Name based sockets

apropos MPTCP API

Interface discussions

Late last year (nov/dec) there was a vivid discussion about API.

Provide a new API or keep the socket() interface untouched.

- In other words, change the semantics or not.

Not mutually exclusive

This is not a Yes/No question.

MPTCP can have both!

For example HIP

- socket() API which is unchanged
- Native API

There is nothing to loose!

Not mutually exclusive

This is already what most developers use. The majority of frameworks provide socket abstractions.

Java / .NET / Python / You name it...

Name Based Stack

Started in RRG as a means to abstract locator substrate (IP) to permit multi-homing/mobility without

- Adding new infrastructure
- Impacting routing scalability

I would like to share what we did there and get your opinions.

Name Based Sockets !

The problem

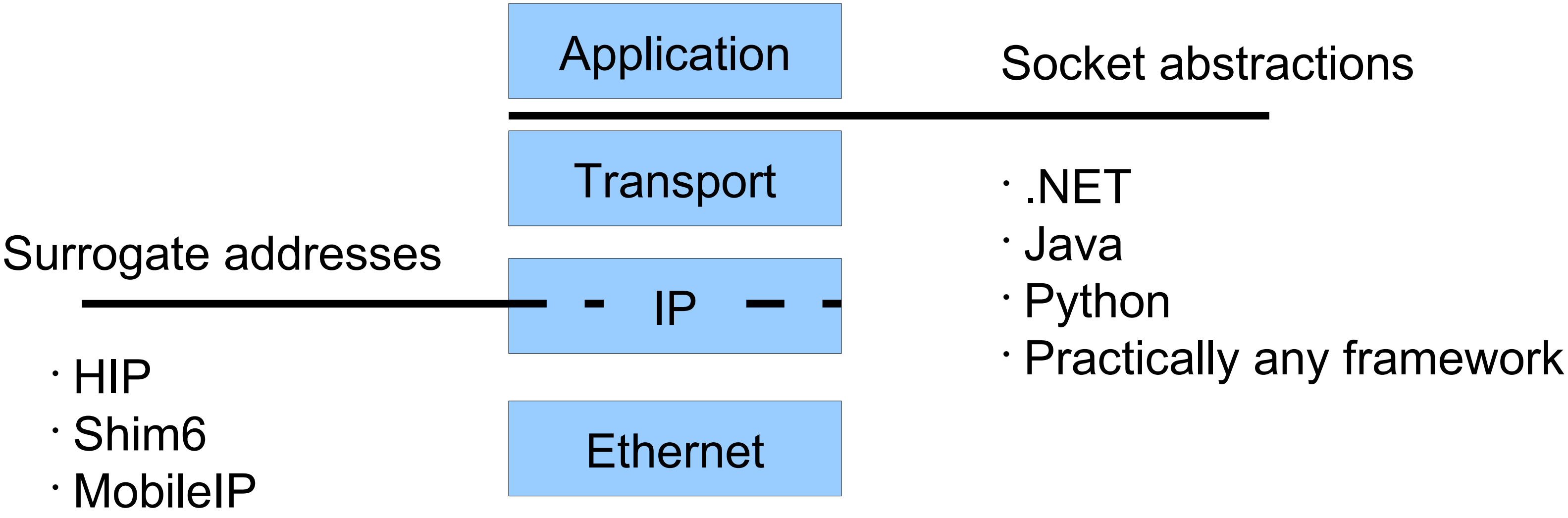
FQDN resolution and IP management is dealt with by the application.

All cool stuff have to be implemented by the application.

- Mobility
- Multi-homing
- IPv4/IPv6 agnosticism
- NA(P)T traversal
- Path diversity exploitation
- Etc...

```
addr = gethostbyname( someString );
 ...
connect( ...,  addr, ... );
write( ... );
close( ... );
connect( ..., addr, ...);
write( ... );
close( ... );
```

Two typical approaches



Application

Socket abstractions

Transport

- .NET
- Java
- Python
- Practically any framework

Surrogate addresses

IP

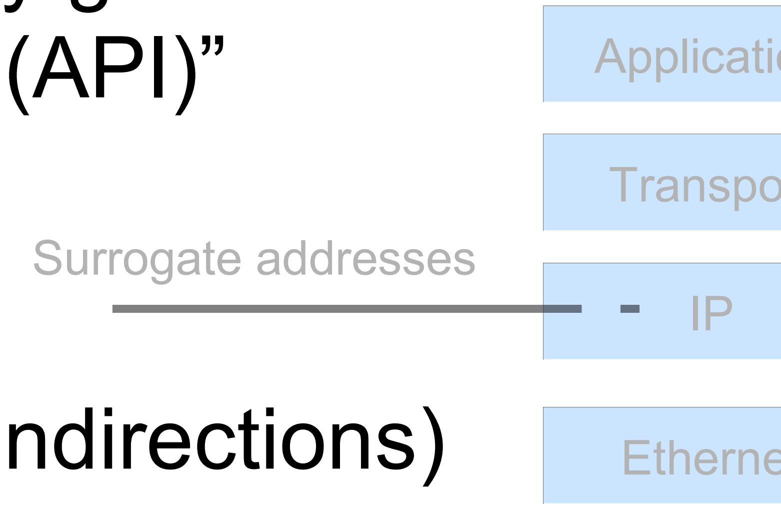
- HIP
- Shim6
- MobileIP

Ethernet

Surrogate addresses

“Application transparency gives backwards compatibility (API)”

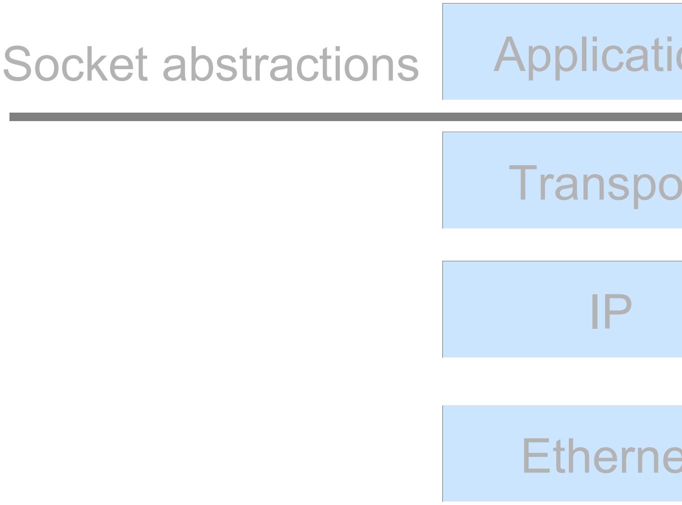
- Extra namespaces.
- Extra resolutions (more indirections)
- Applications are not aware, hence still might try to solve issues in app-space.



Socket abstractions

Developers seem to like them...

- One implementation for every framework
- More often than not
  - Resolve once
  - Reuse IP
  - Reuse IP
  - Reuse IP
  - Reuse IP
  - Reuse IP
  - Reuse IP



Socket abstractions

Applicati

Transpo

IP

Etherne

Cherry picking

- Provide the socket abstraction developers like.
- Do allow all the cool functions of surrogate addresses
  - But don't introduce new indirections
  - And be explicit about that it is different

Components

- API
- Initial name exchange
- More transport protocols (being worked on)
- Address updates (being worked on)
- Backwards compatiblity (on the road map)
- Hosts without a registered DNS name (FQDN) (on the road map)
- Security (never ending story)

Components

- API
- Initial name exchange
- More transport protocols (being worked on)
- Address updates (being worked on)
- Backwards compatiblity (on the road map)
- Hosts without a registered DNS name (FQDN) (on the road map)
- Security (never ending story)

The components (API)

- listen() - Prep for incoming session

```
fd = listen( src_name, dst_name, local_port, transport );
```

- open() - Initiate outgoing session

```
fd = open( src_name, dst_name, remote_port, transport );
```

- accept() - Receive incomming session

```
( src_name, dst_name, fd ) = accept( fd );
```

- read() - Receive data

```
data = read( fd );
```

- write() - Send data

```
write( fd, data );
```

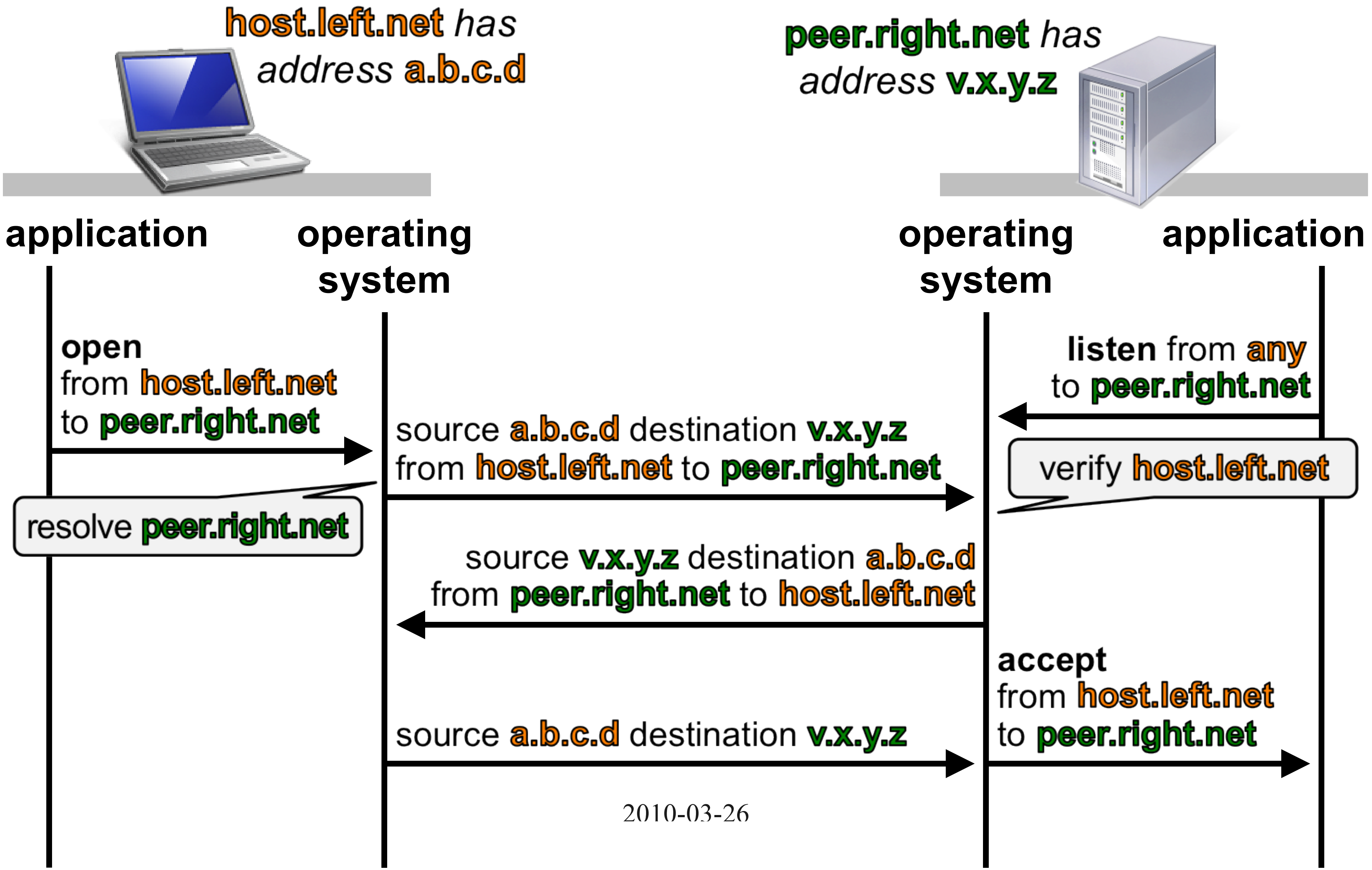
- close() - Close session

```
close( fd );
```

Components

- API
- Initial name exchange
- More transport protocols (being worked on)
- Address updates (being worked on)
- Backwards compatiblity (on the road map)
- Hosts without a registered DNS name (FQDN) (on the road map)
- Security (never ending story)

Initial Name Exchange



host.left.net *has address* **a.b.c.d**

peer.right.net *has address* **v.x.y.z**

application

operating system

operating system

application

open
from **host.left.net**
to **peer.right.net**

resolve **peer.right.net**

listen from **any**
to **peer.right.net**

verify **host.left.net**

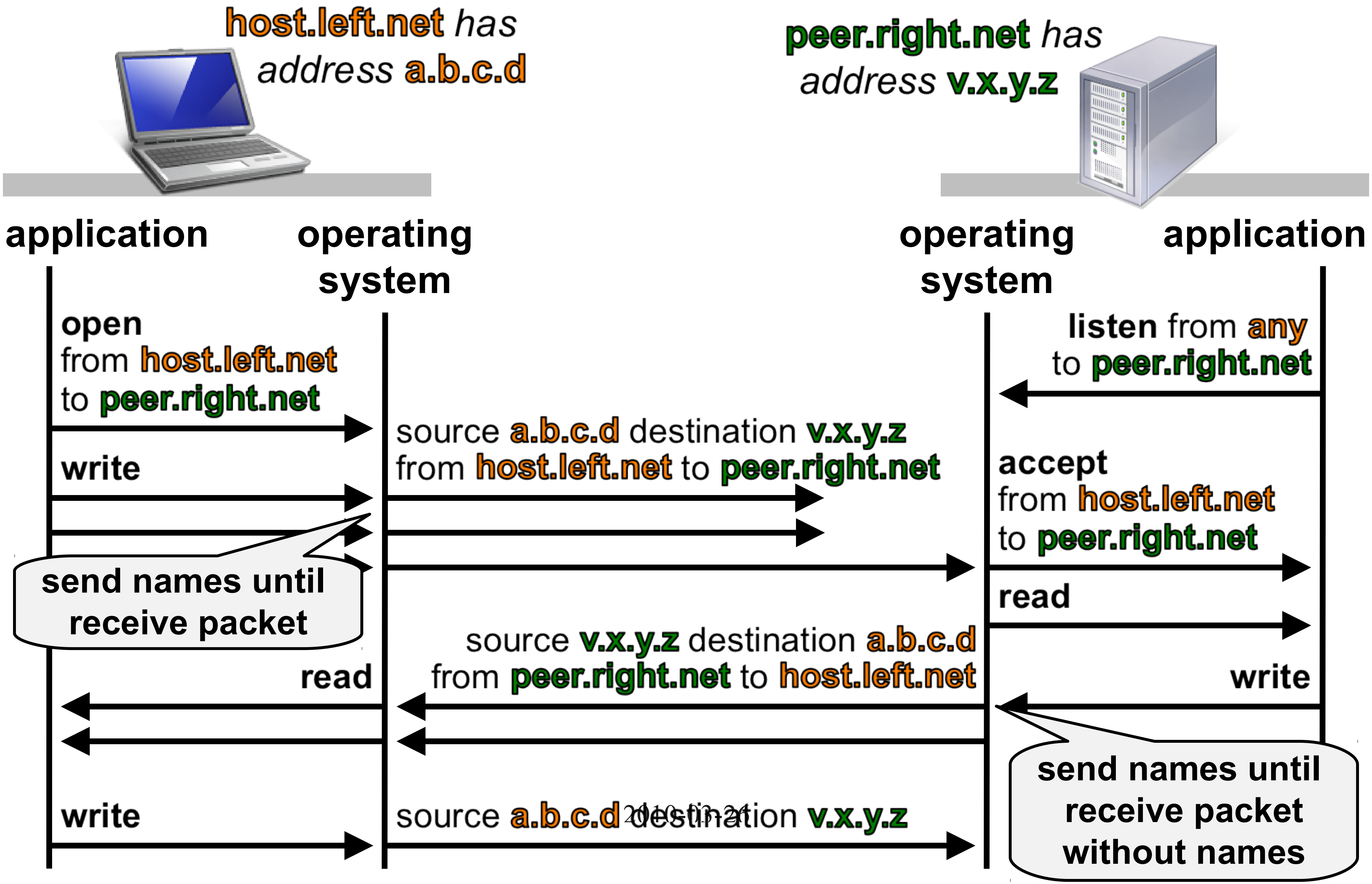
source **a.b.c.d** destination **v.x.y.z**
from **host.left.net** to **peer.right.net**

source **v.x.y.z** destination **a.b.c.d**
from **peer.right.net** to **host.left.net**

accept
from **host.left.net**
to **peer.right.net**

source **a.b.c.d** destination **v.x.y.z**

Initial Name Exchange



host.left.net *has address* a.b.c.d

peer.right.net *has address* v.x.y.z

application **operating system** **operating system** **application**

open from host.left.net to peer.right.net

listen from any to peer.right.net

source a.b.c.d destination v.x.y.z from host.left.net to peer.right.net

write

accept from host.left.net to peer.right.net

send names until receive packet

read

source v.x.y.z destination a.b.c.d from peer.right.net to host.left.net

read

write

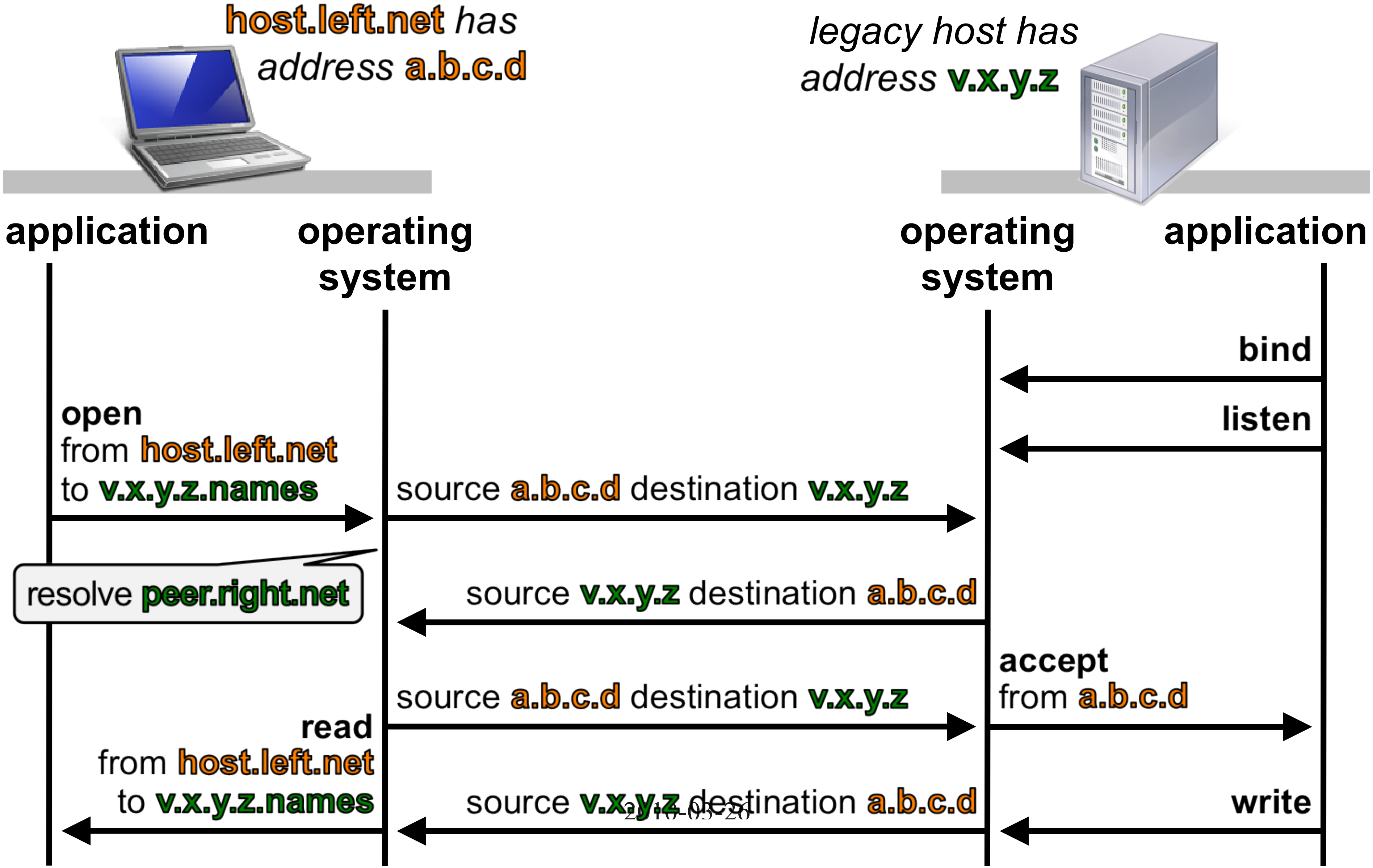
send names until receive packet without names

write

source a.b.c.d destination v.x.y.z

2010-03-26

Backwards Compatibility



host.left.net *has address* **a.b.c.d**

legacy host has address **v.x.y.z**

application **operating system** **operating system** **application**

bind

listen

open
from **host.left.net**
to **v.x.y.z.names**

source **a.b.c.d** destination **v.x.y.z**

resolve **peer.right.net**

source **v.x.y.z** destination **a.b.c.d**

source **a.b.c.d** destination **v.x.y.z**

accept
from **a.b.c.d**

read
from **host.left.net**
to **v.x.y.z.names**

source **v.x.y.z** destination **a.b.c.d**

write

Components

- API
- Initial name exchange
- More transport protocols (being worked on)
- Address updates (being worked on)
- Backwards compatiblity (on the road map)
- Hosts without a registered DNS name (FQDN) (on the road map)
- Security (never ending story)

Current development

- Support for UDP
  - Using TCP-like semantics
- Mobility/Multi-homing
  - Evaluating existing solutions
    - Shim6, MIPv6, MPTCP or something else entierly.
- Collaboration between
  - Ericsson
  - Tsinghua University
  - Swedish Institute of Computer Science

The current prototype

- Supports TCP
  - Uses TCP semantics
    - socket(), listen(), open(), accept(), read(), write()
- Exchanges names
- Linux
  - Ubuntu (client/server)
  - Android (client)

Implemented by Juan Lang.

Components

- API
- Initial name exchange
- More transport protocols (being worked on)
- Address updates (being worked on)
- Backwards compatiblity (on the road map)
- Hosts without a registered DNS name (FQDN) (on the road map)
- Security (never ending story)

Security

- Initial name exchange
  - Trivial to forge your own name
    DNS verification required
  - Same weakness as for initiating host

a. Is it acceptable security? (I think yes)

(b. Does it even matter?

– I'm playing with the thought that maybe it might not matter (I'm open for flames :))

Questions?