

Research On GameSpy Protocol

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Part I

Introduction

Chapter 1

History of GameSpy

Chapter 2

Related Works

Part II

General Information



In this chapter we describe the structure of GameSpy SDK and GameSpy servers.

Chapter 3

SDK Module

GameSpy SDK contains of 16 modules.

- Brigades
- Chat
- Presence & Messaging
- CDKey
- Stats & Tracking
- Persistent Storage
- Transport
- NAT Negotiation
- Peer to Peer communication
- Patching & Tracking
- Server Browser
- Query & Reporting
- SAKE Persistent Storage
- ATLAS Competition
- Voice Chat
- Web Authentication

Chapter 4

GameSpy Back-end Servers

GameSpy back-end servers are list as follows.

- GameSpy Presence Connection Manager (GPCM)
- GameSpy Presence Search Player(GPSP)
- GameSpy Query and Report (QR)
- GameSpy Server Browser (SB)
- GameSpy Stats & Tracking (GStats)
- GameSpy Chat
- GameSpy NAT Negotiation (NatNeg)
- GameSpy CDKey
- GameSpy Web Services
- GameSpy SAKE Storage (SAKE)

Chapter 5

Access Sequence of The Client

If a user want to use GameSpy service, the access sequence is listed in Figure 5.1 and we describe the detail below.

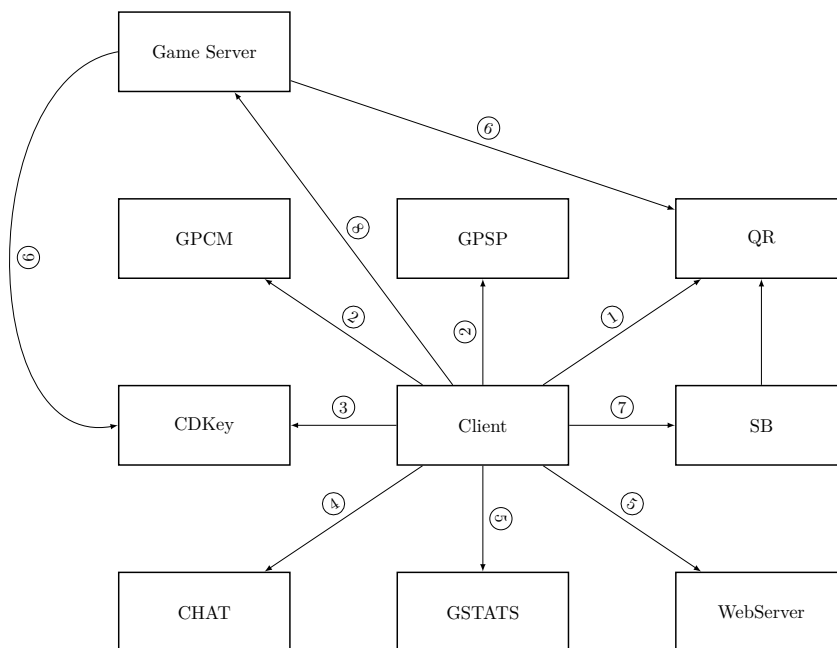


Figure 5.1: The access sequence of client

Explanation of access sequence

1. Client checks in QR server, which tells client GameSpy back-end server status.
2. Client accesses GPCM or GPSP to check their account and login.
3. Client accesses to CDKey to verify his cd-key in login phase.

4. Client logs in to Chat server.
5. Client retrieves player data(level, exp, etc.) from GStats(old game use this server to store player data, new game use Web Server to store player data).
6. When a game server is launched it will send heartbeat to QR server to tell QR its information.
7. Client accesses to SB to search online game server.
8. Client logs in to game server with his information and cd-key.
9. Game server will check his cd-key by accessing to CDKey server, after every information is verified, client should be able to play their game.

Chapter 6

Basic Description of Protocol

In this part, we describe some of the basic patterns that are used in all GameSpy servers.

6.1 String Pattern

We first introduce the pattern of the string, which is used to make up a request and response. The following servers do use the pattern: Presence Connection Manager, Presence Search Player, GameSpy Status and Tracking, CD-Key, Query Report(version 1) This kind of string represents a value in a request and response sent by the client or the server as Table 6.1.

String	Description
\key\value\	The key is key , the value of the key is value

Table 6.1: String pattern

There are two kind of patterns the first one is value string, the second one is command string. **Value String** This kind of string represents a key value pair in the request or response string, it has a key and a correspond value as shown in Table 6.2.

String	Description
\pid\13\	The key is pid , the value of the pid is 13
\userid\0\	The key is userid , the value of the userid is 0

Table 6.2: Value string

Command String

This kind of string represents a command in a request sends by the client or the server as Table 6.3. The command will end with \\ or \ depends on whether run at the server-side or client-side.

String	Description
\command\\	This is a command

Table 6.3: Command string

Part III

GameSpy Presence & Messaging

Presence & Messaging system allows a game to add account authentication or registration, which includes a profile where personal information could be stored (such as email, first name), a friend list (called buddies), private messages.

GameSpy Presence contains two servers, GameSpy Presence Connection Manager (GPCM) and GameSpy Presence Search Player (GPSP). GPCM is a server that manages the profiles (such as login, storing the profile information).

Chapter 7

Common Information

In this section we describe the common information, methods, techniques that GPCM and GPSP have.

7.1 Server IP and Ports

Table 7.1 are the IP and Ports of GPCM and GPSP that client or game connect to.

Name	IP	Port
GPCM	gpcm.gamespy.com	29900
GPSP	gpsp.gamespy.com	29901

Table 7.1: IP and Ports for GameSpy Presence Servers

Chapter 8

GameSpy Presence Connection Manager

8.1 Request Command of GameSpy Presence Connection Manager

Table 8.1 lists the request (known by us) that clients send to GameSpy Presence Connection Manager server (GPCM).

Commands	Description
<code>\inviteto\</code>	Invite friends
<code>\login\</code>	Login to GPCM
<code>\getprofile\</code>	Get the profile of a player (including your own)
<code>\addbuddy\</code>	Add a player to my friend list
<code>\delbuddy\</code>	Delete a player from my friend list
<code>\updateui\</code>	Update login information (email, password)
<code>\updatepro\</code>	Update my profile such as first name, last name, gender etc.
<code>\logout\</code>	Logout manually by user
<code>\status\</code>	Update the status of a user (Such as what game is the player playing)
<code>\ka\</code>	Keep client or session alive
<code>\bm\</code>	Message command
<code>\blk\</code>	Block list
<code>\bdy\</code>	Friend list
<code>\lt\</code>	Login ticket

Table 8.1: Request For GameSpy Presence Connection Manager

Error response string for (GPCM, GPSP):

`\error\``\err\` < errorcode > `\fatal\``\errmsg\` < errormessage > `\id\1\final\`
(8.1)

8.2 GPI Connect Module

8.2.1 Login

We show the login communication diagram in Fig 8.1

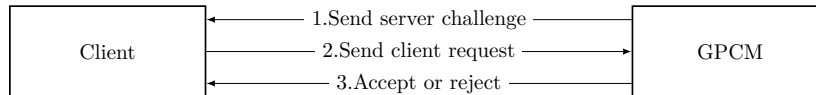


Figure 8.1: Login diagram

Server initial Challenge:

When a client is connected to GPCM server, GPCM Server will send a challenge to client. The challenge string shows in 8.2.1 and 8.2.2. However we do not know the correct functionality of 8.2.2.

Code 8.2.1

```
\lc\1\challenge\<challenge string>\final\
```

Code 8.2.2

```
\lc\1\challenge\<challenge string>\nur\\userid\<user id>\profileid\<profile id>\final\
```

- challenge: The challenge string sent by GPCM.

Keys	Description	Type
challenge	The challenge string sended by GameSpy Presence server	String
nur	? Create new user delimiter	
userid	The userID of the profile	Uint
profileid	The profileID	Uint

Table 8.2: The first type login response

Client Login Request:

There are three ways of login:

- AuthToken: Logging using an alphanumeric string that represents an user.
- UniqueNick: Logging using a nickname that is unique from all the players.
- User: Logging with nickname, email and password.

We show the common part of login request in 8.2.3

Code 8.2.3

```
\login\\challenge\<challenge string>\*\userid\<user id>  
\profileid\<profile id>\partnerid\<partner id>  
\response\<challenge response string>\firewall\<firewall flag>  
\port\<port>\productid\<product id>\gamename\<game name>  
\sdkrevision\<sdk revision number>\quiet\<quiet mode flag>  
\id\<operation id>\final\
```

Where the value of * in 8.2.3 depending on which login method user is using.

Code 8.2.4

```
\authtoken\<authentication token>\  
\uniquenick\<uniquenick name>\  
\user\<nick name+@+email>\
```

Keys	Description	Type
login	The login command which use to identify the login request of client	
challenge	The user challenge used to verify the authenticity of the client	See A
authtoken	The token used to login (represent of an user)	String
uniquenick	The unique nickname used to login	String
user	The users account (format is NICKNAME@EMAIL)	String
userid	User id	Uint
profileid	Profile id	Uint
partnerid	This ID is used to identify a backend service logged with gamespy.(Nintendo WIFI Connection will identify his partner as 11, which means that for gamespy, you are logging from a third party connection)	Uint
response	The client challenge used to verify the authenticity of the client	String
firewall	If this option is set to 1, then you are connecting under a firewall/limited connection	Uint
port	The peer port (used for p2p stuff)	Uint
productid	An ID that identify the game you're using	Uint
gamename	A string that rapresents the game that you're using, used also for several activities like peerchat server identification	string
namespaceid	Distinguish same nickname player	Uint
sdkrevision	The version of the SDK you're using	Uint
quiet	? Maybe indicate invisible login which can not been seen at friends list	Uint
lt	The login ticket used for login into SAKE	String
id	The operation number	Uint

Table 8.3: Login parameter string

Server response:

When received client's login request, server check the challenge and proof. if client pass the check, server will first send response8.2.5 and then it will send friend list friend status, message, add friend request.

Code 8.2.5

```
\lc\2\sesskey\<session key>\userid\<user id>\uniquenick\<unique
nick>\lt\<login ticket>\<challenge proof>\final\
```

Keys	Description	Type
sesskey	The session key, which is a integer rapresentating the client connection	Uint
userid	The userID of the profile	Uint
profileid	The profileID	Uint
uniquenick	The logged in unique nick	String
lt	The login ticket, unknown usage	String
proof	The proof is something similar to the response but it vary	String

Table 8.4: The second type login response

Proof in 8.4 generation: $md5(password)||48spaces$ The user could be AuthToken or the User/UniqueNick (with the extra PartnerID). server challenge that we received before. the client challenge that was generated before.

8.2.2 SDK Revision

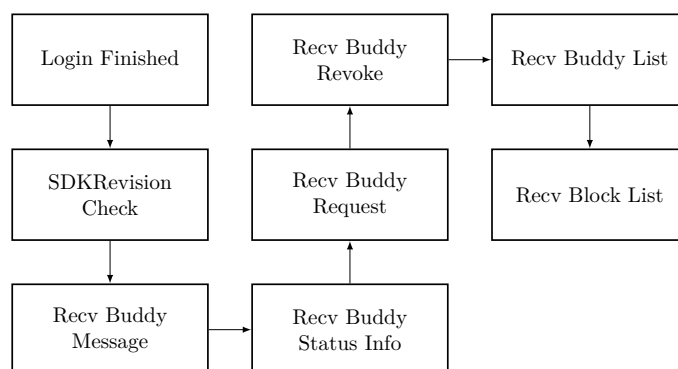


Figure 8.2: SDK Revision process

When a player finished login, GPCM will check his sdkrevision, sdkrevision is an addition of each sdkrevision number. Every addition of sdkrevision number will make GPCM act differently.

Code 8.2.6

- Extended message support
 - 1 GPI_NEW_AUTH_NOTIFICATION = 1
 - 2 GPI_NEW_REVOKE_NOTIFICATION = 2
- New Status Info support
 - 4 define GPI_NEW_STATUS_NOTIFICATION = 4
- Buddy List + Block List retrieval on login
 - 8 GPI_NEW_LIST_RETRIEVAL_ON_LOGIN = 8
- Remote Auth logins now return namespaceid/partnerid on login
 - 16 GPI_REMOTEAUTH_IDS_NOTIFICATION = 16
- New CD Key registration style as opposed to using product ids
 - 32 GPI_NEW_CDKEY_REGISTRATION = 32

For now, we know the sdkrevision number of GameSpy SDK test and Crysis2.

8.3 GPI Buddy Module

8.3.1 Buddy Message

The Buddy Message is a method to transmit message, buddy add request, game invite, friend revoke(friend deletion), buddy status(online status etc.).

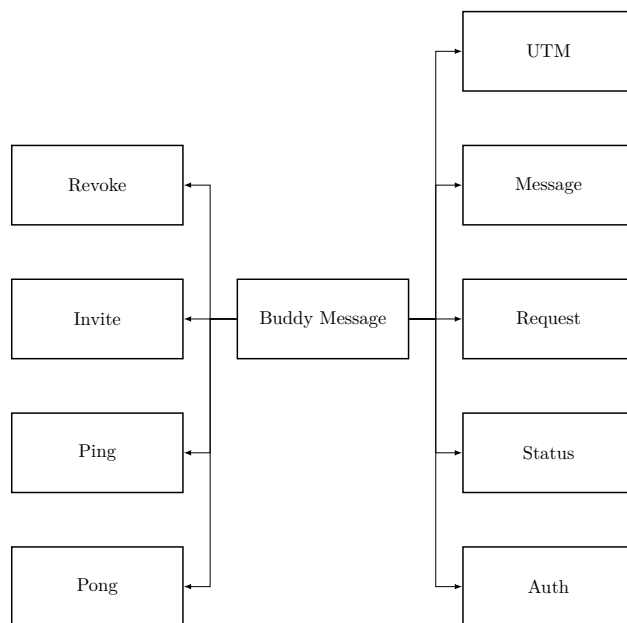


Figure 8.3: Buddy message module

When a Buddy Message received by a client, the client will determine Buddy Message type according to Table 8.5.

Definition	Value
GPI_BM_MESSAGE	1
GPI_BM_REQUEST	2
GPI_BM_REPLY	3
GPI_BM_AUTH	4
GPI_BM_UTM	5
GPI_BM_REVOKE	6
GPI_BM_STATUS	100
GPI_BM_INVITE	101
GPI_BM_PING	102
GPI_BM_PONG	103
GPI_BM_KEYS_REQUEST	104
GPI_BM_KEYS_REPLY	105
GPI_BM_FILE_SEND_REQUEST	200
GPI_BM_FILE_SEND_REPLY	201
GPI_BM_FILE_BEGIN	202
GPI_BM_FILE_END	203
GPI_BM_FILE_DATA	204
GPI_BM_FILE_SKIP	205
GPI_BM_FILE_TRANSFER_THROTTLE	206
GPI_BM_FILE_TRANSFER_CANCEL	207
GPI_BM_FILE_TRANSFER_KEEPALIVE	208

Table 8.5: Buddy Message Definition

Because Client1 and Client2 are in NAT network, so they can not connect each other using p2p, so GPCM will forward message for them. The forward diagram shows in Figure 8.4

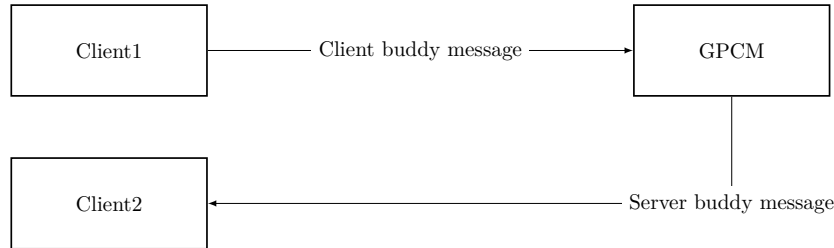


Figure 8.4: Buddy message diagram

All Buddy Message from Client will have same prefix which we show in 8.3.1

Client request:

Code 8.3.1

```
\bm\<buddy message type>\sesskey\<session key>\t\<profile id>\date\<date>\... \final\
```

Keys	Description	Type
bm	Indicate the buddy message command, please see 8.5	Uint
t	Profileid of the receiver	Uint
sesskey	The session key of the sender client	Uint
msg	The message contents	String

Table 8.6: Client buddy message command in prefix

All Buddy Message from GPCM will have same prefix which we show in 8.3.2. The contents in ... is different from each Buddy Message Type.

Server response:

Code 8.3.2

```
\bm\<buddy message type>\f\<profile id>\date\<date>\... \final\
```

Keys	Description	Type
bm	Indicate the buddy message command, please see 8.5	Uint
f	Profileid of the sender	Uint
date	The date that this message is sent, this value can be empty, possible format should be <i>xxxxxxx</i> e.g. 20200201	Uint
msg	The message contents	String

Table 8.7: Buddy message command in prefix

Next following subsections we introduce message contents, the message content will use in both client buddy message and server buddy message. We only write the message contents after `\msg\`.

8.3.1.1 Message

This is a general message

Code 8.3.3

```
\msg\<message content>\final\
```

8.3.1.2 UTM

Code 8.3.4

```
\msg\<UTM message>\final\
```

8.3.1.3 Request

This is a add friend request.

Server response:

Code 8.3.5

```
\msg\|signed|<signature>\final\
```

8.3.1.4 Auth

Auth method do not have contents after `\date\`.

8.3.1.5 Revoke

Revoke method is called when a client1 deleted a client2 in his friend list. When deletion is finished in client1, client1 will send revoke message to GPCM, GPCM will forward this message to client2, then client2 will delete player1 in his friend list. Revoke method do not have contents after `\date\`.

8.3.1.6 Status

This is an old method for game to get status information. buddy status 8.3.1.6 and buddy status info 8.3.2 can not be used at same time. Buddy status method is a part of Buddy Message module, old game send buddy status through a buddy message.

Server response:

Code 8.3.6

```
\msg\|s|<status code>|ss|<status string>|ls|<location string>|ip|<ip address>|p|<port>|qm|<quiet mode flag>\final\
```

8.3.1.7 Invite

Invite method is used to invite a player to a game which is currently playing by another player.

Client request:

Code 8.3.7

```
\msg\|p|<product id>|l|<location string>\final\
```

8.3.1.8 PING

Ping method maybe is used to check the ping to other player.

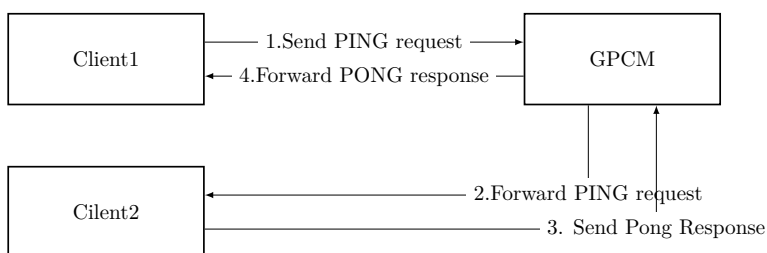


Figure 8.5: PING and PONG diagram

Client request:

Code 8.3.8

```
\msg\|final\
```

8.3.1.9 PONG

Server response:

Code 8.3.9

```
\msg\1\final\
```

8.3.2 Buddy Status Info

This is a new method used in new game. 8.3.1.6 is an old method used in old game. Currently we can not tell you which game use new method and which use old method.

Server response:

Code 8.3.10

```
\bsi\state\<buddy status>\profile\<profileid>\bip\<buddy ip>  
\bport\<buddy port>\hostip\<host ip>\hprivip\<host private ip>  
\qport\<query port>\hport\<host port>\sessflags\<session flags>  
\rstatus\<rich status>\gameType\<game type>\gameVnt\<game  
variant>\gameMn\<game map name>\product\<productid>  
\qmodeflags\<quiet mode flags>\final\
```

Keys	Description	Type
bsi	buddy status info command	
state	Buddy status state	Enum
profileid	The profileID	Uint
bip	Buddy ip	String
bport	Buddy port	Uint
hostip	Host ip	String
hprivip	Host private ip	String
qport	Query port	Uint
hport	Host port	Uint
sessflags	Session flag	Uint
rstatus	Rich status ?	String
gameType	Game type	String
gameVnt	Game variant	String
gameMn	Game map name	String
product	Productid	uint
qmodeflags	Quiet mode flag	Enum

Table 8.8: Buddy status info keys

8.3.3 Buddy List

Buddy list is a list which contains your friends. GPCM server will send buddy list when a client is logged in. Process is showing in Fig 8.6 and the response is showing in 8.3.3.

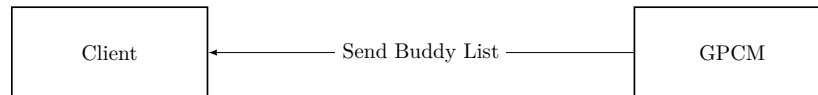


Figure 8.6: Buddy List

Server response:

Code 8.3.11

```
\bdy\<number of profileid>\list\<profileid 1>,  
<profileid 2>,...,<profileid n>\final\
```

8.3.4 Block List

Block list is an list which contain the players you do not like. GPCM server will send block list when a client is logged in. Process is showing in Fig 8.7 and the response is showing in 8.3.12.

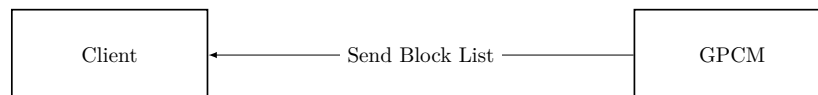


Figure 8.7: Block List

Server response:

Code 8.3.12

```
\blk\<number of profile id>\list\<profileid 1>,<profileid 2>,...,  
<profileid n>\final\
```

8.3.5 Add Buddy

When a client want to add another client into his buddy list. He will send the following request to GPCM.

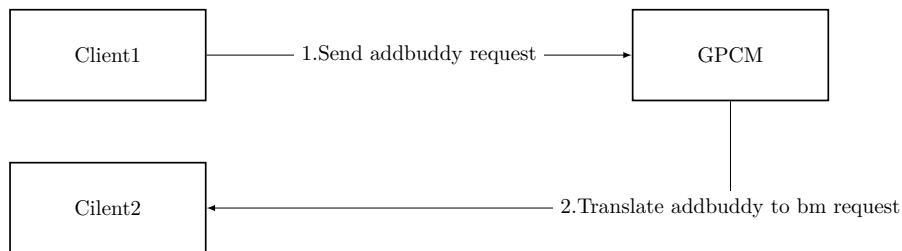


Figure 8.8: Add friend diagram

Client request:**Code 8.3.13**

```
\addbuddy\\sesskey<session key>\newprofileid<profile id>
\reason<add friend reason>\final\
```

8.3.6 Delete Buddy

When a client want to delete a friend in his buddy list. He will send the following request to GPCM.

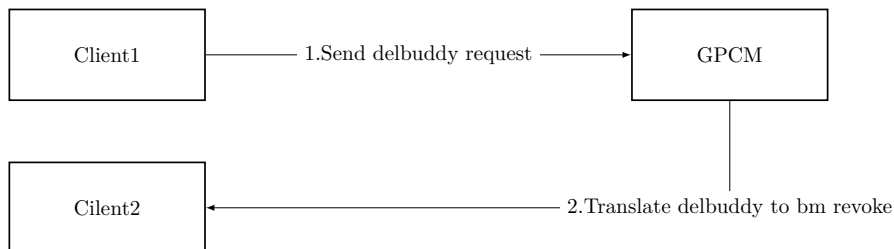


Figure 8.9: Delete friend diagram

Client request:**Code 8.3.14**

```
\delbuddy\\sesskey<session key>\delprofileid<profile id>\final\
```

8.4 GPI Info Module

8.4.1 Profile

8.4.1.1 Get Profile Information

Find a user's profile information.

Client request:

Code 8.4.1

```
\getprofile\ \sesskey\<session key> \profileid\<profile id>
\id\<operation id>\final\
```

Server response:

Code 8.4.2

```
\pi\ \profileid\<profile id>\nick\<nick name>
\uniquenick\<uniquenick>\email\<email>\firstname\<first name>
\lastname\<last name>\icquin\<icquin>
\homepage\<home page URL>\zipcode\<zip code>
\countrycode\<country code>\lon\<longitude>\lat\<latitude>
\loc\<location>\birthday\<birthday>\sex\<gender>
\pmask\<public mask>\aim\<aim name>\pic\<picture>
\occ\<occupation id>\ind\<industry id>\inc\<income id>
\mar\<married id>\chc\<child count number>\i1\<interest 1>
\o1\<ownership 1>\conn\<connection type id>
\sig\<peer to peer signature>\id\<operation id>\final\
```

Keys in profile module:

Key	Description
cpubrandid	cpu barand id
cpuspeed	cpu speed
memory	memory
videocard1ram	GPU memory size
videocard2ram	GPU memory size
connectionid	connection id
connections speed	connection speed
hasnetwork	unknow
passwordenc	encrypted password

Table 8.9: Other keys in profile

8.4.1.2 Update Profile Information

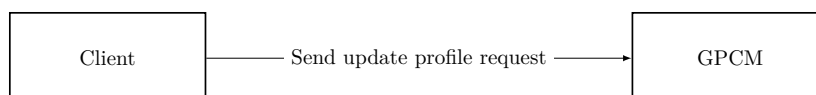


Figure 8.10: Update profile diagram

Client request:

Code 8.4.3

```
\updatepro\\sesskey\<session key>\*\partnerid\<partner id>\final\
```

The * in 8.4.3 is the profile information key and value pairs such as \nick\<nick name>\, etc.

8.4.1.3 Update User Information

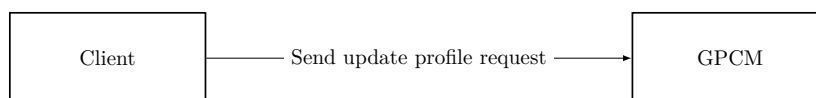


Figure 8.11: Update user diagram

Client request:

The * in 8.4.4 is the profile information key and value pairs such as \passwordenc\<encrypted password>\, etc.

Code 8.4.4

```
\updateui\\sesskey\<session key>\*\final\
```

8.4.2 GPI Profile Module

8.4.2.1 Create New Profile

Create a new profile with nick name.

Client request:

Code 8.4.5

```
\newprofile\\sesskey\<session key>\nick\<nick name>\id\<operation id>\final\
```

8.4.2.2 Replace Existed Profile

Replace nick name in a profile with a new nick name.

Client request:

Code 8.4.6

```
\newprofile\\sesskey\<session key>\nick\<old nick name>\replace\1\oldnick\<nick name>\id\<operation id>\final\
```

8.4.2.3 Delete Profile

Client request:

Code 8.4.7

```
\delprofile\\sesskey<session key>\id<operation id>\final\
```

Server response:

Code 8.4.8

```
\dpr\final\
```

8.4.3 GPI Unique Module

8.4.3.1 Register Unique Nick

This method will register a new unique nick. There are two request 8.4.9 and 8.4.10. The first one is only register unique nick, and the second one is register unique nick with cd key.

Client request:

Code 8.4.9

```
\registernick\\sesskey<session key>\uniquenick<unique nick>  
\partnerid<partner id>\id<operation id>\final\
```

Code 8.4.10

```
\registernick\\sesskey<session key>\uniquenick<unique nick>  
\cdkey<cd key>\partnerid<partner id>\id<operation id>\final\
```

Server response:

Code 8.4.11

```
\rn\final\
```

8.4.3.2 Register CD Key

Client request:

Code 8.4.12

```
\registercdkey\\sesskey<session key>\partnerid<partner  
id>\id<operation id>\final\
```

Server response:

Code 8.4.13

\rc\final\

8.4.4 GPI Transfer Module

Chapter 9

GameSpy Presence Search Player

GPSP server provides search function for client.

Table 7.1 are the GPSP IP and Ports that client/game connect to.

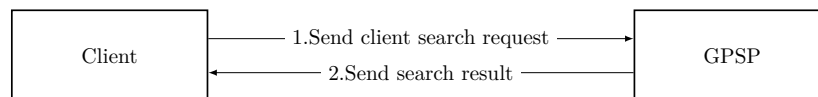


Figure 9.1: GPSP diagram

9.0.1 Search User

Client request:

Code 9.0.1

```
\search\\sesskey\<session key>\profileid\<profile id>\nick\<nick name>\uniquenick\<unique nick name>\email\<email>\gamename \<game name>\final\
```

Server response:

Code 9.0.2

```
\bsr\<profile id>\nick\<nick>\final\
```

9.0.1.1 User Creation

This command 9.1 is used to create a user in GameSpy.

```
\newuser\email\ < email > \nick\ < nick >  
\passwordenc\ < passwordenc > \productid\ < productid >  
\gamename\ < gamename > \uniquenick\ < uniquenick >  
\cdkeyenc\ < cdkeyenc > \partnerid\ < partnerid > \id\1\final\  
(9.1)
```

The description of each parameter string is shown in Table ???. This is the response that server sends to client:

```
\bsr\ < profileid > \nick\ < nick > \uniquenick\ < uniquenick >  
\namespaceid\ < namespaceid > \firstname\ < firstname >  
\lastname\ < lastname > \email\ < email >  
\bsrdone\ < gamespyencdeterminator > \final\  
(9.2)
```

Part IV

Persistent Storage

Part V

Transport

Part VI

NAT Negotiation

Three matchup servers: natneg1. natnet2. natneg3.

IP: natneg1.gamespy.com or natneg2.gamespy.com or natneg3.gamespy.com

Protocol: UDP Port: 27901

Nat Negotiation mechanism: Because the ip address and other environment are changing from time to time, so when a client1 wants to connect to client2, he does not know any informations about client2, so he cannot connect to client2. using natneg it can ask client2 information on gamespy nat server and connect to client2.

The Nat Negotiation do the following things: 1.connect to GameSpy nat server 2.send the data that contain all information about himself to gamespy nat server 3.GameSpy Nat server store clients information. 4.when a client1 is try to connect to other client2: (1) client1 send request to gamespy nat server (2) gamespy nat server send the information about client2 to client1 (3) client1 get the client2 information and connect.

1. Client discovers if the servers are reachable sends the following data

```
typedef struct __InitPacket
{
    unsigned char porttype;
    unsigned char clientindex;
    unsigned char usegameport;
    unsigned int localip;
    unsigned short localport;
} InitPacket;

#define REPORTPACKET_SIZE BASEPACKET_SIZE + 61
typedef struct __ReportPacket
{
    unsigned char porttype;
    unsigned char clientindex;
    unsigned char negResult;
    NatType natType;
    NatMappingScheme natMappingScheme;
    char gamename[50];
} ReportPacket;

#define CONNECTPACKET_SIZE BASEPACKET_SIZE + 8
typedef struct __ConnectPacket
{
    unsigned int remoteIP;
    unsigned short remotePort;
    unsigned char gotyourdata;
    unsigned char finished;
} ConnectPacket;

#define BASEPACKET_SIZE 12
#define BASEPACKET_TYPE_OFFSET 7
typedef struct __NatNegPacket
{
    // Base members: unsigned char magic[NATNEG_MAGIC_LEN];
    unsigned char version;
    unsigned char packettype;
    int cookie;

    union
    {
        InitPacket Init;
        ConnectPacket Connect;
        ReportPacket Report;
    } Packet;
} NatNegPacket;
```

Magic: 0xFD 0xFC 0x1E 0x66 0x6A 0xB2 Version: 0x03
Command 1: Natify Request (0x12) Cookie: htonl(777)

Sets Packet Init. portType to 1 if Natneg server is natneg1, 2 if it's natneg2, 3 if it's natneg3

Command 2: Address check (discover mapping)

Sets portType to as the same as Command 1 Cookie is htonl(0 for natneg1 (map1A), 1 for natneg2, 2 for natneg3, 3 for natneg1 second map (Map1B))

Part VII

Peer to Peer communication

Part VIII

Patching & Tracking

Part IX

Query & Reporting

Custom keys are used to define custom data to report, for example if the user is playing with a Windows or Macintosh PC.

There could be two types of custom keys: Player keys (they end with _): Custom player information Team keys (they end with _t): Custom team (or brigade) information Server keys (they don't end with anything): Custom server information

Custom keys starts from 50 to 253

IP: gamename.master.gamespy.com Port 27900 Protocol: UDP

There is more than one Query report ports, if 27900 is not found the system will try to scan the ports up to 28000

A dedicated server sends some information data to GameSpy Master Server to let GameSpy know that a new server was started, so users can find the server in the server browser like GameSpy 3D or GameSpy Arcade.

A server needs to be registered to GameSpy master Server, it's done with a challenge Sending the heartbeat challenge packet and processing the response. If an error happens, the AddError packet is sent.

A. Heartbeat (Only done if the server is public) The heartbeat checks if the dedicated server is active or not. When a dedicated servers sends a data, the time when the data is sent is saved in the Master server. If the Master server does not receive a new data in 10 seconds, Master server removes the dedicated server to the list and assumes the server is offline.

The dedicated server have to send the heartbeat packet each 10 seconds in order to maintain his connection alive.

The Instance key is a random 4 bytes array characters generated by the client when it tries to connect to the server

The heartbeat communicates everything new it happens to the server, like someone connected or similar.

Keep alive packet: A 5 bytes buffer composed by 0x08 (The packet id) Instance key

3 types of heartbeat packets Type 3: Challenge heartbeat Type 2: A server is shutting down Type 1: User requested a change in the game data Type 0: Normal heartbeat

General heartbeat packet:

0x03 (The Packet ID) Instance key

A key represents the information of a data, much like a Dictionary (Similar to GPSP, but it uses \0 rather than \\\)

List of known keys: localipX (Where X is the number of local IP starting from 0): Local IP of the server localport: Query port binded by the server, where the Master Server can connect to natneg: If you can nat negotiate with the server (If you do, the keep alive packet will also be sent) statechanged: Integer (Type of heartbeat, see above) gamename: Name of the game

If the server want to track the local clients public ip, also this two extra parameters will be sent: publicip: Public IP of the server publicport: Public port

The custom keys are now added with their respective value Server, Player and Team

NOTE: In the heartbeat, we are always querying the current known keys, so rather than being "customkey_one\0customkey_one_data\0" it's just "customkey_one\0\0" (Each key is delimited by \0)

B. Check queries (Process any new query)

We receive some data from the server.

CD-Key query: They start with 0x3B, nothing else is known See CD-KEY Reverse for more information

Query Report 1 queries (compatibility): They start with \

Nat Negotiation query: If the length is bigger than 6 and we find the NatNeg magic data See NatNeg Reverse for more information

Query Report 2: If the first two bytes are 0xFE and 0xFD

Query Report 2 Queries: Structure: Byte

0

= 0xFE Byte

1

= 0xFD Byte

2

= Packet type Byte

3 – 10

= Request key (An array long 7 bytes)

After all the queries are processed, the dedicated server sends back some data. Which can be the challenges or something different.

Packet types:

Query (0x00) This packet verify the IP of the client by checking if the random data it was send before (With 0x09) is the same. If it isn't the server won't verify the client.

The dedicated server will send a notification to the Master Server about who authenticated and who didn't

A character from the start of the data is called EXFlags and they are used to see if the QR2 server supports different things (an example is: Split if the server supports splitting the queries)

Maximum of 7 queries can be splitted

How a query is created: A key called splitnum is created which contains the current number of key splitted The key type (server, team or player) The key data

Challenge (0x01) This packet is used for verify the server with the master server.

Calculate the challenge: First the backend option, each server can have some custom backend option, like disabling the Query Report challenge The data send is the following:

2Bytesthatarethebackendoptionwitha\0

PublicIP(Lengthof8,readedwithhtonl)andPort(lengthof4)

Maxof64bytescontaingarandomdatathatwillbethechallenge,thisismuchlikeGPCM

Algorithm of calculating the challenge (Client side):

See qr2.c at line 785 (compue_challenge_response) for more information A.

Encrypt the challenge with the secret key B. Encode the encrypted challenge

Echo (0x02) Simply reply the same data as the server sended

The first byte is 0x05 Then the data the server sended (max 32 bytes are allowed)

Heartbeat (0x03) Check "General heartbeat packet"

Add Error (0x04) The master server sended an error to the dedicated server
For example about Server registration (Failed challenge)

Echo response (0x05) This is a response of the Echo packet that Server sended to Client Server to Client ID is 0x02, Client to Server ID is 0x05

Client Message (0x06) Sended the following data (After the packet structure)

The first byte is 0x07 (Message ACK) The other 4 bytes is the length of the message key

There can be sent a Nat negotiation packet now (With the natneg magic)

Or it can be a normam data

Max 10 messages to track

0x07???

Keep alive (0x08) Ignored packet

Prequery IP Verify (0x09) [Server to Client only] Try to verify the IP of a client that connects to the server. This is only done if the user enable the IP challenge. Each new client has to verify themself with a challenge.

A new key is added to the data to send:

Part X

Server Browser

Part XI

SAKE Persistent Storage

Part XII

ATLAS Competition

Part XIII

Voice Chat

Part XIV

Web Authentication

Part XV

GameSpy Status & Tracking

when game connect to GSTATS server, server will send an message to game which contains the challenge, the total length of message must bigger than 38bytes, and the challenge must bigger than 20bytes. when game received the challenge it will compute a response, the response is formed as follows. $response = CRC32(\langle server\ challenge \rangle, \langle length\ of\ server\ challenge \rangle) || \langle game\ secret\ key \rangle$ then game will compute the MD5 hash as $MD5value = MD5(\langle response \rangle, \langle length\ of\ response \rangle)$ then encoded with EncType3 then construct the challenge-response message as `\auth\ \gamename\ < gamename > \response\ < MD5value > \port\ < port > \id\ < id >`

session key length (unknown) connction id = transfer ascii of sessionkey to integer

the initialization phase is finished. server challenge message length (bigger than 38-byte) server challenge length (bigger than 20-byte) `\final\` is encrypted using XOR EncType1 at the end of the challenge that sends by the server.

Part XVI

Chat Server

Appendix A

Login Proof Challenge Generation Algorithm

Appendix B

Gstats Initial Encryption

Appendix C

CDKey Server Initial Encryption