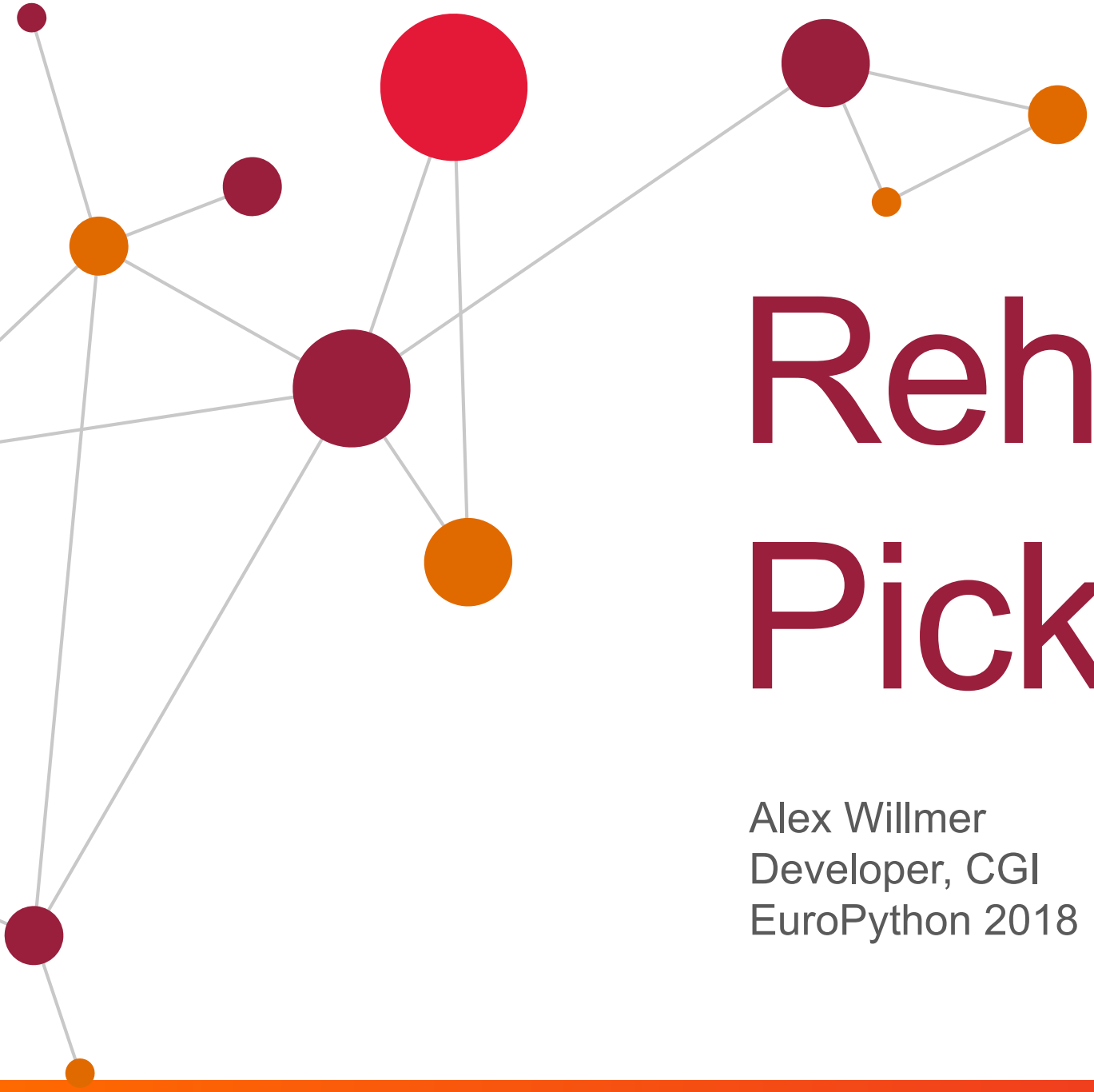


CGI

Experience the commitment®

Rehabilitating Pickle

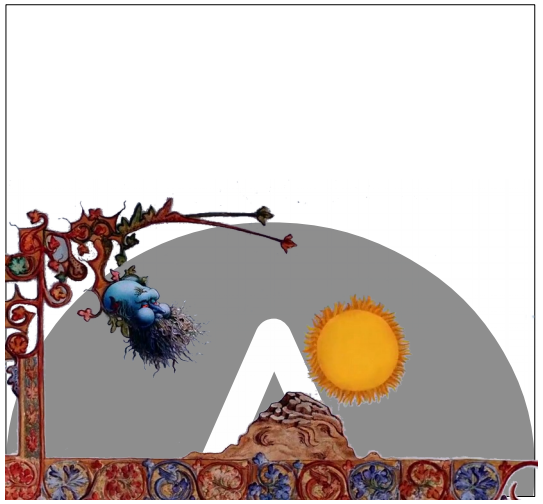
Alex Willmer
Developer, CGI
EuroPython 2018

Previously at CGI

DevOps with Ansible

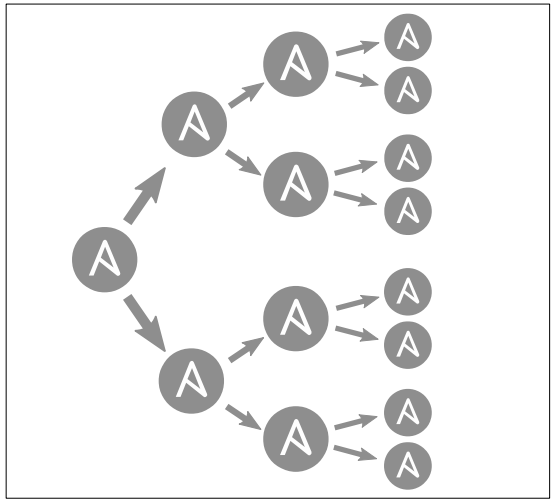
There is much rejoicing

(Yayyy)

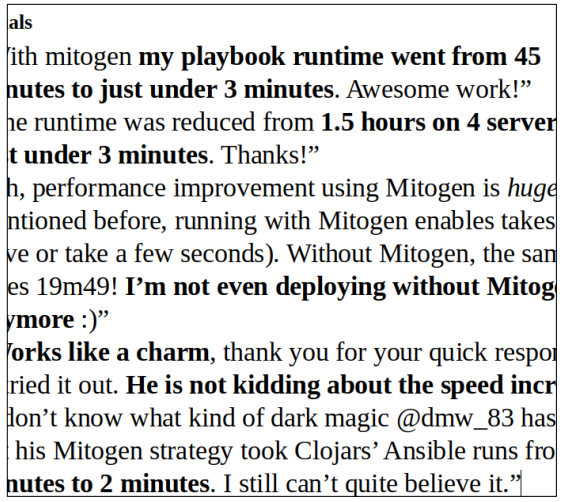


Playbooks grow, get slow

Summer becomes Winter



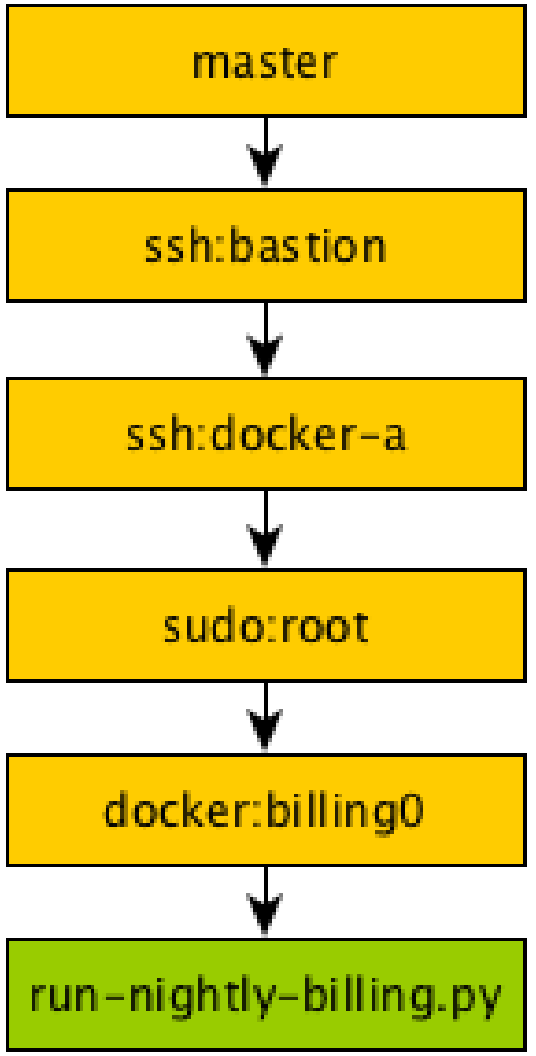
Mitogen for Ansible appears



Ansible is fast again …

Mitogen

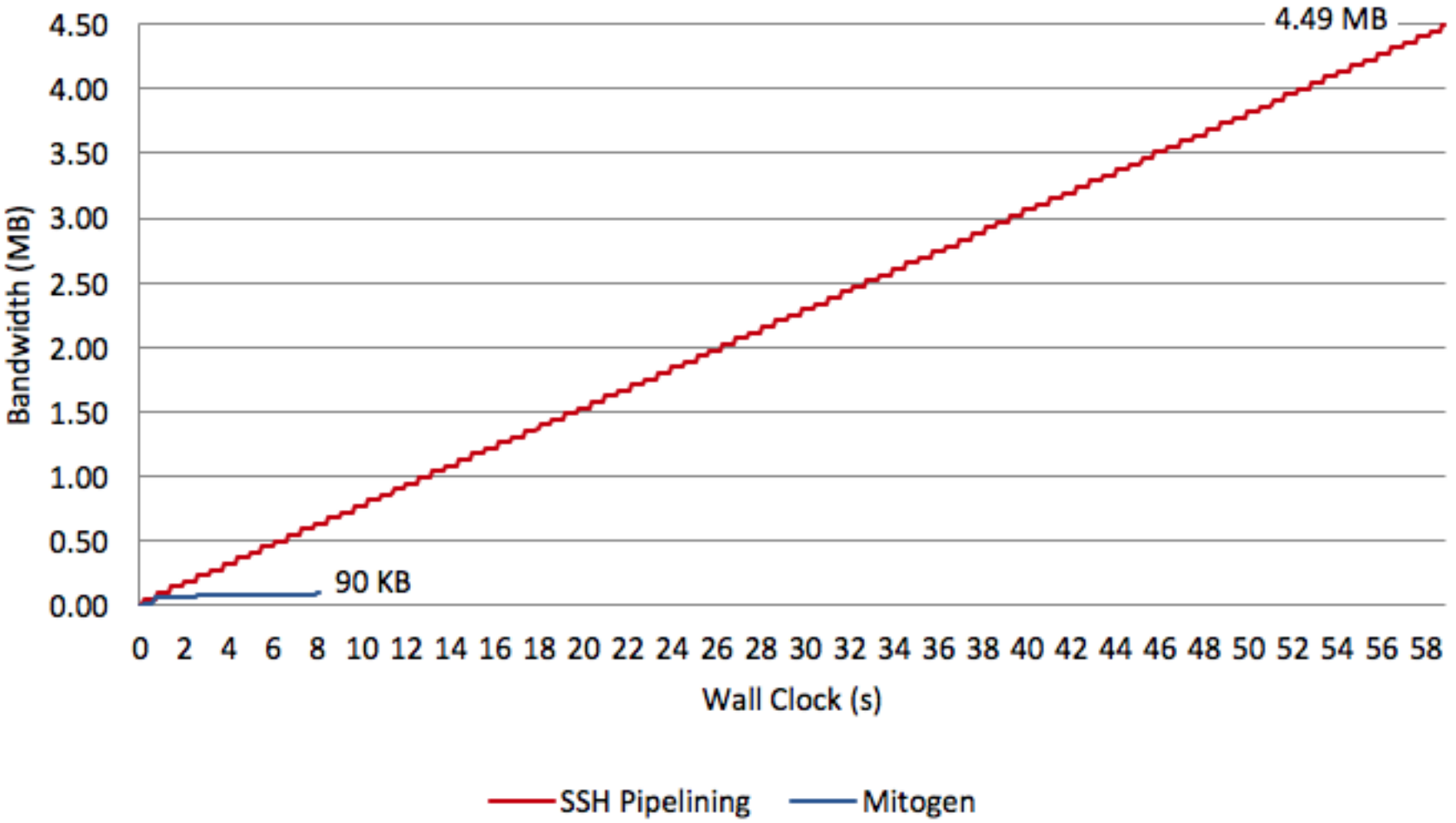
```
bastion = router.ssh(
        hostname='jump-box.mycorp.com')

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 for Ansible

```
# ansible.cfg
[defaults]
strategy_plugins = <...>/ansible_mitogen/plugins/strategy
strategy = mitogen_linear
```

Mitogen for Ansible



Pickle

```
>>> pickle.dumps((1., 'text', [2,], {3: None}),
...                 protocol=0)
b'(F1.0\nVtext\np0\n(lp1\nL2L\na(dp2\nL3L\nNstp3\n.'

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

Why Pickle?

- Works everywhere Python does
- Preserves nearly all Python types, & custom classes
- Handles recursive data structures
- 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

pickle.load() executes arbitrary code

```
>>> pickle.loads(b"cos\nsystem\n"
...                   b"(S'echo hello world'\ntR.")
hello world
0
```

Demo

Restricting globals

```
WHITELIST = {"set", "frozenset"}

class RestrictedUnpickler(pickle.Unpickler):
    def find_class(self, module, name):
        if module == "builtins" and name in WHITELIST:
            return getattr(builtins, name)
        raise pickle.UnpicklingError("Denied!")
```

Other attacks

Denial of service

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

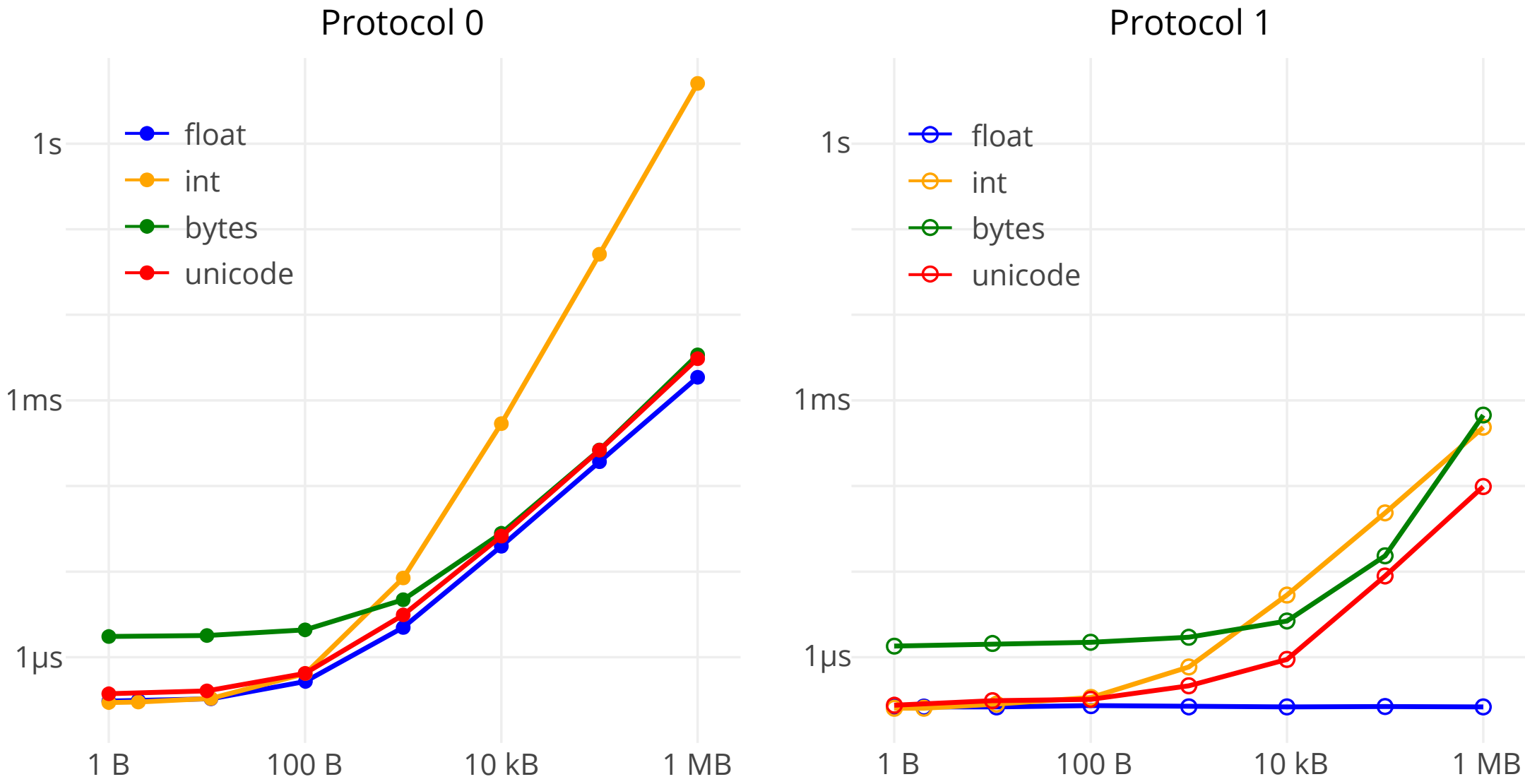
Weird machines

- Unused opcodes
- Parser abuse
- Stack corruption

Data Exposure

- Object traversal (gadget chains)

Protocol downgrade

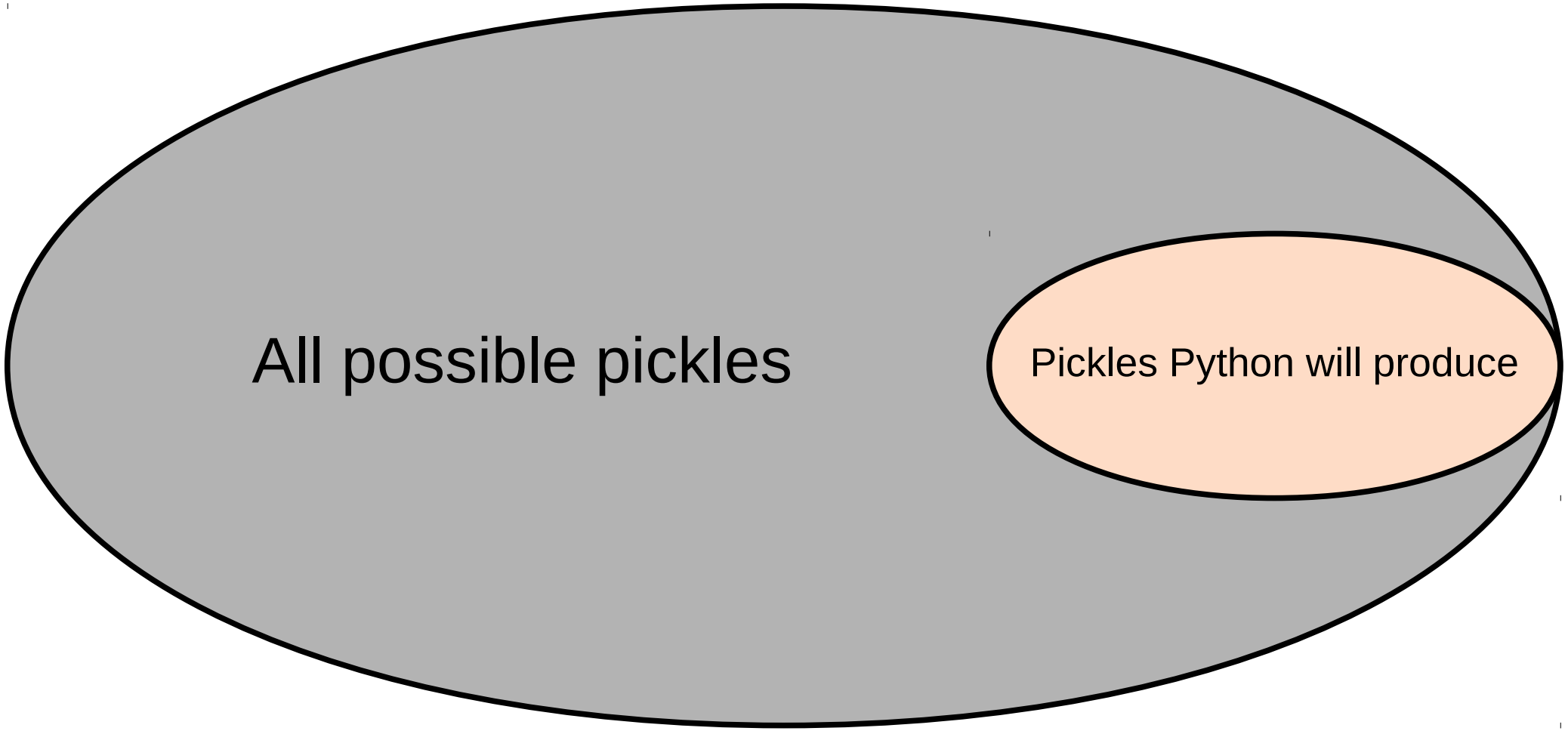


Billion laughs / pickle bombs

```
>>> 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.pkl', '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, more info

- github.com/moreati/pickle-fuzz

Mitogen, zero install distributed programs (by David Wilson)

- mitogen.readthedocs.io

Pikara, pickle analyzer (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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