OpenSolaris, Crossbow and JIMS

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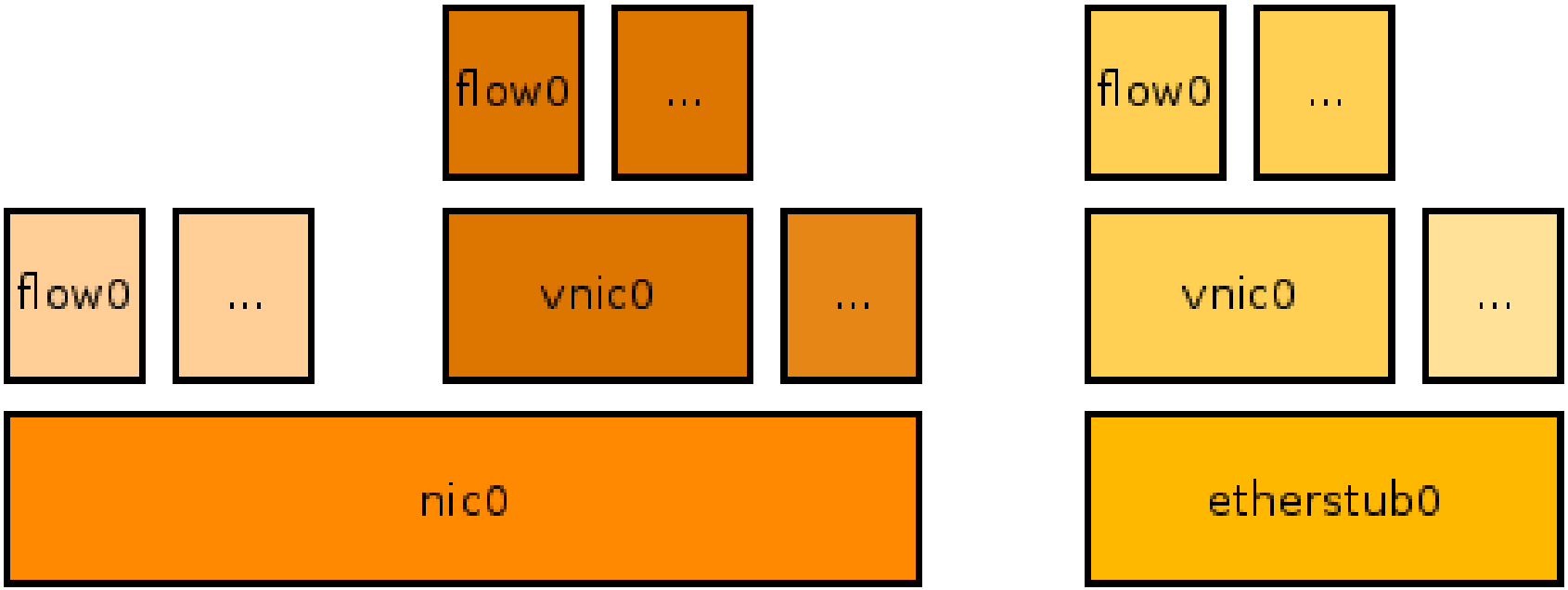
Crossbow components and their relationship



Available link operations

- Plumbing
- Putting interface up/down
- Setting IP address
- Setting mask address
- Getting parent link name

Etherstub and Link (Vnic, Nic) parameters

Read-only parameters:

- **BRIDGE** - The name of the bridge to which this link is assigned, if any
- **OVER** - The physical datalink(s) over which the datalink is operating
- **STATE** - The link state of the datalink. The state can be up, down, or unknown
- **MTU** - The maximum transmission unit size for the datalink being displayed
- **CLASS** - The class of the datalink. dladm distinguishes between the following classes:
  - **phys** - A physical datalink.
  - **vnic** - A virtual network interface.

Etherstub and Link (Vnic, Nic) properties

Editable properties:

- **maxbw** - The full duplex bandwidth specified as an integer with one of the scale suffixes (K, M, or G for Kbps, Mbps, and Gbps). The default is **no bandwidth limit**
- **learn_limit** - Limits the number of new or changed MAC sources to be learned over a bridge link. The default is **1000**
- **cpus** - Names of processors that can perform operations for this link. The default is **no CPU binding**
- **priority** - Relative priority for the link. Possible values are: **high**, **medium**, or **low**. The default is **high**

Etherstub and Link (Vnic, Nic) statistics

Read-only statistics:

- **IPACKETS** - Number of packets received on this link
- **RBYTES** - Number of bytes received on this link
- **IERRORS** - Number of input errors
- **OPACKETS** - Number of packets sent on this link
- **OBYTES** - Number of bytes sent on this link
- **OERRORS** - Number of output errors

Flows

Bandwidth control and priority for protocols, services and containers.

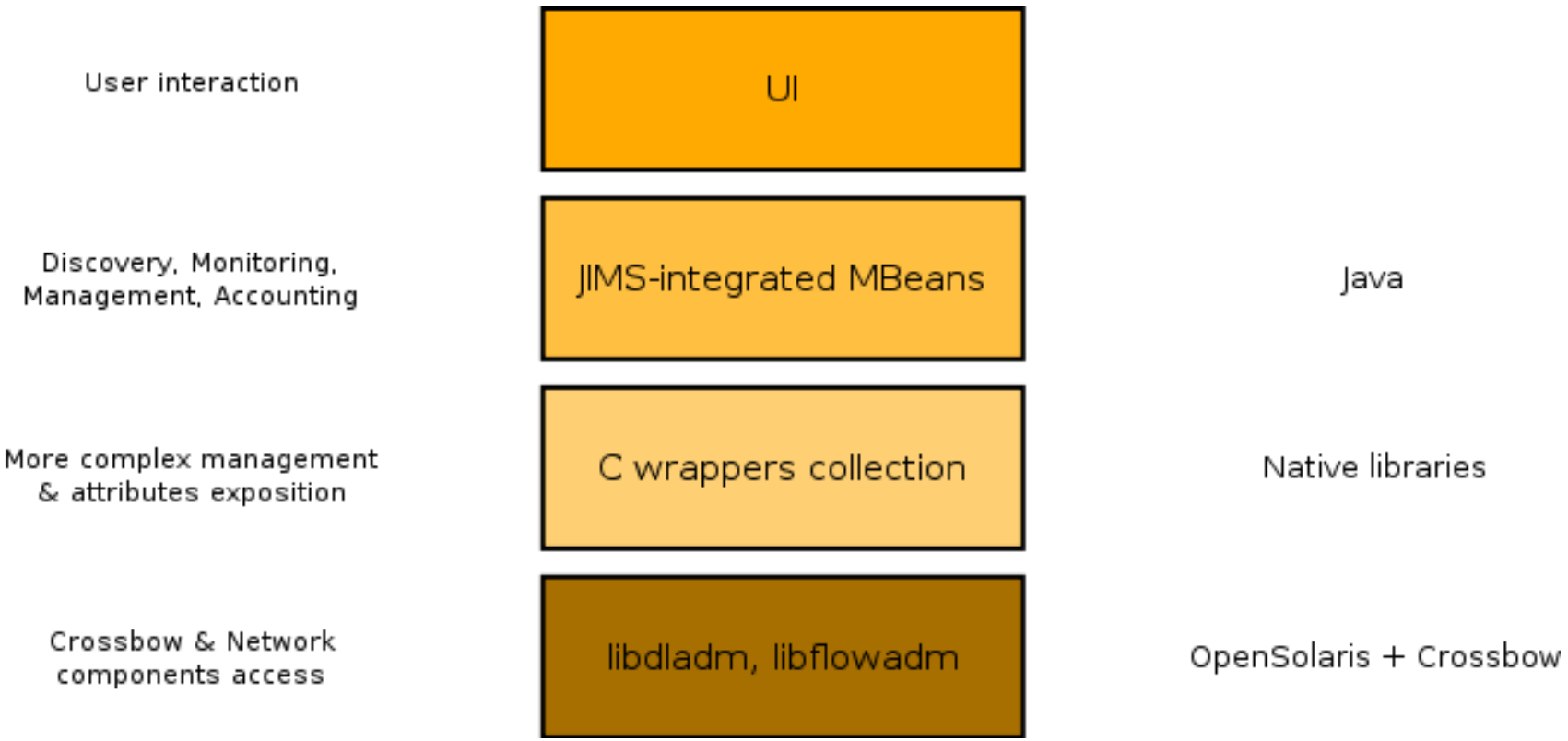
Individual flow restrictions:

- **local_port**, **remote_port**
- **transport** - **tcp|udp|sctp|icmp|icmpv6**
- **dsfield**
- **local_ip[/prefix_len]**, **remote_ip[/prefix_len]**

Flow restrictions:

- **maxbw** - The full duplex bandwidth.
- **priority** - Relative priority for the link.

Layers and responsibility



lib*adm

Crossbow Project libraries.

- `libdladm` provides API to manipulate VNICs, etherstubs and NICs
- `libflowadm` allows flow management (descriptors - e.g. addresses, protocols, ports, QoS - flow priority and maximum bandwidth)

Simple operations: `dladm_set_flowprop`, `dladm_vnic_delete`, etc.

Native wrappers

Exploit Crossbow lower-level *adm libraries to provide more complex functionality.

3 modules: `xbow-native-lib-etherstub`, `xbow-native-lib-flow`, `xbow-native-lib-link`.

- `create_etherstub`
- `get_properties`
- `plumb`

MBeans

Two kinds of objects:

- managers (EterstubManager, FlowManager, (V)NicManager) entity discovery, creation, deletion
- entities (flows, etherstubs, V(NIC)s)
  - per-instance attributes management and monitoring
  - hierarchy reflected in naming (e.g. MBean for `flow0` created over `e1000g0` link is registered as `<domain>:type=Flow,link=e1000g0,name=flow0`)

Most often 1:1 MBean method : Native function mapping with return code to exception translation.

Graphic User Interface

Possible frameworks:

- Eclipse RCP
- Jopr
- Web frameworks (Spring 3, JSP)

Development and code quality

- Java and native builds with maven
- Unit tests & mocks for both MBean and native code
- Code coverage reports

Roadmap

- DONE
  C wrappers, MBeans layer → management and monitoring possible with JConsole
- ONGOING
  JIMS integration, collecting statistics
- FUTURE
  Graphic user Interface, QoS-aware zone migration