

Project CARDIGAN

An SDN Controlled Exchange Fabric

Dean Pemberton

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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...

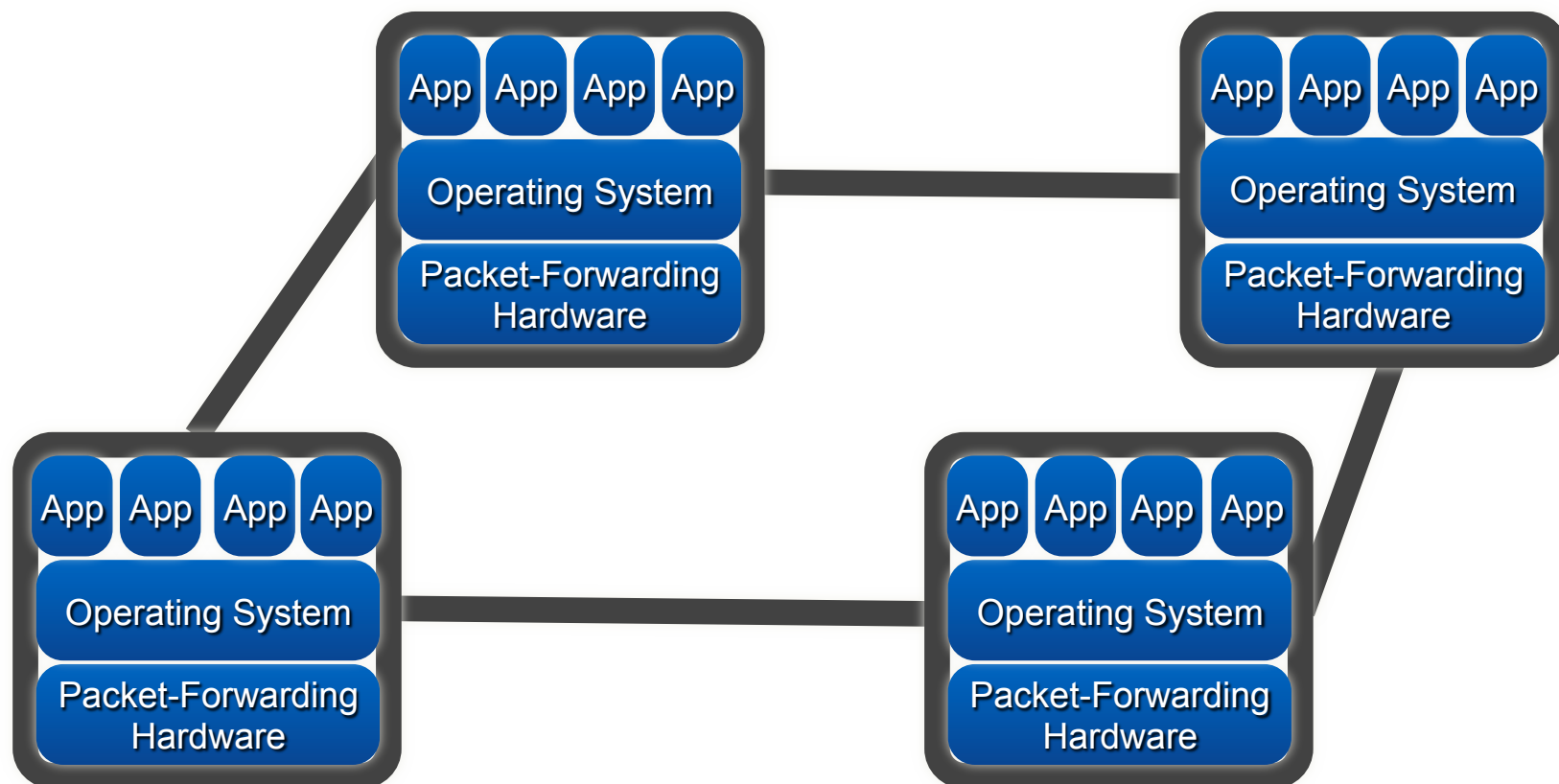
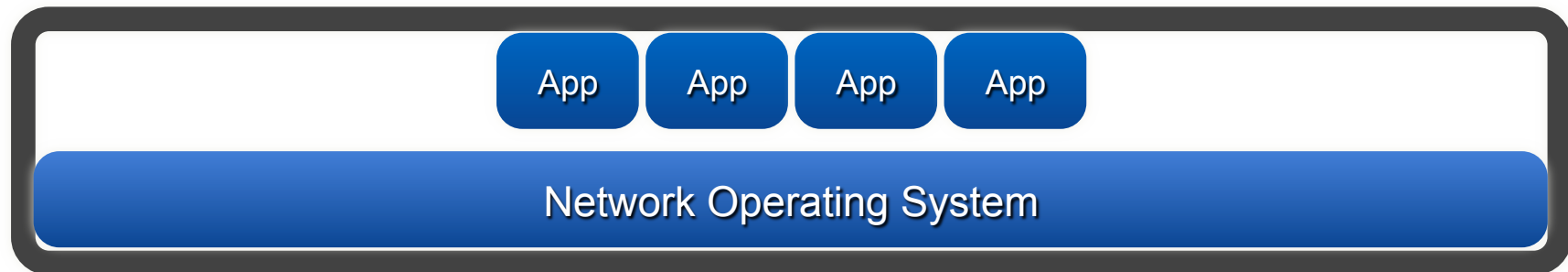
- We've heard from Citylink that the exchanges need work.
- There was a real need to demonstrate production use of SDNs to the community
- A community of SDN expertise was growing in New Zealand and they needed a project to focus on
- Citylink and REANNZ were considering SDNs as a future direction
-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

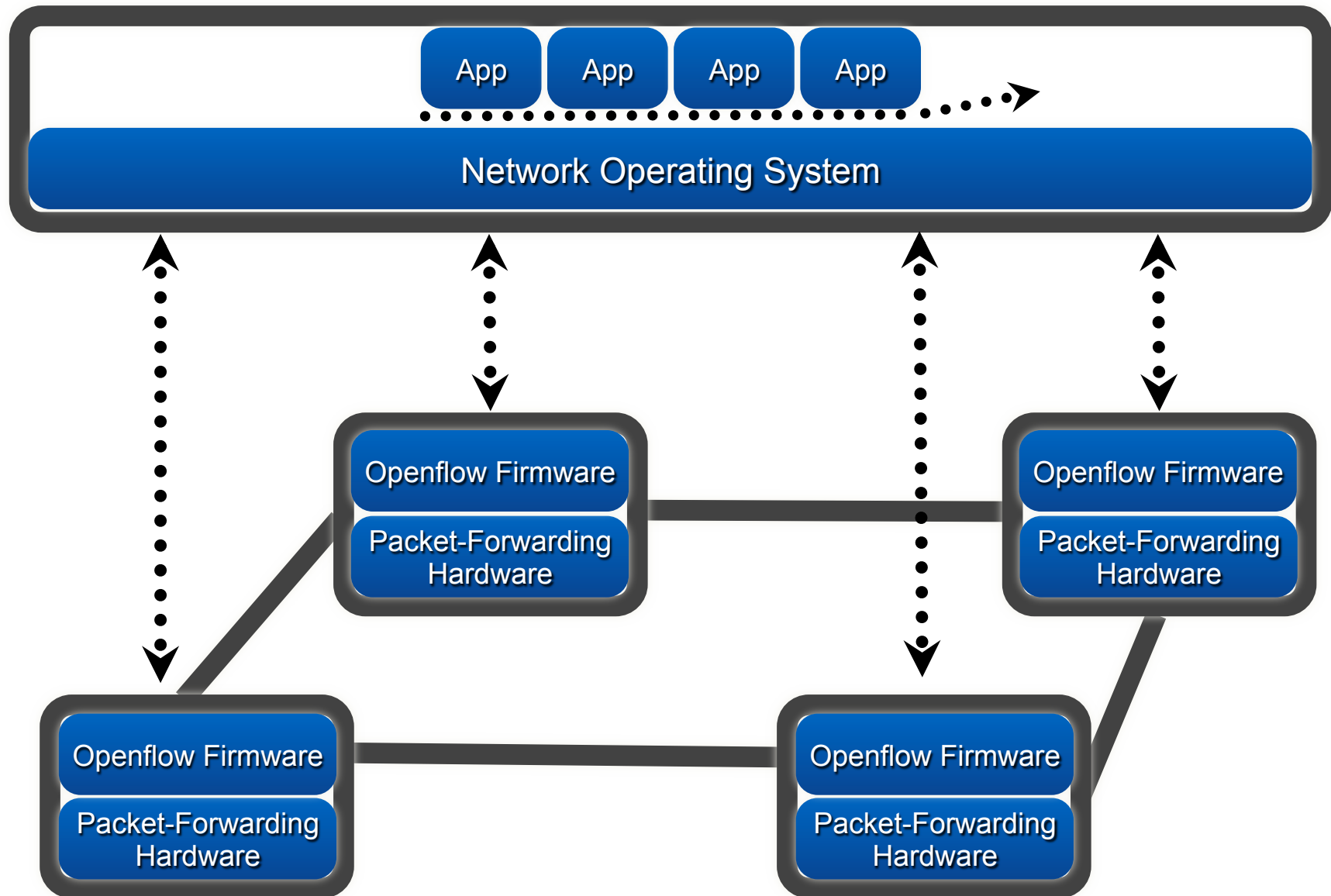
Together all these things came together and formed ...

Project Cardigan

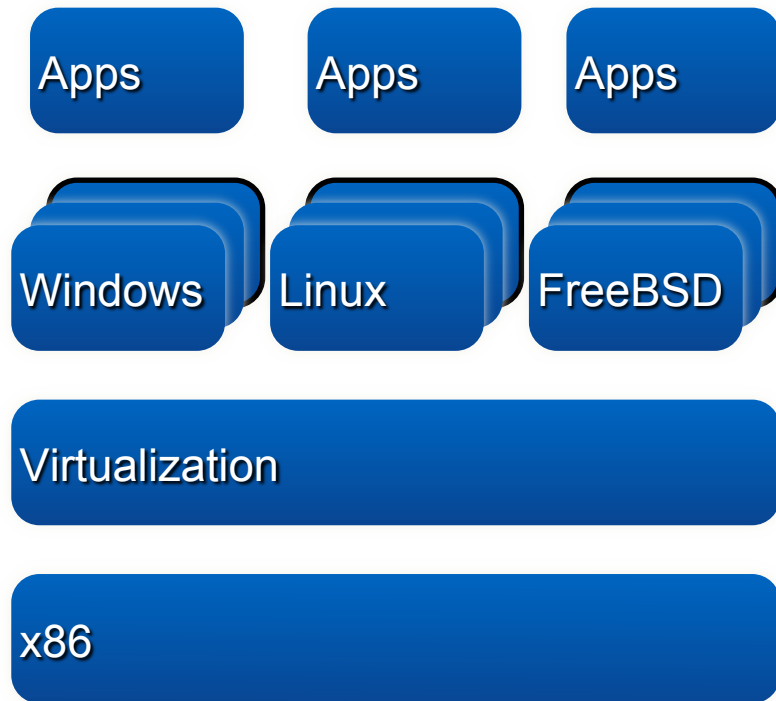
More on the name later.

What

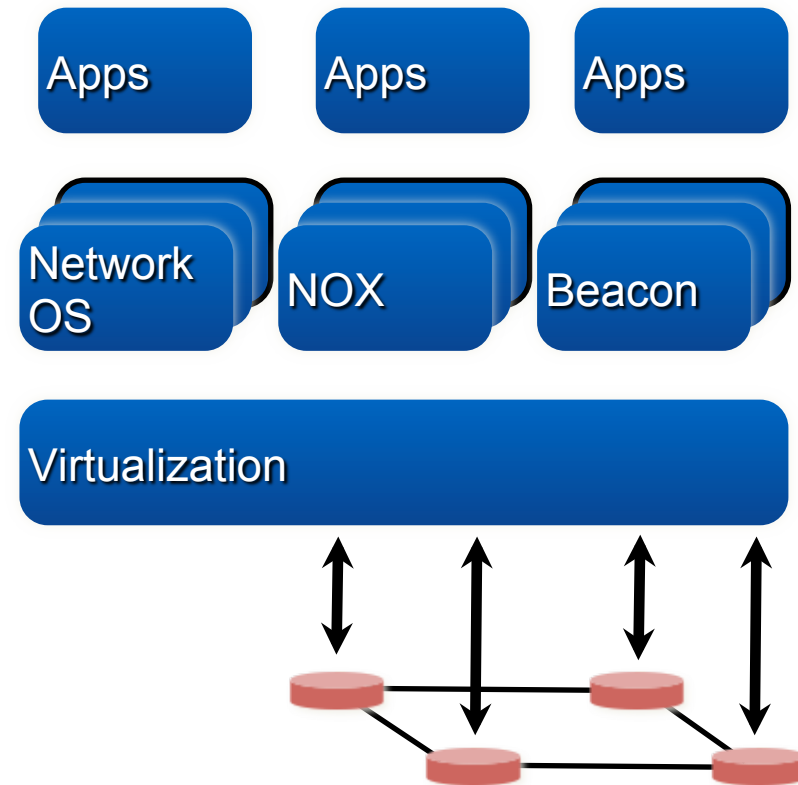




Computer Industry



Network Industry



Impacts

- Ability to Innovate through Software
- Decreased Cycle from Lab to Production
- Less Complex Networks that are Easier to Manage and More Secure
- Cost Reductions through Increased Competition, Hardware Commoditization & Open-Source Software

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

We need a nationwide SDN fabric

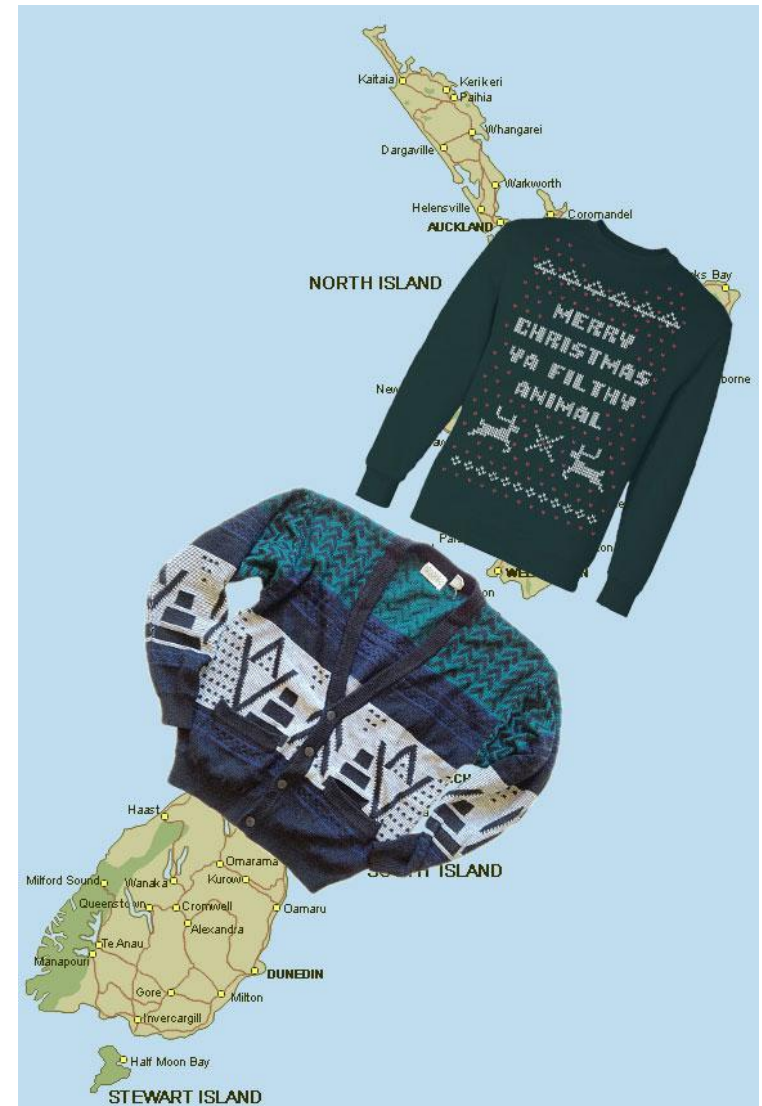
A NEW ZEALAND wide SDN fabric

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 - 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)

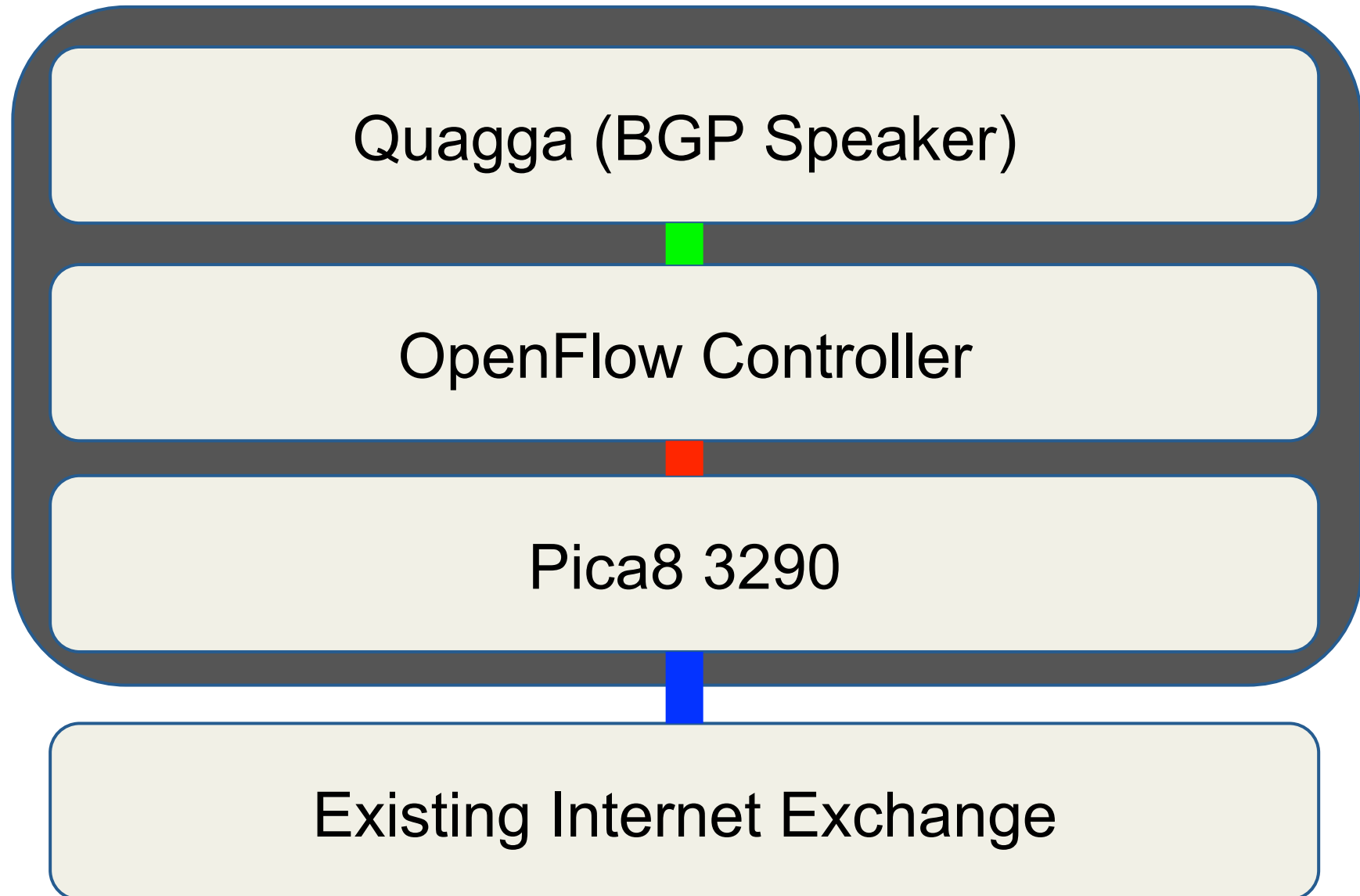
Quagga

Pica8 3290

PicOS v1.6 (based on OVS v 1.9)



Project Cardigan - Phase 1



Project Cardigan - Phase 1

From the WIX looking glass

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	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!

**networking is
still boring**

Project Cardigan - Phase 1

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.

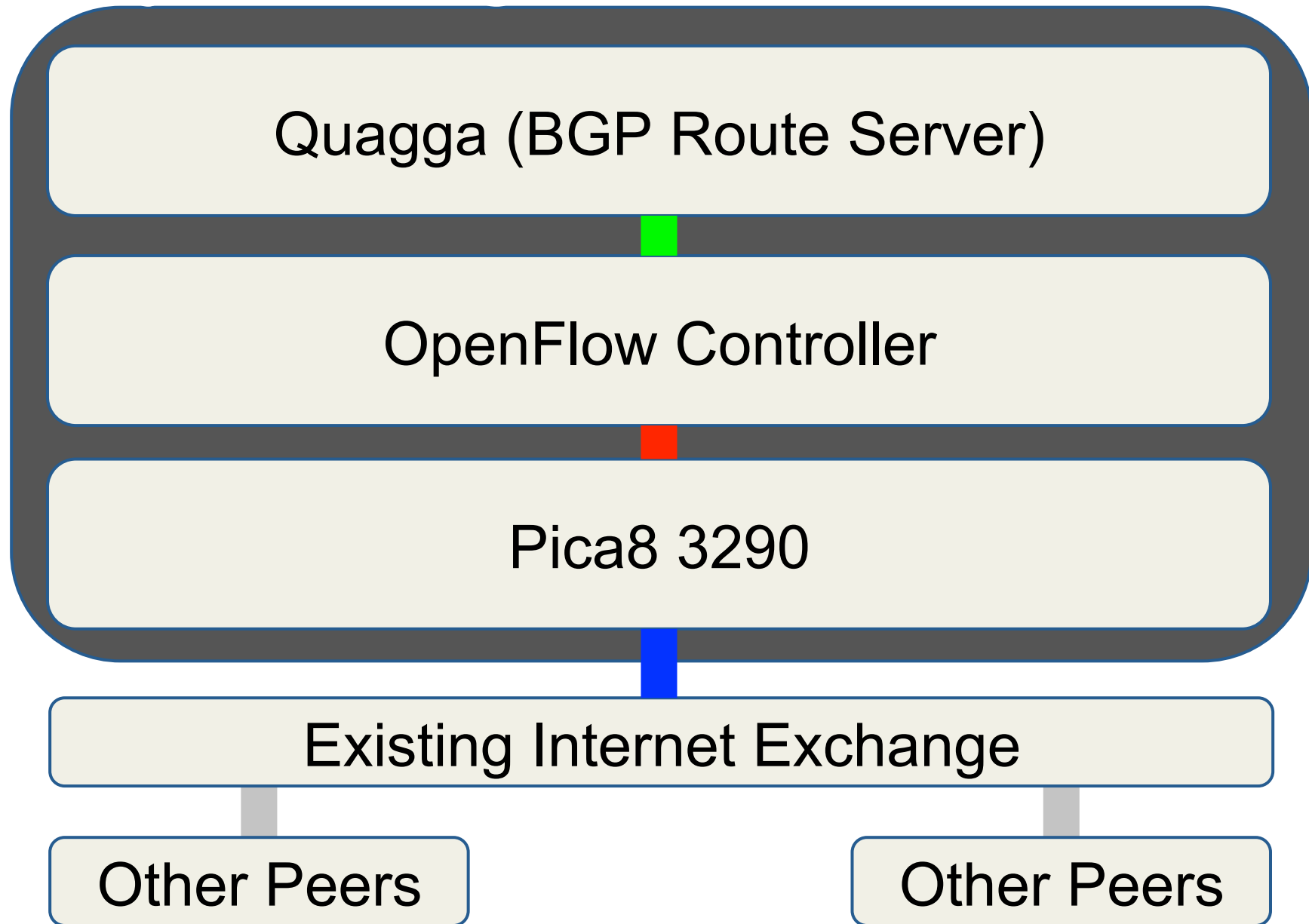
Project Cardigan - Phase 2

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 UPDATE!!!!

**networking is
still boring**

Project Cardigan - Phase 2

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

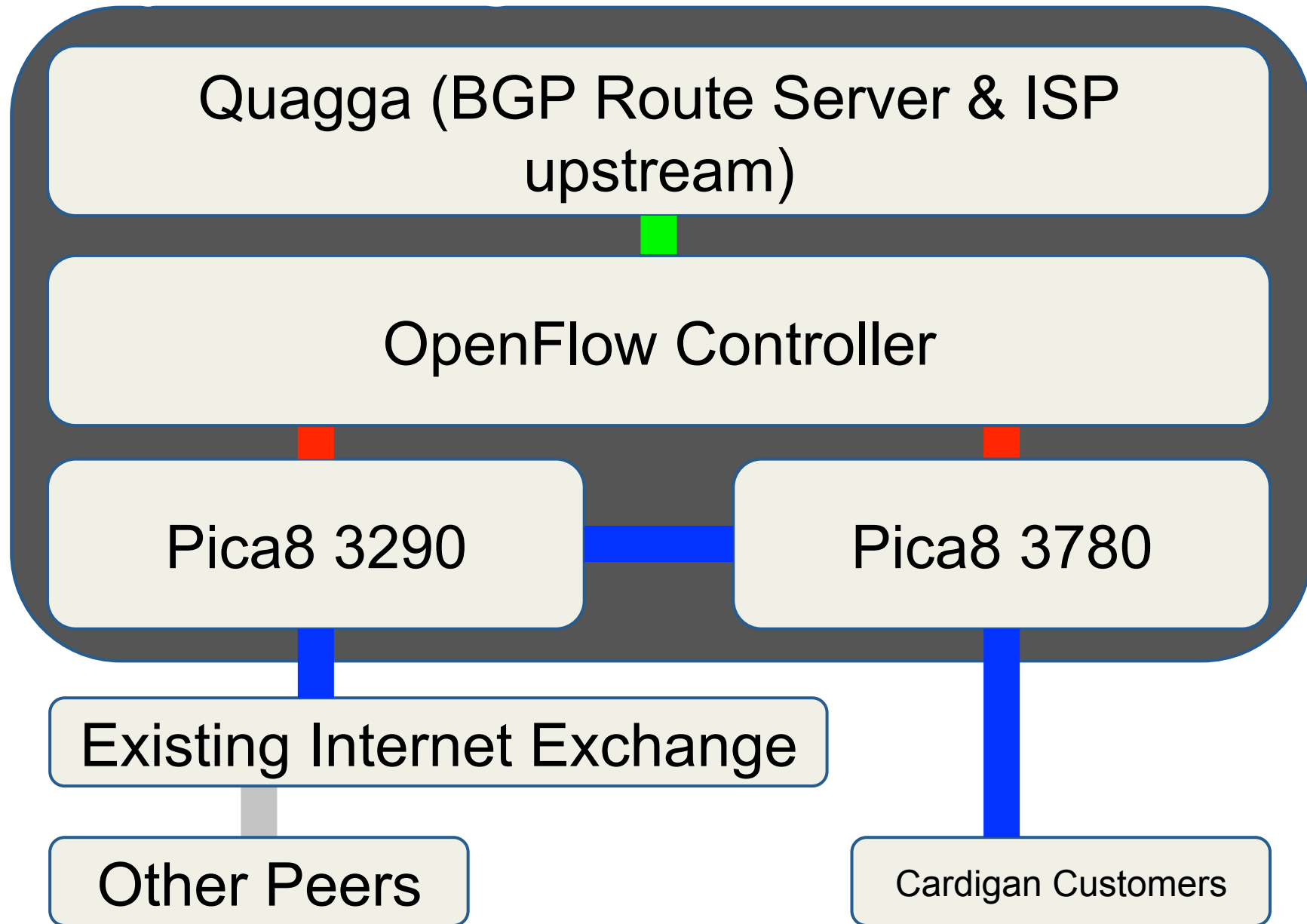
Pica8 3780

Control Plane Network extended via L2 VLAN

Data Path extended via dark fibre

BIG THANKS TO CITYLINK





Big thanks to:



Project Cardigan - Phase 3

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

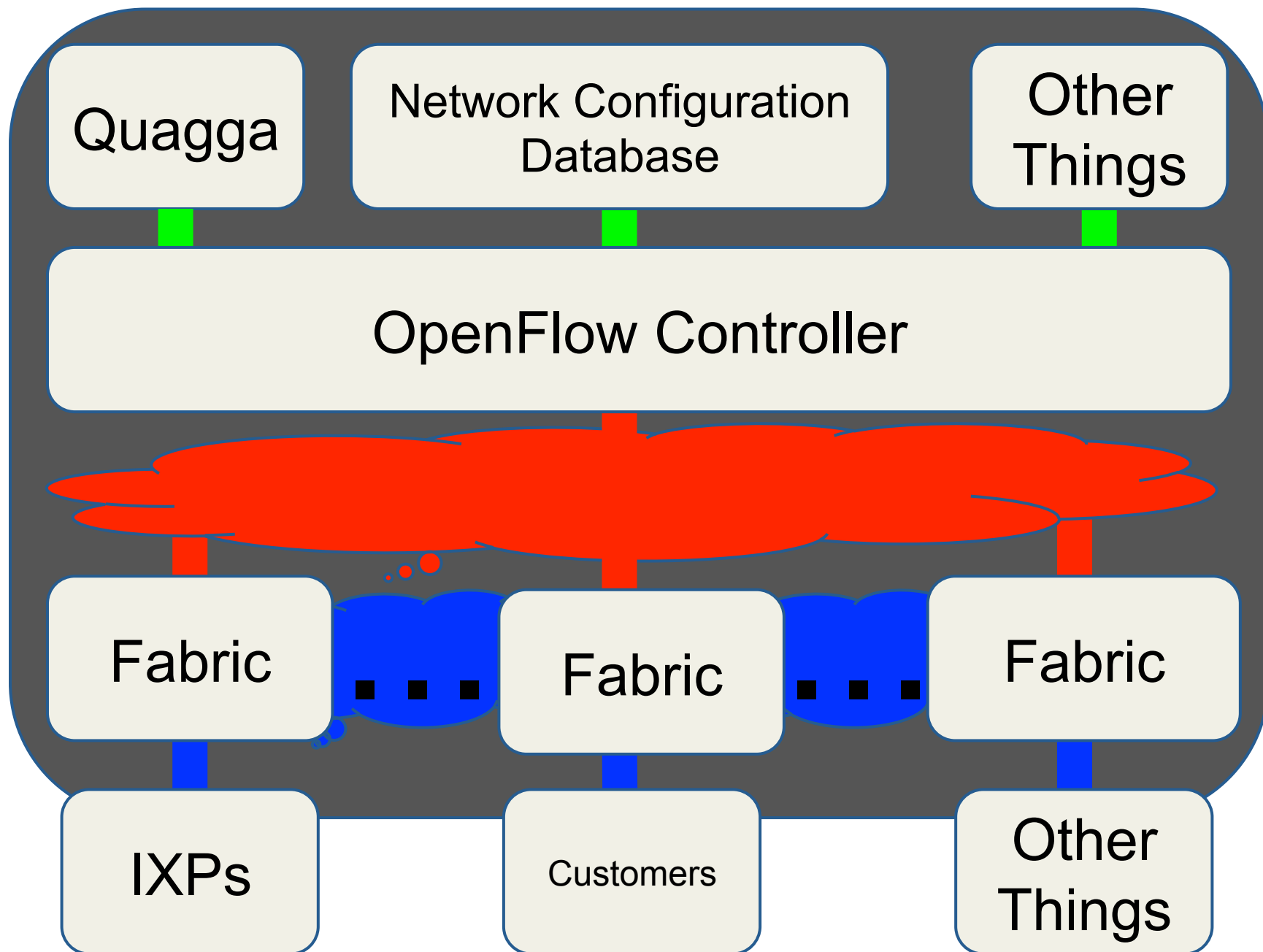
Now that I have a fabric and traffic I can start to actually control things.

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 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 Lurier

Pica8

RouteFlow (CPqD)

Quagga

Google Network Research