P2P Networks – Exercise
Solution For Exercise # 5

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Chord

1.1 Finger Table

- Assume a Chord network with an 8-bit identifier space. Currently, 12 nodes are in the system. Their identifiers are: 0, 8, 13, 16, 17, 31, 36, 44, 49, 52, 55, 60. Compute and note the finger tables of nodes 16, 44, and 55. Use the format indicated by Table 1 for each finger these nodes.

1.1 Finger Table

- Node IDs ∈ [0, 8, 13, 16, 17, 31, 36, 44, 49, 52, 55, 60]
- Finger table of nodes with identifiers
  - id ∈ [16, 44, 55]
- Finger[i] = Succ(id+ 2^{i-1}) while i ∈ [1, n)

i	Target ID	Successor
1	$16 + 2^0 = 1$	17
2	$16 + 2^1 = 18$	31
3	$16 + 2^2 = 20$	31
4	$16 + 2^3 = 24$	31
5	$16 + 2^4 = 32$	36
6	$16 + 2^5 = 48$	49
7	$16 + 2^6 = 80$	0
8	$16 + 2^7 = 144$	0

1.1 Finger Table

i	Target ID	Successor
1	$44 + 2^0 = ?$	?
2	$44 + 2^1 = ?$	?
3	$44 + 2^2 = ?$	?
4	$44 + 2^3 = ?$	?
5	$44 + 2^4 = ?$	?
6	$44 + 2^5 = ?$	?

i	Target ID	Successor
1	$55 + 2^0 = ?$	?
2	$55 + 2^1 = ?$	?
3	$55 + 2^2 = ?$	?
4	$55 + 2^3 = ?$	?
5	$55 + 2^4 = ?$	?
6	$55 + 2^5 = ?$	?

1.2 Node Join

- A new Peer wants to join the Chord overlay described in § 1.1. Its identifier is assumed to be 58. The peer knows the address of node 16 and contacts it with a join request. Note all exchanged messages until the new node knows its successor on the Chord ring for the following two scenarios:
  - only the successor links are used for routing
  - the successor links as well as the links stored in the finger tables are used for routing

Use the format given by table 2 to list all messages.

1.2 a) Node Join

Sender	Receiver	Message
58	16	JOIN 58
16	17	JOIN58
17	31	JOIN58
31	36	JOIN58
36	44	JOIN58
44	49	JOIN58
49	52	JOIN58
55	60	JOIN58
60	58	SUCC60

1.2 Node Join

- A new Peer wants to join the Chord overlay described in § 1.1. Its identifier is assumed to be 58. The peer knows the address of node 16 and contacts it with a join request. Note all exchanged messages until the new node knows its successor on the Chord ring for the following two scenarios:
  - a) only the successor links are used for routing
  - b) the successor links as well as the links stored in the finger tables are used for routing

Use the format given by table 2 to list all messages.

1.2 b) Node Join

Sender	Receiver	Message	
58	16	JOIN 58	
16	49	JOIN 58	f[6]
49	55	JOIN 58	f[4]
55	60	JOIN 58	succ
60	**58**	SUCC 60	

1.3 Finger and Routing Table Size

- Which information must be stored in a Chord finger table in order to be correctly used during routing? Justify your answer.
  - IP address and port used by the referenced node
  - Identifier of the referenced node

1.4 Finger and Routing Table Size

- Assume an n-bit Chord identifier space, i.e., id ∈ [0, 2n− 1]. Further assume, that each IP address requires 32 Bit of storage while ports require 16 Bit. What is the minimum size of a Chord finger table? What is the minimum size of the complete routing table of a Chord node? Justify your answers.
  - Finger table size : n * (32 + 16 + n) bits = n * (n + 48) bits
  - Routing table size
    - (n+1) * (32+16 + n) Bits = (n+1) * (n + 48) bits
    - Finger table + predecessor link
    - Successor link = 1st finger

1.5 Duplicate Finger Table Entries

- We already mentioned that there exist duplicate entries in the finger tables of most Chord nodes. In which scenario would there be no duplicate entries in the finger tables of all nodes in a Chord network? Justify your answer.
  - For every node, each finger should point to a different node

Next Exercise

- Exercise # 7
- Due date 14.12.2011
- 14:25 – 16.05
- S2|02 - C110