

# **Site Multihoming**

## **Examining Site Multihoming in Finnish Networks**

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# Site Multihoming

## Contents

- Cover and contents (2 slides)
- Introduction (2)
- The problem statement (1)
- Methodology (1)
- Results (2)
- Own work (1)
- Conclusions and future work (1)

2+8 slides total

# Introduction (1)

## Terminology

### □ Multihoming

- connecting to more than one ISP simultaneously
- for redundancy, independence or whatever reasons

### □ Site multihoming

- end-site, like an enterprise, multihoming
- ie. network multihoming, not single node or whole ISP

### □ More specific route (with different path)

- someone advertising e.g. 193.166.0.0/16 (the less specific)
- someone else advertising e.g. 193.166.1.0/24 (the more specific)
- all traffic to 193.166.1.0/24 will go to the latter

# Introduction (2)

## Motivations for multihoming

### Independence

- not locked in with one ISP
- no renumbering if you change ISPs

### Redundancy

- not affected by different failures (link, router, ...)

### Load sharing

- inbound and outbound traffic balancing

### Performance

- possibly different requirements etc. for heavy/light traffic
- e.g. VoIP with low latency/jitter with one ISP, bulk on the other

### Policy

- administrative reasons, such as separation of research/commercial traffic

# The problem statement

## Problem

- The extent and methods of IPv4 site multihoming are not clear
  - describe the background and the techniques
  - so, explore how it's done!
  
- There are no solutions for IPv6 site multihoming
  - due to most IPv4 techniques being unscalable
  - same mechanisms do not apply
  - new mechanisms have been proposed but there is no consensus
  - so, apply the observations learned from IPv4
    - analyze IPv6 mechanisms
    - create a model how to classify organizations and their requirements
    - based on that, suggest a roadmap on which mechanisms to pursue

# Methodology

## Methodology

### □ Literature

- reading a lot of RFCs, drafts, documents, etc.

### □ Operational experience

- routing design etc. at Funet for 2+ years
- participation in various IETF, RIPE, etc. working groups

### □ Collecting of routing data in FICIX for 6+ months

- analyze route advertisements for different types of multihoming
- also short analysis of the trend in 6 months

### □ Query to major Finnish ISP's

- ask about questionable advertisements and multihoming practises

# Results (1)

## Results - IPv4

- 3-4 different types of site multihoming
  - having an AS number and address space
  - advertising a more specific route from different path
  - multi-connecting to single ISP
  - the use of NAT for multihoming
- Relative popularity
  - the first two about equally common
  - the third difficult to measure, but common
  - the fourth in some use, difficult to measure
- Generic routing information
  - 1661 prefixes announced, from /14 to /32
  - 50% of prefixes /24, which are 1.7% of the advertised space
  - 13% of all routes are more specifics
    - during 6 months, over 50% increase, only a fraction removed

# Results (2)

## Results - IPv6

### □ Analysis on Methods

- a lot of issues in many of them
- most depend on multiple addresses in every node from different ISPs
- details omitted

### □ Classification of organizations

- types: small, minimal, large, international
- possible requirements: independence, redundancy, load sharing
- which reqs seem to be needed recorded in a matrix

### □ Choosing the multihoming mechanism

- classify the solutions as immediate, short term and long term
- don't consider long term solutions here
- describe which mechanisms fit for each organization type

# Own/other work

## Own/other work

- Other: some background mostly
  - most multihoming motivations, some terminology
  - background knowledge on BGP, addressing, etc.
  - site multihoming mechanism specifications themselves
  - should be more..
- Own: the rest of the 80 pages :-)
  - route advertisement data collection, processing, etc.
  - formulation of site multihoming scalability problem
  - constraints in IPv4 and IPv6 when defining the mechanisms
  - one IPv6 multihoming mechanism
  - categorization and presentation of route advertisements
  - gathering the information by other means
  - IPv4 classification of organizations
  - analysis of IPv6 site multihoming mechanisms
  - classification to organization and requirements
  - methods for choosing the multihoming mechanism

# Conclusions

## Conclusions

### □ IPv4 site multihoming

- done with 3-4 mechanisms
- most of them architecturally unscalable

### □ IPv6 site multihoming

- lots of solutions, no consensus how to proceed
- a roadmap presented in the thesis
- a few short term mechanisms need a bit of work
- a lot of long term mechanisms to be researched
- aiming for architecturally good approaches

### □ The world is not ready yet :-)

## Future work

### □ A lot of it, as always

- Extending based on the thesis
  - 12 paragraphs worth of ideas
- Short term work on IPv6 site multihoming
  - also a lot :-)