The Road to an Open Internet is Paved With Pragmatic Disclosure & Transparency Policies

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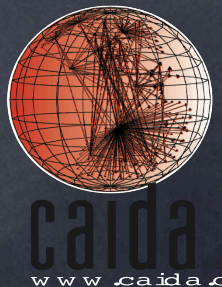erin@caida.org

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Roadmap

- **(1)   Motivation**

- **(2)   Catalyst- Broadband Network Management D&T policies**

- **(3)   Coordinator Tool for D&T Interventions**
  - **Transparency reports - MBA**
  - **Edge measurements- net.info**

- **(4)   Applying Coordinator to Use Contexts**
  - **Packet loss (narrow-ended, specific)**
  - **Social Aspirations (open-ended, general)**
- **(5)   Conclusions**

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(1) Motivation

- **Context transition** from legacy telecomm to Internet
  - <u>Tech</u>:   legacy POTS$\rightarrow$ "Internet as new PSTN"
  - <u>Econ & Law</u>: legacy reg & stakeholders $\rightarrow$ market-based reg + new interests
  - <u>Society</u>: public policy interests remain
  - <u>Interdependencies</u>: FCC OIO – new framework challenge
- **Health BB ecosystem needs Informed decisionmakers $\rightarrow$ Info Sharing is prereq** to effective markets and regulation
  - Stakeholders' info needs vary, info is costly to collect and share, and info that matters for decisions has strategic value.
    - <u>Consumers</u>: BB & CAD services
    - <u>CAD providers</u>: BB access options to position goods & services
    - <u>ISPs</u> (BB): network design & provisioning
    - <u>Regulators</u>: BB access options & CAD practices to design & enforce
  - **E.g**. informed consumer- switch provider- price competition
  - **E.g**., >> BB performance connection data $\rightarrow$ threaten subscriber privacy $\rightarrow$ increase network vulnerability

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(1) Motivation: D&T critical to Internet Economics

- **Info sharing for market & reg efficiency = info economics problem**
  - Complex , dynamic value-chain (markets, rights, architecture) with many blurred/overlapping vertical and horizontal relationships
  - Shared infrastructure ➔ cost recovery issue ➔ Strategic (divergence: private incentives v. collective welfare)
  - Asymmetric, imperfect info issues everywhere (market power abuses, coordination failures)
- **Disclosure & Transparency Policies are key tools to address**
  - How? Facilitate incentive-compatible info sharing among market participants.
  - Why? Informed decision-making, evidence-based policy, credible enforcement.
  - Who? Everyone. Buyers/Sellers/regulators

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(2) Catalyst- Broadband Network Management Policies

- **OIO D&T provisions** play central role: '10 OIO – struck down, *except* for D&T. Court recognized authority of FCC to issue such rules (all else potential wobblers)

- **Includes** : info disclosure obligations, performance measurement and reporting platforms and practices, & processes for enabling multi-stakeholder participation in decision-making
  - Interpretation & implementation challenges
  - Induce intervention tools

- **Range of D&T intervention tools:**
  - FCC orders and consent decrees
  - transparency & market research reports
  - consumer complaints
  - Emergent capabilities: edge measurement tools (*net.info)*, adapt models such as the Key Facts Indicator, ISP Censorship Transparency Reports, FCC NORS reporting

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(2)Catalyst- D&T Policies

- **2015 OIO hybrid nature** = source of authority + seeds of dispute re: info sharing
  - <u>Principles</u>: flex, universality, discretion v. application ambiguity, outcome uncertainty, ex-post remediation
  - <u>Rules</u>: ex-ante compliance specificity, certainty v. rigid decisions, less adaptable to evolving markets & tech
- **Provides raw materials for D&T policies, NOT a blueprint for how** applied to the myriad network management scenarios and considerations
- **Bright Line**
  - ISP Transparency of *Performance, Practices, Terms*
  - Disclosure process for *Safe Harbor* compliance
  - *No traffic blocking, throttling, or paid prioritization* of lawful content, applications, services, or devices for BB access
- **Light Touch**
  - *General Conduct Standard* prohibits practices that unreasonably interfere with or disadvantage Consumers or Edge Providers;
  - *Reasonable Network Management exception*
- ***BOTH* have decision, application and evaluation gray zones that warrant intervention tools to address ambiguous and emergent interpretations**.

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(2) Catalyst- D&T Policies

- **E.g., Fading bright lines**
  - OIO requires specific and detailed performance disclosures for users and edge providers (actual speed, latency, packet loss)
  - Performance metrics are far from standardized or settled
  - OIO does not indicate HOW loss should be measured or THAT diff loss measurement methods yield diff answers
- **E.g, Internet traffic exchange not-so-forbearance**
  - OIO explicitly forbears application interconnection, BUT FCC retains discretionary authority to govern interconnection via prohibition on unjust and unreasonable practices standard (caseXcase)
  - QoS degradation: owing to users w/ Gpbs packet binging OR ISP nudging for surcharge/higher tier?
  - Is throttling protected IA/RNM or discoverable artificial congestion?

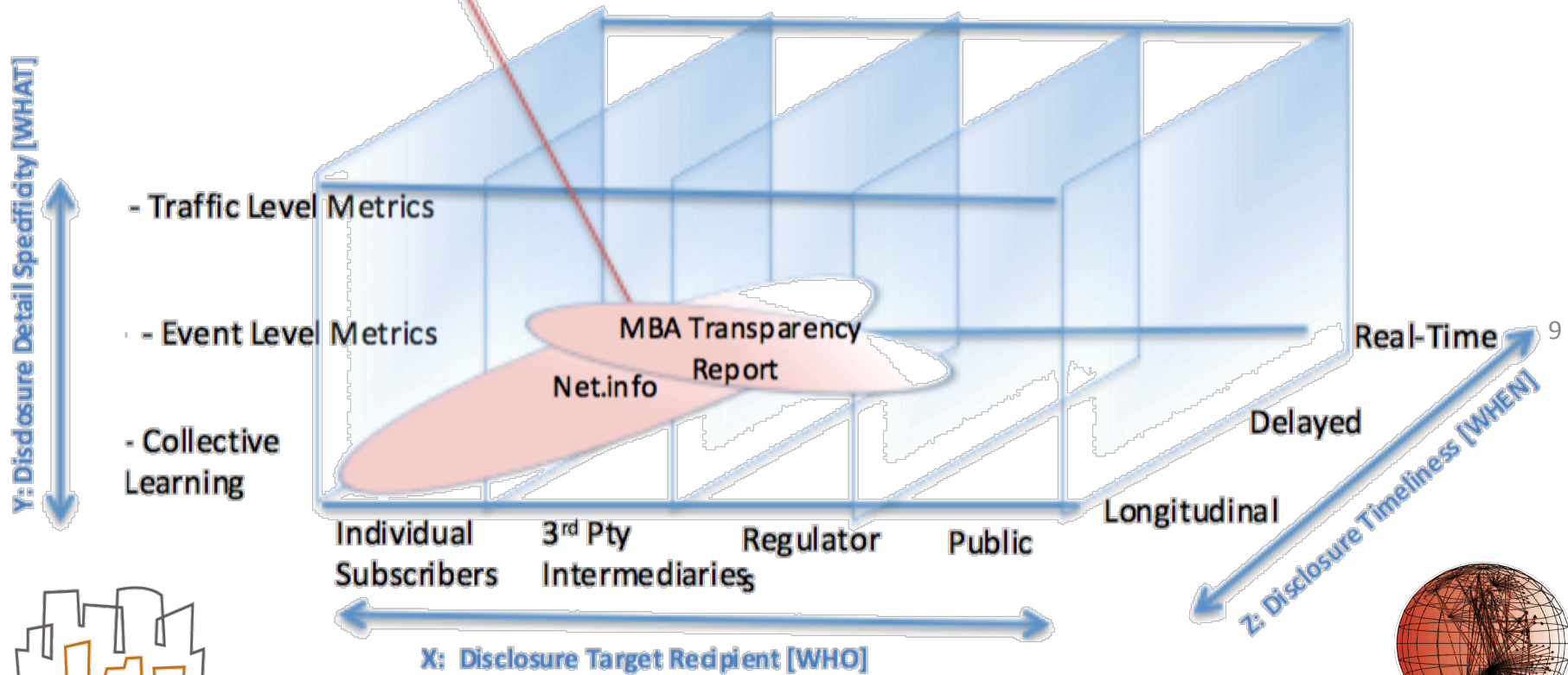# (stated differently) (2) Catalyst- D&T Policies

- **All D&T issues involve costs and are strategic**
  - Information use and sharing is costly.
    - Information Economics 101: decision-making involves costs…
    - Direct costs: data acquisition, distribution, management
    - Indirect costs: impact on market outcomes shift payoffs (e.g., competitive advantage, effectiveness of regulatory constraints, price discrimination, ..). Potential to shift pay-offs in predictable ways renders D&T strategic.
  - Have to consider incentives of participants for truthfulness
- **Consequently, D&T is context-dependent (and hence nuanced)**
  - "Why? What? Who? How?" : what is the information sharing *game*? Need to understand who the actors are, what rules constrain their actions, how do payoffs depend on actors choices?
- **Markets & regulation need to be practical!**
  - FCC OIO tools important, but not sufficient.
  - Market-based mechanisms interact with and complement OIO

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(3) Coordinator Tool for D&T Interventions

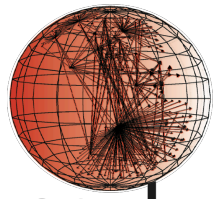Disclosure Interventions @ intersecting dimensions

Visual model to conceptually :
- Compare interventions according to a diversity of questions raised by D&T policies
- Evaluate how multiple tools might address those questions

Y: Disclosure Detail Specificity [WHAT]

- Traffic Level Metrics

- Event Level Metrics

- Collective Learning

MBA Transparency Report

Net.info

Real-Time

Delayed

Longitudinal

Z: Disclosure Timeliness [WHEN]

Individual Subscribers

3rd Pty Intermediaries

Regulator

Public

X: Disclosure Target Recipient [WHO]

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(3) Coordinator Tool for D&T Interventions

- **Need multiple D&T to address knowledge gaps**
  - Various sources of BB mgmt information
  - value of existing sources
  - impact on stakeholders
  - how to improve info asymmetries (correct or find new sources),
  - how to integrate and share the information
  - what intervention strategies effectively protect Internet openness, promote innovation and investment.
- **Little consensus on best-practices for BB net management**
  - Are traffic level metrics to individual subscribers >/< effective than collective learning disclosure strategies?
  - What's the relative effectiveness for consumer protection between disclosure to regulators and disclosures to the public or 3rd parties?
  - What is a successful strategy for measuring congestion?
- **Ultimate issue:** whether stakeholders <u>have the info</u> they need and <u>trust in provenance</u>; no one-size-fits-all approach given the 5 D&T Policies and application discretion

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(3) D&T Interventions- Transparency Reports

- **Measuring Broadband America (MBA)**
  - Participating ISPs eligible for safe harbor compliance with the OIO transparency requirements
  - **D&T profile**:   traffic level data and event level measurements (WHAT-axis); primarily targeted for the FCC and 3rd party (WHO-axis); results in periodic (delayed) reporting of results (WHEN-axis)
  - **What it accomplishes**:
    - **(a)** specificity meets Safe Harbor and reduces regulatory uncertainty for ISPs
    - **(b)** network effects and accountability among ISPs, may enhance data quality, metrics consistency and reporting standards
    - **(c)** better informed technique comparison (apples::apples)

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(3) D&T Interventions – Edge Measurement Tools

- **Net.info:** technical communication channel for ISPs to direct customer-specific info to enhance edge-measurement capabilities
  - **a)** performance chars (user up/download speeds, data caps); **b)** practices (network management info, security/threat notification); **c)** commercial terms (privacy policy changes, © alert system notification)

- **D&T profile:** event- and collective learning- level metrics (WHAT-axis), across stakeholder spectrum, for individual consumers and 3rd party researchers (WHO-axis), in real time (although aggregation for longitudinal data as well) (WHEN-axis).

- **What it accomplishes**
  - Trusted : resilient to spoofing, phishing, privacy preserving, reliability, etc.
  - Decentralized & voluntary
 - Efficient mechanism (lt wt, low $)
  - Automation Capable

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(4) Applying Coordinator to Use Contexts – Packet Loss

- **Spoiler Alert:** : specific edge measurement intervention is more effective than a type of transparency report in disclosing certain required performance metrics and practices (loss, security) because of the level of detail, timeliness and targeted recipient.

- **(A)   MBA**
  - **D&T profile**: What: traffic-event; Who: FCC-3rd pty; When: delayed
  - **Deficiencies**

    (a) different measurement methods for loss may give very different answers ("loss" as UDP/ICMP/VOIP packet; down/upload speed and latency under load)

    (b) loss depend on other network performance (how TCP is managed, which ISP don't control)

    (c) released 1x/yr for 1mo period

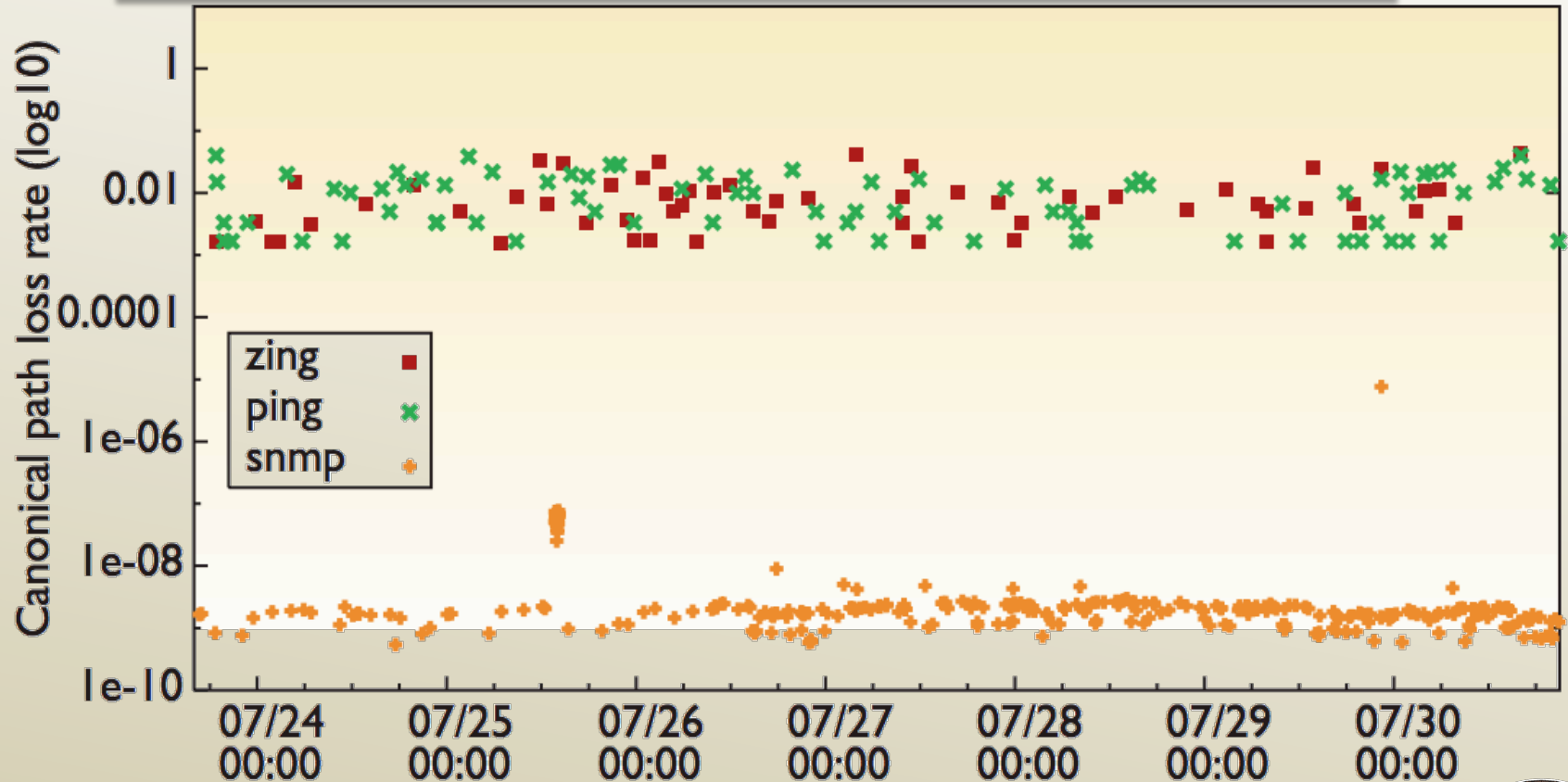   **(d)** not just active msrmt, router interface   IMAGE→

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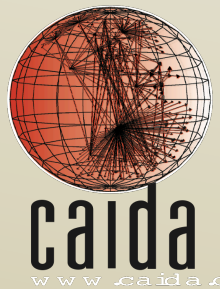
(4) Applying Coordinator to Use Contexts- Packet Loss

Comparable routes loss rates from router interface v. active probes

http://pages.cs.wisc.edu/~pb/intcomp_final.pdf

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(4) Applying Coordinator to Use Contexts – Packet Loss

(B) Net.info

- **D&T profile**: WHAT: event- and collective learning- level metrics; WHO: across the spectrum of stakeholders, primarily individual consumers and 3rd party researchers; WHEN: real time/longitudinal

- **Advantages**

  - enable testing tools, eg, FCC's measurement devices & crowd-sourced *speedtest.com* to automatically collect accurate service detail

  - could enhance regulatory & end user monitoring of BB performance.

  - enhancing Internet security, >>reduce response time between infection ID'd and remediation

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(4) Applying Coordinator- Internet Aspirations

MBA

* Strengthen trust among collective subscribers (supported by FCC)

*Translating N2H concepts (QoE)

* Reducing conflict b/t stakeholders

* Social level autonomy

* Econ efficiency

Net.info

* Engender consumer trust (corroborate/refute ISP data)

* Independence facilitate collective learning

* Reliability: consistency & accuracy issues

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(4) Applying Coordinator to Use Contexts – Internet Aspirations

- **D&T profile for Aspirations**: likely collective learning (WHAT), and engage all stakeholders (i.e., all types of disclosure recipients, WHO), and at all time-scales (i.e. real to longitudinal in the WHEN).

- **MBA** reports focus on longitudinal, mid- to fine-grained data for regulators or third party intermediaries could be assistive in strengthening trust among the collective subscribers viz-a-viz third party research reporting. Those contours however would not make for progress in stewarding network-to-human-layer concepts like QoE, ameliorating conflicts between stakeholders, or impacting social level autonomy or economic efficiency.

- **net.info** that can in more real time and directly enable communication with individual subscribers and third party analysts may also engender consumer trust by allowing corroboration or refutation of ISP discretionary disclosures. Because of the independent nature of it's design, it also portends a stronger likelihood of being embraced as a disclosure mechanism by those same stakeholders, which is a necessary prerequisite for the high level collective learning that underpins the *aspirations* challenges.

(5) Key Conclusions…

- **(1) Multiple tools necessary** -- Nuanced & Practical
  - For context-dependent & strategic
  - **No one-size-fits-all** works all situations (incentives, transaction costs, etc.)
  - **Trust**: diversity of control, perspective (no silver bullet trust source)
  - **Imperfect Info**: efficient search, learning (don't know where info is)
  - **Robust**: failure tolerant
- **(2) FCC Policy Mostly good**
  - OIO asserts obligation, but leaves details to market
  - Multiple Interventions (reports, process, measurement, etc.)
  - Work w industry, Retain stick
- **(3) Edge-based metrics**
  - For end-to-end
  - Incentives (edge control), flexible/dynamic (min. coord required)
  - Distributed, Decentralized (Voluntary), automated

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