

Accurate yet long winded title:

Exposing network, VM edge and
power topology via LLDP and BGP-
LinkState -- and possible
implications

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Applying web principles to the network [control plane focus]

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Conway's Law

- *“Any organization that designs a system (defined broadly) will produce a design whose structure is a copy of the organization's communication structure.”*
- *What does this mean?*
 - *Think Reese's peanut butter cups—chocolate and peanut butter – two great tastes that taste great together*
 - *Conway's law would suggest org structures hamper creation of Reese's peanut butter cups*

What has made the web so successful?

- HTTP – open
- Apache – open source
- Linux – open source
- COTS hw – cheap

HTTP

Apache

Linux

COTS hw

Web stack

Web model versus router model

HTTP

Apache

Linux

COTS hw

BGP, ISIS,
PIM, etc.

Proprietary
CLI

Proprietary
OS/chassis

Proprietary
ASICs

Web stack

Router stack

Is this SDN?

- “open” API
- manage (“hide”) proprietary router environment
- Can we do better?

HTTP

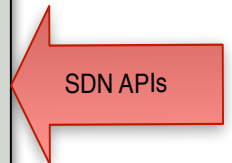
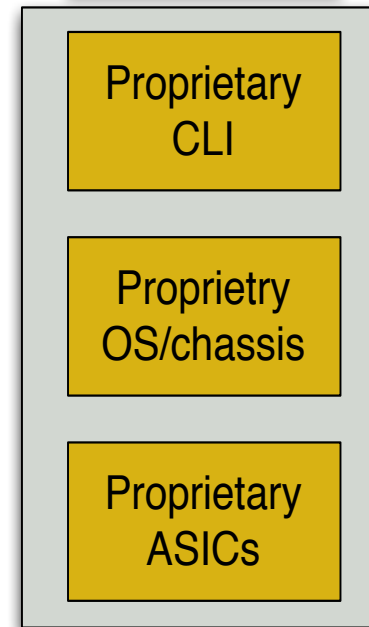
Apache

Linux

COTS hw

Web stack

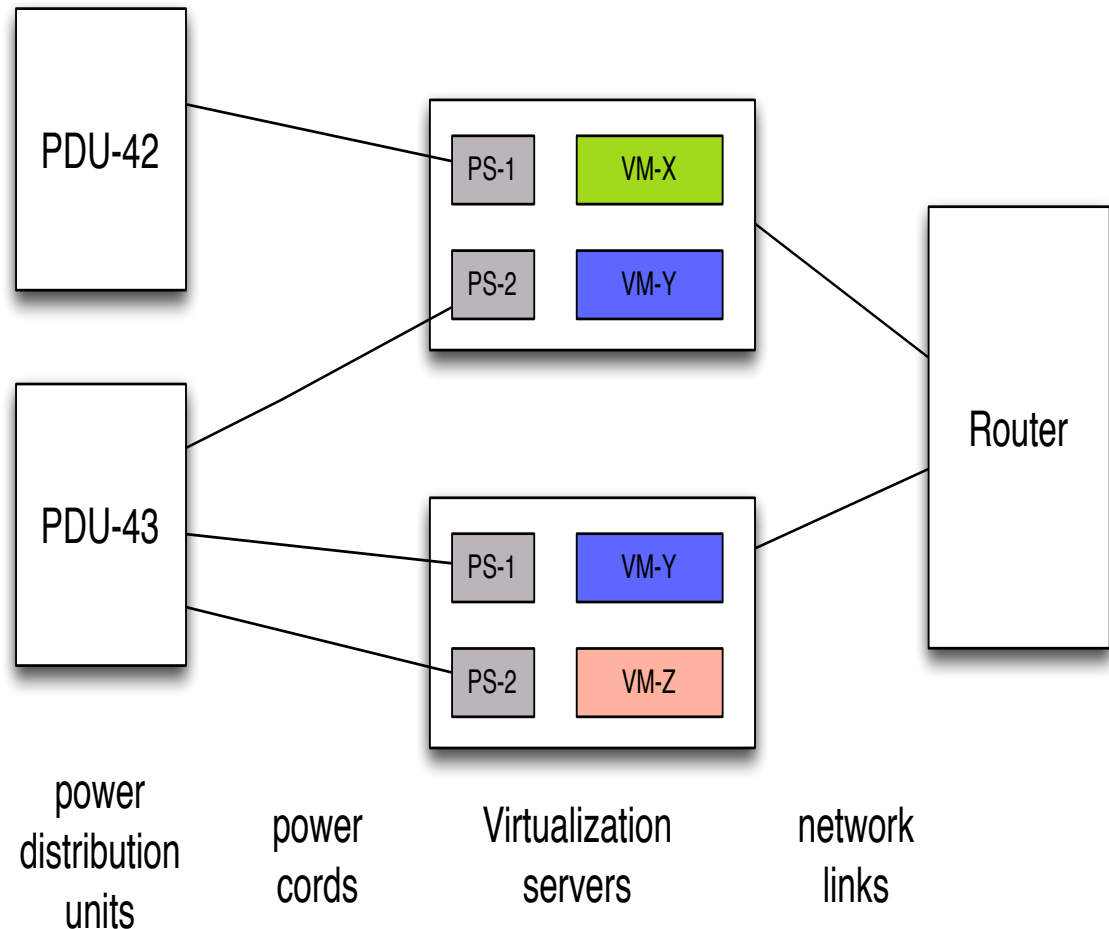
BGP, ISIS,
PIM, etc.



Router stack

Service Providers and virtualization

- Virtualization
 - COTS hw
 - Many servers, many locations
- Apps as VMs
- App could run across multiple CPs (cloud providers)
- Agility



Applying application thinking to the network

1. Router VM in every COTS hw virtualization server
2. Rethink how we build/encode network control information
3. Bigdata thinking applied to network—per web transaction mining -> per packet mining

Background to Rethinking how we build/encode network control information

- Network/Ops:
 - What App/VMs are really running in site X right now?
- Facility:
 - Not all sites and servers are identically configured power-wise
- Application:
 - Are my VMs running in an environment that has sufficient network/server/power redundancy?

Three infrastructure topologies related to cloud applications

1. Network topology
 2. VM “edge” topology
 3. “power” topology
- Who owns auditing these topologies?
 - What if my app spans multiple cloud providers?

Who owns auditing these topologies?

- Past:
 - Some org or the network folks
- This isn't a Comcast problem, this isn't a cloud provider problem this is an application problem
- Put auditing onus on the apps
- *It's hard to audit info that is dynamic and isn't learned in real-time*

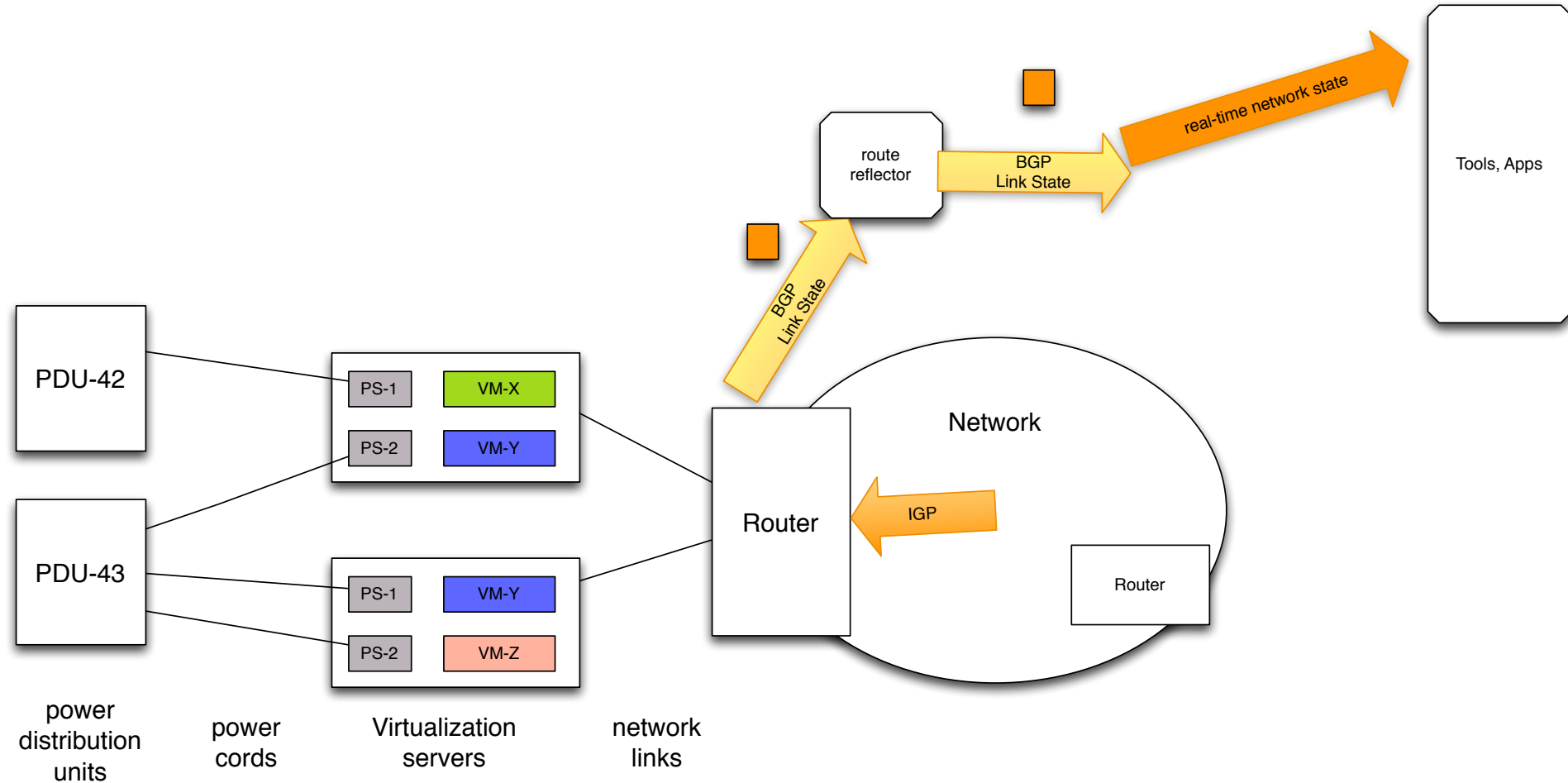
How do we dynamically expose these infrastructure topologies?

- IGP
- LLDP
- BGP LinkState

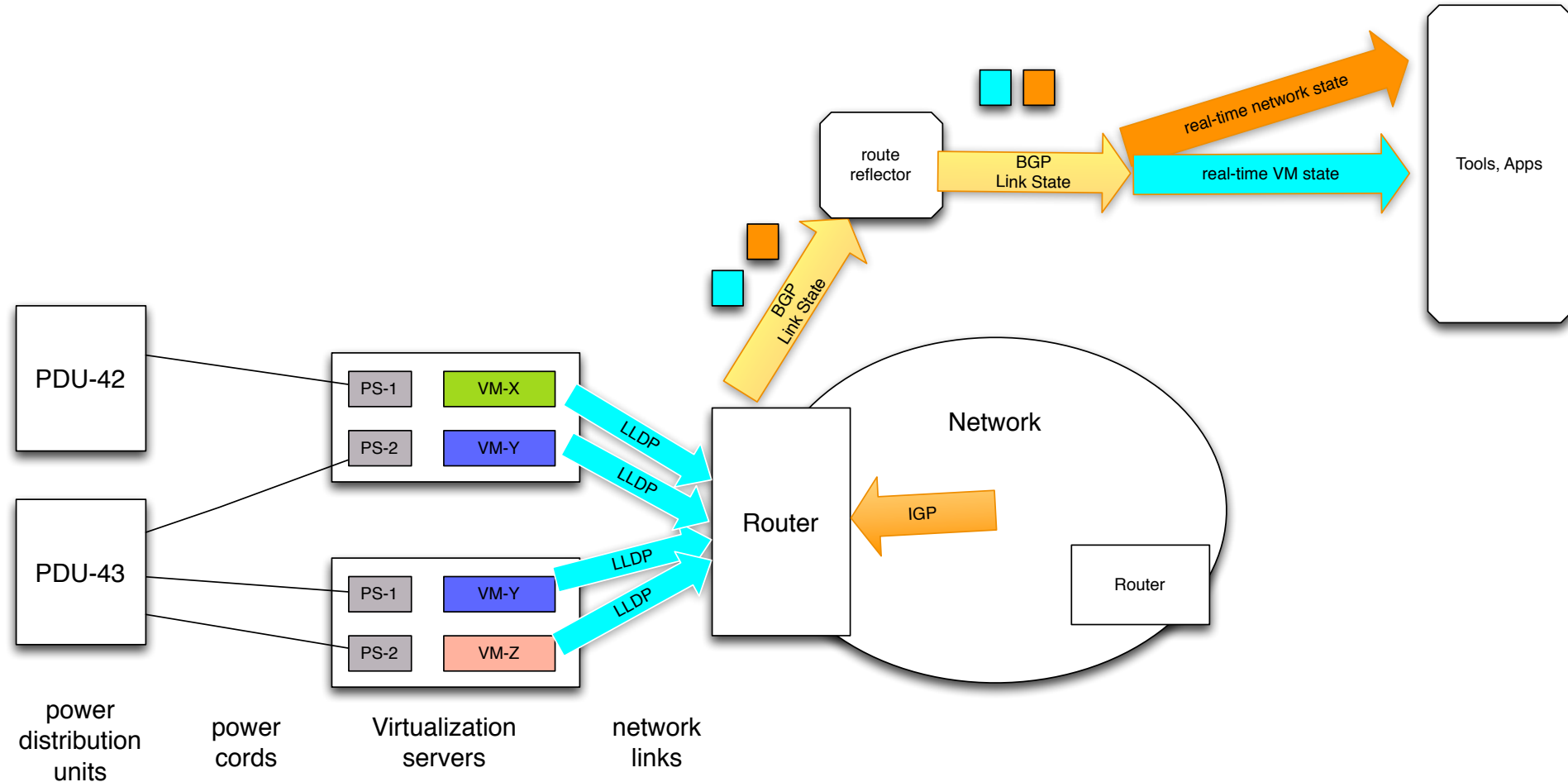
Two key protocols

- BGP LinkState
 - New AF
 - Export IGP and TE state north bound
 - Part of IETF I2RS WG
 - draft-ietf-idr-ls-distribution-02
- LLDP
 - Link Layer Discovery Protocol
 - TLV based ethernet protocol
 - Supported in linux and recent router code

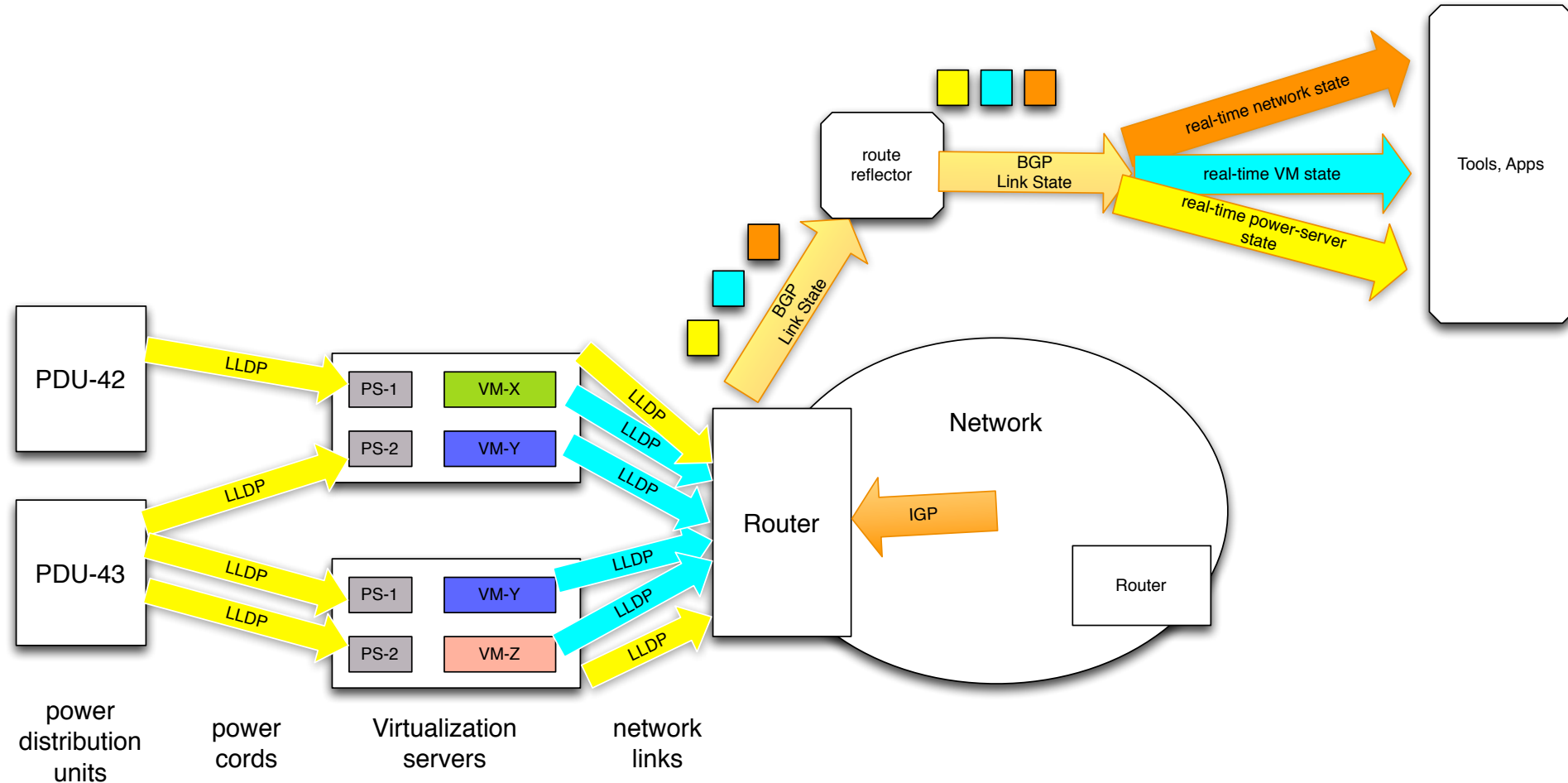
Step 1: Expose network topology



Step 2: Expose VM edge topology

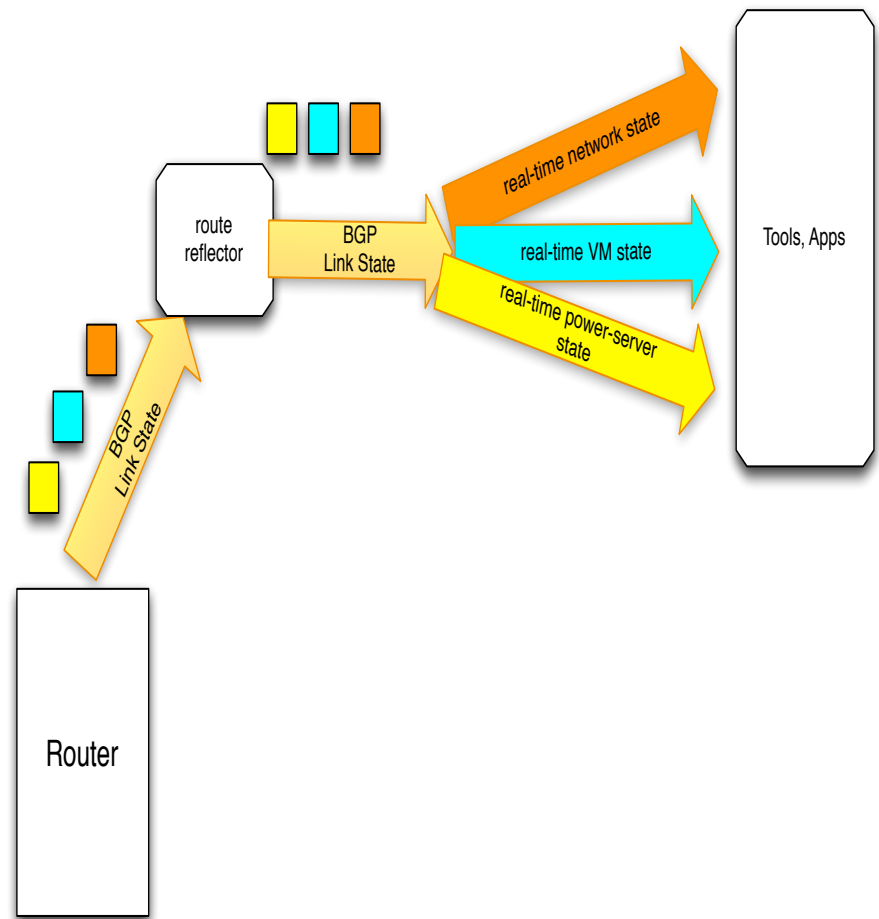


Step 3: Expose power topology



What are we left with?

- A real-time database of:
 - Where all services are running
 - App/VM->server->router interface mapping
 - PDU->Power Supply->server mapping
- Application Value:
 - Better VM placement
 - Enable app auditing



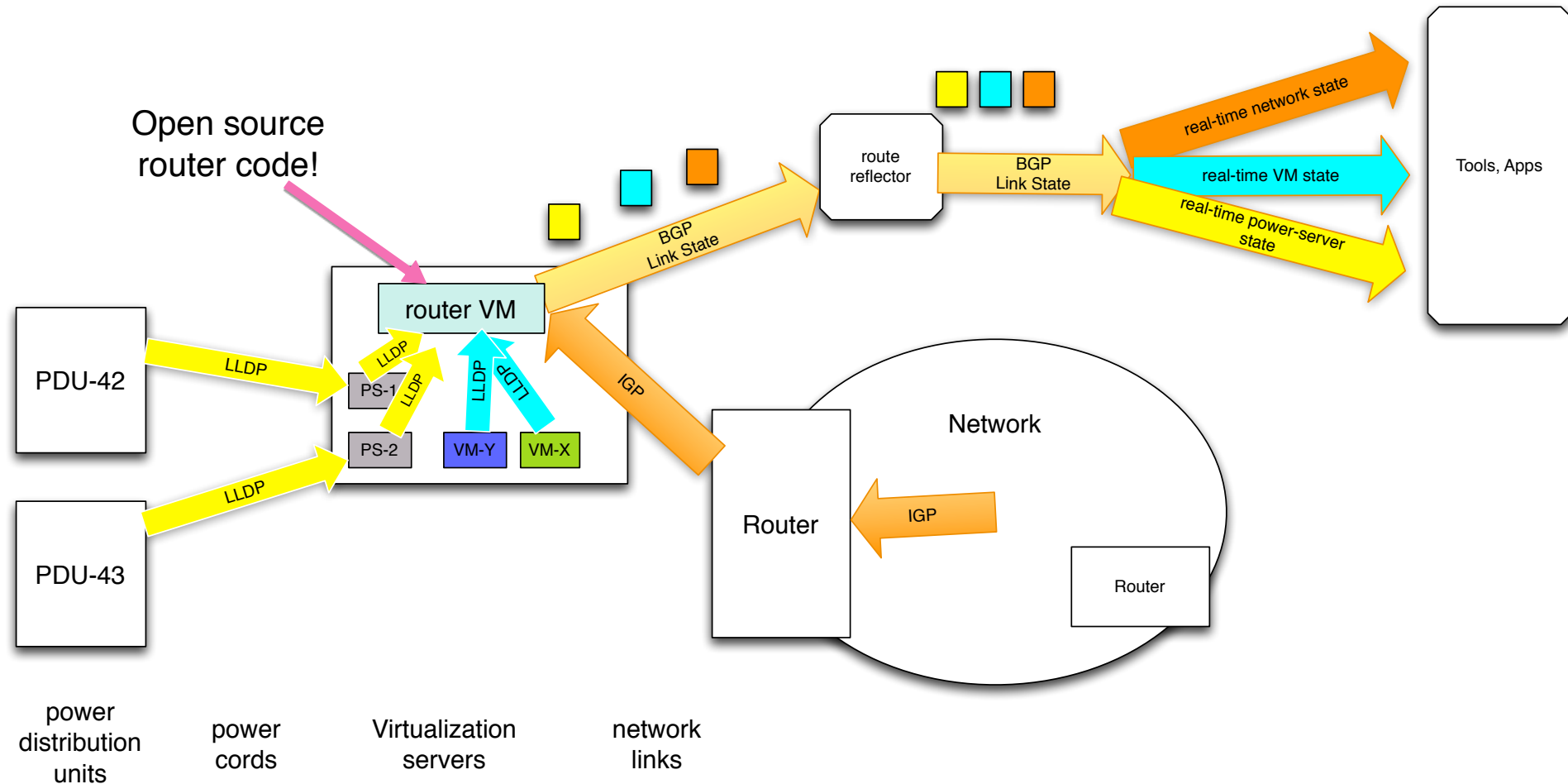
Lots more info to encode into BGP LinkState

- Encode this new information in bits/bytes?
- Is it time to think about something a bit more current?
- Like XML/JSON?
 - Hey, the web guys developed and use that stuff don't they?
 - Aren't they pretty successful at what they do?

Web thinking applied to network control protocols -> Make BGP RESTful

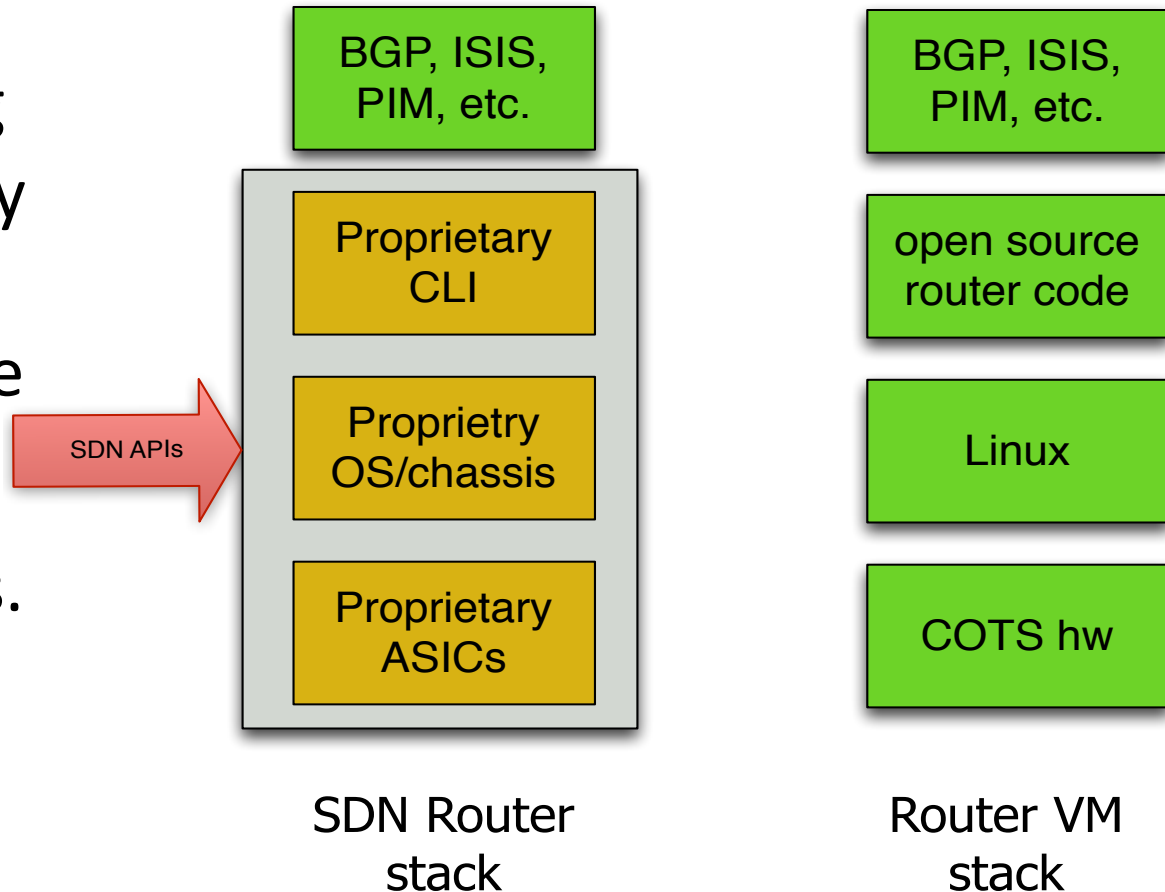
- Proposal:
 - Encode BGP LinkState using XML/JSON
 - Convert BGP LinkState primitives to be RESTful
- Result:
 - BGP LinkState operates like a web app
 - Apply web's software methodology, scale and efficiency in the network control protocol space.
- Does this apply to the IGPs too?

Remember I mentioned router VMs?



Which is better?

- Virtualization applied to routing is the evolutionary tipping point in the network space
- open API (SDN) vs. open source (router VM)



Applying web principles to the network [making peanut butter cups]



Thanks!

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