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# ЗБІРНИК ВПРАВ І ТЕКСТІВ АНГЛІЙСЬКОЮ МОВОЮ З АВТОМАТИКИ І КОМП'ЮТЕРНИХ СИСТЕМ УПРАВЛІННЯ

Міністерство освіти і науки України
Вінницький національний технічний університет

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Затверджено Вченою радою Вінницького національного технічного університету як навчальний посібник для студентів спеціальності 7.091401 - "Системи управління і автоматика". Протокол N 13 від 4 липня 2002 р.

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**Г. М. Багнюк, В.О. Плиненко**
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Навчальний посібник містить п'ятнадцять основних та дванадцять додаткових текстів, які складаються з граматичного та додаткового матеріалу для читання.

Граматичний матеріал вводиться невеликими порціями, що сприяє інтенсифікації навчального процесу.

Додатковий матеріал складений з текстів про використання автоматики та комп'ютерних систем управління в різних галузях народного господарства.

Навчальний посібник призначений для студентів спеціальності 7.091401 - "Системи управління і автоматика" і може бути корисним для спеціалістів в цій галузі.

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# Зміст

## Unit I

1. Memorize the following words:

require
store (v)
host computer
bandwidth
background
feed(v)
feeder
feedback
counter
lattice
amplifier
conduct (v)
conductivity
intermediate
flexibility

2. Memorize the following word-combinations:

drafting hardware
numerical control
computer-aided design (CAD)
materials requirements planning
random access memory
an access speed
processing power
printed circuit board
memory size
sophisticated design

3. Translate the following sentences with model verbs and their equivalents:

1. The scientists are able to perfect this system operation due to the application of superconducting materials.
2. The engineers must test a new receiver for using it in this system.
3. We have to increase the current strength by decreasing the resistance of the circuit.
4. After finishing the experiment the scientists will have to discuss the results.
5. The students will be allowed to conduct this experiment in the laboratory.

4. Translate the text "Browse this Color Laser".

# Browse this Color Laser

With its latest color laser printer. Tektronix has abandoned continuous-tone color for dithering. Eschewing variable-size pixels at 600 dots per inch. Tektronix has bet that the Phaser 550's 1200- by 1200-dpi native resolution will be the new standard for quality and consistency in color laser output. Tektronix is also placing heavy emphasis on the printer's monochrome output speed of 14 pages per minute (ppm) and on the ease of use that stems from its PhaserLink Web-based management interface.

With a full configuration costing nearly $10,000. Tektronix is aiming the Phaser 550 at corporate workgroups. By also offering the Phaser 550 in a stripped-down version for $6995. Tektronix hopes to lower the color laser price barrier. We found that this printer's color output is indeed excellent for a color laser. that its text quality matches that of a good 600-dpi monochrome laser. and that the Web interface has advantages but is not yet a complete print-management solution.

## So Long. Con-Tone

The current crop of so-called continuous-tone color laser printers. including Tek-tronix's Phaser 540 and 540 Plus. use variable-size dots to fine-tune their color output. But variations in physical factors. such as voltage. drum speed. or toner particle size. make the exact dimensions of the printed dots hard to reproduce consistently from job to job and printer to printer.

Tektronix has addressed the problem of dot inconsistency by avoiding it entirely and going with higher resolution (see the Technology Focus on page 122). The Phaser 550's Matsushita color laser engine produces a true 1200- by 1200-dpi resolution. With dithering. it generates at least the same apparent resolution as that produced by pulse-width-modulated lasers at 600 by 600 dpi. Dithering patterns are visible with close scrutiny but color quality is the same as that of a good 600-dpi continuous-tone color laser.

The entry-level version of the Phaser 550 ships with 8 MB of installed memory -enough to support three- and four-color printing at only 600 by 600 dpi. To take advantage of the printer's 1200- by 600-and 1200- by 1200-dpi modes. you'll have to purchase a minimum of 16 MB of additional RAM in proprietary SIMMs ($1195) as well as Tektronix's Extended Features Option ($795. firmware on a SIMM).

The Phaser 550 uses a 32-MHz AMD 29040 RISC processor with a compression coprocessor to accelerate throughput and reduce physical memory requirements. Tektronix claims the Phaser 550 is the fastest desktop color laser on the market. citing a print-engine speed of 4.7 ppm in three-color mode (cyan. magenta. and yellow toners only) and with resolution at 600 by 600 dpi. Print speed drops when you switch to higher-quality output modes. but monochrome print speed is competitive with that of many monochrome lasers at 14 ppm for 600 by 600 dpi and 7 ppm for 1200 by 1200 dpi.

The Phaser 550 supports Pantone-approved solid color simulations, ICM and ColorSync 2.0 color profiles, and Tek-Color dynamic correction. A 250-sheet feeder tray is standard, and you can add two more 250-sheet trays.

Even in its minimal configuration, the printer provides Adobe PostScript Level 2 and HPGL support. However, PCL 5 emulation (monochrome only) is optional and must be enabled specifically for each printer with a 28-digit authorization code you request from Tektronix.

Tektronix ships only 17 Type 1 outline fonts with the printer. Installing the Extended Features Option provides an additional 22 fonts. The printer accepts Adobe Type 1, Type 3, and TrueType downloadable fonts as well as a variety of user-defined fonts. Attaching an external hard drive adds font storage.

Interfaces and Drivers

You can install one of three optional PhaserShare network cards (one at a time). The Ethernet card ($595) supports EtherTalk, and the Token Ring card supports TokenTalk. Both cards provide TCPЯP support as well as Novell NetWare support (including Novell Embedded Systems Technology (NEST) and NetWare Directory Service). A LocalTalk/serial cam also available.

The Phaser 550 comes with support software for a wide range of platforms; this software comes on CD-ROM and floppy disks. Drivers and installation utilities are provided for Macintosh, Windows 3.1.

Software design, as editor and pioneering natural-language researcher Terry Winograd notes, is a young discipline. Its guiding principles are still a little nebulous. So, *Bringing Design to Software is* a little nebulous, too, the better to capture the freshest ideas from the software-design frontier.

This brilliant collection of essays, on topics ranging from the role of the artist in software design to redesigning the Macintosh power switch, never tells how software should be designed. Instead, it takes the designer's view of the field itself, stepping back to find the relevant questions and resisting the temptation to grope hastily for answers. It's up to the readers to draw their own conclusions.

Mitch Kapor's "A Software Design Manifesto," delivered six years ago at Esther Dyson's PC Forum, leads with an enumeration of the difficulties that plague under-designed software and a call for the establishment of a distinct software-design profession. The remaining chapters take off from there, proposing new approaches to design, examining a few design successes, and further illuminating the context of the design problem.

## Unit 2

1. Memorize the following words:

to require
bandwidth
reliability
feature
to perform
performance
range (v)
range (n)
deliver
include
capability
rate
debugging
scheduling
advantage
scale
similar
wafer
gate
remote

2. Memorize the following word-combinations:

viewable resolution
turnkey system
a function menu
visible trace
a wire-frame image
custom processors
stand-alone processors
high-end workstation
computing power
main memory

3. Translate the following sentences with model verbs and their equivalents:

1. The energy which had to be supplied by the generator or battery was transformed into heat within the conductor.
2. For improving the system operation the designer was to use low weight equipment.
3. The designer was able to conduct a new device by using semiconductors.
4. We may say that photoelectric properties of transistors are largely used in TV-sets.
5. The frequency of an oscillator is to be kept constant by means of an oscillating crystal.

4. Translate the text "Better Replication Coming for Databases".

## Better Replication Coming for Databases

Replication technology delivers numerous benefits, but it's not a panacea for all your distributed-data needs. By distributing data to geographically disparate offices, replication can improve application performance when a high-bandwidth communications link to a central database is unavailable or impractical. It also adds fault tolerance—users can access data locally if a central server happens to go down. However, some developers say that they want to replicate among different database vendors' databases. They also want better tools to resolve conflicts.

BYTE talked to developers, consultants, and vendors to see where the replication capabilities of Microsoft's SQL Server 6.0 and Access for Win 95, Oracle's Oracle?, and Lotus Notes release 4 need to improve.

Access for Win 95's replication abilities reflect the database's workgroup orientation. Access synchronizes data, plus forms and reports, and supports one- or two-way replication. One-way replication adds consistency by permitting changes at only one end of a pair of databases. Two-way replication is more flexible, since it lets databases propagate changes both ways during synchronization.

Developers that we interviewed were pleased to find replication in a desktop database but said that one Access limitation is in resolving conflicts when a data record has been modified in both the main and remote copies of data. If the same row has been changed in two replicas, Access's default rule is that the database in which the row has changed most often wins. Developers say they want more sophisticated, prebuilt rules. Other drawbacks are listed in the table below.

Microsoft's SQL Server 6.0 for Win NT is designed to avoid replication conflicts altogether. Microsoft recommends that SQL Server developers use one-way replication. Larry Joseph, CEO of Strategic Database Systems, uses SQL Server's one-way replication in a traffic-law-enforcement database and decision-support system. In his application, users enter new records for traffic tickets, accident reports, and other events. At night that data is redistributed to site offices. The next day, users access the data for decision support in read-only mode.

Support for bi-directional replication is crucial to other companies' applications, however. For example, Clair Graham, system engineer for Xtra International (San Francisco), says that his Oracle? applications, in which databases in three major business offices and numerous area offices located around the world constantly insert, update, and query records, demand two-way replication.

In Xtra's application, which is used to manage an international container-leasing operation, major offices in the U.S., Paris, and Singapore exchange data through symmetric (two-way) replication over a WAN. Smaller offices exchange data with maj offices through updateable snapshots. Graham says biexchange data with maj offices through updateable snapshots. Graham says bi-directional replication le branch offices update data locally with controlling when updates take place to the central databases. This helps contain communications costs by eliminating the need for an expensive, high-speed link to the central server.

Lotus Notes popularized replication a an integral element of its groupware do sign, and the latest version, release 4, ado numerous improvements. Developers w interviewed were generally pleased wit Notes' new replication features.

But one complaint heard universally is that replicating among different vendors databases requires additional products such as Praxis's OmniReplicator (see December 1995 BYTE, page 36). Gary Voth group product manager at Microsoft, says the lack
of a replication-exchange standard similar to the ODBC standard for data access is partly to blame for this minima multivendor replication support.

However, this is beginning to change in a new version of SQL Server, slated for mid-1996 release. "The first step, in version 6.5, is unidirectional replication where changes in SQL Server get rolled into DB2, Oracle, and Access," Voth says. "We'll follow that version with an update at a later date that adds full bi-directional replication with other major systems as well."

"Action-Centered Design," in which former ACM president Peter Denning and developer Pamela Dargan argue that traditional business-process reengineering must be refocused on user actions and user satisfaction, is typical of the new-approach category. (It also contains a telling passage that, in summarizing the experiences of the designers of products' like Quicken and the Macintosh user ice, points out that none of the designers paid much attention to standard soft-engineering methodology.)

Organizations for User-Centered Design" uses lessons at Intuit to suggest methods for better user contribution to design. In "The Consumer Spectrum," a chapter that helps establish the context of the, design problem, Paul Saffo (of the Institute for the Future) proposes a model for defining consumer concerns.

Each of the 14 chapters is followed by a lighter profile section in which the authors illustrate the subject, usually with a familiar industry example. For instance, an interview with David Liddle, a Xerox Palo Alto Research Center (PARC) alumnus, is followed up with a description of the now-historic Xerox Star; a comparison of corporate prototyping cultures is nicely reflected in its profile section, a comparison of HyperCard, Director, and Visual Basic. Although each chapter is obviously written to stand on its own, little pointers to appropriate sections in other chapters help to weave a thread throughout book.

## Unit 3

1. Memorize the following words:

to transmit
carry (v)
carrier
charge carrier
to transfer
shift (n)
applied
tool
draft (v)
drafting (n)
retrieve
provide (v)
supply
support
suit (v)
fit (v)
lattice
junction
outmoded
time response

2. Memorize the following word-combinations:

a host computer
a particular user
application programs
computing resources
storage media
special-purpose programs
off-the-shelf software
reference manuals

3. Translate the following sentences paying attention to the words with "ing" forms.

1. Testing a new receiver for the application in this system was the prime engineers' task.
2. Without testing the equipment it's impossible to use it in the experiment.
3. The main task of engineer is testing the equipment.
4. Testing the engine the engineer applied new methods.
5. In designing electronic computers we have passed from valves to transistors.
6. Systems using microprocessors can be hooked together to do the work that until recently only microcomputer systems were capable of doing.
7. The properties of the ionosphere consisting of several layers depend upon many factors.
8. By raising the cathode temperature we increase the number of emitted electrons.

For 24 hours, it was the world's biggest Web site and the most elaborate journalistic experiment in history. It was also a revealing proving ground for new technology - the same technology that forward-looking content providers and businesses will have to master before large-scale publishing and commerce on the Internet become a reality.

The 24 Hours in Cyberspace project began as another installment in a series of photo documentaries masterminded by Rick Smolan, a former *National Geographic* photographer. This time, Smolan tried to document how people around the world are using computer technology, especially the Internet and the Web. He also decided to publish some of the stories on the Web the same day, to be followed later by his usual coffee-table book and CD-ROM.

What began as an interesting journalistic project soon mushroomed into a massive technical challenge. Smolan had to build the biggest (in terms of installation size) Web site ever contemplated, staff it with skilled personnel, find software that could generate attractive Web pages in minutes, and keep the whole thing running for 24 hours with no downtime. To raise the stakes still further. the project itself became a media event.

Not everything went according to plan. The project was almost torpedoed by technical problems, including a mysterious memory leak that caused the database server to lose 175 MB of RAM per hour. However, Smolan's all-star team of technical wizards managed to keep the Web site alive, and it recorded more than 4 million hits that day. (Netscape's home page can record up to 10 times that number on a busy day, but the 4-million count is never-theless impressive.) More important, Cyber24 previewed what any business will face if it tackles Web publishing on a similar scale.

The project's sponsors (nearly 50 companies, led by Adobe Kodak, and Sun Microsystems) lent hardware and software word more than $5 million, plus some of their best experts. Smolan also hired a few technical gurus of his own. Last November, about three months before the February 8 event date, they started building their 6000-square-foot "mission control in San Francisco.

From the beginning, it was an invent-as you-go project. For instance, most Web site follow a traditional publishing model is which someone creates Hypertext Markus Language (HTML) pages off-line and post then on a server for browsing by users. But the Cyber24 site had to do much more. It accepted raw input in the form of ASCII text, scanned photographs, and digitized audio; provided about 80 writers, photo editors, and sound technicians with Ac tools to rapidly shape that material into HTML pages; and staged the finished pages on a network of 14 mirrored Web servers in the U.S., bridged to five more minors throughout the world. (For a look at how the information flowed, visit the 24 Hours in Cyberspace site at http://www.cyber24.com.)

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The torrent of incoming data came not only from the 150 professional photographers that Smolan deployed *from* me Arctic Circle to South Africa, but also from everyday users who uploaded submissions. More than 1000 photographers in 27 countries shot 6000 rolls of film and hundreds of digital images. Everything had to be archived for later use in the book and CD-ROM.

Nobody knew how much capacity or bandwidth they'd need so they prepared for the worst. MFS Communications hooked the Cyber24 site directly into its prime Internet hubs on the Atlantic and Pacific coasts. These hubs, known as Metro Area Exchange (MAE) East and MAE West, are the gateways to a high-speed fiber-optic backbone that uses asynchronous transfer mode (ATM) and synchronous optical network (SONET). DS-3 and T1 lines connected project servers to the hubs.

At mission control, the high-speed lines from MAE West were funneled through a NetEdge ATM bridge and a Cisco 7000 router. Sun's Firewall-1 security software guarded against intruders. Behind this wall, technicians assembled four Fast Ethernet (100Base-T) LANs, plus a MediaNet Fiber Distributed Data Interface (FDDI) ring.

Sun lent 60 of its latest UltraSparc workstations, two SS-1000 database servers (each with eight CPUs, 1 GB of RAM, and an 84-GB RAID-5 disk array), and three Netra servers for FTP and E-mail. NEC Electronics lent 25 PowerMate PCs with 100-MHz Pentiums. There were also some Mac clones from Power Computing, mostly in the audio-processing studio. The latter systems had FDDI cards from Sonic Solutions and Telos Zephyr ISDN boxes. Collectively, the Cyber24 site had 11,000 MB of RAM and 300 GB of mass storage.

The project leaders made some surprising software choices. The story editors created all their Web pages with an automated layout tool from NetObjects (Redwood City, CA). NetObjects is a tiny start-up company, and its prototype layout tool is so new it doesn't even have a name. Yet the editors successfully created 63 multipage stories without writing any HTML code.

For their database software, the project leaders bypassed the more obvious choices in favor of Illustra, a relatively new relational DBMS from Illustra Information Technologies (Oakland, CA). Illustra is particularly good at handling multimedia data types, and the Cyber24 project generated many gigabytes of digitized photos, audio clips, and text. Adobe Photoshop was the logical choice for picture editing. The Cyber24 team sprang another surprise by tying all this software together with a custom front end that was based on templates displayed by Netscape Navigator. In other words, they pushed the underlying OSes so far into the background that they were virtually transparent to the editors.

"We have Mac bigots. Windows bigots. Sun bigots, and typewriter bigots," explained William J. Ray, Illustra's director of market development. "They don't have time to worry about what the right mouse button does on this computer or what the left button does on that computer. They can just sit and start working."

Amazingly, when the big day arrived, everything worked. Well, almost. The technicians never did trace the source of that 175-MB-per-hour memory leak. The network slowed to a crawl when the server dwindled to about 300 MB of RAM. However, they recovered the memory by rebooting the server every four hours, a solution good enough for a short-term project.

When it was over, they began tearing down what they had labored three months to build. It may be years before anyone constructs another Web site on this scale, but when they do, they'd be wise to hire some Cyber24 veterans as consultants. A century ago, the modem mass media was born when newspapers advanced from hand-set type and single-sheet platen presses to Linotype machines and high-speed rotary presses. In the near future, the on-line mass media will advance from hand-coded HTML pages and narrowband modems to automated layout software and broadband networks. Some of that new technology will trace its ancestry back to 24 Hours in Cyberspace.

## Unit 4

1. Memorize the following words:

scheduling
pure
band
wafer
time delay
add(v)
additional
rectify (v)
rectifier (n)
range (n)
grain
do pant
coating
trap
band gap
tailor (v)
level
suit (v)
amplifier
proccessibility

2. Memorize the following word-combinations:

straight lines
curved lines
application packages
general-purpose programs
database management system
reference information
stock programs
custom processors
random access memory
computing power

3. Translate the following sentences paying attention to the words with "ing" forms.

1. We can increase the current strength by <u>decreasing</u> the resistance of the circuit.
2. Part of the signal <u>traveling</u> along the ground is called the ground wave.
3. <u>Obtaining</u> new data on the waves traveling was necessary for future investigations.
4. <u>Constructing</u> simple radio-sets was followed by more complex devices using semiconductors.
5. The new receiver <u>being tested</u> will be used in this system.

4. Translate the text "RAD for Real - Time Apps".

5. Unknown words:

embed – вкладати, будувати
in terms of – з точки зору
fault of – стійкий до пошкоджень
collaboration – співробітництво
simultaneously – одночасно
multitude – множина
equivocally – двозначно
enhancement – покращення
embrace – охоплювати
handle – оброблювати, керувати

If you've tried visual programming, you probably believe it's the future. Rapid application development (RAD) tools like Microsoft's Visual Basic and Borland's Delphi help create GUIs and ease the access to relational databases.

However, math-intensive and real-time applications haven't yet benefited from the visual programming paradigm. System Description Language (SDL) is extending RAD to these types of applications. Obviously, numerical applications require a lot of problem-specific methods that can hardly be implemented visually. Real-time systems embedded in a jet fighter, a telephone switch, or a washing machine have high requirements in terms of fault tolerance, stability, and reliability. But with conventional RAD tools, developers are more concerned with what the program does than are with how it does it.

Increased time-to-market pressure and reduced product life cycles, especially in the telecommunications industry, make life even tougher for engineers. Additionally, a medium-size telecommunications project contains up to a million lines of C code and involves a higher degree of collaboration than other programming areas.

Applications in the telecommunication field are typically distributed. Think of a telephone exchange that handles hundreds of subscribers simultaneously. The exchange routes the call, checks the time spent on the call, and passes that information to a database for later billing. This happens 24 hours a day with thousands of connections each day and means constant interaction among a multitude of small software components.

The higher levels of regulation that are being imposed on real-time software developers, such as ISO 9001 certification and various governmental or military specifications, recognize these high requirements. Consequently, RAD in such an environment demands a graphical language that lets designers define unequivocally the interaction of components and the signal flow between components. Additionally, to reduce development cycles, a sufficient RAD tool for real-time development has to provide facilities for component reuse.

SDL is a formal language that lets designers model communicating finite-state machines. A system described by a finite-state machine consists of processes, signals, and channels. SDL adds data processing to this model so that a state transition can also perform computations on data stored in variables, thus combining systems design and a visual approach to programming.

SDL has its origin in the telecommunications area and has been especially embraced by this industry. Much of the research work on this formal language has been carried out in the labs of me Danish telecommunications company, TeleDanmark, Swedish Telecom, and Telia Research in Sweden. The international telecommunications standards body accepted SDL in 1976; several major enhancements have been added since then. For example, SDL-84 introduced abstract data types, and the SDL-92.

## Unit 5

1. **Memorize the following words:**

supply
wire (n)
wire (v)
wireless
support
driver
set(v)
set of (n)
precise
dedicated
boundary
available
environment
request
facilities
maintain
sharpness
mode
gate
switch (v)

2. **Memorize the following word-combinations:**

time response
time delay
an artificial intelligence
knowledge-based expert system
windowing capability
an expert system shell
a flexible manufacturing system
machine tools
flexible transfer lines
storage media

3. **Translate the following sentences paying attention to the absolute participle construction:**

1. Electrons moving through the conductor, electrical energy is generated.
2. The current in a circuit was decreased when the resistance was increased, other factors remaining the same.
3. Transistors being very sensitive to light, engineers use this property.
4. Some radioactive materials have been found in nature, uranium being one of them.
5. The engineers using semiconductors, good results have been achieved.

**Translate the text "The Art of Software Design".**

### The Art of Software Design

Software design, as editor and pioneering natural-language researcher Terry Winograd notes, is a young discipline. Its guiding principles are still a little nebulous. So, *Bringing Design to Software is* a little nebulous, too, the better to capture the freshest ideas from the software-design frontier.

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"Action-Centered Design," in which former ACM president Peter Denning and developer Pamela Dargan argue that traditional business-process reengineering must be refocused on user actions and user satisfaction, is typical of the new-approach category. (It also contains a telling passage that, in summarizing the experiences of the designers of products' like Quicken and the Macintosh user ice, points out that none of the designers paid much attention to standard soft-engineering methodology.)

Organizations for User-Centered Design" uses lessons at Intuit to suggest methods for better user contribution to design. In "The Consumer Spectrum," a chapter that helps establish the context of the, design problem, Paul Saffo (of the Institute for the Future) proposes a model for defining consumer concerns.

Each of the 14 chapters is followed by a lighter profile section in which the authors illustrate the subject, usually with a familiar industry example. For instance, an interview with David Liddle, a Xerox Palo Alto Research Center (PARC) alumnus, is followed up with a description of the now-historic Xerox Star; a comparison of corporate prototyping cultures is nicely reflected in its profile section, a comparison of HyperCard, Director, and Visual Basic. Although each chapter is obviously written to stand on its own, little pointers to appropriate sections in other chapters help to weave a thread throughout the book.

The topics are diverse, but three strong themes lurk behind almost every paragraph. First: Software design, like all design, is best when it's iterative. Second, the software designer must always start from the user's perspective. Last, and also least, the best analogy for the relationship of software design to the current practice of software development is that of architecture to engineering. The architecture analogy gets a little tiring, but it serves to nail down the designer's part in the software development process.

This is a book about design first, and software a distant second. For those involved in creating software, almost all of whom approach the subject of software design from the other end, this collection of new ideas provides a refreshing, and necessary, perspective.

## Unit 6

1. Memorize the following words:

digit
select (v)
sign(n)
rotation
to call
call for
handle
determine
capacity
release
ratio
accept
message
pattern
substrate
shifting
scale
dimension
waveguide

2. Memorize the following word-combinations:

data-handling equipment – обладнання для керування даними
the means of communication – засоби зв'язку
a particular memory cell – комірка пам'яті
a control unit – блок керування
at the proper time – належний час
to run the queue [kju: ] – керувати послідовністю
debugging the code – код налагоджування
the complete list of... – повний список
memory space – об'єм пам'яті
temporary numbers – тимчасові числа

3. Translate the following sentences paying attention to the absolute participle construction:

1. The designers used some new tubes, the main characteristics remaining the same.
2. The speed of light being very great, we can't measure it by ordinary methods.
3. Many metals are good conductors, silver presenting one of them.
4. The principle of action being extremely simple, the device was widely used for various purposes.
5. Thermistors are very sensitive to light, this property being very important.

4. Translate the text "A whole New Side to CAD".

# A Whole New Side to CAD

As computer-aided design (CAD) functionality has moved into the mainstream, the price of that power has plummeted. Developers of traditional CAD software have taken a page from Autodesk's playbook by offering 80 percent of AutoCAD's capabilities for 20 percent of the price. That's the same formula that worked so well for Autodesk when it first took on turnkey CAD vendors back in the mid-1980s. Indeed, the under-$500 CAD arena is getting quite full these days. Even Autodesk is in the thick of things, with its own low-cost version of its flagship product, AutoCAD LT97.

For many users, $5,000 CAD programs are priced beyond reach, or they provide features well outside the scope of average drafting tasks. Although some quite serviceable drafting programs can be had for even less money, the four packages reviewed in this roundup - Autodesk's AutoCAD LT 97, Intergraph's Imagineer Technical 2.0, International Microcomputer Software's Turbo-CAD v4 Professional, and SoftSource's Vdraft—are each priced under $500, and they provide most of the 2-D CAD functions you're likely to need. Many also offer some interesting advances not yet available in more expensive applications. All four are well-suited for professional use, though some are more appropriate than others for certain tasks.

As we look at mis representative sample, several interesting trends emerge. Without question, AutoCAD is the standard, and all these programs compete directly against that product. Autodesk's DWG file format is so ubiquitous that SoftSource's Vdraft uses .DWG as its native format. All the programs can also read and write AutoCAD Release 13 files, but file integrity through a round-trip translation is questionable at best.

With the exception of Autodesk's own AutoCAD LT 97, none of the packages presently import Release 14 data. That situation will soon change, however, when Visio begins shipping IntelliCAD in the first quarter of 1998.

IntelliCAD was originally developed by a subsidiary of Soft-desk, an AutoCAD third-party developer recently acquired by Autodesk. IntelliCAD uses R14. DWG files as its native format. It also supports AutoLISP and ADS, two of AutoCAD's programming environments.

IntelliCAD was not available at the time of this review. Nevertheless, many traditional Autodesk developers have already announced their plans to port architectural and engineering add-ons to IntelliCAD. Also not available in time for this review is DesignCAD LT, from ViaGrafx, a replacement for the vendor's DesignCAD 2D product. DesignCAD LT should be available by the time you read this.

# Unit 7

## 1. Memorize the following words:

routine
share (v)
simulation
similar
similarity
reliable
predict
couple
shortage
junction
remote
execute
feedback
background
transactions
retrieve
behavior
counter
feed
view point

## 2. Memorize the following word-combinations:

alphanumeric names – літерно числові назви
default feature – параметр, що приймає значення за замовчуванням
running the code on the computer – прогін коду на комп'ютері
interrupt unit – блок переривань
power supply – джерело живлення
a binary-coded address – адреса двійкового коду
storage capacity – об'єм пам'яті
a wire-frame image – каркасне зображення
computing power – обрахункова потужність
drafting hardware – апаратне забезпечення для креслення

## 3. Translate the following sentences with different infinitive functions:

1. To create a powerful energy source was of prime importance for a constructor.
2. To obtain new data on the wave traveling was necessary for future investigations.
3. The purpose of the experiment is to convert heat directly to electricity.
4. The object of this system is to provide a powerful energy supply.
5. The designer have to test the system to be used in the laboratory.
6. Cells to be connected in parallel should be of the same type and voltage.
7. To perform reasonable operations a computer must have a way of accepting data.
8. The experiments to be carried out will be very important.

9. In order to program properly, the programmer needs detailed data about the program and the way it is to be done.
10. To make possible a human being communication and is the main purpouse of the input unit.
11. These devices are likely to find use in large server installations video production.

4. Translate the text "Help-Desk Helpers".

## Help-Desk Helpers

Maintaining a help desk to solve users' problems in a large organization calls for just that, organization - of knowledge about hardware, software, schedules, and past experience. This job can be aided considerably by special-purpose software.

NSTL narrowed its focus to single-user applications that are meant for departmental use. The products are DKHelpDesk and DKInventory Manager (DK Systems), bundled as a single product and called DKHelpDesk here; Heat Professional for Windows (Bendata); HelpTrac (Monarch Bay Software); Professional Help Desk Premium, here called Professional Help Desk (PHD); Q-Support (Datawatch); and SupportMagic (Magic Solutions).

Our tests are based on supporting internal clients only. We looked at system installation and setup, logging and tracking of calls, finding answers to questions, automated call logging, and tracking the configuration of hardware and software.

Choosing the right software for a help desk is a highly individualized proposition. One help-desk manager we talked to wants a product that emphasizes ease of use and entering call data. Another needs flexibility, largely because the help-desk analysts are experienced users.

However, NSTL's overall ratings favor usability over flexibility and performance. Because many companies reengineer their help desks to place junior-level analysts at the first contact level without compromising support, it's important to provide tools that are easy to learn and operate.

HowRWofks

Help-desk software is a customized database application that facilitates storage and retrieval of information about users, their computer hardware and software, the calls they make to the support center, and some means for support personnel to create and access a pool of information that will help them answer the questions asked. The process varies considerably, depending on such variables as:

- Who the client is (internal employee or external customer).
- How the call is submitted.
- The nature of the problem (hardware or software).
- How urgent the problem is.
- What analysts can take the call.
- What information is available.

All six programs tested let analysts assess these factors quickly by searching for information in the help database. Response time improves when the analyst can access the user, configuration, and call-history information in one application.

But it a help-desk program is only a database, why not build one from scratch? First, with these programs available, users don't have to spend the effort and money to design the database. Second, although call logging and asset management are database functions, problem resolution gets into the more difficult area of expert systems. Third, the documentation that comes with these packages can be helpful in running a help desk.

System Setup and Administration

When you're setting up a help-desk application, you need to think about how you're going to enter analyst data and assign access rights to the database, customize the

program, and set the hours of operation. All the tested programs allow you to restrict access based on passwords. For example, you might want to restrict junior analysts from creating standard problem solutions.

In a given environment, predesigned databases nearly always require some type of data or a form that the program's designer didn't foresee. A program that allows data-table and data-form customization gives the administrator tremendous flexibility.

The ability to attach work hours to individual analysts helps track availability. This helps avoid forwarding calls to analysts who are unavailable.

Although most of the information in help-desk databases is entered by analysts as they receive calls for help, the ability to import existing client and configuration data is a great help in getting these programs up and running. The majority of the programs tested claim to offer easy-to-use data-import utilities. However, NSTL's.

# Unit 8

## 1. Memorize the following words:

cell
core
drawback
target
approach
bus
supply
require
range
fault
failure
tool
feeder
use(v)
user
device
advantage
rate
release
capacity

## 2. Memorize the following word combinations :

a number of - a set of – низка, певна кількість
band gap – заборонена зона
feature size – розмір елементу
fine-line lithography – дуже точна літографія
conducting band – зона провідності
secondary storage – допоміжні пристрої пам'яті
memory-size – об'єм пам'яті

## 3. Translate the following sentences paying attention to the infinitive constructions :

1. We know B.Pascal to be the fist inventor of the mechanical computer.
2. The magnetic recording is done on a disk which permits an information to be stored or read at one or several points on it.
3. Our engineers want the complex problems to be solved by computers.
4. It's quite necessary for the programmer to understand the work of all units of a computer.
5. Information has to be in the form of digits or characters for a digital computer to perform reasonable operations.
6. The progress toward smaller computer is likely to continue.
7. The logic element is known to be the basic component of all computers.
8. pnp-transistors are likely to denote sequence of doped regions in the silicon.
9. Oxygen concentration is known to influence many silicon properties.
10. A thin film happens to be employed to select the areas on a water that are to be oxidized.

4. Translate the text "Grade a Printing".

5. Unknown words:

edit – редагувати
respective – відповідний
fit -- встановлювати, підганяти
unlike – на відміну від
round up – огинати, округлювати
tabloid-size – короткий огляд, стислий текст
engine – машина, двигун
stack(n) – набір, комплект
stack(v) – складати
ultimately -- в кінці-кінців
annoyance – неприємність
figure(v) – зображати, позначати (цифрами)
queue -- черга
currently – тепер, актуально
tray -- підставка, блок, панель
jam-proof -- перевірка на заїдання
crumple – згинати
reasonable розумний, поміркований

## GRADE A PRINTING

The latest printer in Lexmark's Optra S line, the Optra S 2450 ($2,650 street), has a lot to live up to. In *PC Magazine's* most recent look at network printers (June 10, 1997), the two Optra S printers reviewed were Editors' Choices in their respective categories. The Optra S 2450 is just as impressive, but with a 24-ppm engine it fits firmly in the departmental printer category.

Unlike most departmental printers we've seen recently—including all the entries in our last roundup—the maximum-size paper for the Optra S 2450 is A-size (letter and legal) rather than tabloid size. But if you never make tabloid-size prints, there's no point in paying extra.

The base configuration of the printer ($2,250 street) comes with 4MB of RAM and a parallel port. The version we looked at included 12MB of memory and a Fast Ethernet card. The extra RAM is enough to hold several rasterized pages. This means that the engine rarely has to stop and wait for a page to finish processing, even if there is a complex page in a print job. Lexmark claims that the additional RAM increases performance by 20 to 40 percent.

Setup is simple enough: The printer fits over the stackable paper-feed module and automatically makes the right connections. Installing the Postscript level 2 driver and combination PCL 5 and 6 driver is also simple (the printer uses Lexmark's own Postscript emulation). The problems appear when you set up the printer to work on your network.

One of the first steps is to print the setup page from the LCD-based front-panel menu. Unfortunately, the manual does not tell you where to find the option. which is four menu levels deep. More troublesome are the Lexmark Mark Vision's instructions, which tell you to set up the printer without using NetWare s Peon-sole. The manual says to change settings on a given screen without explaining which settings you should change—or why. The details are available on CD-ROM, but it would be easier to read the hard copy. Ultimately, however, this is just a minor annoyance.

Once you've figured out how to use the MarkVision, you'll find that it offers a full array of configuration and network-management features. Not only can you configure the printer, you can also create, manage, and configure print servers and print queues. You can even monitor the printer status by having the message that's currently showing in the printer's LCD get displayed on your screen. Even better, the LCD messages are in English, not arcane codes.

Paper handling is a strong point. The base unit comes with a 250-sheet printer drawer and a stackable sheet feeder with two 500-sheet drawers. MarkVision lets you specify what kind of paper is in each drawer. The printer can automatically choose the right drawer for a print job and switch to another drawer with the same paper (should the first drawer run out of paper). There are also a variety of high-volume paper trays available.

Even more impressive is that the printer is all but jam-proof. To make the printer jam, we not only had to crumple the paper but tear the leading edge as well. Even then, it didn't always jam.

Performance is another strong point. We ran the Optra through the same suite of tests that we used in our last network printer roundup (using the same test-bed setup). Compared with the 24-page printers in that roundup, the Optra turned in the fastest time (or within 3 seconds of the fastest time) on every test.

Output quality for both text and graphics was appropriate for both the 600-dpi and 1,200-dpi modes, with edge enhancement adding a quality boost to text and line graphics. The printer offers a so-called 1,200 image quality mode, which enhances grayscale images without slowing the printer down to 1,200-dpi speed.

The combination of features—from paper handling to network management and functionality to performance — makes this printer a clear winner by any reasonable standards.

## Unit 9

1. Memorize the following words:

engine
choice
bit
add(v)
increase
set up
set of
connect (v), connection, connector
install
use
apply
manage, management
feature
change
level
available
entry
draw (v), drawing
switch (on) off
volume

2. Memorize the following word combinations :

data-handling equipment – обладнання для керування даними
factor of advantage – коефіцієнт переваги
proper speed – відповідна швидкість
a control unit – блок керування
at a time - одночасно
random-access memory (RAM) – пристрій пам'яті з довільним доступом (ОЗП)
read-only memory(ROM) – постійний пристрій запам'ятовування (ППЗ)

3. Translate the following sentences paying attention to the infinitive constructions :

1. The input and output units are known to be the parts of a computer.
2. Automation control systems are known to have appeared quite recently.
3. Oxygen concentration is known to influence many silicon wafer properties, such as a wafer strength, resistance to thermal warping, instability and resistively.
4. New developments in materials are believed to be due to new manufacturing forms and vice versa.
5. The layout happens to specify the pattern of each layer of the I.C.
6. Plasma etching is expected to play an important role in manufacture of semiconductor and other devices requiring fine-line lithography.

4. Translate the text "Editors Choice"

The major portion of the window is the drawing sheet, which in turn contains a sheet outline. Only entities actually placed within the outline are printed, but you can work on designs using the entire sheet and create multiple sheet outlines in each drawing. Tabs along the bottom of the screen let you switch between sheets, and you can have multiple drawings open simultaneously.

You draw objects in Imagineer by first selecting the entity type and then clicking in the drawing sheet. For precise entity creation, you can specify coordinates and dimensions in the ribbon toolbar. This can become tedious, however, because you must constantly shift focus from the drawing to the toolbar.

SmartSketch is one of several unique features that make using Imagineer quite intuitive. It provides visual feedback alongside the cursor as

you draw, indicating geometry such as midpoints, intersections, and endpoints. *Intent tones* interpret your intentions as you draw and modify entities by observing how you move .the cursor once you click on the mouse.

Relationships between objects give Imagineer constraint capabilities. By applying and maintaining relationships, you can modify a part of a drawing that has a relationship to another part of a drawing; the other part will then get updated automatically. For example, you can draw objects that always remain parallel, perpendicular, tangent, connected, or equal to. other objects.

Many CAD programs create *associative dimensions*, whereby dimensions change when you modify the object they annotate. Imagineer also allows dimensions to drive the elements they are applied to. For instance, after placing a driving dimension specifying the distance between two elements, you can move Die elements by changing the dimension value.

You can store a frequently used drawing in one document and place it in another at any scale, position, or orientation. The Imagineer Technical Browser, embedded in Microsoft Internet Explorer 3.02, lets you drag and drop symbols into the current drawing sheet.

Since Imagineer functions as both an OLE 2.0 server and a container, you can link and embed Imagineer documents within other applications. Imagineer also recognizes the formats of other CAD programs, such as AutoCAD, enabling you to insert or embed .DWG files into Imagineer documents. Imagineer can also view any HTML document, and since Imagineer itself is also an ActiveX document, you can open an Imagincer Technical document with its own toolbars and menus in Internet Explorer.

Imagineer Technical is a powerful, state-of-the-art design program. Though not strictly a CAD package, it may prove to be more suitable for many 2-D design tasks than more conventional CAD applications.

## Unit 10

1. Memorize the following words:

entry
sheet
edge
volume
jam
currently
include
contain
compare(v)
comparison
facility
default
appropriate
advantage
approach
relative
relations
debugging
drag(v)
replace

2. Memorize the following word combinations :

a particular memory cell – особлива комірка пам'яті
data-handling equipment – обладнання для керування
a factor of advantage – коефіцієнт переваги
auxiliary devices – допоміжні пристрої
a program-compatible models – програмно сумісні

3. Translate the following sentences paying attention to the "ing" forms:

1. When applying mathematical methods to the solving of technical problems engineers are most often interested in obtaining a finite numerical results.
2. Mathematical tables are necessary aids for performing computation work.
3. In modem computers LS/ circuits and RAM/ROM memories are used for executing sophisticated operations.
4. The students get the practical training when they are working at various plants.
5. A memory unit is used for storing information.
6. Electronics being used not only in industry but in many other fields of human activity as well, one should have an idea of what it is.
7. The past electronic machines, such as microcomputers, are effective for carrying out complicated computations.
8. Some fundamental factors influencing resist performance include adherence coating thickness, heat treatment.
9. Computers are fast enough to permit man to control mechanisms, having rates of response exceeding his own reaction time.
10. Semiconductors are in a wide variety of solid-state devices including integrated circuits, transistors, diodes…

11. Junction-transistors are solid-states devices having three layers of alternately negative and positive type semiconductor material.
12. Types of semiconductor materials commonly used are elements falling into group IV of the Periodic Table, such as silicon or germanium.

4. Translate the text «Fast Channel: Fast and Flexible»

5. Unknown words:

cause – спричиняти
fiber – волокно
a range of – радіус дії
router – низка, ряд
hood – визначник маршрута
deploy – чехол, ковпак
loop – петля, виток
share – частина, спільно використовувати
fabrics – вироби
yield – вихід продукції
leverage – важіль
benefit – користь, вигода
shield – захист, екран
ensure – гарантувати
alignment – регулювання, перевірка

## FIBRE CHANNEL: FAST AND FLEXIBLE

The processing power of computer chips doubles every 18 months, theorized Intel's founder Gordon Moore. And that phenomenon has proved remarkably constant over the last 20 years. But now Moore's law has run smack into Amdahl's law, which posits that 1 Mbps of I/O is required for every MIPS of processing power.

This collision of truths is causing problems for network managers as powerful machines and bandwidth-hungry applications outstrip I/O capacity. One solution to such problems is Fibre Channel.

Despite its name, Fibre Channel is more than a channel and runs on more than just fiber. Channels, such as ES-CON and SCSI, are designed for high performance and high reliability, using dedicated, short-distance connections between computers or between computers and peripherals. Traditional networks, on the other hand, offer more flexibility and greater distance capabilities. Fibre Channel integrates features of both: the speed and reliability of channels with the flexibility and connectivity of networks. The result is a high-speed ANSI-standard transport mechanism for data, voice, and video.

Some 80 companies are now members of the Fibre Channel Association, including Hewlett-Packard, IBM, Kodak, Seagate, Silicon Graphics, and Sun Microsystems. Many of these member companies are making and delivering a range of Fibre Channel products, such as network interface cards (NICs), storage devices, routers, and switches.

Under the Hood

Fibre Channel moves data at very high rates. Currently available products run at 266 or 1062 Mbps—enough to handle even demanding applications, such as uncompressed, full-motion, high-quality video. Fibre Channel can be deployed as a simple point-to-point connection^ loop, or a switched fabric.

A point-to-point configuration is the simplest topology, connecting two Fibre Channel systems directly. Arbitrated loops are Fibre Channel ring connections that provide shared access to bandwidth via arbitration. Switched Fibre Channel networks, called fabrics, yield the highest performance by leveraging the benefits of cross-point switching. For example, when fabric users add ports to their network, they increase the aggregate capacity of the network. The aggregate data rate of a fully configured Fibre Channel network can be in the terabit-per-second range.

The ANSI specification that defines Fibre Channel distributes its functions among five layers that in many ways parallel the Open Systems Interconnection (OSI) model (see the figure "Pick Your Protocol" below). FC-0 is the physical layer, which can use single-mode fiber, multi-mode fiber, or copper. For the fiber interfaces. Fibre Channel uses a low-cost duplex SC connector. Shielded twisted-pair media use a nine-pin connector. And coaxial-cable systems use a TNC receiver and a BNC transmitter.

The next layer, FC-1, specifies byte synchronization and an encoding/decoding scheme, where 8 bits of data are encoded in 10-bit groups. A unique "comma character" ensures proper word and byte alignment; the encoding also handles error correction.

## Unit 11

1. Memorize the following words

| | |
|---|---|
| add(v) | attract (v) |
| additional | junction |
| interactive | use |
| provide | scheduling |
| supply | intelligence |
| support | accurate (a) |
| capability | precise |
| consume | point out |
| implementation | share |
| sophisticated | intermediate |

2. Memorize the following word combinations :

the complete list of - повний список
octal numbers – вісімкові числа
running the code – прогін коду
crossing lines – лінія перетину
memory space – об'єм пам'яті
intermediate stages – проміжні етапи
temporary numbers – тимчасові числа

3. Translate the following sentences paying attention to the passive forms:

1. An ammeter should be connected to the circuit in series.
2. The transmitter section of the telephone is equipped with a special microphone and an amplifier to enlarge the voice of the speaker.
3. Electric signals are amplified with the help of a semiconductor device.
4. The student was asked if pure germanium could be employed as a semiconductor material.
5. The grid must be placed between the cathode and plate.
6. This subject will be dealt with different elements.
7. The computer's role is influenced not only by its speed but also by its memory-size.

4. Translate the text "Breaking the Code"

5. Unknown words to the text:

to stare – уважно дивитись.
authoring – дозвіл, санкція
attributes - атрибути
handler – пристрій обробки, програма обробки
grapple – схопити, зачепити
shield – екран, захист
icon - піктограма
bug – помилка в програмі
enhancement - збільшення
edit – монтаж, редагування

If you don't want to stare at a screen full of code (but you still want the added interactive elements that Dynamic HTML can provide), mBED Interactor 1.1 may be your answer. A low-cost ($249 list) authoring tool, mBED Interactor allows nonprogrammers to add multimedia elements to their Web pages.

Instead of grappling with JavaScript, you build an mbed-let (the interactive application that is ultimately embedded into an HTML document) by using object-oriented code modules called players. Like a traditional multimedia authoring program, mBED allows you to set attributes for each player object. Attributes can include data or the actual content, such as text, GIF, or JPEG images and WAV or Real Audio sound files; properties or formatting, such as the location of a picture, the color of text, or the volume of a sound; and handlers, which control how an object responds to specific events.

The program earns high marks for an interface that shields authors from the underlying programming code. Players are created by clicking icons on a toolbar, edited in easy-to-understand dialog boxes, and assembled in the graphical layout window. In addition, both the Score Player and the Handler dialog box employ predefined lists of behaviors made accessible via a pop-up menu. It is quite easy to sequence the events in your application or to link a trigger (like a mouse click) to a response (like a command to play an audio file).

Specialized players provide fast and sophisticated effects. For example, the Button player is able to display different bitmaps when the user moves the mouse over or clicks on a control. And creating an animation is as straightforward as importing a series of images into the Sprite player or using the Path player to move an element across the screen.

At output time, mBED automatically generates two versions of your applet in order to guarantee compatibility with Microsoft Internet Explorer's and Netscape Communicator's slightly different implementations of DHTML. Alternately, you can choose to deliver your creation as a Java or a proprietary mBED application (which requires a Netscape plug-in or ActiveX control). Choosing these alternative de livery methods gives you access to features that are not currently supported by DHTML, such as anti-aliased text, alpha-channel transparency, and the ability to resize objects at runtime.

Though mBED Interactor provides a static list of object-level dependencies as a debugging tool, it leaves the larger issue of Web site management to full-featured HTML author ing programs. During testing, we discovered screen redraw problems with Matrox graphics cards and a minor bug that generates invalid path names for IE 4 (this was fixed in Version I.I.I, which will be available for downloading from mBED's Web site on December 1.). We'd also like to see enhancements to several of the tools, such as the ability to choose colors from a Web-safe palette, editable free-form animation paths, and support for streaming video formats.

## Unit 12

1. Memorize the following words

apply (v)
application
applied
set of
set up (v)
connect(v)
connection
connector
install
like (adv.)
unlike (adv.)
both...and
encrypt
review
appear (v)
appearance (n)
jam
add
addition
in addition to...

2. Memorize the following word combinations :

valid interpretation – обґрунтована інтерпретація
alphanumeric names – буквено-цифрові назви
executable statements – виконавчі оператори
to meet the needs (requirements) – відповідати вимогам
debugging statements – оператор налагоджування
step-by-step instructions – поетапні команди

3. Translate the following sentences paying attention to the infinitive constructions:

1. In the laboratory we saw the perforator punch holes in the cards of standard size.
2. It's quite necessary for the programmer to understand the work of all units a computer.
3. We watched the floppy disk begin to operate.
4. Our engineers want the complex problems to be solved by computers
5. They know these three factors to be the tube parameters or characteristics
6. They consider most tubes of this type to use mercury vapour as the gas.

4. Translate the text «Turn Numbers into Pictures»

5. Unknown words to the text:

gradually - поступово
insurance - страхування
mapping – нанесення на
earthquake - землетрус
warehouse - склад
deploy - розгортати
scratch – подряпина, відмітка
wrap - загортати

As the demand for visual data grows, tools that graphically represent data in spreadsheets and databases are gradually becoming state of the art. New rapid application development (RAD) tools and libraries for programming graphics applications are making life easier for developers. They provide a wide range of geometry, display, object-generation, and modeling functions and also help manage the storage of graphical objects in relational databases.

For instance, insurance companies use mapping software to more easily evaluate risks in earthquake regions. Big international warehouse chains require graphics programs to help manage their distribution systems. If you're developing an enterprise-wide visualization system, you know how time-consuming it is to integrate existing databases in a consistent visualization scheme. Your development strategy depends on answers to such questions as "Shall I use low-level or high-level, procedural or object-oriented libraries?," "Which parts can be based on third-party graphics kernels?," and "How many off-the-shelf modules can I use?"

Graphics applications consist of three main parts: user interface, object generation, and data management. The development strategy for an enterprise tailored application can take two main paths: Use a graphics kernel with a flexible programming interface or deploy a library and build the program from scratch. Libraries can be procedural or object-oriented, wrapped as DLLs.

Advantages of Procedural Libraries

The advantage of procedural libraries is that they can be used with standard DLL-compatible development tools as well as with comfortable tools, such as Visual Basic and Turbo Pascal. Object-oriented class libraries can usually be used only with the compiler that created the libraries. However, most library producers offer versions for the market-leading C++ compilers.

Class libraries offer the well-known advantages of object-oriented programming, including overriding, overloading, and inheritance. Inheritance is especially beneficial during the design of a user interface when you can define subsequent windows in a user dialog box as instances or as derived classes of one superclass. If you use a high-level GUI library, you don't even need to know the internal structure of the classes.

If you want to develop a CAD, mapping, or business visualization application, things can get complicated. There are two basic routes you can take: Build your own visual application or modify a shipping CAD or mapping application. There are several CAD packages on the market, but most come with inflexible APIs. C++ class libraries, on the other hand, offer open design possibilities but require a deep knowledge of graphics data management and a keen understanding of the OS's features, such as its event-handling and basic I/O functions.

## Unit 13

1. Memorize the following words

| | | |
|---|---|---|
| single | reside | subroutine |
| tiny | consumer | bandwidth |
| sophisticated | complete | loop |
| implement | chart | manual (a) |
| carry out | experience | manual (n) |
| reduce | skill | encryption |
| increase | ability | |

2. Memorize the following word combinations :

independent variables – незалежні змінні
unused core storage – невикористана частина ОЗП
a source program – вихідна програма
the first-time programmer – програміст-новачок
line-by-line – рядок за рядком
query language – мова запитів
the triggering light beam – світловий промінь, що запускає
trial and error method – метод проб та помилок

3. Translate the following sentences paying attention to the absolute Participle Construction :

1. The computer performs the operation three times, the code for number 3 being stored in one of the registers.
2. Specialists use computers widely, the latter helping in performing computations at great speeds.
3. Personal computers being used for many purposes, scientific go on improving their characteristics.
4. The computer is used in industrial processes and scientific researches, its main function being to carry out reasonable operations with numbers and to calculate complex problems.
5. A printer's line is usually between 60 and 150 characters long, with 120 characters being a common length.
6. A current flowing through the coil, the two pieces of iron core become temporarily magnetized by the influence of current and attract each other.

4. Translate the text «Smart Forms for the Enterprise»

5. Unknown words to the text

validation – затвердження, легалізація
reliance – довіра, впевненість
update – модернізація
mail (v) – надсилати поштою

In theory, replacing paper with electrons can improve an organization's efficiency. This is most true for forms, which make up a huge part of most companies' paper volume, carry mission-critical data, and contain a structure that lends itself to computerization. Today's leading forms programs are up to the challenge, providing windows onto corporate databases while using E-mail to intelligently route data around the enterprise.

In this roundup, NSTL evaluates four electronic-forms management packages for Windows: Delrina FormFlow 1.1, Novell' s InForms 4.1, JetForm' s JetForm 4.1, and Microsoft Electronic Forms Designer 1.0. (Lotus was upgrading Lotus Forms during our testing and didn't participate.)

To be included in the testing, a program must be able to act as a database front end, complete with field-level database lookups and validation. It must provide such design features as drawing tools, listboxes, radio buttons, and check boxes as well as standard text-entry fields and labels. And it must support routing over standard E-mail systems.

Delrina FormFlow and InForms are the best of the field. Although both are extremely versatile and easy to use, Delrina FormFlow comes out slightly ahead of In-Forms, primarily due to its slightly faster performance and InForms' reliance on Novell's Group Wise for E-mail functions.

## Form Functions

Forms programs do four things: design, filling, database access, and E-mail-enabled functions (e.g., routing, work flow, and tracking). Design features include the controls we've come to expect in graphical packages (e.g., color selection, grids, rulers, and the ability to import logos). Filling, database access, and E-mail features tend to vary more across products.

Filler modules help you work with previously created forms. The programs vary widely in the number of database access and display options they provide for their fillers. In all the products except Microsoft's, anyone who has the filler software can use the form. In Microsoft's program, you must edit Microsoft Mail configuration files to provide other users with access to the form.

Forms programs also provide access to databases for data entry and retrieval. You can use the forms to retrieve data, distribute it, collect it, and update the database (see the Technology Focus on page 120).

The programs let you address and send a form by E-mail while viewing the form; recipients use the same form to view the associated data. Thus, you can electronically mail blank or partially filled forms to recipients, who fill them out on-line. To do this, a forms program must provide more than a window to the database. It must store the data as part of the form or in a temporary database attached to the form.

## Unit 14

1. Memorize the following words

| | | |
|---|---|---|
| to represent | shift | default |
| follow | specify | pure |
| locate | turnkey | feature |
| entrance | reference | consumer |
| share | correspond | provider |
| advantage | array | support |
| disadvantage | range | |

2. Memorize the following word combinations :

on the fly – одразу, прямо
as far as – оскільки
as well as – так, як і
the project staff – персонал проекту
off-the-shelf- готове програмне забезпечення
a many-fold increase – чисельне збільшення
a rigid off-repeated program – жорстка програма, що неодноразово повторюється

3. Translate the following sentences paying attention to the different infinitive forms :

1. These fluctuations are shown to have resulted in the development of hum in the tube output.
2. The action to be referred to is known as cathode bombardment.
3. To reduce fluctuations is extremely necessary.
4. We know emission to be controlled by space charge in the high-vacuum tube.
5. She appears to know everything about the properties of this substance.
6. He described the tube to be used in all modern systems.
7. To do the program for a computer the programmer must have a good knowledge of mathematics.
8. To make possible communication with a human being and a computer is the main purpose of the input unit.

4. Translate the text «Doctors Go On-line»

5. Unknown words to the text:

barely – тільки, лише
psychiatry – психіатрія
challenge – виклик, важка задача
render (v) – надавати, передавати
retain – підтримувати, зберігати
capture (v) –захопити
crucial – вирішальний, критичний
urban – місцевий

## DOCTORS GO ON – LINE

Modern medicine uses high-tech equipment extensively. But until recently, medicine had barely been influenced by state-of-the-art communications technology. That situation is now changing rapidly.

Telemedicine (i.e., telecommunications-supported medicine) lets doctors investigate and treat patients via videoconferencing and electronic information exchange. Instead of moving patients to doctors, or vice versa, hospitals transmit digital information about patients, saving transport, time, and money.

Physicians' use of telemedicine systems varies according to medical specialty. For example, radiologists, currently the main users of telemedicine technology, distribute digitized images and interpret them either on radiological workstations or, more conventionally, by printing the digital images to film. The radiologist's report is then returned to the originating physician via fax or e-mail, or the film might be discussed in a videoconferencing session.

Telemedicine projects are not restricted to radiology; systems are now operating in the fields of psychiatry, pathology, orthopedics, dermatology, accident and emergency medicine, and other disciplines. Such telemedicine applications have to cope with many technical challenges, three of which are listed below.

DATA VOLUMES. Medical images must be rendered at high resolutions to retain diagnostic quality. The American College of Radiology recommends approximately 2048 by 2048 pixels at 12-bit gray-scale for primary diagnostic reading and 4096 by 4096 pixels (with the same contrast depth) for mammography.

RETRIEVAL SPEED. Busy medical-staff members cannot wait for massive images to be loaded over slow networks. This means high-bandwidth networks and fast transaction speeds in image retrieval have to be achieved.

INTUITIVE USER INTERFACES. Users often are not computer-literate; thus, systems have to be easy to understand and operate.

Medical engineers construct telemedicine systems using off-the-shelf hardware and software. Some applications need very high-resolution display and image-capturing equipment; fortunately, the current multimedia boom means the prices of sophisticated imaging boards are falling.

Interoperational standards for system integration are crucial to ensure that standard computer equipment can access medical devices. Direct image capturing from computerized tomography (CT) or magnetic resonance imaging (MRI) scanners and the distribution of images from laboratories to physicians are made far easier through a common exchange format.

Additionally, images should include, at the very least, the patient's name, age, sex, current problem, and medical history for identification. That's also an issue of standardization. But telemedicine proponents expect the emerging Digital Imaging and Communications in Medicine (DICOM; see the text box "Image Standards" on page 48IS 8) standard to replace the proprietary nature of many of today's medical-image data-exchange systems.

# Unit 15

1. Memorize the following words

compatible, challenge, drawback, feedback, core, cell
capacity, acquire, acquisition, dissipation, random
outmoded, retrieve, intermediate, suite [swi:t], volume, value
bug, require, security

2. Memorize the following word combinations :

data security – захист інформації
system security – безпека роботи системи
run time –час прогону програми
interrupt unit – блок переривання
memory allocation statements – оператори розподілу пам'яті
an object program – кінцева програма
relative addresses – відносні адреси
bit-map – схема розподілу
database processing tools – засоби обробки баз даних

3. Translate the following sentences paying attention to the different grammar forms:

1. The designer was able to construct a new device by using semiconductor.
2. For improving the system operation the designer was to use low weight equipment.
3. They didn't have to analyze these data.
4. Lasers have been built on the basis of transistors and now they are successfully used.
5. Cosmic radiation is influenced by some phenomena of nature.
6. The properties of these systems were much spoken about.
7. Computers and calculating machines can be subdivided into classes analog and digital. the basic difference being the way in which numbers are represented inside the machine for purpose of calculating.
8. The computer is sure to have become an important and powerful tool for collecting, recording, analyzing and distributing tremendous masses of information.

## A COMPUTER IN YOUR WALLET

Smart cards will soon exist in virtually every area of our lives. In France, for instance, 22 million bank-card holders have smart cards, and all bank-payment terminals accept smart cards as well as traditional magnetic-stripe ATM or PIN cards. Proponents expect the cards to also play an increasingly

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Many industry experts see Europe as being on the leading edge of smart-card use. That's partly because a decade ago the European telecommunications infrastructure was more amenable to handling off-line transactions than on-line credit-card transactions. In addition, the transnational banking structure in European countries, as opposed to the more fragmented U.S. banking system, is well suited to propel the introduction of smart-card-based electronic banking.

The power of smart cards lies in their ability to store and manipulate data, to handle multiple applications on one card, and to perform secure transactions. A typical smart card stores 3 KB of data, which is about 80 times more than what a magnetic-stripe card can hold. Some can store up to 8 KB.

The devices come in several varieties, from simple memory cards to those carrying their own microprocessors. The four categories are listed below.

Unprotected memory cards. These cards act as a storage medium for tokens. They carry an application code and a simple mechanism to specify the issuer of the card, but they can't perform off-line processing. Unprotected memory cards are used as prepaid phone cards in France, the Netherlands, and Germany.

Wired-logic memory cards. Smart cards at the next-highest level use either EPROM or EEPROM and are used for access-control systems in offices or research labs. The cards contain "hard-wired" data protection, providing a higher level of security. They can, for instance, be reloaded with monetary value. Examples include the new-generation phone cards that are increasingly being used in the Benelux countries.

Microprocessor cards. Typical microprocessor cards have an 8-bit microprocessor with an OS in ROM and 96 to 512 KB of RAM, along with 3 to 16 KB of ROM. Many smart-card processors have 8-bit data registers and are compatible with the Motorola6805 or Intel 8051 architecture. But more 16-bit-data-register processors, such as Hitachi's H9/300, are being used. For nonvolatile memory, they use EEPROM technology, with capacities ranging from 1024 bytes to 16 KB.

Contactless cards. When applications require high throughput—in mass transit, where people pass by a smart-card reader, for example — contactless cards are optimal. They contain an antenna that picks up an electromagnetic signal that emanates from the reader. This signal powers the card and transmits the data. Loose-coupled cards work with distances up to 1 mm, while proximity smart cards accept distances of 1 to 10 cm.

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Contactless cards add an analog front end to the smart card's logic and memory components. Today's semiconductor technology enables digital and analog components to reside on a single chip without electromagnetic interference. But the card's antenna is embedded in the plastic. Industry observers say the next generation of smart cards will integrate contactless and contact technology, allowing one card to work with all types of readers.

**Microcontrollers versus Microprocessors**

Microcontroller differs from a microprocessor in many ways. First and the most important is its functionality. In order for a microprocessor to be used, other components such as memory, or components for receiving and sending data must be added to it. In short that means that microprocessor is the very heart of the computer. On the other hand, microcontroller is designed to be all of that in one. No other external components are needed for its application because all necessary peripherals are already built into it. Thus, we save the time and space needed to construct devices.

## 1.1 Memory unit

Memory is part of the microcontroller whose function is to store data. The easiest way to explain it is to describe it as one big closet with lots of drawers. If we suppose that we marked the drawers is such a way that they can not be confused, any of their contents will then be easily accessible. It is enough to know the designation of the drawer and so its contents will be known to us for sure.

Memory components are exactly like that. For a certain input we get the contents of a certain addressed memory location and that's all. Two new concepts are brought to us: addressing and memory location. Memory consists of all memory locations, and addressing is nothing but selecting one of them. This means that we need to select the desired memory location on one end, and on the other end we need to wait for the contents of that location. Beside reading from a memory location, memory must also provide for writing onto it. This is done by supplying an additional line called control line. We will designate this line as R/W (read/write). Control line is used in the following way: if r/w=1, reading is done, and if opposite is true then writing is done on the memory location. Memory is the first element, and we need a few others in order for our microcontroller to work.

## 1.2 Central Processing Unit

Let's add 3 more memory locations to a specific block that will have a built in capability to multiply, divide, subtract, and move its contents from one memory location onto another. The part we just added in is called "central processing unit" (CPU). Its memory locations are called registers.

Registers are therefore memory locations whose role is to help with performing various mathematical operations or any other operations with data wherever data can be found. Lets look at the current situation. We have two independent entities (memory and CPU) which are interconnected, and thus any exchange of data is hindered, as well as its functionality. If, for example, we wish to add the contents of two memory locations and return the result again back to memory, we will need a connection between memory and CPU. Simply stated, we must have some "way" through which data goes from one block to another.

### 1.3 Bus

That "way" is called "bus". Physically, it represents a group of 8, 16, or more wires There are two types of buses: address and data bus. The first one consists of as many lines as the amount of memory we wish to address, and the other one is as wide as data, in our case 8 bits or the connection line. First one serves to transmit address from CPU memory, and the second to connect all blocks inside the microcontroller.

As far as functionality, the situation has improved, but a new problem has also appeared: we have a unit that's capable of working by itself, but which does not have any contact with the outside world, or with us! In order to remove this deficiency, let's add a block which contains several memory locations whose one end is connected to the data bus, and the other has connection with the output lines on the microcontroller which can be seen with the naked eye as pins on the electronic component.

### 1.4 Input-output unit

Those locations we've just added are called "ports". There are several types of ports : input, output or two-way ports. When working with ports, first of all it is necessary to choose which port we need to work with, and then to send data to, or take it from the port.

When working with it the port acts like a memory location. Something is simply being written into or read from it, and it is possible to easily register that on the pins of the microcontroller.

### 1.5 Serial communication

With this we've added to the already existing unit the possibility of communication with an outside world. However, this way of communicating has its drawbacks. One of the basic drawbacks is the number of lines which need to be used in order to transfer data. What if it is being transferred to a distance of several kilometers?, The number of lines times number of kilometers doesn't promise the economy of the project. It leaves us having to reduce the number of lines though in such a way that we don't lessen its functionality. Suppose we are working with three lines only, and that one line is used for sending data, other for receiving, and the third one is used as a reference line for both the input and the output side. In order for this to work, we need to set the rules of exchange of data. These rules are called protocol. Protocol is therefore defined in advance so there wouldn't be any misunderstanding between the sides that are communicating with each other. For example, if one man is speaking in French, and the other in English, it is highly unlikely that they will quickly and effectively understand each other. Let's suppose we have the following protocol. The logical unit "1" is set up on the transmitting line until transfer begins. Once the transfer starts, we lower the transmission line to logical "0" for a period of time (which we will designate as T), so the receiving side will know that it is receiving data, and so it will activate its mechanism for reception. Let's go back now to the transmission side and start putting logic zeros and ones onto the transmitter line in the order from a bit of the lowest value to a bit of the highest value. Let each bit stay on line for a time period which is equal to T, and in the end, or after the 8th bit, let us bring the logical unit "1" back on the line which will mark the end of the transmission of one data. The protocol we've just described is called in professional literature NRZ (Non-Return to Zero).

As we have separate lines for receiving and sending, it is possible to receive and send data (info.) at the same time. Block which enables this way of communication is called a serial communication block. Unlike the parallel transmission, data moves here bit by bit, or in a series of bits which is where the name serial communication comes from. After the reception of data we need to read it from the transmitting location and store it in memory as opposed to sending where the process is reversed. Data goes from memory through the bus to the sending location, and from there to the receiving unit according to the protocol.

## 1.6 Timer unit

Now that we have the serial communication down, we can receive, send and process data.

However, for us to be able to utilize it in industry we need a few more blocks. One of those is the timer block which is significant to us because it can give us information about time, duration, protocol etc. The basic unit of the timer is a free counter which is in fact a register whose numeric value increases in even intervals, so that by taking its value during periods Tl and T2 and on the basis of their difference we can determine how much time has elapsed. This is a very important part of the microcontroller whose mastery requires most of our time.

## 1.7 Watchdog

One more thing requiring our attention is a flawless performance of the microcontroller during its use. Suppose that as a result of some interference (which often does occur in industry) our microcontroller stops executing the program, or worse, it starts working incorrectly.

Of course, when this happens with a computer, we simply reset it and it will keep working. However, there is no reset button we can push on the microcontroller and thus solve our problem. To overcome this obstacle, we need to introduce one more block called watchdog. This block is in fact another free counter where our program needs to write a zero in every time it executes correctly. In case that program gets "stuck", zero will not be written in, and counter alone will reset the microcontroller upon obtaining its maximum value. This will result in running the program again, and correctly this time around. That is an Important element of every program that needs to be reliable without man's supervision.

## 1.8 Analog-Digital Converter

As the peripheral signals are substantially different from the ones that microcontroller can understand (zero and one), they have to be converted into a mode which can be comprehended by a microcontroller. This task is performed by a block for analog-digital conversion or by an AD converter.

This block is responsible for converting an information about some analog value to a binary number and for follow it through to a CPU block so that CPU block can further process it.

## 1.9 Program

Program writing is a special field of work with microcontrollers and is called "programming". Lets try writing a small program in a language that we will make up ourselves and that everyone will be able to understand.

```
START
REGISTER1=MEMORY LOCATION_A
REGISTER2=MEMORY LOCATION_B
PORTA=REGISTER1 + REGISTER2
    END
```

The program adds up the contents of two memory locations, and views their total on port A. The first line of the program stands for moving the contents of memory location "A" into one of the registers of central processing unit. As we need the other data as well, we will also move it into the other register of the central processing unit. The next instruction instructs the central processing unit to add up the contents of those two registers and send a result obtained to port A, so that sum of that addition would be visible to the outside world. For a more complex problem, program that works on its solution will be bigger. Programming can be done in several languages such as Assembler, C and Basic which are most commonly used languages. Assembler belongs to lower level languages that are programmed slowly, but take up the least amount of space in memory and gives the best results where the speed of program execution is concerned. As it is the most commonly used language in programming microcontrollers it will be discussed in a later chapter. Programs in C language are easier to be written, easier to be understood, but are slower in executing from assembler programs. Basic is the easiest one to learn, and its instructions are nearest a man's way of reasoning, but like C programming language it is also slower than assembler. In any case, before you make up your mind about one of these languages you need to consider carefully the demands for execution speed, for the size of memory and for the amount of time available for its assembly.

After the program is written, we need to install the microcontroller into a device and let it work. In order to do this we need to add a few more external components necessary for its work. First we must give life to a microcontroller by connecting it to a supply (voltage needed for operation of all electronic instruments) and oscillator whose role is similar to the role that heart plays in a human body. Based on its clocks microcontroller executes instructions of a program. As it receives supply microcontroller will perform a small check up on itself, look up the beginning of the program and start executing it. How the device will work depends on many parameters, the most important of which is the skillfulness of the developer of hardware, and on programmer's expertise in getting the maximum out of the device with his program

# GRID COMPUTING

Imagine a time in the not-too-distant future, when every computer-like device in the world—from mainframes to cell phones—is connected by a global system that dwarfs the current Internet in scale. A network so pervasive, so ingrained in all aspects of our daily lives, that nobody even thinks about buying a computer any more than you think about whether your air conditioner is getting its electricity from a coal-, nuclear-, or solar-powered generating plant. When you need to solve a particular problem, you just pick up a receiver and listen for a data tone to indicate that you're connected to the rest of the world—then draw on as much or as little processing power as you need, depending on whether you want to find the perfect anniversary gift or simulate gene splicing on a newly discovered chromosome. This network will be far too complicated for any single person to manage, but it will always appear to be available when you need it because the data servers will be able to manage themselves, automatically correcting problems, responding to unpredictable events, and fetching resources as needed. In fact, more than anything, this infrastructure will not only be intelligent, but it will also likely resemble a human nervous system in many respects. At the end of the month, you'll receive a bill for the amount of resources you've used and, since the resource is a commodity, you can switch to another service at any time.

While this seems like the stuff of science fiction, companies like IBM, Hewlett-Packard, and Sun Microsystems believe that this vision of the future is not only strategic, but inevitable, and they're betting billions of dollars on making it into reality. The concept is an extension of today's distributed-computing approach, in which a network of computing devices taps into a main server where important software and data reside. By contrast, so-called "grid computing" involves many thousands or millions of small, distributed-computing devices, linked together in local or regional networks, which are in turn interconnected on a global level. The grid functions as if it were one giant virtual computer, with very close integration of servers, storage, and other resources; everyone connected to the grid is able to share these resources in a very fast, efficient manner. Grids can be used to address so-called "Grand Challenge" problems, including advanced genetics research, modeling global weather patterns, or global air traffic control. This class of high-risk/high-reward problems is also known as "Deep Computing," and has commonly been addressed by interconnecting a large number of computer processors in parallel.

**Lightweight versus Heavyweight Grids**

While they hold the potential to be the next disruptive technology in the computing industry, the concept of grid computing isn't new. It can be traced hack to early experiments with distributed, parallel processing, and so-called "lightweight grids" such as SETI@home, a continuation of the former NASA

Search for Extra-Terrestrial Intelligence (http://setiathome.ssl.berkeley.edu/). Using free software downloaded over the Internet, your home computer scavenges spare processing cycles to analyze signals from the Arecibo Radio Telescope. There are currently over 1.6 million SETI@home subscribers in 224 countries, averaging 10 trillion operations per second and having contributed the equivalent of over 165,000 years of computing time to this project. This is arguably the world's largest distributed supercomputer, interconnected over the existing Internet.

Small-scale grid models have been under investigation for years by the University of Southern California, Argonne National Laboratory, and NASA, among others. Also, commercial applications have recently started to attract the attention of major corporations. Grids are still in their infancy, however; the ultimate goal is the creation of so-called "heavyweight grids," which are much larger and more powerful systems linked on a national or international scale. Today, heavyweight grids are under development in several countries, including the United Kingdom's National Grid and The Netherlands. Recently, IBM was selected to build the Distributed Terascale Facility (DTF), which would be the world's most powerful computing grid, capable of 13.6 trillion calculations per second and a storage capacity of more than 600 terabytes of data, or the equivalent of 146 million full-length novels. The Terascale Facility, with $53 million funding from the NSF, is a joint undertaking of the National Center for Supercomputing Applications (NCSA), the San Diego Supercomputing Center (SDSC), Argonne National Laboratory, and the California Institute of Technology. The grid will include the fastest supercomputers and high-resolution visualization environments, toolkits for grid computing, and data storage facilities integrated into an information infrastructure called the "TeraGrid," which will enable thousands of scientists around the country to share computing resources over the world's fastest research network in search of breakthroughs in life sciences, climate modeling, and other critical disciplines.

**The Globus System**

Systems such as these are based mainly on protocols, standards, and software tools under development by Globus, an open-source community led by Carl Kesselman at the University of Southern California Information Sciences Institute and Ian Foster of Argonne National Lab and the University of Chicago (http://www .globus.org/). In the same way that the Linux community has become a major part of open standards, Globus is working with the grid movement to help various standards and technologies to reach maturity; this includes developing tools to enable remote sharing of massive computing and storage resources, sophisticated resource management, scheduling and scalability routines, privacy and security tools, and other software functionality that is largely unavailable in today's peer-to-peer networking environments. Over the past five years, Globus toolkits have been deployed at over 20 multimillion dollar eScience projects around the world. IBM is a major supporter of grid computing, having used Globus technology to establish its own grid—a geographically distributed supercomputer linking research labs in the United States, Israel, Switzerland, and Japan. IBM has also established a state-of-the-art e-Utility Lab and testbed in Texas that is already working with a number of forward-thinking e-businesses on ways to extend grids beyond government labs and research environments into mainstream business of the Fortune 500 companies, and to grid-enable key systems and technologies. Emerging software standards such as Universal Description Discovery and Integration (UDDI) are important to this effort, as well as natural languages to analyze unstructured data such as web pages, HTML, video, and MP3 audio files.

Utility pricing is one of the features that makes grid computing attractive to large businesses; the increased flexibility this model affords could save billions of dollars alone, without even considering the other benefits of grids. Utility pricing, or pay-as-you-go models, are already offered by several vendors including IBM; both Compaq and Hewlett-Packard offers such models, which are likely to persist in some form following their recent merger. For example, IBM has announced its Dynamic E-Business initiative, which addresses business relationships between potential grid users, suppliers, and service providers. This approach is different from capacity-on-demand models, in which companies own or lease servers and pay an additional, fixed charge when they activate excess processing capacity. By contrast, in the utility model, the company doesn't own anything—it simply pays for its use of servers, storage, and disk I/O capacity. These resources are metered through software measurement tools and can be billed in various ways, usually either on a per-user or per-processor basis; either way, the cost per user goes down as the server utilization rises. This approach avoids one of the major pitfalls of today's information technology systems, namely capacity planning. Many corporations have difficulty accurately forecasting their demand for information technology (IT) resources. This has become more obvious during the recent economic slowdown, when anticipated revenues fail to materialize and overbuilt IT capacity becomes a burden most companies would prefer not to bear. Since utility pricing directly ties cost to revenue, it should allow companies to weather fluctuations in the market better by amortizing costs over time. The metering information can be used to determine exactly how much capacity is required under different system loads, ensuring that the end user always has adequate resources to run whatever their application demands. It's also envisioned that recurring monthly utility costs will prove to be lower than current purchased server models, although it is possible that a utility plan could cost more than a conventional approach if utilization runs above expectations for a long period of time. Companies should also be able to deploy e-business initiatives faster and more easily respond to changing business conditions, since server costs would become part of a monthly operations budget, rather than an annual capital budget that must continually justify its return on investment. Leasing IT resources is also a good way to guard against technology obsolescence in a world that continues to experience Moore's Law-type growth in server capacity.

**Dense Wavelength Division Multiplexing**

In addition to software and management, another distinguishing feature of grids is an intelligent, broadband, low-latency network infrastructure, which provides much of the value in a grid computer. In fact, a high-bandwidth network is one of the most critical resources involved in enabling a grid, surpassing even the processor speed in its importance to overall performance. This is not a unique requirement of grids; recent trends toward clustered, parallel computer architectures such as the Parallel Sysplex (http://www-l.ibm .com/servers/eserver/zseries/pso/) and PowerParallel (http://www.rs6000.ibm .com/resource/technology/sp_sw2/spswp2_l.html) systems have also driven the need for high-bandwidth fiber optic coupling links between computers. Future grid computer nodes will likely he more tightly coupled in their data-sharing ability than the SETI@home systems. Instead, they might resemble a scaled-up version of today's largest clustered supercomputers. Current state-of-the-art parallel supercomputers consist of a few hundred nodes, each capable of executing perhaps a few hundred million instructions per second. A hypothetical grid computer may consist of thousands or millions of nodes, each capable of executing billions of instructions per second. A small grid network is likely to require multi-terabyte or petabyte bandwidth, and could easily grow several times larger than this. Such networks require either higher data rates per link or many low-speed links operating in parallel. This presents an opportunity for effective use of multiplexing techniques to handle the grid's increasing demand for bandwidth. Conventional SONET-based networks use time division multiplexing (TDM) to share many data channels across a single physical path; however, this approach does not scale well to the huge bandwidths required in a grid. Furthermore, grid computer nodes are distributed over tens to hundreds of kilometers or more. The combined distance and bandwidth requirements far exceed the capabilities of copper-based networks. Fortunately, optical networks offer a viable alternative, with theoretical available bandwidths of over 100 terabits per second on a single optical fiber (about 20 billion one-page e-mail messages or 2 billion phone calls). The data rate of individual channels in a grid will probably be in the range of 1-10 gigabits per second, and there is potential to combine hundreds of these channels over a common network using wavelength multiplexing approaches. Wavelength division multiplexing (WDM) is emerging as the preferred technology for grid networks. It takes advantage of the fact that different wavelengths or colors of light will not interfere with each other when they are carried over the same optical fiber, as in Figure 1. The concept is similar to frequency multiplexing used by FM radio, except that the carrier "frequencies" are in the optical portion of the spectrum (around 1550 nanometers wavelength or $2\,10^{14}$ Hertz). Thus, by placing each data channel on a different wavelength (frequency) of light, it is possible to send many channels of data over a common optical fiber. Data from nodes in the grid would be remodulated using distributed feedback laser diodes with a tightly controlled wavelength spacing or wavelength locking approach. The optical signals would then be combined into a single fiber using a diffraction grating, prism, or similar mechanism. Each node or group of nodes in the grid could be designed to receive only selected wavelength channels of data, and the network could be reconfigured in real time to add or drop any combination of wavelengths at a given node. More data channels can be carried per fiber if the wavelengths are spaced closer together. In this manner, WDM systems may be classified as either coarse, wide spectrum, or dense WDM (DWDM); see Table 1. Successive generations of DWDM equipment have supported more wavelengths, thus more channels, over a common fiber link. Current industry standards ratified by the International Telecommunications Union (ITU) establish a minimum spacing of 0.8 nm (100 GHz) and accommodate about 32 wavelengths per fiber. Future systems are expected to handle hundreds or even thousands of wavelengths at less than half the current wavelength spacing. Using optical amplifiers, DWDM networks can be extended to the distances required for grid networking. The next generation of DWDM involves more than simply increasing the number of channels, however. New grid network topologies are also being enabled by the capability of third-generation and higher DWDM systems to support meshed or nested rings with dual redundant paths, self healing at the physical layer, data regeneration, and more advanced survivability or path protection than currently available. By contrast, conventional telecommunication networks have deployed ATM over SONET rings with separate overlay networks to accommodate IP data and other kinds of traffic as in Figure 2. The overlay networks are optically transparent, but remain service specific. Since grid traffic has different characteristics than voice traffic, overlay networks cannot make efficient use of the available bandwidth as they scale to multiple, concatenated rings. Consequently, optically transparent overlay networks are being replaced by a service-transparent DWDM core capable of allocating bandwidth on demand. This offers the advantages of a highly scalable, low cost, protocol-independent infrastructure, and may be the first step towards all-optical grid networks. Unlike first-generation DWDM, more recent technology allows wavelength multiplexing networks to be cascaded together because they act as a complete "3R" repeater that can:

- Retime the signal to remove jitter and improve clock/data recovery.
- Reshape the signal to remove pulse distortion caused by dispersion.
- Regenerate the signal to ensure that there is sufficient optical power to reach its destination.

Full protection switching at the physical or transport layer is available on a per-channel basis to restore service in the event of either a fiber break or failure of a hardware component in the system; a properly designed DWDM grid network would have no single points of failure.

The historical trend of growth in aggregate system bandwidth is likely to continue for the near future. However, this approach requires the service layer to upgrade more than twice as fast as the transport layer or roughly double capacity every six months (some estimates have shown the service layer growing over 70 times by 2003). A more realistic approach is to have the transport and service layers evolve together, although this still requires service layer capacity to double on a yearly basis. To keep pace with bandwidth growth, future DWDM systems may employ ultra-dense fourth-generation DWDM systems. The desire for efficient bandwidth management is also likely to drive the use of subrate multiplexing, or the combination of multiple TDM data channels within a single wavelength on a DWDM network. This hybrid approach may prove to be the most cost effective way to increase the total number of channels in a grid network. Future grid networks may also allow reuse of wavelengths for different purposes as the data hops between nodes on the grid. It has also become apparent that future DWDM technology will require some level of electronic signal processing in order to ensure the necessary data integrity, quality of service, reliability, security, and man-ageability of the network infra-structure. Previously, these features have been provided over the legacy telecommunications infrastructure. Indeed, SONET-based traffic is already carried over a physical layer that uses DWDM optical fiber interfaces. However, the growth of IP traffic has led to a complicated arrangement with up to four separate transport layers (IP over ATM over SONET over DWDM). In an effort to simplify this approach and streamline the data flow in future grids, there is a clearly emerging trend toward elimination of the ATM and SONET layers, and toward the direct transmission of IP or grid data over DWDM. This new model requires the DWDM layer to assume many of the traditional functions associated with ATM over SONET, such as protection switching. In particular, two standards efforts are currently under way to link data packets directly to DWDM optical wavelengths, so that the optical network can take some advantage of the intelligence embedded in IP traffic. This so-called "optical IP" effort could eventually let grid users dynamically request portions of a fiber cable's bandwidth for a particular time or service. One such standards effort is the Optical Domain Service Interconnect (ODSI) coalition (http://www .odsi-coalition.com/), a loose connection of vendors providing optical transmission equipment, access services, terabit routers, switches, and network provisioning software. ODSI seeks to define common control interfaces between optical or electrical physical layers and IP media access layers of the Open Systems Interconnect (OSI) model. This work may ultimately rely on derivatives of the Internet Engineering Task Force (IETF) Multi-Protocol Label Switching (MPLS), a means of defining IP flows that is already widely used in the electrical signaling domain. ODSI will propose low-level (below Layer 3) control plane standards that must be met by vendors of both optical transmission equipment and broadband IP switches/routers.

their limits. The increasing sophistication pf electronics systems continually pushes the state-of-the-art of both memory and logic circuits. Improvements in cost. speed. density and power consumption are being sought.

Submicron technology refers to the fabrication of semiconductor devices with features having masked dimensions less than one micron. Normal IC technology uses mask dimensions of about five microns. By using electron beams. it is now possible to fabricate circuits with features less than one micron. Within the next few years submicron technology will become a major factor in the production of integrated circuits.

Because of the small dimensions required. it is no longer possible to use conventional optical methods to define the surface of an integrated circuit. Even optical inspection is limited because of the small dimensions. In place of light. X-rays and electron beams are used to pattern the surface of the semiconductor wafer.

In the same manner as the electron microscope provided superior resolution over the optical microscope, electron beam technology is about to impact the integrated circuit industry. The advantage of e-beam technology is that the wavelength of electrons is substantially less than the wavelength of light. E-beam technology is accompanied by the use of X-rays. X-rays have the advantage that they travel in a straight line. X-rays do not require vacuum as do electrons. which may simplify production techniques.

The use of submicron technology has the same effect as increasing the size of the silicon wafer. Since the devices are smaller. the number of devices per wafer is greater. Also. since the die sizes are smaller. the loss due to a die containing a material defect is smaller. The yield percentage increases. The net effect is more good dice per wafer. As is known, one of the basic measures of semiconductor performance is the number of good dice per wafer.

Submicron technology can be used for standard IC design and processing. It can be applied to both MOS and bipolar integrated circuits including injection logic. This technology applies to very fast circuits and microwave structures.

The impact of submicron technology on the IC industry will be more significant than the impact of MOS on the semiconductor industry. A principal application impact of submicron technology will be in the areas of magnetic bubble and semiconductor memories. Although the first submicron production structures range about 64 kilobits. "million-bit chips" are possible. The super-LSI technology appears in new products where increased complexity can still be utilized. The one-chip medium-size computer quickly becomes a reality in conjunction with its one-chip memory or, alternately. a minicomputer will tend to have everything on one chip.

The utilization of submicron technology requires a completely new facility. All aspects of mask making. inspection. and other procedures are changed.

Molecular electronics is a new concept of electronic systems. Basically it seeks to integrate into a solid block of the material the functions performed by

Conductors that are compatible with the device geometries must carry current densities much greater than the allowable limits defined by electromigration effects, resulting in a low reliability.

## SEMICONDUCTORS AS MATERIALS

A semiconductor is a material having a resistivity in the range between conductors and insulators and having a negative temperature coefficient. The conductivity increases not only with temperature but is also affected very considerably by the presence of impurities in the crystal lattice.

Types of semiconductor material commonly used are elements falling into group IV of the Periodic Table, such as silicon or germanium. The donor and acceptor impurities are group V and group in elements, respectively. differing in valency by only one electron.

Certain compounds such as gallium arsenide (Symbol: GaAs) which has a total of eight valence electrons, also make excellent semiconductors.

GaAs is a direct-gap III-V semiconductor that has a relatively large band gap and high carrier mobility. The relatively high earner mobility allows the semiconductor to be used for high-speed applications and because of the large energy gap it has a high resistivity that allows easier isolation between different areas of the crystal. The conduction band is a two-state conduction band: some electrons therefore are "hot" electrons, i.e. they have small effective mass and higher velocity, this resulting in the Gunn effect.

GaAs is difficult to work since diffusion of impurities into the material is extremely difficult. Epitaxy, or ion implantation must therefore be used to produce areas of different conductivity type. The main uses for gallium arsenide have been as microwave devices, such as Gunn diodes or IMPATT diodes, but lately it has been used as a MESFET (a GaAs junction field-effect transistor) for high speed logic circuits.

## SUBMICRON TECHNOLOGY

Silicon is the workhorse for most integrated circuit devices. Silicon processing technologies continually change. A number of technological changes must be expected with the advent of electron beam mask-making, i.e. with the development of submicron technology to produce ultra-complex devices based upon dimensions which can no longer be fabricated with the use of visible or near visible light.

The need for submicron technology is based upon continuing pressures to improve microelectronic capabilities. The present optical methods are reaching electronic circuits or even whole systems. Its goal is to rearrange the internal physical properties of the solid in such a way that phenomena occurring within or between domains of molecules will perform a function ordinarily achieved through the use of an assembly of electronic components.

## MOLECULAR ELECTRONICS

Molecular electronics is the most forward-looking of several modem approaches to the development of small, reliable, efficient electronic systems. Almost all attempt to perform the required electronic functions in solid semiconductor-type materials. Molecular electronics, however, is unique in its goal of doing away with the traditional concept of circuit components. Should this goal be fully realized, or even partially so, it would extend the capabilities of electronic systems well beyond that which can be achieved today. In addition to lowering size and weight, increasing reliability and reducing power requirements, molecular blocks could make possible the execution of tasks now too complex to be performed economically by conventional methods and permit the performance of electronic functions which cannot be achieved at all with lumped components.

## THE HEART OF THE COMPUTER

The processor is the "brains" of the computer, the location of 'those fantastically small circuits. Think of it as an overworked ' adding machine that also can make simple logic decisions.

It can decide that two numbers are equal or not equal, that a certain condition does or does not exist in the circuitry. It can decide that things are true or false based on rules the programmer supplies to make that decision. This, combined with the ability to add and subtract at lightning-fast speeds and store the results of these processes, allows the programmer to give step-by-step instructions to be carried out on command.

## PERSONAL COMPUTER

The first personal computer (PC) was put on the market in 1975.

Today the personal computer can serve as a work station for the individual. Moreover, just as it has become financially feasible to provide a computer for the individual worker, so also technical developments have made the interface between man and machine increasingly "friendly", so that a wide array of computer functions are now accessible to people with no technical background.

A personal computer is a small computer based on a microprocessor; it is a microcomputer. Not all microcomputers, however, are personal computers. A microcomputer can be dedicated to a single task such as controlling a machine tool or metering the injection of fuel into an automobile engine; it can be a word processor, a video game or a "pocket computer" that is not quite a computer. A personal computer is something different: a standalone computer that puts a wide array of capabilities at the disposal of an individual.

The first generation of true personal computers, which came on the market between 1977 and 1981, had eight-bit microprocessors; the most recently introduced systems have 16-bit ones. Now 32-bit microprocessor chips are available, and soon they will be included in complete computer systems. As for dock frequency, the trend has been from one megahertz (one million cycles per second) a few years ago to 10 megahertz or more today.

## BIG PROBLEMS REQUIRE BIG COMPUTERS

The expanding role of the macro computer is due to the ever-increasing number of applications that transcend the capabilities of micros and minis. Certain real time problems—such as the preparation, launch, and guidance of a space vehicle or satellite, for example, require millions of calculations for each external stimulus, with response time of only one or two seconds at the most. The large on-line databases required to solve such problems and the interdependent nature of the calculations can be handled only by the huge memory capacities and high throughputs of large-scale computers.

Other problems are so complicated that millions of bytes of high-speed storage are necessary to fully describe them and solve them in time for the answers to be useful. A weather-prediction model and other complex simulations are cases in point.

For example, if weather prediction is to be possible, countless factors such as wind currents, solar effects, and even planetary configurations must be calculated, correlated, and simulated.

Similar problems are involved in the mapping of ocean processes, and probing out of new energy sources.

Large-scale computers are necessary to do the complex processing necessary to create intricate electronic and photographic image from the coded data sent by space craft and satellites.

In the realm of pure science macro computers may one day be used to model and bring some order to the incredibly complex realm of subatomic particles.

Some complex problems can be split into pieces and handled by several independent small computers or by a network of interconnected small computers. But when a multiplicity of operations must be accomplished simultaneously and/or where a high degree of data integration is necessary, the only answer is a macro computer.

## MICROELECTRONICS IN DATA-PROCESSING

In many computer systems today a number of processors are connected together to form a distributed-processing network. Most commonly the network consists of a number of minicomputers, but mainframe computers and microcomputers can also be incorporated into it. Input-output ports and data-transmission hardware are considered an active part of the network only if they are able to process information. Parts of a task are distributed among the elements of the network. Each element works independently for some period of time, communicating as necessary with other elements.

Distributed-processing systems can be organized in several ways. A large distributed-processing system can be organized into a hierarchical structure. At the top of the hierarchy is asingle mainframe computer that communicates with processors in the network at a secondary level, which in turn can communicate with other processors on a tertiary level and so on. In a pure hierarchy the processors on any particular level cannot communicate directly with one another. Instead communications must be routed through the next higher level.

Alternatively a distributed-processing system can be organized into a peer structure. All the computers are on the same level and communicate with one another on an equal footing. Except for very small networks, however, it seldom happens that every element in the network can communicate with every other element. Instead the hierarchical structure and peer structure can be combined into a hybrid system in which the processors on a particular level can communicate with one another and with processors on the next higher level.

## SOFTWARE

The chips and other electronic elements and the various peripheral devices constitutes the computer's hardware. The hardware can do nothing by itself; it requires the array of programs, or instructions, collectively called software. The core of the software is an "operating system" that controls the computer's operations and manages the flow of information.

The operating system mediates between the machine and the human operator and between the machine and an "application" program that enables the computer to perform a specific task.

To understand the kind of tasks done by the operating system, consider the sequence of steps that must be taken to transfer a file of data from the primary memory to disk storage. It is first necessary to make certain there is enough space available on the disk to hold the entire file. Other files might have to be deleted in order to assemble enough continuous blank sectors. For the transfer itself sequential portions of the file must be called up from the primary memory and combined with "housekeeping" information to form a block of data that will exactly fill a sector. Each block must be assigned a sector address and transmitted to the disk. Numbers called checksums that allow errors in storage or transmission to be detected and sometimes corrected must be calculated. Finally, some record must be kept of where the file of information has been stored.

If all these tasks had to be done under the direct supervision of the user, the storage of information in a computer would not be worth the trouble. Actually the entire procedure can be handled by the operating system; the user merely issues a single command, such as "Save file". When the information in the file is needed again an analogous command (perhaps "Load file") begins a sequence of events in which the operating system recovers the file from the disk and restores it to the primary memory.

## MEMORY

Memory is the predominant computer subsystem. The ideal memory is inexpensive, small in size, and large in capacity. It consumes little power and operates at the same speed as computer logic. Today, such a memory is a concept rather than a reality. Therefore, to provide optimum storage capability, computer designers have partitioned storage into many memories serving specialized purposes.

Read-only memories (ROM), write optional memories (WOM), and associative memories can be used extensively in medium and large family members — particularly in establishment of system management. Associative memories can be used for compiling, job assignment, parallel processing, search operations, handling of priorities and interrupts, and recognition of I/O commands.

Programmable logic arrays can perform many of the executive processes currently performed by software and can be used to tailor a system to meet particular user needs. These arrays and associative memories can replace operating system programs and be used to establish logical system organization.

# LARGE SCALE INTEGRATION: MEMORIES

Three factors have contributed to the rapid development growth in the number of circuit elements per chip.

One factor is improvement in techniques for growing large single crystals of pure silicon. By increasing the diameter of the wafers—the discs of silicon on which chips are manufactured — more chips can be made at one time, reducing the unit cost.

Moreover, the quality of the material has also been improved, reducing the number of defects per wafer. This has the effect of increasing the maximum practical size of a chip because it reduces the probability that a defect will be found within a given area. The chip size for large-scale integrated circuits has grown from less than 10.000 square mils (thousandths of an inch) to 70.000.

A second factor is improvement in optical lithography, the process whereby all the patterns that make up a circuit are ultimately transferred to the surface of the silicon. By developing optical systems capable of resolving finer structures, the size of a typical transistor, as measured by the gate length, has been reduced from a few thousandths of an inch in 1965 to two microns today.

When assessing the future course of ICs, it is customary to project another order of magnitude in circuit performance through a continuing reduction in the feature size of the devices on chip.

However, at our current level of IC development we must face several pragmatic barriers that will require some degree of research creativity to overcome. For example, the chip complexity is extrapolated to 100,000,000 transistors per chip and beyond.

However, the latest models indicate that the power level of next-generation devices will be on the order of 10 mW. Thus, a chip of this extrapolated complexity with these devices would require 1000 watts of input power and a packaging system capable of dissipating such power. Since these small devices would operate at reduced supply voltages, the 1000 watts of input power would require currents on the order of 200 amperes and perhaps greater on a chip that should be less than one square inch in area. This set of conditions would apply only to a high-duty cycle and high-performance design and points out that important complexity/performance trade-offs must occur.

## UKRAINE

Ukraine is situated in the south-west of the former USSR and covers the area of 603,700 square kilometres. The geographical position of Ukraine is very favourable to the development of its relations with countries of Europe, as well as with the countries throughout the world. It borders on Russia, Byelorussia, Moldova, Poland, Czech, Slovakia, Hungary, Rumania. It is washed by the Black Sea and the sea of Azov and has very important ports. The major part of the Ukrainian area is flat and only 5% of it is mountainous. The Ukrainian Carpathians and the Crimean Mountains are the most famous Ukrainian mountains and make up those 5%. The major rivers are the Dnieper, the Dniester, the Bug, the Donets and others.

It is a well developed industrial and agricultural country. Ukraine is rich in iron ore, coal, natural gas, oil, salt and other mineral resources. The country has a big metallurgical, machine-building, fuel and power base; it is the producer of chemical and agricultural raw materials. One of the most important branches of national economy is the power industry. Besides, Ukraine produces planes and ocean-liners, tractors and combines, excavators and cars, up-to-date instruments and equipment, electronic microscopes and TV sets, computers and synthetic diamonds.

Scientists of Ukraine enriched the world science with important discoveries and inventions. They contributed much to solving the main problems of automation of production processes and electric welding. The Academy of Sciences of Ukraine includes many outstanding scientists and research workers famous for their important research work. Our scientists created new improved machines and mechanisms, they do important research work in biology, medicine, nuclear physics.

Besides different branches of industry Ukraine has highly developed mechanized agriculture. There are many good arable lands in the country.

The population of Ukraine is over 55 million people. The representatives of many nationalities live there: the Ukrainians, Russians, Byelorussians, Moldavians, Poles and Bulgarians. It has a very rich and varied culture and history. There are a lot of higher educational establishments in Ukraine, a lot of professional theatres and Phylarmonic Societies, public libraries and state museums. Ukrainian books are exported to more than 100 countries of the world. Nowadays people of Ukraine display a keen interest in Ukrainian history and cultural heritage. Many masterpieces of Ukrainian culture have been revived.

Ukraine is a member of the United Nation Organization and takes part in the work of many international organizations. It is visited by delegations, groups of specialists, art companies, sport teams and tourists from different countries of the world and establishes new contacts with these countries.

## AT THE MAP OF UKRAINE

The independence of Ukraine was proclaimed on the 24-th,of August, 1991. Now it is a sovereign state.

The territory of Ukraine extends 900 km from north to south and 1,300 km from east to west. The total area of Ukraine is 603,700 sq. km. Its population equals 52 million people.

In the west Ukraine borders on Poland, Czech, Slovakia, Hungary and Romania. It also borders on Russia, Byelorussia and Moldova. In the north of Ukraine there are forests, in the west — the Carpathian mountains, in the eastern and central Ukraine — black-soil steppelands. In the south Ukraine is washed by the Black Sea and the Sea of Azov.

So we can admire picturesque slopes of the green Car-pathians and the Crimean hills, the green forests of Poltava, Chernigiv and Kyiv, the endless steppes of Kherson, Mikolaiyv and Odessa. It is really the land of woods, lakes and rivers. Typical representatives of the Ukrainian fauna are hare, fox, squirrel, bear, wolf, goat. Among the trees growing in the Ukrainian territory are birch, pine, oak, fir-tree. The Carpathians are covered with forest, but there are meadows here which are called as "polonyna". The highest point of the Ukrainian Carpathians is Goverla. The Crimean Mountains stretch for about 150 km along the coast of the Black Sea. The highest point of them is the Mountain Roman-Kosh — 1445 m above sea level.

The main territory of Ukraine is flat, but 5% of it make up mountains. The major rivers are the Dnieper River, the Dniester, the Bug, the Donets and others.

The Ukraine's main minerals are iron manganese, lead-and-zink and titanium ores, and coal. The iron-ore field at Kruvuy Rig produces a lot of iron ore. The Donetsk coal field is one of the largest in the country.

There is a series of electric power stations on the Dnieper River. Nuclear power engineering is being expanded. The lessons from the Chernobyl disaster are taken into account when new nuclear plants are being built.

Ukraine's industry includes metalmaking, mechanical engineering, precision-instrument manufacture, power engineering, chemical production, mining, construction, aircraft engineering and the automotive industry.

Ukraine is a producer of sugar beets and sunflower seeds, potatoes and other vegetables. The level of mechanization on cattle farms has exceeded lately. There are large-scale irrigation systems in the south.

So the geographical position of Ukraine is very favourable to the development of its industry and agriculture.

## FROM THE HISTORY OF UKRAINE

The history of Ukraine goes back to the remote past., The decision of reunification with Russian state was adopted at Zemsky Sobor at the end of

1653, and it was ratified in 1654 at the historical Pereyaslav Rada. The reunification of the western parts of Ukraine took place in 1939.

The Ukrainian state existed in 1918 — 1921 and its first President was the famous Ukrainian scientist Mukhailo Gru-shevsky. When the revolution won a victory, Ukraine became the socialist republic.

The Ukrainian people suffered greatly during the Great Patriotic War. On September 21, 1941, following the orders of General Head-quarters, our troops withdrew to the left bank of the Dnieper and the enemy gained control of its capital, Kyiv. The fascists destroyed its buildings and monuments and ruthlessly exterminated the population. The enemy destroyed all the railway bridges across the Dnieper, burned down the University, the whole blocks of flats were reduced to ashes. Kreshchatic, the main thoroughfare of Kyiv, lay in ruins. But the Ukrainian people began their war of resistance and did not give in. At the beginning of November 1943 the troops of the First Ukrainian Front launched a gigantic offensive near Kyiv and on the 6-th of November the enemy was driven out of the Ukrainian capital. 4 million and a half of the Ukrainian people were killed, more than 2 million were taken to Germany as slaves.

In 1985 the period of "Perestroika" began and in August 1991 putch took place. Ukraine and other republics proclaimed their independence. And the 24-th of August 1991 is observed as the national Ukrainian holiday of independence; 90% of the people voted for the independence of Ukraine.

The first President of Ukraine was Leonid Kravchuk. *In* 1994 Ukrainian people elected a new President, Leonid Kuchma and deputies to the 450-member legislature, the Verhovna Rada.

Many states of the world acknowledge the independence of Ukraine. It is a sovereign state which establishes new relations with the countries throughout the world.

## NATIONAL FLAG OF UKRAINE
## NATIONAL EMBLEM OF UKRAINE

The combination of the blue and yellow colours — "Ukrainian colours" — reaches far back into pre-christian times. These colours predominated on the flags of the medieval Kyivan State and were prominent during the Cossack age.

First accepted as the national Ukrainian flag by the Supreme Ukrainian Council in Lviv in 1848, the blue-and-yellcw flag met with popular approval in all parts of Ukraine at the beginning of the 20-th century.

On 22 March 1918 the blue-and-yellow flag was ratified as the national flag of the independent Ukrainian National Republic, and with the unification of all Ukrainian lands in 1919, it became the only Ukrainian flag. With the Indent, the blue-and-yellow flag for many years symbolized the aspirations of the Ukrainian people for independence.

Following the declaration of independence, the blue-and-yellow flag was adopted as the national flag of Ukraine by an Act of Parliament on on the 28-th of January, 1992.

The trident is an ancient symbol of the Ukrainian people, dating back to more than 3000 years. In the loth century it became the dynastic coat of arms of the Kyivan princes, including Volodymyr the Great and Yaroslav the Wise.

With tile restoration of Ukrainian independence, the trident was adopted as the official emblem of the Ukrainian National Republic in 1918.

The trident together with the blue-and-yellow flag have served for many generations as the symbol of the Ukrainian struggle for independence.

By an Act of Parliament on the 19-th of February, 1992, the trident once again became the national emblem of Ukraine, symbolizing the united historical development of the Ukrainian people.

## THE POLITICAL SYSTEM OF UKRAINE

On the 24-th of August, 1991 Ukraine became an independent state. On the 1-st of December the everlasting dream of the Ukrainian people came true; 90% of the people voted for the independence of Ukraine and since that time the Ukrainian people had became the masters of their own destiny.

The Ukrainian political system has a popularly elected President, a 450-person single-chamber national Parliament — the Verkhovna Rada. The yellow and blue flag is hoisted over it

A Prime Minister is nominated by the President and is a subject to approval by the Verkhovna Rada. The Constitution has been modified by a multiparty system.

The first President of the country became Leonid Kravchuk. In 1994 Ukrainian people elected a new President, Leonid Kuchma and deputies to the 450-member legislature. Voting, which is not compulsory, is by secret ballot and from the age of 18,. The candidate polling the largest number of votes in a constituency is elected. Though Ukraine has a wealth of political parties, ranging from unreconstructed communities to far-right nationalities, personal and regional loyalties tend to play larger role in the Ukrainian political life than programmatic parties. A key challenge facing Ukraine is the establishment of effective, democratic governing institutions that strike a balance between executive and legislative authority.

Ukraine is divided into 24 regions, each of which has an elected council whose Chairman (elected at large) also serves as head of the executive branch. The status of the autonomous Republic of Crimea is being redefined. In March, 1995, the central government suspended the Crimean constitution following a year of political instability caused in past by attempts of local politicians to develop a foreign policy independent of Kyiv.

## THE UNITED STATES OF AMERICA

The United States of America is one of the largest countries in the world. It is the most powerful and highly developed country of the world. The USA is situated in the central part of the North American Continent. Its western coast is washed by the Pacific Ocean and eastern one by the Atlantic Ocean and the Gulf Stream. The USA is separated from Canada in the north by the 49-th parallel and the Great Lakes, and from Mexico in the South by a line following The Rio Grande River and continuing across the highlands to the Pacific Ocean.

The total area of the USA is over 9 million square kilometres- The USA consists of three separate parts. They are the Hawaiian Islands, situated in central part of the Pacific Ocean, Alaska, separated by the Canadian territory and the rest major part of the USA.

The Great Rocky mountains run north and south. Some of them form a divide between rivers that flow westward and those that flow towards the Atlantic or the Gulf of Mexico. The continental part of the USA consists of the highland regions and two lowland regions. The highland regions are the Appalachian mountains in the east and the Cordillera in the west. The lowlands are situated between the Cordillera and the Appalachian mountains and are usually called the prairie. Eastern lowlands are called Mississippi valley.

The main rivers of the USA are the Mississippi, the longest river in the world, and the Hudson river.

The population of the US is about 250 million people. The USA is a highly developed industrial country. It has a highly developed motor-car industry which is concentrated in and around Detroit. Electric and electronic engineering, transport, communication, ship-building, textile industry are very powerful. Ship-building is developed along the Atlantic coast and in San Francisco. The textile industry is to be found in the north-east and in the south of the country. There are coal-mines in the Cordillera Mountains and the Kansas City region. Iron is mined near the Great Lakes.

The rich oil fields are in California, Texas and some other regions.

The capital of the United States is Washington, Among other big cities and towns are New York, San Francisco, Chicago, Los Angeles and others.

The USA has a highly developed railway system, and also has the best network of roads in the world.

The USA is a federation of states. It consists of 50 states and the district of Columbia. The President is the head of the government, he is elected for four years. The US Congress consists of two Houses — the Senate and the House of

Representatives. The head of the Senate is the Vice-President, the head of the House of Representatives is the Speaker. The Republican and the Democratic Parties are the main parties in the country. At the election time they contest presidency and the majority of seats in the Congres

## AT THE MAP OF THE USA

The vast and varied expanse of the United States of America stretches from the heavily industrialized, metropolitan Atlantic seaboard, across the rich flat farms of the central plains, over the majestic Rocky Mountains to the fertile densely populated west coast, then halfway across the Pacific Ocean to the semi-tropical island-state of Hawaii. The area of the United States is about 9,400,000 square kilometres. It is twice as large as all the countries of Europe.

The USA is advantageously placed in the middle of North American Continent in the temperate zone between the latitude 25° and 49° North.

The United States is the land of bountiful rivers and lakes. The broad Mississippi River which is of great historic and economic importance to the United States runs 5,969km from Canada into the Gulf of Mexico — the world's third longest river after the Nile and the Amazon. A canal south of Chicago joins one of the tributaries of the Mississippi to the five Great Lakes..— making it the world's largest inland water transportation route and the biggest body of fresh water in the world. The St. Laurence Seaway, which the United States shares with Canada, connects the Great Lakes with the Atlantic Ocean.

The USA is washed by the Atlantic Ocean in the East, the Pacific Ocean in the West and the Gulf of Mexico in the South. Across the eastern part of the country from north to south extend the Appalachians, a group of low and much denuded mountains. Between the Appalachians and the Atlantic ocean lie the coastal low-lands, the northeastern coast-line is indented and contains a number of bays. The lowlands continue southward into the Peninsula of Florida.

Across the western part of the USA extend the Cordilleras, a young mountain system consisting of the number of lofty ranges. The highest peak is Witney, 4,418 m high.

Between the Rocky Mountains and the Sierra Nevada there are the Great Basin plateau and others. They are crossed by Colorado and Columbia rivers that cut deep canyons.

The Valley of California lies along the Pacific coast. the climate here is subtropical.

The Great Lakes in the north-east of the country play an important role as the biggest intercountry water basin. The Huron, Erie, Michigan, Ontario are navigable, the length of shipping lines being 1,800 km.

## BIG CITIES OF THE UNITED STATES OF AMERICA

The United States of America is one of the largest countries in the world. There are many big cities and towns in it. New York, San Francisco, Washington, Chicago, Los Angeles are the biggest ones.

For hundred years New York has been the nation's leading financial and commercial centre and its leading port of entry. It is also the centre of fashion, theatre, music and culture.

New York is a city of islands consisting primarily of two islands (Manhattan and Staten), part of third island (Long Islands) and part of the mainland. It is situated at the junction of the Hudson and East Rivers with New York Bay, an arm of the Atlantic Ocean.

The total area of New York City is 319,8 square miles. The extreme length of the city from north to south is 36 miles, and its extreme breadth is 16,5 miles. New York has a humid climate with sudden changes of weather.

New York City consists of five boroughs: the Bronx, Brooklyn, Manhattan, Queens and Richmond.

The most important industries are manufacturing, printing, publishing, food, chemical and primary metal industries.

New York City has long been a major transportation centre. Its harbour is one of the largest of the world's ports.

New York is a city of banks. Wall Street is the financial heart of the city. The New York Stock exchange is located at 11 Wall Street.

The new cultural centre in the city is the Lincoln Centre for the performing Arts, which was built in the 1960s.

Los Angeles is the largest city on the west coast with a population of three million and an area of 480 square miles.

It was created in 1781 by the Gokecnor in Spanish — The Town of Lady, the Queen of Angels — Los Angeles. Later, with the arrival of two railways, the city began to grow. Trainload after trainload of people arrived, the population grew from 12,000 to 50,000 in two years and Los Angeles was on its way to becoming the great and still growing city of today. Points of interest are far apart in Los Angeles.

## THE POLITICAL SYSTEM OF THE USA

There are now 50 states in the USA. Under the Constitution, the states delegated by many of their sovereign powers to the central government in Washington. But they kept many important powers for themselves. Each of the states, for example, retains the right to run its own public school system, to decide on the qualifications of its voters, to license its doctors and other professionals, to provide police protection for its citizens and to maintain its roads.

Under the Constitution, the federal government is divided into three branches, each chosen in a different manner, each able to check and balance the others.

The Executive Branch is headed by the President, who, together with the Vice President, is chosen in nationwide elections every four years. Americans vote for the states of professional electors equal to the number of Senators and Representatives each state has in Congress (a total of 535 persons). The candidate with the highest number of votes in each state wins all the electoral votes of that state. The presidential candidate needs 270 electoral votes. Any natural-born American who is 35 years old or older may be elected to this office. The President proposes bills to Congress, enforces federal laws, serves as Commander-in-Chief of the Armed Forces and, with the approval of the Senate makes treaties and appoints federal judges, ambassadors and other members of the Executive Departments. Each Cabinet head holds the title of Secretary and together they form a council called the Cabinet.

The Vice President, elected from the same political party as the President, acts as chairman of the Senate.

The Legislative Branch is made up of two houses: the Senate and the House of Representatives. The 435 seats in the House of Representatives are allocated on the basis of population, although every state has at least one representative. Each state elects two members of the 100-member Senate, a Senator's term of office is six years.

Both two Houses must approve a bill for it to become law, but the President may veto or refuse to sign it. If so, Congress reconsiders the bill. If two-thirds of the members of both houses then approve it, the bill becomes law even without the President's signature.

The Judicial Branch is made up of Federal District Court, 11 Federal Courts of Appeals and, at the top, the Supreme Court.

In order to amend the Constitution, Congress must pass the proposed amendments by a two-third majority vote in each House, and three-fourths of the states must concur.

## THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

The United Kingdom is situated on the British Isles. The British Isles consist of two large islands. Great Britain and Ireland, and a great number of small islands. Their total area is over 244,000 square kilometres.

The British Isles are separated from European continent by the North Sea and the English Channel. The western coast of Great Britain is washed by the Atlantic Ocean and the Irish Sea.

Northern Ireland occupies one third of the island of Ireland. It borders on the Irish Republic in the south.

The'island of Great Britain consists of three main parts:

England (the southern and middle part of the island), Wales (a mountainous peninsula in the west) and Scotland (the northern part of the island).

There are no high mountains in Great Britain. In the north the Cheviots (the Cheviot Hills) separate England from Scotland, the Pennines stretch down North England almost along its middle, the Chambrian mountains occupy the greater part of Wales, and the Highlands of Scotland are the tallest of the British mountains. Ben Nevis, the tallest peak of the Highlands, is only 1,343 metres high.

Most of the rivers flow into the North Sea. The Thames is the deepest and longest of the British rivers, it is over 300 kilometres long. Some of the British greatest ports are situated in the estuaries of the Thames, Mersey, Tyne, Clyde and Bristol Avon.

Great Britain is not very much rich in mineral resources, it has some deposits of coal and iron ore and vast deposits of oil and gas that were discovered in the North Sea.

The warm currents of the Atlantic ocean influence the climate of Great Britain.

The population of the United Kingdom is over 56 million people. The main nationalities are: English, Welsh, Scottish and Irish. Great Britain is a highly developed industrial country. Ship-building, coal-mining, metallurgical and textile industries are the older fields of industry. The newer ones are aircraft, automobile, chemical industries, electronic engineering. The main industrial centres are London, Birmingham, Glasgow, Manchester, Liverpool, Edinburgh and Cardiff.

The capital of Great Britain is London. Oxford and Cambridge are called

University towns.

Administratively Great Britain is divided into 55 counties.

The United Kingdom is a parliamentary monarchy. The Queen is formally the head of the state, but in fact the country is ruled by the Parliament. The parliament consists of two Houses: the House of Commons and the House of Lords. The prime minister is the head of the government.

## AT THE MAP OF GREAT BRITAIN

The British Isles consist of two main islands: Great Brit-am and Ireland. The United Kingdom of Great Britain and Northern Ireland includes these two islands, over five hundred small islands and Northern Ireland. Its total area is about 94,250 square miles. Great Britain consists of England, Wales and Scotland. The southern part of the isle Ireland is the Republic of Eire.

Britain is comparatively small country, but it has a great variety of scenery. In Scotland there are wild desolate mountains. It is the most northern of the British countries. Scotland occupies the area of 78,8 thousand square km. With England lying to the south it is bounded on the north west by the Atlantic Ocean, and on the east by the North Sea. The mainland of Scotland can be divided into such regions: the Highlands, the Central Lowlands and the Southern Uplands. The mountains and the rocks of the Highlands stand out in defiance of frost, rain and wind as the highest mountains in the British Isles that had taken their present shape in the Great Ice Age. Their average height does not exceed 457 metres above sea level. The Southern Uplands seldom rise over 579 metres above sea level.

In England and Wales all the high land is in the west and north-west. The south-eastern plain reaches the west coast only at one or two places — at the Bristol Channel and by the mouths of the river Dee and Mersey.

hi the north there are the Cheviots separating England from Scotland, the Pennines going down England like a backbone and the Cumbrian mountains of the Lake District, to the west are the Cambrian mountains which occupy the greater part of Wales.

The south-eastern part of England is the low-lying land with gentle hills and a coast which is regular in outline.

The position of the mountains naturally determined the direction and length of the rivers, and the longest rivers, except the Severn and Clyde, flow into the North Sea, and even the Severn flows eastward or south-east for the greater part of its length, hi the estuaries of the Thames, Mersey, Tyne, Clyde, Tay, Bristol Avon are some of the greatest ports in Great Britain.

Almost all the area of Northern Ireland is a plain of volcanic origin deepening in the centre to form the largest lake of the British Isles, Lough Neagh. The landscape is hilly, the mountains are not very high and are mostly situated on the fringe of the plateau. The coastline of Northern Ireland is rugged with rocks and cliffs, it is indented by gulfs and bays.

## FROM THE HISTORY OF GREAT BRITAIN

When Roman troops conquered southeast of England in summer of AD 43, the Emperor Claudius and his processional elephants crossed the Thames at the site of London, building their wooden bridge (as archaeologists established in 1981) close to the present London Bridge, opened in 1973. They called their port Londinium, and it became the capital of Britain. The Romans enclosed it in a wall (the Roman wall), first definite boundary, which was built about the year 200, and its fragments may still be seen.

London stands on the River Thames which has played a big role in the history of the city. Because of the river it developed into a major port and trading centre and it was by way of the river. That various invaders sailed to the site on which present-day London stands — the Romans, the Ougles, the Saxons, and the Normans.

When the Normans began invading England in 1066, they built a castle by the river — the Tower of London — to keep Londoners under control.

The conquest of England by the Normans began in 1066 with the battle of Hastings, where the English fought against the Normans. The conquest was complete in 1071.

Who were the Normans who conquered England? Some 150 years before the conquest of England they came to a part of France, opposite England, a part which we now call Normandy.

There they adopted the Christian faith, the French language and the Roman law of their new home in France. So they became French. The Normans brought to England the French language. After the Norman conquest there were three languages in England. There was Latin (the language of church and the language in which all learned men wrote and spoke), then there was French (the language which the kings and nobles spoke and which many people wrote), and finally, there was the English language which remained the language of the masses of the people.

So it is obvious that the role of the Norman Conquest was also great for the development of feudalism and absolute monarchy in Britain.

## THE POLITICAL SYSTEM OF GREAT BRITAIN

Britain is a parliamentary democracy with a constitutional monarch — Queen Elizabeth n — as head of state.

Political stability owes much to the monarchy. Its continuity has been interrupted only once (the republic of 1649-1660) in over a thousand years. The Queen is impartial and acts on the advice of her ministers.

Parliament comprises the House of Commons, the House of Lords and the Queen in her constitutional role. The House of Commons has 650 elected Members of Parliament, each representing a local constituency. The Lords is made up of hereditary peers and peeresses, and two archbishops and 24 most senior bishops of the established Church of England, The centre of parliamentary power is the House of Commons. Limitations on the power of the Lords — it rarely uses its power to delay passage of a law — are based on the principle that the House is a revising chamber should complement the Commons and not rival it.

General elections to choose Members of Parliament must be held at least every five years. Voting, which is not compulsory, is by secret ballot and is from the age of 18. The candidate polling the largest number of votes in a constituency is elected. The main British parties are the Conservative Party; the Liberal Party, the Social Democratic Party, the Labor Party.

The Government is formed by the party with majority support in the Commons. The Queen appoints its leader as the Prime Minister. As head of the Government the Prime Minister appoints ministers. Ministers are collectively responsible for government decisions and individually responsible for their own departments. The second largest party forms the official Opposition, with its own leader and "shadow cabinet". The Opposition has a duty to criticize government policies and to present an alternative programme.

Elected local authorities provide housing, education, personal social services, police and fire brigades.

Much legislation applies throughout Britain, England and Wales. Scotland and Northern Ireland, however, have their own legal systems with differences in law and practice. The proceeds from serious crime such as drug trafficking, robbery and fraud may be confiscated by the courts. Law enforcement is carried out by 52 locally based police forces.

## INTEGRATED CIRCUIT DEVELOPMENT

Three factors have contributed to the rapid development growth in the number of circuit elements per chip.

One factor is improvement in techniques for growing large single crystals of pure silicon. By increasing the diameter of the wafers—the discs of silicon on which chips are manufactured — more chips can be made at one time, reducing the unit cost.

Moreover, the quality of the material has also been improved, reducing the number of defects per wafer. This has the effect of increasing the maximum practical size of a chip because it reduces the probability that a defect will be found within a given area. The chip size for large-scale integrated circuits has grown from less than 10.000 square mils (thousandths of an inch) to 70.000.

A second factor is improvement in optical lithography, the process whereby all the patterns that make up a circuit are ultimately transferred to the surface of the silicon. By developing optical systems capable of resolving finer structures, the size of a typical transistor, as measured by the gate length, has been reduced from a few thousandths of an inch in 1965 to two microns today.

Finally refinements in circuit structure that make more efficient use of silicon area have led to a hundredfold increase in the density of transistors on the chip.

## THE FUTURE OF ICS

When assessing the future course of ICs, it is customary to project another order of magnitude in circuit performance through a continuing reduction in the feature size of the devices on chip.

However, at our current level of 1C development we must face several pragmatic barriers that will require some degree of research creativity to overcome. For example, the chip complexity is extrapolated to 100,000,000 transistors per chip and beyond.

However, the latest models indicate that the power level of next-generation devices will be on the order of 10 mW. Thus, a chip of this extrapolated complexity with these devices would require 1000 watts of input power and a packaging system capable of dissipating such power. Since these small devices would operate at reduced supply voltages, the 1000 watts of input power would require currents on the order of 200 amperes and perhaps greater on a chip that should be less than one square inch in area. This set of conditions would apply only to a high-duty cycle and high-performance design and points out that important complexity/performance trade-offs must occur.

PROMs, and PIAs are non-volatile, but cannot be writterion during normal operation.

A number of new memory types have recently appeared. We can expect corelike RAMs to become available in the near future.

RAMs, being used for temporary data storage, are good "scratch pads" for digital devices; they are used as computer memories for the full range of computer sizes, often in a mixture of ROM, RAM, and core memory.

ROMs and PROMs are used for permanent storage, such as the programs in microcomputers, and start-up programs in larger machines. They are also used to sequence sequential machines from one state to the next, and they are very useful for data conversion, table lookup (trigonometric tables, for example), and generation of complex logical functions. A FROM is used to test a new memory content: if it is correct, a ROM is manufactured with the same content if the number of devices or speed requirements (ROMs are faster) justify the expense; PROMs are used for slower devices produced in smaller quantities.

## CACHE MEMORY

A cache memory is a small, high-speed system memory that fits between the CPU and the main memory. It accesses copies of the most frequently used main-memory data. When the CPU tries to read data from the main memory, the cache memory will respond first if it has a copy of the requested data. If it doesn't, a normal main-memory cycle will occur.

Cache memories are effective because computer programs spend most of their memory cycles accessing a very small part of

the memory

A cache memory cell has three components: an address memory cell, an address comparator and a data memory cell. The data and address memory cells together record one word of cached data and its corresponding address in main memory. The address comparator checks the address cell contents against the address on the memory address bus. If they match, the contents of the data are placed on the data bus.

An ideal cache memory would have many cache memory cells, each holding a copy of the most frequently used main-memory data. This type of cache memory is called fully associative because access to the data in each memory cell in through the data's associated, stored address.

Not all locations in the memory address space should be cached. Hardware I/O address shouldn't be cached because bits in an I/O register can and must change at any time, and a cache copy of an earlier I/O state may not be valid.

## My native town

I'd like to tell you about my native town. There is a proverb: " East or West - Home is Best". When we say "home" we mean not only our house, our apartment, street, family, we mean our town too.

I think there are places and things we always long to come back to and my native town is the very place I always miss when I am far away. I like my town very much and no wonder I mink Vinnitsa is one of the best towns in the world. I am sure to be born in Vinnitsa is "to be born with a silver spoon in the mouth".

The foundation of our town was laid in the 14th century. It began its life as a fortress on the left bank of the river Southern Bug. Our town ifs full of historical remains. Nearly every street and stone has its own history. In Vinnitsa past and present are so mixed mat it is very difficult to separate them.

In 1362 the land, weakened by the tatar-mongol invasion (raids), was captured by Lithuanian Princes Koriatovichs and they founded our town. The first settlement was surrounded by a moat (кріпосний рів) with a bridge across it. In the 16th century a new fortification appeared on the island of Kempe. The town began to grow and spread to the right bank of the river. This part of Vinnitsa was called "the Centre" and the part on the left bank got the name of "the Old Town".

In 1569 the Polish gentry expanded its influence on the mayor part of Ukraine. The started building Roman-Catholic churches and monasteries. Remain of such a building can still be found in the town, the so called "Mury". In the 19th century Vinnitsa became the centre of craft and trade. In 1871 its population was more than 30 thousand people.

Now Vinnitsa is one of the most important industrial and cultural centres of Ukraine with a population of more than 400th people.

It is very beautiful in spring when nature awakens from its long winter sleep, the trees are filled with new life, the grass is beginning to shoot and everything looks fresh and transparent. I can't help admiring my town and its wondrous scenery.

As I've already mentioned our town is ancient and modem at the same time: the great and small live in mutual respect.

One of the distinctive features of our town is its people who create its beauty and power. The everyday life of our town is very busy and complicated but the citizens of Vinnitsa try to make our town more beautiful and prosperous. Numerous factories and plants of our town produce up-to-date instruments, TV-sets, synthetic diamonds, washing powder, soap. ball-bearings, and foodstuff.

People say that Vinnitsa is a real pearl in Ukrainian crown.

It is famous for its places of interest. If you come to our town for the first time you'll have to keep late hours to see all the attractions of Vinnitsa.

First of all I advise you to visit the Natural History Museum and get acquainted with the historical background of Vinnitsa, leam about places and people whose activities have eamed fame to the country's science and culture. And Mykola Ivanovich Pyrogov was one of them.

Not far from Vinnitsa in the village of Pirogov there is a museum. It is there that the prominent surgeon spent the last 15 years of his life. The museum comprises his house, his private dispensary, an estate, covering an area of 16 hectars and a family vault in which Pirogov's embalmed body is preserved. Photographs, paintings, sculptures, manuscripts and other exhibits give a comprehensive idea of the life and work of the famous scientist.

M.I.Pirogov was one of the best representatives of mankind. When he settled in the village "Vishnya" he was already known all over the world. He could have spent the rest of his life in wealth enjoying the respect of his countrymen, but he could let no grass grow under his feet. He did his best to cure people and help them to keep fit. The museum was founded in 1947.It contains 5500 exhibits. The museum library has more then 9000 books and magazines, including Pirogov heritage.

As a tribute in the great scientist the Medical Institute, the street, the regional hospital are named after Pirogov. In 1991 a monument to the wonderful doctor was erected.

I am sure this museum is worth seeing. One more place I recommend you to visit is Kotsyubinsky Museum. We are proud that the prominent Ukrainian writer M. Kotsyubinsky was born and spent more that 33 years of his life in our town. The museum is situated in one of the side streets of Vinnitsa, surrounded by a majestic old orchard. The house where Kotsyubinsky was born is more than 180 years old. It belonged to Kotsyubinsky's grandfather Maxim Abaza. The museum was opened on the 8th of November 1927.The exposition of the museum is housed in 6 small rooms. The exhibits acquaint us with childhood and adolescence of M.Kotsyubinsky, the beginning of his literary career. His works "Fata Morgana", "Intermezzo", "Kharytya", "AFir-Tree", "awitch", "For the Good of Everyone" made him famous. To commemorate Kotsyubinsky's name one of the streets, the pedagogical University bear his name. In summer, if you take a boat trip down the river you'll be able to see a huge stone where Kotsyubinsky liked to spend his free time. It is called Kotsyubinsky's stone now.

It's nice to tour the streets of our town because it is full of historical remains. You'll see a number of Monuments to our famous countrymen. Tourists usually start their tour in Soborna Street. You can see the monument to Ivan Bevz, opening this street. I.Bevz was the director of Vinnitsa Drama Theatre, then he worked in the library, situated not far from Kotsyubinsky Museum. He took part in the resistant movement during the Great Patriotic War. He was at the head of Vinnitsa underground organization. Fascists arrested and killed him. He was awarded the honourable title of the " Hero of the Soviet Union".

Soborna Street is the central street in our town. It is a very buzy street because a lot of cars, buses, trolley buses run along it. It is the financial, buziness and cultural centre of our town. Vinnitsa cinemas, Drama Theatre are also in or close to this street.

Vinnitsa can be considered the centre of science as it has 4 Universities, one Academy, 36 schools and many Research Institutes.

I'd like to tell you about one of the oldest educational Institutions of our town - its Pedagogical University because I think there is no family in our town who has not met with its graduates.

# VOCABULARY

## A

| | |
|---|---|
| accessible | доступний; зручний |
| accessory | допоміжний; додатковий |
| accumulate | накопичувати; акумулювати; нарощувати |
| accuracy | точність; чіткість |
| actuator | датчик; перетворювач; силовий привід |
| adjustment | регулювання; установка; підгонка |
| advantage | перевага |
| advent | поява |
| aisle | проліт, прохід |
| albeit | хоч |
| amount | кількість, величина, сума |
| application | застосування; використання |
| arrival | поява |
| artificial | штучний |
| assembly | збирання; складання; монтаж |
| auxiliary | допоміжний; запасний |
| automation | автоматизація, автоматика |
| avoid | уникати |
| axis (pl axes) | вісь |

## B

| | |
|---|---|
| base | база |
| batch | серія; партія; група |
| bedrock | основа; базис |
| benefit | перевага; користь; благо |
| binary | двоїсний; бінарний |
| bit | біт; розряд |
| bottleneck | вузьке місце; перепона; перешкода |
| brain | мозок; обчислювальна машина |
| brazing | паяння |
| break | гальмо |
| breakthrough | досягнення; відкриття |

## C

| | |
|---|---|
| cell | комірка, елемент |
| check v | перевіряти; контролювати |

| | |
|---|---|
| chip | чіп; кристал |
| complicated | складний |
| comprehend | розуміти, охоплювати |
| countouring | нанесення контуру |
| convert | перетворювати |
| cost n | вартість; витрати |
| corollary | висновок; підсумок |
| couple v | з'єднувати; зв'язувати |
| crimping | гофрування |
| cumbersome | громіздкий; важкий |
| cursor | стрілка; вказівник |

## D

| | |
|---|---|
| damage n | шкода; пошкодження; збитки |
| data | дані |
| decision | рішення |
| definition | визначення |
| delete | усувати; стирати |
| delivery | подача; постачання |
| detect | виявляти |
| deviation | відхилення; девіація |
| device | прибор; пристрій |
| dimension | розмір; величина; об'єм |
| disadvantage | недолік |
| discern | розрізняти; бачити |
| distinction | відмінність; різниця |
| distinguish | розрізняти |
| doable | здійснимий |
| downtime | простій; час простою |
| drilling | буріння; сверління |
| drive n | привід |
| durability | тривала міцність; зносостійкість |

## E

| | |
|---|---|
| edge | край; грань; ребро |
| edit | редагувати |
| effector | ефектор; виконавчий елемент |
| eliminate | усувати; вилучати |
| embossing | тиснення; різьба |
| encoder | кодуючий пристрій; шифратор |

| | |
|---|---|
| encounter | збігатися; стикатися |
| environment | оточення |
| equipment | обладнання |
| error | помилка, огріх |
| estimate n | оцінка |
| evaluation | оцінка; обчислення; визначення |
| evolve | розвивати(ся) |
| exchange v | замінювати; обмінювати(ся) |
| execute | виконувати |
| expensive | дорогий; коштовний |
| experience | досвід |
| extraterrestrial | міжпланетний |
| extremely | надто; надзвичайно |

## F

| | |
|---|---|
| facility | пристрій; обладнання |
| fast | швидкий |
| fastener | кріплення |
| failure | несправність; збій; невдача |
| faulty | несправний; пошкоджений |
| feasibility | можливість; імовірність, здійснимість |
| feed v | уводити |
| flexible | гнучкий |
| flow | потік |
| fluctuation | коливання |
| fodder | їжа |
| friction | тертя |

## G

| | |
|---|---|
| generation | вироблення; виробництво, генерування |
| goal | ціль |
| goods | товари |
| grip per | захват; затиск |
| guidance | керування; керівництво |

## H

| | |
|---|---|
| halt v | зупиняти |
| handle v | обробляти; оперувати |
| handling | обробка |

| | |
|---|---|
| hardware | апаратура; апаратне обладнання |
| hazardous | небезпечний |
| hole | отвір; перфорація; пробивка |
| housing | покриття |

I

| | |
|---|---|
| identify | пізнавати; розпізнавати |
| image | зображення |
| impede | затримувати; ставити перепони |
| implication | залучення; включення |
| improvement | удосконалення; поліпшення |
| inadequate | недостатній |
| include | вмикати |
| input | уведення; вхідні, дані |
| install | встановлювати; монтувати |
| integration | інтеграція; об'єднання |
| interact | взаємодіяти; впливати |
| interchangeably | поперемінне; по черзі |
| intersection | перетинання; точка перетину |
| investigation | дослідження; вивчення |

J

| | |
|---|---|
| join | з'єднувати |
| jump | перехід, команда переходу |
| junction | з'єднання, перехід |
| just | тільки що; щойно |
| justification | оправдання |

K

| | |
|---|---|
| keyboard | комутаційна панель; клавіатура |
| kit | комплект; набір (інструменту) |

L

| | |
|---|---|
| life | термін служби |
| load | навантаження |
| low | низький |

## M

| | |
|---|---|
| machine tool | верстат |
| maintain | обслуговувати; ремонтувати |
| maintenance | технічне обслуговування і ремонт |
| malfunction | перебій; помилка |
| management | керування; керівництво |
| memory | пам'ять |
| message | сигнал; повідомлення |
| meter | лічильник; вимірювальний прилад |
| metering | вимірювання; збирання даних |
| mismatch | невідповідність |
| moisture | волога; вологість |
| monitor v | керувати |
| mount | встановлювати |

## N

| | |
|---|---|
| network | мережа; схема; ланцюг |

## O

| | |
|---|---|
| onerous | важкий; скрутний |
| overlap | збігатися |
| output | вивід вихідні дані |

## P

| | |
|---|---|
| path | шлях ; маршрут; траєкторія |
| penetration | проникнення; проникання |
| performance | характеристика; продуктивність |
| peripherals | периферійне (зовнішнє) обладнання |
| perpetuate | зберігати |
| plane | площина |
| playback | відтворення; зчитування |
| precise | точний; певний |
| precision | точність |
| process v | обробляти |
| productivity | продуктивність; доцільність |
| profitability | рентабельність; прибутковість |
| punch | пробивка; перфорація |
| purchase v | купувати; здобувати |

## Q

| | |
|---|---|
| quality | якість |

## R

| | |
|---|---|
| range | діапазон; область |
| rate | швидкість; міра ; коефіцієнт |
| recognition | пізнавання; упізнавання |
| reduce | скорочувати; знижувати |
| reliable | надійний |
| reliability | надійність |
| repair v | ремонтувати; виправляти |
| replace | заміняти |
| replacement | заміна; підстановка |
| resemble | нагадувати; бути схожим на |
| resolver | (лічильне) розв'язувальний пристрій |
| response n | відповідь; реакція |
| response v | відповідати; реагувати |
| roadblock | перешкода; перепона |
| rolling | Прокатка |
| rotate | обертатися |
| retrofit | модифікувати |
| routing | трасування; призначення тракту |

## S

| | |
|---|---|
| scan n | сканування, перегляд; пошук |
| scheduling | розподіл; складання |
| screen | екран; екранна сітка |
| screw | гвинт |
| sequencing | упорядкування; установлення |
| servomotor | сервомотор; серводвигун |
| servosystem | сервосистема; система автоматичного регулювання |
| shape | форма |
| share v | ділити(ся) |
| shorten | скорочувати |
| significant | важливий; значний |
| similarity | схожість; подібність |
| simulate | моделювати; імітувати |
| skill | уміння |
| sluggish | інертний |

| | |
|---|---|
| software | програмне забезпечення |
| soldering | паяння |
| solution | рішення |
| sophisticated | складний |
| sound | звук |
| specification | визначення; інструкція |
| speed up | прискорювати |
| spindle | шпиндель; вісь; стержень |
| spray | розпиляти; розпилювати |
| stamping | штамповка |
| steering | керування |
| store v | зберігати |
| straightforward | простий |
| supervise | спостерігати; контролювати; керувати |
| supplier | постачальник |

## T

| | |
|---|---|
| tactile | відчутний; помітний |
| tally v | відповідати; реєструвати |
| tangible | відчутний; реальний |
| tapping | нарізка різьби мітчиком |
| technique | метод; технологія; обладнання |
| tolerance | допуск канал; |
| track | доріжка; перфорація |
| transponder | перетворювач безперервних даних у цифрові |
| trimming | підгонка |
| trouble-shooting | відшукування неполадок (пошкоджень) |
| turn n | поворот; обертання |

## U

| | |
|---|---|
| underestimate | недооцінювати |
| undergo v | піддаватися |
| upper | верхній |
| unit n | пристрій |
| user | користувач |
| utilization | використання |

## V

| | |
|---|---|
| value | значення; величина; оцінка |
| velocity | швидкість |

| | |
|---|---|
| vendor | продавець |
| verify | контролювати; перевіряти |
| versatile | різноманітний; універсальний |
| vision | бачення; зір |

## W

| | |
|---|---|
| wear | знос; спрацювання |
| welding | зварювання; зварка |
| winding | намотка; намотування |
| workpiece | оброблюваний виріб |
| worn-out | зношений; відпрацьований |

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