11:50 - A Glimpse at the Future

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Research

Projects,
New Technologies

Development

Prototypes,
Products

Education

Students,
Politics,Ph.D.

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Research for Practice

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Standardization - IETF

RFC 7999

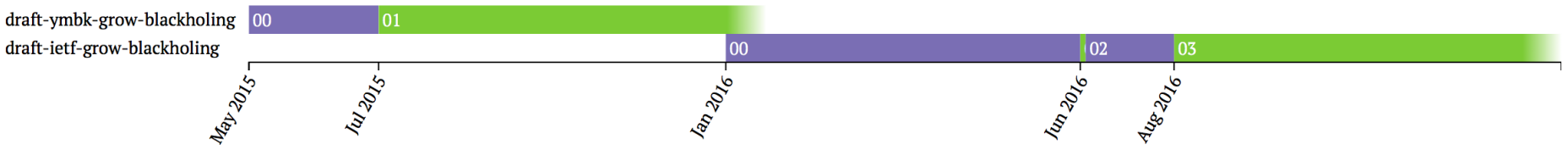
- Standardized signaling of blackholing
- 65535: reserved ASN
- 666
- NO_EXPORT / NO_ADVERTISE

BLACKHOLE BGP Community for Blackholing

draft-ietf-grow-blackholing-03

Document | IESG evaluation record | IESG writeups | Email expansions | History

Versions 00 01 02 03



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Current Research Projects

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ENDEAVOUR

- Towards a flexible software-defined network ecosystem
- Goal: Bringing SDN to the Inter-domain settings
- Results are open access
- **Prototype** up & running on software

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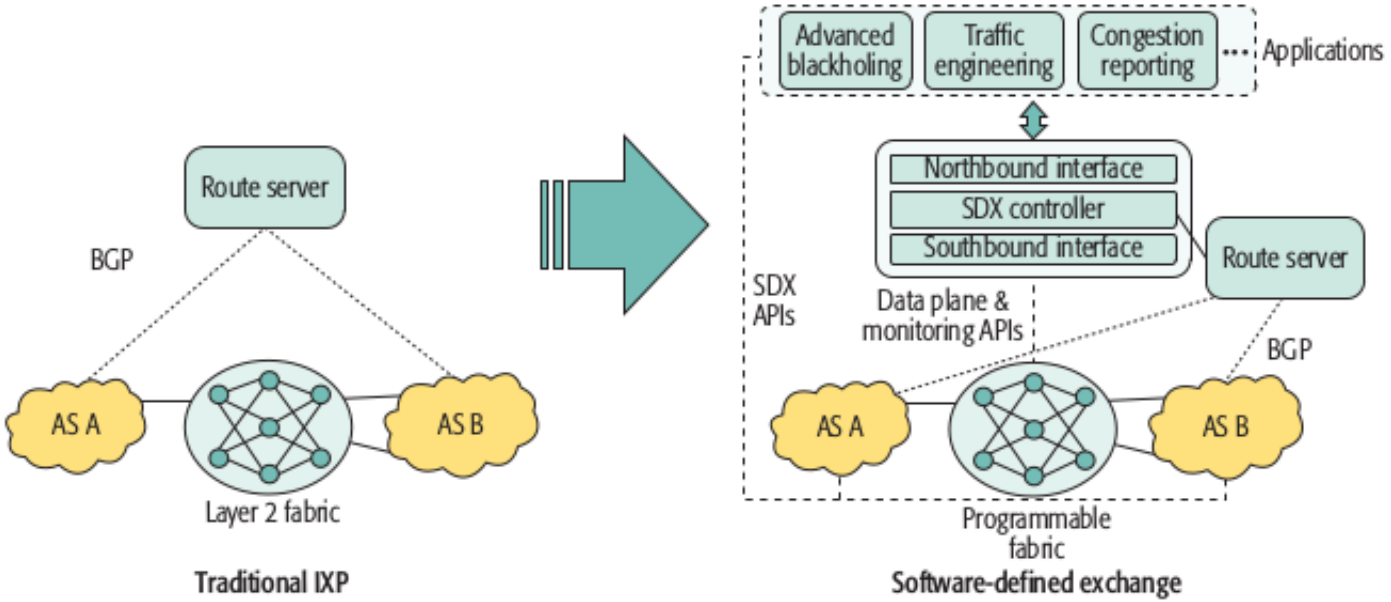

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Detecting Peering Infrastructure Outages in the Wild

Detecting Peering Infrastructure Outages in the Wild

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ABSTRACT

Peering infrastructures, namely colocation facilities and Internet exchange points, are located in every major city, have hundreds of network members, and support hundreds of thousands of interconnections around the globe. These infrastructures are well provisioned and managed, but outages have to be expected, e.g., due to power failures, human errors, attacks, and natural disasters. However, little is known about the *frequency* and *impact* of outages at these critical infrastructures with high peering concentration.

In this paper, we develop a novel and lightweight methodology for detecting peering infrastructure outages. Our methodology relies on the observation that BGP communities, announced with routing updates, are an excellent and yet unexplored source of information allowing us to pinpoint outage locations with high accuracy. We build and operate a system that can locate the epicenter of infrastructure outages at the level of a building and track the reaction of networks in near real-time. Our analysis unveils four times as many outages as compared to those publicly reported over the past five years. Moreover, we show that such outages have significant impact on remote networks and peering infrastructures. Our study provides a unique view of the behavior of the Internet under stress that often goes unreported.

CCS CONCEPTS

• **Networks** → **Network components**; **Network measurement**; **Network structure**; **Error detection and error correction**;

KEYWORDS

Outages, Colocation, Interconnection Facilities, IXP, Peering, BGP, Resilience

1 INTRODUCTION

Today, our economy as well as our social life rely on the smooth and uninterrupted operation of the Internet. While the Internet has shown an amazing resilience as a whole, even short outages can have a significant impact on a subset of the Internet user population. Past major Internet outages have been studied in depth, including outages due to network component failure, e.g., hardware, software, and configuration failures in routers [91], optical layer outages [44], natural disasters [25, 28, 35, 53, 78], and nation-wide censorship [28, 29, 77]. Most of these events affected either individual networks or entire regions. This can be attributed to the fact that the Internet's architecture used to be quite hierarchical. Thus, most *local outages* were expected to have a *local impact*.

During recent years the Internet infrastructure has changed significantly, a phenomenon that is referred to as the "flattening" of the Internet's hierarchy. In this setting, the majority of Internet inter-domain traffic flows *directly* between edge networks, bypassing transit providers [58]. For example, eyeball networks reduce their transit costs and improve end-to-end performance [40, 46] by directly peering with content providers, content distribution networks, and cloud providers, which are now a major source of traffic [32, 43, 76]. Direct peering is enabled by *third party peering infrastructures* (also referred as carrier-neutral peering infrastructures), such as *colocation facilities* and *Internet Exchange Points* (IXPs). These infrastructures are increasingly deployed in cities around the globe [47] and their members are growing constantly [57, 63], supporting millions of peerings [93].

Given the high concentration of peerings established at colocation facilities and via IXPs, many government bodies consider them critical infrastructures [31, 38, 60, 89]. Unfortunately, little is known

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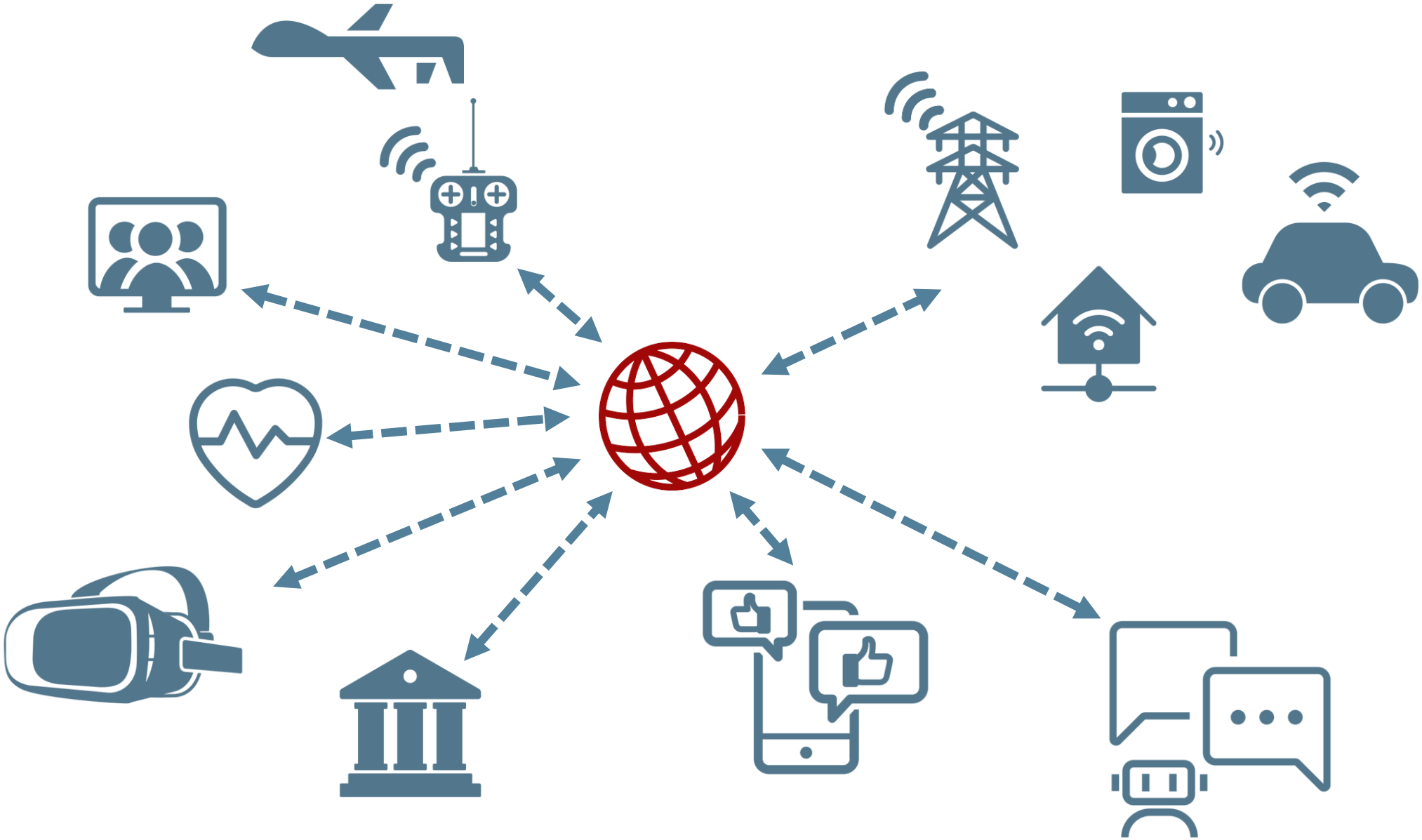

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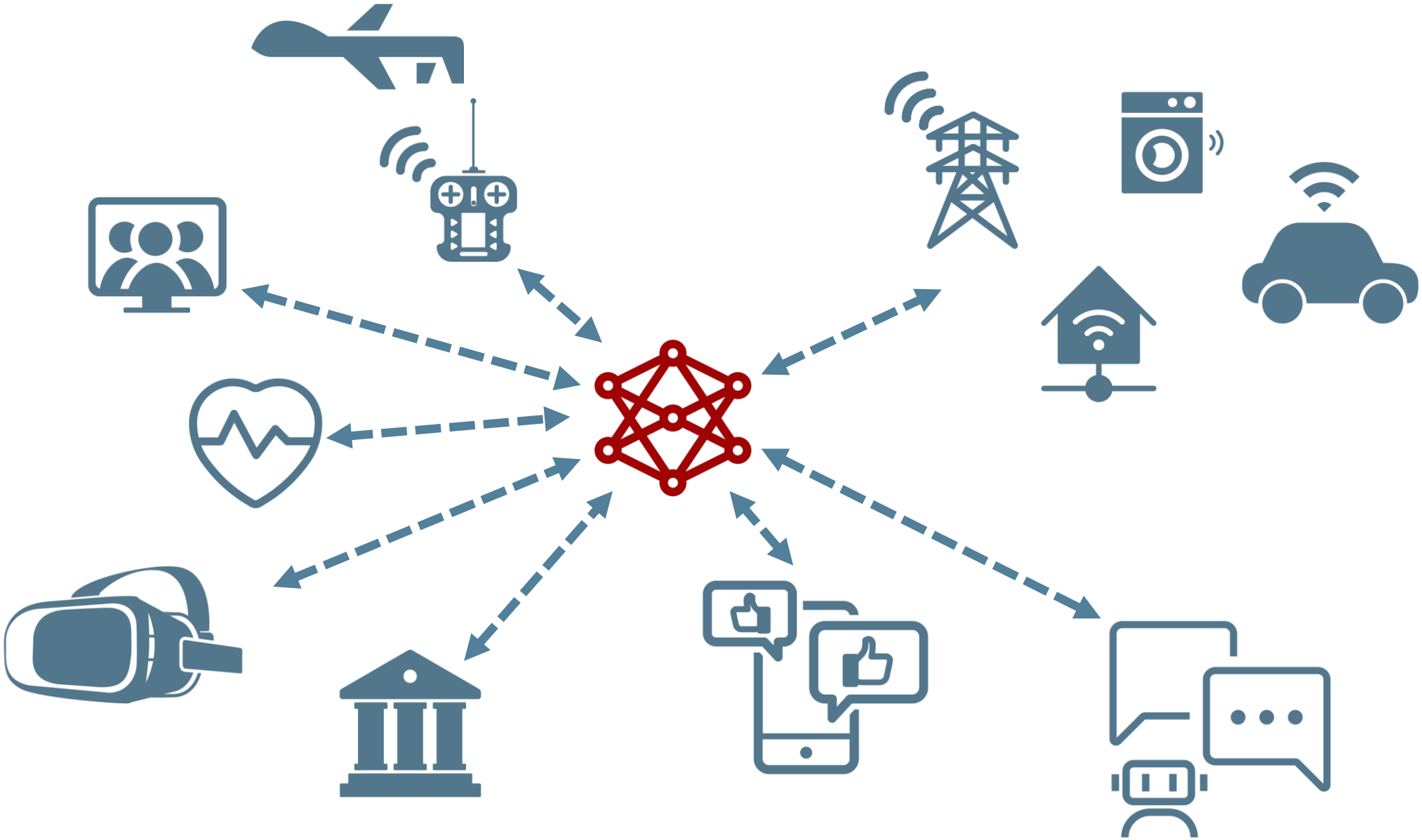

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Thank you!

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