

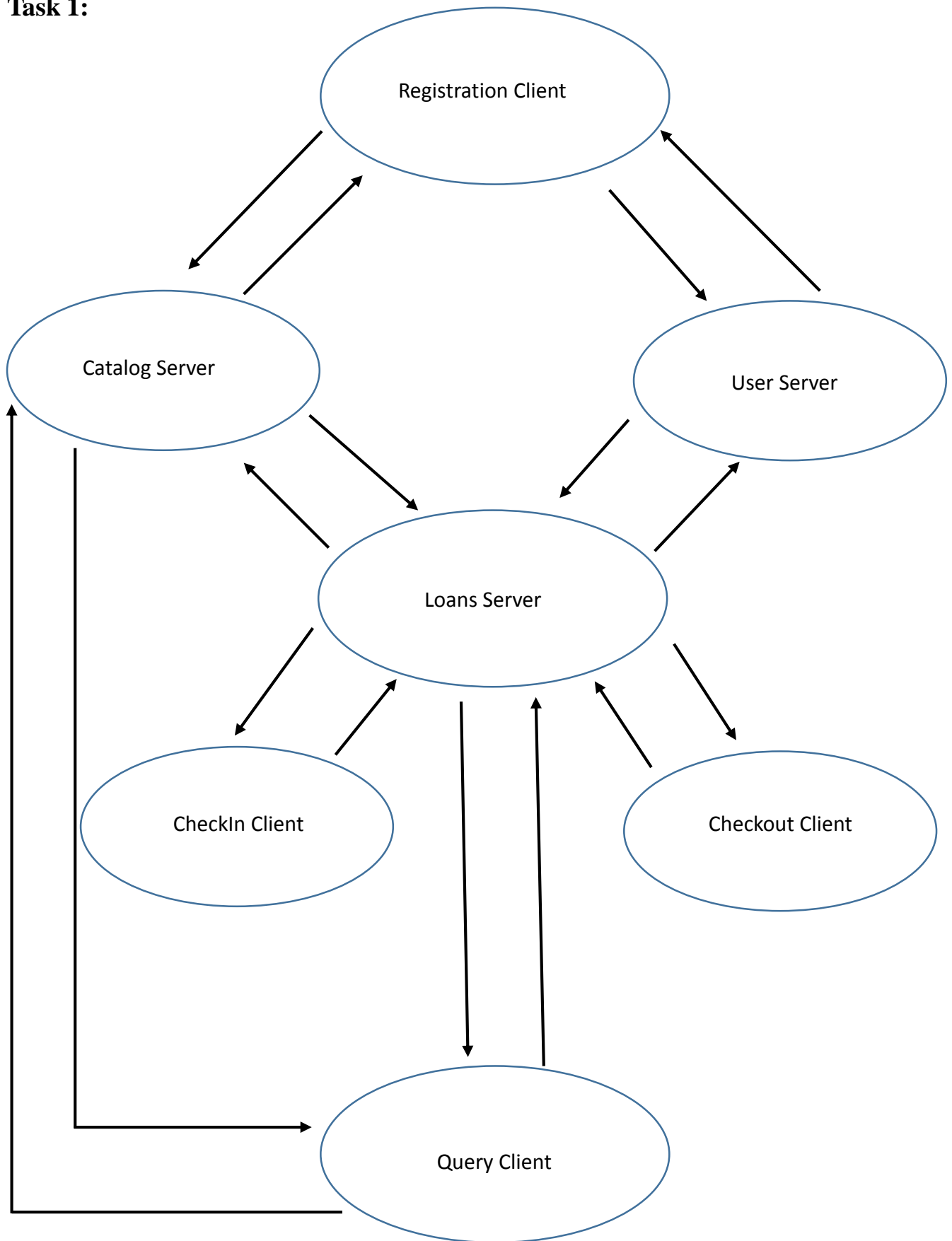
COMS3200 - ASSIGNMENT 1

(PART A)

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Task 1:



Task 2:

Sending Process	Send Primitive	Receiving Process	Receive Primitive	Message Format Names
Registration Client	RPC call	Catalog Server	RPC accept	1
Catalog Server	RPC reply	Registration Client	RPC call	2
Registration Client	RPC call	User Server	RPC accept	3
User Server	RPC reply	Registration Client	RPC call	4
Query Client	RPC call	Catalog Server	RPC accept	5
Catalog Server	RPC reply	Query Client	RPC call	6
Query Client	RPC call	Loans Server	Non-blocking receive	7
Loans Server	Non-blocking send	Query Client	RPC call	8
CheckIn Client	RPC call	Loans Server	Non-blocking receive	9
Loans Server	Non-blocking send	CheckIn Client	RPC call	10
Checkout Client	RPC call	Loans Server	Non-blocking receive	11
Loans Server	Non-blocking send	Checkout Client	RPC call	12
Loans Server	Non-blocking send	Catalog Server	RPC accept	13
Catalog Server	RPC reply	Loans Server	Non-blocking receive	14
Loans Server	Non-blocking send	User Server	RPC accept	15
User Server	RPC reply	Loans Server	Non-blocking receive	16

Task 3:

Registration Client

The Registration Client sends a request to a Catalog Server (User Server) and waits for the reply before taking any action, we should notice that Registration Client behaves like a typical client, so it should use RPC Call.

Catalog Server & User Server

The Catalog Server (User Server) behaves like a typical client, because Catalog Server (User Server) blocks until messages arrive and send reply. Therefore, the RPC server accept should be used to receive messages and RPC reply should be used to reply.

Query Client

The Query Client sends a request to a Loan Server (Catalog Server) and waits for the reply before taking any action, we should notice that Query Client behaves like a typical client, so it should use RPC Call.

CheckIn Client & Checkout Client

The CheckIn Client (Checkout Client) sends a request to a Loans Server and waits for the reply before taking any action, we should notice that CheckIn Client (Checkout Client) behaves like a typical client, so it should use RPC Call.

Loans Server

The Loans Server is more difficult than other processes, because the Loans Server communicates several processes, so in order to enable quicker response and receive, Loans Server use non-blocking primitives should be used (for both sending and receiving).

Task 4:

Message 1:

Item ID	Authors	Title	Additional publication information	Catalog Code
Fixed length string (L=12)	Variable-length Array(n) [Variable length string]	Variable length string	Variable length string	Variable length string
12 bytes	$n*(8 \sim 36) + 4$	4 ~ 36 bytes	4 ~ 36 bytes	4 ~ 36 bytes

Total: $28 \sim 124 + n*36$ bytes (n is number of authors)

Assume that the maximum number of authors is 7, so the total size is: 28 ~ 376 bytes.

Message 2:

Reply message (from Catalog Server to Registration Client)
Fixed length string (L=1)
4 bytes

Total: 4 bytes

Assume that if Registration Client can create/update a catalog in Catalog Server, the Catalog Server will reply “Y”, if not, reply “N”.

Message 3:

User ID	User Name	Phone Numbers (home, work, mobile)	Email Address
Fixed length string (L=12)	Variable length string	Variable length string*3	Variable length string
12 bytes	4 ~ 36 bytes	12 ~ 108 bytes	4 ~ 36 bytes

Total: 28 ~ 192 bytes

Message 4:

Reply message (from User Server to Registration Client)
Fixed length string (L=1)
4 bytes

Total: 4 bytes

Assume that if Registration Client can create/update a user in User Server, the User Server will reply “Y”, if not, reply “N”.

Message 5:

Number of request (1 to 2)	Title	Author	Catalog Code
Unsigned Integer	Variable length string	Variable length string	Variable length string
4 bytes	8 ~ 36 bytes	8 ~ 36 bytes	8 ~ 36 bytes

Total: 12 ~ 76 bytes

Message 6:

Number of matches (0 to 20)	Item ID	Authors	Title	Additional publication information	Catalog Code
Unsigned Integer	Fixed length string (L=12)	Variable-length Array(n) [Variable length string]	Variable length string	Variable length string	Variable length string
4 bytes	12 bytes	$n \cdot (8 \sim 36) + 4$	8 ~ 36 bytes	8 ~ 36 bytes	8 ~ 36 bytes

Total: $4 \sim 20 \cdot (124 + n \cdot 36)$ bytes (n is number of authors)

Assume that the maximum number of authors is 7, so the total size is: 4 ~ 7520 bytes.

Message 7:

1. Search loan status of a particular book, by entering the Item ID

Item ID
Fixed length string (L=12)
12 bytes

Total: 12 bytes

2. Enter their ID and get a list of their current borrowings and holds

User ID
Fixed length string (L=12)
12 bytes

Total: 12 bytes

3. Enter user ID and Item ID in order to put that book on hold for one week

User ID	Item ID
Fixed length string (L=12)	Fixed length string (L=12)
12 bytes	12 bytes

Total: 24 bytes

4. Enter user ID and Item ID in order to renew the loan for a period of four weeks

User ID	Item ID
Fixed length string (L=12)	Fixed length string (L=12)
12 bytes	12 bytes

Total: 24 bytes

Message 8:

1. Get loan status of a particular book

Number of reply (1 to 2)	Flag (loan, hold and renewed loan)	Date (yyyy-mm-dd)
Unsigned Integer	Fixed length string (L=1)	Fixed length string (L=10)
4 bytes	4 bytes	12 bytes

Total: 20 bytes

Assume that if flag is loan, then reply “L”, if flag is renewed loan, then reply “R”, if flag is hold, then reply “H”.

2. Get a list of their current borrowings and holds

Number of reply (0 to 3)	Item ID	Flag (loan, hold and renewed loan)	Date (yyyy-mm-dd)
Unsigned Integer	Fixed length string (L=12)	Fixed length string (L=1)	Fixed length string (L=10)
4 bytes	12 bytes	4 bytes	12 bytes

Total: 32 bytes

Assume that if flag is loan, then reply “L”, if flag is renewed loan, then reply “R”, if flag is hold, then reply “H”.

3. Put that book on hold for one week

Number of reply (3)	Item ID	Flag (loan, hold and renewed loan)	Date (yyyy-mm-dd)
Unsigned Integer	Fixed length string (L=12)	Fixed length string (L=1)	Fixed length string (L=10)
4 bytes	12 bytes	4 bytes	12 bytes

Total: 32 bytes

Assume that if flag is loan, then reply “L”, if flag is renewed loan, then reply “R”, if flag is hold, then reply “H”.

4. Renew the loan for a period of four weeks

Number of reply (3)	Item ID	Flag (loan, hold and renewed loan)	Date (yyyy-mm-dd)
Unsigned Integer	Fixed length string (L=12)	Fixed length string (L=1)	Fixed length string (L=10)
4 bytes	12 bytes	4 bytes	12 bytes

Total: 32 bytes

Assume that if flag is loan, then reply “L”, if flag is renewed loan, then reply “R”, if flag is hold, then reply “H”.

Message 9:

Item ID
Fixed length string (L=12)
12 bytes

Total: 12 bytes

Message 10:

Flag (loan, hold and renewed loan)	Date (yyyy-mm-dd)
Fixed length string (L=1)	Fixed length string (L=10)
4 bytes	12 bytes

Total: 16 bytes

Assume that if flag is loan, then reply “L”, if flag is renewed loan, then reply “R”, if flag is hold, then reply “H”.

Message 11:

User ID	Item ID
Fixed length string (L=12)	Fixed length string (L=12)
12 bytes	12 bytes

Total: 24 bytes

Message 12:

User Name	Book Name (Title)	Authors	Due Date (yyyy-mm-dd)	Holds
Variable length string	Variable length string	Variable-length Array(n) [Variable length string]	Fixed length string (L=10)	Fixed length string (L=1)
4 ~ 36 bytes	4 ~ 36 bytes	$n \times (8 \sim 36) + 4$	12 bytes	4 bytes

Total: $28 \sim 92 + n \times 36$ bytes (n is number of authors)

Assume that the maximum number of authors is 7, so the total size is: 4 ~ 344 bytes.

Assume that if this book is on hold to a different user, the Holds is “Y”, if not, the Holds is “N”.

Message 13:

Item ID
Fixed length string (L=12)
12 bytes

Total: 12 bytes

Message 14:

Book Name (Title)	Authors
Variable length string	Variable-length Array(n) [Variable length string]
4 ~ 36 bytes	$n*(8 \sim 36) + 4$

Total: $8 \sim 36 + n*36$ bytes

Assume that the maximum number of authors is 7, so the total size is: $4 \sim 288$ bytes.

Message 15:

User ID
Fixed length string (L=12)
12 bytes

Total: 12 bytes

Message 16:

User Name
Variable length string
4 ~ 36 bytes

Total: 4 ~ 36 bytes

Task 5:

Assumptions:

1. Assume that the Catalog Server reply a response to Registration Client. If Registration Client can create/update a catalog in Catalog Server, the Catalog Server will reply “Y”, if not, reply “N”. So the length of reply is 1, and size is 4 bytes.
2. Assume that the User Server reply a response to Registration Client. If Registration Client can create/update a user in User Server, the User Server will reply “Y”, if not, reply “N”. So the length of reply is 1, and size is 4 bytes.
3. Assume that the maximum number of authors is 7.
4. Assume that if this book is on hold to a different user, the Holds is “Y”, if not, the Holds is “N”. So the length of Holds is 1, and size is 4 bytes.
5. Assume that if flag is loan, then reply “L”, if flag is renewed loan, then reply “R”, if flag is hold, then reply “H”. So the length of flag is 1, and size is 4 bytes.

Limitation

1. If the number of book authors is more than 7, so the message cannot store the author which is after 7.
2. If the Loans Server is break, the CheckIn and CheckOut Client cannot use until the Loans Server is recover.
3. If the User Server is Overloading, it may makes Registration Client or Loans Server time-out.