

# Bootstrapping IX-Denver

## A Cooperative IX Case-Study

NANOG 70  
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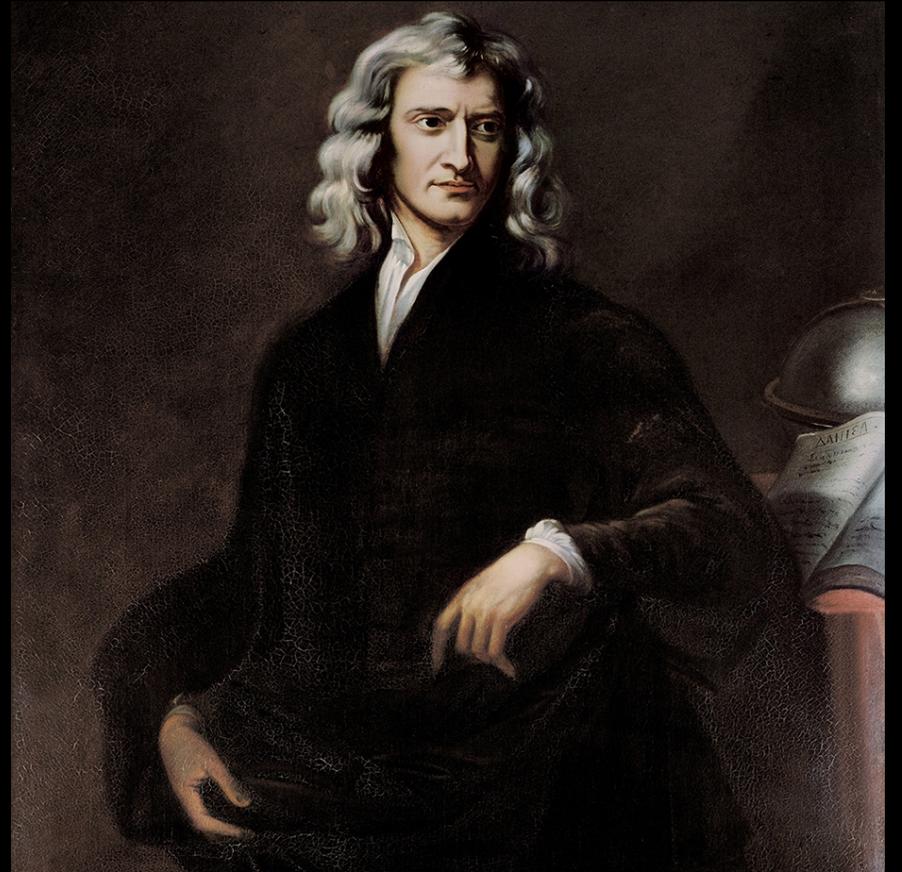
# What are we talking about?

1. Motivation
2. Getting started
3. Finding a home
4. Hardware
5. Software
6. Paperwork
7. Chickens and eggs
8. Surprises
9. Motivating good behavior
10. Where we stand
11. Future plans
12. Applying these lessons

# Why this presentation?

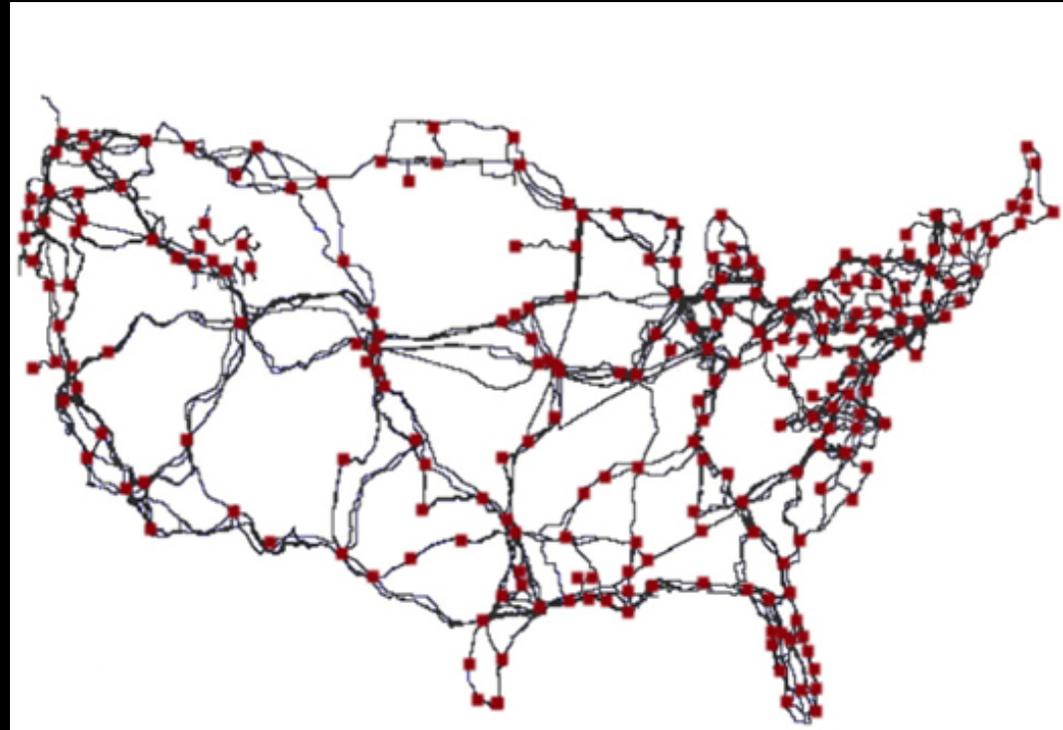
"If I have seen further, it is by standing on the shoulders of giants."

- A case study
- Provide a template
- Hopefully inspiration as well



# Why start IX-Denver?

- IXPs are where networks become internetworks
  - Adding robustness to the Internet
  - Having more IX' in more places is a good thing
- Denver should be a hub
  - Geography
  - Fiber interconnection
  - Universities, Tech Offices, Start-ups...
  - 19<sup>th</sup> largest metro in US and growing



# Really though, why?

- Make a difference
- Give back
- Dream big
- Educate ourselves
- Be remembered

...Passion



# What are we trying to do?

## Mission

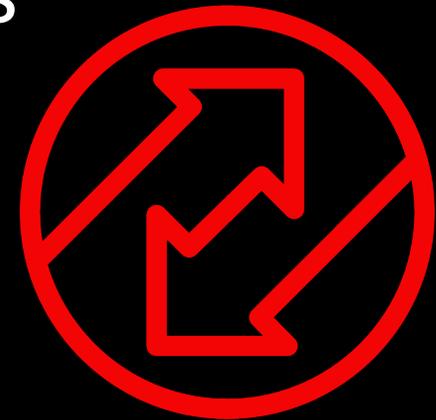
Provide open, neutral, community oriented, and membership based Interconnection eXchange Points.

## Vision

Constantly improve inter-connectivity across the Internet community.

# How are we doing it?

- Non-profit, community oriented (Open-IX/Euro-IX)
- Low, flat-rate membership fees and port costs
- Always non-blocked switching fabric
- Re-evaluation of port costs on an annual basis
- Expert level, well connected operators



# What about Any2Den?

- Everybody deserves options
  - There is such a thing as too many IXPs
  - Two is not too many
- Adding resiliency
  - Backing each other up
  - Different facilities (future)
- A different approach
  - Neutral / Transparent / Open
  - Community focused & Member driven

Coopetition

~~Zero Sum~~

# Where to start?

- First step was forming a team

- Inspire others to join you
- Board of Directors
  - zero interest loan

- Friendly help

- PCH and Other IX'
- Donations from Patrons

- One step at a time

- Lofty goals, measured action



# Who helped?

- Mark Calkins
- Chris Grundemann
- Jay Hanke
- Ogi Mitev
- Ryan Privette
- 910 Telecom
- GDT
- Juniper Networks
- Myriad Supply
- NWAX
- PCH

<http://ix-denver.org/?q=board>

<http://ix-denver.org/?q=patrons>

# Where to build?

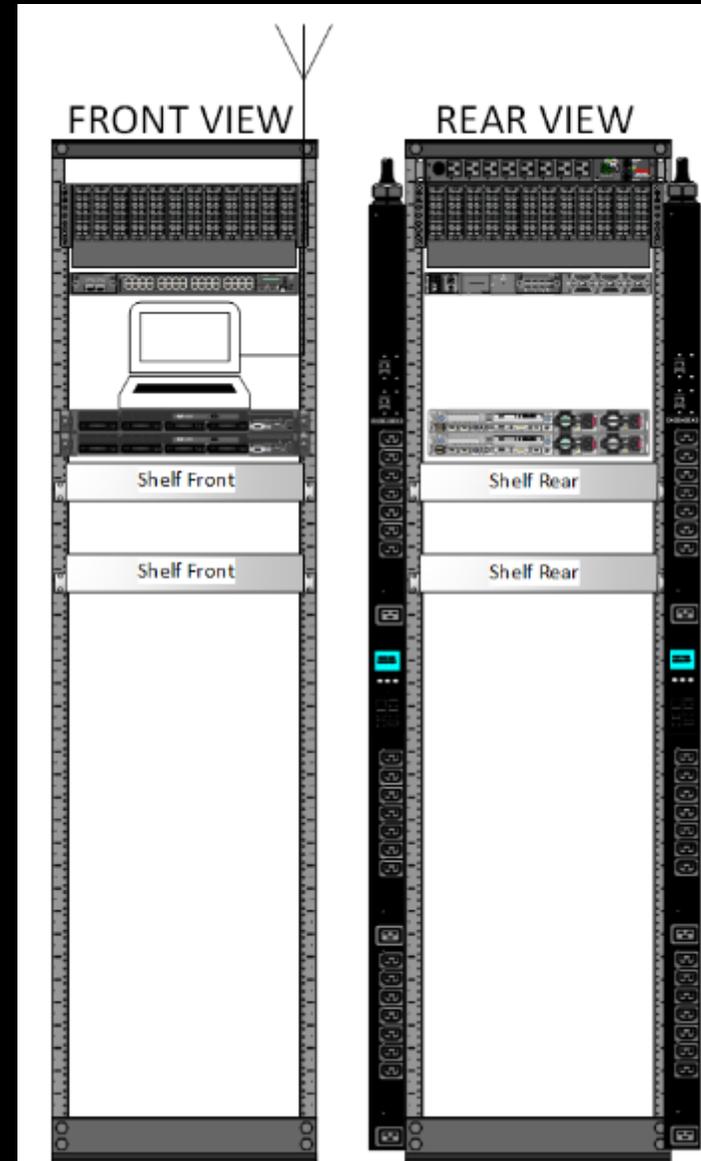
- 910 Telecom made sense
  - Location, location, location
  - Connectivity in & out of building
  - Cross-connect fees
- Introducing IX to DC
  - Making contact
  - Educating the stakeholders
  - Providing value
- Donated space and power
  - In the MMR!





# Just a switch?

- **Juniper EX4550**
  - A reasonable 'non-blocked' starter switch
- **Servers**
  - Salvage for now
- **OoB access**
  - Inexpensive 4g plan (tmob) & capable <\$100 oob router
- **Cabling**
  - Panels and fiber (all donated)
- **Power**



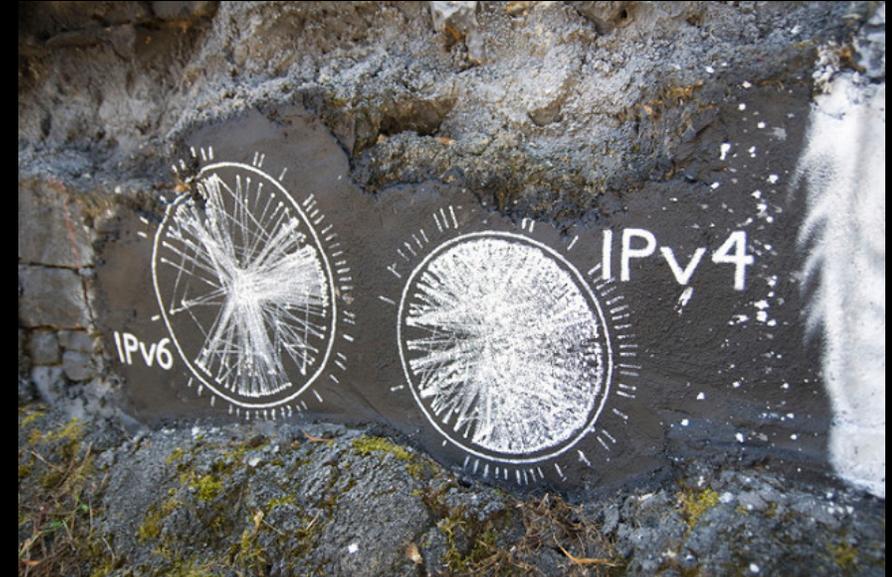
# What else?

- Website + social media stuff + Slack
- Route server (Bird)
- IXP Manager (includes MRTG)
- Nagios (Slack integration)
- Google docs
- Financial software
- Email lists
  - we still need to get this right



# What about IPs?

- ASN - 394594
- IPv4 - 206.53.175.0/24
  - Should have asked for more
- IPv6 - 2001:504:58::/48
  - Use the bottom /64 for the public IX subnet
  - Use visually identical host IDs
    - E.g. A member with IPv4 address 206.53.175.10 will also have IPv6 address 2001:504:58::10



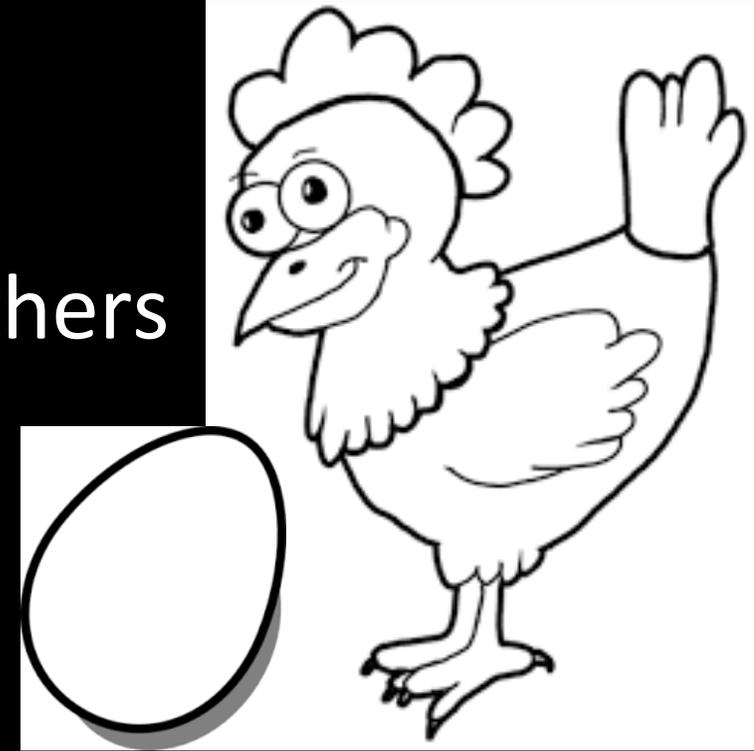
# How are we structured?

- Bylaws (“borrowed” from SIX & NWAX)
- Colorado non-profit corporation
- Bank Account
- Taxes (W9)
- Insurance
- Federal non-profit...
  - 501(c)(6) -or- 501(c)(12)



# Why would anyone join?

- Classic chicken and egg situation
- The value of an IX is in connecting to others
- The first member gets no value
- Lucky that many folks see future value
- Fees waived to start
  - 'At cost' recommended donations to members (\$200 for 1g or 10g)
- Community / connections are key



# Who joined right away?

- Aerux Broadband
- Blackfoot Communication
- CloudFlare
- Colorado Central Telecom
- Front Range GigaPop
- Hurricane Electric
- Mammoth Networks
- SoftLayer
- Teliax
- Yahoo

Thank you, founding members!

# What surprised us?

- **Transit**

- Poor non-profit
- Should it be this hard?
- Or are we a unique case?

- **ARIN**

- \$1500 - our largest expense

- **Focus on eyeballs**

- Content will come



# Can we do more?

- Interconnection is great
  - Especially low cost, neutral IX
  - Lower barrier to enter for new to peering networks
- Platform for innovation
  - Member driven = innovation
  - Try new things, set an example (route server script)
  - Publish & present (hi there)

**I SNEEZED  
ON THE BEAT  
AND THE BEAT  
GOT SICKAH**

# Even more?

- Educating (new) members

- Why Peer?

- Finding leverage

- Route server policy!

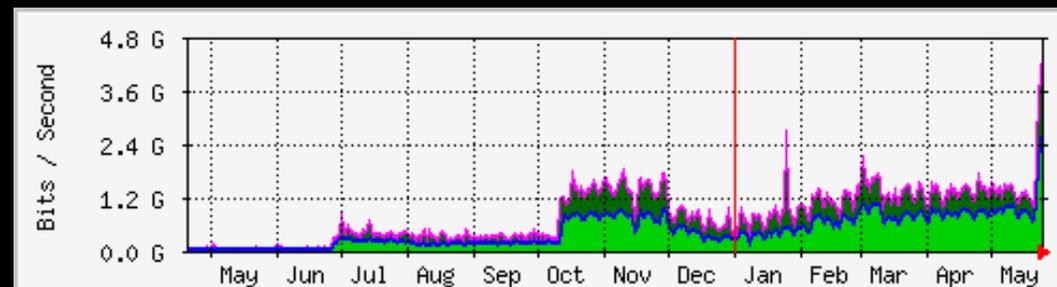
- Creating community

- D-NOG?



# How far have we come?

- 20 members
- >5G traffic
- Extension switch
  - Thanks MICE & NPN!
- First event
  - 5 December 2016 @ “The Corner Office”



# Where are we going?

- More facilities
- More members
- More community
- 2017 Elections
- Federal status
- Member portal?
- DNS



# What have we learned?

- This can be done
- Help is available
- The right team matters
- Community is required
- Technology is the easy part
- It doesn't have to cost a fortune
- Eyeballs drive traffic (duh)



# What can you do?

- Come peer at IX-Denver!
- Help us innovate!
- **Start a local IX!**

