OPENFABRICS ALLIANCE

10TH ANNUAL INTERNATIONAL DEVELOPER WORKSHOP

Scalable name and address resolution infrastructure

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#OFADevWorkshop

SA interaction difficulties

- SA MAD formats, RMPP, libibumad “quirkiness”
- Application shortcuts
  - Hard coded PR data
  - Ignoring parts of queried PR data
  - Only work on a limited set of clusters or cluster types
- Direct access to libibumad and the SA are vectors for security breaches

Current stack is not scalable

- Nodes access the same SA services multiple times from ibacm, kernel, libibumad…
  - PR queries
  - Notice/multicast registrations
- Name resolution through standard DNS requires an ARP from IP to GID

ibacm name resolution

- Relies on IPoIB (DNS, ARP, etc)
- Names map to <GID, Pkey> “end point”
  - User’s often don’t care about the partition they are running on.
  - “cross” partition names can’t be resolved
    - Local apps need knowledge of a common partition prior to name resolution.
  - Some work done in this area via ibacm_hosts.data
- Current name resolution requires source “end point” to be specified

ibacm as a SA proxy

- ibacm provides a good starting point for addressing some of these concerns…

Goals

- Provide controlled and consistent access to user space name and PR resolution services (AKA SA access)
  - SA access control
  - Accuracy
  - Ease of use
  - Portability
  - Enable all consumers to access ibssa
- Provide caching and other ibacm services to kernel users

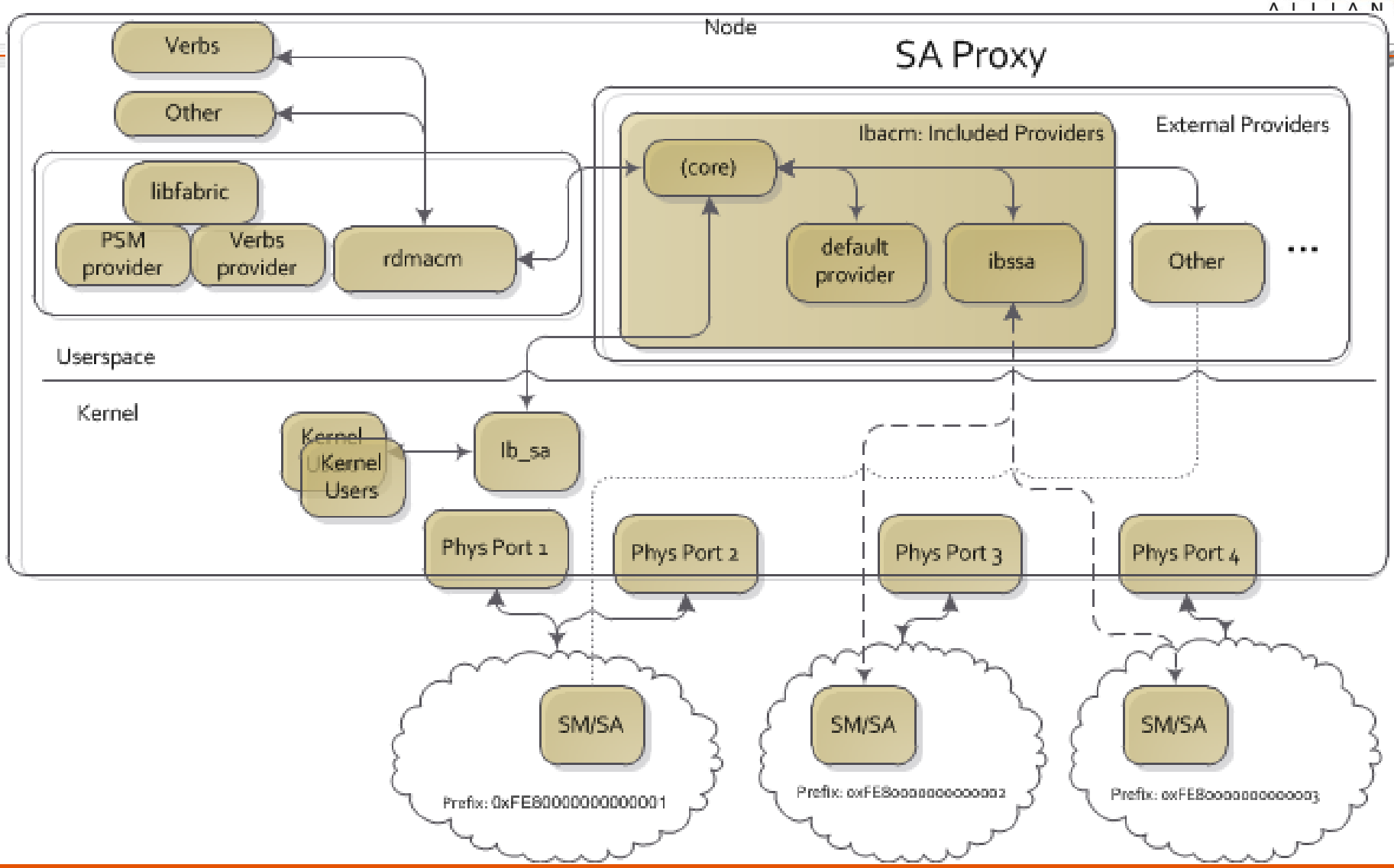
ibacm enhancements

- Applications query ibacm as a local “SA proxy”
  - All SA interactions done through ibacm
  - Additional name services provided
  - ibacm can control access to SA and libibumad
- ibacm is backed by “providers”
  - ibssa
  - Current features as default
  - Enhancements for name services are planned

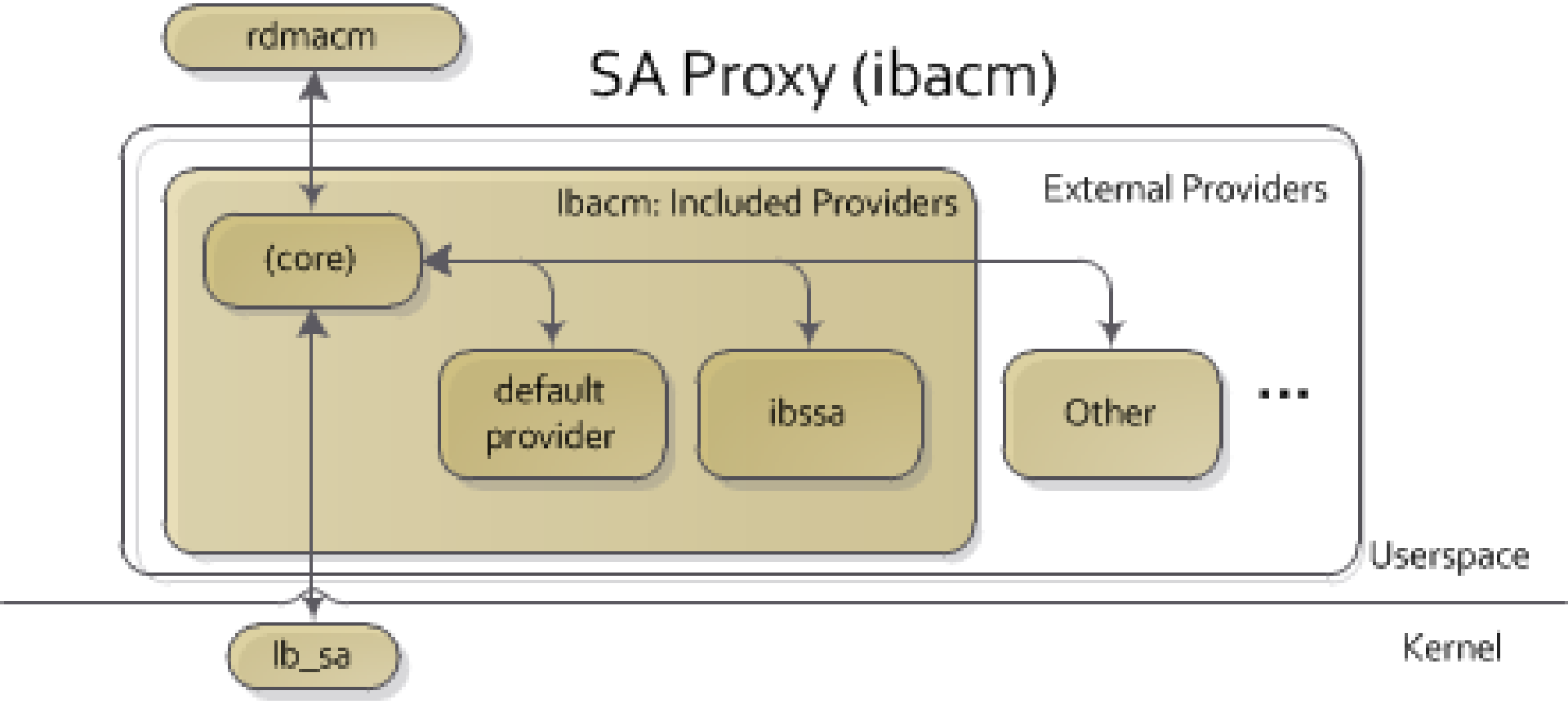
ibacm enhancements

- Name resolution services
  - "DNS" for direct name resolution
    - Name to PR (or GID, <GID, PR>, IP, <IP, PR>)
- ibacm provides service to the kernel
  - Uses netlink
  - Leverages the same infrastructure for all users

Arch


Node
SA Proxy
Verbs
Other
libfabric
PSM provider
Verbs provider
rdmacm
Ibacm: Included Providers
(core)
default provider
ibssa
External Providers
Other
...
Userspace
Kernel
Kernel UKernel Users
Ib_sa
Phys Port 1
Phys Port 2
Phys Port 3
Phys Port 4
SM/SA
Prefix: 0xFE80000000000001
SM/SA
Prefix: 0xFE8000000000002
SM/SA
Prefix: 0xFE8000000000003

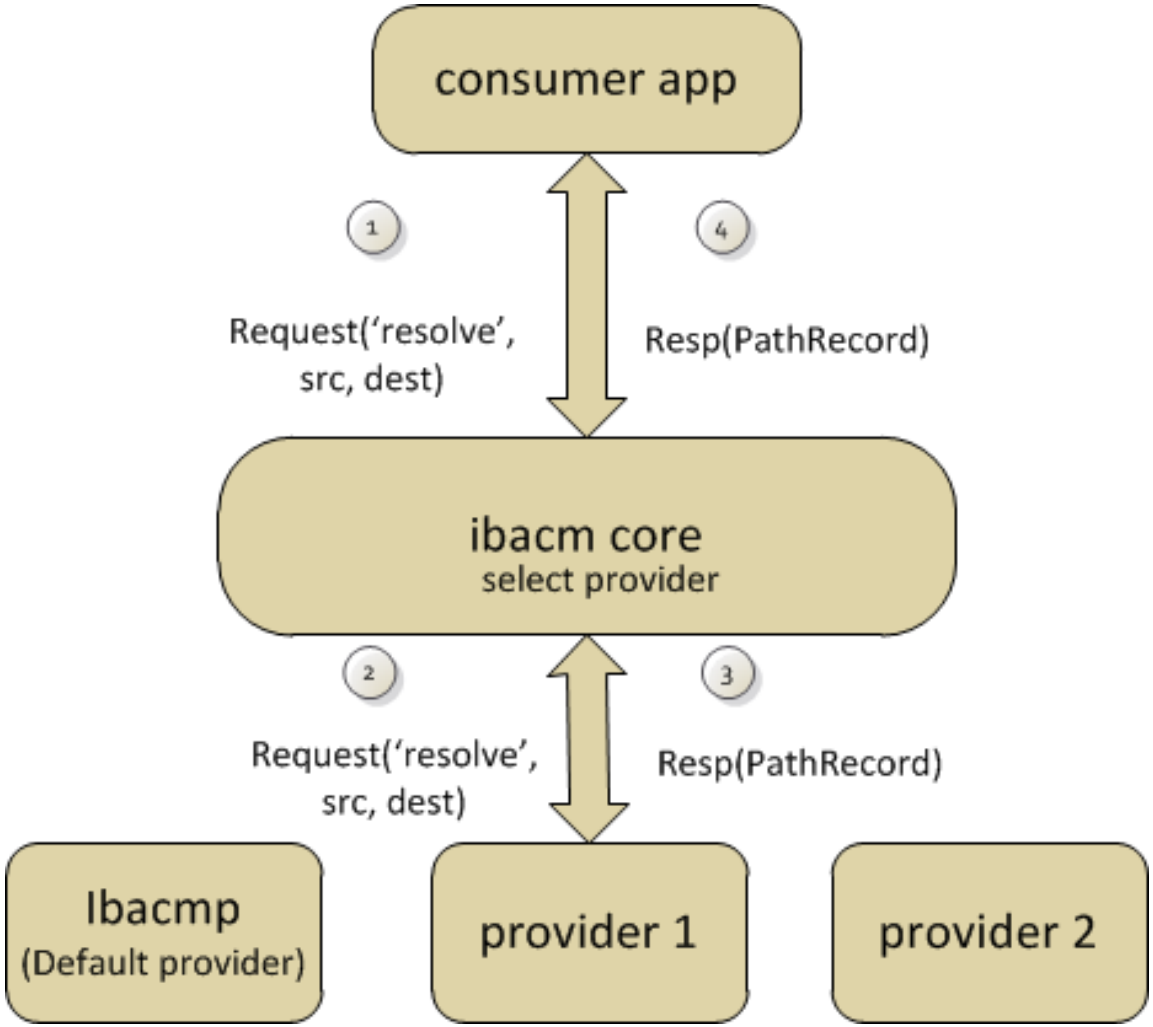
Architecture (non-eye chart)



Implementation plans

- Separate out ibacm into “core” and default provider
- Core handles
  - Provider loading and assignment to ports/End points
  - Steering client requests to correct provider
  - Port/device Events
  - Netlink requests and events
  - Administration like config file parsing, log file, etc
- Default provider handles
  - Same functionality as current resolve functions

Initial data flow details



Provider API's

- Prototype code being worked
  - Collaborating with OFI WG and rdmacm
  - submission to the list imminent
  - "prov" branch in ibacm's git tree
- The API will evolve, collaborating with ibssa
- Main API calls will include
  - Path Record resolution
  - Name to GID mapping helper

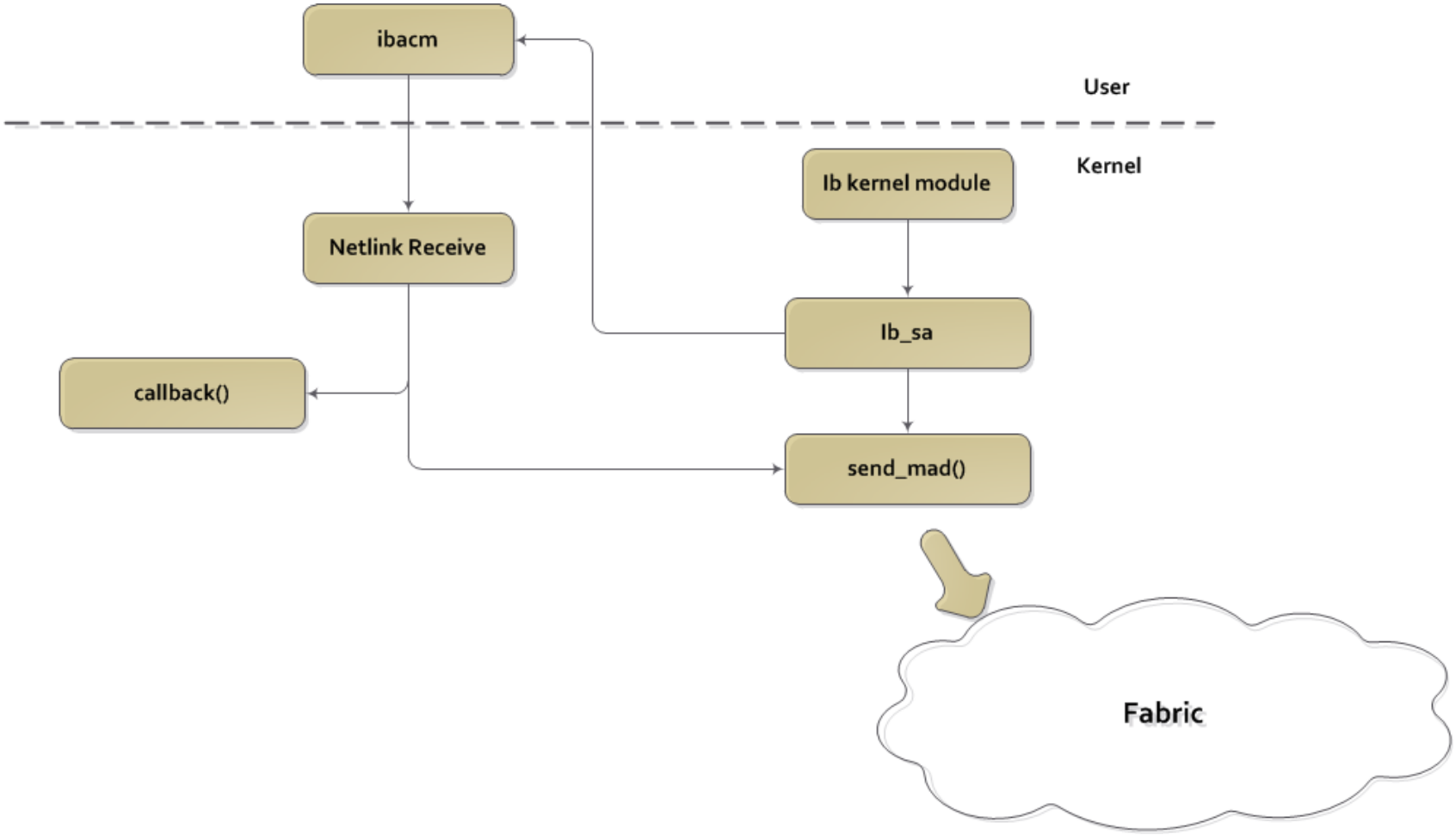
Expand *_getaddrinfo

- Use ibacm first to resolve a Name prior to calling getaddrinfo (DNS)
  - Call can provide Path Record hints through the normal “hints” parameter
    - For example Service ID, Pkey etc.
- Need both librdmacm and ibacm changes
- Only single local end point can be supported now
  - Future local end point resolution can be determined by GID returned from provider name -> GID map

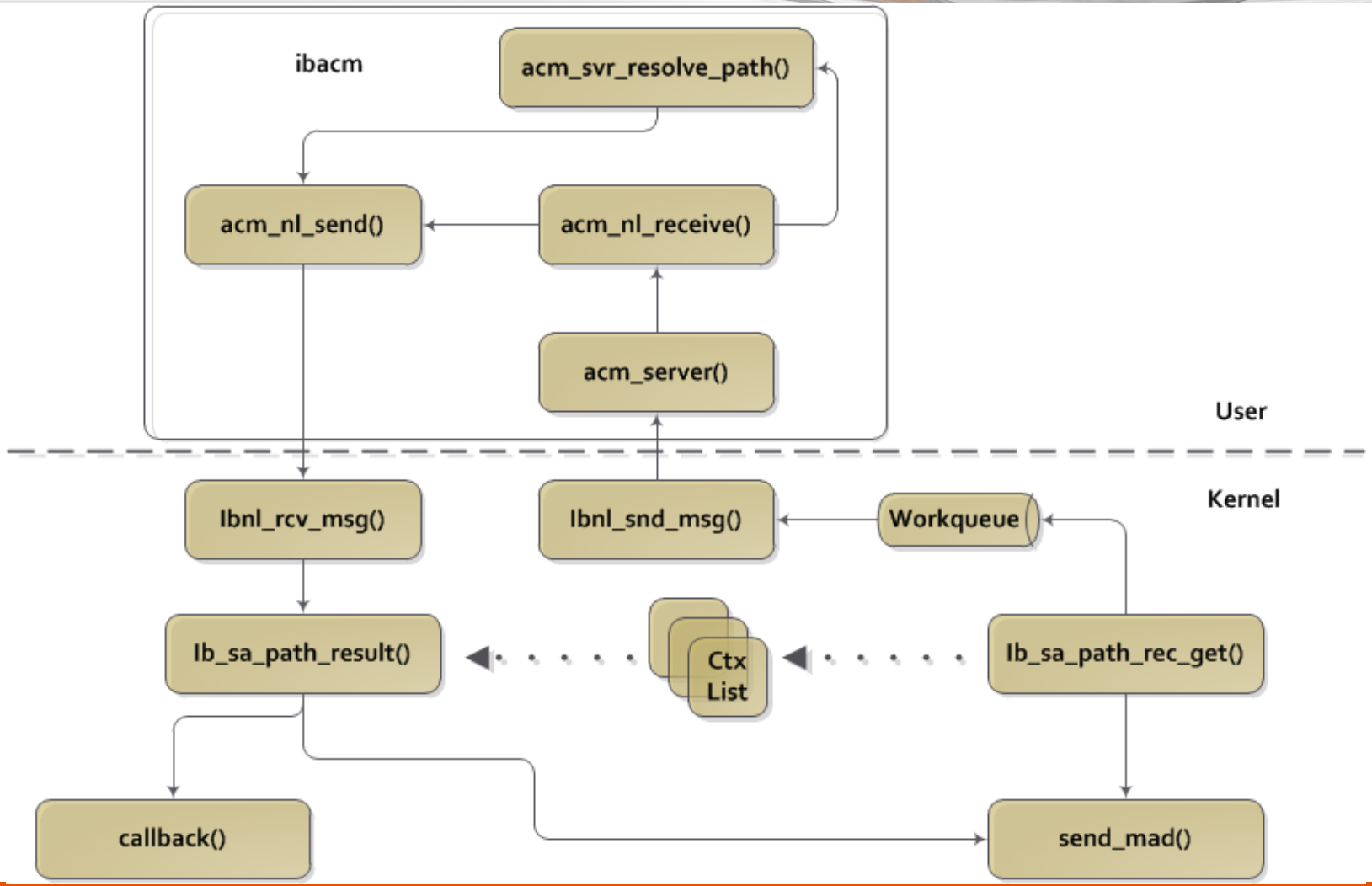
Kernel ibacm access

- SRP, IPoIB, and rdma_cm kernel modules use ib_sa to query for Path Records
- Extend ibacm PR resolution/caching to kernel modules
- Use netlink messages to communicate with ibacm
- Expand existing RDMA netlink interface
- Currently connecting with ib_sa using ibacm messages
  - Exploring the use of ib_mad and using MAD formatted messages

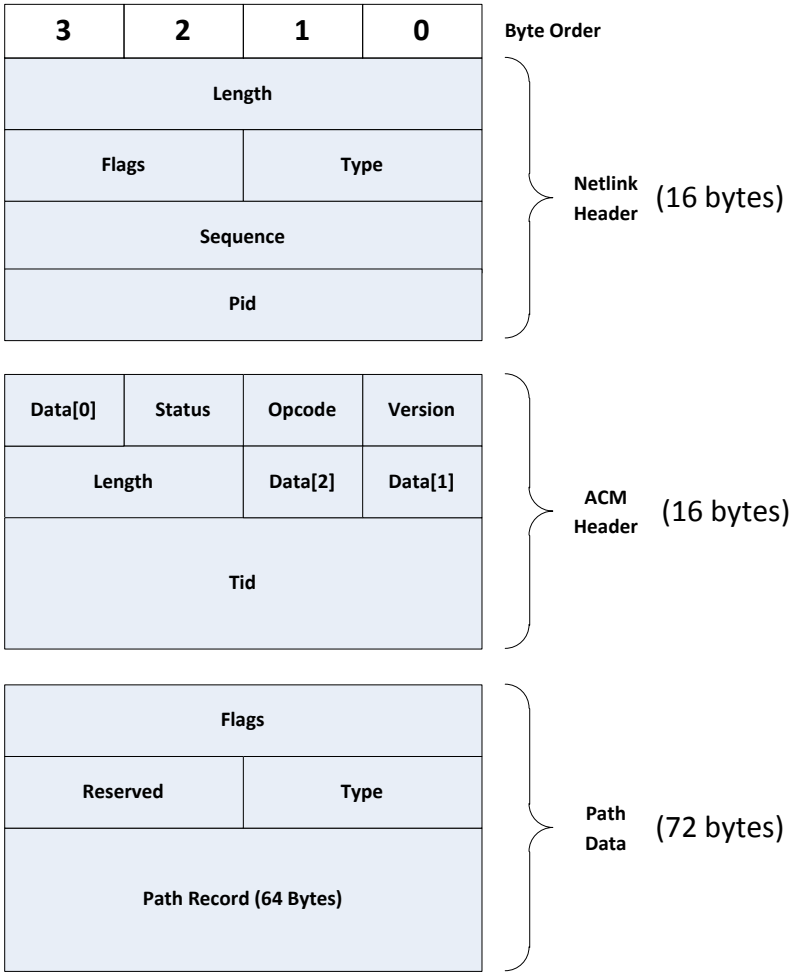
Overview


ibacm
User
Kernel
Ib kernel module
Netlink Receive
Ib_sa
callback()
send_mad()
Fabric

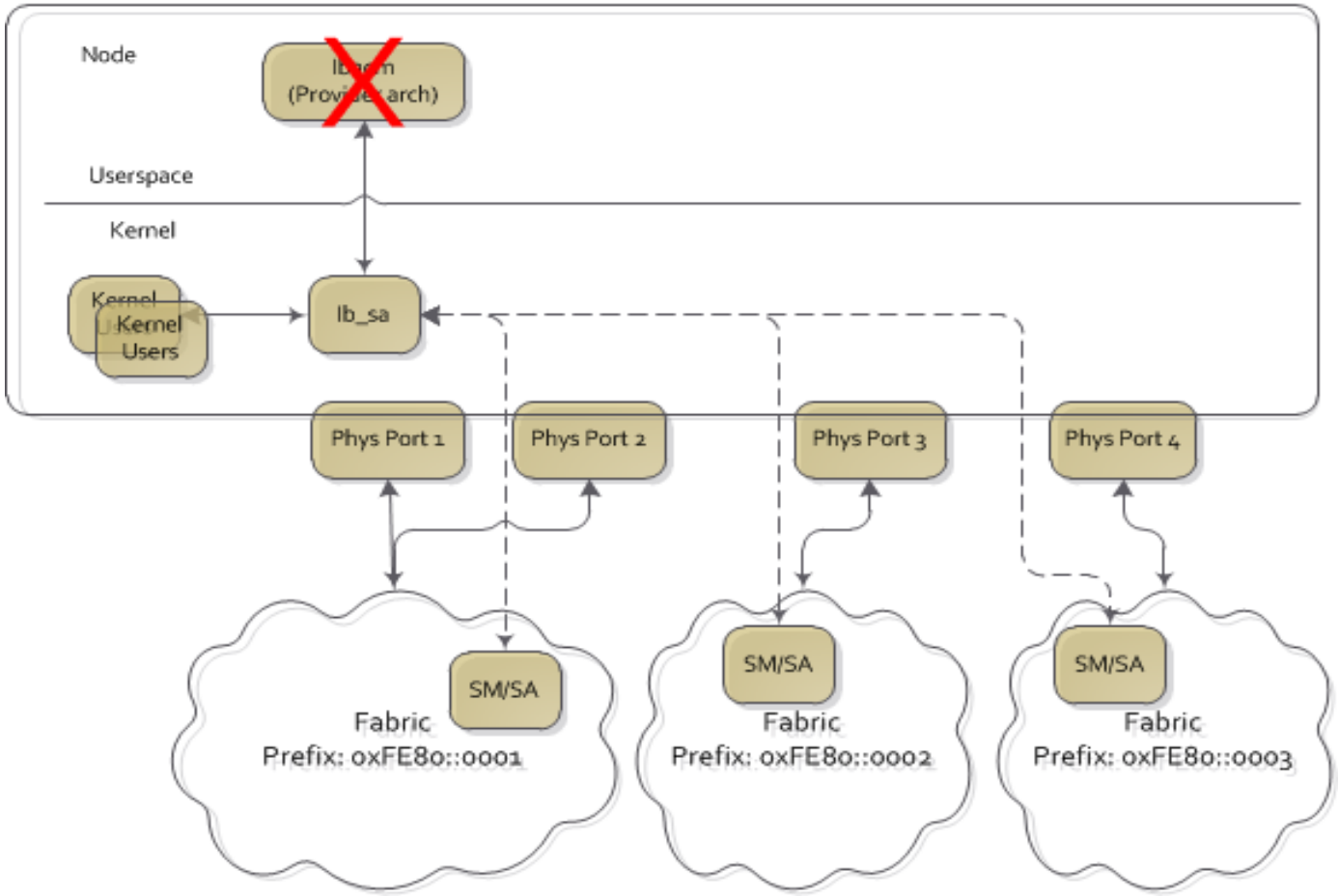
A little more detail…



Current Netlink / ibacm Message Format



Kernel still uses SA when ibacm not available



Future work

- SA event registration and reporting
  - Notice
- Multicast
- IP to GID mapping
  - IPoIB netlink to ibacm?
  - arpd extentions?

Thank you

- Hal Rosenstock
- Kaike Wan
- Sean Hefty

Thank You

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Current SA interactions

- Applications
  - Direct SA
    - Libibumad
    - UD QP
  - Librdmacm
    - Ibacm
    - Dns/arp
- Kernel
  - Direct SA access only

Name service requirements

- Generic interface to request remote node by name through “DNS like” resolution
  - Mapping provided by providers based on cluster configuration, node configuration, and/or provider/SA communication.

librdmacm example

- New librdmacm example app

```
$ resolve_name -h
usage: resolve_name <name>
        [-h]
        [-s <service id>] Specify a service ID in PR
'hints'
```

librdmacm example

```
$ resolve_name priv03
ai_family 0
ai_route : 0x1ff15a0
Path information
  service_id: 0x0
  dgid: fe80::11:7500:79:1815
  sgid: fe80::11:7500:79:1763
  dlid: 2
  slid: 1
…

$ resolve_name google.com
ai_family 2
dest (null) 173.194.33.133
```