Appendix A

Developer Architectures and Application Screenshots

ISI X-Bone Software Architecture Diagram

Figure 6
Appendix A con’t

ISI X-Bone Communications Architecture

Figure 7

ISI X-Bone GUI Control Page

You are logged in with these credentials (taken from your X.509 certificate):

User: Yu-Shun Wang <yushunw@isi.edu>
Location: Marina del Rey, CA, US
Organization: USC Information Sciences Institute, Div 7

This overlay manager (www.xbone.net) is configured as follows:

- DNS Domain: xbone.net
- Protocol: 1.5
- Release: 2.0, 30/10/2001

This is the main control page for the X-Bone. Please choose an overlay operation from the following options, or go to the certification authority (CA) page:

- Overlay Creation
- Discover Available Resource Desmons
- Overlay Status Monitoring
- Overlay Terseover
- Overlay Pause/Resume
- Overlay Administration

If you encounter any problems, please contact us.

Figure 8
## Appendix A con’t

ISI X-Bone GUI Resource Discovery Page

![X-Bone Available Resource Daemons](image)

You are logged in with these credentials (taken from your X.509 certificate):

- **User**: Yu-Shun Wang <yuoshunw@isi.edu>
- **Location**: Marina del Rey, CA, US
- **Organization**: USC Information Sciences Institute, Div 7

### Host Information

<table>
<thead>
<tr>
<th>Host</th>
<th>Operating System</th>
<th>X-Bone Release</th>
<th>Dynamic Routing</th>
<th>IPsec Algorithms</th>
<th>Deployed Overlays</th>
<th>Tunnels In Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>mtv.isi.edu 128.9.160.79</td>
<td>FreeBSD/KAME</td>
<td>2.0</td>
<td>no</td>
<td>none, mds, shallone, des, 3des</td>
<td>2 / 1000</td>
<td>4 / 1000</td>
</tr>
<tr>
<td>tlc.isi.edu 128.9.160.21</td>
<td>FreeBSD/KAME</td>
<td>2.0</td>
<td>no</td>
<td>none, mds, shallone, des, 3des</td>
<td>2 / 1000</td>
<td>4 / 1000</td>
</tr>
<tr>
<td>tnm.isi.edu 128.8.160.57</td>
<td>FreeBSD/KAME</td>
<td>2.0</td>
<td>no</td>
<td>none, mds, shallone, des, 3des</td>
<td>2 / 1000</td>
<td>4 / 1000</td>
</tr>
</tbody>
</table>

### Router Information

<table>
<thead>
<tr>
<th>Router</th>
<th>Operating System</th>
<th>X-Bone Release</th>
<th>Dynamic Routing</th>
<th>IPsec Algorithms</th>
<th>Deployed Overlays</th>
<th>Tunnels In Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>crn.isi.edu 128.9.160.76</td>
<td>FreeBSD/KAME</td>
<td>2.0</td>
<td>no</td>
<td>none, mds, shallone, des, 3des</td>
<td>2 / 1000</td>
<td>10 / 1000</td>
</tr>
<tr>
<td>tbo.isi.edu 128.9.160.79</td>
<td>FreeBSD/KAME</td>
<td>2.0</td>
<td>no</td>
<td>none, mds, shallone, des, 3des</td>
<td>2 / 1000</td>
<td>10 / 1000</td>
</tr>
<tr>
<td>sci.isi.edu 128.9.160.93</td>
<td>FreeBSD/KAME</td>
<td>2.0</td>
<td>no</td>
<td>none, mds, shallone, des, 3des</td>
<td>2 / 1000</td>
<td>8 / 1000</td>
</tr>
</tbody>
</table>

Back to the main X-Bone page.

**Figure 9**
ISI X-Bone GUI Overlay Creation Page

This page allows you to create a new overlay. Please fill out all remaining red fields.

Overlay-Wide Properties

- **Name**: Name of the new overlay. Suffix "xbone.net" will be added automatically. If "use DNS" is checked below, the overlay name will also become part of the DNS names of your overlay nodes.
- **DNS**: If checked, the overlay manager will assign DNS names in the OM's domain to the nodes of the new overlay. If unchecked, no DNS entries are created, and you will need to use IP addresses directly to reach overlay nodes.
- **Search Radius**: Multicast search radius limiting the region in which the overlay manager will look for X-Bone hosts willing to participate in setting up the new overlay.

Dynamic Routing

- **Use Dynamic Routing**: This option will determine whether to use Static Routing or Dynamic Routing within the overlay. Only dynamic routing with RIP running GateD are supported.
- **Application Deployment**: Automatically deploy and start an application after the overlay has been set up. You need to specify the complete URL of the deployment script, e.g., http://file://, file://, or (anonymous) ftp://.

Host Properties

- **Number of Hosts**: Number of hosts in the overlay. (Hosts are overlay nodes that do not route packets.)
- **Host Operating System**: Operating system requirements for the hosts. Only hosts of the checked operating systems will be picked for the new overlay.

Router Properties

- **Number of Routers**: Number of routers in the overlay. (Routers are overlay nodes that route packets.)
- **Router Operating System**: Operating system requirements for the routers. Only routers of the checked operating systems will be picked for the new overlay.

Link Properties

- **Authentication**: IPSec authentication algorithm used to authenticate all overlay traffic.
- **Encryption**: IPSec encryption algorithm used to encrypt all overlay traffic.
- **DummyNet (FreeBSD only)**
  - **Transmission Delay**: Per-link transmission delay in milliseconds.
  - **Bandwidth Limit**: Per-link bandwidth limit.
  - **Queue Length Limit**: Per-hop queue length limit.
  - **Loss Probability**: Per-hop loss probability.

Figure 10

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ISI X-Bone GUI Overlay Status Page

<table>
<thead>
<tr>
<th>Name</th>
<th>User</th>
<th>Location</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>line-test-xbone.net</td>
<td>Yu-Shun Wang <a href="mailto:yushun@isi.edu">yushun@isi.edu</a></td>
<td>Marina del Rey, CA, US</td>
<td>USC Information Sciences Institute, Div 7</td>
</tr>
</tbody>
</table>

**Overlay Parameters**

<table>
<thead>
<tr>
<th>Topology</th>
<th>Authentication</th>
<th>Encryption</th>
<th>Dynamic Routing</th>
<th>Dummynet</th>
</tr>
</thead>
<tbody>
<tr>
<td>linear</td>
<td>none</td>
<td>3des</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Node Details**

<table>
<thead>
<tr>
<th>Role</th>
<th>Resource Daemon</th>
<th>Local Tunnel End</th>
<th>Remote Tunnel End</th>
<th>Tunnel End Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router</td>
<td>cmr.isi.edu</td>
<td>172.66.1.2</td>
<td>172.66.1.1</td>
<td>up</td>
</tr>
<tr>
<td></td>
<td>FreeBSD/KAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router</td>
<td>hbo.isi.edu</td>
<td>172.26.1.14</td>
<td>172.26.1.13</td>
<td>up</td>
</tr>
<tr>
<td></td>
<td>FreeBSD/KAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>miv.isi.edu</td>
<td>172.26.1.9</td>
<td>172.26.1.10</td>
<td>up</td>
</tr>
<tr>
<td></td>
<td>FreeBSD/KAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router</td>
<td>sqc.isi.edu</td>
<td>172.26.1.10</td>
<td>172.26.1.9</td>
<td>up</td>
</tr>
<tr>
<td></td>
<td>FreeBSD/KAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>bfr.isi.edu</td>
<td>172.26.1.1</td>
<td>172.26.1.2</td>
<td>up</td>
</tr>
<tr>
<td></td>
<td>FreeBSD/KAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>binuiiis.edu</td>
<td>172.26.1.5</td>
<td>172.26.1.6</td>
<td>up</td>
</tr>
</tbody>
</table>

Back to the main X-Bone page.

Figure 11
Appendix B

IDART™ X-Bone Component Communications Sequence

Note: The optional DNS components are not shown in this sequence.

X-Bone Component Communication Diagram

1. Browser builds and submits overlay configuration request
2. CGI submits requested configuration description to OM. OM-API parses and verifies request.
3. OM multi-casts invitations on base network.
4. RDs that can participate send UDP replies.
5. OM sends configuration information to RDs
6. RDs send configuration result status to OM
7. OM sends overlay result status to CGI for display to client

Figure 12
Appendix B con’t

X-Bone Component Communication Diagram

1. Browser builds and submits overlay configuration request
2. CGI submits requested configuration description to OM. OM-API parses and verifies request.
3. OM multi-casts invitations on base network.
4. RDs that can participate send UDP replies.
5. OM sends configuration information to RDs
6. RDs send configuration result status to OM
7. OM sends overlay result status to CGI for display to client

Figure 13

Figure 14
Appendix B con’t

X-Bone Component Communication Diagram

1. Browser builds and submits overlay configuration request
2. CGI submits requested configuration description to OM. OM-API parses and verifies request.
3. OM multicasts invitations on base network.
4. RDs that can participate send UDP replies.
5. OM sends configuration information to RDs
6. RDs send configuration result status to OM
7. OM sends overlay result status to CGI for display to client

Figure 15

Figure 16
Figure 17

1. Browser builds and submits overlay configuration request.
2. CGI submits requested configuration description to OM. OM-API parses and verifies request.
3. OM multi-casts invitations on base network.
4. RDs that can participate send UDP replies.
5. OM sends configuration information to RDs.
6. RDs send configuration result status to OM.
7. OM sends overlay result status to CGI for display to client.

Figure 18

1. Browser builds and submits overlay configuration request.
2. CGI submits requested configuration description to OM. OM-API parses and verifies request.
3. OM multi-casts invitations on base network.
4. RDs that can participate send UDP replies.
5. OM sends configuration information to RDs.
6. RDs send configuration result status to OM.
7. OM sends overlay result status to CGI for display to client.