

IP Addressing Exercises ANS

Lecture 6, Spring 2026

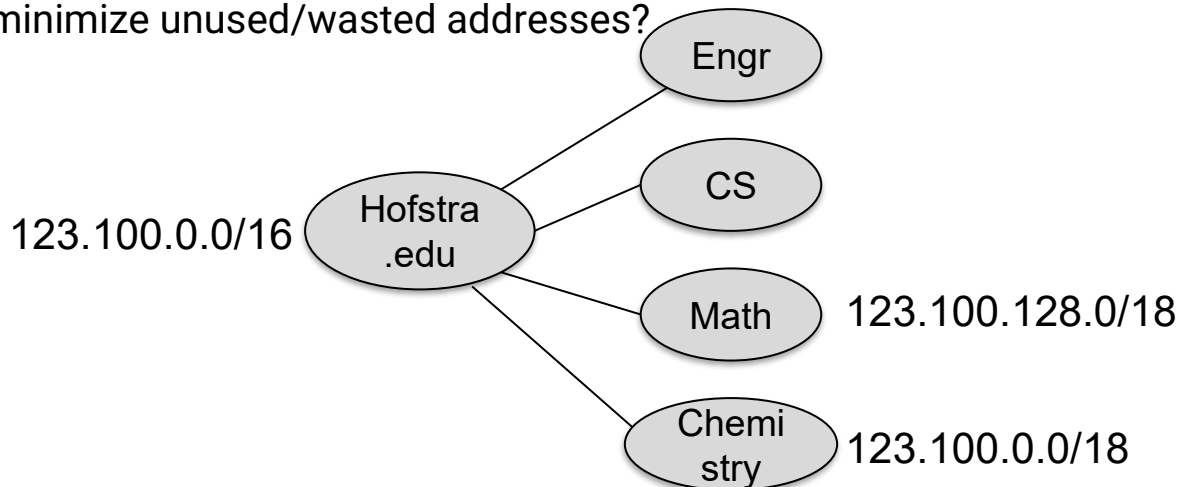
IP Addressing

- Hierarchical Addressing
- Assigning Addresses
- Writing Addresses
- Aggregating Routes
- IPv6 Changes

Q. IP Addressing

Suppose hofstra.edu is the Provider AS for Engineering (Engr), CS, Math, and Chemistry, and needs to assign IPv4 addresses to them. Assume that the CIDR (Classless InterDomain Routing) addressing scheme is used, and that the domain hofstra.edu has the 123.100.0.0/16 prefix reserved.

- 1) Which addresses are included in the Math department's prefix? How many addresses are in this range?
- 2) 123.100.192.0/18 is reserved for Engr and CS. Assign equal halves of this address space to the two departments.
- 3) You want to start a new department of AI, and assign it an unused address range. You foresee that no more than 50 people will enroll. Assuming one address per person, what prefix would you assign to it to minimize unused/wasted addresses?



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1) Which addresses are included in the Math department's prefix 123.100.128.0/18?
How many addresses are in this range?

ANS: Math's address prefix 123.100.128.0/18, in binary (with the prefix bolded), is:

01111011 . 01100100 . 10 000000 . 00000000

The range of allowed addresses is thus:

01111011 . 01100100 . 10 000000 . 00000000 ...

01111011 . 01100100 . 10 111111 . 11111111

which in decimal is [123.100.**128**.0, 123.100.**191**.255].

If Math's prefix is 18 bits long, and IPv4 addresses are 32 bits long, then there are $32 - 18 = 14$ bits available to uniquely identify hosts, so this prefix contains 2^{14} addresses.

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2) 123.100.192.0/18 is reserved for Engr and CS. Assign equal halves of this address space to the two departments.

ANS: This address space has the prefix:

01111011 . 01100100 . 11 000000 . 00000000

To divide this /18 prefix in two, we can assign one /19 prefix to each department:

Engr: **01111011 . 01100100 . 110 00000** . 00000000 123.100.**192**.0/19

CS: **01111011 . 01100100 . 111 00000** . 00000000 123.100.**224**.0/19 (or vice versa)

3) You want to start a new department of AI, and assign it an unused address range. You foresee that no more than 50 people will enroll. Assuming one address per person, what prefix would you assign to it to minimize unused/wasted addresses?

ANS: A 64-address prefix will hold enough addresses for AI, which requires 6 bits for hosts with range of $2^6 = 64$ addresses. Thus, we need a $(32 - 6) = /26$ prefix. We have to assign a prefix that is currently unclaimed. If Math claimed 123.100.128.0/18, Engr/CS claimed 123.100.192.0/18, and Chemistry claimed 123.100.0.0/18, then only the 123.100.64.0/18 prefix is unclaimed. Hence AI should claim 123.100.64.0/26. In summary:

Math: 123.100.128.0/18 == **01111011 . 01100100 . 10 000000 . 00000000**

Engr/CS: 123.100.192.0/18 == **01111011 . 01100100 . 11 000000 . 00000000**

Chemistry: 123.100.0.0/18 == **01111011 . 01100100 . 00 000000 . 00000000**

AI: 123.100.64.0/26 == **01111011 . 01100100 . 01 000000 . 00000000**