DNS and IP addresses

3/4/26

IP Addresses

- IPv4 address: 32-bit number

  Written as 4 dot-separated bytes (byte = 8 bits):

  123 . 45 . 0 . 6

  Each part is 0-255

- IPv6 address: 128-bit number

  Written as 8 colon-separated fields of hex digits:

  1234 : 5678 : 90ab : cdef : : 12 : feed : beef

  Omit leading zeros (and all 0s)

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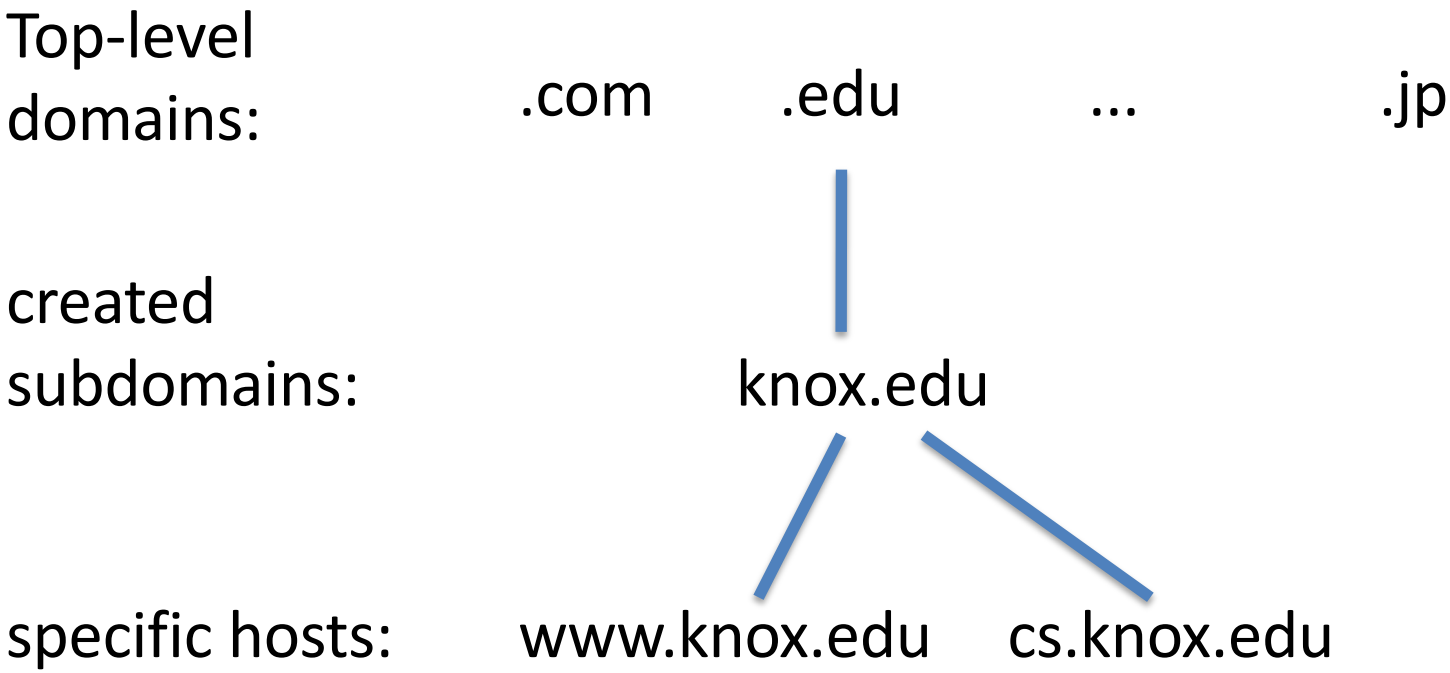
- Original implementation: Look up in hosts.txt file, downloaded nightly from central server

  (For some reason, this approach didn’t scale…)

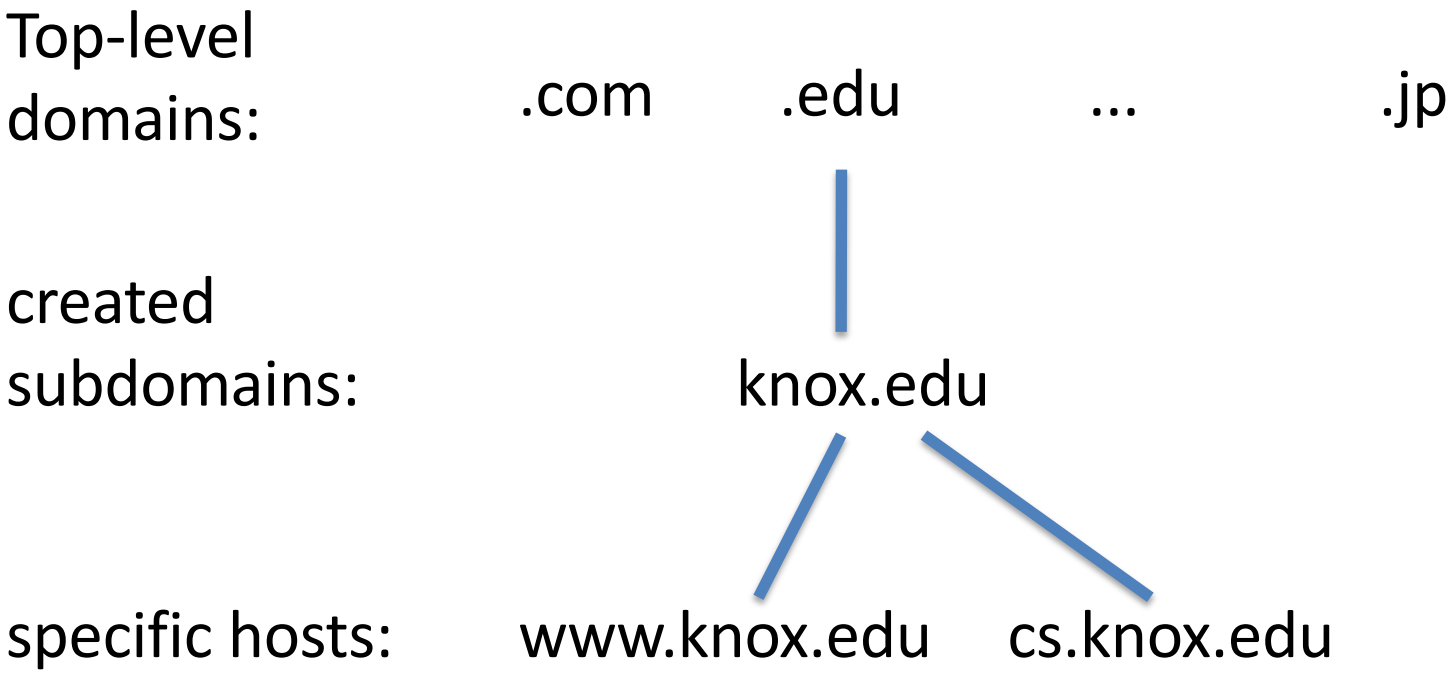
Delegating authority

Top-level domains: .com .edu ... .jp

Delegating authority

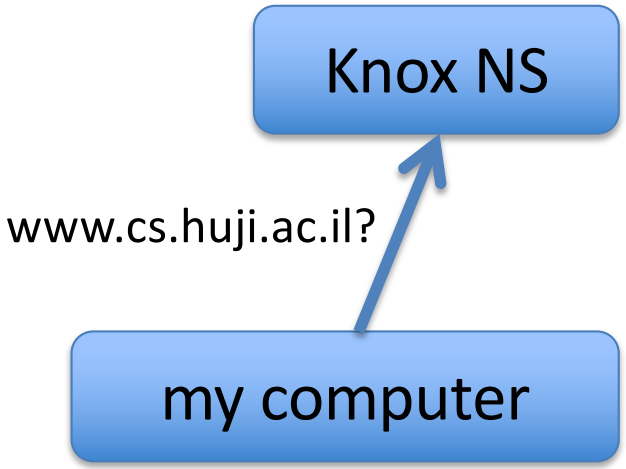


Delegating authority



Each domain provides nameserver that knows its children's IP addresses; same servers are used by members of that domain

Looking up a name



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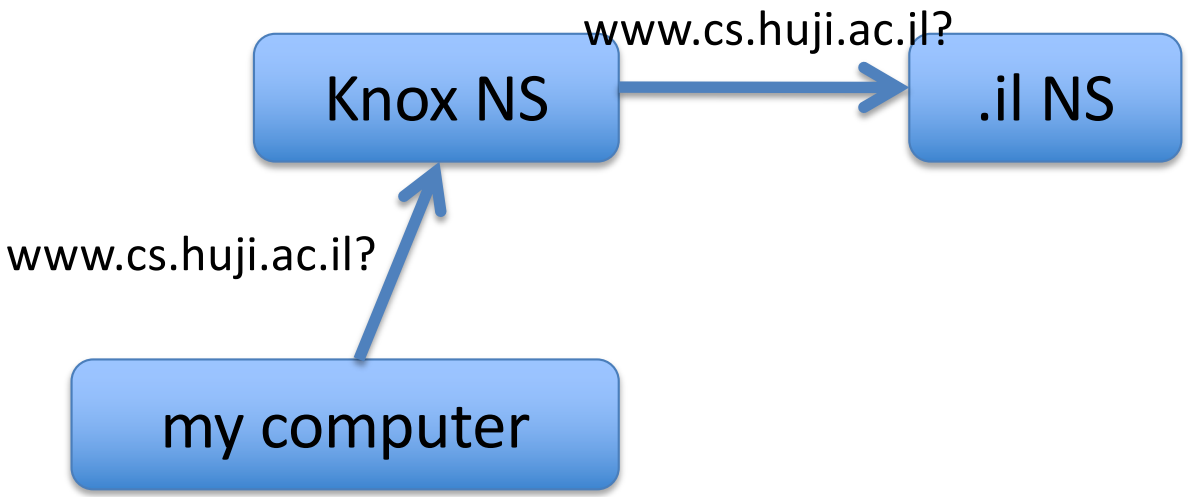

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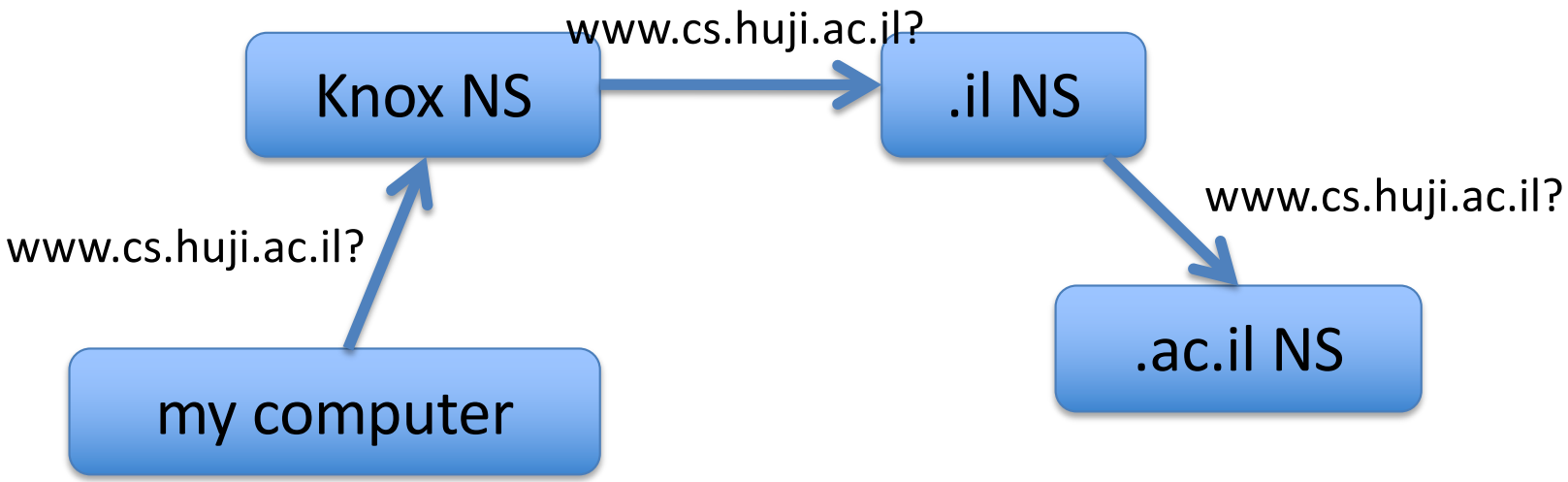

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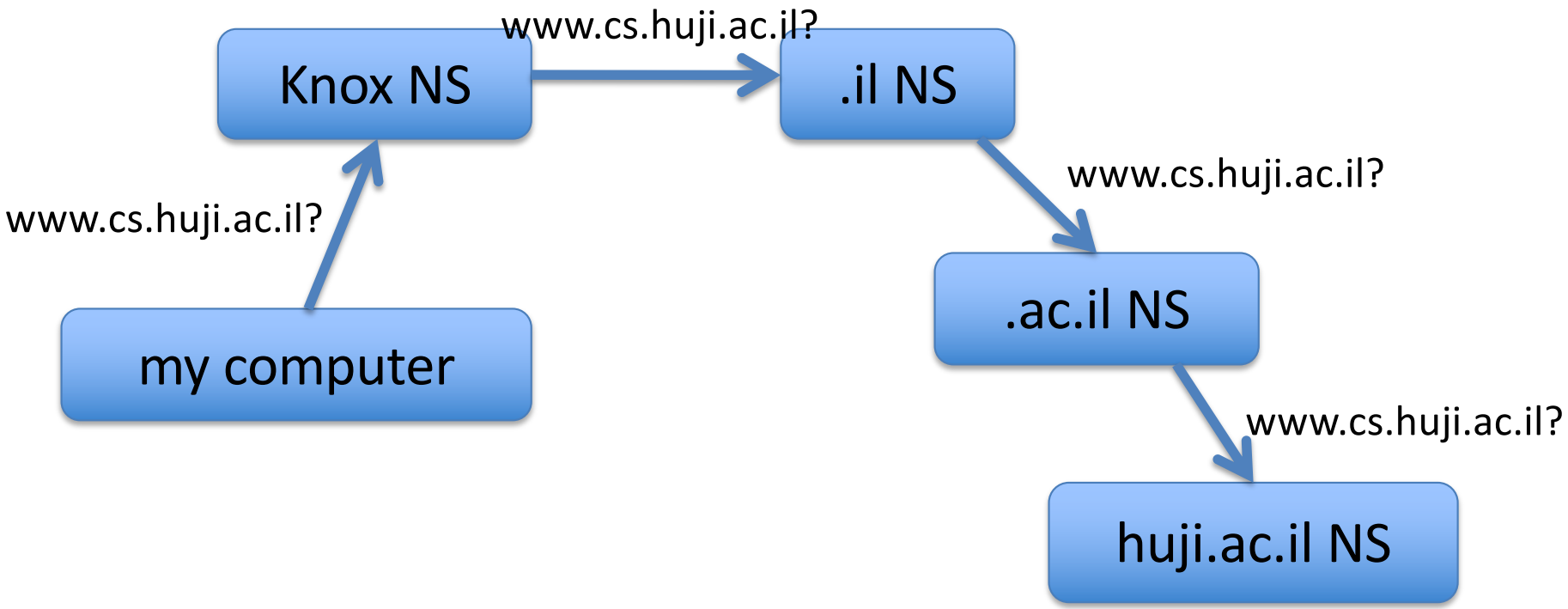

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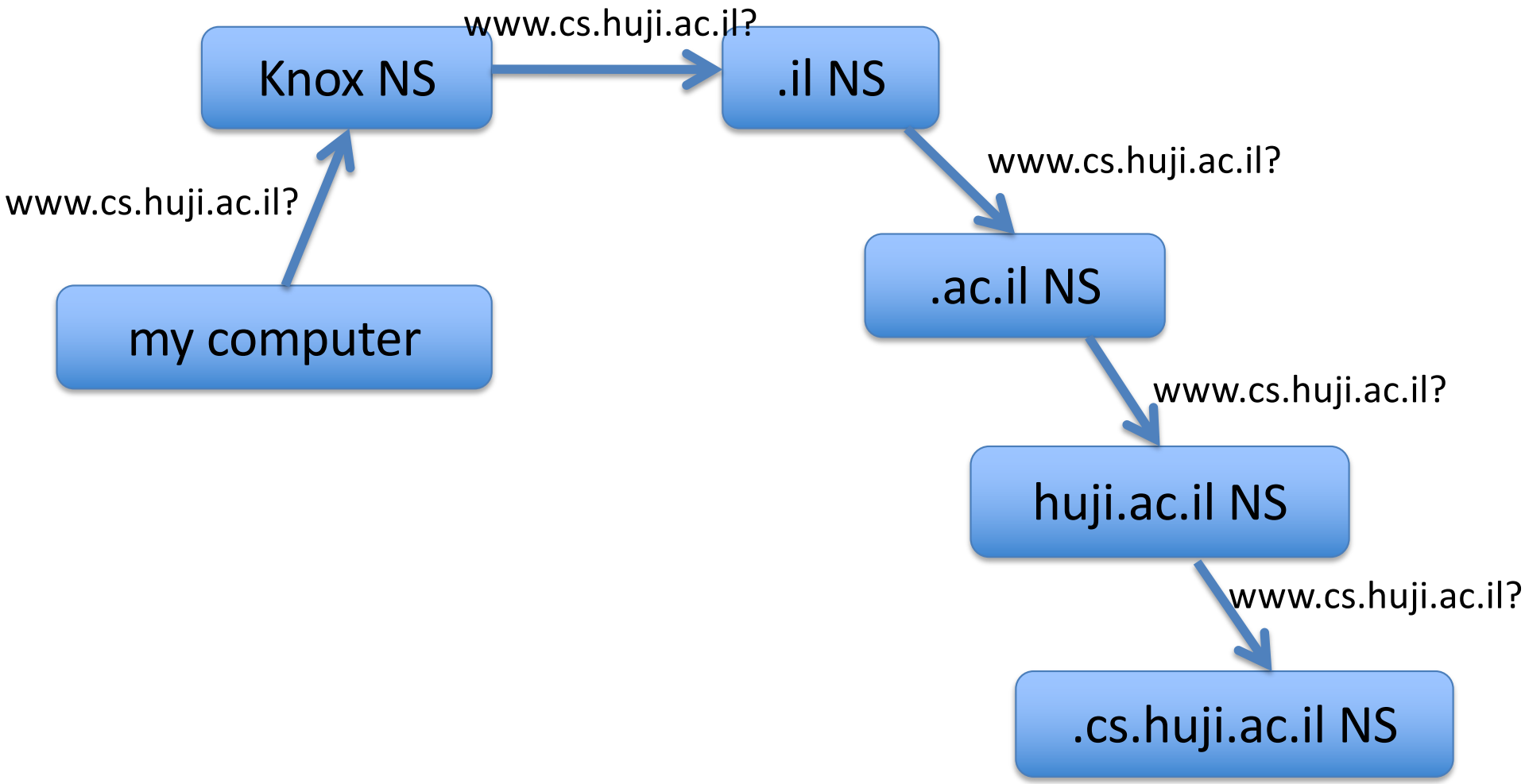

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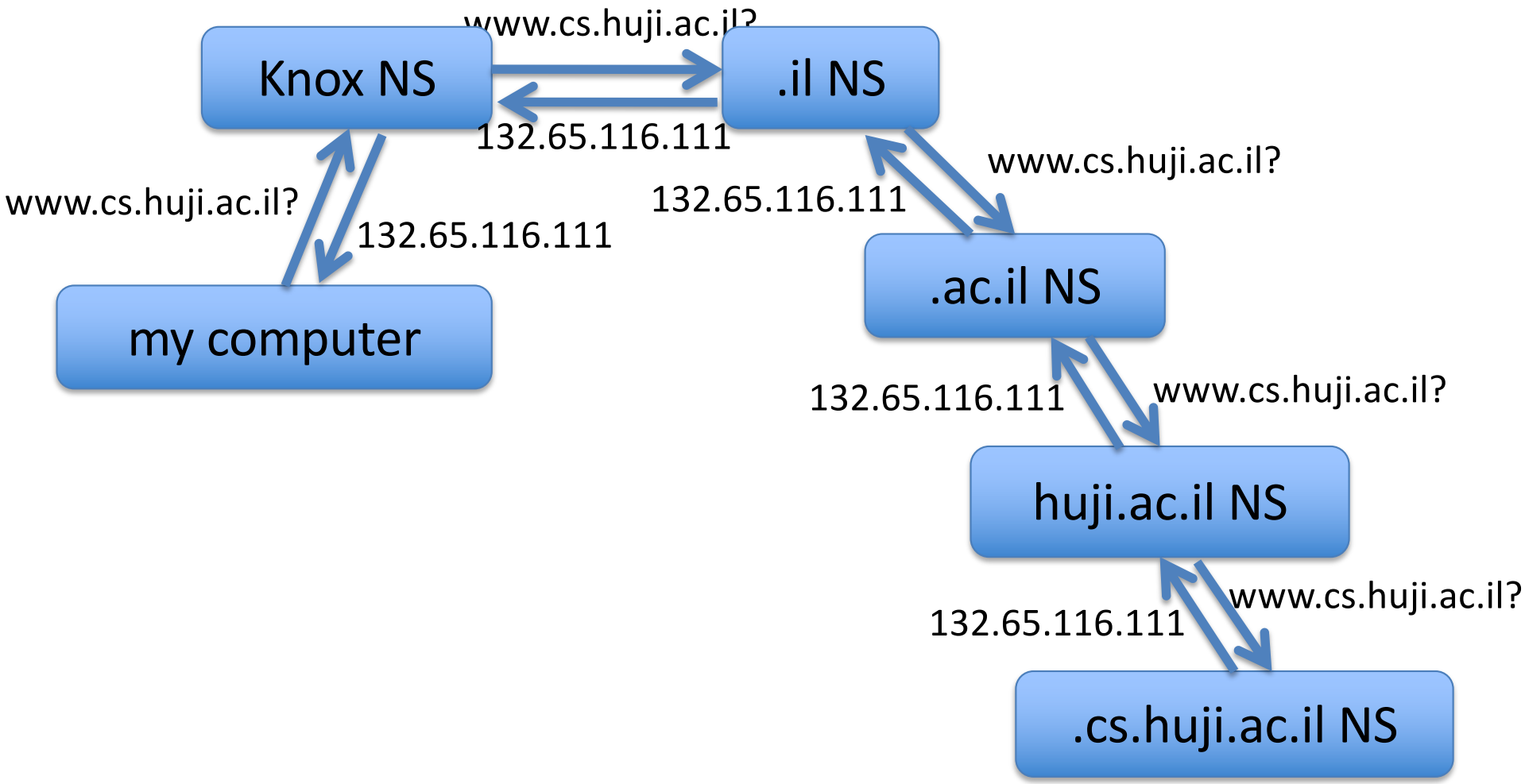

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A. 3
B. 4
C. 6
D. 8
E. Some other value

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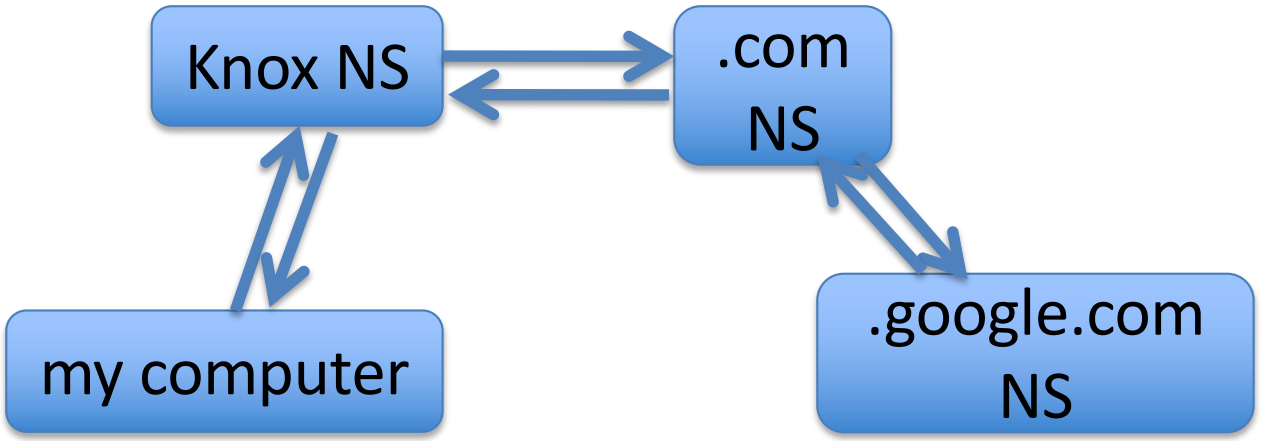

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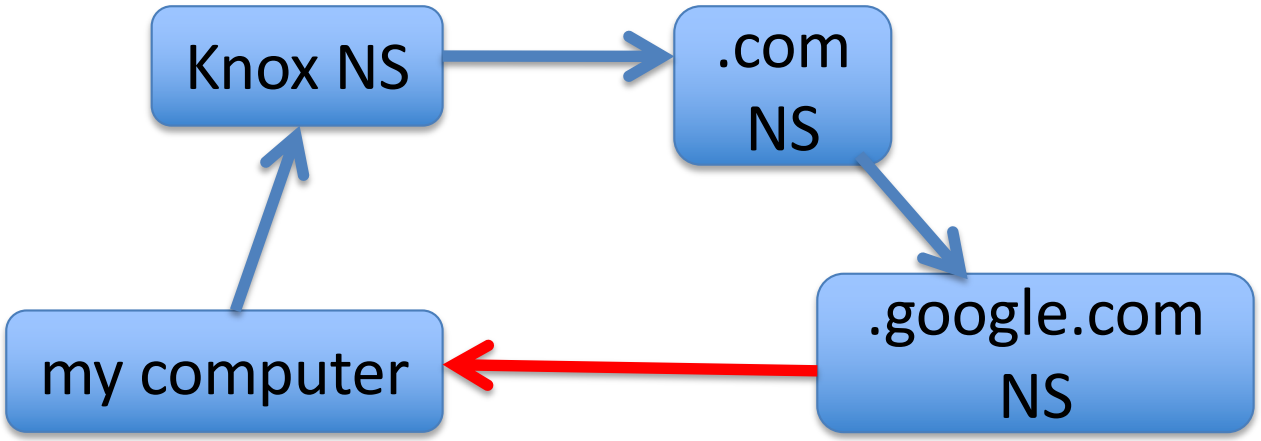

Why not just reply directly?

Reasons caching works well

- Some websites are disproportionately popular
- Users tend to view multiple pages from the same website
- Users tend to revisit websites they've recently visited

Cache poisoning

- Attacker “volunteers” IP address to the name server
- Clients going to that site (e.g. yourbank.com) are instead directed to the attacker’s server, which steals their information