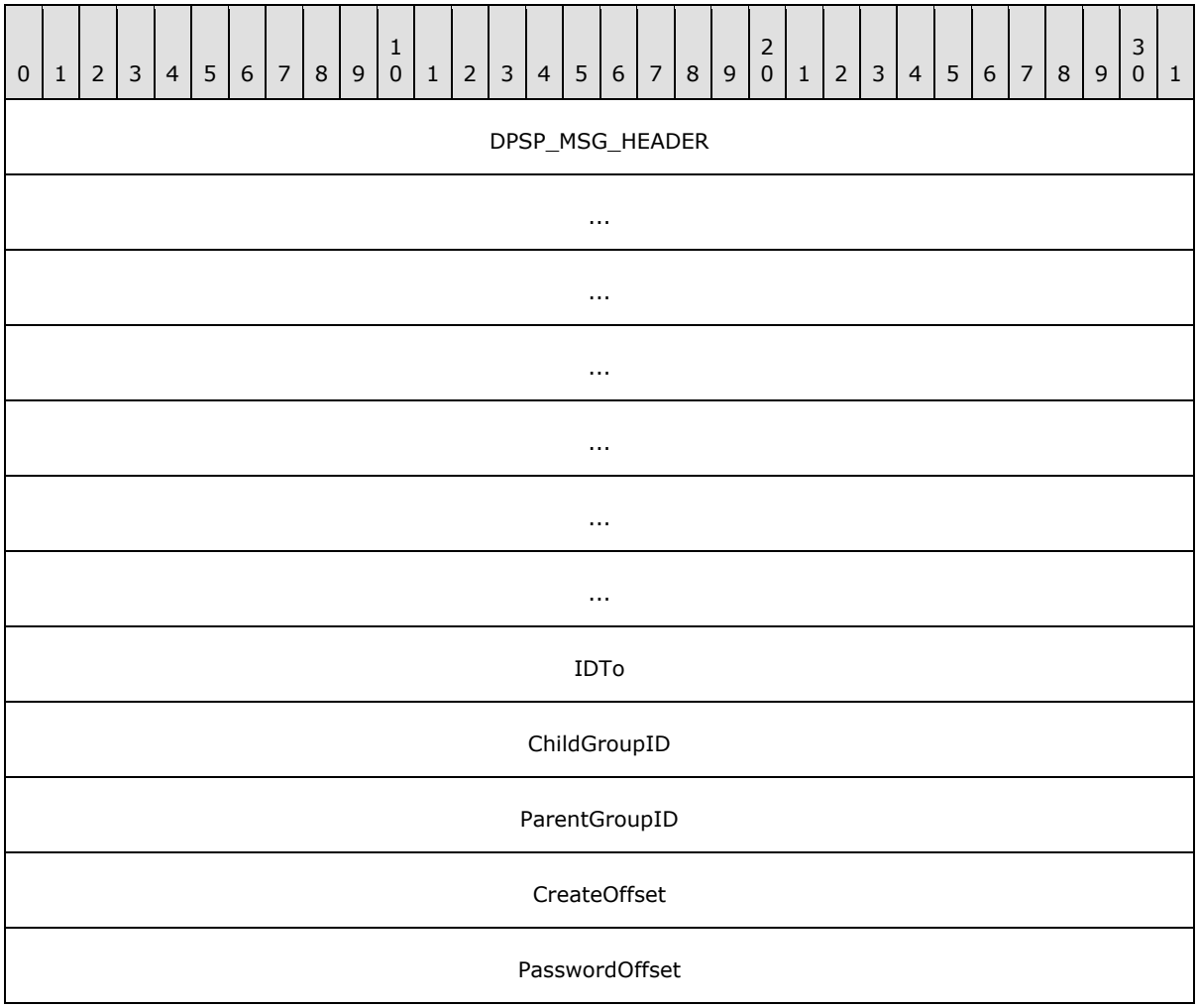
GroupID (4 bytes): MUST be set to the group ID of the newly deleted group.

CreateOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<25>

PasswordOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<26>

2.2.24 DPSP_MSG_DELETEGROUPFROMGROUP

The DPSP_MSG_DELETEGROUPFROMGROUP packet is sent to delete a group from a group.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 40.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<27>

ChildGroupID (4 bytes): MUST be set to the group ID of the child group to remove.

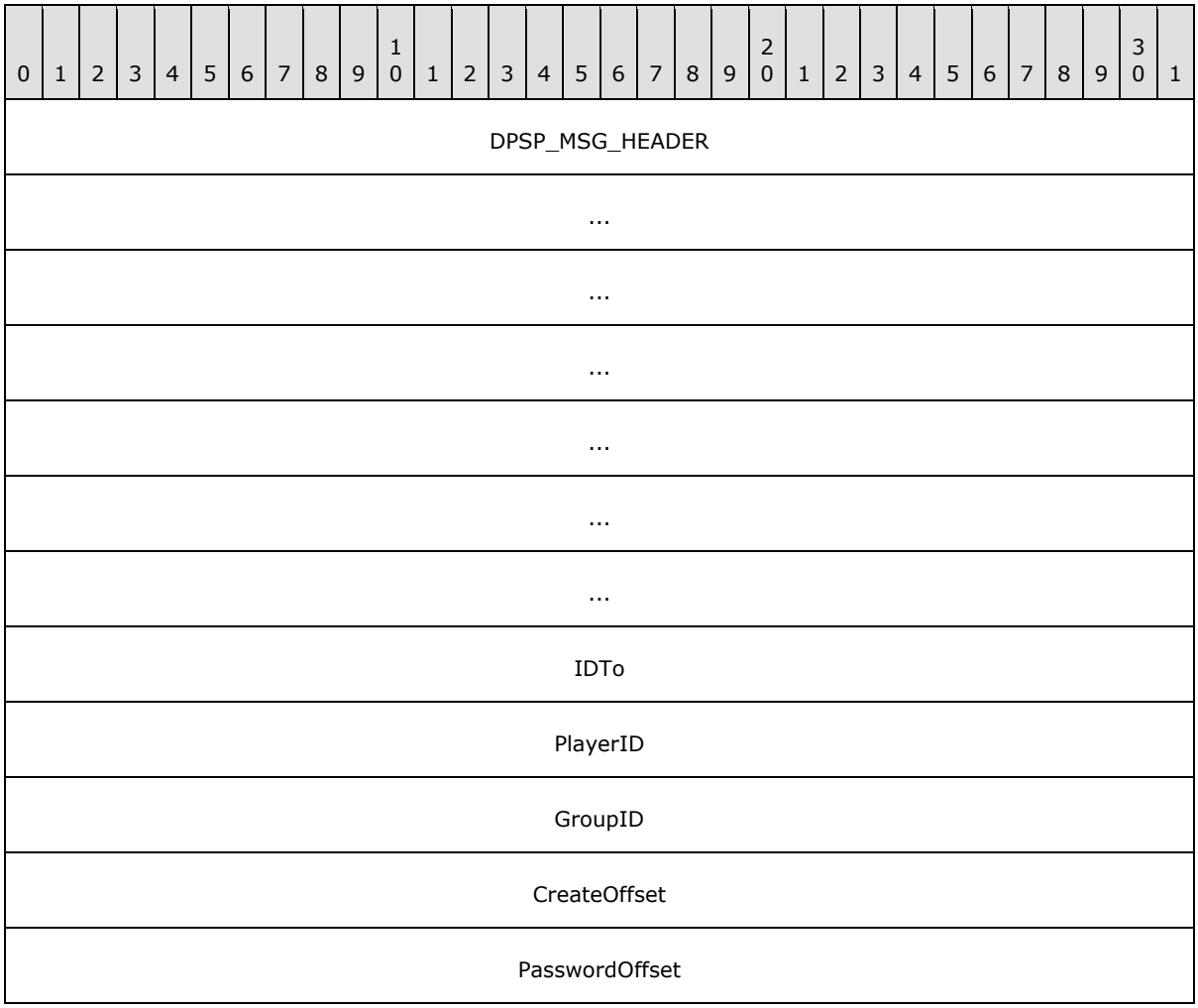
ParentGroupID (4 bytes): MUST be set to the group ID of the parent group containing the child group.

CreateOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<28>

PasswordOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<29>

2.2.25 DPSP_MSG_DELETEPLAYER

The DPSP_MSG_DELETEPLAYER packet is sent to indicate that a player has been deleted.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 11.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<30>

PlayerID (4 bytes): MUST be set to the player ID of the newly deleted player.

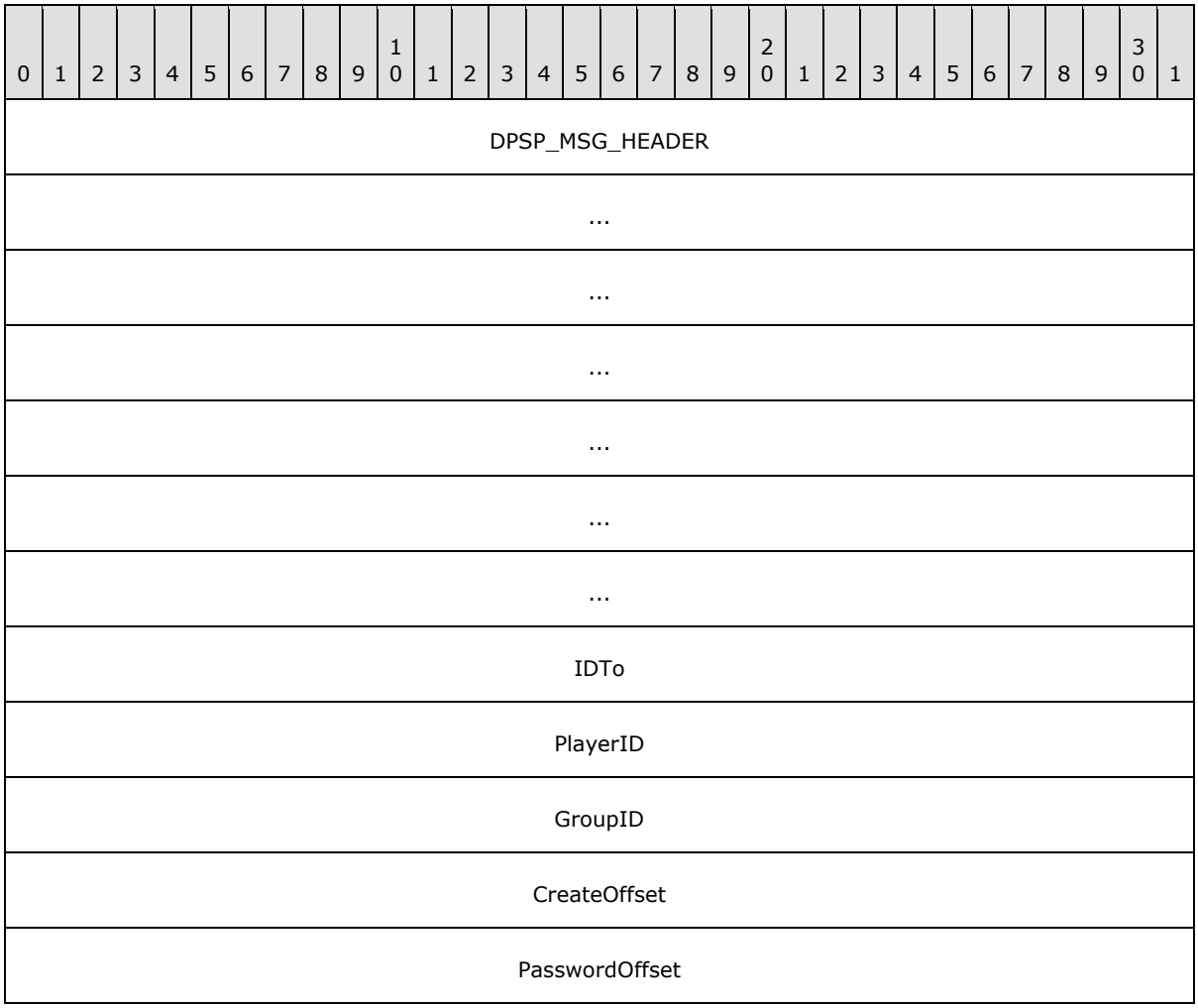
GroupID (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<31>

CreateOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<32>

PasswordOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<33>

2.2.26 DPSP_MSG_DELETEPLAYERFROMGROUP

The DPSP_MSG_DELETEPLAYERFROMGROUP packet is sent to indicate that a player has been deleted from a group.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 14.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<34>

PlayerID (4 bytes): MUST be set to the player ID of the newly deleted player.

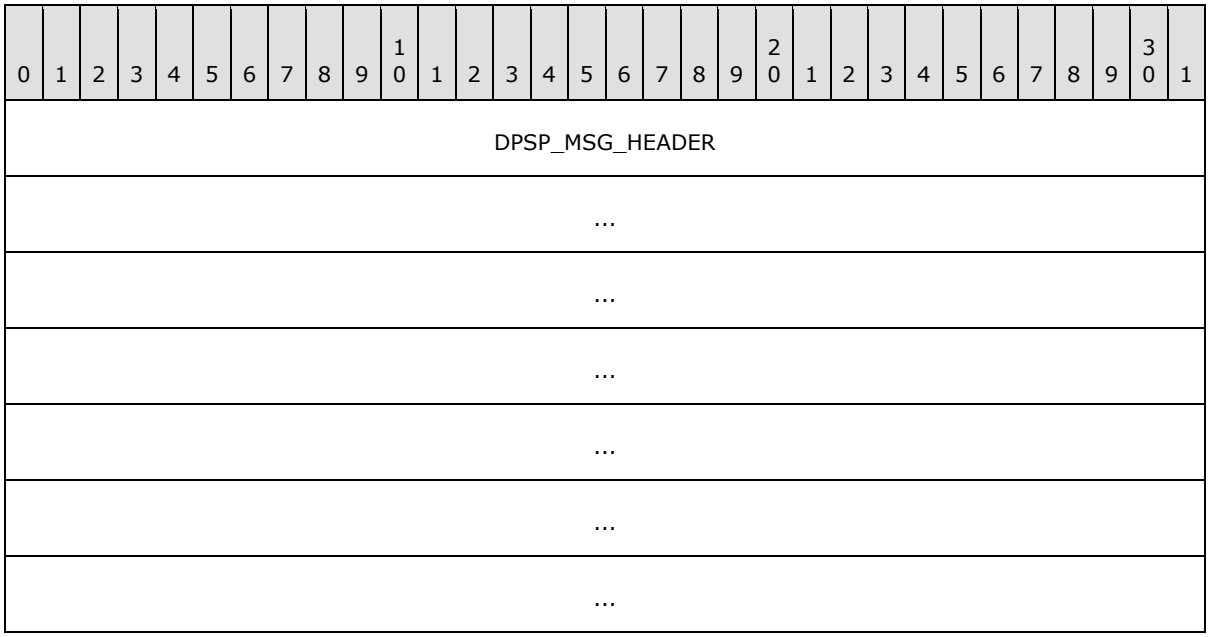
GroupID (4 bytes): MUST be set to the group ID that contained the deleted player.

CreateOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<35>

PasswordOffset (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<36>

2.2.27 DPSP_MSG_ENUMPLAYER

The DPSP_MSG_ENUMPLAYER packet is sent to the server to request an enumeration of DirectPlay 4 players.

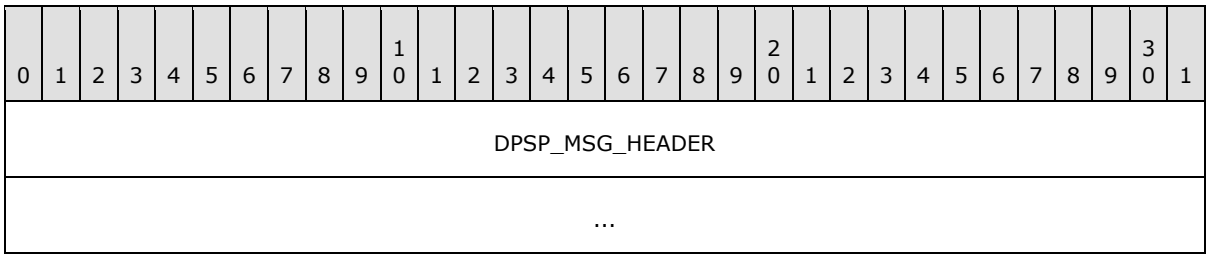


DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 4.

2.2.28 DPSP_MSG_ENUMPLAYERSREPLY

The DPSP_MSG_ENUMPLAYERSREPLY packet MAY be sent in response to a DPSP_MSG_ENUMPLAYER (section 2.2.27) message.

Note If the **CS** flag in the DPSESSIONDESC2 (section 2.2.5) structure associated with the session is set, implementations SHOULD use the **DPSP_MSG_ENUMPLAYERSREPLY** message; otherwise, implementations SHOULD use the DPSP_MSG_SUPERENUMPLAYERSREPLY (section 2.2.53) message.



...
...
...
...
...
PlayerCount
GroupCount
PlayerOffset
ShortcutCount
DescriptionOffset
NameOffset
PasswordOffset
DPSessionDesc2 (variable)
...
SessionName (variable)
...
Password (variable)
...
PlayerInfo (variable)
...

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 3.

PlayerCount (4 bytes): MUST be set to the number of players contained in the **PlayerInfo** field.

GroupCount (4 bytes): MUST be set to the number of groups contained in the **PlayerInfo** field.

PlayerOffset (4 bytes): MUST be set to the offset, in octets, of the **PlayerInfo** field from the beginning of the message.

ShortcutCount (4 bytes): MUST be ignored on reception.<37>

DescriptionOffset (4 bytes): MUST be set to the offset, in octets, of the **SessionDescription** field from the beginning of the message.

NameOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **SessionName** field. A value of zero means a null session name.

PasswordOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **Password** field. A value of 0 means a null password.

DPSessionDesc2 (variable): Structure that contains the DirectPlay session description information. MUST be set to a **DPSESSIONDESC2** (section 2.2.5) structure that contains the DirectPlay session description information.

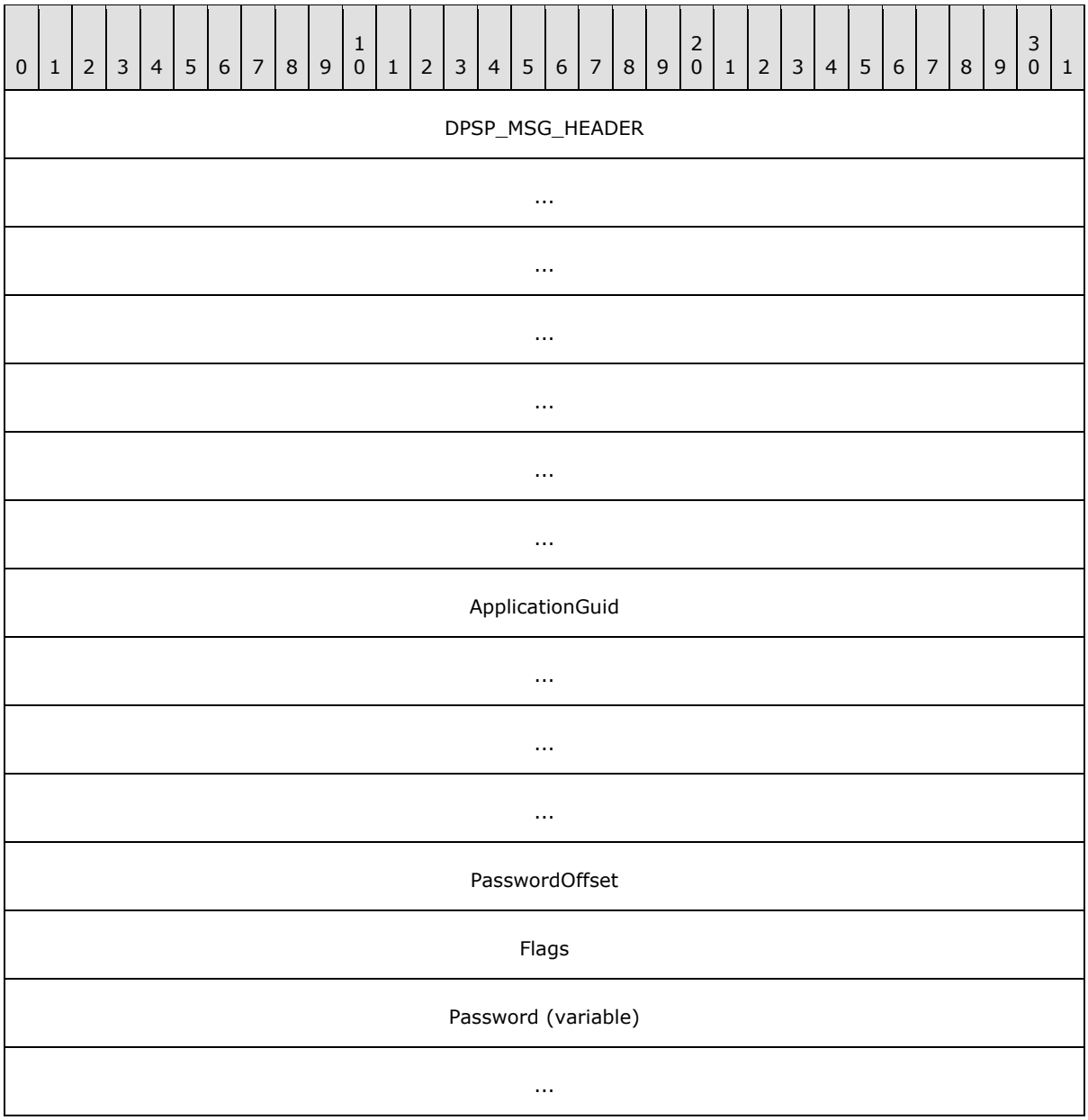
SessionName (variable): Null-terminated Unicode string that contains the session name.

Password (variable): Null-terminated Unicode string that contains the password.

PlayerInfo (variable): MUST be set to an array of **DPLAYI_PACKEDPLAYER** (section 2.2.2) structures. Each entry can hold either group information or player information. The same structure is used for groups and players. Player entries are followed by group entries. The number of entries in the array can be found by adding the **PlayerCount** and **GroupCount** fields.

2.2.29 DPSP_MSG_ENUMSESSIONS

The DPSP_MSG_ENUMSESSIONS packet is sent by the client to request an enumeration of DirectPlay 4 sessions.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 2.

ApplicationGuid (16 bytes): MUST be set to the **application identifier** for the game.

PasswordOffset (4 bytes): MUST be set to the offset, in octets, of the password from the beginning of the message.

Flags (4 bytes): MUST be set to one or more of the specified enumeration session flags passed in by the game.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
AV	AL	X				PR	X																								

AV (1 bit): Enumerate sessions that can be joined.

AL (1 bit): Enumerate all sessions, even if they cannot be joined.

X (4 bits): Not used, SHOULD be zero on transmission and MUST be ignored on reception.

PR (1 bit): Enumerate all sessions, even if they require a password.

X (25 bits): Not used, SHOULD be zero on transmission and MUST be ignored on reception.

Password (variable): MUST be set to a Null-terminated Unicode string that contains the password. This value is present only if the **PasswordOffset** field is non-zero.

2.2.30 DPSP_MSG_ENUMSESSIONSREPLY

The DPSP_MSG_ENUMSESSIONSREPLY packet is sent by the server in response to a **DPSP_MSG_ENUMSESSIONS** (section 2.2.29) request. One packet is sent for each active session.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
DPSP_MSG_HEADER																															
...																															
...																															
...																															
...																															
...																															
...																															
SessionDescription																															
...																															
...																															

...	
...	
...	
...	
...	
(SessionDescription cont'd for 4 rows)	
...	NameOffset
...	SessionName (variable)
...	

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 1.

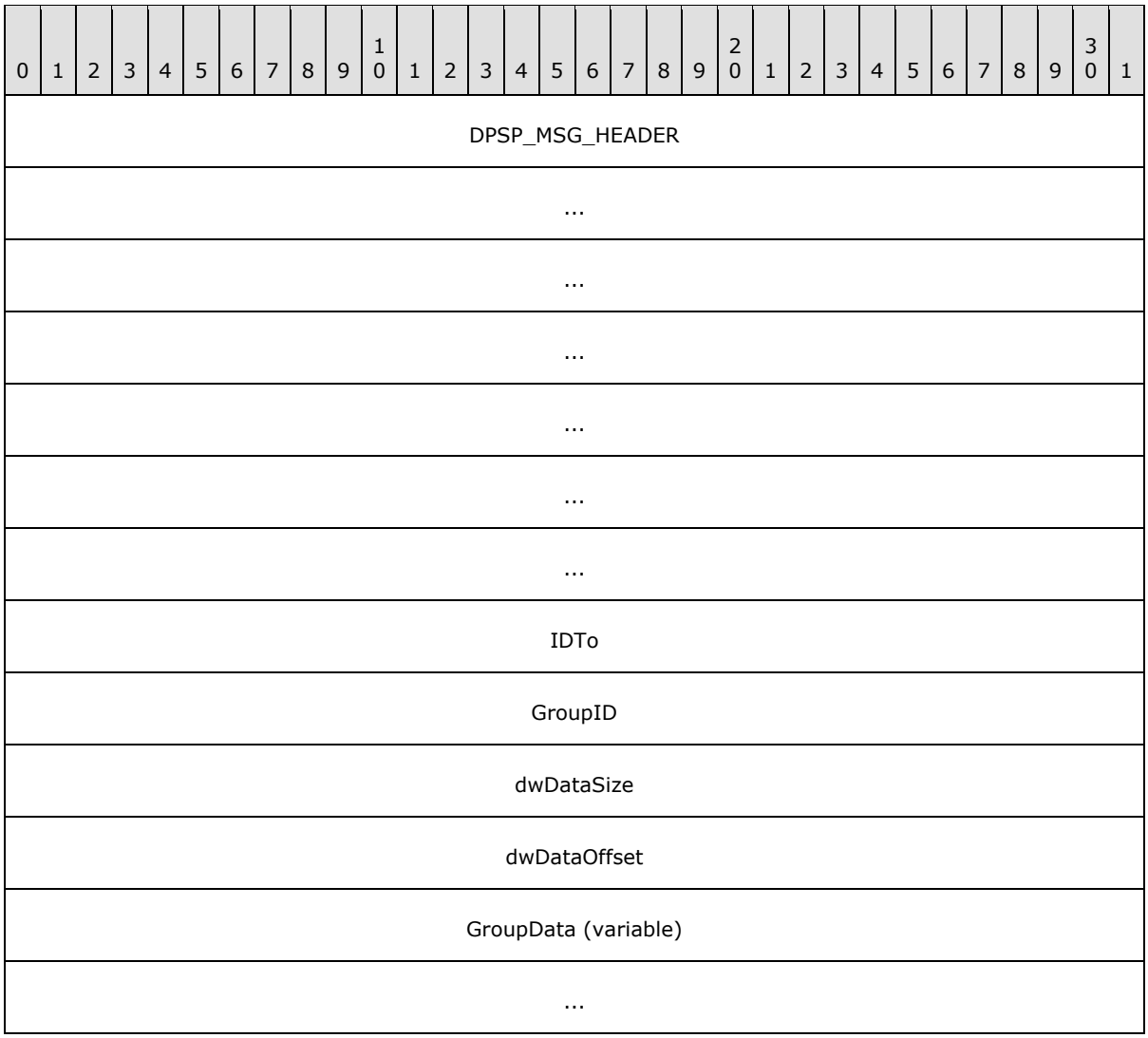
SessionDescription (50 bytes): MUST be set to a **DPSESSIONDESC2** (section 2.2.5) structure that describes the session.

NameOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message in the **SessionName** field.

SessionName (variable): MUST be set to the null-terminated Unicode string that contains the session name. This value is present only if the **NameOffset** field is non-zero.

2.2.31 DPSP_MSG_GROUPDATACHANGED

The DPSP_MSG_GROUPDATACHANGED packet is sent to inform all participants that group data changed.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 17.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<38>

GroupID (4 bytes): MUST be set to the identifier of the group whose data is being set.

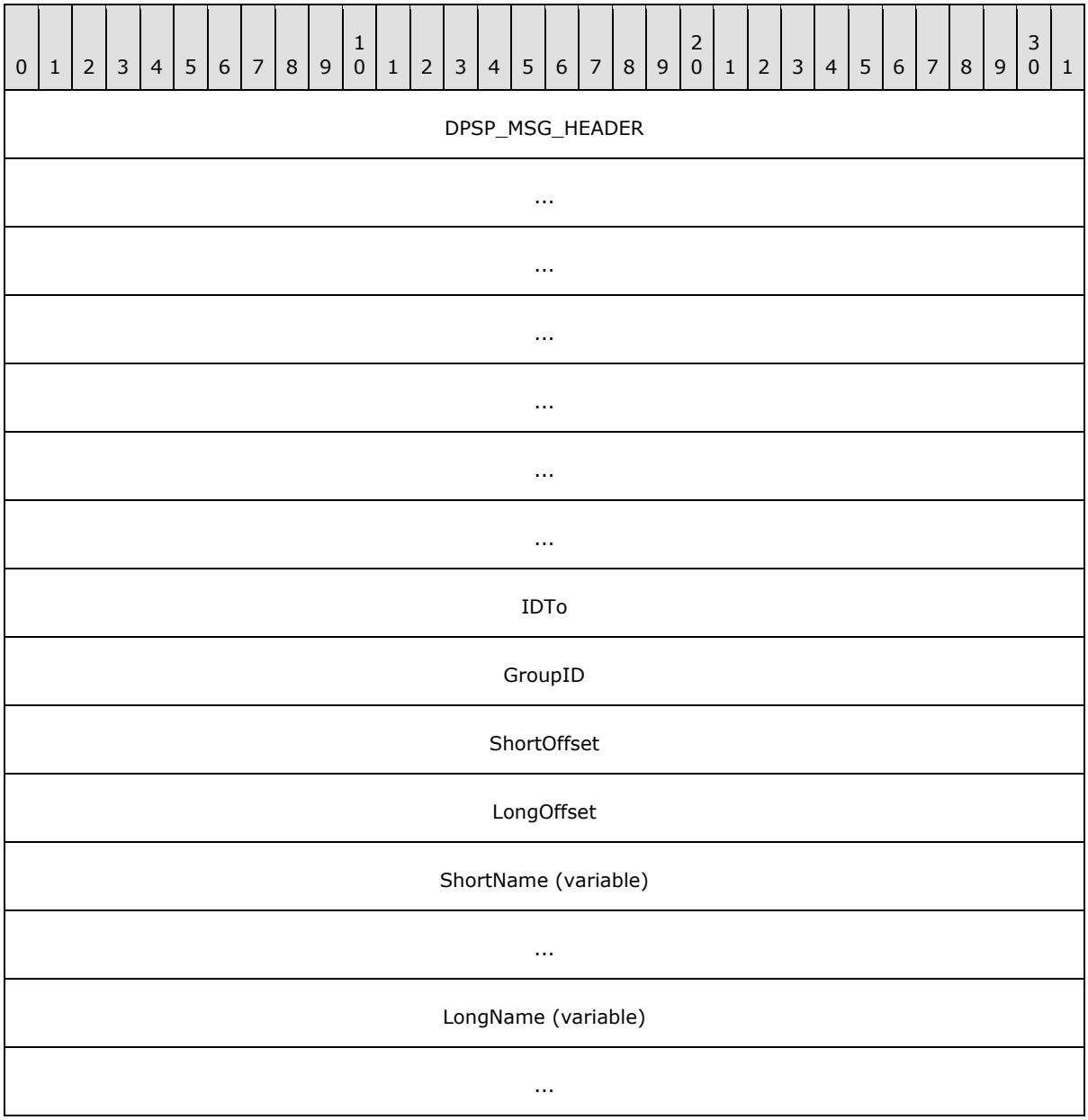
dwDataSize (4 bytes): MUST be set to the length of **GroupData**.

dwDataOffset (4 bytes): MUST be set to the offset, in octets, of **GroupData** from the beginning of the message.

GroupData (variable): Byte array that contains application data associated with the group.

2.2.32 DPSP_MSG_GROUPNAMECHANGED

The DPSP_MSG_GROUPNAMECHANGED packet is sent to inform all participants that a group name changed.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 18.

IDTo (4 bytes): Ignored. SHOULD be set to 0 on transmission, and MUST be ignored on reception.<39>

GroupID (4 bytes): MUST be set to the identifier of the group whose data is being set.

ShortOffset (4 bytes): MUST be set to the offset, in octets, of the **ShortName** field from the beginning of the message, or 0, which indicates a null short name.

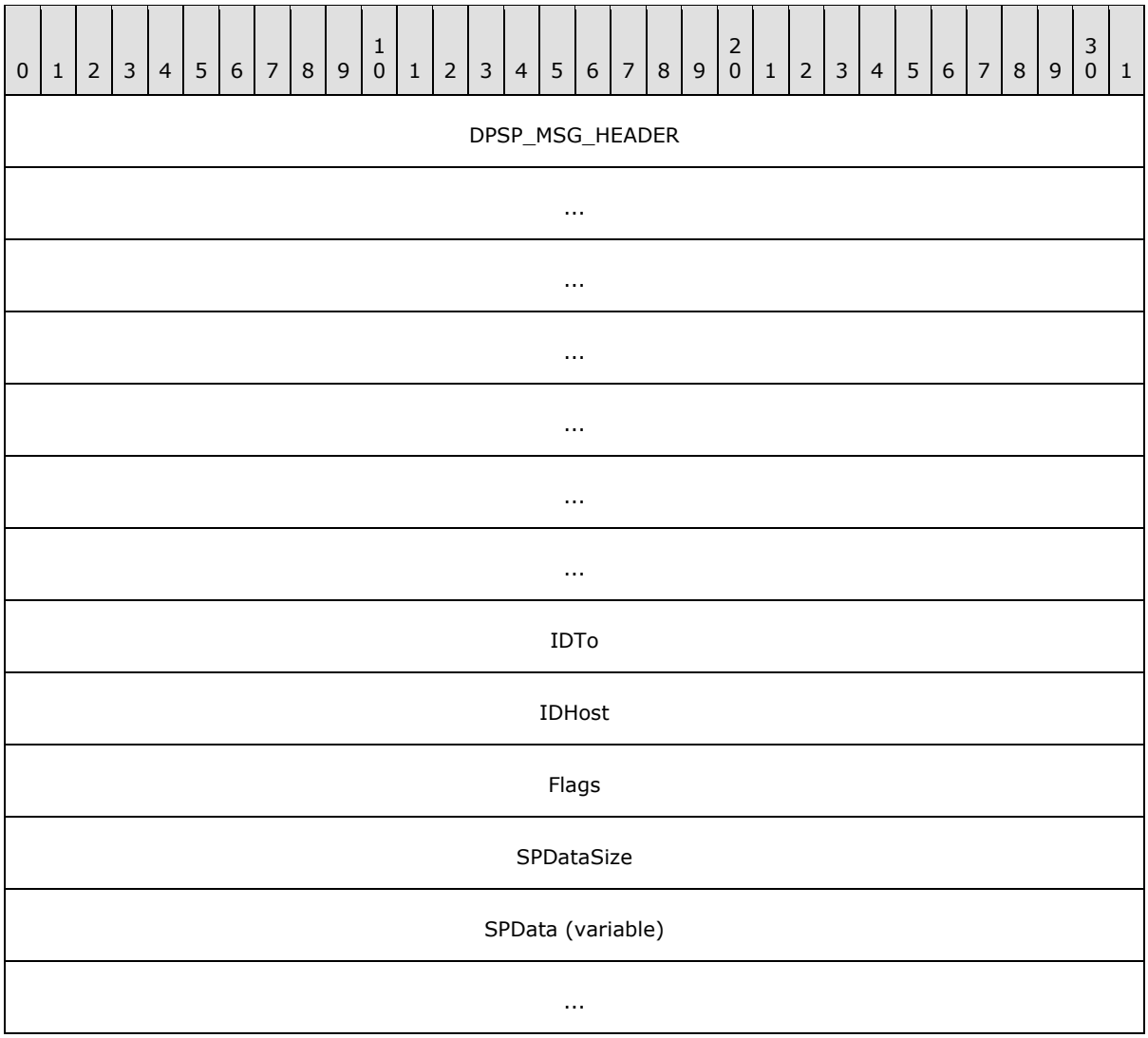
LongOffset (4 bytes): MUST be set to the offset, in octets, of the **LongName** field from the beginning of the message, or zero, which indicates a null long name.

ShortName (variable): MUST be set to the Null-terminated Unicode string that contains the new short name.

LongName (variable): MUST be set to the Null-terminated Unicode string that contains the new long name.

2.2.33 DPSP_MSG_IAMNAMESERVER

The DPSP_MSG_IAMNAMESERVER packet is sent to inform participants of the name server's (host's) identity.

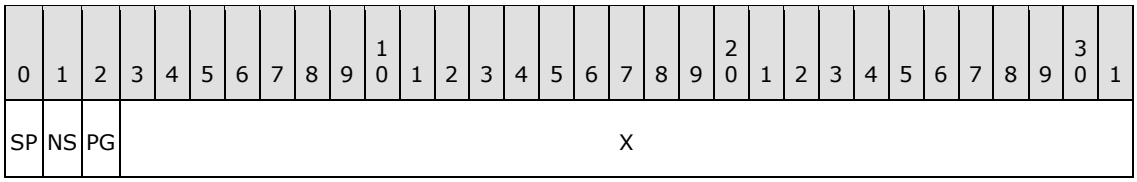


DPSP_MSG_HEADER (28 bytes): The message header for this packet. The Command Value member of this field MUST be set to 53.

IDTo (4 bytes): MUST be set to the identifier of the destination player.

IDHost (4 bytes): MUST be set to the system player identifier of the new DirectPlay host.

Flags (4 bytes): MUST be set to the player flags that describe the system player of the new host.



SP (1 bit): The player is the system player.

NS (1 bit): The player is the name server (host). MUST be combined with **SP**.

PG (1 bit): The player belongs to a group. This flag MUST be set for system players, for other players that have been added to a group using DPSP_MSG_ADDPLAYERTOGROUP (section 2.2.12), or for groups that have been added to a group using DPSP_MSG_ADDSHORTCUTTOGROUP (section 2.2.13).

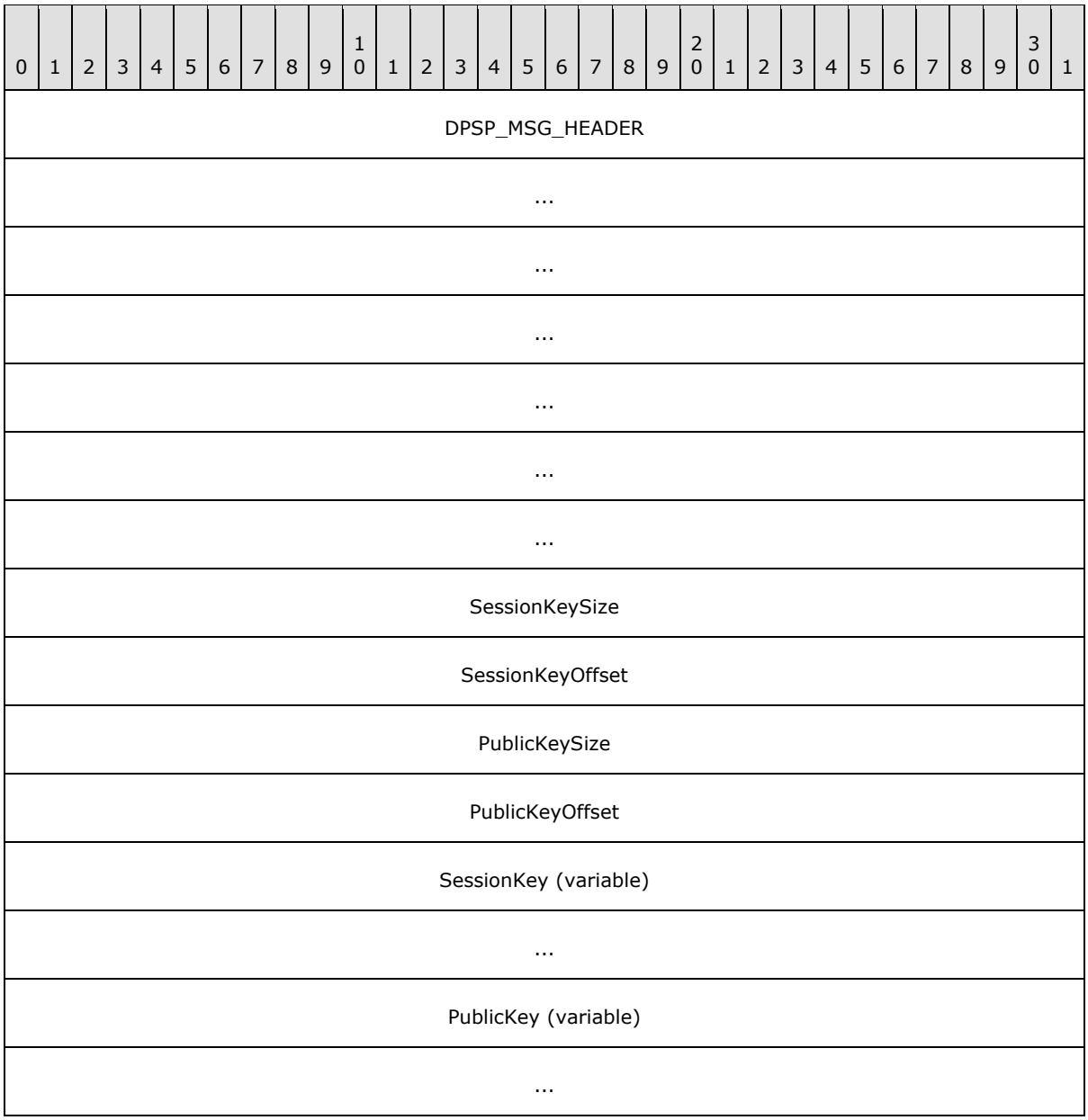
X (29 bits): Unused. All bits that have this label SHOULD be set to 0 when sent and MUST be ignored when received.

SPDataSize (4 bytes): MUST contain the length, in octets, of the **SPData** field.

SPData (variable): If **SPDataSize** is nonzero, MUST be set to the data that is used by the DirectPlay Service Provider.<40>

2.2.34 DPSP_MSG_KEYEXCHANGE

The DPSP_MSG_KEYEXCHANGE packet is used to send the client's public key to the server.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 43.

SessionKeySize (4 bytes): MUST be set to the size, in octets, of the **SessionKey** field.

SessionKeyOffset (4 bytes): MUST bet set to the offset, in octets, from the beginning of the message to the **SessionKey** field.

PublicKeySize (4 bytes): MUST be set to the size of the **PublicKey** field.

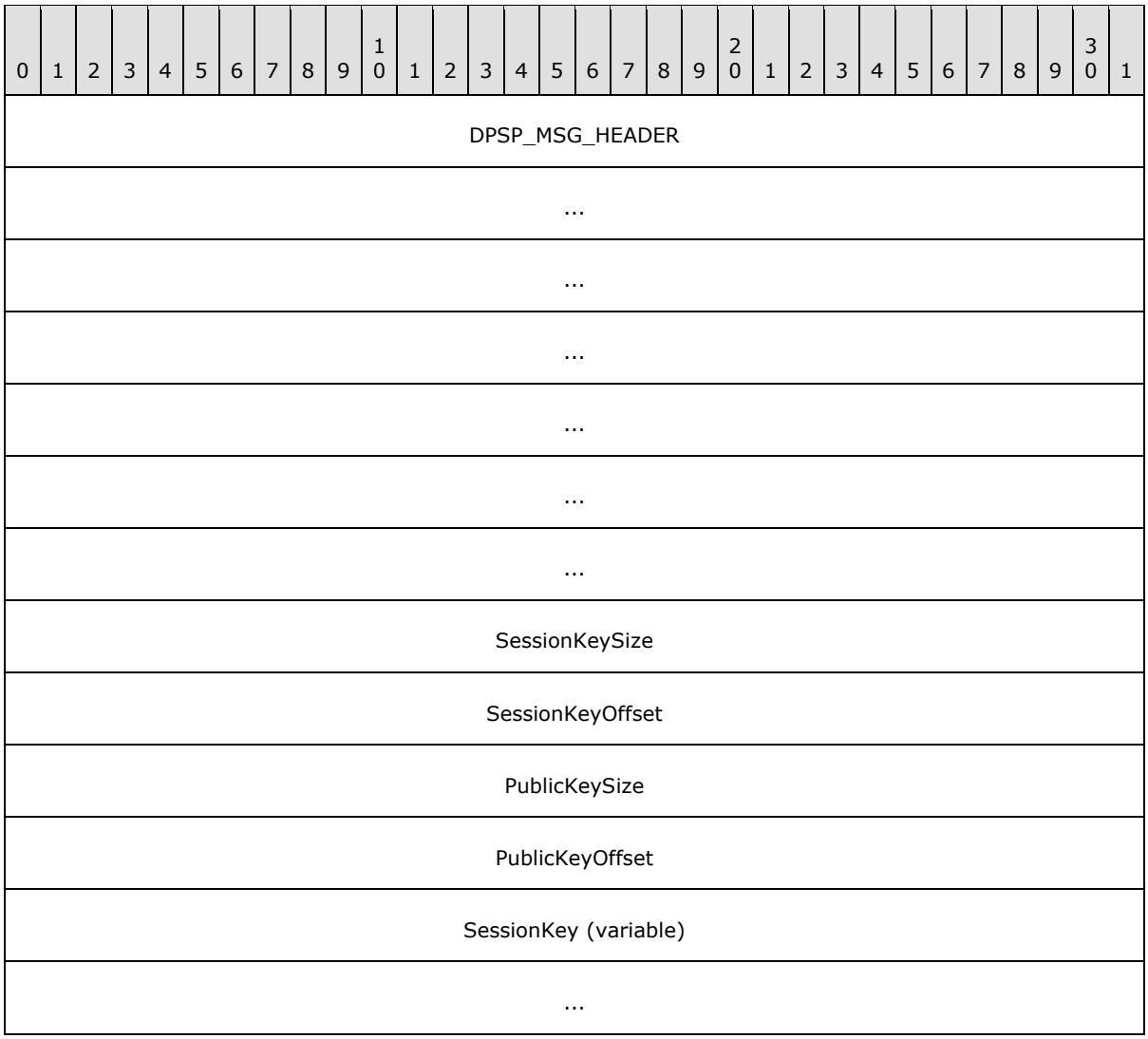
PublicKeyOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **PublicKey** field.

SessionKey (variable): Array of bytes that contains the key used to encrypt data.

PublicKey (variable): Array of bytes that contains the client's public key.

2.2.35 DPSP_MSG_KEYEXCHANGEREPLY

The DPSP_MSG_KEYEXCHANGEREPLY packet is sent in response to a **DPSP_MSG_KEYEXCHANGE** (section 2.2.34) message that contains the server's public key.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 44.

SessionKeySize (4 bytes): MUST be set to the size, in octets, of the **SessionKey** field.

SessionKeyOffset (4 bytes): MUST bet set to the offset, in octets, from the beginning of the message to the **SessionKey** field.

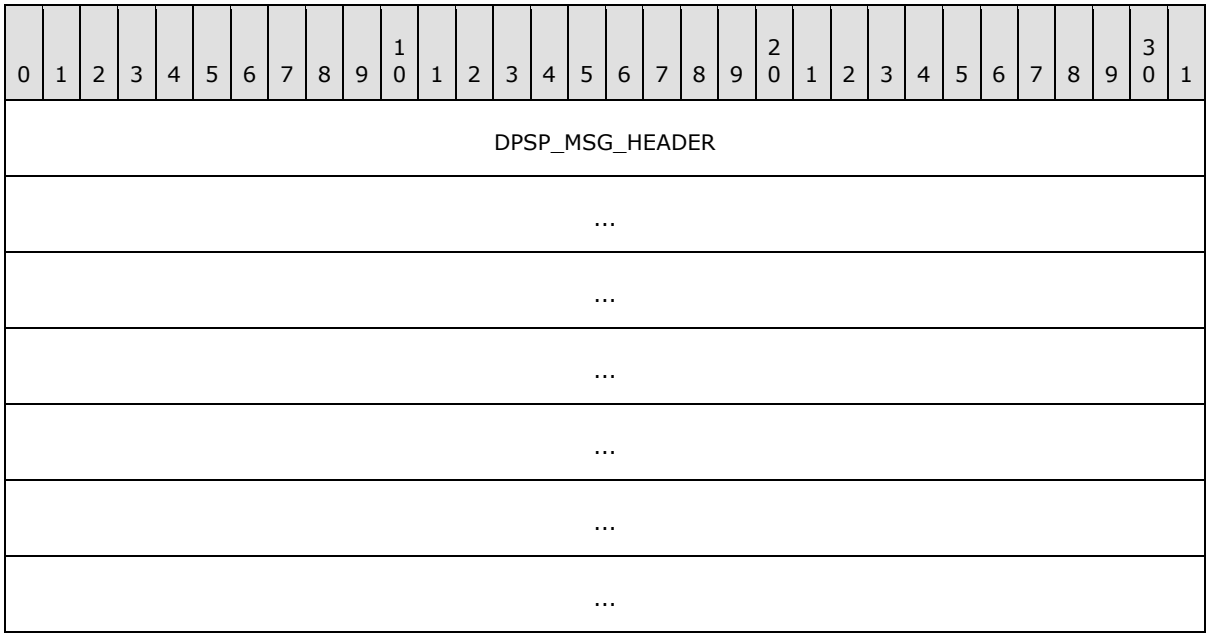
PublicKeySize (4 bytes): Not used. SHOULD be set to 0 on transmission, and MUST be ignored on reception.

PublicKeyOffset (4 bytes): Not used. SHOULD be set to 0 on transmission, and MUST be ignored on reception.

SessionKey (variable): Array of bytes that contains the key used to encrypt data.

2.2.36 DPSP_MSG_LOGONDENIED

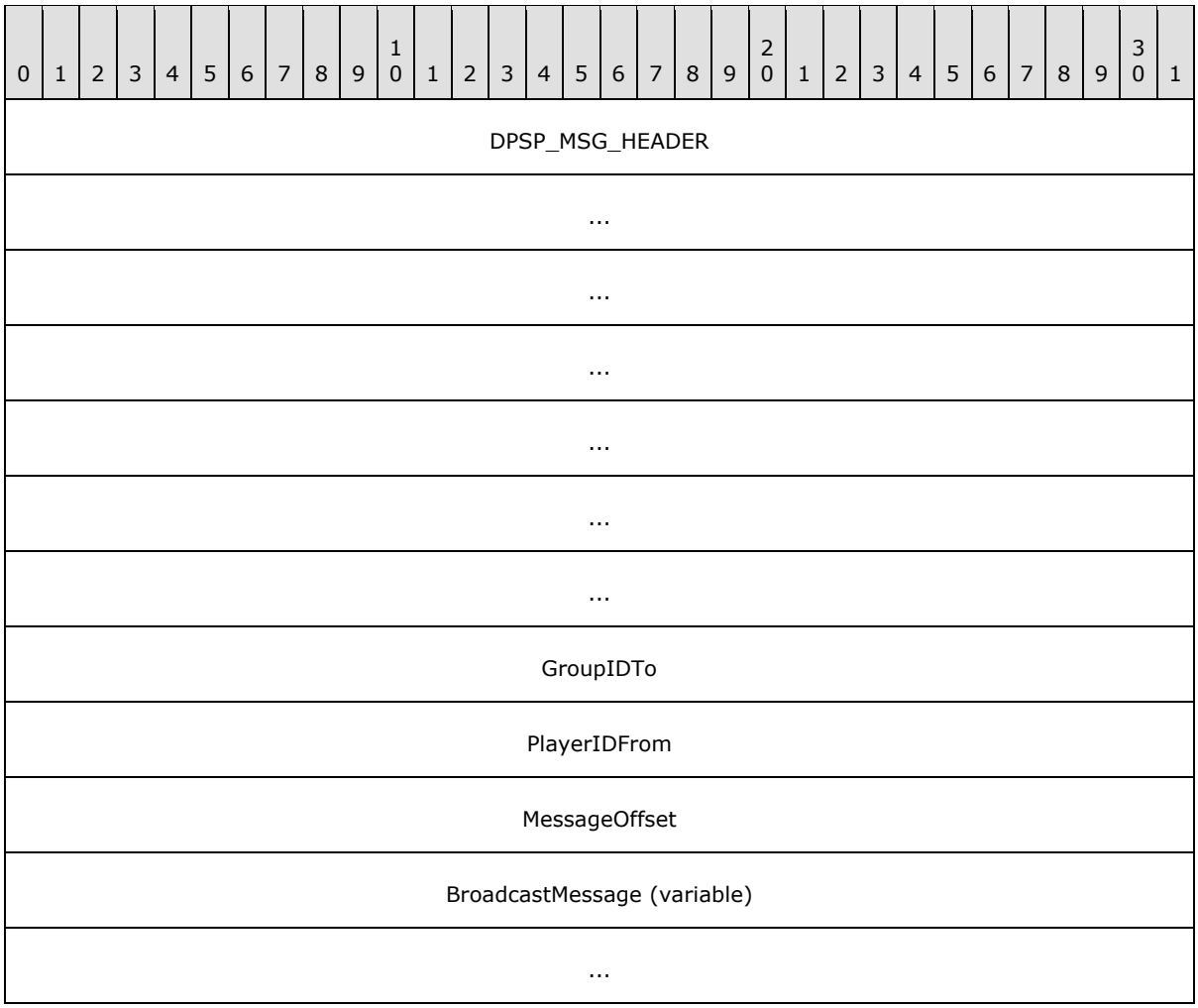
The DPSP_MSG_LOGONDENIED packet is sent to indicate that a logon failed.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 30.

2.2.37 DPSP_MSG_MULTICASTDELIVERY

The DPSP_MSG_MULTICASTDELIVERY packet is used to perform a message broadcast.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 55.

GroupIDTo (4 bytes): MUST be set to the identifier of the group that is the target of the request.

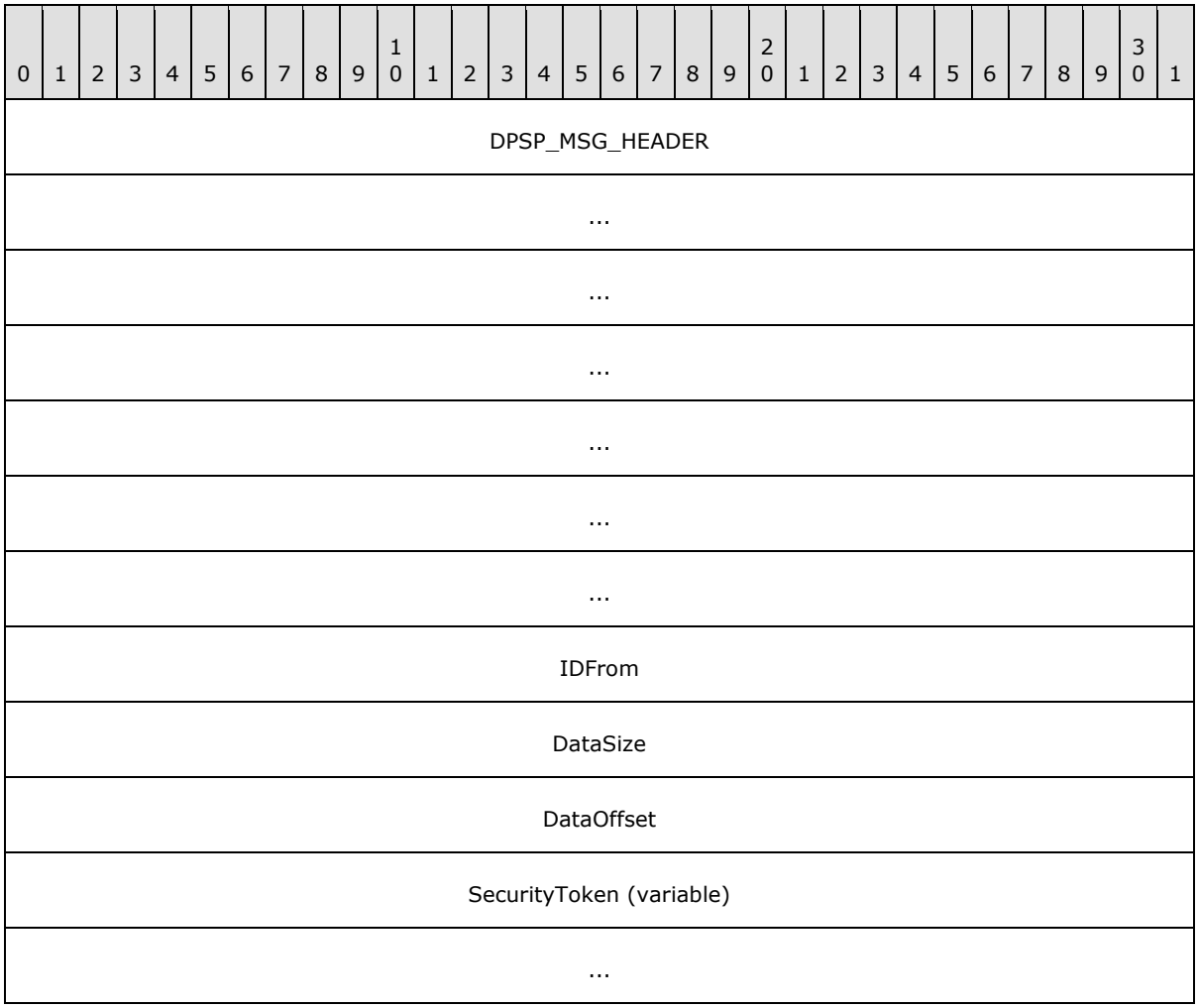
PlayerIDFrom (4 bytes): MUST be set to the identifier of the player that is originating the request.

MessageOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **BroadcastMessage** field.

BroadcastMessage (variable): Array of octets that contain the message to broadcast. This field MUST contain a complete DirectPlay 4 Protocol message. However, the message MUST begin with the **Signature** field of the DPSP_MSG_HEADER (section 2.2.6) rather than the entire **DPSP_MSG_HEADER** structure.

2.2.38 DPSP_MSG_NEGOTIATE

The DPSP_MSG_NEGOTIATE packet is sent to indicate to the server that the client is seeking to initiate a secure connection.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 32.

IDFrom (4 bytes): MUST be set to the ID of the system player on the sender's system.

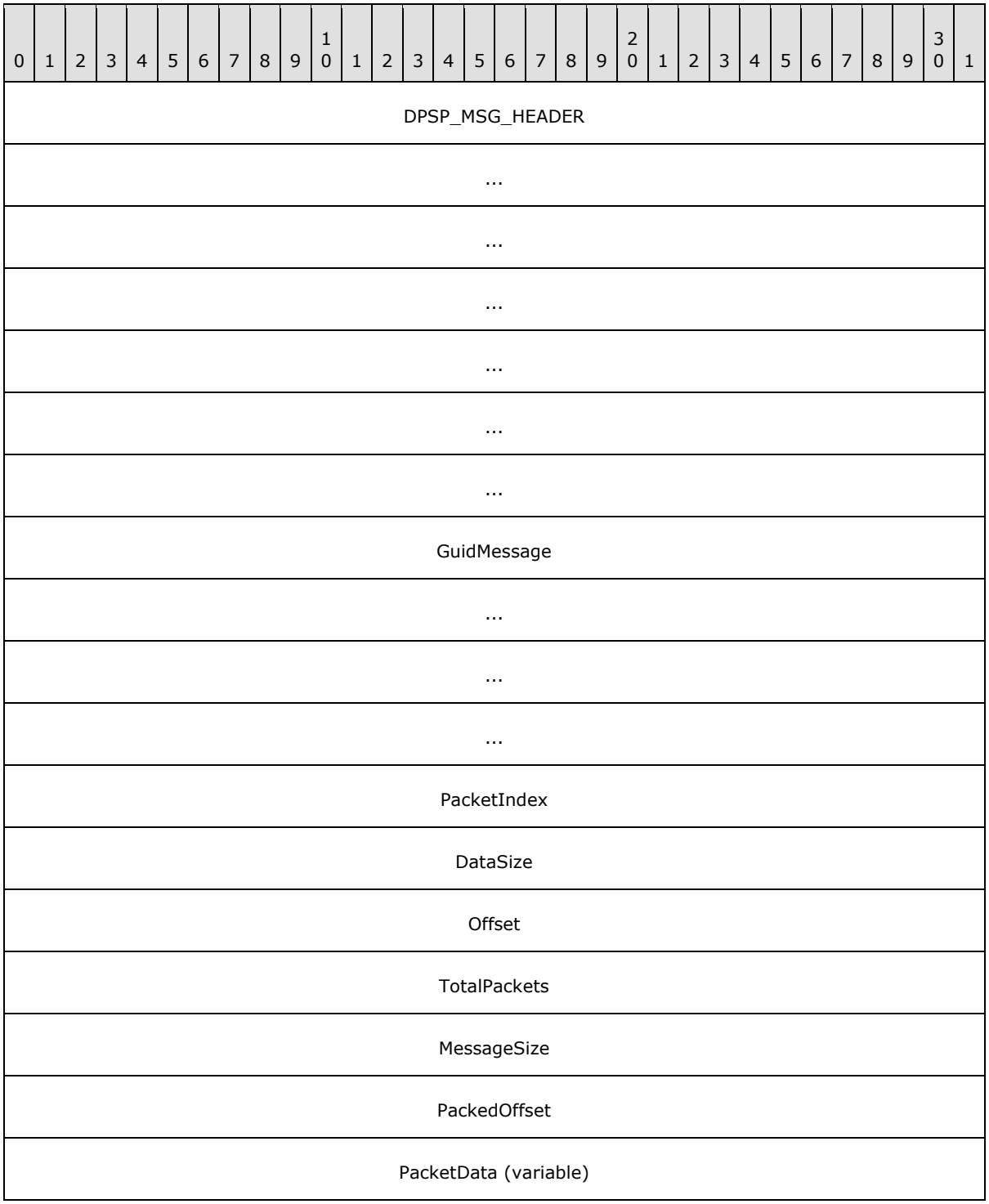
DataSize (4 bytes): MUST be set to the size, in octets, of the **SecurityToken** field.

DataOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **SecurityToken** field.

SecurityToken (variable): Opaque security token whose size is specified by the **DataSize** field.

2.2.39 DPSP_MSG_PACKET

The DPSP_MSG_PACKET packet contains player-to-player data that is part of a larger message that does not fit within the Maximum Transmission Unit (MTU) size of the transport.



…

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 21.

GuidMessage (16 bytes): MUST be set to an identifier that uniquely identifies the message to which the packet belongs.

PacketIndex (4 bytes): MUST be set to the index of the packet in the series of packets that make up the message.

DataSize (4 bytes): MUST be set to the total size, in octets, of the data in the packet.

Offset (4 bytes): MUST be set to the offset of this packet in the larger message to be transmitted.

TotalPackets (4 bytes): MUST be set to the total number of packets that are used to transmit this message.

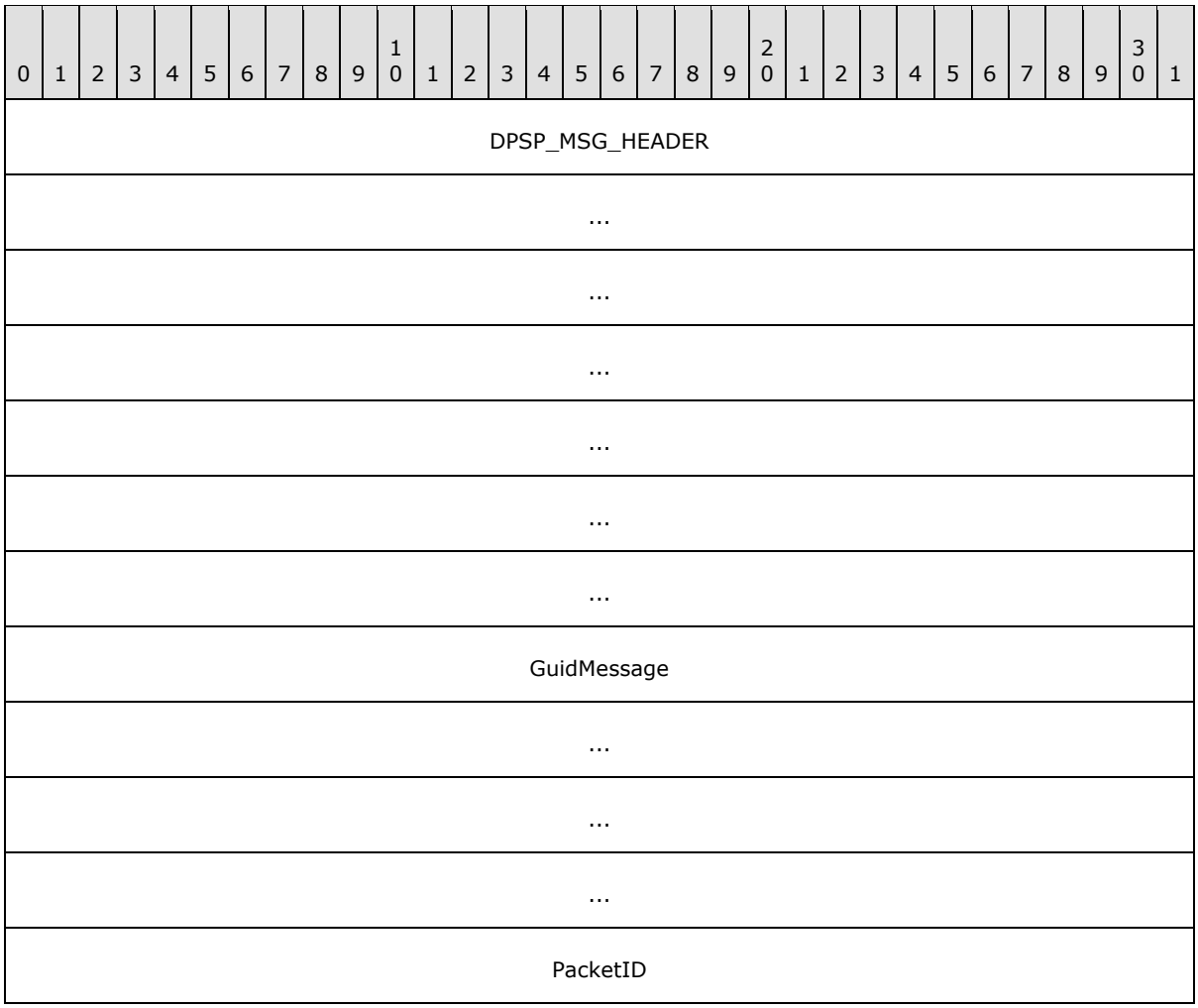
MessageSize (4 bytes): MUST be set to the size of the buffer, in octets, that will contain the entire message.

PackedOffset (4 bytes): MUST be set to the offset, in octets, into the message of the actual packet data.

PacketData (variable): Array of **DataSize** bytes that contains the packet data. **PacketData** is a fragment of a large message that spans multiple packets because it exceeded the Maximum Transmission Unit size of the network. When all fragments have been reassembled, the large message must contain a complete DirectPlay 4 packet.

2.2.40 DPSP_MSG_PACKET2_ACK

The DPSP_MSG_PACKET2_ACK packet is sent in response to a **DPSP_MSG_PACKET2_DATA** (section 2.2.41) message.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 49.

GuidMessage (16 bytes): Identifier of the message to which this packet belongs.

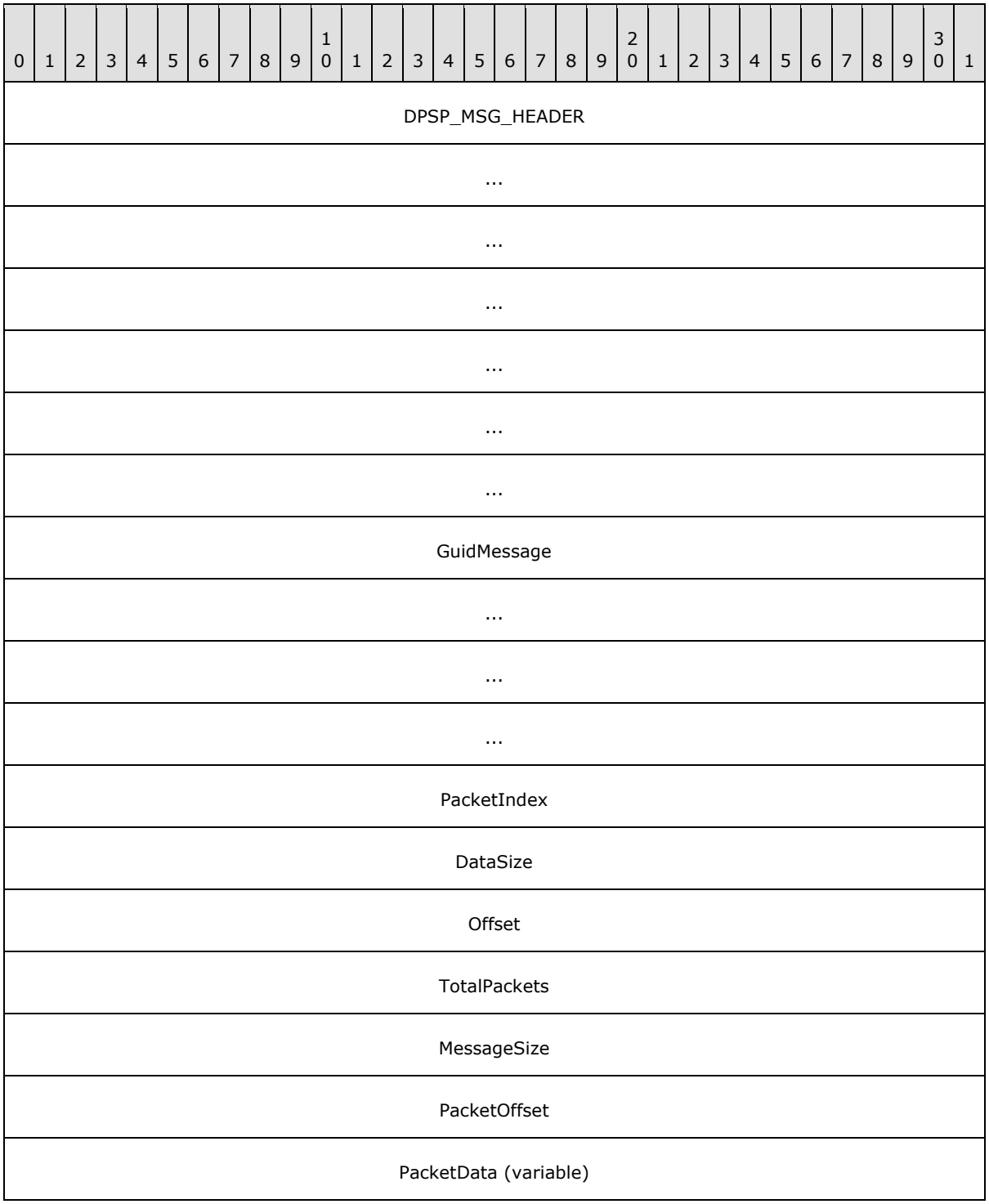
PacketID (4 bytes): Acknowledgment packet identifier.

2.2.41 DPSP_MSG_PACKET2_DATA

The DPSP_MSG_PACKET2_DATA packet contains a player-to-player message that is part of a larger message that does not fit within the Maximum Transmission Unit (MTU) size of the transport. It must be acknowledged with a **DPSP_MSG_PACKET2_ACK** (section 2.2.40) message.

Once all the DPSP_MSG_PACKET2_DATA packets for a particular message have been received (as identified by the **GuidMessage** field), they are assembled into one contiguous message that is the concatenation of all the **PacketData** fields of all the associated DPSP_MSG_PACKET2_DATA messages. If the message was sent without reliability, then after a 15 second period during which no DPSP_MSG_PACKET2_DATA packets are received for a particular message, then the entire message is discarded.

This assembly mechanism for large messages is used both for internal system messages and for user messages. The packet breakup and assembly system is unaware of the contents of the payload. Once the payload is reassembled, the payload is re-indicated to the lowest level of the receive path as any other received message.



…

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 48.

GuidMessage (16 bytes): MUST be set to an identifier that uniquely identifies the message to which the packet belongs.

PacketIndex (4 bytes): MUST be set to the index of the packet in the series of packets that make up the message.

DataSize (4 bytes): MUST be set to the total size, in octets, of the data in the packet.

Offset (4 bytes): MUST be set to the offset of this packet in the larger message to be transmitted.

TotalPackets (4 bytes): MUST be set to the total number of packets that are used to transmit this message.

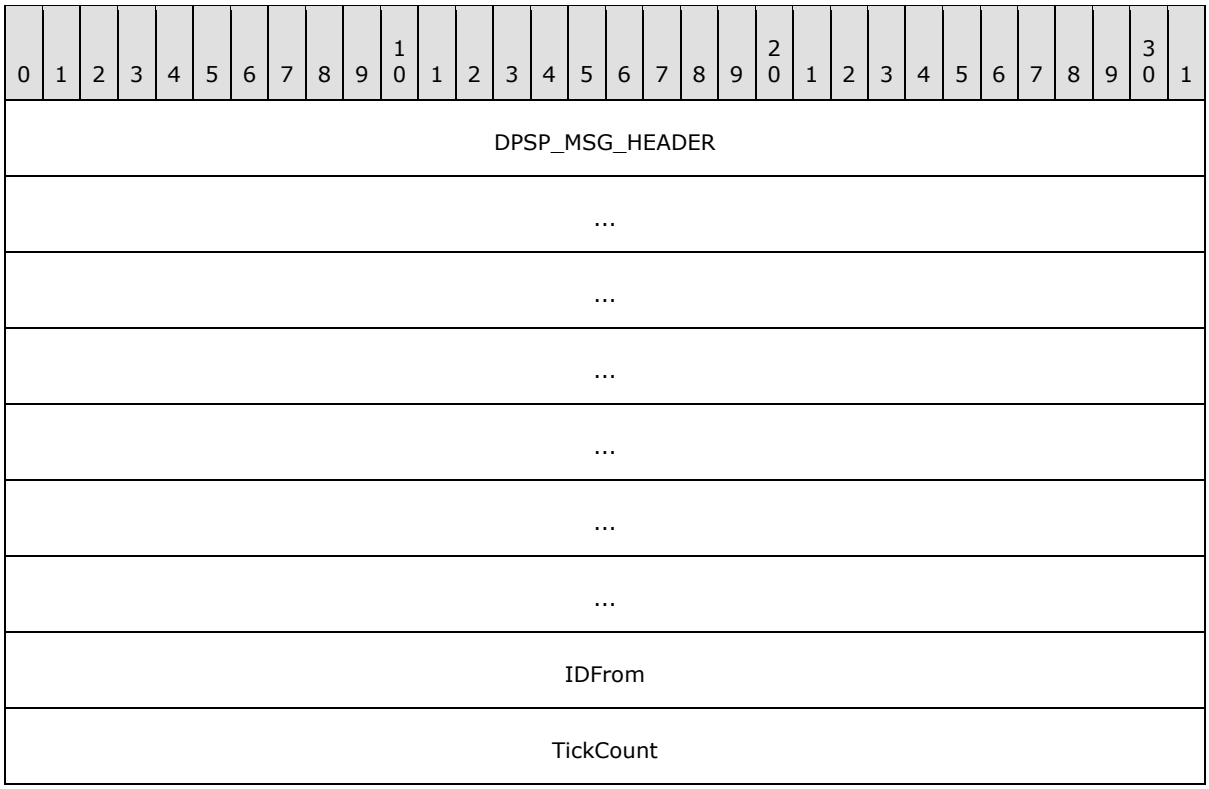
MessageSize (4 bytes): MUST be set to the size of the buffer, in octets, that will contain the entire message.

PacketOffset (4 bytes): MUST be set to the offset, in octets, into the message of the actual packet data.

PacketData (variable): Array of **DataSize** bytes that contains the packet data.

2.2.42 DPSP_MSG_PING

The DPSP_MSG_PING packet is used to keep the UDP session active and to optimize the protocol.



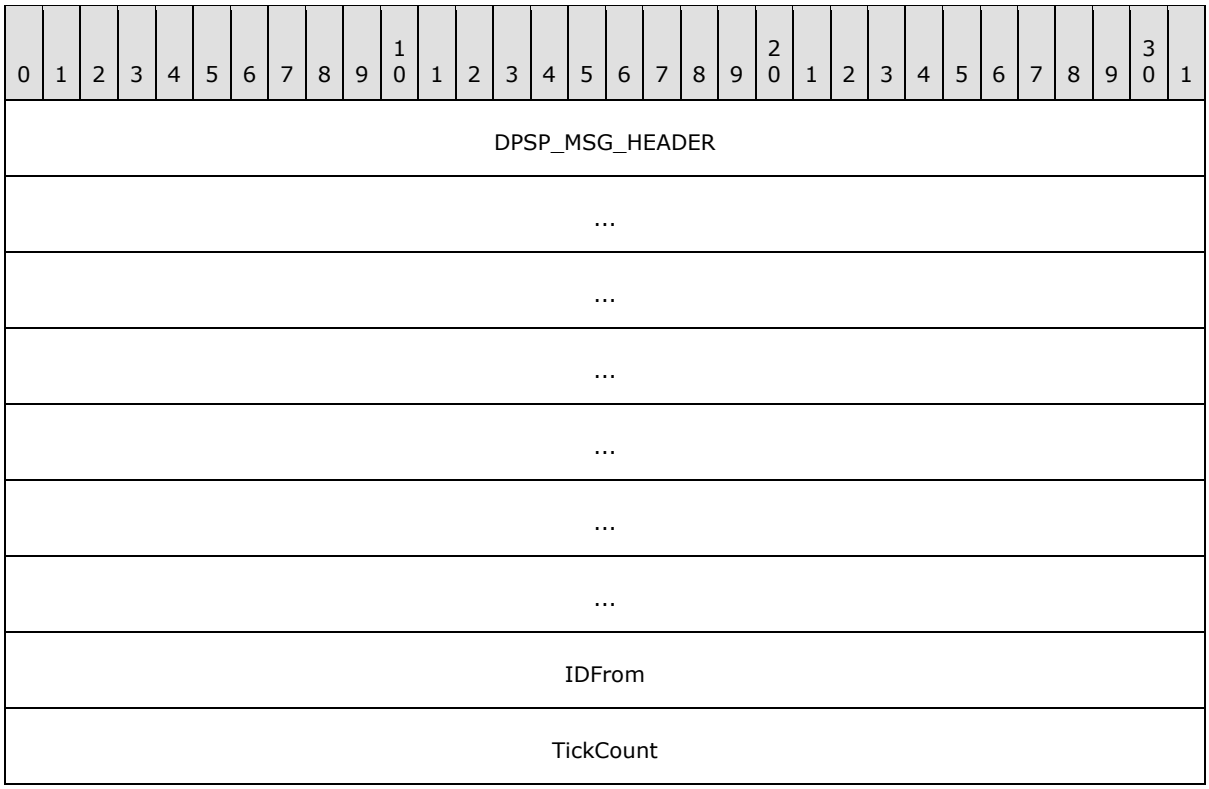
DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 22.

IDFrom (4 bytes): MUST be set to the identifier of the player who sent the ping.

TickCount (4 bytes): MUST be set to the number of milliseconds that have elapsed since the system was started.

2.2.43 DPSP_MSG_PINGREPLY

The DPSP_MSG_PINGREPLY packet is sent in response to a **DPSP_MSG_PING** (section 2.2.42) message.



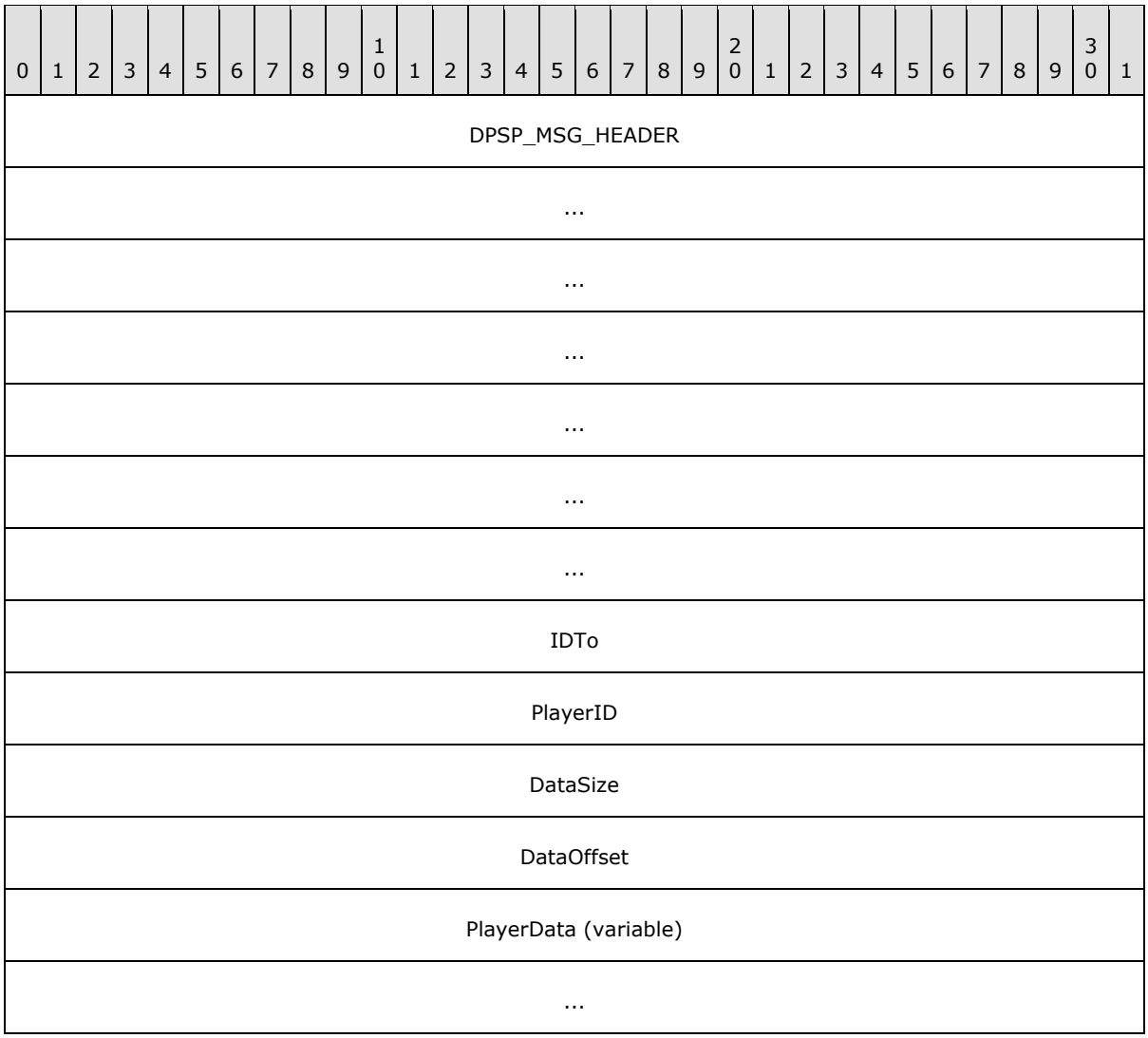
DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 23.

IDFrom (4 bytes): MUST be set to the identifier of the player who sent the ping for which this is a response.

TickCount (4 bytes): MUST be set to the value in the **DPSP_MSG_PING** (section 2.2.42) for which this is the reply.

2.2.44 DPSP_MSG_PLAYERDATACHANGED

The DPSP_MSG_PLAYERDATACHANGED packet is sent to inform all participants that a player's data changed.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 15.

IDTo (4 bytes): Identifier of the destination player. MUST be 0.

PlayerID (4 bytes): MUST be set to the identifier of the player whose data is being set.

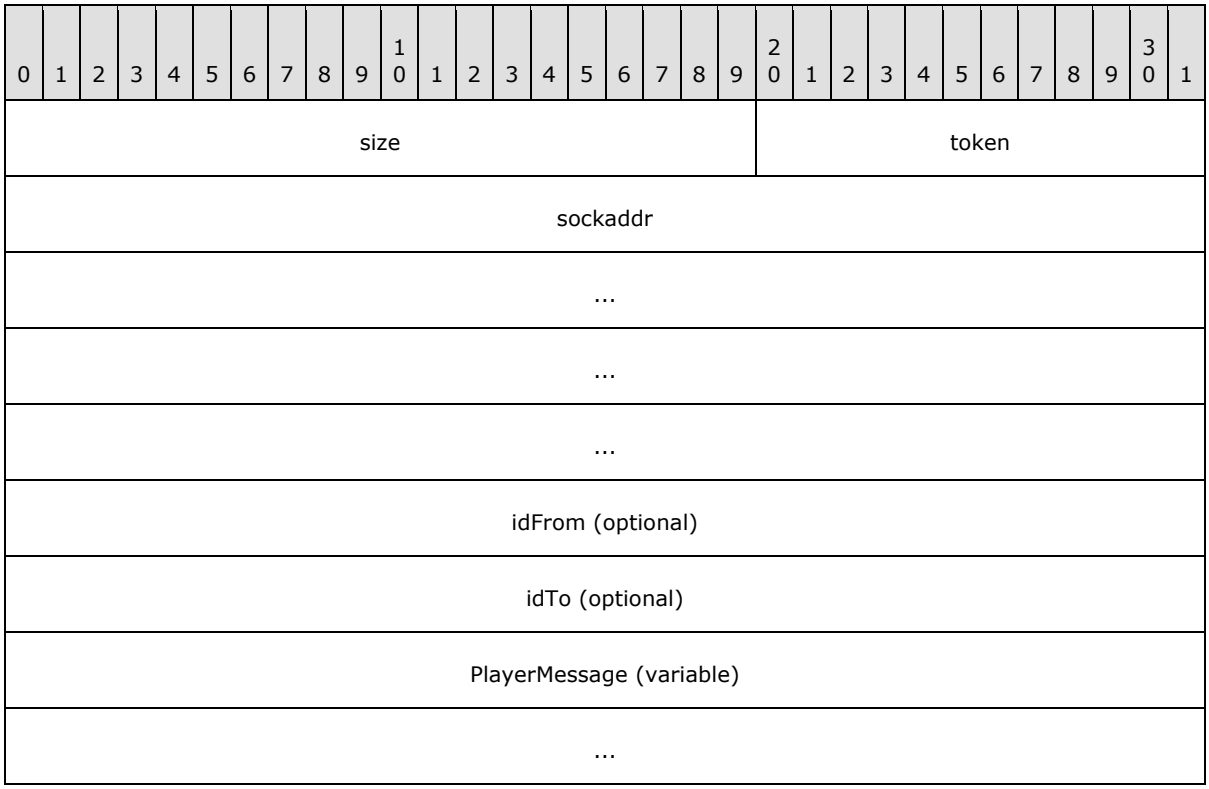
DataSize (4 bytes): MUST be set to the length of **PlayerData**, in octets.

DataOffset (4 bytes): MUST be set to the offset, in octets, of **PlayerData** from the beginning of the message.

PlayerData (variable): Game data that contains **DataSize** octets of changed data associated with the player.

2.2.45 DPSP_MSG_PLAYERMESSAGE

The DPSP_MSG_PLAYERMESSAGE is used to send a player-to-player message.



size (20 bits): Indicates the size of the message (in octets). The value is obtained by performing a bitwise AND (&) operation with the **token** field and 0x000FFFFF.

token (12 bits): Describes high-level message characteristics. The value is obtained by performing a bitwise AND (&) operation with the **size** field and 0xFFF00000.

Value	Meaning
0xFAB	Indicates that the message was received from a remote DirectPlay machine.
0xCAB	Indicates that the message will be forwarded to all registered servers.
0xBAB	Indicates that the message was received from a DirectPlay server.

sockaddr (16 bytes): Not used to transmit data. This field is a placeholder within the packet, to be used by the sender and the receiver before the packet is sent or after it is received. For more information about the SOCKADDR structure, see [SOCKADDR].

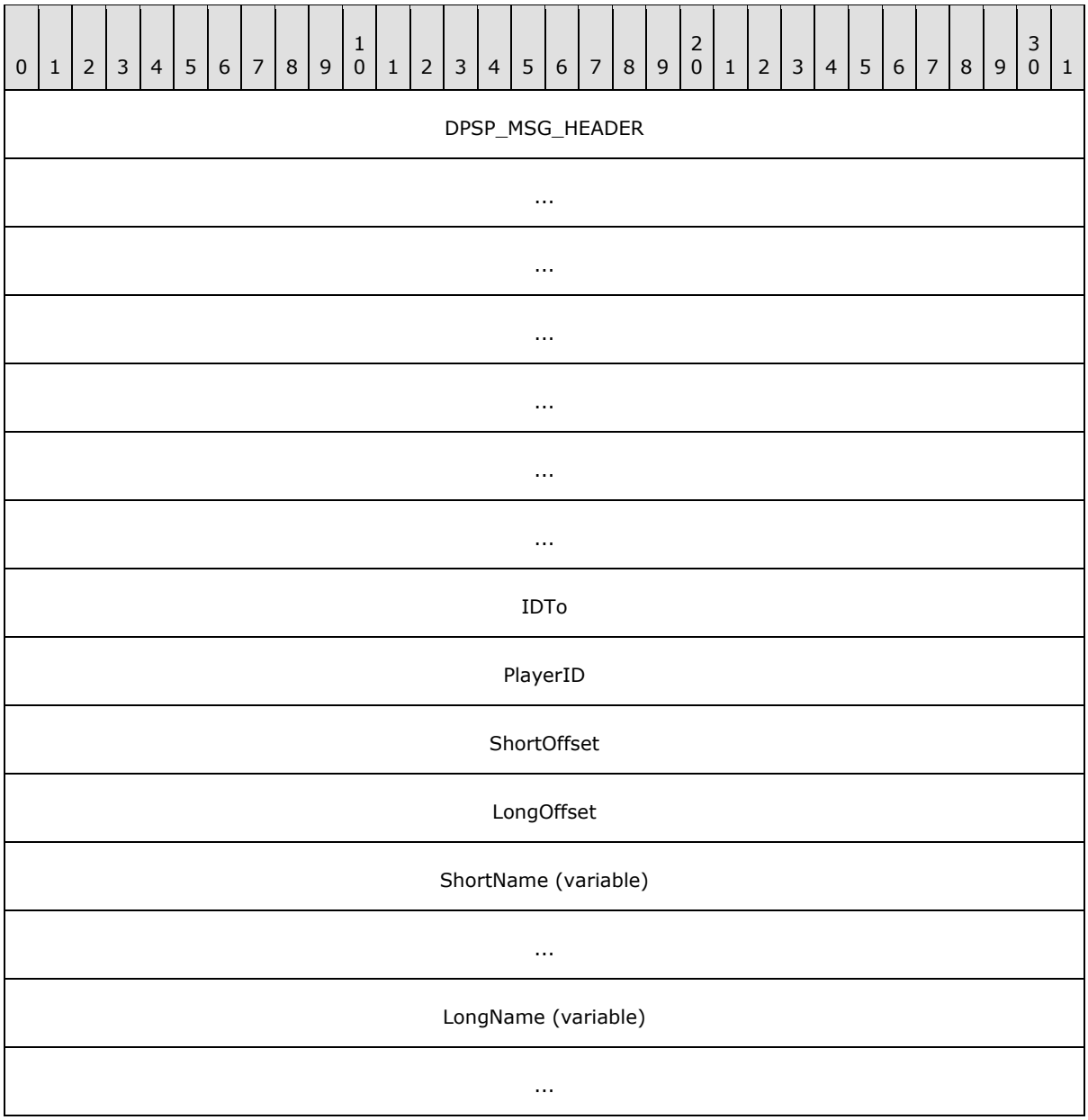
idFrom (4 bytes): Identifier of the player who is the message's source. This field MUST be present when the **NM** flag in the **DPSESSIONDESC2** structure (section 2.2.5) is NOT set for the session, and MUST NOT be present when the **NM** flag is set for the session.

idTo (4 bytes): Identifier of the player who is the message's destination. This field MUST be present when the **NM** flag in the **DPSESSIONDESC2** structure (section 2.2.5) is NOT set for the session, and MUST NOT be present when the **NM** flag is set for the session.

PlayerMessage (variable): Player messages are the primary application method of communication between DirectPlay applications. They are distinguished from other DirectPlay messages by the format of their header, and the lack of the presence of the "play" signature in the header. The **PlayerMessage** portion of the message contains an application-specific payload.

2.2.46 DPSP_MSG_PLAYERNAMECHANGED

The DPSP_MSG_PLAYERNAMECHANGED packet is sent to inform all participants that a player's name changed.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 16.

IDTo (4 bytes): Identifier of the destination player. MUST be set to 0.

PlayerID (4 bytes): MUST be set to the identifier of the player whose name is being changed.

ShortOffset (4 bytes): MUST be set to the offset, in octets, of the **ShortName** field from the beginning of the message or 0, which indicates a null short name.

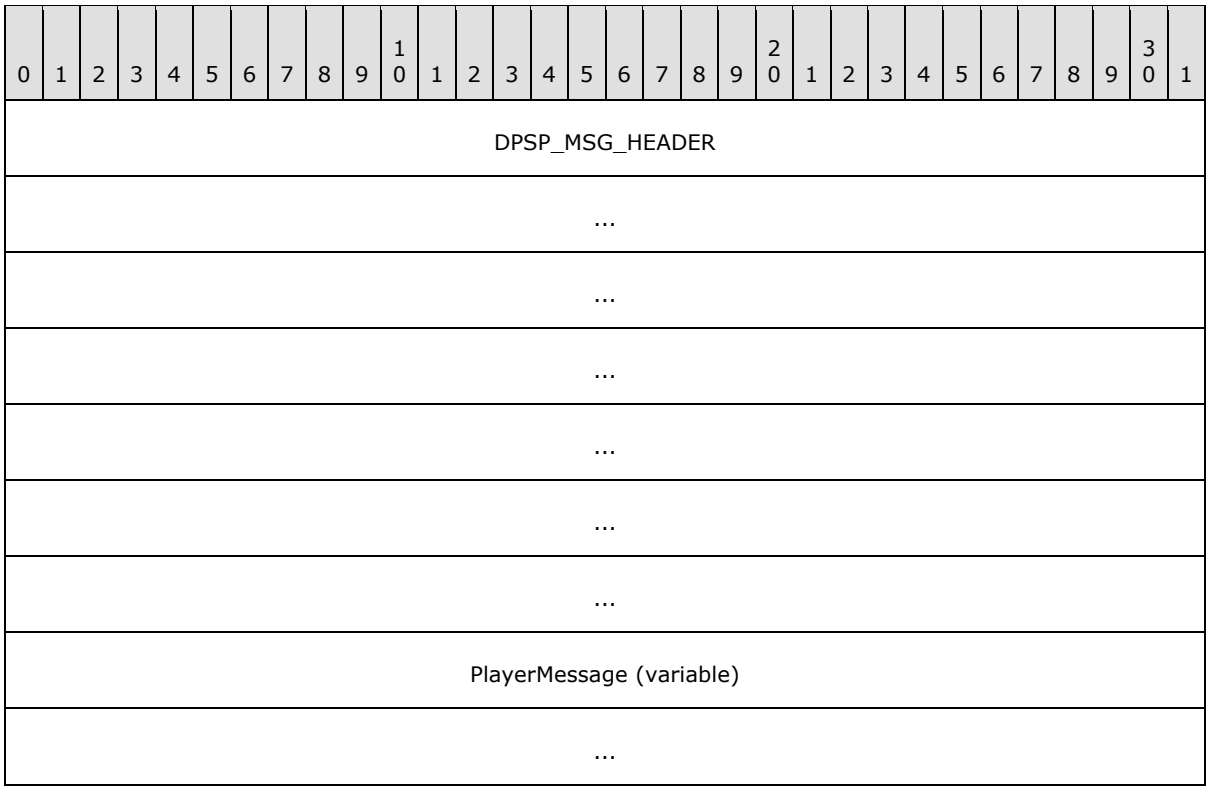
LongOffset (4 bytes): MUST be set to the offset, in octets, of the **LongName** field from the beginning of the message or 0, which indicates a null long name.

ShortName (variable): Null-terminated Unicode string that contains the new short name.

LongName (variable): Null-terminated Unicode string that contains the new long name.

2.2.47 DPSP_MSG_PLAYERWRAPPER

The DPSP_MSG_PLAYERWRAPPER packet provides a wrapper message for a **DPSP_MSG_PLAYERMESSAGE** (section 2.2.45) packet.

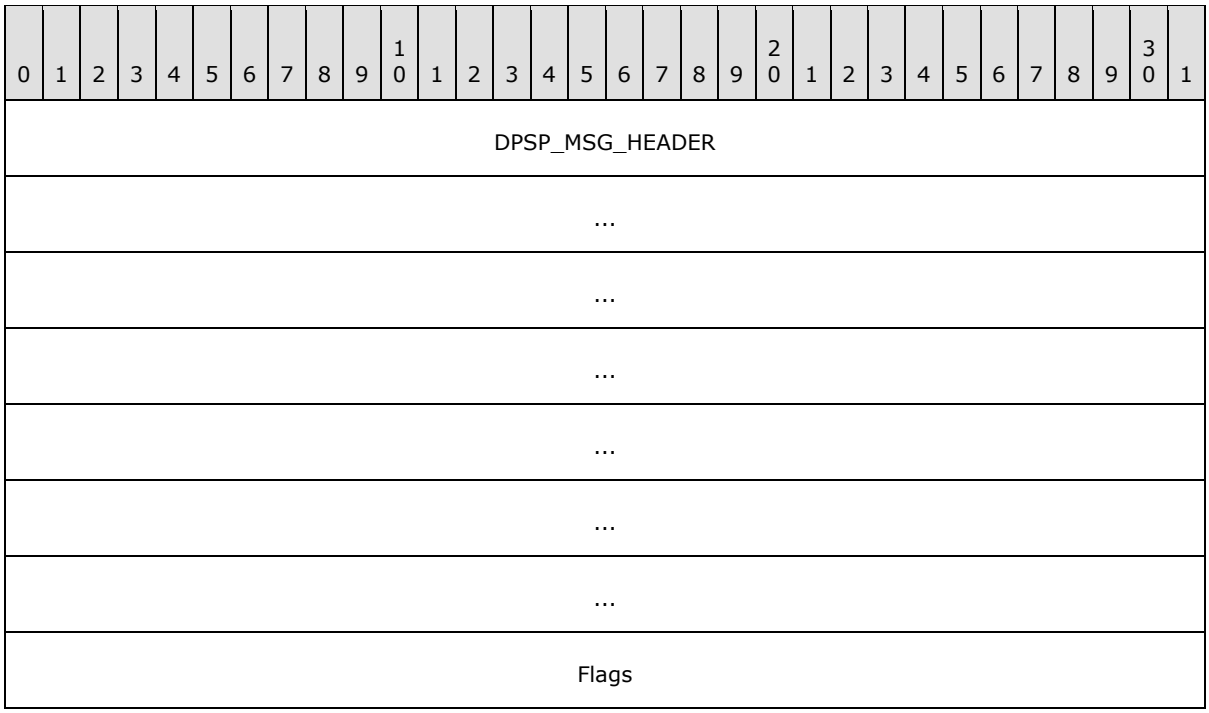


DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 25.

PlayerMessage (variable): Enclosed player message.

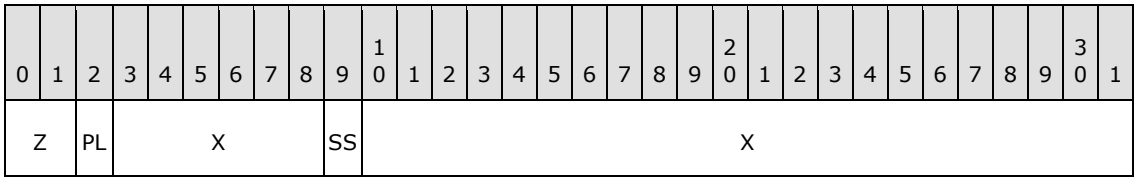
2.2.48 DPSP_MSG_REQUESTGROUPID

The DPSP_MSG_REQUESTGROUPID packet is sent to the game host to request a new group identifier.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 6.

Flags (4 bytes): Flag values. MUST be set to one or more of the following:



Z (2 bits): All bits with this label MUST be set to 0.

PL (1 bit): The player is local to the current machine.

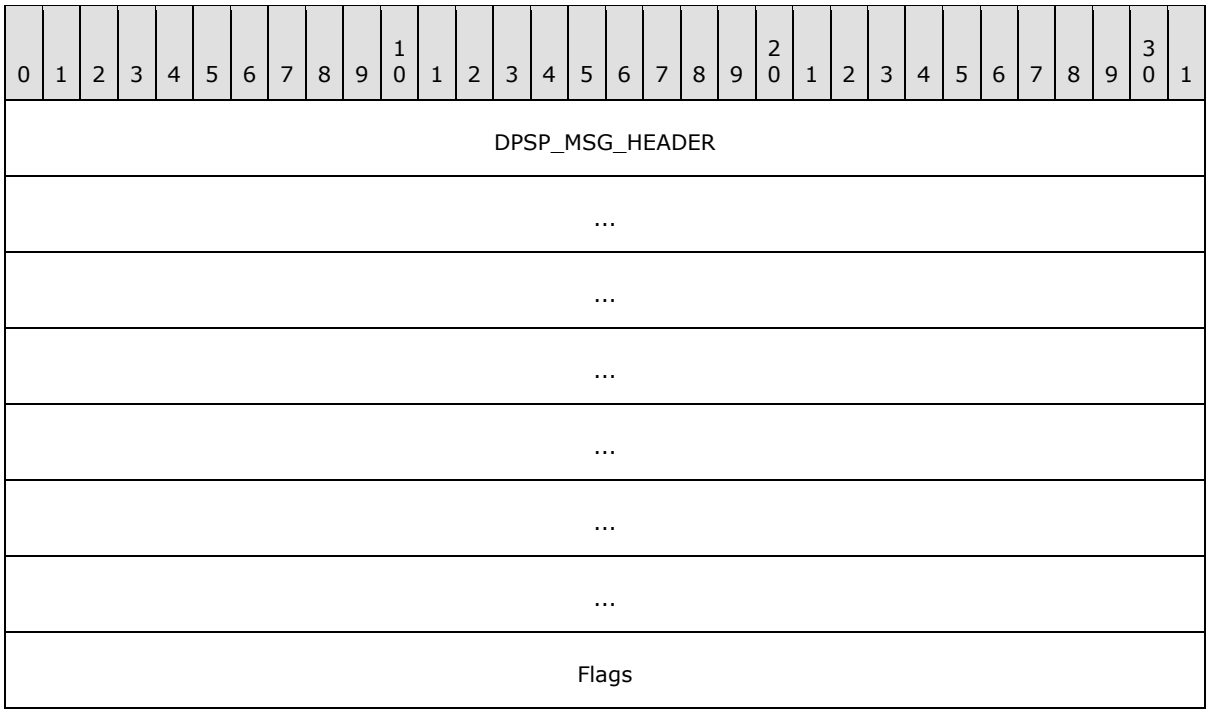
X (6 bits): All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

SS (1 bit): Indicates that the session belongs to a secure server and needs user authentication.

X (22 bits): All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

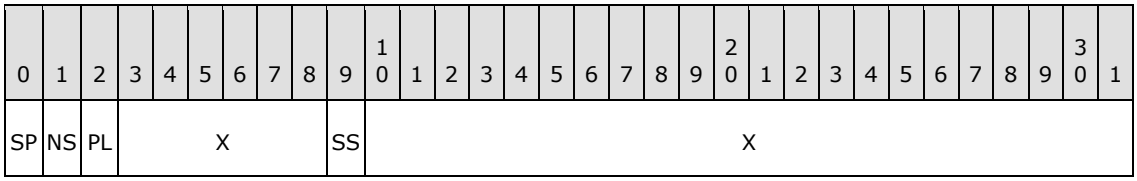
2.2.49 DPSP_MSG_REQUESTPLAYERID

The DPSP_MSG_REQUESTPLAYERID packet is sent to the game host to request a new player identifier.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 5.

Flags (4 bytes): Flag values. MUST be set to one or more of the following:



SP (1 bit): Player is the system player. This flag must be combined with the **SS** flag or the **NS** flag to form a compound value.

NS (1 bit): The player is the name server (host) player.

PL (1 bit): The player is local to the current machine.

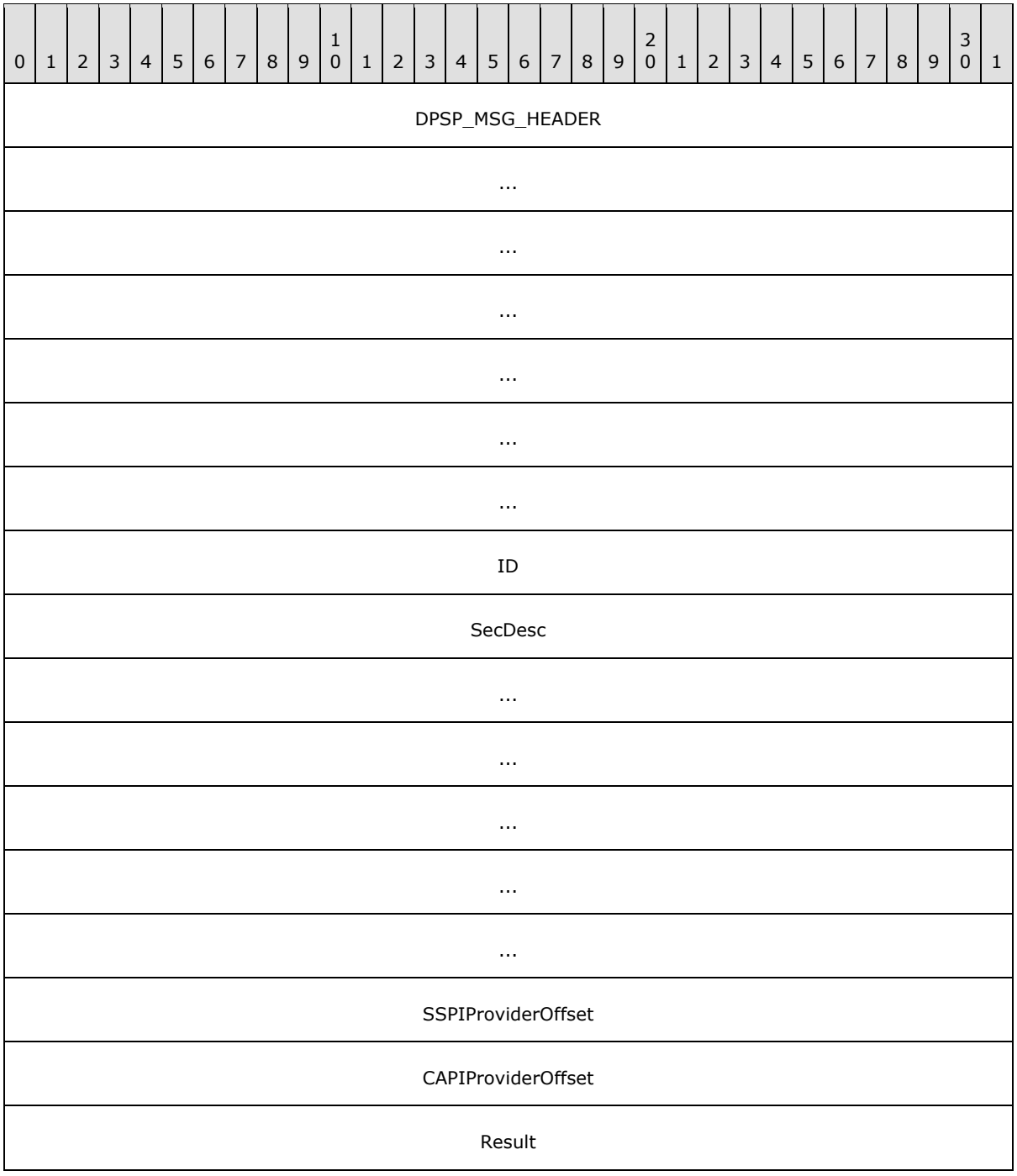
X (6 bits): All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

SS (1 bit): Indicates that the session belongs to a secure server and needs user authentication.

X (22 bits): All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

2.2.50 DPSP_MSG_REQUESTPLAYERREPLY

The DPSP_MSG_REQUESTPLAYERREPLY packet is sent in response to a **DPSP_MSG_REQUESTPLAYERID** (section 2.2.49) or **DPSP_MSG_REQUESTGROUPID** (section 2.2.48) message. The reply message contains either a new player identifier or a new group identifier.



SSPIProvider (variable)
...
CAPIProvider (variable)
...

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 7.

ID (4 bytes): MUST be set to the new player (or group) identifier.

SecDesc (24 bytes): MUST be set to a **DPSECURITYDESC** (section 2.2.4) structure which contains the security properties of the DirectPlay session instance.

SSPIProviderOffset (4 bytes): MUST be set to the offset, in octets, of the Security Support Provider Interface (SSPI) provider name from the beginning of the message. 0 means that the session is not secure.

CAPIProviderOffset (4 bytes): MUST be set to the offset, in octets, of the Crypto API [MSDN-CAPI] provider name from the beginning of the message. Zero means that the session will not use encryption.

Result (4 bytes): MUST be set to a Win32 HRESULT error code. If 0, the request succeeded; if non-zero, indicates the reason the request failed. For a complete list of HRESULT codes, see [MS-ERREF].

SSPIProvider (variable): Null-terminated Unicode string that contains the SSPI name. If no SSPI provider is specified, the session is not a secure session.

CAPIProvider (variable): Null-terminated Unicode string that contains the CAPI provider name. For a list of provider names, see Cryptographic Provider Names.

2.2.51 DPSP_MSG_SESSIONDESCCHANGED

The DPSP_MSG_SESSIONDESCCHANGED packet is sent to notify players that a session description changed.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
DPSP_MSG_HEADER																															
...																															
...																															
...																															

...
...
...
IDTo
SessionNameOffset
PasswordOffset
SessionDesc
...
...
...
...
...
...
...
(SessionDesc cont'd for 4 rows)
...	SessionName (variable)
...
Password (variable)
...

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 26.

IDTo (4 bytes): MUST be set to 0.

SessionNameOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **SessionName** field. If this field is 0, the session name is not present.

PasswordOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message to the **Password** field. If this field is 0, the session has no password.

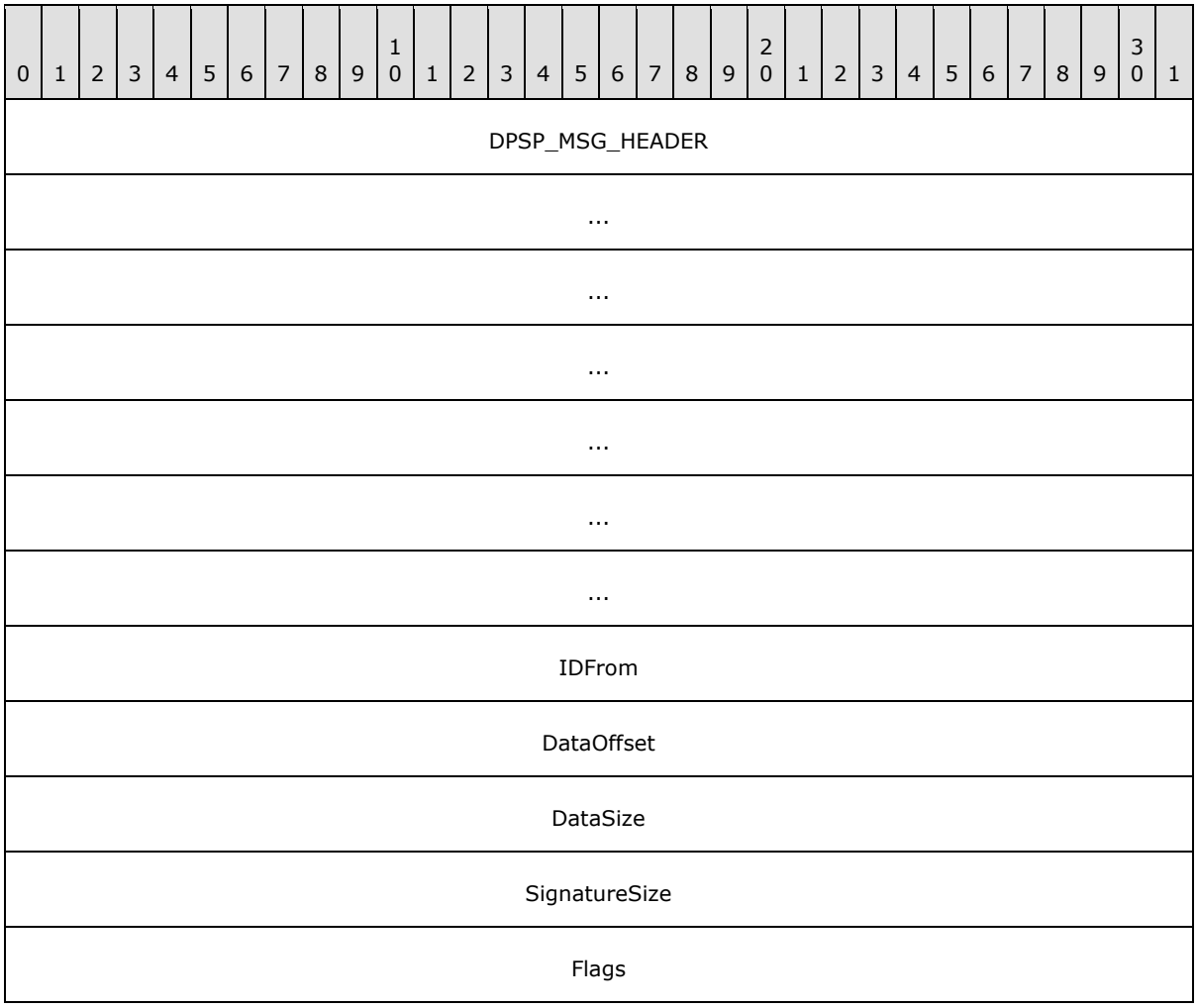
SessionDesc (50 bytes): MUST be set to a **DPSESSIONDESC2** (section 2.2.5) structure containing the session description.

SessionName (variable): If present, MUST be set to a null-terminated Unicode string containing the session name.

Password (variable): If present, MUST be set to a null-terminated Unicode string containing the session password.

2.2.52 DPSP_MSG_SIGNED

The DPSP_MSG_SIGNED packet is used to send a signed message along with its signature.



Message (variable)
...
Signature (variable)
...

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 34.

IDFrom (4 bytes): MUST be set to the System Player ID of the sender.

DataOffset (4 bytes): MUST be set to the offset, in octets, of the DirectPlay message.

DataSize (4 bytes): MUST be set to the size of the **Message** field, in octets.

SignatureSize (4 bytes): MUST be set to the size of the signature, in octets.

Flags (4 bytes): Flag values. MUST be set to one or more of the following:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
SS	SC	EC	X																												

SS (1 bit): If set, the message was signed by the Security Support Provider Interface [SSPI] specified when the session was established.

SC (1 bit): If set, the message was signed by the cryptographic algorithm specified when the session was established.

EC (1 bit): Message was encrypted by CAPI.

X (29 bits): All bits with this label SHOULD be set to 0 when sent, and MUST be ignored when received.

Message (variable): Array of bytes that contains the DirectPlay message. The **Message** field MAY contain any DirectPlay 4 Protocol message. However, the message MUST begin with the **Signature** field of the DPSP_MSG_HEADER (section 2.2.6) rather than the entire **DPSP_MSG_HEADER** structure. Once authentication is negotiated, DirectPlay sends all messages in as signed, except:

- The DPSP_MSG_ADDFORWARDREQUEST (section 2.2.11) and DPSP_MSG_SESSIONDESCCHANGED (section 2.2.51) messages are sent signed and encrypted.
- The higher layer determines whether the DPSP_MSG_PLAYERMESSAGE (section 2.2.45) or DPSP_MSG_ASK4MULTICASTGUARANTEED (section 2.2.15) message should be sent signed and/or encrypted.

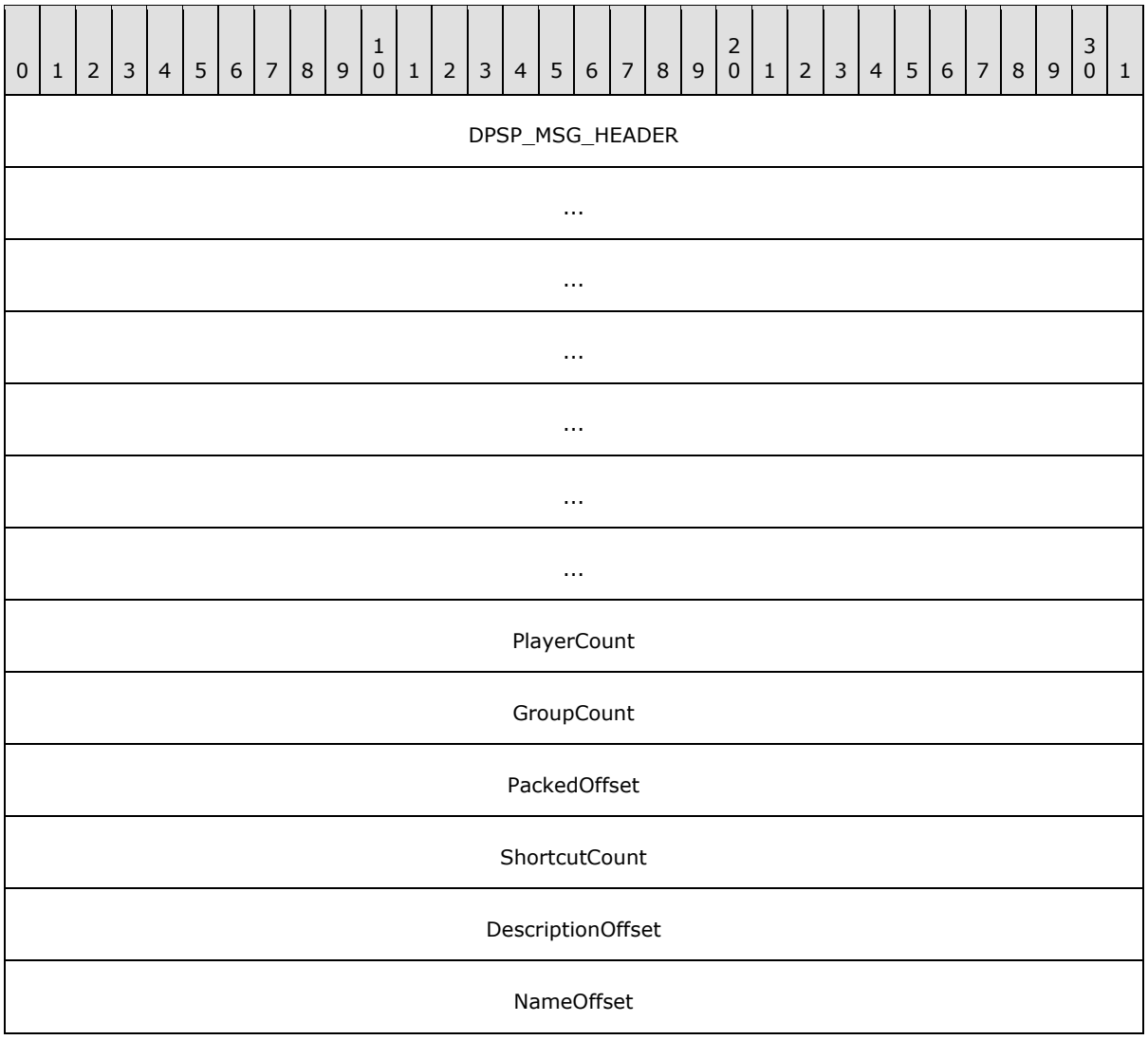
- The DPSP_MSG_PING (section 2.2.42) and DPSP_MSG_PINGREPLY (section 2.2.43) messages are not signed or encrypted.

Signature (variable): Array of bytes that contains the message signature.

2.2.53 DPSP_MSG_SUPERENUMPLAYERSREPLY

The DPSP_MSG_SUPERENUMPLAYERSREPLY packet is sent in response to a **DPSP_MSG_ENUMPLAYER** (section 2.2.27) message. This packet applies only to DirectX version 5.0 or later. For information about supported versions, see 1.7.

Note If the **CS** flag in the DPSESSIONDESC2 (section 2.2.5) structure associated with the session is NOT set, implementations SHOULD use the **DPSP_MSG_SUPERENUMPLAYERSREPLY** message; otherwise implementations SHOULD use the DPSP_MSG_ENUMPLAYERSREPLY (section 2.2.28) message.



PasswordOffset	
DPSessionDesc	
...	
...	
...	
...	
...	
...	
...	
(DPSessionDesc cont'd for 4 rows)	
...	SessionName (variable)
...	
Password (variable)	
...	
SuperPackedPlayer (variable)	
...	

DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 41.

PlayerCount (4 bytes): Number of players.

GroupCount (4 bytes): Number of groups.

PackedOffset (4 bytes): Offset, in octets, of the **SuperPackedPlayer** field from the beginning of the message.

ShortcutCount (4 bytes): Number of groups with shortcuts.

DescriptionOffset (4 bytes): MUST be set to the offset, in octets, of the **DPSessionDesc** field from the beginning of the message.

NameOffset (4 bytes): MUST be set to the offset, in octets, from the beginning of the message in the **SessionName** field. A value of zero means a null session name.

PasswordOffset (4 bytes): MUST be set to the offset, in octets, of the **Password** field from the beginning of the message. A value of zero means there is no password.

DPSessionDesc (50 bytes): MUST be set to a **DPSESSIONDESC2** (section 2.2.5) structure that contains the DirectPlay session description information.

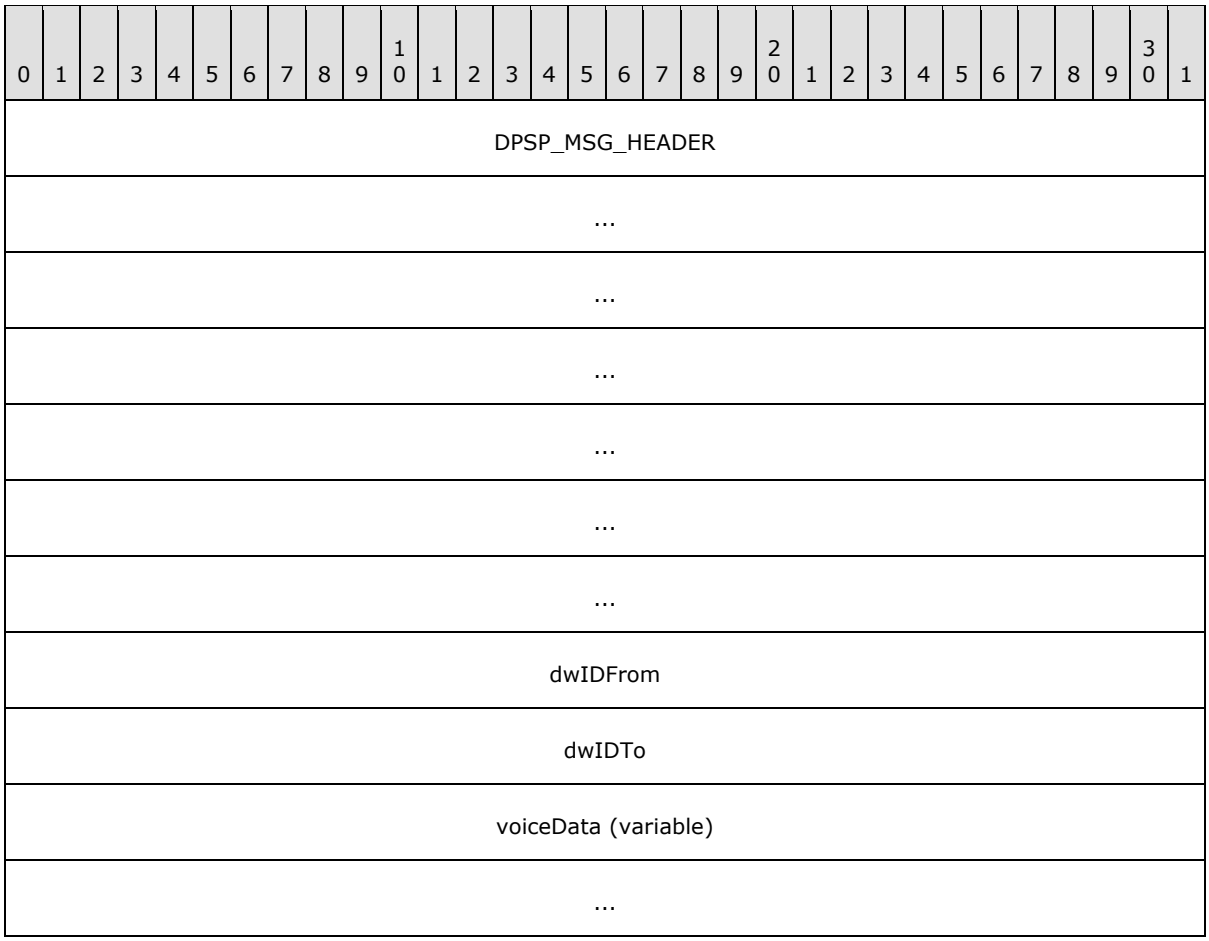
SessionName (variable): MUST be set to the null-terminated Unicode string that contains the session name.

Password (variable): If present, MUST be set to the null-terminated Unicode string that contains the password for the session.

SuperPackedPlayer (variable): Array of **DPLAYI_SUPERPACKEDPLAYER** (section 2.2.3) structures. The number of elements in the array is determined by finding the sum of the **Player Count**, **Group Count**, and **Shortcut Count** fields. The order of items in the array is fixed, and is as follows: players, groups, and shortcuts.

2.2.54 DPSP_MSG_VOICE

The DPSP_MSG_VOICE packet is used to send voice message data.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 54.

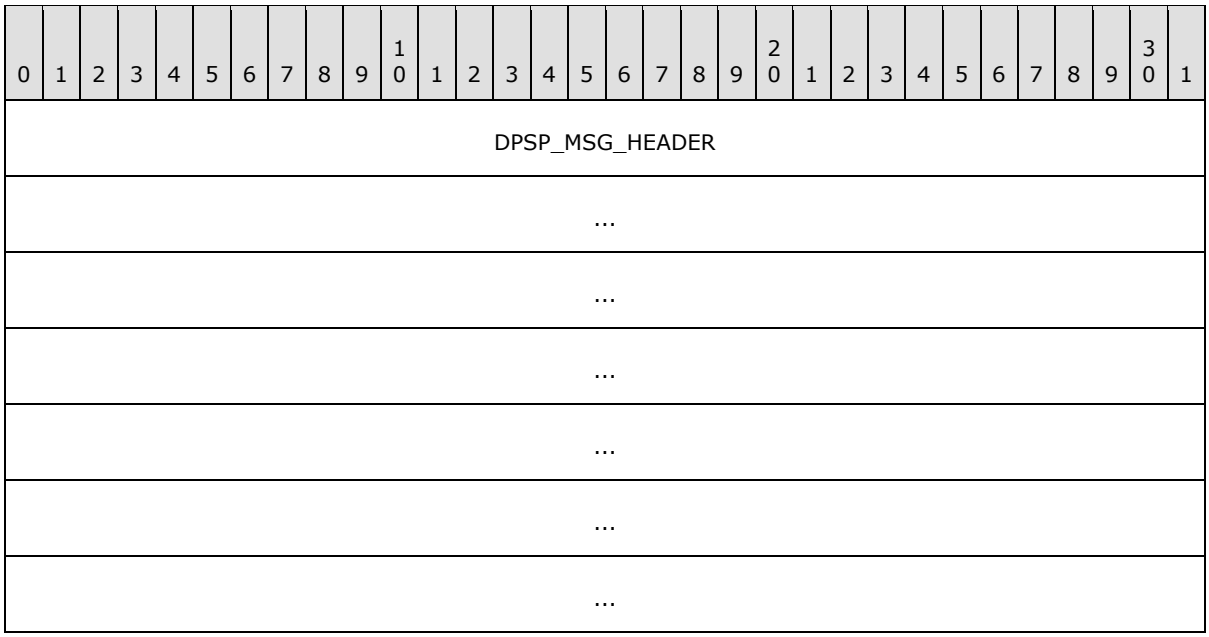
dwIDFrom (4 bytes): The Player ID of the source for the voice data.

dwIDTo (4 bytes): The Player ID of the destination for the voice data.

voiceData (variable): Variable-sized voice data payload to be delivered to the voice layer. See [MC-DPLVP].

2.2.55 DPSP_MSG_YOUAREDEAD

The DPSP_MSG_YOUAREDEAD packet is sent in response to a **DPSP_MSG_PING** (section 2.2.42) message, when the sender of the ping is not recognized as a player who belongs to the active session.



DPSP_MSG_HEADER (28 bytes): Message header for this packet. The Command Value member of this field MUST be set to 24.

3 Protocol Details

All computers that implement the DirectPlay Protocol are considered peers of each other; however, the game host has special responsibilities beyond those of other game clients.

Implementations MUST ignore malformed packets and packets with unknown message types.

3.1 DirectPlay Client Details

3.1.1 Abstract Data Model

This section describes a conceptual model of possible data organization that an implementation maintains to participate in this protocol. The described organization is provided to facilitate the explanation of how the protocol behaves. This document does not mandate that implementations adhere to this model as long as their external behavior is consistent with that described in this document.

Each participant in the DirectPlay protocol functions as a peer, and as such each SHOULD maintain the following state.

Game: An application using the DirectPlay protocol has certain state associated with the game.

Game.ApplicationGuid: A **Globally Unique Identifier (GUID)** that uniquely identifies the game being played.

Game.SSPIProvider: A Unicode string that specifies which authentication service to be used when authenticating game clients. If this value is not provided by the game, then DirectPlay4 will use the NTLM authentication service as specified in [MS-NLMP]<41>.

Game.CAPIProvider: A Unicode string that specifies which cryptographic service is to be used when signing or encrypting game messages. If this value is not provided, then the value of "Microsoft Base Cryptographic Provider v1.0" is used<42>.

Game.CAPIProviderType: A 32-bit integer that specifies the required capabilities of the cryptographic provider used by the DirectPlay4 client. If the game does not provide a specific value, it MUST be interpreted as PROV_RSA_FULL<43>.

Game.EncryptionAlgorithm: A 32-bit integer that specifies the required encryption algorithm to be used for secured DirectPlay messages. If the game does not provide a specific value, it MUST be interpreted as CALG_RC4.<44>

Session List: A list of all of the game sessions hosted on the current machine. For each session in the session list, the following information MUST be maintained.

Session.SessionName: A description of the session.

Session.GameData: 128 bits of game specific data.

Session.InstanceID: GUID which uniquely identifies this instance of the game.

Session.Flags: Flags about the capabilities/configuration of the session.

Session.Host: The computer that "hosts" the session. The session host is responsible for maintaining the player and group list and for responding to **DPSP_MSG_ENUMSESSIONS** (section 2.2.29) requests.

Session.MaxPlayers: The maximum number of players that can participate in a game session.

Session.CurrentPlayers: The current number of players in the game.

Session.Password: The password for the session.

Session.NewPlayersDisabled: If true, the game host MUST NOT accept new players to the session. This field corresponds to the **NP** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.MigrateHost: If true, when the game host exits, the remaining DirectPlay4 clients will designate a new game host. This field corresponds to the **MH** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.ReliableProtocol: If true, then messages transmitted by the protocol MUST be transmitted via a reliable mechanism. This field corresponds to the **RP** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.NoMessageId: If true, then the protocol MUST omit the **idFrom** and **idTo** fields when sending all **DPSP_MSG_PLAYERMESSAGE** messages (section 2.2.45), making the effective structure 8 bytes shorter. Similarly, the protocol MUST assume that the **idFrom** and **idTo** fields are not present when receiving **DPSP_MSG_PLAYERMESSAGE** messages. This setting allows higher layers to reduce the size of player messages in exchange for losing the identity of the sending and receiving players. **Session.NoMessageId** corresponds to the **NM** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.JoinDisabled: If true, then the game host MUST NOT allow nascent game instances to join the game, but will continue to allow new players to be created by established game instances. This field corresponds to the **JD** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.KeepAlive: If true, then the game client MUST periodically send **DPSP_MSG_PING** messages to the other members of the game. This field corresponds to the **KA** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.NoDataMessages: If true, then the game clients MUST NOT send **DPSP_MSG_PLAYERDATACHANGED** messages (section 2.2.44). This field corresponds to the **ND** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.Authenticated: If true, then the game host MUST authenticate all new game clients. This field corresponds to the **SS** flag in the **DPSESSIONDESC2** structure (section 2.2.5). This flag is incompatible with the Session.MigrateHost option.

Session.Private: If true, then the game host MUST require that the password in the **DPSP_MSG_ENUMSESSIONS** message (section 2.2.29) match the Session.Password. This field corresponds to the **P** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.PasswordRequired: If true, then the game host MUST require a password to join the session. This field corresponds to the **PR** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Sesssion.MulticastServer: If true, then the game clients MUST send all DirectPlay messages to the game host and the game host MUST relay all the DirectPlay messages to the other game clients. This field corresponds to the **MS** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.ClientServer: If true, then the game host MUST NOT transmit information about non system players. This field corresponds to the **CS** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.NoPreserveOrder: See the DirectPlay4 Reliable Protocol [MC-DPL4R] for information on this flag. This field corresponds to the **NO** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.OptimizeLatency: Indicates that message transmission SHOULD be optimized for latency, rather than bandwidth, when appropriate. Implementations MAY ignore this flag. This field corresponds to the **OL** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.NoSessionDescMessages: If true, then when the game running on the game host modifies the state of the session data model, the game host MUST NOT transmit **DPSP_MSG_SESSIONDESCCHANGED** messages (section 2.2.51). This field corresponds to the **NS** flag in the **DPSESSIONDESC2** structure (section 2.2.5).

Session.SessionKey: Encryption key used to encrypt messages when the game requests that a message be sent encrypted.

Session.HostPublicKey: Public key for the game host.

Player List: A list of all the current players in the game. Each Player MUST maintain the following information.

Player.LongName: The "long name" for the player. The meaning of a "long name" is game defined.

Player.ShortName: The "short name" for the player. The meaning of a "short name" is game-defined.

Player.ID: A 32-bit identifier that uniquely represents the player within the game.

Player.SystemPlayer: If this flag is set, then the player is the "system player" for this game instance. This flag corresponds to the DPLAYI_PLAYER_SYSTEMPLAYER flag in the **Flags** field of the **DPSP_MSG_REQUESTPLAYERID** (section 2.2.49) message.

Player.GameData: Per-Game data associated with each player.

Player.ChatterCount: A counter incremented when messages are received, and reset to 0 every time the Ping Timer elapses.

Group List: A group is a container for players or other groups. Each group MUST contain the following information.

Group.LongName: The "long name" for the group. The meaning of a "long name" is game-defined.

Group.ShortName: The "short name" for the group. The meaning of a "short name" is game-defined.

Group.ID: A 32-bit identifier that uniquely represents the group within the game.

Group.ParentID: The ID of the group that contains this group.

Group.GameData: Per-Game data associated with each group.

Client: A player in the gaming session. Each client MUST contain the following information.

Client.HostPublicKey: Public key for the game host on this session.

Client.ClientPrivateKey: Private key used when encrypting or signing messages to be sent to the game host.

Client.ClientPublicKey: Public key transmitted to game host.

3.1.2 Timers

3.1.2.1 Session Enumeration Timer

The Session Enumeration Timer is set by a DirectPlay client when it sends a **DPSP_MSG_ENUMSESSIONS** (section 2.2.29) request. The timeout value for this timer is application-defined.<45>

3.1.2.2 Reliable API Timer

The Reliable API Timer is set by a DirectPlay client when it sends a request that requires a response. The timeout value for this timer is 5 seconds.

3.1.2.3 Logon Timer

The Logon Timer is set by a DirectPlay client when it is exchanging the **DPSP_MSG_NEGOTIATE** (section 2.2.38), **DPSP_MSG_CHALLENGE** (section 2.2.17), and **DPSP_MSG_CHALLENGERESPONSE** (section 2.2.18) messages. The timeout value for this timer is 25 seconds.

3.1.2.4 Packetize Timer

The Packetize Timer is set by a DirectPlay client when it is sending **DPSP_MSG_PACKET2_DATA** (section 2.2.41) messages. The initial timeout value for this timer is 900 milliseconds. This value SHOULD continue to be used until a packet is acknowledged. At that time, 1.5 times the round trip latency of the packet and acknowledgment SHOULD be used instead. If the measured latency is less than 25 milliseconds, the timer should be set to 1.5 times 25, or 37.5 milliseconds.

3.1.2.5 Ping Timer

The Ping Timer is set by a DirectPlay client when either the joined session has the **Session.KeepAlive** flag set, or the session has the **Session.MigrateHost** flag set and the client is waiting for the new host to send a **DPSP_MSG_IAMNAMESERVER** (section 2.2.33) message. It elapses periodically so that **DPSP_MSG_PING** (section 2.2.42) messages are sent to players with a ChatterCount of 0, that is, for which no messages have been received since the last Ping Timer expiration. If not waiting for the **DPSP_MSG_IAMNAMESERVER** message, **DPSP_MSG_PING** messages are sent only to the host; otherwise they are sent to all connected systems. The period for this timer is 35 seconds.

3.1.3 Initialization

No special initialization actions must be performed.

3.1.4 Higher-Layer Triggered Events

Most client actions in the DirectPlay protocol are triggered by game actions. In the following sections, each of the game actions supported are enumerated and the protocol actions associated with those actions are described.

In addition to those actions explicitly enumerated in the following sections, a game may chose to query information contained in the abstract data model from the DirectPlay client on the machine.

3.1.4.1 Enumerate Sessions

When a higher-level entity chooses to enumerate the estabished game sessions, the DirectPlay protocol client MUST format a **DPSP_MSG_ENUMSESSIONS** message (see section 2.2.29) with the ApplicationGuid set to **Game.GUID** and the **Flags** and **Password** field set appropriately based on information from the higher-level entity to the broadcast socket address (255.255.255.255) on the DirectPlay UDP port (see section 1.9).

It then MUST start listening for responses on the DirectPlay TCP/IP port (see section 1.9). It then MUST start the session enumeration timer. Until the session enumeration timer expires, it MUST collect all **DPSP_MSG_ENUMSESSIONSREPLY** (section 2.2.30) messages. It then MUST return that collected information to the higher level. If no **DPSP_MSG_ENUMSESSIONSREPLY** messages are received, it MUST return that information to the higher level.

3.1.4.2 Join Session

When a higher-level entity chooses to join an existing session (determined from received **DPSP_MSG_ENUMSESSIONSREPLY** (section 2.2.30) packets), the DirectPlay client MUST create a new Player in the players list, setting the **Player.SystemPlayer** flag. It MUST then format a **DPSP_MSG_REQUESTPLAYERID** (section 2.2.49) packet with the DPLAYI_PLAYER_SYSTEMPLAYER flag set in the **Flags** field to the host server for the specified game instance. It MUST then start the Reliable API timer and wait for a **DPSP_MSG_REQUESTPLAYERREPLY** response (section 2.2.50) from the host server. If no reply is received before the Reliable API timer fires, it MUST communicate this information to the higher-level entity.

3.1.4.3 Enumerate Players or Groups

If the DirectPlay client is joined to a session, then the DirectPlay client SHOULD return the list of players from the **Player List** contained in the abstract data model. If the DirectPlay client is NOT joined to a session, then the DirectPlay client MUST format and transmit a **DPSP_MSG_ENUMPLAYER** (section 2.2.27) to the game host. It must then start the Reliable API timer and wait for either a **DPSP_MSG_SUPERENUMPLAYERSREPLY** (section 2.2.53) message from the game host or a **DPSP_MSG_ENUMPLAYERSREPLY** (section 2.2.28). If no reply is received before the Reliable API timer fires, it MUST communicate this information to the higher-level entity. Once the DirectPlay client receives the **DPSP_MSG_SUPERENUMPLAYERSREPLY** message or **DPSP_MSG_ENUMPLAYERSREPLY** message, it MUST return that information to the higher-level entity.

3.1.4.4 Create Player

When a higher-level entity indicates that the DirectPlay client should create a player, and the DirectPlay client has joined a session, the DirectPlay client MUST create a new player in the **Player List** with the **Player.SystemPlayer** flag clear. It MUST then format a **DPSP_MSG_REQUESTPLAYERID** (section 2.2.49) packet with the DPLAYI_PLAYER_SYSTEMPLAYER flag clear in the **Flags** field to the host server for the specified game instance. It must then start the Reliable API timer and wait for a **DPSP_MSG_REQUESTPLAYERREPLY** response (section 2.2.50) from the host server. If no reply is received before the Reliable API timer fires, it must communicate this information to the higher-level entity.

3.1.4.5 Delete Player

When a higher-level entity indicates that the DirectPlay client should remove a player, and the DirectPlay client has joined a session, the DirectPlay client MUST format and transmit a **DPSP_MSG_DELETEPLAYER** (section 2.2.25) packet to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.6 Create Group

When a higher-level entity indicates that the DirectPlay client should create a group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_REQUESTGROUPID** (section 2.2.48) packet with the DPLAYI_PLAYER_SYSTEMPLAYER flag clear in the **Flags** field to the host server for the specified game instance. It must then start the Reliable API timer and wait for a **DPSP_MSG_REQUESTPLAYERREPLY** response (section 2.2.50) from the host server. If no reply is received before the Reliable API timer fires, it must communicate this information to the higher-level entity.

3.1.4.7 Remove Group

When a higher-level entity indicates that the DirectPlay client should remove a group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_DELETEGROUP** (section 2.2.23) message. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_DELETEGROUP** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_DELETEGROUP** message to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.8 Set Group Data

When a higher-level entity indicates that the DirectPlay client should change the data associated with a group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_GROUPDATACHANGED** (section 2.2.31) message. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_GROUPDATACHANGED** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_GROUPDATACHANGED** message to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.9 Set Group Name

When a higher-level entity indicates that the DirectPlay client should change the name of a group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_GROUPNAMECHANGED** (section 2.2.32) message. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_GROUPNAMECHANGED** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_GROUPNAMECHANGED** message to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.10 Set Player Data

When a higher-level entity indicates that the DirectPlay client should change the data associated with a player, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_PLAYERDATACHANGED** (section 2.2.44) message. If the **Session.MulticastServer**

flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_PLAYERDATACHANGED** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_PLAYERDATACHANGED** message to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.11 Set Player Name

When a higher-level entity indicates that the DirectPlay client should change the name associated with a player, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_PLAYERNAMECHANGED** (section 2.2.46) message. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_PLAYERNAMECHANGED** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_PLAYERNAMECHANGED** message to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.12 Add Player to Group

When a higher-level entity indicates that the DirectPlay client should add a player to a group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_ADDPLAYERTOGROUP** (section 2.2.12) packet with the **PlayerID** and **GroupID** fields set to the Player ID and Group ID to be added. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_ADDPLAYERTOGROUP** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_ADDPLAYERTOGROUP** message to each of the computers currently joined to the game session. There is no response expected to this message.

3.1.4.13 Remove Player from Group

When a higher-level entity indicates that the DirectPlay client should remove a player previously added to a group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_DELETEPLAYERFROMGROUP** (section 2.2.26) packet with the **PlayerID** and **GroupID** fields set to the Player ID and Group ID to be added. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_DELETEPLAYERFROMGROUP** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_DELETEPLAYERFROMGROUP** message to each of the computers currently joined to the game session. There is no response expected to this message.

3.1.4.14 Add Group to Group

When a higher-level entity indicates that the DirectPlay client should add a group to another group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_ADDSHORTCUTTOGROUP** (section 2.2.13) packet with the **ChildGroupID** field set to the Group ID of the child group to be added and the **ParentGroupID** field set to the Group ID of the parent group in which to add the child group. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_ADDSHORTCUTTOGROUP** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_ADDSHORTCUTTOGROUP** message to each of the computers that are currently joined to the game session. There is no response expected to this message.

3.1.4.15 Remove Group from Group

When a higher-level entity indicates that the DirectPlay client should remove a group from another group, and the DirectPlay client has joined a session, the DirectPlay client MUST format a **DPSP_MSG_DELETEGROUPFROMGROUP** (section 2.2.24) packet with the **ChildGroupID** field set to the Group ID of the child group to be removed and the **ParentGroupID** field set to the Group ID of the parent group from which to remove the child group. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_DELETEGROUPFROMGROUP** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_DELETEGROUPFROMGROUP** message to each of the computers currently joined to the game session. There is no response expected to this message.

3.1.4.16 Send Application Data

There are three options available to the higher-level entity (game) when requesting that the DirectPlay client send a message to another client. The game can request guaranteed delivery of the message; the game can request encrypted delivery of the message, and the game can request that the contents of the message be signed.

When a higher-level entity indicates that the DirectPlay client should send a message to another player or group, if the DirectPlay client has not joined a session, then the DirectPlay client MUST return an error to the application.

If the DirectPlay session specified by the game has the **Session.MulticastServer** flag set, AND the higher layer entity wishes to send a message to a group, AND the local client is not the DirectPlay host, then the DirectPlay client MUST route the message through the host. Instead of transmitting the message to the peers in the group directly, it MUST wrap the message with a **DPSP_MSG_ASK4MULTICAST** (section 2.2.14) or **DPSP_MSG_ASK4MULTICASTGUARANTEED** (section 2.2.15) header, depending on whether it wishes guaranteed deliver, and send this message to the host. The host MUST then forward the message without the header on to the clients in the group. If the DirectPlay session was also created with the **Session.ReliableProtocol** flag set, then the forwarded message MUST be re-wrapped, but with a **DPSP_MSG_MULTICASTDELIVERY** (section 2.2.37) header instead.

If the **Session.Authenticated** flag is not set, then the DirectPlay client MUST ignore the Encrypted or Signed option and treat the message as if the application did not request encryption or signing. Encryption and the signing of messages allows for applications to secure their payload and verify that the participants are valid, as well as ensure that the messages are not transformed during transport. Encryption and message signing are activated by the application<46>.

Note Secure game sessions should be differentiated from password protected game sessions. DirectPlay 4 allows for securing access to a game session with a user-specified cleartext password that is specified by the host and which MUST be provided by all clients. Although not very secure, this form of security provides a very lightweight alternative that does not require user accounts and associated management. It is used to casually restrict access to a particular instance of a game session

If the session has the **DPSESSION_DIRECTPLAYPROTOCOL** flag set, then the DirectPlay client MUST transmit the message using the DirectPlay4 Reliable Protocol [MC-DPL4R].

3.1.4.16.1 Sending Encrypted/Signed data

When a higher-level entity wishes to send encrypted or signed data, then the DirectPlay client MUST encrypt or sign the data using the encryption algorithm specified by **Game.CAPIProviderType** and the public key of the recipient. It must then wrap the encrypted or signed data in a

DPSP_MSG_SIGNED packet (section 2.2.52). If the higher-level entity requested that the message be signed, the DirectPlay client MUST append the encryption signature to the **DPSP_MSG_SIGNED** packet and transmit the resulting packet to the designated recipient.

3.1.4.16.2 Sending Unencrypted/Signed data

When a higher-level entity wishes to send unencrypted/unsigned data, then the DirectPlay client MUST check the outgoing message.

If the data has the value 0x79616c70 (ASCII 'play') at offset 20 into the data, then the DirectPlay client MUST format a **DPSP_MSG_PLAYERWRAPPER** message (section 2.2.47) that wraps the data. It MUST then transmit the data to the recipient computer.

If the data does not have the value 0x79616c70 (ASCII 'play') at offset 20 into the data, then the DirectPlay client MUST transmit the message to the recipient computer directly with no header data via a streaming protocol.

In either case, when the higher-level entity does not specify guaranteed delivery for the data, the DirectPlay client MUST send the data to the socket address associated with the target player<47>.

3.1.4.17 Send Chat

When a higher-level entity (game) requests that the DirectPlay client send a text chat message to another client or a group, the sending client MUST construct a **DPSP_MSG_CHAT** (section 2.2.19) message. If the target is a group, it MUST send a copy of the **DPSP_MSG_CHAT** message to each player in the group. Otherwise, the client MUST send the message only to the desired player.

If the DirectPlay session specified by the game has the **Session.MulticastServer** flag set, AND the higher-layer entity wishes to send a chat message to a group, AND the local client is not the DirectPlay host, then the client MUST route the message through the host as described in section 3.1.4.16.

3.1.4.18 Large Messages

When a higher-level entity (game) requests that the DirectPlay client send a message that is larger than the Maximum Transmission Unit size supported by the transport, the sending client MUST split the message into smaller fragments that will fit. Each fragment MUST then be transmitted using a **DPSP_MSG_PACKET** (section 2.2.39) header if the message is unreliable, or a **DPSP_MSG_PACKET2_DATA** (section 2.2.41) header if the message is reliable. If it is unreliable, the **DPSP_MSG_PACKET** messages SHOULD be transmitted immediately. If it is unreliable, the sender MUST only send the first **DPSP_MSG_PACKET2_DATA** message, and MUST start the Packetize Timer to retry the fragment if necessary. Future reliable fragments MUST NOT be sent until this fragment is acknowledged as specified in sections 3.1.5.28 and 3.1.5.29.

3.1.5 Message Processing Events and Sequencing Rules

When a DirectPlay client receives a packet on the DirectPlay port, it MUST inspect the four bytes of data at offset 8 into the packet. If the value at that location is NOT the sequence: 0x70, 0x6c, 0x61, 0x79 (ASCII play), then the DirectPlay client MUST interpret the incoming packet as raw game data, and the DirectPlay client MUST inform any higher-level entity of the arrival of this message.

If the 4-byte value at location 8 in the incoming packet is NOT 0x70, 0x6c, 0x61, 0x79, then the DirectPlay client MUST interpret the incoming data as a **DPSP_MSG_HEADER** structure (section 2.2.6), and MUST implement the following behaviors based on the **Command Value** field of that header.

Note The DirectPlay 4 Protocol does not perform validation on the sender of a message. An implementation MAY choose to validate the sender of a message, but it is not a requirement for compatibility with DirectPlay. For more information, see section 5.1.

3.1.5.1 DPSP_MSG_REQUESTPLAYERREPLY

When a DirectPlay4 client receives a **DPSP_MSG_REQUESTPLAYERREPLY** message (section 2.2.50), if the DirectPlay client does not have a **DPSP_MSG_REQUESTPLAYERID** (section 2.2.49) command outstanding, the DirectPlay client MUST ignore the message.

Otherwise, the DirectPlay client MUST remember the **ID** (contained in the **DPSP_MSG_REQUESTPLAYERREPLY** message) as the **Player.ID** for the newly created player.

If the player being created has the **Player.SystemPlayer** flag set and the **Session.Authenticated** flag is NOT set, then the client MUST format a **DPSP_MSG_ADDFORWARDREQUEST** message (section 2.2.11) with the **PlayerID** field set to the system player ID. The client MUST then start the reliable API timer and wait for a **DPSP_MSG_SUPERENUMPLAYERSREPLY** message (section 2.2.53). If no reply is received before the reliable API timer fires, then the client MUST return this information to the higher-level entity.

If the player being created has the **Player.SystemPlayer** flag set, and the **Session.Authenticated** flag is set, then the client MUST format an NTLM NEGOTIATE packet as specified in [MS-NLMP] using information provided by the higher-level entity (or the operating system, if applicable).

The DirectPlay client MUST then format and transmit a **DPSP_MSG_NEGOTIATE** (section 2.2.38) to the game host with the **SecurityToken** of the message set to the NEGOTIATE message. It MUST start the Login Timer and wait for the game host to reply with a **DPSP_MSG_CHALLENGE** (section 2.2.17) message. If the Login timer expires before a **DPSP_MSG_CHALLENGERESPONSE** (section 2.2.18) response is received, the DirectPlay client must indicate that the logon operation failed to the higher level.<48>

If the player being created does NOT have the **Player.SystemPlayer** flag set, the DirectPlay client MUST format a **DPSP_MSG_CREATEPLAYER** (section 2.2.21) message. If the **Session.MulticastServer** flag is set, the DirectPlay client MUST wrap the **DPSP_MSG_CREATEPLAYER** message in a **DPSP_MSG_ASK4MULTICAST** message (section 2.2.14) and it MUST transmit the wrapped **DPSP_MSG_CREATEPLAYER** message to the game host. If the **Session.MulticastServer** flag is not set, the DirectPlay client MUST transmit the **DPSP_MSG_CREATEPLAYER** message to each of the computers currently joined to the game session. There is no response expected to this message.

3.1.5.2 DPSP_MSG_CHALLENGE

When a DirectPlay4 client receives a **DPSP_MSG_CHALLENGE** (section 2.2.17) it MUST ignore the message if it is not in the process of joining a session. If the client IS in the process of joining a session, it MUST stop the logon timer and it MUST format an NTLM RESPONSE packet as specified in [MS-NLMP]. It then must format and send a **DPSP_MSG_CHALLENGERESPONSE** (section 2.2.18) message to the game host. It MUST then start the logon timer.

3.1.5.3 DPSP_MSG_ACCESSGRANTED

When a DirectPlay4 client receives a **DPSP_MSG_ACCESSGRANTED** (section 2.2.7) message, the DirectPlay4 client MUST ignore the message if it is not in the process of joining a session. If the DirectPlay4 client is in the process of joining the session, it MUST save the PublicKey contained in the **DPSP_MSG_ACCESSGRANTED** message as **Session.HostPublicKey**.

The DirectPlay4 client MUST then generate a public/private key pair and remember it as **Client.PublicKey** and **Client**.

The DirectPlay4 client MUST then format a **DPSP_MSG_KEYEXCHANGE** (section 2.2.34) request with the **PublicKey** field set to the public key received in the **DPSP_MSG_ACCESSGRANTED** and the **SessionKey** field set to the session's public key and it MUST then transmit it to the game host. It MUST then start the logon timer.

3.1.5.4 DPSP_MSG_AUTHERROR

When a DirectPlay4 client receives a **DPSP_MSG_AUTHERROR** (section 2.2.16) message, the DirectPlay4 client MUST ignore the message if it is not in the process of joining a session. If the DirectPlay4 client is in the process of joining a session, it MUST fail the session join operation returning the **Error** field in the **DPSP_MSG_AUTHERROR** to the higher-level entity.

3.1.5.5 DPSP_MSG_LOGONDENIED

When a DirectPlay4 client receives a **DPSP_MSG_LOGONDENIED** (section 2.2.36) message, the DirectPlay4 client MUST ignore the message if it is not in the process of joining a session. If the DirectPlay4 client is in the process of joining a session, it MUST fail the session join operation, returning an access denied error to the higher-level entity.<49>

3.1.5.6 DPSP_MSG_KEYEXCHANGEREPLY

When a DirectPlay4 client receives a **DPSP_MSG_KEYEXCHANGEREPLY** message (section 2.2.35), the DirectPlay4 client MUST remember the **SessionKey** contained in the message as **Session.SessionKey**. It MUST then format a **DPSP_MSG_ADDFORWARDREQUEST** message (section 2.2.11) with the **PlayerID** field set to the system player ID. The client MUST then start the reliable API timer and wait for a **DPSP_MSG_SUPERENUMPLAYERSREPLY** message (section 2.2.53). If no reply is received before the reliable API timer fires, then the client MUST return this information to the higher-level entity.

3.1.5.7 DPSP_MSG_SUPERENUMPLAYERSREPLY

When a DirectPlay4 client receives a **DPSP_MSG_SUPERENUMPLAYERSREPLY** (section 2.2.53) message, if the DirectPlay client is in the process of joining a session, the DirectPlay client MUST merge the player information contained in the **DPSP_MSG_SUPERENUMPLAYERSREPLY** with the **Player List**. It must then indicate to the higher-level entity that the client has successfully joined the game.

If the DirectPlay4 client is NOT joining a session, then if the DirectPlay client is processing an Enumerate Players or Groups higher-level event (section 3.1.4.3), the DirectPlay4 client MUST return the information contained in the **DPSP_MSG_SUPERENUMPLAYERSREPLY** to the higher-level entity. Otherwise, the DirectPlay client MUST ignore the message.

3.1.5.8 DPSP_MSG_ADDFORWARDREPLY

When a DirectPlay4 client receives a **DPSP_MSG_ADDFORWARDREPLY** message (section 2.2.10), if the DirectPlay client is in the process of joining a session, it MUST indicate that the join failed and return the **Error** field to the higher-level entity. Otherwise, the DirectPlay client MUST ignore this message.

3.1.5.9 DPSP_MSG_SIGNED

When a DirectPlay4 client receives a **DPSP_MSG_SIGNED** message (section 2.2.52), it MUST verify that the signature of the **Message** field matches the **Signature** field.

If bit 2 in the **Flags** field is equal to 1 (0x00000004), then the **Message** field MUST first be decrypted using the encryption algorithm specified in section 3.1.1 using the **Session.SessionKey** as the encryption key.

If the **Flags** field is equal to 0x00000001, then the **Signature** field MUST be interpreted as a NTLMSSP_MESSAGE_SIGNATURE structure as specified in [MS-NLMP], section 2.2.1.4.

If the **Flags** field is equal to 0x00000002, then the **Signature** field MUST be interpreted as a signature block created by the signature algorithm as specified in section 3.1.1.

Once the **Message** field has been validated, then the DirectPlay client MUST reinterpret the **Message** field as if it was received from the sender.

3.1.5.10 DPSP_MSG_ADDFORWARD

When a DirectPlay client receives a **DPSP_MSG_ADDFORWARD** message (section 2.2.8), it MUST add a new entry in the **Player List** using the information contained in the message. The DirectPlay client MUST then format and transmit a **DPSP_MSG_ADDFORWARDACK** message (section 2.2.9) to the game host. There is no response expected to this message.<50>

3.1.5.11 DPSP_MSG_CREATEGROUP

When a DirectPlay client receives a **DPSP_MSG_CREATEGROUP** (section 2.2.20) message, it MUST create a new entry in the **Group List** using the information contained in the message. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.12 DPSP_MSG_CREATEPLAYER

When a DirectPlay client receives a **DPSP_MSG_CREATEPLAYER** (section 2.2.21) message, it MUST create a new entry in the **Player List** using the information contained in the message. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.13 DPSP_MSG_CREATEPLAYERVERIFY

When a DirectPlay client receives a DPSP_MSG_CREATEPLAYERVERIFY message (section 2.2.22), the recipient should respond as though it had received a DPSP_MSG_CREATEPLAYER message (section 2.2.21). The client should create the specified player, if it was not already created.

However, in contrast to the usual response to a DPSP_MSG_CREATEPLAYER message, the recipient MUST NOT send any DPSP_MSG_CREATEPLAYERVERIFY messages. By not sending any DPSP_MSG_CREATEPLAYERVERIFY messages in response, a feedback loop is avoided.

3.1.5.14 DPSP_MSG_DELETEPLAYER

Each DirectPlay client has a "system player" allocated to it by the system. In addition, a client may create as many non-system players as they desire, where each player has a unique identity.

A DirectPlay client may delete any player it created by sending the **DPSP_MSG_DELETEPLAYER** (section 2.2.25) message. A client may NOT delete the players of another peer.

When a DirectPlay client is instructed to leave the game session by the game session host, the client must delete all of its players and disconnect from the game session. The disconnect process results in the deletion of the client's system player.

When a DirectPlay client receives a **DPSP_MSG_DELETEPLAYER** (section 2.2.25) message, it MUST locate the specified **PlayerID** in the **Player List** using the information contained in the message, and remove the player associated with the **PlayerID**. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.15 DPSP_MSG_DELETEGROUP

When a DirectPlay client receives a **DPSP_MSG_DELETEGROUP** (section 2.2.23) message, it MUST look the specified **PlayerID** up in the **Player List** using the information contained in the message and remove it. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.16 DPSP_MSG_GROUPDATACHANGED

Only the owner of a **group** may change the group's data by sending the **DPSP_MSG_GROUPDATACHANGED** (section 2.2.31) message. The owner of the group is the DirectPlay4 client that created the group. When a DirectPlay4 client is destroyed, so are any groups that it created.

When a DirectPlay client receives a **DPSP_MSG_GROUPDATACHANGED** message, it MUST locate the specified **GroupID** in the **Group List** using the information contained in the message, and update the per-game data associated with the group. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.17 DPSP_MSG_GROUPNAMECHANGED

When a DirectPlay client receives a **DPSP_MSG_GROUPNAMECHANGED** (section 2.2.32) message, it MUST look the specified **GroupID** up in the **Group List** using the information contained in the message and update the name associated with the group. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.18 DPSP_MSG_PLAYERNAMECHANGED

When a DirectPlay client receives a **DPSP_MSG_PLAYERNAMECHANGED** (section 2.2.46) message, it MUST look the specified **PlayerID** up in the **Player List** using the information contained in the message and update the name associated with the player. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.19 DPSP_MSG_PLAYERDATACHANGED

When a DirectPlay client receives a **DPSP_MSG_PLAYERDATACHANGED** (section 2.2.44) message, it MUST look the specified **PlayerID** up in the **Player List** using the information contained in the message and update the per-game data associated with the player. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.20 DPSP_MSG_ADDPLAYERTOGROUP

When a DirectPlay client receives a **DPSP_MSG_ADDPLAYERTOGROUP** (section 2.2.12) message, it MUST look the specified **GroupID** up in the **Group List** and the specified **PlayerID** in the **Player List**. It MUST then add the player associated with the **PlayerID** to the group specified by the

GroupID. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.21 DPSP_MSG_DELETEPLAYERFROMGROUP

When a DirectPlay client receives a **DPSP_MSG_DELETEPLAYERFROMGROUP** (section 2.2.26) message, it MUST locate the specified GroupID in the **Group List** and the specified **PlayerID** in the **Player List**. It MUST then remove the player associated with the PlayerID from the group specified by the GroupID. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.22 DPSP_MSG_SESSIONDESCCHANGED

When a DirectPlay client receives a **DPSP_MSG_SESSIONDESCCHANGED** (section 2.2.51) message, it MUST update any cached local representation of the DPSESSIONDESC2 structure.

3.1.5.23 DPSP_MSG_ADDSHORTCUTTOGROUP

When a DirectPlay client receives a **DPSP_MSG_ADDSHORTCUTTOGROUP** (section 2.2.13) message, it MUST look the specified **ChildGroupID** and **ParentGroupID** values up in the **Group List**. It MUST then add the group specified by **ChildGroupID** to the group specified by the **ParentGroupID**. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.24 DPSP_MSG_DELETEGROUPFROMGROUP

When a DirectPlay client receives a **DPSP_MSG_DELETEGROUPFROMGROUP** (section 2.2.24) message, it MUST look the specified **ChildGroupID** and **ParentGroupID** values up in the **Group List**. It MUST then remove the group specified by **ChildGroupID** from the group specified by the ParentGroupID. The DirectPlay client SHOULD inform any higher-level entity of the arrival of this message.

3.1.5.25 DPSP_MSG_VOICE

When a DirectPlay client or server receives a **DPSP_MSG_VOICE** (section 2.2.54) message it MUST pass the contents of the voiceData, **dwIDFrom** and **dwIDTo** to the DirectPlay Protocol: DirectPlay Voice Extension if it is active. If the **DirectPlay Voice Protocol** is not present within the session then this message MUST be ignored. For details on how the contents of the message are processed, see the **DirectPlay Voice Protocol** document [MC-DPLVP].

3.1.5.26 DPSP_MSG_CHAT

When a DirectPlay client receives a **DPSP_MSG_CHAT** (section 2.2.19) message, it MUST inform any higher-level entity of the arrival of the chat string from the specified player to the specified player or group. The client MUST also increment the Player ChatterCount.

3.1.5.27 DPSP_MSG_PACKET

When a DirectPlay4 client receives a **DPSP_MSG_PACKET** message (section 2.2.39) it MUST determine if previous fragments of the packets identified by **MessageGuid** have already been processed. If not, the client MUST begin reassembling the total message, starting with the received fragment. Otherwise, the client MUST check that **PacketID** is the next ID in the sequence, and ignore the packet if not. It MUST then include the additional fragment payload in its correct location

in the total message. When all fragments have been received, the completed message MUST be delivered to the higher-layer entity.

3.1.5.28 DPSP_MSG_PACKET2_DATA

When a DirectPlay4 client receives a **DPSP_MSG_PACKET2_DATA** message (section 2.2.41) it MUST send a **DPSP_MSG_PACKET2_ACK** (section 2.2.40) message to the sender to acknowledge reception. It MUST then determine if previous fragments of the packets identified by **MessageGuid** have already been processed. If not, the client MUST begin reassembling the total message, starting with the received fragment. Otherwise, the client MUST check that **PacketID** is the next ID in the sequence, and ignore the packet if not. It MUST then include the additional fragment payload in its correct location in the total message. When all fragments have been received, the completed message MUST be delivered to the higher-layer entity.

3.1.5.29 DPSP_MSG_PACKET2_ACK

When a DirectPlay4 client receives a **DPSP_MSG_PACKET2_ACK** message (section 2.2.40) it MUST determine if the packet identified by **MessageGuid** and **PacketID** has not already been acknowledged. If it has, the client MUST ignore this redundant acknowledgment. Otherwise, the client MUST reset the Packetize Timer, and send the next PacketID in the fragmented message. If there are no more packets, then the entire message has completed and the Packetize Timer MUST be cancelled.

3.1.5.30 DPSP_MSG_PING

When a DirectPlay4 client receives a **DPSP_MSG_PING** message (section 2.2.42) it MUST look up the player specified by the **IDFrom** field in the **Player List**. If the ID does not represent a valid player, the client MUST ignore this message. Otherwise, the client MUST send a **DPSP_MSG_PINGREPLY** message (section 2.2.43) and echo the **TickCount** field. It MUST also increment the Player ChatterCount.

3.1.5.31 DPSP_MSG_PINGREPLY

When a DirectPlay4 client receives a **DPSP_MSG_PINGREPLY** message (section 2.2.43) it MUST look up the Player specified by **IDFrom** in the **Player List**. If the ID does not represent a valid Player, the client MUST ignore this message. Otherwise, the client MUST also increment the Player ChatterCount.

3.1.5.32 DPSP_MSG_YOUAREDEAD

Only a DirectPlay4 client that determines itself to be the game session host may send a **DPSP_MSG_YOUAREDEAD** message (section 2.2.55) to another peer in the game session.

Any DirectPlay4 client that is not the game session host, yet receives a **DPSP_MSG_IAMNAMESERVER** message (section 2.2.33), treats the sender of the **DPSP_MSG_IAMNAMESERVER** message as the new game session host.

If a DirectPlay4 client is the game session host and it receives a **DPSP_MSG_IAMNAMESERVER** message, the game session host responds to the sender with a **DPSP_MSG_YOUAREDEAD** message to tell that client to disconnect from the game session.

When a DirectPlay4 client receives a **DPSP_MSG_YOUAREDEAD** message, it MUST terminate all connections to all systems and communicate this event to a higher-level entity.

3.1.6 Timer Events

3.1.6.1 Packetize Timer

When the Packetize Timer expires, the DirectPlay4 client MUST resend the current **DPSP_MSG_PACKET2_DATA** message (section 2.2.41) message, unless it has already sent the same packet 16 times and 60 seconds have elapsed since the first packet was sent, in which case the client MUST abort sending the entire message.

3.1.6.2 Ping Timer

When the Ping Timer expires, the DirectPlay4 client SHOULD send a **DPSP_MSG_PING** message (section 2.2.42) to the host if no messages have been received since the last Ping Timer expiration. If 8 **DPSP_MSG_PING** messages have been sent without a reply, the connection to the host should be terminated.

3.1.7 Other Local Events

3.1.7.1 Host Migration

The Host Migration process is initiated when the game session host leaves the session for any reason, such as failing to reply to 8 DPSP_MSG_PING (section 2.2.42) messages. When this occurs, clients in the session MUST check whether the host migration flag (**Session.MigrateHost**) is set in the abstract data model. If the flag is NOT set, the clients MUST terminate connections to all other systems and inform the higher layer (game) that the game session has terminated. When the flag is set, a deterministic algorithm is employed to establish the new game session host.

The algorithm requires clients to locate the system players in the **Player List**, and of these, to determine which player has the lowest PlayerID value. If the system player with the lowest PlayerID value is found to be local, then the client associated with that player MUST become the new game session host. This player then sends a DPSP_MSG_IAMNAMESERVER (section 2.2.33) message to all other clients.**Note** Because PlayerIDs are assigned by the host, a new player has no way to "force" itself to become the *new* host. In addition, although PlayerIDs are allocated sequentially (and starting from a random value), the random value is XORed with a secret value to generate the PlayerID. As a result, there is no guarantee that the distributed PlayerID values will be sequential. For more information, see section 5.1.

If the system player with the lowest PlayerID is not local, the client MUST start the Ping Timer to detect any other unreachable players until it either receives a **DPSP_MSG_IAMNAMESERVER** message, or all other systems are determined to be unreachable and the local system player now has the lowest PlayerID value.**Note** The DirectPlay 4 Protocol does not perform validation on the sender of a message. An implementation MAY choose to validate the sender of a message, but it is not a requirement for compatibility with DirectPlay. For more information, see section 5.1.

Any client that cannot be seen by the new host should be ejected from the game session by the host sending the client a **DPSP_MSG_IAMNAMESERVER** message. However, in the existing implementation, only the session host can send messages to inform players that they are no longer in the session, which the session host would not do if a particular client were not reachable from the game session host. Therefore, this behavior is flawed.

The nature of the host migration process is such that any client can send a **DPSP_MSG_IAMNAMESERVER** message at any time during the process. The algorithm for determining the new game session host is run on all clients simultaneously, and normally, only the client that is determined to be the new host will send the **DPSP_MSG_IAMNAMESERVER** message. However, sometimes multiple clients may leave the game session simultaneously and

connectivity between clients may become inconsistent. As a result, there are situations where more than one client in a session may decide that it has become the new host and as a result, may send the **DPSP_MSG_IAMNAMESERVER** message.

Because a client that may potentially become the new host (in the case where there have been multiple client failures) times out each potential new host in-line and in-order, the total amount of time to resolve a migration can be very long. During this time, the view on the game can become inconsistent among the clients. These inconsistencies can lead to a problem where multiple clients with varying views of the remaining clients in the game session may elect themselves as the new host at the same time. This can cause fragmentation of the session, or possibly multiple sessions with overlapping inconsistent views of the remaining clients.

It should be noted that the host migration system in DirectPlay 4 is insufficient for handling some complex host migration situations. Recovery from the simultaneous failure of multiple clients may or may not succeed in leaving an accurate image of the clients in the session. This problem is addressed by DirectPlay 8.

3.2 Game Host Details

Under the DirectPlay 4 Protocol, the first computer that creates a DirectPlay4 session is designated as the game host. This server functions the same as any other game client, but has certain additional responsibilities associated with game management. These include:

- Responding to game session enumeration requests.
- Accepting nascent game instances into the game session and forwarding their information to established instances.
- Redistributing specific multicast requests from game clients to all game instances.

3.2.1 Abstract Data Model

This section describes a conceptual model of possible data organization that an implementation maintains to participate in this protocol. The described organization is provided to facilitate the explanation of how the protocol behaves. This document does not mandate that implementations adhere to this model as long as their external behavior is consistent with that described in this document.

The game host acts as a DirectPlay client, and as such MUST implement the same abstract data model as other DirectPlay clients. In addition, the game host MUST implement the following abstract data model.

ClientList: A list of all the current DirectPlay4 clients.

Each Client MUST contain the following information:

Client.SessionKey: An encryption key used to protect data transmitted to the client.

3.2.2 Timers

3.2.2.1 Nametable Population Timer

The Nametable Population Timer is set by a DirectPlay host when it receives a **DPSP_MSG_ADDFORWARDREQUEST** message (see section 2.2.11). The timeout for this timer is 15 seconds.

3.2.2.2 Ping Timer

The Ping Timer is set by a DirectPlay server when the **Session.KeepAlive** flag is set in the abstract data model. It elapses periodically so that **DPSP_MSG_PING** (section 2.2.42) messages are sent to any connected player with a ChatterCount of 0, that is, for which no messages have been received since the last Ping Timer expiration. The period for this timer is 35 seconds.

3.2.3 Initialization

When a DirectPlay4 host computer starts up, it MUST open a UDP datagram socket on port 47624 and listen for broadcast datagrams sent to that port. It MUST also open a TCP and UDP port within the defined DirectPlay4 port range of 2300 to 2400. The game host MUST also assign a new GUID value to **Session.InstanceID**.

3.2.4 Higher-Layer Triggered Events

A DirectPlay4 game host functions as a DirectPlay client and as such MUST handle all the higher-layer triggered events as specified in section 3.1.4.

3.2.5 Message Processing Events and Sequencing Rules

3.2.5.1 DPSP_MSG_ASK4MULTICAST

When a DirectPlay4 host receives a **DPSP_MSG_ASK4MULTICAST** (section 2.2.14) message, it MUST validate that the **PlayerFrom** and **GroupTo** fields refer to a valid player and group, respectively, or else ignore the message. If valid, the host MUST then extract the wrapped message payload at MessageOffset and resend the message to all members of the specified group. If the DirectPlay has the **Session.ReliableProtocol** flag set, then the forwarded message MUST be re-wrapped, but with a **DPSP_MSG_MULTICASTDELIVERY** (section 2.2.37) header instead. The host MUST also increment the Player ChatterCount.

3.2.5.2 DPSP_MSG_ASK4MULTICASTGUARANTEED

When a DirectPlay host receives a **DPSP_MSG_ASK4MULTICASTGUARANTEED** (section 2.2.15) message, it MUST validate that the **PlayerFrom** and **GroupTo** fields refer to a valid player and group, respectively, or else ignore the message. If valid, the host MUST then extract the wrapped message payload at MessageOffset and resend the message to all members of the specified group using the guaranteed message mechanism. If the DirectPlay session has the **Session.ReliableProtocol** flag set, then the forwarded message MUST be re-wrapped, but with a **DPSP_MSG_MULTICASTDELIVERY** (section 2.2.37) header instead. The host MUST also increment the Player ChatterCount.

3.2.5.3 DPSP_MSG_ENUMSESSIONS

When a DirectPlay4 host receives a **DPSP_MSG_ ENUMSESSIONS** (section 2.2.29) message, it MUST format and transmit one **DPSP_MSG_ENUMSESSIONSREPLY** (section 2.2.30) for each session on the DirectPlay4 host computer which meets the following criteria.

- The host MUST only return those sessions whose **Game.ApplicationGuid** matches the **ApplicationGuid** field in the **DPSP_MSG_ ENUMSESSIONS** request.
- If the **AV** flag of the **Flags** field of the **DPSP_MSG_ ENUMSESSIONS** is set, the host MUST NOT return those sessions whose **Session.MaxPlayers** is less than or equal to **Session.CurrentPlayers**.

- If the **AL** flag is set, the host MUST return those sessions whose **Session.MaxPlayers** is less than or equal to **Session.CurrentPlayers**.
- If the **PR** flag is NOT set, the host MUST return those sessions whose **Session.Password** matches the **Password** field in the **DPSP_MSG_ ENUMSESSIONS** request.

The information in the **DPSP_MSG_ENUMSESSIONSREPLY** MUST be extracted from information stored in the abstract data model. The host MUST send the response via the TCP protocol to the port specified in the **SockAddr** field of the **DPSP_MSG_HEADER** portion (section 2.2.6) of the request and to the IP address that sent the request.

3.2.5.4 DPSP_MSG_REQUESTPLAYERID

When a DirectPlay host receives a **DPSP_MSG_REQUESTPLAYERID** (section 2.2.49) message, it MUST inspect the **Flags** field of the **DPSP_MSG_REQUESTPLAYERID** request. If the DPLAYI_PLAYER_SYSTEMPLAYER flag is set, then this request is a request to join the game. If the DPLAYI_PLAYER_SYSTEMPLAYER flag is not set, then the request is a request to add a normal player from an existing member of the session.

When adding a normal player to the session, the game host MUST check to see if **Session.CurrentPlayers** is equal to the **Session.MaxPlayers** constraint or if the **Session.NewPlayersDisabled** flag is set; if it is, the game host MUST format and transmit a **DPSP_MSG_REQUESTPLAYERREPLY** (section 2.2.50) with the **Result** field set to DPERR_NONEWPLAYERS (0x8877014A). Otherwise, the game host MUST reserve a new player ID for the new player and the game host MUST add the player to the **Player List**. The game host MUST then format and transmit a **DPSP_MSG_REQUESTPLAYERREPLY** message with the **ID** field set to the new player ID. The **SecDesc** field in the **DPSP_MSG_REQUESTPLAYERREPLY** structure MUST be filled with 0s, and the **Result** field MUST be set to S_OK (0x00000000).**Note** Although PlayerIDs are allocated sequentially (and starting from a random value), the random value is XORed with a secret value to generate the PlayerID. As a result, there is no guarantee that the distributed PlayerID values will be sequential. For more information, see section 5.1.

When a client is joining a session, the game host MUST check to see if **Session.CurrentPlayers** is equal to the **Session.MaxPlayers** constraint or if the **Session.JoinDisabled** flag is set; if it is, the game host MUST format and transmit a **DPSP_MSG_REQUESTPLAYERREPLY** with the **Result** field set to DPERR_NONEWPLAYERS (0x8877014A). Otherwise, the game host MUST reserve a new player ID for the new player and the game host MUST add the player to the **Player List**. The game host MUST then format and transmit a **DPSP_MSG_REQUESTPLAYERREPLY** message with the **ID** field set to the new player ID and the **Result** field MUST be set to S_OK (0x00000000). If the **Session.Authenticated** flag is not set, then the **SecDesc** field in the **DPSP_MSG_REQUESTPLAYERREPLY** structure MUST be filled with 0s. If the **Session.Authenticated** flag is set, then the **SecDesc** field MUST be filled in with the **SSPIProvider** field set to **Game.SSPIProvider** value for the authentication.<51>

The **CAPIProvider** field MUST be set to **Game.CAPIProvider**; the **CAPIProviderType** field MUST be set to **Game.CAPIProviderType** and **Encryption Algorithm** MUST be set to **Game.EncryptionAlgorithm**.

3.2.5.5 DPSP_MSG_ADDFORWARDREQUEST

When the game host receives a **DPSP_MSG_ADDFORWARDREQUEST** message (section 2.2.11), the game host MUST format a **DPSP_MSG_ADDFORWARD** message (section 2.2.8) containing the information for the system player contained in the **DPSP_MSG_ADDFORWARDREQUEST**.<52>

The game host MUST then transmit the **DPSP_MSG_ADDFORWARD** request to each of the other players in the game to allow them to update their name tables. It MUST then start the

NametablePopulation timer and wait for each of the players to respond with a **DPSP_MSG_ADDFORWARDACK** (section 2.2.9) message.

3.2.5.6 DPSP_MSG_ADDFORWARDACK

When a DirectPlay host computer receives a **DPSP_MSG_ADDFORWARDACK** message (section 2.2.9), if the host has an outstanding **DPSP_MSG_ADDFORWARDACK** from the client which sent the message, the DirectPlay host computer MUST indicate that it has received the **DPSP_MSG_ADDFORWARDACK**. When the DirectPlay host computer has received a **DPSP_MSG_ADDFORWARDACK** message from all of the clients to which it sent the **DPSP_MSG_ADDFORWARD** message (section 2.2.8), then the game host MUST format and transmit a **DPSP_MSG_SUPERENUMPLAYERSREPLY** message (section 2.2.53) to the client that sent the **DPSP_MSG_ADDFORWARDREQUEST** (section 3.2.5.5).

3.2.5.7 DPSP_MSG_NEGOTIATE

When a DirectPlay host receives a **DPSP_MSG_NEGOTIATE** message (section 2.2.38), it MUST ignore the message if the sending client is not in the process of joining a game; otherwise, it MUST process it as an **NTLM NEGOTIATE_MESSAGE** packet, as specified in [MS-NLMP] section 2.2.1.1.

If the negotiate message is successful, then the host MUST format and transmit a **DPSP_MSG_CHALLENGE** message (section 2.2.17) with the **SecurityToken** field set to an **NTLM CHALLENGE_MESSAGE**, as specified in [MS-NLMP] section 2.2.1.2.

If the negotiate message is unsuccessful, then the host MUST format and transmit a **DPSP_MSG_AUTHERROR** message (section 2.2.16) to the client.

3.2.5.8 DPSP_MSG_CHALLENGE_RESPONSE

When a DirectPlay host receives a **DPSP_MSG_CHALLENGERESPONSE** message (section 2.2.18), it MUST ignore the message if the sending client is not in the process of joining a game; otherwise it MUST process it as an NTLM AUTHENTICATE_MESSAGE packet, as specified in [MS-NLMP] section 2.2.1.3.

If the authenticate message is successful, then the host MUST format and transmit a **DPSP_MSG_ACCESSGRANTED** message (section 2.2.7) with the **PublicKey** field set to **Session.SessionPublicKey**.

If the authenticate message is unsuccessful, then the host MUST format and transmit a **DPSP_MSG_AUTHERROR** message (section 2.2.16) to the client.

3.2.5.9 DPSP_MSG_KEY_EXCHANGE

When a DirectPlay server receives a **DPSP_MSG_KEYEXCHANGE** message (section 2.2.34), it MUST remember the **PublicKey** and **SessionKey** fields in the message as **Client.PublicKey** and **Client.SessionKey** and it MUST use these keys for subsequent encrypted communication to the client.

It MUST then allocate a new public/private key pair to be used when transmitting messages to this client and save it as **Client.HostPublicKey**. It MUST then format and transmit a **DPSP_MSG_KEYEXCHANGEREPLY** message (section 2.2.35) with the **SessionKey** set to **Client.HostPublicKey**.

3.2.5.10 DPSP_MSG_PING

When a DirectPlay4 server receives a **DPSP_MSG_PING** message (section 2.2.42) it MUST be handled as specified in section 3.1.5.30, except that if **IDFrom** does not represent a valid Player, the server MUST send a **DPSP_MSG_YOUAREDEAD** message (section 2.2.55) rather than ignoring the packet.

3.2.5.11 DPSP_MSG_PINGREPLY

When a DirectPlay4 server receives a **DPSP_MSG_PINGREPLY** message (section 2.2.43), it MUST be handled as specified in section 3.1.5.31 except that if IDFrom does not represent a valid Player, the server MUST send a **DPSP_MSG_YOUAREDEAD** message (section 2.2.55) rather than ignoring the packet.

3.2.6 Timer Events

3.2.6.1 Name Table Population Timer

When the Name Table Population Timer expires, the game host MUST format and transmit a **DPSP_MSG_SUPERENUMPLAYERSREPLY** message (section 2.2.53) to the client that sent the **DPSP_MSG_ADDFORWARDREQUEST** (section 3.2.5.5).

3.2.6.2 Ping Timer

When the Ping Timer expires, the DirectPlay4 server SHOULD send a **DPSP_MSG_PING** (section 2.2.42) message to all connected systems if no messages have been received since the last Ping Timer expiration. If 8 **DPSP_MSG_PING** messages have been sent without a reply, the connection to the system should be terminated.

3.2.7 Other Local Events

No other local events modify protocol behavior.

4 Protocol Examples

4.1 DirectPlay4EnumSessionsRequest

The following is a sample DPSP_MSG_ENUMSESSIONS (section 2.2.29) message, indicating its parsed fields and example values.

```
- DirectPlay4:
 DpspMsgEnumSessions (0x0002): ,
 Application GUID: {A052A50B-FFE0-CF11-9C4E-00A0C905425E},
 Flags: 0x00000002,
 Message Size: 70,
 Token: 0xfab
- MessageSize:
 Message Size: 70,
 Token: 0xfab
 Size: 70 (0x46)
 Token: 0xFAB - Message received from a remote DirectPlay machine
- SockAddr: Family = 2 (0x2),
 Port = 64520 (0xFC08),
 Address = 0.0.0.0
 SinFamily: 2 (0x2)
 SinPort: 64520 (0xFC08)
 SinAddr: 0.0.0.0
 SinZero: 0 (0x0)
- Message:
 DpspMsgEnumSessions (0x0002): ,
 Application GUID: {A052A50B-FFE0-CF11-9C4E-00A0C905425E},
 Flags: 0x00000002
 Signature: play
- CmdToken: DpspMsgEnumSessions (0x0002)
 Command: DpspMsgEnumSessions (0x0002)
 Version: 14 (0xE)
- DpspMsgEnumSessions:
 GuidApplication: {A052A50B-FFE0-CF11-9C4E-00A0C905425E}
 PasswordOffset: 32 (0x20)
- Flags: 0x00000002
 Available:  (...............................0)
   Don't enumerate sessions which can be joined
 All:  (...............................1.)
   Enumerate all sessions even if they can't be joined
 Previous:  (..............................0..) Obsolete
 NoRefresh:  (..............................0...)
   The response from previous enums will be freed
 Async:  (..............................0....)
   Don't start an asynchronous enum sessions
 StopAsync:  (..............................0.....)
   Don't stop an asynchronous enum sessions
 PasswordRequired: (..............................0......)
   Don't enumerate sessions if they require a password
 ReturnStatus: (..............................0.......)
   Don't return enumeration status
 Unused:  (000000000000000000000000........)
 Password: Password
```

4.2 DirectPlay4 EnumSessionsReply

The following is a sample DPSP_MSG_ENUMSESSIONSREPLY (section 2.2.30) message, indicating its parsed fields and example values.

```
- DirectPlay4: DpspMsgEnumSessionsReply (0x0001): ,
 Session Name: LOTHAIR,
 Message Size: 128,
 Token: 0xfab
- MessageSize: Message Size: 128,
 Token: 0xfab
 Size: 128 (0x80)
 Token: 0xFAB - Message received from a remote DirectPlay machine
- SockAddr: Family = 2 (0x2), Port = 64520 (0xFC08),
 Address = 0.0.0.0
 SinFamily: 2 (0x2)
 SinPort: 64520 (0xFC08)
 SinAddr: 0.0.0.0
 SinZero: 0 (0x0)
- Message: DpspMsgEnumSessionsReply (0x0001): ,
 Session Name: LOTHAIR
 Signature: play
- CmdToken: DpspMsgEnumSessionsReply (0x0001)
 Command: DpspMsgEnumSessionsReply (0x0001)
 Version: 14 (0xE)
- DpspMsgEnumSessionsReply:
- Desc:
 Size: 80 (0x50)
+ Flags: 0x00000404
 GuidInstance: {21FAA08E-42FC-B546-AFD3-5E1584FBBB60}
 GuidApplication: {A052A50B-FFE0-CF11-9C4E-00A0C905425E}
 MaxPlayers: 1000 (0x3E8)
 CurrentPlayers: 1 (0x1)
 SessionNameOffset: 0 (0x0)
 PasswordOffset: 0 (0x0)
 Reserved1: 508731553 (0x1E52A0A1)
 Reserved2: 0 (0x0)
 User1: 0 (0x0)
 User2: 2 (0x2)
 User3: 3 (0x3)
 User4: 4 (0x4)
 NameOffset: 92 (0x5C)
 SessionName: LOTHAIR
```

4.3 Joining a Game

A nascent game instance joining a game host and a third, established game instance.

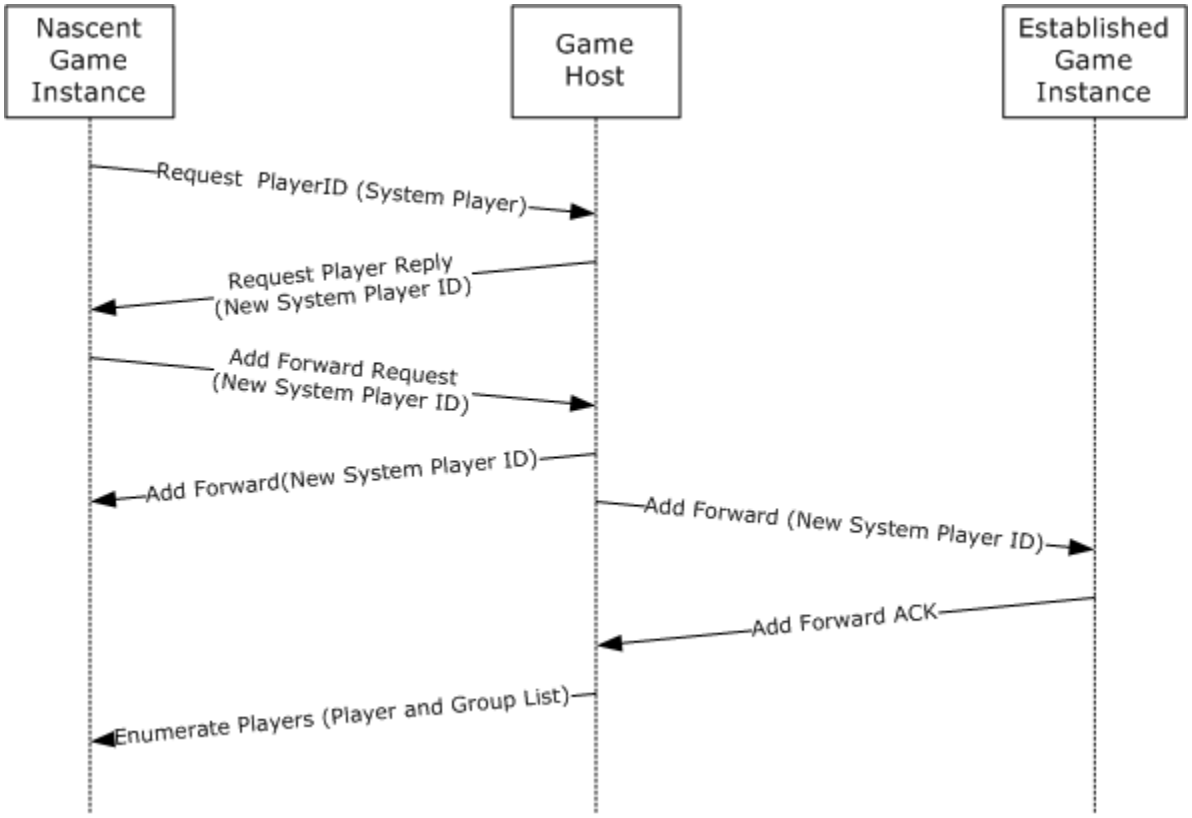


Figure 4: Joining a game

- A nascent game instance transmits a **DPSP_MSG_REQUEST_PLAYERID** (section 2.2.49) message requesting a new system player to the game host.
- The game host responds with a **DPSP_MSG_REQUEST_PLAYER_REPLY** message (section 2.2.50) with the new system player ID.
- The nascent game instance transmits a **DPSP_MSG_ADD_FORWARDREQUEST** message (section 2.2.11) to the game host.
- The game host transmits a **DPSP_MSG_ADD_FORWARD** message (section 2.2.8) to each of the established game instances.
- The established game instances respond with a **DPSP_MSG_ADD_FORWARDACK** message (section 2.2.9).
- The game host completes the join process by sending a **DPSP_MSG_SUPERENUMPLAYERSREPLY** message (section 2.2.53) to the nascent game instance with the state of the session.

5 Security

5.1 Security Considerations for Implementers

The following security considerations pertain to the DirectPlay 4 Protocol:

- The DirectPlay 4 Protocol was not designed to be a secure protocol. Any application that requires end-to-end security would need to implement secure identity, and possibly encryption and/or packet signing. This is no different than the case where applications are built on sockets.<53>
- The only exploits that are prevented in DirectPlay4 are problems where the formatting of a message could lead to a buffer overrun or cause a system to crash. Since DirectPlay4 was a sufficiently complex and proprietary protocol, used primarily in the domain of game applications, it was not anticipated that there would be much point in attacking the link. If an application did wish to secure a link, it could use the secure modes and packet signing that would prevent such exploits as mentioned above.
- The DirectPlay 4 Protocol does not perform validation on the sender of a message. An implementation may choose to validate the sender of a message, but it is not a requirement for compatibility with DirectPlay.
- PlayerIDs are assigned by the game session host and as a result, a new player has no way to "force" itself to become the *new* host. For more information, see section 3.1.7.1.
- Although PlayerIDs are allocated sequentially (starting from a random value), the random value is XORed with a secret value to generate the PlayerID. As a result, there is no guarantee that the distributed PlayerID values will be sequential. From a security perspective, this manner of allocation is helpful because it generates values that cannot be easily guessed. If an implementation were to attempt to spoof a game and join the session by accurately guessing a PlayerID value, the implementation would also have to recognize the secret value in order to be able to guess the next PlayerID.

5.2 Index of Security Parameters

None.

6 Appendix A: Windows Behavior

The information in this specification is applicable to the following versions of Windows:

- Windows NT
- Windows 2000
- Windows XP
- Windows Server 2003
- Windows Vista

Exceptions, if any, are noted below. Unless otherwise specified, any statement of optional behavior in this specification prescribed using the terms SHOULD or SHOULD NOT implies Windows behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that Windows does not follow the prescription.

<1> Section 1.5: The DirectPlay 4 Protocol is only available in Windows operating systems that have the DirectX 6 runtime (from the DirectX 6 development kit), or later version of the runtime installed. The computer systems that support this configuration consist of all Windows PC-based operating systems, including Windows Me. Additionally, applications may have installed the DirectX 6 runtime (or later version) on a particular Windows system, in which case those computers would also have the DirectPlay 4 Protocol available.

<2> Section 1.7: The following DirectPlay4 dialects are natively included in the specified Windows operating systems.

Operating System Version	Native Dialect Version
Windows 2000	DX71VERSION
Windows XP	DX8VERSION
Windows Server 2003	DX8VERSION
Windows Vista	DX9VERSION

An operating system service pack or out-of-band **DirectX** redistributable may upgrade the native dialect to a later version. The maximum version to which a dialect may be upgraded is shown in the following table.

Operating System Version	Maximum Dialect Version
Windows 2000	DX9VERSION
Windows XP	DX9VERSION
Windows Server 2003	DX9VERSION
Windows Vista	DX9VERSION

The DirectX SDK provided multiple programming interfaces with names such as **IDirectPlay4** and **IDirectPlay3**, but these do not affect the wire protocol. All interfaces implement the DirectPlay 4

Core and Service Provider Protocol according to the native or upgraded dialect associated with the operating system.

<3> Section 2.2.2: If provided, the Windows Winsock DirectPlay Service Provider stores the following data in the **ServiceProviderData** field:

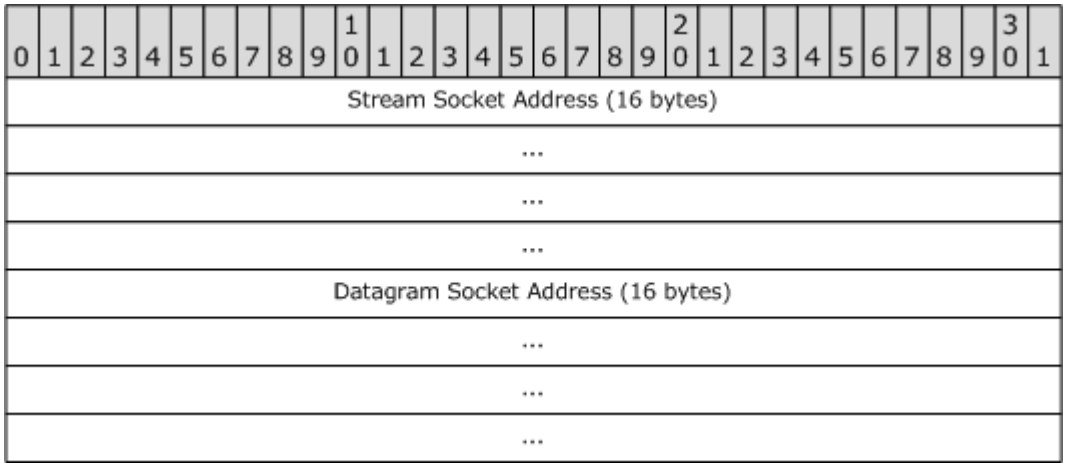


Figure 5: Windows Winsock DirectPlay Service Provider stores this data in the ServiceProviderData field

Stream Socket Address: A SOCKADDR_IN structure that contains the addressing information to be used when contacting this player over TCP. If the **PL** flag is set in the **Flags** field, the **Address** field of this SOCKADDR_IN MUST be set to 0.0.0.0.

Datagram Socket Address: A SOCKADDR_IN structure that contains the addressing information to be used when contacting this player over UDP. If the **PL** flag is set in the **Flags** field, the **Address** field of this SOCKADDR_IN MUST be set to 0.0.0.0.

<4> Section 2.2.3: If the Windows Winsock DirectPlay Service Provider is used, the **SP** field is set to 0x1 in the **PlayerInfoMask** field, and the **ServiceProviderDataLength** field is set to 0x20.

<5> Section 2.2.3: If provided, the Windows Winsock DirectPlay Service Provider stores the following data in the **ServiceProviderData** field:

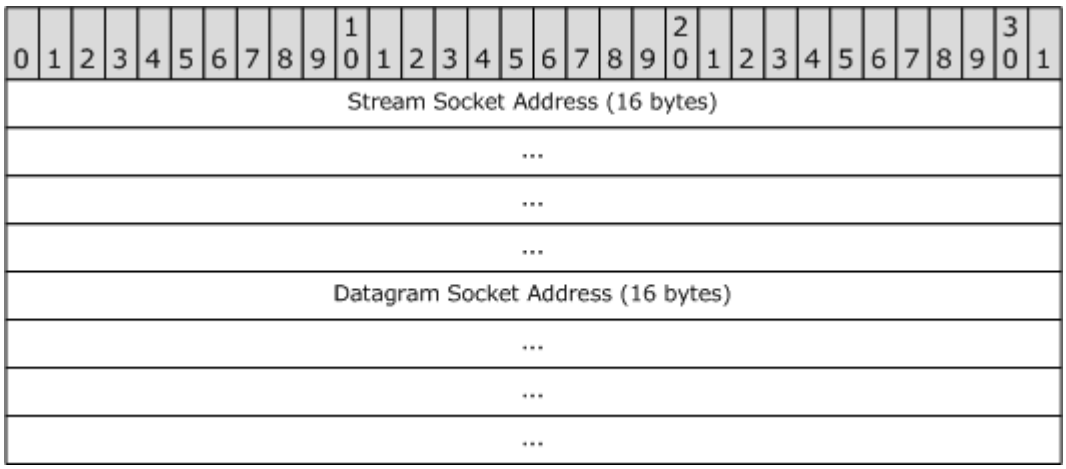


Figure 6: Windows Winsock DirectPlay Service Provider stores this data in the ServiceProviderData field

Stream Socket Address: A SOCKADDR_IN structure that contains the addressing information to be used when contacting this player over TCP. If the **PL** flag is set in the **Flags** field, the **Address** field of this SOCKADDR_IN MUST be set to 0.0.0.0.

Datagram Socket Address: A SOCKADDR_IN structure that contains the addressing information to be used when contacting this player over UDP. If the **PL** flag is set in the **Flags** field, the **Address** field of this SOCKADDR_IN MUST be set to 0.0.0.0.

<6> Section 2.2.4: Windows sets the **Size** field to 0.

<7> Section 2.2.4: An implementation SHOULD support at least one of the values shown in the following table:

Algorithm	Description	OS Versions	Reference
CALG_AES 0x00006611	Advanced Encryption Standard (AES). This algorithm is supported by the Microsoft AES Cryptographic Provider.	▪ Windows XP SP1 ▪ Windows Server 2003 ▪ Windows Vista	[FIPS197]
CALG_3DES 0x00006603	Triple DES encryption algorithm (3DES).	▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	For more information, see the entry for [TDEA] in section 1.2.1.
CALG_DES 0x00006601	DES Encryption Standard (DES).	▪ Windows 2000 ▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	[FIPS46-2] and [FIPS46-3]
CALG_RC2 0x00006602	RC2 block encryption algorithm (RC2). This algorithm is supported by the Microsoft Base Cryptographic Provider.	▪ Windows NT ▪ Windows 2000 ▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	[RFC2268]

Algorithm	Description	OS Versions	Reference
CALG_RC4 0x00006801	RC4 stream encryption algorithm (RC4). This algorithm is supported by the Microsoft Base Cryptographic Provider.	▪ Windows NT ▪ Windows 2000 ▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	[RC4-CRYPTO]

For more information about these encryption algorithms, see [MSDN-ALG_ID].

Implementations MAY choose to support other algorithms and values not shown here; if they do, they SHOULD reuse the values specified in [MSDN-CRYPTO] in order to avoid collisions.

<8> Section 2.2.5: When the **OL** flag is present, Windows disables the Nagle algorithm for its TCP sockets.

<9> Section 2.2.5: Windows does not initialize the **SessionName** field to 0 on transmission; the receiver MUST ignore the data.

<10> Section 2.2.5: Windows does not initialize the **Password** field to 0 on transmission; the receiver MUST ignore the data.

<11> Section 2.2.6: On Windows Vista, the current version of the DirectPlay protocol is 14 (0x000E).

<12> Section 2.2.13: Windows sets this field to 0 on transmission.

<13> Section 2.2.13: Windows sets this field to 0 on transmission.

<14> Section 2.2.20: IDTo is always set to 0.

<15> Section 2.2.20: GroupID is always set to 0.

<16> Section 2.2.20: PasswordOffset is always set to 0.

<17> Section 2.2.21: IDTo is always set to 0.

<18> Section 2.2.21: GroupID is always set to 0.

<19> Section 2.2.21: PasswordOffset is always set to 0.

<20> Section 2.2.22: **IDTo** is always set to 0.

<21> Section 2.2.22: **GroupID** is always set to 0.

<22> Section 2.2.22: **PasswordOffset** is always set to 0.

<23> Section 2.2.23: IDTo is always set to 0.

<24> Section 2.2.23: **PlayerID** is always set to 0.

<25> Section 2.2.23: CreateOffset is always set to 0.

<26> Section 2.2.23: PasswordOffset is always set to 0.

<27> Section 2.2.24: IDTo is always set to 0.

<28> Section 2.2.24: CreateOffset is always set to 0.

<29> Section 2.2.24: PasswordOffset is always set to 0.

<30> Section 2.2.25: IDTo is always set to 0.

<31> Section 2.2.25: GroupID is always set to 0.

<32> Section 2.2.25: CreateOffset is always set to 0.

<33> Section 2.2.25: PasswordOffset is always set to 0.

<34> Section 2.2.26: IDTo is always set to 0.

<35> Section 2.2.26: CreateOffset is always set to 0.

<36> Section 2.2.26: PasswordOffset is always set to 0.

<37> Section 2.2.28: The ShortcutCount field is uninitialized on transmission.

<38> Section 2.2.31: Windows sets the IDTo field to 0.

<39> Section 2.2.32: Windows sets the IDTo field to 0.

<40> Section 2.2.33: If provided, the Windows Winsock DirectPlay Service Provider stores the following data in the **SPData** field:

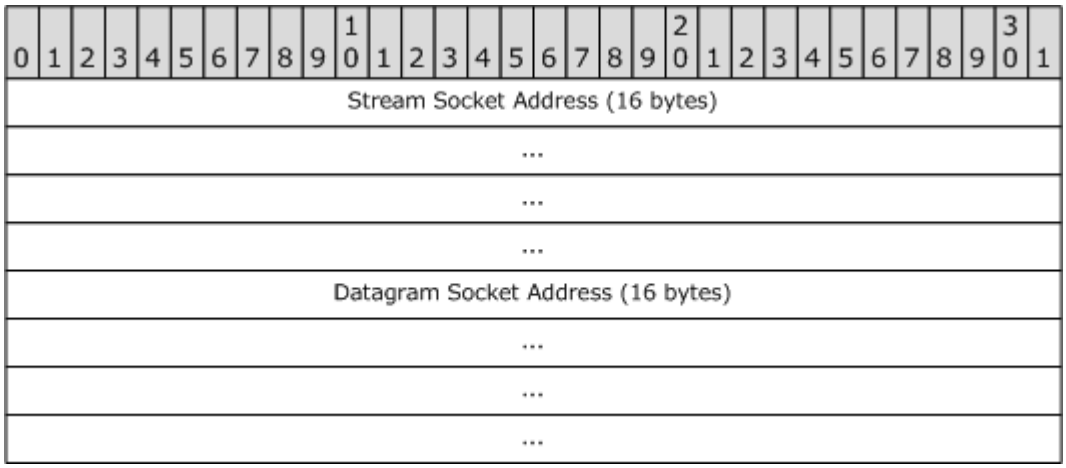


Figure 7: Windows Winsock DirectPlay Service Provider stores this data in the SPData field.

Stream Socket Address: A SOCKADDR_IN structure that contains the addressing information to be used when contacting this player over TCP. The **Address** field of this SOCKADDR_IN MUST be set to 0.0.0.0.

Datagram Socket Address: A SOCKADDR_IN structure that contains the addressing information to be used when contacting this player over UDP. The **Address** field of this SOCKADDR_IN MUST be set to 0.0.0.0.

<41> Section 3.1.1: The only supported value for Game.SSPIProvider is NTLM.

<42> Section 3.1.1: The Game.CAPIProvider MUST be one of the following cryptographic provider names.

- Microsoft Base Cryptographic Provider v1.0
- Microsoft Enhanced Cryptographic Provider v1.0
- Microsoft RSA Signature Cryptographic Provider
- Microsoft Base RSA SChannel Cryptographic Provider
- Microsoft Enhanced RSA SChannelStrong Cryptographic Provider
- Microsoft Base DSS Cryptographic Provider
- Microsoft Base DSS and Diffie-Hellman Cryptographic Provider
- Microsoft Enhanced DSS and Diffie-Hellman Cryptographic Provider
- Microsoft Base DH SChannel Cryptographic Provider
- Microsoft Enhanced DH SChannel Cryptographic Provider
- Microsoft Base Smart Card Crypto Provider

<43> Section 3.1.1: The Game.CAPIProviderType value MUST be one of the following values.

- PROV_RSA_FULL (0x00000001).
- PROV_RSA_SIG (0x00000002): The PROV_RSA_SIG provider type is a subset of the PROV_RSA_FULL type, it only provides support for hashes and signatures using the RSA signature algorithm.
- PROV_DSS (0x00000003): The PROV_DSS provider type is a subset of the PROV_RSA_FULL type; it only provides support for hashes and signatures using the DSS signature algorithm.
- PROV_FORTEZZA (0x00000004): The PROV_FORTEZZA provider type specifies cryptographic protocols and algorithms specified by the National Institute for Standards and Technology.
- PROV_MS_EXCHANGE (0x00000005): The PROV_MS_EXCHANGE provider type is intended for the needs of Microsoft Exchange.

<44> Section 3.1.1: An implementation SHOULD support at least one of the values shown in the following table:

Algorithm	Description	OS Versions	Reference
CALG_AES 0x00006611	Advanced Encryption Standard (AES). This algorithm is supported by the Microsoft AES Cryptographic Provider.	▪ Windows XP SP1 ▪ Windows Server 2003 ▪ Windows Vista	[FIPS197]

Algorithm	Description	OS Versions	Reference
CALG_3DES 0x00006603	Triple DES encryption algorithm (3DES).	▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	For more information, see the entry for [TDEA] in section 1.2.1.
CALG_DES 0x00006601	DES Encryption Standard (DES).	▪ Windows 2000 ▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	[FIPS46-2] and [FIPS46-3]
CALG_RC2 0x00006602	RC2 block encryption algorithm (RC2). This algorithm is supported by the Microsoft Base Cryptographic Provider.	▪ Windows NT ▪ Windows 2000 ▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	[RFC2268]
CALG_RC4 0x00006801	RC4 stream encryption algorithm (RC4). This algorithm is supported by the Microsoft Base Cryptographic Provider.	▪ Windows NT ▪ Windows 2000 ▪ Windows XP ▪ Windows Server 2003 ▪ Windows Vista	[RC4-CRYPTO]

For more information about these encryption algorithms, see [MSDN-ALG_ID].

Implementations MAY choose to support other algorithms and values not shown here; if they do, they SHOULD reuse the values specified in [MSDN-CRYPTO] in order to avoid collisions.

<45> Section 3.1.2.1: If no application-defined timer has been set, Windows uses a default timer value of 5 seconds.

<46> Section 3.1.4.16: In DirectPlay library implementations for Windows platforms, encryption and signing services are provided by the Windows platform APIs.

<47> Section 3.1.4.16.2: If the DirectPlay client is using the DirectPlay Winsock Service, and the higher level did not specify guaranteed delivery, then the datagram (**UDP**) or message (**TCP**) MUST

be sent over the protocol (UDP or TCP, respectively) to the socket address associated with the target player.

<48> Section 3.1.5.1: The only SSPI provider supported is "NTLM".

<49> Section 3.1.5.5: Windows returns a DPERR_LOGONDENIED error code to the caller when this message is received.

<50> Section 3.1.5.10: If the Windows Sockets DirectPlay provider is used, the **SpData** field of the DPSP_MSG_ADDFORWARD request contains the IP address and port number that MUST be used to communicate with the system player.

<51> Section 3.2.5.4: The only supported SSPI provider is the NTLM SSPI provider which implements the NT LAN Manager (NTLM) Authentication Protocol, as specified in [MS-NLMP].

<52> Section 3.2.5.5: If the Windows Winsock DirectPlay Service Provider, than the **DPSP_MSG_ADDFORWARD** message MUST contain the IP address of the sender of the **DPSP_MSG_ADDFORWARDREQUEST** message, and the port number contained in the **DPSP_MSG_HEADER.SockAddr** field (section 2.2.6).

<53> Section 5.1: DirectPlay actually provides access to end-to-end secure identity using Windows NT security, and provides for packet encryption and signing. For secure operation, that mode should be employed.

7 Index