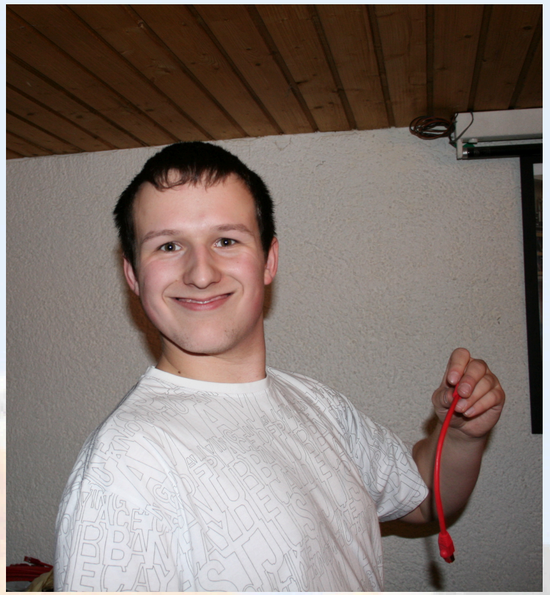
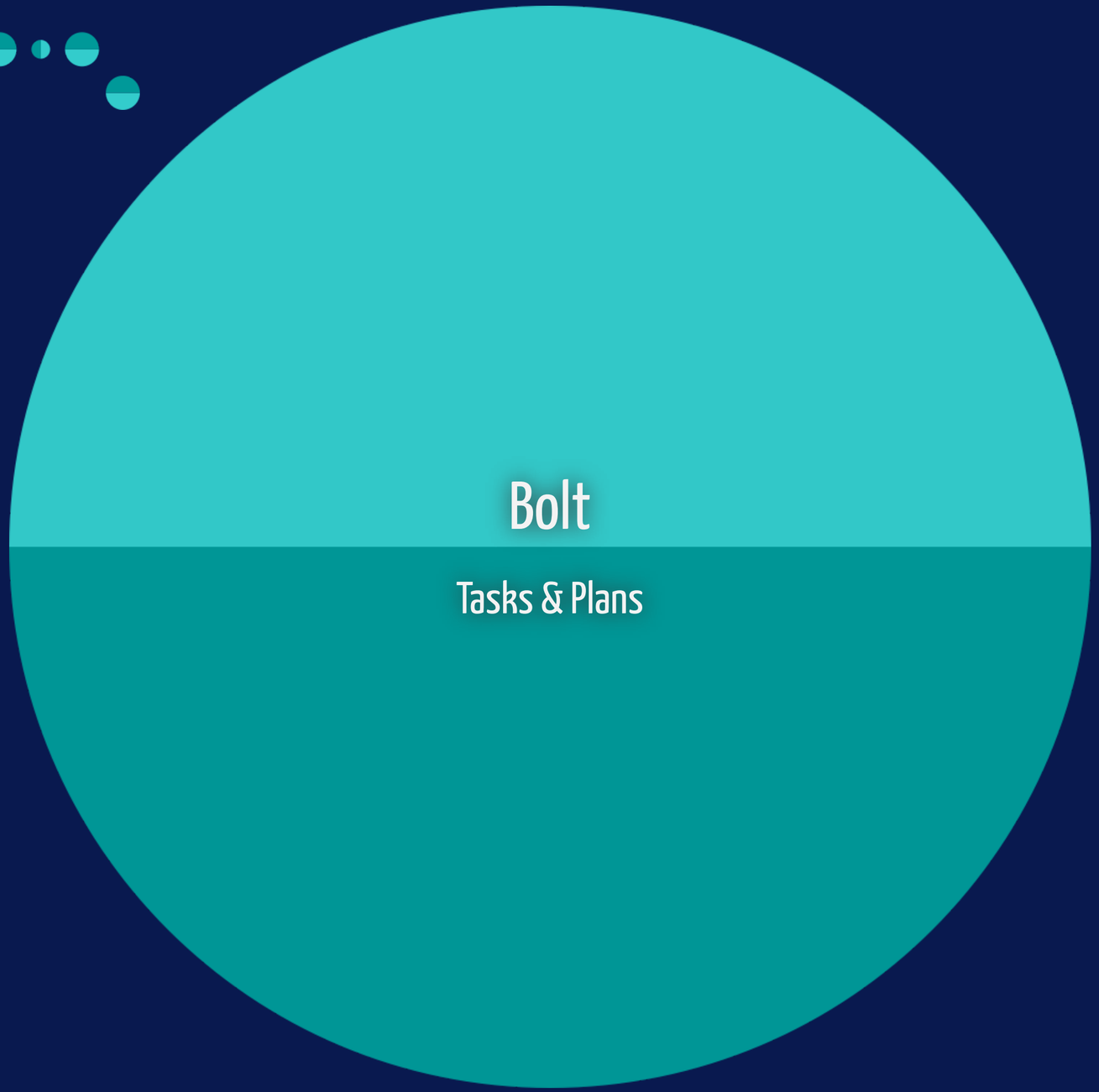
beladels

Doing mass PE upgrades in highly restricted environments

$ whoami

- Tim 'bastelfreak' Meusel
- Puppet Contributor since 2012
- Merging stuff on Vox Pupuli (Puppet Community) since 2015
- Vox Pupuli Project Management Committee member
- Senior IT Automation Consultant at betadots





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Bolt

Tasks?!

- Runs tasks via ssh or WinRM on remote systems
  - CLI only

Bolt

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  - CLI only
- A task is a executable binary/script + json file

```
{
  "puppet_task_version": 1,
  "supports_noop": false,
  "description": "Rename branch",
  "parameters": {
    "control_repo_branch": {
      "description": "Control-repo branch",
      "type": "String"
    }
  }
}
```

```
#!/bin/bash

pushd /tmp/control-repo || exit
git branch -m production old_prod
git branch -m "$PT_control_repo_branch" production
```

Bolt

Tasks?!

- Runs tasks via ssh or WinRM on remote systems
  - CLI only
- A task is a executable binary/script + json file
- Input and output of each task is JSON
  - makes parsing, scripting and concatenating easy

Bolt

Tasks?!

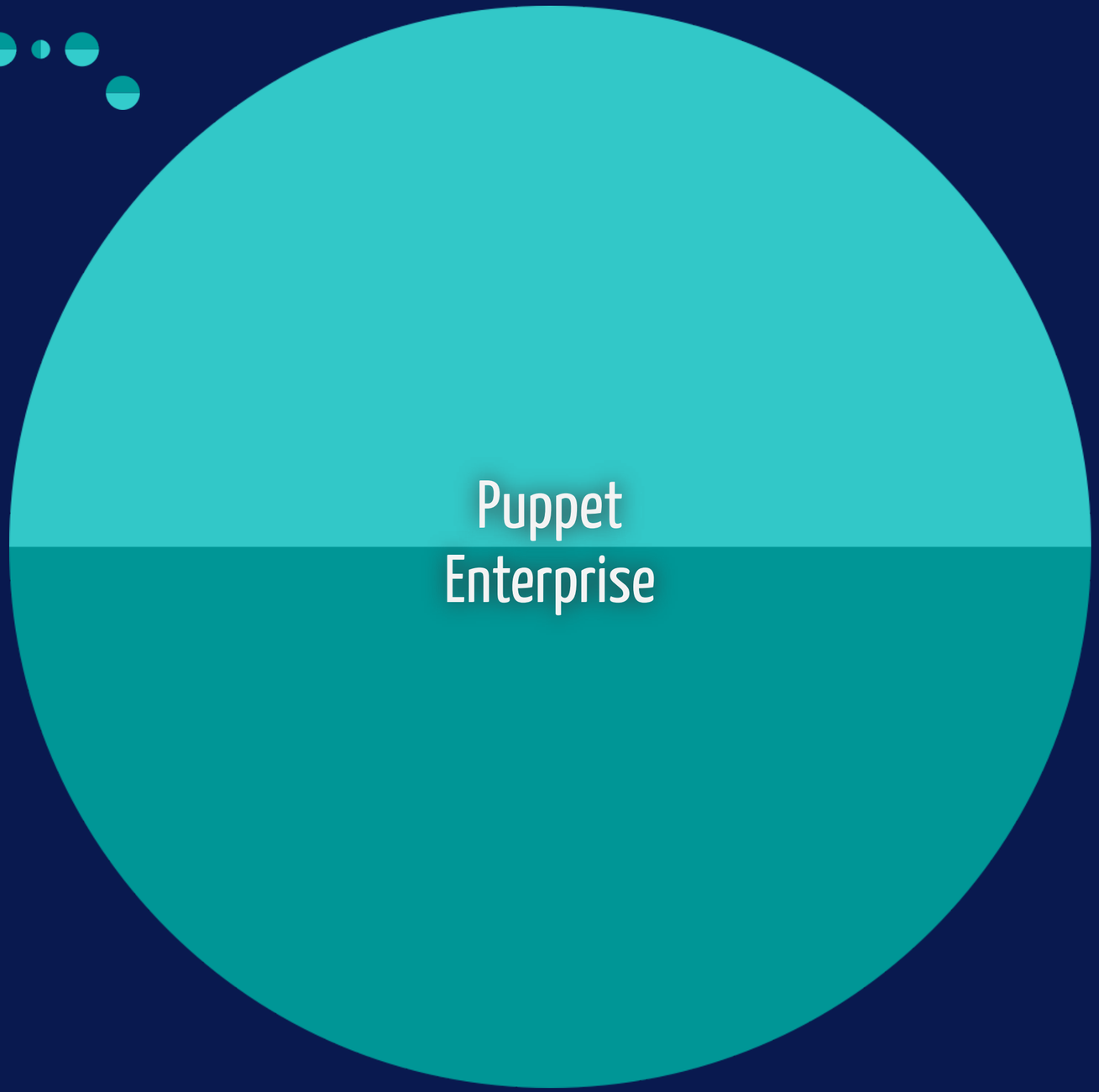
Plans?!

- Bolt Plans are written in Puppet DSL (or YAML)
- Plans apply puppet code, execute Bolt or Puppet functions, start tasks or other plans

```
# @param message the string we want to paste to STDOUT
plan test::foo (
  String[1] $message = 'Hi CfgMgmtCamp!',
) {
  out::message($message)
  run_task('puppet_agent::install', get_targets('all'))
}
```

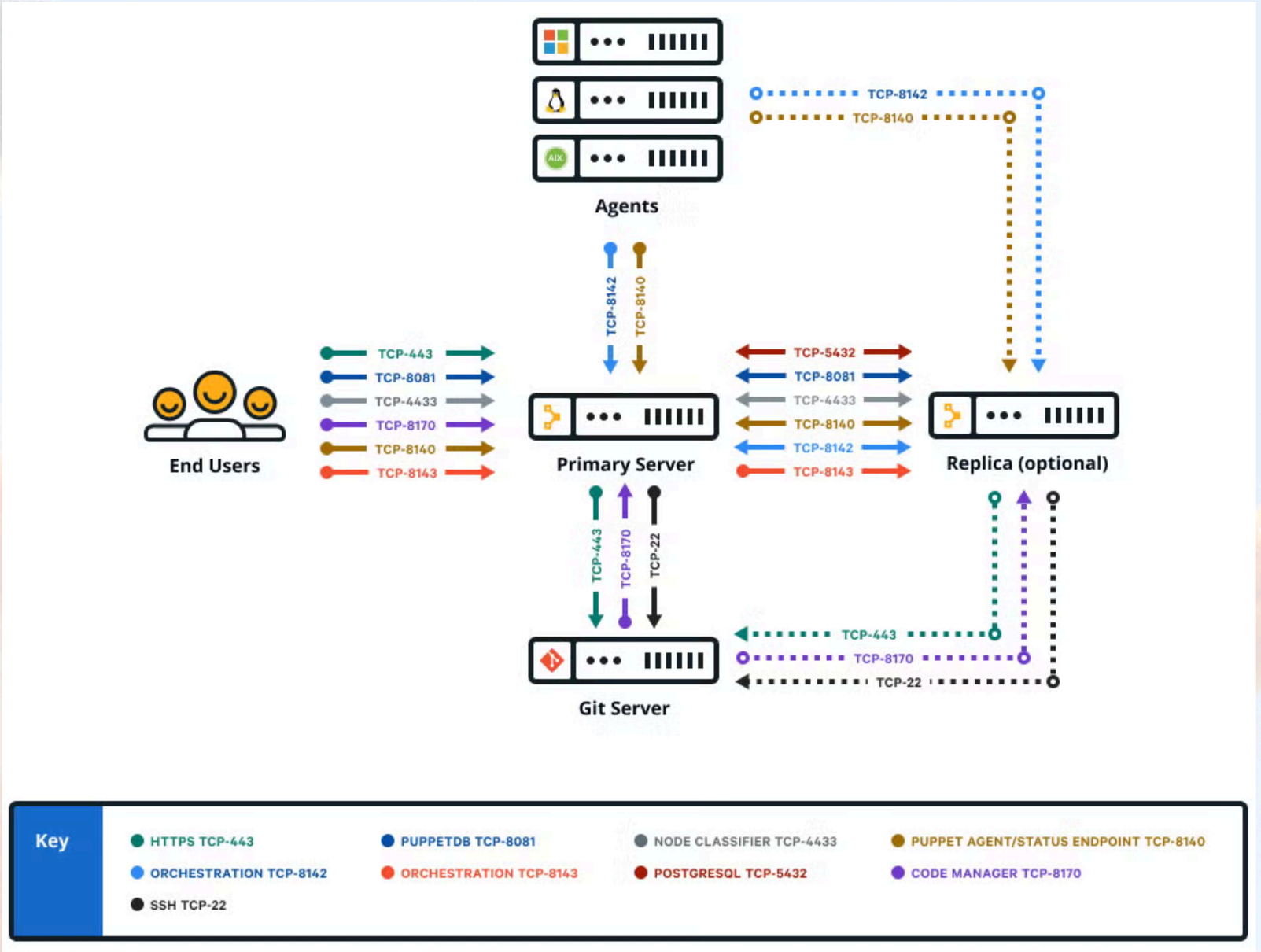
Bolt is the missing part in the ecosystem for imperative workflows and orchestration

It combines scripts and Puppet code


Puppet
Enterprise

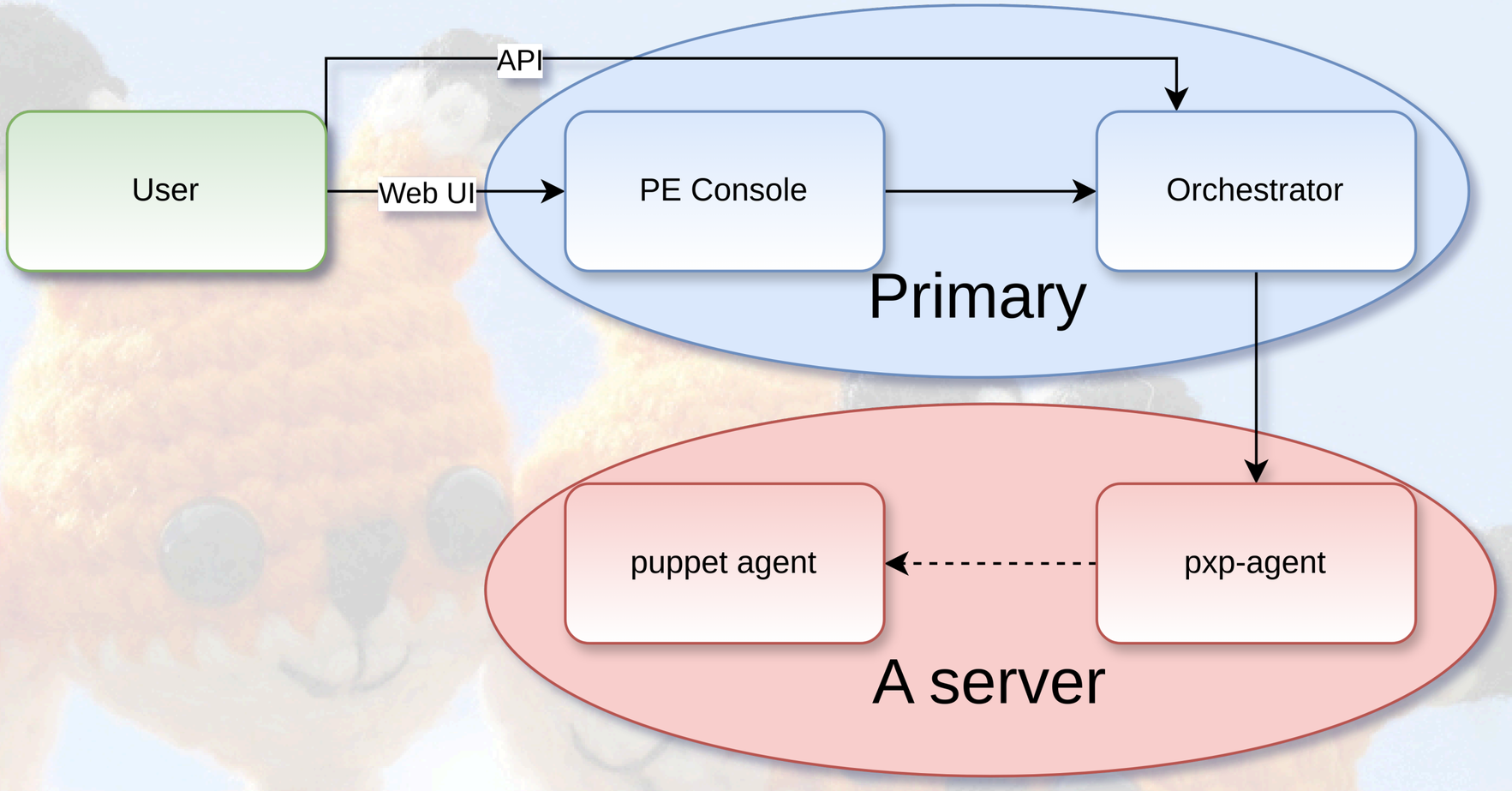
PE

What?


Agents
TCP-8142
TCP-8140
TCP-8142
TCP-8140
End Users
TCP-443
TCP-8081
TCP-4433
TCP-8170
TCP-8140
TCP-8143
Primary Server
TCP-5432
TCP-8081
TCP-4433
TCP-8140
TCP-8142
TCP-8143
Replica (optional)
TCP-443
TCP-8170
TCP-22
TCP-443
TCP-8170
TCP-22
Git Server
Key
HTTPS TCP-443
PUPPETDB TCP-8081
NODE CLASSIFIER TCP-4433
PUPPET AGENT/STATUS ENDPOINT TCP-8140
ORCHESTRATION TCP-8142
ORCHESTRATION TCP-8143
POSTGRESQL TCP-5432
CODE MANAGER TCP-8170
SSH TCP-22

PE

What?



- Orchestrator can run Puppet tasks and Plans
- Basically an API & Web UI for bolt

PE

What?

Puppet Plans

- What are Puppet tasks & Plans?
- Like bolt task & Plans
- Use the PXP agent as transport

PE

What?

Puppet Plans

- What are Puppet tasks & Plans?
- Like bolt task & Plans
- Use the PXP agent as transport
- Orchestrator is closed source, PXP agent is open source
- There are subtle differences between `Bolt plans` and `Plans in PE`
  - `Plans in PE` have less features?! https://www.puppet.com/docs/pe/2025.0/plans_limitations.html

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PE in highly restricted environments

A user story

PE

Setup

- An organisation with many regulations and restrictions

PE

Setup

- An organisation with many regulations and restrictions
- Runs 3000 different services

Each service:

- consists of a couple of virtual machines

PE

Setup

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PE

Setup

- An organisation with many regulations and restrictions
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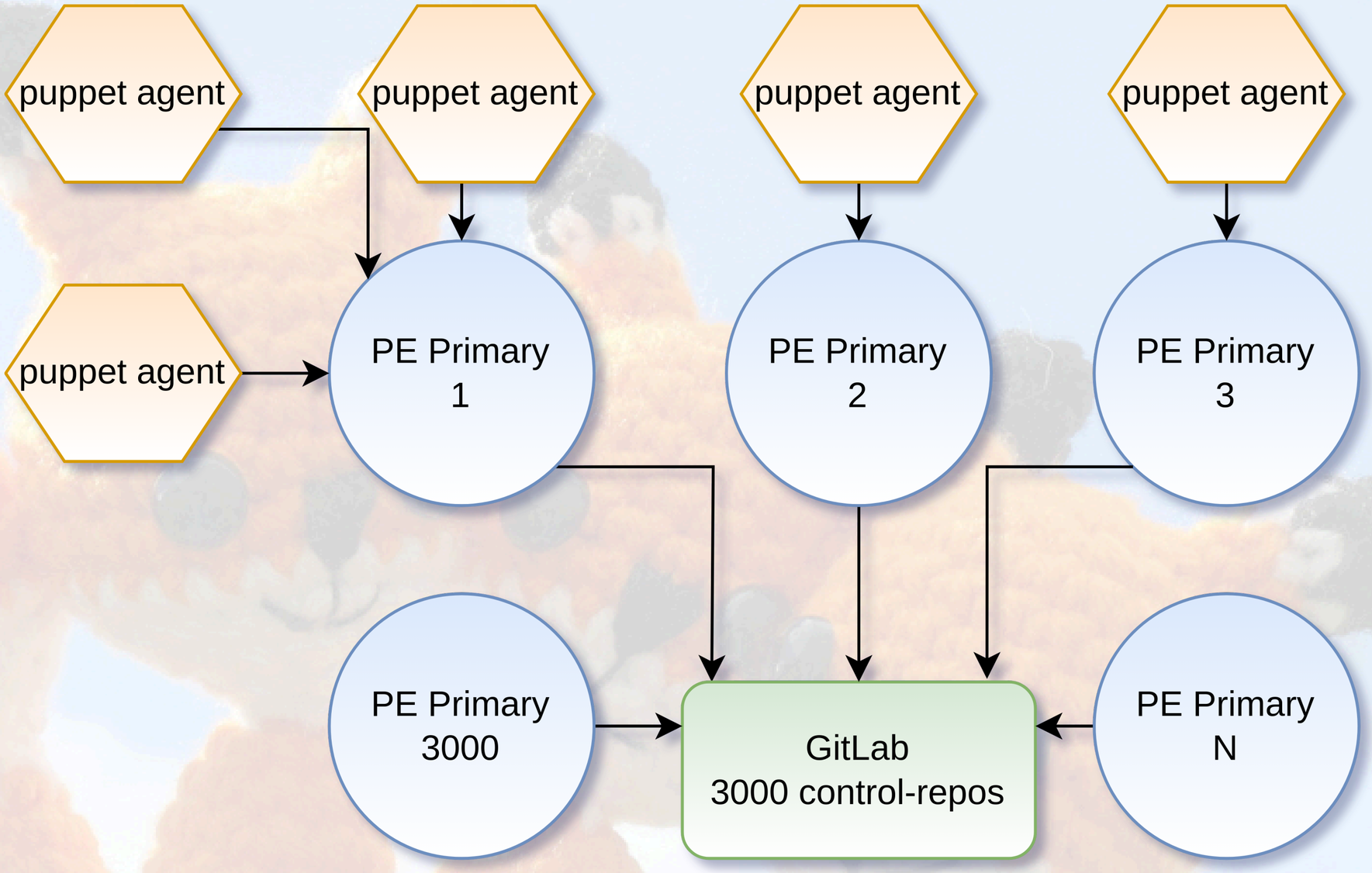
Each service:

- consists of a couple of virtual machines
- needs to be isolated from each other
- Has to be managed by Puppet

PE

Setup


puppet agent
puppet agent
puppet agent
puppet agent
puppet agent
PE Primary
1
PE Primary
2
PE Primary
3
PE Primary
3000
GitLab
3000 control-repos
PE Primary
N

PE

Setup

- 1 central GitLab
  - contains all puppet modules
  - contains 3000 control repos
- 3000 individual primaries
- 5-40 agents per primary

PE

Setup

Constraints

"security" constraints:

- No ssh access to a service

PE

Setup

Constraints

"security" constraints:

- No ssh access to a service
    - The PE APIs are available

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PE

Setup

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"security" constraints:

- No ssh access to a service
  - The PE APIs are available
- No code changes for running services allowed
  - Architects wanted "immutable" services
- Of course no internet access
  - Everything needs to be mirrored internally
  - No HTTP proxy available

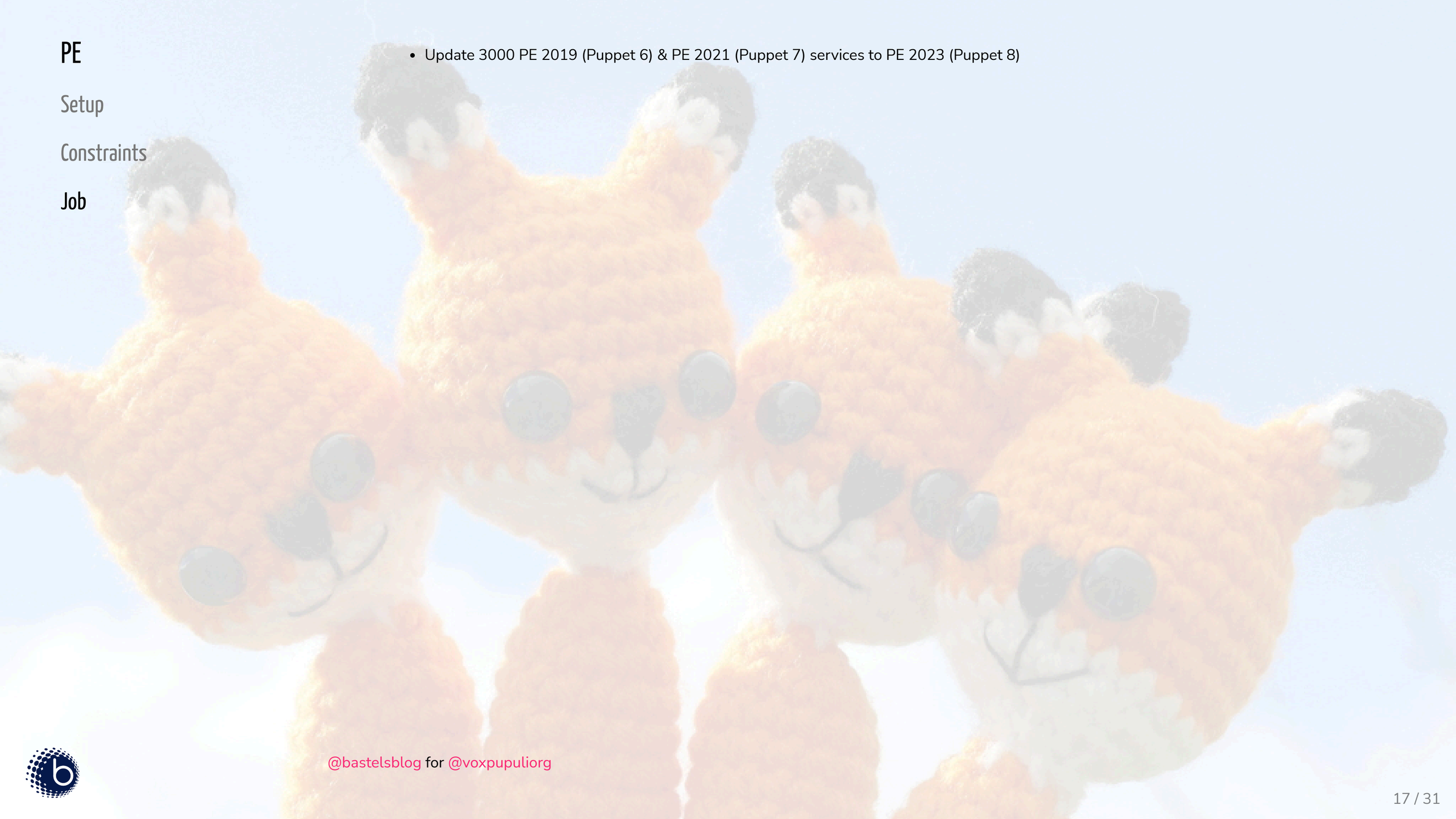
PE

Setup

Constraints

Job

- Update 3000 PE 2019 (Puppet 6) & PE 2021 (Puppet 7) services to PE 2023 (Puppet 8)



PE

Setup

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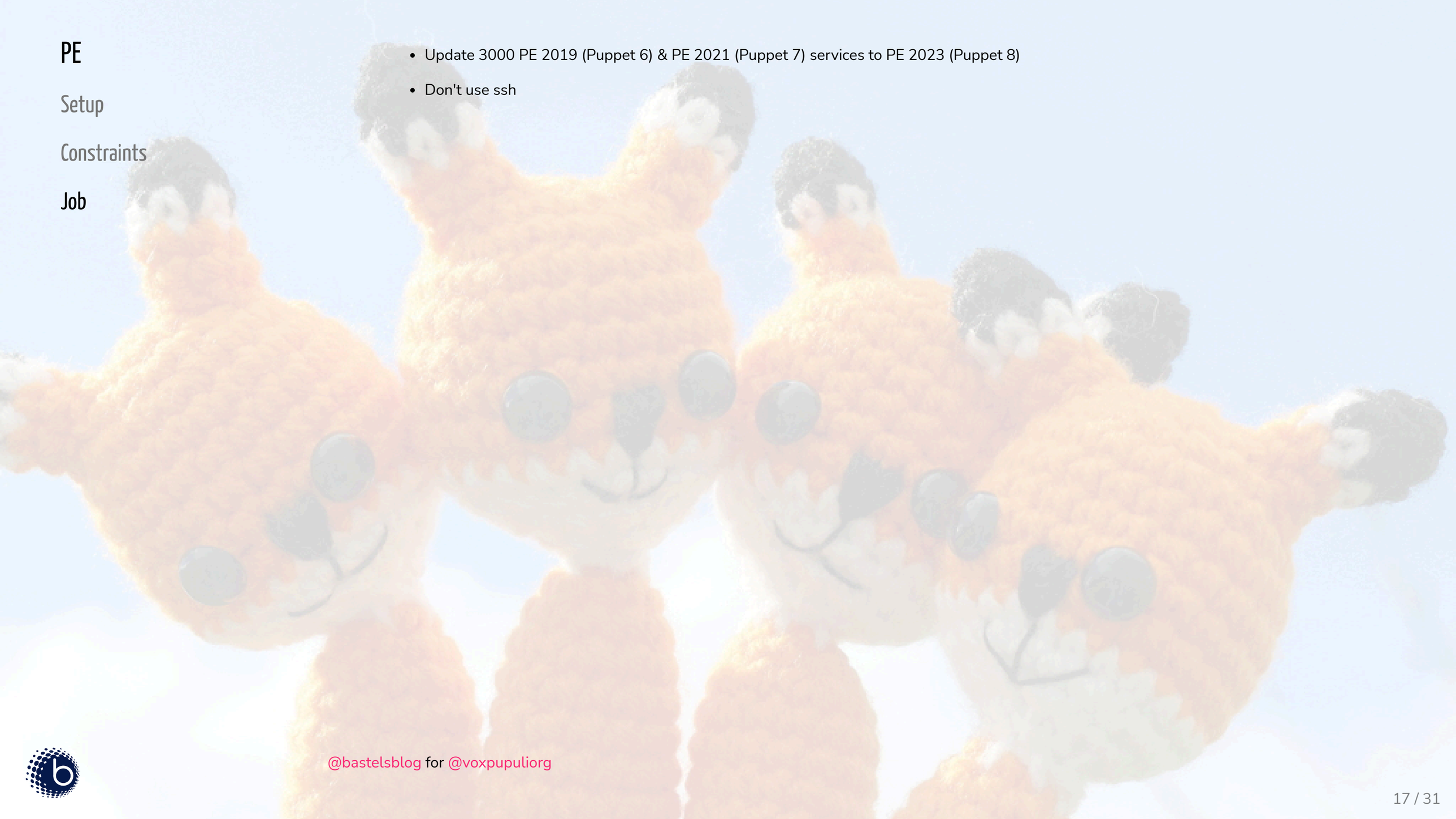
- Update 3000 PE 2019 (Puppet 6) & PE 2021 (Puppet 7) services to PE 2023 (Puppet 8)
- Don't use ssh



PE

Setup

Constraints

Job

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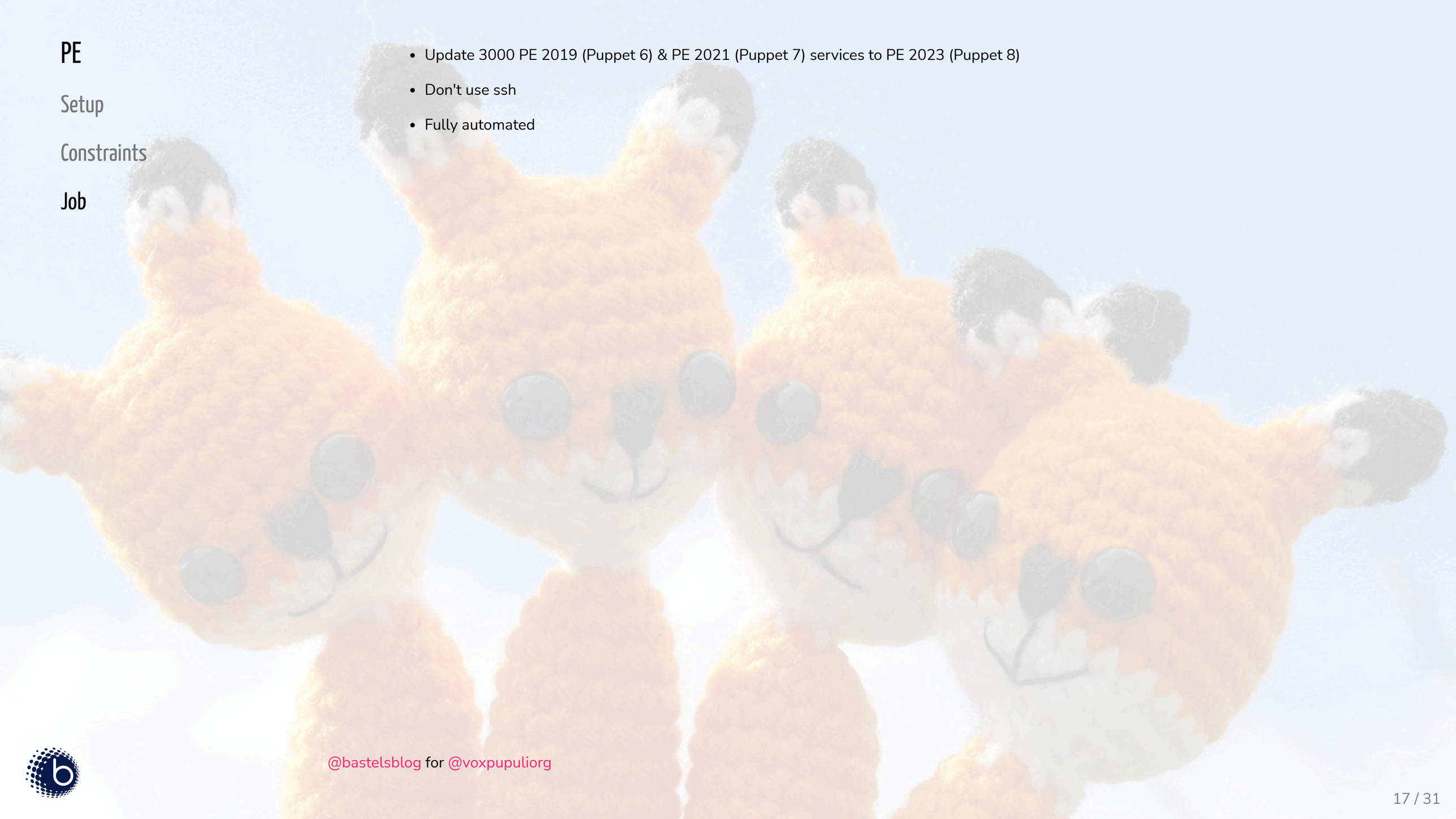
- Fully automated



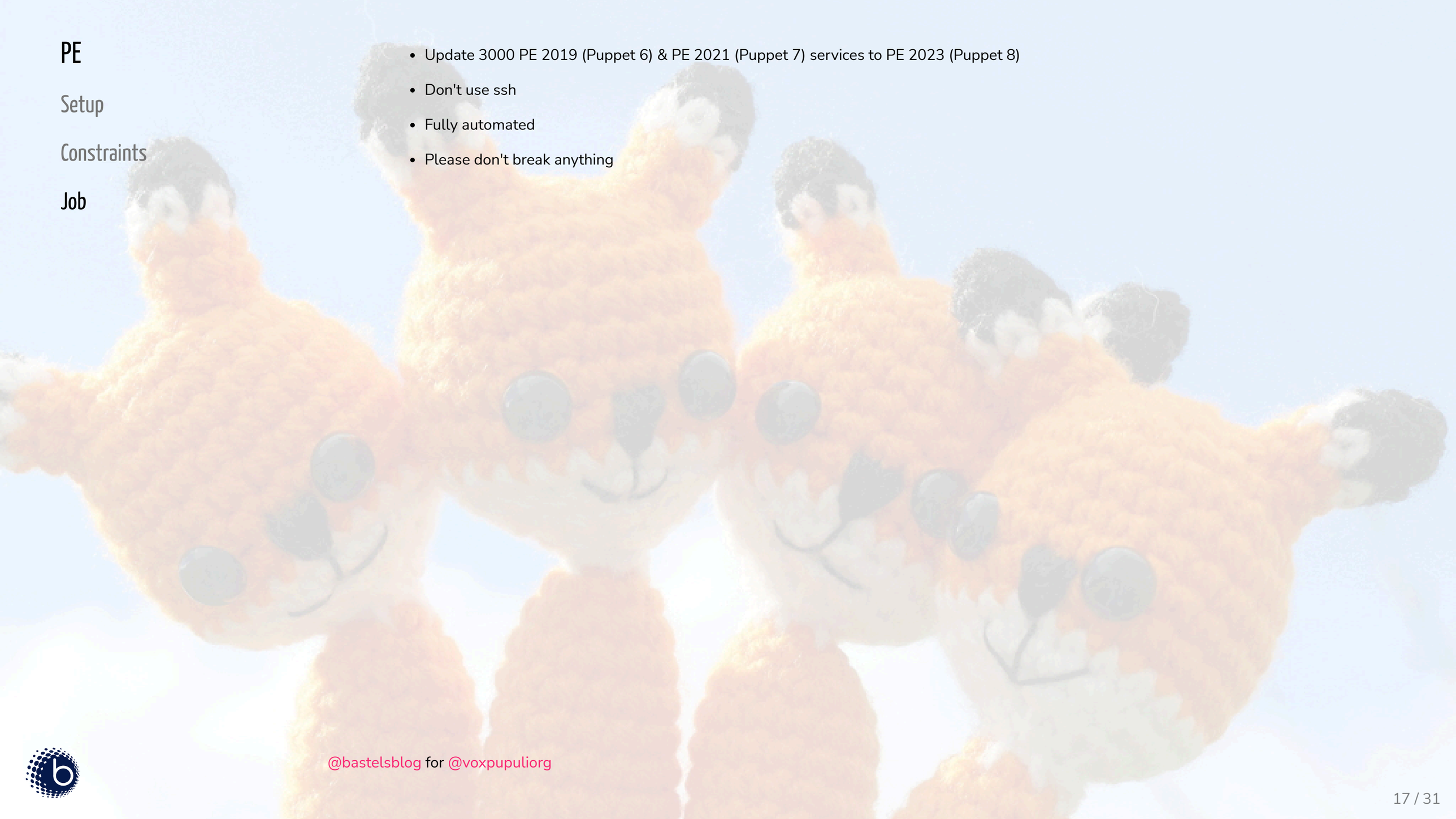
PE

Setup

Constraints

Job

- Update 3000 PE 2019 (Puppet 6) & PE 2021 (Puppet 7) services to PE 2023 (Puppet 8)
- Don't use ssh
- Fully automated
- Please don't break anything



PE

Setup

Constraints

Job

- I mentioned this to Perforce employees

PE

Setup

Constraints

Job

- I mentioned this to Perforce employees
- Perforce reached out to me for a collaboration

The idea:

- I implement the upgrade somehow
- Perforce assists, helps to review PRs quickly
- Perforce can publish a whitepaper
- We publish the solution

PE

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Constraints

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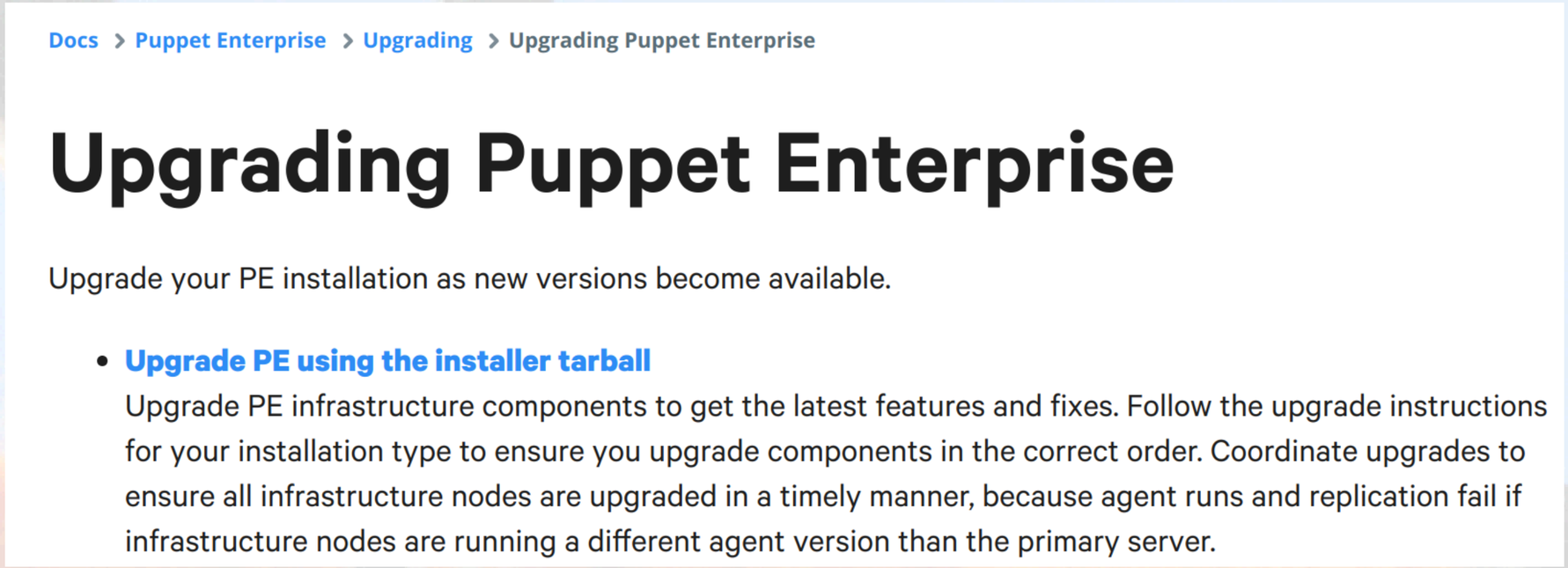
The idea:

- I implement the upgrade somehow
- Perforce assists, helps to review PRs quickly
- Perforce can publish a whitepaper
- We publish the solution
- Perforce stopped responding to all emails

How you are supposed to Upgrade PE



Docs > Puppet Enterprise > Upgrading > Upgrading Puppet Enterprise

Upgrading Puppet Enterprise

Upgrade your PE installation as new versions become available.

- **Upgrade PE using the installer tarball**
  Upgrade PE infrastructure components to get the latest features and fixes. Follow the upgrade instructions for your installation type to ensure you upgrade components in the correct order. Coordinate upgrades to ensure all infrastructure nodes are upgraded in a timely manner, because agent runs and replication fail if infrastructure nodes are running a different agent version than the primary server.

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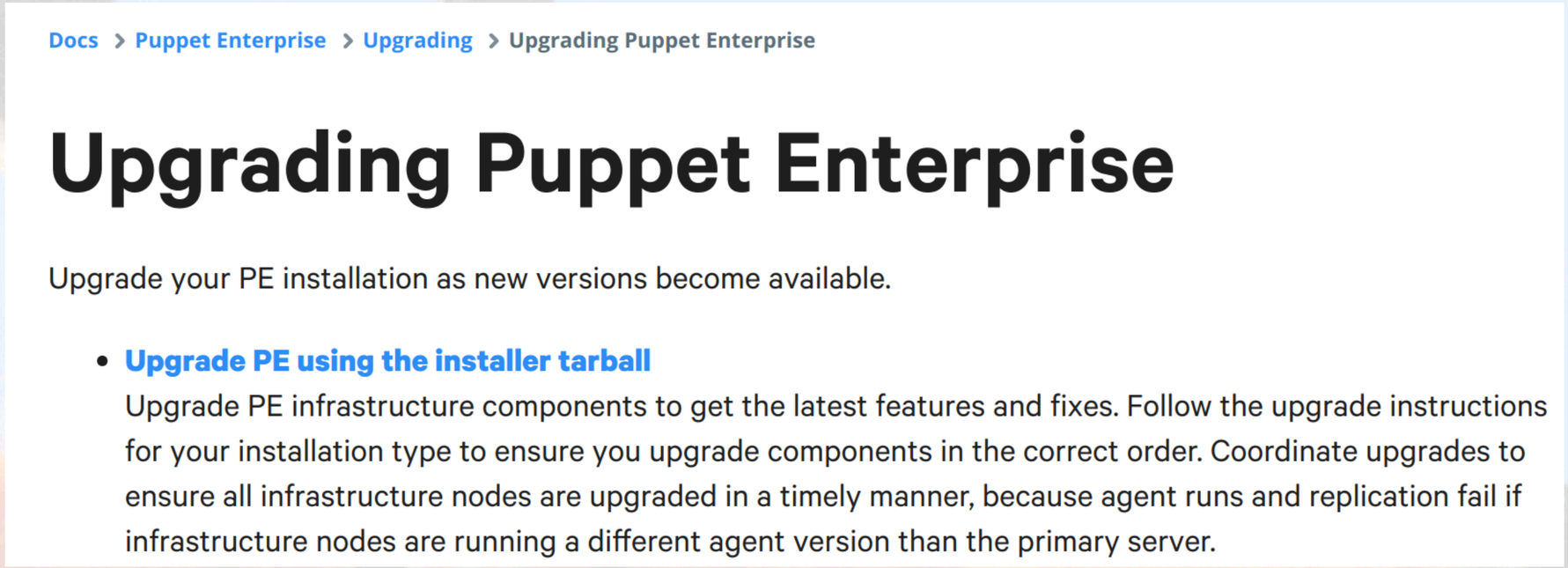

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- TL;DR: "ssh to the Primary and download a tarball"

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  - PE version specific
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- contains a yum repo with some rpms and a long bash script
- one package contains puppet modules
- bash script install the rpms & runs puppet apply

PE

Setup

Constraints

Job

Upgrade?

- License prohibits putting the puppet modules into my GitLab
- License prohibits putting the rpms on my local mirror

PE

Setup

Constraints

Job

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Upgrading Puppet Enterprise

Upgrade your PE installation as new versions become available.

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- **Upgrade PE using PIM**
  Puppet Installation Manager (PIM) supports the upgrading of Puppet Enterprise (PE) for all supported installation architectures. For an interactive experience, choose the guided upgrade process and follow the steps in your terminal. Alternatively, if you do not require guidance, you can run your upgrade from the PIM command line by passing a JSON file containing your installation parameters.

- https://www.puppet.com/docs/pe/latest/upgrading_pe.html
- PIM is a frontend around puppetlabs-peadm

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PE

Setup

Constraints

Job

Upgrade?

- PIM is a frontend around Bolt & puppetlabs-peadm
- PEADM: A module with tasks and plans to install/modify/upgrade PE

PE

Setup

Constraints

Job

Upgrade?

- PIM is a frontend around Bolt & puppetlabs-peadm
- PEADM: A module with tasks and plans to install/modify/upgrade PE
- PEADM wraps the original installer tarball

PE installer

- We cannot run the installer directly, because we don't have ssh access

PE

Setup

Constraints

Job

Upgrade?

Upgrade!

- The Orchestrator has an API to start plans
- Can it upgrade itself?

PE

Setup

Constraints

Job

Upgrade?

Upgrade!

- The Orchestrator has an API to start plans
- Can it upgrade itself?
  - No

PE

Setup

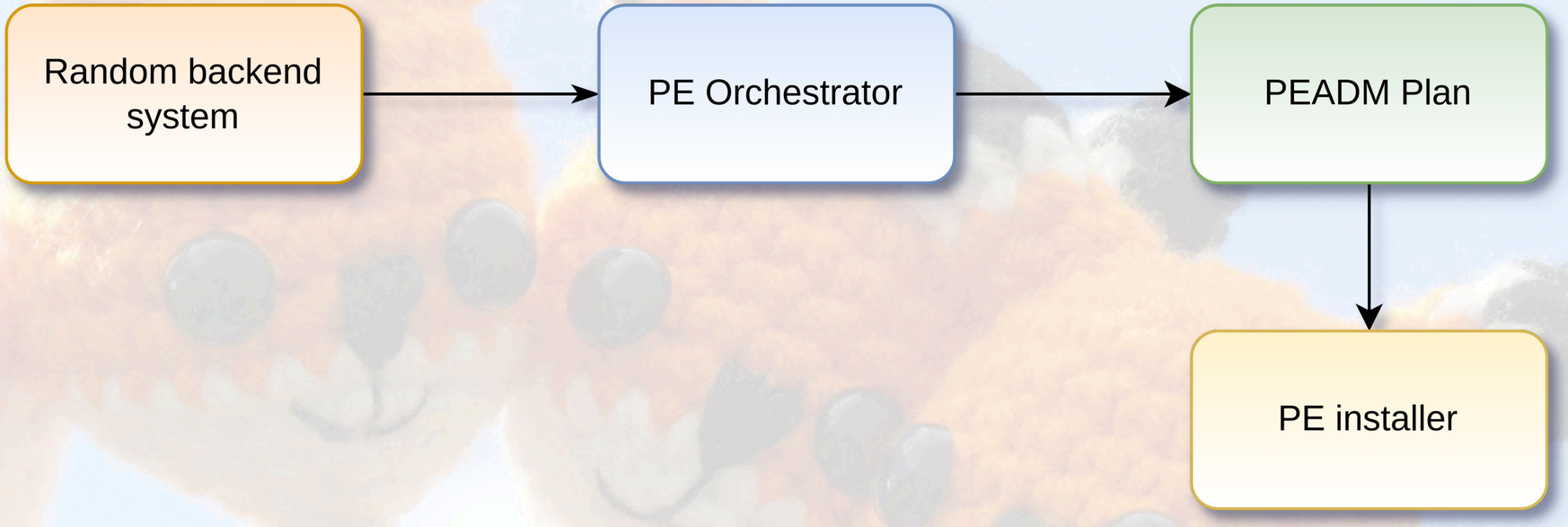
Constraints

Job

Upgrade?

Upgrade!

- The Orchestrator has an API to start plans
- Can it upgrade itself?
  - No
  - orchestrator rpm needs to be upgraded and service needs to be restarted
  - This will deadlock or abort the PEADM plan



- The module puppetlabs/service has tasks to start/stop/inspect a service

PE

Setup

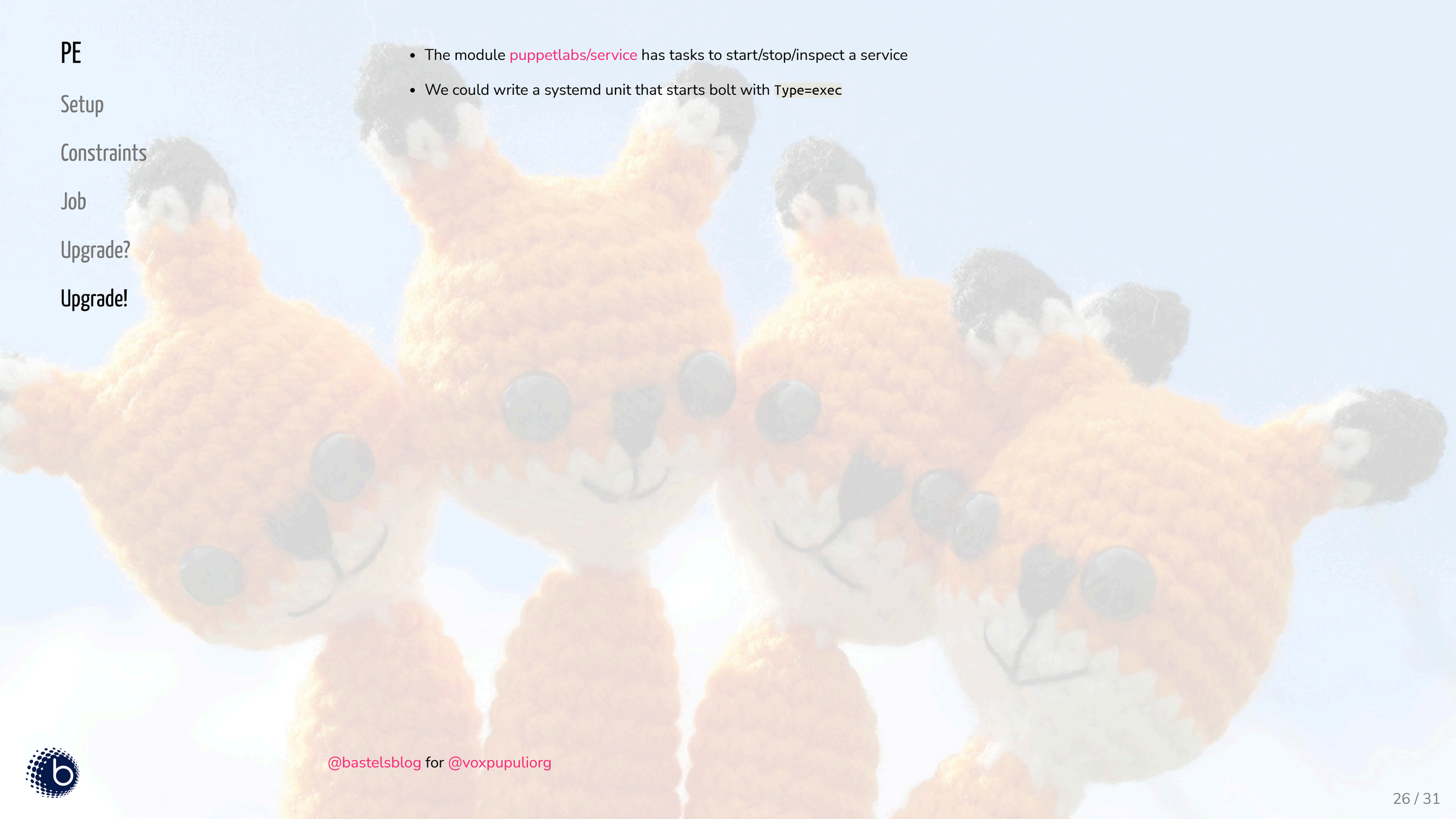
Constraints

Job

Upgrade?

Upgrade!

- The module puppetlabs/service has tasks to start/stop/inspect a service
- We could write a systemd unit that starts bolt with `Type=exec`



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PE

Setup

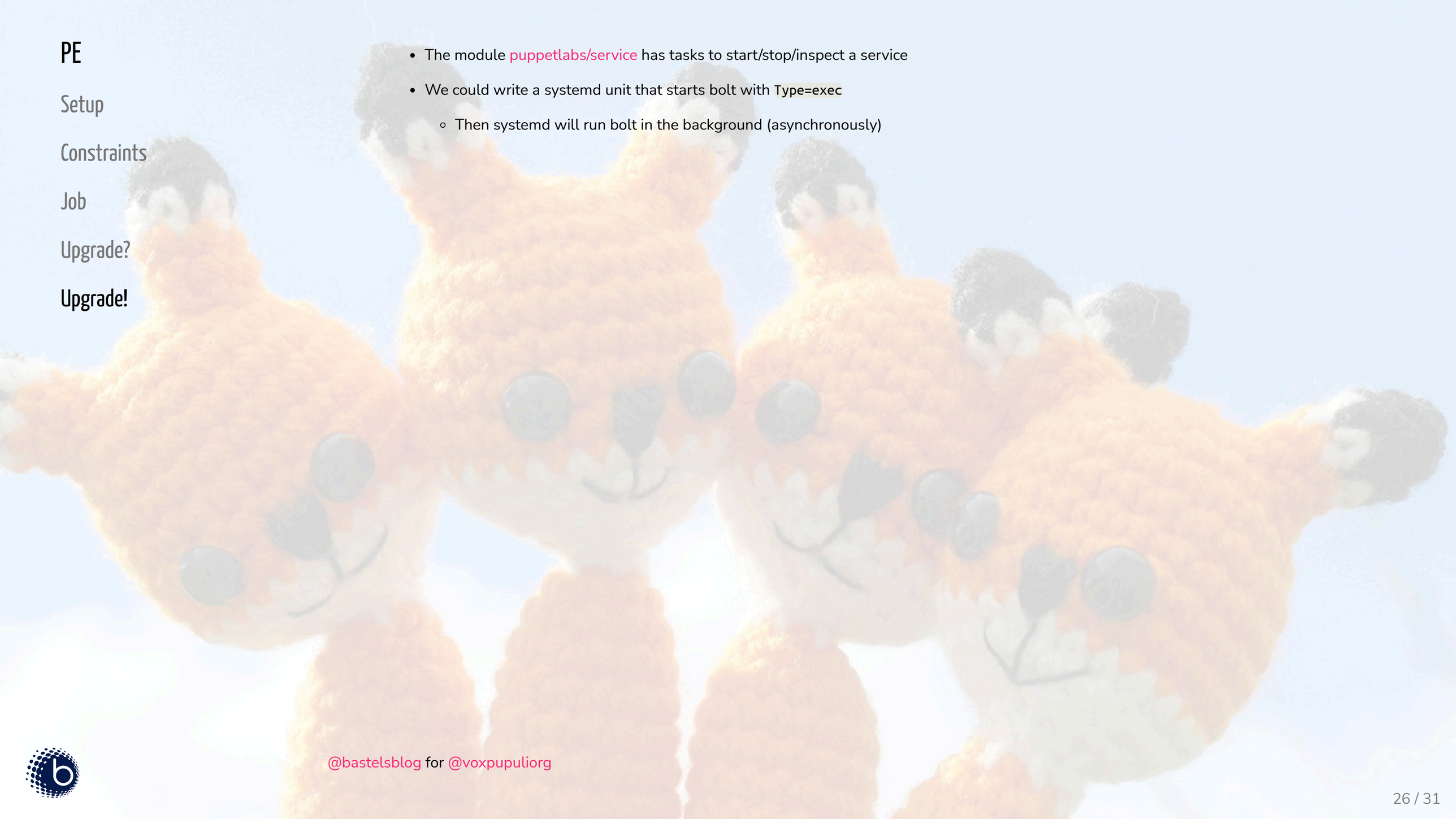
Constraints

Job

Upgrade?

Upgrade!

- The module puppetlabs/service has tasks to start/stop/inspect a service
- We could write a systemd unit that starts bolt with `Type=exec`
  - Then systemd will run bolt in the background (asynchronously)



- The module puppetlabs/service has tasks to start/stop/inspect a service
- We could write a systemd unit that starts bolt with `Type=exec`
    - Then systemd will run bolt in the background (asynchronously)

```
root@pe ~ # systemctl cat peadmmig@.service
# /etc/systemd/system/peadmmig@.service
# THIS FILE IS MANAGED BY PUPPET
[Unit]
Description=run bolt plans in project peadmmig

[Service]
Type=exec
ExecStart=/opt/puppetlabs/bin/bolt plan run %i --params @/opt/peadmmig/%i.json
User=peadmmig
Group=peadmmig
WorkingDirectory=/opt/peadmmig
# don't add RemainAfterExit, then we cannot track the state via puppet anymore after bolt started
root@pe ~ #
```

PE

Setup

Constraints

Job

Upgrade?

Upgrade!

- A template service unit contains a singele `@` and accepts strings afterwards
- This allows us to pass plan names to our unit
- `systemctl start peadmmig@profiles::convert.service`

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- `systemctl start peadmmig@profiles::convert.service`
- PE doesn't have bolt installed by default
- In May 2024 we asked if PE could provide bolt by default
  - Still no response. It was promised multiple times that someone will take a look at the issue

- A template service unit contains a singele `@` and accepts strings afterwards
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- `systemctl start peadmmig@profiles::convert.service`
- PE doesn't have bolt installed by default
- In May 2024 we asked if PE could provide bolt by default
  - Still no response. It was promised multiple times that someone will take a look at the issue
- Vox Pupuli now has a module to install bolt: forge.puppet/com/puppet/bolt
  - The module can create the systemd template service unit + all required configuration

PE

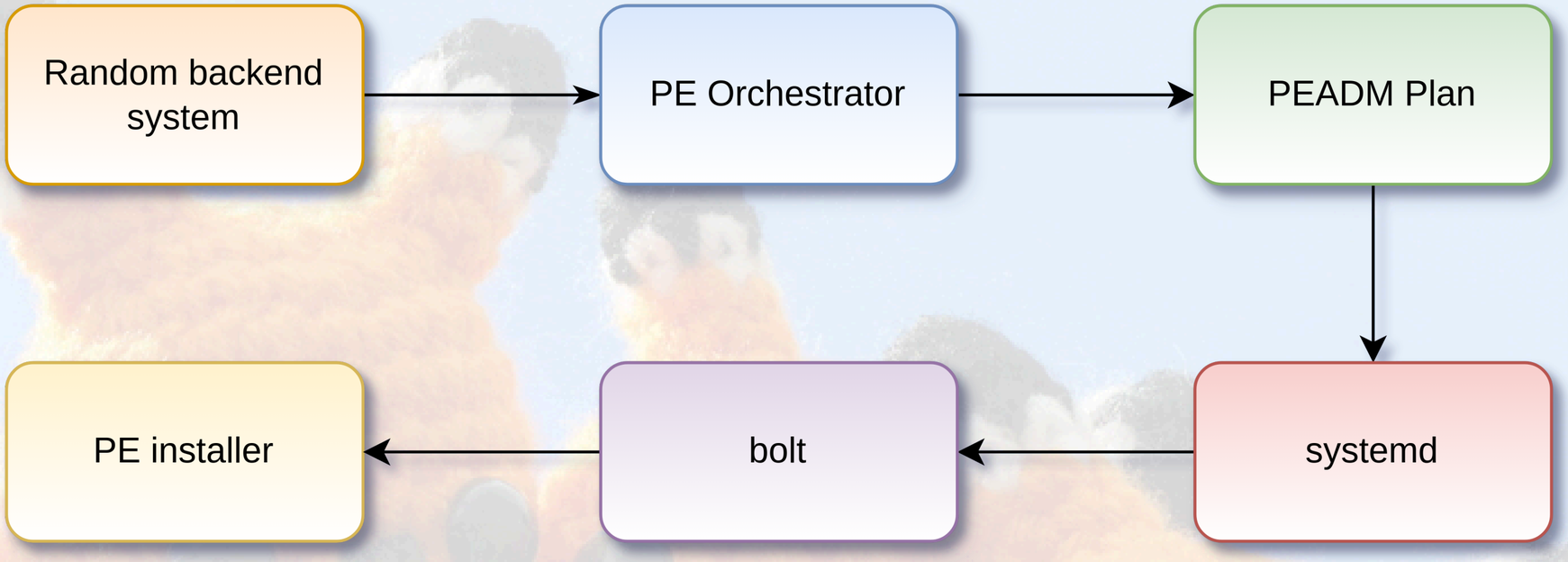
Setup

Constraints

Job

Upgrade?

Upgrade!



PE

Setup

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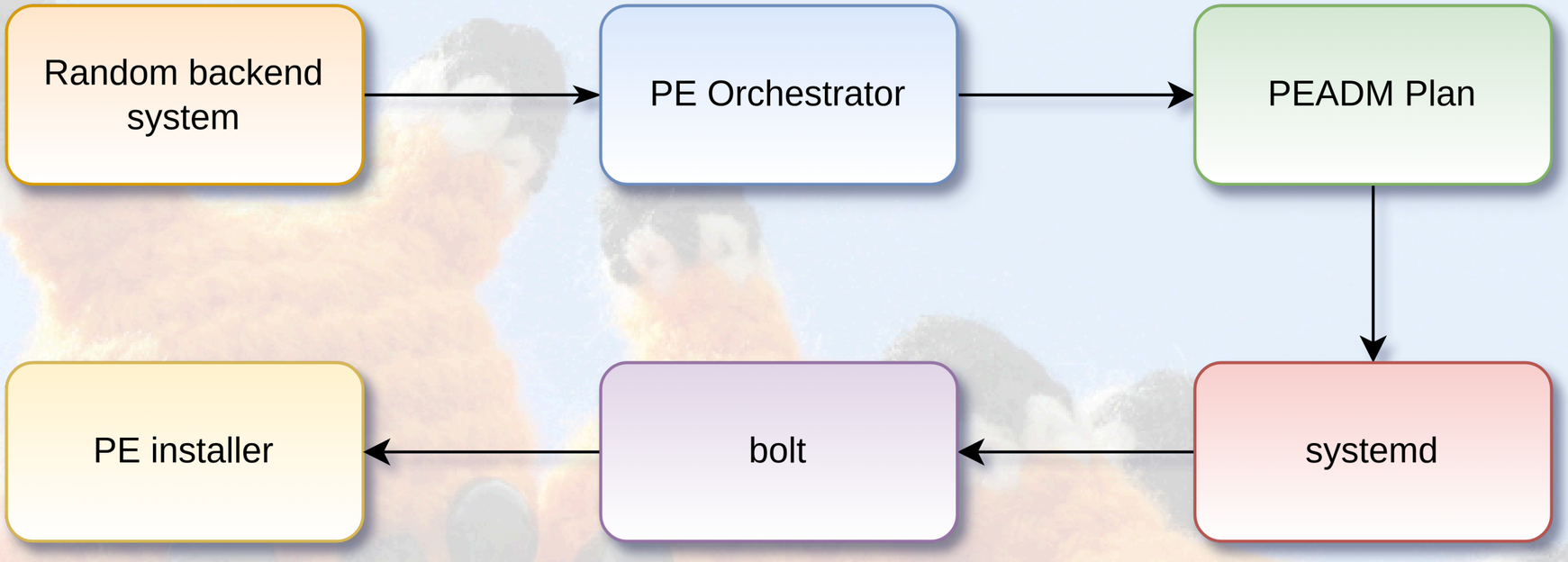


- During development, this worked surprisingly well

PE

Setup

Constraints

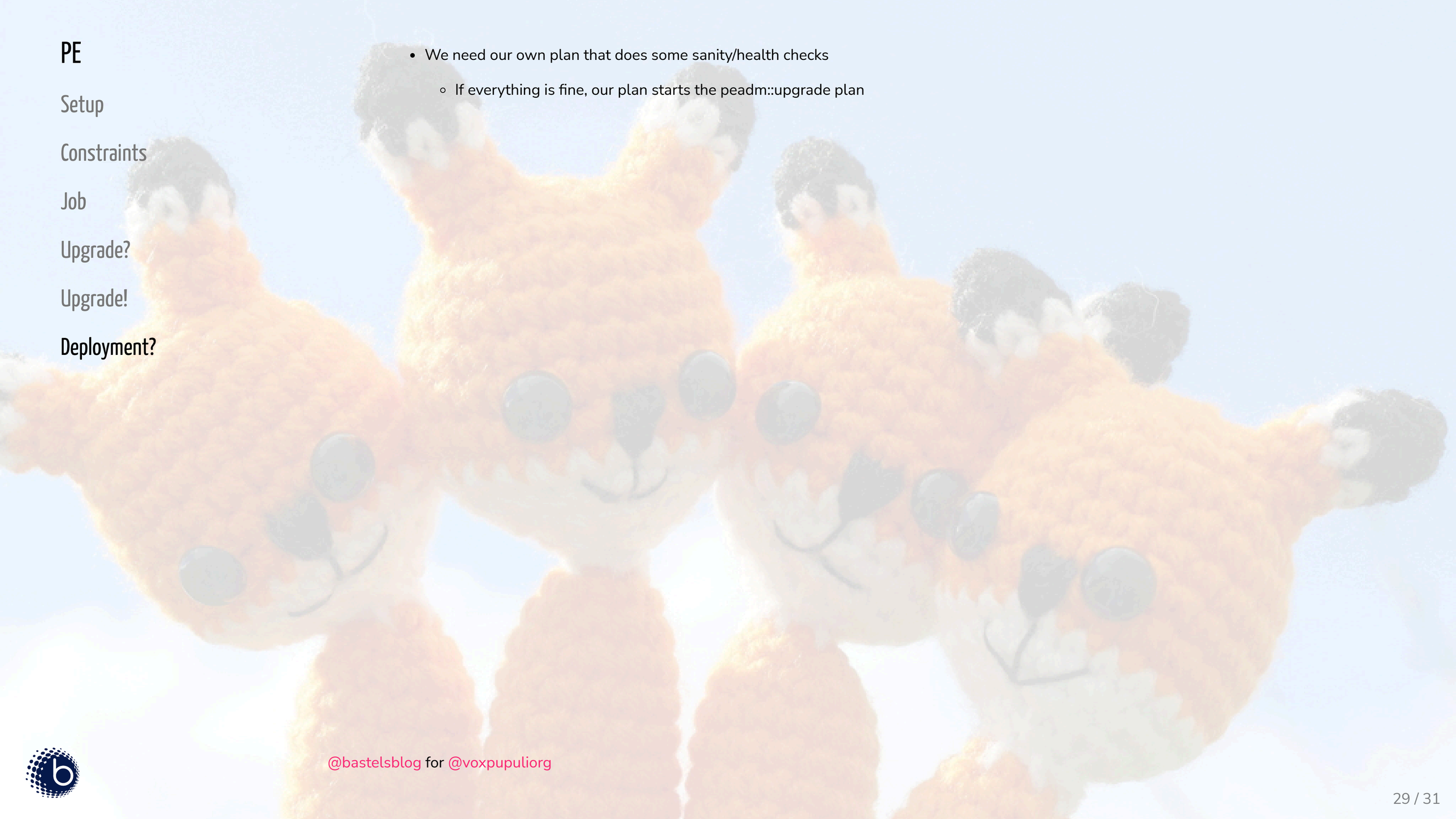
Job

Upgrade?

Upgrade!

Deployment?

- We need our own plan that does some sanity/health checks
  - If everything is fine, our plan starts the peadm::upgrade plan



- We need our own plan that does some sanity/health checks
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  - If everything is fine, our plan starts the peadm::upgrade plan
- We need to run peadm::convert before peadm::upgrade
  - This will replace the TLS certificate on your primary
- We need to deploy our own plans, but code deployments aren't allowed
- "No code deployments that might impact normal puppet agent operations"
- PE supports multiple control repositories
  - We can add another control repo, that only contains tasks/plan/modules for PE upgrades
  - No agent will make a puppet run in this environment

- PE has two ways to specify a control repo:
- A single control repo

```
puppet_enterprise::profile::master::r10k_remote: 'https://github.com/testcontrolrepo.git'
```

- N control repos

```
puppet_enterprise::master::code_manager::sources:
  foo:
    remote: 'https://github.com/bastelfreak/testcontrolrepo.git'
    prefix: false
  baz:
    remote: 'https://github.com/voxpupuli/controlrepo'
    prefix: true
```

- how to deploy code
- different preparation steps
- cleanup node groups / pe.conf
- ensure PEADM uses correct node group
- the issue with the installer URL
- stderr redirection https://github.com/puppetlabs/puppetlabs-peadm/pull/523
- duplicated tasks for running puppet agent
- duplicated fact detection https://github.com/puppetlabs/puppetlabs-peadm/pull/459

- Puppet is very flexible and suiteable for different usecases
- There are many hidden gems and extensions available
- More docs from Puppet/Perforce for edgecases & advanced users would be awesome!
- For feedback: `bastelfreak` on slack.puppet.com/Libera.Chat IRC or tim@bastelfreak.de
- This talk and previous ones: github.com/bastelfreak/talks

Thanks for your attention!

]

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