

# CS 716: Introduction to communication networks

- 4<sup>th</sup> class; 3<sup>rd</sup> Aug 2011

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# Clicker Question

1. Which of the following best describes the concept of "protocol"?

A) A protocol is a connection for peer layers of a network to communicate with each other.

B) A protocol is a set of rules which govern the syntax and semantics of communication between corresponding layers in a network.

C) A protocol defines standards that determine the format and interpretation of data in a network.

D) A protocol is a set of services that one layer uses from layers below it.

- Choose one of the options below.

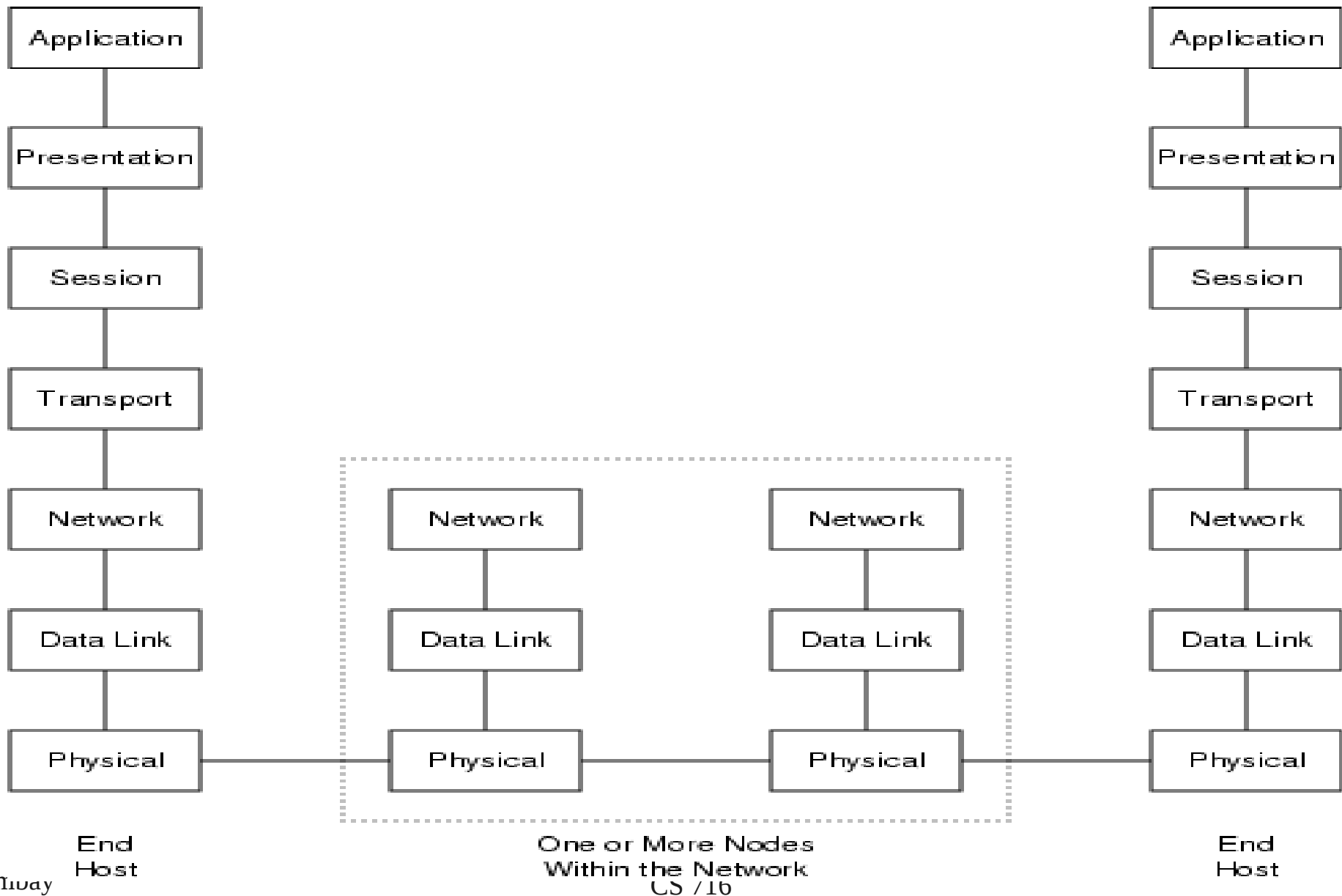
1. All of the above

2. A), B) and C)

3. B) and C)

4. D) only

# Technical slide on layering



# Today's class

- Importance of layering in the networking context: Questions below to help you think about it.
  - What is the purpose of such a layering mechanism?
  - What will happen if we do not have it?
  - What are the pros and cons?
  - In what situations should we use layering?
  - In what situations should we not use layering?
  - Any other questions..?

# Activity: Debate

- Class divided into 2 sets of groups A and B.
- Groups in set A should come up with answers to:
  - What are the advantages of using layering?
  - When should we use layering? Give examples.
- Groups in set B should come up with answers to:
  - What are the disadvantages of using layering?
  - When should we not use layering? Give examples.
- 5 minutes to discuss within groups, then debate!

# Analysis of answers

- List down answers
- Categorize the answers/situations into:
  - Presence of layering
    - Pros: Advantages gained due to layering.
    - Cons: Price paid for the above advantages (trade-off).
  - Absence of layering
    - Pros: Advantages gained due to \*not\* having layering.
    - Cons: Dis-advantages of \* not\* using layering.

# Some points from last year

- Layering allows us to do Divide and Conquer.
- Independent development of each layer possible.
- Reworking or upgradation is easy.
- Not having layering requires repeated building of same functionality.
- Abstraction of lower layer details, increases reliability.
- Layering has data and computation overheads –
  - header is required to be added (or removed) at each layer.
- Not layering is good for embedded systems - compact; high performance.
- Incorrect implementation can prove difficult to debug!
- .....

# Key Points regarding layering

- For using layering:
  - Pros: Abstraction, Managing complexity is easier.
  - Cons: Performance overhead (time taken and additional header size).
- For not using layering:
  - Pros: Suitable for 1-time activity on a 'small' scale.
  - Cons: When there is re-use or multiple choices.



# Activity: Think-Pair-Share

- Question:
  - Can you think of examples of other areas where you have seen some concept similar to layering being applied?
- Think - Think individually for 2 minutes.
- Pair - Discuss with your neighbour.
- Share - Discuss with entire class.
- Instructor: List down answers that come up.

# Some examples from last year

- Post-office
  - Chip design
  - Software design
  - Manufacturing
  - Any hierarchical organization
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- Note: Most of above are single stack. In order to find a two stack communication analogy, we need to look at entities having distribution mechanisms – Mumbai Dabbawalas!

# Clicker Question

A layer at one level on the sender side of a network communicates with layers at the \_\_\_\_\_ level on the receiver side.

1. Corresponding level

2. Higher level

3. Lower level

4. All levels

5. Either corresponding or higher levels but not lower levels

It is not sufficient to just pick an answer. You need to also think about how you will justify your answer!

# Reflection

- What did I learn in today's class?
- Each student to mention one point.
  
- Take-home questions:
  - What decides the number of layers?
  - When is it desirable for a layer communicate with layers other than its peer?