

Network Resource Utilization and Social Networking

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Abstract

The Internet and the World Wide Web have become two key components in today's technology based organizations and businesses. As the Internet is becoming more and more popular, it is starting to make a big impact on people's day-to-day life. As a result of this revolutionary transformation towards the modern technology, social networking on the World Wide Web has become an integral part of a large number of people's lives. Considering the already immense and increasing popularity of social networking, this paper explores the increase of network resource utilization due to social networking. The paper effectively shows the popularity of social networking in today's context and provides statistical information on network resource usage caused due to social networking. The potential socio-economic issues associated with this increase of resource usage are also discussed where appropriate.

1. Introduction

Today, social networking sites seem to be blooming all over the Internet. These highly interactive, Web 2.0 like websites are attracting the attention of millions of people all around the world. As a result, social networking websites like Face Book, Hi5 and My Space are now among the most visited websites in the world.

Social networking sites generally offer a variety of interactive services to their members. Some of these services include on-line forums, picture sharing, audio/video streaming, blogging and instant messaging. These services enable people from all layers of the society and in different walks of life to build new relationships, keep in contact with their loved ones and in some cases be financially benefited.

Websites as dynamic as social networking sites are built using state of the art and extremely resource hungry technologies such as AJAX and Web Services. As these interactive and multimedia powered websites continue to become popular, a considerable amount of network resources, specially the bandwidth of corporate networks, are consumed by the visitors to such sites. Social networking services like picture sharing and audio/video streaming can eat up a significant amount of bandwidth off a corporate network.

This has raised a number of socio-economic and ethical issues in the corporate world during the last few years. In this paper we perform a comprehensive statistical analysis on the resource usage caused by social networking websites. The next few sections of this paper discuss the problem of high resource utilization due to social networking and problems associated with it in detail.

2. Social Networking and Network Resource Usage

In the past, movie download has been the most bandwidth consuming activity in university networks as well as in other networks. But most of the networks now restrict the download limit, so movie downloads are limited to a certain extent. In the recent years a new class of bandwidth killers has emerged. They are Social Networking sites.

Social Networking sites like Facebook not only take bandwidth away, they can also cause additional DNS lookups. Social Networking sites like Facebook and YouTube are contributing to an exponential increase in DNS traffic. This is because they pull content from all over the internet. Most of these sites use content-delivery networks to extend the geographical reach of their content, so users can access it closer at home.

2.1. Global Stats

The popularity of the social networking sites can be compared using Year-Over-Year (YOY) growth of unique audience. The YOY growth for social network sites globally is shown in Figure 1 (1). From the figure, it can be seen that YOY growth of Facebook has dramatically increased over the past year.

Site	Feb-08		Feb-07		YOY Growth	
	Unique Audience (000)	Time per Person (hh:mm:ss)	Unique Audience (000)	Time per Person (hh:mm:ss)	Unique Audience	Time per Person
Myspace.com	55,419	2:12:19	53,362	2:00:24	4%	10%
Facebook	20,043	1:06:43	9,923	1:04:54	102%	3%
Classmates Online	12,955	0:10:21	12,815	0:09:03	1%	14%
Windows Live Spaces	7,882	0:05:02	9,253	0:08:29	-15%	-41%
LinkedIn	7,392	0:10:31	1,990	0:05:10	271%	104%
AOL Hometown	6,004	0:01:58	8,907	0:01:54	-33%	4%
Club Penguin	4,727	0:09:04	3,233	0:45:37	46%	-80%
Reunion.com	4,323	0:04:34	4,348	0:04:49	-1%	-5%
AOL Community	3,337	0:36:58	4,641	1:05:33	-28%	-44%
Flixster	2,619	0:07:38	1,591	0:12:28	65%	-39%
Buzznet.com	2,526	0:02:29	1,332	0:03:53	90%	-36%
bebo	2,255	0:12:42	1,211	1:07:42	86%	-81%
Imeem	2,187	0:05:28	1,382	0:31:32	58%	-83%
Meetup.com	1,940	0:12:16	1,215	0:07:07	60%	72%
Last.fm	1,938	0:06:43	1,508	0:02:24	29%	180%
Care2.com	1,765	0:04:34	1,626	0:05:03	9%	-10%
MyYearbook	1,738	1:00:02	2,368	0:09:04	-27%	562%
Yahoo! 360°	1,734	0:11:05	3,291	0:14:06	-47%	-21%
Ning	1,464	0:04:43	N/A	N/A	N/A	N/A
Friendster	1,389	0:10:06	857	0:06:16	62%	61%

Figure 1 Year Over Year Growth of social network sites

Google Insights (2) also reveals that there is an increase in the search for Facebook sites in recent years in Sri Lanka.



Figure 2 Web Search Volume for Facebook

According to Virgin Media, a cable service provider with 10 million subscribers in United Kingdom, the amount of DNS traffic generated by Social Networks has grown dramatically. DNS traffic generated by YouTube and Facebook has doubled recently (3). YouTube has grown from 0.5% to 0.75% and Facebook has grown from 0.5% to 1%. Still this represents only a fraction of the bandwidth of Virgin Media. But when it comes to University networks the percentage value will be very significant. Because of the way of the pages of these social network sites are structured a single page can generate hundreds of DNS queries.

2.2. Traffic Monitored Per User

We used Wireshark and monitored the interface of one of the computers. The statistics are based on browsing the two sites www.facebook.com and www.youtube.com independently at two different times. The results shown below highlights the number of content-delivery networks that is being accessed by each site. The results also highlight the amount of content that is being downloaded automatically to the computer when accessing the site.

The traffic was monitored for a period of 1 minute when browsing Facebook. Figure 3 show the HTTP requests send by the server and the host. These results highlight the number of content-delivery networks accessed when browsing Facebook. This implies that there is a large amount of DNS queries when accessing this social network site.

HTTP Load Distribution with filter: http				HTTP Load Distribution with filter: http			
Topic / Item	Count	Rate	Percent	Topic / Item	Count	Rate	Percent
[-] HTTP Requests by Server	444	0.003170		[-] HTTP Requests by Server Address	444	0.003170	100.00%
[-] HTTP Requests by Server Address	444	0.003170	100.00%	[-] 192.248.8.106	444	0.003170	100.00%
[-] HTTP Requests by HTTP Host	444	0.003170	100.00%	server.iad.liveperson.net	5	0.000036	1.13%
[-] server.iad.liveperson.net	5	0.000036	1.13%	www.facebook.com	18	0.000129	4.05%
[-] www.facebook.com	18	0.000129	4.05%	static.ak.fbcdn.net	35	0.000250	7.88%
[-] static.ak.fbcdn.net	35	0.000250	7.88%	b.static.ak.fbcdn.net	105	0.000750	23.65%
[-] b.static.ak.fbcdn.net	105	0.000750	23.65%	mail.google.com	2	0.000014	0.45%
[-] mail.google.com	2	0.000014	0.45%	login.facebook.com	1	0.000007	0.23%
[-] login.facebook.com	1	0.000007	0.23%	photos-b.ll.facebook.com	8	0.000057	1.80%
[-] photos-b.ll.facebook.com	8	0.000057	1.80%	photos-g.ak.fbcdn.net	10	0.000071	2.25%
[-] photos-g.ak.fbcdn.net	10	0.000071	2.25%	profile.ak.facebook.com	104	0.000743	23.42%
[-] profile.ak.facebook.com	104	0.000743	23.42%	vthumb.ak.facebook.com	1	0.000007	0.23%
[-] vthumb.ak.facebook.com	1	0.000007	0.23%	photos-f.ll.facebook.com	7	0.000050	1.58%
[-] photos-f.ll.facebook.com	7	0.000050	1.58%	photos-b.ak.fbcdn.net	14	0.000100	3.15%
[-] photos-b.ak.fbcdn.net	14	0.000100	3.15%	photos-h.ak.fbcdn.net	9	0.000064	2.03%
[-] photos-h.ak.fbcdn.net	9	0.000064	2.03%	creative.ak.facebook.com	6	0.000043	1.35%
[-] creative.ak.facebook.com	6	0.000043	1.35%	0.channel13.facebook.com:80	1	0.000007	0.23%
[-] 0.channel13.facebook.com:80	1	0.000007	0.23%	photos-f.ak.fbcdn.net	13	0.000093	2.93%
[-] photos-f.ak.fbcdn.net	13	0.000093	2.93%	external.ak.fbcdn.net	1	0.000007	0.23%
[-] external.ak.fbcdn.net	1	0.000007	0.23%	photos-c.ak.fbcdn.net	13	0.000093	2.93%
[-] photos-c.ak.fbcdn.net	13	0.000093	2.93%	photos-d.ak.fbcdn.net	14	0.000100	3.15%
[-] photos-d.ak.fbcdn.net	14	0.000100	3.15%	photos-e.ak.fbcdn.net	14	0.000100	3.15%
[-] photos-e.ak.fbcdn.net	14	0.000100	3.15%	photos-g.ll.facebook.com	5	0.000036	1.13%
[-] photos-g.ll.facebook.com	5	0.000036	1.13%	photos-e.ll.facebook.com	4	0.000029	0.90%
[-] photos-e.ll.facebook.com	4	0.000029	0.90%	photos-d.ll.facebook.com	4	0.000029	0.90%
[-] photos-d.ll.facebook.com	4	0.000029	0.90%	0.channel13.facebook.com	4	0.000029	0.90%
[-] 0.channel13.facebook.com	4	0.000029	0.90%	photos-a.ak.fbcdn.net	15	0.000107	3.38%
[-] photos-a.ak.fbcdn.net	15	0.000107	3.38%	photos-a.ll.facebook.com	2	0.000014	0.45%
[-] photos-a.ll.facebook.com	2	0.000014	0.45%	photos-c.ll.facebook.com	7	0.000050	1.58%
[-] photos-c.ll.facebook.com	7	0.000050	1.58%	photos-h.ll.facebook.com	3	0.000021	0.68%
[-] photos-h.ll.facebook.com	3	0.000021	0.68%	platform.ak.facebook.com	10	0.000071	2.25%
[-] platform.ak.facebook.com	10	0.000071	2.25%	b.static.ak.facebook.com	1	0.000007	0.23%
[-] b.static.ak.facebook.com	1	0.000007	0.23%	static.slide.com	3	0.000021	0.68%
[-] static.slide.com	3	0.000021	0.68%	deco-00.slide.com	2	0.000014	0.45%
[-] deco-00.slide.com	2	0.000014	0.45%	widget-fe.slide.com	1	0.000007	0.23%
[-] widget-fe.slide.com	1	0.000007	0.23%	logging.slide.com	1	0.000007	0.23%
[-] logging.slide.com	1	0.000007	0.23%	photos-h.pe.facebook.com	1	0.000007	0.23%
[-] photos-h.pe.facebook.com	1	0.000007	0.23%				
[-] HTTP Responses by Server Address	442	0.003156		[-] HTTP Requests by HTTP Host	444	0.003170	100.00%
				[-] HTTP Responses by Server Address	442	0.003156	

Figure 3 HTTP requests by server address and HTTP host

It is seen when accessing a photo album in Facebook, the remaining pictures of the album are automatically cached even though we might not want to view them. As can be seen from Figure 4, a large number of HTTP packets (more than 40%) are due to images that are automatically downloaded. The analysis is carried out for only 1 minute and for one user. During this period only one picture album was accessed and one page of the album was viewed. With simple mathematics we can see the effect on the bandwidth when a large number of users access Facebook.

Wireshark: Protocol Hierarchy Statistics

Display filter: http

Protocol	% Packets	Packets	Bytes	Mbit/s	End Packets	End Bytes	End Mbit/s
Frame	100.00%	898	558949	0.032	0	0	0.000
Ethernet	100.00%	898	558949	0.032	0	0	0.000
Internet Protocol	100.00%	898	558949	0.032	0	0	0.000
Transmission Control Protocol	100.00%	898	558949	0.032	0	0	0.000
Hypertext Transfer Protocol	100.00%	898	558949	0.032	453	213372	0.012
Line-based text data	8.46%	76	55834	0.003	76	55834	0.003
Portable Network Graphics	1.22%	11	10397	0.001	11	10397	0.001
JPEG File Interchange Format	26.28%	236	191311	0.011	236	191311	0.011
CompuServe GIF	12.58%	113	81862	0.005	113	81862	0.005
Media Type	0.22%	2	1315	0.000	2	1315	0.000
Secure Socket Layer	0.78%	7	4858	0.000	7	4858	0.000

Figure 4 Packet usage

3. Conclusion

The introduction and emergence of social networking web sites have done a major impact in the internet traffic. According to the above stats it can be seen how much a bandwidth they consume as a percentage. Because these web sites contain pictures/audio/video media types that draw attention of people easily, networks are flooded with this multimedia traffic which consumes larger part of the available bandwidth. In Organisations and Universities social networking is not needed in their day to day operations. So from the above stats it can be concluded that network resource utilisation is inefficient because of the impact of social networks.

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