A Methodology for installing additional minicomputer hardware.

By Dennis Adams

This paper was written in November 1988, and appeared in the "Notebooks" section of "Computing" magazine. It is one of the first IT papers published by Dennis, whilst he was a Systems Programmer responsible for VMS Systems Management at Barclays Commercial Services.

References to the Intel 80386 chip give away the age of this document! Despite this, there are a number of basic principles of good IT governance that still apply many years later.

Notebook: **HARDWARE**

Title: **A Methodology for installing additional minicomputer hardware**

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At BCS, we use Digital Equipment (DEC) VAX systems. These machines are often referred to as "mini" computers, and therefore, by implication, litte more than multi-user PCs.

This can have serious consequences when dealing with end-users of management who are sufficiently computer-literate to believe that computers just need to be purchased and plugged in, and their problems will be solved. The fact is that the modern VAX system, which probably includes losely coupled (Clustered) processors, Network file serving and synchronous multi-processing CPUs is far more powerful and complex even than the latest multi-megabyte '386 PC.

In my opinion, the proper way to treat a VAX system is to approach it in the same way as a mainframe This includes the approach used for planning installations. Unlike the beloved (?) PC, installation is not just a question of "plug in and go".

What we needed was a methodology that systematically identified all the tasks required to install an additional VAX system, from the point where we had identified a need for the additional hardware, to the point where the system could be handed over to the Computer Operations, fully integrated into the existing cluster and ethernet.

Taking a leaf out of our favourite software methodology book, we were able to identify 9 distinct phases in the overall implementation "project", These were as follows:

1. Determine Hardware Requirements.
2. Determine Software Requirements.
3. Design Physical Configuration.
4. Design Software Configuration.
5. Design Security, Backup and Recovery.
6. Order and Plan Installation.
7. Prepare Site for Installation.
8. Install
9. Implement as Running System.

The first thing to note is that the ordering of the hardware occurs as part of item (6). In my opinion, good planning in the initial phases is essential to determine our exact purchasing requirements. There is nothing worse than obtaining a hard-fought purchase approval, only to discover that that final bill will be above budget because certain peripheral equipment has not been included in the estimate.

1. Determine Hardware Requirements.

This phase starts once the Capacity planning function in the company has determined that additional resources will be needed. Of course, if additional resources can be obtained by tuning or re-scheduling of workloads, then this phase is never needed.

The following questions should be considered:

- Processors: Types, Floating Point Processors?
- Additional Memory: size and no of units?
- Disks: type, top or middle cabinet?
- Tape Drives: type and cabinet configuration?
- Cables: type and length?
- Communication boards, including cluster interface?
- Additional memory, disk, tape or printer controllers?
- Additional cabinets to hold disks, memory expansion etc.?
- Power cables: length and connections?

Anyone who has ordered a cabinet, only to discover that communications cables were a separate item, will realise why these questions must be asked.

Our objective here is to determine the part numbers and precise specifications of items to be purchased. We also prepare a list of questions for the potential supplier, to clarify what part numbers are involved, whether they can connect in the way we would like.

At this phase, alternative purchase options can be examined (lease or buy, purchase several processors or one large one, for example). We can then decide on the final hardware purchase option.

At this stage, we also prepare a provisional list of items for hardware maintenance. These days, maintenance costs can be a significant element of the purchase and running costs of a system.

2. Determine Software Requirements.

Once we have defined our hardware requirements, we need to specify the system software that is required to make it run.

For example, our final purchase order will include VMS licence, type and media, DEC-net license, type and media, and licensing for other existing layered products (e.g. File Serving etc.). Should existing licenses be modified (.eg. transferred to the new VAX, or amended to include it)? Could we cancel existing licenses (e.g. for products we no longer need)?

We can then decide on the final software purchase option, license types etc.

By the end of this phase, we shall have an exhaustive list of all items for order, specifying part numbers and quantities, and a list of software license changes required.

As with the previous phase, we also need to compile a list if software maintenance changes required.

3. Design Physical Configuration.

Once our hardware requirements have been defined in detail, we can obtain figures for size, weight, power and heat consumption of the hardware units involved.

This will enable us to design the physical layout of the computer room, and determine the additional tasks needed to prepare the site before delivery.

- Where will the units go?
- Are there restrictions on distances between units?
- Is there sufficient power?
- Do we have to move some other hardware?
- Are all communications available (e.g. ethernet cables and repeaters)?
- Is additional air-conditioning required?

Our objective during this phase is to decide where the hardware should go and what other connections and facilities (power, air-conditioning and communications) are required to achieve this. Don't forget during this phase that air-conditioning is also a drain on electricity power resources!

By the end of this phase we will have a map of the physical area where the hardware will be, together with a list of items to be moved, and instructions on the new computer room layout.

Instructions will also have to be prepared for the electricians for re-cabling etc.

4. Design Software Configuration.

At the same time as the physical layout is being designed, we need to produce detailed plans about the software configuration.

The following questions should be answered:

- What Applications software will run on this system?
- What specific tuning parameters will therefore be needed?
- Should any application software be installed as shareable images?
- What Page/Swap files etc. are required?
- What additional disk, tape and communication units must be configured at startup time?
- What Logins and UAFs will run on this system?
- What DEC-net services will be required?
- Design UAF (User Authorisation File) and login control procedures.

At this point we can then design system startup command procedures, specify tuning parameters, page and swap files sizes etc. We will also have an exhaustive list of all the DCL command files which will need to be changed. For example, a number of internal auditing programs may be specifically designed to run on specific processors only, for security or efficiency reasons.

At the end of this phase, we will have completed a **"Processor Configuration Sheet".**This is an internal document that we developed at BCS to enable us to record the physical and logical position of each processor in the network. By examining the configuration sheets, we are able to determine the total resources at any one time, and the topology of the network. This is a valuable planning tool.

5. Design Security, Backup and Recovery.

Backup, recovery and the entire security environment must be continually in mind when a new system member is being installed.

How can this system be incorporated in the current security policy? Are changes of, or amendments to, current security policy required by the introduction of the new hardware?

We need to specify security controls to operate, and backup and recovery procedures for the operators.

During this phase, we also design all the new backup command files, write the new Operators Instructions, and complete the designs for all other command files that will be needed after implementation.

6. Order and Plan Installation.

This phase of the project is self-explanatory! Nevertheless, it is still wise to formalise it. How many people have ordered a VAX for delivery on the 4th floor without determining whether or not it will come up the lift shaft?

By the time the order is placed, we will not only know the exact specification of the equipment (hardware and software), but also the entire environment planned.

Once all this initial planning has been completed, it should be a straightforward administrative task to place the order, arrange a delivery date, arrange for special requirements for installation, lifting equipment, access for vehicles etc.

Also, we need to arrange for pre-contract checks for the maintenance of the equipment, prepare the Hardware Maintenance Order, prepare the order for existing license amendments, and the future VMS, DEC-net and layered product upgrades.

Confirm staff availability, schedule installation date, schedule down-time and advise users, and prepare detailed plan for installation date.

7. Prepare Site for Installation.

Given the documentation from the previous phases, and the detailed plan for installation date, it is now necessary to do the physical work prior to installation.

Prepare the physical space. Prepare the power supplies and communication cables. Amend in-house software as required (e.g. logical name useage, checking for node names). Amend existing VMS software as required (e.g. generalise systartup) and amend network software as required (e.g. change dedicated terminal server ports).

Once the physical preparation is completed and the software amendments are completed, we should be ready, in good time, to proceed to the penultimate phase.

8. Install

This phase is controlled by an itemised list of the tasks, as defined by the previous phases.

- Physical Installation.
- Connection to network.
- Install Operating System.
- Install DEC-net, or other communication software.
- Install layered products.
- Create site-specific tailored system startup routines.
- Preliminary Operating System tuning parameters.

The “deliverable” at the end of this phase is a complete running system, running under its Operating System, and a member of the network.

However, a number of tasks will still need to be completed before the project can be signed off.

9. Implement as Running System.

Monitor and tune VMS on this system. If the processor type, useage, and configuration is familiar to us, then this may not be so essential at first. However, if we are dealing with a new model of VAX, and the software environment is unfamiliar, it is important to try “test loading” the system to determine performance problems before the end-users are allowed access to it. Install and test all the final application software.

Complete all the necessary internal documentation (the processor configuration sheets mentioned above, for example). Confirm the orders for Hardware Maintenance, for existing license amendments, future VMS, DEC-net and layered product upgrades.

If applicable, register the processor with Remote Hardware Monitoring database, to ensure that remote preventative maintenance is planned on a regular basis.

Implement the detailed Operations Procedures, designed in the previous phases.

Finally, announce the system availability to the users.

Why did it take so long?

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