A Network in a Laptop: Rapid Prototyping for Software-Defined Networks

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Presented by 101064535 鄭如意
Motivation

I have a new idea about SDN

Paper deadline approaching

No hardware
Motivation

Same code can’t be deployed in real network
Motivation

VM switch

VM host

VMs are too heavy weights
Idea of Mininet

- Environment: Linux
- Hosts: A host in Mininet is simply a shell process (e.g. bash) moved into its own network namespace with the unshare(CLONE NEWNET) system call.
Idea of Mininet

Mininet

Lightweight => scalability
Idea of Mininet

Deployment

TCP/SSL connection

controller
Mininet workflow

Step 3: Control the behavior between hosts

Command line

```
mininet> Host 1 ping Host 2
mininet> Host 2 ping Host 1
```

API -- MiniEdit

Python API for define some script

Interactive

Host 1

Host 2
Monitor Interface

The image shows a software interface with data about network traffic. The interface includes columns for Hosts, Switches, Controllers, Graph, Ping, Iperf, Interrupt, and Clear. Each column contains data about the network traffic in MBytes and Mbits/sec. The interface seems to be related to network monitoring and management, possibly for a network simulation tool like Mininet.
### Performance

<table>
<thead>
<tr>
<th>$S$ (Switches)</th>
<th>User (Mbps)</th>
<th>Kernel (Mbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>445</td>
<td>2120</td>
</tr>
<tr>
<td>10</td>
<td>49.9</td>
<td>940</td>
</tr>
<tr>
<td>20</td>
<td>25.7</td>
<td>573</td>
</tr>
<tr>
<td>40</td>
<td>12.6</td>
<td>315</td>
</tr>
<tr>
<td>60</td>
<td>6.2</td>
<td>267</td>
</tr>
<tr>
<td>80</td>
<td>4.15</td>
<td>217</td>
</tr>
<tr>
<td>100</td>
<td>2.96</td>
<td>167</td>
</tr>
</tbody>
</table>
## Performance

<table>
<thead>
<tr>
<th>Topology</th>
<th>Host</th>
<th>Switch</th>
<th>Setup(s)</th>
<th>Stop(s)</th>
<th>Mem(MB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>2</td>
<td>1</td>
<td>1.0</td>
<td>0.5</td>
<td>6</td>
</tr>
<tr>
<td>Linear(100)</td>
<td>100</td>
<td>100</td>
<td>70.7</td>
<td>70.0</td>
<td>112</td>
</tr>
<tr>
<td>VL2(4, 4)</td>
<td>80</td>
<td>10</td>
<td>31.7</td>
<td>14.9</td>
<td>73</td>
</tr>
<tr>
<td>FatTree(4)</td>
<td>16</td>
<td>20</td>
<td>17.2</td>
<td>22.3</td>
<td>66</td>
</tr>
<tr>
<td>FatTree(6)</td>
<td>54</td>
<td>45</td>
<td>54.3</td>
<td>56.3</td>
<td>102</td>
</tr>
<tr>
<td>Mesh(10, 10)</td>
<td>40</td>
<td>100</td>
<td>82.3</td>
<td>92.9</td>
<td>152</td>
</tr>
<tr>
<td>Tree(4^4)</td>
<td>256</td>
<td>85</td>
<td>168.4</td>
<td>83.9</td>
<td>233</td>
</tr>
<tr>
<td>Tree(16^2)</td>
<td>256</td>
<td>17</td>
<td>139.8</td>
<td>39.3</td>
<td>212</td>
</tr>
<tr>
<td>Tree(32^2)</td>
<td>1024</td>
<td>33</td>
<td>817.8</td>
<td>163.6</td>
<td>492</td>
</tr>
</tbody>
</table>
Attribute of Mininet

- **Advantage:**
  - Interactive
  - Sharing
  - Deployment

- **Disadvantage:**
  - $O(n)$ linear lookup for software tables
  - Host cannot be migrated live like VMs.
Conclusion

• Mininet is a system for rapidly prototyping large network on the constrained resources of a single laptop.

• [http://mininet.org/](http://mininet.org/)