

(Ab)Using Route Servers

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Agenda

- Why Route Servers?
- What do Route Servers do?
- Current implementations and Route Server Working Group
- Functionality and scalability testing

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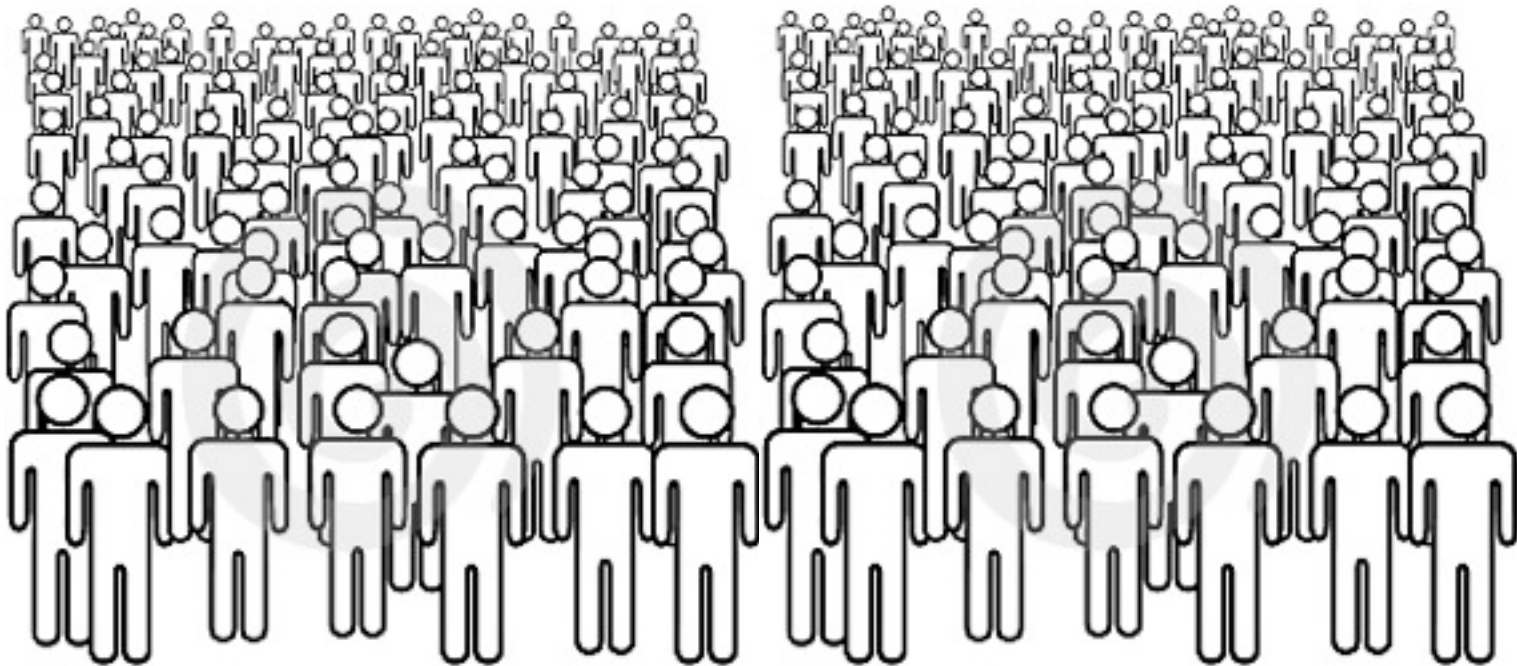
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Why Route Servers?

- Internet Exchange (e.g. AMS-IX, DE-CIX, LINX)
- Peering Platform for many Parties
- Route Servers for the Participants

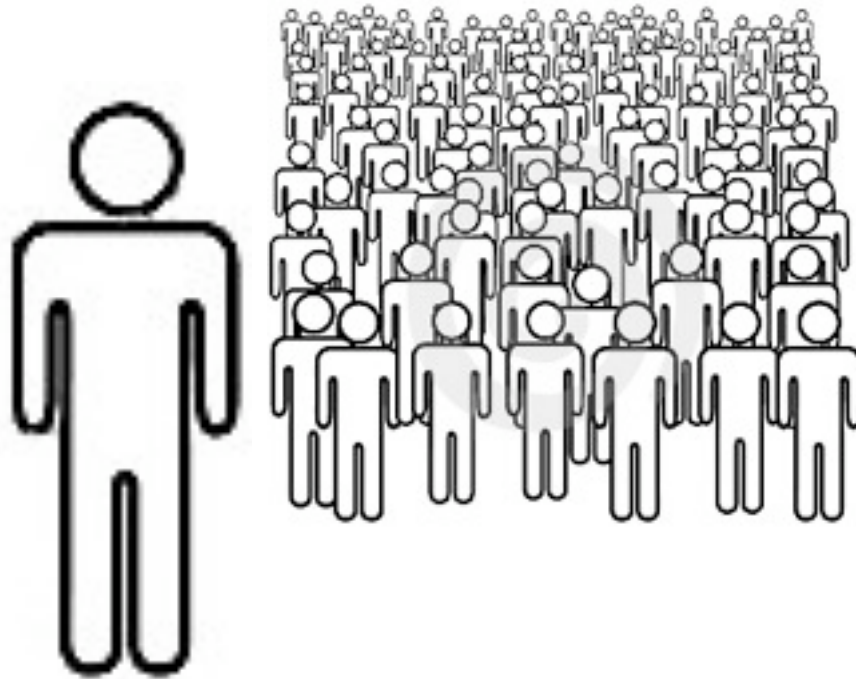
Why Route Servers?

- Peer with as many parties as possible
- ➔ Maintaining lots of BGP Sessions



Why Route Servers?

- Reach a lot of Parties with just one BGP session



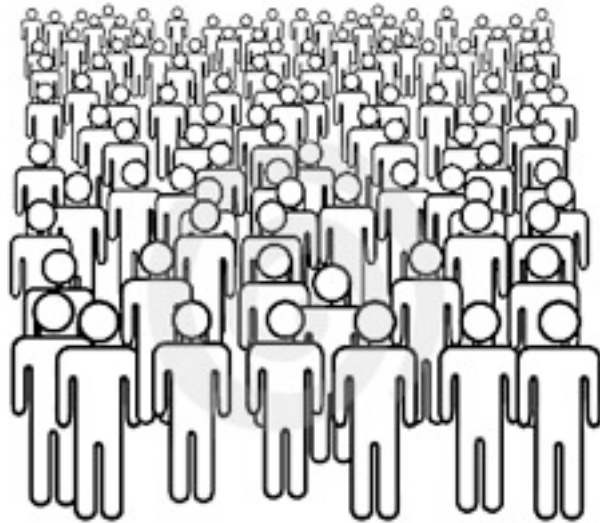
Why Route Servers?

- Redundancy ... in case your sessions die ...



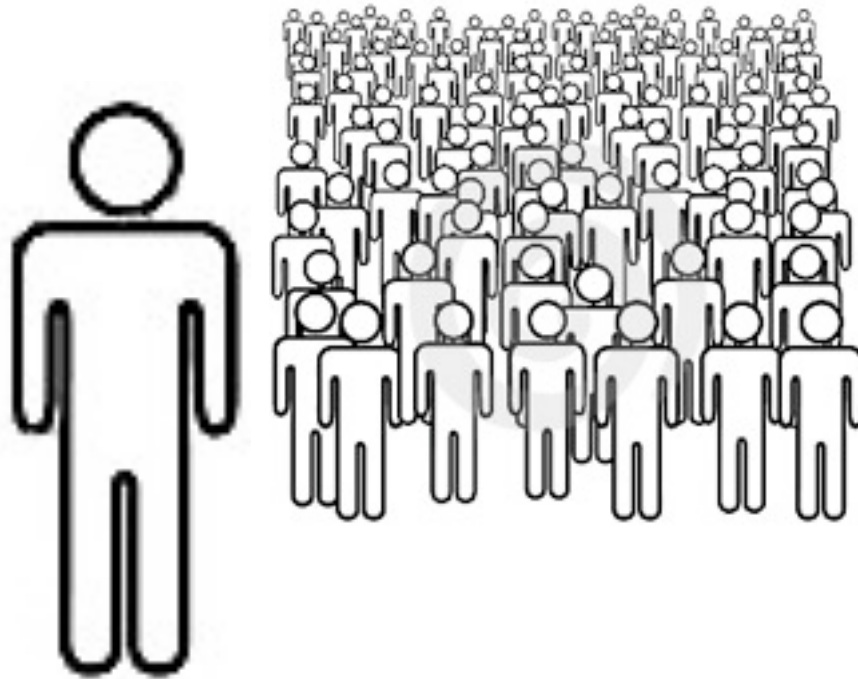
Why Route Servers?

- Redundancy ... in case the Route Server dies ...



Why Route Servers?

- Easy entry point for new Members to the Exchange - immediate traffic



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- Why Route Servers?
- **What do Route Servers do?**
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What do route servers do?

- Receive UPDATES from every participant

```
19:58:33.721679 IP (tos 0x0, ttl 64, id 44576, offset 0, flags [DF], proto TCP (6), length 117)
10.23.0.5.58880 > 10.23.0.1.179: P, cksum 0xb892 (correct), 48:113(65) ack 61 win 1460
<nop,nop,timestamp 1976783474 3177206804>: BGP, length: 65
  Update Message (2), length: 65
```

```
...
  AS Path (2), length: 10, Flags [T]: 65499 11 12 13
```

```
...
  Next Hop (3), length: 4, Flags [T]: 10.23.0.5
```

```
...
  Updated routes:
    2.0.5.0/24
```

```
19:58:33.723897 IP (tos 0x0, ttl 64, id 42762, offset 0, flags [DF], proto TCP (6), length 117)
10.23.0.4.33349 > 10.23.0.1.179: P, cksum 0xb033 (correct), 48:113(65) ack 61 win 1460
<nop,nop,timestamp 1976783474 1916183085>: BGP, length: 65
  Update Message (2), length: 65
```

```
...
  AS Path (2), length: 10, Flags [T]: 65500 11 12 13
```

```
...
  Next Hop (3), length: 4, Flags [T]: 10.23.0.4
```

```
...
  Updated routes:
    2.0.4.0/24
```

What do route servers do?

- Apply filters for the receiving peers

```
from AS65500 accept ANY  
to AS65500 announce AS65499
```

```
from AS65499 accept ANY  
to AS65499 announce AS65500
```

What do route servers do?

- Perform “best path” selection for every peer
- Store Routing Information Base (RIB) for every peer

```
flags destination          gateway          lpref    med aspath origin
*>    2.0.4.0/24            10.23.0.4       100     200 65500 11 12 13 i
*>    2.0.5.0/24            10.23.0.5       100     200 65499 11 12 13 i
```

What do route servers do?

- Forward the RIB contents to the desired peer

```
19:58:33.901718 IP (tos 0xc0, ttl 1, id 15745, offset 0, flags [DF], proto TCP (6), length 103)
10.23.0.1.179 > 10.23.0.4.33349: P, cksum 0x2b21 (correct), 61:112(51) ack 114 win 17376
<nop,nop,timestamp 1916183105 1976783474>: BGP, length: 51
  Update Message (2), length: 51
```

```
...
  AS Path (2), length: 10, Flags [T]: 65499 11 12 13
```

```
...
  Next Hop (3), length: 4, Flags [T]: 10.23.0.5
```

```
...
  Updated routes:
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```

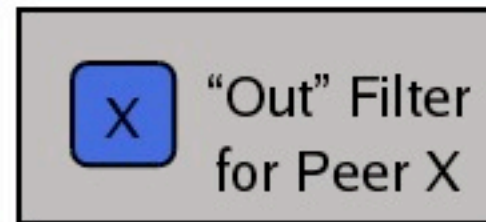
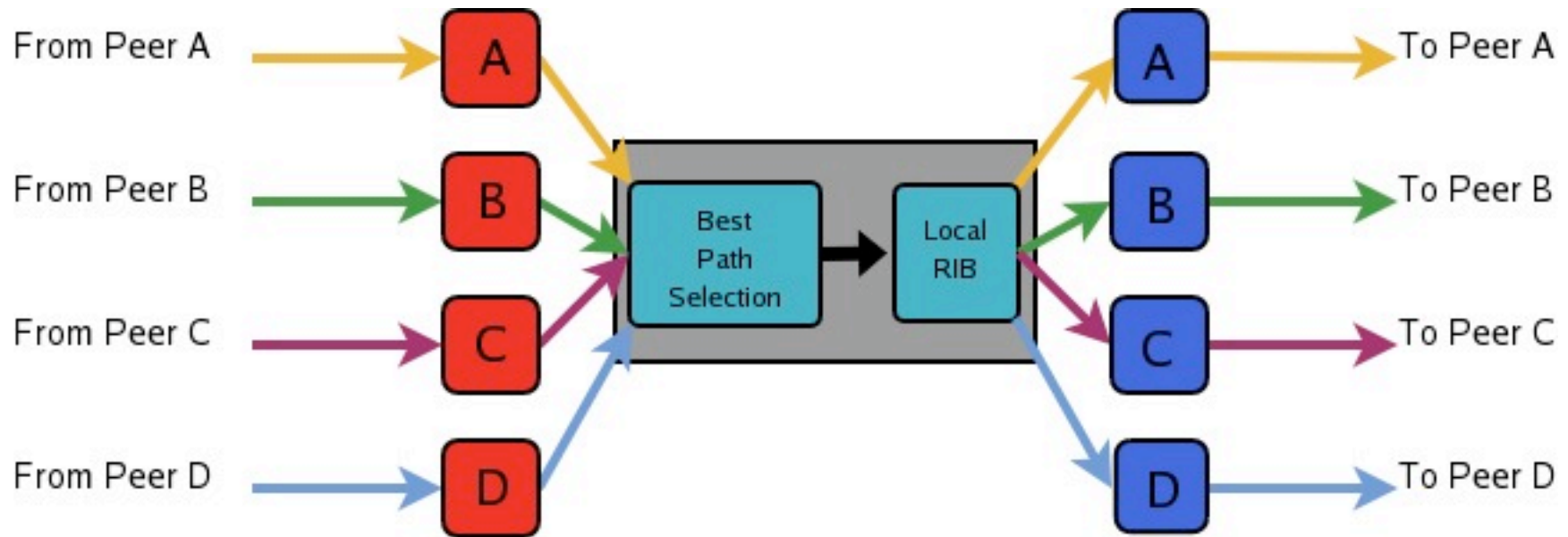
```
19:58:33.903463 IP (tos 0xc0, ttl 1, id 12268, offset 0, flags [DF], proto TCP (6), length 103)
10.23.0.1.179 > 10.23.0.5.58880: P, cksum 0x377e (correct), 61:112(51) ack 114 win 17376
<nop,nop,timestamp 3177206824 1976783474>: BGP, length: 51
  Update Message (2), length: 51
```

```
...
  AS Path (2), length: 10, Flags [T]: 65500 11 12 13
```

```
...
  Next Hop (3), length: 4, Flags [T]: 10.23.0.4
```

```
...
  Updated routes:
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What do route servers do?



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- **Current implementations and Route Server Working Group**
- Functionality and scalability testing

Current Implementations

- Quagga
- OpenBGPD
- BIRD

Route Server Working Group

- Andy Davidson - LONAP
- Chris Malayter - Switch & Data
- Elisa Jasinska - AMS-IX
- Mo Shivji - LINX
- Robert Wozny - PL-IX
- Sebastian Spies - DE-CIX
- Wolfgang Hennerbichler - VIX



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Functional Testing

AS4 / 32 Bit ASN

- All three implementations support AS4
- All three versions tested as of 04.12.2009 to properly implement AS4

IPv6

- All three implementations support IPv6
- We highly recommend running a current version of any of three implementations
- MANY bugs fixed between in 2009
- Running a port of a route server is ill-advised and can leave a bad taste in your mouth!

Scalability

Testing

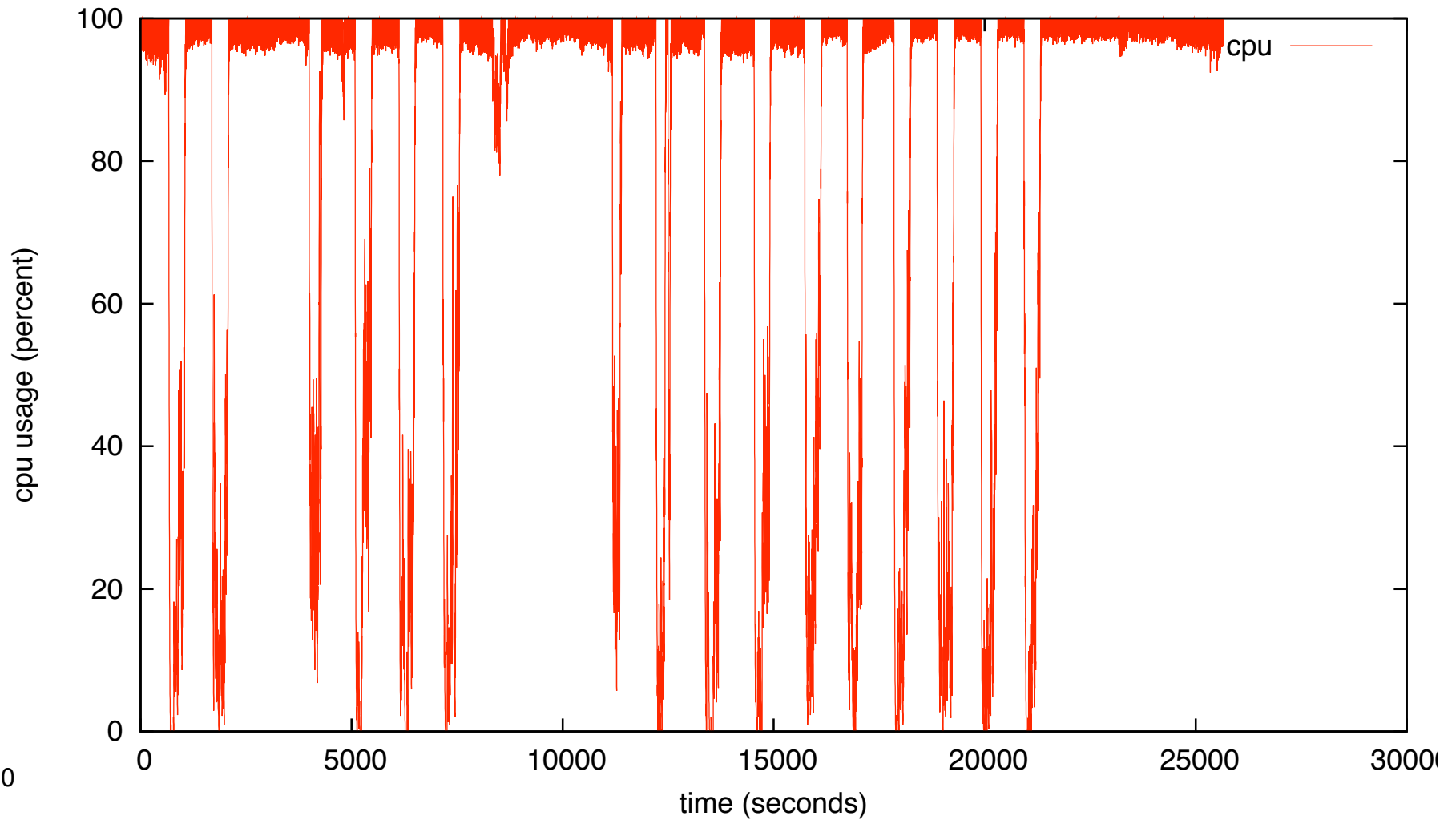
- 100 sessions, set up from IXIA
- 500 or 1000 prefixes per session
- Additional random flapping

Quagga

- Single threaded implementation
- Issues with performing its tasks on time
- CPU thrashing during periods of instability
- Bug causing crash during flapping

Quagga CPU

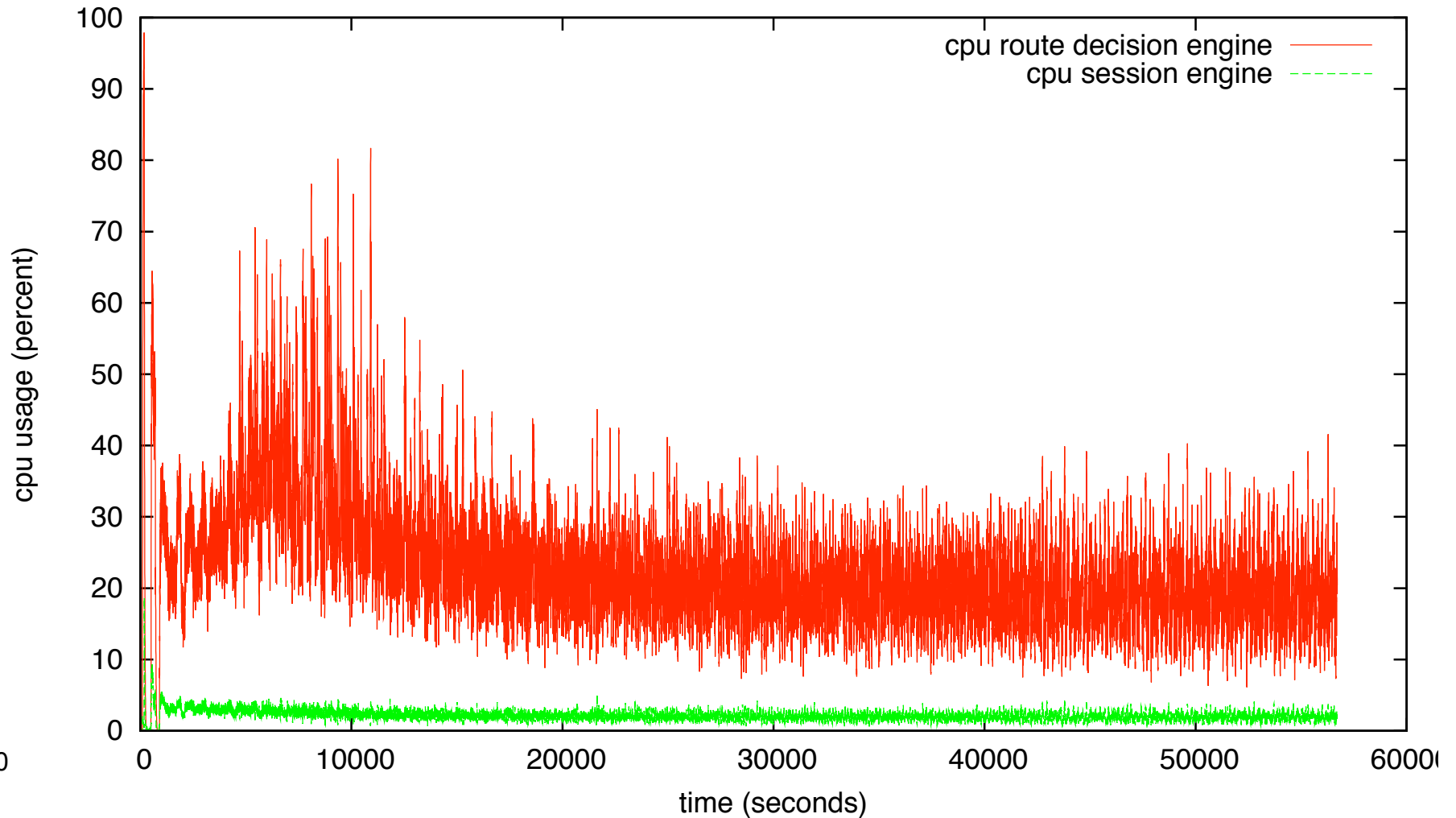
Quagga cpu usage
multiple-rib; 100 sessions
IXIA vs. Quagga
500 prefixes per session with random flapping
lab4
2 x Intel(R) Xeon(R) CPU 3050 @ 2.13GHz



OpenBGPd CPU

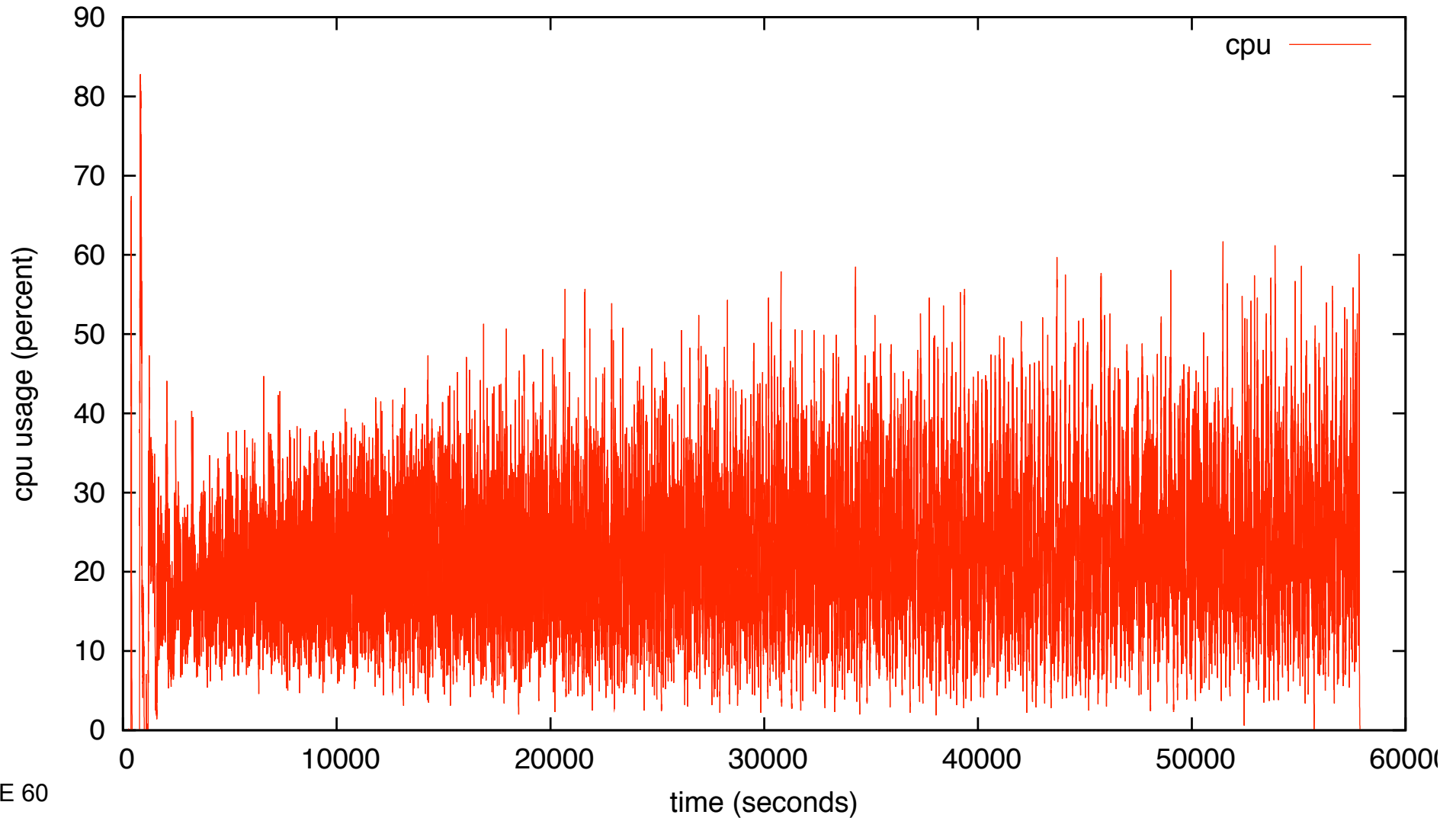
OpenBGPd cpu usage
multiple-rib; 100 sessions
IXIA vs. OpenBGPd
1000 prefixes per session
lab2.paix.net

4 x Intel(R) Xeon(TM) CPU 3.60GHz (GenuineIntel 686-class) 3.61 GHz



BIRD CPU

BIRD cpu usage
multiple-rib; 100 sessions
IXIA vs. BIRD
500 prefixes per session with random flapping
lab6.paix.net
4 x Intel(R) Xeon(TM) CPU 3.80GHz



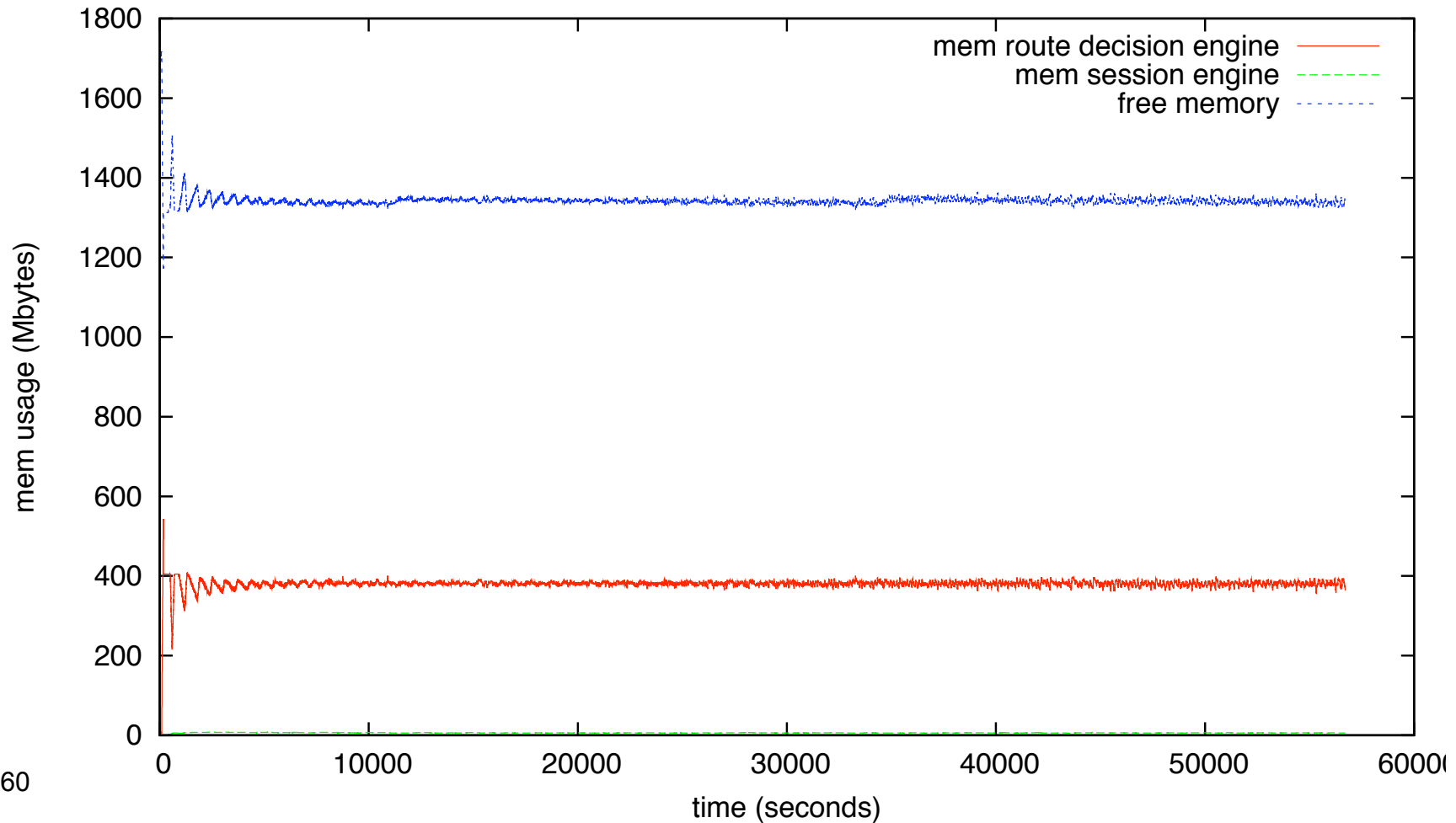
OpenBGPD

- Multi-threaded implementation
- Session thread keeps sessions active while instability is occurring
- 1GB memory limitation per process on i386 and a 4 GB memory limitation on amd64

OpenBGPd Mem

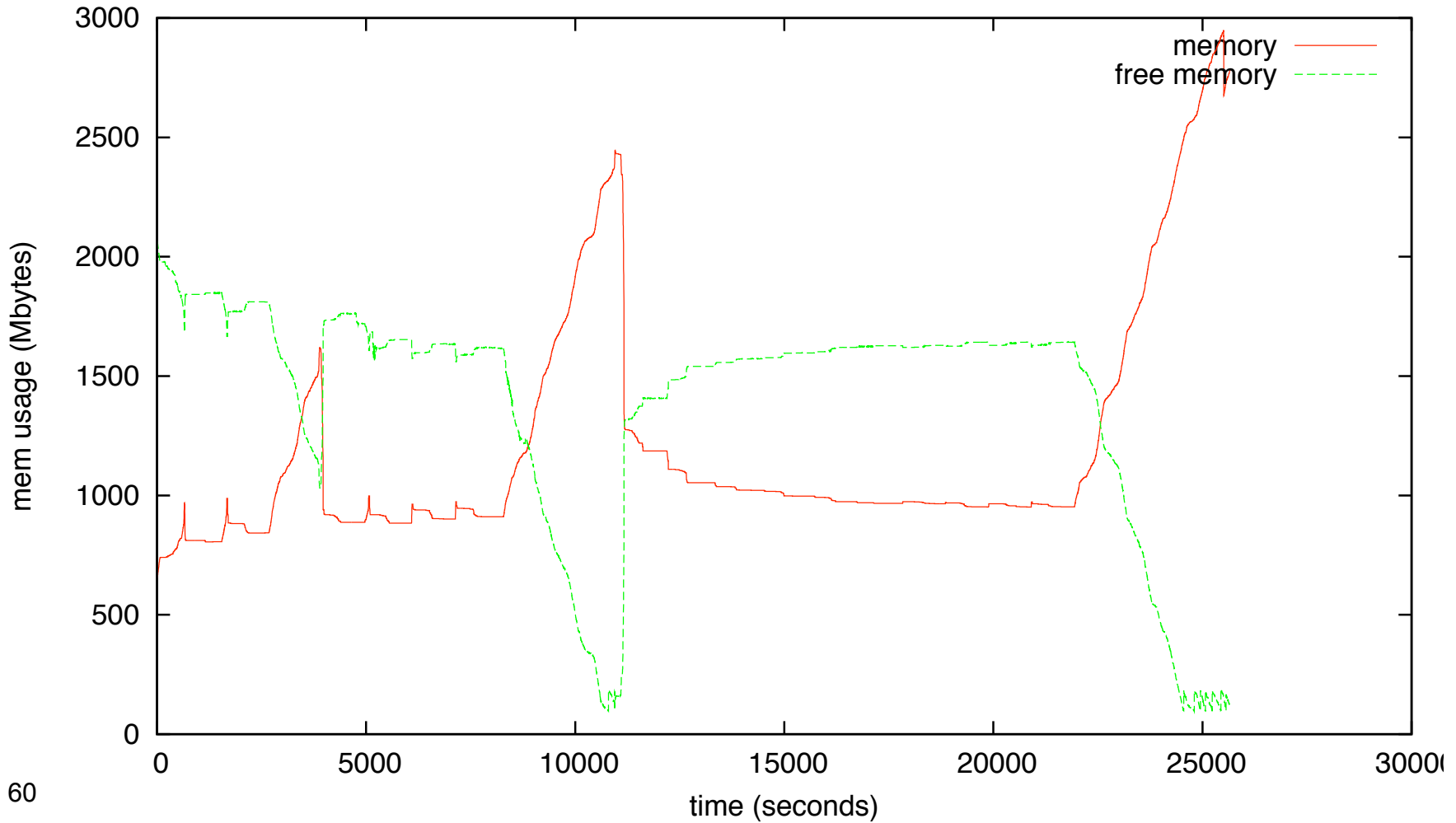
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Quagga Mem

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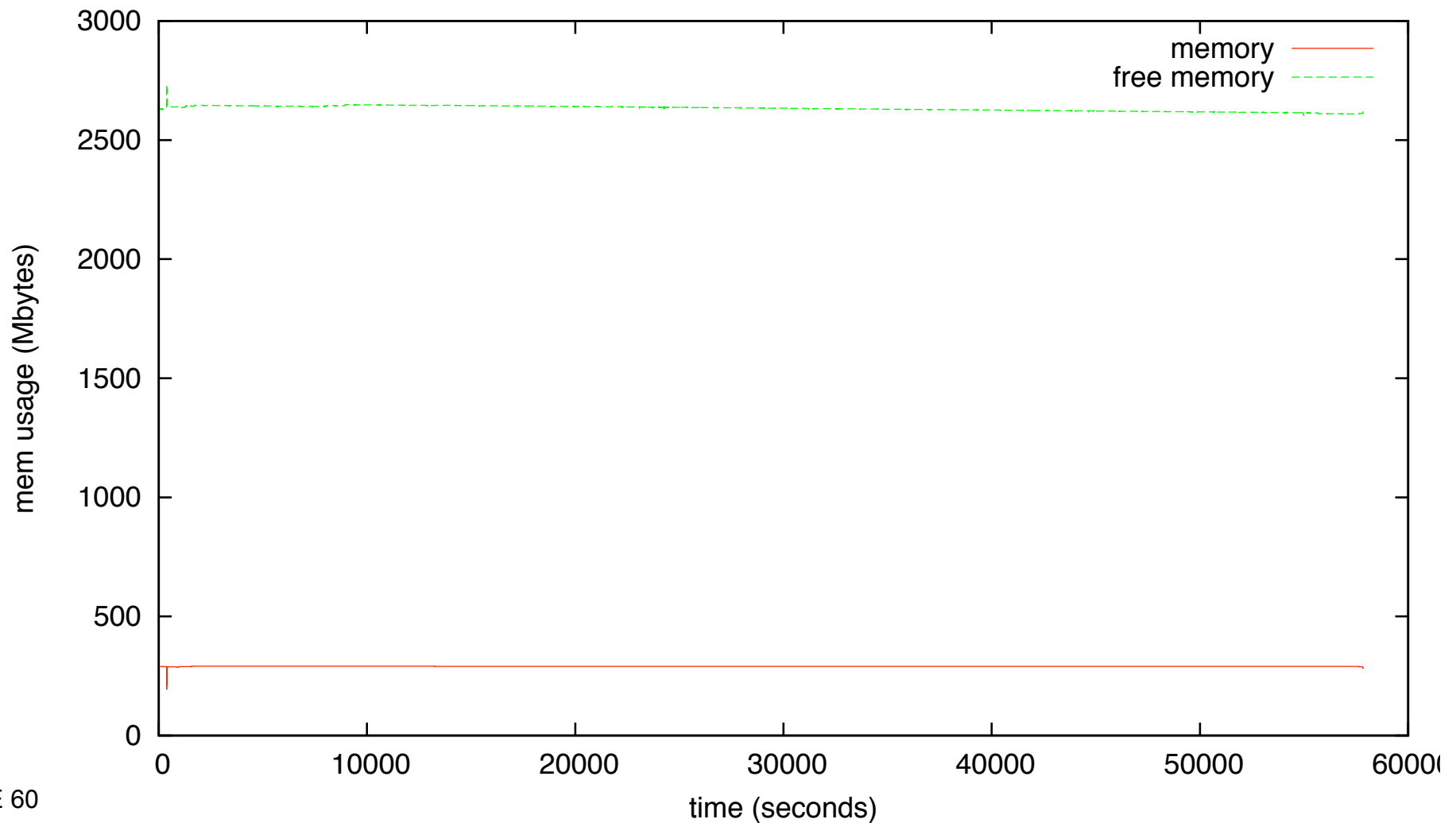


BIRD

- Single threaded implementation
- Amazing scheduling system
- The most stable route server we tested
- Discovered odd memory freeing issues in Linux glibc

BIRD Mem

BIRD mem usage
multiple-rib; 100 sessions
IXIA vs. BIRD
500 prefixes per session with random flapping
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Thank you!
Questions?

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