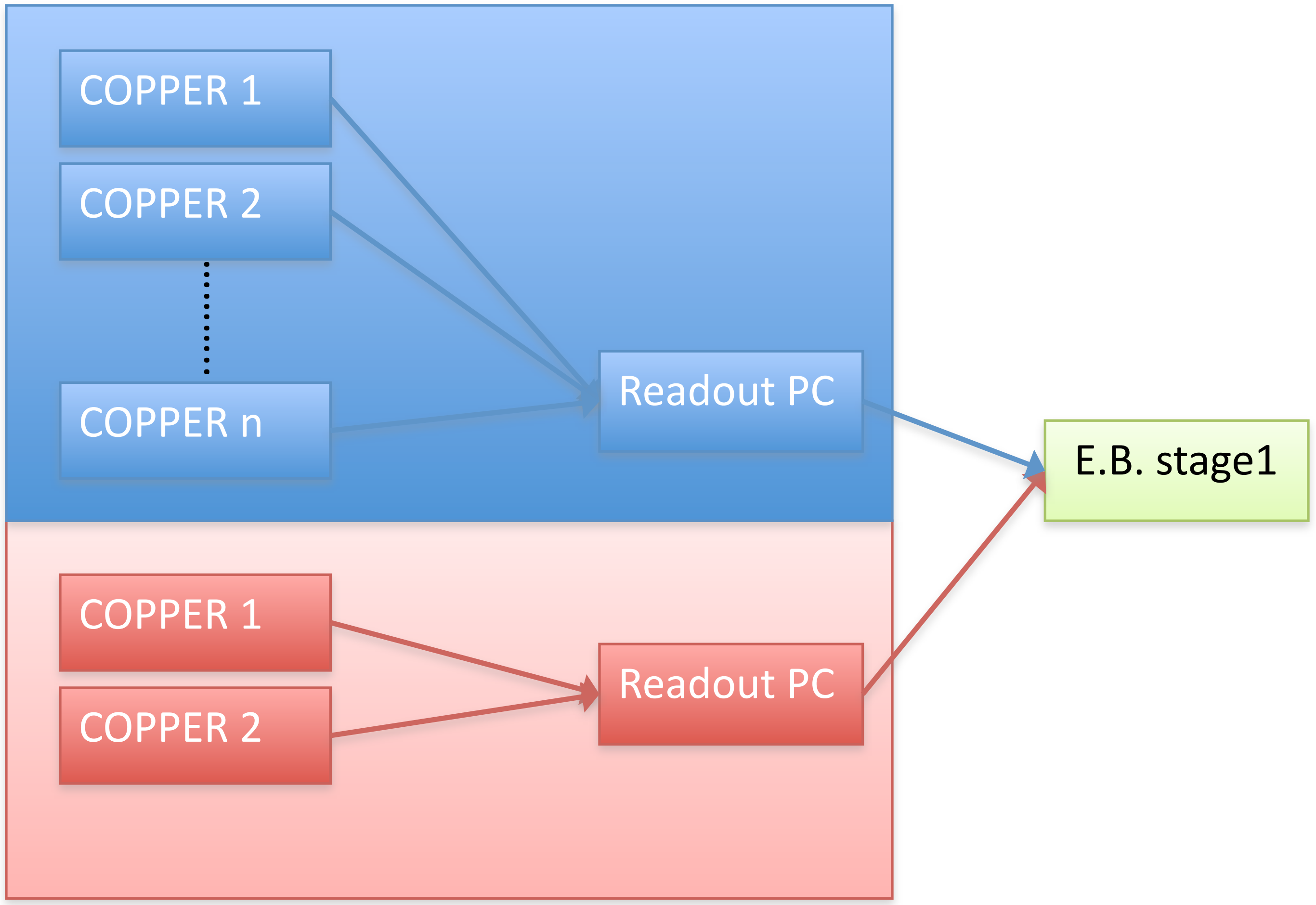
E.B. for SuperBelle

T.Higuchi & yamagata

Current data flow

- Connection making: from upstream to downstream



Problem

- When something bad happen in downstream, all of upstream must be restarted by exp-shift.
  - # of upstream > # of downstream
  - It takes long long time, even in current DAQ
  - Will be more longer in SuperBelle.

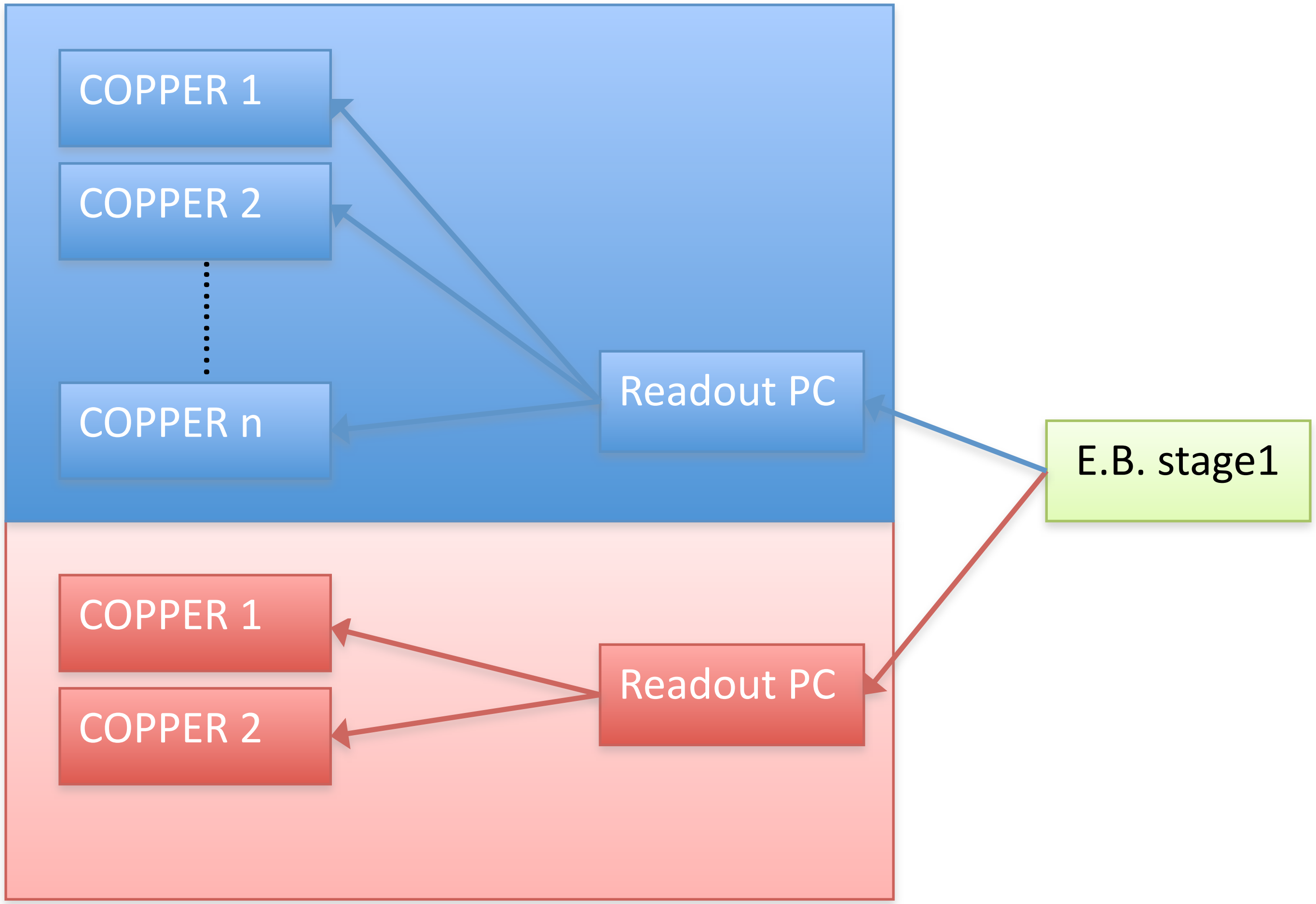
- All components rely on the "status" of NSM
  - But sometimes components are not fully ready even if it says "READY".

Reduce # of restart components

- Connection from downstream to upstream may be effective.
  - If one upstream which has been connected just now found in any problem, all downstream nodes are restarted.
  - Even in the case, the # of restart nodes == # of downstream < # of upstream

Connection from down to up

Readout PC doesn't access COPPERs until it is accessed from E.B.



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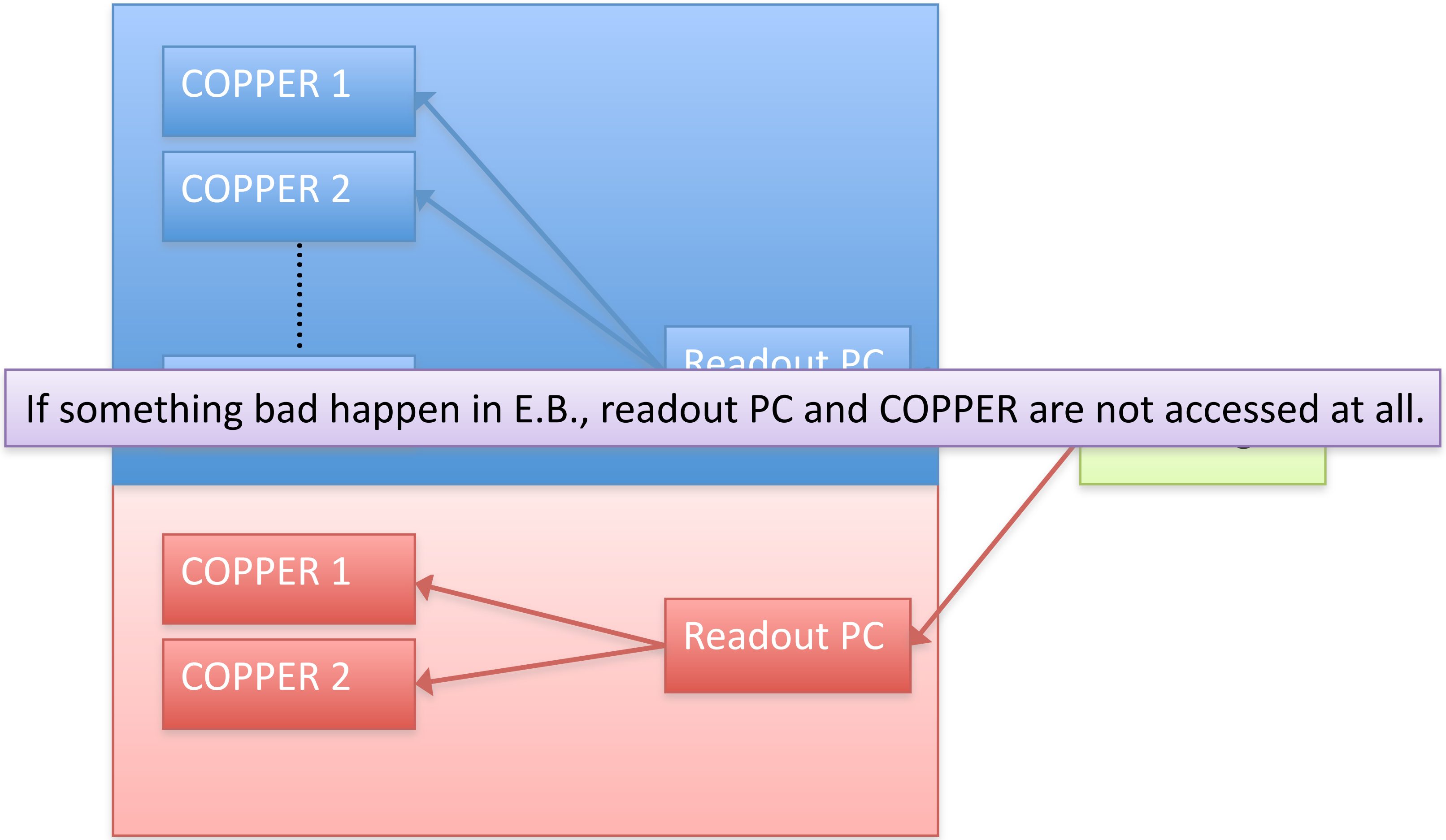

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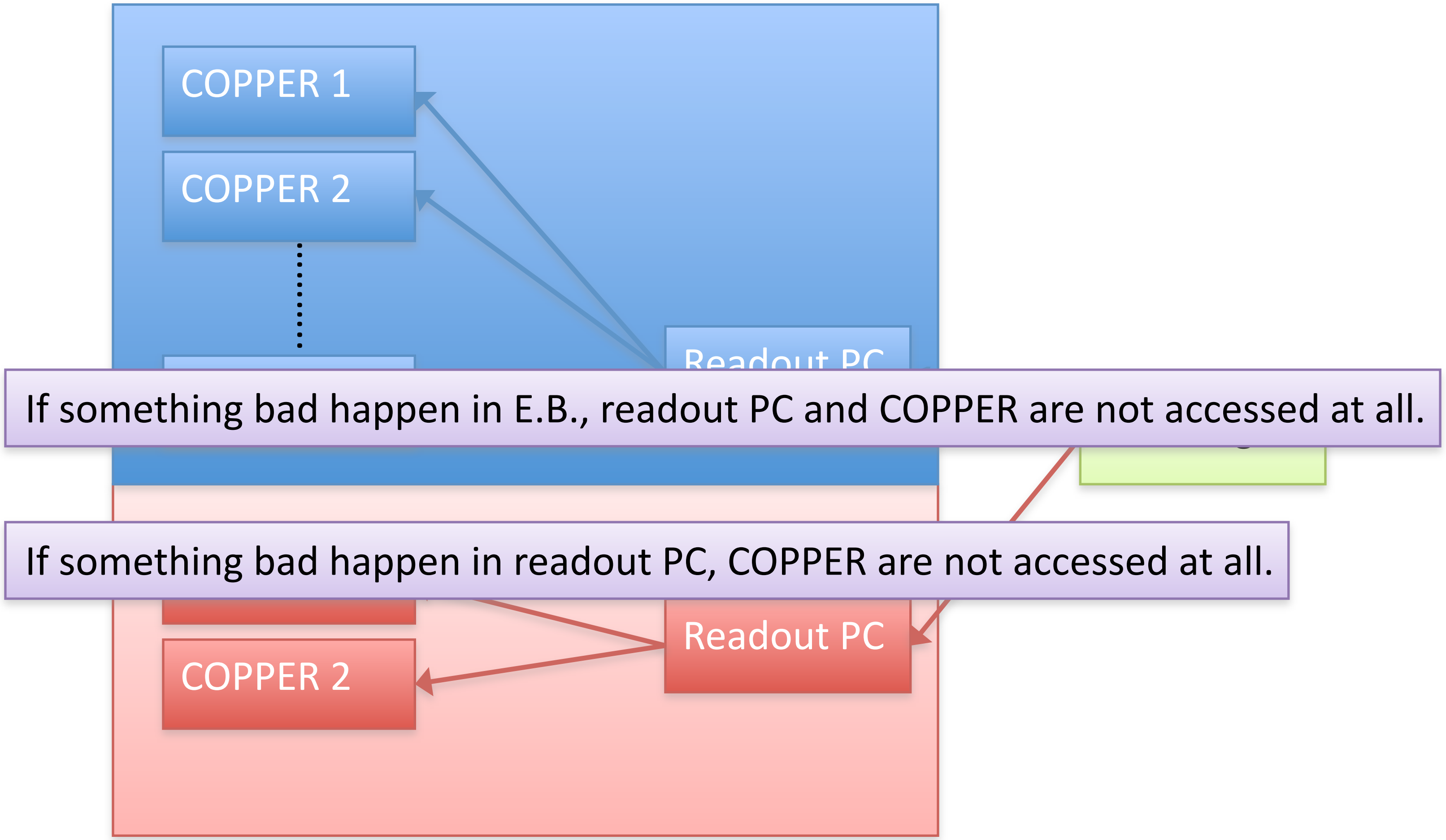

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Difficulty about status

- The reason of the RUN start failure is very, very various.
  - Dead socket connection
  - A wreck of Shared Memory or Semaphore
- Pre-defined STATUS message is too short to tell the exact way to the recovery way.
- We are developing stateless system event building and COPPER readout

What is the stateless?

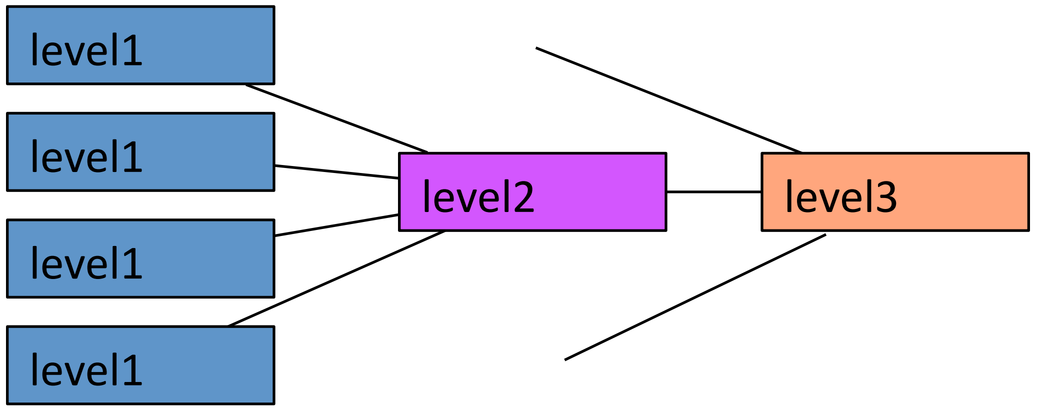
- If RUN is not started, no process is running.
- All processes of E.B. are,
  - kicked from inetd at the RUN start
  - killed by connection close at the RUN end

But we want to know all COPPER status before the RUN start!

- Service Discovery such as
  - SunRPC
  - ZEROconf
    - Bonjour
    - Avahi
- But we have rwho/rwhod
  - We can detect host status (up/down)
  - Other status can be adopted via utmp

Two types for E.B. node

- Multiple input,
  Single output
  - traditional E1,2,3



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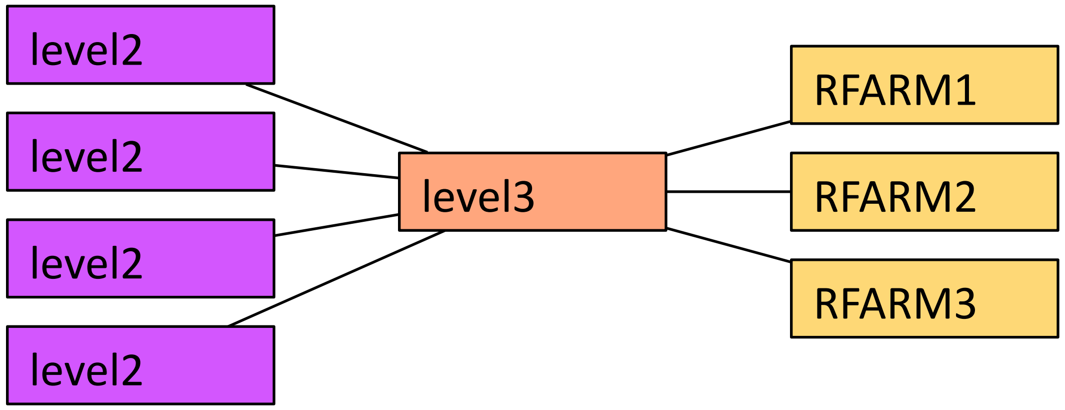

Why?

- Current Scheme
  - E.B. software locates in EFARM
  - # of EFARM == # of RFARM
    - Each of RFARM has their own EFARM
- In the case of Super Belle
  - # of RFARM will be very large
  - # of PC in EFARm will be awfully large
  - large # of EFARM makes it hard to manage
- We will build only one EFARM
  - so multiple in/out component is needed.

Inetd childlen can't handle multiple downstream!

- Inetd kicks the child program for each accept of the connection.
- So each of the process has only one downstream socket.
- But E.B. must distribute data to multiple RFARM.
  - File descriptor passing to other process

File descriptor passing

man –s 2 recv says,

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Open file descriptors are now passed as ancillary data for AF_UNIX domain sockets, with cmsg_level set to SOL_SOCKET and cmsg_type set to SCM_RIGHTS.

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(1)

Connection from RFARM1

$\longrightarrow$

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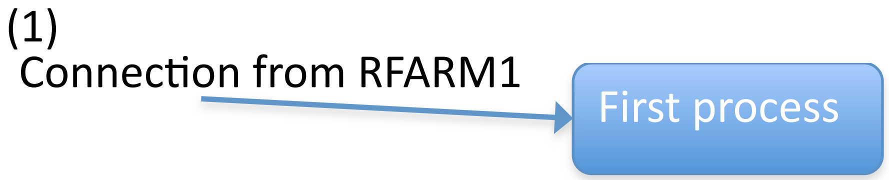

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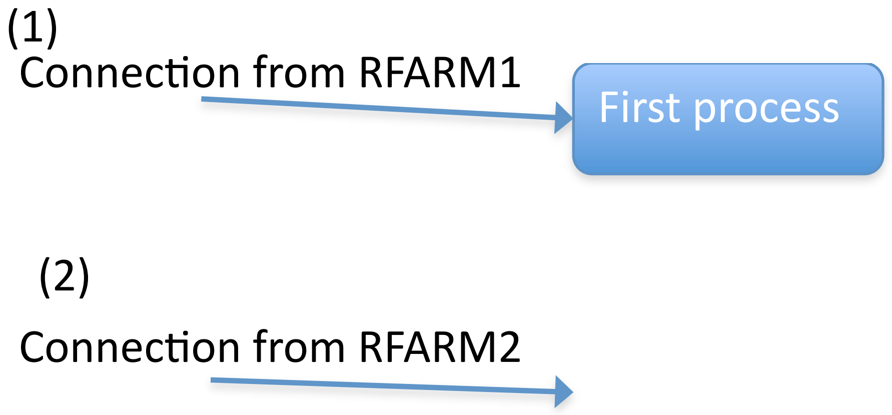

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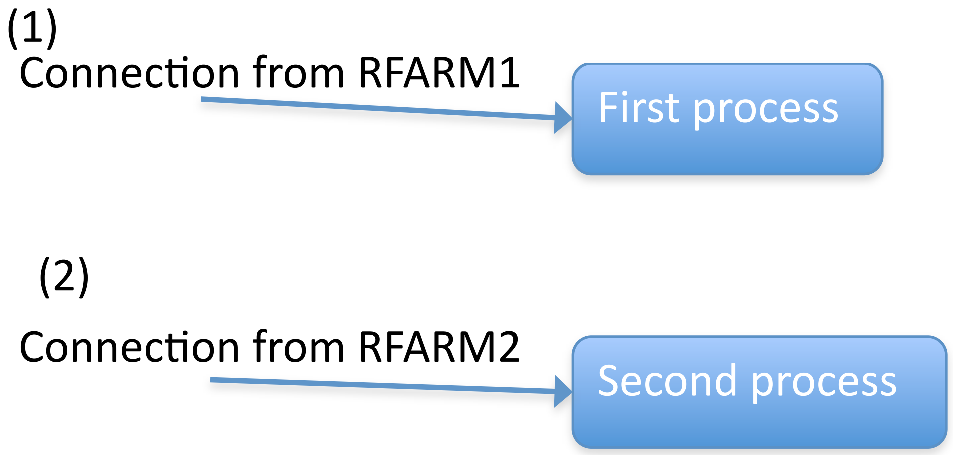

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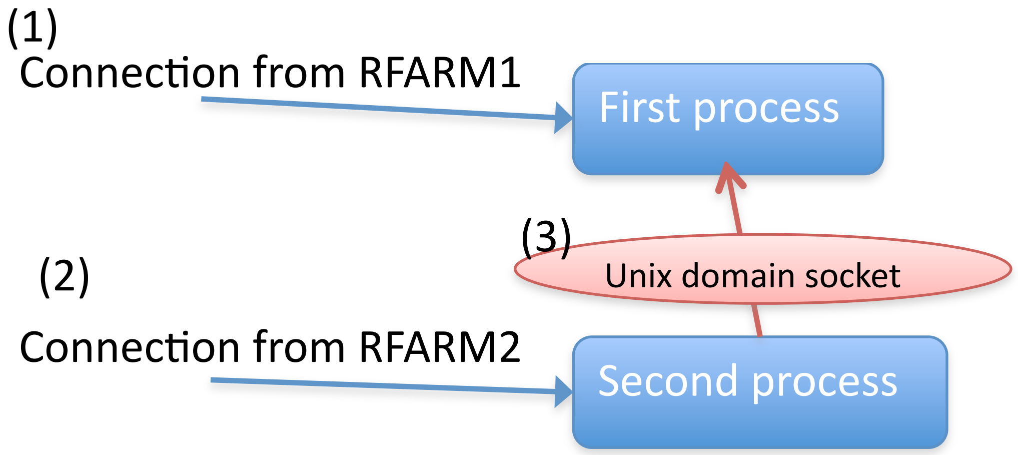

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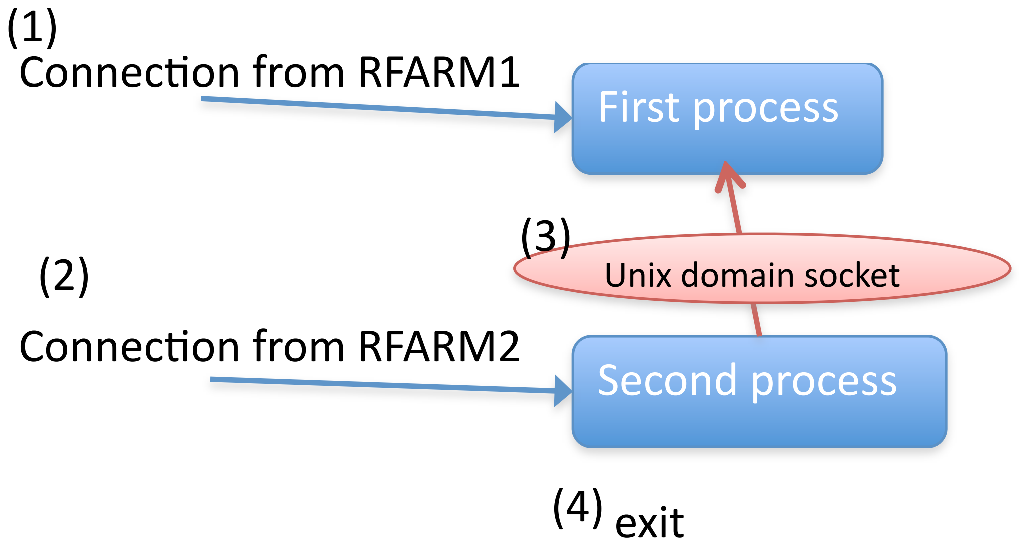

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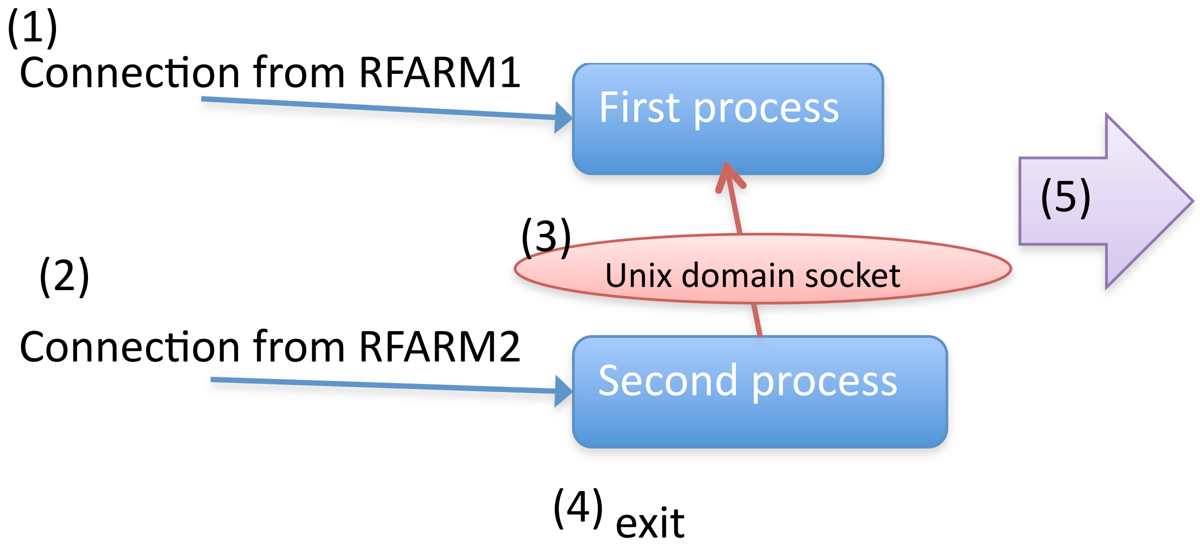

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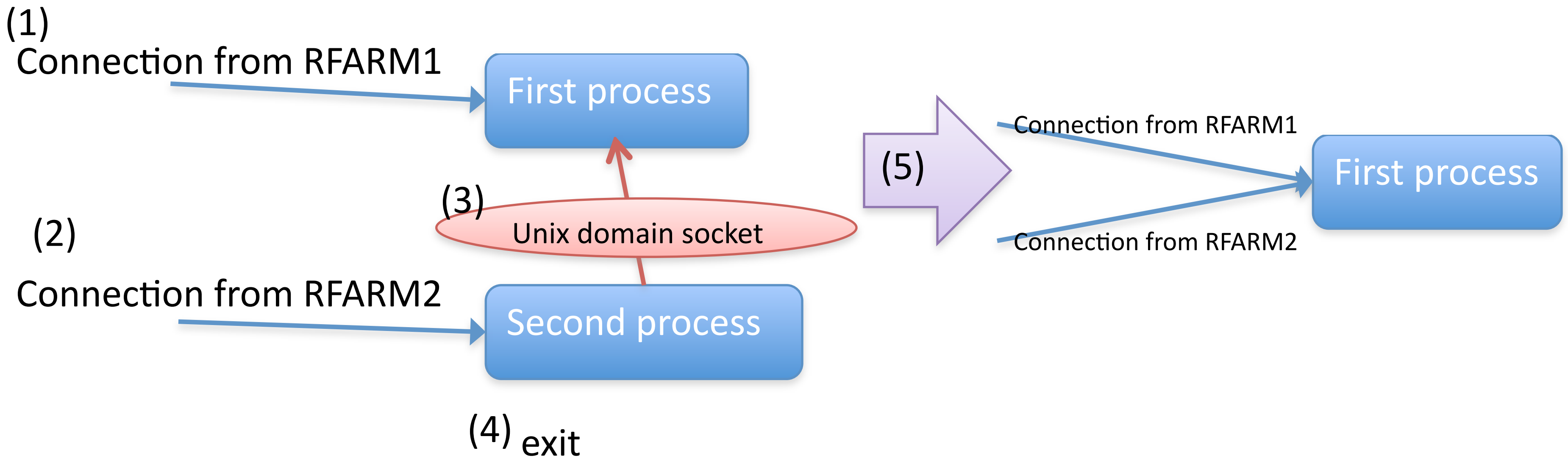

How about CPU consumption?

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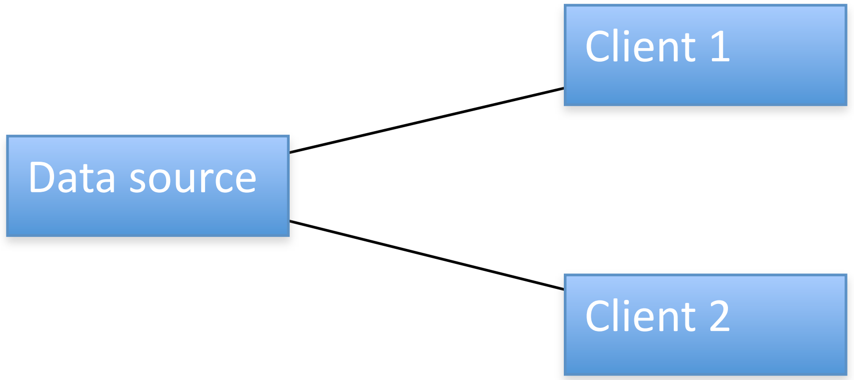
1Gbps link consumes 1GHz CPU power.

1Gbps receiving + sending requires 2GHz.

Test

- Data source
  - Xeon 3.4GHz (C2D Gen.)
  - FSB 1600
- Client 1
  - Xeon 3.0GHz (C2D Gen.)
  - FSB 1333
- Client 2
  - Pentium4 2.6GHz
  - FSB 533
- Connected via e1000, point-to-point



Check the throughput and CPU consumption

Observed speed at client side

#tdiff=time to receive 10M words from server

tdiff=0.356304(sec) 117.717006

tdiff=0.356299(sec) 117.718658

tdiff=0.356540(sec) 117.639087

tdiff=0.356301(sec) 117.717997

tdiff=0.356541(sec) 117.638757

....

117MB/s, fully occupied GbE

CPU consumption

- 7-8% at the server side

```
top - 16:42:52 up 4 days, 22:30,  3 users,  load average: 0.06, 0.11, 0.09
Tasks: 162 total,   1 running, 157 sleeping,   4 stopped,   0 zombie
Cpu(s):  0.0%us,  1.0%sy,  0.0%ni, 97.9%id,  0.0%wa,  0.2%hi,  0.9%si,
0.0%st
Mem:  16632668k total,   714200k used, 15918468k free,   198828k buffers
Swap:        0k total,        0k used,        0k free,   415912k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
17578 nobody    15   0  2668 1532 1456 S    8  0.0   2:06.43 fdpass
    1 root      15   0  2060  660  572 S    0  0.0   0:03.31 init
    2 root      RT  -5     0    0    0 S    0  0.0   0:00.00 migration/0
    3 root      34  19     0    0    0 S    0  0.0   0:00.00 ksoftirqd/0
    4 root      RT  -5     0    0    0 S    0  0.0   0:00.00 watchdog/0
```

CPU consumption

- Client 1 (Xeon 3.0GHz)

```
top - 16:31:02 up  5:04,  3 users,  load average: 0.43, 0.24, 0.13
Tasks:  59 total,   1 running,  58 sleeping,   0 stopped,   0 zombie
Cpu(s):  2.0% us,  2.0% sy,  0.0% ni, 92.5% id,  0.0% wa,  0.0% hi,  3.5% si
Mem:  16439168k total,  1697956k used, 14741212k free,   276380k buffers
Swap:        0k total,        0k used,        0k free,   308216k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
 4298 yamagata  15   0 84452  40m  416 S 11.0  0.3   3:30.07 xxx
    1 root      16   0  4772  588  488 S  0.0  0.0   0:00.69 init
```

CPU consumption

- Client 2

```
top - 16:48:46 up  5:23,  2 users,  load average: 0.47, 0.50, 0.42
Tasks:  61 total,   2 running,  55 sleeping,   4 stopped,   0 zombie
Cpu(s):  0.5% us, 10.4% sy,  0.0% ni, 88.1% id,  0.0% wa,  1.0% hi,
0.0% si
Mem:   3114716k total,   276328k used,  2838388k free,    43820k buffers
Swap:  2096472k total,        0k used,  2096472k free,   136880k cached
Change delay from 1.0 to:
  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
17179 yamagata  15   0 42724  40m  408 R 20.9  1.3   5:45.34 xxx
17203 yamagata  16   0  2672  968  768 R  1.0  0.0   0:00.14 top
    1 root      16   0  1948  548  472 S  0.0  0.0   0:00.73 init
    2 root      RT   0     0    0    0 S  0.0  0.0   0:00.44 migration/0
    3 root      34  19     0    0    0 S  0.0  0.0   0:00.01 ksoftirqd/0
```

This indicates

- CPU consumer is not sender, but receiver
  - may be because of TCP Segmentation Offload.
- Single process can distribute a few GbE data stream to multiple machines
  - But the bus bandwidth will limit total network bandwidth around 5Gbps from my experience about 10GbE NIC.

So we continue this strategy

- But investigation is still necessary
  - Dependency
    - seems to be depend on FSB speed
    - how about i7?
- More PCs are necessary to test
  - As we have only old PCs, extrapolate is danger

Summary

- Multiple input/output skeleton is ready to test
  - will be usable up to a few Gbps output
  - Must be tested by newer PCs
- In the next step, we will confirm it co-works with stateless neighbor detection based on rwho service.