Internet Mapping at IP level

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Grupo de **R**edes, **S**istemas y **S**ervicios **T**elemáticos
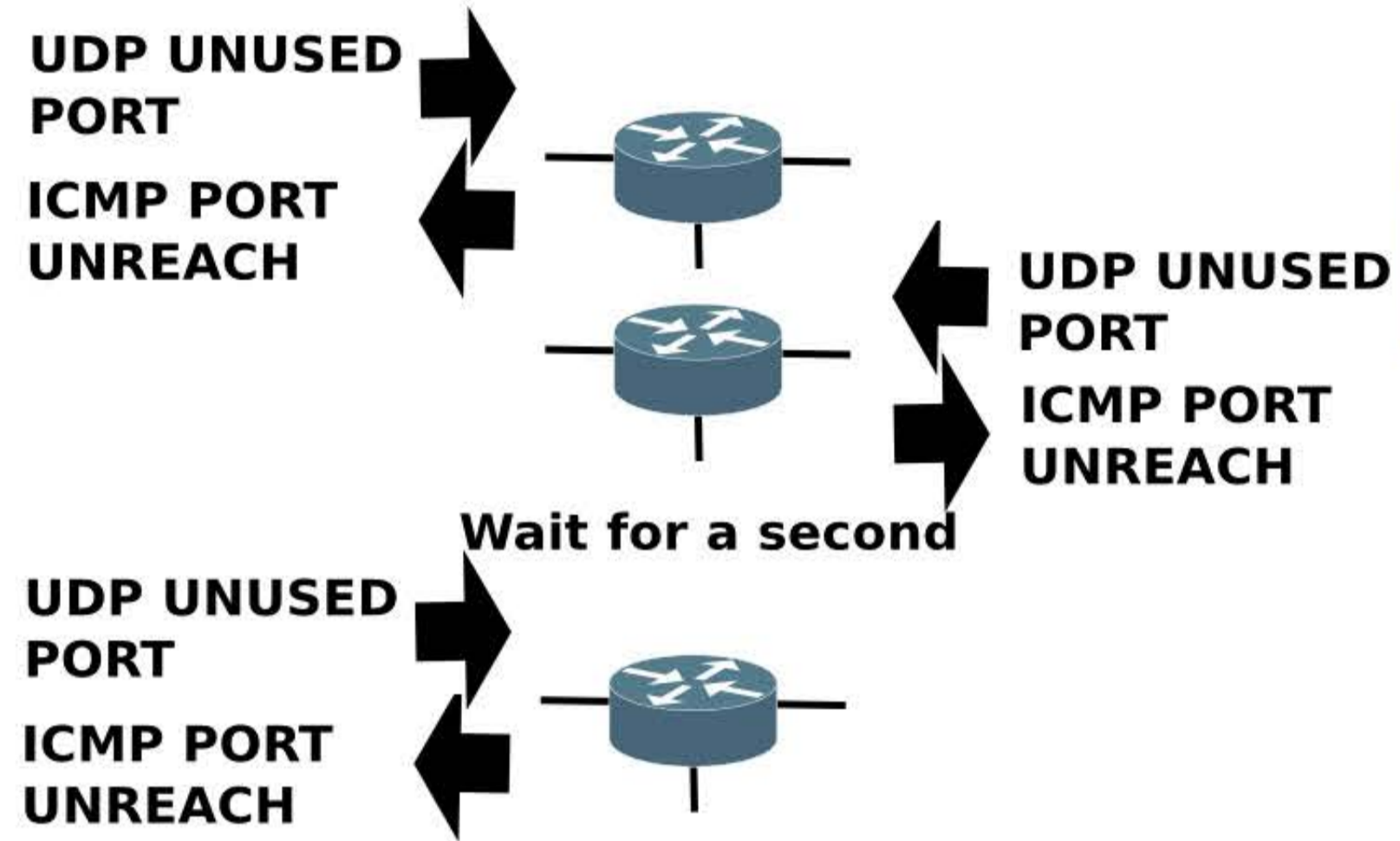
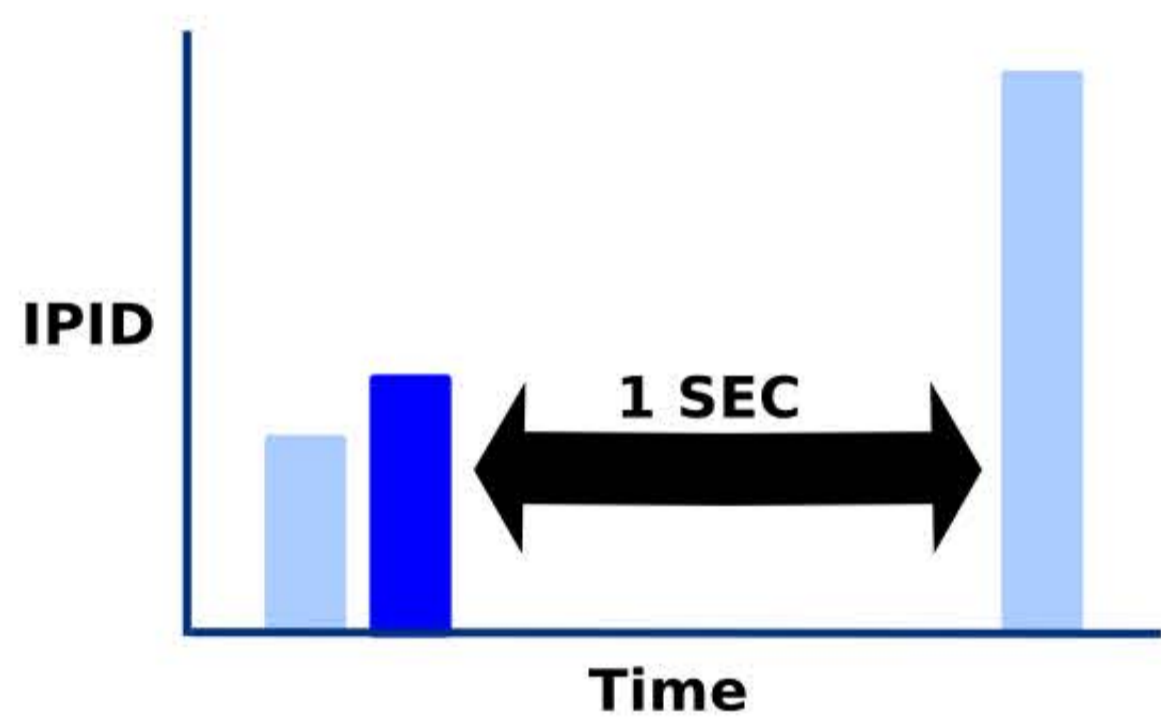## IP address alias identification

1.Mercator
Same source.
Same router.

UDP UNUSED PORT
ICMP PORT UNREACH
UDP UNUSED PORT
ICMP PORT UNREACH
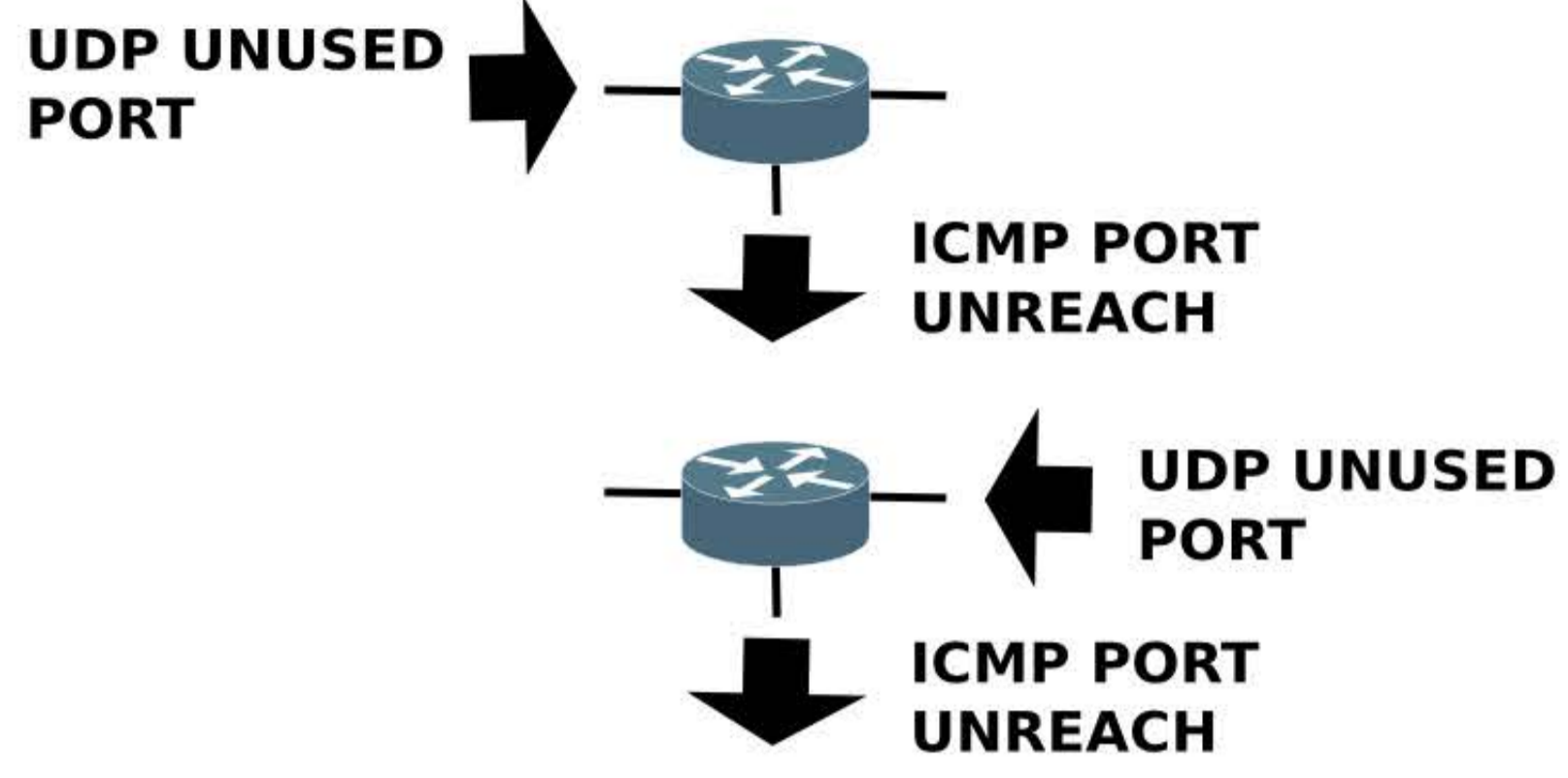
2.Ally
Compare received IPID

UDP UNUSED PORT
ICMP PORT UNREACH
UDP UNUSED PORT
ICMP PORT UNREACH

Wait for a second
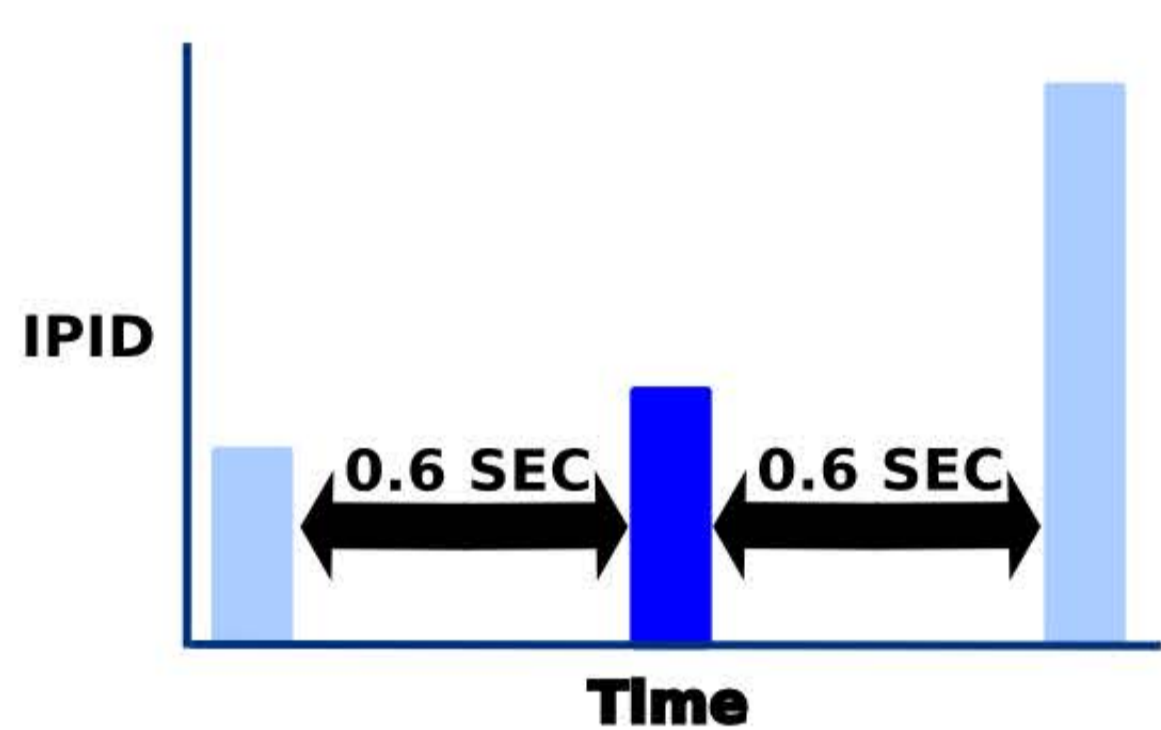
UDP UNUSED PORT
ICMP PORT UNREACH

IPIDS have a increasing secuence means IP belong same router.

IPID
1 SEC
Time

3.Our proposal

Change timming:
Same offset time between packets.

IPID
0.6 SEC   0.6 SEC
Time

Increasing Number of probing packets:
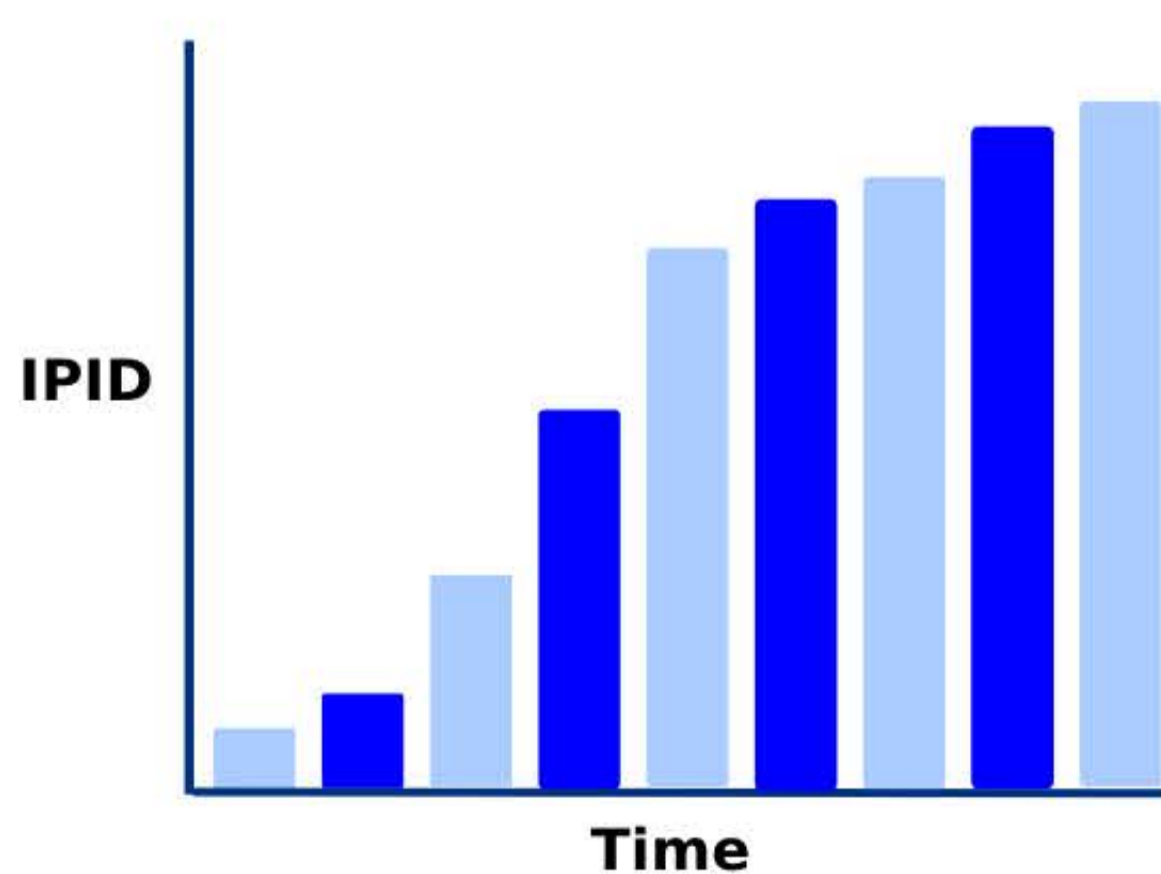
IPID
Time

New types of probing packets:

Send Packet → **Received Packet**

UDP UNUSED PORT
ICMP ECHO REQUEST
ICMP TIMESTAMP REQUEST
TCP UNUSED PORT

ICMP PORT UNREACHABLE
ICMP ECHO REPLY
ICMP TIMESTAMP REQUEST
TCP RESET
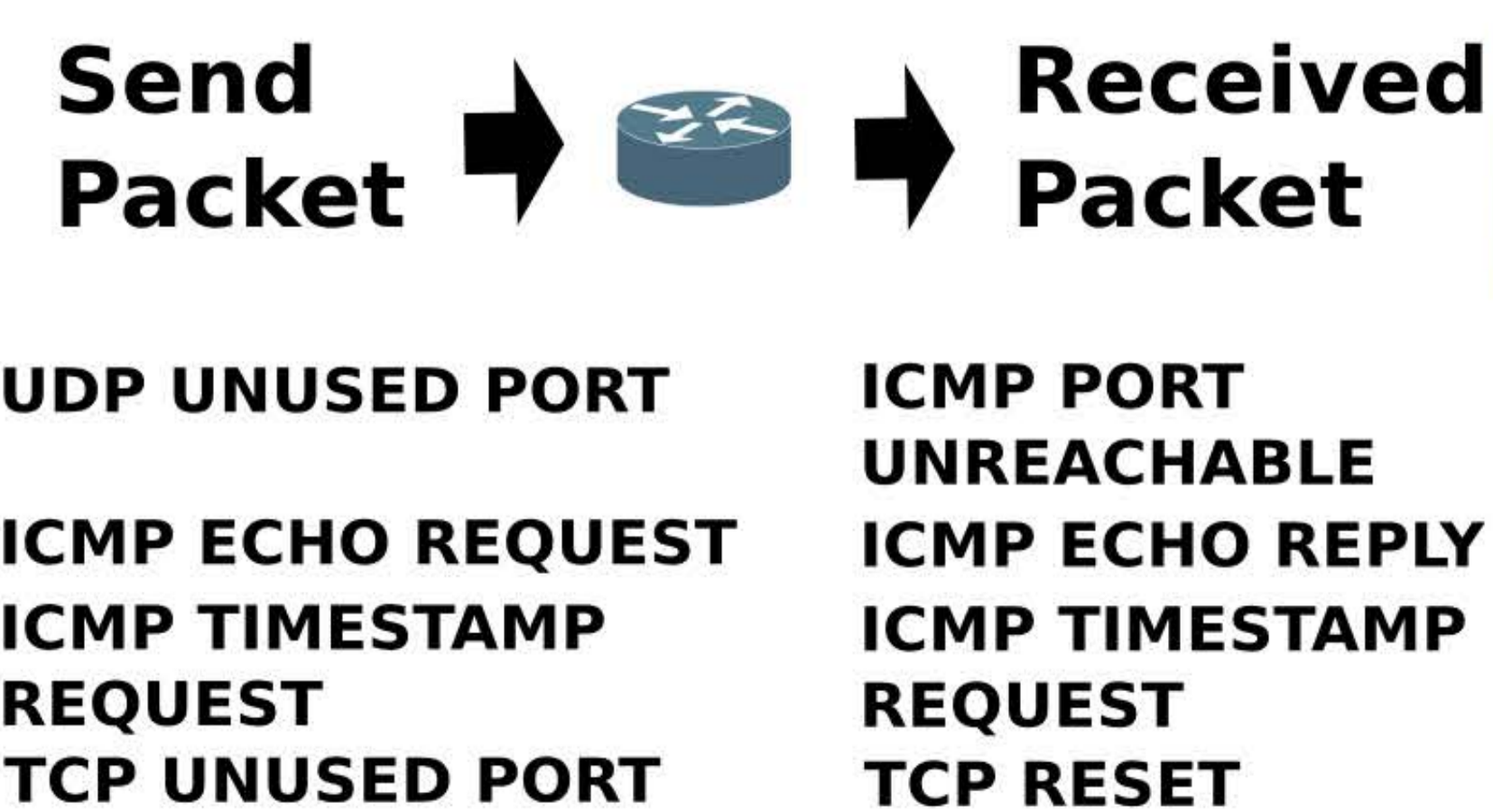
IPID based

Internet topology map

?

Path discovery

IP1   IP2   IP3
IP4   IP5   IP6
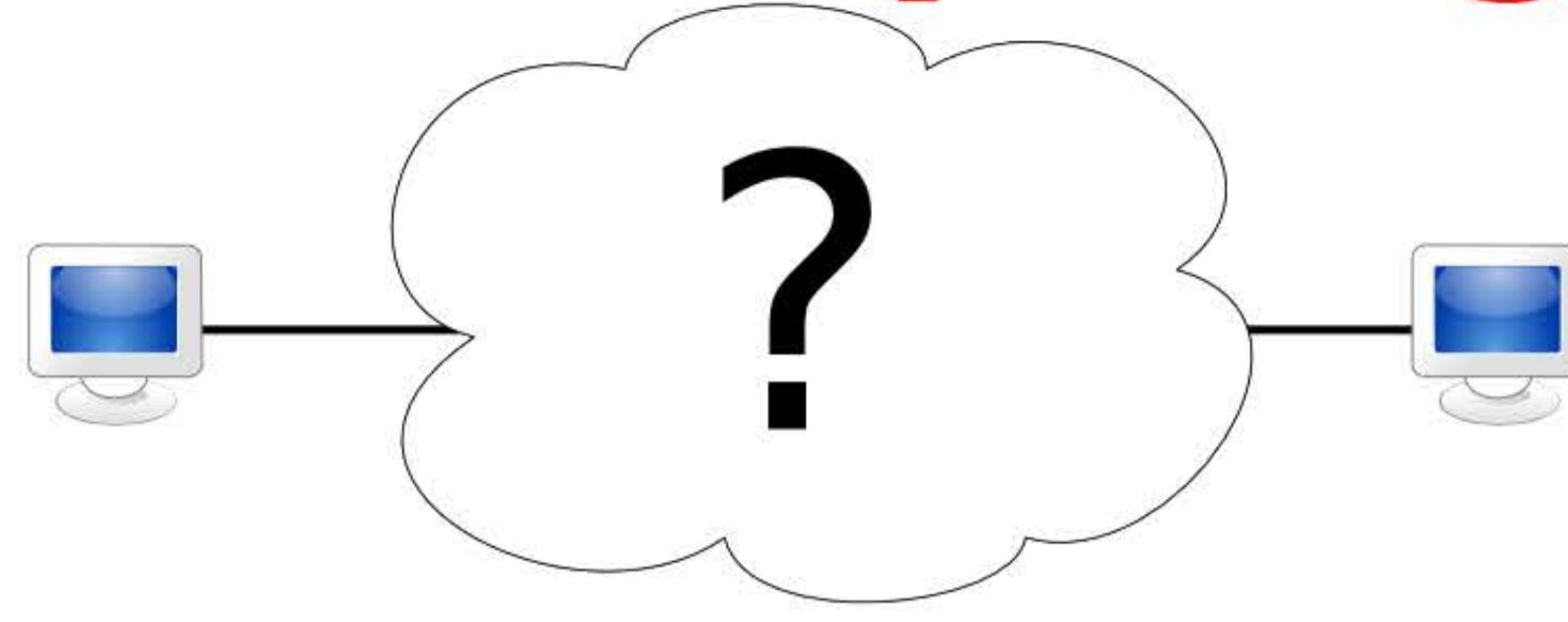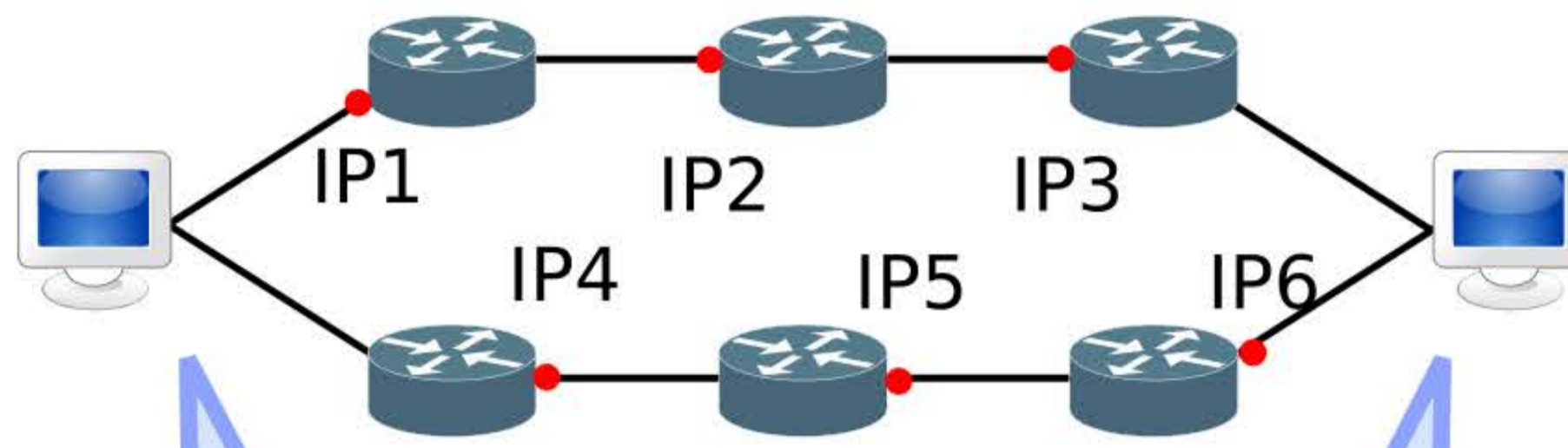
Are they the same router?
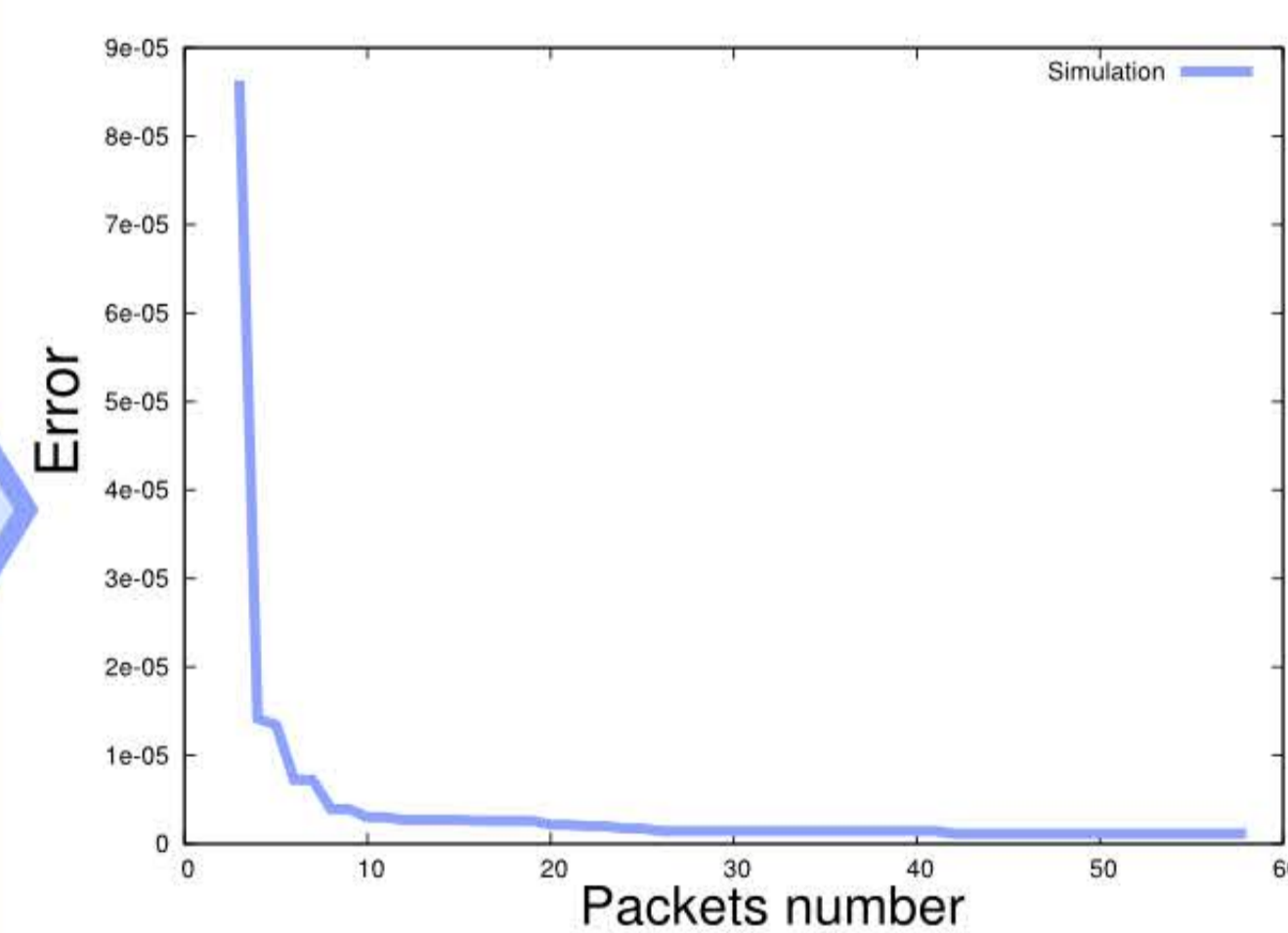
IP1   IP2   IP3
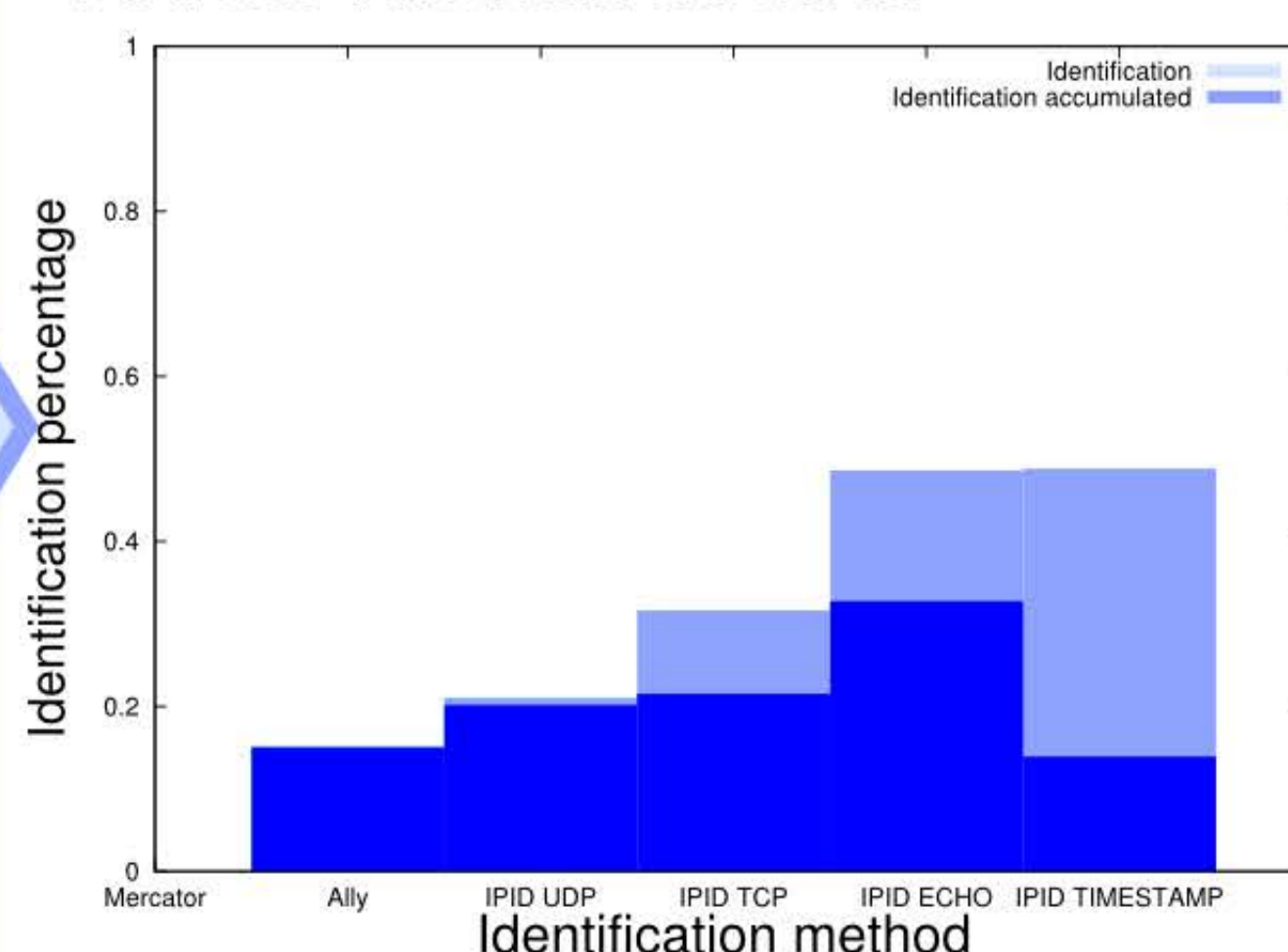IP4   IP5   IP6
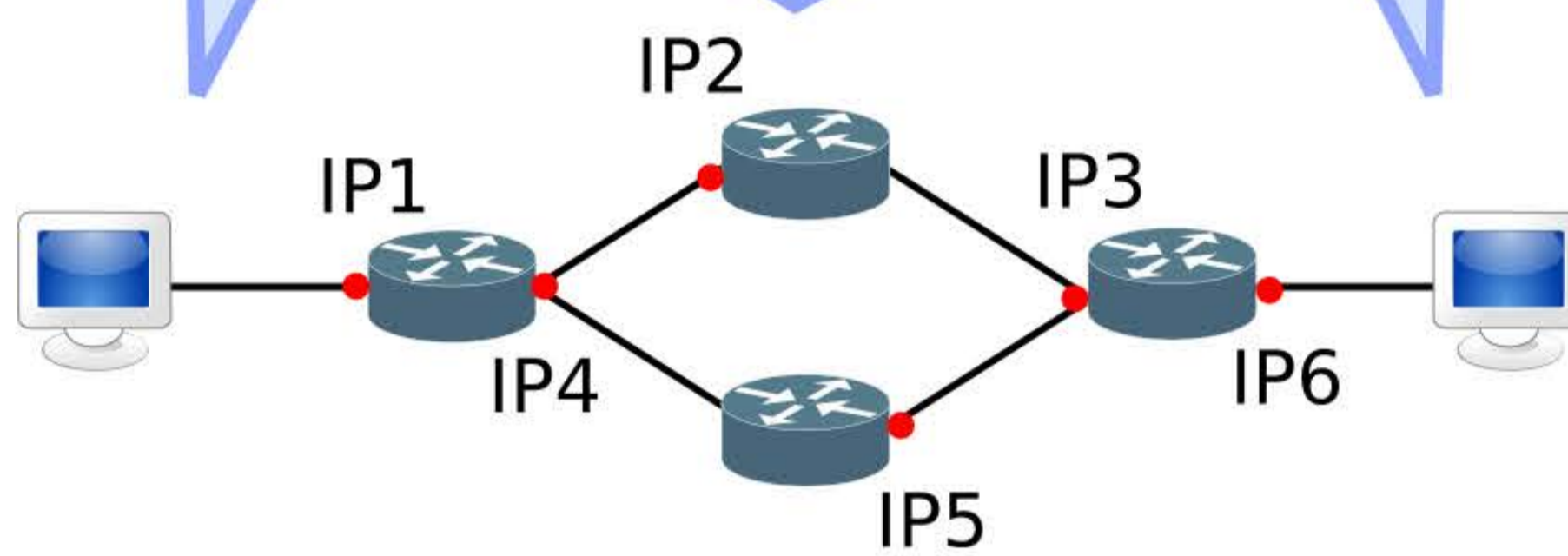
Conclusions

Identification has been improved from 15% to 48%

Efficiency has been improved close to an 12% by using IP offset instead of TTL method, besides this method is distributable.

Error reduction in Ally with the number of packets.

Simulation
Error
Packets number

Results in planetlab network shows an improvement in router identification.

Identification
Identification accumulated
Identification percentage
Mercator Ally IPID UDP IPID TCP IPID ECHO IPID TIMESTAMP
Identification method

Diferent platforms in order to discover the network.

INTERNET2
PLANETLAB
ARCHIPELAGO
etomic

Route discovery
- Traceroute
- Paris-traceroute
- Using record-route

Improving efficiency

1.TTL method
Get the TTL from IP1 and IP2
|TTL1 - TTL2| < offset

2.IPID method
Get the IPID from IP1 and IP2
|IPID1 - IPID2| < offset

Our proposal:

3.IP OFFSET method
Get IPs in hexadecimal
|IP1 - IP2| = IP OFFSET

Survival graph in ETOMIC net:

All
Only alias
$P(x<X)$
0.0 0.4 0.8
0e+00   1e+09   2e+09   3e+09
IP offset
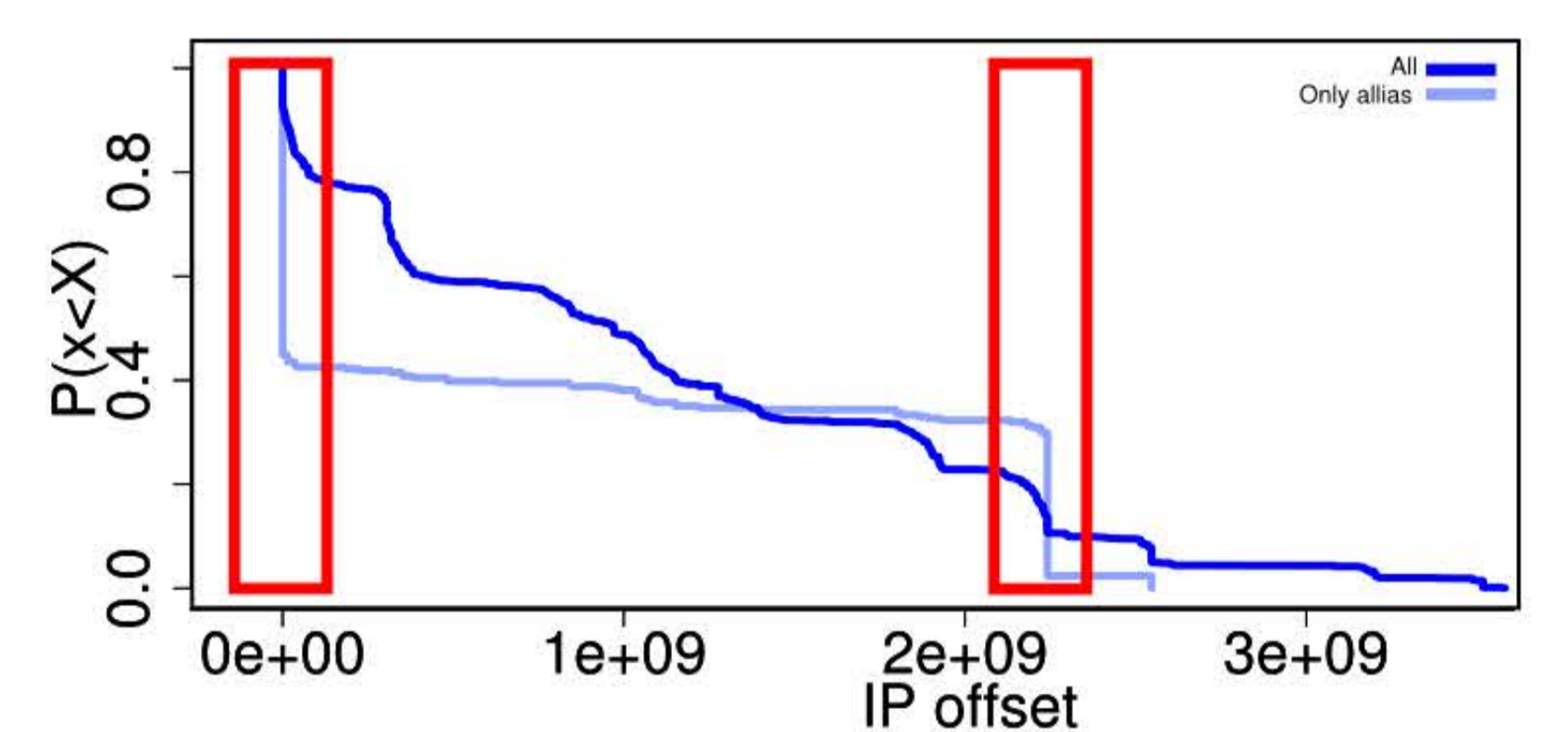
Comparison between methods:

Aliases resolved
0.80 0.90 1.00
0.0 0.2 0.4 0.6 0.8 1.0
Pairs tested
IP offset
TTL offset
IPID offset
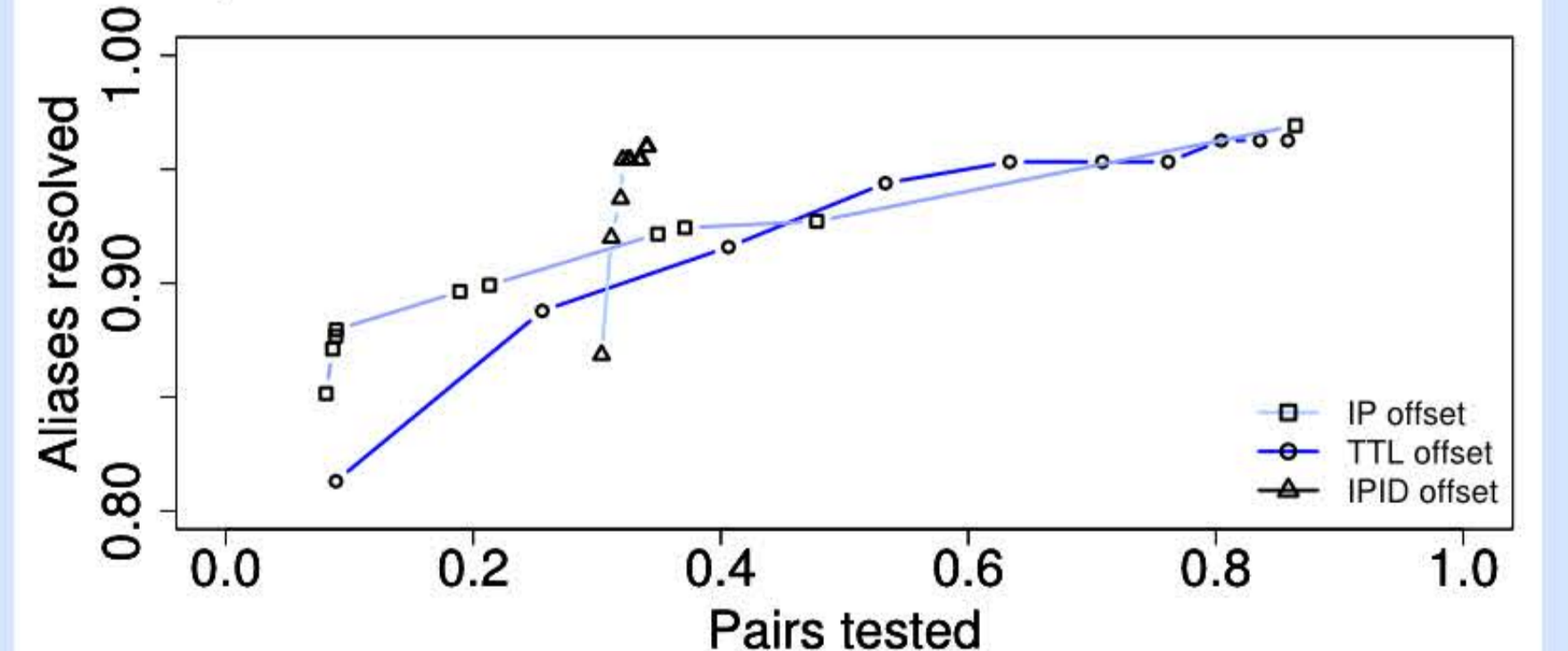
EM clusters trained with ETOMIC net and used into PLANETLAB net:

Alias identified
Pairs used