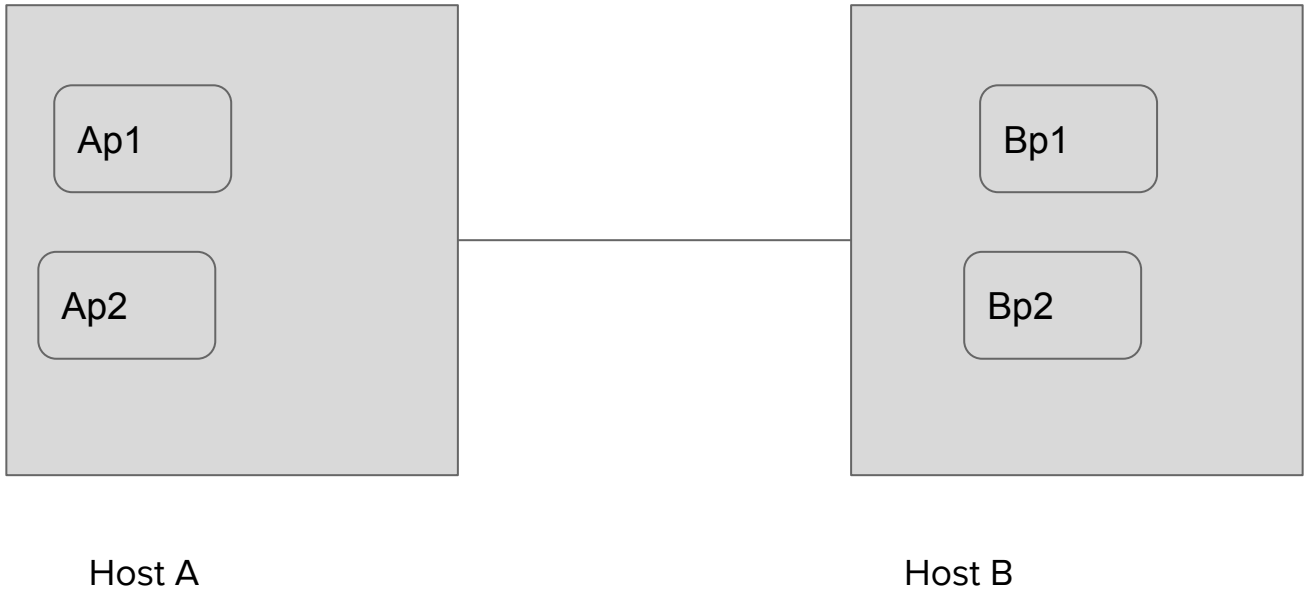
Lection 06: UDP

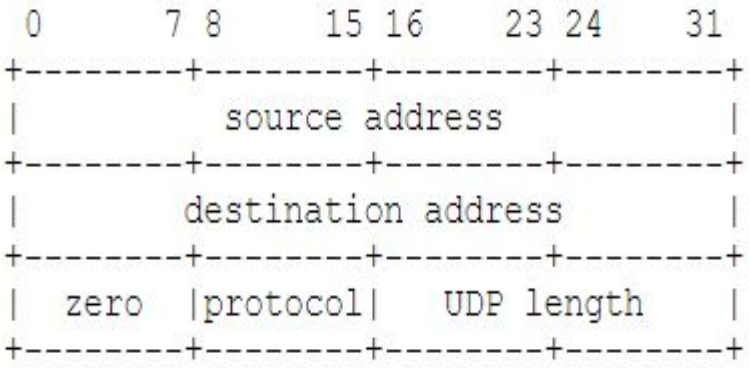
v.2022.10.26

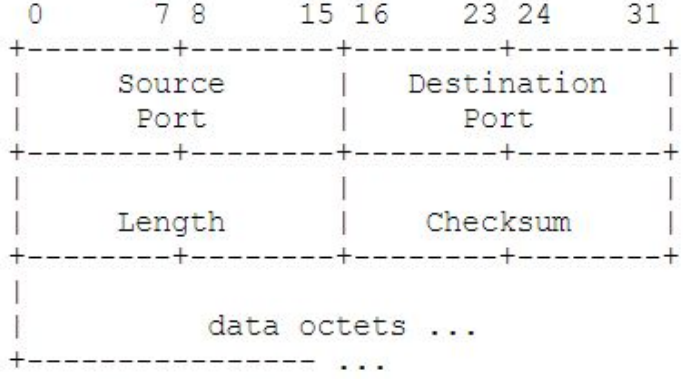
A to B



UDP

This protocol provides a procedure for application programs to send messages to other programs with a minimum of protocol mechanism. The protocol is transaction oriented, and delivery and duplicate protection are not guaranteed. Applications requiring ordered reliable delivery of streams of data should use the Transmission Control Protocol (TCP)

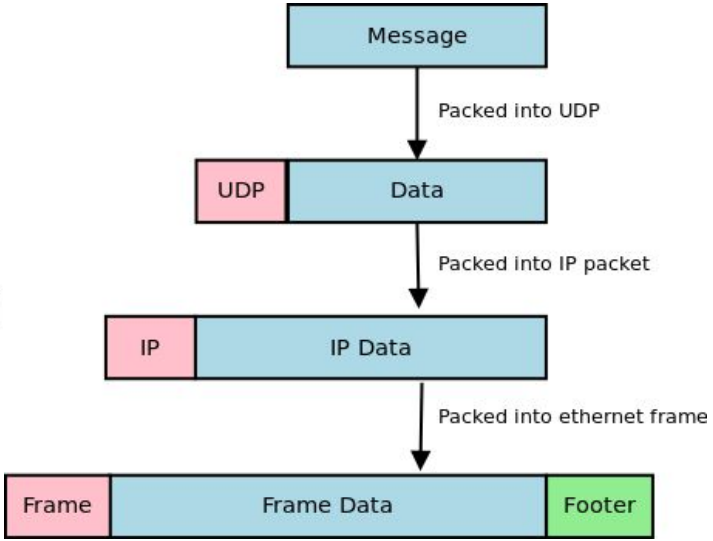




User Datagram Header Format

UDP

- Протокол транспортного уровня
- Работает поверх IP
- Предназначен для передачи данных между процессами на разных сетевых устройствах (или на одном и том же)
- Не требует установки соединения
- Не гарантирует доставку сообщений
- Описан в RFC 768



UDP like

- **UDP Lite**

  проверка контрольной суммы только для части пакета. Для данных, где повреждение части данных не проблема

- **другие**

  подтверждение пакетов, контроль потока данных, повторная отправка, много чего еще ...

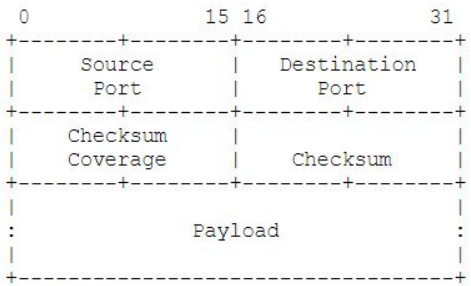


Figure 1: UDP-Lite Header Format

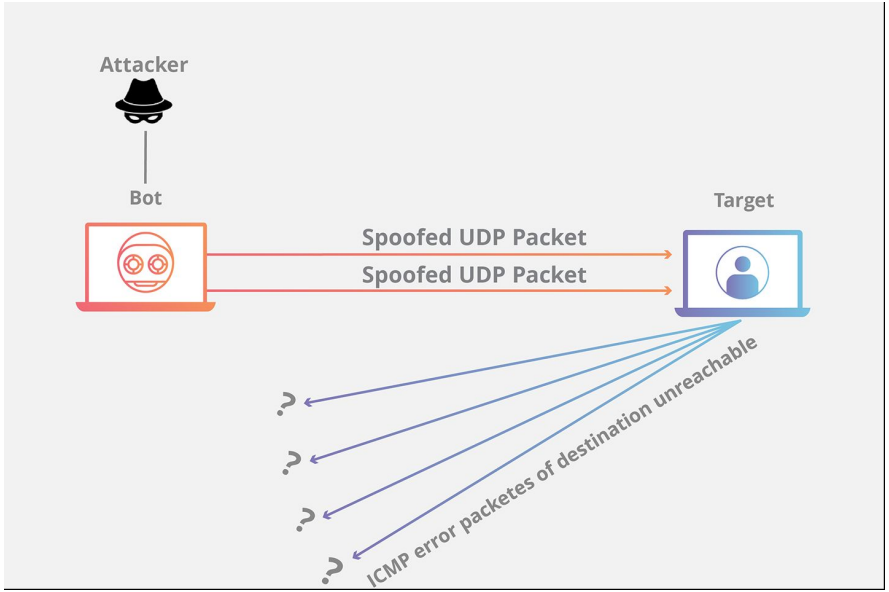
Protocol Name	URL	License	Available As	Commercial Pricing	Engineer Grade
ENet	http://enet.bespin.org	Freeware	Source or Compiled DLL (Windows)	Free	Software Developer
UDP Data Transfer (UDT)	http://udt.sourceforge.net	BSD/LGPL	Source (open)	Free (BSD)	Software Developer
Stream Control Transmission Protocol (SCTP)	http://tools.ietf.org/html/rfc3286 www.sctp.org	Typically implementations seem to be BSD	Found in recent OS network stacks	Free (BSD)	System Integrator/ Software Developer
UDP-Lite	www.ietf.org/rfc/rfc3828.txt	Varies with implementation: DIY = royalty-free	Found in recent OS network stacks	Free (Open Standard—although not clear if implementations have specific licensing)	Software Developer
Datagram Congestion Control Protocol CCP	http://tools.ietf.org/html/rfc4340	Varies with implementation: DIY = royalty-free	Can be found in some recent OS network stacks (Linux 2.6.14) but not widely supported	Free (Open Standard—although not clear if implementations have specific licensing)	Software Developer
fasp (Aspera)	http://asperasoft.com	Commercial License	Browser Plug-In/Server Software	POA	System Integrator
RelayCaster Streaming Protocol (RCSP—Motama)	www.motama.com/relaycaster.html	Commercial License	19" Appliance or Server software—Model of Software client available under license	POA	System Integrator
ZiXi	www.zixi.com	Commercial License	Various software products: main ones are "Feeder," "Receiver," and "Broadcaster"	POA	System Integrator
FileCatalyst	www.filecatalyst.com	Commercial License	Software client server	POA	System Integrator/ Desktop User
Mass Transit HP v7 (Group Logic)	http://udptcp.org	Commercial License	Software client server	POA	System Integrator/ Desktop User

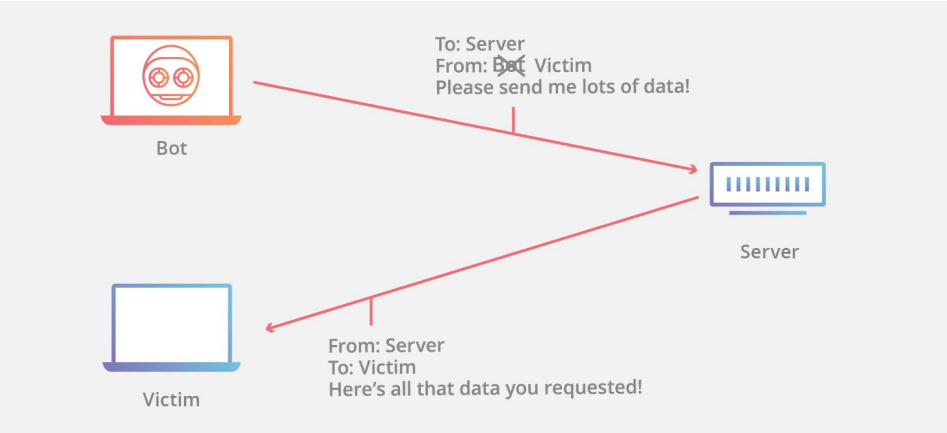
UDP Congestion

Because UDP itself provides no congestion control mechanisms, it is up to the applications that use UDP for Internet communication to employ suitable mechanisms to prevent congestion collapse and establish a degree of fairness. [RFC2309] discusses the dangers of congestion-unresponsive flows and states that **"all UDP-based streaming applications should incorporate effective congestion avoidance mechanisms."**

UDP Attack

- UDP Flood, Spoofing
- DNS Spoofing, Amplification





UDP & Sockets

- Сокет – связующее звено между транспортным и прикладным уровнем
- Сокет связан с IP адресом и портом
  - Сервер: IP + порт на локальном компьютере
  - Клиент: IP + порт на удаленном компьютере
- Широковещательные/групповые адреса для обмена данными с несколькими процессами

Tools: iperf3 && netcat && awk

- nc -l 4444 > message.txt
- echo “hello world” | nc 127.0.0.1 4444
- iperf3 -s
- info gawkinet
- tcpdump

Cons

- *Unreliable* – When a UDP message is sent, it cannot be known if it will reach its destination; it could get lost along the way. There is no concept of acknowledgment, retransmission, or timeout.
- *Not ordered* – If two messages are sent to the same recipient, the order in which they arrive cannot be guaranteed.
- *Lightweight* – There is no ordering of messages, no tracking connections, etc. It is a very simple transport layer designed on top of IP.
- *Datagrams* – Packets are sent individually and are checked for integrity on arrival. Packets have definite boundaries which are honored upon receipt; a read operation at the receiver socket will yield an entire message as it was originally sent.
- *No congestion control* – UDP itself does not avoid congestion. Congestion control measures must be implemented at the application level or in the network.
- *Broadcasts* – being connectionless, UDP can broadcast - sent packets can be addressed to be receivable by all devices on the subnet.
- *Multicast* – a multicast mode of operation is supported whereby a single datagram packet can be automatically routed without duplication to a group of subscribers.