

Project CARDIGAN

An SDN Controlled Exchange Fabric

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- What
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Why?

networking is

**networking is
boring**

**“Insanity is doing the same thing,
over and over again, but expecting
different results.”**

Ever thought that networking might be in a bit of a rut?

- Sure we can build faster things.
 - 10M Ethernet
 - 100M Ethernet
 - ...
 - 100G Ethernet
- Sure we can build bigger things.
 - 50,000 routes
 - 100,000 routes
 - 442,341 routes

But stop to think for a moment... Are we just doing the same things and expecting a different result?

What if we took a moment and stopped thinking the same way...

- What would that look like?
- Maybe it changes nothing
- Maybe it changes some small things
- Maybe it changes some big things

It's worth a shot!

Software Defined Networking

SDN is to Networking as

Open Source is to Operating Systems

Before we had Open Source operating systems, we had to rely on other people having good ideas...

Now we are allowed to develop our own. Even if we're the only one who finds it useful.

The other reason...

- We've heard from Citylink that the exchanges need work.
- There was a real need to demonstrate production use of SDNs to the community
- A community of SDN expertise was growing in New Zealand and they needed a project to focus on
- Citylink and REANNZ were considering SDNs as a future direction
- Someone said it couldn't be done. Them's fighting words!

Together all these things came together and formed ...

Project Cardigan

More on the name later.

What

What is an Internet Exchange?

Lets start from scratch...

Brand new thinking.

What's an Internet Exchange

What is an Internet Exchange?

- It's a network fabric that participants connect to
- They advertise their networks
- Any packet you place into the exchange finds the appropriate destination

What an Internet Exchange is NOT

- A Router
- A Switch
- A Layer 3 Switch
- A Hardware forwarding Router

It's just a place you poke two things...

Advertisements for things you'll accept

and

Packets you want to get rid of

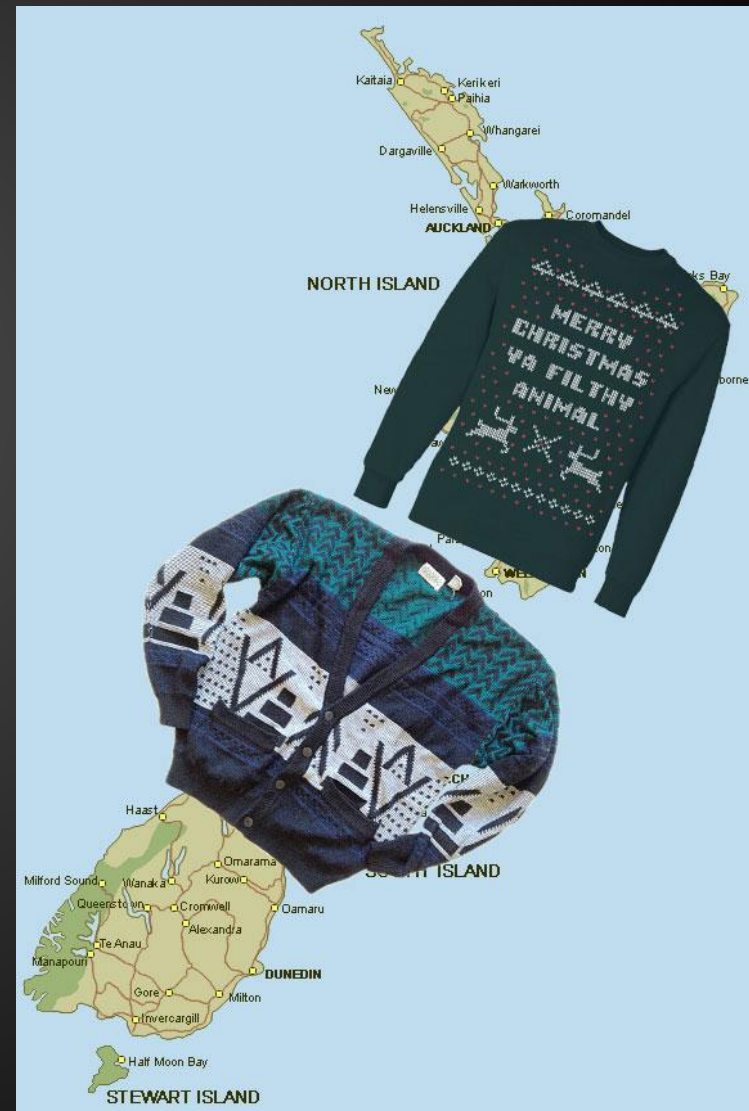
Project Cardigan - when project name brainstorming goes wrong

- We need a nationwide SDN fabric
- A NEW ZEALAND wide SDN fabric
- New Zealand has lots of sheep
- Sheep are covered in wool
- You knit wool into cardigans
- It's like wrapping New Zealand in a big cardigan



Project Cardigan - when project name brainstorming goes wrong

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Project Cardigan - Phase 1

Deploy an SDN Controlled Fabric connected to an Internet Exchange.

The fabric should participate as an exchange member.

Completed 11/12/12

OpenFlow Controller (running on a VM)

Custom VANDERVECKEN code (based on RouteFlow)

Quagga

Pica8 3290

PicOS v1.6 (based on OVS v 1.9)



Project Cardigan - Phase 1

Quagga (BGP Speaker)



OpenFlow Controller

Pica8 3290

Existing Internet Exchange

Project Cardigan - Phase 1

From the WIX looking glass

Neighbor	V	AS	MsgRcvd	MsgSent	TbIVer	InQ	OutQ	Up/Down	State/PfxRcd
202.7.0.119	4	9483	24345	27397	0	0	0	07:21:59	1

WoooooHoooooo

I've peered with the route servers and advertised a route!

PROJECT CARDIGAN UPDATE!!!!

**networking is
still boring**

Project Cardigan - Phase 1

OI!

Remember - we were thinking in a new way.

This is as far as we can tell, this is the first time anyone has connected an SDN controlled fabric to a production Internet Exchange and used it to become a full participant.

Lets carry on.

Project Cardigan - Phase 2

Configure fabric to operate as a full Route Server.

Completed 19/12/12

Looked at the WIX looking glass page and configure sessions on the fabric for all existing WIX participants.

Anyone can now peer across the fabric.

Project Cardigan - Phase 2

Quagga (BGP Route Server)



OpenFlow Controller



Pica8 3290



Existing Internet Exchange



Other Peers



Other Peers

PROJECT CARDIGAN UPDATE!!!!

**networking is
still boring**

Project Cardigan - Phase 2

JEEZE!

There is just no pleasing some people

This is as far as we can tell, this is the first time SDN controlled fabric operating as a Route Server on a production Internet Exchange.

Lets carry on.

Project Cardigan - Phase 3

Deploy a DISTRIBUTED SDN Controlled Fabric connected to an Internet Exchange and pass production customer traffic across the fabric.

Completed 23/01/13 (Yep, just this Wednesday)
custom Inter-Switch-Link code care of Joe Stringer and Chris Lorier

Pica8 3780

Control Plane Network extended via L2 VLAN

Data Path extended via dark fibre

BIG THANKS TO CITYLINK



Project Cardigan - Phase 3

Quagga (BGP Route Server & ISP upstream)

OpenFlow Controller

Pica8 3290

Pica8 3780

Existing Internet Exchange

Other Peers

Cardigan Customers

Big thanks to:



Project Cardigan - Phase 3

Hang ON!

You said "pass production customer traffic"

Yep. REANNZ office network was connected at one side of the fabric. Routes advertised into the fabric and traffic passed across the fabric and out onto the exchange.

Big thanks to Dylan Hall and REANNZ

Big thanks to:



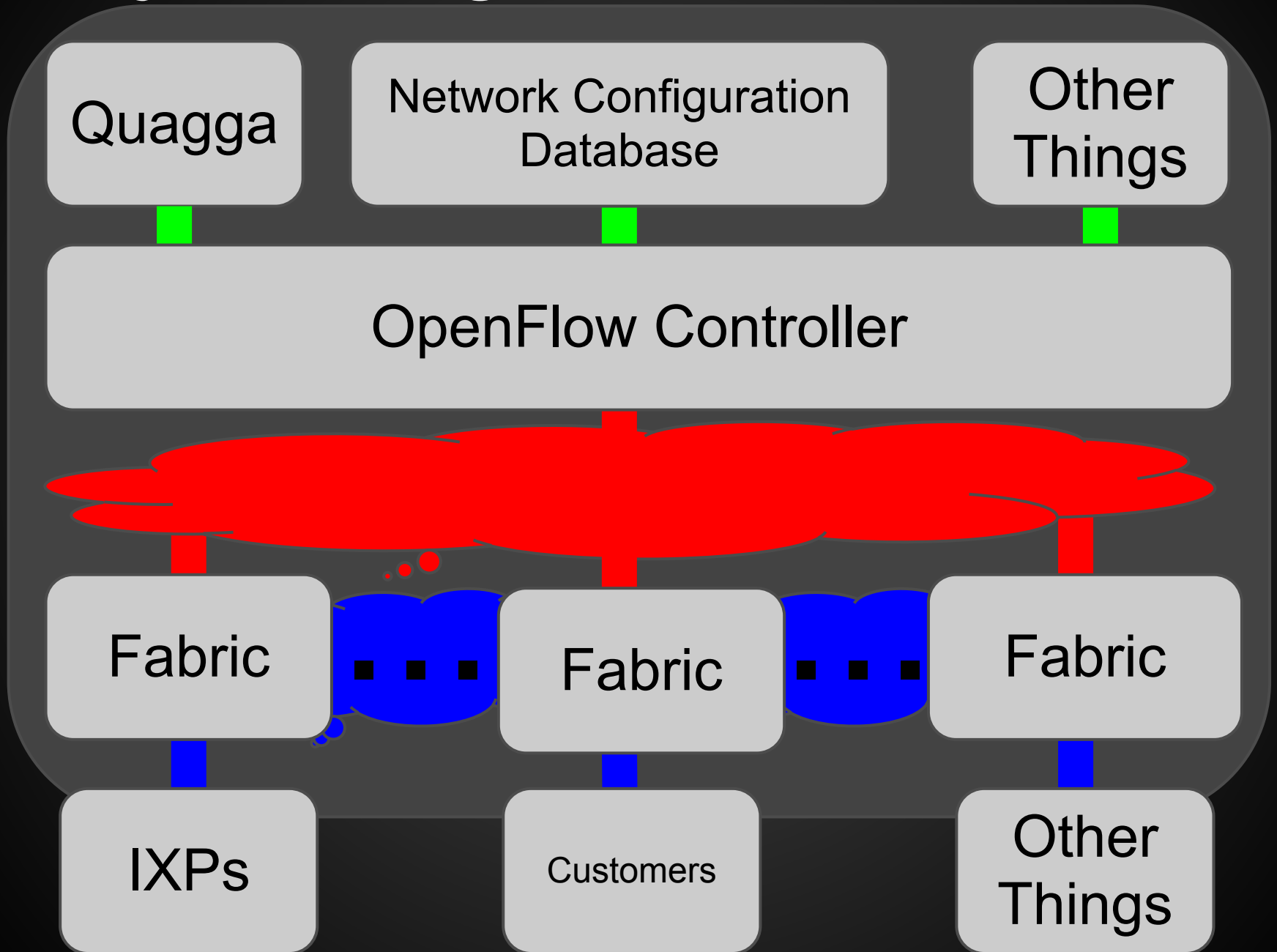
What next?

Project Cardigan - Phase n

Now that I have a fabric and traffic I can start to actually control things.

- I want to look at what information we can collect at Layer3 to influence Layer2 behaviour.
- I want to see what we can do to make Layer2 P-P and P-MP services richer.
- I want to deploy a set of nodes in Auckland
- I want to help Citylink get this into a production ready state.

Project Cardigan - Phase n



PROJECT CARDIGAN UPDATE!!!!

**networking is
almost not
quite boring**

PROJECT CARDIGAN UPDATE!!!!

**watch this
space!**

Project Cardigan - Thanks

Prophecy Networks

Citylink

REANNZ

Victoria University of Wellington

Waikato University

FX Networks

Netspace

Joe Stringer

Chris Lorier

Pica8

RouteFlow (CPqD)

Quagga

Google Network Research