



Comcast's Experiences In a P4P Technical Trial

[draft-livingood-woundy-p4p-experiences-02](#)

Jason Livingood
and
Rich Woundy

November 18, 2008



Background

- Comcast, as an active participant in the Internet community, regularly evaluates new technologies and often shares the results to accelerate development and standardization.
- Comcast is a member of the P4P Working Group, whose mission is to work with Internet service providers (ISPs), peer-to-peer (P2P) companies, and technology researchers to develop “P4P” mechanisms that accelerate distribution of content and optimize utilization of ISP network resources.
- P4P allows P2P networks to optimize traffic within each ISP, reducing the volume of data traversing the ISP’s infrastructure and creating a more manageable flow of data.
- P4P also can accelerate downloads for end-users.
- The Comcast P4P Trial is first P4P Trial over cable infrastructure.

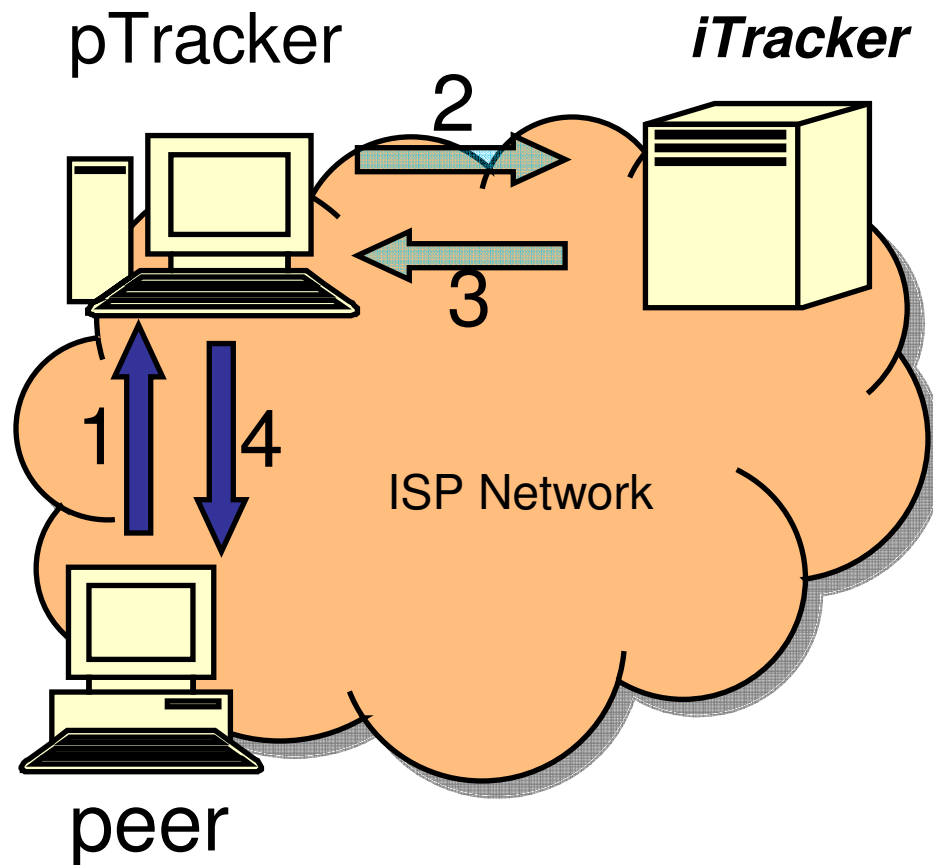


Key Results of Comcast's P4P Trial

- P4P improved download speeds
- P4P was effective localizing traffic in the trial
 - Traffic entering and leaving Comcast's network was reduced
 - Upstream congestion was not observed
- Comcast believes P4P has merit and will continue working with the technical community on further testing, standardization and evaluation of how P4P and related technologies (ALTO) benefit end-users and optimize the network



P4P Architecture



How P4P Works:

1. Peer begins a P2P session by querying pTracker
2. pTracker occasionally asks the iTracker for guidance arranging more efficient P2P sessions
3. iTracker returns P2P peering suggestions based on network topology
4. pTracker selects and returns a set of active peers according to its intelligence and guidance from the iTracker

Definitions:

- **Peer** – Client computer requesting a P2P session
- **pTracker** – Runs and manages P2P network
- **iTracker** – Houses information about network topology and suggests P2P relationships. Can be run by ISPs, P2P networks or third parties



Comcast P4P Trial Parameters

- Pando Networks distributed a 21MB licensed video file to Pando P2P clients globally including computers connected to Comcast's High-speed Internet network
- Three other ISPs conducted P4P trials at the same time
- P4P performance evaluated by comparing different P2P swarms
 - Random P2P – used as a control swarm
 - Pando Network Aware (PNA) – proprietary mechanism
 - Three configurations of P4P: Generic, Coarse, Fine
- Data Collection
 - July 2, through July 17, 2008
 - 15,518 downloads within Comcast during that time
 - Transit data is a sample of all downloads, including other trial participants
 - Data in this presentation was collected by Pando Networks and Yale University



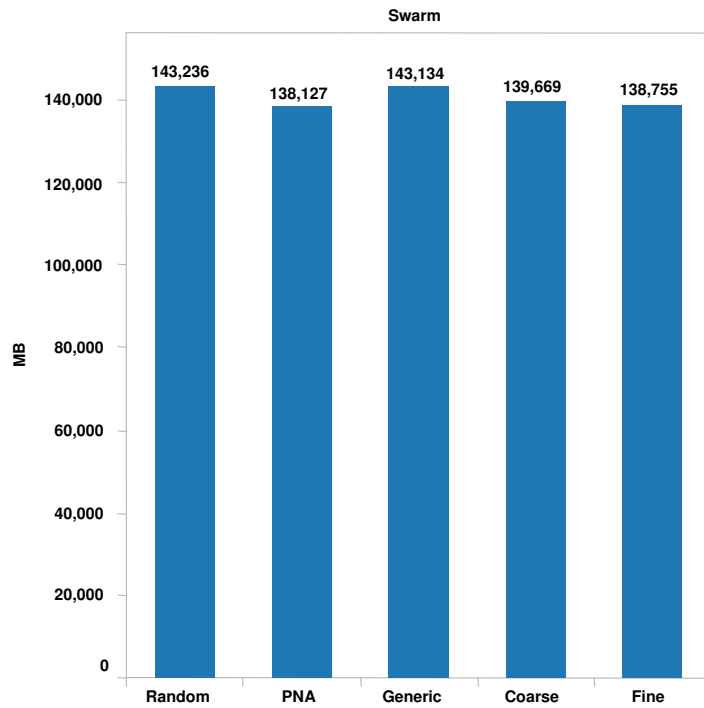
Performance Summary

Swarm	Global Average B/s	Change	Comcast Average B/s	Change
Random Peer Assignment	144,045		254,671	
P4P Fine Grained	162,344	+13%	402,043	+57%
P4P Generic Weight Matrix	163,205	+13%	463,782	+82%
P4P Coarse Grained	166,273	+15%	471,218	+85%

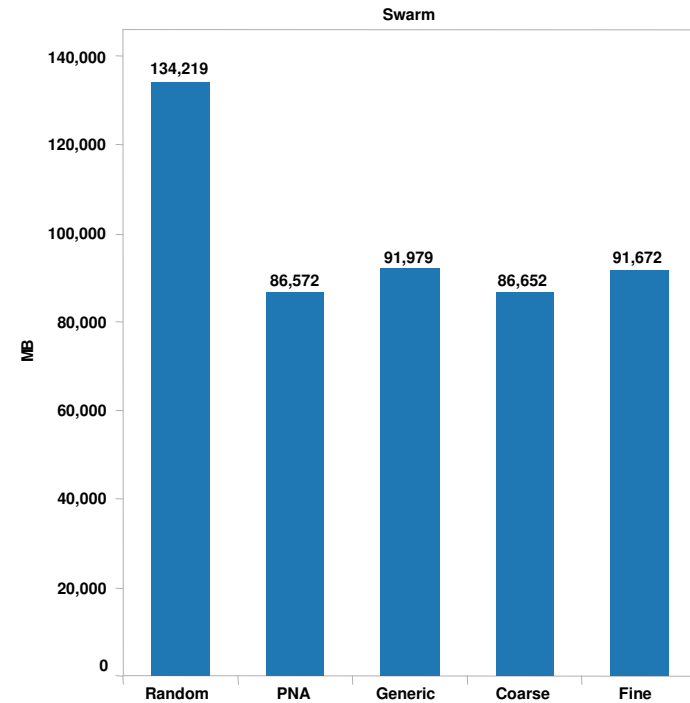


Comcast Upload Volumes

Last Mile



Internet

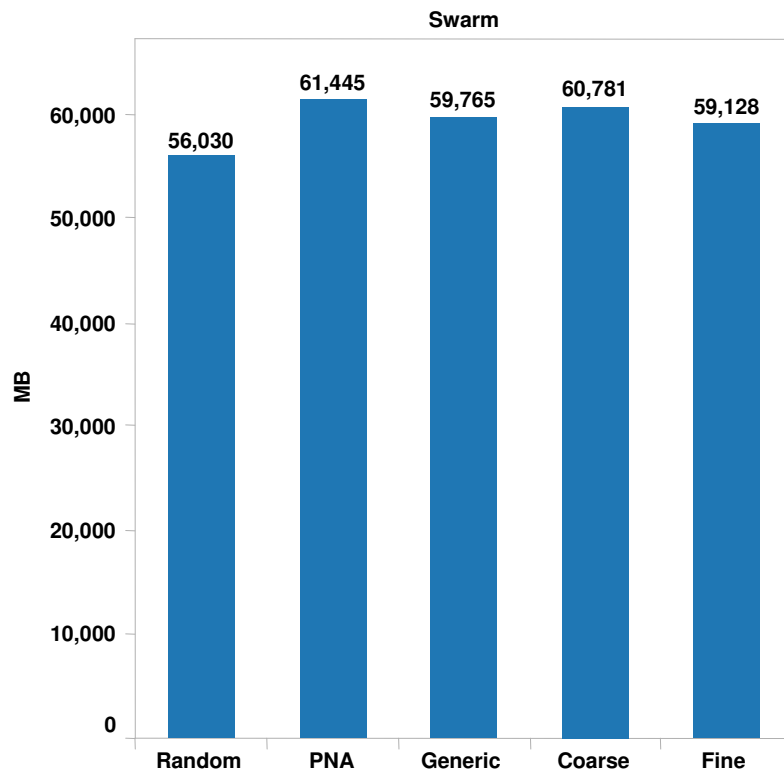


P4P reduced outgoing Internet traffic by an average of 34%

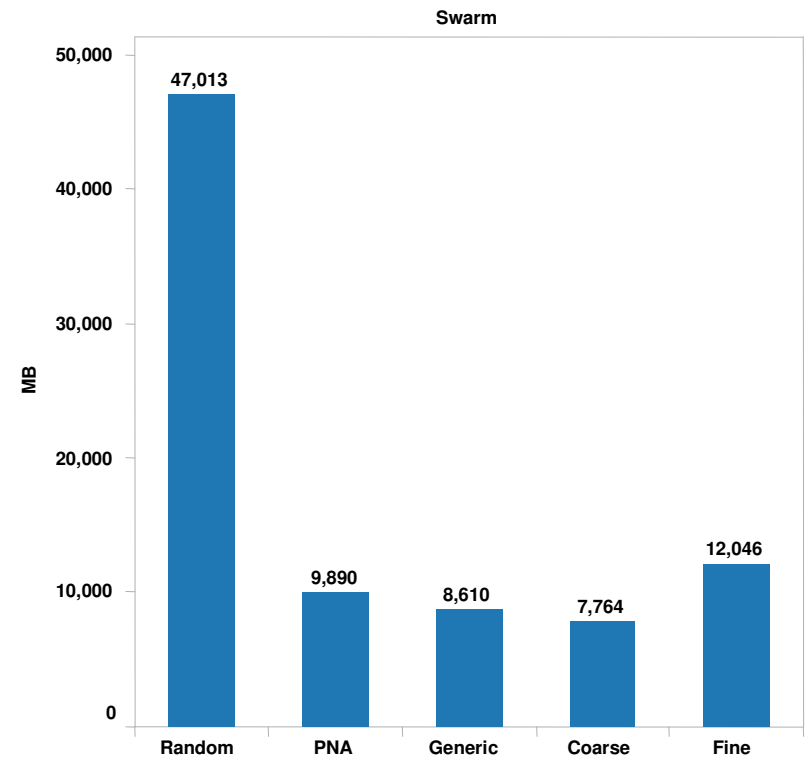


Comcast Download Volumes

Last Mile



Internet



P4P reduced incoming Internet traffic by an average of 80%



Next Steps and Caveats

- More trials are needed to understand the role of P4P
 - Extend trials to more vendors and content distributors
 - Larger swarms
 - More diverse content – file sizes, streaming, etc.
- Comcast observed positive results from initial P4P testing; however, peer-to-peer (P2P) traffic presents other challenges that P4P does not currently resolve
 - P4P does not address last-mile network congestion
 - P4P is not applicable to the vast majority of P2P traffic today
 - P4P is useful for managed content delivery networks; however, the majority of P2P traffic is unmanaged