MODERN NETWORK VISIBILITY

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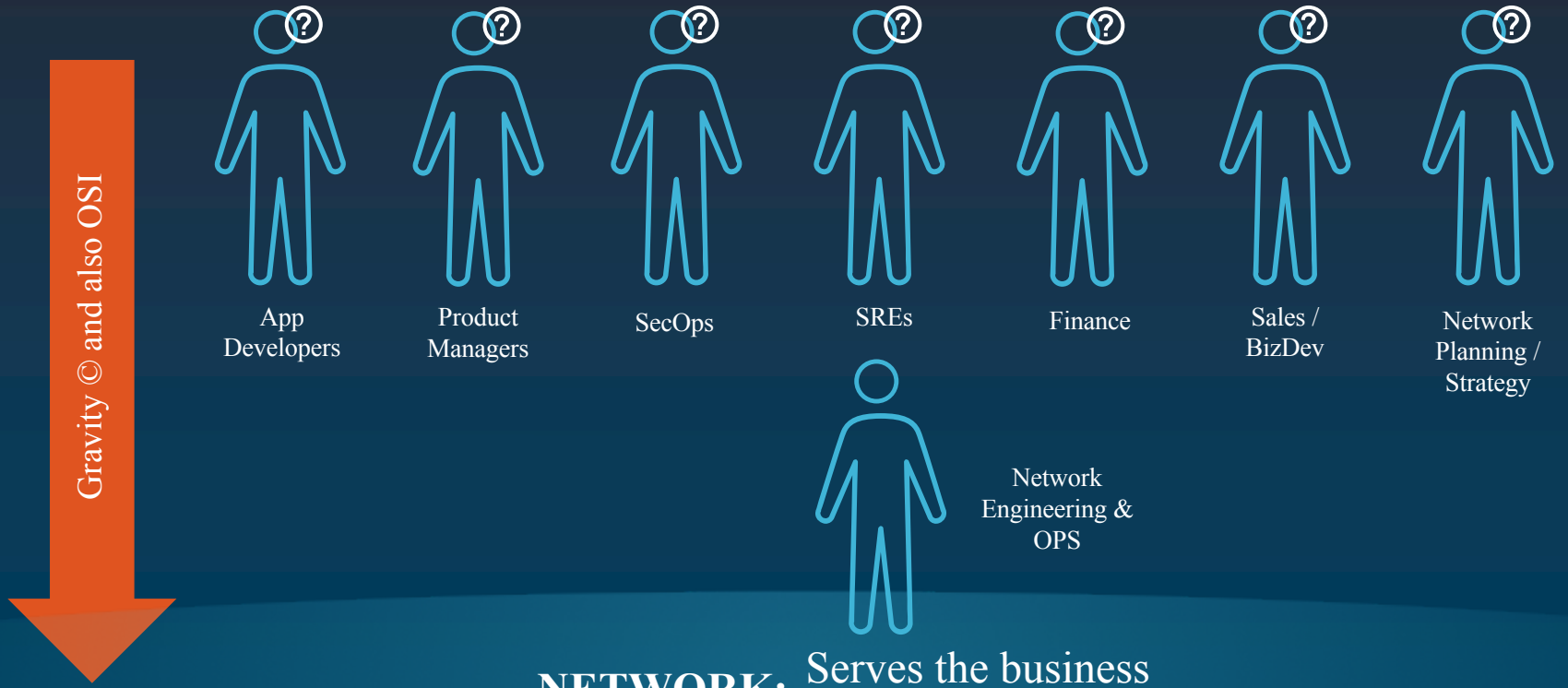
kentik®

Easily, the world's most powerful network analytics.

Field notes.
Resulting requirements.
Design principles.

The network is the foundation of your value stack



NETWORK: Serves the business
Sees the business

Requirements for a modern flow platform?

- Flows can contain information that the **rest of the company** can/want to/should use
  - Flows should be **enriched with business logic** suitable for non-engineering user profiles
  - UI needs to drive content **producer/consumer** dynamics

- **Network engineers shouldn't be on the critical path** of other employees wanting/Needing that data
  - If others are going to leverage flow data, it better come with **a UI that works** for everyone.
  - **Flexible** dashboarding
  - Non NetEng users need **understandable viz** + canned **task-specific views**

Siloed tools, siloed teams

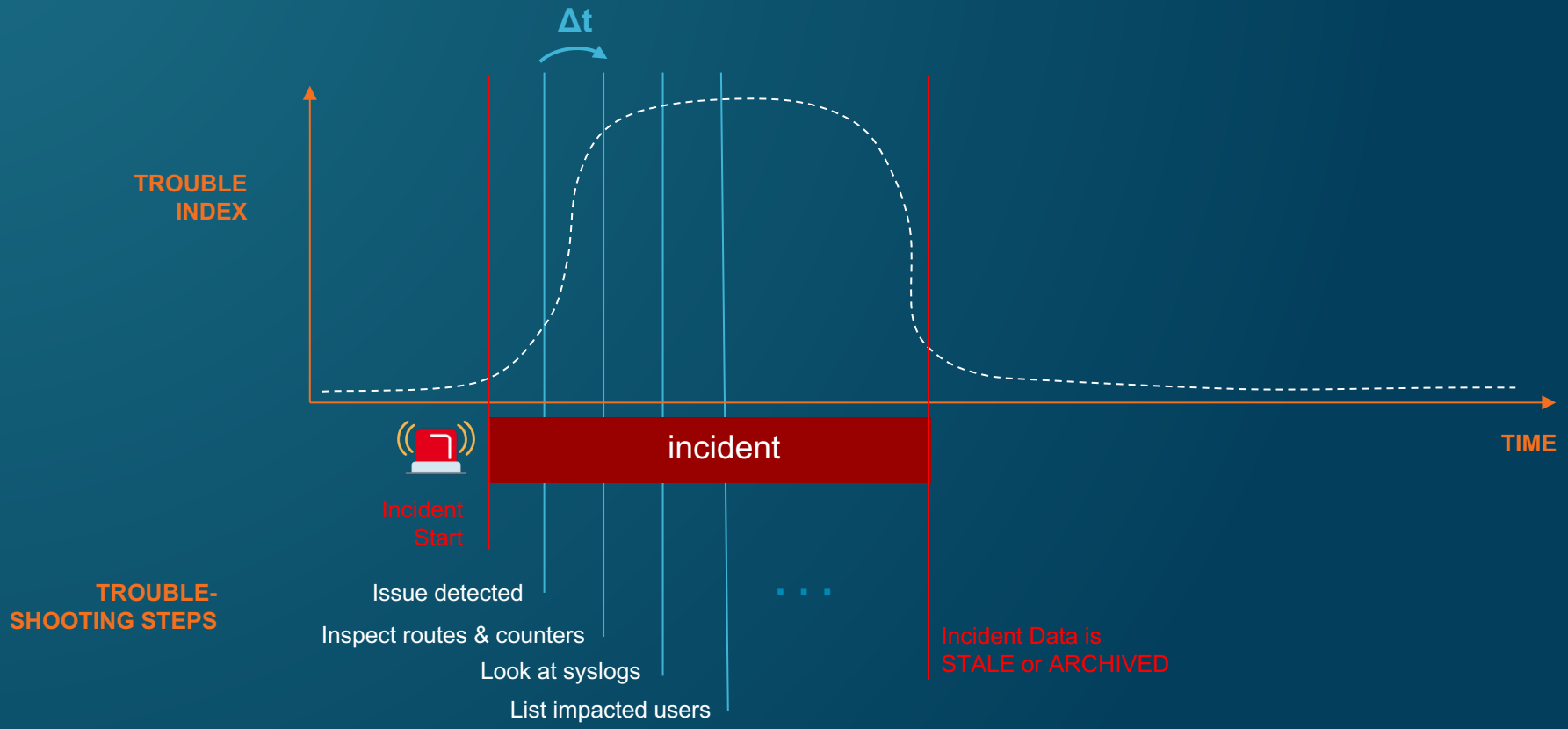
PLENTY OF TOOLS

- Flow collection subsystem
- SNMP collection subsystem
- Routing Tables
- On-Router interface counters
- Network Monitoring System
- NC Versioning
- Time Series / Metrics DB
- Incident management systems
- SIEMs
- Syslogs
- IM
- (Network) CRMs / Registries
- IPAMs, DNS Zone files

OWNED BY PLENTY OF TEAMS

- Network Operations
- Network Architects
- Software Engineers
- SREs
- Security Engineers
- (even sales engineers)
- NOC / Customer Support

Classical incident timeline

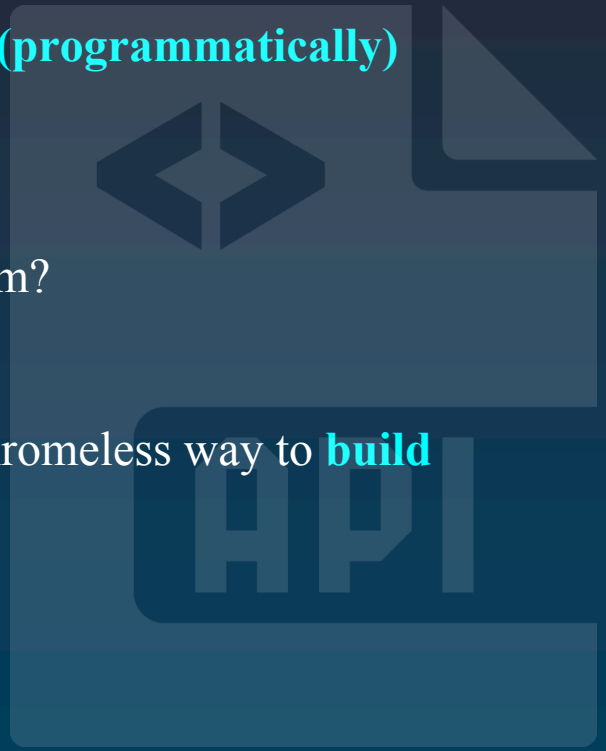


Requirements for a modern flow platform?

- Troubleshooting requires **fast data path IN**
  - Near real time ingest-to-query
- Troubleshooting requires **fast data path OUT**
  - <10s query responses
- We want **full-resolution flows**: aggregation dilutes precious information
  - We also want **history** under the same conditions
- Flow information needs to be **drill-down and drill-out friendly**
  - Ad-hoc explorations need to be fast and uninterrupted
- More importantly, outlines the need for an **automated Anomaly Detection engine** that leverages all of the above.

Automation & downstream usage of flow data

- If your data is useful to other teams **make it (programmatically) available**
- **Automate all the things**
  - provisioning devices in the flow platform?
  - Zero touch provisioning
- Let competent users leverage the data in a chromeless way to **build the features you don't offer yet**
- out-of the box **integrations**:
  ticketing systems, chatops, custom triggers
- **Power real-world SDN** using Network Data as a signal



Requirements for a modern flow platform?

- **Data needs to be portable**
  - Programmatic formats
  - Formats that non-developers understand: pdf reports, CSV/XLS, visualization images

- **API-first** design principle
  "*If the UI shows it, then you can CURL it*"

Scale gets in the way

Back of the enveloppe

Small Network
10 routers,
10Gbps peak traffic,
5,000 fps

Medium Network
50/100 routers,
100-500 Gbps peak traffic,
50-100k fps

Large Network
100+ routers
5-10 Tbps peak traffic
500k-1,000k fps

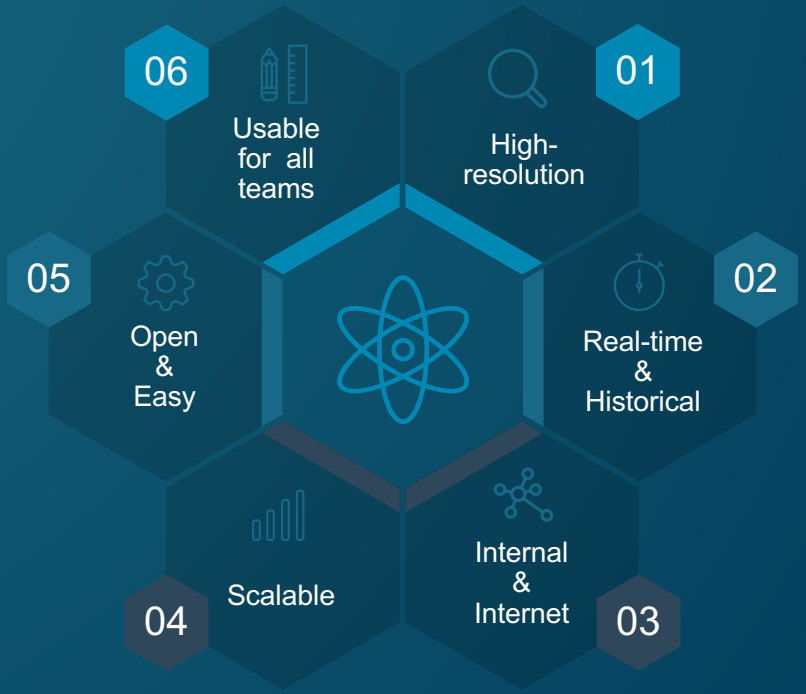
1 FPS = 1 row in store per second

- Query over 50 routers
- Each router doing 1,000 fps
- For a time-range of 1 week

→ pull 30B rows / 15TB
→ reply in <10s

Ingest → Enrich → Store → Query functions all need to scale horizontally

In summary...


06
Usable for all teams
01
High-resolution
05
Open & Easy
02
Real-time & Historical
04
Scalable
Internal & Internet
03

Game of (bad) tradeoffs

- Aggregate to solve
  - for scale
  - Constrained storage (appliance)

- Loss of resolution, Miss signal inside aggregate
  - Keep changing your aggregates to match what you want to see

- Deferred enrichment batch jobs
  - Dodge complexity

- Useful data lags behind, loss of immediate visibility

- Not designed like a BI tool
  - UI is an afterthought

- No drill-downs/out
- Each new view needs be developed, inflexible
- Only NetEng can use

- Flow store using vanilla tech (MySQL, Elasticsearch, Hadoop, Druid…)

- Doesn’t natively speak CIDR
- Fast but no history
- Full but Slow
- Sharding hell

Going beyond the basics.
Contextualizing flow-data.
aka **Enrichment**.

Making data useful: flow enrichment

Vanilla
Netflow v*,
IPFix,
SFlow

SNMP
Interface names/descr
Interface capacity
IP addressing

(MP)BGP
AS Path
Next Hop
VRF/VXLAN MPLS

ENRICHMENT AT INGEST

GeoIP
IP → ASN
ASN → AS Name

Customs
Ports/Protocols
Address Families
Curated data-feeds

Enriched,
Context bearing
Flow record

Making data **super** useful: NEXT LEVEL CONTEXT

1st class citizen, UI supported config

Interface Classification
Inside/outside directionality
Connectivity type
Provider vs Customer

Network Classification
e2e directionality

Customer/Provider tagging
CRM meets flows

Custom AS Groups
Networks w/ multiple ASNs
Private ASNs

Custom Geo
Country groups/Markets
Sub country groups

Curated data feeds, auto-applied

Clouds
ISP Embedded + Self-hosted CDNs
Cloud providers

Threat feeds
Botnets
Infected hosts

Applications tagging
OTT services
Well known Apps

Full on BYOB
Rules matching flow attributes
Mark flows upon match

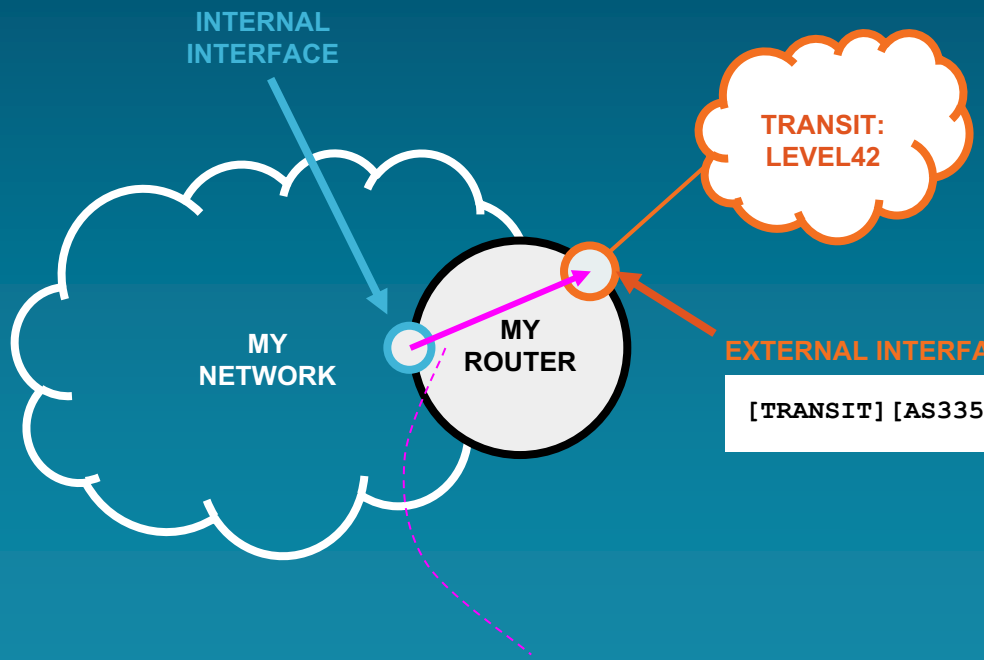
And remember...

- **Enrichment needs to happen at ingest time**
  - Enrichment mappings will sit in memory
  - ...where compute is costly
  - ...you will need to correlate w/ other live streams

- **Cardinality kills !**
  - Enrichment data-feeds can/should map **millions of IPs to large number of values**
  - Don’t **drop at ingest**, don’t **make queries slower**

- **Change frequency kills !**
  - When large #values mapped to IPs keep changing

Useful enrichment: Interface Classification



Enriched flow record: {direction, connectivity, provider/customer}

src_int: {INTERNAL, BACKBONE, n/a}

dst_int: {EXTERNAL, TRANSIT, LEVEL42}

Useful enrichment: Interface Classification

INTERFACE DESCRIPTION (SNMP)

`[TRANSIT][AS33356][Level42][more description text]`

DESCRIPTION MATCH REGEX (Enrichment engine)

`^\[TRANSIT\]\[.*\]\[(.*)\].*$`

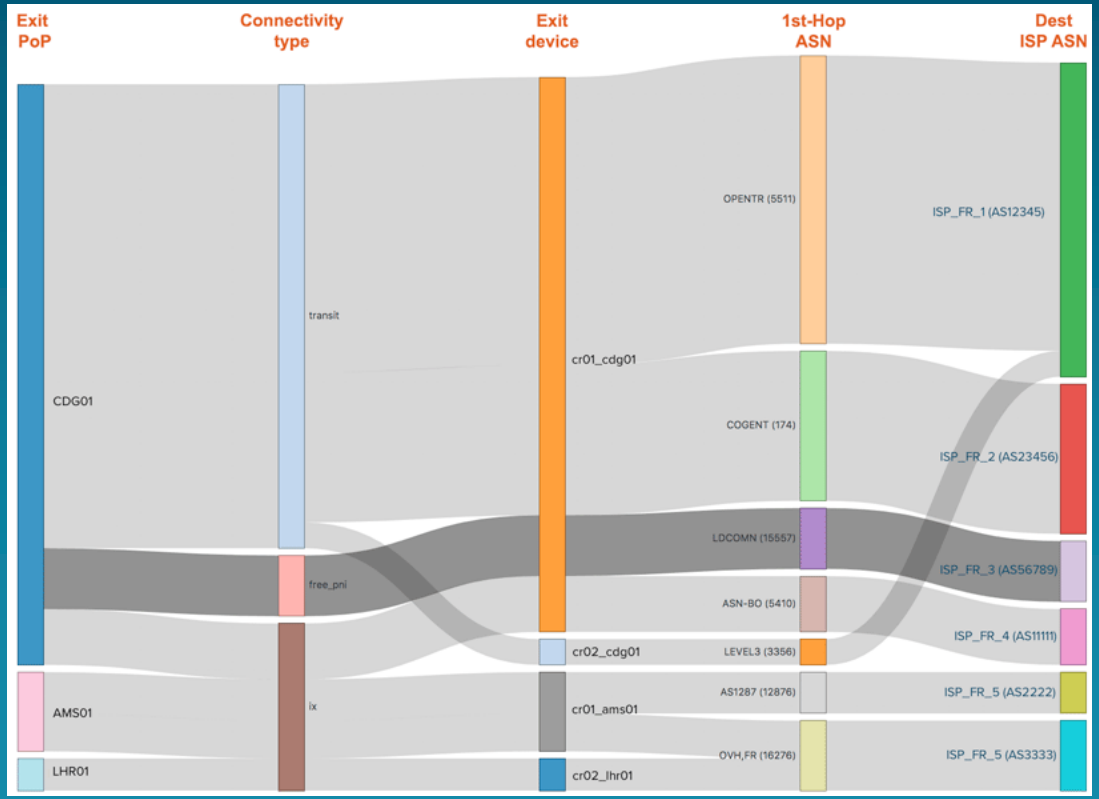
INTERFACE CLASSIFIERS

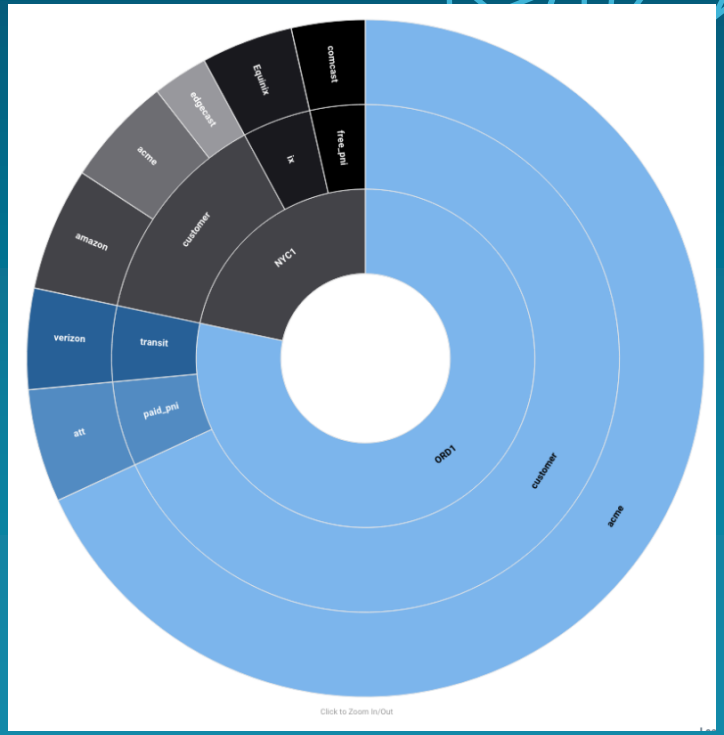
SET INTERFACE NETWORK BOUNDARY: **EXTERNAL**
SET INTERFACE CONNECTIVITY TYPE: **TRANSIT**
SET INTERFACE PROVIDER: **$1** (LEVEL42)

Enriched flow record

src_int: {INTERNAL, BACKBONE, n/a}
dst_int: {EXTERNAL, TRANSIT, LEVEL42}

Useful enrichment: Interface Classification

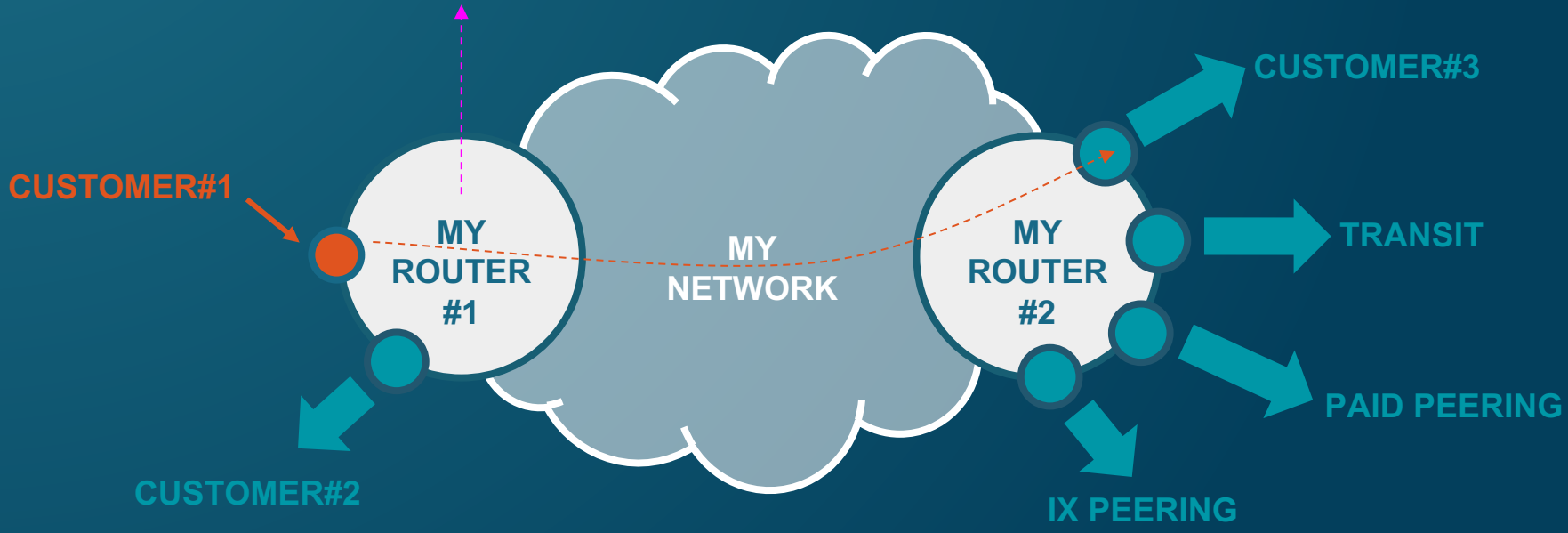




Next:
Future-Proof Network Visibility.

Ultimate Exit Discrimination

FLOW RECORD:
- Ultimate Exit {country, site, device, interface,}: {country, site, MYROUTER#2, customer#3_interface}
- Ultimate Exit Connectivity Type: customer
- Ultimate Exit Connectivity Provider/Customer: CUSTOMER#3



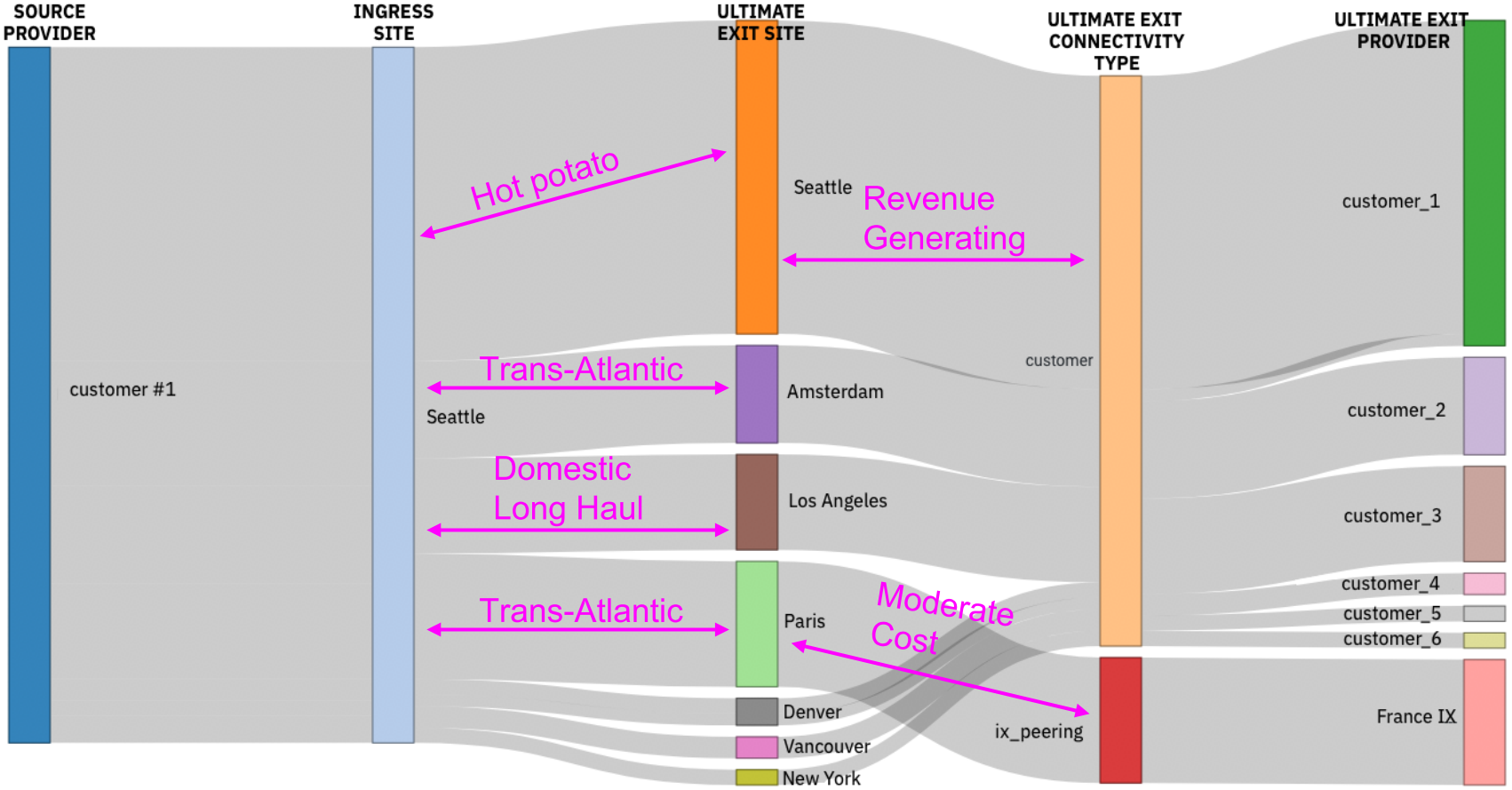
Ultimate Exit Discrimination

- **Hard, because at ingest** - you can't take flow info from the egress and attach it to the ingress ! (time travel…)

- **Ultimate Exit + Interface Classification**
  - Foundation to any **Cost Modelling** activity

- **BizDev / SalesForce freed** from collecting/wrangling spreadsheet data and interrupting NetEng work.

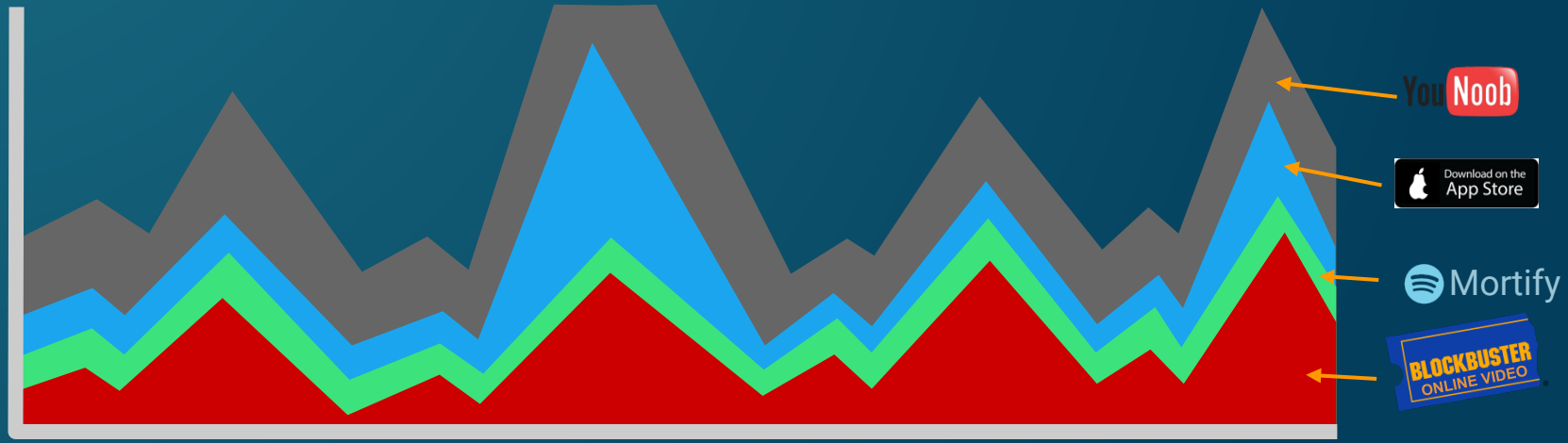
Ultimate Exit discrimination



Ultimate Exit discrimination

$$\$COST = \sum_{connectivity} (\$Mbps \times Mbps) + \sum_{transport} (\$Mbps \times Mbps)$$

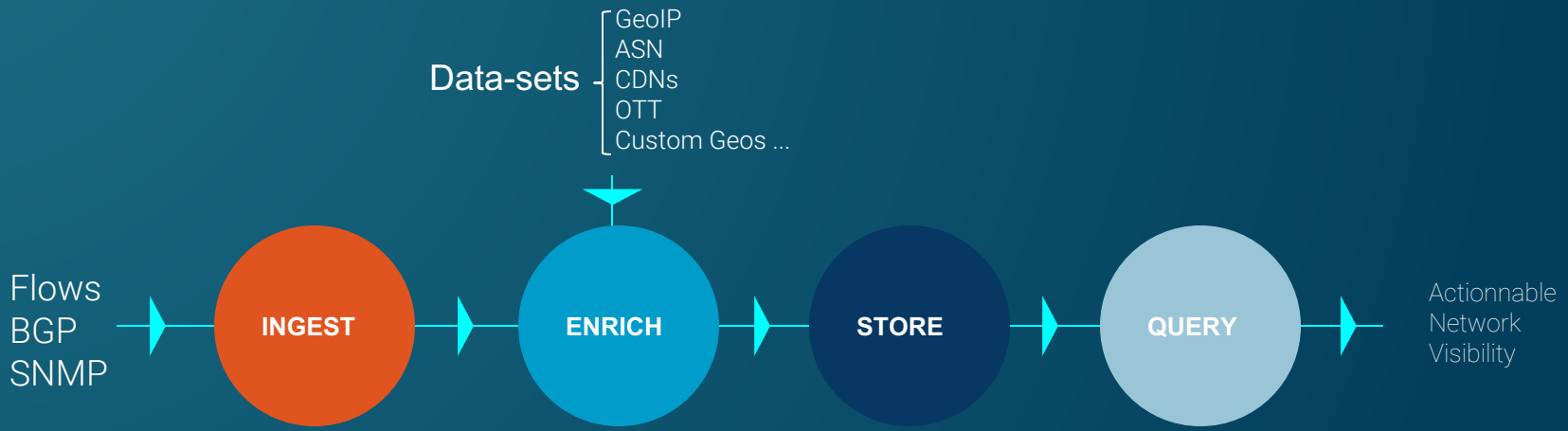
Over-the-Top (OTT) traffic enrichment



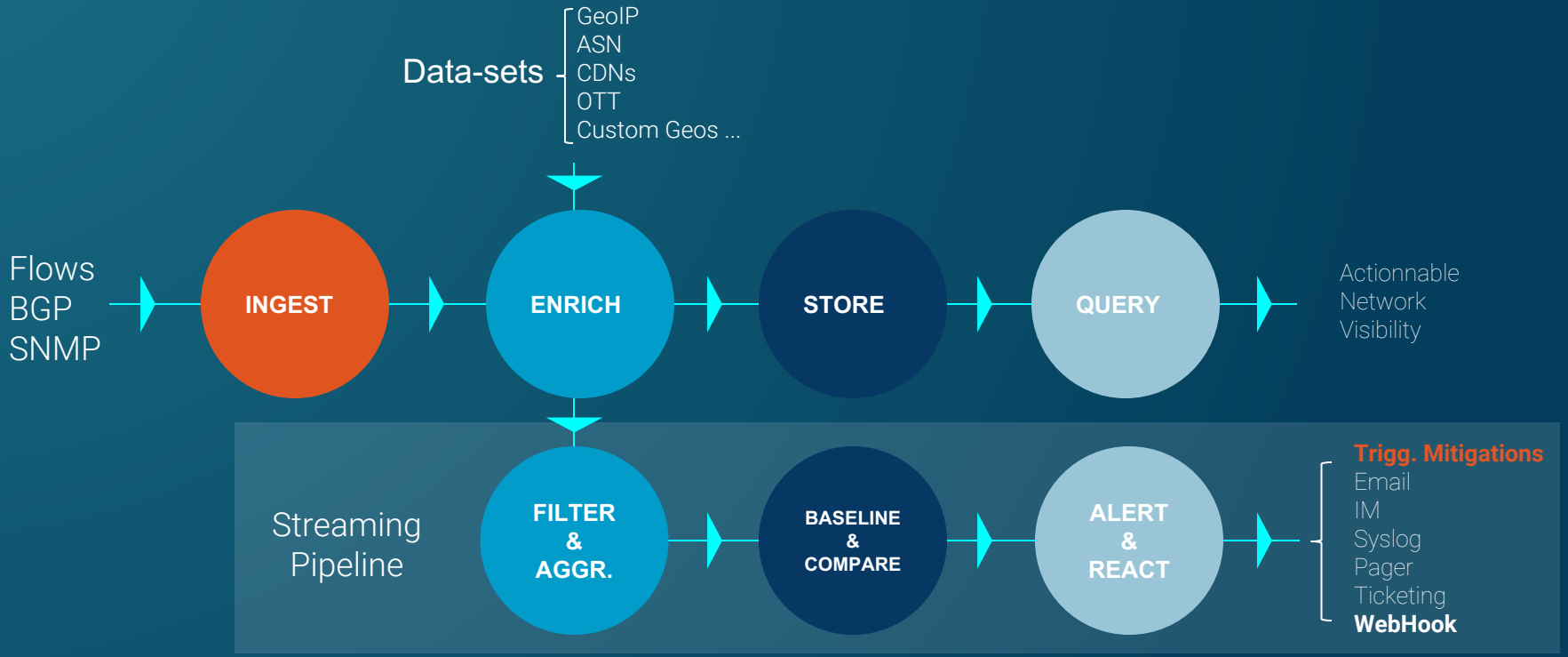
Over-the-Top (OTT) traffic enrichment

- **Hard, but feasible**
  - OTT providers rely on owned infrastructure and CDNs
  - Combine Flows + DNS query data + Curated host patterns
  - Still done near real time at ingest.
  - A high cardinality / frequency flow tagging backend is required
- **Business impact**
  - **Identify** traffic or cache embedding opportunities
  - Additional, **end-to-edd end-user support tool**

Anomaly detection



Anomaly detection



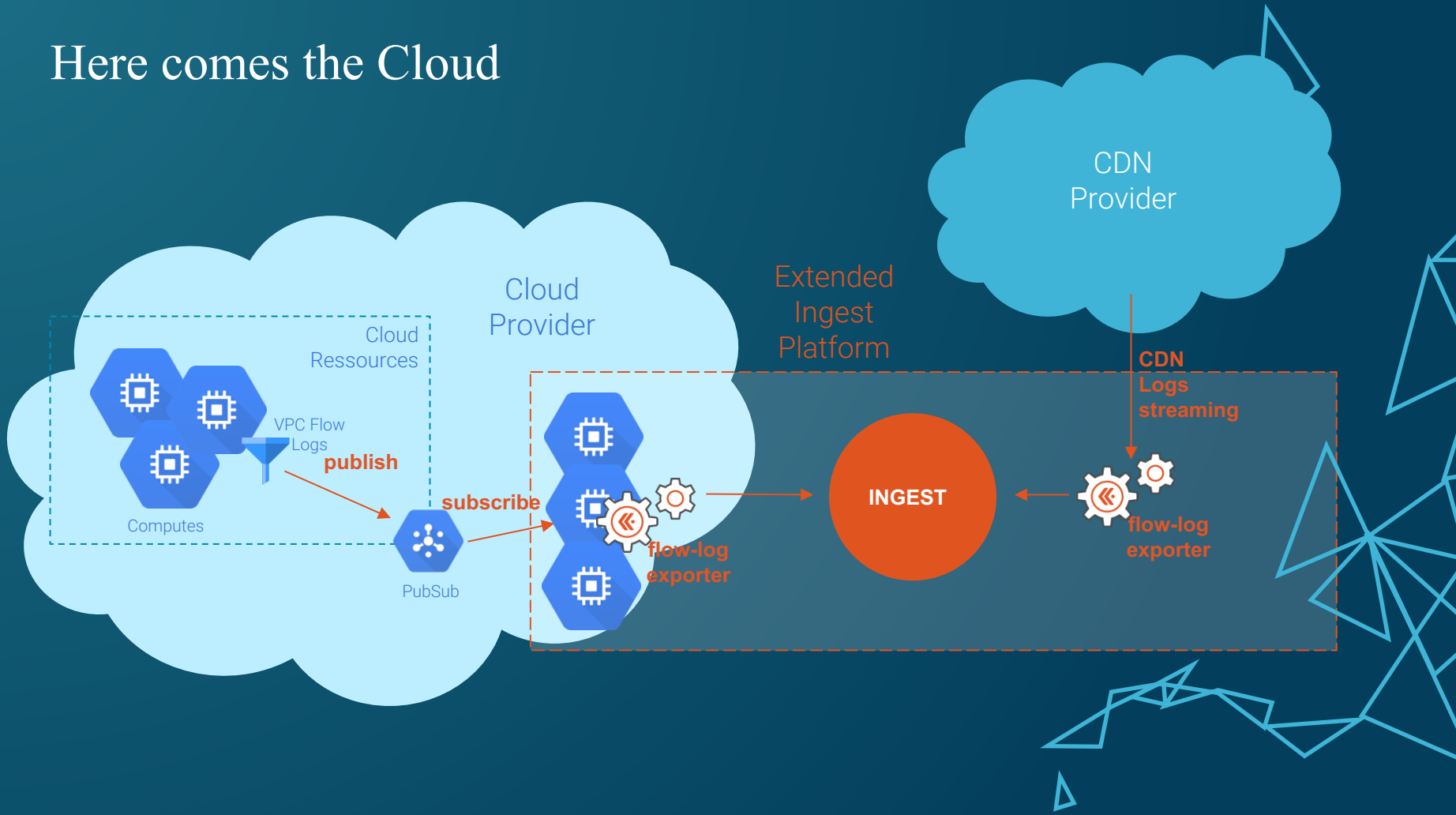
Anomaly detection

- **Leverage your enriched flow data**
  - Baseline flow derived metrics (bps, pps, #unique_ips)
- **Generic Anomaly Detection**
  - Not only DDoS: capacity, {Service, Geo, Subnet} coming in and out of TopN
  - Through the lens of this enriched data (connectivity type, customer identification, any custom dimension…)
- **Tee the ingested data** into a real-time system

Here comes the Cloud

- **Hybridization of production environments**
  - Network Infrastructure
  - Native Apps
  - Building Apps in the cloud
  - Consuming Cloud Apps
  - Also using CDNs
- **New dependencies**
  - Internally hosted platforms break because of external components, vice-versa
- **Loss of global context**
  - No end to end visibility
  - Inability to baseline and track performance for migrating apps to the cloud
  - We’re re-silo’ing visibility !!!

Here comes the Cloud



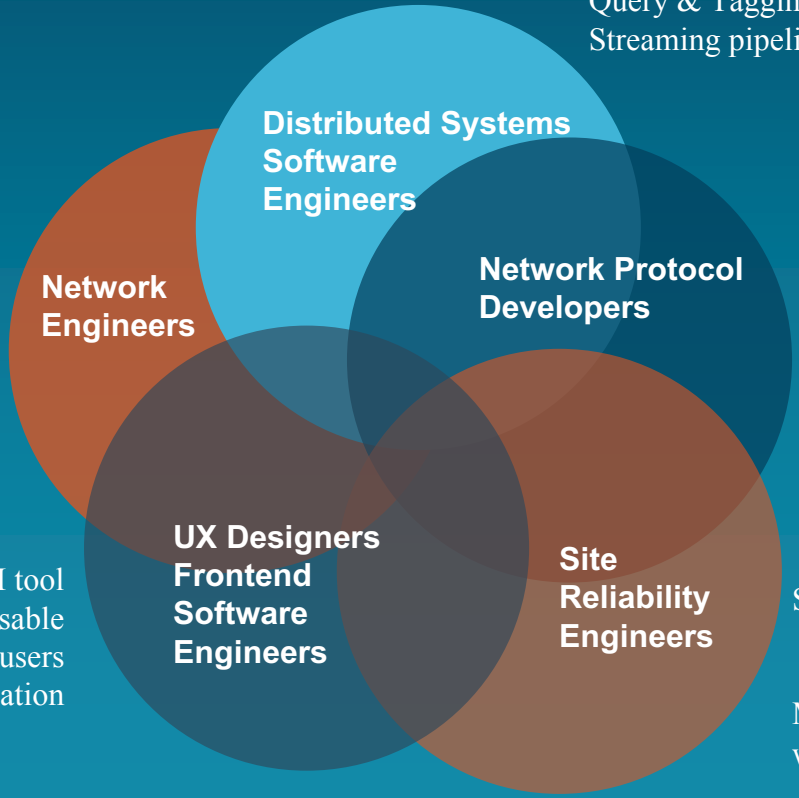
Once this is all built

- An increasing number of users rely on it
- Your Network Automation relies on it
- Tenants rely on it
- It drives some of your business
- Your monitoring/alerting depends on it

Congrats.
Your Modern Network Visibility Platform is now **business and ops critical.**

Should we do it ourselves?

Horizontal scalability
Distributed Enrichment Ingest
Custom Flow Datastore
Query & Tagging Engine
Streaming pipelines



Field experience of
Production Networks to fuel
the other groups involved

Speak/Code *flow
Sampling
Templates
(MP)-BGP daemons
SNMP collectors
Programmable mitigations

Build a specialized BI tool
Make the UX composable
Enable producer/consumer users
Data-visualization

Support fast/iterative
Build
Deploy
Make all of the above
work reliably

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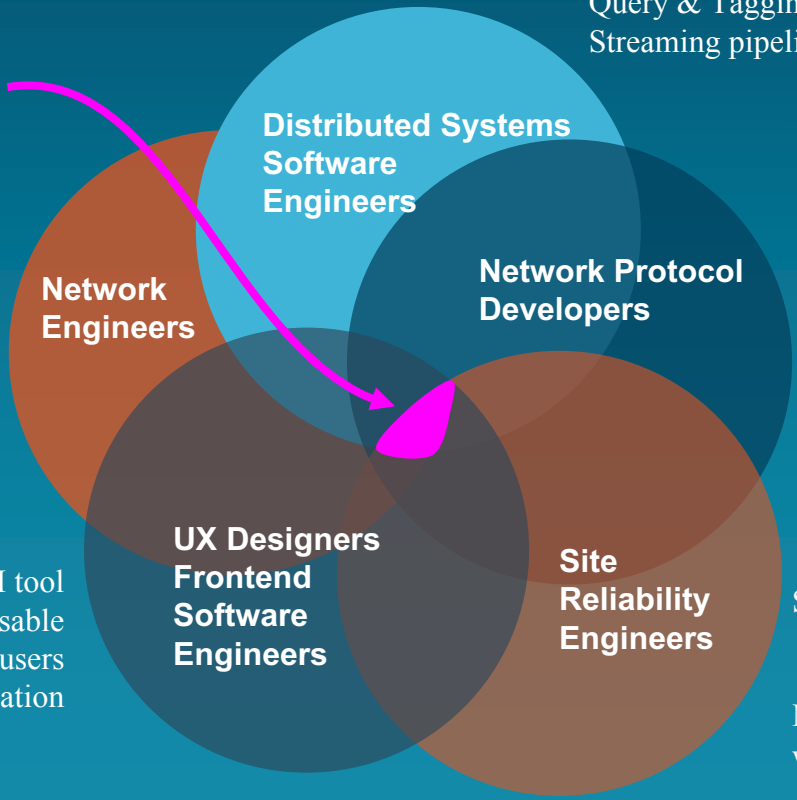

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THANK YOU.

QUESTIONS?

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Easily, the world's most powerful network analytics.