TELCOM2310: Application of Networks Project

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Link to recorded presentation: https://pitt-my.sharepoint.com/:v:/g/personal/prr56_pitt_edu/EZaM-GgEiNdOjmmyf7iGhOMB91W26nQoGaGOA9Be3c-prg?e=3rnrez

RTP VS RTCP

- Real time Protocol (RTP)
- Real time Control Protocol (RTCP)

RTP (Real Time Protocol)

- RTP (Real-time Protocol) is a network standard. Its main objective is to transmit audio or video data that is optimized for a consistent delivery for live data. RTP is used in internet telephony and, voice over IP and video calls such as Microsoft Teams, Facetime, What's App. This can also be used in multicast conference calls.

How does RTP work?

- RTP as stated in earlier slide is intended for sending live or real-time content over the internet. RTP mostly uses UDP packets. Some background network data is sent over the internet in packets. The way packets are delivered in simple terms, data packets are tagged and divided in smaller packets and sent out. Some packets might arrive a little after some packets might not even arrive. So, we can start to see a problem here if we are live streaming. This will not work if we are streaming any live content. This is where RTP comes in. RTP fixes this, it takes packets by favoring quick delivery basically like if we were to prioritize this special data ensuring the best effort possible to keep live stream from dropping or buffering.

RTCP (Real Time Control Protocol)

- RTCP Real time control protocol is known as the companion protocol if RTP real time protocol. RTCP allows senders and receivers to transfer a sequence of reports to each other. These reports contain supplementary information about the data being transferred and the performance or the network. RTCP are also encapsulated inside UDP packet for the transmission and are sent according to protocol number which is greater than the port number of the referenced RTP stream.

RTP & RTCP come Together

- RTP helps in achieving interoperable environment. The contrast RTCP controls the performance of the data exchange by providing feedbacks.

What services should an RTP provide?

Real-time protocols are used to facilitate communication between devices or systems in real-time.

Services provided by RTP:

- Synchronization
  - Real-time systems need to synchronize their clocks so that they can communicate effectively with one another.
  - This is important because when two systems communicate, they need to know exactly when a message was sent and received, down to the millisecond, in order to make decisions and take actions based on that information.
- Prioritization
  - Real-time systems often handle time-sensitive data, such as audio or video streams, which need to be given priority over other types of data.
  - Real-time protocols ensure that these time-sensitive data packets are given priority over less critical data, such as emails or file transfers.
  - This ensures that the most important data is delivered as quickly and reliably as possible.
- Error detection and Correction
  - Real-time communication can be sensitive to errors, and even small errors can cause disruptions or distortions in the data.
  - Real-time protocols use various methods to detect and correct errors, such as checksums, error correction codes, and retransmission of lost data packets.
  - This helps ensure that the data is accurate and reliable.

What services should an RTP provide?

- Flow control
  - Ensures data is transmitted at a rate that the receiving system can handle.
  - Real-time protocols use various techniques, such as buffering or pacing, to regulate the flow of data to prevent overload or underutilization of system resources.
  - This helps to ensure that data is transmitted at a consistent and appropriate rate.
- Congestion control
  - Used to prevent network congestion that can occur when too much data is transmitted at once.
  - Real-time protocols use various algorithms to detect and avoid congestion by adjusting the rate of data transmission or by notifying the sender to slow down or stop sending data temporarily.
  - This helps to ensure that real-time communication remains efficient and reliable.
- Security Services
  - Protects data from unauthorized access or tampering.
  - Real-time communication often involves sensitive or confidential data, and it is important to ensure that this data is transmitted securely.
  - Real-time protocols use various security mechanisms, such as encryption or authentication, to protect data from interception or modification by unauthorized parties.

By providing these services, real-time protocols enable devices and systems to communicate in real-time without delay, ensuring that critical data is delivered quickly and accurately.

How do RTPs fit into the TCP/IP Protocol Stack?

RTP (Real-time Transport Protocol) is a protocol that is used for transmitting audio and video data over the internet. It is an important part of the TCP/IP protocol stack, which is a collection of communication protocols used for transmitting data over the internet.

The TCP/IP protocol stack has four layers:

- Application layer
- Transport layer
- Network layer
- Data link layer.

RTP fits into the transport layer, which is responsible for transmitting data between two devices on the internet.

In the TCP/IP protocol stack, the transport layer has two main protocols:

- TCP, and
- UDP.

How do RTPs fit into the TCP/IP Protocol Stack?

RTP is built on top of UDP, and it is used for transmitting real-time data, such as audio and video streams.

RTP provides features that are essential for transmitting real-time data over the internet. For example:

- It provides timestamping, which allows the receiver to reconstruct the timing of the data that was transmitted.
- This is important because real-time data needs to be played back at the right speed to avoid issues such as stuttering or delays.

RTP also provides a mechanism for transmitting metadata along with the audio or video data. This metadata can include information such as the format of the data, the source of the data, and other information that is needed to properly decode the data.

In summary, RTP is a protocol that is used for transmitting real-time audio and video data over the internet. It fits into the transport layer of the TCP/IP protocol stack and is built on top of UDP. RTP provides important features that are essential for transmitting real-time data, such as timestamping and metadata transmission.

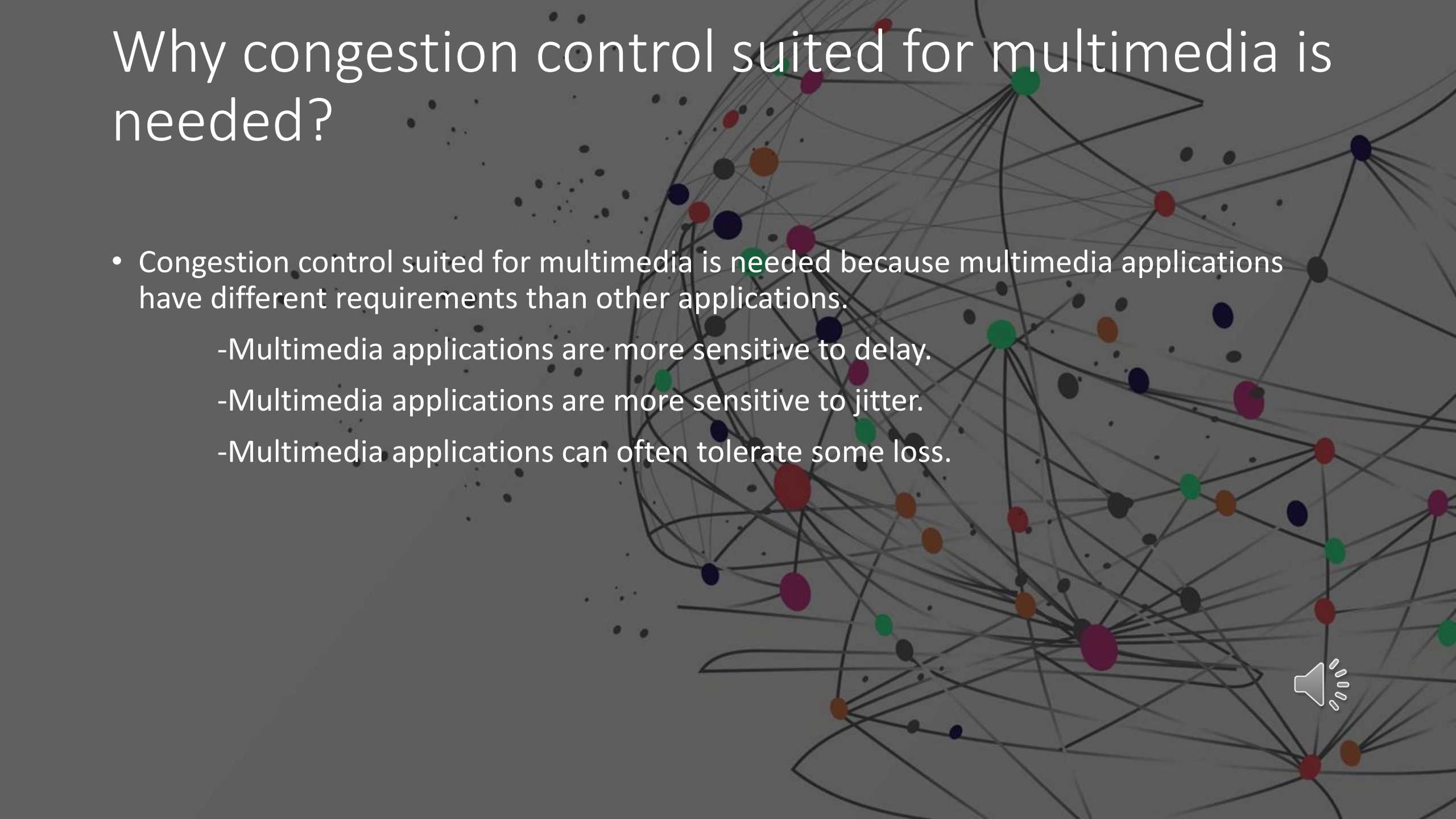
Why congestion control suited for multimedia is needed?

- Congestion control suited for multimedia is needed because multimedia applications have different requirements than other applications.

  -Multimedia applications are more sensitive to delay.

  -Multimedia applications are more sensitive to jitter.

  -Multimedia applications can often tolerate some loss.



How congestion control suited for multimedia is different from other methods

- Traditional congestion control methods, such as TCP, are not well-suited for multimedia applications because they focus on reliability and in-order delivery, which are not as important for multimedia applications.
- Traditional congestion control methods, such as TCP, work by using a congestion window, which is a limit on the amount of data that can be sent at any one time.
- Congestion control in RTP is implemented by the sender of the RTP data. The sender uses a congestion control algorithm to determine the rate at which it should send data.
- The congestion control algorithm uses feedback from the network to determine the current network conditions. The feedback can be in the form of packet loss, delay, or Explicit Congestion Notification (ECN).
- Based on the feedback, the congestion control algorithm adjusts the rate at which the sender sends data.

DCCP (Datagram Congestion Control Protocol

- DCCP is a transport-layer protocol that provides congestion control for unreliable datagrams.

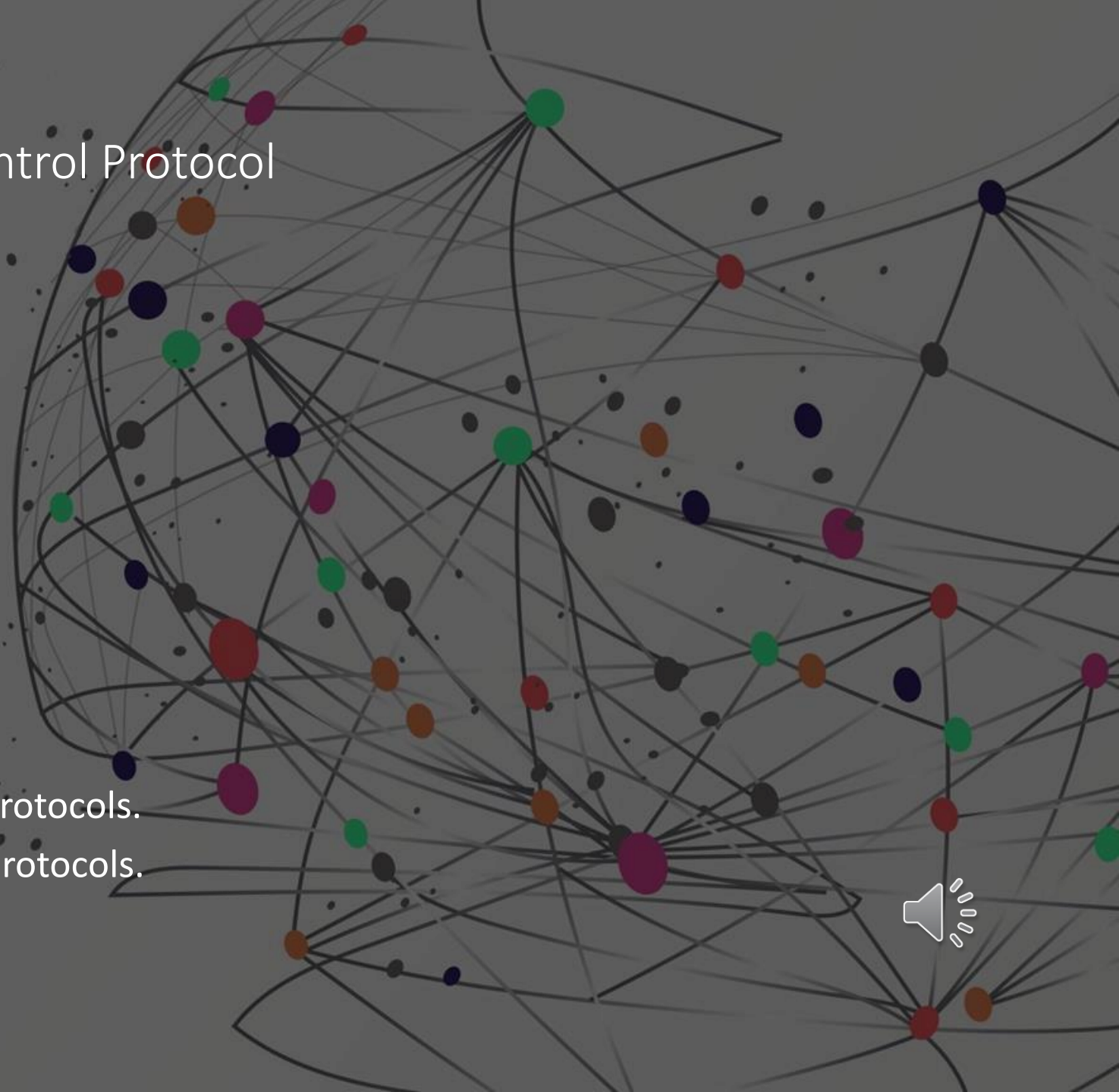
Benefits of using DCCP :
- DCCP is suitable for applications that transfer fairly large amounts of data, but can benefit from control over the tradeoff between timeliness and reliability.

Different features of DCCP :
- DCCP features include reliable connection setup, teardown, Explicit Congestion Notification (ECN), congestion control, and feature negotiation.

Examples of applications that use DCCP :

- Applications that use DCCP include streaming media, online gaming, and VoIP.

DCCP (Datagram Congestion Control Protocol



Advantages and disadvantages of DCCP:

Advantages of DCCP include:

- It is a reliable protocol.
- It is a congestion-controlled protocol.
- It is a feature-rich protocol.

Disadvantages of DCCP include:

- It is a complex protocol.
- It is not as widely supported as other protocols.
- It is not as well-documented as other protocols.

Thank You!