Internet Daemons

Network Optimization & Communication Rights
Who am I?

Associate professor in Information and Communication Technology Studies at Concordia University in Montreal, Canada

Research focuses on the politics and policy involving algorithms and software as infrastructure

Active policy engagement focused on telecommunications, privacy, artificial intelligence, and disinformation
Open Access

The book is open access thanks to the support of Concordia University
YouTube, Netflix Begin Slowing Services to Handle Coronavirus Strain

The internet should generally hold up under the load of a pandemic. But content providers say they’re taking extra precautions just to make sure.

By Karl Bode
Experts Say the Internet Will Mostly Stay Online During Coronavirus Pandemic

Home users may see problems due to neglected U.S. infrastructure, but the internet overall should be able to weather the storm, experts suggest.

by Karl Bode  
Mar 19 2020, 6:00am  Share  Tweet  Snap

ISPs use a number of modern network technologies to handle congestion in real time, often letting them intelligently and automatically “deprioritize” the traffic of heavy users in overloaded areas.
Bandwidth management is a problem without a good solution
Two Moments in Internet History

1. Donald Davies and British contributions to packet switching

2. ComCast and the origins of contemporary congestion management
Case One: Donald Davies
A common network has to be a shared network
Donald Davies and packet-switching in 1966
# Table I: Bibliography of Several Distributed Network Routing Doctrines

<table>
<thead>
<tr>
<th>Date</th>
<th>Designation</th>
<th>Principal Investigator</th>
<th>Published Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>Two-Phase</td>
<td>E. Baran</td>
<td>Patent disclosure.</td>
</tr>
<tr>
<td>1960</td>
<td>Bus-Port Path Routing</td>
<td>P. Baran</td>
<td>Current series.</td>
</tr>
</tbody>
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The Routing Problem of Packet Switching
Time sharing

Digital communication at Project MAC (CTSS) circa 1965

Time-sharing computer systems were both experiments in computing and communication.
October 1967—A project meeting held through a computer at Stanford Research Institute
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Davies notes that time sharing systems, specifically the Dartmouth Time Sharing System, have “different kinds of users, for example computers offering real-time services and keyboard / printers for human use, in a way which allows them all to intercommunicate usefully.”
An early optimizer: the CTSS supervisor
Packets

Translates time-sharing from a model of computer resource sharing to a design for a new digital communication infrastructure.
First ACM Symposium on Operating Systems Principles
Optimally allocating network resources like time-sharing
The Optimization Problem

According to Leonard Kleinrock, it involved “the problem of allocating network resources to the demands placed upon those resources by the user population.” It was a technical problem distinct “from the ‘softer’ social, political, legal and ecological problems”.
An Isarithmic network?

“Since data carrying packets must be created and destroyed, the balance is kept by using empty packets... When data are ready to enter the network, an empty packet must be found and replaced by a data carrying packet.”

-Donald Davies, 1972

Fig. 1. Characteristic of an isarithmic network (with 18 nodes).

Those plotted here were based on an intermediate stage of development. We did not investigate the precise mechanism of congestion or in particular what caused the complete stoppage of flow at a certain value of $P$. By better design the saturation can be pushed to higher values of $P$ and the optimum to higher values of $C$. 
A common network does not have a common purpose
Case Two: Comcast
Network neutrality did not solve the network management
Comcast is using Sandvine to manage P2P Connections

WHO: Comcast and Sandvine, a peer-to-peer (P2P) management application,

WHAT: A device that monitors P2P activity and interferes with requests for the peer within Comcast to UPLOAD data (downloads appear to be not affected, uploads within Comcast are not affected, transfers already in progress are not affected, and a small percentage of the new transfer requests are still permitted).

WHERE: On the boundaries, at the point where Comcast connects to other points of the Internet,

WHEN: Earliest evidence is 6 months ago, but use appears to have increased or become more "clamped-down" recently,

WHY: To reduce costs associated with P2P bandwidth growth

HOW IT WORKS:

Robb Topolski uncovers Comcast slowing down P2P in 2007
United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued January 8, 2010                Decided April 6, 2010

No. 08-1291

COMCAST CORPORATION,
PETITIONER

v.

FEDERAL COMMUNICATIONS COMMISSION AND UNITED STATES OF AMERICA,
RESPONDENTS

NBC UNIVERSAL, ET AL.,
INTERVENORS

On Petition for Review of an Order
of the Federal Communications Commission
Managing rise in peer-to-peer file sharing
Analysis & Decision-Making Flow Using an Example of an Upstream Port That May Be Approaching Congestion

1. **Congestion Management Process**
   - Check CMTS Utilization

2. **Is CMTS Upstream Port Utilization At An Average of > 70% for > 15 Mins?**
   - **YES**
     - CMTS in Near Congestion State
     - Congestion may occur soon
     - Search Recent ~15 Min. Block of IPDR Data
     - **THEN**
   - **NO**

3. **Are Any Users Consuming An Average of > 70% of Provisioned Upstream Bandwidth for > 15 Mins?**
   - **YES**
   - **THEN**
     - Change User's Upstream Traffic from PBE to BE
   - **NO**

4. **Is User in BE Consuming An Average of < 50% of Provisioned Upstream Bandwidth?**
   - **YES**
     - Change User's Upstream Traffic Back to PBE from BE
     - **THEN, AT NEXT ANALYSIS POINT (~15 MINS)**
   - **NO**

5. **No Action Taken**
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Managing bandwidth management is a governance issue
Implications
These problems may get worse as...

Automation reduces explainability and oversight of network management

Policy forums become captured or politicized

New technologies require more complex network management
Bandwidth management is a problem without a good solution.
How could human rights be that solution?
Select Publications


McKelvey, F. (2019, July 29). Daemons are the programs that run the internet. Here's why it's important to understand them. The Conversation. http://theconversation.com/daemons-are-the-programs-that-run-the-internet-heres-why-its-important-to-understand-them-119154

McKelvey, F. (2020, March 6). Before adopting new technologies, we must define the common good. Centre for International Governance Innovation. https://www.cigionline.org/articles/adapting-new-technologies-we-must-define-common-good