# Integration of Transmission Electron Microscopy in Computing Grid Structure

Marco Vittori Antisari[1], Silvio Migliori[1]

1. ENEA, FIM Department, C.R. Casaccia, Via Anguillarese 301, 00123 Rome, ITALY

vittori@casaccia.enea.it

In the last ten years the increasing availability of fast data transfer by computer connection worldwide has stimulated several initiatives on telepresence, tele-cooperation, remote operation and so on, owing to new possibility of being more and more embedded in a realm which can be actually very far in space.

The possibility of operating from a remote site a transmission or a scanning electron microscope appears realistic considering that in all the instruments of the last generation, most commands are already placed under the control of a local personal computer managing the microscope, generally by a proprietary software package.

However electron microscopes, like all the instruments delivering information by images, have strict requirements on the connection bandwidth in order to provide the remote user with a data flux large enough for real time imaging. In this communication we want to describe the configuration of a new transmission electron microscope which can be operated through the data network by a remote user. The microscope, a last generation FEI TECNAI G2 30F, is equipped with all the devices developed by the manufacturer in order to allow remote operation. In particular all the mechanical movements, like the stage driving, the insertion and centering of all the aperture and the phosphor screen lifting are motorized and placed under computer controls.

The presentation will cover both the instrumental aspects as well as the networking philosophy. The project is carried out at ENEA in close cooperation between the Department of "Material Science and Engineering" and the Central Service of "Network Management". In fact both the microscope structure and the architecture of the data transmission and management have to be carefully setup for a successful operation.

In order to achieve the fast high quality image transmission necessary for full remote microscope operation and to implement digital vision applications, the microscope is integrated in the infrastructure ENEA- GRID which allows to access to overall computational power of several hundred Gigaflops provided by several multiplatform systems managed by local computational centers. The GRID relies on the availability of a number of key components: a unified graphical user interface (Citrix Metaframe portal), a Load Sharing Facility (LFS) multicluster and a distributed filesystem (AFS). These components allow easy and fast distribution of software applications and files over the network.