

A

Seminar report

On

## Google Wave

Submitted in partial fulfillment of the requirement for the award of degree  
Of CSE

**SUBMITTED TO:**

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**SUBMITTED BY:**

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## Acknowledgement

I would like to thank respected Mr. .... and Mr. .... for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

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Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

## Preface

I have made this report file on the topic **Google Wave**; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to .....who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

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## Introduction

**Google Wave** is a software framework centered on online real-time collaborative editing, previously developed by Google. It was first announced at the Google I/O conference on May 27, 2009. Google Wave is a web-based computing platform and communications protocol, designed to merge key features of media like e-mail, instant messaging, wikis, and social networking. Communications using the system can be synchronous and/or asynchro Software extensions provide contextual spelling/grammar checking, automated translation among 40 languages, and numerous other features.nous, depending on the preference of individual users

Initially released only to developers, a preview release of Google Wave was extended to 100,000 users in September 2009, each allowed to invite additional users. Google accepted most requests submitted starting November 29, 2009, soon after the September extended release of the technical preview. On May 19, 2010, Google Wave was released to the general public.

On August 4, 2010, Google announced the suspension of stand-alone Wave development and the intent of maintaining the web site at least for the remainder of the year. Development was handed over to the Apache Software Foundation which started to develop a server based product called Wave in a box (WIAB).

## What is a wave?

A wave is equal parts conversation and document. People can communicate and work together with richly formatted text, photos, videos, maps, and more. A wave is shared. Any participant can reply anywhere in the message, edit the content and add participants at any point in the process. Then playback lets anyone rewind the wave to see who said what and when. A wave is live. With live transmission as you type, participants on a wave can have faster conversations, see edits and interact with extensions in real-time.

**Google Wave is a real-time communication platform.** It combines aspects of email, instant messaging, wikis, web chat, social networking, and project management to build one elegant, in-browser communication client. You can bring a group of friends or business partners together to discuss how your day has been or share files.

Lars and Jens Rasmussen, the original creators of Google Maps unveiled their latest project, Google Wave. As Lars describes it, "We set out to answer the question: What would email look like if we set out to invent it today?"

**Google Wave has a lot of innovative features, but here are just a few:**



**Real-time:** In most instances, you can see what someone else is typing, character-by-character.

**Embeddability:** Waves can be embedded on any blog or website.

**Applications and Extensions:** Just like a Facebook application or an iGoogle gadget, developers can build their own apps within waves. They can be anything from bots to complex real-time games.

**Wiki functionality:** Anything written within a Google Wave can be edited by anyone else, because all conversations within the platform are shared. Thus, you can correct information, append information, or add your own commentary within a developing conversation.

**Open source:** The Google Wave code will be open source, to foster innovation and adoption amongst developers.

**Playback:** You can playback any part of the wave to see what was said.

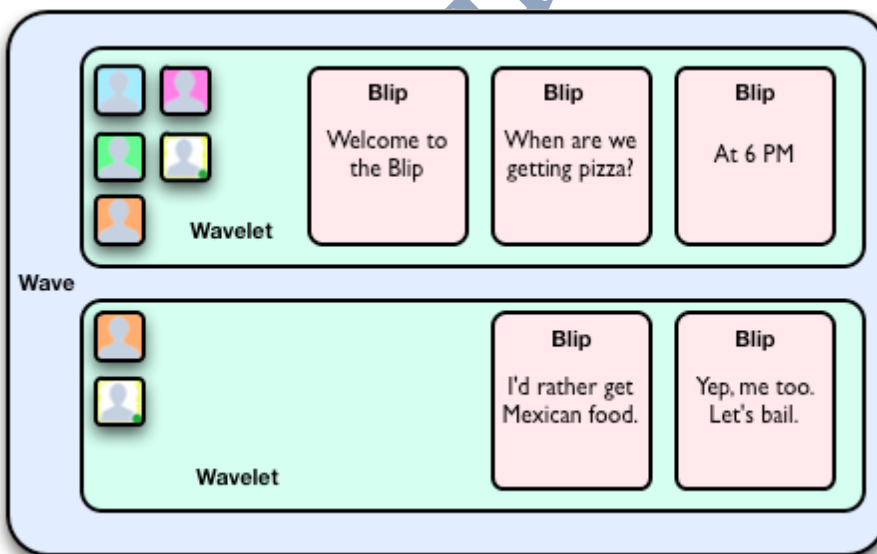
**Natural language:** Google Wave can autocorrect your spelling, even going as far as knowing the difference between similar words, like “been” and “bean.” It can also auto-translate on-the-fly.

**Drag-and-drop file sharing:** No attachments; just drag your file and drop it inside Google Wave and everyone will have access.

While these are only a few of the many features of Google Wave, it’s easy to see why people are extremely excited.

Google Wave was the brainchild of a team based out of Sydney, Australia. The core team members are two brothers, Jens and Lars Rasmussen, and lead project manager Stephanie Hannon, all of whom were involved in Google Maps previously. Google Wave was announced today at Google’s I/O Developer conference, although the product will not be available to the public for several months.

## 2. Terminology:



Google Wave actually has its own lingo – yes, you have to learn a few definitions if you’re going to really understand this new communication platform. Having



knowledge of these terms will help you understand more about Google's newest project.

**Wave:** A wave, specifically, refers to a specific threaded conversation. It can include just one person, or it can include a group of users or even robots (explained below). The best comparison I can make is that it's like your entire instant messaging (IM) history with someone. Anything you've ever discussed in a single chat or conversation is a wave.

**Wavelet:** A wavelet is also a threaded conversation, but only a subset of a larger conversation (or a wave). It's like a single IM conversation – a small part of a larger conversation and a larger history. Wavelets, though, can be created and managed separately from a wave.

**Blip:** Even smaller than a Wavelet, a Blip is a single, individual message. It's like a single line of an IM conversation. Blips can have other blips attached to them, called children. In addition, blips can either be published or unpublished (once again, it's sort of like typing out an IM message but not yet sending it).

**Document:** A document actually refers to the content within a blip. This seems to refer to the actual characters, words, and files associated with a blip.

**Extension:** An extension is a mini-application that works within a wave. So these are the apps you can play with while using Wave. There are two main types of extensions: Gadgets and Robots.

**Gadgets:** A gadget is an application users can participate with, many of which are built on Google's OpenSocial platform. A good comparison would be iGoogle gadgets or Facebook applications.

**Robots:** Robots are an automated participant within a wave. They can talk with users and interact with waves. They can provide information from outside sources (i.e. Twitter or they can check content within a wave and perform actions based on them (i.e. provide you a stock quote if a stock name is mentioned).

**Embedded Wave:** An embedded wave is a way to take a Google Wave and the conversation within it and place it on your website. Users could use this as a chatroom, as a way to contact you, or for something more.

### 3.WaveGadgets:



A Wave Gadget is one of two types of Google Wave extensions. Gadgets are fully functional applications. According to Google, gadgets are primarily for changing the look and feel of waves, although this seems to only scratch the surface of the potential of a wave gadget.

First: almost any iGoogle or OpenSocial gadget can run within Google Wave. That means thousands of applications that have been already created will work in Google Wave.

Second: a gadget built within Google Wave can take advantage of live interaction with multiple users. This means something like a live online game with active participation from all users. In that way, it has similarities to Facebook or MySpace applications, which take advantage of your friend network

to make games, quizzes, and applications more meaningful and useful.

Gadgets are specific to individual waves, rather than to specific users. Thus, it's not like having a Facebook app on your profile – the gadget belongs to everyone within the wave. They also do not have titles, to better integrate with the actual conversation. Some of the gadgets already built include a Sudoku gadget, Bidder (which turns your wave into an auction), and Maps (which allows for collaboration on a Google Map).

#### 4.Wave Robots:

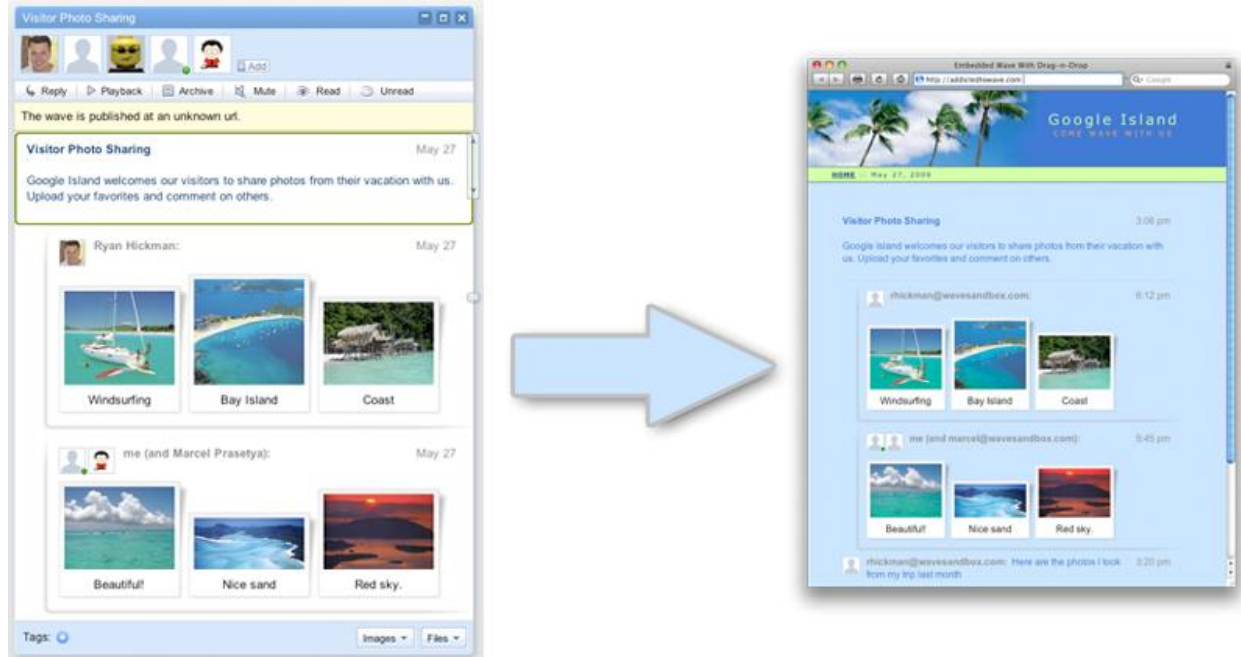


Robots are the other type of Google Wave extension. Robots are like having another person within a Google Wave conversation, except that they're automated. They're a lot like the old IM bots of the past, although far more robust. Robots can modify information in waves, interact with users, communicate with others waves, and pull information from outside sources. Because it acts like a user, you can define its behaviour based on what happens in the chat. You could build one as simple as "change the word dog to the word cat"

or one as complex as a fully-functional debugger. We'll probably start seeing some very advanced robots in the near future.

Some of the robots already in service include Debuggy (an in-wave debugger), Stocky (which pulls stock prices based on stock quote mentions), and Tweety (the Twave robot, which displays tweets inside of a wave).

## 5. Wave Embeds:



Wave embeds are a little more complex than embedding a YouTube video onto your blog, yet in the end, that's really what Google Wave Embeds are: a way to take Google Waves onto a third party website. Embedded Waves support many of the functions of the actual Google Wave client, including dragging-and-dropping files.

While the Wave Embeds is still very early stage, Google has already built two: YouTube Playlist Discuss and Multiple Extensions Embed. The former allows you to discuss a YouTube video via a wave and the latter allows for interaction with multiple waves on the same page.

One possibility: Google Wave Embeds may be a real-time replacement to static comments. If Google perfects wave embeds, you could even see YouTube.com comments replaced with waves, although it is way too early to make any calls on the potential of this.

## 6. Why Google Wave:

- Why do we have to live with divides between different types of communication — email versus chat, or conversations versus documents?
- Could a single communications model span all or most of the systems in use on the web today, in one smooth continuum? How simple could we make it?

What if we tried designing a communications system that took advantage of computers' current abilities, rather than imitating non-electronic forms?

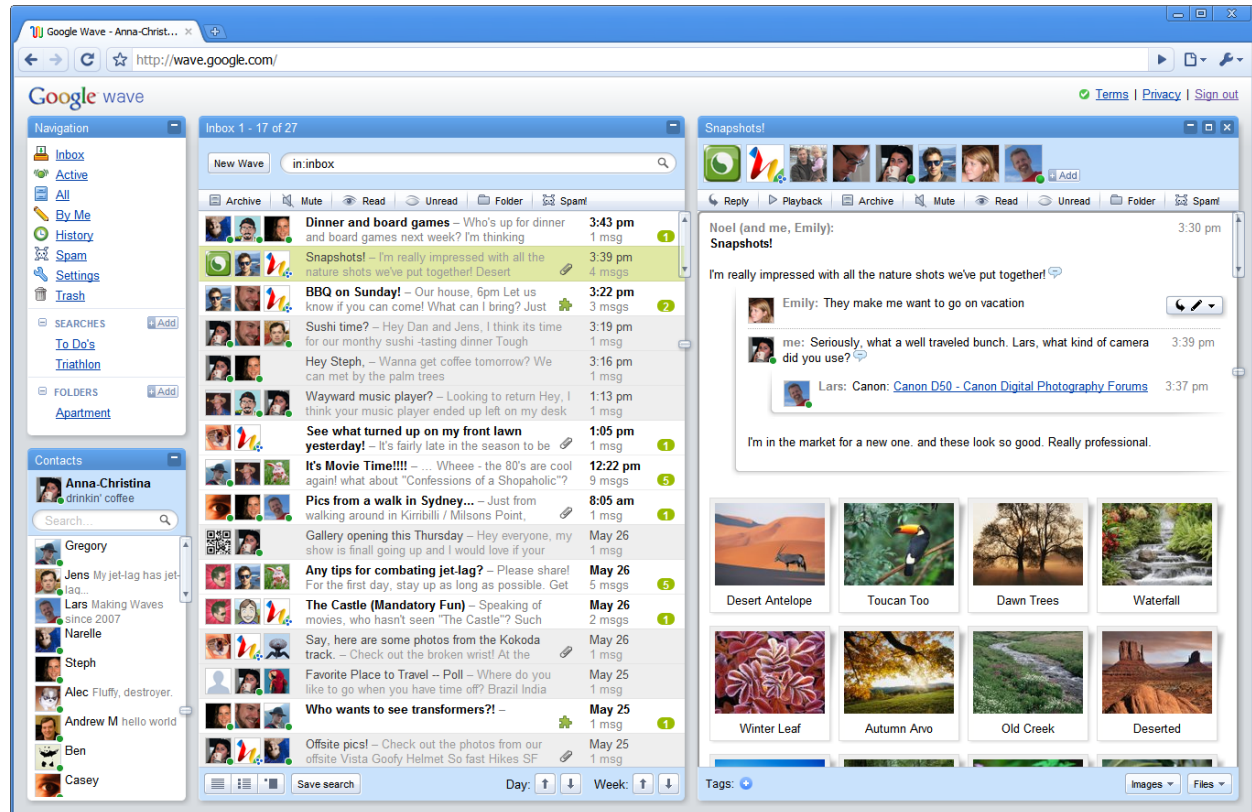
### 6.1 Responding in Context:

Let's say I want to communicate with someone. I start a wave, just as I might start an email message. The recipient(s) see an incoming wave, just as they see an email today. Where the magic starts is with replies. In email, you have the choice of including no context, only a portion of the message you're replying to, or the whole thing. In the first case, you need to go back to the original message for context; in the second, you have wasted copies going back and forth. Come into the middle of a long thread and you may be replying to a discussion that has already moved on or covered the point you want to express. But what if there were only one message, shared in the cloud? Now, your comment on the second paragraph is attached directly to that point in the conversation. There are no redundant copies of portions of the message, as replies are seen in context. As you can see in the screenshot below (click to enlarge), a Wave inbox looks much like an email inbox. But look to the right, and you can see how the replies are embedded right into the middle of the original message, so Stephanie's question about what camera Jens used for his photos appears right in context.

Now, you might ask how well this works for long, complex messages rather than



the short one shown in the demo. I don't know the answer, but I suspect that Wave will be even stronger in that case. Our experience with collaborative editing of book manuscripts at O'Reilly suggests that the amount and quality of participation goes up radically when comments can be interleaved at a paragraph level.



## 6.2 Is it a particle or a wave? It's both:

First generation email/IM integration let you see when someone was online, and opt to instant message someone rather than send them an email. Wave simply erases the distinction.

If both people are online at the same time, a wave acts just like an instant message -- except that you see each character as it is typed. "In our experience, a lot of time in IM is spent waiting for the other person to press 'Done'," says Lars. (However, it is possible to set Wave to hold your messages till you are done.) A key point here is that Google's relentless focus on reducing the latency of online

actions is bringing the online experience closer and closer to our real world experience of face-to-face communication. When you're talking with someone, you know what someone is saying before they finish their sentence. You can respond, or even finish their sentence for them. So too with Wave.

The real-time connectedness of Wave is truly impressive. Drop photos onto a wave and see the thumbnails appear on the other person's machine before the photos are even finished uploading.

### **6.3 Step by step playback draws a cheer:**

Let's say you are added to a conversation (a wave) that has been going on for a long time? You can be added at any relevant point, not just the end. But even cooler, you can do a playback of the entire evolution of the conversation.

But wait: there's more! Let's say you want to edit your message (or even a message that was written by another participant in the wave). Yes, you can. The original author is notified, but every participant can see that the message has been modified, and if they want, can replay the changes.

This leads to a change in behaviour: conversations become shared documents. The screenshot below shows a simple example, as Gregory and Casey collaborate to produce a good answer to Dan's question. As Stephanie Hannon, the product manager for Google Wave, said to me, "In Wave, you don't have to make the choice between discussing and collaborating."

Pics from a walk in Sydney...

Reply Playback Archive Mute Read Unread Folder Spam

Pics from a walk in Sydney... May 26

Just from walking around in Kirribilli / Milsons Point, under the bridge where Luna Park

Dan P: What is Luna Park? Dan 4:28 pm

Gregory (and Casey): It is an amusement park on the water. It has a long Gregory history, in Sydney and in Melbourne. In Sydney, it's burned down a couple of times, and has been shut down intermittently for ever. It no longer has any big rollercoasters (it used to have The Big Dipper, now you have to put up with The Wild Mouse, which is quite the disappointment).  
If you go, the best thing is the Casey

is. It was a lovely day!

clouds sun in the grass ferris wheel IMG\_0713

Shane Stephens (and me): Those are some great photos! Where were the ones of grass taken? 4:31 pm

me: Wow, I cant wait to go, too 4:27 pm

Michael: ooh.. nice pics! 4:29 pm

Adam (and Michael): Wow, photos from Sydney without the Opera House? Or the 4:33 pm

Tags: + Images Files

As anyone who's used version control knows, a document with lots of discussion and edits can become pretty messy. No problem. You can export an edited wave as a new wave, and start over. "One of our design principles," says Lars, "is that the product of a wave can be as important as the original wave."



Nor do you need to include everyone in every part of a conversation. Essentially, Lars, says, "waves are tree-shaped sets of messages. You can shape a subtree, or a sub-conversation and limit the set of participants in any way you like."

### **7.Wave as a Platform:**

The Google Wave product (available as a developer preview) is the web application people will use to access and edit waves. It's an HTML 5 app, built on Google Web Toolkit. It includes a rich text editor and other functions like desktop drag-and-drop (which, for example, lets you drag a set of photos right into a wave).

Google Wave can also be considered a platform with a rich set of open APIs that allow developers to embed waves in other web services, and to build new extensions that work inside waves.

The Google Wave protocol is the underlying format for storing and the means of sharing waves, and includes the "live" concurrency control, which allows edits to be reflected instantly across users and services. The protocol is designed for open federation, such that anyone's Wave services can interoperate with each other and with the Google Wave service. To encourage adoption of the protocol, we intend to open source the code behind Google Wave.

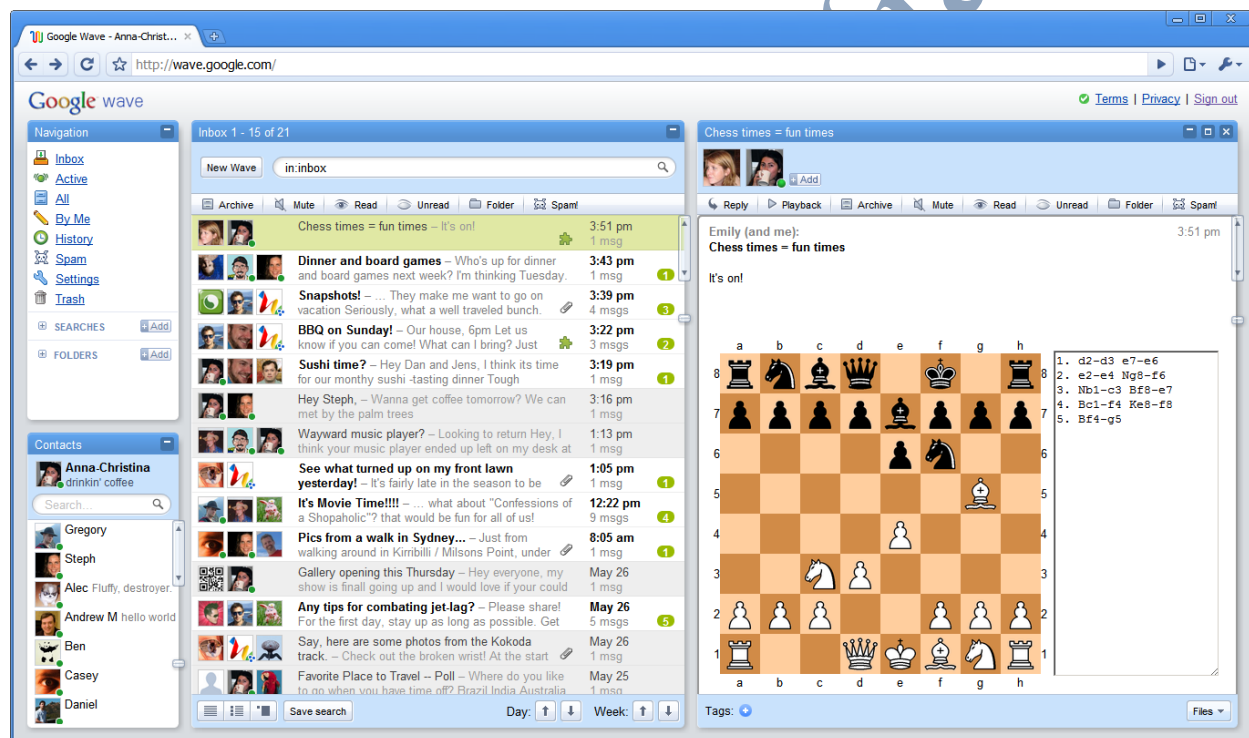
Anyone who's followed my writing knows that I'm a huge fan of simple systems with extensible architectures. So I was excited to see that the team didn't lard lots of features into the core product, but instead added new features via the Wave APIs, much as they hope third party developers will do.

One useful extension, Polly (Poll-y) lets you incorporate polls into a wave. In the wave shown below, participants are asked whether they can make it to a party. Responses appear immediately in the wave. That's the way these things ought to work! No jumping to a website to see the results of an Evite or a poll.



The API has been used to build a bunch of cool extensions: Bloggy, a blog client, lets you make a blog post as a wave. When people comment, they join the conversation. Spelly is a spell-checker that uses the entire corpus of the web as its dictionary. Linky is a link-recognition engine that is clever enough to recognize that the link you just entered is a YouTube video, or a link to a photo, and give you the option to embed the target of the link into the wave. There's even a twitter client - you can tweet into and out of a wave! And of course, buggy, a bug-reporting tool that can also be a participant in a wave.

**Wave can also be used as the base for interactive games. For example, here's a real-time interactive chess game in Wave:**



## 7.1 Open Source, Open Protocol, and Federated Wave Clouds:

Google wants other providers to adopt Wave - the protocol allows federation between independent Wave clouds. The team hopes that Wave will become as ubiquitous and interoperable as email and instant messaging, not just a Google product.

I support this vision. The Wave team has done a great job, but for Wave to really succeed, it needs to become a new fundamental service on the net. An open protocol means that anyone can build their own Wave services - everything from Wave servers to Wave extensions. But open source means that people can push the envelope in adapting the service to new environments, devices, and use cases.

I'm hopeful that the industry will take up the challenge, and build on what is being shown at Google I/O this morning. Eric Raymond noted that every open source project begins with a plausible promise. There's no question that the plausible promise is on stage this morning. I hope the folks in the audience at Google I/O, as well as those at Yahoo!, Microsoft, and elsewhere, get on the bandwagon as well. I'm eager to move from email and IM to Wave!

Aside: The fact that this application was built using GWT and HTML 5 really emphasizes Vic Gundotra's points from yesterday, that web applications can not only match, but can even beat the functionality of native apps. It's not just HTML 5, though. It's the commitment to the lightweight nature of the web, to real-time, to lightweight components connected by open protocols rather than to monolithic systems.

Google Wave has a lot of rough edges for now but the company is releasing it along with a set of APIs so that developers can get started on making applications and understanding how it works.

However, Google isn't trying just to launch a new service with Wave; it's trying to create a new protocol, something that could potentially replace email and instant messaging. This is why openness is a top priority for the company. The whole software will be released as open source along with the Google Wave Federation

Protocol, which will allow anyone to host a Wave server, much in the same way as with email servers today.

There are two kinds of Google Wave APIs available to developers. The EmbedAPI will allow them to integrate Wave into their site with a simple JavaScript API. It is possible to embed a wave directly into a web page and its contents and features will be available to anyone. The other API is Extensions which enables developers to create small applications called Robots or Gadgets that will run inside waves providing functionality to users.

The Robots will act as automated participants in the wave and will run on the server side. For now Google developers have provided client libraries in Java and Python. They've also created several of these robots as examples of what can be done. One of them is a Twitter client they call "Tweety," which allows participants to use Twitter inside a Google Wave. Another one is a Maps robot that makes use of Google Maps and enables users to collaborate or plan events with the maps.

Developers are welcomed to use these new APIs so by the time Google is ready to release Wave to the public the development community will be ready to create applications or find new ways to use it.

### **8.What is the Google Wave API?**

The Google Wave API allows developers to use and enhance Google Wave through two primary types of development:

**Extensions:** Build robot extensions to automate common tasks or build gadget extensions to provide a new way for users to interact

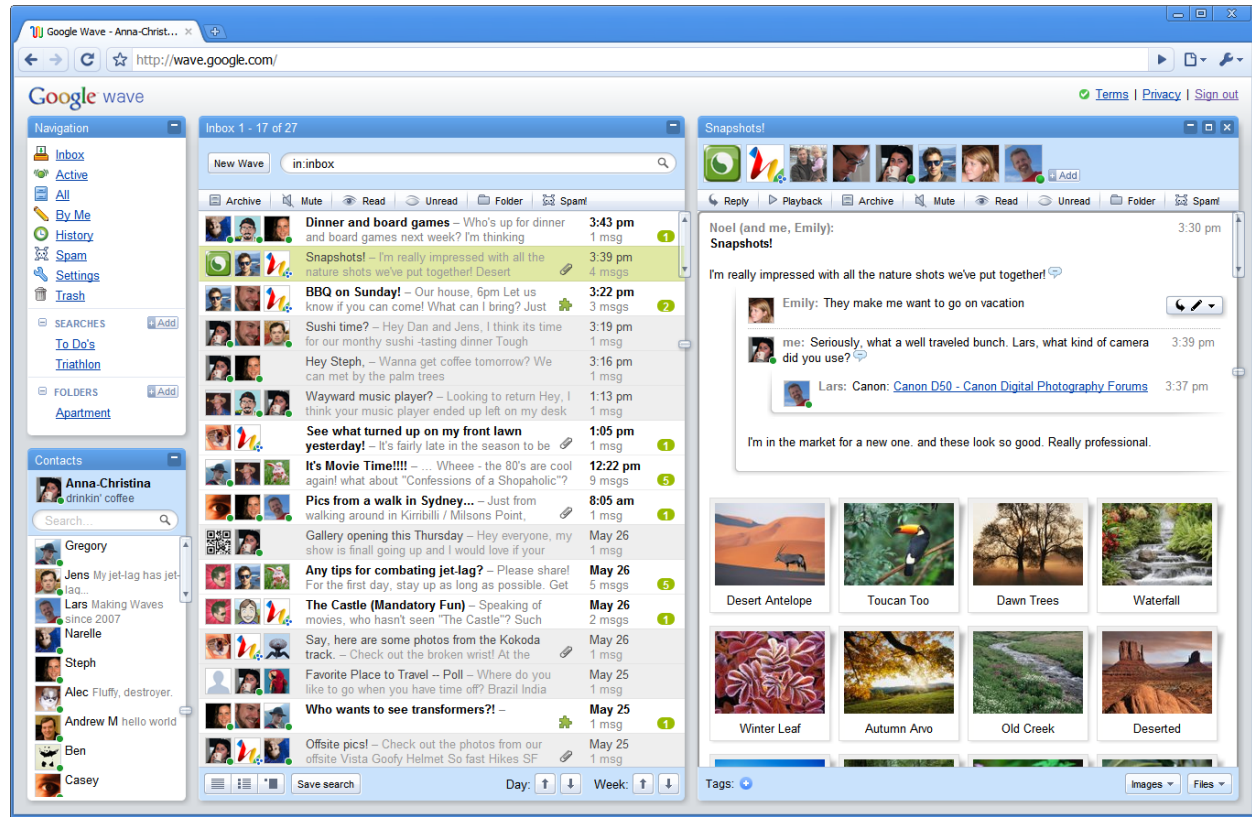
**Embed:** Make your site more collaborative by dropping in a Wave

## Observations on Google Wave:

**1. The basic interface looks a lot like Gmail.** This is generally good since Gmail is widely used and understood by millions of people. The biggest obvious difference is that the inbox/content area that takes up most of the page in Gmail is now split in half, with a list of waves on the left and an active wave on the right. The rest of the page is taken up with a Contacts pane, just like in Gmail, and some standard boilerplate links on the upper right. In fact, it's so consistent with the Google experience (including Google Accounts) that it seems quite likely — to this author anyway — that Google Wave capabilities will be added to Gmail at some point. Upshot: Other companies can and will make their own front end editors/viewers for waves and this user experience has few surprises. It is very much what you'd expect from Google with a user interface/navigation consistent with their other applications.

**2. Google Wave works better with groups of contacts.** While this seems obvious, the issue is that online conversations tend to work better when they can involve a wider range of people than just those that you think of immediately. The tedium of starting a wave is that you have to add all the participants than you'd like to have in it. Auto-joining groups are supported at this time in a fairly interesting fashion (if slightly unexpected, see below in robot participants), but will be critical to create easily and quickly en masse in order to make Google Wave useful and time efficient. One potential issue: Supporting cross boundary waves and simultaneously supporting Google Accounts, Active Directory, and other user account databases. This will be a complex issue for enterprises that want to have waves that extend outside of their organization, as many will, at least until trusted extensions are created that deal with it.





**Screenshot of Google Wave: Strong similarity to Gmail.**

### 3. Simultaneous live conversations create new collaborative patterns. In

my conversations within Google Wave, the real-time capability of the tool changed the nature of the conversations themselves. Unlike the post/response pattern of classic and 2.0 tools both, including e-mail, IM, blogs, wikis, forums, etc, where you get to complete a thought privately and then dispatch it for others to view when you're done, the default in Google Wave is for others to see what you're typing, live. This can have a disconcerting effect and tends to change what is captured by the tool since respondents can start answering before you've even finished, altering what you've typed or making you inclined to abandon the thought completely. In contrast, one of the most important aspects of Enterprise 2.0 apps is that they can capture complete questions/inquiries and the subsequent answers so that the network learns as a whole from the distilled, uninterrupted interaction. Google Wave has the potential to disrupt this valuable pattern that builds collective intelligence, though the

feature can certainly be turned off as well. Organizations are encouraged to monitor and remediate this (possibly through usage guidelines) to ensure they get the full value of the platform.

**4. The notion of participant as either user or robot works well, making the social fabric of conversation both novel and broader.**

With Google Wave, participants aren't just people, they are often software extensions monitoring the wave that can then independently add to the conversation (such as performing real-time language translation, injecting views of Web/enterprise data, or even whole applications.) This is true of the initial group creator and Web publishing capabilities of Google Wave in particular, at least in its current form, and takes a little getting used to. This is also where the implicit assumptions of Google Wave may lose neophyte users. Whether they will be able to understand the significance of adding robot participants (non-human software extensions) to a conversation, including that they can cause unintended consequences including unexpected and significant security implications, remains to be seen. However, from a usability perspective it might actually make a lot of sense for users to add a person or a piece of software to a Wave in the exactly the same way, with largely the same meaning.

**5. Waves are strongly conversation-oriented instead of result-oriented.**

Because each contribution has a visual boundary associated with it and cannot be made to blend into a finished work product, Google Wave cannot replace, for example, the classical wiki as a group editing tool. In the Google world, Google Docs is a better example of a service that can help multiple people create a unified artifact. With Google Wave, the default central artifact being created is a threaded conversation. Note that extensions and gadgets make it possible for 3rd parties to change this, further increasing the potential for multi-modal confusion as users try to understand what interaction model they're engaged in. This open endedness is a boon and a barrier both; Google will have to be careful to balance this aspect of Wave so that users can access the most value



without cognitive dissonance setting it.

**6. Public waves will make Google Wave easily distributable and viral.**

Unlike Gmail, Google Wave can expose conversations publicly if desired, allowing them to be moved to wherever the conversation/information needs to be exposed on the Web/intranet. It will also likely cause Google Wave to be adopted more virally than most of Google's other applications since users can encounter waves all over the network, wherever users want to put them. This leverages Jakob's Law nicely and is one of the more powerful aspects of modern Web application distribution that Google Wave clearly gets right.

**7. Google Wave supports virtually all the key elements of Enterprise 2.0.**

Google Wave is very strong in all of the FLATNESSES components except possibly for signals. As you would expect from Google, search is extraordinarily good within Google Wave, making it possible to quickly find the waves containing the information you're looking for. Tagging, which has been particularly important for many Enterprise 2.0 deployments, is also present in Google Wave as well as extensions, social capabilities, and all the rest. The largely missing element signals (which you can actually argue is present in the form of the inbox) means that Google Wave doesn't seem to have RSS/ATOM feeds, e-mail notifications, etc. to let users know when conversations they care about are updated. In my opinion, however, this will almost certainly be remedied in the near future.

**Open source**

Google released most of the source code as open source software, allowing the public to develop its features through extensions. Google allowed third-parties to build their own Wave services (be it private or commercial) because it wanted the Wave protocol to replace the e-mail protocol. Initially, Google was the only Wave service provider, but it was hoped that other service providers would launch their own Wave services, possibly designing their own unique web-based clients as is common with many email service providers. The possibility also existed for native Wave clients to be made, as demonstrated by Google with their CLI-based console client.

## 9. Opera Unite



Opera Unite is an extensible framework that allows for several web services (referred to as "Applications") to be hosted from the user's computer, including a web server for hosting a site, file and photo sharing, a chat room, and streaming media.. An Opera Unite user's applications run on a domain associated with their My Opera Community account, and are accessible from any web browser

## Smartphones and PDAs

Main article: Opera Mobile



Opera Mobile can be used on smartphones such as the Nokia 5800.

Opera Mobile is an edition of Opera designed for smartphones and personal digital assistants (PDAs).

### Mobile phones

Main article: Opera Mini



When a user browses the web using Opera Mini, the request is sent via the General Packet Radio Service (GPRS) to one of the Opera Software company's servers, which retrieves the web page, processes it, compresses it, and sends it back to the user's mobile phone.

### Wii

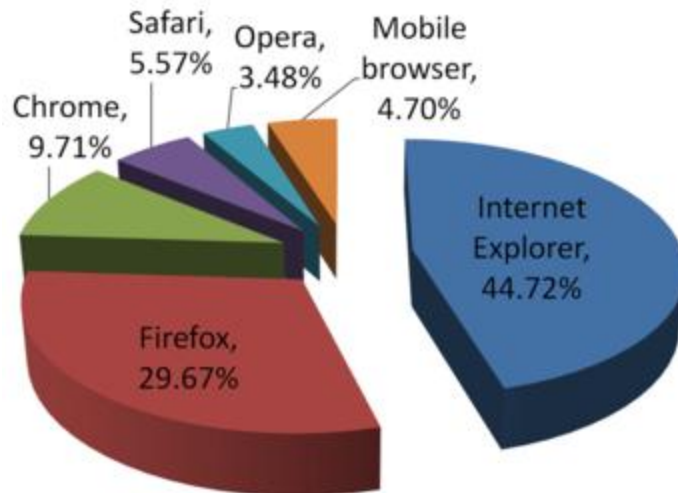
Main article: Internet Channel



On 10 May 2006, the Opera Software company announced that it was partnering with Nintendo to provide a web browser for Nintendo's Wii gaming console.

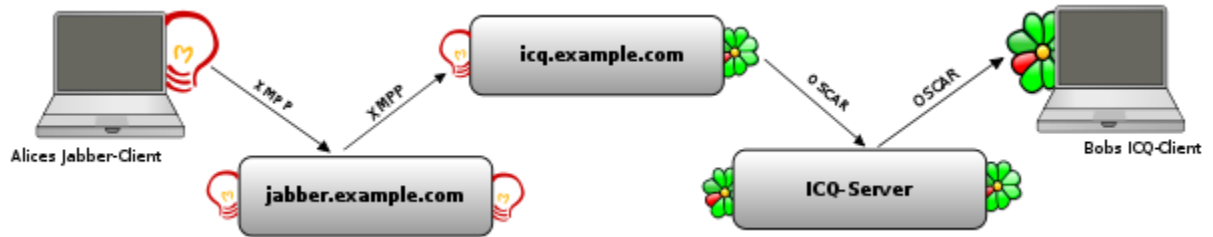
### Market adoption

Browser usage on Wikimedia - Oct 2010



Statistics reference: Usage share of web browsers

### 10.Connecting to other protocols:



Alice sends a message through the XMPP net to the ICQ transport. The message is next routed to Bob via the ICQ network.

### XMPP via HTTP transport

Another aspect of XMPP is the HTTP binding for users behind restricted firewalls. In the original specification, XMPP could use HTTP in two ways: polling and binding. The polling method, now deprecated, essentially implies messages stored on a server-side database are being fetched (and posted) regularly by an XMPP client by way of HTTP 'GET' and 'POST' requests

### Development

The IETF XMPP working group has produced a number of RFC protocol documents: RFC 3920, RFC 3921, RFC 3922, RFC 3923, RFC 4622, RFC 4854, RFC 4979

- Data Forms
- Service Discovery
- Multi-User Chat

## Conclusion

Google Wave is a new communication service previewed today at Google I/O. "A wave is equal parts conversation and document, where people can communicate and work together with richly formatted text, photos, videos, maps, and more."

The service seems to combine Gmail and Google Docs into an interesting freeform workspace that could be used to write documents collaboratively, plan events, play games or discuss a recent news. Google Wave has been designed by the founders of Where 2 Tech, a start-up acquired by Google to create a cuttingedge mapping service, which later became Google Maps.

"In Google Wave you create a wave and add people to it. Everyone on your wave can use richly formatted text, photos, gadgets, and even feeds from other sources on the web. They can insert a reply or edit the wave directly. It's concurrent richtext editing, where you see on your screen nearly instantly what your fellow collaborators are typing in your wave. That means Google Wave is just as well suited for quick messages as for persistent content -- it allows for both collaboration and communication. You can also use "playback" to rewind the wave to see how it evolved."

### Google Wave is a

- **Product**
- **Platform**
- **Protocol**

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