ECE 697J – Advanced Topics in Computer Networks

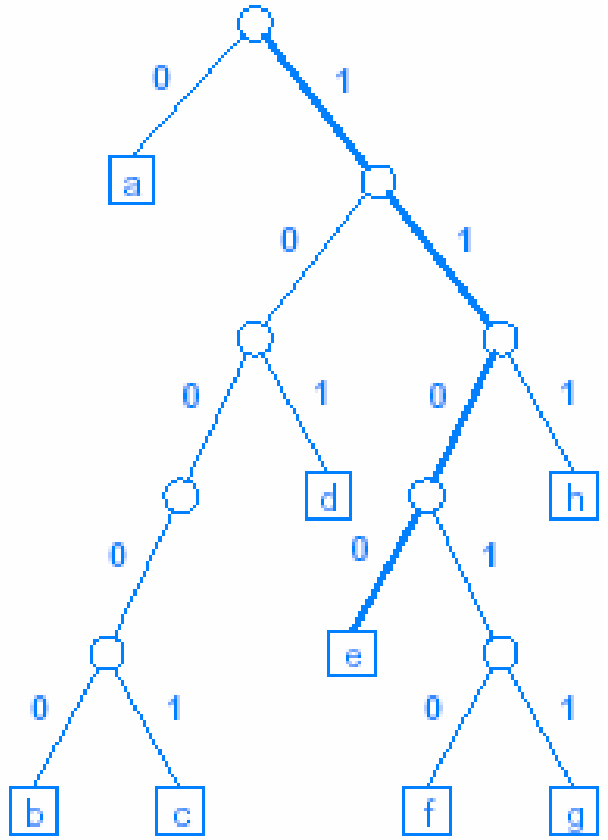
Packet Processing Algorithms and Data Structures
9/23/03

Routing Recap

- Example routing tree:

string	prefix	node
01011	0	a
10000	10000	b
10001	10001	c
10101	101	d
11001	1100	e
11010	11010	f
11011	11011	g
11101	111	h

(a)



(b)

Routing Exercise

- Draw tree for the following prefixes:
  - A: 0010*
  - B: 010*
  - C: 0101*
  - D: 0*
  - E: 10*
  - F: 1011*
  - G: 100*
- Which prefixes match the following lookups?
  - 01
  - 101
  - 0001
  - 1

Overview

- IP lookup paper
- Packet processing algorithms and data structures
  - Bridge algorithm
  - Hashing
  - TCP recognition
  - TCP splicing
- Protocol processing software
  - Interrupts
  - Threads

Bridge Algorithm

- Purpose: forwards frames only on necessary segments
- Algorithm:

```
Do forever {
   acquire frame
   set I to interface on which frame arrived
   extract source S and destination D
   add (S,I) to list L
   if (D,I) is in L {
    drop frame
   } else {
    forward frame on all interfaces but I
   }
}
```

- Is this the best possible bridging algorithm?

Table Lookup and Hashing

- Hash Table:
  - Compute function of “key” to determine table location
  - Check if slot is empty or holds another item
  - Could cause collisions – how can they be resolved?
- Hash function:
  - Many functions possible
  - Comer: double hashing
- Double hashing:
  - Compute Q := (P_1 x K) mod N, R := (P_2 x K) mod N
  - Use slot Q
  - If collision, then search with Q := (Q + R) mod N until slot found

Next Class

- Software-based router architectures
  - Read chapter 7
- Router design paper
  - Read paper