

Small-scale P2P File-sharing for the Academic Environment

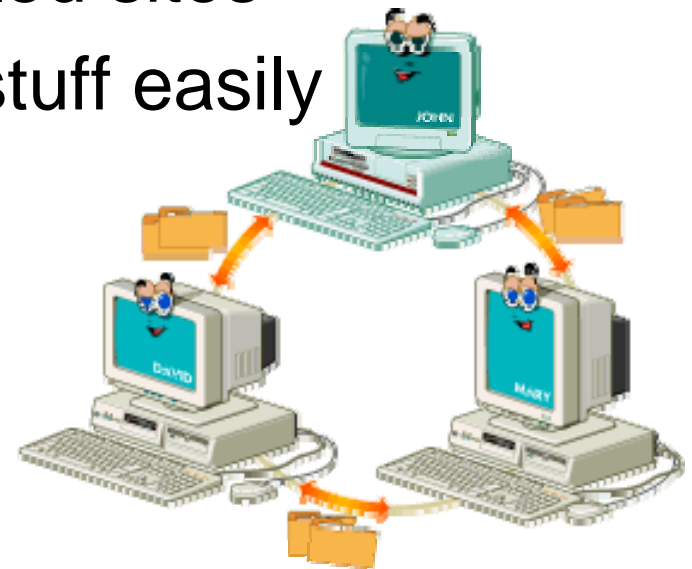
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Contents

- Motivation
 - for the need of P2P filesharing in Academia
 - for the need of user motivation
- Context: Comtella P2P Filesharing System
 - Two Comtella versions
- Ensuring Presence
- Motivating New Contributions
- Motivating High Quality Contributions
- Design of Mechanisms for Self-Sustainable On-line Community

Context I: in a Research Group

- Need a search engine for locally stored papers
 - Web links disappear, protected sites
 - Hard disks too large to find stuff easily
- Why P2P?
 - Harvest the resources of a community of researchers
 - Advantages of a distributed approach vs centralized



Context II: In the Classroom

- Example: the “Ethics and IT” class
 - Themes: 1-ethics and IT, 2-privacy, 3-freedom of speech, 4-intellectual property, 5-wiretapping and encryption, 6-computer crime and security, 7-workplace issues, 8-can we trust computers, 9-general social issues and 10-professionalism
 - Textbook: good, but provides mainly U.S. context
 - Previous solution: students find web-materials and post them on their websites; instructor visits the personal websites, selects the best links and posts them on the class website.
 - Laborious, delayed effect, subjective (instructor picks)
- Why P2P solution?
 - Users are producers, maintainers and consumers: “power to the people”
 - Shared files become immediately available to everyone
 - Protocol allows simple search
 - Easy to develop, cheap to maintain

2 Contexts – 2 Versions of Comtella

- Comtella 1

- For sharing academic papers (PDF files)
- Papers classified and searched by category (requires peers to share a category list)
- Applied for 3 months in several research groups at the CS Dept., ~20 users

- Comtella 2

- For sharing class-related web-links (popular magazine articles etc.)
- Links classified according to the curriculum topics (usually weekly topics)
- Applied for 3 months in a 4th year class on Ethics and IT, 35 users



omtella 1

- Used by graduate students to search, store and share academic papers
 - Where did I save that file??
 - Who else may want to read this paper?
 - Did any of my colleagues find anything in this area?
- Allows both local and global search
- Client based on Gnutella 0.6 protocol (uses Jtella)
- Applied experimentally across the CS Dept for 3 months.



Search Share Community Transferring

Select Categories... Distributed Artificial Intelligence = Multi-agent systems

- AI
- Computer Applications
- Computer Graphics
- Networks
 - Distributed Systems
 - Network Architecture and Design
 - Adhoc networks (peer to peer)
 - Asynchronous transfer mode (ATM)
 - Centralized networks
 - Circuit-switching networks
 - Distributed networks
 - Frame relay networks
 - ISDN (Integrated Services Digital Network)
 - Network communications
 - Network topology
 - Packet-switching networks
 - Store and forward networks
 - Wireless communication
 - Mobile / Ubiquitous computing
- Sample Code
- Theory of Computation
- User Issues
- balance-theory-2.pdf
- BookChapterHLB.doc
- Cassell.pdf
- Challenges and Benefits of...
- CIA2002-FaustoGuinchigli...
- Constructivism and Good T...
- Constructivism.doc
- AAMAS%2703-workshop-t...
- jin_tao[1].pdf
- esoa03_8c[1].pdf
- esoa03_2c[1].pdf
- esoa03_1c[1].pdf
- KazaaUsability.pdf
- Eliassi.pdf
- coral.pdf
- SmartRouter[1].pdf
- ledlie02selforganization.pdf
- horne01escrow.pdf
- p2p.pdf
- Bin Yu Thesis.pdf
- charniak99maximumentrop...
- Challenge Problem Agent-M...
- kuopperd.pdf
- litman.pdf
- lesh.pdf
- Towards Incentive-Compati...
- eigenTrust.pdf
- freerider.pdf
- modeling.pdf
- HyperCUP-Poster-ISWC20...
- foster01anatomy.pdf
- buddyweb.pdf
- douceur02reclaiming.pdf
- ACM SYMMETRIC-qing2.pdf
- goal-based-autonomous-soc...
- Kostuik-Vassil.ps
- niu.iaa

Category	Subcategory	From Host / URL
Group and Organization Interfaces	Collaborative computing	LocalDisk
Group and Organization Interfaces	Collaborative computing	LocalDisk
es	User-centered design	LocalDisk
Distributed Artificial Intelligence	Intelligent agents	LocalDisk
systems	Semantic Web	LocalDisk
systems	Distributed databases	LocalDisk
Education	Collaborative learning	LocalDisk
Education	Collaborative learning	LocalDisk
systems	Distributed applications (e.g. P...	http://julita.usask.ca/Text...
systems	Distributed applications (e.g. P...	http://agentus.com/WSAB...
Distributed Artificial Intelligence	Multi-agent systems	http://www.co.umist.ac.uk/...
Distributed Artificial Intelligence	Multi-agent systems	http://www.co.umist.ac.uk/...
Distributed Systems	Distributed applications (e.g. P...	128.233.16.252
Distributed Artificial Intelligence	Intelligent agents	794850
Distributed Systems	Distributed applications (e.g. P...	230008
Distributed Systems	Distributed applications (e.g. P...	407855
Group and Organization Interfaces	Collaborative computing	84382
Distributed Systems	Distributed applications (e.g. P...	236604
Distributed Systems	Distributed applications (e.g. P...	36874
Distributed Artificial Intelligence	Multi-agent systems	895914
Natural Language Processing	Text analysis	173706
Distributed Artificial Intelligence	Multi-agent systems	114503
User/Machine Systems	Human factors	59392
User Interfaces	Training / help / documentation	67584
Group and Organization Interfaces	Collaborative computing	96256
Distributed Artificial Intelligence	Multi-agent systems	81002
Distributed Systems	Distributed applications (e.g. P...	179923
Distributed Systems	Distributed applications (e.g. P...	107042
Distributed Systems	Distributed applications (e.g. P...	80432
Distributed Systems	Distributed applications (e.g. P...	815063
Distributed Systems	Distributed applications (e.g. P...	308123
Distributed Systems	Distributed applications (e.g. P...	130960
Distributed Systems	Distributed applications (e.g. P...	397532
Network General	Data communication	699442
User/Machine Systems	Human information processing	0
Distributed Artificial Intelligence	Multi-agent systems	493277
Distributed Artificial Intelligence	Multi-agent systems	2978

Why not share more files?

Your contribution to the community will be rewarded with better services by your peers.

All files downloaded are saved in: C:\Documents and Settings\jiv\comtella\myDownloads, and are set to be shared by default, unless you explicitly unshare them.

Problems

- User Participation
 - “critical mass” needed
 - most users are free-riders
- Question 1: How to prevent free riding?
- Question 2: Why do people contribute?
 - doesn't cost (effort, money, inconvenience)
 - there is some incentive (usefulness, glory, money)
 - serves a greater cause (e.g. cancer research, SETI@home, etc.)

Approaches to Prevent Free Riding

- Sledge-hammer approaches
 - Impose a minimum participation level in order to participate at all (ensures sharing)
 - Make it hard to quit the application (ensures infrastructure)
- Economy-based (incentive-based) approaches
 - Define “participation points” that can be earned by users
 - Reward users with high participation point scores with
 - Digital cash (Mojo-nation, I-Help)
 - Better quality of service (KaZaA, eMule, Comtella1)
 - Reputation / power (Slashdot.org, Comella1,2)
- Socio-economic approaches (Comtella)
 - Based on social psychology (persuasion theory / captology - techniques from advertisement and CRM)

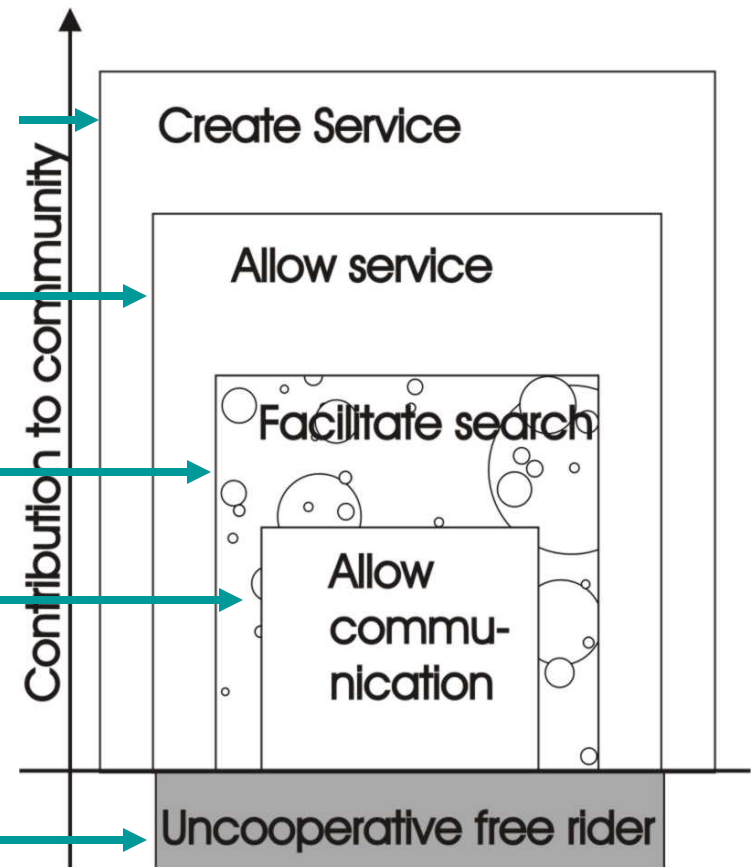
Important Condition: System Must be Useful

- Allow searching own files
 - Any file stored on disk can be found with Comtella
 - Shared files can be stored anywhere on disk
- Integration with other tools
 - With Browser (e.g. IE, Netscape, Mozilla, etc.)
 - allows viewing files directly from Comtella
 - prompts the user to share papers when opens a PDF file
 - With Word Processor (e.g. MS Word)
 - generating lists of references automatically
- Additional functionality
 - Adding annotations and ratings



Levels of Participation

- Bring new files
- Provide disk space / processor time
- Dispatch requests
- Stay on-line
- Use and quit



Ensuring Presence

Comtella 1

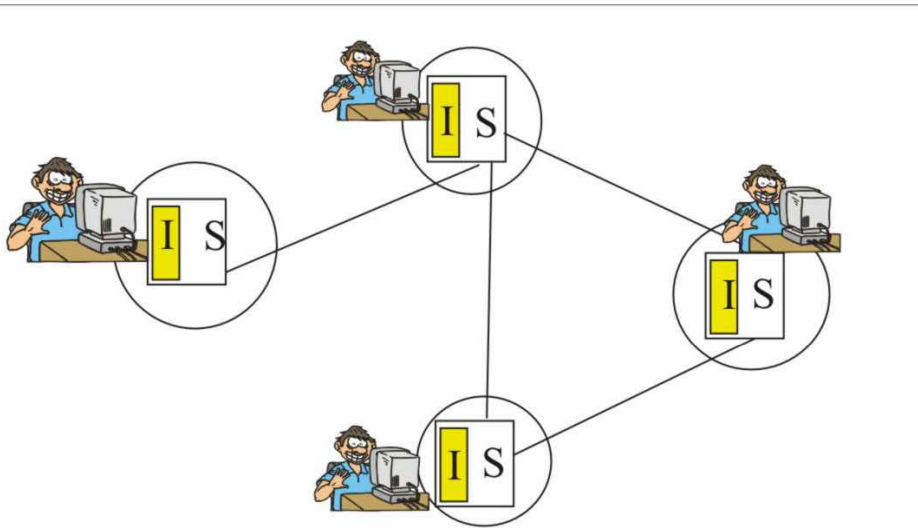
- Low presence was the greatest problem in Comtella 1
- Student activated their client only when they needed a resource and quitted afterwards
- Negative feedback loop

Comtella 2

- Moved all clients on a server machine where they run all the time → the infrastructure is ensured, the shared files are available all the time
- Create another client – a GUI which allows users to log in their client on the server

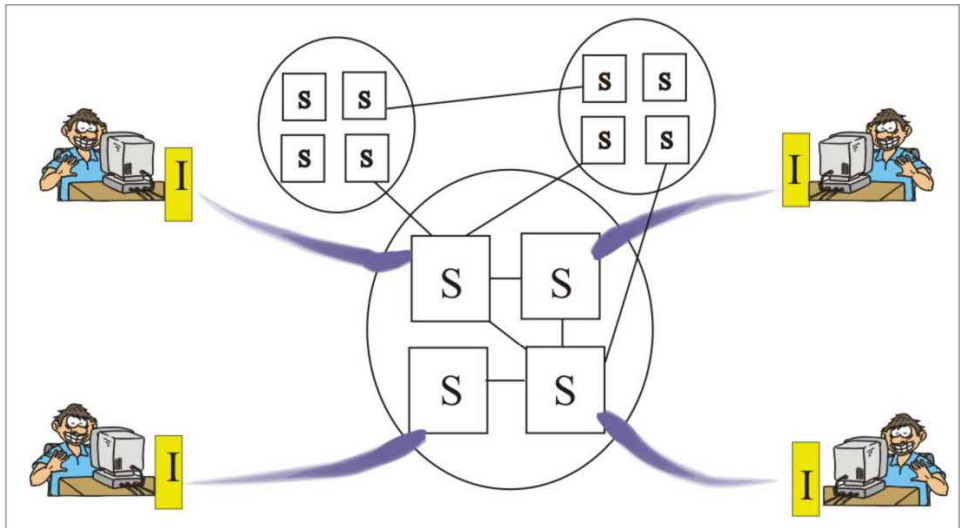
Solution = centralization?

Ensuring Presence: Architecture



Interface (I) is part of the Servent (S) which resides on the user machine. S interact through Gnutella.

Comtella 1



The Interface (I) is split from the servent (S); I resides on the user machine, S resides on a server; S interact among themselves with Gnutella; I interacts with S through socket.

Comtella 2



Comtella 2 in the Ethics Class

- Share only URLs (bookmarks), not files

Title	URL	Category	From	Original Provider
Hackers Are Good Citizens	http://www.cpsr.org/cpsr/privacy/crime/denning.hackers.ht...	Computer Security and Co...	john	john
Serial Numbers for the Internet	http://www.junkbusters.com/ht/en/intel.html#halt	Privacy	john	john
VOIP: Letter to FCC on Privacy	http://www.epic.org/privacy/voip/fccltr12.15.03.html	Privacy	john	john
Know Your Data Campaign	http://www.privacyinternational.org/countries/uk/surveillan...	Privacy	john	john
Stalking as an Invasion of Privacy	http://www.canoe.ca/NewsStand/WinnipegSun/News/200...	Privacy	john	john
Another Serial Number Article	http://bigbrotherinside.org/#Rationale	Privacy	john	john
Pirates Sneer at Intel Chip	http://www.wired.com/news/technology/0,1282,17478,00....	Privacy	john	john
Using Comtella	http://www.cs.usask.ca/classes/490/t2/comtella-instructio...	Technology Trends: Morali...	local	local
Academic Dishonesty talk by Dr. D...	http://www.okalrel.org/outloud/SMITH_Academic_Integrity...	Technology Trends: Morali...	local	local
Student Plagiarism in an Online W...	http://www.asee.org/prism/december/html/student_plagiar...	Technology Trends: Morali...	local	local
Students decry plagiarism detectio...	http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/106...	Technology Trends: Morali...	local	local
Computers to check for essay cheats	http://www.opuswindsor.ca/Communication.asp?Table=Di...	Technology Trends: Morali...	local	local
General advice on good writing (De...	http://www.dennisfox.net/courses/guidelines.html	Technology Trends: Morali...	local	local
Is vigilante hacking legal?	http://news.com.com/2100-1002_3-990469.html	Computer Security and Co...	local	local
DRM Website	http://www.drmwatch.com/legal/	Intellectual Property	local	local
A Framework for Ethical Decision ...	http://www.scu.edu/ethics/practicing/decision/framework....	Technology Trends: Morali...		julita
LittleBrother is watching you	http://www.scu.edu/ethics/publications/iie/v9n2/brother.html	Privacy		julita
Cybersmut	http://www.scu.edu/ethics/publications/iie/v9n1/cybersmut...	Freedom of Speech		julita

Ensuring New Contributions

Low-effort sharing

Comtella 1

- One-click file sharing
- Automatic suggestion of category (text analysis of article)
- Automatic reminder to share if a PDF or PS file is opened in browser

Comtella 2

- Category selection is easy, typically users search and share for one given category each week
- Impossible to make the browser to automatically remind
- Students were required to share files for the class (participation mark)

Solution = integrate systems, prompt, help with paper annotation OR make it a policy to share

Search – by the theme of the week

Comtella File Sharing System V2.2B1 - MADMUC Lab, Unive...


Search Share Community Visualization Help

Comtella Gold

Select Categories: [Week 6 & 7 >>> Computer Security and Computer Crime](#)

Keywords (opt):

Additional Options: Remove the duplicate papers. Show only the new papers (after my last login).

Search 

Rating	Title	URL	Sharing Time	Provider	Relationship	Comment
	Beware of Identify Theft	http://www.symantec.com/region/can/en...	2004-02-19 15...	wez927	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
✓	"Dear Secetarial Staff" scam	http://www.e-gov.biz/servit/members/pre...	2004-02-11 08...	* local *	- <input type="checkbox"/> <input checked="" type="checkbox"/> +	N/A
	'Cyber Sweep' Nets 125 Arrests	http://www.wired.com/news/business/0...	2004-02-08 16...	cce381	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
✓	'Homeless hacker' pleads guilty...	http://edition.cnn.com/2004/TECH/intern...	2004-01-11 12...	* local *	- <input type="checkbox"/> <input checked="" type="checkbox"/> +	N/A
✓	Arresting abuse online	http://society.guardian.co.uk/children/co...	2004-02-10 21...	rkc876	- <input type="checkbox"/> <input checked="" type="checkbox"/> +	N/A
	Athens Olympic Organizers Wo...	http://story.news.yahoo.com/news?tmpl...	2004-02-11 00...	qig261	- <input type="checkbox"/> <input checked="" type="checkbox"/> +	N/A
	Beware These Internet Scams	http://www.cbsnews.com/stories/2003/0...	2004-02-09 12...	kdh851	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
✓	California law will force compani...	http://www.security-encryption-news.co...	2004-02-06 11...	* local *	- <input type="checkbox"/> <input checked="" type="checkbox"/> +	N/A
	Canada lags in cyber crime def...	http://www.findarticles.com/cf_dls/m0CG...	2004-02-19 15...	wez927	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	Canadian Criminal Code: Mischi...	http://laws.justice.gc.ca/en/C-46/41802...	2004-01-10 19...	smc748	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	Cannibal Case Grips Germany	http://www.washingtonpost.com/ac2/wp...	2004-02-10 21...	rkc876	- <input type="checkbox"/> <input checked="" type="checkbox"/> +	N/A
	Computer Crime Prevention	http://www.rcmp.ca/scams/ccprev_e.htm	2004-02-26 10...	jum409	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	Computer Viruses and Organize...	http://www.technewsworld.com/perl/stor...	2004-02-19 15...	wez927	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	Cracking Down On Crime	http://www.informationweek.com/story/s...	2004-02-28 21...	dhr992	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
★★★★☆	Cyber Alert: Portrait of an Ex-H...	http://www.businessweek.com/@@BrG...	2004-02-11 20...	kmh809	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	Cyber-crime hits UK	http://www.itweb.co.za/sections/busines...	2004-02-28 21...	dhr992	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
★★★★☆	Cybersecurity's Leaky Dikes	http://www.businessweek.com/technolo...	2004-02-11 20...	kmh809	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	Does Cyber Crime Pay?	http://www.webtalkguys.com/article-pipk...	2004-02-19 15...	wez927	- <input type="checkbox"/> <input type="checkbox"/> +	N/A
	FBI pushes for cyber ethics edu...	http://www.billingsgazette.com/computin...	2004-02-22 22...	slb534	- <input type="checkbox"/> <input type="checkbox"/> +	N/A

Download Clear/Stop Searching Visit

Ensuring New Contributions

Rewarding Contributions

Comtella 1

- Count different forms of contributions
 - Number of new files brought in the system
 - Number of shared files
 - Disk space of shared files
 - Cooperative – Uncooperative acts during downloads
 - Number of downloads vs number of uploads
- Reward in terms of *better QoS* (bandwidth → download speed)
- Result – reward was not important really; speed was very good anyway

Comtella 2

- Count contributions:
 - Number of new links
 - Number of downloaded and shared links
 - Number of comments
 - Frequency of being on-line
- Reward in terms of *access to more powerful search options*
 - Remove duplicate results
 - See only new results
 - Sort results by various criteria
- Result – seems to have been useful; about 64% usage of extra options

Solution = define appropriate metrics for participation;
choose rewards that the students really care about

Social awareness

In isolation, selfishness is logical

To gain perspective, users need feedback about their social environment

In cities, the sidewalks provide the right kinds and numbers of interactions from which neighborhoods emerge.



Name: daley
ID: f8cf7997cc531157ffbc2db39380f200
IP Address: 128.233.7.254:6346

Files shared:

- **ciaa009a-final.ps** - (Computation by Abstract Devices / Automata)
- **circfin.ps** - (Formal Languages / Operations on languages)
- **close.ps** - (Formal Languages / Operations on languages)
- **closure.ps** - (Formal Languages / Operations on languages)
- **dvectors.ps** - (Life and Medical Science / Biology and genetics)
- **lang.ps** - (Formal Languages / Classe4s defined by grammars or automata)
- **ldlad.ps** - (Formal Languages / Operations on languages)
- **technote.ps** - (Computers and Education / Teaching strategies)
- **template.ps** - (Formal Languages / Operations on languages)
- **trends.ps** - (Life and Medical Science / Biology and genetics)

Interested in:

- **Computation by Abstract Devices / Automata** (somewhat interested)

Connected to:

Eramian - daley has a strong relationship with



Ensuring New Contributions

Social Visibility

Comtella 1

Show a visualization of community using [night-sky metaphor](#).

- Only users who are currently active are shown
- Category of interest is not shown
- Colour, size and position of a star show the user's cooperativeness, level of contribution and groups of users exchanging frequently files.
- Size depends on who is currently on line (mistake!)
- Low level of participation leads to too few stars on the sky which is not motivating -- a negative feedback loop
- Misrepresentation? (Erickson)

Comtella 2

Show the whole community, the [peers as nodes](#)

- Those that are active at the moment – filled with colour
- Colour depends on user's rank (a combined participation metric)
- Size depends on the number of new contributed links
- Can be generated to show the contributions for a particular week (topic)
- The size can be used to show different aspects of participation (# new files, # total shared files, frequency of log-in)
- Students used the visualization, but only the default view

Solution = visualization that provides both community information and facilitates social comparison

Ensuring New Contributions Social Visibility

Sorting Criteria Bar ->

Sort by original contribution By total sharing By status By usage frequency

List of all the available interest areas :

General View

- General View
- Technology Trends: Morality and Ethics
- Privacy
- Freedom of Speech
- Intellectual Property
- Wiretapping and Encryption
- Computer Security and Computer Crime
- Computers and Work
- Broader Social Issues
- Can we trust the Computer?
- Ethics and Professionalism

Comtella File Sharing System V2.3B1 - MADMUC Lab, University of Saskatchewan

Search Share Community Visualization Help

Freedom of Speech Sort by original contribution By total sharing By status By usage frequency

Hall of Fame

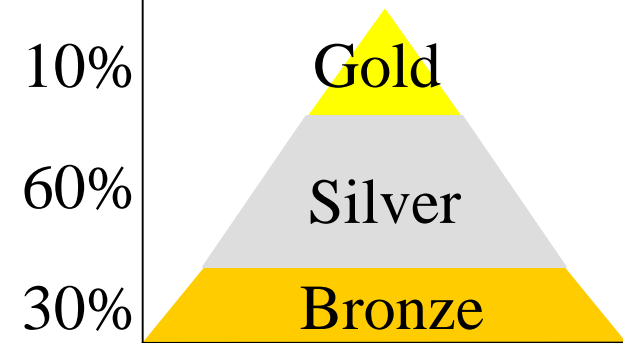
Hall of Shame

Refresh and Reset to Default

Freedom of Speech: mah820, Offline, Total Sharing:14, Original:6

Ensuring New Contributions

Introducing Status in **Comtella 2**



- Persuasion strategy used in CRM
 - Examples: Club memberships, Air Miles etc.
 - Based on the theory of discrete emotions (fear) – effective persuasion strategy
- Status
 - based on a combination of participation metrics
 - visualized as a card (gold, silver or bronze) - [example](#)
- High-status users are rewarded with
 - Visibility in the community (visualization by status)
 - Better search options for gold and silver members

Solution = introduce a notion of social status,
combined with visualization and rewards

Ensuring New Contributions Rewarding Contributions

The screenshot displays the Comtella File Sharing System V2.2B1 interface. A red box highlights the 'Comtella Gold' badge. A pop-up window titled 'Your level is based on your contribution.' shows the user's status as a Gold Member in Week 9, with various contribution metrics and progress bars.

Comtella Gold

Select Categories: [Week 9 >>> Broader Social Issues](#)

Keywords (opt):

Additional Options: Remove the duplicate papers Show only the new papers (after my last login).

Your level is based on your contribution.

Your level in week 9 is Gold Member.

Your contributions (compared to the top contributor in each category)

Metric	Value	Target
Your login frequency :	80	100
The number of new links you brought in :	74	100
The number of links you shared :	35	100
The number of your comments :	20	100
Your online time :	69.9	100

Rating	Item	Sharing Time	Relationship	Comment
★★★★☆	Legu...	4-03-12 17...	- [] +	Click Me
★★★★☆	Court	4-03-09 00...	- [] +	Click Me
★★★★☆	Defen	4-03-09 00...	- [] +	Click Me
★★★★☆	Oracl	4-03-09 00...	- [] +	Click Me
★★★★☆	Does	4-03-09 01...	- [] +	Click Me
★★★★☆	Psycl	4-03-09 00...	- [] +	Click Me
★★★★☆	Comp	4-03-09 01...	- [] +	Click Me
★★★★☆	With	4-03-10 12...	- [] +	Click Me
★★★★☆	Dentr	4-03-10 13...	- [] +	Click Me
★★★★☆	As Co	4-03-10 15...	- [] +	Click Me
★★★★☆	Hacki	4-03-10 15...	- [] +	Click Me
★★★★☆	Bug V	4-03-10 15...	- [] +	Click Me
★★★★☆	Defen	4-03-10 15...	- [] +	Click Me
★★★★☆	FAILU	4-03-11 09...	- [] +	Click Me
★★★★☆	Can the Net solve the problem o...	http://www.computerweekly.co.uk/Articl... 2004-03-11 10...	- [] +	Click Me
★★★★☆	How the Wi-Fi future might look	http://www.businessweek.com/technolo... 2004-03-09 16...	- [] +	Click Me
★★★★☆	Wiring the Fashion Trend of the ...	http://www.jpl.nasa.gov/technology/featu... 2004-03-12 17...	- [] +	Click Me
★★★★☆	Trend Talk: Computer Fashion	http://realitytimes.com/rtnews/rtapages/2... 2004-03-12 17...	- [] +	Click Me
★★★★☆	Chat Room Lingo	http://www.digitaljournal.com/news/?arti... 2004-03-12 17...	- [] +	Click Me
★★★★☆	Wireless content gets new sec...	http://news.com.com/2100-1039-515171... 2004-03-16 14...	- [] +	Click Me
★★★★☆	Microsoft Prep Software Undat	http://www.internetweek.com/showArticl 2004-03-09 00	- [] +	Click Me

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Experiments

1. Is P2P useful in the classroom?
 - Compare two offerings of the Ethics in CS class, in 2003 and 2004, one without and one with Comtella 2.
 - Metrics: # papers brought in by students, regularity of contributions
2. Are the methods for encouraging participation effective?
 - Compare the number of contributed papers when using a baseline version and motivational version of Comtella 2.
 - The same student group, first without and then with treatment.

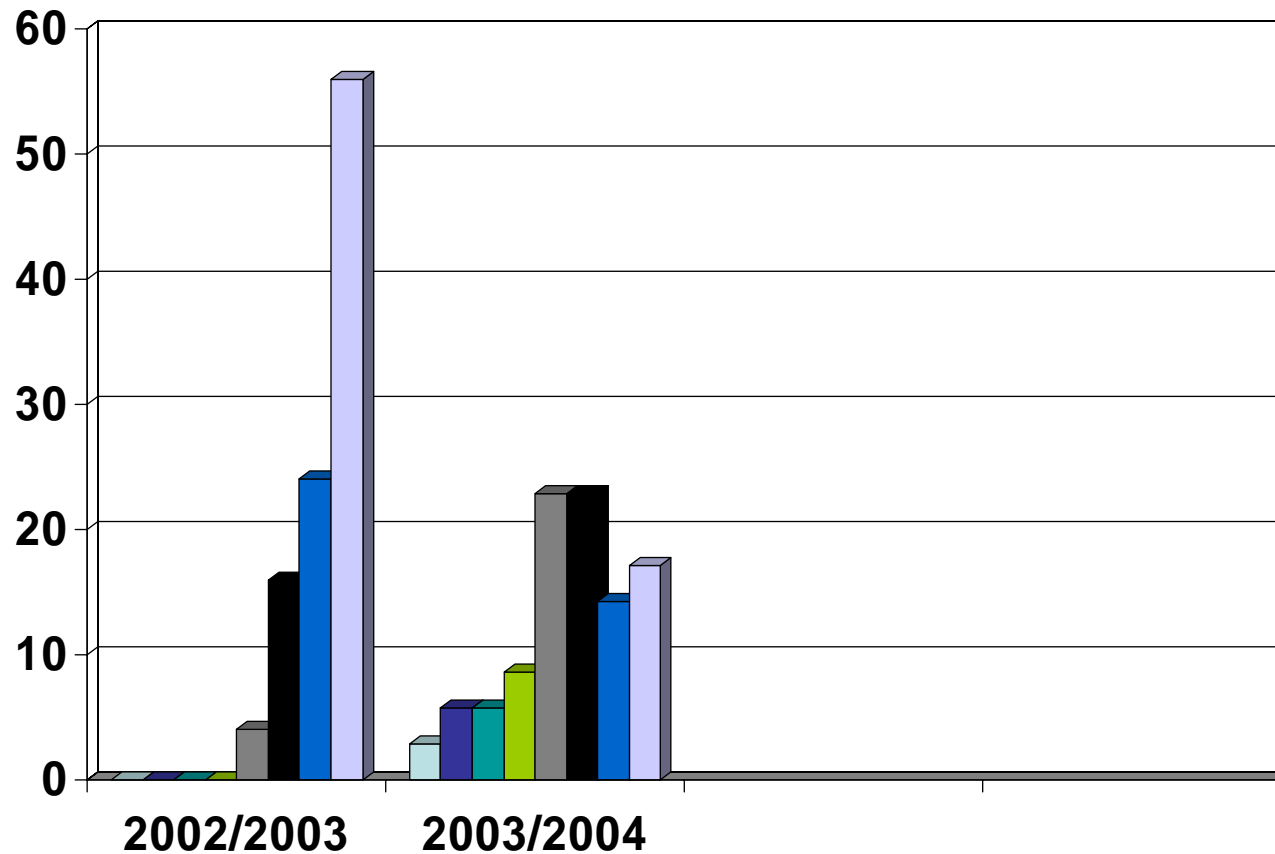
Question 1. Is Comtella useful in the classroom?

- Comparing two offerings of the class: one using personal websites and one using Comtella 2 (Jan 04 – Feb 29, 2004)

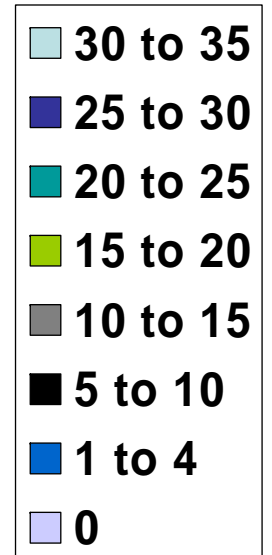
Parameters \ Class offering	2002/03 - first 6 themes (using personal websites)	2003/04 - first 6 themes (using Comtella)
Nr of students in class:	25	35
Total Nr. of contributed links:	51	334
Average Nr. of new links / person (from those who contributed)	4.63	11.52
Nr of students who did not contribute at all:	14 (56% of the class)	6 (17% of the class)
% links contributed by the top five (5) students:	78% of all the contributed links	39% of all contributed links

Results: how many new links did students contribute

% of students

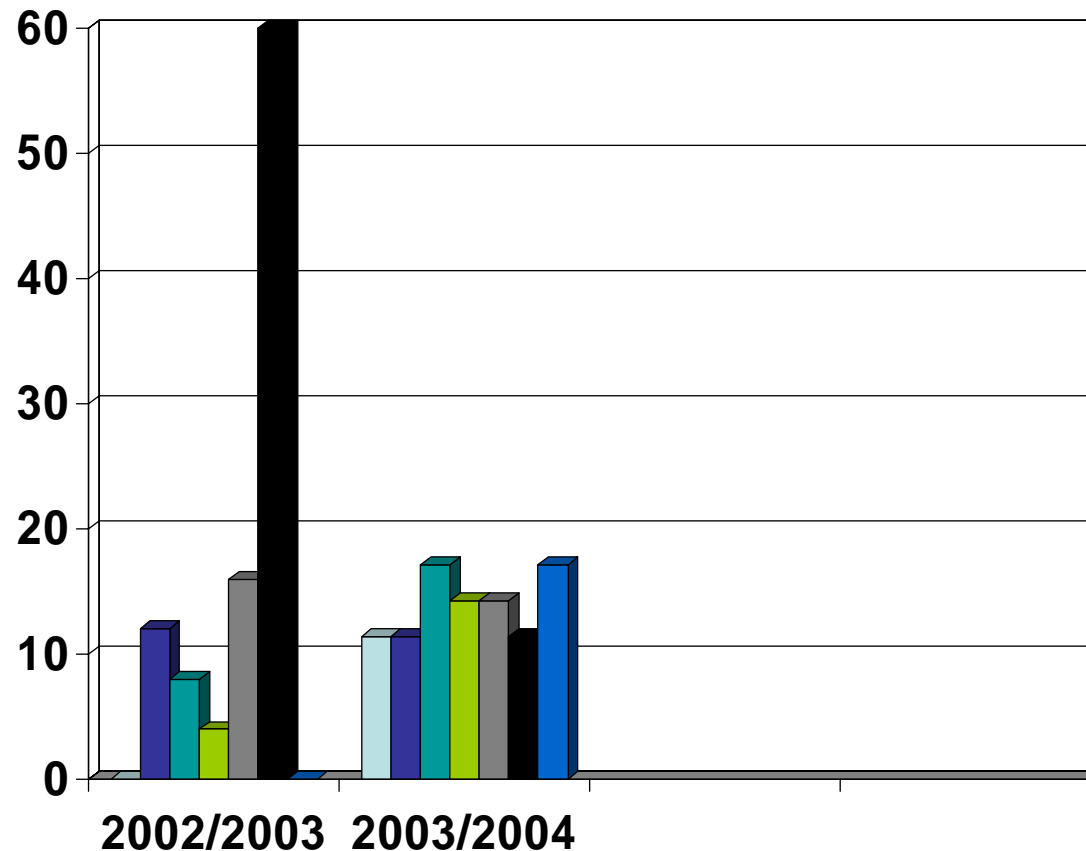


Number of contributed links



Results: how regularly did students contribute?

% of students



Contributed in:

- in 6 weeks
- in 5 weeks
- in 4 weeks
- in 3 weeks
- in 2 weeks
- in 1 week
- did not contribute

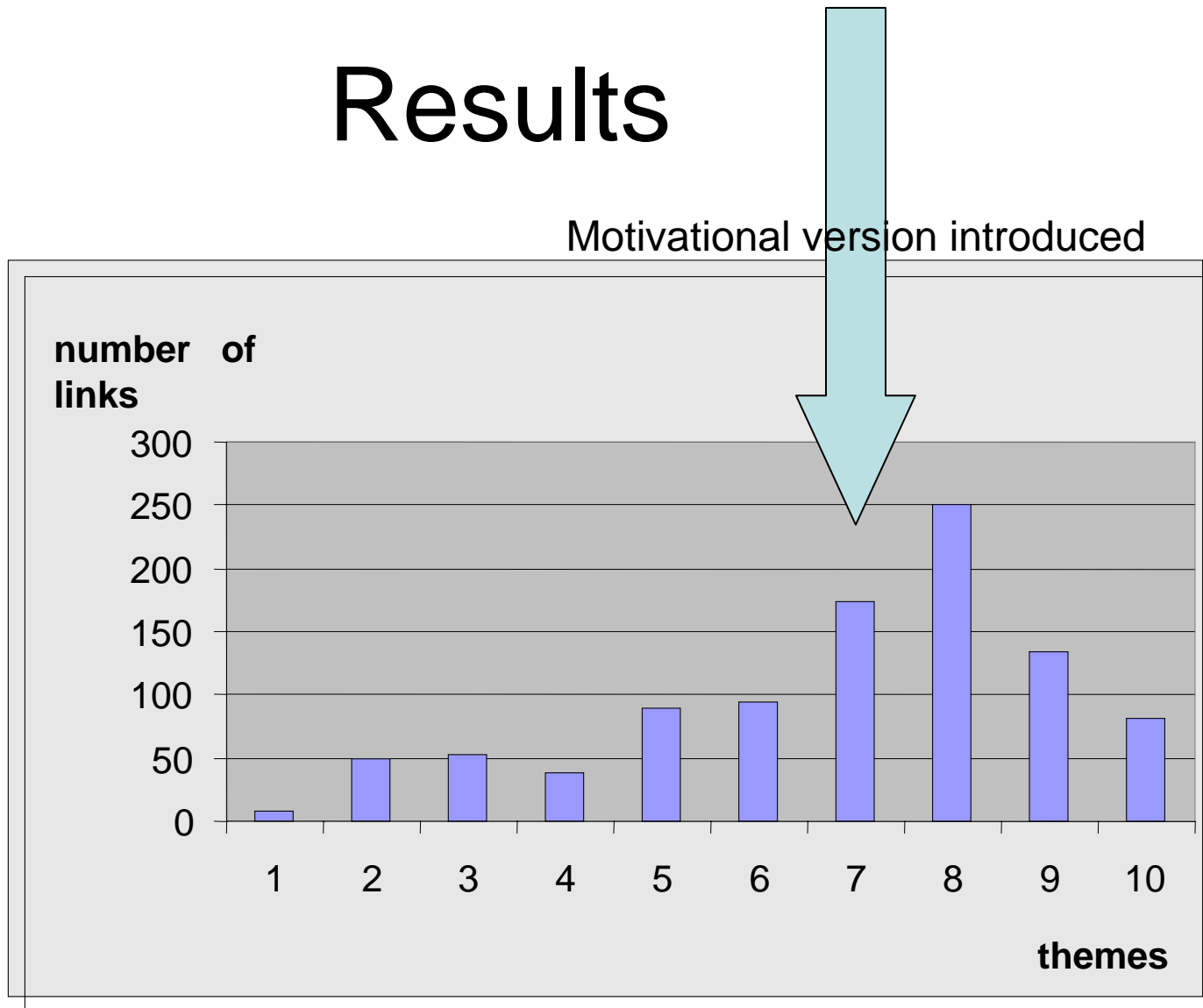
Discussion

- Comtella made it much easier
 - to share links
 - to find links shared by others and share on the go while viewing the already shared links
- The search facility was very useful
- Timeliness was important
 - shared papers are immediately available

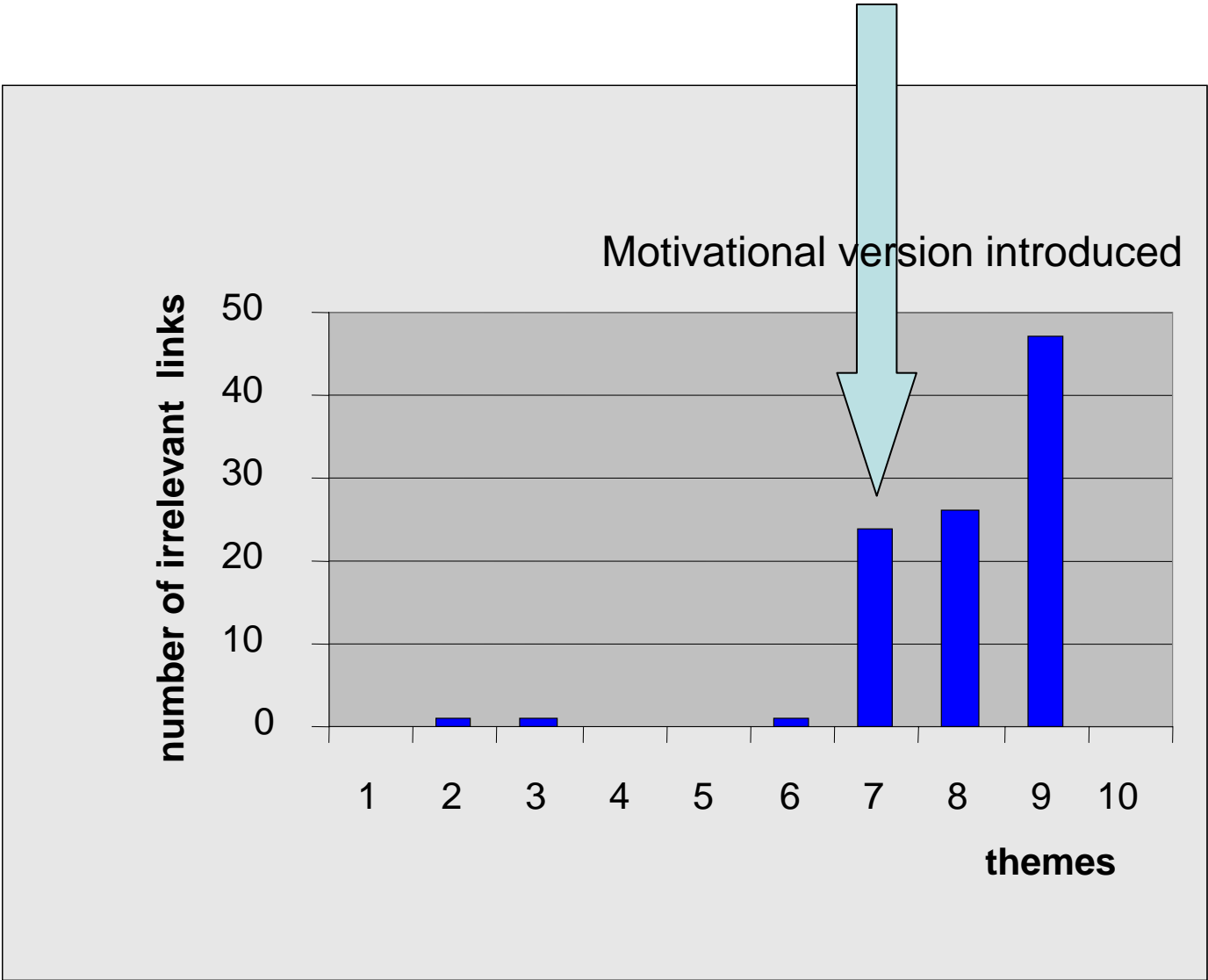
Question 2: Are our methods for encouraging participation effective?

- Compare student contributions before and after introducing the motivational version (with status, extra functionality for gold and silver, and social visualization)
 - Number of new links shared
 - Number of irrelevant links shared (gaming)

Results



Total number of links shared by all students over the 10 themes (weeks)



Number of irrelevant links contributed (cheats).

How to ensure good quality of contributions ?

- **Comtella 3** (first deployment this fall in a 4th year class on MAS, 15 st.)
- **Entirely centralized: web-application: JSP, mySQL**
- Measure quality of papers
 - Track “cheaters”: let people flag irrelevant papers
 - Track how many people view a contribution and how they rate it (like “Impact factor”)
 - Encourage users to rate contributions
 - Compute and display average ratings of papers
 - Compute a **reputation** of a user as a contributor and as a rater
 - User status depends **both** on the number of contributions and on reputation
- **Reward quality** – users with high reputation are **moderators** (~Slashdot)
 - Higher status users have more rates to give away
 - Users gain status mostly based on their reputation
- Encourage users to rate papers
 - Each rating of a paper earns a c-unit that can be invested to increase the visibility of a contributed paper in the default view of search results

[Show it](#)

Conclusions

- P2P file-sharing can support collaborative collection of a shared class resource repository
 - Finally, a legal application of P2P!
 - Success (confirmed by students in a questionnaire after the end of class)
 - Students suggested that the system is used widely in many CS and humanities classes
- Persuasion techniques can be effective in designing incentive mechanisms
 - Rewarding students (reciprocation)
 - Hierarchical membership (theory of fear)
 - Visualization (social comparison)
- Be careful!
 - Every incentive system can be and will be gamed
 - If no attempts of gaming, it is not effective

More info: at <http://bistrica.usask.ca/madmuc/peer-motivation.htm> 😊