



Lecture 27

Groupware



Today's Outline

- What is Groupware
- Classification of Groupware
- Need of Groupware's
- Time Space Matrix
- Examples

What is Groupware?

- CSCW: Computer Supported Cooperative Work is a generic term, which combines the understanding of the way people work in groups with the enabling technologies of computer networking, and associated hardware, software, services and techniques.
- Software *specifically* designed
 - to support group working
 - with cooperative requirements in mind





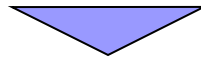
CSCW - Groupware

“Groupware is distinguished from normal software by the basic assumption it makes: groupware makes the user aware that he is part of a group, while most other software seeks to hide and protect users from each other ... Groupware ... is software that emphasizes the multiple user environment, coordinating and orchestrating things so that users can “see” each other, yet do not conflict with each other.”

Baecker (1995)

Why is Groupware design hard?

- Multiple users
- “Virtual” (not physical) presence
- The Network!!



- Some distinguishing features of Groupware:
 - ☐ asynchronous communication
 - ☐ anonymous communication
 - ☐ automatically archive of communication

Classification of Groupware

■ Groupware can be classified in several ways:

- by **where and when** the individual participants perform the cooperative work - summarized in a time/space matrix.
- by the **function** of the system — e.g., collaborative design, group authoring, meeting support, etc.

Classification of Groupware

□ by the **structural support function** of the software

- *computer-mediated communication* — where direct communication between participants is supported.
- *meeting and decision support systems* — where common understandings are captured.
- *shared applications and artifacts* — where the participants' interaction with shared work object (the artifacts of work) are supported.



Why is Groupware becoming Important?

- Form groups with common interests
- Better customer service
- Fewer meetings - cut down on travel costs, time and related costs
- Integration of geographically disparate teams
- Leveraging professional expertise
- Facilitate group problem-solving

The Need for CSCW -Groupware

- Much work in HCI focuses on the development of better interfaces between users and computer systems.

- Emphasis has been on the individual user's model of the task, the actual behavior of users, their errors, etc.

- A core problem in HCI has been that the majority of studies to date take as their focus the *individual user* working on a computer system



The Need

- The object of interest is no longer simply human-computer interaction (HCI), but rather human-computer-human-interaction (HCHI).



The Need for CSCW - Groupware

- The focus in CSCW is more on the nature of the work performed, and the role of computers in its support or disruption, than simply on the affordances offered by technologies of "communication".
- There is a greater emphasis on field studies in specific work domains
- Much interest has centered on more qualitative, interpretive, ethnographic studies of work practices in an effort to understand more fully the "artful practices" of ensembles of workers as they accomplish their work activities



The Need for CSCW

CSCW vs. HCI:

- Interaction among people, not between computers and people.
- Simple extensions of single-user applications do not work!
- We have to understand group processes.
- Intuition does not work. We have to understand the working environment

The Time/Space Matrix

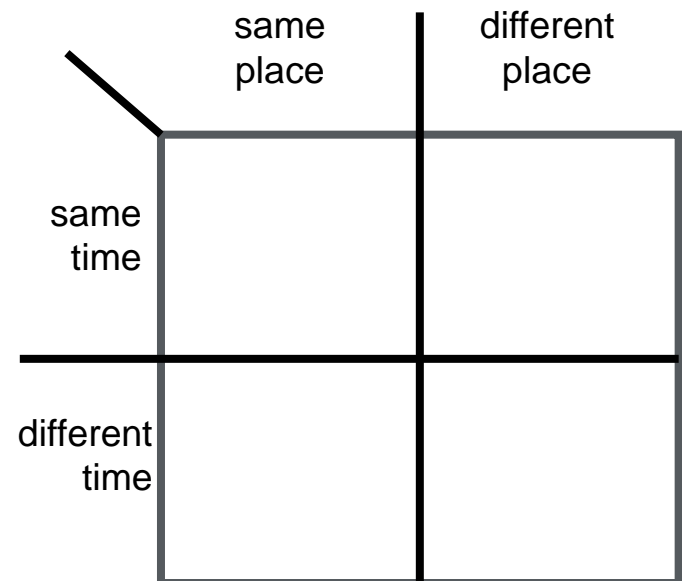
Common names for axes:

time:

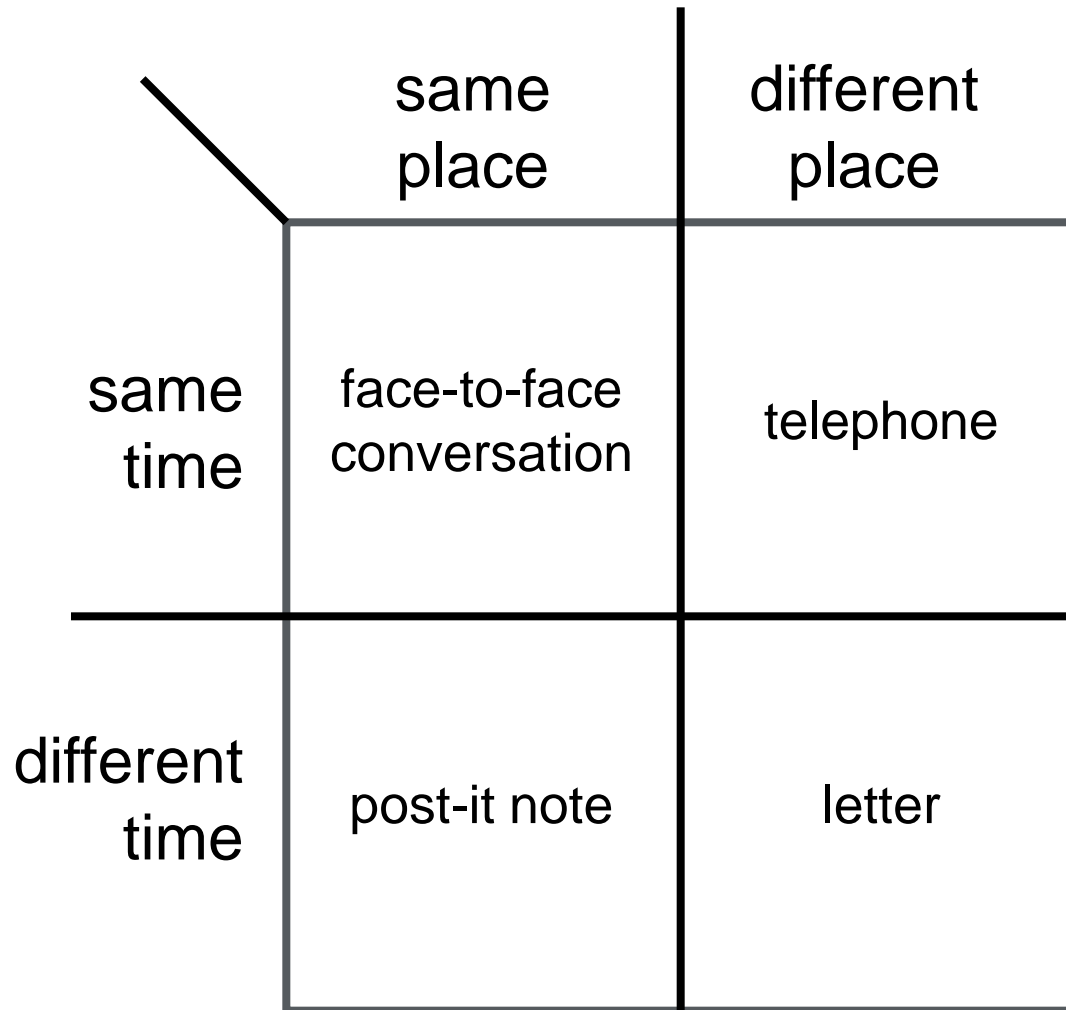
synchronous/asynchronous

place:

co-located/remote



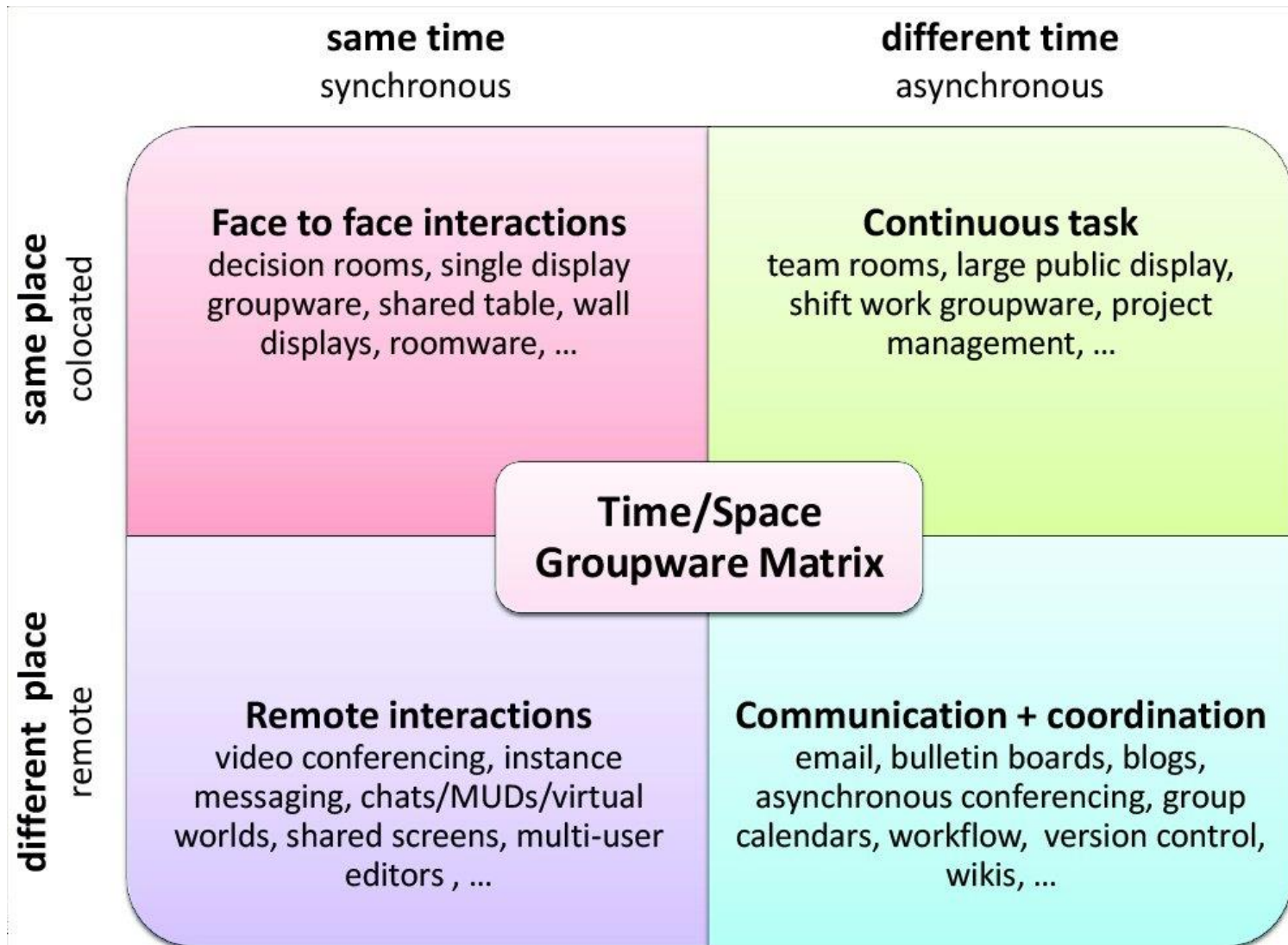
Time/Space Matrix



A 2x2 matrix diagram illustrating communication methods based on time and space. The matrix is divided into four quadrants by a horizontal and a vertical line. The top-left quadrant is labeled 'face-to-face conversation', the top-right 'telephone', the bottom-left 'post-it note', and the bottom-right 'letter'. The horizontal axis is labeled 'same time' (top) and 'different time' (bottom). The vertical axis is labeled 'same place' (left) and 'different place' (right). A diagonal line points from the top-left corner of the matrix towards the top-left quadrant.

	same place	different place
same time	face-to-face conversation	telephone
different time	post-it note	letter

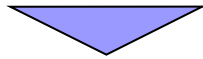
Groupware Matrix



[1] Different time / different place

Communication + Coordination

- Wiki
- Blogs
- Workflow
- Version Control



- Shared participation over time
- Geographically world wide

Wikis

- Group-viewable / editable web site
- community of strangers *to* community of collaborators
- culture of what is allowed *VS.* hard-coded access control



Email and bulletin boards

- *asynchronous/remote*
- familiar and most successful groupware
- Recipients of email:
 - direct* in To: field
 - copies* in Cc: field
- delivery identical – difference is social purpose

Email and Bulletin Board

http://mail.google.com - Gmail - Compose Mail - @gmail.com ...

Send Save Now Discard

From: DeSalvionjr [change](#)

To:

[Add Cc](#) | [Add Bcc](#)

Subject:

[Attach a file](#) [Add event invitation](#)

B *I* U ~~ABC~~ **T** [Check Spelling](#) ▼

[Plain Text](#)

Blah Blah Blah Blah!

Send Save Now Discard

vBulletin vBulletin 3.8.3

vBulletin Community Forum

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Welcome to the vBulletin Community Forum.

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Forum	Last Post	Threads	Posts
vBulletin Announcements			
vBulletin Announcements (15 Viewing) Find out the latest news about vBulletin here Sub-Forums: vBulletin vBulletin & Press Releases	Who's Who on Team vB by Ray Maroon Mon 29th Jun '09 3:35pm	391	1,566
Announcements Discussions This forum is now closed to new posts and will be archived. Please use the Suggestions and Feedback forum for discussion about vB features and the Site Feedback forum for discussions about the vBulletin.com site.	Announcements and Discussions... by Steve Machol Tue 12th May '09 4:25pm	135	39,831
vBulletin Sales			
vBulletin Pre-sales Questions (14 Viewing) Do you have a question you are dying to ask an existing vBulletin user about vBulletin?	I already have a lifetime...	13,000	36,000

Structured message systems (ctd)

Type: Lecture announcement

To: all students

From: Yasser Fouad --**Moderator**

Subject: Course seminar

Time: 8:10 Thursday

Place: Hall 1

Speaker: students

Title: The HCI

Text: Recent research on HCI constructed meaning has focused on the image of the Computer and its dialectic interpretation within an uncultured hermeneutic. This talk ...

N.B. global structuring by designer

vs. local structuring by participants

txt is gr8

- instant messaging
 - 1996 – ICQ small Israeli company

- SMS

- y is it we al lv shrt msgs
- originally a feature of internal management protocol
- short messages (160 chars) and text with numbers
- no-one predicted mass adoption!!
- now phones with cameras for MMS

Hi, u there
yeh, had a good night last night?
uhu 😊
want to meet later

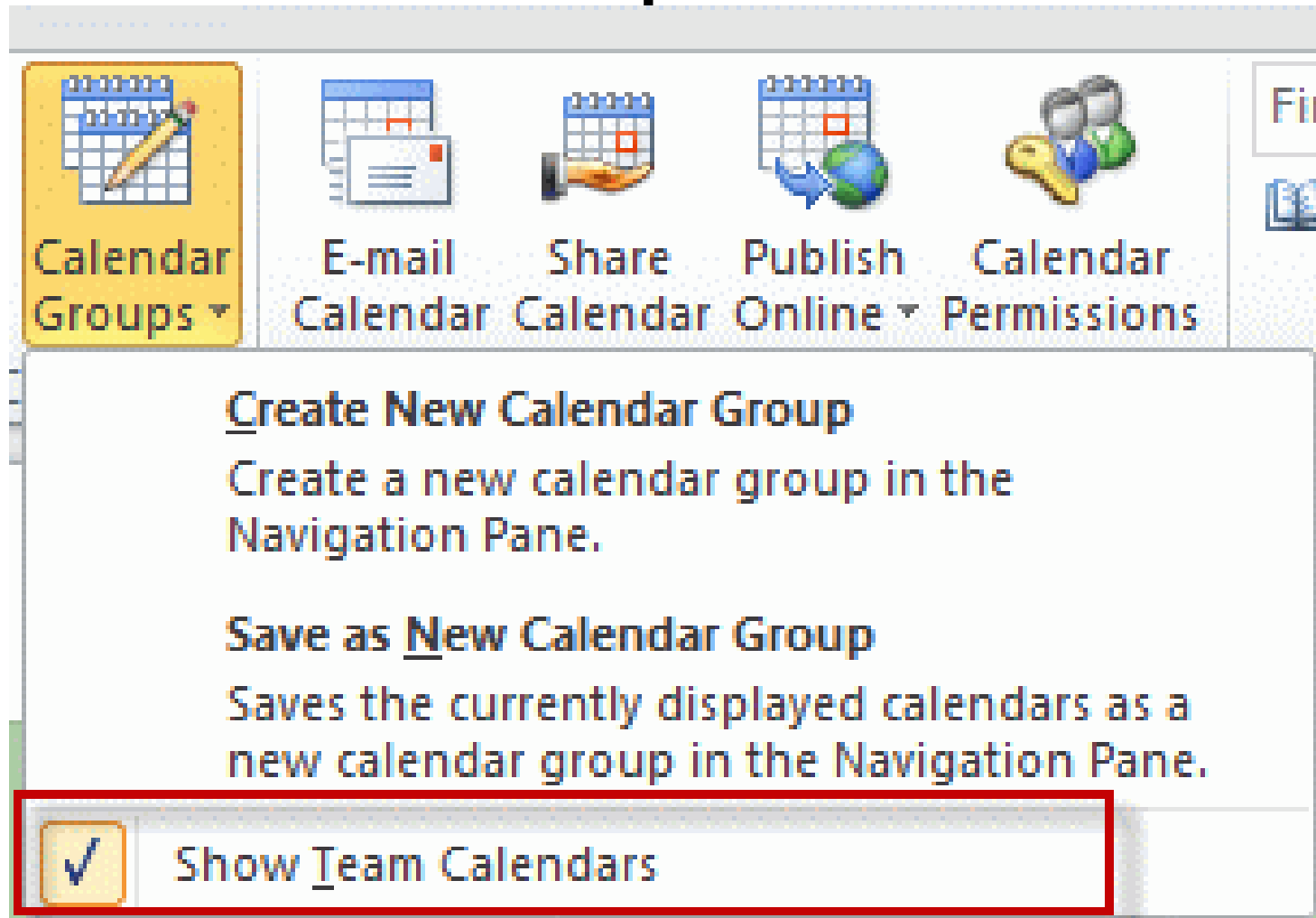




Group Calendars

- common calendar
 - ☐ meeting scheduling
 - ☐ resource use
 - ☐ privacy
 - ☐ who keeps things up to date?
 - ☐ how do you stop people scheduling your meetings?

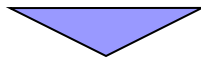
Calendar Groups



[2] Same time / different place

Remote interaction

- Video-Conferencing,
- Real-time groupware
- Messaging (Instant messaging, Email)
- Virtual worlds
- Multi-User editors
- Shared Screen (vnc)

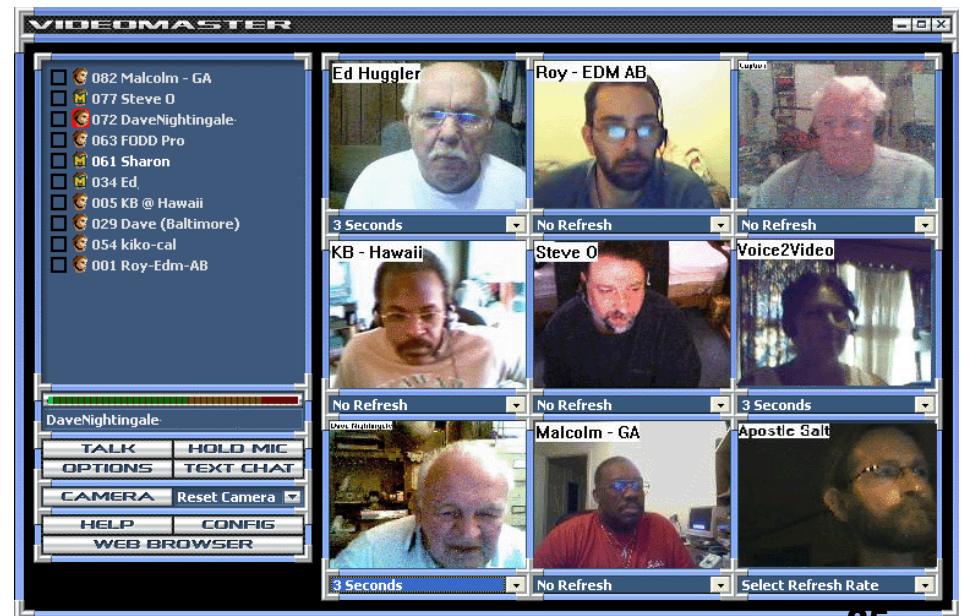


- Multi-user participation
- Nonverbal cues
- Differing levels of fidelity (text, voice, avatar)

Video / Audio conferencing

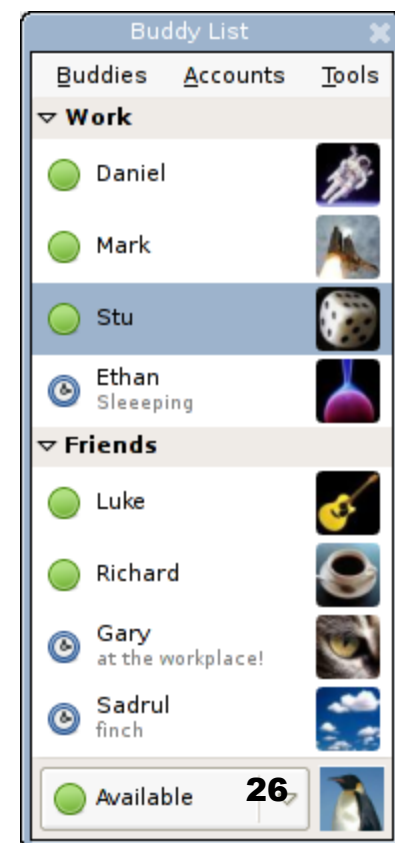
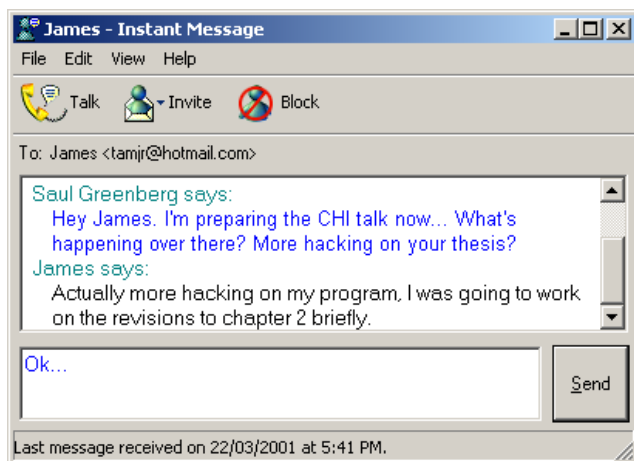
■ Desktop conferencing

- bandwidth/latency issues
- what is the value of talking heads?

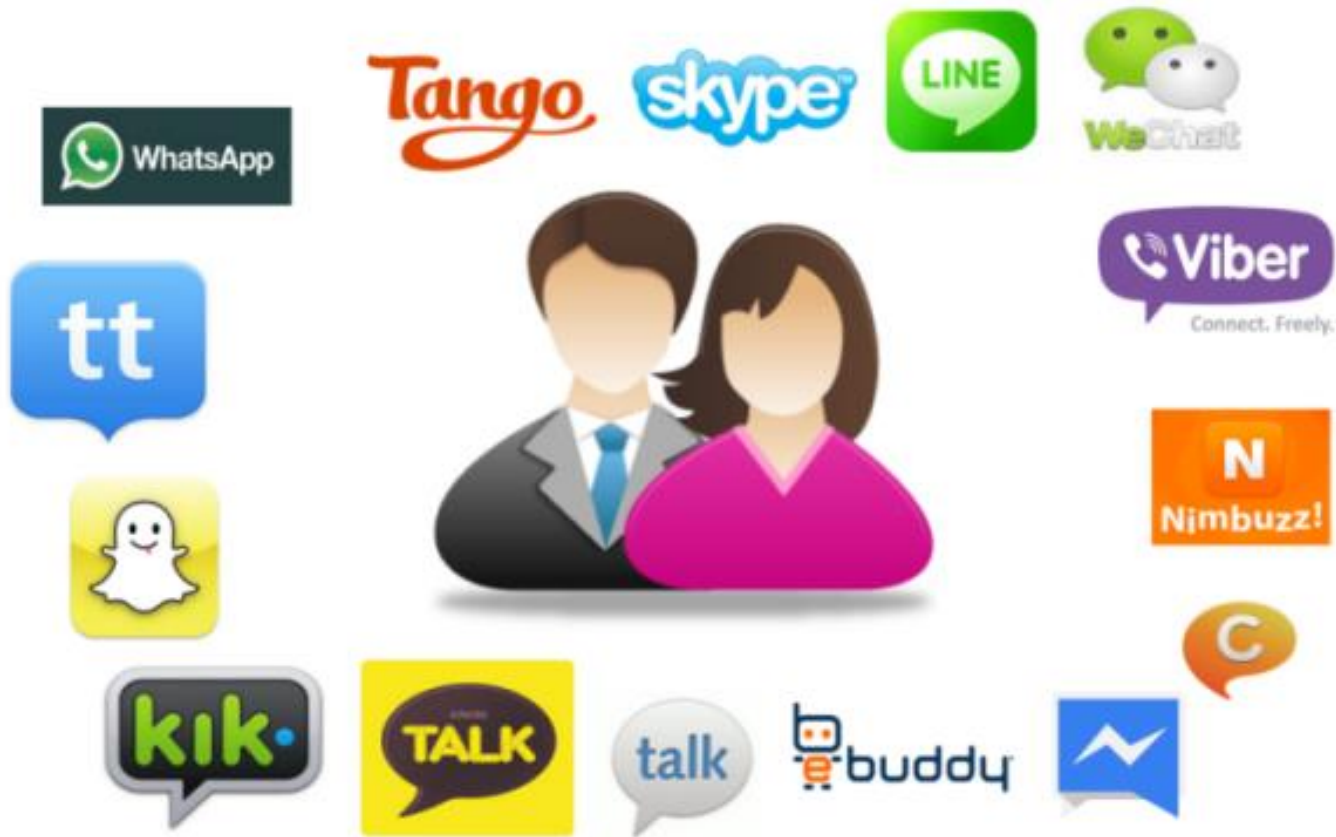


Instant messengers

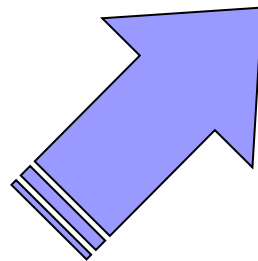
- Casual interaction
 - awareness to light-weight conversations
- Killer app
 - evolving social norms
 - defining communities



Famous Instant Messengers



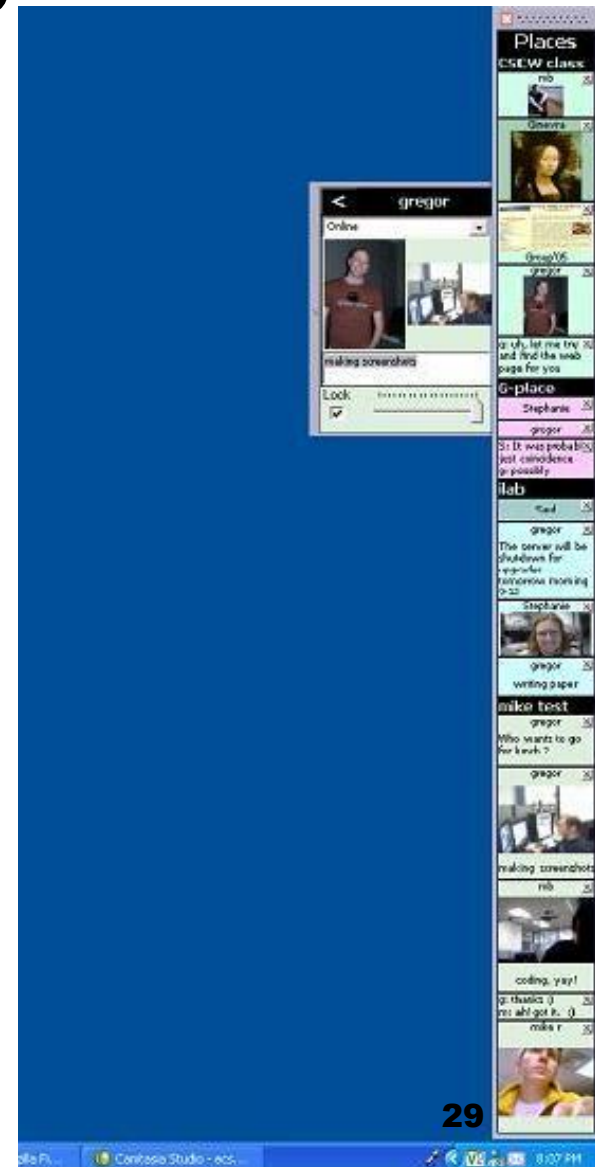
Enhancements in same time / different place



Internet Traffic and Number of users Increased!

Rich Instant Messaging

- Can do much more than text
 - How does one handle complexity?
 - How does one handle interruption?



Shared Screens/Windows

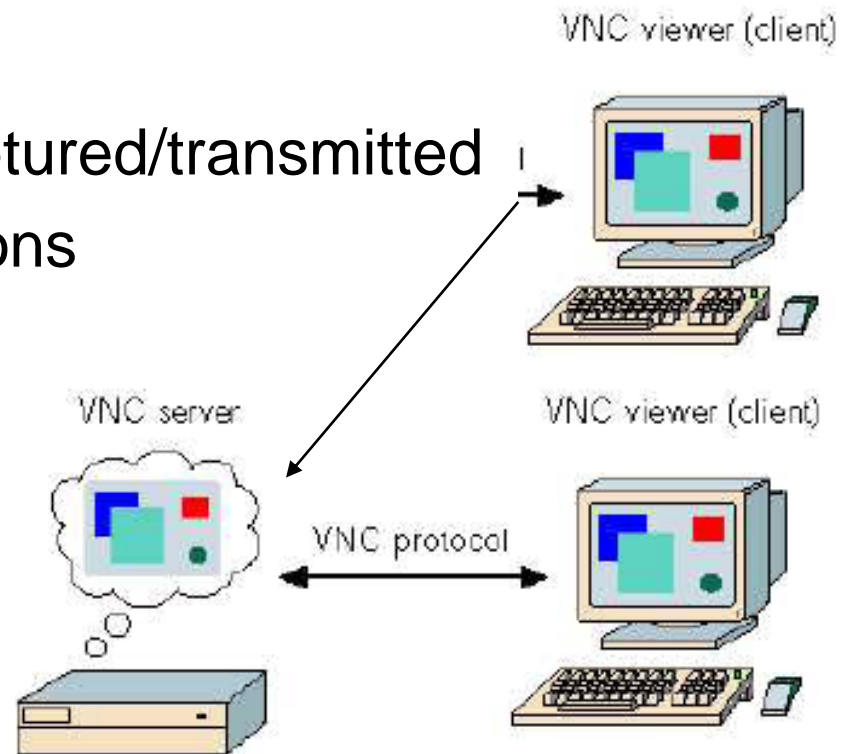
- Share unaltered single user applications

- technical concerns

- how regions are captured/transmitted
 - architectural limitations
 - controlling input
 - access control...

- social limitations

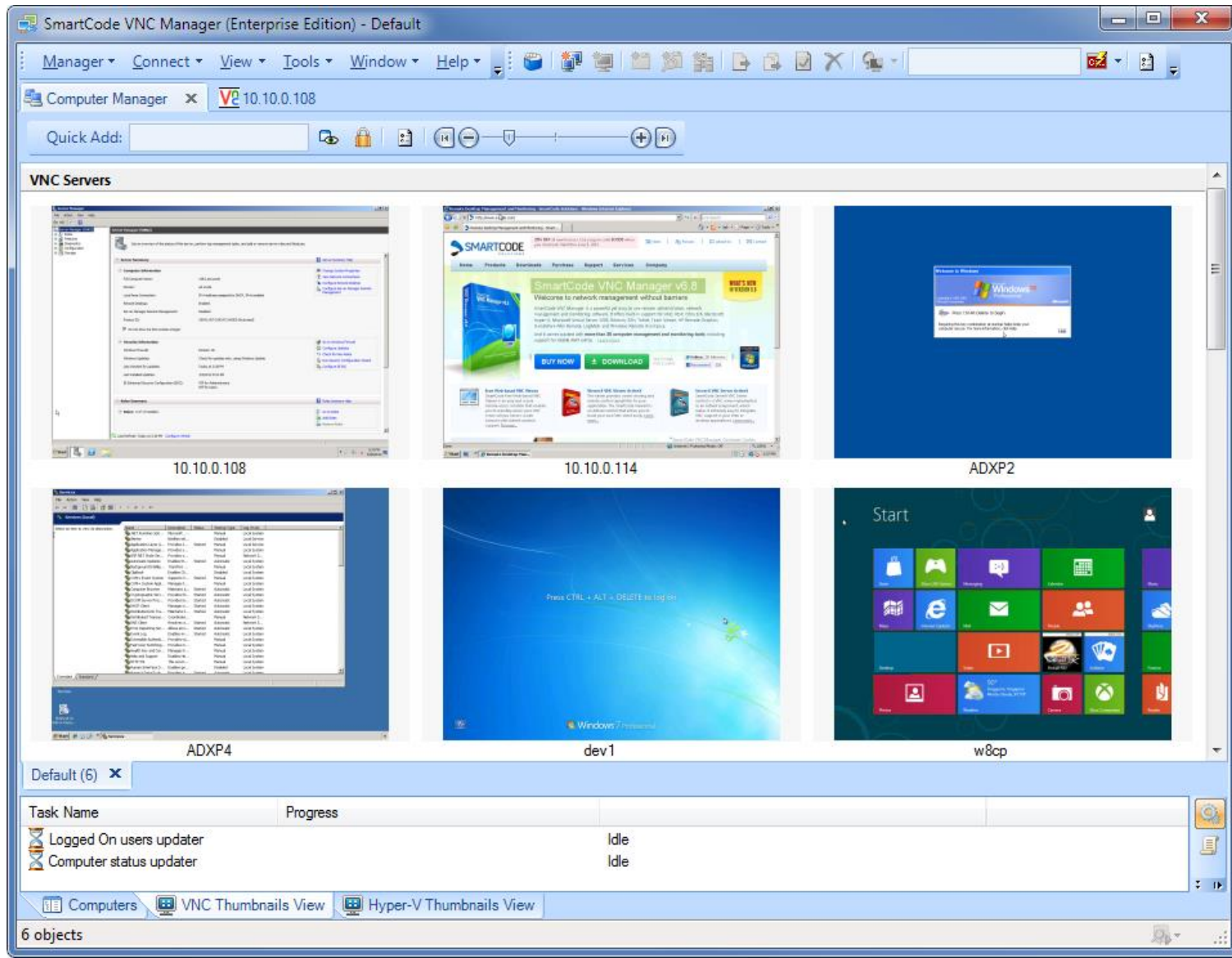
- turntaking
 - control
 - privacy



Richardson, T., Stafford-Fraser, Q., Wood, K. and Hopper, A.

Virtual Network Computing. IEEE Internet Computing. Vol. 2, No. 1. p33-39. January/February, 1998.

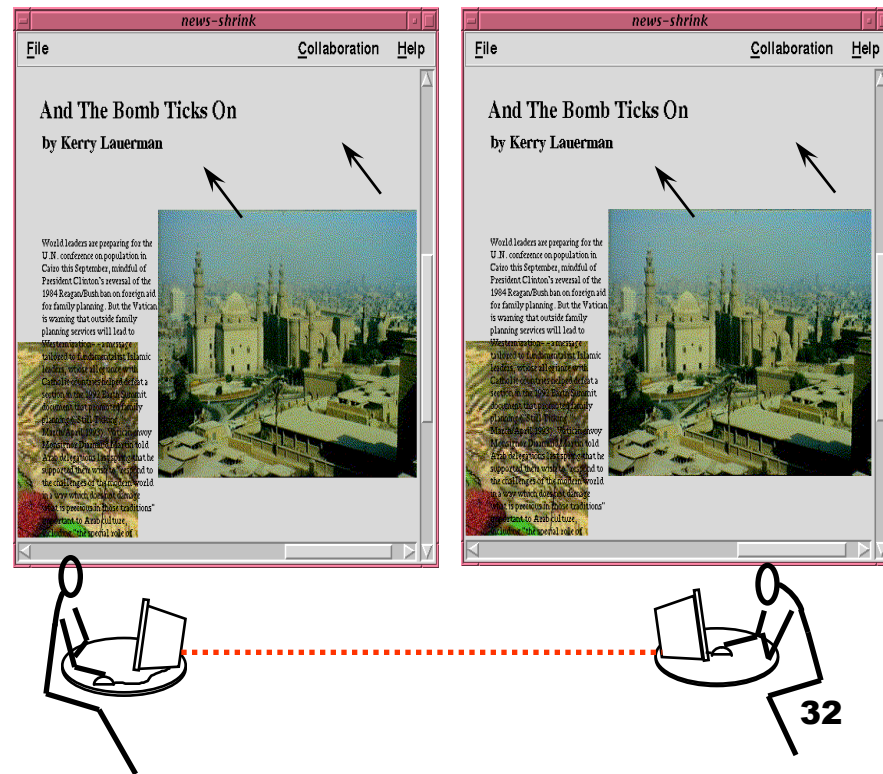
Shared Screens –VNC Manager



Multi-user editors

- True groupware for visual artifacts
 - structured documents (e.g., text paper)
 - visual workspace (2d graphics)

- awareness
- conflicting actions
- tight vs loose coupling
- relaxed wysiwiw



Video conferences and communication

- synchronous/remote
- Technology:
 - ISDN + video compression
 - internet, web cams
- major uses:
 - video conferences
 - pervasive video for social contact
 - integration with other applications
- often cheaper than face-to-face meetings
 - (telecommunications costs vs. air flights)

collaborative virtual environments (CVEs)

- meet others in a virtual world
 - participants represented – embodiment
 - artifacts too ...
 - computer (e.g. spreadsheet) and ‘real’ (virtually) objects
 - text?
 - consistent orientation or easy to read




- MUDs (Multi-user domains)
 - 2D/3D places to meet on the web
 - users represented as avatars



Example: ideas for different time / same place

Lean Manufacturing:
Visible System Metrics



PRODUCTION RATE* PART # 1350-R2

HR	TARGET	ACTUAL	TARGET ACCUM	ACTUAL ACCUM	+/-	NOTES
1	75	75	75	75	-	
2	75	72	150	147	-3	
3	75	70	225	217	-8	
4	75	71	300	288	-12	
5	75	75	375	371	-4	
6	75	71	450	440	-10	
7	75	75	525	520	-5	
8	75	75	600	600	0	

Notes:
 4- Run short of stock
 last entry
 Done-
 Need new spec. sheet
 print out for R2. old one
 destroyed.
 Thanks
 A.



Machine Number	Next Job SKU#	Current Job%	OEE %
15	1531	75%	72%
17	1572	95%	77%
21	1514	44%	82%
22	1499	15%	93%
23	1528	26%	63%

Location	Flow Rate	Temperature	PPM Emission
Area 1	245	355	11000
Area 2	355	400	12000
Area 2A	423	350	12500
Area 3	564	275	13000
Area 4	343	320	11500
Area 5	250	330	11000
Area 5A	452	390	15500
Area 5B	356	345	11750
Area 6	475	400	12000
Area 6A	276	275	12000
Area 6B	285	275	13500

[3] same time / same place

With
“PowerPoint
Slides”

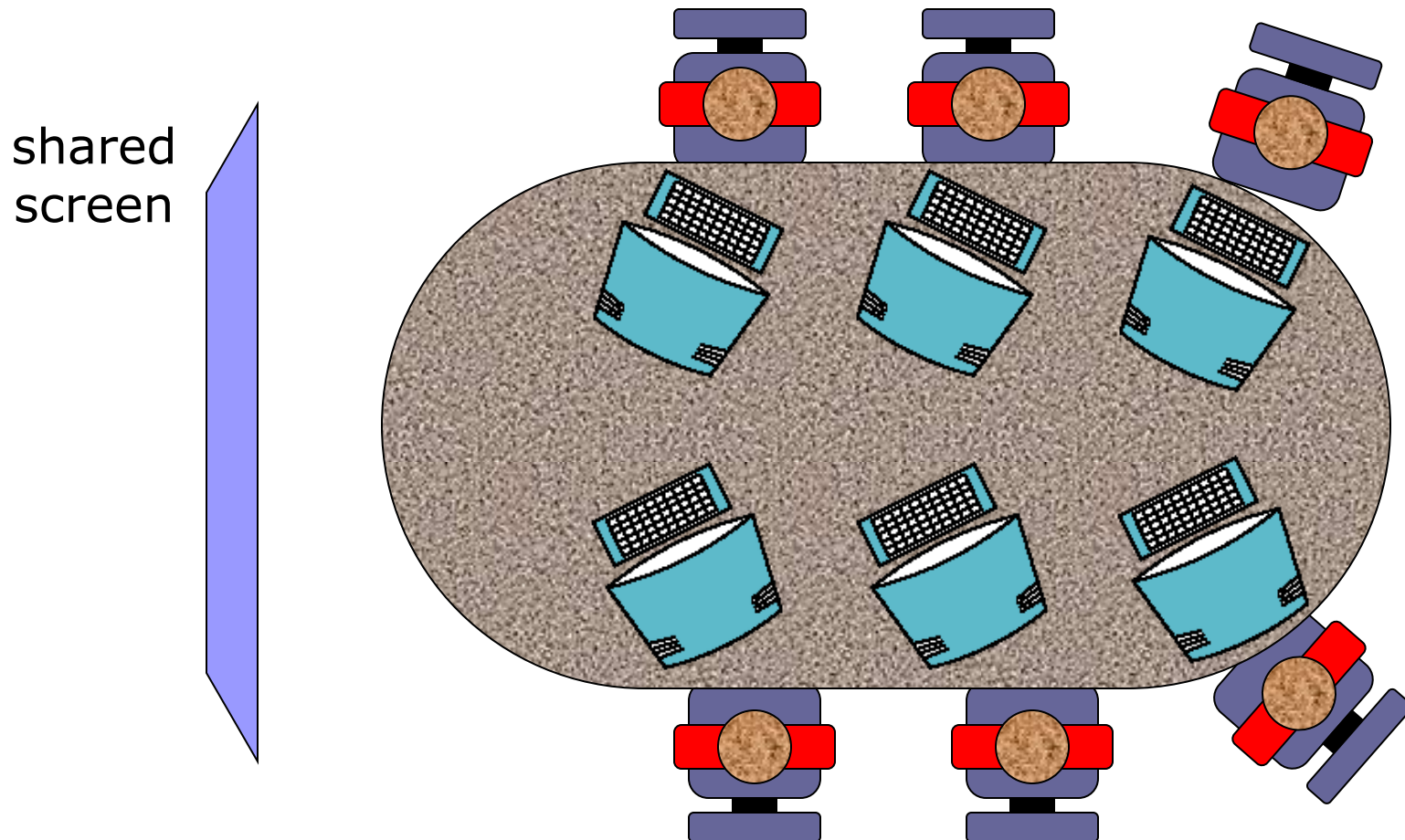


Without
“Slides”



Is PowerPoint
in need of
Groupware
innovation?

Typical meeting room



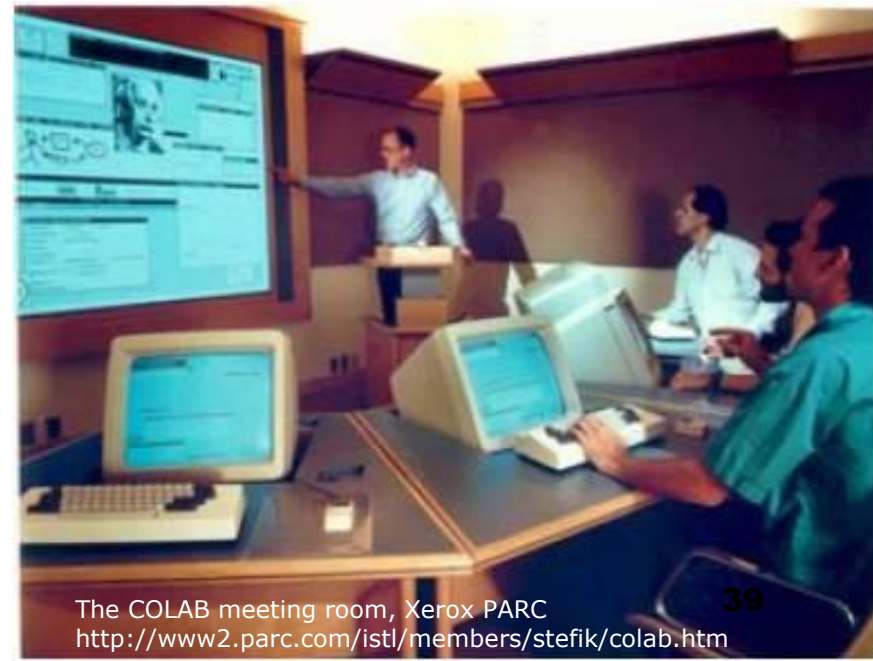


Group Decision Rooms

- Embeds decision making process
 - dedicated computer-based conference facility
 - real time large group support (5-50)
 - typically facilitated
 - embeds a structured meeting process
 - domain of MIS

Group Decision Rooms

- Typical function
 - explore unstructured problems
 - brainstorm ideas
 - organize/prioritize results
 - voting...
 - good for brainstorming.



Single Display Groupware

- Multiple people using a single display
 - multiple input devices
 - simultaneous input
 - new interaction widgets
- technical issues (O/S)
- conflict with conventional applications
- supporting social conventions of simultaneous work
- mice vs. direct touch...



Edward Tse
<http://group.lab.cpsc.ucalgary.ca/papers/2001/SDGToolkit-MScThesis/SDGToolkit-MSc.pdf>

Shared Table / Wall Displays

- device characteristics
- social affordances of tables/wall



*InteracTable and Dynawall,
From the GMD Darmstadt web site on I-Land*

The Time/Space Groupware Matrix

same time

synchronous

different times

asynchronous

same place

colocated

face to face interactions

continuous task

team rooms

large public displays

shift work groupware

project management

remote interactions

communication+coordination

Control Rooms

- Information that goes across shifts



Reuters,
http://www.electrosonic.com/command_and_control.shtm



NASA Mission Control Center
<http://spaceflight.nasa.gov/shuttle/reference/mcc/>

Connected meeting rooms ??

- Meeting / classroom
- Video /
- audio links
- Which type??



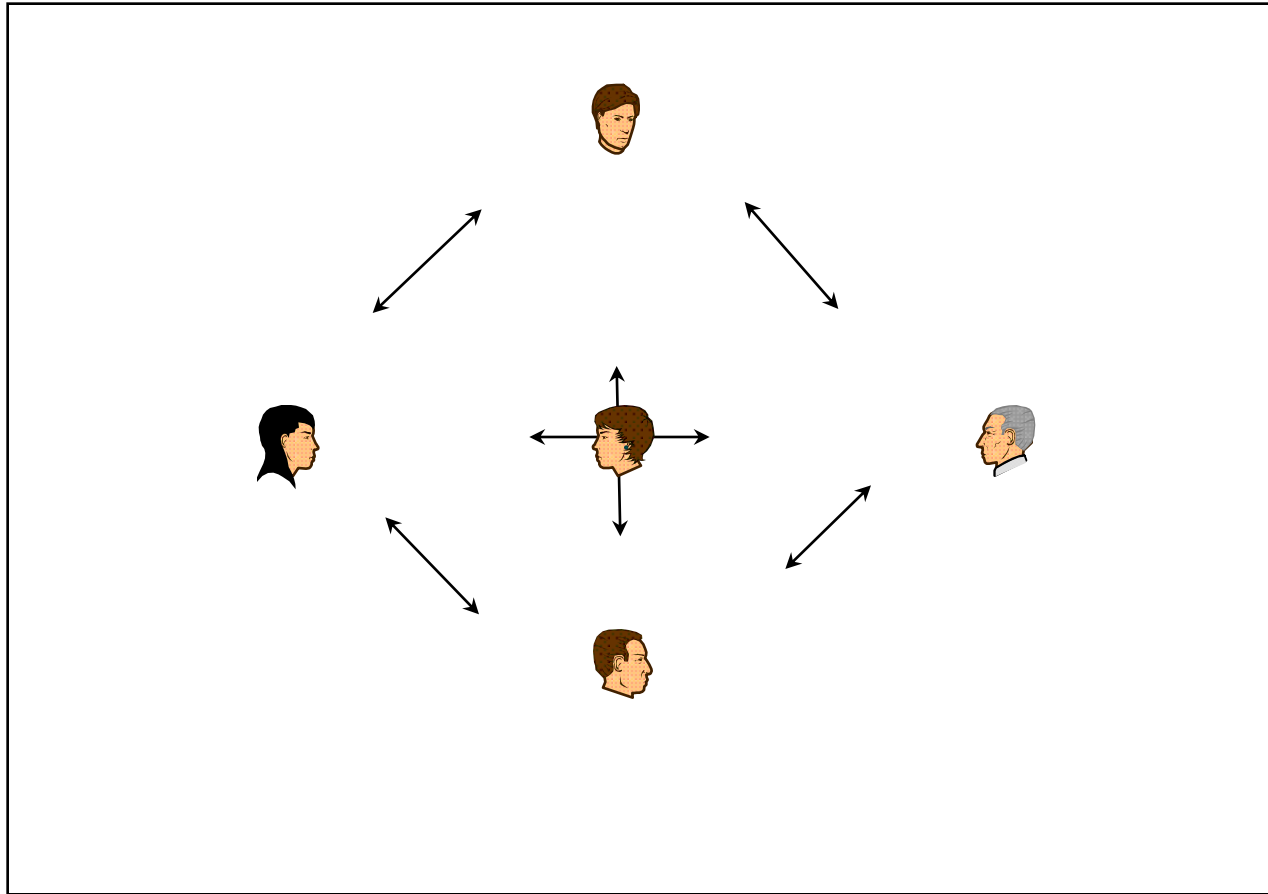
Anytime, any place groupware

same time

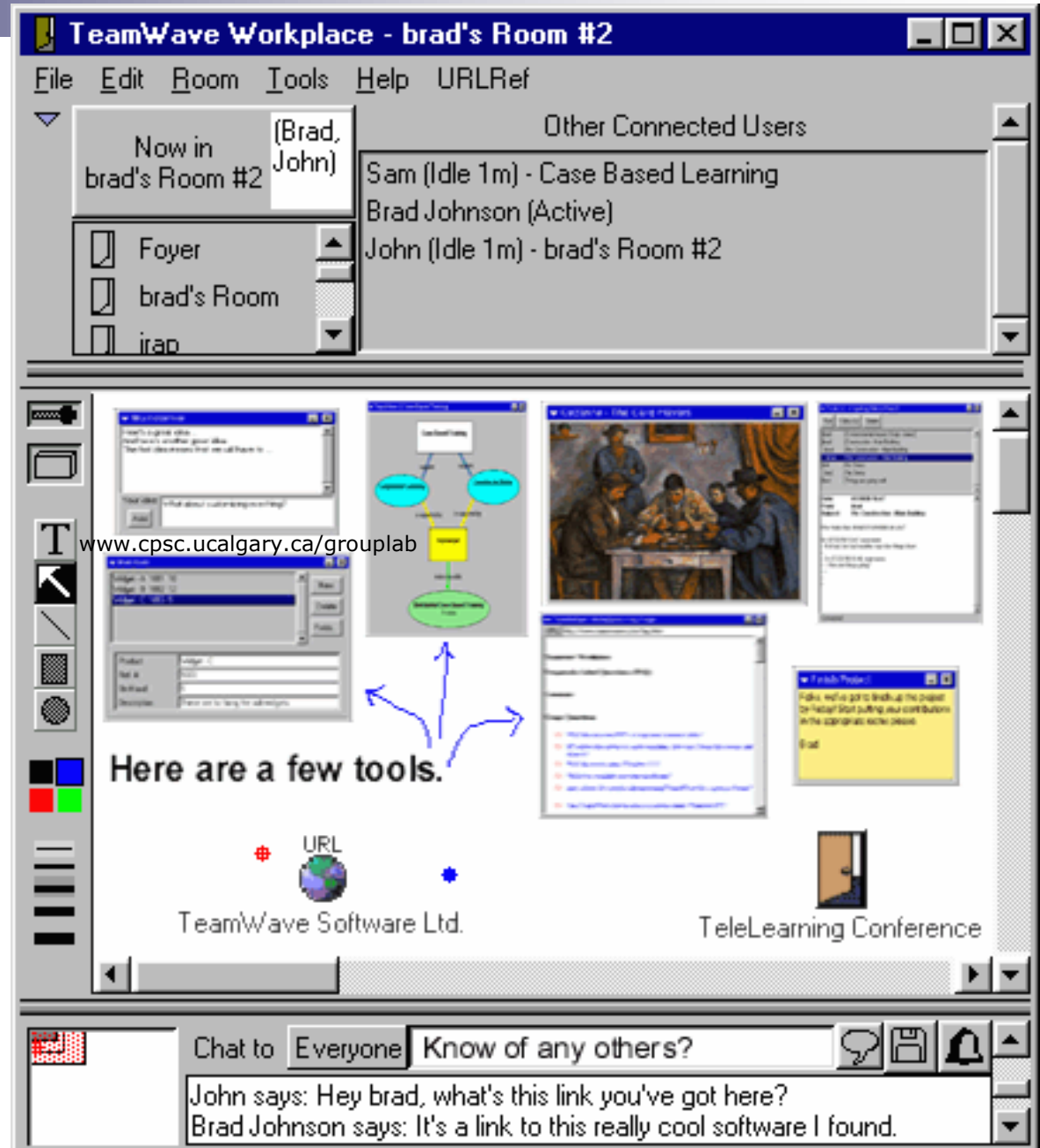
different times

same
place

different
places



Teamwave Workplace



Perspective : Synchronicity

	co-located	remote
concurrent synchronized <i>people intentionally active at the same time</i>	meeting rooms shared work surfaces and editors, shared PCs and windows	video conferences, video wall, etc.
semi-synchronized <i>people active in near real time</i>	rapid email exchanges, delayed IM exchanges	
Mixed <i>may include active and serial activity</i>	co-authoring systems, shared calendars	
Serial <i>forces <u>turn</u>taking</i>	argumentation tools	
Unsynchronized <i>people use tools at different times</i>	email and structured messages, electronic conferences	

Extended matrix for CSCW

From Grudin, 1994

		Time		
		Same	Different but predictable	Different and unpredictable
Place	Same	Meeting facilitation	Work shifts	Team rooms
	Different but predictable	Tele/video/desktop conferencing	Electronic mail	Collaborative writing
	Different and unpredictable	Interactive multicast seminars	Computer bulletin boards	Workflow



Applying CSCW to Education

- Virtual Classroom is an environment to facilitate collaborative learning for distance education students.
- Constant communication with other learners is obvious.
- Virtual Classroom is expected to exceed the traditional classroom in its ability to 'connect' students and course materials.



implementing groupware

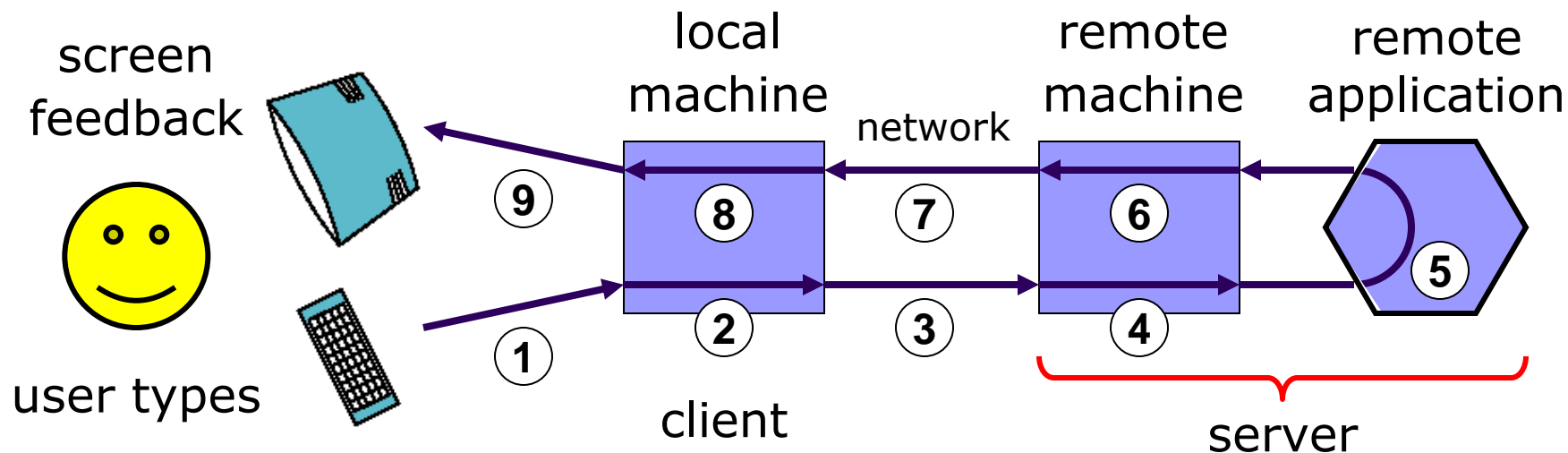
feedback and network delays

architectures for groupware

feedthrough and network traffic

toolkits, robustness and scaling

Feedback and network delays



At least 2 network messages + four context switches

With protocols 4 or more network messages

Types of architecture

centralised – single copy of application and data

- ☐ client-server – simplest case
 - N.B. opposite of X windows client/server
- ☐ master-slave special case of client-server
 - N.B. server merged with one client

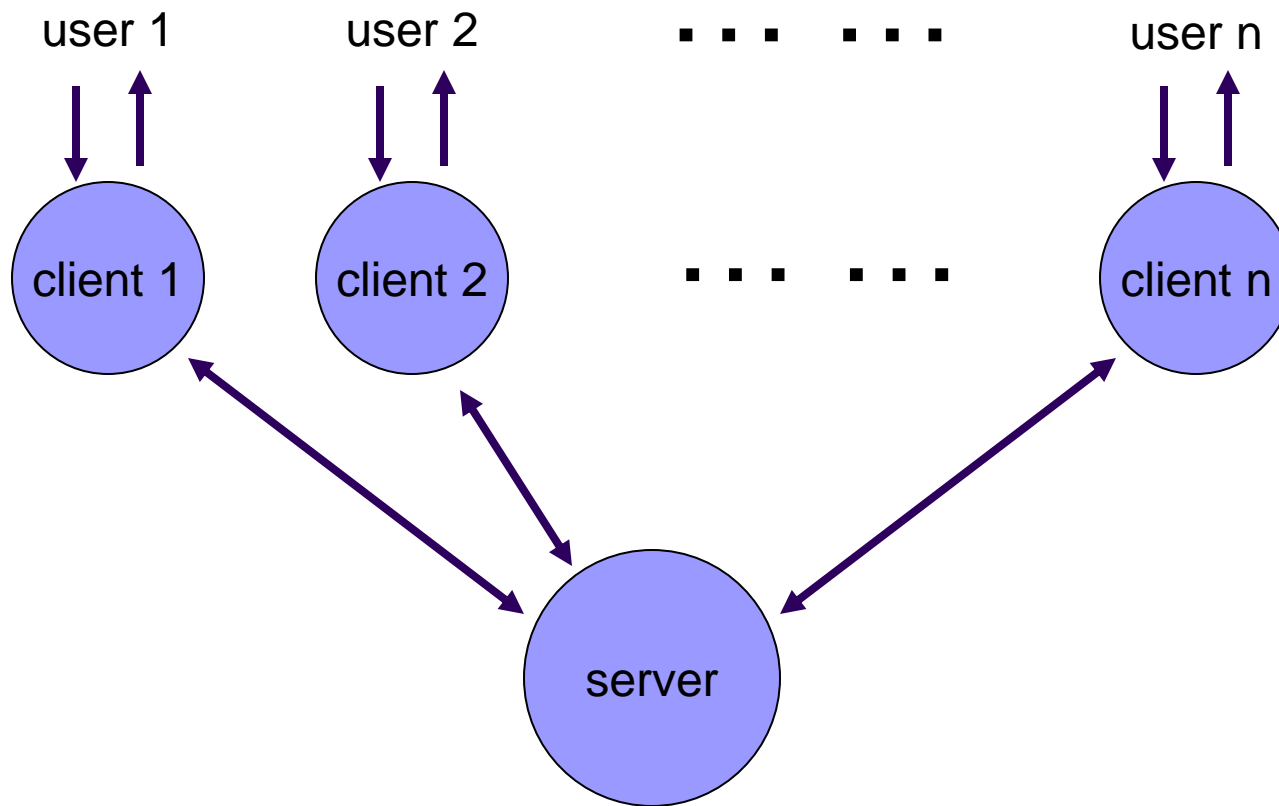
replicated – copy on each workstation

- ☐ also called peer-peer
- ☐ + local feedback
- ☐ race conditions

Often 'half way' architectures:

- ☐ local copy of application + central database
- ☐ local cache of data for feedback
- ☐ some hidden locking

Client-server architecture



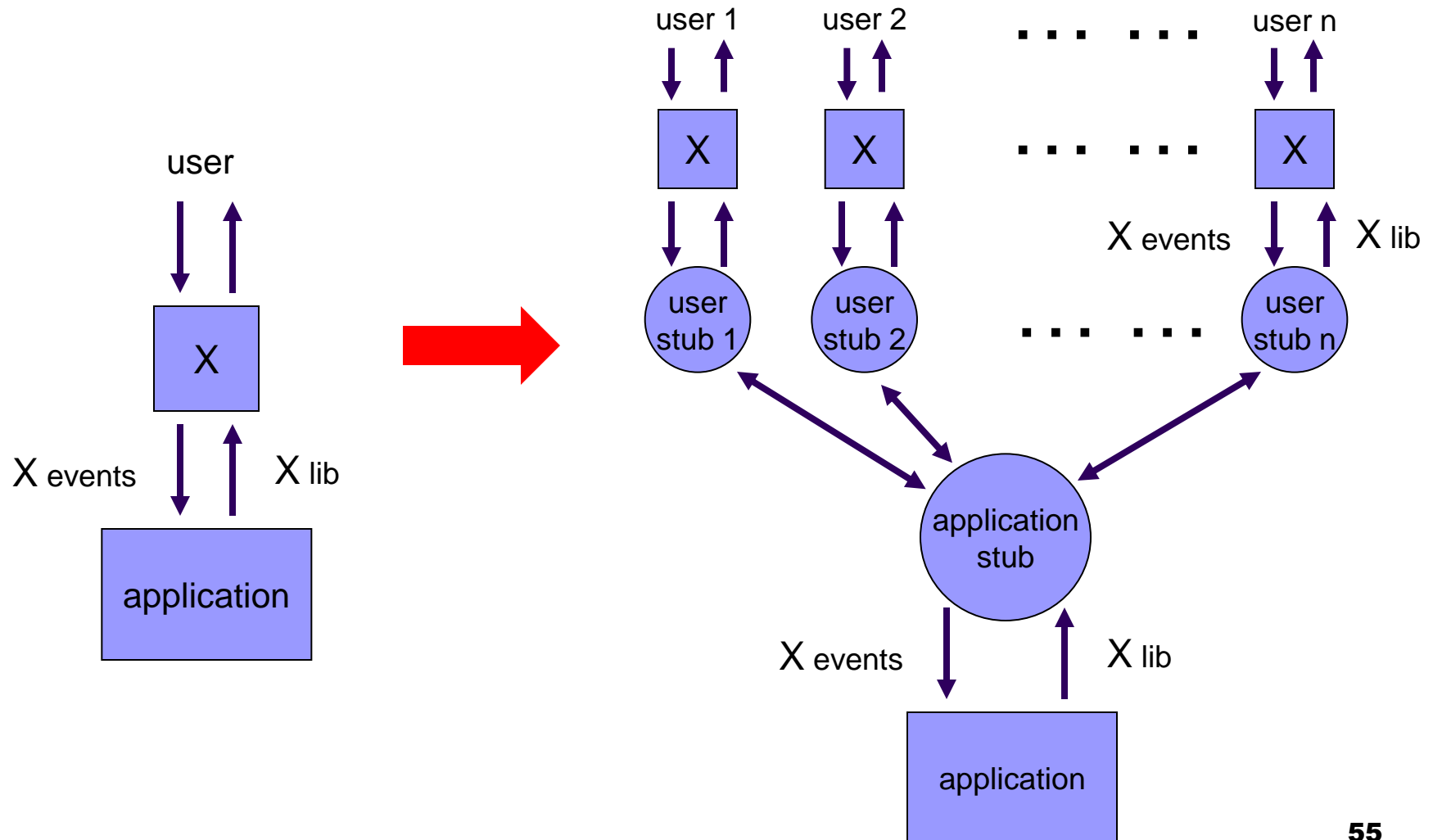
Shared window architecture

- Non-collaboration aware applications
 \Rightarrow *client/server* approach
 corresponding feedback problems
- no 'functionality' – in the groupware
 but must handle *floor control*

example: shared X

- single copy of real application
- *user stub* for each user acts as an X application (X client)
- one *application stub* acts like X server for real application
- *user stub* passes events to single *application stub*
- stubs merge X events coming in
 and replicate X lib calls going out (strictly protocol)

Shared X



Feedthrough & traffic

- Need to inform all other clients of changes
- Few networks support broadcast messages, so ...
n participants \Rightarrow n-1 network messages!
- Solution: increase granularity
 - reduce frequency of feedback
 - but ...
poor feedthrough \Rightarrow loss of shared context
- Trade-off: timeliness vs. network traffic

Graphical toolkits

Designed for single user interaction

Problems for groupware include

- pre-emptive widgets
(e.g., pop-up menus)
- over-packaged text
(single cursor, poor view control)

notification-based toolkits with *callbacks* help (chap. 8)



Robustness and scalability

crash in single-user interface – one sad user

crash in groupware – disaster !

but ...

- groupware complex: networks, graphics etc.
- scaling up to large numbers of users?
- testing and debugging – hard!

... some tips ...

- network or server fails – standard solutions
- client fails – three `R's for server:
 - **robust** – server should survive client crash
 - **reconfigure** – detect and respond to failure
 - **resynchronise** – catch up when client restarts
- errors in programming
 - defensive programming
 - simple algorithms
 - formal methods
- unforeseen sequences of events
 - *deadlock* – never use blocking I/O
 - never assume particular orders
 - network packet ≠ logical message

scaling and testing

■ scaling up

- robustness \Rightarrow simple algorithms
... but don't scale well – need to evolve
- good software architecture helps
- document fixed-size assumptions
- know operating system limits (e.g. open files)

■ testing for robustness

- take off the kid gloves ... mistreat it
- reboot, pull out network cable, random input
- create a rogue client, simulate high loads
- and when you think it is perfect
... give it to some computing students to test



Summary

- Modern groupware are used for

- ☐ Communication
- ☐ Telecommuting
- ☐ Solving daily business problems

With no travel cost involve!

Also

- Groupware foster Creativity!