Monitoring BitTorrent swarms

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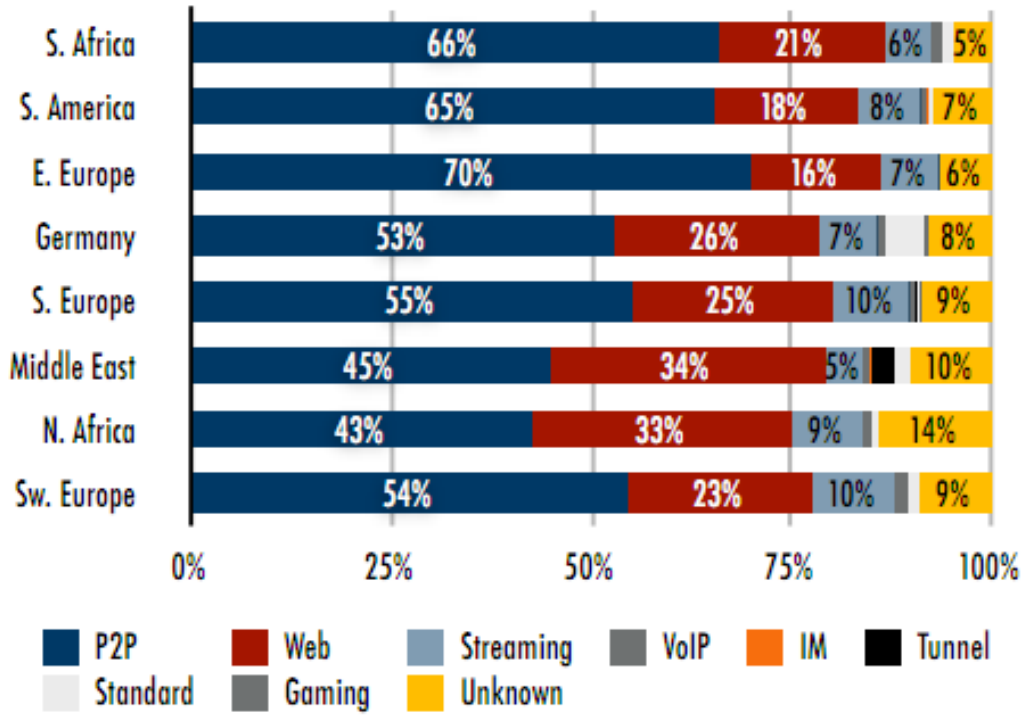
Outline

Motivation

Increasing usage of P2P communications
BitTorrent accounts for 60% of worldwide P2P traffic



Motivation

- P2P protocols generate a great amount of traffic
- Affects quality of service of other protocols
- P2P communications results in high inter-ISP traffic
- Inter-ISP traffic is expensive for ISPs

Work Objectives

- Study monitoring real Internet BitTorrent swarms
- Data gathered used to identify patterns in BitTorrent networks:
  - Locality - decrease inter-ISP traffic
  - Content - increase content availability

BitTorrent Protocol

File-sharing protocol

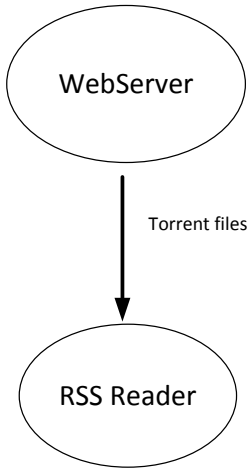
- Peers share files among themselves
- Files are divided into smaller pieces
- Central Server (Tracker) which provides a list of active peers
- Mechanisms that make peers chose to download from the ones with the largest bandwidth

Contributions

This study differs in:

- Locality studied for two different periods
- Content study that focuses on repeated content
- PSM - an approach to increasing content availability
- Peer and Tracker behaviors that can affect locality

Methodology for gathering data



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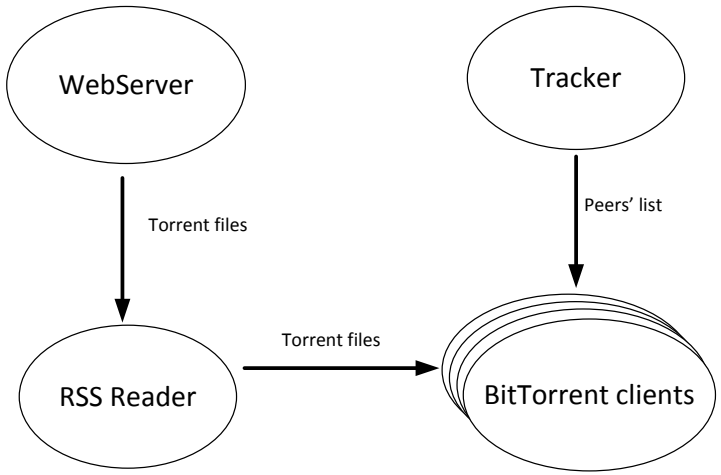

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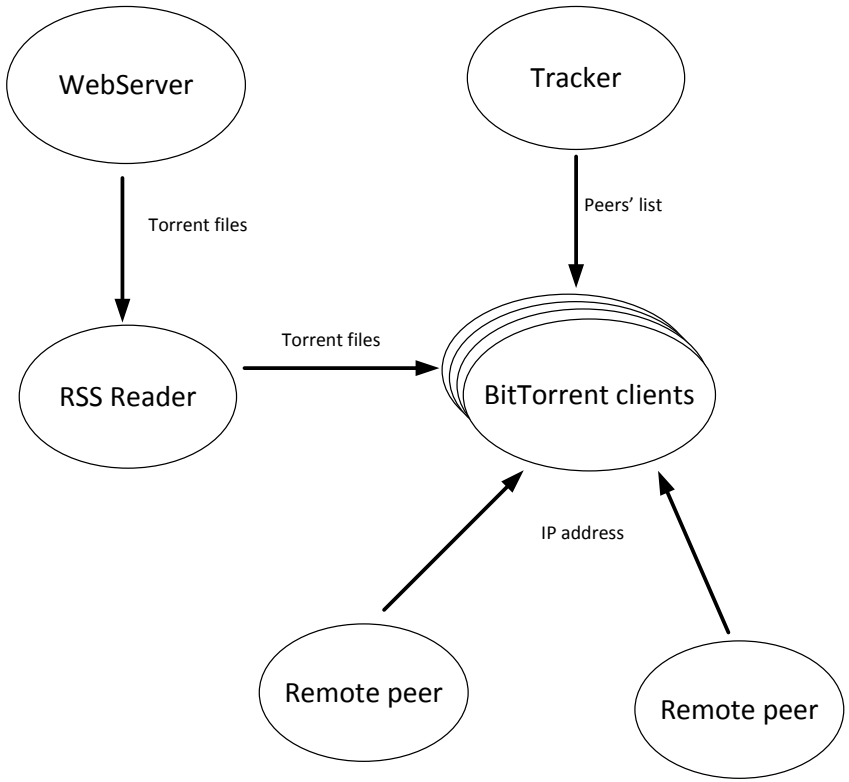

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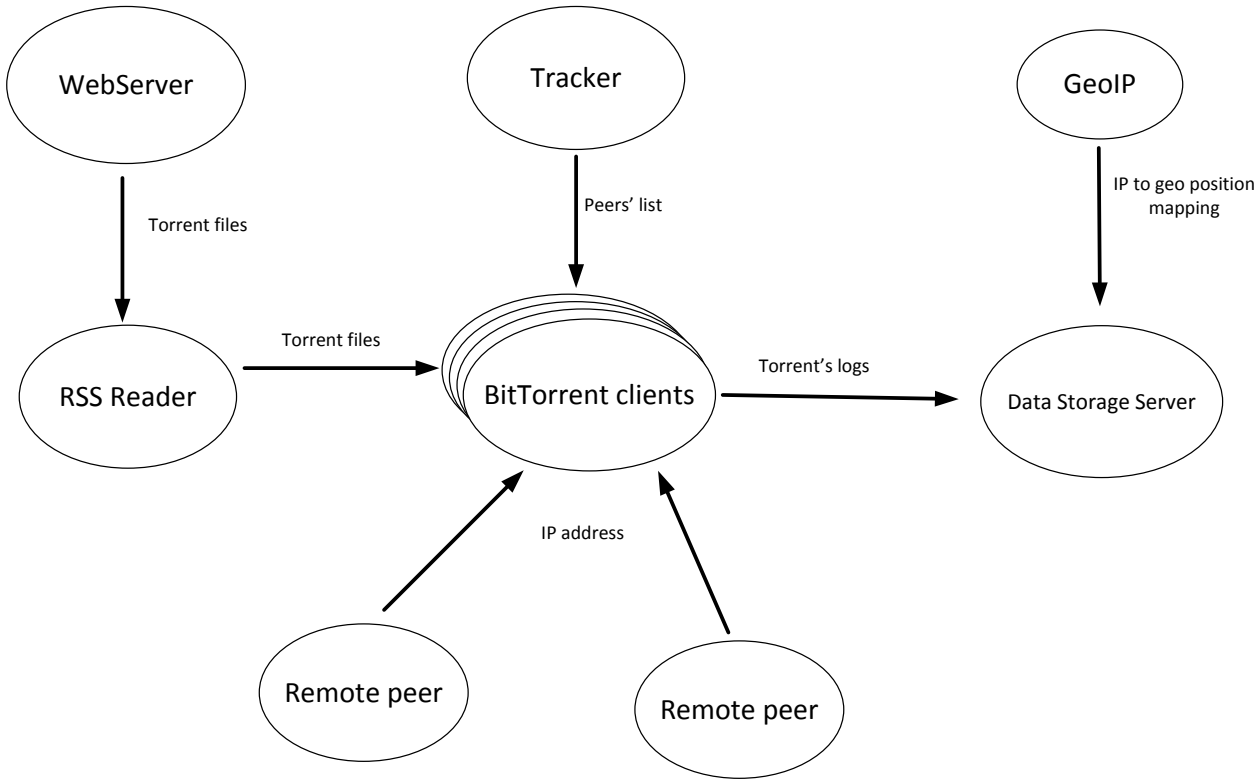

Methodology for analyzing data

The torrent database:

- 3211 torrent files from PirateBay, isohunt and btjunkie
- Torrent files collected from the 25^{th} of April 2011 to the 18^{th} of July 2011
- PirateBay's one hundred most popular torrent files on the 25^{th} of April
- isohunt's twenty most popular torrent files on the 24^{th} of May for each major category (audio, video, and tv)

Methodology for analyzing data

- Different data analysis criteria for each study:
  - Locality study
  - Content study
- Monitoring stopped for all swarms that dropped below 30 peers and 0 seeders for a period of a week
- Monitoring nodes not part of the results.

Results

- Locality Analysis
- Content Analysis
- Peer and tracker behavior

Locality Analysis

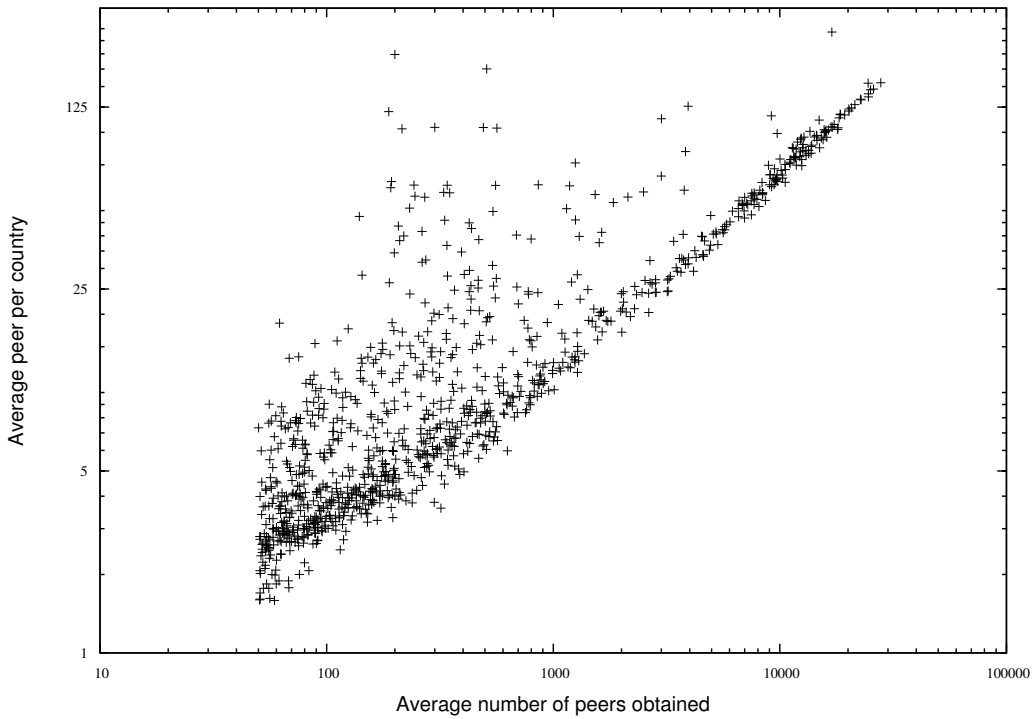

Figure: Average number of peers obtained and average number of peers per country.

Locality Analysis

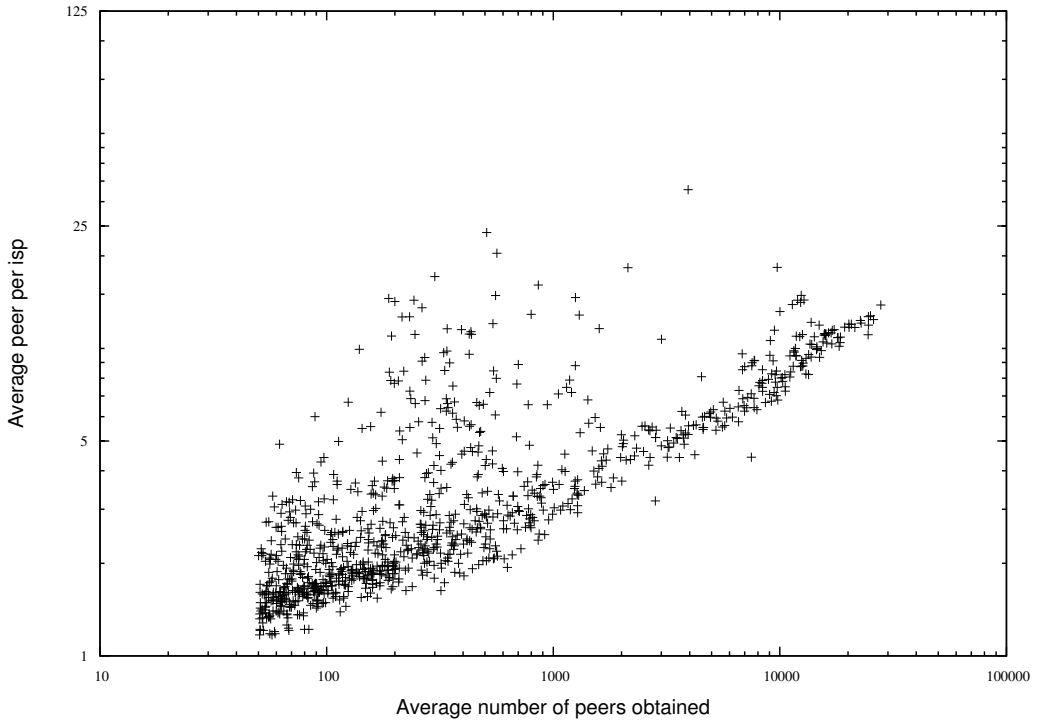

Figure: Average number of peers obtained and average number of peers per ISP.

Locality Analysis - Regional content

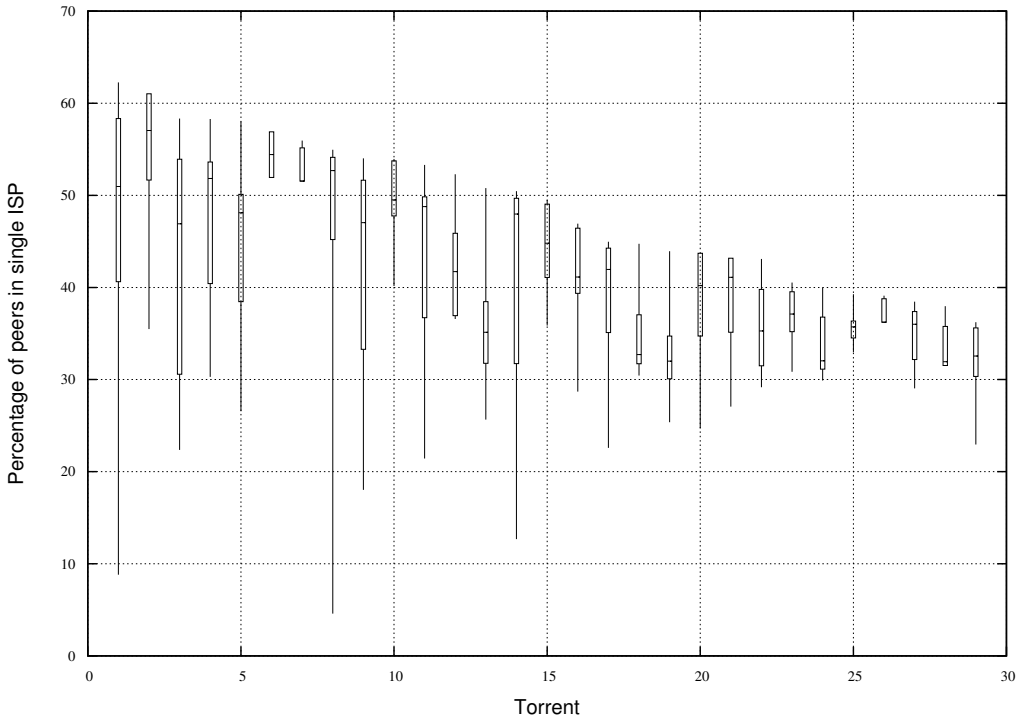

Figure: Regional torrents with 30% of all peers belonging to the same ISP, at least 75% of the times.

Content Analysis

- Content pollution
- Content repetition

Content Analysis - Content pollution

- Files with most parts the same
- Files did not represent any real content
- From the 3211 files collected, 221 were found to be polluted content

Content Analysis - Content repetition

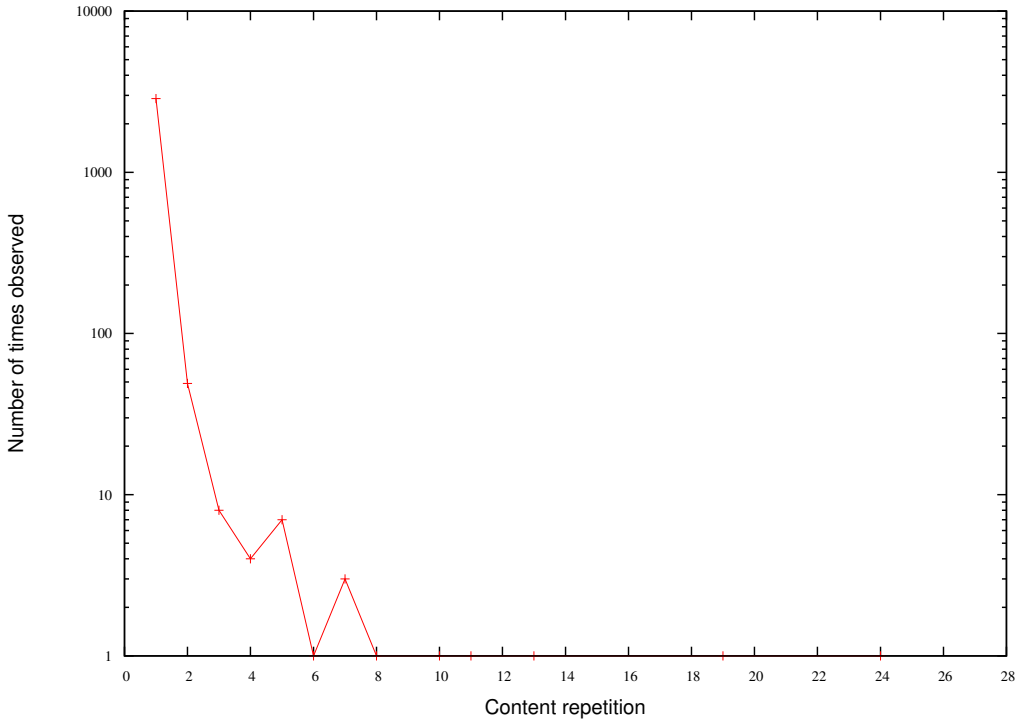

Figure: Histogram of the content repetition frequency.

Content Analysis - Content repetition

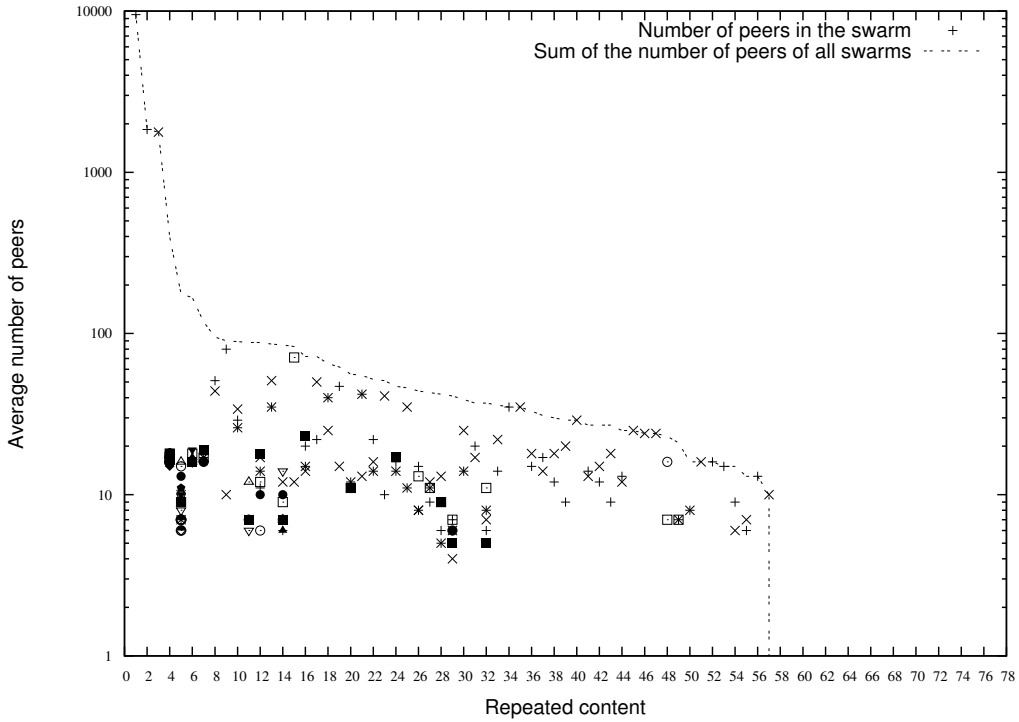

Figure: Average number of peers per content.

Content Analysis - Content repetition

	Torrent 1	Torrent 2	Torrent 3	Total
Num. Countries	87	68	38	101
Avg. Peers/Country	6.20	5.25	2.61	9.85
Num. ISPs	238	178	54	342
Avg. Peers/ISP	2.26	2.01	1.83	2.91

Table: Torrent aggregation benefits.

PSM

- Peers query for swarms that share similar content to the one they are currently downloading
- Peers participate in multiple swarms, isolated from each other
- Its databases are populated through the different queries received

PSM

- Service outside BitTorrent
- Requires no modifications to the BitTorrent protocol
- BitTorrent client application requires only an extension/add-on to make use of the service

PSM

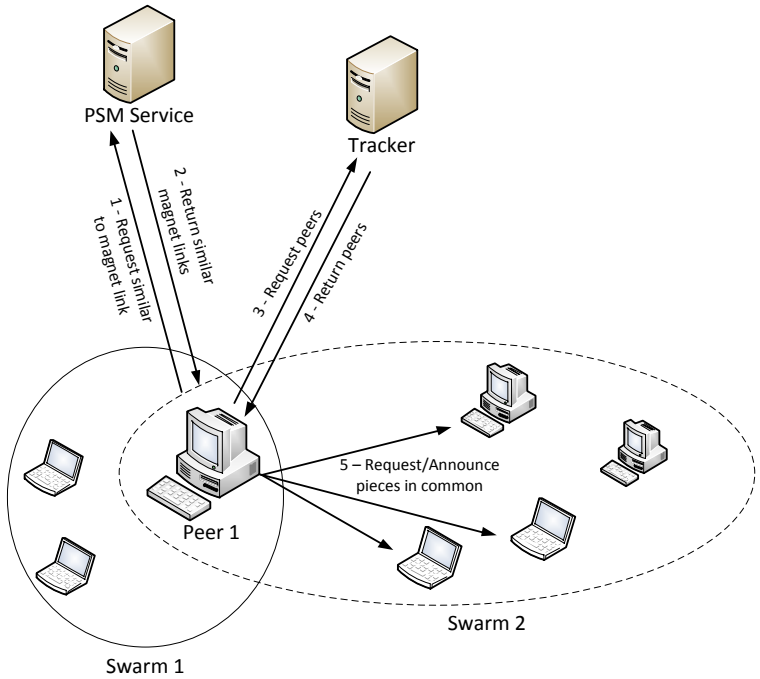

Figure: PSM workflow.

Conclusions

- High locality properties in both large and small size swarms
- Many patterns observed:
  - Content shared
  - Peer behavior
- Findings suggest that BitTorrent traffic can be restrained and inter-ISP traffic decreased

Publications

This paper was submitted to be presented at INFOCOM'2012 and we are now waiting for its evaluation.

* António Homem Ferreira, Ricardo Lopes Pereira and Fernando M. Silva. Partial Swarm Merger: Increasing BitTorrent content availability.