

TUGAS IMPLEMENTASI KASUS MENGGUNAKAN CONCURRENCY



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**Kelas:
Pemrograman Jaringan D**

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Surabaya**

2021

Soal

Buatlah program yang mengimplementasikan

1. Multi process
2. Multi thread
3. Multi process asynchronous
4. Multi thread asynchronous

dengan menggunakan protokol transport UDP. Kasus dapat didefinisikan sendiri dan buatlah arsitektur jaringan anda sendiri di simulator GNS3.

Buatlah laporan dalam bentuk PDF yang berisikan screenshot dari

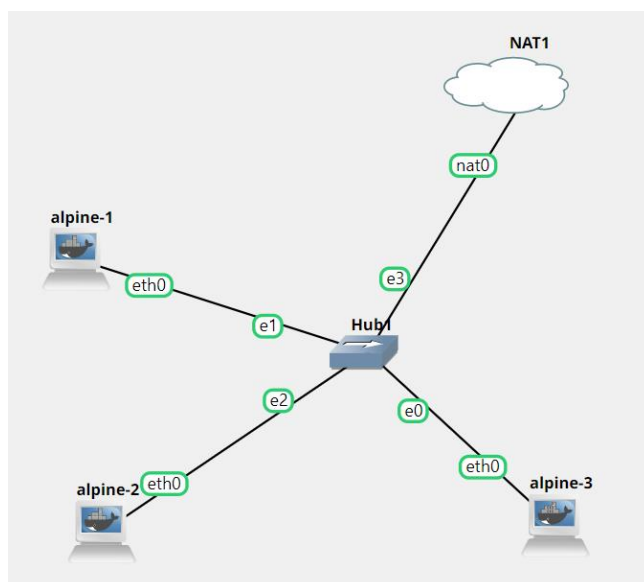
1. Deskripsi kasus yang dibuat
2. Gambar arsitektur jaringan (dalam simulator GNS3)
3. Program yang dibuat (1-4)
4. Hasil outputnya

Jawaban

1. Kasus

Terdapat 2 server dan 1 client. Client akan melakukan pengiriman 2 file gambar ke 2 server dengan menggunakan transport UDP. Pengiriman file gambar dari client ke 2 server dilakukan dengan 4 cara yang berbeda yaitu multi process, multi thread, multi process asynchronous, dan multi thread asynchronous.

2. Topologi



Konfigurasi

alpine-1: client

```

< role      alpine-1  x      alpine-2  x      alpine-3  >  -  x
/ # ifconfig
eth0      Link encap:Ethernet  HWaddr 42:21:88:16:E9:C5
          inet addr:192.168.122.72  Bcast:192.168.122.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:94 errors:0 dropped:0 overruns:0 frame:0
          TX packets:15 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:21120 (20.6 KiB)  TX bytes:4326 (4.2 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

/ # 
```

alpine-2: server 1

```

< role      alpine-1  x      alpine-2  x      alpine-3  >  -  x
/ # ifconfig
eth0      Link encap:Ethernet  HWaddr 6E:2A:5A:DE:49:B8
          inet addr:192.168.122.223  Bcast:192.168.122.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:106 errors:0 dropped:5 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:21388 (20.8 KiB)  TX bytes:3984 (3.8 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

/ # 
```

alpine-3: server 2

```
alpine-1 x alpine-2 x alpine-3 x > - x
/ # ifconfig
eth0      Link encap:Ethernet  HWaddr 9A:DC:ED:77:9E:E6
          inet addr:192.168.122.181  Bcast:192.168.122.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:110 errors:0 dropped:3 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:21924 (21.4 KiB)  TX bytes:3984 (3.8 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

/ #
```

3. Program yang dibuat

1. multi_process.py

```
master Pemrograman_Jaringan_D / progjar3 / TugasConcurrency / multi_process.py / <> Jump to - Go to file ...

KresnaAP tugas 3 minor Latest commit 64e3ce 3 hours ago History
1 contributor

51 lines (39 sloc) 1.41 KB Raw Blame
1 # from library import download_gambar, get_url_list
2 import time
3 import datetime
4 import socket
5 from multiprocessing import Process
6
7
8 TARGET_IP = "0.0.0.0"
9 TARGET_PORT = 10000
10
11 sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
12 sock.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEPORT, 1)
13 sock.setsockopt(socket.SOL_SOCKET, socket.SO_BROADCAST, 1)
14
15
16 def kirim_gambar(image=None):
17     if image is None:
18         return False
19
20     #buka gambar dalam format binary
21     f = open(image, "rb")
22     l = f.read(1024)
23     while (1):
24         if(sock.sendto(l, (TARGET_IP, TARGET_PORT))):
25             l = f.read(1024)
26     f.close()
27
28
29 def kirim_semua():
30     texec = dict()
31     images = ['1.png', '2.png']
32     catat_awal = datetime.datetime.now()
33     for k in range(len(images)):
34         print(f"mengirim {images[k]}")
35         waktu = time.time()
36
37         #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi kirim gambar secara multiprocess
38         texec[k] = Process(target=kirim_gambar, args=(images[k],))
39         texec[k].start()
40
41     #setelah menyelesaikan tugasnya, dikembalikan ke main process dengan join
42     for k in range(len(images)):
43         texec[k].join()
44     catat_akhir = datetime.datetime.now()
45     selesai = catat_akhir - catat_awal
46     print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
47
48
49 #fungsi kirim_gambar akan dijalankan secara multi process
50 if __name__ == '__main__':
51     kirim_semua()
```

2. multi_process_async.py

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Go to file

...

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History

1 contributor

54 lines (41 sloc) 1.61 KB

Raw Blame

```
1 # from library import download_gambar, get_url_list
2 import time
3 import datetime
4 import socket
5 from multiprocessing import Process, Pool
6
7
8 TARGET_IP = "0.0.0.0"
9 TARGET_PORT = 1000
10
11 sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
12 sock.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEPORT, 1)
13 sock.setsockopt(socket.SOL_SOCKET, socket.SO_BROADCAST, 1)
14
15
16 def kirim_gambar(image=None):
17     if (image is None):
18         return False
19
20     #buka gambar dalam format binary
21     f = open(image, "rb")
22     l = f.read(1024)
23     while (l):
24         if(sock.sendto(l, (TARGET_IP, TARGET_PORT))):
25             l = f.read(1024)
26     f.close()
27
28
29 def kirim_semua():
30     texec = dict()
31     images = ['1.png', '2.png']
32     status_task = dict()
33     task_pool = Pool(processes=20) #2 task yang dapat dikerjakan secara simultan, dapat diset sesuai jumlah core
34     catat_awal = datetime.datetime.now()
35     for k in range(len(images)):
36         print(f"mengirim {images[k]}")
37
38     #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi kirim gambar secara multiprocessing
39     texec[k] = task_pool.apply_async(func=kirim_gambar, args=(images[k],))
40
41     #setelah menyelesaikan tugasnya, dikembalikan ke main process dengan mengambil hasilnya dengan get
42     for k in range(len(images)):
43         status_task[k]=texec[k].get(timeout=10)
44
45     catat_akhir = datetime.datetime.now()
46     selesai = catat_akhir - catat_awal
47     print(f"Waktu TOTAL yang dibutuhkan (selesai) detik {catat_akhir} s/d {catat_akhir}")
48     print("status TASK")
49     print(status_task)
50
51
52 #fungsi kirim_gambar akan dijalankan secara multi process
53 if __name__=="__main__":
54     kirim_semua()
```

3. multi_thread.py

master Pemrograman_Jaringan_D / progjar3 / TugasConcurrency / multi_thread.py / <> Jump to

Go to file

KresnaAP tugas 3 minor

Latest commit 64ebee 3 hours ago

History

1 contributor

53 lines (39 sloc) 1.4 KB

Raw Blame

```
1 # from library import download_gambar, get_url_list
2 import time
3 import datetime
4 import threading
5 import socket
6
7
8 TARGET_IP = "0.0.0.0"
9 TARGET_PORT = 1000
10
11 sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
12 sock.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEPORT, 1)
13 sock.setsockopt(socket.SOL_SOCKET, socket.SO_BROADCAST, 1)
14
15
16 def kirim_gambar(image=None):
17     if image is None:
18         return False
19
20     #buka gambar dalam format binary
21     f = open(image, "rb")
22     l = f.read(1024)
23     while (1):
24         if(sock.sendto(l, (TARGET_IP, TARGET_PORT))):
25             l = f.read(1024)
26     f.close()
27
28
29 def kirim_semua():
30     texec = dict()
31     images = ['1.png', '2.png']
32
33     catat_awal = datetime.datetime.now()
34     for k in range(len(images)):
35         print(f"mengirim {images[k]}")
36         waktu = time.time()
37
38         #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi kirim gambar secara multithread
39         texec[k] = threading.Thread(target=kirim_gambar, args=(images[k],))
40         texec[k].start()
41
42     #setelah menyelesaikan tugasnya, dikebalikan ke main thread dengan join
43     for k in range(len(images)):
44         texec[k].join()
45
46     catat_akhir = datetime.datetime.now()
47     selesai = catat_akhir - catat_awal
48     print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
49
50
51 #fungsi kirim_gambar akan dijalankan secara multithreading
52 if __name__ == '__main__':
53     kirim_semua()
```

4. multi_thread_async.py

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Go to file

...

KresnaAP tugas 3 minor

Latest commit a683770 2 hours ago History

1 contributor

55 lines (42 sloc) 1.54 KB

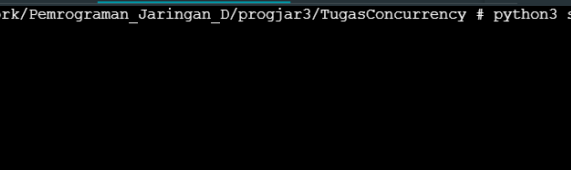
Raw Blame

```
1 # from library import download_gambar, get_url_list
2 import time
3 import datetime
4 import concurrent.futures
5 import socket
6
7
8 TARGET_IP = "0.0.0.0"
9 TARGET_PORT = 1000
10
11 sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
12 sock.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEPORT, 1)
13 sock.setsockopt(socket.SOL_SOCKET, socket.SO_BROADCAST, 1)
14
15
16 def kirim_gambar(image=None):
17     if image is None:
18         return False
19
20     #buka gambar dalam format binary
21     f = open(image, "rb")
22     l = f.read(1024)
23     while (1):
24         if(sock.sendto(l, (TARGET_IP, TARGET_PORT))):
25             l = f.read(1024)
26     f.close()
27
28
29 def kirim_semua():
30     texec = dict()
31     images = ['1.png', '2.png']
32     status_task = dict()
33     task = concurrent.futures.ThreadPoolExecutor(max_workers=4)
34     catat_awal = datetime.datetime.now()
35     for k in range(len(images)):
36         print(f"mengirim {images[k]}")
37         waktu = time.time()
38
39     #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi kirim gambar secara multithread
40     texec[k] = task.submit(kirim_gambar, images[k])
41
42     #setelah menyelesaikan tugasnya, dikembalikan ke main thread dengan memanggil result
43     for k in range(len(images)):
44         status_task[k]=texec[k].result()
45
46     catat_akhir = datetime.datetime.now()
47     selesai = catat_akhir - catat_awal
48     print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
49     print("hasil task yang dijalankan")
50     print(status_task)
51
52
53 #fungsi kirim_gambar akan dijalankan secara multithreading
54 if __name__ == '__main__':
55     kirim_semua()
```

4. Hasil output

1. Multi process


- server 1



The screenshot shows a terminal window with three tabs labeled 'alpine-1', 'alpine-2', and 'alpine-3'. The 'alpine-2' tab is active and highlighted with a red underline. The terminal prompt is '/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency #'. The command 'python3 server.py' has been entered, and the output '1' is displayed on the next line.

[illegible]

- server 2



The screenshot shows a terminal window with a dark background. At the top, there are three tabs labeled 'alpine-1', 'alpine-2', and 'alpine-3'. The 'alpine-3' tab is currently selected and highlighted. Below the tabs, the terminal displays the command prompt `/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency #` followed by the command `python3 server.py`. The command has been executed, and the output is a large block of text that has been truncated, indicated by a vertical ellipsis (`...`) on the right side of the terminal window.


```
alpine-1 x alpine-2 x alpine-3 x > - x
\xa8%\xc0\x0f\x80\xfb\x81\xef\xa5\\xee\n\xce#\x8d-\x0b\x964MM]mF(\xe4\xc3\xfe\x
b4\xcb\x89\x1b\xc4\x92f\xc5\x03\xc0\x0fi\'U\x17\xa5\\xee\x0c\xce#\x82\x05K\x9
a\x81\xa6\xae\x9eD(2\xfc\xfe\x0c\xcb\xfb0KDM\x96\x07\x81\x9f\x0d0N\xaa.\xf2\xa2ei\
xdY\xbo\xa4\xf5\xd4\xd5\x16\x0c-\x00kh\xcb\x96\x1b\xe4\x5E\x8b\x81\x9f\x02
\x97\x00\x17\xa6\n\x0f\xce#\u\x9a\x05K\x1a\xa2\xa6\xae6\xa2-Y\xfb\x05yNh i\xcd\x
1a \x0f\x9e+=Y)\x1a\x1e\x0b\x964BMJ]=\x9b\xe5\xeb\x58\xddR\xac\x87\xa6T\x19\xcb
\xde\x01(\x8d\x8e\x05K\x9a\x83\xe9\x6KY^\xb8\x9e\x1b\x9bH=\xe1\x94J\n'\xc1\x92
\x82\x0c\xeeF\xaci/\xa1\xde\x03\x826\x914\x04-\xc0U\x0cUN\xa9\xa4\x18\x16,iL\x
0c\x96\x13\xfb7X\xe1\x09\x1e\x98\x13\x1aJ\xe3n\n\x8b\x8e\x8b6P]\x05\\\x95r\x9b16\x
92$\xb0`Ickp\xee\x06\xee,/\xc4=\j\x07\x18\xfb8%\xcb\x0b\x05/R.w\x04F\x92\x8b4*
\x16,\xa9#\xa9\xba\xda\x10\x08\x99\xe5\x85\xeb\x05\x00SCCi\x04n\x06\xae fy\xa1\xfb
aj\xca\xe5\x01\x08H\x92\xa6\x03\x82\x06v\x06vZ\xe1\xfd<\x9ctu\x0db\xe0\x0f
\x00\xb5\x0c\xef\xfbz\xa7\\\xfex\x1d\x9aJ\x02\x8cY\x00\xa4\t\x03\x04\x05\xa3\x80m
yd\xfb\x06\xfb7E\x9b\x02\xfe\xca\nj\xfb0\xfbek\xca\x05 \xc6\x02\x04\x0b1`I=\x0
1\x04\x05\x0c\x0e\x0b4\x85k(\x0Y\x83\xe7\x99\x0c\x03\xe3\x92M\xa4\xfb\x02\x8b\x
80\x1b\x07\x0cfu\x04E\xea\xba\x94\xcb=\x81\x09\xcd\x12\x0b\x96$\xa9\x02\x02\xcb
\xcb\x06\xca\xefg\x02\x9b\x06$\x1b[w\x03\x16\xa7E\xabz\xbb\xfb1\\\x92\x05K\x0222r
.\xb7-\xa8p=\x1dx\x02j\x9e'\x02\x8f\x8aI\x09\xde\x96\x02\xfb\x06\xfb\x05\x022s;p
\x1b\xfb0\x0f\x96\x17(\xfex\x99\x93\x04F\x16,IC3\x08\xfb\x05\x19k.`\x1b\x03\x8fY\x
e9\x99;\x8d\x9f\xcd\x05\x96\x01\xfb7\xaf\xfb0,Y\xcb\x9fW\xfb\x09\x0d\x0b\x0a\x0a@=\xf4
\xfb\x0c7)P\x92\x86\xe5\xfb\x03\xaf\x19\x05\xad\x04\x87@\x00\x00\x00\x00IEND\xaeB
'\x82'
dikirim oleh ('192.168.122.72', 34230)
```

- client

```
alpine-1 x alpine-2 x alpine-3 x > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 multi_proc
ess.py
mengirim 1.png
mengirim 2.png
Waktu TOTAL yang dibutuhkan 0:00:00.031610 detik 2021-06-12 03:31:15.141897 s/d
2021-06-12 03:31:15.173507
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency #
```

2. Multi thread

- server 1

```
alpine-1 x alpine-2 x alpine-3 x > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 server.py

```

```
< alpine-1 x alpine-2 x alpine-3 x > - X
\xa8%\xc0\x0f\x80\xf3\x81\xef\xa5\\\xee\n\xce#\x8d-\x0b\x964MM)mF(\xe4\xc3\xfe\x
b4\xcb\x89\x1b\xc4\x92f\xc5\x03\x0f\x0f'i'\x17\xa5\\\xee\x0c\xce#\x82\x05K\x9
a\x81\xa6\xae\x9eD(2\xfc\xfe\x0c\xcb\xfb0KDM\x96\x07\x81\x9f\x0d0N\xaa.\xf2\xa2ei\
xddY\x0b\xa4\xf5\xd4\xd4\xd5\x16\x0c-\xc0kh\xcb\x96\x1b\xe4\xd5E\x8b\x81\x9f\x02
\x97\x00\x17\xa6\n\x0f\xce#\u\x9a\x05K\x1a\xa2\xa6\xae6\xa2-Y\x05Y\nh i\xcd\x
1a \x0f\x9e+=Y]\x1a\x1e\x0b\x964BM]=\x9b\xe5e\xeb\xe58\xddR\xac\x87\xa6T\x19\x08
\xde\x01(\x8d\x8e\x05K\x9a%\x83\xe9\xd6KY^\xb8\x9e\x1b\x9bH=\xe1\x94J'n`\xc1\x92
\x82\x0c\xeeF\xaci/\xa1\xde\x03\xd826\x91\x0c-\xc0U\x0c\xUN\xa9\xa4\x18\x16,iL\x
0c\x96\x13\xf7X\xe1\xd9\x1e\x98\x13\x1aJ\xe3n\n\xb8\x8e\x8b6P]\x05\\\x95r\x9b16\x
92$\xb0`Ickp\xee\xd6\xee,/\\/\xc4=\\j\xb7\x18\xfb8%\xcb\x0b\x05/R.w\x04F\x92\xb4*
\x16,\xa9#\xa9\xa6\xda\x10\xd8\x99\xe5\x85\xeb\x05\x05CCi\x04n\x06\xaeFy\xa1\xfb
aj\xca\x05\x0c1\xd8H\x92\xa6\x03\x82%uXSWO\x06v\x04vZ\x0e1\xfd<\x9ctu\x0db\x0e\x0f
\x0c\x05\x0c0\xef\x1fz\xa7\\\x0f\x0d\x9aJ\xd2\x8cY\xb0\xa4\t\xd3\xd4\xd5\xa3\x80m
yd\xfb1\xda\x06\xf7tE\x9b\x02\xfe\xca\n%j\xfb0\xfbek\xca\x05_\xc6\xd2\x04\xb1`I=\xd
1\xd4\xd5\x0c\x0e\x0b\x85k(\x0Y\x83\xe7\x99\x0c\x03\xe3\x92M\xa4\xff\x02\x8b\x
80\x1b\x07\xcfu\x04E\xea\xba\x94\xcb=\x81\x9b9$\xcd\x12\x0b\x96\x9a\x02\x02\xcb
\xcb\x06\xca\xefg\x02\x9b\x06\x01b[w\x03\x16\xa7E\xabz\xbb\xfb1\\\x92\x05K\x02d2s;
.\xb7-\xa8p=\x1dx\x02j\x9e'\x02\x8f\x8aI\x0b9\xde\x96\x02\xff\x06\xfb5\x02d2s;p
.\x1b\xfb0\x0f\x96\x17(\x0f\x9e9\x93\x04F\x16,IC3\x08\xfb5\x19k.`\x1b\x03\x8fY\x
e9\x99;\x8d\x9f\xcd\x05\x96\x01\xf7\xaf\xfb0,Y\xcb\x9fW\xfb\x09\x0d\x0c\x0a@=\xf4
\xfb\x07]P\x92\x86\xe5\x7f\x03\xaf\x19\x05\xad\x04\x87@\x00\x00\x00\x00IEND\xaeB
'\x82'
dikirim oleh ('192.168.122.72', 54903)
```

- server 2

```
< alpine-1 x alpine-2 x alpine-3 x > - X
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 server.py
```

```
< alpine-1 x alpine-2 x alpine-3 x > - X
\xa8%\xc0\x0f\x80\xf3\x81\xef\xa5\\\xee\n\xce#\x8d-\x0b\x964MM)mF(\xe4\xc3\xfe\x
b4\xcb\x89\x1b\xc4\x92f\xc5\x03\x0f\x0f'i'\x17\xa5\\\xee\x0c\xce#\x82\x05K\x9
a\x81\xa6\xae\x9eD(2\xfc\xfe\x0c\xcb\xfb0KDM\x96\x07\x81\x9f\x0d0N\xaa.\xf2\xa2ei\
xddY\x0b\xa4\xf5\xd4\xd4\xd5\x16\x0c-\xc0kh\xcb\x96\x1b\xe4\xd5E\x8b\x81\x9f\x02
\x97\x00\x17\xa6\n\x0f\xce#\u\x9a\x05K\x1a\xa2\xa6\xae6\xa2-Y\x05Y\nh i\xcd\x
1a \x0f\x9e+=Y]\x1a\x1e\x0b\x964BM]=\x9b\xe5e\xeb\xe58\xddR\xac\x87\xa6T\x19\x08
\xde\x01(\x8d\x8e\x05K\x9a%\x83\xe9\xd6KY^\xb8\x9e\x1b\x9bH=\xe1\x94J'n`\xc1\x92
\x82\x0c\xeeF\xaci/\xa1\xde\x03\xd826\x91\x0c-\xc0U\x0c\xUN\xa9\xa4\x18\x16,iL\x
0c\x96\x13\xf7X\xe1\xd9\x1e\x98\x13\x1aJ\xe3n\n\xb8\x8e\x8b6P]\x05\\\x95r\x9b16\x
92$\xb0`Ickp\xee\xd6\xee,/\\/\xc4=\\j\xb7\x18\xfb8%\xcb\x0b\x05/R.w\x04F\x92\xb4*
\x16,\xa9#\xa9\xa6\xda\x10\xd8\x99\xe5\x85\xeb\x05\x05CCi\x04n\x06\xaeFy\xa1\xfb
aj\xca\x05\x0c1\xd8H\x92\xa6\x03\x82%uXSWO\x06v\x04vZ\x0e1\xfd<\x9ctu\x0db\x0e\x0f
\x0c\x05\x0c0\xef\x1fz\xa7\\\x0f\x0d\x9aJ\xd2\x8cY\xb0\xa4\t\xd3\xd4\xd5\xa3\x80m
yd\xfb1\xda\x06\xf7tE\x9b\x02\xfe\xca\n%j\xfb0\xfbek\xca\x05_\xc6\xd2\x04\xb1`I=\xd
1\xd4\xd5\x0c\x0e\x0b\x85k(\x0Y\x83\xe7\x99\x0c\x03\xe3\x92M\xa4\xff\x02\x8b\x
80\x1b\x07\xcfu\x04E\xea\xba\x94\xcb=\x81\x9b9$\xcd\x12\x0b\x96\x9a\x02\x02\xcb
\xcb\x06\xca\xefg\x02\x9b\x06\x01b[w\x03\x16\xa7E\xabz\xbb\xfb1\\\x92\x05K\x02d2s;
.\xb7-\xa8p=\x1dx\x02j\x9e'\x02\x8f\x8aI\x0b9\xde\x96\x02\xff\x06\xfb5\x02d2s;p
.\x1b\xfb0\x0f\x96\x17(\x0f\x9e9\x93\x04F\x16,IC3\x08\xfb5\x19k.`\x1b\x03\x8fY\x
e9\x99;\x8d\x9f\xcd\x05\x96\x01\xf7\xaf\xfb0,Y\xcb\x9fW\xfb\x09\x0d\x0c\x0a@=\xf4
\xfb\x07]P\x92\x86\xe5\x7f\x03\xaf\x19\x05\xad\x04\x87@\x00\x00\x00\x00IEND\xaeB
'\x82'
dikirim oleh ('192.168.122.72', 54903)
```

- client

```
< .ole alpine-1 x alpine-2 x ali > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 multi_thre
ad.py
mengirim 1.png
mengirim 2.png
Waktu TOTAL yang dibutuhkan 0:00:00.011325 detik 2021-06-12 03:40:01.729350 s/d
2021-06-12 03:40:01.740675
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency #
```

3. Multi process asynchronous

- server 1

```
< alpine-1 x alpine-2 x alpine-3 x > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 server.py

```

```
< .ole alpine-1 x alpine-2 x ali > - x
\xa8%\xc0\x0f\x80\xfb\x81\xef\xa5\\\xee\n\xce#\xbd-\xc0b\x964MM]mF(\xe4\xc3\xfe\x
b4\xcb\x89\x1b\xc4\x92f\xc5\x03\xc0\x0fi'U\x17\xa5\\\xee\x0c\xce#\u\x82\x05K\x9
a\x81\xa6\xae\x9eD(Z\xfc\xfe\xc0\xcb\xfb0KDM\x96\x07\x81\x9f\x0N\xaa.\xf2\xa2ei\
xddY\x0\x04\xfb\x04\x05\x16\x00-\xc0kh\xcb\x96\x1b\xe4\x05E\x8b\x81\x9f\x02
\x97\x00\x17\xa6\n\x0f\xce#\u\x9a\x05K\x1a\xa2\xa6\xae6\xa2-Y\xfb5\x0yNh i\xcd\x
1a \x0f\x9e+=Y]\x1a\x1e\x0b\x964BMJ]=\x9b\x05e\xeb\x058\xddR\xac\x87\xa6T\x19\x08
\xde\x01(\x8d\x8e\x05K\x9a%\x83\x09\x06KY^\xb8\x9e\x1b\x9bH=\xe1\x94J\n'\xc1\x92
\x82\x0c\xeeF\xaci/\xa1\xde\x03\x0826\x91\x04-\xc0U\x0c6UN\xa9\xa4\x18\x16,iL\x
0c\x96\x13\xfb7X\x01\x09\x1e\x98\x13\x1aJ\x03n\n\x08\x8e\x06P]\x05\\\x95r\x0b916\x
92\x0b0'Ickp\xee\x06\xee,/\x04=\x0b7\x18\xfb8%\xc0b\x0b\x05/R.w\x0c4F\x92\x0b4*
\x16,\xa9#\xa9a\xba\xda\x10\x08\x99\x05\x85\xeb\x05\x03Cci\x04n\x06\x0efy\xa1\xfb
a]\x0a\x05\x01\x08H\x92\xa6\x03\x82\x0uXSW0\x06v\x04vz\x0e1\xfd<\x9ctu\x0b\x0e0\x0f
\x00\x05\x0c\x0f\x1fz\xa7\\\xf0\x1d\x9aJ\x02\x08cY\x0b0\xa4\t\x03\x04\x05\xa3\x80m
yd\xfb1\xda\x06\xfb7E\x9b\x02\xfe\xca\n%j\xfb0\xfbek\xca\x05 \xc6\x02\x04\x0b1'I=\xd
1\x04\x05\x0c\x0e\x0b4\x85k(\x0Y\x83\x07\x99\x0c\x03\x03\x92M\xa4\xff\x02\x08b\x
80\x1b\x07\x0c\xfb4E\x0a\xba\x94\x0b=\x81\x09\x0c\x02\x12\x0b\x96\x9a\x0b\x02\x0c
\xcb\x06\x0a\x0efg\x02\x9b\x0c6%\x1b[w\x03\x16\xa7E\xabz\xbb\xfb1\\\x92\x05K\x02Z\r
.\xb7-\xa8p=\x1dx\x02j\x9e'\x02\x8f\x8aI\x0b9\x0e\x96\x02\xff\x06\xfe\x0b5\x02d2s;p
\x1b\x00\x0f\x96\x17(\x0f\x09\x93\x0b4F\x16,IC3\x0d\xfb\x0b5\x19k.'\x1b\x03\x08Y\x
e9\x99;\x8d\x9f\x0c\x05\x96\x01\xfb7\xaf\xfb0,r\xcb\x9fW\xfc\x09\x0b\x0d\xac\xba@=\xf4
\xfc\x07)F\x92\x86\x05\xfb\x03\xaf\x19\x0b\x0d\x04\x87@x00\x00\x00\x00IEND\xaeB
'\x82'
dikirim oleh ('192.168.122.72', 44965)

```

- server 2

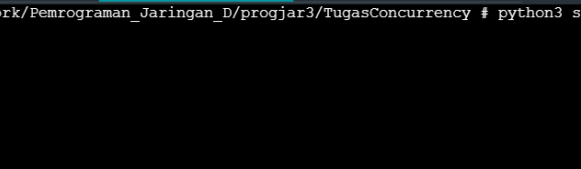
```
< alpine-1 x alpine-2 x alpine-3 x > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 server.py
```

```
< alpine-1 x alpine-2 x alpine-3 x > - x
\xa8%\xc0\x0f\x80\xfb\x81\xef\xa5\\\xee\n\xce#\x8d-\x0b\x964MM)mF(\xe4\xc3\xfe\x
b4\xcb\x89\x1b\xc4\x92f\xc5\x03\x00\x0fi'\u017\xa5\\\xee\x0c\xce#\u082\x05K\x9
a\x81\xa6\xae\x9eD(Z\xfc\xfe\x0c\xcb\xfb0KDM\x96\x07\x81\x9f\x0N\xaa.\xf2\xa2ei\
xddY\xb0\xa4\xf5\xd4\xd4\xd5\x16\x0c-\xc0kh\xcb\x96\x1b\xe4\x5E\x8b\x81\x9f\x02
\x97\x00\x17\xa6\n\x0f\xce#\u09a\x05K\x1a\xa2\xa6\xae6\xa2-Y\x5f\x0yNh i\xcd\x
1a \x0f\x9e+=Y)\x1a\x1e\x0b\x964BMJ)=\x9b\x5e\xeb\x58\xddR\xac\x87\xa6T\x19\xc8
\xde\x01(\x8d\x8e\x05K\x9a%\x83\x9e\x96KY^\xb8\x9e\x1b\x9bH=\xe1\x94J\n' \xc1\x92
\x82\x0c\xeeF\xaci/\xa1\xde\x03\x826\x91\x4-\xc0U\x0cUN\xa9\xa4\x18\x16,iL\x
0c\x96\x13\xf7X\xe1\xd9\x1e\x98\x13\x1aJ\x9e3n\n\x8b\x8e\x8b6P]\x05\\\x95r\x9b916\x
92%\xb0' Ickp\xee\x86\xee,/\/\xc4=\\j\x7\x18\xfb8%\xcb\x0b\x85/R.w\x8cF\x92\x84*
\x16,\xa9#\x9a\xba\xda\x10\xd8\x99\x5e\x85\xeb\x85\x05CCi\x84n\x06\xaeFY\x81\xfb
aJ\xca\x85\x81\x88H\x92\xa6\x83\x82\xuXSW0\x06v\x04vZ\x81\xfd<\x9ctu\x8db\x8e0\x0f
\x80\x85\x00\xef\x1fz\xa7\\\xfex1d\x9aJ\x82\x8cY\x8b0\xa4\t\x83\x84\x85\xa3\x80m
yd\x81\xda\x06\xfbtE\x9b\x02\xfe\xca\n%j\xfb0\xfeK\xca\x85 \xc6\x82\x04\x81'I=\xd
1\x8d\x85\x00\x0e\x84\x85K(\x0Y\x83\x87\x99\x00\x83\x83\x92M\xa4\xff\x02\x8b\x
80\x1b\x07\x8fu\x84E\x8a\xba\x94\x8b=\x81\x89%\xcd\x12\x0b\x96%\x9a\x8az\x02\x8b
\x8b\x86\xca\xefg\x02\x9b\x86%\x1b[w\x83\x16\xa7E\xabz\xbb\xfb\\\x92\x05K\x82Z\r
.\xb7~\xa8p=\x1dx\x2j\x9e'\x02\x8f\x8aI\x8b9\xde\x96\x02\xff\x06\xfe\x8b5\x82s;p
\x1b\xfb0\x0f\x96\x17(\x8f\x9e9\x93\x84F\x16,IC3\x8d\xff\x8b5\x19k.'\x1b\x03\x8fY\x
e9\x99;\x8d\x9f\xcd\x05\x96\x01\xfb7\xaf\xfb0,Y\xcb\x9fW\xfc\x8d\x8d\xac\x8a@=\xf4
\xfc\x87}\x92\x86\x85\xfb\x83\xaf\x19\x8b5\xad\x84\x87@\x00\x00\x00\x00IEND\xaeB
'\x82'
dikirim oleh ('192.168.122.72', 44965)
]
```

- client

```
< .ole alpine-1 x alpine-2 x alpine-3 x > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 multi_proce
ss_async.py
mengirim 1.png
mengirim 2.png
Waktu TOTAL yang dibutuhkan 0:00:00.022053 detik 2021-06-12 03:36:15.546850 s/d
2021-06-12 03:36:15.568903
status TASK
{0: None, 1: None}
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency #
```


- server 1



The screenshot shows a terminal window with a dark background. The title bar at the top has three tabs: "alpine-1", "alpine-2" (which is selected and highlighted with a red underline), and "alpine-3". Each tab has a close button (X) on its right. Below the title bar, the terminal displays a command prompt: `/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 server.py`. The cursor is positioned at the end of the command, ready for input.

```
<  |ole      alpha-1  x      alpha-2      al>  |  -      X
xc0e\xc0\x0b7\x81K8c.\x8b\x83\xfb3Hc\x5f\x82g\xadASW\x8f\xaf\x3bddd\x7f'0'\xc3\x3dDR
\x8g\xcc0\x0f0\x80f\x83\x81\xef\x5a5\|xee|n|cxf|x8d-\x0b9\x964MM|mf(\x04\x3c\xfe\x
b4\xcb\x89\x1b\x1c4a\x92f\xcc5\x03\x0c0\x0f0i'\|0\|x17\x5a5\|xee|00\xcefe\x82\x05K9
a8\x1\xab6\xae\x9ed|Z\xfc\xfe\xcc0\xcb\x9f0KDM\x96\x07\x819\xcf\x0d0N\xaa.\xf2\x2a2e|
\xddY\x0b\xaf5\x04\x04\x05\x16\x0c~\xc0kh\xcb\x96\x1b\x04\x5d5E\x8b\x81\x9f\x02
\x97\x00\x17\x7a6|\n\x0f\xcefe\x9a\x05K\x1a\x2a\xab6\xae6\xab2-Y\xfc5\x0eY0Nh |x\cd\x
1a |x0f\x9e+Y\|x1a\x1e\x0b\x964BMJ|=x1b\x05e\x5e\x5e58\xdd\xrac\x87\xaf0\x19\xcd\x
\xde\x01(\x8d\x8f\x05K\x9a9\x83\x9e\x06KY~\xb8\x9e\x1b\x9bH~\xe1\x94J\n |'c\x1\x92
\x82\x00\xaeE\xfaci|\xaf\x0d\x03\x826\x916\xca-\xc00\x0c0u\x0c0u\x9a\x94d\x18\x16e,iL\x
0c\x96\x13\x7fX\x01\x09\x1e\x98\x13\x1aJ\x0e3n\n\x0b9\x08\x0b6Pj\x05\\\x95r\x0b916\x
925\x0b' Ickp\x0e\xab6\xee,/\|x\|x7b\x18\xf8g\xcb\x0b\x05d\x5R.\x04\xcf\x92\xab1f
\x16.\xa9g\x9a\x9a\x04\x10\xdd8\x99\x05e\x85\x5e\x5e58\x0c0SCCI\x4d4n\x06\xae7f\xaf4
aJ\xcc0\x5c\x0c1\xdd8H\x92\x0a\xfc3\x82g\x5eSWM0\x06v\x040vZ\x01\xfd\x19c9tu\xcd0\x0e0f
\x0c\x0b5\x0c0\xef\x1f2\x7a6\|x\|x\xfd\x1d\x9a9\x0d\x2\x8cY\x0b\x04\x2a\td\x3d\x4d\x5a3\x80m
ydl\xfd\x1d\x06\x0f7B\x9b\x02\xfe\xca|\n83g\xfc0\xfe\xk\xca\xca\x5c\x5c\x0d\x2d\x04\x0b1-T~\xd
1\xfd\x4d56\xk\x0e\x0b4\x85k(\x0eY0\x83\x07\x999\xcc0\x03\x0e3\x92M\x9a\x4\xff\x02\x8b\x
80\x1b\x07\xfcfu\x04E\xea\x0a\xba\x94\xcb~\x81\x0b95\xcd\x12\x0b\x966\x9a\xab2\x02\xcb
\xcb\x0d6\xca\xfdg\x02\x09\x0c65\x1b[w\xdd3\x16\x7aE\xabz\x0bb\xff\\\x92\x05K\xdd2Zr|
.\xb7\x048p=|x1d\x0f\x2\x9e'\|x02\x8f\x8a8|b9\x9d\x96\x02\xbb\x06\xfe\x5a5\x05\x2d2p
\x1b\x0f0\x0d\x96\x17(\x0ef\x9e9\x93\x0b4F\x16,IC3\x8d\x0b\xff\x5a5\x19k.\x1b\x03\x8fYf
e9\x99;\x8d\x9f\xcd\x05e\x96\x01\x07\x7aef\x0a,\xf\xcb\x9fW\xfc\xcd\x09\x0b\x04\x0aE~\xf4
\xfc\x077P|\x92\x86\x055\x7f\x0b3\xaf\x19\x05\x5a\xdd\x4d\x87@x00\x00\x00\x00IEND\xabE
'\x82'
```

- server 2



The screenshot shows a terminal window with three tabs labeled 'alpine-1', 'alpine-2', and 'alpine-3'. The 'alpine-3' tab is active. The terminal prompt is `/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency #`. The command `python3 server.py` has been entered and executed. The output of the script is a large block of text, mostly obscured by a black redaction box. The visible text includes a header '=====', a list of 10 items (1-10) with names and IDs, a separator '=====', and a list of 10 items (1-10) with names and IDs. The list items are as follows:

No	Nama	ID
1	Andi	1001
2	Budi	1002
3	Citra	1003
4	Dina	1004
5	Eka	1005
6	Fani	1006
7	Gina	1007
8	Hani	1008
9	Irena	1009
10	Joni	1010

The output ends with a separator '====='. The terminal window also shows standard window controls (back, forward, close) and a search bar.

```
< alpine-1 x alpine-2 x alpine-3 x > - x
xc0e\xc0\xb7\x81KS.\x8b\x83\xf3Hc\xc5\x82%\xadASW\x8f\xa3\xbddz\x7f`o`\xc3\xd8DR
\xa8%\xc0\x0f\x80\xf3\x81\xef\xa5\\\xee\n\xce#\xad-\x0b\x964MM]mF(\xae4\xc3\xfe\x
b4\xcb\x89\x1b\x46\x92f\xc5\x03\x00\x0fi'\u\x17\xa5\\\xee\x0c\xce#\u\x82\x05K\x9
a\x81\xa6\xae\x9eD{z\xfc\xfe\x0c\xcb\x0f0KDM\x96\x07\x81\x9f\xd0N\xaa.\xf2\xa2ei\
xddY\xb0\xa4\xf5\xd4\xd4\xd5\x16\x00~\xc0kh\xcb\x96\x1b\x4e4\xd5E\x8b\x81\x9f\x02
\x97\x00\x17\xa6\n\x0f\xce#\u\x9a\x05K\x1a\xa2\xa6\xae6\xa2-Y\x5f\x0yNh i\xcd\x
1a \x0f\x9e+=Y]\x1a\x1e\x0b\x964BMJ]=\x9b\x5e\xeb\x58\xddR\xac\x87\xa6T\x19\xc8
\xde\x01(\x8d\x8e\x05K\x9a%\x83\xe9\xd6KY^\xb8\x9e\x1b\x9bH=\xe1\x94J\n`\xc1\x92
\x82\x0c\xeeF\xaci/\xa1\xde\x03\xd826\x916\xc4-\xc0U\x0c6UN\xa9\xa4\x18\x16,iL\x
0c\x96\x13\x7fX\x01\x98\x1e\x98\x13\x1aJ\xe3n\n\xb8\x8e\x6P]\x05\\\x95r\x916\x
925\xb0`Ickp\xee\xd6\xee,/\/\xc4=\\}\xb7\x18\xf8%\xcb\x0b\xd5/R.w\x4F\x92\xb4*
\x16,\xa9#\x9a\xba\xda\x10\xd8\x99\xe5\x85\xeb\x5c\x0SCci\xd4n\x06\xae fy\xal\x
aJ\xca\x5c\x1\xd8H\x92\xa6\xc3\x82%uXSW0\x06v\x04vZ\x01\xfd<\x9ctu\xcd\x0b\x0f
\x0c\x05\x0f\x1fz\xa7\\\xfex1d\x9aJ\xd2\x8cY\xb0\xa4\t\xd3\xd4\xd5\xa3\x80m
yd\x1f1\xda\x06\xf7tE\x9b\x02\xfe\xca\nj\x0f\xfeK\xca\x5c \xc6\xd2\x04\xb1`I=\xd
1\xd4\xd5\x0c\x0e\x4\x85k(\x0Y\x83\xe7\x99\x0c\x03\xe3\x92M\xa4\xff\x02\x8b\x
80\x1b\x07\xcfu\x4E\xea\xba\x94\xcb=\x81\xb9%\xcd\x12\x0b\x96%\x9a\xbaZ\x02\xcb
\xcb\xd6\xca\xefg\x02\x9b\x5c6%\x1b[w\xd3\x16\xa7E\xabz\xbb\xfi\\\x92\x05K\xd2Z\r
.\xb7~\xa8p=\x1dx\xd2j\x9e'\x02\x8f\x8aI\xb9\xde\x96\x02\xff\x06\xfe\x5b\x5d2s;p
\x1b\x0f\x0f\x96\x17(\xef\xe9\x93\xb4F\x16,IC3\xd8\xff\x5b\x19k.`\x1b\x03\x8fY\x
e9\x99;\x8d\x9f\xcd\x05\x96\x01\xf7\xaf\x0f,Y\xcb\x9fW\xfc\xd9\xbd\xac\xba@=\xf4
\xfc\x07)F\x92\x86\xe5\x7f\xb3\xaf\x19\xb5\xad\xd4\x87@\x00\x00\x00\x00IEND\xaeB
'\x82'
dikirim oleh ('192.168.122.72', 42917)
```

- client

```
< role alpine-1 x alpine-2 x alj > - x
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # python3 multi_thre
ad_async.py
mengirim 1.png
mengirim 2.png
Waktu TOTAL yang dibutuhkan 0:00:00.005337 detik 2021-06-12 03:56:29.622952 s/d
2021-06-12 03:56:29.628289
hasil task yang dijalankan
{0: None, 1: None}
/home/work/Pemrograman_Jaringan_D/progjar3/TugasConcurrency # █
```