ITU-T Workshop on IP Traffic Flow Measurement

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Typical use of IP traffic flow measurements in telecom operators

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Agenda

- **Introduction**
- Traffic measurements:
  - Who does what
  - Coupling flow data with BGP
- Complications

Internet: content to eyeballs a simplified taxonomy

- Players in the Internet:
  - A – Access providers (radio, cable, DSL, fiber, etc.)
  - B – IP carriers
  - B – IXPs, Internet eXchange Points
  - C – Content providers
  - C – Hosting

IP traffic flow measurements

- By this time of the day we should know lots of things already on the topic ☺
- Let's do a quick recap:
  - Flow-based technologies available: NetFlow, IPFIX
  - Efficient correlation of traffic data with routing information (BGP) is possible; tools are publicly available
  - Use of data reduction techniques (ie. sampling, aggregation) is valid to keep data-set manageable. Accuracy affected.
  - Use of divide-et-impera techniques is valid to distribute computing of results

Routing in the public Internet

- BGP is used for inter-domain routing in the public Internet
- Traffic is routed to destination
- Routing domains are distinguished by ASNs – Autonomous System Numbers:
  - Now 32-bit, "space for everybody"
    - Price for multi-homing is falling so people are even encouraged …
    - Unlikely IP transit will disappear, things might well consolidate though …
  - RPKI/ROA trend: traditional base of trust being broken

=>*"Can the basic block of inter-domain routing be mapped to something real, say, a country?" Not really!*

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  - **Coupling flow data with BGP**
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Traffic measurements: common ground

- Capacity planning
  - Build capacity where needed
- Traffic Engineering
  - Steer traffic where capacity is available
- Security
  - Events notification, alarms, mitigation, etc.
- Historical traffic trends
  - Feed into Sales department
- Feed into 3rd party (even home-made) tools

Traffic measurements: content providers

- CDN (Content Delivery Networks):
  - Monitor traffic quality (mix of methods)
  - Destination-based accounting is popular:
    - Possible because one direction prevails …
    - … and this is the one routed by the CDN

    => *This is accomplished with flow-based IP traffic measurements*

    => *This is used more as an internal cost-control measure than to bill customers*
- Hosting, data-center:
  - Monitor co-located server quotas

Traffic measurements: IP carriers

- IP carriers use flow measurements to:
  - Detect revenue leaks
  - Determine customer profitability
  - Do customer retention
- IP carriers interpretation of usage-based billing (typically SNMP-based):
  - Price per Mbps @ 95th percentile port utilization
  - Burst possible

=> *No distinction is made on IP traffic primitives when billing customers*

Traffic measurements: access providers

- Monitor customer quotas
- Monitor BBA fair-usage policy compliancy
- Abuse
- Radius accounting is popular; but flow accounting is useful for abuse purposes

=> *No distinction is made on IP traffic primitives when billing customers*

Traffic measurements: internal billing

- Networks with international scope
- Subsidiaries in several countries, responsible for own profits and losses
- Corporate international IP backbone

=> *Subsidiaries transit over the corporate IP backbone*

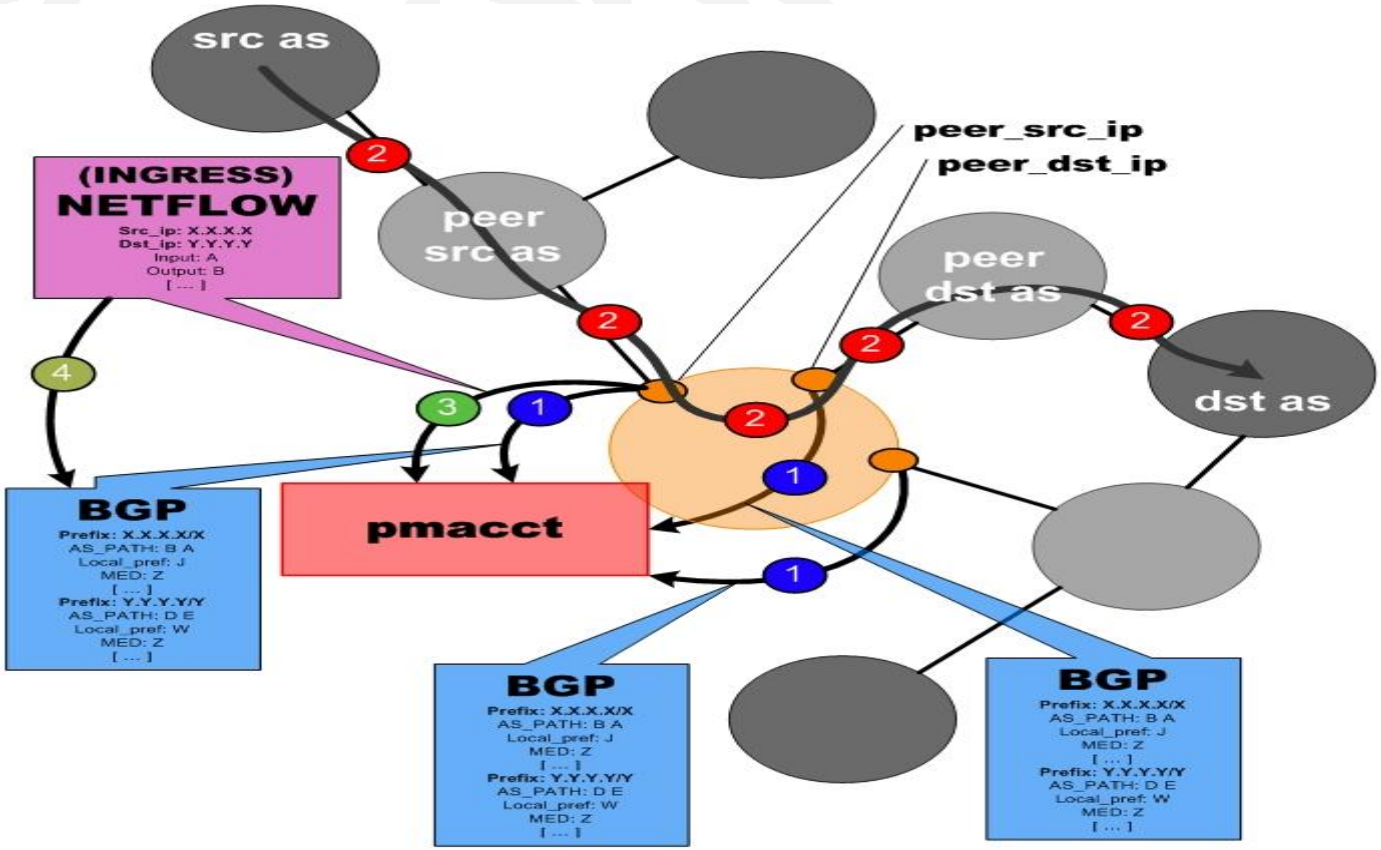
- Not uncommon backbone utilization is measured to bill subsidiaries proportionally

=> *This is accomplished with flow-based IP traffic measurements*

Coupling traffic measurements with BGP

- Method(s):
  - #1: Coupling at the router (feeling like moving control plane information over and over ..)
  - #2: Coupling at the collector (illustrated next slide)
- Tools are available for each method:
  - #1: ie. NetFlow v9/IPFIX, Cisco FNF, etc.
  - #2: ie. Arbor Peakflow (Commercial), pmacct (OSS)

Coupling traffic measurements with BGP (collector approach illustrated)



1. Edge routers send full BGP tables to pmacct
2. Traffic flows
3. NetFlow records are sent to pmacct
4. pmacct looks up BGP information: NF src addr == BGP src addr

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Control plane woes

- Control plane vs data plane
  - BGP says to route to X via Y and Z
  - Hidden more specifics in, say Y, can route to X via J

  => *Accuracy of accounting is jeopardized*
- Asymmetric routing, load-balancing and multi-homing impact needs a careful analysis

Application layer woes

- A traffic flow between two end-points, say A and B, is better represented by two uni-directional flows, say, A->B and B->A
- In voice and TDM in general morphology of these two uni-directional flows is congruent

=> *In the IP world this is never a guarantee. Morphology is dictated by the specific application.*

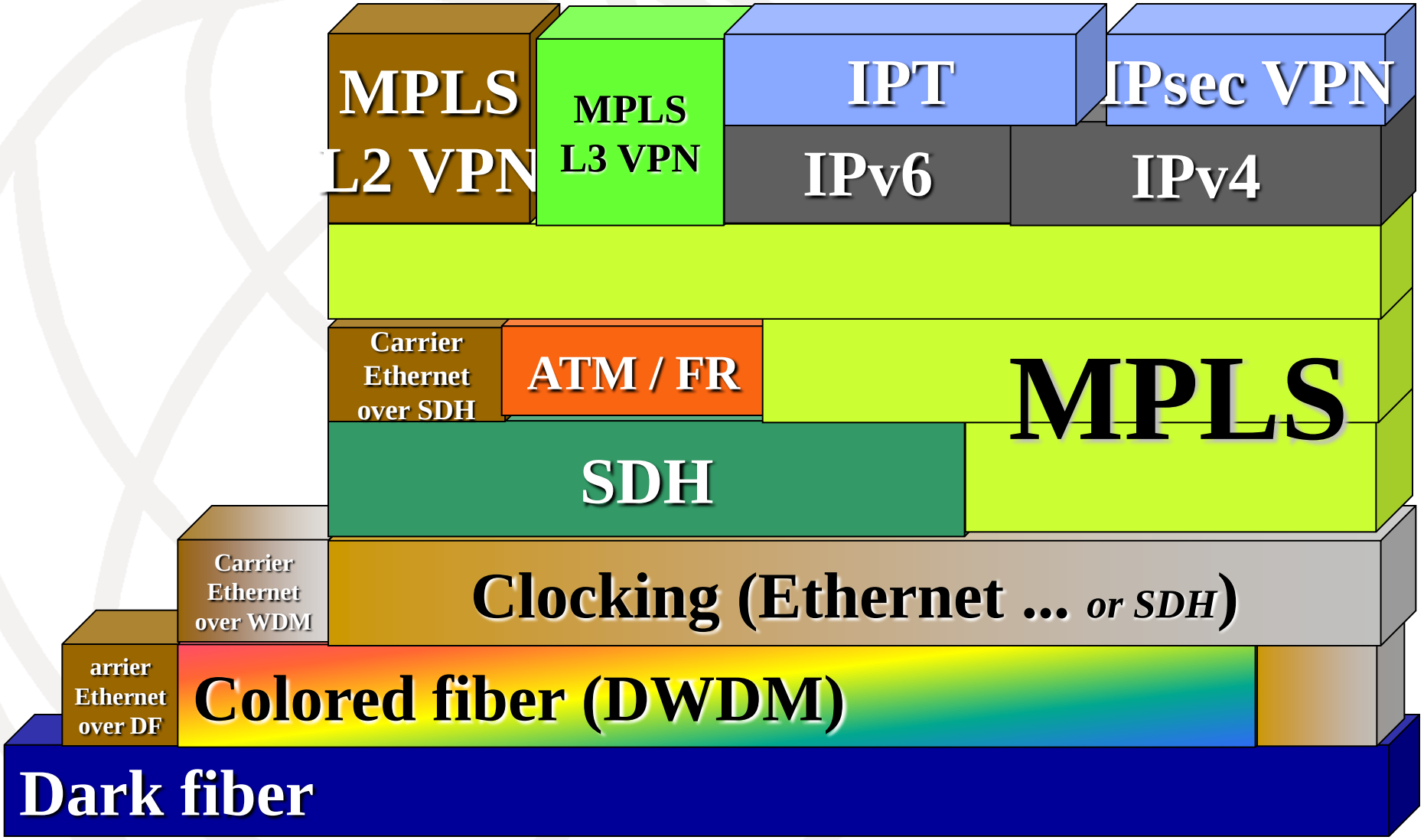
IP addressing woes

- IP addresses issued in one world region are not required to stay within that region
- Common case among wholesalers: they tend not to like to affiliate to multiple RIRs (costs, trainings, procedures, etc.)

=> *But:*

- *They lend part of their address space to customers*
- *They are not the best at documentation ☺*
- *Big dynamic IP pools worsen the situation*

Layering woes (L1, L2 and L2.5) (1/2)



Layering woes (L1, L2 and L2.5) (2/2)

- ISP A lies in country X
- IP connectivity is cheaper bought in country Y
- ISP A thinks of a combined solution:
  - They will buy transmission (dark fiber, wave, etc.) between X and Y from party B
  - They might optionally build a footprint in Y
  - They will buy IP transit in country Y from party C

=> *Which country this traffic belongs to?*

Thanks for your attention
Any questions?

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