Distributing delivery of large Security Challenge payloads

ISGC 2019

Nikhef

Who Am I?

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Nikhef

Software Engineer @ Nikhef

Red Team for EGI SSC

SSC

We Want Large Files

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Large as in >50MB

Tor Browser

Anything really

Job Submission Systems Can’t Cope

Grid Storage Is Too Much Work

So What Does Work?

We Need Redundancy

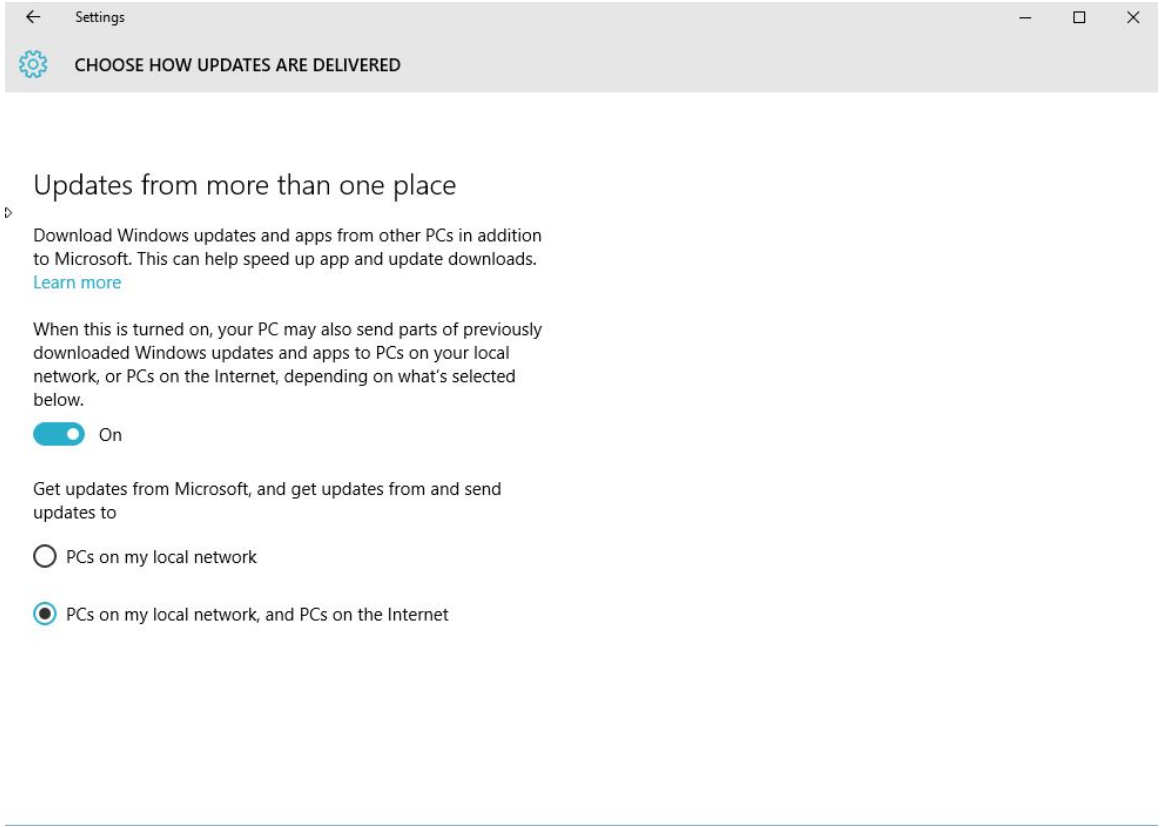
We Need Agility

We Need Ease of Use

BitTorrent

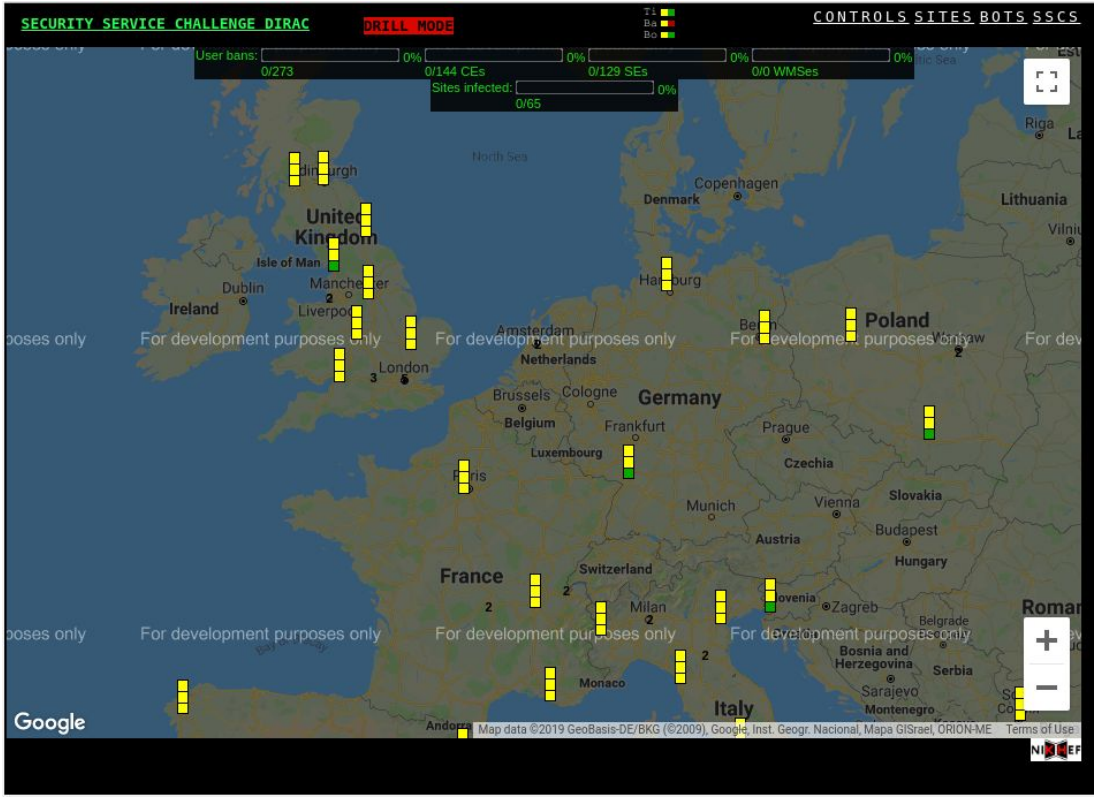
—

Works for pirates



Works for Microsoft

So Does It Work for Us?



Tor

Critical ⟶ Must be downloaded

Web Seeds as redundancy

x86 and x64 client

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Seed Box(es)

20GBit+ Transit Connection

No Firewall (except to limit access to the torrent UI)

Transmission

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aria2 on Grid Nodes

“aria2 is a lightweight multi-protocol & multi-source command-line download utility.”

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Has BitTorrent

Has Web Seeds

Written in C++

No strange dependencies

Sounds good right?

So we set it up

But...

Problem #1

No two sites offer the same environment

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Some sites have CentOS 7

Some sites have SLC6

Solution #1

CVMFS

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Consistent

Offers a more modern environment

Available on all target sites (LHCb)

Problem #2

aria2 compilation takes 15 minutes on a good day

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15 minutes on a 2018 EPYC

30 minutes on my 2017 laptop

Solution #2

Static builds

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Available on GitHub

Certificate checking had to be disabled

Torrents check some integrity

Problem #3

aria2 static builds segfault at CERN

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This we found out during the SSC launch

Solution #3

None

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We do not know why this happened

Fallbacks implemented, using wget

We could have sent a signal

Everything worked, bots came online

Some statistics

223

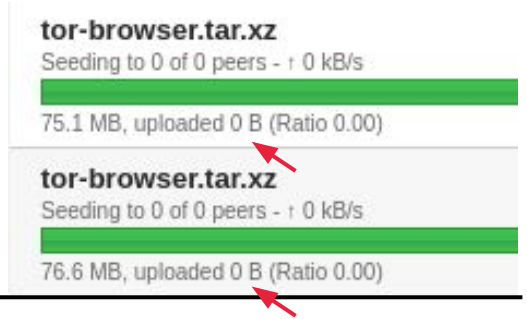
Number of unique aria2 IPs our tracker saw

1031

The number of tracker hits by aria2 clients

0

The number of bits our seedbox uploaded



Why?

Web Seeds

~35 vs 1

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Theory: Web Seeds pushed out the actual torrent traffic

P2P is more complicated than just a request

So is this useful?

For widely available files: No...

And for specific files?

Not really, in my opinion*

Fundamental issues

Unsuitable Networks

Not vulnerable enough

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No UPnP

No NAT-PMP

(But yes firewalls)

No seeding, or you'll get caught

Politically Problematic

Hosting ‘Hacking Pirates’ is apparently not very popular

Too much work

Tracker (or DHT)

Seed Box(es)

Generating Torrents

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Software

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Less portable than expected

Mainly aimed at desktops

Mainly aimed at home environments

aria2 is nice, *once it works*...

In Short:
Save yourself some time, use a cheap web CDN

SSC: Detection and Artifacts

In chronological order

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DIRAC kills idle jobs

CPU/time is monitored

Setting up tor is not intense enough

Our bots wait for instructions

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DIRAC kills idle jobs

Should we burn CPU for nothing?

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Luckily...

Undocumented feature

```
self.log.verbose('Initializing Watchdog instance')
watchdog.initialize()
self.log.verbose('Calibrating Watchdog instance')
watchdog.calibrate()
# do not kill Test jobs by CPU time
if self.jobArgs.get('JobType', '') == 'Test':
  watchdog.testCPUConsumed = False

if 'DisableCPUCheck' in self.jobArgs:
  watchdog.testCPUConsumed = False

if exeThread.isAlive():
  self.log.info('Application thread is started in Job Wrapper')
  watchdog.run()
else:
  self.log.warn('Application thread stopped very quickly...')

if exeThread.isAlive():
  self.log.warn('Watchdog exited before completion of execution thread')
  while exeThread.isAlive():
    time.sleep(5)
```

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Major Indicators

Detecting Strange Jobs

DIRAC / Site perspective

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Jobs with check-evading flags

Jobs are idle for days

Detecting Torrents

Should you?

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Mainly web traffic

Bencode tracker communication

Torrent files on the system

Detecting Unusual CPU Load

yes > /dev/null &

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‘yes’ is highly optimized

No throughput

Miner-like activity

Detecting DDOSes

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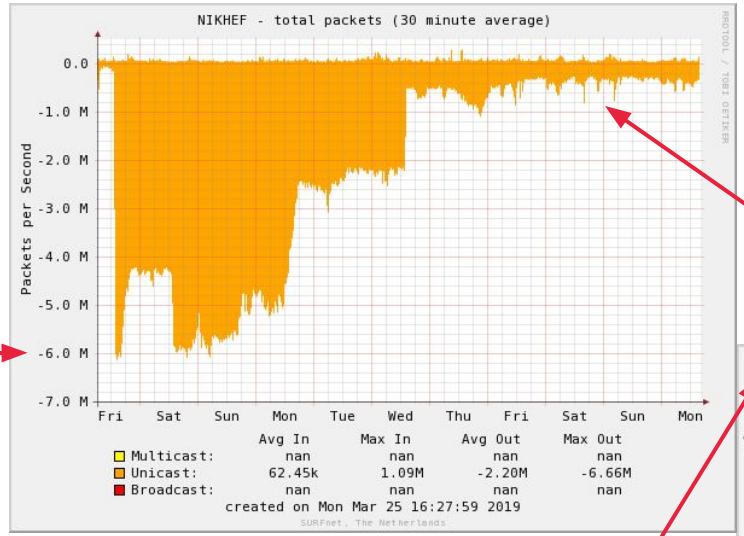
UDP Packet Flooding

Limited traffic

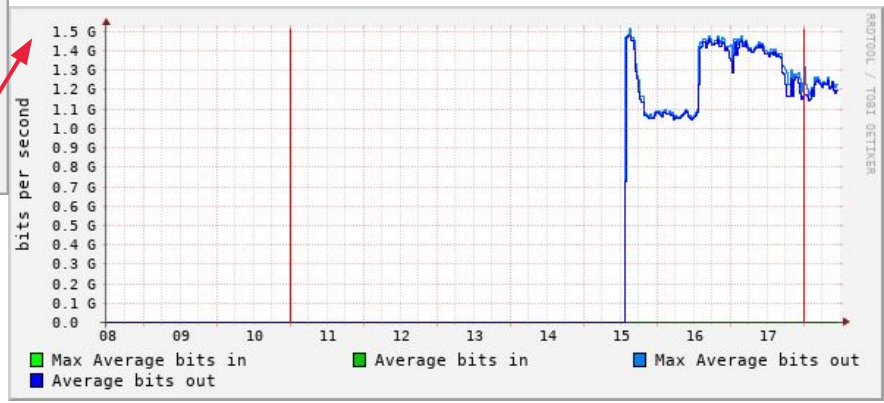
Detecting a (D)DOS attack



6 Mio packs

This is not a baseline

1,5Gb



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Detecting a (D)DOS attack

SURFcert started complaining

Nikhef ‘complained’ to EGI

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Detecting a (D)DOS attack

No machines were harmed in the process of this attack

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Detecting Bot Characteristics

Using methods from the workshop on Sunday

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UUIDs in the bot

egissc tor address

Makeself pilot-like initialization

SSC Fun Facts

Total Bots: ~250

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Some in short queues ⟶ killed

Some glite, some DIRAC

Some were redeployed

First Ban: <12h

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Tor was found

LHCb job on an ATLAS site

Longest DDOS

Still going on...

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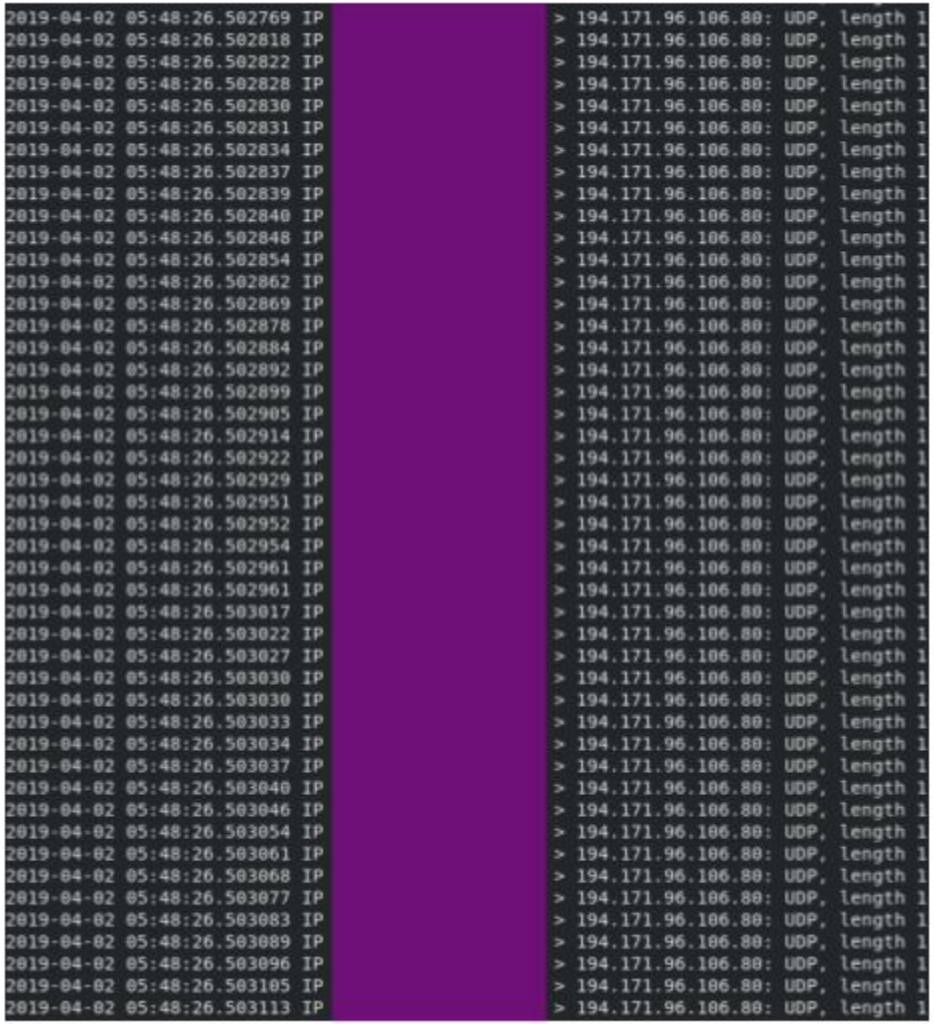
More than 3 weeks

Currently around 60 Mb/s


2019-04-02 05:48:26.502769 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502818 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502822 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502828 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502830 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502831 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502834 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502837 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502839 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502840 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502848 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502854 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502862 IP > 194.171.96.106.80: UDP, length 1
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2019-04-02 05:48:26.502892 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.502899 IP > 194.171.96.106.80: UDP, length 1
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2019-04-02 05:48:26.502954 IP > 194.171.96.106.80: UDP, length 1
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2019-04-02 05:48:26.502961 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.503017 IP > 194.171.96.106.80: UDP, length 1
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2019-04-02 05:48:26.503096 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.503105 IP > 194.171.96.106.80: UDP, length 1
2019-04-02 05:48:26.503113 IP > 194.171.96.106.80: UDP, length 1

Bots still responding: 5

Excluding the DDOSing bots

Not currently doing anything

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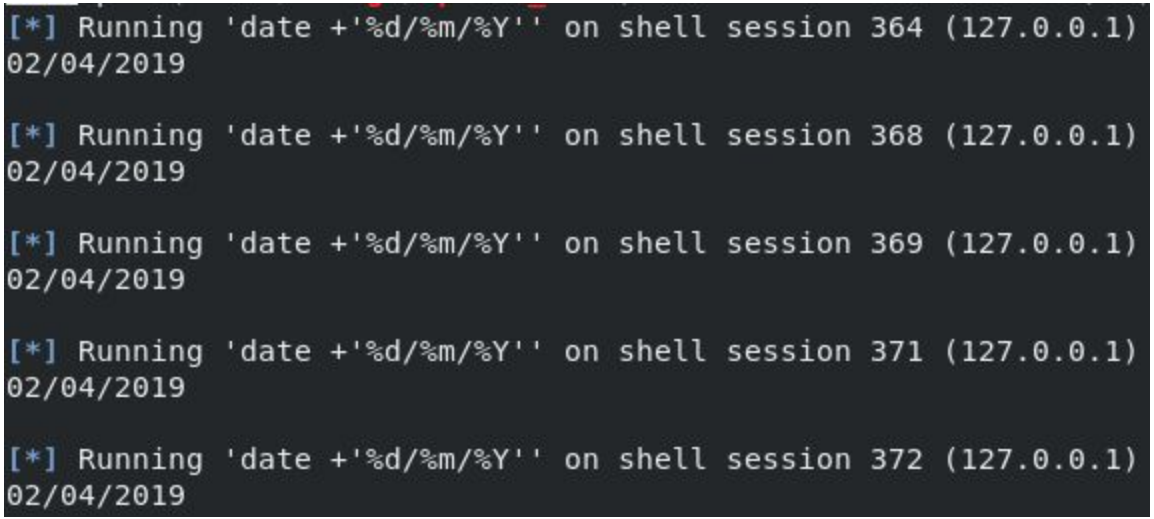

(127.0.0.1) is a Tor side-effect

Debug sessions: ~4

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All gave up

Voluntarily infecting more hosts?

Pilot Users Banned: many

Basically every site banned the LHCb Pilot User, more or less crippling DIRAC

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Timing of the SSC: Very Bad

(for LHCb)

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