Trying to replace my job with a small robot army

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Presentation description

Twenty years ago, we used to manage our networks by hand-editing configurations. A human operator would deploy them — again, often by hand — on the live network and check to see if it worked. That same operator would watch for logs and pings to see if something had changed, and use their own judgement to decide if that change was good or bad.

Today, we are surrounded by technologies and practices that make so much of this manual work obsolete. Just as web services have gone from being hand-coded to automatically provisioned and scaled in the cloud, networks are— oh no wait. We’re still managing our networks almost exactly the same way as we did twenty years ago.

But your authors look gloomily at the enormous changes wrought by cloud providers, and we’re wondering why the network itself doesn’t benefit from them. Yes, it works. At least, we manage to keep things running, somehow. But what are we missing?

Our reliability is not what it could be. Sure, the operator can make a mistake with a provisioning system, but there’s a world of difference between that and a state where you have to type multiple commands just right, and anything could happen if you get it wrong. But also, when we’re spending valuable person-brainpower on making sure we don’t make typos, there’s an enormous opportunity cost.

Ten years ago, HEAnet deployed a provisioning tool for our point-to-point ethernet services. Technically it’s nothing particularly special; it just sets up some circuits and configures the monitoring to go with them. But it truly changed how we work. Yes, this is “easy” work, but it’s exactly the kind of work that computers are good at. When human beings don’t have to do this busywork anymore, we become much more enthusiastic about creating and using these services, and we’re freed up to deal with higher level challenges. There are many projects and architecture decisions that we just wouldn’t have been able to do without our small robot creating point-to-points.

Wouldn’t it be great if we could get a small robot army to provision all our network services?

It’s harder than it looks, though. We’ve taken a few different runs at this, and each attempt presented its own challenges. Our first big try was in the Mantychore project, which was present at TNC2012. Our partners and ourselves did a lot of good work there, but we found that when you start from the ground up, like we did, it’s difficult to try to match even some of what our human engineers already do.

So we went back, and we looked again at what we could buy. This keeps changing, so what we saw was different to when we’d looked previously. But we’ve changed too.

As NRENs, we tend to be very good at procurement; that is, determining a list of requirements and then finding the most economically advantageous solution that meets those requirements. But it’s
much, much more difficult when trying to buy a robot army — sorry, when trying to buy a management and provisioning system. Its job isn’t just to shift packets reliably to a certain standard. This thing becomes our jobs. If it’s pleasant to use, our jobs will be pleasant and we’ll be more productive. If we find ourselves fighting with it to get things done… then a lot of our work time will be spent fighting.

And if it’s vendor specific, then suddenly we’ve backed ourselves into a corner and we might not be able to escape.

So one of the things we’ll be covering in the presentation is how on earth you try to handle that within the constraints of public procurement. Our approach was to go heavy on the demoing and trialling, while doing everything we could to decouple the provisioning system from the network itself.

But it doesn’t stop there.

In the end, we just didn’t like what we saw. Vendor neutral provisioning systems are pretty few and far between at the best of times; the biggest market for them seems to be large, rich vendors gobbling up the company that sells them. So even if we saw one we really liked — and we didn’t — we wouldn’t have a lot of confidence that it would continue to support our equipment choices over the lifetime of our network.

Maybe there’s a middle ground. To recount:

- we want something that will take the tedious work away from our engineers
- we should make changes offline first, and the network should reflect that
- the first party solutions have a big risk of lock-in
- the third party solutions out there weren’t great
- building the whole thing is just too much to handle
- we think it’s not too much to ask for something that we actually like to use

Many NRENs have done a great job taking their existing workflows and changing them to use source control and provisioning; Ansible has changed things a lot. If that’s the best we can do, then that’s actually pretty good. But the better the interface works with you, the more work you can get done, so we’re not quite ready to give up on the GUI just yet.

So we went back and looked at those first party options again. We knew they’d integrate really well with the equipment we were getting. But they also come with APIs, so there’s a pretty good chance they’d integrate well with other things as well.

Perhaps the right answer is to go with a first-party solution, and build on top of that. The important thing is that instead of going all the way down to the level of “here are some config fragments”, we can use the existing tools for requests like “please create a circuit with these characteristics.” We still have to do some work, but it’s nowhere near the scope of trying to build the whole thing ourselves.

So we’ve been on this journey for some years now, and we’ve learned a lot. But there’s even more to come. As we write this abstract, we’re deploying the first equipment for the network that will form the HEAnet backbone for the coming decade — Juniper MX and ACX series routers. The provisioning system (CSD, running atop JUNOS SPACE) is almost ready. Our software development team have been hard at work reading our engineers’ minds and weaving the different systems together. And we are perhaps days away from the first live, production traffic crossing the network.

This is the culmination of all these lessons in a very practical way. By early 2017, we’ll know just what the impact is going to be.