Week 1 – Introduction to Networking Continued

COMP nologies

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Recap: Protocol Hierarchies

- Example information flow supporting the virtual communication in layer 5

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Relationship of Services and Protocols

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Relationship of Services and Protocols

- **<u>Service = set of primitives that a layer provides to a layer above it</u>**
  - ❑ Provided through the interfaces between layers (service provider vs. service users)
  - ❑ Defines what operations the layer is prepared to perform on behalf of its us
  - ❑ Abstract: nothi   ns are implemented

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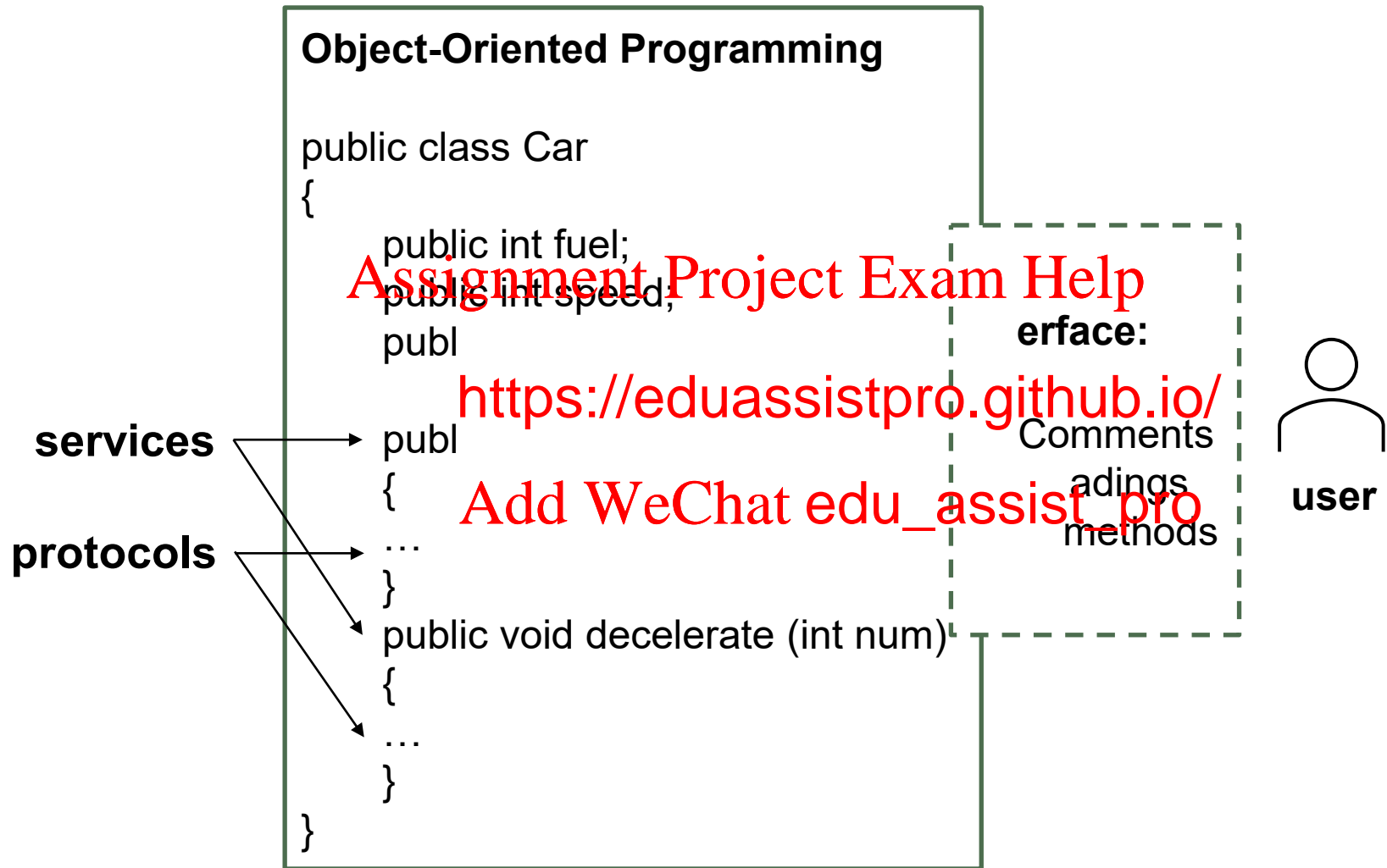Add WeChat edu_assist_pro

- **<u>Protocol = a set of rules governing the format and meaning of packets that are exchanged by peers within a layer</u>**
  - ❑ Packets sent between peer entities

Relationship of Services and Protocols

Object-Oriented Programming

```
public class Car
{
    public int fuel;
    public int speed;
    publ

    publ
    {
    …
    }
    public void decelerate (int num)
    {
    …
    }
}
```

services

protocols

erface:

Comments

adings

methods

user

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Reference Models

- The OSI Reference Model

- The TCP/IP Reference Model

- A Compari   IP

- A Critique   Protocols

- A Critique of the TCP/I   Model

Reference Model

■ Concepts and their relationship
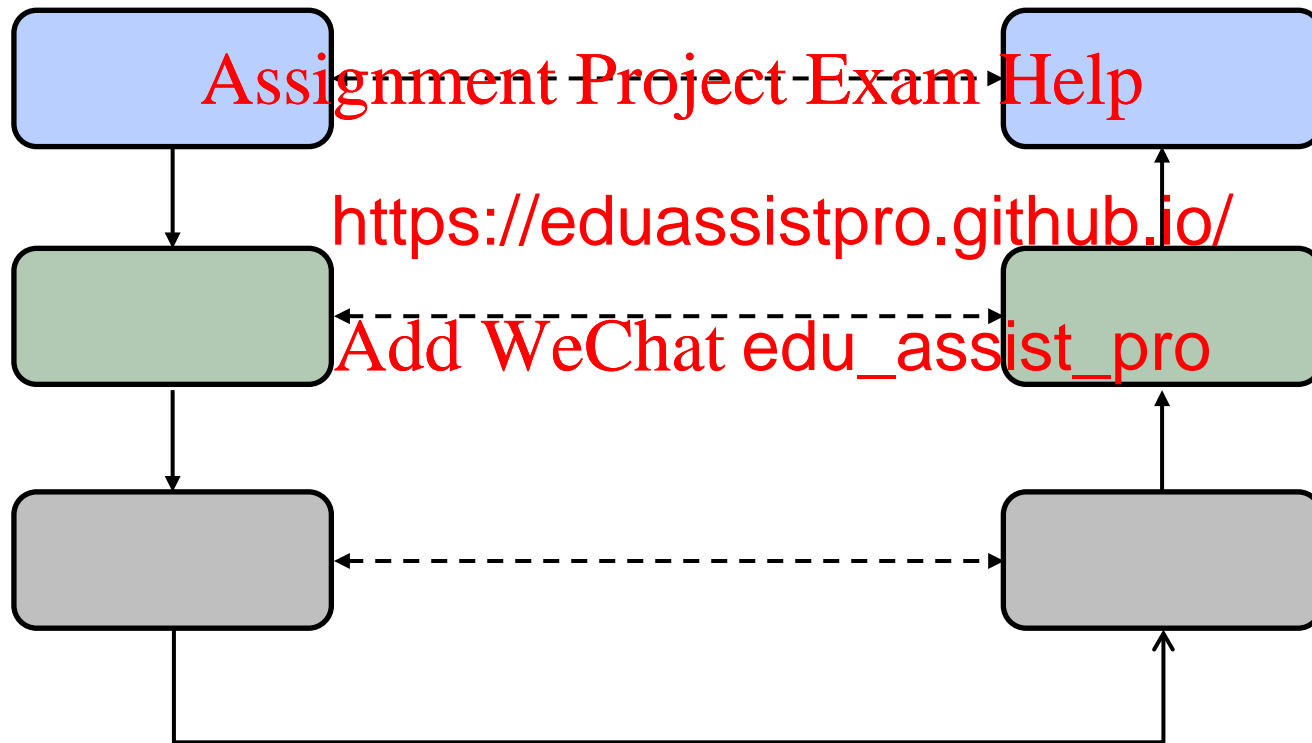
Why Do We Need a Reference Model?

- A reference model provides a **common baseline for the development** of many services and protocols by independent parties

- It's engineeri an **"abstract"** **reference model**, and corr mplementations are always required for valid ses

- Since networks are very complex systems, a reference model can serve to **simplify the design process**

OSI Reference Model

- Open Systems Interconnection (OSI)
- ISO, John Day (revised 1995)
- 7 Layers
- Layer division decisions

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cipled

OSI Layer Division Principles

1. A layer should be created where a **different abstraction** is needed.

2. Each layer should **perform a well-defined function.**

3. The layer boundaries should be chosen to **minimise the information f   es.**

4. The number o   **enough that** distinct functions need not to   together in the same layer out of necessity;   **enough that** the architecture does not become unwieldy.

5. The function of each layer should be chosen with a view toward defining **internationally standardised protocols.**

OSI Reference Model

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TCP/IP Reference Model

- Transmission Control Protocol/Internet Protocol

- Vint Cerf & Bob Kahn (1974)

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- 4 layers

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TCP/IP Reference Model (2)

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TCP/IP Reference Model (3)

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Comparing OSI and TCP/IP Models

- Different numbers of layers

- OSI distinguishes the following three concepts explicitly

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  - Services

  - Interfaces   https://eduassistpro.github.io/

  - Protocols   Add WeChat edu_assist_pro

- TCP/IP has successful p

A Critique of the OSI Model

Why OSI did not take over the world?

- Bad technology
- Bad implementations
- Bad timing
- Bad politics

A Critique of the OSI Model: Bad Timing

■ When is good timing for a standard?

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A Critique of the TCP/IP Model

Problems:

- Not a general model

- Service, interface, and protocol not distinguished

- Did not split k layers

- Minor protoc ed, hard to replace

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Hybrid Model
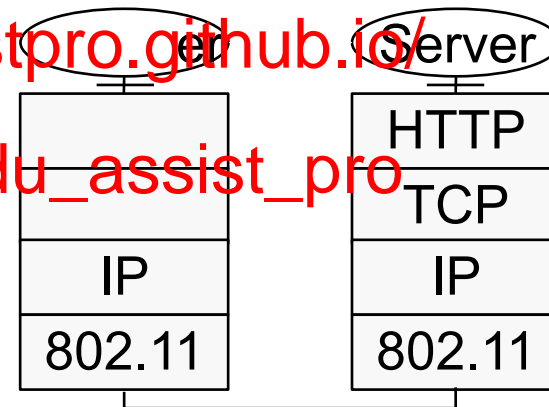
- The hybrid reference model to be used in this subject

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A typical network scenario

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Client	Server
	HTTP
	TCP
IP	IP
802.11	802.11

Origins of Internet: The ARPANET

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- **(a)** Structure of the telephone system.
- **(b)** Baran's proposed distributed switching system.

The ARPANET

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- Growth of the ARPANET (a) December 1969. (b) July 1970.
- (c) March 1971.   (d) April 1972.   (e) September 1972.

Architecture of the Internet

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Network Standardisation

Body	Area	Examples
ITU (International Telecommunication Union)	Telecommunications	ADSL MPEG4
IEEE (Institute of Electr Electronics Engineers)		Ethernet WiFi
IETF (Internet Engineering Task Force)	Internet	HTTP/1.1 DNS
W3C (The World Wide Web Consortium)	Web	HTML5 standard

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