Sieci Komputerowe

Protokoły UDP i TCP

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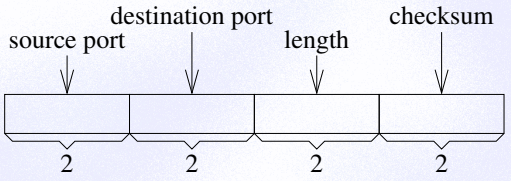
Plan wykładu

- Protokół UDP.
- Protokół TCP.

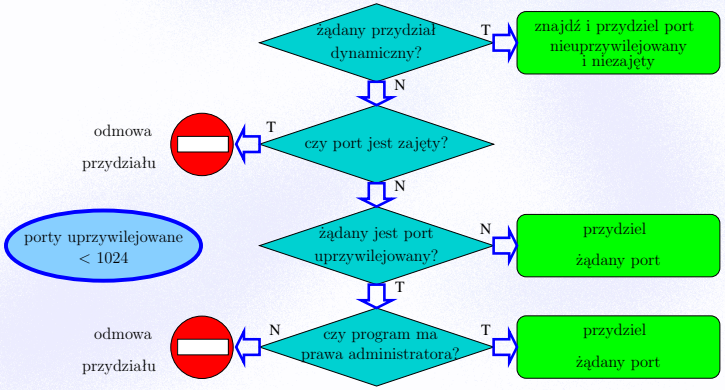
Standardy

RFC	Std	Tytuł/Autorzy	Data
0768	006	User Datagram Protocol. *J. Postel.*	1980.08.28
0791	005	Internet Protocol. *J. Postel.*	1981.09.01
0792	005	Internet Control Message Protocol. *J. Postel.*	1981.09.01
0793	007	Transmission Control Protocol. *J. Postel.*	1981.09.01
1122	003	Requirements for Internet Hosts - Communication Layers. *R. Braden, Ed.*	1989.10
2001	P	TCP Slow Start, Congestion Avoidance, Fast Retransmit, and Fast Recovery Algorithms. *W. Stevens.*	1997.01
2581	P	TCP Congestion Control. *M. Allman, V. Paxson, W. Stevens.*	1999.04
3390	P	Increasing TCP's Initial Window. *M. Allman, S. Floyd, C. Partridge.*	2002.10

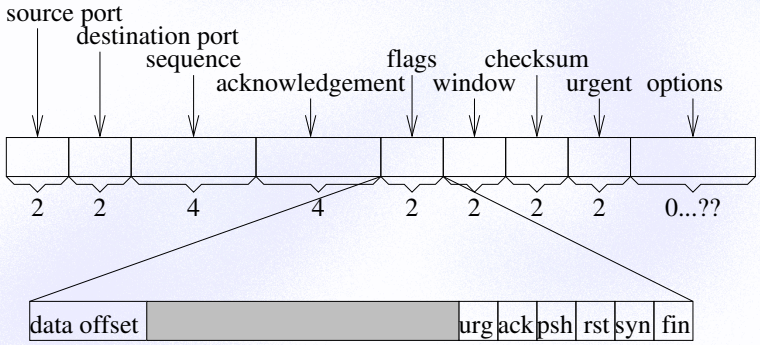
Nagłówek UDP



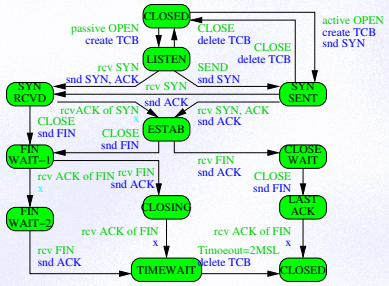
Przydział portu



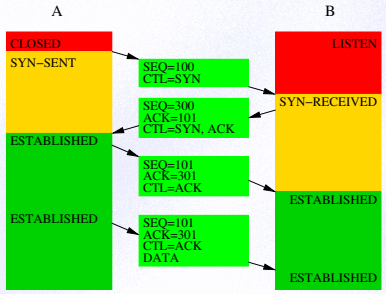
Nagłówek TCP



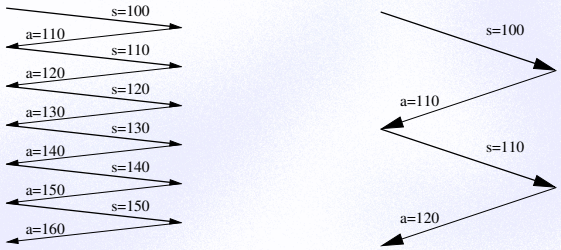
Graf stanów TCP



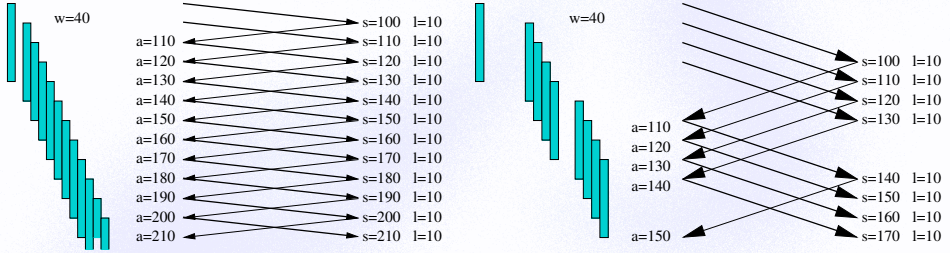
Nawiązanie połączenia TCP



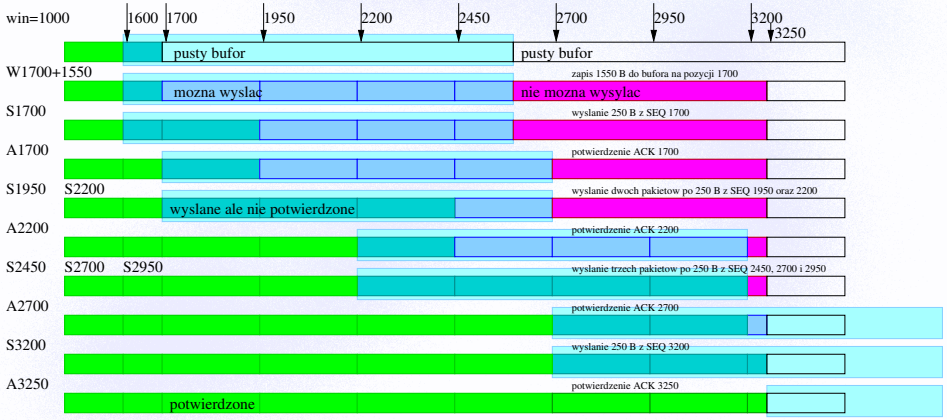
Okno = 1 pakiet



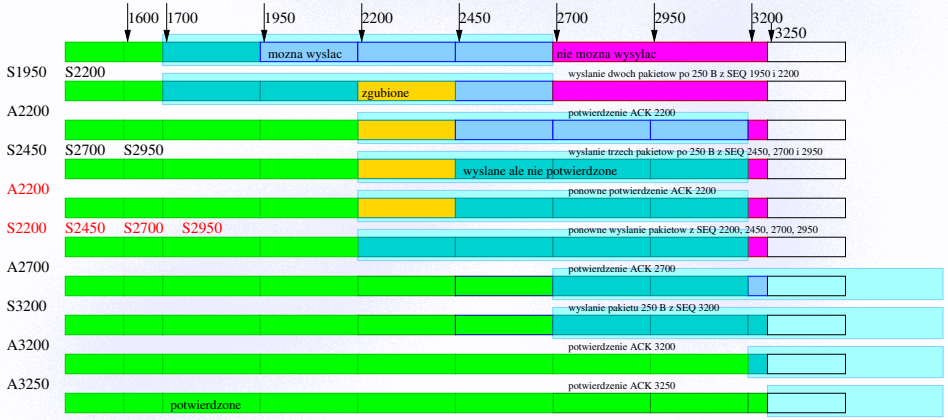
Okno > 1 pakiet



Ruchome okno



Retransmisja



Przykładowa sesja TCP - nawiązanie połączenia

```
------------------------------
  1  ETHER Type=0800 (IP), size = 58 bytes
  1  IP  D=194.29.160.2 S=194.29.166.77 LEN=44, ID=10335, TOS=0x0, TTL=255
  1  TCP D=25 S=37511 Syn Seq=1165798929 Len=0 Win=8760 Options=<mss 1460>
  1  SMTP C port=37511
------------------------------
  2  ETHER Type=0800 (IP), size = 60 bytes
  2  IP  D=194.29.166.77 S=194.29.160.2 LEN=44, ID=42613, TOS=0x0, TTL=62
  2  TCP D=37511 S=25 Syn Ack=1165798930 Seq=2406549079 Len=0 Win=24820 Options=<mss 1460>
  2  SMTP R port=37511
------------------------------
  3  ETHER Type=0800 (IP), size = 54 bytes
  3  IP  D=194.29.160.2 S=194.29.166.77 LEN=40, ID=10336, TOS=0x0, TTL=255
  3  TCP D=25 S=37511 Ack=2406549080 Seq=1165798930 Len=0 Win=8760
  3  SMTP C port=37511
```

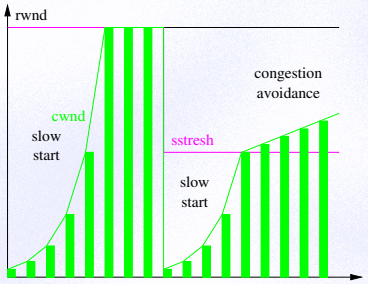
Przykładowa sesja TCP - transmisja danych

```
------------------------------
  4  ETHER Type=0800 (IP), size = 169 bytes
  4  IP  D=194.29.166.77 S=194.29.160.2 LEN=155, ID=42617, TOS=0x0, TTL=62
  4  TCP D=37511 S=25 Push Ack=1165798930 Seq=2406549080 Len=115 Win=24820
  4  SMTP R port=37511 220 elektron.elka.pw
------------------------------
  5  ETHER Type=0800 (IP), size = 54 bytes
  5  IP  D=194.29.160.2 S=194.29.166.77 LEN=40, ID=10337, TOS=0x0, TTL=255
  5  TCP D=25 S=37511 Ack=2406549195 Seq=1165798930 Len=0 Win=8760
  5  SMTP C port=37511
------------------------------
  6  ETHER Type=0800 (IP), size = 60 bytes
  6  IP  D=194.29.160.2 S=194.29.166.77 LEN=46, ID=10338, TOS=0x0, TTL=255
  6  TCP D=25 S=37511 Push Ack=2406549195 Seq=1165798930 Len=6 Win=8760
  6  SMTP C port=37511 quit\r\n
------------------------------
  7  ETHER Type=0800 (IP), size = 60 bytes
  7  IP  D=194.29.166.77 S=194.29.160.2 LEN=40, ID=42618, TOS=0x0, TTL=62
  7  TCP D=37511 S=25 Ack=1165798936 Seq=2406549195 Len=0 Win=24820
  7  SMTP R port=37511
```

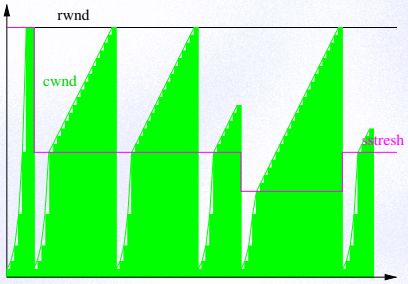
Przykładowa sesja TCP - zamykanie połączenia

```
------------------------------
  9  ETHER Type=0800 (IP), size = 60 bytes
  9  IP  D=194.29.166.77 S=194.29.160.2 LEN=40, ID=42620, TOS=0x0, TTL=62
  9  TCP D=37511 S=25 Fin Ack=1165798936 Seq=2406549219 Len=0 Win=24820
  9  SMTP R port=37511
------------------------------
 10  ETHER Type=0800 (IP), size = 54 bytes
 10  IP  D=194.29.160.2 S=194.29.166.77 LEN=40, ID=10339, TOS=0x0, TTL=255
 10  TCP D=25 S=37511 Ack=2406549220 Seq=1165798936 Len=0 Win=8760
 10  SMTP C port=37511
------------------------------
 11  ETHER Type=0800 (IP), size = 54 bytes
 11  IP  D=194.29.160.2 S=194.29.166.77 LEN=40, ID=10340, TOS=0x0, TTL=255
 11  TCP D=25 S=37511 Fin Ack=2406549220 Seq=1165798936 Len=0 Win=8760
 11  SMTP C port=37511
------------------------------
 12  ETHER Type=0800 (IP), size = 60 bytes
 12  IP  D=194.29.166.77 S=194.29.160.2 LEN=40, ID=42621, TOS=0x0, TTL=62
 12  TCP D=37511 S=25 Ack=1165798937 Seq=2406549220 Len=0 Win=24820
 12  SMTP R port=37511
```

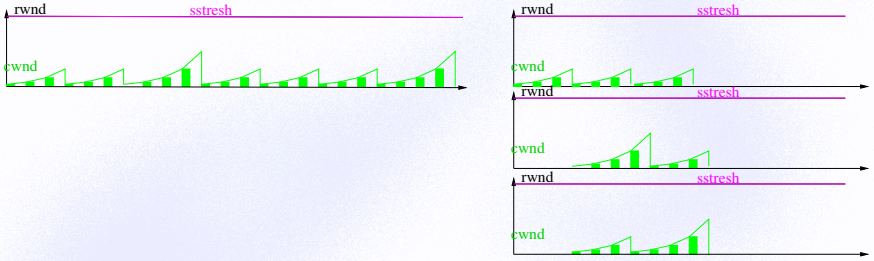
Powolny start



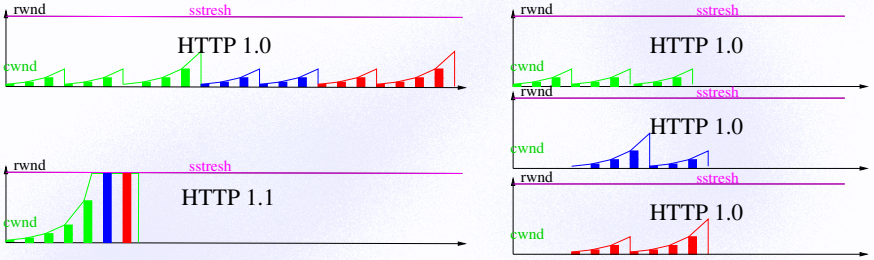
Przeciążenie



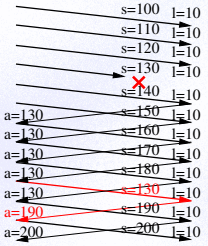
HTTP 1.0



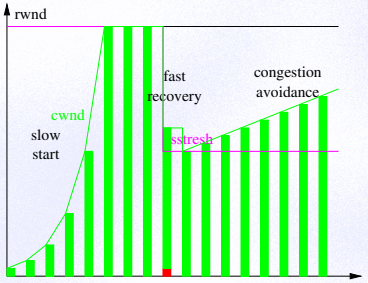
HTTP 1.0 i 1.1



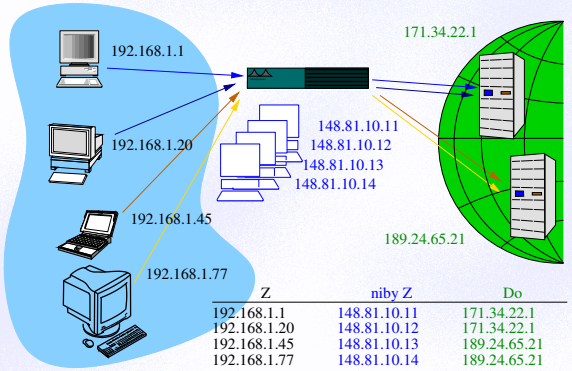
Szybka kontynuacja



Szybka kontynuacja

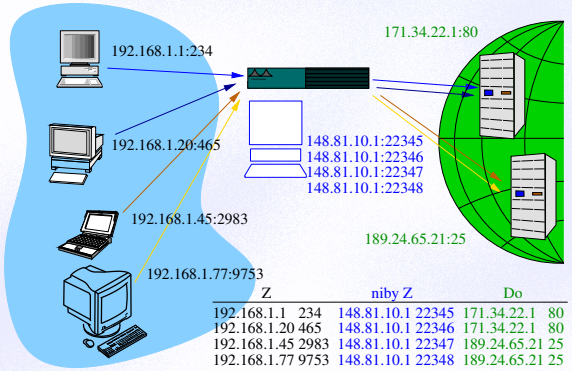


NAT - 1 do 1



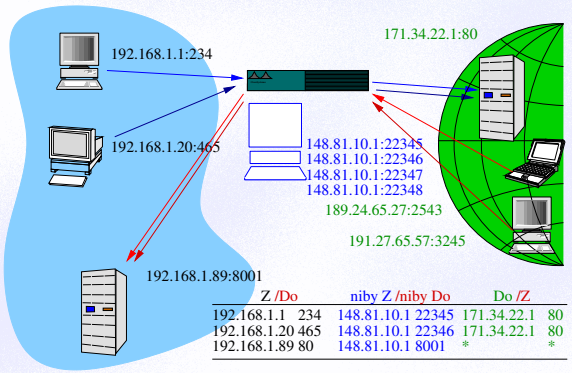
Z	niby Z	Do
192.168.1.1	148.81.10.11	171.34.22.1
192.168.1.20	148.81.10.12	171.34.22.1
192.168.1.45	148.81.10.13	189.24.65.21
192.168.1.77	148.81.10.14	189.24.65.21

NAT - maskarada



Z		niby Z		Do	
192.168.1.1	234	148.81.10.1	22345	171.34.22.1	80
192.168.1.20	465	148.81.10.1	22346	171.34.22.1	80
192.168.1.45	2983	148.81.10.1	22347	189.24.65.21	25
192.168.1.77	9753	148.81.10.1	22348	189.24.65.21	25

NAT - serwer



Z		/Do	niby Z		/niby Do	Do	/Z
192.168.1.1	234		148.81.10.1	22345		171.34.22.1	80
192.168.1.20	465		148.81.10.1	22346		171.34.22.1	80
192.168.1.89	80		148.81.10.1	8001	*		*

Dziękuję za uwagę

mgr inż. Jerzy Sobczyk