HTCondor and Networking

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HTCondor built in a simpler time:

• Every machine can connect to every other
• More TCP ports available than can be used
• Every machine has 1 network interface
• IPv4 “enough addresses for everyone”
• DNS exists everywhere, correctly and reliably
• All connections symmetric
Design Problem: Listeners everywhere

- Multihoming?
- Firewalls?
- NAT?
- Asymmetry?

Each daemon has ONE address in collector!
What is “the name?”

The “sinful” string:

examples

<192.168.1.15:9618>
<192.168.1.15:9618?key=value>

In MyAddr attribute

And condor_tool –addr ‘<sinful>’
Which Address will a machine advertise?

If…
BIND_ALL_INTERFACES = true  (default)
NETWORK_INTERFACE = unset  (default)
ENABLE_ADDRESS_REWRITING = true  (default)

Then…
Machine **listens** on all interfaces,
Collector rewrites to “collector” interface
Network rewrite

Central Manager

192.168.5.15

10.0.5.15

Execute Machine

eth0

eth1
Which Address will a machine advertise?

If...

BIND_ALL_INTERFACES = false (undefault)
NETWORK_INTERFACE = 10.* (or)
NETWORK_INTERFACE = eth0 (or)
NETWORK_INTERFACE = 10.5.3.4

Then...

Machine **listens** on specified interface (only), and advertises that!
Which Address will a machine advertise?

If...

BIND_ALL_INTERFACES = false (default)
NETWORK_INTERFACE = unset (default)

Then...

Machine \textbf{listens} on one interface, heuristically chosen by condor, and advertises that.
Completely Punting to proxy

\[ \text{TCP\_FORWARDING\_HOST} = \text{foo.com} \]

- Says “you can connect to me at foo.com”
- How?
  - Up to you:
    - Ssh forwarding
    - iptables?
    - Magic
Solutions for firewalls

- Easiest: HIGHPORT/LOWPORT
  - LOWPORT = 9000
  - HIGHPORT = 10000
- Assuming holes punched in firewall
- If only need inbound (common case):
  - IN_LOWPORT = 9000
  - IN_HIGHPORT = 10000
How Many ports?

› Schedd:
  • $5 + 5 \times \text{MAX\_JOBS\_RUNNING}$

› Startd
  • $5 + 5 \times \text{max slots}$

› (Assuming no shared_port or CCB)
What happens on port exhaustion?

› Badness.
› Jobs won’t start for no apparent reason
› Keep an eye on ports in this case.
Split Network

Central Manager

192.168.5.15

10.0.5.15

eth0

eth1

Execute Machine
Private network support

PRIVATE_NETWORK_INTERFACE = 1.2.3.4
PRIVATE_NETWORK_INTERFACE=eth1
PRIVATE_NETWORK_NAME=MyPrivNet

Any time two condor machine connect, condor will use this network and advertise it. Need not actually be the *private* network
Problem: only ~ 60,000 TCP ports
Need one per shadow
Shared port Service
  * Doesn’t work with standard universe*
USE_SHARED_PORT = true
DAEMON_LIST = ... SHARED_PORT
Changes sinful string to
<192.168.1.100:9618?sock=xxx_yyy>
condor_shared_port

schedd

Internet

Fire wall

shared_port

starter
Bypasses firewalls by reversing connection

Requires one machine with no firewall
  • Usually the collector

Doesn’t work with standard universe

Only bypasses one firewall
  • Usually in front of the startds
  • Schedds / Central managers w/o firewalls
CCB: Condor Connection Broker

Diagram showing the connection between schedd, CCB, Internet, and startd, with an outbound firewall between the Internet and startd.
CCB Configuration

» CCB built into condor_collector

CCB_ADDRESS = $(COLLECTOR_HOST)
PRIVATE_NETWORK_NAME = domain
Still an active area of work

ENABLE_IPV6 = true
ENABLE_IPV4 = false
NETWORK_INTERFACE = \\2607:f388:1086:0:21b:24ff:fedf:b520
Putting it all together

- CCB works with shared port
  - Common Combination
- If you have CCB, probably don’t need highport/lowport
- CCB works together with private networks
  - Can be big performance win
Thank you!