
LTER WORKSHEET: MSI (MINIMUM STANDARD INSTALLATION) TECHNOLOGICAL CAPABILITIES AT ALL SITES OF THE LTER NETWORK, November 1988

The following worksheet outlines a Minimum Standard Installation (MSI) of various technological capabilities at all sites of the LTER Network. The worksheet was developed at the LTER Coordinating Committee (LTER/CC) meeting at Kellogg Biological Station, November 3-4, 1988. As LTER/CC evaluates technological capabilities and requirements of the LTER Network over the next several years, this worksheet will be reviewed. Additions and revisions are expected. The worksheet was initiated by the LTER Executive committee, using as a starting point the "Shugart Committee Report". (The Shugart Committee Report: Report of the NSF Advisory Committee on Scientific and Technological Planning for Long-Term Ecological Research Projects. March 1988. Authors: H.H. Shugart, chair, Univ. Virginia; W. Parton, Colorado State Univ.; G. Shaver, Woods Hole; S. Stafford, Oregon State Univ.)

Preliminary costs for this worksheet list were estimated by a small group at the LTER/CC meeting (David Foster, Harvard Forest; John Magnuson, North Temperate Lakes; Bill Lauenroth, Central Plains Range; Robert Robbins, NSF). The worksheet was further clarified by the LTER Network Office (Jerry Franklin, Caroline Bledsoe) with technical assistance from Bob Robbins and re-reviewed by Lauenroth, Magnuson and Foster. Further changes are expected and costs are preliminary. For input on BIS, please contact David Foster, HFR; on computer networking, contact Robert Robbins, NSF.

RATIONALE:

The rationale for development of this MSI worksheet was based on the Shugart Committee Report. This report made it clear that the LTER Network required at least a minimum level of technological capability in order to carry out several of its goals (see goals statement, LTER/CC Minutes document). Therefore, this MSI concept was developed to:

- (1) carry out inter-site goals of the Network,
- (2) provide all LTER sites with a list of the items necessary to achieve an MSI,
- (3) provide some standardization across the network, and
- (4) provide NSF with a recommendation for funding of MSI's for Scientific/Technological supplements for FY 1989 and beyond.

DEFINITION OF MSI

A. GIS SYSTEM

A GIS (Geographic Information System) system consists of

hardware (a small, multi-user computer (UNIX, VMS or other non MS-DOS operating system with more than 640K memory) equipped with a large, high resolution color screen, a digitizer and plotter), software (ARC/INFO, including TIN and COGO) and staff (a half-time technical person).

B. LAN & WAN

Local area networks (LAN) and wide area networks (WAN) consist of a LAN and a connection to one or more WANs.

C. HIGH-CAPACITY DATA STORAGE SYSTEM

This high-capacity, archival mass-storage system consists of an optical disk drive (either WORM or erasable) and appropriate connectors/hardware for linkage to a computer.

DETAILED DESCRIPTIONS OF MSI:

1. GIS ARC/INFO system. The cost of this software varies greatly

(\$9,000 - \$150,000) depending on the hardware upon which it is to run. For example, the estimated cost (including installation) for a full system running on a SUN-386i-250 is approximately \$13,000 (university discounted price).

2. ARC/INFO annual software maintenance contract is about

\$3,000/yr. This cost, which does not apply for the first year, is a recurring cost and is not included in the total cost for this worksheet.

3. For use with the GIS, a small multi-user (UNIX, VMS, etc. but

not MS-DOS) computer with a high resolution 19 inch color monitor, 8-16 mByte memory minimum, and extensive mass storage (300 mB disc). Examples of computers with these capabilities are SUN-386i-250, Micro VAX, VAX station, etc. Estimated cost = \$16,000 - 24,000 (university discounted price).

4. Multi-pen plotter, preferably with multi-sheet or continuous

roll paper feed. Estimated cost = \$2,000 - \$4,000.

5. Digitizer, 24 X 24 inch minimum. Estimated cost = \$4,000 -

\$6,000. One GIS expert strongly recommended purchase of a larger 36 X 48 digitizer (approximate cost \$11,500). He felt that most sites would need the larger size within a few years.

6. Technical person to set up, use and help with GIS. Assuming

at least a half-time person, the estimated cost is approximately \$23,000, assuming an annual rate for full-time salary of \$27,000. Average benefits and overhead are included in the \$23,000 estimate. This personnel cost is probably a recurring item.

7. LAN

Each MSI-equipped LTER site should have at least some of its local personal computers (PCs) attached to a local-area network. Because the details of a local-area network installation are highly site-specific, no standard configuration can be given. However, a minimum system might consist of a single network server attached to four PCs. Assuming that the PCs are already owned by the LTER site, a sample budget is as follows:

Sample MSI Budget:

dedicated server.....\$ 5,000 - 8,000

(a 386 PC)

network connections for 4 PCs..... 3,000 - 5,000

(network cards and cabling)

network software..... 2,000 - 3,000

(e.g., 3COM, Novell, etc.)

8. WAN

Access to wide-area networking is essential for establishing intersite LTER networking capabilities. Access to WAN requires a connection to a host computer that can act as a gateway to an existing wide-area network such as BITNET, CSNET, or NSFNET. Acquiring a wide-area network connection is entirely site dependent and therefore no specific or general recommendation or cost estimate can be made. The expense of such a connection may vary from nothing (for a simple connection to an existing, nearby system) to tens of thousands of dollars annually (if a dedicated line must be leased to connect a

remote site to another host). Estimated costs may be \$0 - \$10,000. An average cost of \$5,000 has been included in the total. There will be some recurring costs for system maintenance.

9. Computer cables, wires, connectors, optical disks, etc.

Estimated cost = \$1,000 - \$2,000.

1. Optical disk device (WORM or erasable optical disc) for secure storage of long-term data sets. Apparently there is currently no industry standard for these devices. Therefore if all sites do not choose the same device, it will probably be difficult or impossible to exchange optical disks among sites.

We suggest that each site must decide whether to purchase a device soon (and deal with incompatibility problems later) or whether to postpone purchase for a year or more, in hopes that an industry standard will be adopted (or that the LTER Network will choose its own standard). Although the IBM model # 3363 may become the industry standard for MS-DOS machines, it will not work for other operating systems.

The choices are between immediate need and compatibility of disks across the network. Estimated (university-discounted) price for an IBM WORM device is about \$2,100-\$2,500. Individual discs are about \$65 each (included in supplies item #9 above). We do not have price estimates for the Read-Write devices.

As the above information indicates, the choice of an optical disk device is highly system dependent. If you decide to request funds to purchase this item in FY 1989, please choose wisely.

11. Recurring Costs.

This item is not included in the total costs. Recurring costs for hardware, software and personnel are significant. These costs cannot be covered by supplemental funds. Sites may wish to develop plans for incorporation of these recurring costs into their LTER core funding.

TOTAL COSTS \$76,100 - \$95,500

Overhead has been factored into the personnel item. Presumably there will be no overhead on equipment. Equipment matching funds may be available from universities or other sources.