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Dictionary of Computing

Fourth Edition

Oxford New York Tokyo
OXFORD UNIVERSITY PRESS
1996

Ref.
QA
76.15
.D526
1996

3-3-98

42.96

*Oxford University Press, Walton Street, Oxford OX2 6DP
Oxford New York
Athens Auckland Bangkok Bogota Bombay
Buenos Aires Calcutta Cape Town Dar es Salaam
Delhi Florence Hong Kong Istanbul Karachi
Kuala Lumpur Madras Madrid Melbourne
Mexico City Nairobi Paris Singapore
Taipei Tokyo Toronto
and associated companies in
Berlin Ibadan*

Oxford is a trade mark of Oxford University Press

*Published in the United States
by Oxford University Press Inc., New York*

© Market House Books, 1983, 1986, 1990, 1996

*First published 1993
Reprinted 1983, 1984, 1985
Second Edition 1986
Third Edition 1990
Reprinted 1990, 1991 (twice), 1992
Fourth Edition 1996*

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A catalogue record for this book is available from the British Library

*Library of Congress Cataloging in Publication Data
(Data available)*

ISBN 0-19-853855-3

*Text prepared by Market House Books Ltd, Aylesbury
Printed in Great Britain by
Biddles Ltd, Guildford & King's Lynn*

AGN 5335

INNER CODE

is inserted by the compiler at the point of call, thereby avoiding the overhead of a normal function call.

inner code See concatenated coding system.

inoculation A technique for virus prevention in which a *vaccine*, the *signature* (but not the harmful code) of a virus, is deliberately added to a program. This is effective only against those specific viruses that are programmed to avoid reinfecting code by detecting the presence of their own signature.

inorder traversal Another name for symmetric order traversal.

input 1. The process of entering data into a processing system or a peripheral device, or the data that is entered.

2. A signal that is applied to an electrical circuit, such as a logic circuit.

3. To enter data or apply a signal.

input area The area of main memory that is currently allocated to hold incoming data. The processing system will usually retrieve data from the input area and transfer it to a working area or register before it is processed. The result of the processing may be written to an *output area*. Subroutines are usually organized so as to replenish the input area from a source such as an input peripheral or communication line and clear the output area by transfer to backing store.

input device Any device that transfers data, programs, or signals into a processor system. Such devices provide the human-computer interface, the *keyboard* being the most common example. Early computers also used punched paper tape and cards but these are now obsolete. Current devices include *pointing devices*, *data collection terminals*, *speech recognition units*, magnetic *card readers*, and *document scanners*. See also logical input device.

input-limited process A process whose speed of execution is limited by the rate at which input data is available or obtained.

input/output (I/O) The passing of information into or out of the central processing unit of a computer system, or the part of the system primarily dedicated to this activity. An important function of most I/O equipment

is the translation between the host processor's signals and the sounds, actions, or symbols that are understood or generated by people. In some cases it may be translation between two types of machine-readable signals, as when a *bar-code scanner* reads the data-encoded package and translates it into an ASCII code. See also I/O.

inquiry station A terminal from which information can be retrieved from a *database*. Generally the terminal has a display and a keyboard, but there may also be ancillary devices such as a *badge reader*. The user makes the inquiry via the keyboard either in the form of a question in plain text or by indicating a selection from a menu on the display. The display will show a series of possible selections that successively narrow the field of search. An inquiry station may also update information as the result of an action arising from an inquiry. An airline booking terminal is an example of an inquiry station. See also interrogation.

inscribe To encode a document by printing information that is readable by both a person and a machine.

insert 1. One of the basic actions performed on *sets* that, when applied in the form

insert(el, S)

adds the element *el* to the set *S*. If *el* is already in *S* the operation has no effect on the membership of *S*. See also operations on sets.

2. One of the basic actions performed on *lists*, that places a new element into a list, not necessarily at one end or the other.

install 1. To take software from the distribution files, which can be on floppy disks, CD-ROM, tapes, or on a remote networked computer, and place it in its permanent location from where it will be executed. The installation process is not just a straight copy as it involves unpacking compressed files, configuring the software to suit its environment, and perhaps allowing the installer to choose how much of the software to install. A typical installation program will offer choices of minimum, custom, or full installations.

2. To fit new hardware features to a computer.

instance See instantiation, unification. See also object-oriented programming.

of the switching process to determine on which onward connection they should be transmitted, or of packets that have been rerouted to an onward connection that is already active, requiring the packet to wait until those ahead of it have been transmitted.

In networks using only terrestrial links, the total network delay is typically dominated by packet assembly times, (b) above. This is not the case where satellite links are used, especially where geostationary satellites are involved.

network fax A fax system in which the digital information that comprises the fax message is transmitted across a data network, rather than across a speech network using modems. The system may well be embedded as a feature in a more general-purpose environment such as a word-processing system.

Network File Service (NFS) A set of protocols that run over an *Ethernet network and offer support for *file transfer and access, and for *paging. The system was originally developed by *Sun to allow the use of workstations without disks: it provides the ability for one workstation, without disks, to use another workstation, with disks, to supply both a file store and paging support. The system is now offered by other suppliers and has become a de facto standard for work of this kind.

network front end An auxiliary processor or system attached to another, usually larger, computer specifically to connect that computer to a network. The goals of a network front end are to improve overall performance by doing network-related tasks that would be expensive on the main computer, and to convert the standard interfaces and protocols used by the external network into a form better suited to the local system's internal operation (and vice versa). A network front end may also be used to multiplex a single network interface among several computers, in which case the network front end may be considered a *gateway or *bridge.

network interconnection *See* inter-networking, Internet.

network layer of protocol function. *See* seven-layer reference model.

network management The activity of managing a (computer) network. Networks, especially data networks, are complex and contain independently operating units, often from a number of different suppliers, as well as using services provided by other agencies such as *PTTs for some parts of the network. In order for the network to be run reliably, for faults to be identified, isolated, and repaired, and for the network as a whole to be developed in a controlled manner, it is necessary to have a management activity operating at several levels:

- (a) routine collection of data on traffic;
- (b) routine collection of data on failures of connections and of network nodes;
- (c) ability to query the status of network nodes in order to assist in fault location;
- (d) ability to control the status of network nodes, including resetting, restarting, and reloading with software;
- (e) ability to withdraw network nodes from service, and to reconfigure routing information.

Ideally, the manager would like to be able to perform all these activities from a workstation connected to the network. For this to be done, the nodes must themselves be treated as addressable objects on the network, and there must be a protocol that allows suitably authorized and qualified personnel to carry out both the routine activities (a) and (b) above, and to take corrective action in the event of a failure. There is a suitable protocol, *SNMP (simple network management protocol), and nearly all suppliers now market products that can process SNMP queries and commands.

network topology *See* network architecture.

network virtual terminal (NVT) *See* TELNET. *See also* virtual terminal.

neural computer A computer system based on a *neural network.

neural network (or net) A form of computation inspired by the structure and function of the brain. One version of this is as follows. The topology is a *weighted directed graph. *Nodes in the graph can be on or off. Time is discrete. At each time instant all the on nodes send an impulse along their outgoing arcs to

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