

Part 1: Select a threshold concept and write the 'what students know', 'what they don't know', 'principles'.

List me all the threshold concepts for the course computer networks. Make a list only.

Here's a list of possible **threshold concepts** for a **Computer Networks** course:

1. **Layered Network Architecture (e.g., OSI & TCP/IP Models)**
2. **Encapsulation and Decapsulation of Data**
3. **IP Addressing and Subnetting**
4. **Routing vs. Switching**
5. **Flow Control and Congestion Control**
6. **Reliable vs. Unreliable Communication (TCP vs. UDP)**
7. **Error Detection and Correction**
8. **MAC Addressing and ARP**
9. **DNS and Name Resolution**
10. **Network Protocol Hierarchies and Interactions**
11. **End-to-End Principle**
12. **Client–Server vs. Peer-to-Peer Models**
13. **Packet Switching vs. Circuit Switching**
14. **Bandwidth, Latency, and Throughput Relationships**
15. **Network Security Fundamentals (Encryption, Authentication, Integrity)**
16. **Quality of Service (QoS)**
17. **Address Translation (NAT)**
18. **Port Numbers and Multiplexing/Demultiplexing**
19. **Link Layer vs. Network Layer Responsibilities**
20. **Control Plane vs. Data Plane in Networking**

List me all the working process of TCP and UDP. Just make a list.

Working Process of TCP (Transmission Control Protocol)

1. Connection establishment using the **Three-Way Handshake**
2. Data segmentation into packets
3. Sequence numbering of packets
4. Reliable delivery using **ACKs (Acknowledgements)**
5. Retransmission of lost packets

6. Flow control using **Sliding Window**
7. Congestion control (e.g., slow start, congestion avoidance)
8. In-order packet reassembly at the receiver
9. Connection termination using **Four-Way Handshake**

Working Process of UDP (User Datagram Protocol)

1. No connection establishment (connectionless)
2. Data encapsulation into datagrams
3. Use of source and destination port numbers for delivery
4. Transmission without reliability checks
5. No acknowledgements or retransmissions
6. Packets may arrive out of order or be lost
7. Faster data transfer due to minimal overhead
8. Suitable for real-time applications (e.g., video streaming, VoIP)

Design me a case study for the concept TCP and UDP. My students already know 3-way hand shake, sliding window navigate, automatic retransmission. My students don't know about Data segmentation into packets, Sequence numbering of packets, Retransmission of lost packets , Use of source and destination port numbers for delivery, Packets may arrive out of order or be lost. Use the principles: flow control, error control, congestion control, Error Detection. Design the case study which is relevant to the current generation students. Don't use any technical terms in the case study. Use Finks Taxonomy.

Case Study:

Title: *The Music Festival Live Stream*

Background Story

A popular music festival is being broadcast online. There are **two ways** for fans to enjoy it:

1. **VIP Pass** – You get the full, high-quality recording, every second in the right order, no missing parts.
2. **Free Live Stream** – You get the show instantly, but sometimes it skips, repeats, or arrives a bit out of order.

The festival team must decide **how to send** the performance to people all over the world.

What Students Already Understand

From earlier lessons, students already know:

- How the *VIP pass* system requires a polite "hello" and "goodbye" before and after sending the show (3-way handshake).
 - How the show is sent in small chunks so the fans' devices don't get overloaded (sliding window).
 - If a part of the show doesn't reach, it is sent again automatically (automatic retransmission).
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What Students Don't Yet Know (To be addressed in the case)

- The show is **split into many small scenes** before being sent (data segmentation).
 - Each scene has a **scene number** so they can be played in the right order (sequence numbering).
 - If a scene goes missing, it is sent again (retransmission).
 - The festival knows **which fan** and **which seat** the show should be sent to (source & destination "addressing").
 - In the free stream, scenes might **arrive in the wrong order** or **be skipped entirely**.
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Principles Embedded in the Case

1. **Flow Control** – Making sure the fan's internet connection doesn't get flooded with too much at once.
 2. **Error Control** – Making sure missing scenes get sent again.
 3. **Congestion Control** – Adjusting the speed if too many fans are watching at the same time.
 4. **Error Detection** – Spotting when a scene is damaged or incomplete.
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Case Study Narrative (Class Activity)

The festival organizers have two options for sending the show:

- **VIP Pass Method (TCP-style)**
 - Before sending, they greet the fan politely to confirm they are ready.
 - They split the show into scenes, number them, and send them in small bursts.
 - If a scene is missing or damaged, it is resent until perfect.
 - The fan gets the show in perfect order, even if it takes a bit longer.
- **Free Live Stream Method (UDP-style)**
 - No greeting or goodbye—just start playing the show right away.
 - Scenes are sent instantly, without checking if they arrive or in what order.
 - Some scenes might skip or be slightly messy, but the fan experiences the performance in real time.

Students are then **put in the role** of the festival team:

- Decide which method to use for **different fan needs**:
 1. A fan making a highlight reel for a documentary.
 2. A fan watching live on their phone while commuting.
 3. A fan in a country with unstable internet.
 - Predict the problems each fan might face with each method.
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Fink's Taxonomy Mapping

Dimension	Application in Case
Foundational Knowledge	Students recall known concepts (handshake, sliding window, retransmission) and connect them to new concepts (splitting scenes, numbering, addressing).
Application	Students choose the right method for different fans, applying the principles of flow, error, congestion control.
Integration	Connects online streaming experiences with networking concepts.
Human Dimension	Students see how design choices affect <i>real people's experiences</i> .
Caring	Students appreciate why different communication methods matter for fairness, reliability, and speed.
Learning How to Learn	Students learn how to map familiar real-world situations to unseen technical processes.

rebuild the case study using **SOLO taxonomy**.

Case Study:

Title: *The Music Festival Live Stream*

Background Story

A popular music festival is being enjoyed worldwide in **two different ways**:

1. **VIP Pass** – You get the entire show in perfect quality, every part in order, nothing missing.
2. **Free Live Stream** – You watch instantly, but sometimes parts skip, repeat, or arrive out of order.

The festival team must choose the **best method** for different fans' needs.

SOLO Taxonomy Application

1. Prestructural (No clear understanding yet)

Students might only know that videos can be sent online but not how this works in detail.
Example thought: *"We just press play and it works."*

2. Unistructural (One relevant idea)

Students recall one thing they've learned—like the greeting before the show (3-way handshake) or sending parts again if missing.
Example thought: *"I know they say hello before sending, and they can resend if something's missing."*

3. Multistructural (Several relevant ideas, but not connected)

Students can list separate facts:

- The show is split into small parts (scenes).
 - Scenes have numbers.
 - Some parts might skip in the free stream.
 - Each fan has an address so they can get their copy.
- Example thought: *"They split the show into scenes, number them, and send them to people, but in free streams, some might be missing."*
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4. Relational (Ideas connected into a coherent whole)

Students link the facts together to explain *why* the two methods work differently:

- VIP Pass: Greet first, split into scenes, number them, check for missing parts, resend if needed, and play in correct order—slower but perfect.
 - Free Live: Start instantly, send scenes without checking, some parts may be missing or in the wrong order—faster but imperfect.
- Example thought: *"VIP is slow but accurate because they check and resend, Free Live is fast but can be messy because they don't check."*
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5. Extended Abstract (Generalizing beyond the case)

Students can take the principle and apply it to other real-world communication:

- Choosing between speed and accuracy for **voice calls, online gaming, or live sports streaming**.
- Predicting which method works best in low internet speed situations.
Example thought: *"This choice between perfect but slower and instant but imperfect applies to other online things, like gaming or video calls."*

Principles Embedded in the Case

- **Flow Control** – Don't overload the fan's connection.
- **Error Control** – Resend missing scenes for the VIP pass.
- **Congestion Control** – Adjust speed if too many fans are watching.
- **Error Detection** – Spot damaged or missing scenes.

I want to test if my students have understood the case study and concept well. Give me 3 questions to test. Use Blooms level.

Here are **3 questions** aligned with **Bloom's Taxonomy** to test understanding of the TCP/UDP case study:

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1. **Understanding (Level 2)**
In your own words, explain why the VIP Pass method delivers the full show perfectly while the Free Live method may skip or reorder parts.
 2. **Applying (Level 3)**
Given an online multiplayer game, decide whether the VIP Pass or Free Live method would be better. Justify your choice using the principles from the case study.
 3. **Evaluating (Level 5)**
A fan has slow internet but wants to watch a sports final live. Evaluate the pros and cons of both methods and recommend the most suitable option.

Part 2: Comparison Table:

A comparison table **showing how your TCP/UDP case study assessment aligns differently with Bloom's Taxonomy, Fink's Significant Learning, and SOLO Taxonomy.**

Aspect	Bloom's Taxonomy	Fink's Significant Learning	SOLO Taxonomy
Purpose	Classifies learning objectives by cognitive complexity (from remembering to creating).	Focuses on types of significant learning that connect knowledge, skills, and attitudes.	Describes depth of understanding from surface to deep and extended.
Focus	<i>What kind</i> of thinking students are doing.	<i>What kind</i> of learning experience students have.	<i>How well</i> students understand and connect ideas.

Aspect	Bloom's Taxonomy	Fink's Significant Learning	SOLO Taxonomy
Levels/Stages	1. Remembering2. Understanding3. Applying4. Analyzing5. Evaluating6. Creating	1. Foundational Knowledge2. Application3. Integration4. Human Dimension5. Caring6. Learning How to Learn	1. Prestructural2. Unistructural3. Multistructural4. Relational5. Extended Abstract
How It Applies to Case Study	Questions test recall of story details (Understanding), applying principles to scenarios (Applying), and making justified choices (Evaluating).	The case links streaming to networking (Integration), relates to students' own experiences (Human Dimension), and motivates appreciation of design trade-offs (Caring).	Shows student progression from "just pressing play" (Prestructural) to applying trade-offs in new contexts like gaming (Extended Abstract).
Assessment Role	Guides question writing for testing specific skills.	Guides learning activity design to ensure meaningful engagement.	Guides evaluation of learning depth and how connected their understanding is.
Strength in This Case	Ensures cognitive challenge in questions.	Ensures the case study is relevant and personally engaging.	Tracks how far students move from surface recall to abstract application.

Part 3: Generate the reflection questions for evaluation and write/ map to suitable learning outcomes.

Question	Bloom's Taxonomy	Fink's Significant Learning	SOLO Taxonomy
1. <i>In your own words, explain why the VIP Pass method delivers the full show perfectly while the</i>	Understanding – Explain ideas and concepts.	Foundational Knowledge – Recall key facts from the case study and	Multistructural – Recognizes several relevant features but may not yet integrate them.

Question	Bloom's Taxonomy	Fink's Significant Learning	SOLO Taxonomy
<i>Free Live method may skip or reorder parts.</i>		connect them to the analogy.	
<i>2. Given an online multiplayer game, decide whether the VIP Pass or Free Live method would be better. Justify your choice using the principles from the case study.</i>	Applying – Use knowledge in a new situation.	Application & Integration – Apply concepts to a real-life gaming scenario, integrating with prior knowledge.	Relational – Links different ideas together to justify the decision.
<i>3. A fan has slow internet but wants to watch a sports final live. Evaluate the pros and cons of both methods and recommend the most suitable option.</i>	Evaluating – Make judgments based on criteria.	Integration & Human Dimension – Weigh trade-offs considering human needs and preferences.	Extended Abstract – Applies principles beyond the original scenario to make a reasoned recommendation.