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NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY – TEXAS INSTRUMENTS INDUSTRIAL COLLABORATORY TESTBED*

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DISCLAIMER

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY - TEXAS INSTRUMENTS INDUSTRIAL COLLABORATORY TESTBED

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A portion of the mission of the NIST Manufacturing Engineering Laboratory (MEL) is to improve and advance length metrology in aid of U.S. Industry. This responsibility is found within the Precision Engineering Division (PED). The successful development of a "Collaboratory" for TelePresence Microscopy provides an important new tool to promote technology transfer in the area of length metrology and measurement technology. NIST and Texas Instruments under the auspices of the National Automated Manufacturing Testbed (NAMT) and in collaboration with the University of Illinois are developing a microscopy collaboratory testbed to demonstrate the value of telepresence microscopy within a large distributed manufacturing facility such as Texas Instruments and between organizations such as NIST , Texas Instruments and Univeristies.

Telepresence Microscopy is an application of the state-of-the-art Internet based technology to long-distance scientific endeavors[1]. Long distance can refer to across the country or from one site within a company to another. Telepresence is currently being applied to electron microscopy in several locations where unique analytical facilities (such as those at NIST) can be utilized via Internet connection. Potentially this can provide tremendous savings to a company where asset sharing can now be rapidly and effectively accessed or remote unique facilities can be utilized without the requirement of expensive and time consuming travel. This methodology is not limited to electron microscopy, but its power is currently exemplified by its application to that form of microscopy.

Large distributed manufacturing sites such as Texas Instruments need rapid response when problems threaten to disrupt multi-million dollar production facilities. If expertise needed to solve the problem or if instrumentation is not locally present, delays are inevitable. Once a sample has been received by an analytical facility experts can rapidly access a Internet accessible site from numerous remote locations can collaborate in real-time to solve the problem.

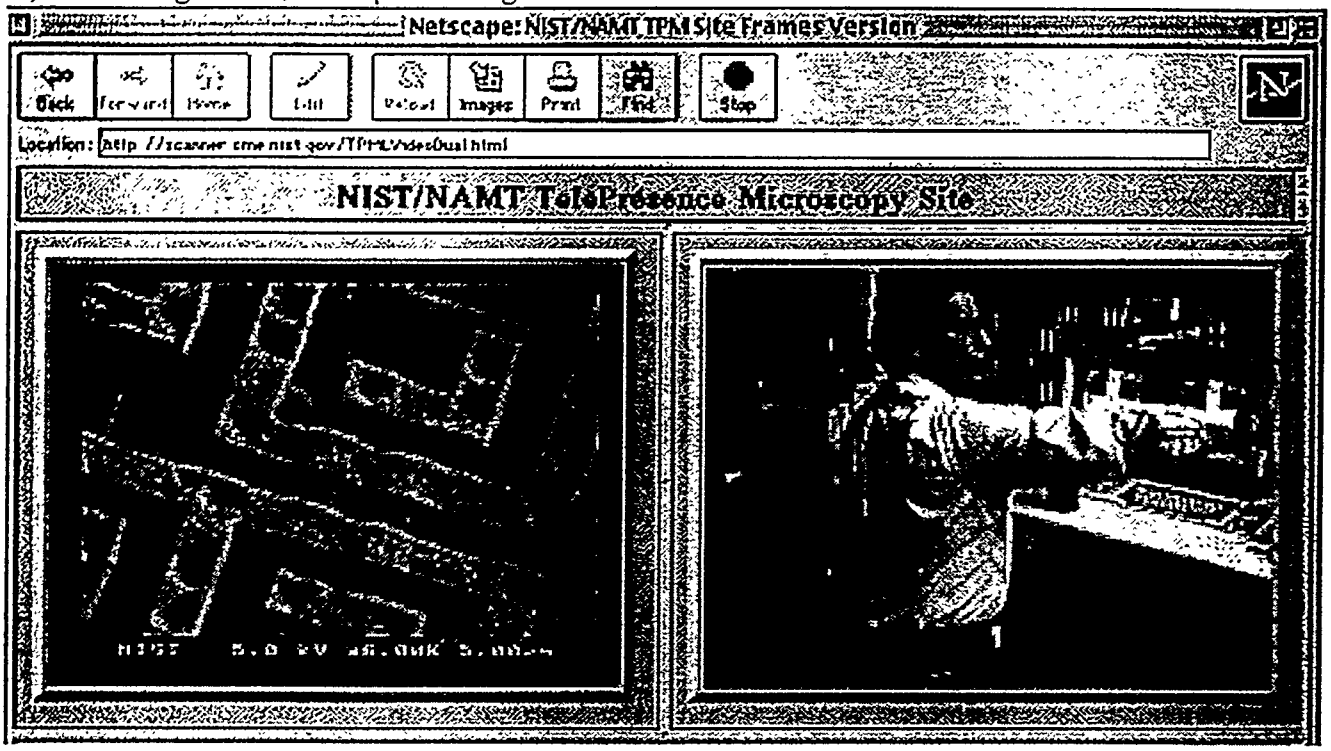
NIST is currently developing an Internet based web site (http://scanner.cme.nist.gov) as a testbed to demonstrate its value to industrial partners. The need for instrument and communication standards provide NIST a strong position in this arena. Where the testbed is concerned, the initial instrument being used is a Hitachi S-4500 high resolution field emission SEM equipped with x-ray analytical capabilities. This instrument is connected to a SUN Ultra-II workstation which in turn is connected to the NIST NAMT high-speed internal asynchronous transfer mode (ATM) network. This intranet is capable of 150 Mbps between internal NIST NAMT sites. Secondary connections with other analytical instrumentation via the ATM network is anticipated in the near future. The NAMT ATM network interfaces with the Internet in the normal manner and the site is accessible using a NetScape compatible web browser. Remote Operation of the instrumentation has also been successfully implemented via the Internet. Users are presented with a WWW based GUI front end which through the TPM Server translates simple actions into microscope control functions. This translation occurs in the TPM server which communicates directly with the SEM via a standard serial communications interface. This operation remains a bandwidth limited procedure due to the nature of the serial interface. . Also implemented at the web site is the NIST/NAMT electronic notebook where collaborators can document the work in progress and is based upon developments being carried out in parallel in the DoE2000 Materials Microcharacterization Collaboratory Project[2].

The TelePresence Microscopy Testbed attempts to bridge the gap between simple "remote microscopy" and true collaboration, by integrating protocols, tools, and interactive links to

instrumentation, data (real-time as well as archived), and audio-visual communications. The initial goal of this project has been to create a virtual space, accessible via the Internet, where microscopists and their industrial collaborators, who are distributed across the nation or the world, can meet and solve industrial problems.

References

1.) N.J.Zaluzec Proceedings of 1995 Microscopy & Microanalysis Meeting, Kansas City. 1995 pg 14
2.) M.C. Wright etal , these proceedings



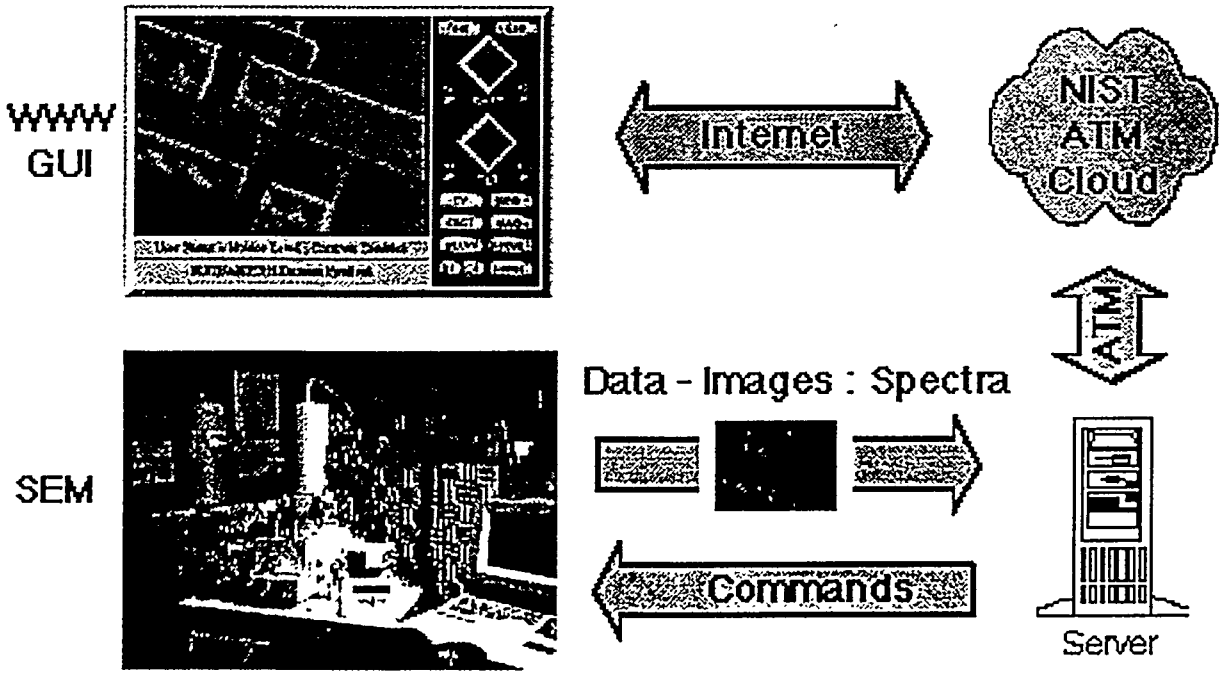


Figure 1.) Top: NIST/NAMT WWW Interface, Bottom: System Communications Architecture Outline