Basic Internet Skills (Supplementary reading)
IT WS I - ICS102
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Contents

NOTE: The document has not been proof-read for grammatical errors. Please try to ignore them.

1 Web Browsers

1.1 Internet and Intranet

Browsers are used to browse websites. There are two types of websites Intranet and Internet. Intranet websites are websites internal to organization such as IIIT Hyderabad and not meant for people outside organization. Internet websites are public websites accessible by everyone around the world such as http://www.google.co.in/.

1.2 Types of browsers

There are many different types of web browsers, such as

- Internet Explorer
- Mozilla Firefox
- Google chrome
- Opera

1.3 Proxy settings

In order to browse Internet websites from campus, one needs Internet connection. But since it is not practical for everyone to have their own Internet connection, Institute procures a high-speed Internet connection for all residents and provides access to it through a proxy server.

Students should use proxy server '**proxy.iiit.ac.in**' and proxy port '**8080**' to be able to use Internet from within campus.

To configure proxy in Firefox in Linux one can use following steps:

1. Start Firefox browser
2. Use 'Preferences' option from 'Edit' menu
3. In 'Firefox preferences' option window choose 'Advanced' tab
4. Within 'Advanced' tab choose 'Network' sub-tab.

5. In 'Network' sub-tab click on 'Settings' button under 'Connection' section
6. In 'Connection Settings' option window choose 'Manual proxy configuration:'.
7. Check the option 'Use this proxy server for all protocols'
8. Fill 'HTTP Proxy' as 'proxy.iiit.ac.in'
9. Fill 'Port' as '8080'
10. In text-box labeled 'No Proxy for' enter '`localhost, 127.0.0.1, iiit.ac.in, .iiit.ac.in, iiit.net, .iiit.net, 172.16.0.0/12, 192.168.0.0/16, 10.0.0.0/8, developer.virtual-labs.ac.in`'
11. Click 'Ok' to close 'Connection settings' dialog box.
12. Click 'Close' to close 'Firefox preferences' dialog box
13. Try to browse Internet by opening some public website such as 'http://www.google.co.in/'
14. Try to browse Intranet by opening some Intranet website such as 'http://intranet.iiit.ac.in/'

Proxy settings need to be done in other browsers such as Opera, Internet explorer, etc. also so that they can be used inside campus. As part of this course only proxy settings for Firefox in Linux would be explained. Please note that proxy settings for Firefox in Windows require some other procedure.

1.4 Tabs

All modern browsers support tabs. With the help of tabs we can open many different websites or pages within same browser window in separate tabs. This allows one to keep task-bar free from multiple browser window options. This also allows more efficient use of RAM as duplication of resources among different windows is not required.

1.5 Browsing websites

All students should be comfortable in browsing websites. Try to browse some websites such as:

- http://www.wikipedia.org/
- http://www.howstuffworks.com/
- http://www.xkcd.com/

1.6 Registration on websites

Many websites require users to register before they all of their functionality can be used. Some websites also require registration fee (usually annual) to be able to use them. During registration websites prompt for information such as Name, Mobile number, Address, Date of birth, etc.

Students are advised not to give correct information on untrustworthy websites. Correct information should usually be given only on trusted Intranet websites, bank websites, insurance websites etc. It is highly recommended that correct information is not shared publicly on social networking websites such as www.facebook.com, www.twitter.com, www.orkut.com, plus.google.com, etc.

Please note that once information is given to a website, it can never be truly deleted. Users can change the information but website can always retain the older versions of the changed text. The same applies for images and videos. One should not upload any image or video on any website, unless they are very sure it wont cause any problem for them and others even in future.

All the options that allow users to delete uploaded files may just stop displaying the link to file on the given website. The website may keep the file on the servers even after deletion, sometimes even for legal requirements. Other websites such as search engine websites crawl or index public websites regularly and cache the content. Users do not have any control over deleting items from cache. In such cases the content can be publicly available practically forever. Moreover in this case users can search for the unwanted content using search engines and locate it easily.

Hence it is very important that private information or files of any nature (documents, images or videos) are not uploaded on public websites, specially social networking websites.

2 Email

Email stands for electronic mail. Email has many advantages over traditional mail systems, such as:

- Users can access email from anywhere in the world and do not need to be present at specific location to receive email.
- Emails get delivered in very short time, usually under a minute
- Email unlike chat or telephone call is asynchronous. Hence sender can send email whenever he/she is free and receiver can read the email

whenever he/she is free. Both sender and receiver do not need to agree upon some common time and both remain available at that common time to use email. This makes email non-intrusive and comfortable.

2.1 Email address structure

Email address consists of two parts: username and domain name, separated by at-the-rate ('@') symbol. For example in email address 'saurabh.barjatiya@iiit.ac.in' username is 'saurabh.barjatiya' and domain name is 'iiit.ac.in'. Domain name can be used to recognize a particular email service provider and username is used to recognize a particular user using the services from the given provider. It can be noted that same username can be used across different domain providers by different users.

2.2 Basic email operations

Users can send email by specifying the recipient email address. Users can also specify that Carbon Copy (CC) or Blind Carbon Copy (BCC) of given email should be delivered to other recipients or themselves. This way users can notify people other then senders and receivers about the conversation.

Users can check emails sent to them usually by logging into web client provided by email service providers. Users can also check email using desktop email clients or mobile email clients discussed later.

It is a good practice for users to delete unwanted emails. This way the amount of space used by emails is minimal. This is important if there is quota limit for email account. This also allows searching of useful emails easier as there are less number of emails to search from.

2.3 Organizing emails

Advanced or frequent users of emails organize emails using folders or labels. The advantage of this approach is that emails related to one topic are available at one place and emails from various different topics do not appear mixed in INBOX. The organization approach depends from person to person. For example students may organize emails with respect to subjects such Maths I, IT WS I, Electrical Science I, C programming, etc. in different folders so that they can read emails related to specific subject easily.

2.4 Email attachments

Users can send files along with emails as attachments. It is not possible to send folders as attachments with email. Whenever it is necessary to send folders as email, they are converted to file using archival or compression algorithms and programs. Then the compressed or archived file is attached with email and sent.

Many times harmful programs (malware) such as viruses, adware, spyware etc. can be sent as email attachments. Hence it is important not to open or run (execute) email attachments from unknown senders.

To ensure that email servers are not loaded to much from a single user, or that emails do not fill up all quota space of recipient etc. there is limit to maximum size of attachment that can be sent with email. The size limit of students email server attachment should be around 2 MB (two mega bytes). The size limit of public email servers (discussed later) should be around 10 MB to 20 MB.

One should avoid sending emails with large attachments unless necessary. Similarly when unwanted email (SPAM) with large attachment is received it should be deleted as soon as possible.

2.5 Spam

Many times users receive email that is not useful for them. The email can be some kind of advertizement for some vendor. Email could also be related to subject, sport or cultural event that user is not interested in. Such unwanted emails are together referred as Spam or unsolicited bulk Email (UBE). In order to deal with spam anti-spam engines are used by most email servers.

Users should avoid using their official email IDs while registering on websites to avoid spam. Usually advanced users keep a dedicated account just for registering on websites and clicking on email verification link. This dedicated account is not used for any personal or official use and hence checked only while registering on a new website. Users can also create email filters to delete spam emails from same sender or subject. This is very useful to delete automated invitations from websites.

2.6 Mailing lists

In order to send emails to large number of recipients mailing lists can be used. For example to send email to all the students in UG I, one can send email to ug1@lists.iiit.ac.in. Some lists may require that mails are sent from official IIIT ID. Such lists may not accept emails sent from other email providers

such as Gmail or Yahoo. Please refer to 'About campus' document to learn more about mailing lists.

2.7 Public email providers

There are many email providers such as www.gmail.com, www.yahoo.com, www.hotmail.com, etc. where any user can register and get access to email. These email providers provide free email service to everyone in return of advertizements that get displayed to the email users. Students are recommended to register on at least following email providers:

- Gmail (http://www.gmail.com)
- Yahoo (http://mail.yahoo.com)
- Hotmail (http://www.hotmail.com)

so that they get used to different types of web interface provided to them. Many of these email providers provide large email quota (1 GB) or more and hence often used to keep a copy of official emails for longer duration.

It is also possible for same person to have many different accounts on same email provider with different usernames. Thus persons can use one email ID for personal use (friends, family, etc.) and other for official use (class-mates, colleagues, etc.)

2.8 Desktop email clients

Apart from checking email through web interface, it is also possible to check email using Desktop email clients such as:

- Thunderbird
- Evolution
- MS Outlook

The desktop email clients communicate with email servers using email related protocols and help in sending and checking email. Desktop based email clients are usually more user friendly and feature rich as it is easier to provide features on Desktop in comparison to web interface. Such clients are also faster as they can are run or interpreted directly by machine or language interpreters in comparison to Javascript based clients interpreted by web browser.

One should use desktop based email clients only on personal computers and avoid their usage on shared machines as desktop based email clients cache emails for faster access. Many clients would also allow user to save email username and password so that users do not need to specify these, whenever they want to send / receive email.

Students are advised to try to desktop clients such as Thunderbird and evolution on their personal machines to learn how to configure such clients. You would be asked for various parameters while adding account into desktop client. Suggested values for various parameters are:

Username : Specify email username. Do not include '@students.iiit.ac.in'. Just specify username part.

Password: Specify email password. Do not choose option of saving password on shared machines

SMTP server: Try students.iiit.ac.in. Leave port to 25 or 465 based on whether protocol is SMTP or SMTPS.

Email protocol : Choose IMAP and do not select POP3. IMAP and POP3 are described later in this document.

IMAP server: Use students.iiit.ac.in. Use default 143 or 993 port based on whether you use IMAP or IMAPS.

If configuration does not works try toggling use of secure protocols at various places. At least receive should work. I am not sure whether students server allows students to send email via SMTP or SMTPS protocol. You may also try toggling 'Use SMTP authentication' option, if normal SMTP does not works.

2.9 Email related protocols

2.9.1 Protocol

In today's world computers are connected with each other so that they can be used to share information. Like human beings use languages such English, Hindi, French, etc. to communicate with each other. Computers use protocols such as SMTP, IMAP, POP3, HTTP, etc. to communicate with each other. For example the word 'http' in URL 'http://www.google.co.in/' signifies that HTTP protocol should be used to receive the web page from server.

Now unlike languages such as English, Hindi, etc. which serve the same purpose, protocols are used for different purposes and usually we cannot use

any random protocol for a specific purpose. For example HTTP protocol is used mostly to send requests and receive replies and hence is mostly used for browsing web, where browsers send request for a web page, or image and server replies with requested data.

2.9.2 SMTP

SMTP is one such protocol. SMTP is used by email servers to send email to each other. Many times one prefers to use desktop email clients such as Outlook, Thunderbird, Evolution, etc. to send email rather than logging in using web interface provide by email service provider. In such cases one requires an SMTP server to be available to be able to send email from our clients to email server.

Understanding of SMTP protocol or proper understanding of what a protocol is, is not expected from UG I students. They should just understand that there is something called protocol which computers use to communicate with each other and that SMTP is one of the protocols used to send emails.

2.9.3 IMAP

IMAP and POP3 are protocols similar to SMTP. IMAP and POP3 protocols are used by email clients to get emails of particular users from email server. These protocols are not used for sending emails, they are used for checking received emails. It should be noted that SMTP protocol is not used for checking received emails. It can be used only for sending emails.

Although both IMAP and POP3 can be used for checking received emails they both are considerably different. IMAP protocol is used to keep copy of emails on the server. When IMAP is used emails are synchronized between email server and IMAP client. Thus any change that is done to emails using web interface (which uses IMAP internally) reflects in desktop client and vice-versa.

The advantages of IMAP protocol are:

- Since emails are synchronized between server and desktop client a copy of email is always available on server. Thus even if desktop clients crash (as desktops are not as reliable as servers), the user does not looses his/her emails.

- IMAP is efficient as it does not downloads complete email when user tries to check email. It just downloads email headers enough to show sender, recipient, message size, subject, date / time etc. Only when

user clicks on email subject, actual email is downloaded from server. Thus IMAP is both fast and more efficient.

- IMAP protocol also deals with attachments efficiently. Thus only when user tries to download or read an attachment, then only the attachment is downloaded from server.

- IMAP allows synchronization of emails across various folders. Thus emails can be organized into folders using one IMAP client and similar folders appear on all other IMAP clients automatically.

2.9.4 POP3

POP3 protocol requires user to download entire email before it can be read or used. Thus complete email body and attachments are downloaded and saved on local computer before they are presented to user. When the user is checking email, the connection to server is not made. Thus POP3 is often favored in cases where continuous access to Internet is not available and users want to download all the emails as and when Internet is available. The same can be achieved in IMAP by use of caching.

One of the drawbacks of POP3 is by default POP3 clients download the emails from server and then delete the copy of email from server. This is serious as if the local desktop crashes, then the emails will be lost.

The only advantage of POP3 in comparison to IMAP is that in POP3 since emails get deleted from server and kept only on local hard-disk we are not required to delete emails very frequently. There is limited email space on server so deleting emails from server ensures that enough space is available on server for new emails. Also there is no shortage of hard-disk space on local machine for emails, thus we can keep large number of emails without worrying about email quota.

Thus IMAP in most cases is superior to POP3, except in case of limited email quota available on email server.

2.10 Web based email clients

There are many different web based interfaces which can be used for email. For example within campus we have at least three different web interfaces for checking emails:

Roundcube : Used on students.iiit.ac.in

Zimbra : Used on research.iiit.ac.in and mail.iiit.ac.in

Squirrelmail : Provided on mail.iiit.ac.in for faster lightweight access

Most online email providers such as Gmail, Yahoo mail, Hotmail etc. have their own even richer interfaces compared to the open-source interfaces mentioned above.

2.11 Smart phones

There was been phenomenal growth of smart phones in last few years. One can check email directly on phone. With the help of wi-fi support on phone, users get access to very fast email access, free of cost, within offices and home. Also due to HSDPA, 3G, Edge or GPRS users can access email on the move with varying speeds and features.

Given the description of IMAP and POP3 above, it is evident that IMAP is suitable for accessing emails using phone and POP3 may not be desired for such uses.

3 Messengers

3.1 What are messengers

Apart from asynchronous communication using email, Internet or computer networks in general also provide users with options of synchronous communications using messengers. Using messengers users can send messages to each other and also receive them instantly (within few seconds). Thus longer discussions requiring many users can be completed in shorter time provided a common time when all the users are free for discussion is available.

Most messengers allow users to send lines of text and emoticons to express their views to other users. Modern messengers also allow users to user voice and video to communicate with other peers.

3.2 Advantages of messenger

Advantage of messenger is that you can get response faster. Messengers display which users are online and also their status (Available, Busy, Do not disturb) etc. so that we can contact them or avoid contacting them accordingly.

3.3 Status lines

Since messengers are synchronous, they also have huge disadvantage that user who receives the message could get interrupted while he/she is doing something very important. Thus it is required that messengers allow users to specify that they are busy with something important and should not be disturbed. This is similar to do not disturb option provided by many conference halls or hotels.

It can be noted that users can avoid getting contacted completely by simply signing off or logging out of messenger. But this would mean that others cannot the user, even if something more important and urgent then users current work comes up. Thus having a status line is more informative and flexible, so that users can inform all other users about their work in one brief line and others can use that information while trying to communicate with the user.

There is also option of invisible mode where users can see which other peers are online but others cannot see that user is online. Thus it is possible for user to initiate connection but others do not realize that they can send messages to the user instantly.

Modern messengers also support off-line messages. Thus it is possible to send messages to user who are not currently on-line. The receipt user receives such messages as and when they login on messenger later.

3.4 Different messaging service providers

There are different type of messaging service providers. Messaging services such as Gtalk and Yahoo messenger have their own back-end servers through which users are able to chat with each other. These services offer very powerful messengers which can be installed as desktop applications and support voice chat, file transfer etc. apart from simple chat. Many times a web interface for chat (such as in case of Gmail) is also provided.

Examples of such desktop messaging clients are:

- Yahoo messenger
- MSN messenger
- Gtalk
- Rediff bol
- Sify messenger

Sometimes websites provide messaging services as front end for yahoo, MSN, AOL, etc. messaging services. Examples of such messaging websites are:

- http://www.meebo.com
- http://www.coolim.com
- http://www.radiusim.com

4 Search engines

4.1 What are search engines

There are many million websites on Internet. It is not possible for users to know, remember or organize all the available websites. Thus a facility which can help in locating websites related to particular topic is required. This facility is provided by Internet search engines

4.2 Different Internet search engines

Various internet search engines are:

- http://www.bing.com/
- http://www.yahoo.com/
- http://www.google.co.in/
- http://www.duckduckgo.com/
- http://www.qwiki.com/
- http://www.wolframalpha.com

4.3 Search techniques

In order to get better results various search techniques are supported by search engines. Some of them are described here. Note that this techniques were learned for google search engine but many of them should work on most common Internet search engines:

Quotes : One can specify set of words that should occur exactly as it is same order by enclosing them in double quotes (“ ”) so that only exact matches are returned.
Example: `"Dark knight rises"`

site: : We can specify that search should be performed only on specified site and pages from other sites should not be returned.
Example: `site:sbarjatiya.com Internet skills`

define: : One can look for definitions of specific terms using define: option.
Example: `define: photosynthesis`

+ or - : We can specify more strictly that given word must be present in search results using ‘+’. We can also specify that certain words must not be present in search results using ‘-’.
Example: `CAT +animal -exam`

filetype: : We can specify the type of file that we are interested in using filetype: option.
Example: `filetype:pdf Shell commands`

inurl: : We can also specify that certain word must be part of URL.
Example: `inurl:download Fedora operating system`

4.4 Image search

Now a days search engines also support powerful image search. There are two types of image search supported. One is basic image search where user specifies some keyword such as ‘Aishwarya Rai’ and search engine displays all images related to given keyword. The other more powerful option is for users to upload an image and search engine displays images similar to the image supplied by user.

5 Useful websites

5.1 Useful Internet websites

www.gmail.com : Very powerful email service. Provides lot of space and very intuitive AJAX rich user interface.

www.google.co.in : Very popular search engine, also sometimes referred to as starting page of Internet

www.yahoo.com : Yahoo website has many services such as search, email, chat, news, games, etc.

www.wikipedia.org : Redirects to http://en.wikipedia.org/wiki/Main_Page. This is a community encyclopedia maintained by millions of users around their world.

www.sourceforge.com : This website is used to host source codes or many open source projects.

www.stackoverflow.com : This website supports Question / Answer type of forum for programmers.

www.w3schools.com : This website has tutorials and references for many web technologies such as HTML, CSS, HTML5, etc.

www.download.com : This website hosts many free software for various types of Operating Systems. Please note that there is difference between Freeware, Shareware, Open source, etc.

www.dictionary.com : This website can be used to search for meaning and definition of English words.

www.wolframalpha.com : This is a very powerful search engine. Apart from being able to search for answers of exact queries, it is also capable of solving very advanced mathematical problems.

www.qwiki.com : This search engine is unique in its approach as it displays the result in form of a video and not text or web pages links as most other websites do.

www.facebook.com / www.orkut.com / www.hi5.com / www.yaari.com : All of these are social networking websites which allow users to post messages which can be seen by other friends and lot of other users publicly.

www.rapidshare.com / www.megaupload.com / www.megashare.com : These websites are used for sharing files amongst various users. It should be noted that there is no guarantee that files available on this websites are genuine. Many times attackers upload virus infected setup files on such servers to infect large number of users. These websites also very often used for piracy of movies, songs, softwares, books, etc.

www.microsoft.com / www.msdn.com : These websites have lot of information related to microsoft products and technologies.

www.imdb.com : This is Internet movie database. This website has detailed information about almost all movies and TV serials. It also has information about producers, actors, etc.

www.youtube.com : This is a video sharing website. Users who have interesting video can upload it on this website and other users around the world can watch the video directly from the site without requiring to download it to the computer.

www.howstuffworks.com : This website has good information on how various things, devices, tools, machines, etc. work.

www.xkcd.com / www.phdcomics.com : These are few among large number of online comic strips that are available on Internet today.

5.2 Useful e-commerce websites

shopping.rediff.com / www.ebay.in : These are few websites which allow purchasing of items directly from the site and deliver the products right at doorstep in India. Users are also allowed to sell second hand material on these websites, apart from brand new products. Good features such as insurance against failed products, cash on delivery, return policies are provided by many such sites.

www.yatra.com / www.makemytrip.com : These websites allow one to plan travel tours and book tickets for plane, train, hotels, etc. from one single convenient place. Many times these websites have high service charges and should be used with keeping these charges in mind, in comparison to directly using hotel or airline website.

www.bookmyshow.com : This website allows booking of movie tickets from home across all major cities and theaters of India. Users can also choose the preferable seats from browser and pay for tickets online. Usually the site sends SMS which can be shown at ticket counter to collect actual tickets. Now a days site also allows printing of actual movie ticket directly at home.

www.erail.in / www.irctc.co.in / www.indianrail.gov.in : These websites are related to train reservations and inquiry.

www.hdfcbank.com / www.icicibank.com : These are bank websites for online bank transactions and for information about various services of each bank.

5.3 Useful intranet websites

Useful intranet websites are:

- mess.iiit.ac.in
- intranet.iiit.ac.in
- vpn.iiit.ac.in
- intranet.iiit.ac.in/courier
- courses.iiit.ac.in
- isas.iiit.ac.in

Many of these have already been described in about campus document. Please refer to that document description of Intranet websites.

6 Threats

While using Internet one should be aware of various threats that are present. One of the threats of using Internet is getting infected by malware (Harmful software). Malware can be broadly categorized into following categories:

Virus : Software which cause harm to computer are known as viruses. The harm could be deletion of files, unwanted modification of files, waste of CPU / RAM resources to make computer slow, unnecessary shutdown of computer, etc.

Spyware : Software which passively try to gather information about user usually to automatically upload it to attacker server are known as spyware. Spyware are typically used to capture private information such as bank account details, credit card numbers, passwords, etc. They can also be used for corporate espionage.

Adware : Software which are used to display unwanted adds to users by windows pop-ups, images, etc. are called adware. These software do not harm the computer or capture private information. Such software are generally used just for advertizements.

Worms : Any malware such as virus, spyware, adware which can spread automatically from one machine to other using networks without requiring user action, are categorized as worms. Worms can basically spread or multiply from one machine to other if they are introduced in a insecure network.

Trojan : Trojan or bots are software which can be used to control a computer remotely. These type of software can be used for attacker to perform various types of tasks on victims computer. Trojans can be used as spyware or viruses or for launching DDOS attacks on some large corporate or government installations.

7 Defense

In order to protect oneself from various types of threats present on Internet various software / hardware solutions are available. Some of them are:

Anti-virus : Software or hardware that helps in protecting computers from viruses are known as anti-virus. Anti-viruses only know about existing viruses and hence guarantee protection from new viruses. Hence presence of anti-virus does not ensures protection from viruses.

Firewall : Software or hardware that protects a computer from undesired network activity is known as firewall. Firewalls enhance security of a computer or network of computers by ensuring that outsiders or untrustworthy computers can contact the protected computers only at specific ports or using specific protocols etc. Thus firewalls reduce the surface area of attack. It should again be noted that present of firewall does not guarantee protection, they just make it hard for attackers to attack.

Spam filters : Spam filters are special software or hardware appliances that use machine learning, artificial intelligence, scoring etc. methods to distinguish Spam from useful mail. Note that spam filters do not really understand the emails, they use various algorithms to try to determine whether a mail could be useful or not. Hence anti-spam filters are also not guaranteed to work.

Careful reader should notice that although present defense systems make it harder for system or user to get affected by attacker, they are not perfect. Hence considerable knowledge and proper usage of systems is required from users to ensure their safety. Just having security software or appliances in place, without use of proper security practices or awareness among users, is not likely to result into a secure network.

8 Security tips

Few security tips which can help users in avoiding security problems and safe-guard them from common attacks are mentioned in this section.

8.1 Strong passwords

Users should use strong passwords. Passwords should not be shared with peers. Password should be lengthy and meaningless. The longer the password the more secure it is. Passwords should have mix of small letters, capital letters, digits and special characters.
Example password: `3r!@NMs5:,SZyT`

8.2 Trust no one

Users should not give correct information to someone without verifying authenticity of other party. For example while registering on some random website and asked for date of birth, address, mobile number etc. **ONLY wrong information should be provided**. Similarly if you receive email claiming to be from Bank, Faculty, Police, God or Don, do not believe it unless you have verified the same using some other mechanism or channel compared to channel from where you have received the information.

For example if you receive email from bank for your bank account password, do not use email itself to verify authenticity of the received email. Go to bank with printout or call bank and verify whether the email received is genuine or not.

Please note that no service provider or bank or server administrator would ever ask you for your password for maintenance. If you forget password, you would request help from bank or server administrator in resetting the password. Why would they require assistance from you, when they themselves have enough power to change your password?

8.3 HTTP vs HTTPS

There are two different protocol which can be used to browse web HTTP and HTTPS. HTTPS is more secure than HTTP. Whenever some bank website or any other website also wants to ask you private information such as credit card number, password, bank account details, etc. it should get those details only via HTTPS protocol. Hence before supplying such details on a page one must verify that page is HTTPS page.

Please also note that it is possible to have a HTTPS page after accepting a expired certificate, certificate with incorrect domain or self-signed certificate. In all such cases authenticity of target computer cannot be verified and such methods should be avoided. Such methods should never be used for financial transaction websites to provide HTTPS page. All financial websites would have proper HTTPS certificate from some recognized certificate authority so that your browser does not generates a certificate warning.

8.4 Firefox plugins

In order to secure Internet browsing and more over to provide considerable privacy to user when he/she is browsing website, a number of Firefox plugins can be used. Some of them are described below:

NoScript : NoScript is not easy to use for beginners as for many websites you would have to ask NoScript to allow website to execute JavaScript code, thus requiring double requests while trying to open web page. But NoScript can protect from large number of Javascript based attacks, and users are encouraged to try to learn to browse websites with NoScript protection in place.

Web of trust (WOT) : Web of trust is very useful plug-in as it warns user whenever they try to access a website that has very bad reputation. The bad reputation could be due to viruses, wrong information, violence, etc. reasons which WOT plug-in will try to indicate clearly to user, so that user can make informed decision. Without WOT onus of checking whether a given website is safe or not is entirely on user, which is completely impractical given that there are many million websites out there.

Ghostery : There are many advertizement networks that can be used to track movement of user from one website to other. With the help of Ghostery users can prevent such tracking advertizement networks from tracking user movement.

Adblock plus : Adblock plus can be used to block advertizements that are displayed by many websites. It should be noted that in some cases it may be illegal to use Adblock plus and website terms and conditions may specifically prevent use of such plugins. But the plug in is very useful as it helps in avoiding annoying ads which not only waste bandwidth but also can be used to track movement of users from one site to another.

BetterPrivacy : BetterPrivacy tries to keep privacy of users browsing activity maintained by removing flash cookies, or flash logs, or applet logs, etc. from remaining on system for long time. Many websites use flash, applet, etc. to give richer user experience. But use of such techniques also requires storing of information on local user computer which can be used to identify user or to track various websites visited by same user. Thus BetterPrivacy periodically (or on browser exit) removes this information to preserve privacy of users to large extent.

If use of all these plugins seems to much, then search on Internet about privacy. For example see demo of http://www.duckduckgo.com where they explain to users why Duck Duck Go is better in terms of privacy when compared to other search engines.

8.5 Sparse table problems

Sparse table problems are described with the help of two examples. These two examples should enable users to appreciate the problem.

8.5.1 Search queries

Consider example of anonymous user who goes to cyber cafe to Browse Internet. Now since the user has not logged in on the search website, he/she would think that no body can trace the search queries back to him/her. Consider following search queries coming from same computer:

- IIIT Hyderabad admissions
- IIIT Hyderabad courses
- IIIT Hyderabad pictures
- DPS R K Puram alumni group
- Long time effects of knee injury
- Surviving flesh eating bacteria
- Tips for healthy bones
- Tips to increase height

Now although the user has not given his/her name, address, etc. but we can easily **uniquely** identify the person who has used the above queries by correlating various queries. For example in above case the queries are most likely from a student who has just passed 12th from DPS R K Puram. The student wants to or has already got admission in IIIT Hyderabad. Student in recent past has most likely suffered a knee injury, probably even a fracture. It is also possible that student has less height than normal 12th passed students.

This much information is more than enough to **uniquely** identify the student in the whole world.

8.5.2 Purchase information

Consider another example of person who goes to super market and purchases all daily use items such as soap, shampoo, tooth-paste etc. using credit card. Now if the same person is moved to another location and given a new identity under witness protection (Watch movie 'Eraser') then the person can be easily identified with the help of purchase details.

If we consider the total number of tooth-pastes available in the market, the number would be more than 20. If we just count the most commonly used or famous tooth-pastes even then number would be around 6 or 7. Since the choice of tooth-paste will not change when person is moved to new location and given a new identity, he/she would continue to purchase the same tooth-paste at new location too. This may not appear dangerous as there could be millions of people around the world purchasing same tooth-paste.

The problem here is that it is not just tooth-paste that gets purchased. Given that there are 6 or 7 famous tooth-pastes, one can easily reject 85% of the population as not being witness just by looking at their tooth-paste choice. Thus we can reject billions of people, to be not be the witness, just because of their tooth-paste choice. This is when witness uses a famous brand of tooth-paste which is used by 15% people around the world. If witness uses some rare tooth-paste type which only 1% people prefer, then we can reject 99% of the world population just by looking at tooth-paste.

Now if we consider hair-oil or shampoo or soap there could be 6 or 7 famous brands of all these. But since the witness is not going to change the choice of hair-oil, shampoo, or soap because of change of identity which each category of item we can reject 85% of the remaining people who could be witness. Thus if we just consider four items such as hair-oil, shampoo, soap, and toothpaste we would be left with $.15^4 = 5.0625 \times 10^{-4}$, which is .05% of the world population.

If we add more items such as cereals, fruits, etc. with other properties of witness such as gender, height, etc. which are not going to be changed as

part of protection, it is not hard to identify witness **uniquely** in the world by just having his/her daily use items purchase information.

Now consider today's scenario where more and more people prefer to pay by card. Also big chains such as Spenders, reliance, etc. give their own shopping cards which one can use after every purchase and would allow linking of various purchases of same person. If this seemingly harmless purchase information is not secured with same safety standards as medical data or personal information, then it might be be used to identify or locate persons.

8.5.3 Conclusion

Thus it is important for users to understand that they can be identified easily uniquely from rest of the worlds population by seemingly anonymous search queries and purchase information. The problem is that although there can be many users around the world who would use the same query or purchase a given brand of tooth-paste, once we add more queries or more items, the chances of someone else doing the same set of queries or purchasing same items reduces exponentially. Thus 20 or 30 queries or purchase item history should be good enough to identify the person or at least narrow down to very limited set of people.

8.6 Netsafe cards

There is increase in number of online purchases. Many times for payment users get choices such as credit card, online bank transfer, etc. Now among most choices the payment by credit card is most risky as the information is supplied to the e-commerce website, in comparison to direct debit facility by e-banking where information is provided at bank website. In order to reduce the risks of credit card misuse, HDFC bank provides option of netsafe cards. Other banks may also have similar option under same or different brand name.

With netsafe facility, HDFC bank allows users to generate a credit card online with limited credit limit supplied by user online. These credit cards can be used only once and automatically expire in 48 hours. Thus we can generate an netsafe card with the limit around the purchase that we want to make and use the credit card for purchase on website. In case website stores the credit card information with security code (CVV number) (which it should not) and later leaks the same information to other people, then our card information would be useless as the card is one time card.

Also if the website is fake and we have supplied credit card information to attack website then the maximum loss is limited to the limit with which

we have generated the card, and not to our total credit limit on given credit card.

8.7 Verified by visa or Verified by master card

In order to secure on-line purchases made through Visa or Master card, Indian government has made it mandatory for banks to implement a security policy called verified by visa or verified by master card. Due to this scheme all credit or debit card purchases done through cards provided by Indian banks and Indian merchants online requires user to enter a online security Pin which is not present on the credit card.

Please note that if some credit card is lost then all the information needed to make purchase with that credit card without this rule in place is always available on card including CVV number or security code. With the help of this rule a secure code, similar to ATM pin is required to make purchase online with given card. In fact many banks ask for ATM pin to be entered while making on-line purchase to verify the identity of the card holder.

Without this security in place credit-card companies and banks were providing insurance against card thefts and frauds. With this security provision, the credit card companies are no longer required to provide insurance against online frauds as they would require verified by VISA or Verified by Master Card PIN which is only known to legitimate owner. To ensure that attack websites cannot capture this PIN along with other card information, similar to direct debit facility through e-banking, the PIN is only entered at bank website and never entered at merchant website. Thus ensuring safety against malicious websites.

9 Basics of computer networks

Minimal basics of computer networks are necessary for users to be able to use network of computers for normal operations. Hence very important basics of computer networks are discussed in this section.

9.1 What is an IP address?

An IP address is a set of four integer numbers, all between 0 and 255 (including) which can be used to identify a computer uniquely in a set of networked computers. Example IP addresses are 1.1.1.1, 0.0.0.0, 1.2.3.4, 255.255.255.255, 10.3.8.35, 10.3.11.56, etc.

9.2 How to find IP address in Windows / Linux?

To find IP address in Linux one can use '`/sbin/ifconfig`' command to get the IP address of all networked interfaces. Note that all computers also have a loop-back interface usually with IP address 127.0.0.1 for self-communication. This address 127.0.0.1 cannot be used for communicating with other computers, as it is meant for communicating within same computer.

9.3 DHCP

There are two common ways of assigning IP address to computers. First is the manual address assignment where the user assigns IP address along with various other necessary information such as subnet-mask, gateway address, DNS address, search domains, etc. But since it is not easy for users to remember all this information for various locations DHCP server is used. Note that manual address allotment also suffers from risk of IP conflict, where two users can accidentally or even intentionally end up having same IP address. When two computers in a network have same address, they both face problems in accessing network.

The other way of assigning IP address is through use of DHCP server. DHCP server gives IP address to machine and usually records the identity of machine in leases file with details like MAC address, Identifier string, etc. information. Using this information DHCP server can recognize the same machine when it requests for IP address in future and try to give same address to the machine.

However if some machine does not requests IP address from DHCP server for very long duration (say months) then DHCP server can remove information about that machine from leases file to keep the size of leases size small. Thus if machine does not appears in network for long time and later resurfaces then that machine may get different IP address, then what was assigned to it months ago, as DHCP server wont have information about older IP address that was assigned to the machine.

If the total number of users in networks are more, but not all the users connect to network at same time, then DHCP server can be used to assign next available free address to the requesting computer. In such cases a small number of IP addresses get rotated among large number of users and same user can get new IP address in every subsequent request.

9.4 DNS

Computers recognize other computers in a network with help of IP addresses. But it is not easy for human beings to remember large number of IP addresses of so many computers. Hence services are often given names such as google.co.in, intranet.iiit.ac.in, bing.com, etc. But since computers only talk with each other using IP address some service is required to convert the names to IP addresses. This service is provided by DNS server. Users can request DNS servers for converting names to IP addresses.

This is similar to contacts or address book functionality that is present in most modern cell-phones were we store contact numbers of our friends and colleagues with easy to remember names and later use these names, instead of numbers to make call or send SMS, although the telephone service provider only understands telephone numbers and not names.