



# ***WiRemote: A remote access system for computer controlled Instruments***

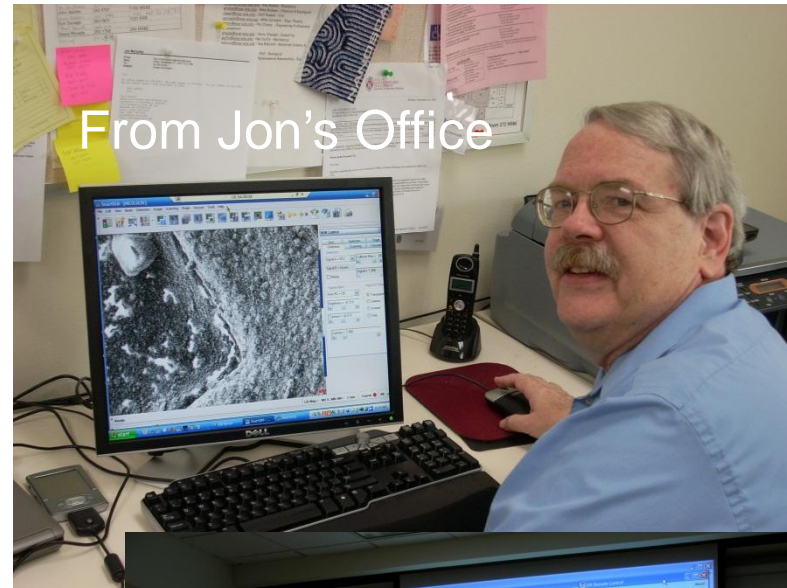
F.D. Nicolalde\*\* and Rehan Amed\*\*, J.J. McCarthy,\*,\*\* R K. Noll\*

\*Materials Science Center, University of Wisconsin, Madison, WI 53706

\*\* UW MRSEC

# Goals for the Project

- **Remote Instrument Access for research and education**
- 1<sup>st</sup> Target Machine: Zeiss 1540 FIB/FESEM
- Make It Cheap and Friendly
  - Java based (portable, Web compatible)
  - Real VNC
  - Skype™
  - Address Legacy instruments (data in separate frame store)
- Extended to Zeiss SEMs (1530), Jeol & Hitachi SEMs on campus, Bruker HiSTAR XRD
- Funded by UW MRSEC and MRFN





# The Result--WiRemote

- JAVA web browser Interface hosted on appspot.com
- Easy
  - Real VNC server and viewer for accessing the instrument computer for display and control, and file transfer;
  - Access to the MSC instrument calendar and scheduling system
  - Video Conference with UW Tech staff using Skype™ or gTalk
  - Remote camera in the lab room with audio and remote position control for viewing any operator activity
  - An indication of transfer speed speedtest.net plugin
  - Legacy instruments addressed via KVM switch with embedded VNC server
  - Instrument profiles, instrument scheduling, login-in and billing links are configurable for your lab
- Cheap
  - Real VNC License \$100/yr.
  - KVM box (Raritan KX-II 101) \$540 (if required)
  - Sweat Equity/time to set up ?



# Performance and Concerns



- Performance from offsite using VPN & KVM (—keeps the IT guys happy)

Download Speed	Real time “feel”
>20 Mbps	Like setting at the SEM
~5 to 10 Mbps	Usable, patience required
<3 Mbps	Just watch the operator

- **Concerns**

- Remote, Unsupervised operators:
  - We require all operators to be trained, they come to us, or we go to them—No Exceptions
  - Remote operators must have an account in the facilities, make a reservation on our calendar (which emails to Instrument owner of an event), and have a UW VPN Account login.
  - Each instrument is interlocked, you must start your session on the calendar or the instrument will not function!
  - Skype with “owner” to load sample(s)
- IT issues: Use the VPN & KVM if you have a fast enough internet backbone—much harder for Hackers to do harm!

Comparison to Commercial Solutions:

UW FEI Package for Titan: Similar Performance. \$50,000 with knob panel (but necessary on (S)TEM ) & software: VNC

Hitachi S4500 with Quartz image system (newer name now) Includes image archive and database. Slower Performance, \$35000, Custom software.

JEOL WEBSEM Version 1: UMN—slow, limited image resolution, hard to keep running. New version VNC based, with JEOL interface much improved: ~\$5000.

Opening Ports thought the Firewalls can give you 2X to 4X speed Increases, but at great risk!



## WiRemote Main screen after Login.

- Calendar Access
- Instrument selection and Profile Editing
- Live room camera
- Skype to staff
- Speedtest



# Calendar Access



## College of Engineering

University of Wisconsin-Madison

Local Account

[Help](#)

[Home](#) [Reserved Events](#) [Edit My User Profile](#) [Unreserved Events](#) [Record Item Usage](#) [Schedule Instrument-Calendar](#) [View My Invoice](#)

Instrument:

Welcome! Please Sign In.

Are you having problems logging in? Try clicking [here](#) for some advice.

If you are not a registered user, please [sign up](#).

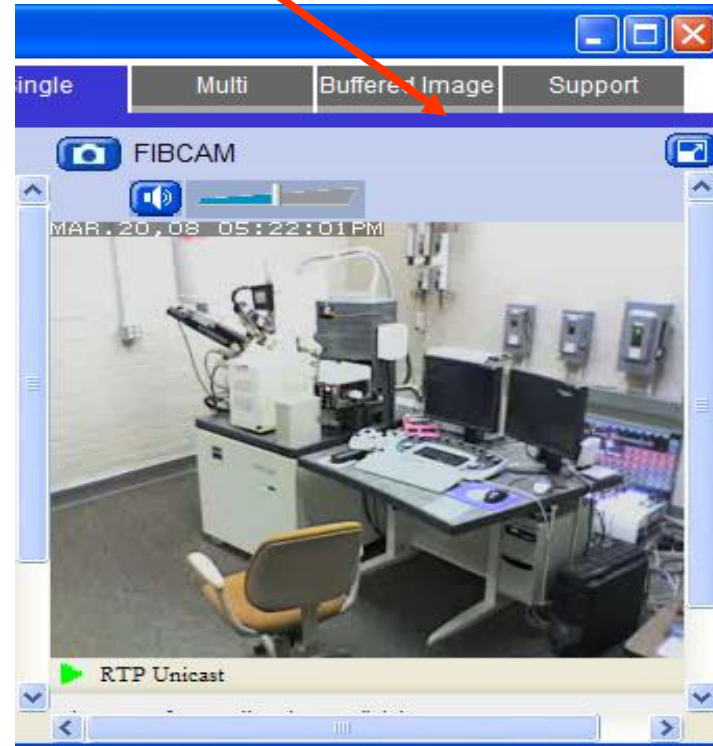
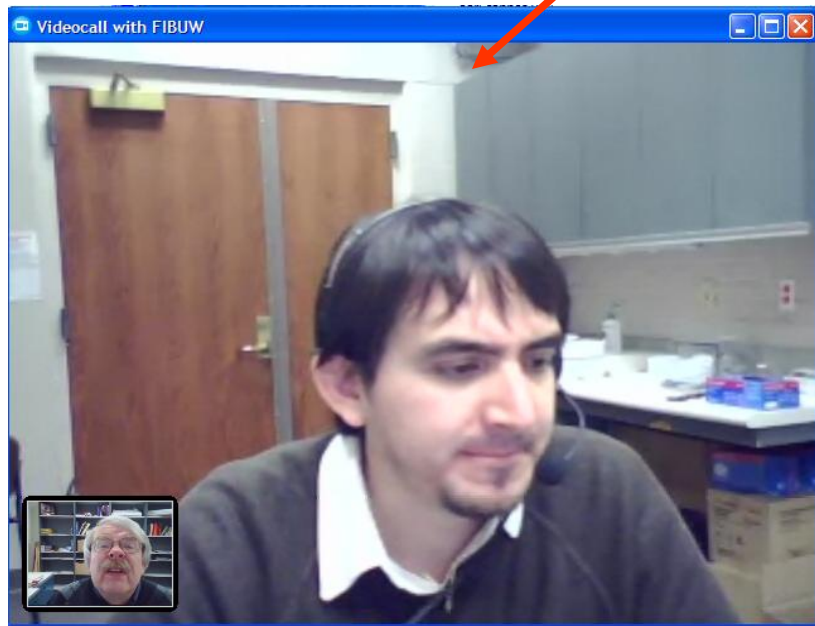
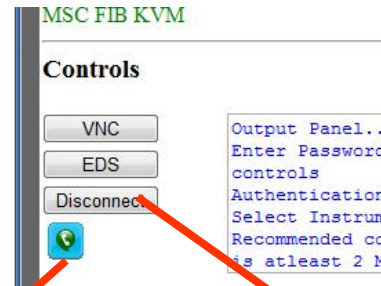
User Name:

Password:

The CrossBeam is now available for general imaging uses on Fridays and evenings and weekends. Monday through Thursday are reserved for FIB work.

March 2008							Apr
Feb	Sun	Mon	Tue	Wed	Thu	Fri	Sat
24	25	26	27	28	29	1	
2 H Shin 3:00 PM-4:00 PM	3 M thalakulam 11:00 AM-2:00 PM	4 M thalakulam 9:00 AM-11:00 AM C kim 1:30 PM-3:30 PM	5 K Kuhlman 10:00 AM-4:00 PM	6 A System 12:00 AM-12:30 AM M thalakulam 2:30 PM-3:30 PM M thalakulam 6:00 PM-7:30 PM	7 K Kuhlman 10:00 AM-4:00 PM	8 K Kuhlman 10:00 AM-4:00 PM H Shin 4:00 PM-7:00 PM M thalakulam 7:00 PM-9:00 PM H Ryu 9:00 PM-11:00 PM	9 F Yi 10:30 AM-4:30 PM M thalakulam 5:30 PM-7:30 PM
16	17	18	19	20	21	22	
		R Noll 9:00 AM-5:00 PM C Simmons 5:00 PM-8:00 PM	K Kuhlman 10:00 AM-4:00 PM	R Noll 9:00 AM-5:00 PM		H Ryu 3:00 PM-7:00 PM	
23	24	25	26	27	28	29	
	H Ryu 6:00 PM-8:00 PM	K Kuhlman 10:00 AM-4:00 PM	K Kuhlman 10:00 AM-4:00 PM R Peterson 4:00 PM-6:00 PM H Ryu 8:00 PM-11:00 PM	S Zenobia 10:00 AM-2:00 PM	J Szczech 2:00 PM-5:00 PM		
30	31	1	2	3	4	5	

# Webcam & Skype Access





# Controlling the FIB



MSC FIB KVM

Controls

VNC  
EDS  
Disconnect

Output Panel...  
Enter Password  
controls  
Authentication  
Select Instrum  
Recommended cc  
is atleast 2 M

SmartSEM - [RKN]

File Edit View Beam Detection Image Scanning Stage Vacuum Tools Help

SEM Control

Gun Apertures  
Detectors Scanning

Operating Mode = Normal  
Store resolution = 1024 \* 768

Line Scan Scan Speed = 6  
 Spot Cycle Time = 2.6  
 Dual Mag Zoom factor = 2

Noise Reduction  
Freeze on = Command  
Noise Reduction = Pixel Avg.

Scan + Unfreeze S

Specimen Current Monitor

Soft Joystick

Stage vector

Stage vector Z = 0.0 %  
Stage vector T = 0.0 %

2 μm EHT = 3.00 kV Signal A = SE2 Date :20 Mar 2008  
WD = 6.5 mm Photo No. = 6674 Time :19:34:01





# Live Demo of WiRemote

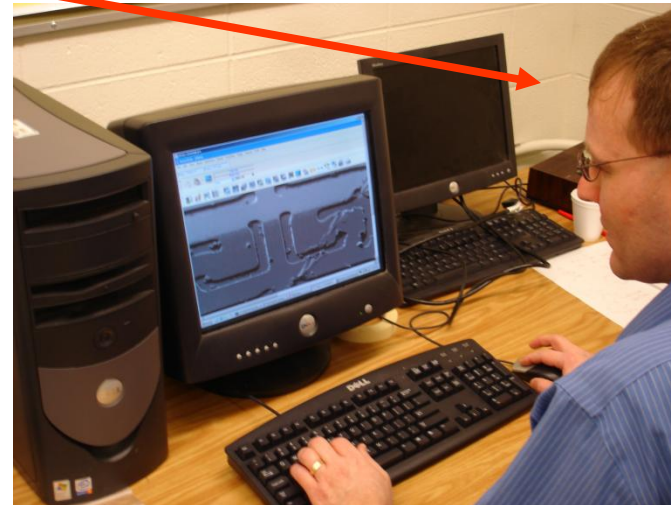
## Zeiss 1540 FIB at UW-Madison Materials Science Center

# Acknowledgments

The authors wish to thank the following :

- Zeiss NanoTechnology Systems Division for assistance in optimizing the image capture and display code on the Dual Beam FIB Instrument.
- Paul Nazario, UW Madison DoIT Network guru
- Professor Doug Dunham (MSC) and Thomas Paine (IT) at UW-Eau Claire

This work is partially supported by the National Science Foundation under Grant No. DMR-0520527. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



# Discussion Time!

