



 *Instant messaging*



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## ▶ Introduction

Instant messaging software offers a tantalizing proposition: Combine the speed of real-time conversation with the functionality of e-mail. Send quick notes to friends and colleagues; attach files, URLs, and even invitations to join group chat without creating large e-mail databases. The promise: Communicate, and collaborate, faster, better, and cheaper than ever before. Instant messaging has undergone some of the most explosive growth of any method of communication in history, and according to a recent Ziff-Davis article (1),

“Instant messaging, by some accounts, is growing faster than any communications medium in history. AOL says its three instant-messaging services have nearly 80 million users, and crossed the 50 million mark in less than 2 1/2 years -- compared with five years for the Internet and 13 years for television.”

It is plainly obvious that this technology is here to stay – it’s just a matter of time before it becomes as common as a telephone or even email. What makes instant messaging so appealing?

## ▶ What is it?

Presence & Instant Messaging software (or IM for short) allow people to communicate in *real time* over the internet, at speeds an order of magnitude faster than the next-fastest mode of communication, email. IM software allows users to create and maintain lists of contacts, friends, and acquaintances, and allows them to know exactly when they are using the Internet (or at the very least, when their friends have the IM application running). A quick glance at one’s IM client tells you exactly which of your friends are online, and what their status is – for example, in ICQ, users can be in one of many different modes – for example: Away, Available, Extended Away, Available To Chat, Busy, Do Not Disturb, etc. There exist many different IM packages today, each of which use their own proprietary protocols, and as such are not compatible among one another. (This, however, is changing – an ambitious project known as *Jabber* hopes to bridge the many gaps between disparate IM packages and protocols.)

The three most popular IM clients that exist today are AOL’s AIM, Mirabilis’ ICQ, and Microsoft’s Messenger service. For the purposes of our discussion, we will focus on the product from Mirabilis (now owned by AOL-Time Warner), as it is generally considered the “original” IM application. As with all modern IM services, ICQ allows users to do much more than simply send text-messages to one another. With the latest version of ICQ, (version 2000b), users can choose to chat, send files, send URLs, initiate voice chats, play games, etc. The functions available seem to increase with each passing day!

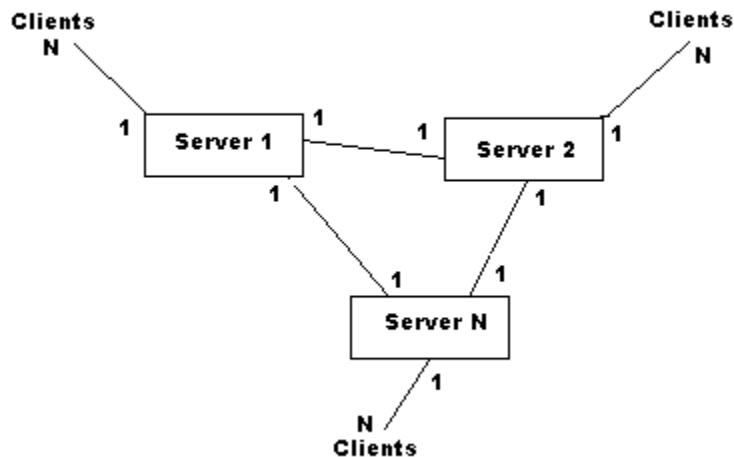
## ▶ History

IM has existed in one form or another for almost 20 years now – precursors to IM existed as early as 1984, in certain Bulletin Board System (BBS) software packages. These features allowed for real-time, person-to-person communication, between users and the system operator, or between users on different nodes of the same BBS. In 1988, a Finnish engineering student named Jarkko Oikarinen (2) invented a similar mode of communication known as Internet Relay Chat (IRC) – as the name implies, this service allowed users to chat from anywhere on the Internet; they were no longer restricted to being on the same BBS. IRC is the most closely related ancestor of all modern IM software; what follows is a brief description of how it works, which will set up our following discussion about IM.

### ▶ A Brief Overview of IRC

When a person wishes to use IRC, they first must launch a program on their computer (or their host computer; this is distinction without difference, however, so this detail can be ignored) and connect to an IRC server – usually on port 6667 or a port similar to that. Sometimes, the IRC server will request that the client connecting identify itself; in other cases, the client is allowed to connect arbitrarily. These servers are in turn connected to all the other servers in a given network. See Figure 1 for an illustration. Once connected, the user can join what are known as channels – these are just virtual “rooms” where groups of people can meet and discuss whatever they wish, in a party-line type of setting. All messages are sent to the main server to which each client is connected, and these servers in turn distribute the messages to other servers – and the receiving servers send the messages to their connected clients, so that all users in a given channel can see what the other users are typing. This setup generally works well, except for a few small problems (the devil, as they say, is in the details).

First, the IRC servers in a given network must remain connected to *all* the other IRC servers for a given network. When a server becomes disconnected from the rest of its network, all the users connected to the (now disconnected) server no longer see the users on the rest of the network, and obviously none of the messages passed are transmitted. This is known as a “net-split” or simply a “split”. A more trivial problem, but still worth mentioning, is that there may be significant lag time between when a message is sent by a user and when the message is received by all the other users in a given chat room – this phenomenon is known as “lag” and while it isn’t as critical as a split, it can still be highly disruptive to the flow of a conversation.



**Figure 1**

As stated earlier, a user sends a message to the general chat room by typing a message into his or her client, and the client sends the message to the server, which in turn broadcasts the message to all the other servers belonging to the same network. However, IRC is not limited to these sorts of party-line chat rooms. Users are able to send private messages to one another, and even transfer files between each other! There are actually two ways to send a private message from one user to another – the normal way is sent via the servers, like any other message, only addressed to a specific person instead of a channel. Another way is via a Direct Client-to-Client Connection (DCC) – in this case, as the name implies, the server is completely ignored, and the message is transferred directly from one client to the other. This eliminates the lag associated with the servers, and also insulates the users against net-splits. Files cannot be transferred through the servers; obviously, this would potentially place an enormous burden on the servers, and so the only way to transfer files between users is via DCC.

At around the same time that IRC was invented, America On-Line (AOL) added what were known as “buddy-lists” to its client software. It functioned in a manner similar to modern IM software, but it was limited to users who were on AOL – this was when AOL was still an on-line service, and not an Internet Service Provider (ISP). This feature eventually spawned AOL’s “AIM” (AOL Instant Messenger) software package, which will be discussed later.

The real break-through for IM came with a company called Mirabilis and their product – an oddly named program called ICQ. Many users wonder what ICQ stands for – and they’re usually quite surprised when they find out! In truth, ICQ stands for nothing – it’s actually a phonemic device that means “I-Seek-You”. Four young

computer enthusiasts from Israel formed Mirabilis in July of 1996, and in four short months, they released the first version of their world-famous program: Version 1 of ICQ. It was free when it was first introduced five years ago, and remains free to this day – although very recently (within the last few months) the latest version of ICQ, version 2000b, has added banner advertisements to the bottom of message windows and file transfer dialogs. ICQ is widely regarded as the first program that was able to bring IM to the mainstream, using a combination of viral marketing (some referred to it being spread via “*word-of-mouse*”) and just plain usefulness. (12)

### ▶ How does it work?

Instant Messaging primarily works similar to a client/server model. When the client connects to a central "server" that verifies your identity and registers you as being online then when other users register and connect, they will know that you are logged on because the server will know that you are online. Therefore rather than to run to your co-workers desk to ask them a question you can send them an Instant Message; this saves on time, and increases productivity.

### ▶ A case Study :: The ICQ Protocol

ICQ, as with all IM software, uses a mixture of both Peer-to-Peer (P2P) and Client-Server architecture. The ICQ protocol has gone through several phases since its initial inception in 1996. There are six versions of the protocol each of which is backward compatible with previous versions.

Before any communication between users can take place, the client must register at the server by logging in. During the login process, the client sends information about itself to the server, including its IP address, the TCP port reserved for ICQ, the user's password and the user's contact list. From now on, the client will assume itself to be 'connected', and will every now and then send a 'keep alive' message to the server. This keep alive message performs two functions: it makes the client sure that it still has access to the server, and it makes the server sure that the user is still online. By default, the client will 'connect' to the server on UDP port 4000.

Communication with persons online is done through a direct TCP connection to that person. All other communication is done through UDP packets sent to the ICQ server. UDP is a connectionless protocol, which, like TCP, is layered on top of IP. The receiver must acknowledge all UDP packets. Retransmission will occur in 10 seconds, if an acknowledgement is not received. After 6 unsuccessful transmissions, a message requesting acknowledgment will be sent. The whole procedure is repeated 2 times. If there is still no reply, the ICQ client will assume the user to be disconnected. After the message has been sent, the TCP connection is not closed, but instead kept

open and used to send future messages to that user. The connection is closed when either of the two users disconnect from their ICQ connection.

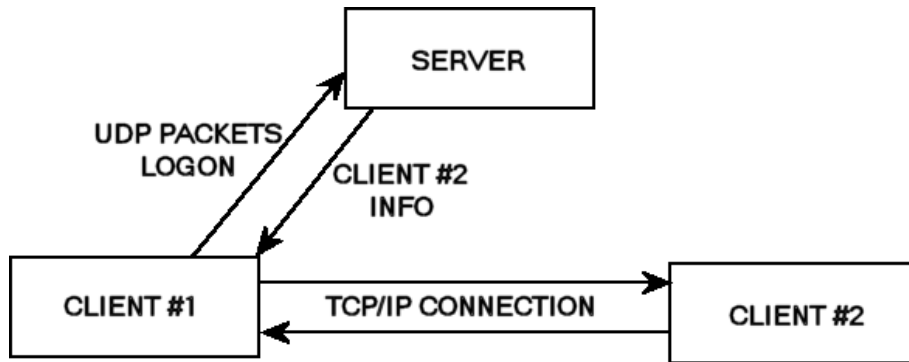


Figure 2

Functions such as sending messages to offline users, getting information about a user, searching for users in the ICQ Global Directory and changing password are done by sending UDP packets to the ICQ server. These packets all follow a simple template, including the senders UIN, a special code indicating which function the server should perform, and optional parameters.

The initial 2 versions were very simplistic but as the software became more advanced there was a need for security and more commands to be passed between clients. In version 3 a checksum was added to help with the integrity of the packets. Versions 4 and 5 use encryption when transferring data making the software more secure. The newest version V6 is a totally new protocol, which uses a more sophisticated encryption system. So far there is basically nothing known about the latest protocol in use by ICQ 2000b. (11)

## ▶ IM standards

There is currently no standard in place but with the size of the market there will be a need to have a definitive standard. This will enable all IM clients to have access to all other users, creating an enormous online community.

The Internet Engineering Task Force (IETF) responsible for setting up standards worldwide has zeroed in on three technical proposals for creating an instant messaging standard:

- IMPS (Instant Messaging and Presence using SIP), an approach that uses the Session Initiation Protocol designed for telephone signaling applications to handle instant messages and online presence perception. This proposal team includes representatives from Cisco and Microsoft.

- IMXP, a proposal that uses the Blocks Extensible Exchange Protocol, which itself supports XML-based messaging as its transport protocol. This proposal team is led by start-up Invisible Worlds.

- SIMPLE (Simple Instant Messaging Protocol), which uses servers as socket-level forwarders to transport messages. This proposal team includes employees of Fujitsu and MIT.

## ▶ The Current State of IM

The following is a short list of some of the most popular IM clients that exist today, as well as some of the more ambitious projects that are attempting to unify all the disparate IM standards. Please note that feature lists are taken verbatim from the products' website, when available.

## ▶ Clients: Features and Platforms

### **AOL Instant Messenger (AIM) – from AOL-Time Warner**

<http://www.aol.com/aim/>

#### Features:

- Receive instant alerts
- Send instant messages
- Share photos, pictures and sounds
- Enjoy live conversations online - FREE
- Chat with friends and family or people with similar interests
- Stay on top of the news and stocks
- Access your complete and combined buddy list from any computer
- Play online games against your AIM Buddies

#### Platforms Supported:

- Windows 95/98/NT/ME/2000
- Windows CE
- PowerPC Mac
- 68K Mac
- Linux
- Palm
- WAP-enabled mobile phones
- AIM Express – No download required; can be run from any computer with a web browser.

## **MSN Messenger – from Microsoft Inc.**

<http://messenger.msn.ca/>

### Features:

- Voice conversations: Are your fingers all worn out from typing? Use the MSN® Messenger Service to set up a voice conversation. Call PC to PC, or PC-to-phone, and take advantage of free long-distance in the U.S. up to 5 minutes!
- World-wide phone calls: Call anywhere in the world for a very low rate. You can still call anywhere in the U.S. for free up to 5 minutes.\*
- MoneyCentral™ tab: Keep track of your stocks in MSN Messenger. For U.S. and Canada (English) only.
- Page your friends: Send text messages to your friends' cell phones and pagers.
- Share your files: Trade pictures, music, documents, or other files using MSN Messenger Service.
- Easy access to Hotmail®: See how many new Hotmail e-mail messages you have. And get notified whenever you receive a new Hotmail e-mail message.

### Platforms Supported:

- Windows
- MacOS

## **ICQ – from Mirabilis (now a wholly owned subsidiary of AOL-Time Warner)**

<http://www.icq.com/>

### Features:

- Send Files
- Send Web Page Address (URL)
- Send Contacts
- Send Voice Message
- Send Greeting Card
- Interactive, multiple user chat
- Send SMS Message to Cell Phones

### Platforms Supported:

- Windows 95/98/2000/ME/NT
- Windows CE



- Windows 3.1x
- PowerPC
- 68K Mac
- Java
- PalmOS

### **Yahoo! Instant Messenger – from Yahoo! Inc.**

<http://messenger.yahoo.com/>

#### Features:

- Free Phone Calls - Make free pc-to-phone calls anywhere in the United States!
- Yahoo! Chat Client - Use Messenger to talk in all your favorite Yahoo! Chat rooms.
- New Instant Messages - Your favorite features are now available with the click of the mouse.
- New Smileys - Send all new smileys to all your friends!
- Font Effects - Fade or alternate the text of your messages.

#### Platforms Supported:

- Windows
- Mac
- FreeBSD
- Linux
- Java
- PalmOS
- WinCE
- RIM Handheld
- WAP-enabled mobile phones

### **Jabber – from Jabber.com**

<http://www.jabber.com/>

#### Features:

- Distributed Server Architecture
- ISP-level service, similar to most other Internet services
- XML based messaging transport protocol
- Simplistic in function, allowing simple and pervasive clients
- Embeddable and Extensible in every way
- Back-end compatibility with all other IM systems (you can communicate with AIM, ICQ, Yahoo!, and MSN users, as well as users of future IM systems)

- Server written entirely in ANSI C for maximum cross-platform compatibility

Platforms Supported:

- Linux / Unix
- Windows
- Macintosh
- BeOS
- OS/2
- And many other lesser-known platforms...

As stated earlier, that was only a small selection of the many IM packages that exist today. There even exist projects that attempt to combine not only all the disparate IM clients and protocols, but also Peer-to-Peer (P2P) file sharing services like Napster and Scour as well! (For example, the OMNI project, which attempts to combine AIM, Yahoo! Instant Messenger, ICQ, MSN, Napster, and Gnutella – all in a single client! (4))

Instant messaging is also big business – as alluded to earlier, in June of 1998, “The instant messaging concept got an endorsement last week when America Online Inc. said it will pay \$287 million for Mirabilis Ltd, an Israeli company that owns [ICQ](#), an instant messaging and chat service with about 12 million registered users.” (9)

Currently, the instant messaging area is undergoing another phase of growth and transformation. Many of the most popular clients (MSN Messenger being the glaring exception) are now available via PDAs and cell phones! This is only the beginning of the Next Big Thing – that is, convergence of all the gadgets and gizmos that people currently use. With IM being available from a cell phone, instant messages are no longer constrained to being just from desktop-to-desktop or from one computer to another – it can now be as ubiquitous as a telephone!

### **How many people are using IM?**

As with all things on the Internet, it’s generally impossible to give exact numbers. But there are several good estimates available, from various sources. For example, C|Net’s Download.com service proclaims that “ICQ is so popular, it recently surpassed the 100-million-download mark on Download.com, a feat that even we couldn't have imagined when we first listed the program in 1996.” (6). The article goes on to add “presently, there are more than 15 million active ICQ users around the globe, and more than 100,000 ICQ-related downloads occur on our site each day.”

AOL, on the main AIM website, claims that over 84 million people are using its IM client – a staggering number, and even more so when you consider that these are people who are *only using AIM*. However, this number may need to be taken with a

grain of salt – according to another document, “every AOL user [is], by definition, a registered AIM user as well” (7).

More generally speaking, we can also find numbers that speak about the industry as a whole, as opposed to specific clients: “A report out from Mobile Insights suggests that ... the Instant messaging market will reach 175 million users worldwide by 2002.” Estimates as early as 1999, from the same document, suggest that users were sending in excess of 750 million messages *per day* – so in the present, it is highly likely that there are more than 1.5 *billion* instant messages being sent every day!

### ▶ Security issues with IM

With the meteoric rise in IM’s popularity, there has inevitably been a tradeoff between the ease of use of the IM clients and their security. The first versions of ICQ were totally lacking in any kinds of security features whatsoever – messages were passed in plain text, and “spoofing” (hijacking of a user’s account and identity) was an all-too-common problem. According to Seth M. McGann in his post to the NT Bugtraq list, “The Client-To-Client Protocol used by ICQ is even worse. It does no authentication of any kind and places all trust in the client. Spoofing messages from arbitrary ICQ users is easy, as is sending file and chat requests. Even worse, if the client gets anything it doesn't expect it crashes (!) sometimes taking Windows with it. There is also no flood protection and packet replay is possible. A few thousand messages will slow my P166 to a crawl. “ (10) The list goes on.

Also, a very common problem faced by many IM users is spam – unwanted and unsolicited messages that appear in the IM clients without warning. Often, these messages are from non-existent accounts and advertise sleazy services like porn sites or off-shore gambling facilities. But because of the weaknesses inherent in many of the IM protocols, end-users are powerless to prevent such messages from accosting them.

The security problems in ICQ and other clients are getting better, with each new release. It is understandable how such sloppiness became built into the programs – after all, with ICQ growing its user base by 100% *per week* (7), the programmers were generally more concerned with adding new features and keeping their systems available to deal with the sheer number of users – security, unfortunately, was left on the backburner for quite some time.

### ▶ Troubles using IM

At times messages that pop up on screen at inopportune moments can destroy a workers concentration and text scrawled that is sent in hurriedness can spark online arguments. Online communication has barriers that face-to-face communication does not encounter and can therefore cause frequent misunderstandings. Some employees find that instant messages can be more annoying than other forms of electronic communication because the messages appear on screen as soon as they are sent where as a recipient of a voice mail, e-mail or fax can choose to acknowledge a message at

their convenience, but with instant messages, the sender is in control, unless the recipient chooses to ignore or avoid the electronic messages. (3)

## **The future of IM**

Instant messengers are not going to fade away; as a matter of fact, there are products being introduced daily that enable businesses to send streaming voice messages via e-mail, conduct real-time voice chats over the Internet and create instant virtual communities on any Web site. (13) In the near future instant messaging will be a business-critical application much like the telephone is today. It will no longer be considered just a distraction for employees. In addition to the myriad applications that IM can find in business (such as streamlining customer-service on online shopping sites, or helping to facilitate employee communication within a firm), we are also beginning to see the convergence of IM with many other devices and mediums, such as PDAs and cellular phones.

Instant messaging is now being installed on devices other than desktop computers. While it hasn't happened yet, we could soon see IM clients being installed in the firmware of the next generation of cellular phones. For now, however, there are just too many competing "standards" to make this feasible. As seen earlier, embedded OSs like Windows CE and PalmOS are also now getting their own versions of instant messengers. As a recent article in Byte magazine put it, Conceivably, your fridge can now let you know when the beer is cold, or it's time to order milk – via an instant message to your computer or cell phone! In fact, it won't be long before your refrigerator will order the milk and pay with your credit card over a secure broadband Internet connection. (5)

There is no denying the power and appeal of IM. While there may be security concerns now, there is no question that these problems will be resolved in the near future. Another hindrance to IM becoming truly mainstream is the lack of any unified standards; again, this is a problem that is being addressed and should not remain an obstacle for much longer. Once these problems are solved, IM will truly come into its own – and its popularity could very well rival that of email or even telephone conversations, some day! The explosive growth experienced by ICQ is a very strong testament to this fact, and it will not be long before every user on the Internet makes use of IM – just like email or the telephone, the (future) ubiquity of IM is beyond question!

## ► Resources employed in creating this document

- (1) <http://www.zdnet.com/zdnn/stories/news/0,4586,2301773,00.html>
- (2) <http://www.zdnet.com/yil/content/surfschool/howto/communicate/irc1a.html>
- (3) <http://netconference.miningco.com/internet/netconference/library/weekly/aa042098.htm>
- (4) <http://www.emphatech.com>
- (5) <http://www.byte.com/column/BYT19991111S0012>
- (6) <http://download.cnet.com/downloads/0-10000-7-2026450.html>
- (7) <http://www.mids.org/pay/mn/1009/dutton.html>
- (8) [http://www.findarticles.com/m0NEW/1999\\_July\\_29/55312683/p1/article.jhtml](http://www.findarticles.com/m0NEW/1999_July_29/55312683/p1/article.jhtml)
- (9) [http://www.internetnews.com/IAR/article/0,,12\\_6911,00.html](http://www.internetnews.com/IAR/article/0,,12_6911,00.html)
- (10) <http://www.digivill.net/~minus/icq/post.txt>
- (11) <http://omega.uta.edu/~tom/ICQ/>
- (12) <http://www.mirabilis.com/company/about.html>
- (13) <http://netconference.about.com/internet/netconference/library/weekly/aa032900a.htm>