CROWN CASTLE

DATA DUCTUS

Learning to Live with Imperfection
(A Service Reconciliation Journey)

Rob Hinst (Crown Castle Fiber)
Scott Barvick (Data Ductus)

NSO Developer Days
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The Crown Castle Fiber Network

- S&P 500 company
- 80,000 route miles of fiber spread over a dozen legacy networks
- Dark Fiber, IP, Ethernet and Wavelength services
- Numerous device vendors
- Change is constant, fast-paced and not always automated.
- Top-notch engineering and operations teams

Problem and (the start of) a solution

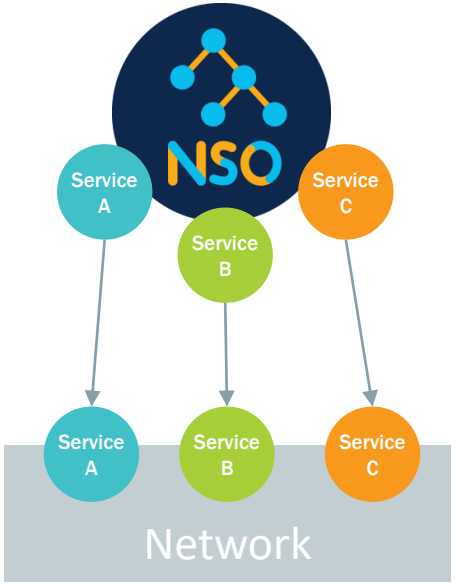
The honeymoon: We develop a bunch of great automation models.

- Everyone loves them
- We're awesome

Challenge: We want to use our new toys on older services configured outside of or before NSO.

Solution: Import services into NSO:

- Determine appropriate service parameters for service creation from OSS database
- Set parameters and commit no-networking
- Away we go!



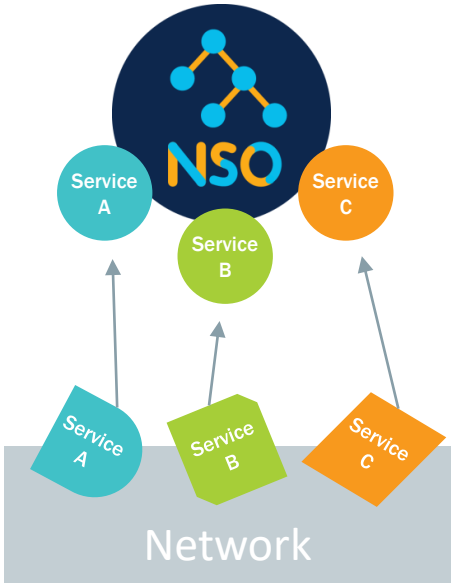
Not so fast!

Many services are out-of-sync.

Can't just re-deploy to network

- Services were imported using service parameters derived from BSS/OSS
- BSS/OSS database might be wrong/out-of-date
- Older records may have important details in free-form notes fields

Figuring out how to make everything "right" is time-consuming and often complicated.



Re-examining our goals

Making everything "right" would be lovely.

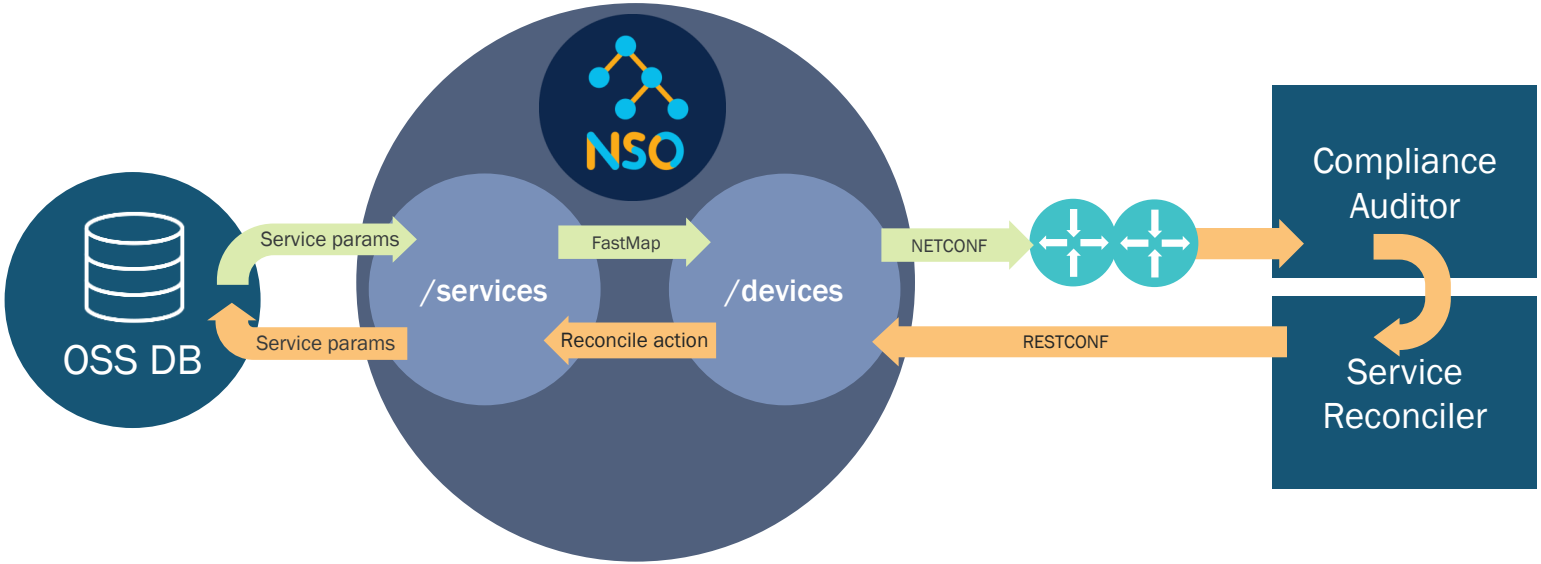
- We'll do that tomorrow.

Our real goal today is to automate more.

- In order to do that, we need to synchronize our data sources:

Lifecycle of a Service

Life is messy. Our lifecycle needs to accept that and work with it.



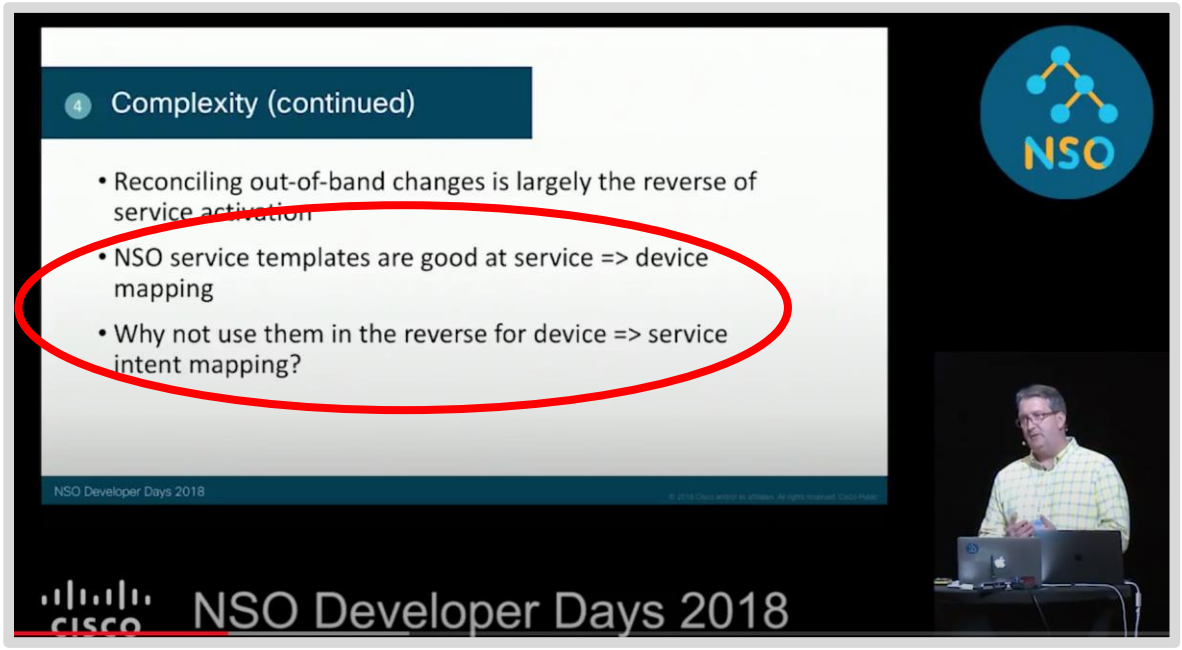
Reconciliation 2017

"The best reconciliation strategy is no reconciliation"

Me

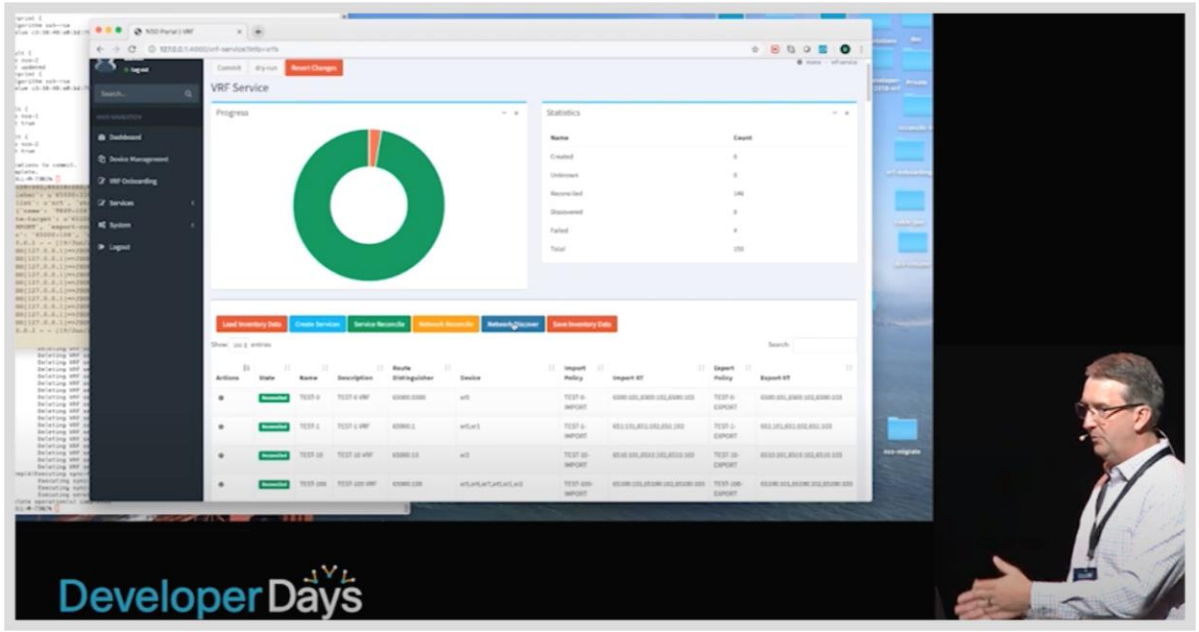
Roque Gagliano: https://www.youtube.com/watch?v=2cD99AJfaVo

Reconciliation 2018



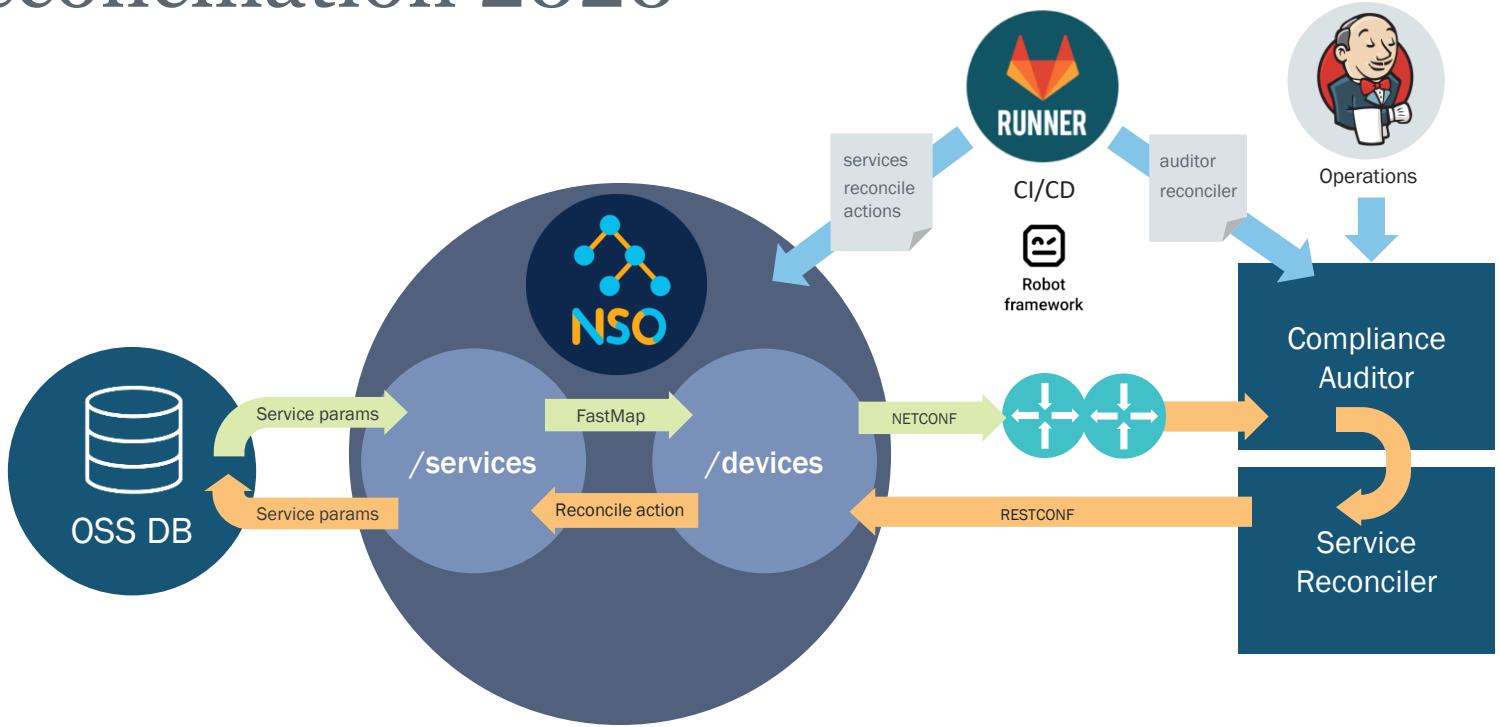
Dan Sullivan: https://www.youtube.com/watch?v=yYzk8aXMCbY

Reconciliation 2019



Dan Sullivan: https://www.youtube.com/watch?v=KudcsCAE-Sw

Reconciliation 2020



Base class with (minimal) per service Python code

Base Reconcile Handler

- Handles the transaction management
- Applies the reconcile template
- Validates the successful reconciliation before commit

```python
import ncs.template
from .BaseHandler import ReconcileHandler

class StaticRouteHandler(ReconcileHandler):
    '''This class implements the staticroute-reconcile action'''

    def set_name(self, inputs):
        self.action_name = "staticroute-reconcile[%s]"%(inputs.uid,)
        self.template_name = 'staticroute-reconcile'

    def get_target(self, root, inputs):
        return root.ncs__services.ltf__lightower.service.staticroute__staticroute[inputs.uid]

    def get_variables(self, root, sn, target_serv, inputs, output):
        variables = ncs.template.Variables()
        variables.add('uid', inputs.uid)
        return variables
```

Per service Python:

1. Method to **set** the log name and the action template name
2. Method to **get** the path to the NSO node for the service instance being reconciled (for dry-run)
3. Method to **get** the variables that are passed to reconcile template

Code can be found at: https://bitbucket.org/dataductus/service-reconcile-base/src

Stacked Services Reconciliation Template

```
<config-template xmlns="http://tail-f.com/ns/config/1.0">

<?save-context BASE?>
<services><circuit><eline>
   <circuit-id>{$CIRC_ID}</circuit-id>
            <a-loc tags="merge">     <!-- top level service reconciliation by leaves in a-loc container -->

                  <!-- Handoff subservice leaves -->
                  <?switch-context BASE?>
                  <?if {boolean(../../ncs:services/ccf:service/handoff:handoff[uid=$A_HANDOFF_UID])}?>
                  <?set-context-node {../../ncs:services/ccf:service/handoff:handoff[uid=$A_HANDOFF_UID]}?>
                  <port-description>{port-description}</port-description>
                  <?end?>

                  <!-- Policer subservice leaves -->
                  <?switch-context BASE?>
                  <?if {boolean(../../ncs:services/ccf:service/policer:policer[uid=$A_POL_UID])}?>
                  <?set-context-node {../../ncs:services/ccf:service/policer:policer[uid=$A_POL_UID]} ?>
                  <policer-name>{ports[hostname=$A_POL_HOSTNAME and port=$A_POL_PORT]/policer-name}</policer-name>
                  <ingress-acl-name>{ports[hostname=$A_POL_HOSTNAME and port=$A_POL_PORT]/acl-name}</ingress-acl-name>
                  <policer-rule-number>{ports[hostname=$A_POL_HOSTNAME and port=$A_POL_PORT]/rule-number}</policer-rule-number>
                  <port-description>{port-description}</port-description>
                  <?end?>

                  <!-- ***** Other subservices contributing to the a-loc container ***** -->

            </a-loc>
</eline></circuit></services></config-template>
```

Summary

- **Uncertainty in the network will continue to exist, but it can be managed**
- **The tools and patterns for solutions are maturing to the point where many different use cases can be supported**
- **Reconciliation 2021?**
  - Built-in reconciliation callback function?
  - Finding what's *not* supposed to be there?
  - Auto-discovering contexts based on "anchor" leafs?

Thank you

For further information please contact:

Rob Hinst, robert.hinst@crowncastle.com
Scott Barvick, scott.barvick@dataductus.com