# A Technology Framework to Support Team Science

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# **Official Charge**

- What technologies and infrastructure are needed to support Team Science?
  - Communication
  - Coordination
  - Information repositories
  - Computational infrastructure
- What factors should be considered in putting together this suite?



- Most science teams are distributed
  - In space
  - In time
- What's hard about working in a distributed team
- What technologies can help
  - Kinds of technologies
  - How they help what's hard
- How to decide what you need



## Based on....

SCIENTIFIC COLLABORATION ON THE INTERNET

ORGAN & CLAYPOOL PUBLISHERS

- 20 years of
   experience studying distributed science teams
   Literature from
  - business, sociology, informatics, ....

### Working Together Apart

Judith S Olson Gary M Olson

Synthesis Lectures on Human-Centered Informatics

John M. Carroll, Serie Editor

# Many teams in science are distributed

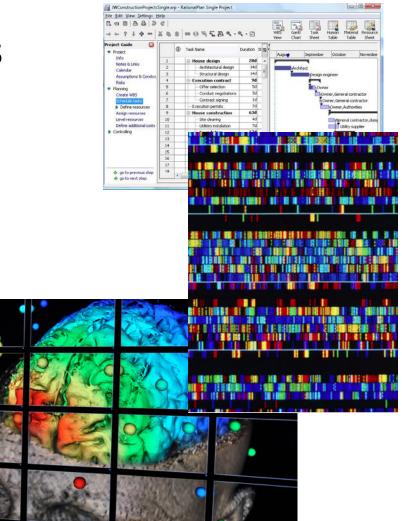
### Large science begets distance



Distance presents challenges

# Collocated teams require technology help

- Asynchronous work is distributed in time
  - Project management
  - Data repositories
  - Shared computational resources



# **Distance work**

- More than 30 meters apart
  - Different floors of a building
  - Different buildings on

campus



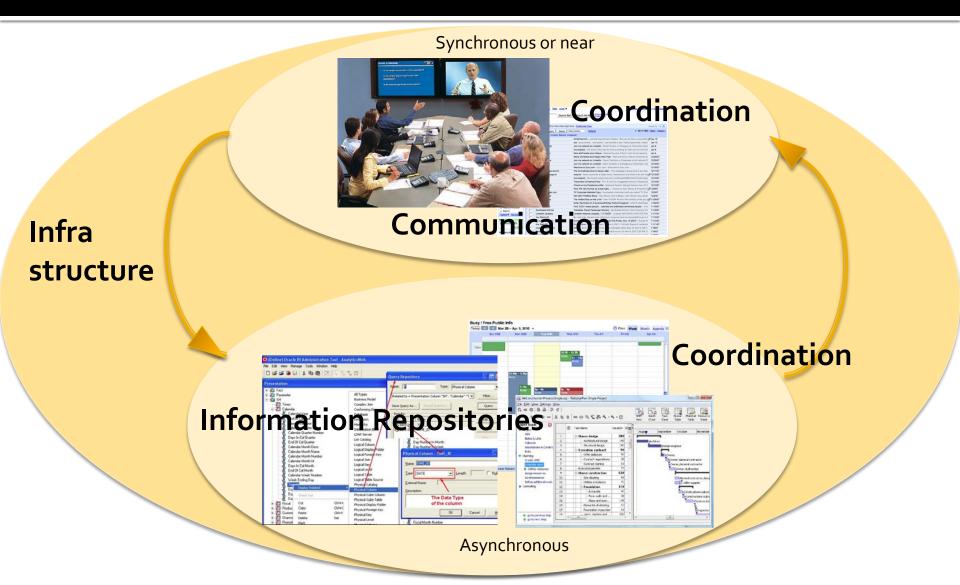


# The Challenges of Distance

- Blind and invisible
  - Lose awareness
- Time zone differences
- Crossing institutions
- Crossing cultural boundaries
- Uneven distribution begets power differences

- Technologies can help
  - but they need appropriate social practices surrounding them

# Kinds of technologies



# Communication

Email

Texting



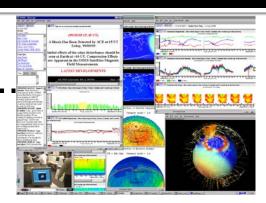
Audio conferencing

Video conferencing



# Communication

- Chat...
- Forum
- Blog
- Wiki.





#4 Added by gart, last edited by Cristina Williams on Dec 07, 2011 (view change)

Some pages in this wiki are restricted - if you need access to such content, send an email to support@bimcommunity.org with details about which page(s) you need to access.

#### BIRN Sites and Collaborators



Click here to view the large map

4 Tools •

#### Hot links:

- Conference call and GoToMeeting info BIRN members only
   Archive - Readiness Assessments - Steering Committee
- Accive reachess Assessments othering com only
   Documentation
- Function BIRN
   Group Management

The following are some older BIRN spaces on the legacy BIRN

#### XWiki:

Function BIRN
 Mouse BIRN

#### Brain Morphometry BIRN archive

Recently Updated

 Brain Research Topic Mapping (Final) updated by Marusin Talia (view change) Sep 20, 2013
 Imm 200, IA, 4, 40, 25 Marushaldh, 2 adminish alustem 446 and

Virtual Worlds.....



## Coordination

### Shared calendars



### Awareness tools



#### 金 C . Search people. Arik Cheshin Ed H. Chi Gary Olson SoCal Gillian Haves Jed Brubaker Jingwen Zhang Marilyn Salzman Airong Luo on Talkatone for i... Dan Russell Hadar Ziv Loren Terveen Marta Rey Meredith Reitman Michael Cupino Robin Jeffries Stuart Card bonnie nardi Dan Atkins David Redmiles Elizabeth Churchill Elizabeth Gerber

#### Chapter11 Wizard 🕁

 File
 Edit View
 Insert
 Format
 Tools
 Table
 Help
 Lasteditwas made on August 20 by Gay Olson

 Image: Comparison of the second seco

Another collaborative project, the Collaboration Consortium, is a multimational industry workgroup, sponsored by Cisco Systems, that was chartered in 2008 to develop a Collaboration Framework™ to be deployed and rigorously evaluated in their own organizations. As an orgoing collaboration among 14 organizational representatives, they used the present version of the Wizard to assess their workgroup's own collaboration. Nine of the 14 representatives completed the CSW. In their 2011 annual report [2], their Wizard "experience" and our findings are summarized, as well as the changes they plan to make, which resulted from our analysis and their discussions of our findings. The Wizard afforded them the opportunity to reflect on their collaboration and redirect some aspects, which TORSC identifies as a factor contributing to successful collaboration [11].

Across the twelveeight projects that have used the CSW, we have collected more than 200150 completed responses. One project had too few responses to be representative (prompting a concerted effort to better understand what we can do to motivate participation once the leaders have deemed it important to assess the project). Here we summarize some of the themes across the five projects we have analyzed in-depth to date.

Common Strengths. Four of the five projects had very high levels of respect for the project manager or core leaders. People were generally thought to be collegial, helpful and collaborative (with one notable exception below). Two meritored explicitly that they had a feeling of group self-efficacy, the ability to overcome obstacles as they arose. One of the projects with the highest self rating of success was high on all three kinds of trust (that others are responsive, do good work and will look out for their interests). Their goals were aligned, unlike many of the weaknesses reported in the other projects. Two were high on recognized



#### Comments 🔒 Share

## Coordination

### Meeting support



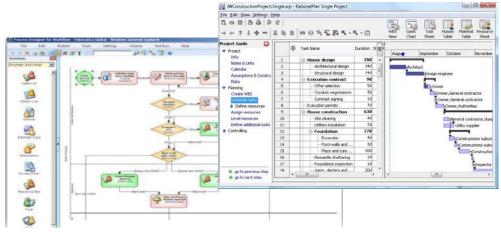


### Large visual displays



# Coordination

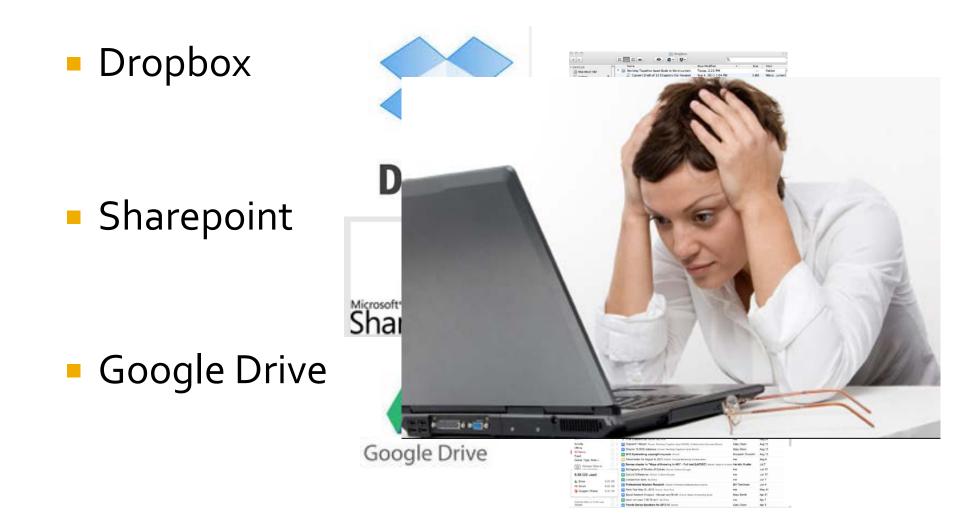
### Workflow



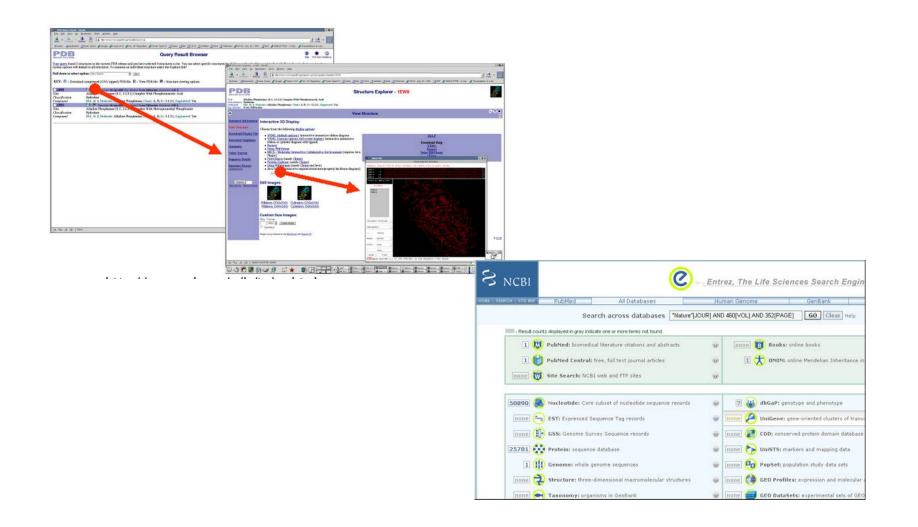
### Resource scheduling



## **Information repositories**



## **Information repositories**



# **Computational Infrastructure**

- System architecture
  - Private, secure machines
  - Massive data
    - ATLAS produces 23 petabytes per second
  - Standard office machines and servers
  - Cloud services
    - Each with their own behavioral consequences

# **Computational Infrastructure**

### Computational resources

- For high-end computational needs
  - NCAR develops these in-house
  - NSF supporting these projects
  - GRID
- For ordinary computation
  - Office technology
- Human computation
  - Crowdsourcing
    - Guttenberg character recognition
    - Christmas bird count



**Christmas Bird Count** 

The 114th Christmas Bird Count will take place from December 14, 2013 through January 5, 2014.

Introducing American Birds: Your Citizen Science Newsletter. <u>Read the August 2013</u> <u>edition.</u>

Sign up to receive American Birds online by going to the <u>Audubon Citizen Science portal</u> and entering your email address just to the right of "Want to keep up with Citizen Science?"

From December 14 through January 5 tens of thousands of volunteers throughout the Americas take part in an adventure that has become a family tradition among generations. Families and students, birders and scientists, armed with binoculars, bird guides and checklists go out on an annual mission often before dawn. For over one hundred years, the desire to both make a difference and to experience the beauty of nature has driven dedicated people to leave the comfort of a warm house during the Holiday essen.



Cedar Waxwing Georgi Bai

# What can technology do to alleviate the challenges of distance work?

### Being blind and invisible

- Video conferencing
- Awareness
  - Both in the moment and
  - Over longer terms
- Time zones
  - Shared calendars
  - Awareness of what others have been doing

# What can technology do to alleviate the challenges of distance work?

- Cross institutions
  - Calendars
  - Protocols for IRBs, Intellectual property...
- Cross country boundaries
  - Information sharing on holidays, customs
  - GlobeSmart



GlobeSmart® provides ready access to detailed information on how to conduct business effectively with people from around the word. Developed from extensive research and interviews with business people from vort 70 countries. GlobeSmart content is organized into more than 50 continuously updated topics for each country.



Used by 140 major global organizations (including 30% of the Global Fortune 100 companies), GlobaSmart addresses one of the greatest causes of difficulty in global business interactions — the challenges of relating and communicating successfully with counterparts from other countries.

# What can technology do to alleviate the challenges of distance work?

- Uneven distribution of people implying uneven power
  - Meeting dynamics to "hear" everyone
    - From the manager

# How do we decide what's appropriate for us?

- It's complicated
  - Speed of response
  - Size of data
  - Security
  - Privacy
  - Accessibility
  - Richness of what needs to be transmitted
  - Ease of use
  - Context of use
  - Compatibility with other things used
  - COST

## Conclusions

- Is this collaboratory using all the technology it should?
  - Communication
  - Coordination
  - Information repositories
  - Infrastructure
- Is it considering the range of possibilities?
- What are the obstacles?
  - Money
  - User training ....
- Choose wisely, reassess periodically

# Thank you

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