[MC-DPL8CS]:
DirectPlay 8 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.
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Date	Revision History	Revision Class	Comments
01/25/2008	2.0	Major	Updated and revised the technical content.

Table of Contents

1 Introduction

The DirectPlay 8 Protocol: Core and Service Providers is intended for use in multiplayer game communication. It provides a protocol to create and manage game **sessions** over existing datagram protocols such as **UDP**. The DirectPlay 8 Protocol: Core and Service Providers relies on the DirectPlay 8 Protocol: Reliable (as specified in [MC-DPL8R]) to manage network connections, to send and receive packets, and to perform reliable communications.

1.1 Glossary

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

Client
Globally Unique Identifier (GUID)
Little-Endian
Network Byte Order
Server

The following terms are specific to this document:

Acknowledgment (ACK): A signal passed between communicating processes or computers to signify successful receipt of a transmission. The DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) acknowledges packet **sequence IDs**.

Client/Server Mode: **Client/Server Mode** consists of one **server** with many **client** connections (one-to-many). From the perspective of each **client**, there is only one connection: the connection to the **server**.

DFRAME: A DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) data frame.

DirectPlay: A network communication library included with the Microsoft **DirectX** application programming interfaces. **DirectPlay** is a high-level software interface between applications and communication services that makes it easy to connect games over various types of networks.

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

DirectX Diagnostic (DXDiag): DXDiag.exe is a diagnostic utility included with Windows that is used to test Microsoft **DirectX** functionality, including **DirectPlay** traffic.

Group: A collection of **players** within a **session**. Typically, **players** are placed in a **group** when they serve a common purpose.

Host: The creator of the **DirectPlay session**, or the oldest **peer** still participating in the **session** after the creator has left. **Hosts** are assigned the responsibility of coordinating the addition or removal of **peers** in the **DirectPlay session**.

Host Migration: The process that occurs when the **peer** that is designated as the **host** leaves the **DirectPlay session**, and the next oldest **peer** becomes the **host**.

Internetwork Packet Exchange (IPX): A protocol maintained by Novell's NetWare product that provides connectionless datagram delivery of messages. The **Internetwork Packet Exchange (IPX)** is based on Xerox Corporation's Internetwork Packet protocol, XNS.

Name Table: The list of systems participating in a **session**; used both for local use and for transmission to enable peer-to-peer connectivity when additional participants join. This could also be considered the **player** list. It has a version number that monotonically increases with every operation that changes the **name table** content, such as adding or removing a **player**.

Name Table Entry: The DN_NAMETABLE_MEMBERSHIP_INFO structure along with associated strings and data buffers for an individual participant in the **session**. These could be considered **players**.

Next Receive: The next 8-bit packet **sequence ID** expected to be received, indicating **acknowledgement** of all packets up to this ID. This is typically represented as a field named bNRcv in packet structures.

Payload: The data that is transported to and from the application that is using the DirectPlay 8 Protocol: Core and Service Providers.

Peer: A **player** within a DirectPlay 8 Protocol: Core and Service Providers **session**. A **peer** has an established connection with every other **peer** in the **session** where synchronization is managed by the **DirectPlay host**.

Peer-to-Peer Mode: **Peer-to-Peer Mode** consists of multiple **peers**. Each **peer** has a connection to all other **peers** in the **session**. If there are N **peers** in the **session**, then each **peer** has N–1 connections.

Player: A participant in a DirectPlay 8 Protocol: Core and Service Providers **session**. See **Name Table Entry**.

Sequence ID: A monotonically increasing 8-bit identifier for packets. This is typically represented as a field named bSeq in packet structures.

Session: A communication **session** that uses the DirectPlay 8 Protocol: Core and Service Providers.

User Datagram Protocol (UDP): A common connectionless, datagram-oriented protocol 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.

[MC-DPL8R] Microsoft Corporation, "DirectPlay 8 Protocol: Reliable Specification" September 2007.

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

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

[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

1.2.2 Informative References

[MC-DPLHP] Microsoft Corporation, "DirectPlay 8 Protocol: Host and Port Enumeration Specification" September 2007.

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

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

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

[RFC2581] Allman, M., Paxson, V., and Stevens, W., Network Working Group, "TCP Congestion Control," RFC 2581, April 1999, http://www.ietf.org/rfc/rfc2581.txt

1.3 Protocol Overview (Synopsis)

The DirectPlay 8 Protocol: Core and Service Providers enables **DirectPlay clients** within a DirectPlay session to communicate multiplayer game session information. The exchange is coordinated by either the **server** or a **host peer**. The protocol depends on the underlying DirectPlay session to handle connectivity and transport between the clients and the server or host.

1.3.1 DirectPlay 8 Protocol: Core and Service Providers Session Management

The DirectPlay 8 Protocol: Core and Service Providers provides a virtual session that exists within the DirectPlay session. This virtual session requires an existing DirectPlay session to operate and maintain its own additional session coordinated by the server or host peer. The protocol does not require that every DirectPlay client participate in the virtual session. The server or host peer maintains the list of clients that are in the multiplayer session, and coordinates the distribution of information and commands to the clients in the session.

1.3.2 Session Modes

DirectPlay sessions are created in one of two modes: client/server or peer-to-peer.

1.3.2.1 Client/Server

Client/Server mode consists of one server with many client connections (one-to-many). From the perspective of each client, there is only one connection: the connection to the server.

1.3.2.2 Peer-to-Peer (Peer/Host)

Peer-to-Peer mode consists of multiple peers. Each peer has a connection to all other peers in the session. If there are N peers in the session, each peer has N–1 connections.

During a peer-to-peer session, one peer in the session is considered the host. The host is responsible for the synchronization of all other peers in the session.

1.3.3 Connecting to a Session

The DirectPlay 8 Protocol: Core and Service Providers requires that clients first be connected through the DirectPlay 8 Protocol: Reliable (as specified in [MC-DPL8R]). After clients are connected through the DirectPlay 8 Protocol: Reliable, they can then connect to a DirectPlay 8 Protocol: Reliable multiplayer session by requesting a connect to the server or host.

1.3.3.1 Client/Server Connect

Clients attempt to connect to a multiplayer session server by sending a connection request message to the server.

The server attempts to validate the **payload** sent in with the connection request message. If the payload is valid, the server sends a connect information request message.

Upon receiving an **acknowledgment** from the server, the client acknowledges the connection by sending a connection acknowledgment message confirming the connection.

1.3.3.2 Peer-to-Peer Connect

The first peer in a DirectPlay session is considered the host of the multiplayer session. This host peer waits for additional clients to connect to the DirectPlay session and to request a connection to the multiplayer session.

A new peer that wants to connect to the multiplayer session sends a connection request message.

The host validates the payload sent in and if it is valid, the host will respond with connection information to the peer.

If the host fails to validate the connection request message, the host sends a connection failed message to the peer.

If the host has successfully validated the connection package, then at the same time it is responding to the connecting peer, the host will also send a message to the other connected **players** indicating that a new player is joining. This informs each existing client that a new peer has joined the session.

When the connecting peer has received confirmation from the host, it acknowledges the connection by sending a message back to the host.

After the host receives the acknowledgment message from the newly connected clientpeer, the host will send a connect instruct message to all existing peers, instructing them to also establish a connection to the new peer. The existing peers will send their unique identifiers to the newly connected peer.

It may be the case that existing peers are unable to connect to the new peer. Existing peers that are unable to connect to the newly connecting peer issue a failure notification back to the host. If the host receives a failure message from any existing peers, the host sends a connection failure message to the peer that is requesting a connection.

1.3.4 Disconnecting from a Session

1.3.4.1 Client/Server Disconnect

If the server wants to remove a client from the multiplayer session, it will send a disconnect message to the client. In response, the client is required to disconnect itself from the DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) session.

If a client wants to leave a multiplayer session, it disconnects itself from the DirectPlay 8 Protocol: Reliable session.

There are no messages specific to the DirectPlay 8 Protocol: Core and Service Providers that a client uses to disconnect itself from a multiplayer session.

1.3.4.2 Peer-to-Peer Disconnect

If the host peer wants to remove a peer from the multiplayer session, the host sends a disconnect message to the peer. In response, the peer disconnects itself from each peer in the multiplayer session, and then disconnects itself from the DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) session.

The host also sends a remove player message to all other peers in the multiplayer session to indicate removal of the disconnecting peer. Peers can receive this message before or after the disconnecting peer has disconnected itself from the DirectPlay 8 Protocol: Reliable session (that is, a peer may receive a remove player message from the host even though the referenced peer has already disconnected from the session).

If the disconnecting peer is the session host, **host migration** is performed (as specified in section 1.3.6).

1.3.5 Integrity Check (Peer-To-Peer)

If a client peer detects a connection loss to another peer, and has not been notified by the host that the peer has left, the detecting client peer sends a disconnect notification message to the host to request that the host verify the connection to the possibly disconnected peer.

In response, the host sends an integrity check to the peer that has been reported as disconnected. This message includes an identifier to the requesting peer (the clientpeer that detected the loss of connection).

Whenever a client peer receives an integrity check message from the host, it must respond to the host by sending an integrity check response message.

The integrity check that was sent from the host is sent via a reliable message through the protocol. If the peer in question has dropped, the message will fail to be sent via the protocol, and the player will be removed from the session.

If the host receives an integrity check response message from the client peer in question, the host will terminate the requesting peer (the peer that detected a connection loss and questioned the integrity of the other peer) by sending a disconnect message to the requesting peer, removing it from the multiplayer session.

1.3.6 Host Migration (Peer-To-Peer)

Host migration enables a set of peer-to-peer clients to elect a new host peer to replace an existing host peer that either drops from the session, cannot be reached, or is otherwise unavailable. A host peer could become unavailable due to lost connectivity, session disconnect, or termination.

Host migration is not performed in sessions that are operating in client/server mode. Only peer-to-peer sessions may perform host migration.

Host migration is initiated when one or more peer-to-peer clients detects a disconnect with the current host. When this occurs, the current **name table** is referenced to determine the oldest client (the peer that has been connected to the session for the longest time determined by the name table version when the player was added to the session) that is still connected to the session. This client

becomes the new host candidate. Note that there may be more than one host candidate if a session splits and multiple connections are severed.

The host candidate (or candidates) sends a message to all connected peers. Each peer that receives the message responds to the candidate with a message to provide the client's name table version to the host candidate.

If the host candidate detects a peer with a name table that is newer than the candidate's, the candidate will send a message back to that peer, instructing the peer to send the name table operations that are in the peer's name table and not in the candidate's name table.

The peer responds by sending a message back to the host candidate. The message must contain the name table operations that are in the peer's name table, but not in the host candidate's name table. The host candidate then begins execution against the name table operations that were returned, which in turn will resynchronize all of the players name tables in the session.

Once all name table operations have been executed, the host candidate then sends a message to all peers informing them that host migration is complete and that the host candidate is now the session host.

1.3.7 Groups

Note When working with **groups**, be aware of considerations related to **DXDiag**. The DirectX Diagnostic tool (DxDiag.exe) implementation of this specification does not support groups.

1.3.7.1 Client/Server Groups

Although the concept of groups exists in a DirectPlay 8 client/server session, all activity related to groups is handled by the DirectPlay 8 server. There is no network traffic between the client and the server to indicate the existence of a group.

1.3.7.2 Peer-to-Peer Groups

Only the session host can create or modify groups. These capabilities include creating and destroying groups, along with adding and removing players from groups.

If a non-host peer wants to create a group, it will issue a message to the host requesting that a new group be generated. Once the host has created the new group (via a request from a peer or locally), it issues a message to all the connected peers indicating to them that a new group has been created.

If a non-host peer wants to add a new player to an existing group, it will issue a message to the host requesting that an existing player be added to an existing group. Once the host receives the request and adds the new player to the group (via a peer or locally), the host will send out a message to all connected peers indicating to them that a new peer/group matching has been created.

If a non-host peer wants to delete a player from an existing group, it must issue a message to the host requesting that a player be removed. Once the host has received the request and has deleted the player from the group (via a peer or locally), the host sends a message to all connected peers letting them know that a peer/group match has been deleted.

If a non-host peer wants to destroy an existing group, it will issue a request to the host. Once the host has received the request and has destroyed the group (via Req or locally), the host will respond to all connected peers letting them know that a group has been destroyed from the session.

1.4 Relationship to Other Protocols

DirectPlay 8 Protocol: Core and Service Providers packets are embedded within DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) packets.

1.5 Prerequisites/Preconditions

The DirectPlay 8 Protocol: Core and Service Providers functions only after a DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) session is established. If the DirectPlay 8 Protocol: Reliable session is terminated, the DirectPlay 8 Protocol: Core and Service Providers session is also terminated.

1.6 Applicability Statement

The DirectPlay 8 Protocol: Core and Service Providers is designed to provide a mechanism for managing multiplayer game sessions within a DirectPlay 8 Protocol: Reliable ([MC-DPL8R]) session.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- Supported Transports: This protocol can be implemented on top of the DirectPlay 8 Protocol: Reliable ([MC-DPL8R]).

1.8 Vendor-Extensible Fields

This protocol uses HRESULT values as specified 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 that the value is a customer code.

1.9 Standards Assignments

This protocol contains no standards assignments.

2 Messages

The following sections specify DirectPlay 8 Protocol: Core and Service Providers messages that are transported and DirectPlay 8 Protocol: Core and Service Providers message syntax.

2.1 Transport

The DirectPlay 8 Protocol: Core and Service Providers creates and manages game sessions by using the DirectPlay 8 Protocol: Reliable ([MC-DPL8R]). The DirectPlay 8 Protocol: Reliable is responsible for managing network connections, sending and receiving packets, and performing reliable communications. All session messages that are sent, are sent reliable through the DirectPlay 8 Protocol: Reliable.

Network addresses that are passed to the DirectPlay 8 Protocol: Reliable are used to establish connections via the DN_ADDRESSING_URL structure (as specified in section 2.2.8).

The data that is passed from the DirectPlay 8 Protocol: Core and Service Providers is passed in the clear to the DirectPlay 8 Protocol: Reliable.

2.1.1 Packet Structure

In regard to a DirectPlay 8 session, all packets are actually embedded within the **DFRAME** from the protocol. If the **bCommand** field within the DFRAME has the PACKET_COMMAND_USER_1 flag set, then we know this is a system message that needs to be interpreted. However, if the PACKET_COMMAND_USER_1 or PACKET_COMMAND_USER_2 flags are not set, this is data that SHOULD be passed directly to the application.

Note PACKET_COMMAND_USER_2 is used specifically for DirectPlay Voice Protocol ([MC-DPLVP]).

2.2 Message Syntax

2.2.1 Connect Messages

2.2.1.1 DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO, DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX

This is the first message passed into a host/server to initiate the connect sequence.

Note DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX is an extended version of the packet for DirectPlay 9 that includes the dwAlternateAddressDataOffset, dwAlternateAddressDataSize, and alternateAddressData 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
dwPacketType																															
dwFlags																															
dwDNETVersion																															

dwNameOffset
dwNameSize
dwDataOffset
dwDataSize
dwPasswordOffset
dwPasswordSize
dwConnectDataOffset
dwConnectDataSize
dwURLOffset
dwURLSize
guidInstance
guidApplication
...
...
...
dwAlternateAddressDataOffset
dwAlternateAddressDataSize
alternateAddressData (variable)
...
url (variable)
...

connectData (variable)
...
Password (variable)
...
data (variable)
...
name (variable)
...

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_PLAYER_CONNECT_INFO 0x000000C1	Sends client/peer connection information to the server/host.

dwFlags (4 bytes): A 32-bit field that specifies the connect flags.

Value	Meaning
DP_OBECT_TYPE_CLIENT 0x0002	Connecting application is a client.
DN_OBJECT_TYPE_PEER 0x0003	Connecting application is a peer.

dwDNETVersion (4 bytes): A 32-bit field that specifies the DirectPlay version.

Value	Meaning
00000001	**DirectX** 8.0
00000002	DirectX 8.1
00000003	PocketPC
00000004	Not used
00000005	Windows Server 2003
00000006	DirectX 8.2
00000007	DirectX 9.0

Value	Meaning
00000008	DirectX 9.0

dwNameOffset (4 bytes): A 32-bit field that provides the offset from the end of **dwPacketType** of the connecting application's name[] field. If **dwNameOffset** is zero, the packet does not include name data.

dwNameSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the data in the name[] field. If **dwNameOffset** is set to zero, dwNameSize SHOULD also be zero. If **dwNameOffset** is not zero, dwNameSize SHOULD also not be zero.

dwDataOffset (4 bytes): A 32-bit field that specifies the offset from the end of dwPacketType of the data[] field. If **dwNameOffset** is zero, the packet does not include application data.

dwDataSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the data[] field. If dwDataOffset is set to zero, dwDataSize SHOULD also be zero. If dwDataOffset is not zero, dwDataSize SHOULD also not be zero.

dwPasswordOffset (4 bytes): A 32-bit field that specifies the offset from the end of dwPacketType of the password[] field.

dwPasswordSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the password. If dwPasswordOffset is set to zero, dwPasswordSize SHOULD also be zero. If dwPasswordOffset is not zero, dwPasswordSize SHOULD also not be zero.

dwConnectDataOffset (4 bytes): A 32-bit field that specifies the offset from the end of dwPacketType of the connectData[] field. If dwConnectDataOffset is zero, the packet does not include connection data.

dwConnectDataSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the connectData[] field. If dwConnectDataOffset is zero, dwConnectDataSize SHOULD also be zero. If dwConnectDataOffset is not zero, dwConnectDataSize SHOULD also not be zero.

dwURLOffset (4 bytes): A 32-bit field that specifies the offset from the end of dwPacketType to the url[] field. If dwURLOffset is zero, the packet does not include the client URL. This URL represents the address of the client/peer that is connecting to the session.

dwURLSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the url[] field. If dwURLOffset is zero, dwURLSize SHOULD also be zero. If dwURLOffset is not zero, dwURLSize SHOULD also not be zero.

guidInstance (4 bytes): A 128-bit field that specifies the instance **Globally Unique Identifier (GUID)** of the connecting client/peer. This is the unique identifier for every instance of the server/host that is running.

guidApplication (16 bytes): A 128-bit field that specifies the application's assigned GUI. This is the unique identifier for the specific application, not per instance.

dwAlternateAddressDataOffset (4 bytes): A 32-bit field that specifies the offset from the end of dwPacketType to the alternateAddressData[] field. If dwAlternateAddressDataOffset is zero, the packet does not include the alternate address data. This field is only used in DirectPlay 9.

dwAlternateAddressDataSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the alternateAddressData[] field. If dwAlternateAddressDataOffset is set to zero,

dwAlternateAddressDataSize SHOULD also be zero. If dwAlternateAddressDataOffset is not zero, dwAlternateAddressDataSize SHOULD also not be zero. This field is only used in DirectPlay 9.

alternateAddressData (variable): A variable-length field that contains a zero-terminated wide character array that specifies alternative address data used to connect the client. This field's position is determined by dwAlternateAddressDataOffset and the size stated in dwAlternateAddressDataSize. The address that is passed is formatted via the DN_ADDRESSING_URL format. This field is only used in DirectPlay 9.

url (variable): A variable-length field that contains a zero-terminated wide character array that specifies the client URL. This field's position is determined by dwURLOffset and the size stated in dwURLSize. It is defined in DN_ADDRESSING_URL.

connectData (variable): A variable-length field that contains a byte array that provides the connection data. This field's position is determined by dwConnectDataOffset and the size stated in dwConnectDataSize.

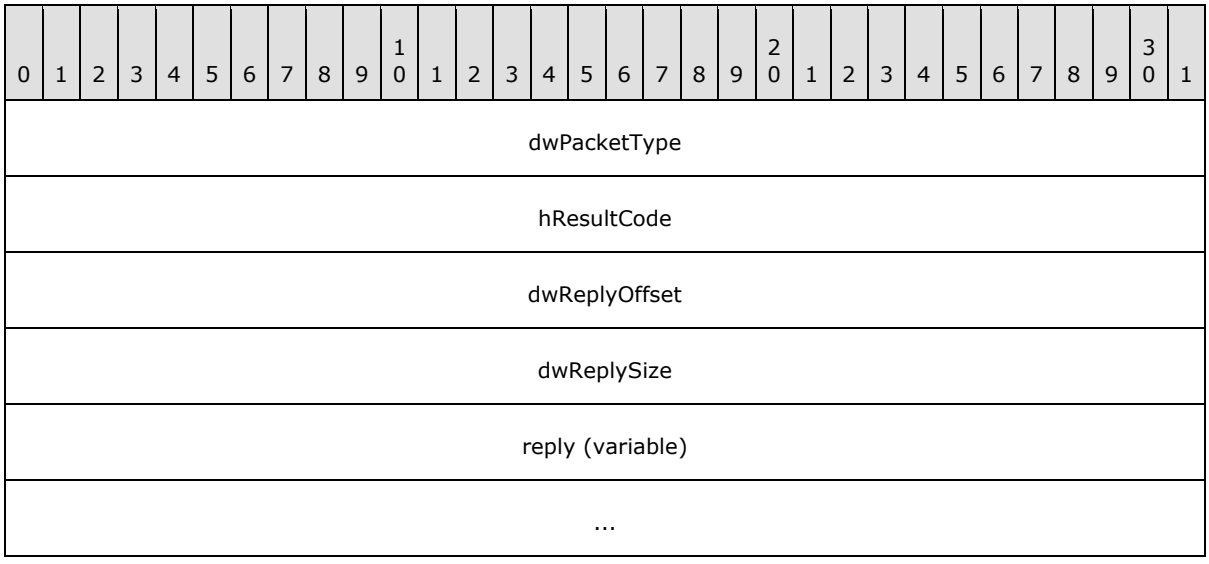
Password (variable): A variable-length field that contains a zero-terminated wide character array that specifies the application password data. This field's position is determined by dwPasswordOffset and the size stated in dwPasswordSize. This data is passed in clear text to the protocol layer.

data (variable): A variable-length field that contains a byte array that specifies the application data. This field's position is determined by dwDataOffset and the size stated in dwDataSize.

name (variable): A variable-length field that contains a zero-terminated wide character array that specifies the client/peer name. This field's position is determined by **dwNameOffset** and the size stated in **dwNameSize**.

2.2.1.2 DN_CONNECT_FAILED

The DN_CONNECT_FAILED packet indicates that a connection attempt failed.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_CONNECT_FAILED 0x000000C5	Connection attempt failed.

hResultCode (4 bytes): A 32-bit field that contains the failure code.

Value	Meaning
DPNERR_ALREADYCLOSING 0x80158050	Server/host is closing or host is migrating.
DPNERR_NOTHOST 0x80158530	Attempting to connect to an application that is not the host/server.
DPNERR_INVALIDINTERFACE 0x80158390	Non-client attempting to connect to a server. Non-peer attempting to connect to a host/peer.
DPNERR_INVALIDVERSION 0x80158460	Version passed in is not a valid DirectPlay version.
DPNERR_INVALIDINSTANCE 0x80158380	Instance GUID is not valid for this session.
DPNERR_INVALIDAPPLICATION 0x80158300	Application GUID is not valid for this application.
DPNERR_INVALIDPASSWORD 0x80158410	Password passed in does not match what is expected.
DPNERR_HOSTREJECTEDCONNECTION 0x80158260	Application-specific failure for not allowing connection.
DPNERR_GENERIC E_FAIL	Non-common errors that cannot be generalized.

dwReplyOffset (4 bytes): A 32-bit field that specifies the offset from the end of dwPacketType to the reply[] field. If dwReplyOffset is zero, there is no reply data.

dwReplySize (4 bytes): A 32-bit field that specifies the size, in bytes, of the data in the reply[] field. If dwReplyOffset is zero, dwReplySize SHOULD also be zero. If dwReplyOffset is not zero, dwReplySize SHOULD also not be zero.

reply (variable): A variable-length field that contains an array of bytes that provides a reply message from the application identifying the connection failure. Reply data is only expected when the failure type is DPNERR_HOSTREJECTEDCONNECTION.

2.2.1.3 DN_SEND_CONNECT_INFO

The DN_SEND_CONNECT_INFO packet is sent from the host/server indicating to the connecting peer/client that it has joined the 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
dwPacketType																															
dwReplyOffset																															
dwReplySize																															
dwSize																															
dwFlags																															
dwMaxPlayers																															
dwCurrentPlayers																															
dwSessionNameOffset																															
dwSessionNameSize																															
dwPasswordOffset																															
dwPasswordSize																															
dwReservedDataOffset																															
dwReservedDataSize																															
dwApplicationReservedDataSize																															
dwApplicationReservedDataOffset																															
guidInstance																															
...																															
...																															
...																															

guidApplication
...
...
...
dpnid
dwVersion
dwVersionNotUsed
dwEntryCount
dwMembershipCount
DN_NameTable_Entry_Info (variable)
...
DN_NameTable_Membership_Info (variable)
...
URL (variable)
...
Data (variable)
...
Name (variable)
...
ApplicationReservedData (variable)
...

ReservedData (variable)
...
Password (variable)
...
SessionName (variable)
...
Reply (variable)
...

dwPacketType (4 bytes): A 32-bit integer that indicates the packet type.

Value	Meaning
DN_MSG_INTERNAL_SEND_CONNECT_INFO 0x000000C2	The server/host response to a client/peer that contains session information.

dwReplyOffset (4 bytes): A 32-bit field that specifies the offset in bytes from the end of dwPacketType of the Reply[] field. If dwReplyOffset is zero, the packet does not include a reply.

dwReplySize (4 bytes): A 32-bit field that specifies the size, in bytes, of the reply[] field. If dwReplyOffset is set to 0, dwReplySize SHOULD also be zero. If dwReplyOffset is not zero, dwReplySize SHOULD also not be zero.

dwSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the application description information. This includes all fields starting with dwSize through dwApplicationReservedDataSize.

dwFlags (4 bytes): A 32-bit integer that specifies the application flags.

Value	Meaning
DPNSESSION_CLIENT_SERVER 0x00000001	A client/server session.
DPNSESSION_MIGRATE_HOST 0x00000004	Host migration is allowed.
DPNSESSION_NODPNSVR 0x00000040	The DirectPlay enumeration server is not running.
DPNSESSION_REQUIREPASSWORD 0x00000080	Password is REQUIRED.

Value	Meaning
DPNSESSION_NOENUMS 0x00000100	No enumerations are allowed from the session. This value is only available in DirectPlay 9.
DPNSESSION_FAST_SIGNED 0x00000200	Fast signing is turned on for the session. Passed to protocol layer. Cannot be used with DPNSESSION_FULL_SIGNED. This value is only available in DirectPlay 9.
DPNSESSION_FULL_SIGNED 0x00000400	Full signing turned on for the session. Passed to protocol layer. Cannot be used with DPNSESSION_FAST_SIGNED. This value is only available in DirectPlay 9.

dwMaxPlayers (4 bytes): A 32-bit integer that specifies the maximum number of clients/peers allowed in the session.

dwCurrentPlayers (4 bytes): A 32-bit integer that specifies the current number of clients/peers in the session.

dwSessionNameOffset (4 bytes): A 32-bit field that specifies the offset in bytes from the end of dwPacketType to the sessionName[] field. If dwSessionNameOffset is zero, the packet does not include a session name.

dwSessionNameSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the sessionName[] field. If dwSessionNameOffset is zero, dwSessionNameSize SHOULD be zero. If dwSessionNameOffset is not zero, dwSessionNameSize SHOULD also not be zero.

dwPasswordOffset (4 bytes): A 32-bit field that specifies the offset, in bytes, from the end of dwPacketType to the start of the password. If dwPasswordOffset is zero, the packet does not include a password.

dwPasswordSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the password. If dwPasswordOffset is zero, dwPasswordSize MUST be zero. If dwPasswordOffset is not zero, dwPasswordSize MUST not be zero.

dwReservedDataOffset (4 bytes): A 32-bit field that specifies the offset, in bytes, from the end of dwPacketType to the reservedData[] field. If dwReservedDataOffset is zero, the packet does not include reserved data.

dwReservedDataSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the reservedData[] field. If dwReservedDataOffset is zero, dwReservedDataSize MUST be zero. If dwReservedDataOffset is not zero, dwReservedDataSize MUST not be zero.

dwApplicationReservedDataSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the applicationReservedData[] field. If dwApplicationReservedDataOffset is zero, dwApplicationReservedDataSize MUST also be zero. If dwApplicationReservedDataOffset is not zero, dwApplicationReservedDataSize MUST not be zero.

dwApplicationReservedDataOffset (4 bytes): A 32-bit field that specifies the offset, in bytes, from the end of dwPacketType to the applicationReservedData[] field. If dwApplicationReservedDataOffset is zero, the packet does not include application reserved data.

guidInstance (16 bytes): The instance GUID of the session instance. It MUST match to join the session.

guidApplication (16 bytes): The application GUID as defined by the host/server.

dpnid (4 bytes): A 32-bit integer created by the server/host that provides the identifier for the new client joining the session. For more information, see DN_DPNID (section 2.2.7).

dwVersion (4 bytes): A 32-bit integer that specifies the current name table version.

dwVersionNotUsed (4 bytes): Not used.

dwEntryCount (4 bytes): A 32-bit integer that provides the number of entries in the name table contained in the **DN_NameTable_Entry_Info** field below. These are in essence players in the session.

dwMembershipCount (4 bytes): A 32-bit integer that provides the number of memberships in the name table contained in the **DN_NameTable_Membership_Info** field below. These are in essence player to group combinations.

DN_NameTable_Entry_Info (variable): This field contains a variable-length array of DN_NAMETABLE_ENTRY_INFO structures. The length of this array is described above in the **dwEntryCount** field. Each entry in this array describes a player in the session.

DN_NameTable_Membership_Info (variable): This field contains a variable-length array of DN_NAMETABLE_MEMBERSHIP_INFO structures. The length of this array is described above in the **dwMembershipCount** field. Each entry in this array describes a player/group combination.

URL (variable): A variable-length field that contains a zero-terminated wide character array that provides the URL of a user in the session. This field's position is determined by dwURLOffset and the size stated in dwURLSize, both fields in the corresponding DN_NAMETABLE_ENTRY_INFO structure. There can be multiple instances of the URL field, as defined by the number of DN_NAMETABLE_ENTRY_INFO sections that are included.

Data (variable): A variable-length field that contains a zero-terminated character array that specifies the user data. This field's position is determined by dwDataOffset and the size stated in dwDataSize, both fields in the corresponding DN_NAMETABLE_ENTRY_INFO structure. There can be multiple instances of the Data field, as defined by the number of DN_NAMETABLE_ENTRY_INFO sections that are included.

Name (variable): A variable-length field that contains a zero-terminated wide character array that contains the client name. This field's position is determined by dwNameOffset and the size stated in dwNameSize, both fields in the corresponding DN_NAMETABLE_ENTRY_INFO structure. There can be multiple instances of the Name field, as defined by the number of DN_NAMETABLE_ENTRY_INFO sections that are included.

ApplicationReservedData (variable): A variable-length field that contains a zero-terminated character array that specifies the application reserved data. This field's position is determined by dwApplicationReservedDataOffset and the size stated in dwApplicationReservedDataSize.

ReservedData (variable): A variable-length field that contains a byte array that provides the reserved data. This field's position is determined by dwReservedDataOffset and the size stated in dwReservedDataSize.

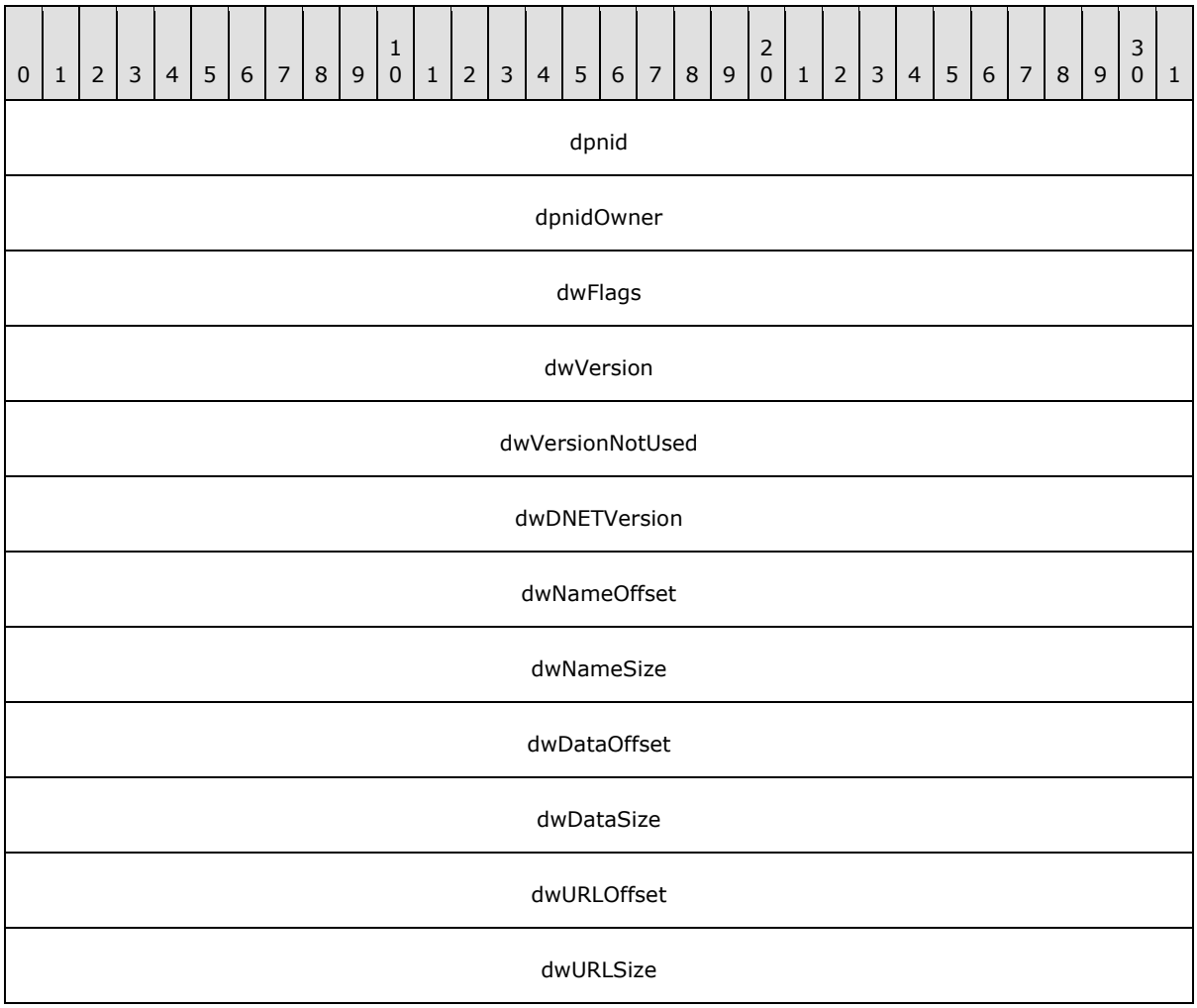
Password (variable): A variable-length field that contains a zero-terminated wide character array that specifies the application password data. This field's position is determined by dwPasswordOffset and the size stated in dwPasswordSize. This data is passed in clear text to the protocol layer.

SessionName (variable): A variable-length field that contains a zero-terminated character array that specifies the session name. This field's position is determined by dwSessionNameOffset and the size stated in dwSessionNameSize.

Reply (variable): A variable-length field that contains a byte array that provides the reply. This field's position is determined by dwReplyOffset and the size stated in dwReplySize.

2.2.1.4 DN_NAMETABLE_ENTRY_INFO

The DN_NAMETABLE_ENTRY_INFO contains a player or group that exists in a DirectPlay 8 name table. This includes all the information that the DirectPlay 8 Protocol: Core and Service Providers would need about a certain entry.



dpnid (4 bytes): A 32-bit integer that specifies the DirectPlay identifier that has been defined by the host/server. For more information, see section 2.2.7).

dpnidOwner (4 bytes): A 32-bit integer that provides the DirectPlay identifier for the owner. For more information, see section 2.2.7).

dwFlags (4 bytes): A 32-bit integer that specifies the **name table entry** flags. Entries are OR'd together.

Value	Meaning
NAMETABLE_ENTRY_FLAG_LOCAL 0x00000001	Name table entry is the local player.
NAMETABLE_ENTRY_FLAG_HOST 0x00000002	Name table entry is the host.
NAMETABLE_ENTRY_FLAG_ALL_PLAYERS_GROUP 0x00000004	Name table entry is the All Players Group.
NAMETABLE_ENTRY_FLAG_GROUP 0x00000010	Name table entry is a group.
NAMETABLE_ENTRY_FLAG_GROUP_AUTODESTRUCT 0x00000040	Name table entry supports group autodestruct.
NAMETABLE_ENTRY_FLAG_PEER 0x00000100	Name table entry is a peer.
NAMETABLE_ENTRY_FLAG_CLIENT 0x00000200	Name table entry is a client.
NAMETABLE_ENTRY_FLAG_SERVER 0x00000400	Name table entry is a server.
NAMETABLE_ENTRY_FLAG_CONNECTING 0x00001000	Name table entry is connecting.
NAMETABLE_ENTRY_FLAG_AVAILABLE 0x00002000	Name table entry is to make member available for use.
NAMETABLE_ENTRY_FLAG_DISCONNECTING 0x00004000	Name table entry to indicate disconnecting.
NAMETABLE_ENTRY_FLAG_INDICATED 0x00010000	Name table entry to indicate connection to application.
NAMETABLE_ENTRY_FLAG_CREATED 0x00020000	Name table entry to indicate application was given a created player.
NAMETABLE_ENTRY_FLAG_NEED_TO_DESTROY 0x00040000	Name table entry to indicate we need to destroy player.
NAMETABLE_ENTRY_FLAG_IN_USE 0x00080000	Name table entry to indicate that player is in use.

dwVersion (4 bytes): A 32-bit integer that specifies the version number of the name table.

dwVersionNotUsed (4 bytes): Not used.

dwDNETVersion (4 bytes): A 32-bit integer that provides the DirectPlay version.

Value	Meaning
00000001	DirectX 8.0

Value	Meaning
00000002	DirectX 8.1
00000003	PocketPC
00000004	Not used.
00000005	Windows Server 2003
00000006	DirectX 8.2
00000007	DirectX 9.0
00000008	DirectX 9.0

dwNameOffset (4 bytes): The offset, in bytes, from the end of dwPacketType to the name[] field. (Defined in DN_SEND_CONNECT_INFO). If dwNameOffset is zero, there is not a name.

dwNameSize (4 bytes): The size, in bytes, of the name[] field. (Specified in section 2.2.1.3). If dwNameOffset is zero, dwNameSize SHOULD also be zero. If dwNameOffset is not zero, dwNameSize SHOULD also not be zero.

dwDataOffset (4 bytes): The offset, in bytes, from the end of dwPacketType to the data[] field. If dwDataOffset is zero, there is no additional data.

dwDataSize (4 bytes): The size, in bytes, of the data[] field. If dwDataOffset is zero, dwDataSize SHOULD also be zero. If dwDataOffset is not zero, dwDataSize SHOULD also not be zero.

dwURLOffset (4 bytes): The offset, in bytes, from the end of dwPacketType to the url[] field. Specified in section 2.2.8).

dwURLSize (4 bytes): The size, in bytes, of the url[] field.

2.2.1.5 DN_NAMETABLE_MEMBERSHIP_INFO

The DN_NAMETABLE_MEMBERSHIP_INFO structure contains information about a name table'sgroup and player memberships. The number of DN_NAMETABLE_MEMBERSHIP_INFO structures in this packet is specified in the **dwMembershipCount** field.

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
dpnidPlayer																															
dpnidGroup																															
dwVersion																															
dwVersionNotUsed																															

dpnidPlayer (4 bytes): A 32-bit integer that specifies the DirectPlay identifier for the user. For more information, see section 2.2.7.

dpnidGroup (4 bytes): A 32-bit integer that provides the DirectPlay identifier for the group. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit integer that specifies the name table version.

dwVersionNotUsed (4 bytes): Not used.

2.2.1.6 DN_ADD_PLAYER (Peer-to-Peer Mode Only)

The DN_ADD_PLAYER packet is sent from the host and instructs peers to add a specified peer to the 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
dwPacketType																															
dpnid																															
dpnidOwner																															
dwFlags																															
dwVersion																															
dwVersionNotUsed																															
dwDNETClientVersion																															
dwNameOffset																															

dwNameSize
dwDataOffset
dwDataSize
dwURLOffset
dwURLSize
url (variable)
...
data (variable)
...
name (variable)
...

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_ADD_PLAYER 0x000000D0	Instructs peers to add the specified peer to the session.

dpnid (4 bytes): A 32-bit field that contains the identifier of the peer to add. For more information, see section 2.2.7.

dpnidOwner (4 bytes): A 32-bit field that contains the identifier of the session owner. For more information, see section 2.2.7.

dwFlags (4 bytes): A 32-bit field that contains player flags.

Value	Meaning
NAMETABLE_ENTRY_FLAG_LOCAL 0x00000001	Name table entry is the local player.
NAMETABLE_ENTRY_FLAG_HOST 0x00000002	Name table entry is the host.
NAMETABLE_ENTRY_FLAG_ALL_PLAYERS_GROUP 0x00000004	Name table entry is the All Players Group.

Value	Meaning
NAMETABLE_ENTRY_FLAG_GROUP 0x00000010	Name table entry is a group.
NAMETABLE_ENTRY_FLAG_GROUP_AUTODESTRUCT 0x00000040	Name table entry supports group autodestruct.
NAMETABLE_ENTRY_FLAG_PEER 0x00000100	Name table entry is a peer.
NAMETABLE_ENTRY_FLAG_CLIENT 0x00000200	Name table entry is a client.
NAMETABLE_ENTRY_FLAG_SERVER 0x00000400	Name table entry is a server.
NAMETABLE_ENTRY_FLAG_CONNECTING 0x00001000	Name table entry is connecting.
NAMETABLE_ENTRY_FLAG_AVAILABLE 0x00002000	Name table entry is to make member available for use.
NAMETABLE_ENTRY_FLAG_DISCONNECTING 0x00004000	Name table entry to indicate disconnecting.
NAMETABLE_ENTRY_FLAG_INDICATED 0x00010000	Name table entry to indicate connection to an application.
NAMETABLE_ENTRY_FLAG_CREATED 0x00020000	Name table entry to indicate that the application was given the created player.
NAMETABLE_ENTRY_FLAG_NEED_TO_DESTROY 0x00040000	Name table entry to indicate that the session owner needs to destroy a player.
NAMETABLE_ENTRY_FLAG_IN_USE 0x00080000	Name table entry to indicate that the player is in use.

dwVersion (4 bytes): A 32-bit field that specifies the current name table version number.

dwVersionNotUsed (4 bytes): Not used.

dwDNETClientVersion (4 bytes): A 32-bit field that contains the DirectPlay version of the client being added to the session.

Value	Meaning
00000001	DirectX 8.0
00000002	DirectX 8.1
00000003	PocketPC
00000004	Not used
00000005	Windows Server 2003
00000006	DirectX 8.2

Value	Meaning
00000007	DirectX 9.0
00000008	DirectX 9.0

dwNameOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType to the peer name. If this field is zero, the packet does not include the peer name.

dwNameSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the name. If dwNameOffset is zero, dwNameSize SHOULD also be zero. If dwNameOffset is not zero, dwNameSize SHOULD also not be zero.

dwDataOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType to peer data. If this field is zero, the packet does not include peer data.

dwDataSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the peer data. If dwDataOffset is zero, dwDataSize SHOULD also be zero. If dwDataOffset is not zero, dwDataSize SHOULD also not be zero.

dwURLOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType to the peer uniform resource locator (URL).

dwURLSize (4 bytes): A 32-bit field that specifies the size, in bytes, of the connecting peer's URL address.

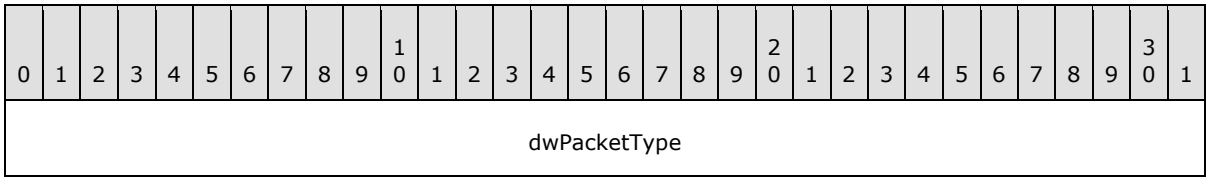
url (variable): A variable-length field that contains an array of characters that specify the client URL.

data (variable): A variable-length field that specifies a byte array of characters that contain user data.

name (variable): A variable-length field that specifies an array of wide characters that contain the peer name including the NULL termination character.

2.2.1.7 DN_ACK_CONNECT_INFO

The DN_ACK_CONNECT_INFO packet is sent from the client/peer to the server/host to acknowledge the receipt of connection information. This packet contains no user data beyond the packet type field.

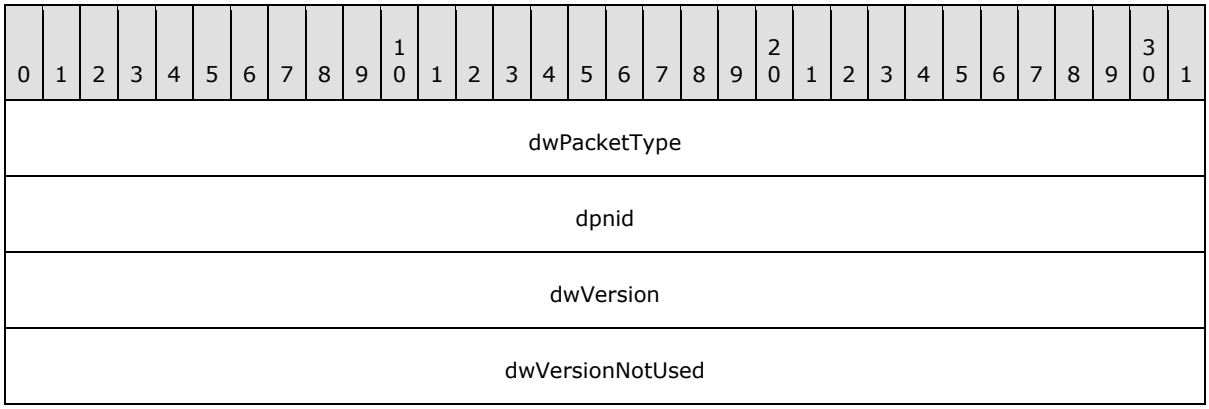


dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_ACK_CONNECT_INFO 0x000000C3	Acknowledges the receipt of session information.

2.2.1.8 DN_INSTRUCT_CONNECT

The DN_INSTRUCT_CONNECT packet instructs a peer to connect to a designated peer.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_INSTRUCT_CONNECT 0x000000C6	Instructs a peer to connect to a designated peer.

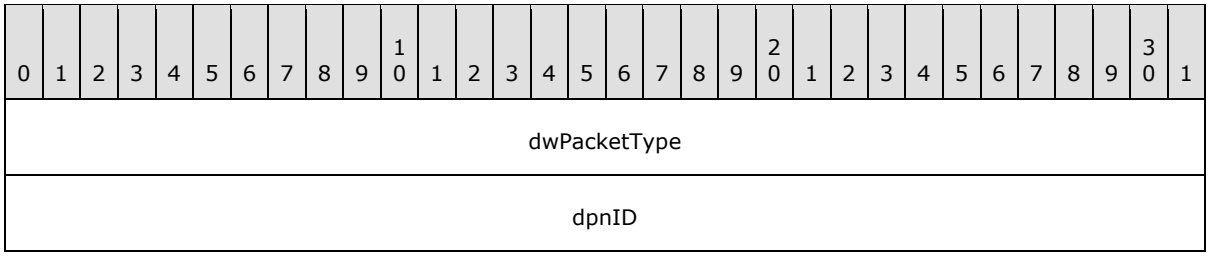
dpnid (4 bytes): A 32-bit field that contains the identifier of the designated client to which the connection is being made. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit field that contains the current version of the name table.

dwVersionNotUsed (4 bytes): Not used.

2.2.1.9 DN_SEND_PLAYER_DPNID

The DN_SEND_PLAYER_DPNID packet is used to send a user identification number to another client.



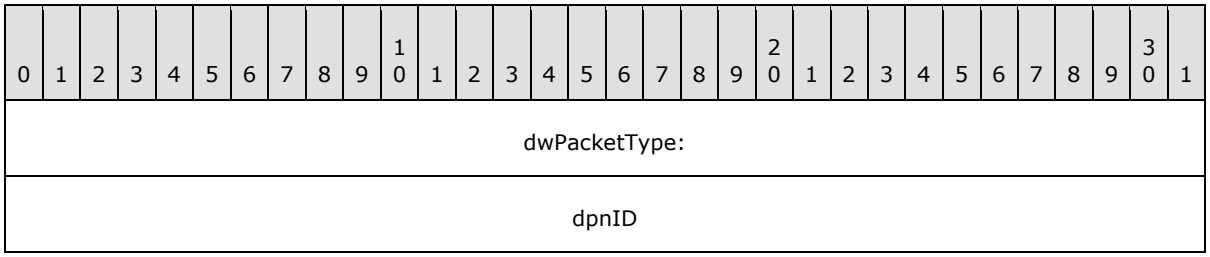
dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_SEND_PLAYER_DNID 0x000000C4	Sends user identification to another client/peer.

dpnID (4 bytes): A 32-bit field that contains the identifier of the client/peer. For more information, see section 2.2.7.

2.2.1.10 DN_INSTRUCTED_CONNECT_FAILED

The DN_INSTRUCTED_CONNECT_FAILED packet is sent from a peer to indicate that it was unable to carry out a host instruction to connect to a new peer.



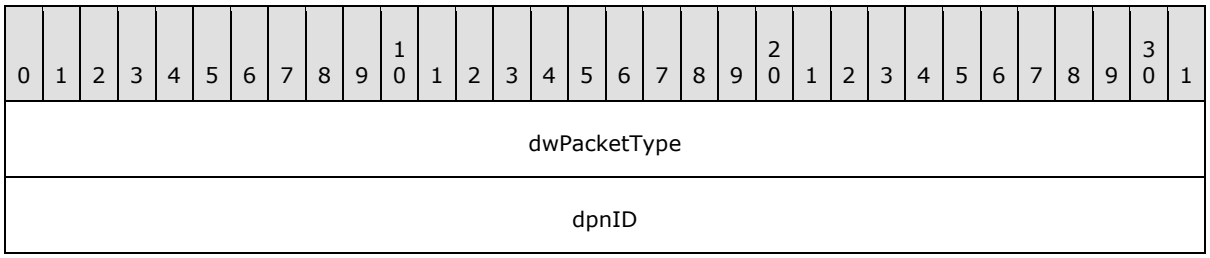
dwPacketType: (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_INSTRUCTED_CONNECT_FAILED 0x000000C7	Indicates that a peer was unable to carry out a host's instruction to connect to a new peer.

dpnID (4 bytes): A 32-bit field that contains the identifier for the peer to which the attempted connection failed. For more information, see section 2.2.7.

2.2.1.11 DN_CONNECT_ATTEMPT_FAILED

The DN_CONNECT_ATTEMPT_FAILED packet is sent from the host to a connecting peer to indicate that an existing peer in the session was unable to carry out the host's instruction to connect to a new peer.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

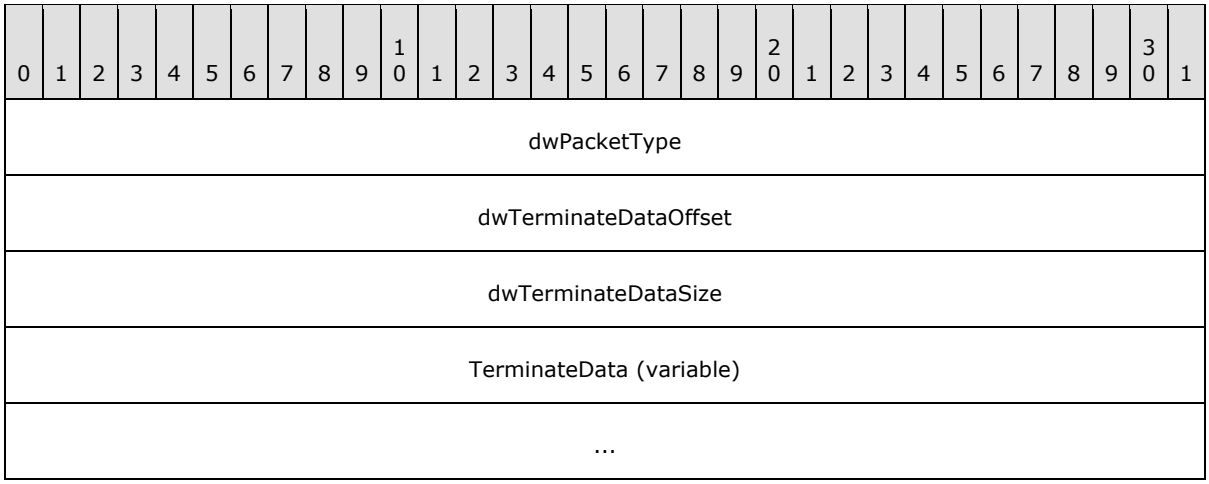
Value	Meaning
DN_MSG_INTERNAL_CONNECT_ATTEMPT_FAILED 0x000000C8	Indicates from the host that an existing peer was unable to carry out the host's instruction to connect to a new peer.

dpnID (4 bytes): A 32-bit field that contains the identifier for the existing peer in the session that was unable to connect to the new peer. For more information, see section 2.2.7.

2.2.2 Disconnect Messages

2.2.2.1 DN_TERMINATE_SESSION

The DN_TERMINATE_SESSION packet instructs the peer to disconnect from the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_TERMINATE_SESSION 0x000000DF	Instructs the peer to close and disconnect itself from the session.

dwTerminateDataOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType for the data passed from the server/host application that describes why the peer is being terminated.

dwTerminateDataSize (4 bytes): A 32-bit field that contains the size, in bytes, of the terminate data. If dwTerminateDataOffset is zero, dwTerminateDataSize SHOULD also be zero. If dwTerminateDataOffset is not zero, dwTerminateDataSize SHOULD also not be zero.

TerminateData (variable): A variable-length field that contains a byte array from the application that describes why the peer is being terminated from the session.

2.2.2.2 DN_DESTROY_PLAYER

The DN_DESTROY_PLAYER packet instructs the peer to remove a specified user from its name table.

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
dwPacketType																															
dpnidLeaving																															
dwVersion																															
dwVersionNotUsed																															
dwDestroyReason																															

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_DESTROY_PLAYER 0x000000D1	Instructs the peer to remove the specified peer from the name table.

dpnidLeaving (4 bytes): A 32-bit field that contains the identifier of the client or server to remove from the name table. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit field that contains the current name table version number.

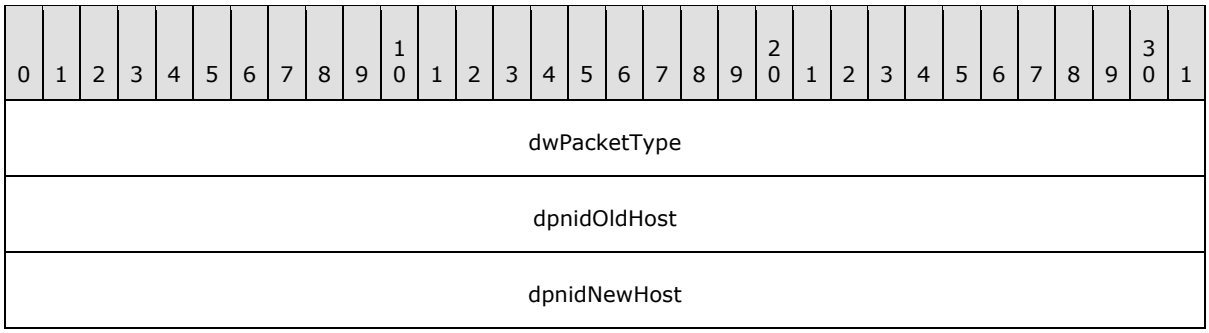
dwVersionNotUsed (4 bytes): Not used.

dwDestroyReason (4 bytes): A 32-bit field that contains the reason for terminating the specified client or server .

Value	Meaning
DPNDESTROYPLAYERREASON_NORMAL 0x0001	Peer/host is leaving.
DPNDESTROYPLAYERREASON_CONNECTIONLOST 0x0002	Connection to peer was lost.
DPNDESTROYPLAYERREASON_SESSIONTERMINATED 0x0003	Session was terminated.
DPNDESTROYPLAYERREASON_HOSTDESTROYEDPLAYER 0x0004	Host removed the peer.

2.2.2.3 DN_HOST_MIGRATE

The DN_HOST_MIGRATE packet is sent from the new host to all remaining peers in the session to notify them that a migration is taking place.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

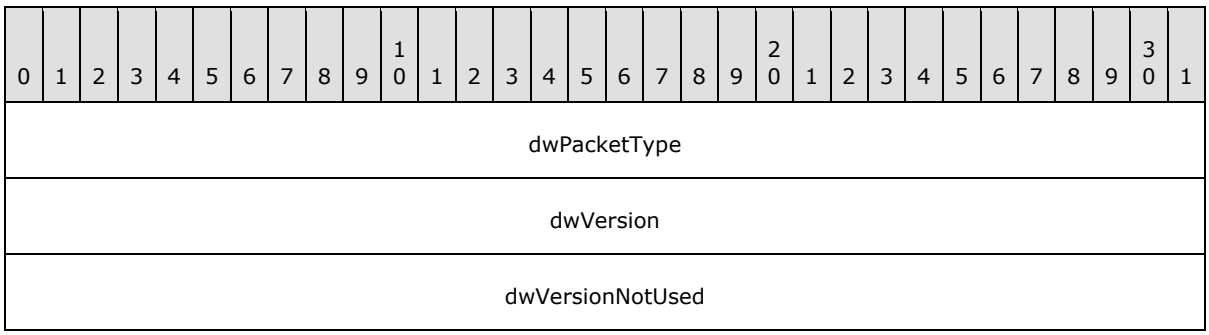
Value	Meaning
DN_MSG_INTERNAL_HOST_MIGRATE 0x000000CD	Notified peers in the session that the host is currently migrating.

dpnidOldHost (4 bytes): A 32-bit field that contains the identifier for the host that has just disconnected. For more information, see section 2.2.7.

dpnidNewHost (4 bytes): A 32-bit field that contains the identifier for the newly assigned host that is in the process of migrating. For more information, see section 2.2.7.

2.2.2.4 DN_NAMETABLE_VERSION

The DN_NAMETABLE_VERSION packet specifies the version number of the name table.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

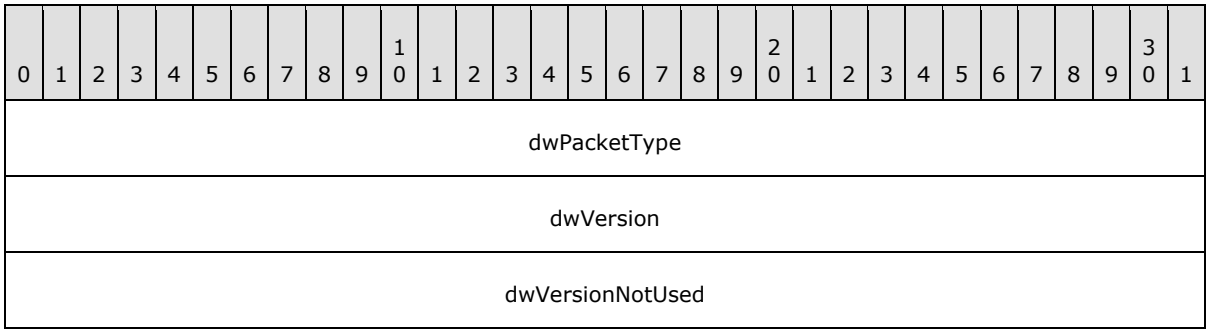
Value	Meaning
DN_MSG_INTERNAL_NAMETABLE_VERSION 0x000000C9	Specifies the version number of the name table.

dwVersion (4 bytes): A 32-bit field that contains the current name table version number.

dwVersionNotUsed (4 bytes): Not used.

2.2.2.5 DN_RESYNC_VERSION

The DN_RESYNC_VERSION packet is used to request that the name table version number be resynchronized to the current version number.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

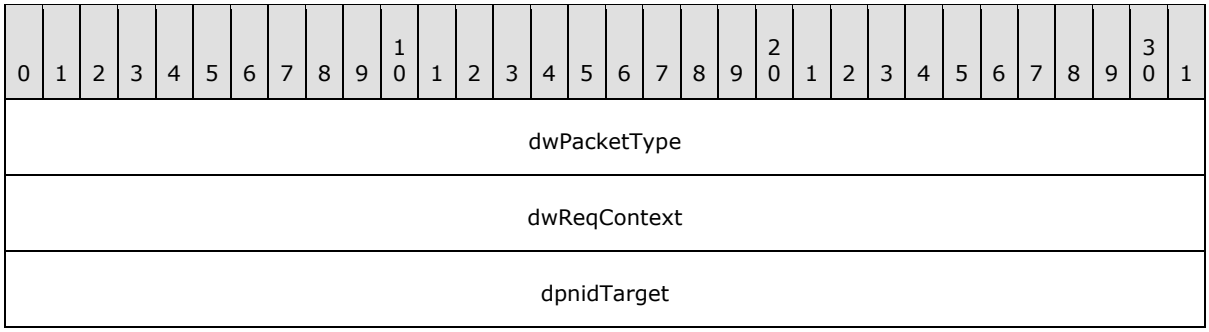
Value	Meaning
DN_MSG_INTERNAL_RESYNC_VERSION 0x000000CA	Requests that the protocol version number be resynchronized to the current version number.

dwVersion (4 bytes): A 32-bit field that contains the current name table version number.

dwVersionNotUsed (4 bytes): Not used.

2.2.2.6 DN_REQ_INTEGRITY_CHECK

The DN_REQ_INTEGRITY_CHECK packet requests that a host determine whether a target client is still in the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

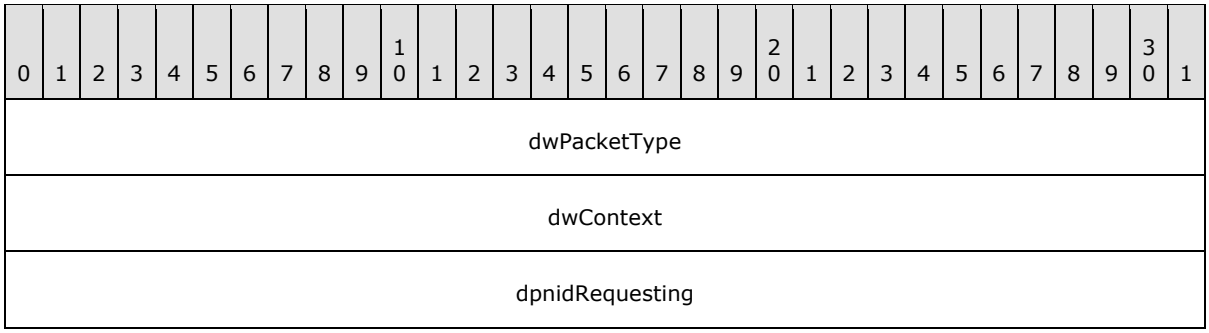
Value	Meaning
DN_MSG_INTERNAL_REQ_INTEGRITY_CHECK 0x000000E2	Requests that the host determine whether a target peer is still in the session.

dwReqContext (4 bytes): A 32-bit field that contains the context for the request operation.

dpnidTarget (4 bytes): A 32-bit field that contains the identifier of the selected target peer for the host to validate. For more information, see section 2.2.7.

2.2.2.7 DN_INTEGRITY_CHECK

The DN_INTEGRITY_CHECK packet is a request from a host to a peer inquiring whether the peer is still in the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

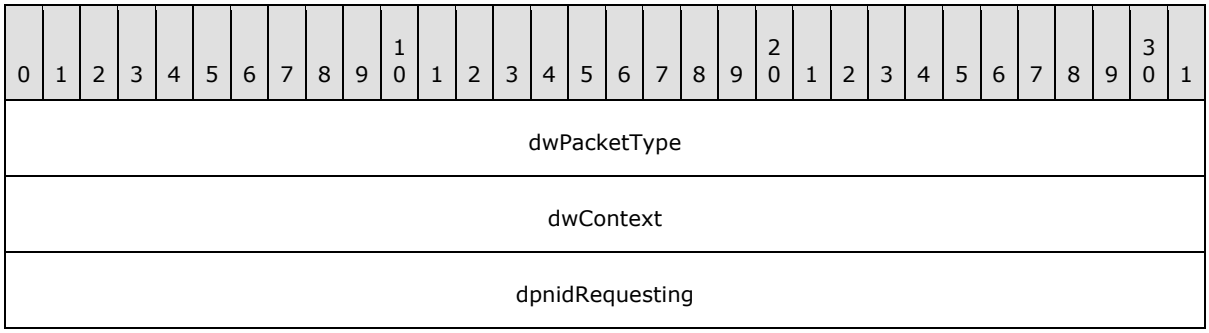
Value	Meaning
DN_MSG_INTERNAL_INTEGRITY_CHECK 0x000000E3	host is requesting a peer to validate that it is still in the session.

dwContext (4 bytes): A 32-bit field that contains the context for this operation. It SHOULD be passed back exactly as in the DN_INTEGRITY_CHECK_RESPONSE.

dpnidRequesting (4 bytes): A 32-bit field that contains the identifier of the peer requesting this validation. For more information, see section 2.2.7.

2.2.2.8 DN_INTEGRITY_CHECK_RESPONSE

The DN_INTEGRITY_CHECK_RESPONSE packet is a response from a peer to the host confirming that it is still in the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_INTEGRITY_CHECK	Host is requesting a peer to validate that it is still in the

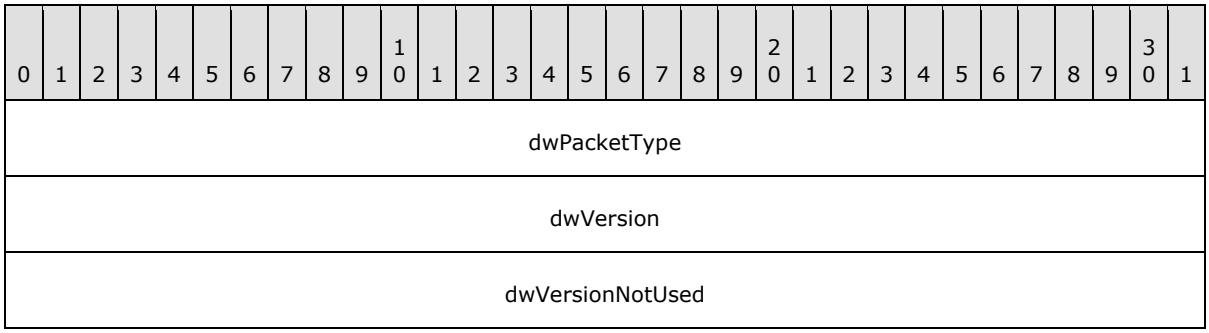
Value	Meaning
0x000000E4	session.

dwContext (4 bytes): A 32-bit field that contains the context of the operation passed in from the host. The value needs to be passed exactly as it was received in DN_INTEGRITY_CHECK.

dpnidRequesting (4 bytes): Identifier of the peer that requested the validation. For more information, see section 2.2.7.

2.2.2.9 DN_REQ_NAMETABLE_OP

The DN_REQ_NAMETABLE_OP packet is sent from the new host to a peer with a newer name table. If no newer name table exists, this message is not sent.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_NAMETABLE_OP 0x000000CB	Sent from the host after a migration requesting the name table from a peer with a newer name table, if any exists.

dwVersion (4 bytes): A 32-bit field that contains the current name table version number of the host.

dwVersionNotUsed (4 bytes): Not used.

2.2.2.10 DN_ACK_NAMETABLE_OP

The DN_ACK_NAMETABLE_OP packet is sent from the peer that is being queried for name table information back to the new host. It will include all entries missing from the new host's name table.

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
dwPacketType																															
dwNumEntries																															
dwMsgId																															
dwOpOffset																															
dwOpSize																															
op																															

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_NAMETABLE_OP 0x000000CC	Sent from the peer to the new host, acknowledging the new name table information.

dwNumEntries (4 bytes): A 32-bit field that contains the number of name table entries included.

dwMsgId (4 bytes): A 32-bit field that contains the internal message for the given name table entry.

Value	Meaning
0x000000C6	DN_INSTRUCT_CONNECT (section 2.2.1.8)
0x000000D0	DN_ADD_PLAYER (section 2.2.1.6)
0x000000D1	DN_DESTROY_PLAYER (section 2.2.2.2)
0x000000D2	DN_CREATE_GROUP (section 2.2.4.2)
0x000000D5	DN_DESTROY_GROUP (section 2.2.4.8)
0x000000D9	DN_ADD_PLAYER_TO_GROUP (section 2.2.4.4)
0x000000DA	DN_DELETE_PLAYER_FROM_GROUP (section 2.2.4.6)
0x000000DB	DN _UPDATE_INFO (section 2.2.5.2)

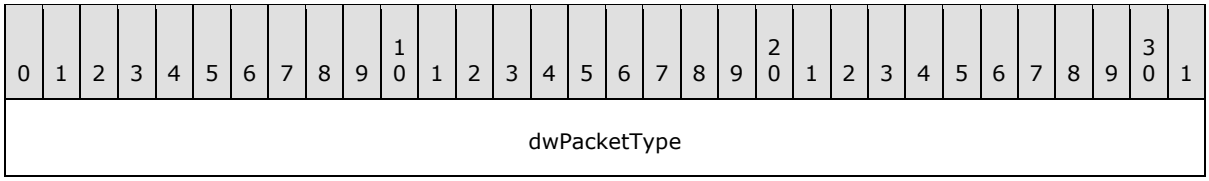
dwOpOffset (4 bytes): A 32-bit field that contains the offset from end of dwPacketType for the given operation buffer.

dwOpSize (4 bytes): A 32-bit field that contains the size for the given operation buffer.

op (4 bytes): A 32-bit field that contains the operation buffer for the name table operation as indicated by dwMsgId. Each operation buffer is atomic to itself.

2.2.2.11 DN_HOST_MIGRATE_COMPLETE

The DN_HOST_MIGRATE_COMPLETE packet informs peers that the session-hosting responsibilities have successfully migrated from the departing old host.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_HOST_MIGRATE_COMPLETE 0x000000CE	Informs peers that the session-hosting responsibilities have successfully migrated from the departing old host.

2.2.3 Send/Receive Messages

There are two different types of user sends:

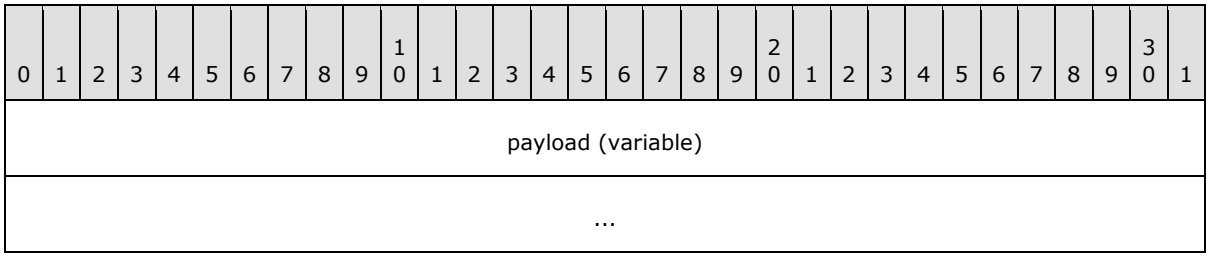
Normal: The sender does not care whether the receiving application actually received the message. In this case, the DN_SEND_DATA message is used.

Requested Completion: The sender REQUIRES confirmation that the message was delivered to the receiving application.

Note "Delivered to the receiving application" means that the message has been delivered to the application layer, not simply obtained by the receiver's machine. In this case, the DN_REQ_PROCESS_COMPLETION message is used.

2.2.3.1 DN_SEND_DATA

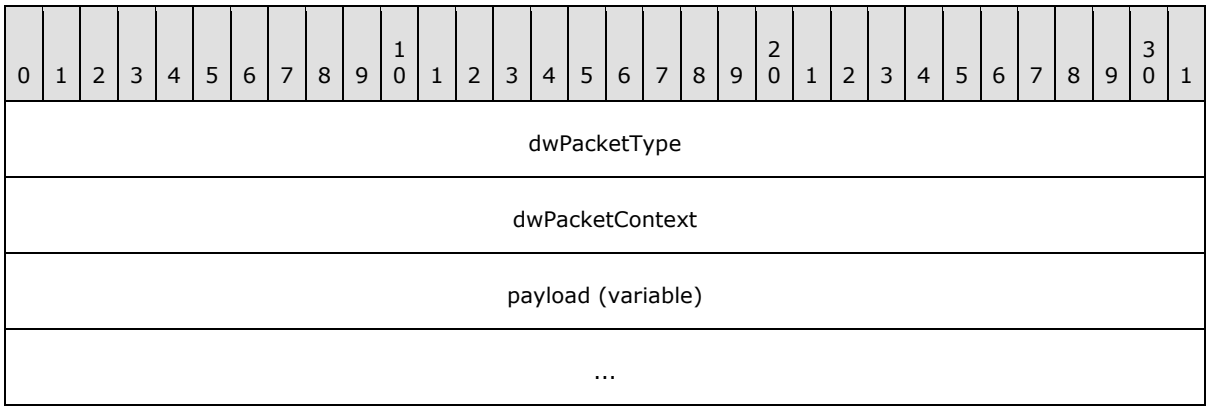
The DN_SEND_DATA message is sent from one player to another player when the sending player's application does not require confirmation from the receiving player's application that the sent data has been consumed.



payload (variable): A variable-length field that contains the application data that is passed from one application to another.

2.2.3.2 DN_REQ_PROCESS_COMPLETION

The DN_REQ_PROCESS_COMPLETION message is sent from one player to another player when the sending player's application wants confirmation regarding when the sent data has been consumed by the receiving player's application.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

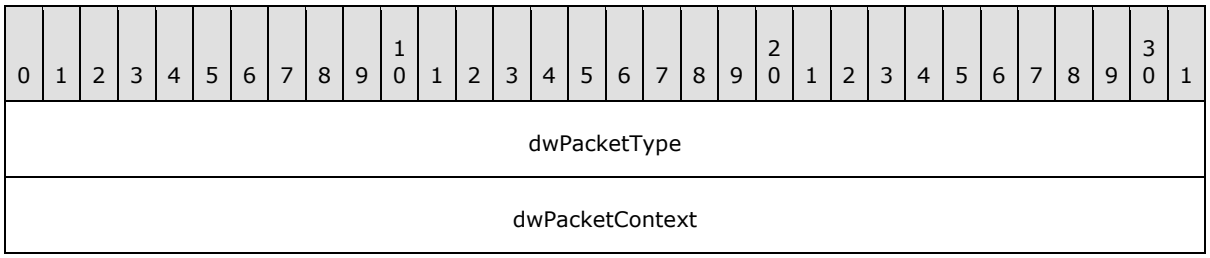
Value	Meaning
DN_INTERNAL_MESSAGE_REQ_PROCESS_COMPLETION 0x000000D0	Used to inform the receiving application that the sending application is requesting delivery verification.

dwPacketContext (4 bytes): A 32-bit field that contains the system identifier for this action. DN_PROCESS_COMPLETION needs to respond to this message in the identical manner in which it was passed.

payload (variable): A variable-length field that contains the application data passed from one player to another.

2.2.3.3 DN_PROCESS_COMPLETION

The DN_PROCESS_COMPLETION message is returned to the peer that sent the data after the sent payload has been consumed.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_PROCESS_COMPLETION	Informs the sender that the payload data has been

Value	Meaning
0x000000D1	consumed.

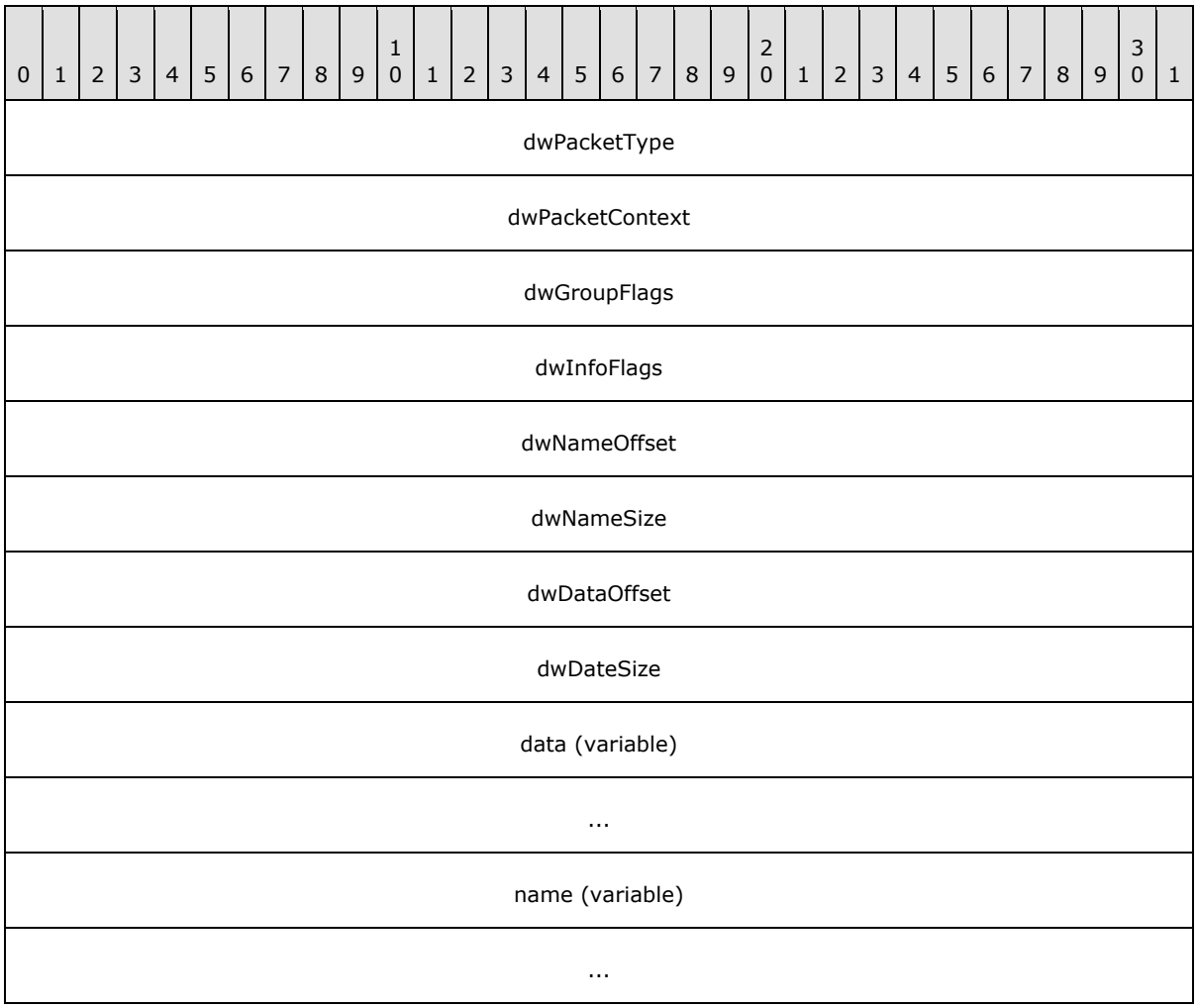
dwPacketContext (4 bytes): A 32-bit field that contains the system identifier for this action. The response to this message SHOULD include this context in the identical manner as it was sent.

2.2.4 Group Messages (Peer-to-Peer Mode Only)

Note When working with groups, be aware of considerations related to DXDiag. The DirectX Diagnostic tool (DxDiag.exe) implementation of this specification does not support groups.

2.2.4.1 DN_REQ_CREATE_GROUP

The DN_REQ_CREATE_GROUP packet informs the host that a peer is requesting that a new group be created for the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_CREATE_GROUP 0x000000D2	Informs the host that a peer is requesting that a new group be created in the session.

dwPacketContext (4 bytes): A 32-bit field that contains the system identifier for this action. DN_CREATE_GROUP (see section 2.2.4.2) SHOULD respond to this message in the identical manner in which it was passed.

dwGroupFlags (4 bytes): A 32-bit field that contains the flags passed in on creation of a group, indicating certain behavior.

Value	Meaning
DPNGROUP_AUTODESTRUCT 0x00000001	Informs the host that the group SHOULD be deleted once all players have been removed.

dwInfoFlags (4 bytes): A 32-bit field that contains the flags passed in specifying the data that is to be updated with this request.

Value	Meaning
DPNINFO_NAME 0x00000001	Indicates whether a name is included with this packet.
DPNINFO_DATA 0x00000002	Indicates whether data is included with this packet.

dwNameOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType of the name[] field for the group. If dwNameOffset is zero, the packet does not include name data.

dwNameSize (4 bytes): A 32-bit field that contains the size, in bytes, of the data in the name[] field. If dwNameOffset is set to zero, dwNameSize SHOULD also be zero. If dwNameOffset is not zero, dwNameSize SHOULD also not be zero.

dwDataOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType of the data[] field. If dwDataOffset is zero, the packet does not include application data.

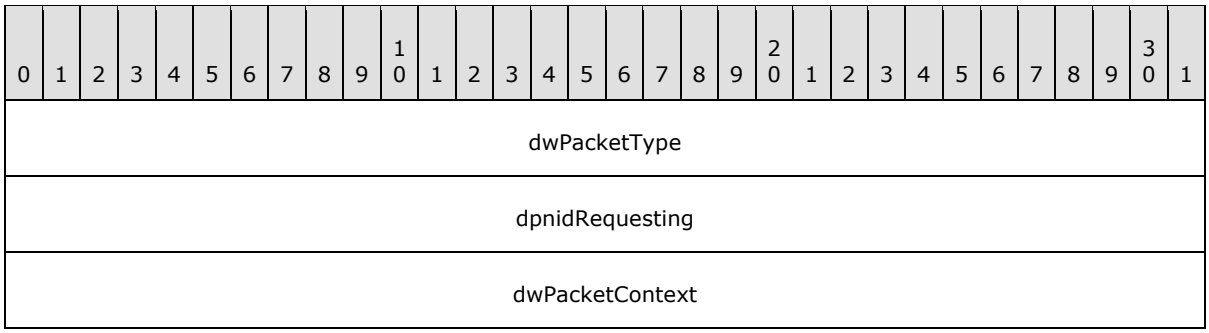
dwDateSize (4 bytes): A 32-bit field that contains the size, in bytes, of the data[] field. If dwDataOffset is set to zero, dwDataSize SHOULD also be zero. If dwDataOffset is not zero, dwDataSize SHOULD also not be zero.

data (variable): A variable-length field that contains the byte array that specifies the application data. This field's position is determined by dwDataOffset and the size stated in dwDataSize.

name (variable): A variable-length field that contains the zero-terminated wide character array that provides the group name. This field's position is determined by dwNameOffset and the size stated in dwNameSize.

2.2.4.2 DN_CREATE_GROUP

The DN_CREATE_GROUP packet informs all of the connected peers that the new group has been successfully created for the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

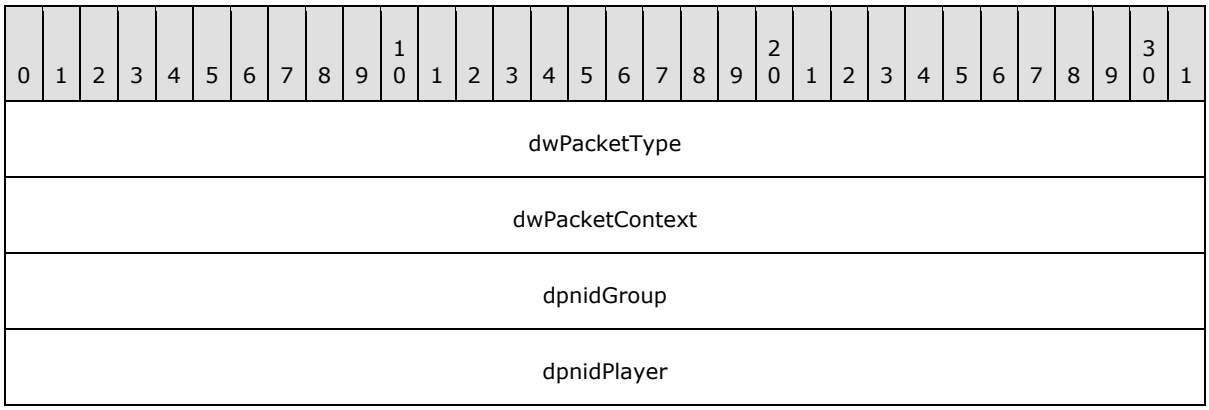
Value	Meaning
DN_MSG_INTERNAL_CREATE_GROUP 0x000000D7	Informs the requesting peer that the group has been created.

dpnidRequesting (4 bytes): A 32-bit field that contains the DPNID of the peer that has requested the group to be created. For more information, see section 2.2.7.

dwPacketContext (4 bytes): A 32-bit field that contains the value sent in with the DN_REQ_CREATE_GROUP from the requesting peer. The value passed MUST be identical to that which was passed in.

2.2.4.3 DN_REQ_ADD_PLAYER_TO_GROUP

The DN_REQ_ADD_PLAYER_TO_GROUP packet informs the host that a peer is requesting that a new player be added to an existing group.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_ADD_PLAYER_TO_GROUP 0x000000D3	Informs the host that a peer is requesting to add a player to an existing group in the session.

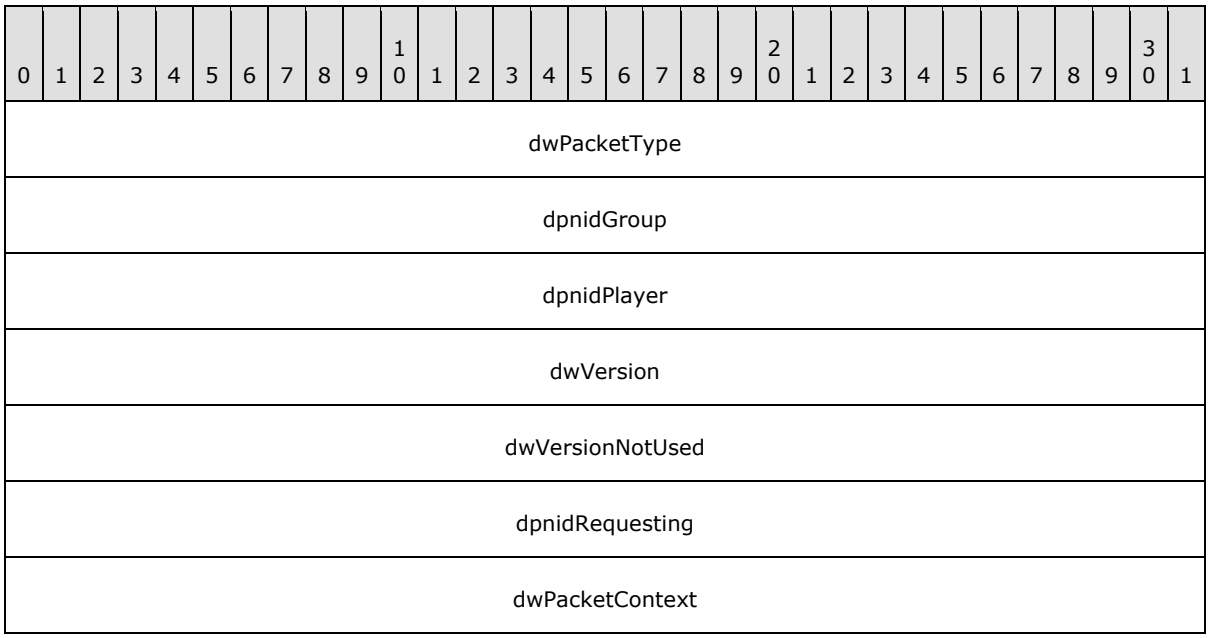
dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. It MUST be passed in exactly with DN_ADD_PLAYER_TO_GROUP.

dpnidGroup (4 bytes): A 32-bit field that contains the group that the peer is asking the new player be added to. For more information, see section 2.2.7.

dpnidPlayer (4 bytes): A 32-bit field that contains the identifier of the player that is being added to the existing group. For more information, see section 2.2.7.

2.2.4.4 DN_ADD_PLAYER_TO_GROUP

The DN_ADD_PLAYER_TO_GROUP packet informs the peers that a player has been added to an existing group.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_ADD_PLAYER_TO_GROUP 0x000000D9	Informs the peers that the host has added a player in a session to a group.

dpnidGroup (4 bytes): A 32-bit field that contains the group to which the peer has been added. For more information, see section 2.2.7.

dpnidPlayer (4 bytes): A 32-bit field that contains the identifier of the peer that has been added to the group. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit integer that specifies the current name table version.

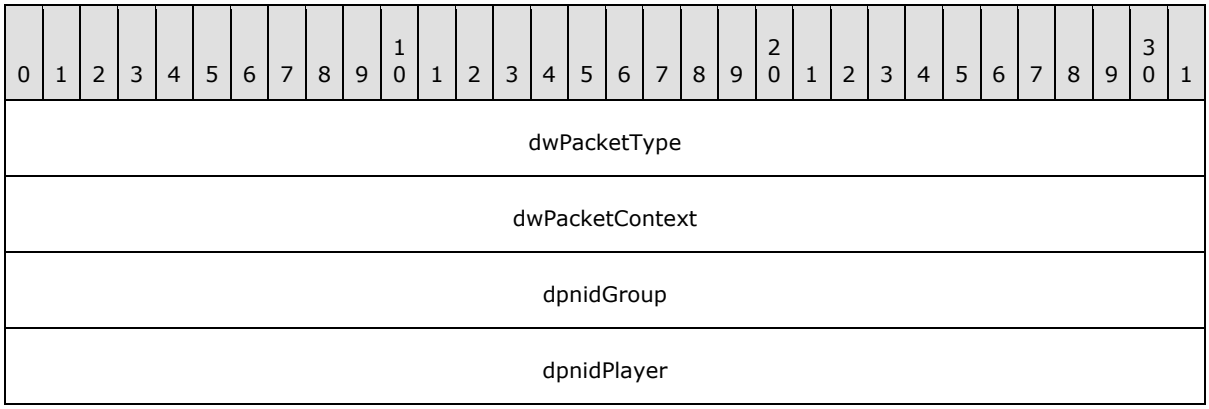
dwVersionNotUsed (4 bytes): Not used.

dpnidRequesting (4 bytes): A 32-bit field that contains the identifier of the peer that has requested the host to add a peer to a group. For more information, see section 2.2.7.

dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. The value MUST be passed in exactly as it was received in DN_REQ_ADD_PLAYER_TO_GROUP.

2.2.4.5 DN_REQ_DELETE_PLAYER_FROM_GROUP

The DN_REQ_DELETE_PLAYER_FROM_GROUP packet informs the host that a peer is requesting a player be removed from an existing group.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_DELETE_PLAYER_FROM_GROUP 0x000000D4	Informs the host that a peer is requesting to add a player in a session to a group.

dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. The value MUST be passed in exactly with DN_DELETE_PLAYER_FROM_GROUP.

dpnidGroup (4 bytes): A 32-bit field that contains the group from which the peer is asking to have the player removed. For more information, see section 2.2.7.

dpnidPlayer (4 bytes): A 32-bit field that contains the identifier of the player that is being removed from the group. For more information, see section 2.2.7.

2.2.4.6 DN_DELETE_PLAYER_FROM_GROUP

The DN_DELETE_PLAYER_FROM_GROUP packet informs the peers that a player has been removed from a group.

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
dwPacketType																															
dpnidGroup																															
dpnidPlayer																															
dwVersion																															
dwVersionNotUsed																															
dpnidRequesting																															
dwPacketContext																															

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_DELETE_PLAYER_FROM_GROUP 0x000000DA	Informs the peers that the host has removed a player in a session from a group.

dpnidGroup (4 bytes): A 32-bit field that contains the group that has removed the player. For more information, see section 2.2.7.

dpnidPlayer (4 bytes): A 32-bit field that contains the identifier of the player that was removed from the group. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit integer that specifies the current name table version.

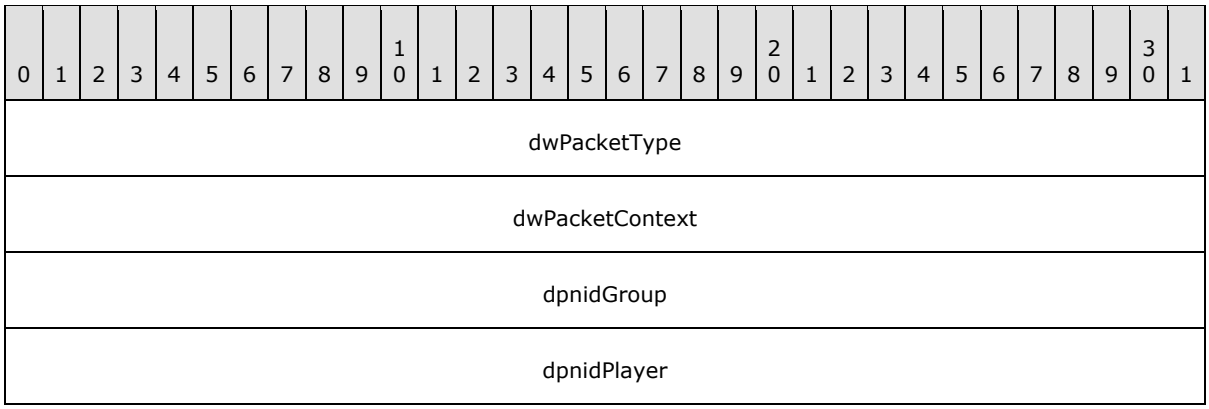
dwVersionNotUsed (4 bytes): Not used.

dpnidRequesting (4 bytes): A 32-bit field that contains the identifier of the peer that has requested the host to remove a player from a group. For more information, see section 2.2.7.

dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. The value MUST be passed in exactly as it was received in DN_REQ_DELETE_PLAYER_FROM_GROUP.

2.2.4.7 DN_REQ_DESTROY_GROUP

The DN_REQ_DESTROY_GROUP packet informs the host that a peer is requesting that a group be deleted from the session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_DESTROY_GROUP 0x000000D5	Informs the host that a peer is requesting that a group be deleted from the session.

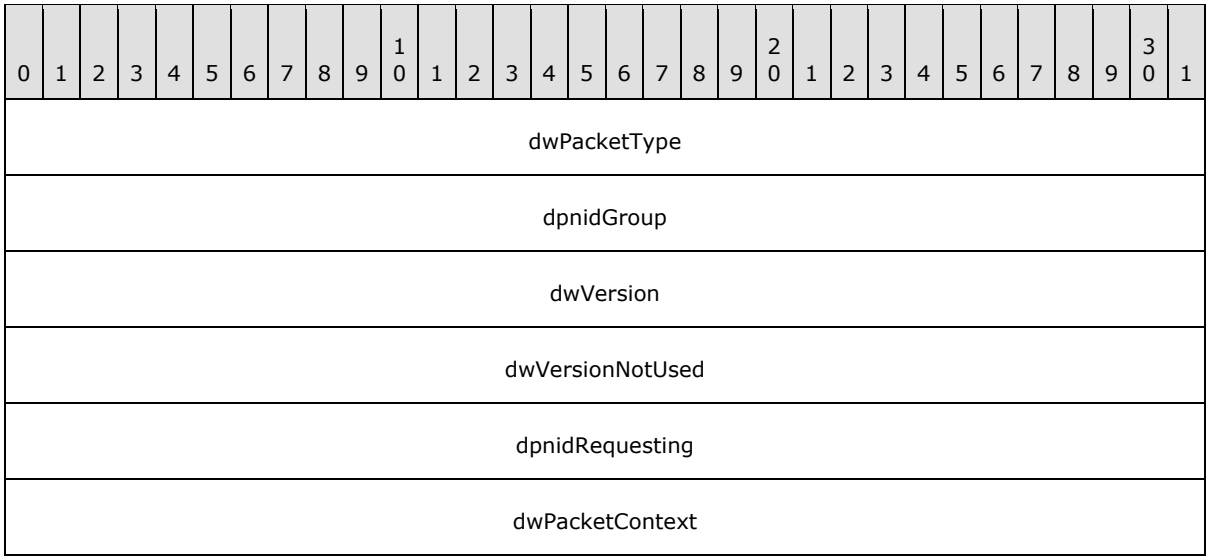
dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. The value MUST be passed in exactly with DN_DESTROY_GROUP.

dpnidGroup (4 bytes): A 32-bit field that contains the group from which the peer is asking to have the player removed. For more information, see section 2.2.7.

dpnidPlayer (4 bytes): A 32-bit field that contains the identifier of the player that is being removed from the group. For more information, see section 2.2.7.

2.2.4.8 DN_DESTROY_GROUP

The DN_DESTROY_GROUP packet informs the peers that a group has been removed from a session.



dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_DESTROY_GROUP 0x000000D8	Informs the peers that the host has removed a group from the session.

dpnidGroup (4 bytes): A 32-bit field that contains the group that has been destroyed. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit integer that specifies the current name table version.

dwVersionNotUsed (4 bytes): Not used.

dpnidRequesting (4 bytes): A 32-bit integer identifying the peer that has requested the host to delete a group. For more information, see section 2.2.7.

dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. The value MUST be passed in exactly as it was received in DN_REQ_DESTROY_GROUP.

2.2.5 Update Information

2.2.5.1 DN_REQ_UPDATE_INFO

The DN_REQ_UPDATE_INFO message is sent from a peer to the host to update information about a specified peer in the 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
dwPacketType																															
dwPacketContext																															
dpnid																															
dwInfoFlags																															
dwNameOffset																															
dwNameSize																															
dwDataOffset																															
dwDataSize																															
data (variable)																															
...																															
name (variable)																															
...																															

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_REQ_UPDATE_INFO 0x000000D6	Update info request from a peer to the host.

dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. The value MUST be passed in exactly with DN_UPDATE_INFO.

dpnid (4 bytes): A 32-bit field that contains the identifier for the peer to have update information. For more information, see section 2.2.7.

dwInfoFlags (4 bytes): A 32-bit field that contains the flags passed in specifying the data fields that are to be updated with this request.

Value	Meaning
DPNINFO_NAME	Indicates whether a name is included with this packet.

Value	Meaning
0x00000001	
DPNINFO_DATA 0x00000002	Indicates whether data is included with this packet.

dwNameOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType of the name[] field for the dpnid. If dwNameOffset is zero, the packet does not include name data.

dwNameSize (4 bytes): A 32-bit field that contains the size, in bytes, of the data in the name[] field. If dwNameOffset is set to zero, dwNameSize SHOULD also be zero. If dwNameOffset is not zero, dwNameSize SHOULD also not be zero.

dwDataOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType of the data[] field. If dwDataOffset is zero, the packet does not include application data.

dwDataSize (4 bytes): A 32-bit field that contains the size, in bytes, of the data[] field. If dwDataOffset is set to zero, dwDataSize SHOULD also be zero. If dwDataOffset is not zero, dwDataSize SHOULD also not be zero.

data (variable): A variable-length field that contains a byte array that provides the application data. This field's position is determined by dwDataOffset and the size stated in dwDataSize.

name (variable): A variable-length field that contains a zero-terminated wide character array that specifies the players' name. This field's position is determined by dwNameOffset and the size stated in dwNameSize.

2.2.5.2 DN_UPDATE_INFO

Response from the host/server to a DN_REQ_UPDATE_INFO packet. This packet is sent to all players with the updated information.

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
dwPacketType																															
dwPacketContext																															
dpnid																															
dwVersion																															
dwVersionNotUsed																															
dwInfoFlags																															
dwNameOffset																															
dwNameSize																															
dwDataOffset																															
dwDataSize																															
dpnidRequesting																															
data (variable)																															
...																															
name (variable)																															
...																															

dwPacketType (4 bytes): A 32-bit field that contains the packet type.

Value	Meaning
DN_MSG_INTERNAL_UPDATE_INFO 0x000000DB	Update info response from a server/host to a client/peer.

dwPacketContext (4 bytes): A 32-bit field that contains the context value passed in for this operation. This value MUST be passed back exactly as it was passed in with DN_REQ_UPDATE_INFO (section 2.2.5.1).

dpnid (4 bytes): A 32-bit field that contains the identifier for the peer that was updated. For more information, see section 2.2.7.

dwVersion (4 bytes): A 32-bit integer that specifies the current name table version.

dwVersionNotUsed (4 bytes): Not used.

dwInfoFlags (4 bytes): A 32-bit field that contains the passed flags that were updated.

Value	Meaning
DPNINFO_NAME 0x00000001	Indicates whether a name is included with this packet.
DPNINFO_DATA 0x00000002	Indicates whether data is included with this packet.

dwNameOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType of the name[] field for the dpnid. If dwNameOffset is zero, the packet does not include name data.

dwNameSize (4 bytes): A 32-bit field that contains the size, in bytes, of the data in the name[] field. If dwNameOffset is set to zero, dwNameSize SHOULD also be zero. If dwNameOffset is not zero, dwNameSize SHOULD also not be zero.

dwDataOffset (4 bytes): A 32-bit field that contains the offset from the end of dwPacketType of the data[] field. If dwDataOffset is zero, the packet does not include application data.

dwDataSize (4 bytes): A 32-bit field that contains the size, in bytes, of the data[] field. If dwDataOffset is set to zero, dwDataSize SHOULD also be zero. If dwDataOffset is not zero, dwDataSize SHOULD also not be zero.

dpnidRequesting (4 bytes): A 32-bit field that contains the identifier for the player that requested that this information be updated. For more information, see section 2.2.7.

data (variable): A variable-length field that contains a byte array that provides the application data. This field's position is determined by dwDataOffset and the size stated in dwDataSize.

name (variable): A variable-length field that contains a zero-terminated wide character array that specifies the players' name. This field's position is determined by dwNameOffset and the size stated in dwNameSize.

2.2.6 DN_NAMETABLE

The name table is a concept used by DirectPlay to keep all participants in a session in sync with the different actions that are being performed.

The name table is really a table of players and groups that are included in the session. Each change to the state of the table is a versioned name table operation. Any participant in the session who applies these operations will generate a view that is consistent with every other players' name table.

The host/server is responsible for all name table operations, where the first operation in the name table is set to a version number of 1, and each subsequent operation is incremented by one.

The following table identifies the name table operations that can be performed.

Action	Meaning
0x000000C6	DN_INSTRUCT_CONNECT (section 2.2.1.8)
0x000000D0	DN_ADD_PLAYER (section 2.2.1.6)
0x000000D1	DN_DESTROY_PLAYER (section 2.2.2.2)
0x000000D2	DN_CREATE_GROUP (section 2.2.4.2)
0x000000D5	DN_DESTROY_GROUP (section 2.2.4.8)
0x000000D9	DN_ADD_PLAYER_TO_GROUP (section 2.2.4.4)
0x000000DA	DN_DELETE_PLAYER_FROM_GROUP (section 2.2.4.6)
0x000000DB	DN _UPDATE_INFO (section 2.2.5.2)

2.2.7 DN_DPNID

The DPNID is a unique identifier created by a DirectPlay host and server for each player and group included in a session. A DPNID value is created for a player or group at the time when that player or group is added to the session. The DPNID for each player and group in the session MUST be unique. The value 0x0 is an invalid value for a DPNID.

The DPNID for a player or group is generated in several steps, at the time when the player or group is added to the session.

1. The index of the entry in the name table that was used to create the player or group is stored in the lowest 20 bytes of the DN_DPNID structure. For example, when the index of the entry within the name table is 5, the index is stored in the structure as follows:

   0xNNN00005

2. Along with the index, the version of the name table that existed when the entry was created is also stored. For example, when the name table version is 10 (0x0A), the index is stored in the structure as follows:

   0x00A00005

3. This value is then XOR'd with the first 32 bytes of the Session Instance GUID to obfuscate. For example, if the Instance GUID begins with 0xA1B2C3D4, the DPNID 0x00A00005 value would be XOR'd with 0xA1B2C3D45. It is important to point out that the DirectPlayhost will use the DPNID of a player or group to determine the location for this entry in the name table.

2.2.8 DN_ADDRESSING_URL

The addressing structure that is used in DirectPlay 8 for the application is in the form of a URL. The structure of the URL is the following:

x-directplay:/key1=value1;key2=value2;key3=value3....

All configuration information for a provider is specified using "key=value" pairs separated by semicolons.

Note This is the opaque representation of a URL, where a single backslash "/" is used as a scheme terminator, not double backslash "//".The responsibility of data interpretation is placed on the consumer of the URL and nothing else can be assumed.

A DirectPlay 8 URL has three components: the scheme, the scheme separator, and the URL data:

Scheme: The scheme used for a DirectPlay 8 URL is "x-directplay".

Scheme Separator: The scheme separator is simply the string ":/" (a colon followed by a backslash), implying that the data that follows is "opaque" and does not conform to the Internet standard. It MUST not be "://" (a colon followed by two backslashes) because the addition of the second backslash implies an Internet standard for the remaining data, and the DirectPlay 8 data does not conform to the Internet standard. If the second backslash is detected, DirectPlay 8 will flag the URL as invalid.

URL Data: The URL data is a combination of "key=value" strings, where each string is separated by a semicolon. The semicolon character is reserved by the URL specification as being scheme-specific, and all of the URL data MUST be in canonicalized form to prevent misinterpretation.

There are no ordering requirements for the "key=value" pairs in the data, except for the "provider" key that is expected to be first to speed up parsing. All "key" identifiers SHOULD be lower-case, and SHOULD not contain characters that are considered reserved, including ';' (semicolon), '/' (backslash), '?' (question mark), ':' (colon), '@' (at sign), '=' (equals sign), '&' (ampersand), and '#' (pound sign). All "value" strings will be treated as case-sensitive to cover future uses.

The following table identifies the current "keys "and their valid "values".

Key	Value
applicationinstance	Text representation of a GUID for an application instance.
baud	Any valid baud rate (subject to potential validation). Used by modem and serial links.
device	Text representation of a device GUID.
flowcontrol	"NONE", "XONXOFF", "RTS", "DTR", or "RTSDTR". Used by modem and serial links.
hostname	Any valid hostname, used only for IP and **IPX**.
parity	"NONE", "EVEN", "ODD", "MARK", or "SPACE". Used by modem and serial links.
phonenumber	Any valid telephone number. Used by modem links.
port	Any valid port address, used for IP and IPX. The port MUST be padded with leading zeros to the maximum number of digits available to the port. At this time, ports are 16 bits, so all port values MUST be five digits to accommodate the maximum port value of 65535. This is done to aid firewalls and proxies in translating addresses. If ports are expanded to be 32 bits, all port values MUST be 10 digits to accommodate a maximum port value of 4294967295.
program	Text representation of the program GUID.
provider	Text representation of the service provider GUID.
stopbits	"1", "1.5", or "2". Used by modem and serial links.

Note The URL specification reserves the characters '?' (question mark) and '#' (pound sign) to represent "extra information" at the end of a URL. DirectPlay8 reserves the '#' (pound sign) token to indicate "user data" appended to the end of a URL. The concept of user data is provided as a means to supply application-specific information in a DNAddress while performing a lobbied launch of that application.

URL Examples

IP Address:

```
x-directplay:/
 provider=%7BEBFE7BA0-628D-11D2-AE0F-006097B01411%7D;
 device=%7BIP ADAPTER GUID%7D;port=0000230034#IPUserData
```

IPX **Address:**

```
x-directplay:/
 provider=%7B53934290-628D-11D2-AE0F-006097B01411%7D;
 device=%7BIPX ADAPTER GUID%7D;port=00230#IPXUserData
```

Serial Address:

```
x-directplay:/
 provider=%7B743B5D60-628D-11D2-AE0F-006097B01411%7D;
 device=%7BCOM PORT GUID%7D;baud=57600;stopbits=1;parity=NONE;
 flowcontrol=RTSDTR#SerialUserData
```

Modem Address:

```
x-directplay:/
 provider=%7B6D4A3650-628D-11D2-AE0F-006097B01411%7D;
 device=%7BMODEM DEVICE GUID%7D;
 phonenumber=555-1212#ModemUserData
```

3 Protocol Details

The following sections specify details of the DirectPlay 8 Protocol: Core and Service Providers.

3.1 Connect Role

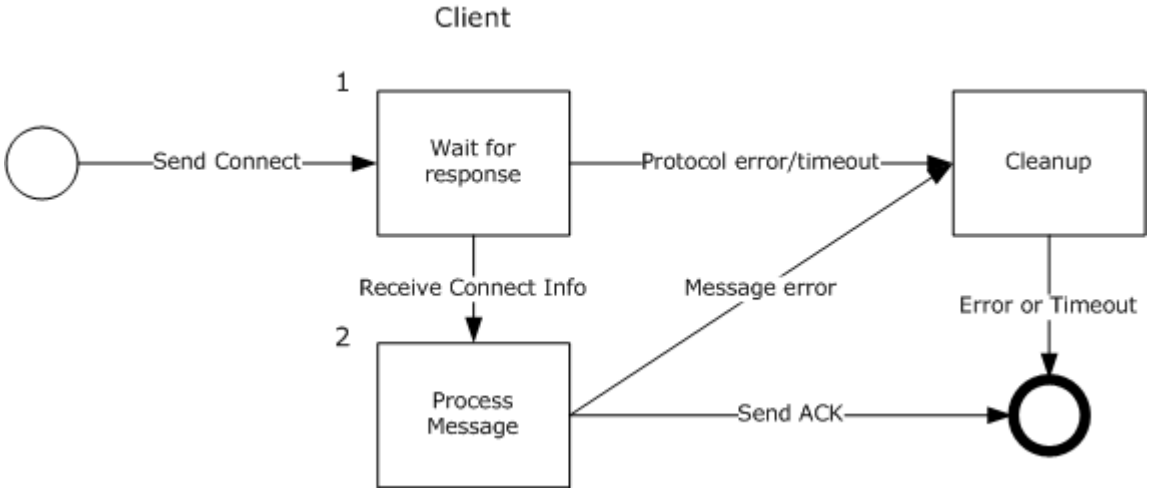


Figure 1: Role of a client when joining the client to the session

The role of a client when attempting to connect to the session:

1. The client sends a DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX message (section 2.2.1.1) to the server and waits for the DN_SEND_CONNECT_INFO message (section 2.2.1.3) to be sent in response. If the server does not respond in time, the protocol times out and terminates the connection.

2. When the DN_SEND_CONNECT_INFO message is received from the server, the client processes the message. After the message is successfully processed, the client MUST send an DN_ACK_CONNECT_INFO message (section 2.2.1.7) to the server. If an error occurs during message processing, the client performs cleanup and ends the connection attempt.

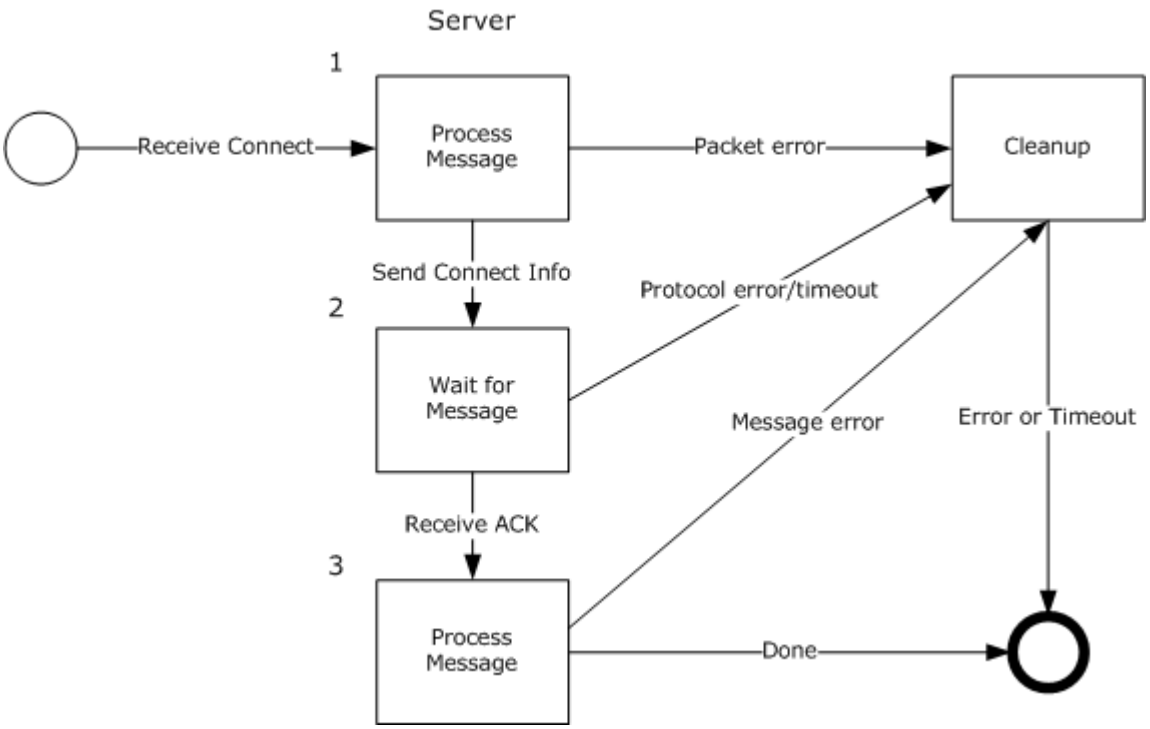


Figure 2: Role of the server when joining the client to the session

The role of the server when responding to a request from a client to be joined to the session:

1. The server receives a DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX message from the client and begins message processing. If an error occurs during message processing, the message is ignored. Otherwise, the server responds to the client with a DN_SEND_CONNECT_INFO message that includes the connection data for the session.

2. The server waits for a DN_ACK_CONNECT_INFO message from the client. If the client does not send the acknowledgment in time, the protocol times out and terminates the connection.

3. When the DN_ACK_CONNECT_INFO message from the client is received by the server, the server processes the acknowledgment. After the acknowledgment is successfully processed, the connection is made and the client is joined to the session. If an error occurs during message processing, the server performs cleanup and ends the connection attempt.

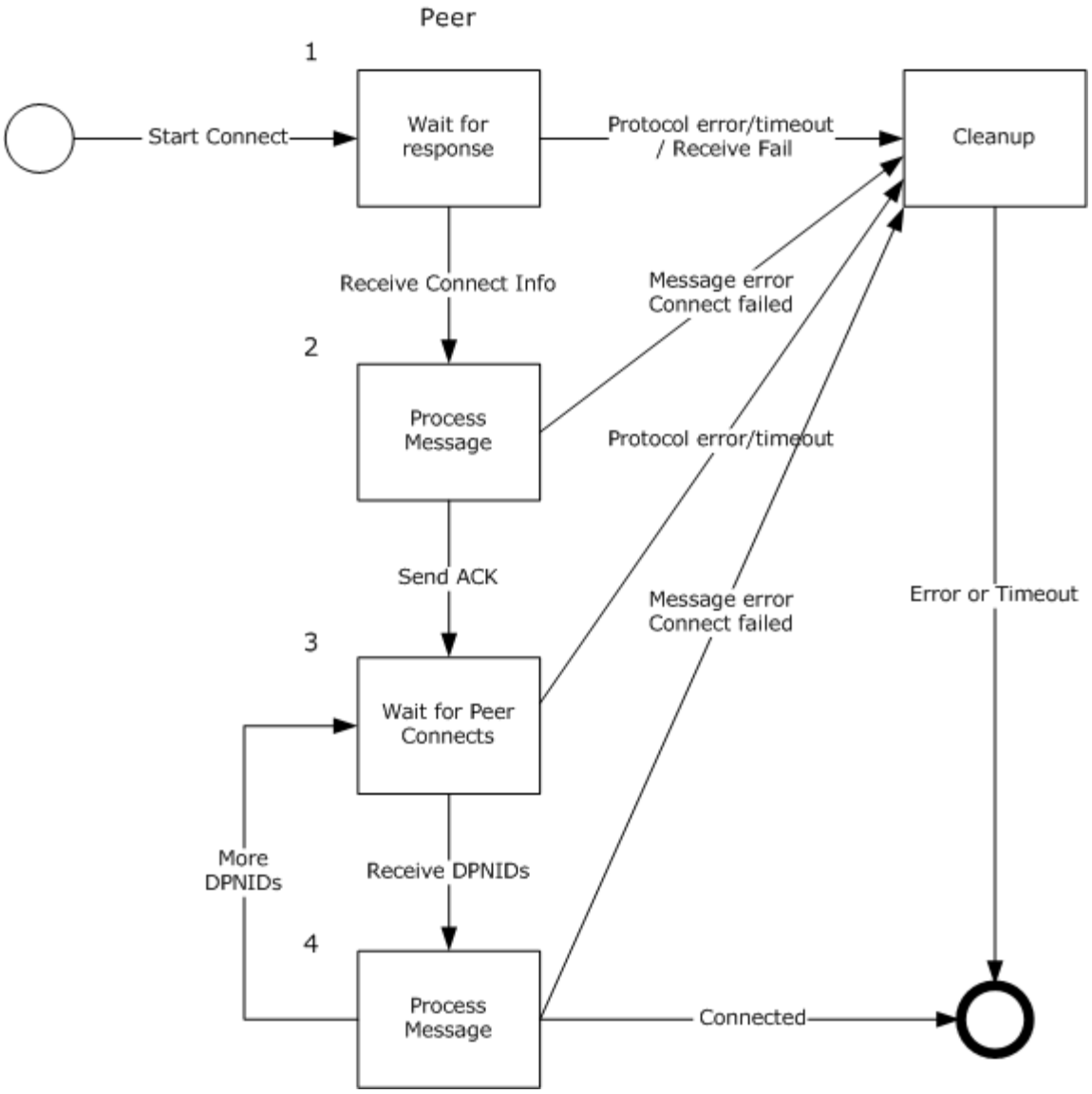


Figure 3: Role of a peer when adding the peer to the session

The role of a peer when attempting to be added to the session:

1. The nascent peer sends a DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX message to the host and waits for a response. If the host does not respond in time, the protocol times out and terminates the connection.

2. When the DN_SEND_CONNECT_INFO message is received from the host, the nascent peer processes the message. After the message is successfully processed, the nascent peer MUST send a DN_ACK_CONNECT_INFO message to the host. If an error occurs during message processing, the nascent peer performs cleanup and ends the connection attempt.

3. After acknowledging the connection, the nascent peer waits to receive DN_SEND_PLAYER_DPNID messages (section 2.2.1.9) from all other connected, established peers in the session. If all

connected, established peers do not respond in time, the protocol times out and terminates the connection.

4. When a DN_SEND_PLAYER_DPNID message is received from an established peer, the nascent peer processes the message. If an established peer is unable to connect to the nascent peer:

   - The established peer responds to the host with a DN_INSTRUCTED_CONNECT_FAILED message (section 2.2.1.10).
   - The connection attempt is cancelled.
   - The host issues a DN_CONNECT_ATTEMPT_FAILED message (section 2.2.1.11) to the nascent peer.

   Otherwise, when DN_SEND_PLAYER_DPNID messages have been successfully received from all other connected, established peers, the nascent peer is connected and added to the session.

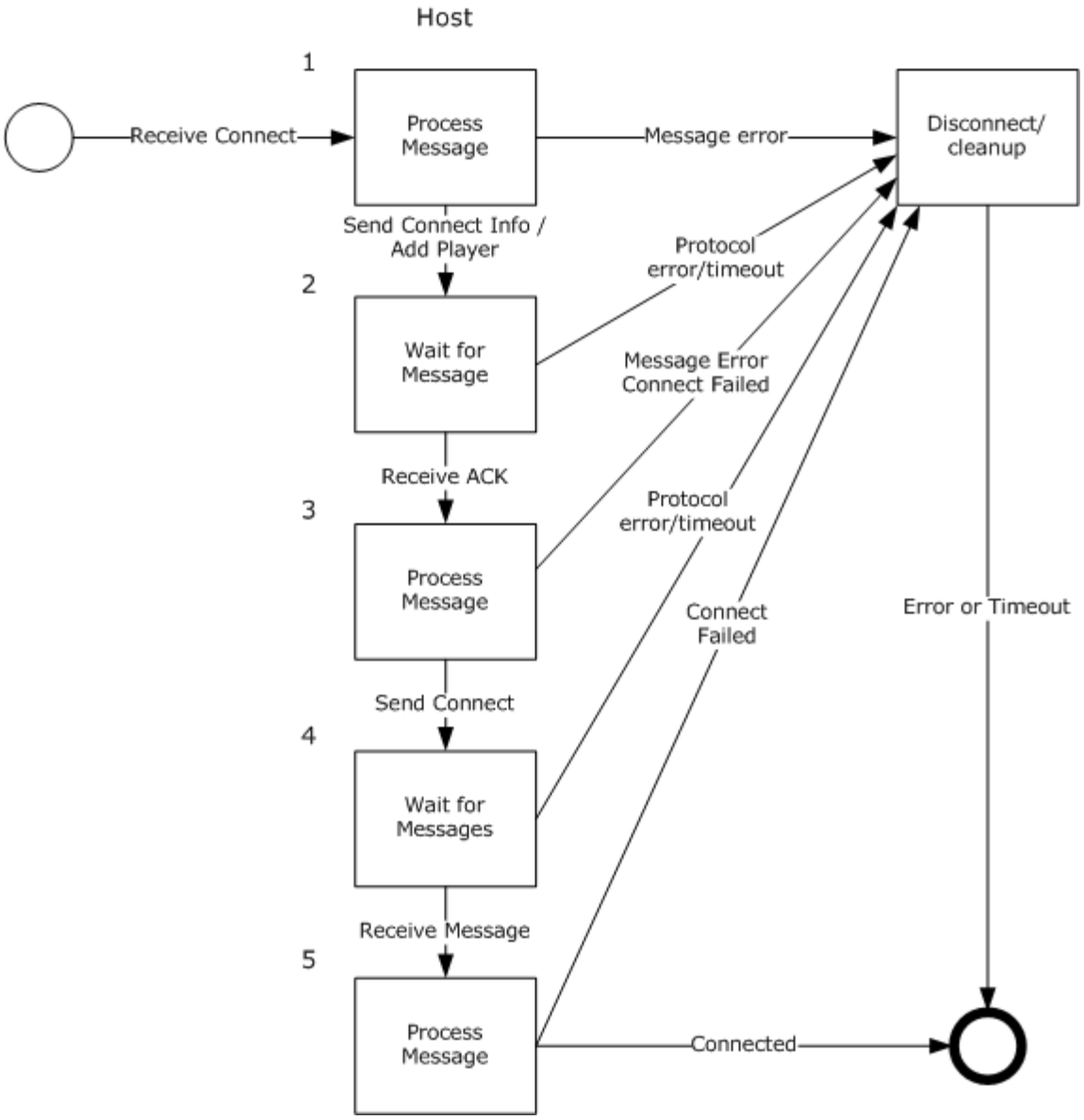


Figure 4: Role of the host when adding a peer to the session

The role of the host when responding to a request from a peer to be added to the session:

1. The host receives a DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX message from a nascent peer and begins message processing. If an error occurs during message processing, the message is ignored. Otherwise, the host responds to the nascent peer with a DN_SEND_CONNECT_INFO message that includes the connection data for the session. At the same time, the host sends DN_ADD_PLAYER messages (section 2.2.1.6) to all connected, established peers in the session.

2. The host waits for a DN_ACK_CONNECT_INFO message from the nascent peer. If the nascent peer does not respond in time, the protocol times out and terminates the connection.

3. When the DN_ACK_CONNECT_INFO message from the nascent peer is received by the host, the host processes the acknowledgment. If an error occurs during processing of the acknowledgment, the host performs cleanup and ends the connection attempt. Otherwise, after the acknowledgment is processed, the host sends a DN_INSTRUCT_CONNECT message (section 2.2.1.8) to all connected, established peers instructing them to attempt a connection to the nascent peer.

4. When a response is received from an established peer, the host processes the message. If an established peer is unable to connect to the nascent peer:

   - The established peer responds to the host with a DN_INSTRUCTED_CONNECT_FAILED message.
   - The connection attempt is cancelled.
   - The host issues a DN_CONNECT_ATTEMPT_FAILED message to the nascent peer.

   Otherwise, when all connected, established peers are able to successfully connect to the nascent peer, the nascent peer is connected and added to the session.

3.1.1 Connection Abstract Data Model

The connect sequence is initiated by the client or the peer. If there happens to be an error or disconnect on the server/host, cleanup and disconnect happens with only the client/peer with the failure. (Remaining clients/peers in the session remain connected.)

In the peer/host model, messages may be sent out to all peers or only the connecting peer.

3.1.2 Timers

The connection sequence is event driven via packets sent and received via the Peer, Client, Host, or Server.

3.1.3 Initialization

There is no initialization criteria for the Connect Role.

3.1.4 Higher Layer Triggered Events

There are no Higher Layer Triggered Events for the Connect Role.

3.1.5 Message Processing Events and Sequencing Rules

3.1.5.1 Client/Server Connect Sequence

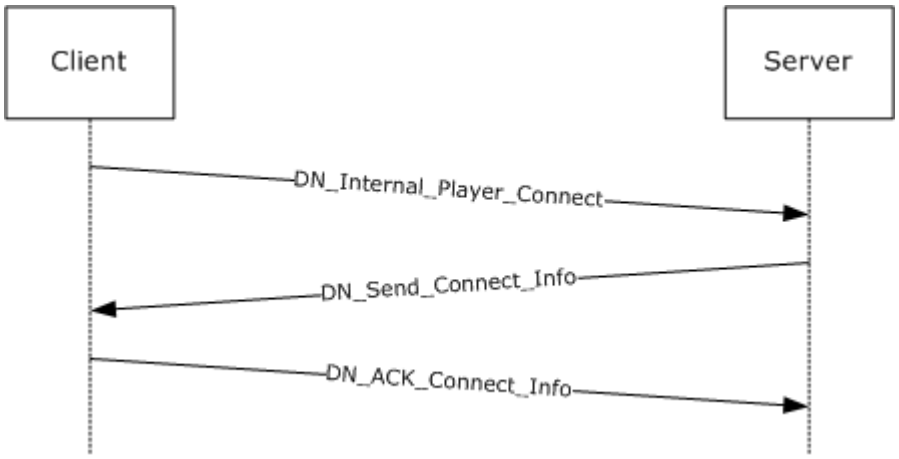


Figure 5: Client/Server Connect Sequence

A server has been launched and is in the process of accepting incoming connections.

1. The client initiates a connect to the server.
2. After passing the protocol connect sequence, as specified in [MC-DPL8R], the message is sent up from the protocol to the application.
3. The client sends a player connect message to the server:
   - DN_Internal_Message_Player_Connect
   - DN_Internal_Message_Player_Connect_Ex (DP9)
4. If the server successfully validates the DN_Internal_Message_Player_Connect information, the server responds to the client:

   DN_Send_Connect_Info

   Note For client/server, there are only two entries in the NameTable_Info message as part of the DN_Send_Session_Info packet.
5. Upon receipt of the DN_Send_Connect_Info message from the server, the client will acknowledge the connection by returning:

   DN_ACK_Connect_Info

3.1.5.2 Peer-to-Peer Connect Sequence

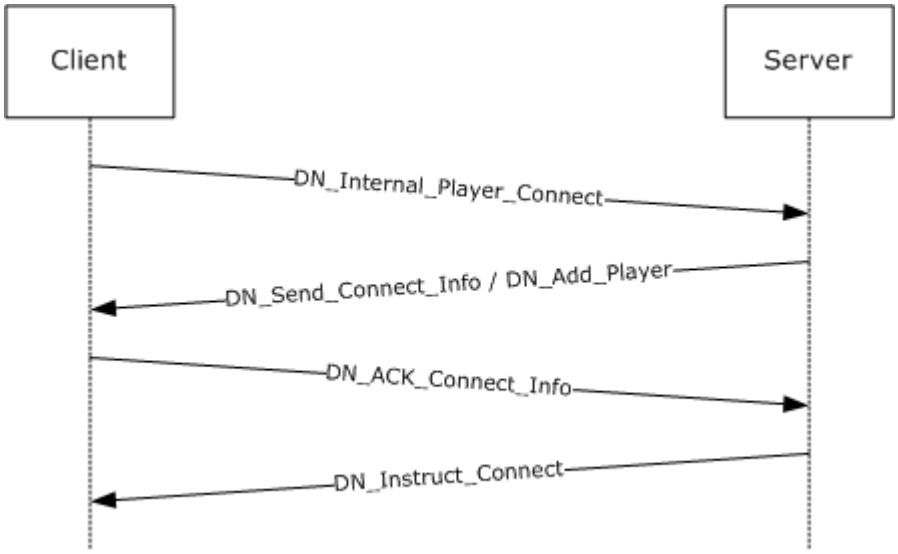


Figure 6: Peer-to-Peer Connect Sequence

Assuming the first peer has been launched, that peer will be deemed the host of the session and will be in the process of accepting incoming connections. (The peer host is responsible for all name table transactions and synchronization across peers in the session.)

A new peer connects to the host at the protocol level.

1. The internal player connect message is sent in from the peer to the host:
   - DN_Internal_Message_Player_Connect
   - DN_Internal_Message_Player_Connect_Ex (DP9)
2. If the host fails in validating the Player_Connect info, the connecting peer is sent:

   DN_Connect_Failed
3. If the host successfully validates the Player_Connect info, the host responds to the connecting peer with:

   DN_Send_Connect_Info

   Note The entries in the NameTable_Info message will exist for each player connected to the session.
4. At the same time as the host is responding to the connecting peer with DN_Send_Connect_Info, the host is also issuing a message to the already-connected peers:

   DN_Add_Player
5. Upon receipt of the DN_Send_Connect_Info message from the host, the connecting peer will acknowledge the connection by returning:

   DN_ACK_Connect_Info

6. After receiving DN_ACK_Connect_Info from the connecting peer, the host instructs all existing peers to also establish a connection to the connecting peer:

   DN_Instruct_Connect

7. Upon establishing a connection, the existing peers will issue their DPNIDs to the new peer being added by sending:

   DN_Send_Player_DPNID

8. If existing peers are unable to connect to the connecting peer, they will issue a fail packet back to the host:

   DN_Instructed_Connect_Failed

9. Upon receiving the DN_Instructed_Connect_Failed message from any of the existing peers, the host will send the connecting peer:

   DN_Connect_Attempt_Failed

10. Host "removes player from the session".

3.1.6 Timer Events

There are no timer events for the Connect Role.

3.1.7 Other Local Events

There are no Other Local Events for the Connect Role.

3.2 Disconnect Role

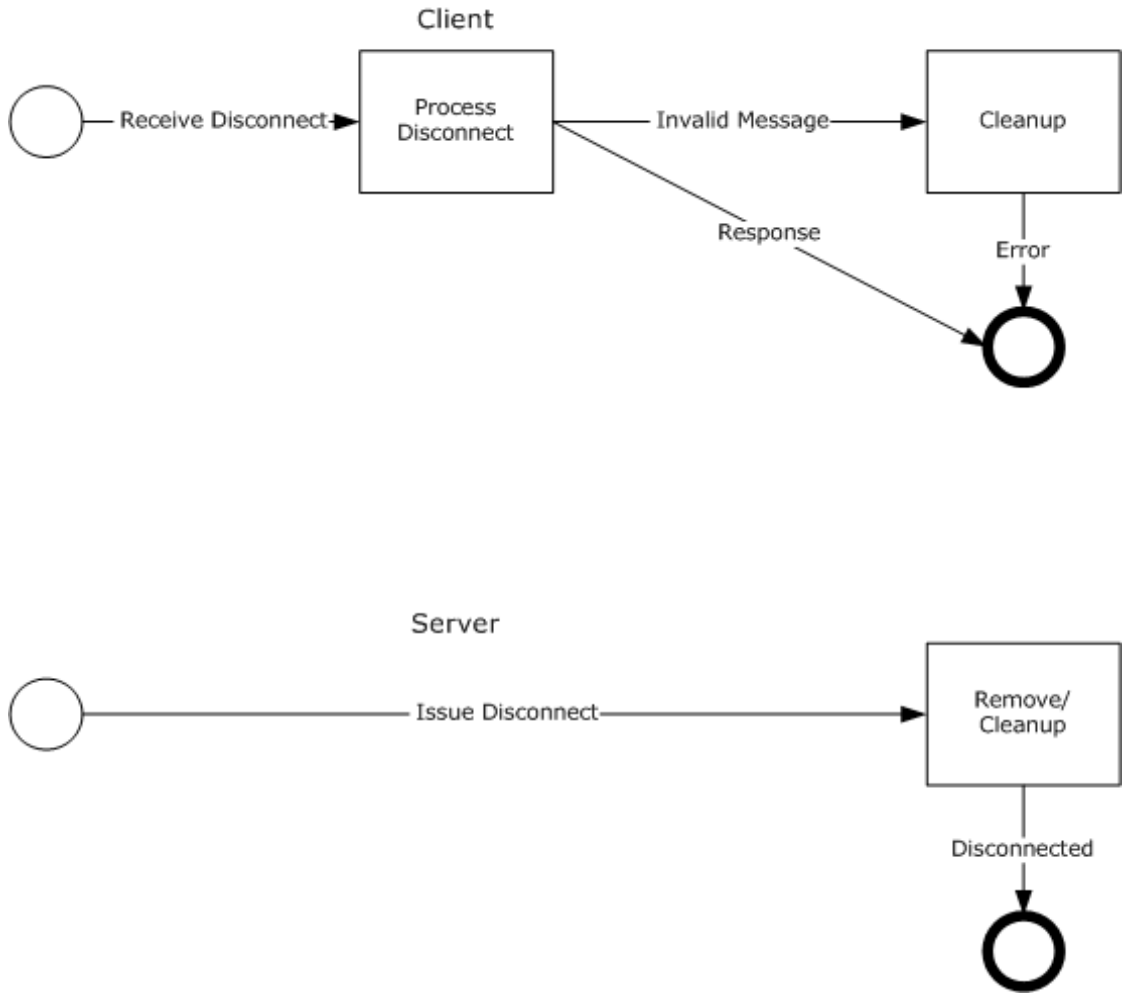


Figure 7: Role of a client and the server when disconnecting the client from the session

The role of the client when responding to the instruction to disconnect:

- The client receives a DN_TERMINATE_SESSION message (section 2.2.2.1) from the server and begins message processing. If an error occurs during message processing, or the received message is invalid, the client performs cleanup and the message is ignored. Otherwise, the client MUST remove itself from the session.

The role of the server when responding to the instruction to disconnect:

- The server sends a DN_TERMINATE_SESSION message to the client and removes the client from the session.

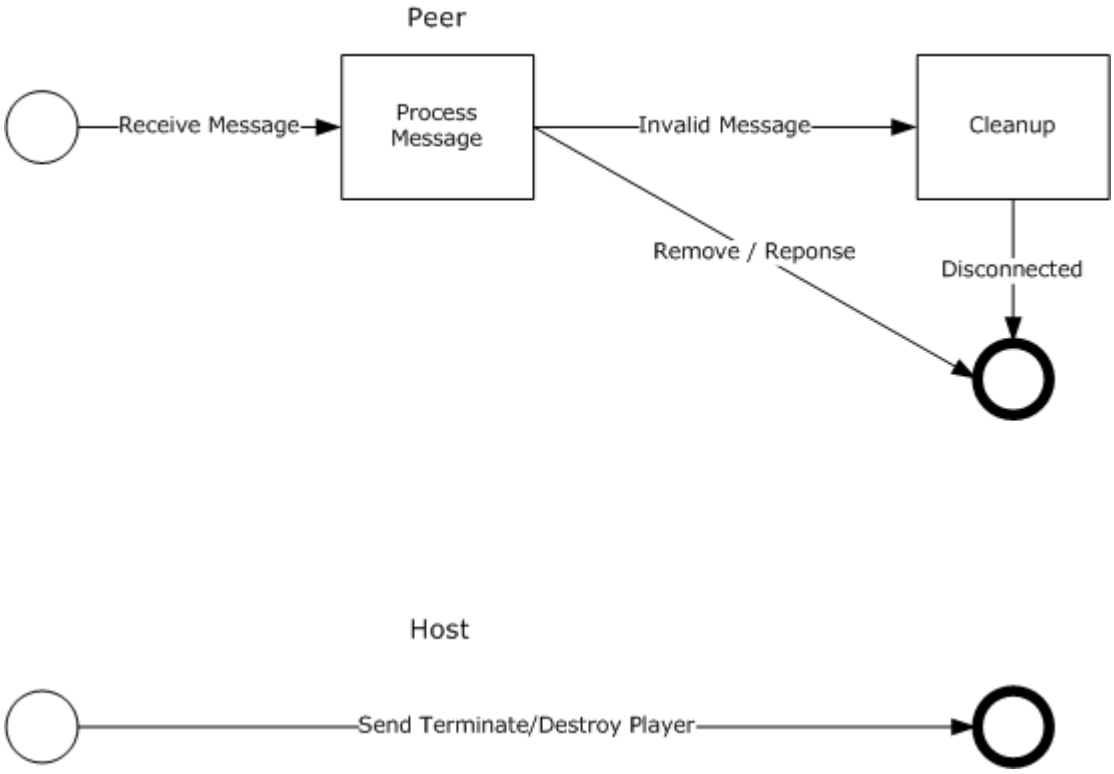


Figure 8: Role of a peer and the host when disconnecting the peer from the session

The role of a peer when responding to the instruction to disconnect:

- The peer receives a DN_TERMINATE_SESSION message from the host and begins message processing. If an error occurs during message processing, or the received message is invalid, the peer performs cleanup and the message is ignored. Otherwise, the peer MUST disconnect from the session.

The role of the host when instructing a peer to disconnect:

- The host sends a DN_TERMINATE_SESSION message to the disconnecting peer, and sends a DN_DESTROY_PLAYER message (section 2.2.2.2) to the other connected peers in the session. Upon receipt of the DN_DESTROY_PLAYER message from the host, the other connected peers MUST remove the indicated player (the disconnecting peer) from the session.

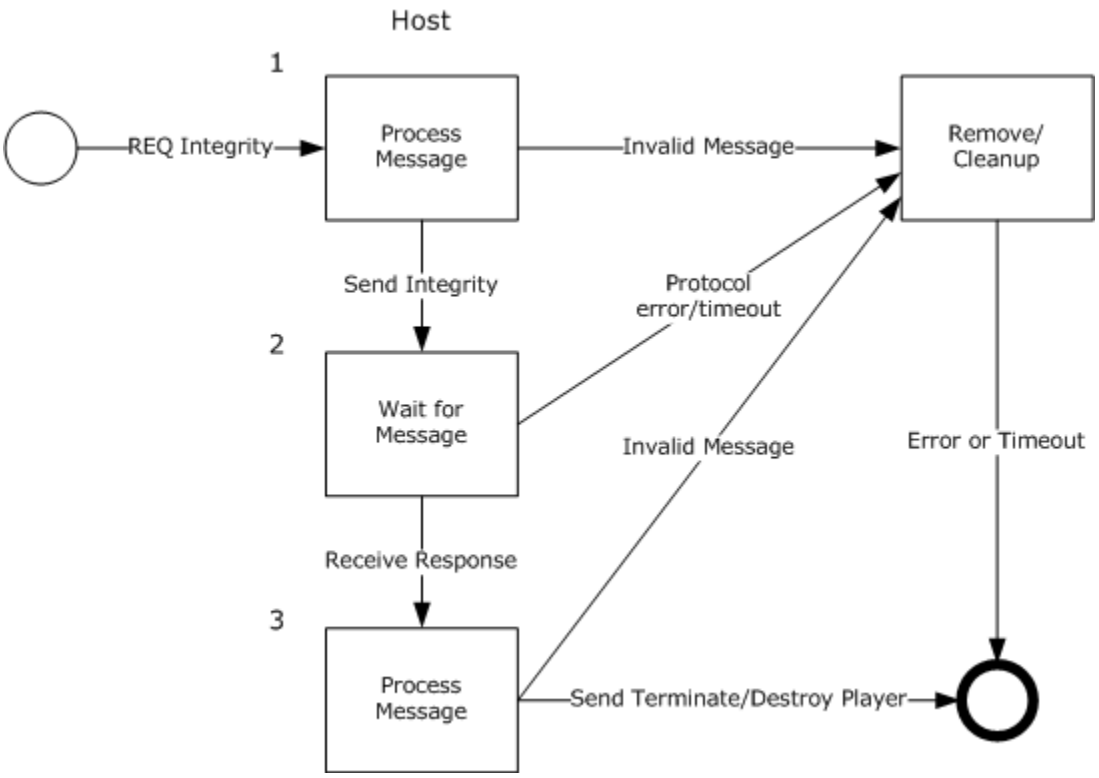


Figure 9: Role of the host when performing a peer integrity check

The role of the host when responding to a request to check the integrity of a peer in the session:

1. The host receives an DN_REQ_INTEGRITY_CHECK message (section 2.2.2.6) from a connected peer in the session and begins message processing. (The peer that is making the request is asking the host to check the integrity of another peer in the session.) If an error occurs during message processing, or the message is invalid, the host performs cleanup and the message is ignored. Otherwise, the host sends a DN_INTEGRITY_CHECK message (section 2.2.2.7) to the peer that is to be checked.

2. The host waits for a DN_INTEGRITY_CHECK_RESPONSE message (section 2.2.2.8) from the peer that is being checked. If the peer does not respond in time, the protocol times out and disconnects the peer that was being checked from the session. The host then sends a DN_DESTROY_PLAYER message to the other connected peers in the session. Upon receipt of the DN_DESTROY_PLAYER message from the host, the other connected peers MUST remove the indicated player (the disconnecting peer) from the session.

3. When a DN_INTEGRITY_CHECK_RESPONSE message is received from the peer that is being checked, the host begins message processing. If an error occurs during message processing, or the message is invalid, the host performs cleanup and the message is ignored. Otherwise, the host sends a DN_TERMINATE_SESSION message to the peer that sent the DN_REQ_INTEGRITY_CHECK message, and sends a DN_DESTROY_PLAYER message to the other connected peers in the session. Upon receipt of the DN_DESTROY_PLAYER message from the host, the other connected peers MUST remove the indicated player (the terminated peer) from the session.

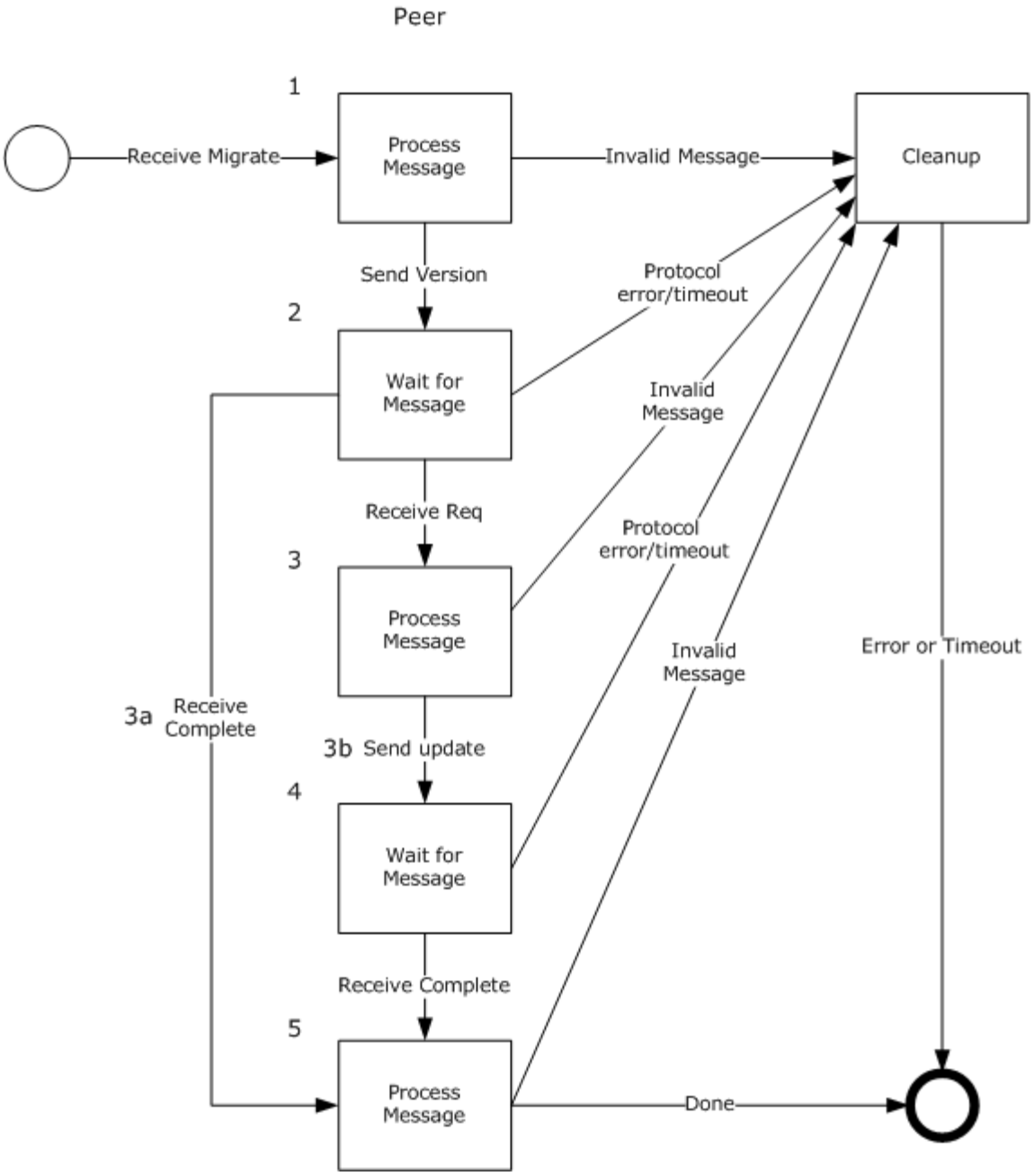


Figure 10: Role of a peer during host migration

The role of a peer when responding to a request to perform host migration:

1. The peer receives a DN_HOST_MIGRATE message (section 2.2.2.3) from the host and begins message processing. If an error occurs during message processing, or the message is invalid, the peer performs cleanup and the message is ignored. Otherwise, the peer responds to the host by sending the nametable version of the peer via a DN_NAMETABLE_VERSION message (section 2.2.2.4).

2. The peer waits for an acknowledgment from the host. If the host does not respond in time, the protocol times out and terminates the connection.

3. When the response is received from the host, the peer processes the message.

    1. If the host has responded with a DN_HOST_MIGRATE_COMPLETE message (section 2.2.2.11), the peer processes the message. If an error occurs during message processing, or the message is invalid, the peer performs cleanup and the instruction to migrate is ignored. Otherwise, host migration is complete.

    2. If the host has responded with a DN_REQ_NAMETABLE_OP message (section 2.2.2.9) to the peer, the peer processes the request and sends a DN_ACK_NAMETABLE_OP message (section 2.2.2.10) to the host.

4. The peer waits for a response from the host. If the host does not respond in time, the protocol times out and terminates the connection.

5. When the response message is received from the host, the peer processes the messages. The peer SHOULD receive DN_RESYNC_VERSION (section 2.2.2.5) and DN_HOST_MIGRATE_COMPLETE messages from the host. If an error occurs during message processing, or these messages are invalid, the peer performs cleanup and the messages are ignored. Otherwise, host migration is complete.

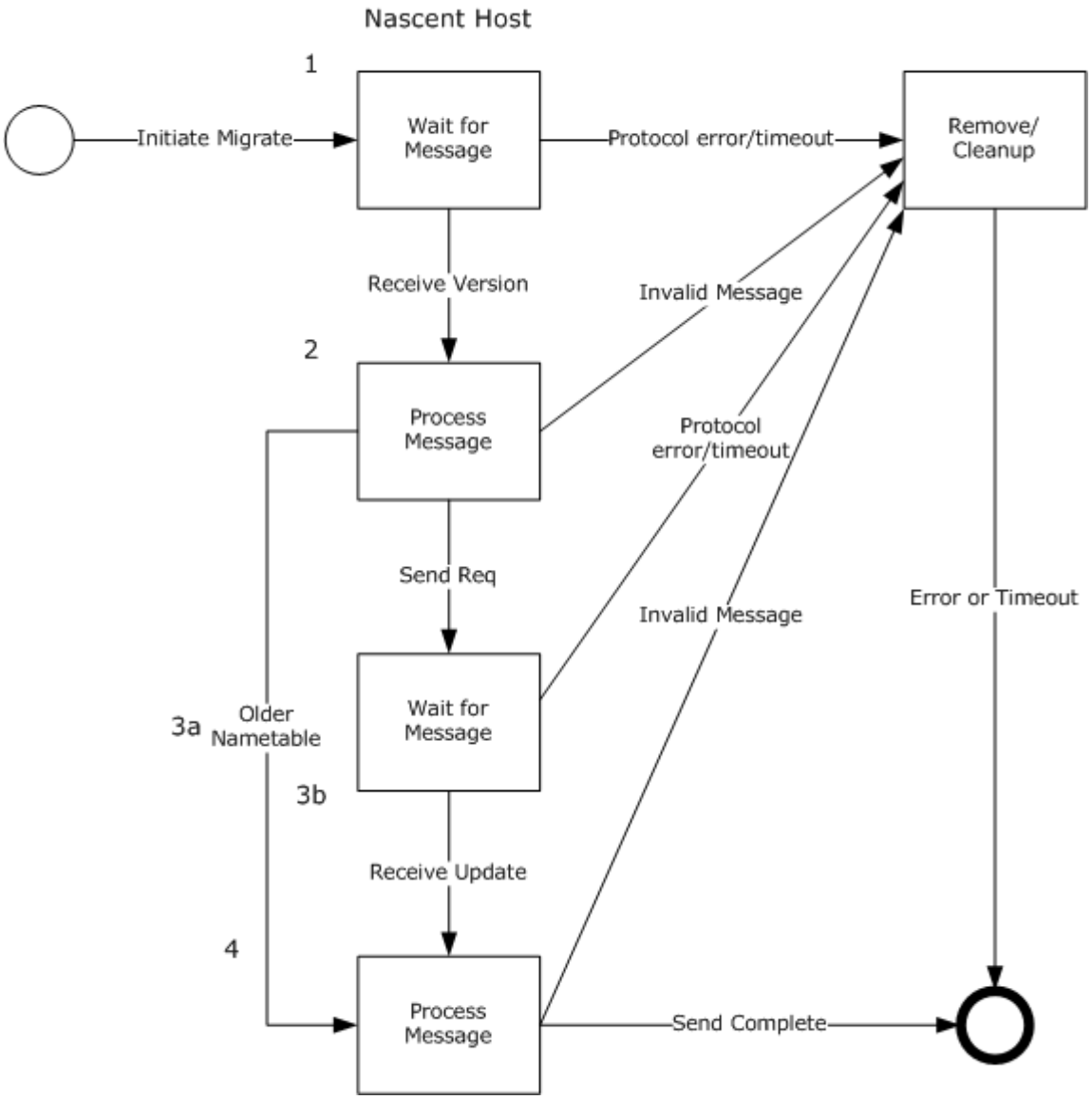


Figure 11: Role of the host during host migration

The role of the host when initiating host migration:

1. The host sends a DN_HOST_MIGRATE message to all connected peers in the session and waits to receive a DN_NAMETABLE_VERSION message from each peer. If a peer does not respond in time, the protocol times out and terminates the connection for that peer.

2. When the DN_NAMETABLE_VERSION response is received from a peer, the host processes the message. If the host receives an invalid nametable response message, the host performs cleanup and the message is ignored.

3. Otherwise, the host examines the peer's nametable to determine if it is newer than the host's nametable.

1. If the peer's nametable is older than the host's nametable, the host sends a DN_HOST_MIGRATE_COMPLETE message to that peer.

2. If the peer's nametable is newer than the host's nametable, the host sends a DN_REQ_NAMETABLE_OP message to that peer and waits for a response. If the peer does not respond in time, the connection to that peer is dropped from the session.

4. When the DN_ACK_NAMETABLE_OP message is received from the peer, the host processes the message and uses the peer's nametable to update it's own nametable. The host then sends a DN_RESYNC_VERSION message containing the new nametable version to all connected peers in the session. Finally, the host sends a DN_HOST_MIGRATE_COMPLETE message to all connected peers in the session.

3.2.1 Connection Abstract Data Model

If there happens to be an error with the protocol or message on the server/host, cleanup and disconnect happens with only the client/peer with the failure. (Remaining clients/peers in the session remain connected.)

In the peer/host model, messages may be sent out to all peers or only the connecting peer.

If a host drops from the session, there are no messages sent from the dropping host. The new host chosen from age in NameTable is responsible for handling the migration.

3.2.2 Timers

The disconnect sequence is event driven via messages sent and received via the Peer, Client, Host, or Server.

3.2.3 Initialization

There is no initialization criteria for the Disonnect Role.

3.2.4 Higher Layer Triggered Events

There are no Higher Layer Triggered Events for the Disconnect Role.

3.2.5 Message Processing Events and Sequencing Rules

3.2.5.1 Client/Server Disconnect Sequence

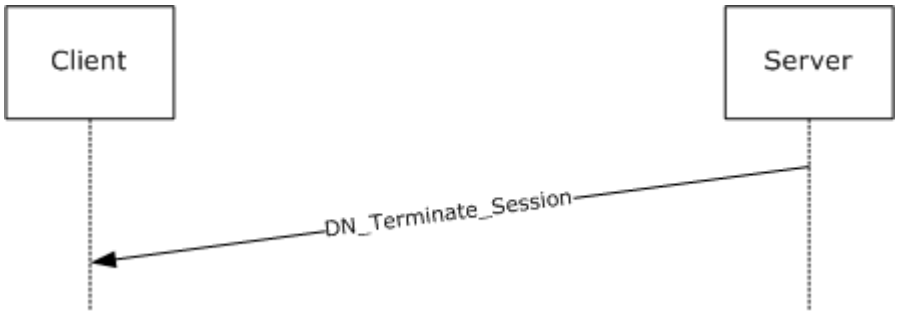


Figure 12: Client/Server Disconnect Sequence

The server is purposefully removing a peer from the session.

1. The server will issue a packet to the client being removed:

   DN_Terminate_Session

2. Once the client receives the DN_TERMINATE_SESSION message, it is REQUIRED to disconnect itself from the session.

3. If a client wants to leave the session, it SHOULD issue a disconnect in the protocol to the server. (No core specific messages.)

3.2.5.2 Peer-to-Peer Non-Host Disconnect Sequence

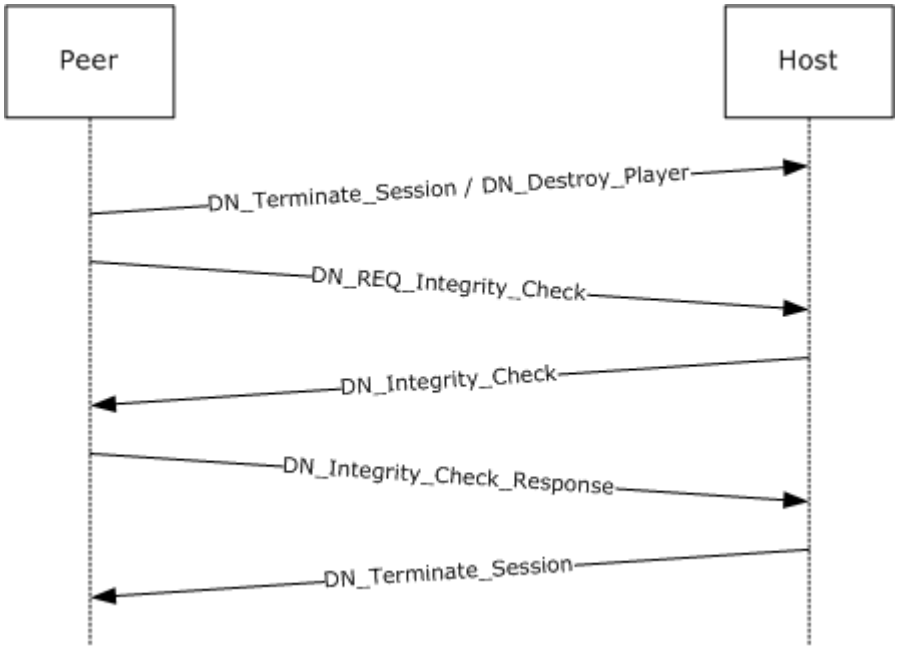


Figure 13: Peer-to-Peer Non-Host Disconnect Sequence

1. If the host is purposefully removing a peer from the session, it will issue a packet to the peer being removed:

   DN_TERMINATE_SESSION

   The peer receiving the DN_TERMINATE_SESSION MUST disconnect all connections and leave the session.

2. The host also issues a message to the remaining connected peers indicating the removal of the disconnecting peer, which MAY occur prior to the full disconnect of the protocol:

   DN_DESTROY_PLAYER

3. If a non-host peer has detected a loss of connection to another peer and has not received a DN_DESTROY_PLAYER message from the host for that peer, it sends a message notifying the host:

   DN_REQ_INTEGRITY_CHECK

4. The host forwards a packet to the peer in question including the DPNID of the questioning peer:

DN_INTEGRITY_CHECK

5. Upon receiving DN_INTEGRITY_CHECK, the peer responds back to the host:

   DN_INTEGRITY_CHECK_RESPONSE

6. If the host receives DN_INTEGRITY_CHECK_RESPONSE, the host will respond to the first peer terminating it from the session:

   DN_TERMINATE_SESSION

3.2.5.3 Peer-to-Peer Host Disconnect (Possible Host Migration)

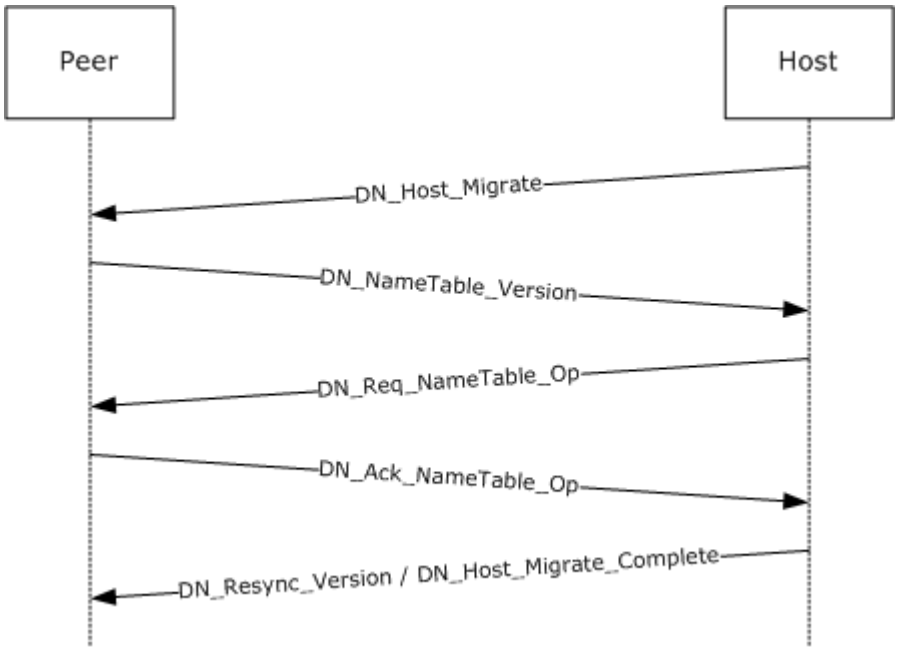


Figure 14: Peer-to-Peer Host Disconnect (Possible Host Migration)

The host drops out of the session.

1. Using the version information for each player from the name table, the oldest remaining player (connected peer) becomes the expected host. (This can be split out to more than one host, if multiple connections are severed when a host leaves.) That new host sends to the remaining connected peers:

   DN_HOST_MIGRATE

2. All peers still in the session will respond to the new host, providing the host with their name table versions:

   DN_NAMETABLE_VERSION

3. If the host sees that there is a peer with a newer name table, the new host will request that peer to send the entries from its name table that are not contained within the host's name table:

   DN_REQ_NAMETABLE_OP

4. Upon receiving DN_Req_NameTable_Op, the peer will return the missing name table entries to the host:

   DN_ACK_NAMETABLE_OP

5. The host runs through its name table operations to get everyone in sync:

   DN_RESYNC_VERSION

   After everyone is in sync, the host will submit its name table version to the other peers in the session.

6. After the name table has been run and is up to date, the host name table is updated and the new host will respond to all connected peers:

   DN_HOST_MIGRATE_COMPLETE

3.2.6 Timer Events

There are no timer events for the Disconnect Role.

3.2.7 Other Local Events

There are no Other Local Events for the Disconnect Role.

3.3 Send/Receive Communications Role

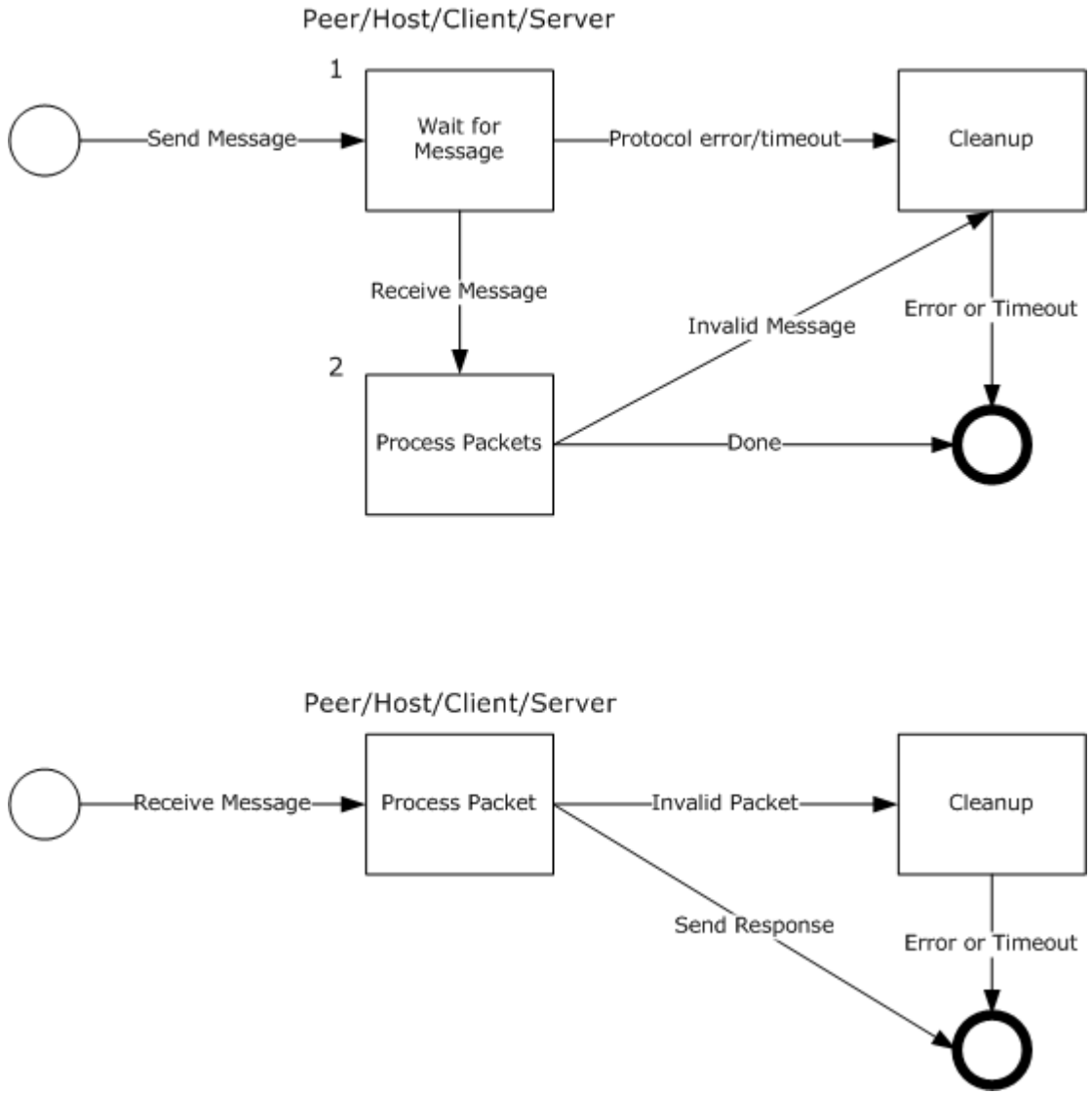


Figure 15: Role of the peer, host, client, and server when sending and receiving messages

The role of the peer, host, client, and server when sending messages (section 2.2.3):

1. When any message is sent, if the sender specifies DN_REQ_PROCESS_COMPLETION (section 2.2.3.2) to indicate that the receiving application MUST confirm delivery of the sent message, the sender waits to receive a DN_PROCESS_COMPLETION response message (section 2.2.3.3). If the response does not arrive in time, the protocol times out and the connection to the receiver is terminated.

2. Otherwise, when the DN_PROCESS_COMPLETION message is received, the send/receive is completed.

The role of the peer, host, client, and server when receiving messages (section 2.2.3):

- When any message is received, the message is processed by the receiver. If the message is found to be invalid, the receiver performs cleanup and the message is ignored. Otherwise, when the message is valid and it contains a DN_REQ_PROCESS_COMPLETION request, a DN_PROCESS_COMPLETION response message is sent back to the sender. If the message does not contain a request for process completion, the message is consumed.

3.3.1 Connection Abstract Data Model

Illustrated in this model is a send where the process completion request has been sent. In the non-process completion case, the messages are just consumed with no retained state.

3.3.2 Timers

The send/receive sequence is event driven via messages sent and received via the Peer, Client, Host, or Server.

3.3.3 Initialization

There is no initialization criteria for the Send/Receive Communications Role.

3.3.4 Higher Layer Triggered Events

There are no Higher Layer Triggered Events for the Send/Receive Communications Role.

3.3.5 Message Processing Events and Sequencing Rules

3.3.5.1 Client/Server and Peer-to-Peer Send/Receive Communications Sequence

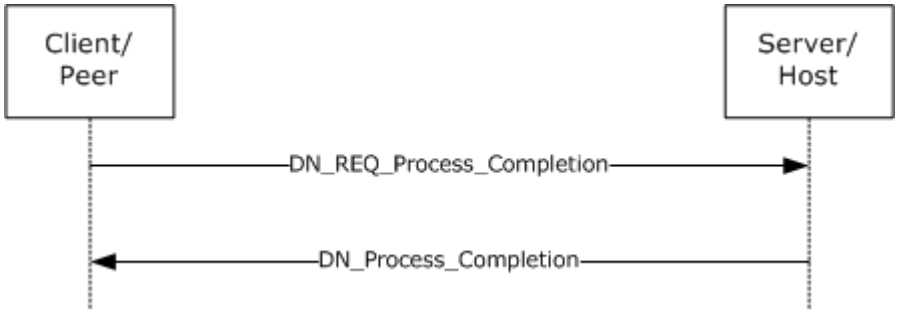


Figure 16: Communications Exchange diagram

Data send and receive sequences are identical for client/server and peer-to-peer modes.

There are two types of general data sends. One requires notification from the session that the user data has been consumed, and the other does not.

To differentiate, on the DFRAME that is handed up from the protocol, if the **bCommand** field has the PACKET_COMMAND_USER_1 bit set, then this is a system message where PacketType and PacketContext will be included.

1. An application sends data to another application and wants a response when that data has been consumed, then it will send:

   DN_REQ_PROCESS_COMPLETION

2. When DN_REQ_PROCESS_COMPLETION is received, it is required that a message is returned indicating that this payload has been consumed:

   DN_PROCESS_COMPLETION

If the bCommand bit does not have the PACKET_COMMAND_USER_1 bit set, the data passed up via the payload is data that SHOULD be passed directly to the application with no further interpretation.

Note If Packet_Command_User_1 is set in the DFRAME, this indicates that it is a core message with the first four bytes indicating the PacketType, and is always sent reliably.

3.3.6 Timer Events

There are no timer events for the Send/Receive Communications Role.

3.3.7 Other Local Events

There are no Other Local Events for the Send/Receive Communications Role.

3.4 Groups Role

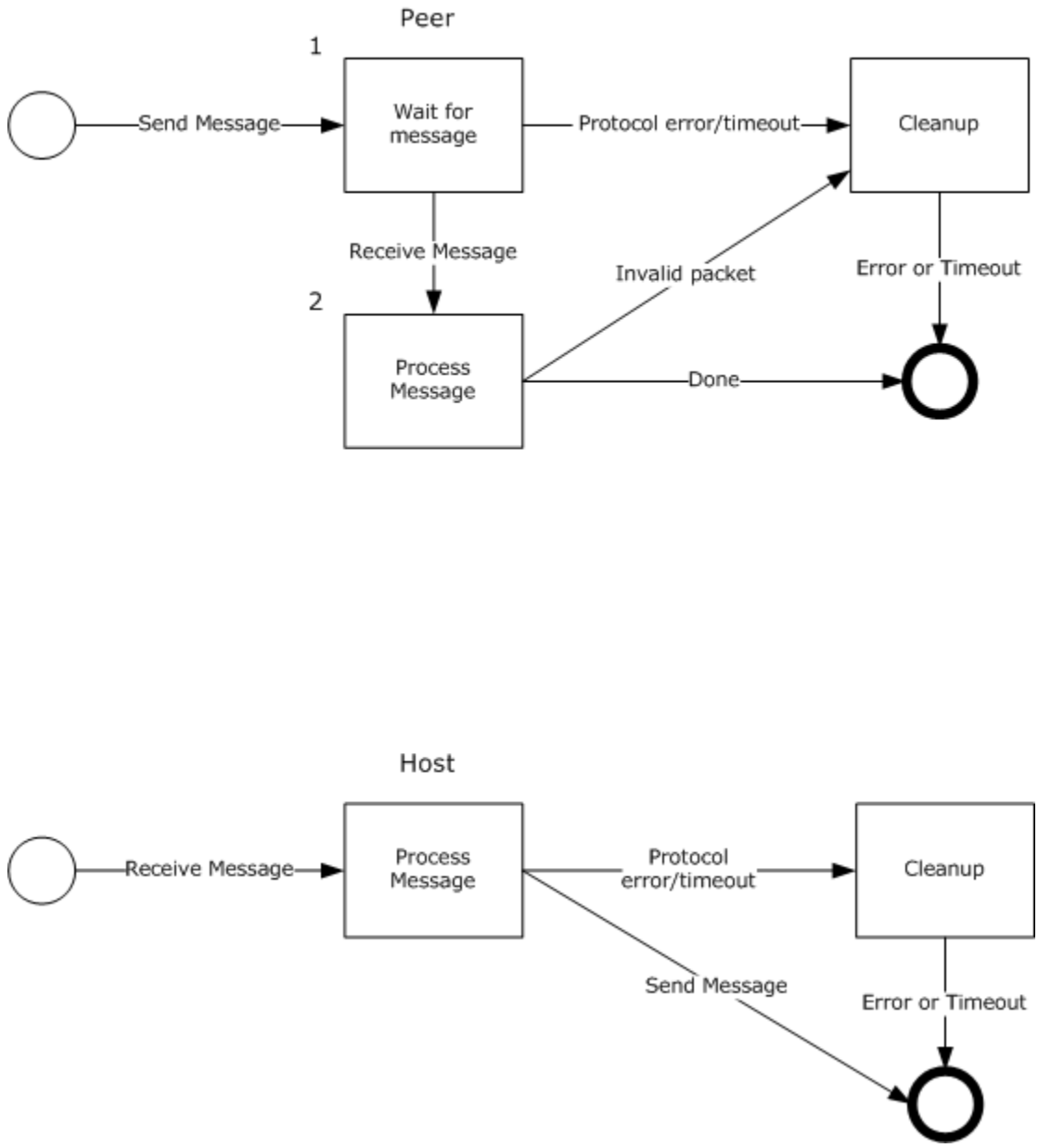


Figure 17: Role of a peer and the host when sending and receiving Group messages

The role of a peer and the host when sending Group messages (section 2.2.4):

1. When any of the following messages are sent, the peer waits for a response from the host.
   - DN_REQ_CREATE_GROUP (section 2.2.4.1)
   - DN_REQ_ADD_PLAYER_TO_GROUP (section 2.2.4.3)
   - DN_REQ_DESTROY_GROUP (section 2.2.4.7)

If the host does not respond in time, the protocol times out and the connection is terminated.

2. Otherwise, when the peer receives any of the following messages in response from the host, the peer processes the message.

   - DN_CREATE_GROUP (section 2.2.4.2)
   - DN_ADD_PLAYER_TO_GROUP (section 2.2.4.4)
   - DN_DESTROY_GROUP (section 2.2.4.8)

   If the message is invalid, the peer performs cleanup and the message is ignored. Otherwise, the message is consumed.

The role of a peer and the host when receiving Group messages:

- When any of the following messages is received from a peer in the session, it is processed by the host.
  - DN_REQ_CREATE_GROUP
  - DN_REQ_ADD_PLAYER_TO_GROUP
  - DN_REQ_DESTROY_GROUP

  If the message is invalid, the host performs cleanup and the message is ignored. Otherwise, the host responds with one of the following messages back to the peer.
  - DN_CREATE_GROUP
  - DN_ADD_PLAYER_TO_GROUP
  - DN_DESTROY_GROUP

Note When working with groups, be aware of considerations related to DXDiag. The DirectX Diagnostic tool (DxDiag.exe) implementation of this specification does not support groups.

3.4.1 Connection Abstract Data Model

With client/server, no group messages that are sent since all group information is local to the server.

3.4.2 Timers

The group sequences are driven via messages sent and received via the Peer, Client, Host, or Server.

3.4.3 Initialization

There is no initialization criteria for the Groups Role.

3.4.4 Higher Layer Triggered Events

There are no Higher Layer Triggered Events for the Groups Role.

3.4.5 Message Processing Events and Sequencing Rules

3.4.5.1 Client/Server Group Role

There are no transactions on the wire for session groups in client/server mode. Session groups are used only in peer-to-peer mode.

3.4.5.2 Peer-to-Peer Group Sequence

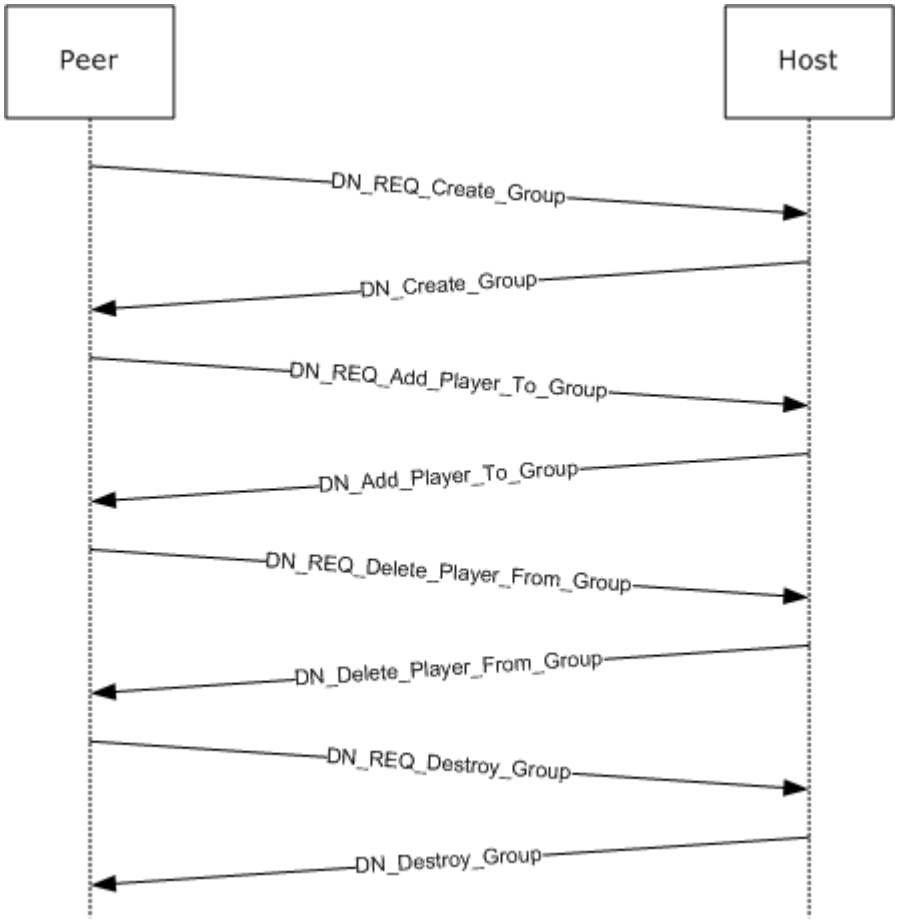


Figure 18: Client and Server Connection Role State Diagrams

Only the session host can create or modify groups. The host can create and destroy groups, and add and remove players from existing groups.

1. If a non-host peer wants to create a group, it MUST issue a message to the host:

   DN_REQ_CREATE_GROUP

2. Once the host has created a new group (via request from a peer or locally), it issues a command to all the connected peers:

   DN_CREATE_GROUP

3. If a non-host peer wants to add a new player to an existing group, it MUST issue a message to the host:

   DN_REQ_ADD_PLAYER_TO_GROUP

4. Once the host has added the new player to the group (via a peer or locally), the host responds to all connected peers with:

   DN_ADD_PLAYER_TO_GROUP

5. If a non-host peer wants to delete a player from an existing group, it MUST issue a message to the host:

   DN_REQ_DELETE_PLAYER_FROM_GROUP

6. Once the host has deleted the player from the group (via a peer or locally), the host responds to all connected peers with:

   DN_DELETE_PLAYER_FROM_GROUP

7. If a non-host peer wants to destroy an existing group, it MUST issue a message to the host:

   DN_REQ_DESTROY_GROUP

8. Once the host has destroyed a group (via Req or locally), the host responds to all connected peers with:

   DN_DESTROY_GROUP

3.4.6 Timer Events

There are no timer events for the Groups Role.

3.4.7 Other Local Events

There are no Other Local Events for the Groups Role.

3.5 Update Information Role

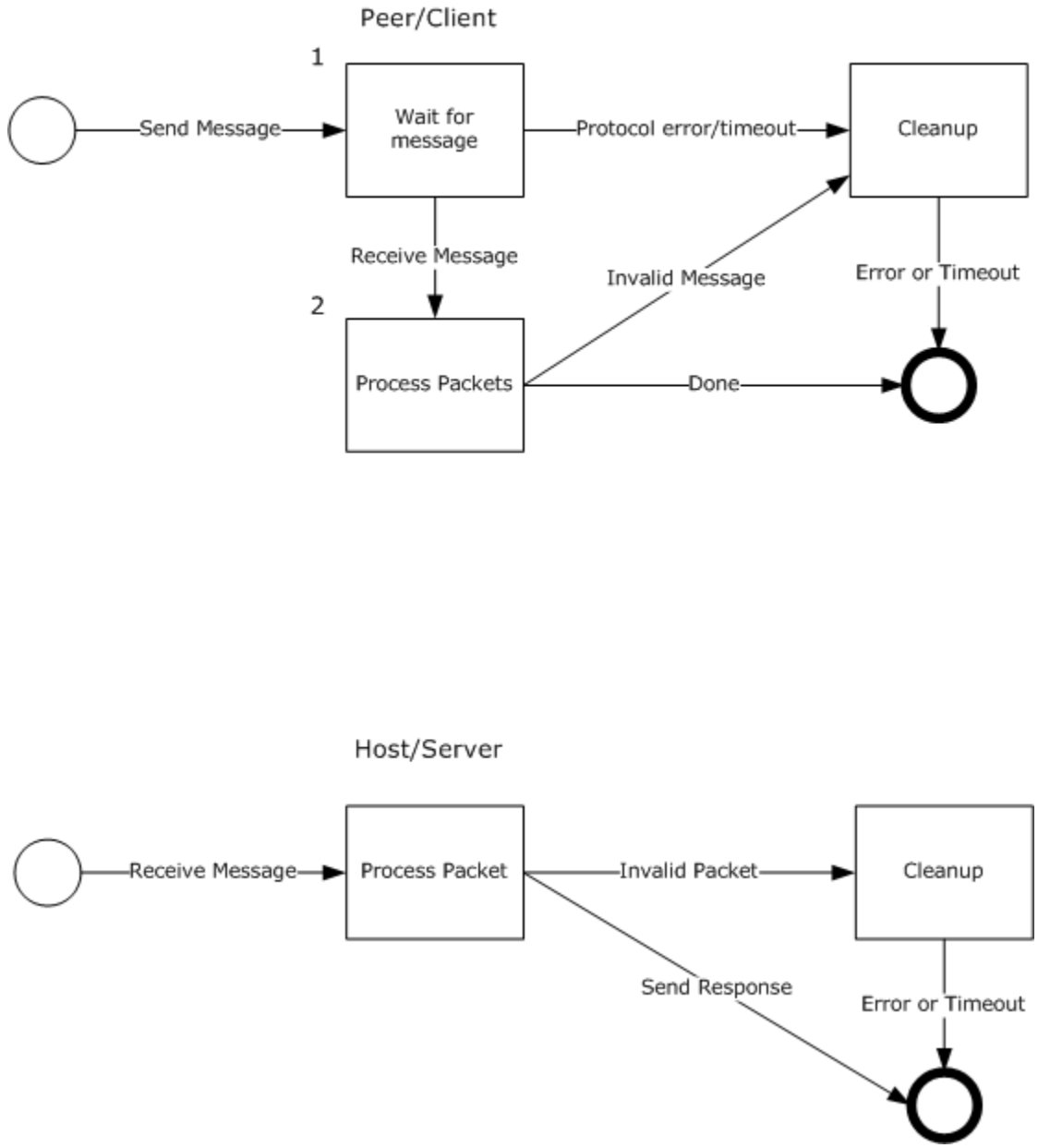


Figure 19: Role of a peer/client and the host/server when sending and receiving Update Information messages

The role of a peer/client when sending Update Information messages (section 2.2.5):

1. When a DN_REQ_UPDATE_INFO message (section 2.2.5.1) is sent, the peer/client waits for a response from the host/server. If the host/server does not respond in time, the protocol times out and the connection is terminated.

2. Otherwise, when the peer/client receives the response from the host/server, the peer/client processes the message. If the message is invalid, the peer/client performs cleanup and the message is ignored. Otherwise, the DN_UPDATE_INFO message (section 2.2.5.2) is consumed.

The role of the host/server when receiving Update Information messages:

- When a DN_REQ_UPDATE_INFO message is received from a peer/client in the session, the message is processed by the host/server. If the message is invalid, the host/server performs cleanup and the message is ignored. Otherwise, the host/server responds by sending a DN_UPDATE_INFO message back to the peer/client.

3.5.1 Update Information Abstract Data Model

An update is requested by a peer or client to a host or server. The host/server will respond to all players with the appropriate response.

If a packet is invalid or the connection times out, the connection is cleaned up for only that connection.

3.5.2 Timers

The update information sequence is event driven via messages sent and received via the Peer, Client, Host, or Server.

3.5.3 Initialization

There is no initialization criteria for the Update Information Role.

3.5.4 Higher Layer Triggered Events

There are no Higher Layer Triggered Events for the Update Information Role.

3.5.5 Message Processing Events and Sequencing Rules

3.5.5.1 Update Information Sequence

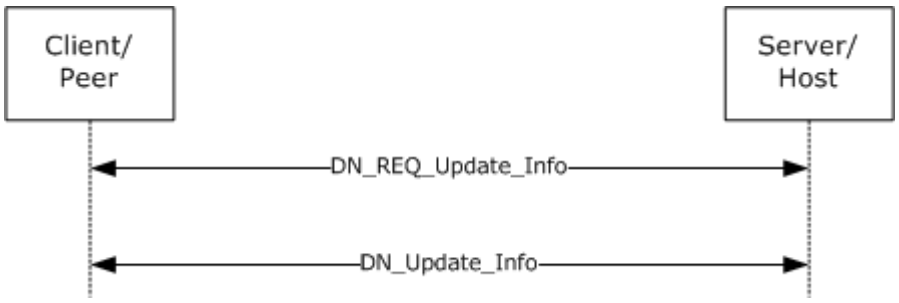


Figure 20: Update Information Sequence Diagram

This is used whenever a non-host player needs to update player or group information.

1. The packet is sent to the host player because the host is responsible for updating the name table and keeping everyone in sync:

   DN_REQ_UPDATE_INFO

2. The host SHOULD respond appropriately to all players with the updated information:

   DN_UPDATE_INFO

3.5.6 Timer Events

There are no timer events for the Update Information Role.

3.5.7 Other Local Events

There are no Other Local Events for the Update Information Role.

4 Protocol Examples

A standard DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO (section 2.2.1.1) for a DirectPlay 8 Protocol: Core and Service Providers session.

In **little-endian** byte order:

- MSGID = 0x000000C1
- dwFlags indicate that this is a DN_OBJECT_TYPE_PEER.
- player Name value of "Test User".

```
00 0A E4 03 27 73 00 0B DB 5C 3F 45 08 00 45 00 00 98 3A 4C 00 00 80
11 9F B1 41 34 EF 3D 41 34 EE B1 08 FE 08 FE 00 84 C2 BF 7F 00 01 00
C1 00 00 00 04 00 00 00 08 00 00 00 60 00 00 00 14 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 23 81 BE 94 AB A1 FB 48 A2 E7 23 85 9E 65 89 36 DA
80 EF 61 1B 69 47 42 9A DD 1C 7B ED 2B C1 3E 58 00 00 00 08 00 00 00
07 02 08 FE 41 34 EF 3D 54 00 65 00 73 00 74 00 20 00 55 00 73 00 65
00 72 00 00 00
```

Upon success, the host will respond with the DN_SEND_CONNECT_INFO (section 2.2.1.3) packet to the connecting peer.

In **network byte order**:

- MSGID = 0x000000C2
- dwFlags indicates that DPNSESSION_MIGRATE_HOST is allowed.
- dwMaxPlayers is not specified.
- dwCurrentPlayers is set to 2 for the host and connecting peer.
- dpnid for the connecting player value is 0x948E8120.
- Name table version entry of 0x03.
- dwEntryCount is set to 2.
- dwMembershipCount is 0, indicating no groups in the session.
- Connecting Peers Name is "Test User".
- Host Peers Name is "Test User".
- Session Name is "Test Session".
- player Name value of "Test User".

```
00 0B DB 5C 3F 45 00 0A E4 03 27 73 08 00 45 00 01 94 06 95 00 00 80
11 D2 6C 41 34 EE B1 41 34 EF 3D 08 FE 08 FE 01 80 0D 9F 7F 00 01 02
C2 00 00 00 00 00 00 00 00 00 00 00 50 00 00 00 04 00 00 00 00 00 00
```

```
00 02 00 00 00 56 01 00 00 1A 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 23 81 BE 94 AB A1 FB 48 A2
E7 23 85 9E 65 89 36 DA 80 EF 61 1B 69 47 42 9A DD 1C 7B ED 2B C1 3E
20 81 8E 94 03 00 00 00 00 00 00 00 02 00 00 00 00 00 00 00 21 81 9E
94 00 00 00 00 02 01 00 00 02 00 00 00 00 00 00 00 07 00 00 00 42 01
00 00 14 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 20
81 8E 94 00 00 00 00 00 01 00 00 03 00 00 00 00 00 00 00 08 00 00 00
2E 01 00 00 14 00 00 00 00 00 00 00 00 00 00 00 CC 00 00 00 62 00 00
00 78 2D 64 69 72 65 63 74 70 6C 61 79 3A 2F 70 72 6F 76 69 64 65 72
3D 25 37 42 45 42 46 45 37 42 41 30 2D 36 32 38 44 2D 31 31 44 32 2D
41 45 30 46 2D 30 30 36 30 39 37 42 30 31 34 31 31 25 37 44 3B 68 6F
73 74 6E 61 6D 65 3D 36 35 2E 35 32 2E 32 33 39 2E 36 31 3B 70 6F 72
74 3D 32 33 30 32 00 54 00 65 00 73 00 74 00 20 00 55 00 73 00 65 00
72 00 00 00 54 00 65 00 73 00 74 00 20 00 55 00 73 00 65 00 72 00 00
00 54 00 65 00 73 00 74 00 20 00 53 00 65 00 73 00 73 00 69 00 6F 00
6E 00 00 00
```

Given a session with two connected peers, the following is an example of general data passed between the peers. The following is the message "Hi there", where the message includes the full 400-byte buffer. Everything after the plain text in this example is just random memory.

```
00 0A E4 03 27 73 00 0B DB 5C 3F 45 08 00 45 00 01 B2 DF CD 00 00 80
11 F9 94 41 34 EF 3D 41 34 EE 32 08 FE 08 FE 01 9E 97 D4 3D 00 05 03
01 00 48 00 49 00 20 00 54 00 48 00 45 00 52 00 45 00 00 00 4E 1C 3F
77 64 00 83 00 00 00 00 00 FC 84 41 7E A4 85 41 7E 22 06 2B 00 A6 88
41 7E BF 3D 3F 77 48 EF CF 00 D1 88 41 7E A8 1B 60 00 00 00 00 00 DA
88 41 7E A6 88 41 7E BF 3D 3F 77 00 00 00 00 24 EF CF 00 01 00 00 00
FC EF CF 00 87 D3 00 00 78 EF CF 00 90 49 3F 77 20 3E 01 05 C2 00 00
00 00 00 00 00 18 5E 69 4F BF 3D 3F 77 BF 3D 3F 77 00 00 00 00 0D 00
00 00 00 01 00 00 58 5E A8 06 BF 3D 3F 77 01 00 00 00 A4 EF CF 00 34
87 41 7E 22 06 2B 00 C2 00 00 00 00 00 00 00 18 5E 69 4F BF 3D 3F 77
CD AB BA DC 00 00 00 00 E0 EF CF 00 BF 3D 3F 77 0C F0 CF 00 16 88 41
7E 00 90 FD 7F 0C F0 CF 00 5A 88 41 7E CC EF CF 00 2A 88 41 7E C2 00
00 00 A8 1B 60 00 BC 1B 60 00 14 00 00 00 01 00 00 00 00 00 00 00 00
00 00 00 10 00 00 00 00 00 00 00 30 88 41 7E 00 00 00 00 00 00 00 00
01 00 00 00 C0 EF CF 00 BF 3D 3F 77 5C F2 CF 00 57 04 44 7E C0 F1 CF
00 08 00 00 00 C0 F1 CF 00 C0 F1 CF 00 C0 F1 CF 00 30 F0 CF 00 85 38
6A 4F 09 00 00 00 C0 F1 CF 00 08 00 00 00 58 5E A8 06 48 F0 CF 00 2E
3B 6A 4F 58 5E A8 06 08 00 00 00 08 00 00 00 C0 F1 CF 00 64 F0 CF 00
A6 3F 6A 4F 58 5E A8 06 08 00 00 00 CE 3D 42 7E 8E 13 00 00 BA B8 41
7E 74 F0 CF 00 BE 7A 6A 4F 00 00
```

5 Security

The following sections specify security considerations for implementers of the DirectPlay 8 Protocol: Core and Service Providers.

5.1 Security Considerations for Implementers

The DirectPlay 8 Protocol: Core and Service Providers provides no security features beyond those included in the underlying DirectPlay 8 Protocol: Reliable ([MC-DPL8R]). The following are some security features that implementers might consider including in their implementations:

- Check all packets to ensure they are of the proper length and contain valid values.
- Ignore malformed messages and messages from unknown clients, unless otherwise specified by the protocol.

5.2 Index of Security Parameters

It is up to the application that is using the DirectPlay 8 Protocol: Core and Service Providers to implement security. The following table only allows for simple passwords to be passed across sessions, but because these are transferred in the free and clear to the protocol, they should not be used for robust security.

Security parameter	Section
Password (variable)	DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO, DN_INTERNAL_MESSAGE_PLAYER_CONNECT_INFO_EX (section 2.2.1.1)
Password (variable)	DN_SEND_CONNECT_INFO (section 2.2.1.3)

6 Appendix A: Windows Behavior

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

- 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 Windows does not follow the prescription.

7 Index

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T

V

W