CGI

Experience the commitment®

Rehabilitating Pickle

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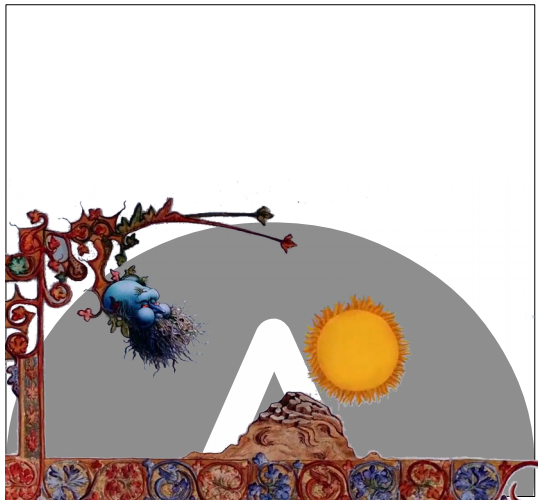
PyConUK 2018

Previously at CGI

DevOps with Ansible

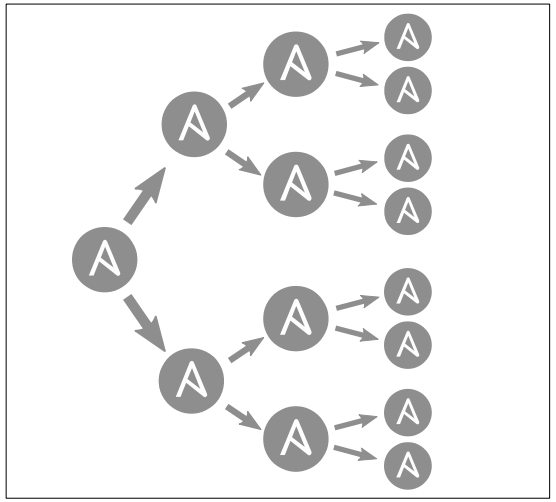
There is much rejoicing

(Yayyy)

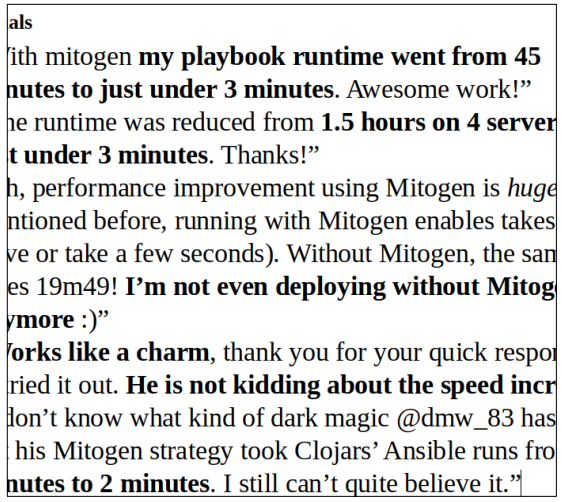


Playbooks grow, get slow

Summer becomes Winter



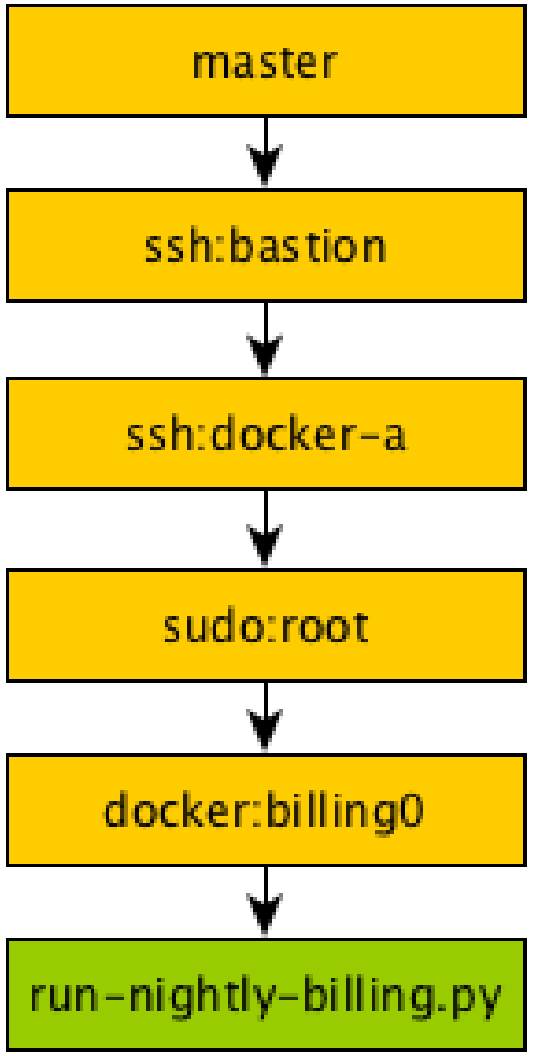
Mitogen for Ansible appears



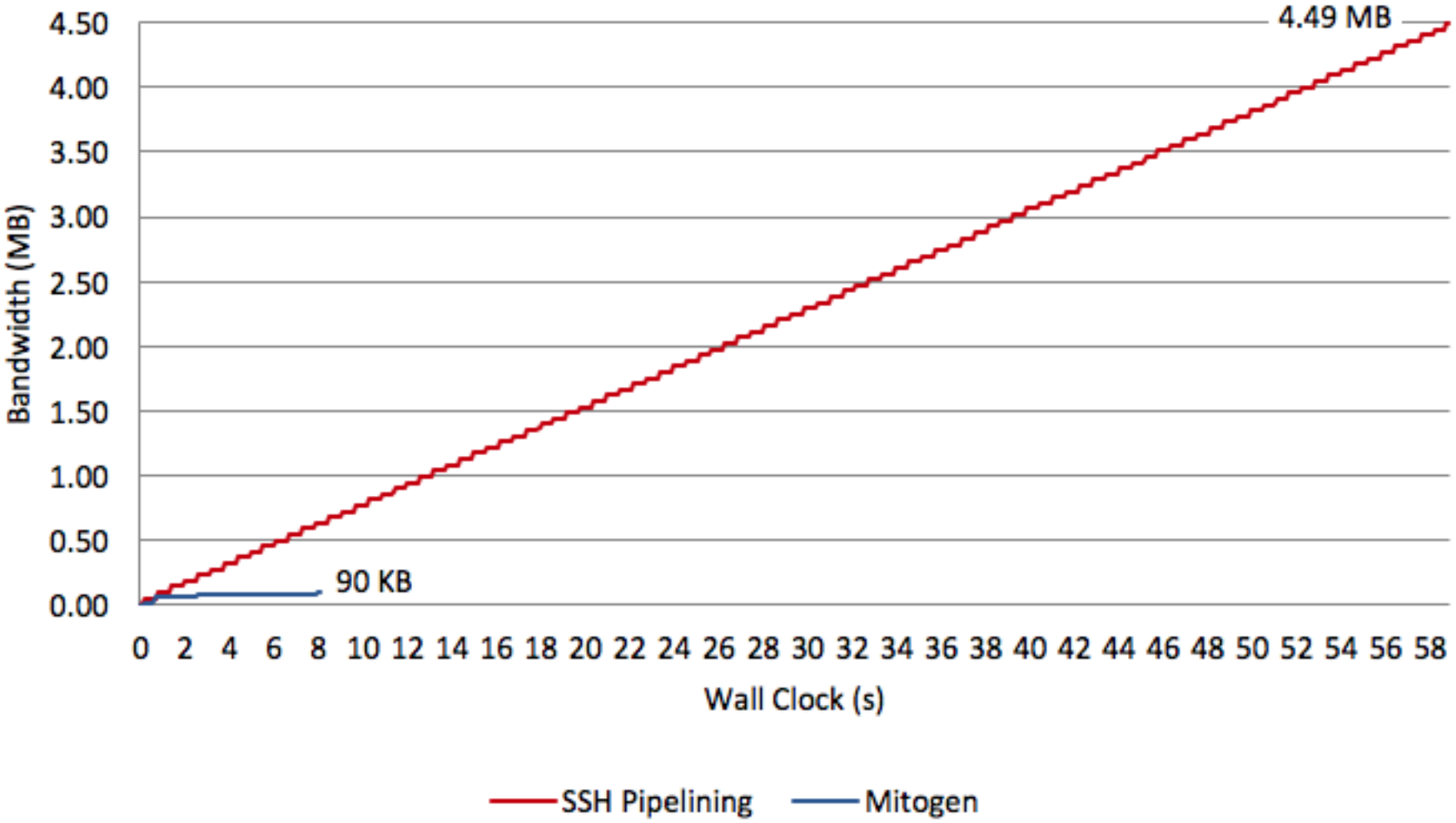
Ansible is fast again …

Mitogen

```
bastion = router.ssh(
        hostname='jump-box.mycorp.com')

docker_host = router.ssh(
        via=bastion_host,
        hostname='docker-a.prod.mycorp.com')

sudo_account = router.sudo(
        via=docker_host,
        username='azure_diamond', password='hunter2')

internal_box = router.docker(
        via=sudo_account,
        container='billing0')

internal_box.call(os.system, './run-nightly-billing.py')
```



Mitogen makes Ansible faster



Pickle

```
>>> original = (1.0, 'text', [2,], {3: None})

>>> pickle.dumps(original, protocol=0)
b'(F1.0\nVtext\np0\n(lp1\nL2L\na(dp2\nL3L\nNstp3\n.'

>>> pickle.loads(_)
(1.0, 'text', [2,], {3: None})
```

Why Pickle?

- Preserves nearly any type or class
  - JSON can’t do tuple(), set(), complex(), large integers, some dict
- Preserves self referencing data structures
  - JSON doesn’t handle recursive structures
- Works everywhere Python does
- Produces compact serializations

DON'T USE PICKLE

Why not Pickle?

> ***Warning:*** *The pickle module is not secure against erroneous or maliciously constructed data. Never unpickle data received from an untrusted or unauthenticated source.*
>
> Python documentation » 12.1 pickle — Python object serialization

Why not Pickle?

> ***Warning:*** *The pickle module is not secure against erroneous or maliciously constructed data. Never unpickle data received from an untrusted or unauthenticated source.*
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> Python documentation » 12.1 pickle — Python object serialization

CVE-2005-2875	CVE-2005-3008	CVE-2007-1100	CVE-2007-5741	CVE-2008-3143	CVE-2010-4574
CVE-2011-1113	CVE-2011-2520	CVE-2012-4406	CVE-2013-5093	CVE-2013-5942	CVE-2014-0485
CVE-2014-1714	CVE-2014-3539	CVE-2014-5340	CVE-2014-8165	CVE-2015-0692	CVE-2015-0693
CVE-2015-5164	CVE-2015-5242	CVE-2016-3957	CVE-2017-10803	CVE-2018-7889	CVE-2018-14572

– US National Vulnerabilities Database (NVD), vulnerabilities involving "pickle"

pickle.load() executes arbitrary code

```
>>> pickle.loads(b"cos\nsystem\n(S'rm -rf'\ntR.")
0
```

Demo

Restricting globals

```
from pickle import Unpickler, UnpicklingError

class RestrictedUnpickler(Unpickler):
    def find_class(self, module, name):
        if module != "builtins":
            raise UnpicklingError("Denied!")
        elif name not in {"set", "frozenset"}:
            raise UnpicklingError("Still no")
        return getattr(builtins, name)
```

Other attacks

Denial of service

- Protocol downgrade
- Billion Laughs (pickle bombs)
- Unhandled exceptions

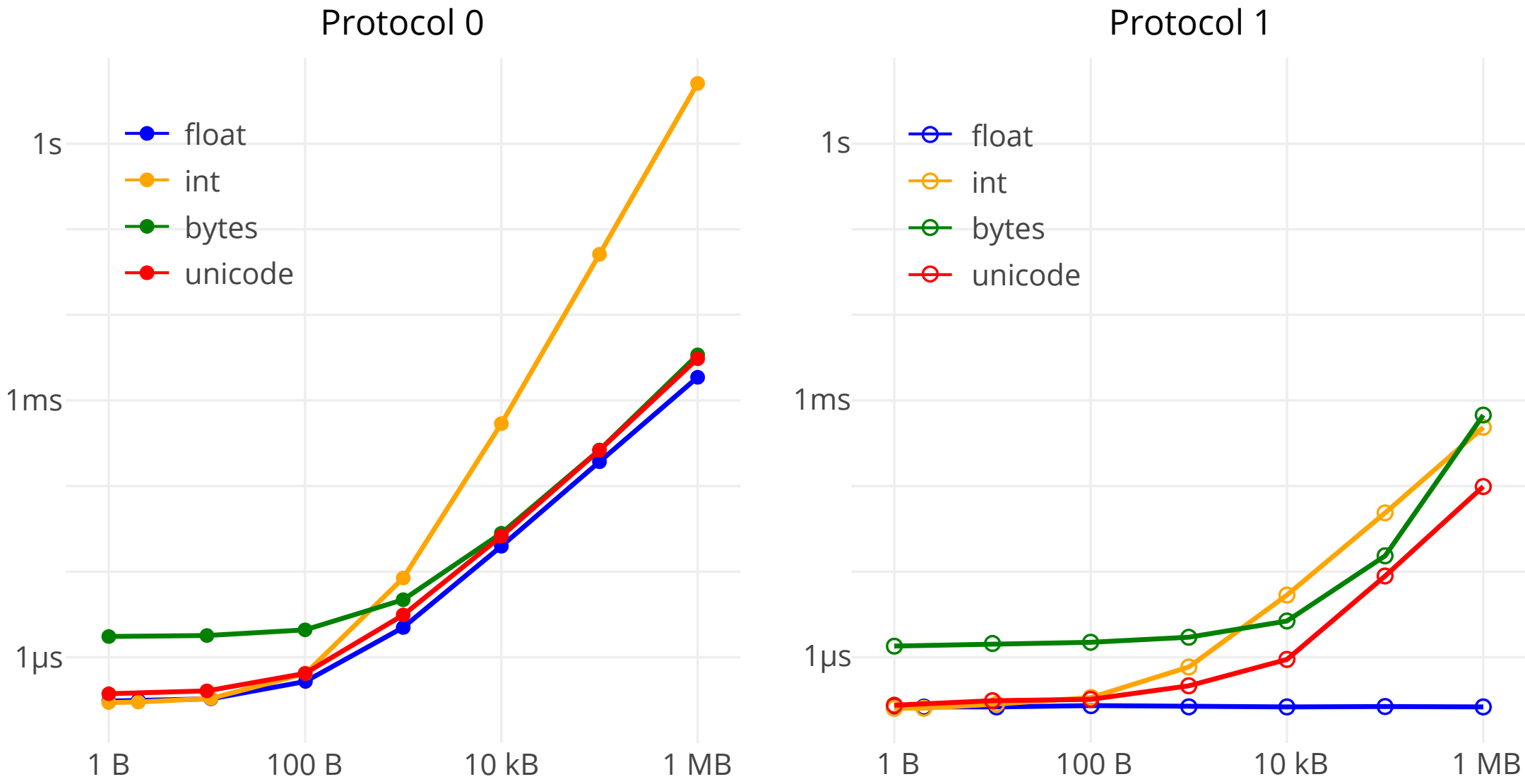
Data Exposure

- Object traversal (gadget chains)

Weird machines

- Unused opcodes (e.g. DUP)
- Parser abuse
- Stack corruption

Protocol downgrade

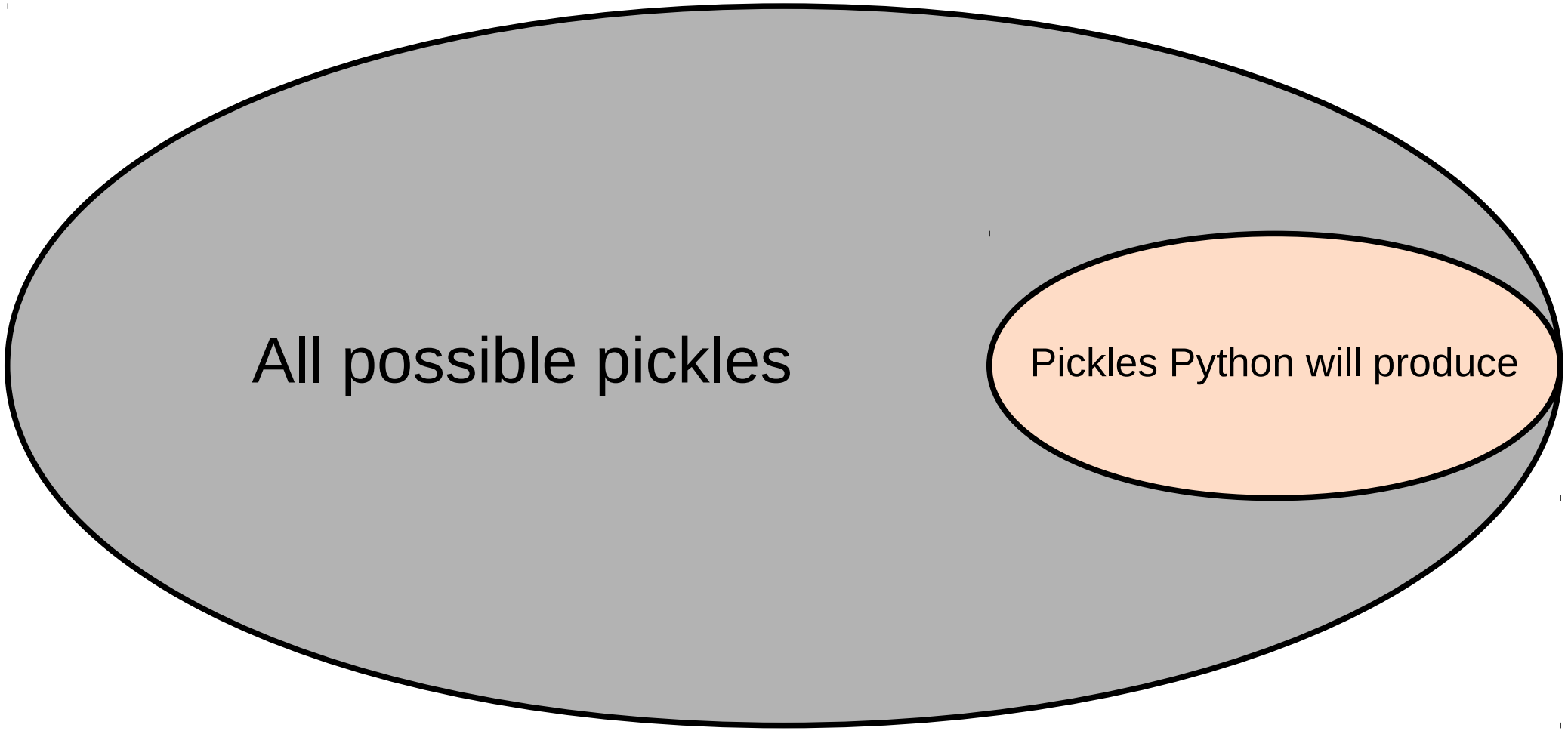


Billion laughs / pickle bombs

```
>>> a = ['lol', 'lol', 'lol', 'lol', 'lol',
...      'lol', 'lol', 'lol', 'lol', 'lol']
>>> b = [a,a,a,a,a,a,a,a,a,a]
>>> c = [b,b,b,b,b,b,b,b,b,b]
...
>>> laughs = [i,i,i,i,i,i,i,i,i,i]
>>> with open('billion-laughs.pkl0', 'wb') as f:
...     pickle.dump(laughs, f)
```

Demo

Weird machines



Other considerations

Don’t use pickle for long term storage

> *Its automatic, magical behavior shackles you to the internals of your classes in non-obvious ways. You can’t even easily tell which classes are baked forever into your pickles. Once a pickle breaks, figuring out why and where and how to fix it is an utter nightmare.*
>
> – Don’t use Pickle – use Camel, Eevee

Thank you

Slides, etc.

- github.com/moreati/pickle-fuzz

Mitogen (by David Wilson)

- mitogen.readthedocs.io

Pikara (by Latacora)

- github.com/latacora/pikara

Sour pickles, real world pickle attacks (by Sensepost)

- sensepost.com/blog/2011/blackhat-2011-presentation/
- youtube.com/watch?v=HsZWFMKsM08

Don’t use pickle – use camel (by Eevee)

- eev.ee/release/2015/10/15/dont-use-pickle-use-camel/

CGI are hiring

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