**Calculator Protocol**

General

The Calculator protocol used for communication between server and client over TCP using sockets.   
The protocol allows the client to

* Authenticate
* Calculate arithmetic operations
* Terminate session

The protocol uses length-prefixed format of 4-bytes int for indicating the message size to overcome the gap of socket send/recv reliability.

**Welcome**

Once a socket is accepted the client listens for a welcome message from the server.

The server sends to the client the welcome message “Welcome! Please log in.”

Description (Server -> Client):

Value data\_length data

Size(bytes) 4 data\_length

data\_length: the length of the data will be sent: 4 bytes unsigned int

data: the data to transmit, not including data\_length, UTF-8

Example:

No cli usage example – server functionality

Send message example:

<length><data>

00000016Welcome! Please log in.   
(length in hex)

Authentication

The client sends the server authentication information

Description (Client -> Server):

Value data\_length header data

Size(bytes) 4 4 data\_length

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “AUTH” so the server can parse and handle.

data: the data to transmit, not including data\_length and header, UTF-8

Example:

User: Bob

Password: simplepass

Send message example:

<length><data>

00000024AUTH User: user1 Password: password

The server sends the client authentication response

Success

Description (Server -> Client):

Value data\_length header data

Size(bytes) 4 3 int(data\_length)

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “SUC” so the client can parse and handle.

data: the message to print

Example:

No cli usage example – server functionality

Send message example:

<length><header><data>

00000000SUC Hi {username\_of\_user}, good to see you.

Failure

Description (Server -> Client):

Value data\_length header data

Size(bytes) 4 3 int(data\_length)

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “FLR” so the client can parse and handle.

data: the message to print

Example:

No cli usage example – server functionality

Send message example:

<length><header><data>

00000000FLR Failed to login.

Error

Description (Server -> Client):

Server tells the client an error has occurred and session is terminated.

Value data\_length header

Size(bytes) 4 3

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “ERR” so the client can parse and handle.

Example:

No cli usage example – server functionality

Send message example:

<length><header>

00000000ERR

Calculation

The client sends the server calculation request

Description (Client -> Server):

Value data\_length header type X Y Z

Size(bytes) 4 3 calculate: 4 1 4

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “CLC” so the server can parse and handle.

“calculate:”: the command from the user

X, Y, Z: operand, operator, operand

Example:

calculate: 4 + 3

Send message example:

<length><header><calculate:><operand> <operation> <operand>

00000000CLCcalculate: 4 + 3

The server sends the client calculation response

Success

Description (Server -> Client):

Value data\_length header R

Size(bytes) 4 3 8

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “RES” so the client can parse and handle.

R: flaot

Example:

No cli example

Send message example:

<length> <header> <R>

00000000RES 7

The server sends the client calculation error

Failure

Description (Server -> Client):

Value data\_length header message

Size(bytes) 4 3 25

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “CER” so the client can parse and handle.

Message: string

Example:

No cli example

Send message example:

<length> <header> <Message>

00000000CER error: result is too big

Maximum

The client sends the server maximum request

Description (Client -> Server):

Value data\_length header type X1 … Xn

Size(bytes) 4 3 max: 4 … 4

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “MAX” so the server can parse and handle.

type: max: command to execute

X1, … , Xn: params to maximize

Example:

max: (X1 X2 … Xn)

Send message example:

<length><header><max:> <(> <X1> …<Xn> <)>

00000000MAXmax: (X1 X2 … Xn)

The server sends the client max response

Description (Server -> Client):

Value data\_length header the maximum is M

Size(bytes) 4 4 14 4

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “MRS” so the server can parse and handle.

M: the max

Example:

No cli example

Send message example:

<length> <header><the maximum is> <M>

00000000MRS the maximum is M

The server sends the client maximization error

Failure

Description (Server -> Client):

Value data\_length header

Size(bytes) 4 3

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “MER” so the client can parse and handle.

Example:

No cli example

Send message example:

<length> <header> <Message>

00000000MER

Factorization

The client sends the server factorization request

Description (Client -> Server):

Value data\_length header X

Size(bytes) 4 3 4

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “FAC” so the server can parse and handle.

X: param to factorize

Example:

factors: X

Send message example:

<length><header> <X>

00000000FAC X

The server sends the client max response

Description (Server -> Client):

Value data\_length header M

Size(bytes) 4 4 4

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “FRES” so the server can parse and handle.

F: the factors

Example:

No cli example

Send message example:

<length> <header> <F>

00000000FRS F

The server sends the client factorization error

Failure

Description (Server -> Client):

Value data\_length header Message

Size(bytes) 4 3 47

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “FER” so the client can parse and handle.

Message: the message regarding the factorization error

Example:

No cli example

Send message example:

<length> <header> <Message>

00000000FER Can't calculate factors of a negative number

Quit

The client sends the server quit request

Description (Client -> Server):

Value data\_length header

Size(bytes) 4 3

data\_length: the length of the data will be sent: 4 bytes unsigned int

header: the string “QUT” so the server can parse and handle.

Example:

quit

Send message example:

<length><header>

00000003QUT