Craft Packets, Generate Traffic

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Creator, Ostinato
Agenda

• About
• Story
• Overview
• Demo
• Topologies
• Performance
• Caveats
• Q&A
whoami

- **21+ years as a network dev/engineer**
  - R2, ISDN, SS7, SIGTRAN
  - L2/L3/MPLS forwarding plane
  - ACLs, Firewall data plane
  - CPEs, DSLAMs, TORs, SP edge/core routers

- **Day Job**
  - Daewoo Telecom, Globespan Virata, Conexant, Ikanos, Cisco, Juniper

- **Side Project**
  - Ostinato

@pstavirs
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The year was 2007
I was working on a Linux datapath accelerator
How to test?
  - Slow/Fast path, various protocols, invalid packets, controlled environment etc.
Didn’t get access to Ixia/Spirent traffic generators
Couldn’t find an equivalent FOSS tool
“What do I do?”
“I’ll write my own!”
A brief history

April 11, 2010 [Wireshark-users]
Announcing “Ostinato” – packet generator and analyzer

- **2007**: Started hacking
- **2008-2009**: Development in a private repo
- **2010**: Public Launch v0.1
- **2011-2018**: More features and bugfixes (v0.1.1 to v0.9.1)
- **2019**: The BIG v1.0
- **2020**: July 2020 Latest v1.1
Sustainability

• **Ostinato and me**
  • 13+ years since inception, 99% of code
  • Side project – personal time, personal resources
  • Full time day job – pay the bills

• **Ostinato is open-source**
  • But open-source sustainability is a problem
    • Money, Time, Resources, Bus-factor, ...

• **Experiments**
  • Past (didn’t work): donations, pay what you want
  • Current: paid binaries, free source code
What is Ostinato?

- Packet Crafter
- Traffic Generator
- Open-source
- Cross-platform
  - Windows, Linux, MacOS

GPL Free Software
What can you use it for?

- Testing devices and network
- Pcap Replay
- Troubleshooting
- Cert study and practice
- Teaching/Learning
- ... and more
Wireshark and Ostinato

Packets on Wire → WIRESHARK → Ostinato = Wireshark in Reverse!

- Packet
  - Protocols
    - Fields
- Packet
  - Protocols
    - Fields

#sf20v  •  Online  •  October 12-16
Features

- Multiple streams (stream = sequence of packets)
- Per stream: rates, bursts, no. of pkts, stats
- Real-time port stats
- Device Emulation (ARP, Ping)
- Common protocols (VLAN, IP, TCP, UDP, IGMP etc.)
- Set/Edit value for any field of any protocol
- Vary packet fields
- ... and many more!
Not supported

- No stateful support
  - No TCP connections (3-way handshake, seq/ack nos.)
  - TCP stateless is supported
    - Useful for ACLs, stateless firewalls etc.
- L4-L7 applications?
  - It depends!
Ostinato Demo time!
Ostinato demos

• Basics
  • Packets from scratch
  • Pcap import/edit/replay

• Scenarios
  • Routing test
  • IMIX test
  • IGMP/multicast test
Ostinato demo – Basics

- Packets from scratch
- Pcap edit/replay
Ostinato demos - Scenarios

- Routing test
- IMIX test
- IGMP/Multicast test
Ostinato demo – Routing

- Routing test
- Device Emulation
Ostinato demo – Routing

- Routing test
- Device Emulation
## Ostinato demo – IMIX

- **IMIX test**
  - **Simple IMIX (7:4:1)**

<table>
<thead>
<tr>
<th>IP PktSize</th>
<th># Pkts</th>
<th>Bytes</th>
<th>Pkt Distrib</th>
<th>Byte Distrib</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>7</td>
<td>280</td>
<td>58.33%</td>
<td>7%</td>
</tr>
<tr>
<td>576</td>
<td>4</td>
<td>2304</td>
<td>33.33%</td>
<td>56%</td>
</tr>
<tr>
<td>1500</td>
<td>1</td>
<td>1500</td>
<td>8.33%</td>
<td>37%</td>
</tr>
</tbody>
</table>
Ostinato demo – IGMP

- 1 x Multicast sender
  - Multicast data stream (UDP)
- 1 x Multicast receiver
  - IGMPv2 join/leave
Topology

Tester ➔ DUT ➔ Tester

Tester ➔ DUT ➔ Tester
Architecture

GUI/Python-Script
- Configuration
- Control
- Results

Protobuf based RPC
- Packet Generation
- Packet Capture
- Device Emulation
- Statistics

Protocols, Packet Length, Rates etc.
Topology Redux

Ostinato GUI or Ostinato API Script (Controller)

Drones (Agents)

DUTs/SUT
Topology Redux (contd.)

Ostinato GUI or Ostinato API Script (Controllers)

Drone (Agent)

DUTs/SUT
## Performance

**Intel I218-V** 1Gbps (1 CPU core)

<table>
<thead>
<tr>
<th>Packet Size</th>
<th>Max Rate (Kpps)</th>
<th>Max Rate (Mbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>920</td>
<td>618</td>
</tr>
<tr>
<td>128</td>
<td>807</td>
<td>955</td>
</tr>
<tr>
<td>256</td>
<td>442</td>
<td>976</td>
</tr>
<tr>
<td>512</td>
<td>231</td>
<td>983</td>
</tr>
<tr>
<td>1024</td>
<td>118</td>
<td>986</td>
</tr>
<tr>
<td>1518</td>
<td>80</td>
<td>984</td>
</tr>
</tbody>
</table>

**Intel XL710** 40Gbps (1 CPU core)

<table>
<thead>
<tr>
<th>Packet Size</th>
<th>Max Rate (Kpps)</th>
<th>Max Rate (Mbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>755</td>
<td>507</td>
</tr>
<tr>
<td>128</td>
<td>753</td>
<td>892</td>
</tr>
<tr>
<td>256</td>
<td>738</td>
<td>1,630</td>
</tr>
<tr>
<td>512</td>
<td>732</td>
<td>3,115</td>
</tr>
<tr>
<td>1024</td>
<td>725</td>
<td>6,055</td>
</tr>
<tr>
<td>1518</td>
<td>725</td>
<td>8,920</td>
</tr>
<tr>
<td>4096</td>
<td>574</td>
<td>18,901</td>
</tr>
<tr>
<td>9018</td>
<td>225</td>
<td>16,268</td>
</tr>
</tbody>
</table>

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Using Ostinato for Linux
Don’t use Windows for performance!
Turbo Transmit

- 10/25/40 Gbps line rate support (64-byte packets)
  - Work in progress
- Promising prototyping results
  - Using AF_XDP
  - 1xCpuCore, XL710 – 22Mpps (14.78Gbps)
  - In comparison, libpcap based – 0.755Mpps
- Early access sign up - ostinato.org/turbo
Caveats

• Professional tool
• Learning curve
• Ostinato is a tool – **YOU** are the brains!

• Feedback/suggestions are welcome
That’s all folks!

Questions?
Please fill out the speaker survey!