**ГУМАНІТАРНИЙ ФАКУЛЬТЕТ**

**Кафедра „Іноземні мови”**

# МЕТОДИЧНІ ВКАЗІВКИ

**з розвитку навичок різних видів**
**професійно орієнтованого читання за темою**

**“*АВТОМАТИКА, ТЕЛЕМЕХАНІКА ТА ЗВ’ЯЗОК*”**

**для студентів 2 курсу факультету АТЗ**

**(англійська мова)**

**Харків - 2011**

Методичні вказівки розглянуто та рекомендовано до друку на засіданні кафедри “Іноземні мови” 29 січня 2010 р.,

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Видання підготовлено відповідно до програми навчальної дисципліни і є складовою частиною навчально-методичного комплексу дисципліни “Англійська мова”.

Дані методичні вказівки мають комунікативну спрямованість навчання іноземним мовам і стимулюють ефективне оволодіння іноземною мовою.

Тексти доступні за своїм лексичним наповненням, до текстів додаються словники, що полегшує роботу студентам.

Вправи забезпечують розширення лексичного словника, а також засвоєння граматики. Все це дає можливість проводити різноманітні види робіт, які сприяють формуванню та закріпленню у студентів мовних навичок та вмінь.

Дані методичні вказівки спрямовані для роботи з текстами для студентів 2 курсу факультету АТЗ.

Укладачі:

старші викладачі О.В. Плотнікова,
В.М. Михайленко

Рецензент:

доц. С.І. Нешко

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Відповідальний за випуск Михайленко В.М.

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**УКРАЇНСЬКА ДЕРЖАВНА АКАДЕМІЯ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ**

ГУМАНІТАРНИЙ ФАКУЛЬТЕТ

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**TEXT 1**

## From the History of Electronic Technology

The evolution of electronic technology is sometimes called a revolution. What we have seen has been a steady quantitative evolution: smaller and smaller electronic components performing increasingly complex electronic functions at ever higher speeds. And yet there has been a true revolution: a quantitative change in technology has given rise to qualitative change in human capabilities.

Before the development of the general-purpose computer, most calculations were done by humans. Tools to help humans calculate are generally called calculators. Calculators continue to develop, but computers add the critical element of conditional response, allowing automation of both numerical calculation and in general, automation of many symbol-manipulation tasks. Computer technology has undergone profound changes every decade since the 1940s.

It all began with the development of the transistor. Prior to the invention of the transistor its function in an electronic circuit could be performed only by a vacuum tube. Tubes came in so many shapes and sizes and performed so many functions that in 1947 it seemed audacious to think that the transistor would be able to compete in limited applications.

The transistor was invented in 1947 by three American physicists at the Bell Telephone Laboratories. On December 16, 1947, they built the point-contact transistor, made from strips of gold foil on a plastic triangle, pushed down into contact with a slab of germanium.

The invention got little attention at the time, either in the popular press or in industry. The transistor proved to be a viable alternative to the vacuum tube. Transistors played a pivotal role in the advancement of electronics - their small size, low heat generation, and small power requirements made possible the miniaturization of complex circuitry such as required by computers. They promised greater reliability and longer life.

Early transistors, which were often described as being a size of a

pea, were actually enormous on the scale at which electronic events take place, and therefore they were very slow. They could respond at a rate of a few million times a second, this was fast enough to serve radio but far below the speed needed for high-speed computers or for microwave communication systems.

And it took years to demonstrate transistors advantages. Only during 1960s and 1970s individual transistors were superseded by integrated circuits in which a multiple of transistors and other components (diodes, resistors, etc.) were formed on a single tiny wafer of semi conducting material.

At first, the computer was not high on the list of potential applications for this tiny device. This is not surprising—when the first computers were built in the 1940s and 1950s, few scientists saw in them the seeds of a technology that would in a few decades come to permeate almost every sphere of human life. Before the digital explosion, transistors were a vital part of improvements in existing analogue systems, such as radios and stereos.

When it was placed in computers, however, the transistor became an integral part of the technology boom. They are also capable of being mass-produced by the millions on a sliver of silicon—the semiconductor chip. It is this almost boundless ability to integrate transistors onto chips that has fueled the information age. Today these chips are not just a part of computers. They are also important in devices as diverse as video cameras, cellular phones, copy machines, jumbo jets, modern automobiles, manufacturing equipment, electronic scoreboards, and video games. Without the transistor there would be no Internet and no space travel.

In the years following its creation, the transistor gradually replaced the bulky, fragile vacuum tubes that had been used to amplify and switch signals. The transistor became the building block for all modern electronics and the foundation for microchip and computer technology.

The second performance benefit resulting from microelectronics

stems directly from the reduction of distances between circuit components. If a circuit is to operate a few billion times a second the conductors that tie circuit together must be measured in fractions of an inch. The microelectronics technology makes close coupling attainable. New principal devices found in electronic circuits: resistors, capacitors, diodes and transistors have a particular role in controlling the flow of electrons so that the completed circuit performs some desired function.

**Exercise 1**
**Memorize the following expressions from the text**

**vacuum tube** - електронна лампа,
**semi conducting material** - напівпроводниковий матеріал,
**tiny device** - мікропристрій,
**digital** - цифровий,
**analogue systems** - аналогові системи,
**semiconductor** - напівпроводник,
**cellular phone** - стільниковий телефон,
**jumbo jet** - аеробус,
**electronic scoreboards** - електронне табло,
**capacitor** - конденсатор,
**slab of germanium** - пластина з германію.

**Exercise 2**
**Answer the questions**

1 What would you say about the evolution of electronic technology?

2 What would you say about the invention of transistor?

3 What were the advantages of the first transistors over the vacuum tubes?

4 What would you say about the early transistors?

5 Why is the size of transistors of prime importance?

6 What is the second performance benefit resulting from microelectronics?

7 What are the principal elements of electronic circuits?

8 What does the overall reliability of electronic systems depend upon?

**Exercise 3**

**Give Ukrainian equivalents to the following English words and word-combinations from the text:**

a quantitative change in technology, to be invented, to get attention, to play a pivotal role, power requirements, greater reliability and longer life, a size of a pea, technology boom, to become the building block for all modern electronics, overall reliability.

**Exercise 4**

**Read and translate following confirmations. Think whether they are true or not, if not give the right version.**

1 New principal devices found in electronic circuits have a particular role in controlling the flow of electrons so that the completed circuit performs some desired function.

2 The transistor became the foundation for microchip and computer technology.

3 Early transistors were very slow.

4 New principal devices were found in electronic technology in the early of $16^{th}$ century.

5 A quantitative change in human capabilities has given rise to qualitative change in technology.

**Exercise 5**

**Work in pairs**

Read the text and discuss the advantage of electronic technology progress. Think about examples you can use to support your point of view.

Use expressions:

- for example,
- I agree,
- I don't agree,
- I think it's true,
- I don't think it's true,
- I think it depends on.

**Exercise 6**

**Read and translate the following sentences paying attention to the function of the verb "to be".**

1 The evolution of electronic technology is sometimes called a revolution.

2 Before the development of the general-purpose computer, most calculations were done by humans.

3 At first an electronic circuit could be performed only by a vacuum tube.

4 Tools to help humans calculate are generally called calculators.

5 The transistor was invented in 1947 by three American physicists at the Bell Telephone Laboratories.

6 A multiple of transistors and other components were formed on a single tiny device of semi conducting material.

7 Early transistors, which were often described as being a size of a pea, were very slow.

8 This is not surprising—when the first computers were built, few scientists saw in them the seeds of a new technology.

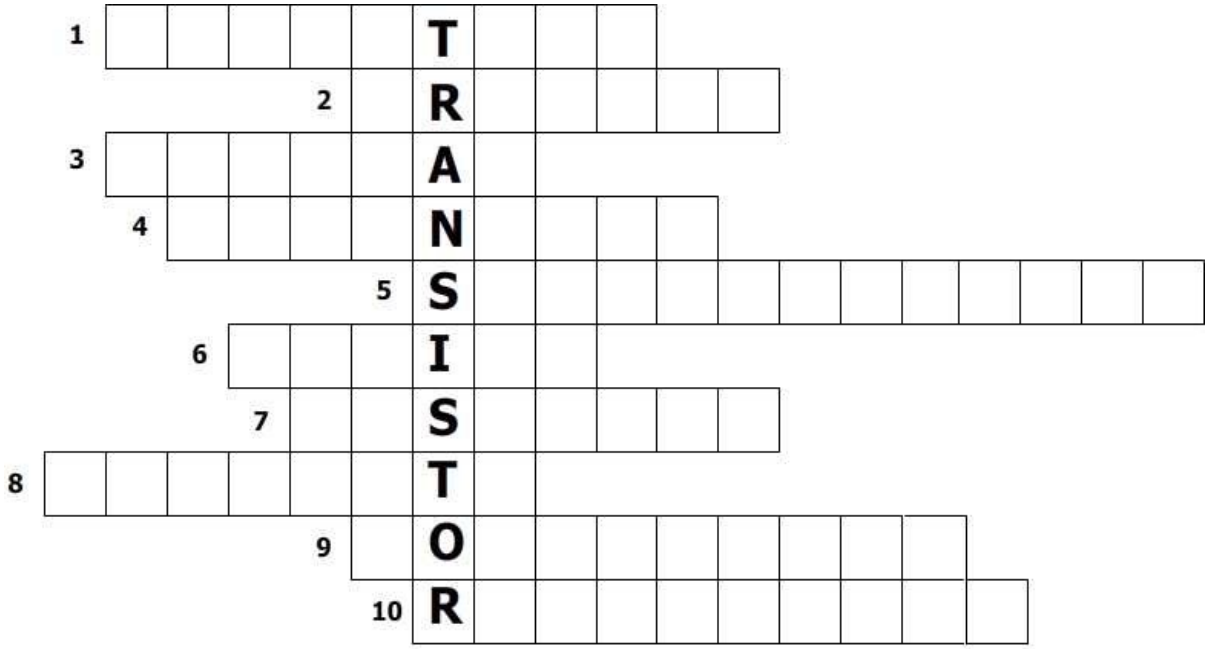
9 The goal of inventors is to make smaller and smaller electronic components for computers.

10 Without the transistor there would be no Internet.

**Exercise 7**

**Crossword**

1 розвиток, еволюція,
2 крихкий,
3 цифровий,
4 перевага,
5 напівпровідник,
6 прилад,
7 дистанція,
8 ємність,
9 регулятор,
10 революція.




## TEXT 2

## Personal Computers

Personal Computers, microcomputers were made possible by two technical innovations in the field of microelectronics: the integrated circuit, or IC, which was developed in 1959; and the microprocessor, which first appeared in 1971. The IC permitted the miniaturization of computer-memory circuits, and the microprocessor reduced the size of a computer's CPU to the size of a single silicon chip.

The invention of the microprocessor, a machine which combines the equivalent of thousands of transistors on a single, tiny silicon chip, was developed by Ted Hoff at Intel Corporation in the Santa Clara Valley, California, an area that was destined to become known to the world as Silicon Valley because of the microprocessor and computer industry that grew up there. Because a CPU calculates, performs logical operations, contains operating instructions, and manages data flows, the potential existed for developing a separate system that could function as a complete microcomputer.

The first such desktop-size system specifically designed for personal use appeared in 1974; it was offered by Micro Instrumentation Telemetry Systems (MITS). The owners of the system were then encouraged by the editor of a popular technology magazine to create and sell a mail-order computer kit through the magazine. The computer, which was called Altair, retailed for slightly less than $400.

The demand for the microcomputer kit was immediate, unexpected, and totally overwhelming. Scores of small entrepreneurial companies responded to this demand by producing computers for the new market. The first major electronics firm to manufacture and sell personal computers introduced its model in 1977. It quickly dominated the field, because of the combination of two attractive features: a keyboard and a cathode-ray display terminal (CRT). It was also popular because it could be programmed and the user was able to store information by means of cassette tape.

Soon two engineer-programmers—Stephen Wozniak and Steven Jobs—started a new computer manufacturing company named Apple Computers. In 1976, in what is now the Silicon Valley, Steve Jobs and

Steve Wozniak created a homemade microprocessor computer board called Apple I. Working from Jobs' parents' garage, the two men began to manufacture and market the Apple I to local hobbyists and electronics enthusiasts. Early in 1977, Jobs and Wozniak founded Apple Computer, Inc., and in April of that year introduced the Apple II, the world's first personal computer. Based on a board of their design, the Apple II was completed with keyboard and color graphics capability, retailed for $1290.

Some of the new features they introduced into their own microcomputers were expanded memory, inexpensive disk-drive programs and data storage, and color graphics. Apple Computers went on to become the fastest-growing company in U.S. business history. Its rapid growth inspired a large number of similar microcomputer manufacturers to enter the field. Before the end of the decade, the market for personal computers had become clearly defined.

In 1981, IBM introduced its own microcomputer model, the IBM PC. Although it did not make use of the most recent computer technology, the PC was a milestone in this burgeoning field. It proved that the microcomputer industry was more than a current fad, and that the microcomputer was in fact a necessary tool for the business community. The PC's use of a 16-bit microprocessor initiated the development of faster and more powerful micros, and its use of an operating system that was available to all other computer makers led to a de facto standardization of the industry.

In the mid-1980s, a number of other developments were especially important for the growth of microcomputers. One of these was the introduction of a powerful 32-bit computer capable of running advanced multi-user operating systems at high speeds. This has dulled the distinction between microcomputers and minicomputers, placing enough computing power on an office desktop to serve all small businesses and most medium-size businesses.

Another innovation was the introduction of simpler, "user-friendly" methods for controlling the operations of microcomputers. By substituting a graphical user interface (GUI) for the conventional

operating system, computers such as the Apple Mackintosh allow the user to select icons—graphic symbols of computer functions—from a display screen instead of requiring typed commands.

**Exercise 1**

**Memorize the following expressions from the text**

| | |
|---|---|
| **integrated circuit, or IC** | - інтегральна мікросхема, |
| **silicon chip** | - кремнієва мікросхема, |
| **Silicon Valley** | - Силіконова Долина, |
| **computer kit** | - комп'ютерне спорядження, |
| **cathode-ray display terminal (CRT)** | - електронно-променевий дисплейний термінал; |
| **Keyboard** | - клавіатура, |
| **graphical user interface (GUI)** | - графічний інтерфейс користувача, |
| **display screen** | - дисплейний екран/ |

**Exercise 2**

**Answer the questions**

1 What two technical innovations made microcomputers possible?
2 What do you know about Silicon Valley?
3 Who were creators of the first Apple Computer?
4 Is the microcomputer a necessary tool for the business community?
5 Are you computer literate?
6 Are you connected to the Internet?
7 Do you have a computer? How powerful is your computer?
8 What company is your computer made by?
9 What size is your computer screen? What do you think it would be the best size to have?
10 How often do you use a computer? What do you use a computer for?

**Exercise 3**

**Give Ukrainian equivalents to the following English words and word-combinations from the text:**

To combine the equivalent of thousands of transistors on a single, to perform logical operations, to store information by means of cassette tape, electronics enthusiasts, expanded memory, de facto, graphic symbols of computer function, to type commands.

**Exercise 4**

**Read and translate following confirmations. Think whether they are true or not, if not give the right version.**

1 Intel Corporation in the Santa Clara Valley, California, is an area that is known to the world as Silicon Valley.

2 The microprocessor is a machine which combines the equivalent of thousands of transistors on a single.

3 Two engineer-programmers - Stephen Wozniak and Steven Jobs were local hobbyists and electronics enthusiasts.

4 Apple Computers went on to become the fastest-growing company in U.S. business history.

5 IBM introduced its own microcomputer model Mackintosh.

**Exercise 5**

**Work in pairs**

Think about computer of your dream would be like. Describe your ideal computer. What special features would it have? What size of computer screen would be desirable for you, and what about mouse and keyboard?

**Exercise 6**

**Transform the following sentences according to the model:**

The invention of the microprocessor was developed by Ted

Hoff. - Ted Hoff developed the invention of the microprocessor.

1 Personal Computers first appeared in 1971.

2 Microcomputer appearance was made possible by two technical innovations in the field of microelectronics: the integrated circuit and the microprocessor.

3 This area is known for you as Silicon Valley.

4 The computer was called Altair by its inventors.

5 Personal Computers were introduced by electronic firm to manufacture and sell.

6 A new computer manufacturing company was named Apple Computer.

7 Personal Computers were standardized by computer makers using an operating system that was available to all computers.

**Exercise 7**

**Read and translate some computer jokes. Add your own new one.**

1 In a computer shop: Customer: "I'd like a mouse mat, please." Salesperson: "Certainly sir, we've got a large variety." Customer: "But will they be compatible with my computer?"

2 Computers male or female?

A sailor was very aware of the fact that the ships are addressed as 'she'. He often wondered what gender computers should be addressed. To answer that question, he set up two groups of computer experts. The first was comprised of women, and the second of men. Each group was asked to recommend whether computers should be referred to in the feminine gender, or the masculine gender. They were asked to give 4 reasons for their recommendation.

The group of women reported that the computers should be referred to in the masculine gender because:

1) In order to get their attention, you have to turn them on.

2) They have a lot of data, but are still clueless.

3) They are supposed to help you solve problems, but half the time they are the problem.

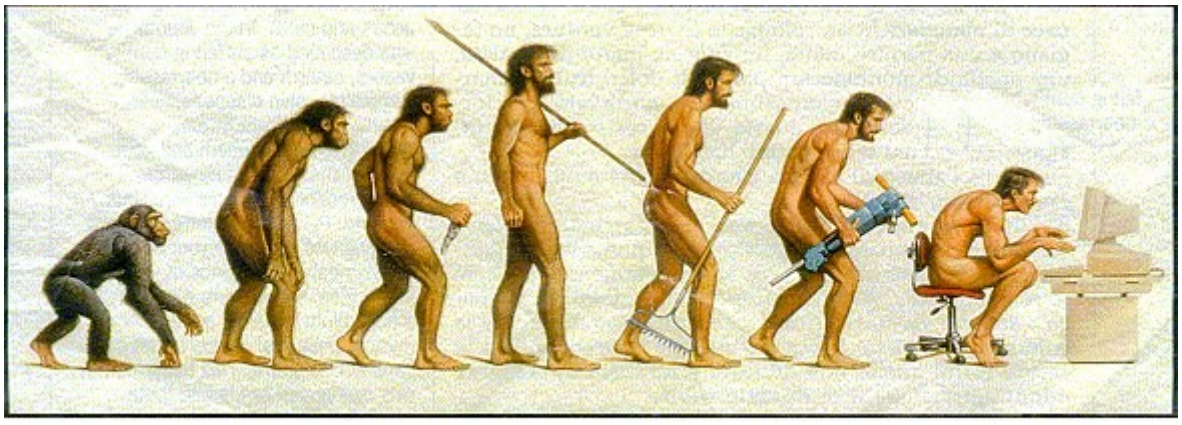
4) As soon as you commit to one, you realize that, if you had waited a little longer, you could have had a better model.

The men, on the other hand concluded that computers should be referred to in the feminine gender because:

1) no one but the Creator understands their internal logic;
2) the native language they use to communicate with other computers is incomprehensible to everyone else;
3) even your smallest mistakes are stored in long-term memory for later retrieval;
4) as soon as you make a commitment to one, you find yourself spending half your paycheck on accessories for it.

3 An office technician got a call from a user (blonde girl). The user told the tech that her computer was not working. She described the problem and the tech concluded that the computer needed to be brought in and serviced. He told her to "Unplug the power cord and bring it up here and I will fix it." About fifteen minutes later she shows up at his door with the power cord in her hand.

4



**Somewhere, something went terribly wrong**

**TEXT 3**

**Microelectronics Engineering**

Microelectronics Engineering is the area of engineering that

focuses on the design and fabrication of electronic devices/systems or subsystems using integrated circuits. Microelectronic Engineers are employed in the rapidly changing industry of microelectronics and microelectronic packaging by companies such as Intel, IBM.

Rapid advances in computer architecture, hardware, software technology and tools, and numerical and non-numerical algorithms, are making significant contributions to the development of computational models and methods to analyze and design complex engineering systems.

**Microelectronics** is a subfield of electronics. Microelectronics, as the name suggests, is related to the study and manufacture, or microfabrication, of electronic components which are very small (usually micrometer-scale or smaller). These devices are made from semiconductors. Many components of normal electronic design are available in microelectronic equivalent: transistors, capacitors, inductors, resistors, diodes and of course insulators and conductors can all be found in microelectronic devices.

Digital integrated circuits (ICs) consist mostly of transistors. Analog circuits commonly contain resistors and capacitors as well. Inductors are used in some high frequency analog circuits, but tend to occupy large chip area if used at low frequencies; it can replace them in many applications.

As techniques improve, the scale of microelectronic components continues to decrease. At smaller scales, the relative impact of intrinsic circuit properties such as interconnections may become more significant. These are called *parasitic effects*, and the goal of the microelectronics design engineer is to find ways to compensate for or to minimize these effects, while always delivering smaller, faster, and cheaper devices.

**Microfabrication** or **micromanufacturing** are the terms to describe processes of fabrication of miniature structures, of micrometer sizes and smaller. Historically the earliest micromanufacturing was used for semiconductor devices in integrated circuit fabrication and these processes have been covered by the term

"semiconductor device fabrication," "semiconductor manufacturing," etc. Practical advances in microelectromechanical systems (MEMS) and other nanotechnology, where the technologies from IC fabrication are being re-used, adapted or extended have led to the extension of the scope and techniques of microfabrication.

Miniaturization of various devices presents challenges in many areas of science and engineering, for example, computer science.

Microfabrication is actually a collection of technologies which are utilized in making micro devices. Some of them have very old origins, not connected to manufacturing, like lithography or etching. Polishing was borrowed from optics manufacturing, and many of the vacuum techniques come from 19th century physics research. Electroplating is also a 19th century technique adapted to produce micrometer scale structures, as are various stamping and embossing techniques.

To fabricate a micro device, many processes must be performed, one after the other, many times repeatedly. These processes typically include depositing a film, patterning the film with the desired micro features, and removing (or etching) portions of the film. For example, in memory chip fabrication there are some 30 lithography steps, 10 oxidation steps, 20 etching steps, 10 doping steps, and many others are performed. The complexity of microfabrication processes can be described by their *mask count*. This is the number of different pattern layers that constitute the final device. Modern microprocessors are made with 30 masks while a few masks suffice for a microfluidic device or a laser diode. Microfabrication resembles multiple exposure photography, with many patterns aligned to each other to create the final structure.

Microfabricated devices are not generally freestanding devices but are usually formed over or in a thicker support substrate. For electronic applications, semiconducting substrates such as silicon wafers can be used. For optical devices or flat panel displays, transparent substrates such as glass or quartz are common. The substrate enables easy handling of the micro device through the many fabrication steps. Often many individual devices are made together on one substrate and then singulated into separated devices toward the

end of fabrication.

Railway development has been growing rapidly in many parts of the world due to its cost effectiveness, extensive transport capacities, and relatively low environmental impact. Microelectronics Engineering widely used in modern railways. Modernization operating automatic system on railways demands of using nanotechnology.

Quantum logic element can eliminate the latency caused in the data transfer and processor determination by complex routing algorithms, simultaneously avoiding deadlock without sacrificing the shortest path. Quantum dot architecture based parallel computers will reduce latency, thereby helping to exploit the potential of parallel computing.

**Exercise 1**
**Memorize the following expressions from the text**

**microfabrication** - мікротехнологія,
**semiconductor** - напівпровідник,
**transistor** - транзистор, кристалічний тріод,
**capacitor** - конденсатор,
**inductor** - індуктор,
**insulator** - ізолятор,
**silicon wafer** - кремнієва пластина,
**Etch** - гравірувати, травити на металі (кислотою),
**doping** - захисте покриття,
**hardware** - хардвер, "залізо" деталі комп'ютера (плати, монітор та ін.),
**software** - програмне забезпечення (ПЗ), комп'ютерні програми, "софт".

**Exercise 2**
**Answer the questions**

1 Can you explain the terms "software" and "hardware"?
2 Where are Microelectronic Engineers employed?
3 What kind of microelectronic components are used in

microelectronic devices?

4 What do you think of today's microfabrication ?

5 What do you think of tomorrow's microfabrication ?

6 What kind of challenges presents miniaturization in many areas of science and engineering?

7 Has nanotechnology made our lives better than our grandparents' lives?

8 What things would you never let technology replace?

**Exercise 3**

**Give Ukrainian equivalents to the following English words and word-combinations from the text:**

Computer architecture, to make a significant contribution, a subfield of electronics, to be made from semiconductors, to occupy large area, the goal of the microelectronics design, smaller and cheaper devices, semiconductor device, computer science, freestanding devices, quantum , doping step, etching steps.

**Exercise 4**

**Read and translate following confirmations. Think whether they are true or not, if not give the right version.**

1 Microelectronics Engineers are employed in the rapidly changing industry of microelectronics.

2 Digital integrated circuits consist only of transistors.

3 Micromanufacturing is the term to describe processes of fabrication of miniature structures, of micrometer sizes and smaller.

4 Railway development is growing rapidly in Ukraine.

5 Microfabrication resembles multiple exposure photography, with many patterns aligned to each other to create the final structure.

**Exercise 5**

**Work in pairs**

1 Almost everybody has a computer. Do you think it is a great invention? What do you think about advantages and disadvantages of that invention? Explain to the rest of your group your opinion.

**Use expression:**

- first of all I'd like to say
- secondly,
- finally,
- my first point is that …
- another important point is that …

**Exercise 6**
**Write an annotation to the text.**

**Exercise 7**
**Find the explanations of the words from the left column in the right column.**

| | |
|---|---|
| 1 Transistor | **a)** a device giving capacitance and usually consisting of conducting plates or foils separated by thin layers of dielectric |
| 2 Capacitor | **b)** a device that has electrical resistance and that is used in an electric circuit for protection |
| 3 Inductor | **c)** an electronic device that has two electrodes or terminals and is used especially as a rectifier |
| 4 Resistor | **d)** a solid substance that conducts electricity in particular conditions (for example, any of a class of solids as germanium or silicon) |
| 5 Diode | **e)** the science of manipulating materials on an atomic scale especially to build microscopic devices |
| 6 Semiconductor | **f)** one that inducts |
| 7 Nanotechnology | **g)** *tran*sfer + re*sistor;* from its transferring an electrical signal across a resistor |

**TEXT 4**

**Automation**

Automation is the use of control systems (such as numerical control, programmable logic control, and other industrial control

systems), in concert with other applications of information technology (such as computer-aided technologies), to control industrial machinery and processes, reducing the need for human intervention. In the scope of industrialization, automation is a step beyond mechanization.

Whereas mechanization provided human operators with machinery to assist them with the physical requirements of work, automation greatly reduces the need for human sensory and mental requirements as well. Processes and systems can also be automated. Automation plays an increasingly important role in the global economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities. Many roles for humans in industrial processes presently lie beyond the scope of automation.

Human-level pattern recognition, language recognition, and language production ability are well beyond the capabilities of modern mechanical and computer systems. Tasks requiring subjective assessment or synthesis of complex sensory data, such as scents and sounds, as well as high-level tasks such as strategic planning, currently require human expertise. In many cases, the use of humans is more cost-effective than mechanical approaches even where automation of industrial tasks is possible.

The automation is widely used on the railways. The aim of automation of railways is to design an integral system to monitor and control traffic on railways with low and medium traffic density. This type of environment presents a clearly identified set of problems arising from a lack of infrastructure for systems that need to be reliable and robust. The solution lies in automating the entire control, traffic and safety system. To achieve this, various communication and distribution technologies and control systems based on fieldbuses and local area networks are used. The complete system is located at various strategic points within the railway environment, enable the entire system to be monitored and controlled.

Various levels of railways automation are considering the possibility of achieving a full cybernetic railway with system-wide

coordination of control and communication on the railways in the nearest future. The automation provided the full range of systems and components from axle-counting systems and switches machines to LED (Light emitting diode) signals and level-crossing protection systems. In excellent quality, designed and built for fault-free installation, maximum availability and simple maintenance.

Specialized hardened computers, referred to as programmable logic controllers (PLCs), are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process.

Computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response. Service personnel who monitor and control these interfaces are often referred to as stationary engineers.

Automation has had a notable impact in a wide range of highly visible industries beyond manufacturing. Once-ubiquitous telephone operators have been replaced largely by automated telephone switchboards and answering machines. Automation is widely used on the railway traffic control system.

**Exercise 1**
**Memorize the following expressions from the text**

**Requirement** - вимога,
**fieldbus** - загальна шина,
**to monitor** - спостерігати, контролювати,

| | |
|---|---|
| **axle-counting systems** | - прискорені розрахунки, |
| **switch machine** | - стрілочний привод, |
| **LED (Light emitting diode) signals** | - світлодіоди, |
| **level-crossing protection systems** | - системи захисту перехрестя рівнів, |
| **fault-free** | - безвідмовний, |
| **local area networks** | - локальні мережі. |

**Exercise 2**

**Answer the questions**

1 What role does automation play in the global economy?

2 In what fields of industry is automation more cost-effective than humans?

3 How is automation used on the railways?

4 What is the aim of automation of railways?

5 Is it possible to automate the entire control, traffic and safety system?

6 What range of systems is automation provided on the railways?

7 What changes will be achieved on the railways in the nearest future?

**Exercise 3**

**Give Ukrainian equivalents to the following English words and word-combinations from the text:**

a step beyond mechanization, to create complex systems, a rapidly expanding range of applications, cost-effective, traffic density, to achieve this, maximum availability and simple maintenance, a wide range, various levels of railways automation.

**Exercise 4**

**Read and translate following confirmations. Think whether they are true or not, if not give the right version.**

**1** Automation reduces the need for human sensory and mental requirements.

**2** Processes and systems cannot be automated.

**3** Automation plays an increasingly important role in the global economy and in daily experience.

**4** Many roles for humans in industrial processes presently lie beyond the scope of automation.

**5** Automation is widely used on the railway traffic control system.

**Exercise 5**
**Work in pairs**

Discuss with your partner the statement "Automation has a great importance on the railway transport". Do you agree or disagree with that statement. What examples do you have?

Use expressions:

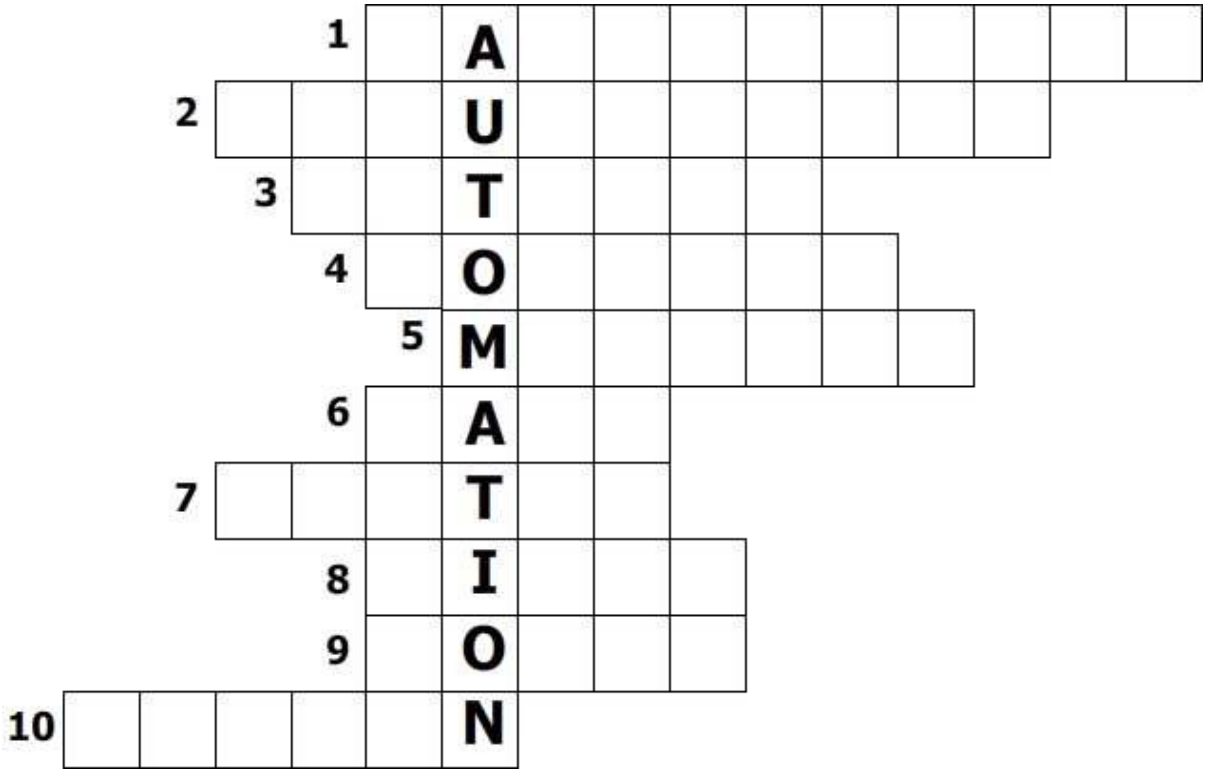
- for example,
- I agree,
- I don't agree,
- I think it's true
- I don't think it's true
- I think it depends on…

**Exercise 6**
**Interview each other with the questions from exercise 2.**

**Exercise 7**
**Crossword**

1 технічне обслуговування,
2 потреба, необхідна умова,
3 мережа,

4 контролювати,
5 дисплей,
6 дані, показники,
7 стрілка, перемикач,
8 діод,
9 рахувати,
10 проект, розрахунок.




## TEXT 5

### Operating requirements of an automatic railway

Our age is called the age of automation. Indeed, automation is increasingly applied to various branches of industry and research.

Automatic control of production processes by means of computing machines has prepared the way for the application of computing technique to railroad transport.

The main justification in seeking a fully automatic railway system must be economic. A system has to give a service at least equivalent to, and preferably better than, that with a conventional system but lower cost. The term “service” itself includes the following components:

1 Flexibility: the conventional railway is flexible in the number of destinations to be served, in the variations of loading, speed and frequency that can be imposed at short notice to meet variations and demand. In practice, it will seldom operate over the whole system exactly in accordance with a predetermined plan.

2 Reliability: any fully automatic system must be at least as reliable, mechanically and electrically, as that which it replaces. But, what is equally important, in the event of any failure it must be possible to overcome the effects of such a failure in such a way as to cause the least possible disturbance to the system as a whole.

3 Safety: it goes without saying that an automatic system must incorporate standards of safety equally high as those in existence before. Any failure of a piece of equipment which forms part of the control mechanism must be on the “safe” side.

The advantages to be achieved by automatic train operation may be summarized as follows:

- **Regularity** of service, deriving from uniformity to driving technique,
- **reduction** in minimum headway achievable and an increase in the maximum line capacity,

- **maintenance** of timetabled performance within minimum possible energy consumption,
- **enforced** observance of speed restrictions,

The ability to provide for automatic recovery from service delays, the possibility of reducing operating manpower.

It is true that in many respects the automatic control can do no better than a good human driver: indeed it is sometimes alleged that a good human driver can, in some respects at least, exceed the performance of the automatic controls. Experience shows that on average the superlatively good human driver is likely to be followed by one of less than average ability and the net effect of the first man's superior driving is to widen the gap between the two trains to as extent which reacts to the increasing determinant of the following train.

The sphere of application of computing machines in general and their application to railroad transport in particular is practically unlimited. Each year the traffic volume on our railway grows. It is necessary within a very short period of time to prepare hundreds of traffic schedules, to determine intensity of railway traffic, and register goods. So, nowadays computers are being widely used to control the transportation process.

The general structure of the automated system of railway control is considered as a large system including a number of smaller subsystems. Electronic computers are now most widely used to automate marshalling yards operations. Under the automatic system developed in our country the sorting of trains in some marshalling yards has been computerized. To facilitate the sorting of trains the computers may be installed directly at the yards themselves.

High accuracy of calculations is needed at the Computer Centre. That is why before the beginning of a working day each computer is carefully examined and its units are regulated. When examined, the computer units are ready for operation.

We are continuously getting nearer to the all-machine age. Planning the operation of trains is not the only field of computers application on railways. Electronic computers are being introduced into other branches of railway engineering as well. Paying wages, tickets reservation, designing locomotives and cars, is controlling processes at works and factories producing machinery.

The automated system called "Express", which is intended for booking railway tickets, has been developed. Passengers do not wait

for a ticket to a train. With the aid of a computer, the booking clerk serves up to five people per minute.

The electronic brains in the present form have freed man from a great number of calculations. But now specialists are working on designing new, better and quicker electronic computers. Their wide use on transport will turn our railways into the most reliable and efficient means of communication.

**Exercise 1**
**Memorize the following expressions from the text**

**Requirement** – вимога,
**flexibility** – гнучкість,
**destination** – місце призначення,
**frequency** – частотність,
**reliability** – надійність,
**safety** – безпека,
**maintenance** – технічне обслуговування,
**marshalling yard** – сортувальна станція,
**timetable, schedule** – розклад.

**Exercise 2**
**Answer these questions**

1 Why do we call our age “the age of automation”?
2 Were the computers first used on railways or in production processes?
3 What railway operations do computers facilitate?

4 What is the structure of the railway automated control system?
5 Why must computers be regularly examined at the Computing Centre?
6 Into what fields of railway engineering are computers being introduced?

7 What is the purpose of developing the “Express” system?
8 On what problem are our computer engineers working?

**Exercise 3**

**Give Ukrainian equivalents to the following English words and word-combinations from the text:**

Production processes, application of computing technique, a predetermined plan, it goes without saying, the maximum line capacity, operating manpower, the gap between the two trains, the sphere of application, booking railway tickets, the all-machine age, to prepare traffic schedules.

**Exercise 4**

**Read and translate following confirmations. Think whether they are true or not, if not give the right version.**

1 Automation is applied to various branches of industry and research.
2 Each year the traffic volume on Ukraine’s railway grows.
3 Computers are being widely used to control the transportation process.
4 The general structure of the automated system of railway control is considered to be a large system including a number of smaller subsystems.
5 Now specialists are working on designing new, bigger electronic computers.

**Exercise 5**

**Work in pairs**

Interview each other with the questions from exercise 2.

**Exercise 6**

**Read and translate the following sentences paying attention to the modal verbs:**

1 To facilitate the sorting of trains the computers may be installed at a marshalling yard.

2 Operators at the Computer Centre needn't do the calculations by hands.

3 Any fully automatic system must be reliable.

4 The advantages of automatic train operation may be summarized in a following list.

5 It's true that in many respects the automatic control can do no better than a good human driver.

6 At the Computer Centre there must be high accuracy of calculations.

**Exercise 7**

**Find the explanations of the words from the left column in the right column.**

| | |
|---|---|
| 1 application | a) the upkeep of property or equipment |
| 2 capacity | b) the quantity that machine can produce |
| 3 flexibility | c) the ability to change to suit new conditions |
| 4 safety | d) a table of departure and arrival times of trains |
| 5 maintenance | e) place where railway wagons are connected, prepared, etc. to trains |
| 6 schedule | f) a practical use of something |
| 7 marshalling yard | g) the state of being safe and protected from danger or harm |

**TEXT 6**

**ELECTRONIC RAILWAY SIGNALING**

In the early years, the industrial applications of electronics were made exclusively in the field of communication. It is interesting to note, that the very first application of electronics in industry, for

purposes other than communication, was made by the railroads. Vacuum tubes enabled to use a circuit that prevents the coding relay contacts from closing or opening when current is flowing.

Electronic circuit require negligible amount of energy. A few microwatts are enough to convey information. Response to an input signal is obtained in a fraction of a microsecond. And such results are accomplished with no mechanical movement. Electronic equipment may be made very compact and lightweight. It is ideal for printed circuitry. With these advantages, the use of electronics will become ever more widespread in signaling practice.

The electronically operated system of signal interlocking is designed to perform the basic function of all railway signaling apparatus by controlling the interlocking of signals so that adequate distances are maintained between following trains and detecting the presence of railway vehicles at the rail circuit. Electronic interlocking monitor and control logic and safety-related facilities in line with the dependencies between signals, switches and vehicles. The input signals must be converted from an analogue signal to a digital representation by A/D converters and further processed by digital signal processing methods. Discrete Fourier transform, an iterative algorithm CORDIC and threshold was used for digital signal processing. The digital signal processing system was implemented in C language and then rewritten to the VHDL language to implement it in the FPGA (Field Programmable Gate Array) device.

It will do this by means of computer techniques using suitable arrangements of plug-in electronic “logic” units in which transistors and magnetic cores perform “logical” switching operations. To perform the movement of a train, the signalman simply turns a switch representing the point of entry to the required route, and pushes a button representing the exit of the route.

The main aim of the automation plan was to develop the signaling and train control system at the high-speed railways. The signaling functions managed by automated control systems prevent train collisions and maximize the rail network capacity and service. The train control manages the velocity of trains through each of the

signal sections, obeying the signal status and, if required, additionally stopping the trains at station platforms. It also manages the switching of many points and crossings giving a choice of over 40 routes along the track system. Within the physical bounds of the track and signaling more than 16 trains can be simultaneously handled, quite comfortably, with the system minimizing conflicts and hence not delaying trains.

The operator or signalman is shown a graphical representation of the track network on the computer screen, depicting which track zones are occupied and by what. By clicking a mouse button the signalman can select any desired route, if available (no conflicting routes set).

If a route has been chosen the system controls the movement of the train through the route, switching all necessary points and also turns on animations such as model semaphore signals and level crossing gates. The first of the automatic running modes is known as automatic routing setting (ARS). When initiated, the ARS looks at position of each train, decides which routes are available and how close to capacity advance areas of the network are. The ARS system does not discriminate what type of train is in each position, its main control philosophy being only to avoid conflicts to keep as many trains as possible moving at any one time.

The latest electronic railway signaling technology differs from the old electromechanical relay system mainly in terms of safety and size. Modern electronic interlocking systems, which have been developed according to the highest safety requirements stipulated in European railway-related standards, operate on fail-safe principle. It requires only limited space as the equipment and can be installed in compact cabinets. These cabinets can be existing buildings or mobile containers.

**Exercise 1**

**Memorize the following expressions from the text**

**convert from an analogue signal to a digital** - конвертувати аналоговий сигнал у цифровий,
**Input signal** - вхідний сигнал,
**a/d (analogue-to-digital) conversion** - аналогово-цифрове перетворення,

**discrete Fourier transform** - дискретне перетворення Фур'е,
**iterative** - ітераційний, повторний,
**plug-in unit** - змінний блок,
**switching operation** - комутаційна операція,
**threshold** - початок,
**implement** - прилад, інструмент,
**depict** - зображати, описувати,
**stipulate** - ставити умовою, зумовлювати,
**fail-safe** - захищений від невмілого (необережного) поводження.

**Exercise 2**
**Answer the questions**

1 Where was the first application of electronics made in industry?

2 What amount of energy is enough to convey information?

3 In what space of time is response to an input signal obtained?

4 Due to what advantages will the use of electronics become ever more widespread in signaling practice?

5 What purpose is the electronically-operated system of signal interlocking designed for?

6 By means of what are adequate distances maintained between following trains?

7 What should the signalman do to permit the movement of a train?

8 How has a new technology changed railway safety?

9 Has a new technology made the signalmen job more difficult or simpler?

**Exercise 3**
**Give Ukrainian equivalents to the following English words and word-combinations from the text:**

The industrial applications of electronics, to convey information, to be obtained in a microsecond, an adequate distances between following trains, the basic function of the railway signaling apparatus, to use the suitable arrangements, to delay trains, animations such as

model semaphore signals, a fail-safe principle.

**Exercise 4**

**Read and translate following confirmations. Think whether they are true or not, if not give the right version.**

1 Electronic circuit requires fair quantities amount of energy.

2 The industrial applications of electronics are made exclusively in the field of communication.

3 The electronically operated system of signal interlocking is designed to control the signals so that adequate distances are maintained between following trains and detecting the presence of railway vehicles at the rail circuit.

4 The early ARS system discriminates what type of train is in each position.

5 The main aim of the automation is to develop the signaling and train control system at the high-speed railways.

**Exercise 5**

**Work in pairs**

Interview your partner about traveling by train. Image an anecdote or thriller about railway journey. Tell the old one or think a new own story.

Use the questions:

- When was the journey?
- Where were you going? Who with? Why?
- What did a signalman, a switchman, an engine driver do?
- What happened? And what happened in the end?

**Exercise 6**

**Find couple of synonyms among the following words**

Application, communication, controlling, conversation, incident, gadget, route, avoidance, service, usage, requirement, start, demand, checking, collision, device, threshold, course, maintenance, prevention.

**Exercise 7**
**Write an annotation to the text.**

**TEXT 7**

**WHY E-TICKETS MUST GET SMARTER**

From a public transport customer's point of view, it would be nice to have only one smart card in your wallet which enables travel everywhere in a familiar way. For example: the Brussels (Mobib) card could be compatible with those of Amsterdam (OV-Chipcaart), London (Oyster), Paris (Navigo) and Cologne (eTicket), and also recognized on Thalys (high-speed operator served the Netherlands, Brussels and Paris), Eurostar, TGV (high-speed trains in France) and ICE (high-speed trains in Germany) services. Instead of nine smart cards you would need only one. The intelligence should be enough to understand at least a part of the other schemes so that you can buy a valid ticket for your journey using a single smart card.

Of course, the medium does not have to be a smart card, it could easily be a chip/antenna in your mobile phone or anywhere else. The way the media communicate with the underlying system can vary as long as both ends understand each other.

It is almost as important that you are informed about your travel options, that you know how to purchase the right ticket, and that you pay for correct amount. Again, it would be nice if you could do this in the way you are used to doing in your own city or country.

It means that all these aspects of travel should be seamless:

- Information before, during and after the trip
- Physical connections and transfers offered by different operators
- One (virtual) ticket for the entire journey, and
- Your money should end up with the different parties who provided the services you enjoyed.

The International Association of Public Transport (UITP) issued a position paper on e-ticketing called *Everybody local everywhere.* In many regions and nations, major investment is being made in electronic ticketing projects. The position paper argues that – as in other industries – technical interoperability and organizational cooperation must be established to make effective use of developments and serve the customer better. The vision "everybody local everywhere" expresses the idea that public transport customers should feel welcome and comfortable anywhere they travel. They should receive a coherent service with simplified interchanges, comprehensive information and hassle-free ticketing. The vision is one of seamless travel and seamless fares. UITP strongly recommends that the different electronic ticketing solutions that exist today converge, and migrate to only one or possibly two systems for all of Europe. Of course, this will not happen overnight and requires considerable effort, and a pan-European project aims to examine just how this might happen.

**Interoperable.** The two-year European-funded interoperable fare-management (IFM) project is to provide travelers with common styles of contactless media throughout Europe which can be used for multiple transport products in different geographic areas, compared with today`s situation where existing smart cards are mostly restricted to specific cities or regions.

The IFM project aims to find a way forward in the development of standards for the interoperability of fare management (electronic ticketing) and will produce a handbook for the implementation of IFM in Europe. From 2010, the findings will be tested in real life and, in a third phase, the measures could become binding in all of Europe.

The project consists of establishing best practice and structure for the following:

- Trust
- Privacy
- Applications and interoperable media
- The IFM organization
- Supporting information and communications technology

systems, and

- Establishing a UITP IFM forum for consensus and dissemination.

**Trust.** This first working package of the IFM Project, lead by the Integrated Transport Smartcard Organization (ITSO), will determine the minimum common features – the features that are required from an interoperable point of view – of an European trust model and the requirements for a European secure application module (EU-SAM).

A trust model is a tool that helps one visualize and understand the degree of confidence that is intentionally or unintentionally granted to individuals and systems, based on the associated risks inherent with granting this confidence. The more completely the trust model is defined, the greater awareness one will gain of the threats and vulnerabilities and especially for risks based on those threats and vulnerabilities. The trust model should describe how trusted transactions can be made between different fare areas when an unknown customer uses an unknown smart card.

One factor that makes this work package very complicated is that IFM systems should be designed as open systems. The associated trust model is far more complex than the alternative "deny model" which is based on the initial refusal of access. How can you be sure that you are guarding all the doors? Who can guarantee the authentication processes, confidentiality, and integrity of data transferred? Who can the ability to hold transacting parties accountable? Should this be done centrally, and if so, by whom? There are many questions like this that need to be addressed.

**Privacy.** This second work package, lead by the University de Paris X-Nanterre, will review the need for privacy of personal data. It will ensure the adequate consideration of the fundamental right of privacy.

Recent years have seen an increasing attention on privacy-aware technologies and mechanisms for the negotiation of private information between customers and enterprises. Personal identities

and profiles are becoming more important as they enable interactions and transactions in inter-enterprise environments, on the web, in e-commerce sites and in mobile environments. The resultant ease of gathering and transmitting such information gives rise to a number of threats to people's privacy. These threats need to be analyzed and addressed in a way that focuses on people and the protection of their privacy.

Interoperability requires the sharing of sensitive data with strangers. Locally, the privacy requirements on sharing data can be decisive in what we can do with the potentially generated data.

Today applications are called projects, products are tickets, and media are like the old smart cards, but now the chip and antenna can be in mobile telephones, a PDA or other gadget. The third work package is about security aspects, life-cycles and application management. It is about migration of older systems to be compatible with other systems in the future.

**Organization and technology**. The organizational aspect will define common organizational models and investigate how existing national organizations and key regional or city implementations can one day be interoperable. Basically, each organization behind every region has to be able to cope with the responsibilities required by the other working packages and the technical interoperability of the media and back-offices. The aim is to identify the common requirements for transport contactless media, identify the benefits of multi-application media to enlarge interoperability, define common requirements on interoperable contactless media and multi-application management for public transport and issue recommendations for migration.

Including the study, UITP is integrated in the European funded IFM Project. It serves as a platform to give valuable input to the project and will help to identify best practices and new ways of cooperation.

**Exercise 1**
**Study the following words and word-expressions:**

**smart card** - смарт-картка (платіжна картка,
**smart** – спритний, кмітливий,
**in a familiar way** - просто, звичайним способом,
**to be compatible with** - бути конкурентоспроможним,
**intelligence** - інформація, інтелект,
**valid ticket** - дійсний квиток,
**to end up** - надходити,
**coherent** - послідовний, ясний,
**comprehensive** - всебічний, вичерпний,
**interchange** - зміна, чергування,
**hassle-free** - безперебійний, надійний,
**converge** - зводити в одну точку,
**to be restricted to** - бути обмеженим у певних рамках,
**implementation** - виконання,
**Binding** - обов`язковий,
**dissemination** - розповсюдження,
**intentionally** - навмисний,
**gain of threats** - поєднання загроз,
**vulnerability** - уразливість,
**authentication process** - процес підтвердження,
**Profile** - короткий біографічний нарис,
**sensitive data** - нестійкі дані,
**Gadget** - технічна новинка,
**to cope with** - задовольняти,
**to enlarge** - розширювати, збільшувати
**valuable input** - цінний внесок.

**Exercise 2**
**Answer the following questions:**

1 What are principal advantages of using a single smart card?
2 Can you tell which aspects of travel should be seamless?
3 Why was a position paper issued?
4 How can the European-funded interoperable fare-management project (IFM) be used for?
5 Which aims does IFM have?

6 What general concepts does IFM consist of?
7 Which common features does IFM determine?
8 What does a trust model of IFM mean?
9 Why are personal identities and profilers becoming more important recent years?

**Exercise 3**
**Give the Ukrainian equivalents to the English word-expressions:**

Public transport customer's point of view, electronic ticketing project, European-funded interoperable fare-management project, contactless media, multiple transport products, Integrated Transport Smartcard Organization, minimum common features, multi-application media.

**Exercise 4**
**Find couples of synonyms among the following words:**

Valuable, to cope with, to authenticate, binding, implementation,, hassle, to end up, valid, intelligence, to define, key, to migrate, option, expensive, to safety, to identify, obligatory, performance, difficulty, to arrive, true, information, to determine, main, to move, choice.

**Exercise 5**
**Transform the following sentences according to the model:**

*Model: You can buy a valid ticket.*
*A valid ticket can be bought by you.*

1 A traveler can use a single smart card. 2 The specialists called a position paper on e-ticketing "Everybody local everywhere". 3 Railways must establish technical interoperability and organizational cooperation. 4 Public transport customers should

receive a coherent service. 5 The IFM project provides travelers with common styles of contactless media. 6 The IFM project will produce a handbook. 7 The first working package of the IFM will determine the minimum common features. 8 The specialists designed the IFM systems as open ones.

**Exercise 6**

**Work in pairs. Make up dialogues on the following topics:**

a) Discuss the problems, over the solution of which the public transport carriers are working.

b) You are a representative of the Publishing House "The International Railway Journal" and you are interviewing Business Development Manager, Video Over IP, Bosch, Netherlands, Mr David Lenot about aims of European-funded interoperable fare-management (IFM) project. Discuss the perspectives of this project.

**Exercise 7**

**Crossword. Find the hidden words. Words can be arranged in any direction.**

1 Complex of functions (m…)
2 Device for receiving of radio waves (a)
3 Journey (t…)
4 Information (i…)
5 Any traveler must have it (t…)
6 Main (k…)
7 Problem (h…)
8 Without touching (c…)
9 Link (c…)
10 Upgraded ticket (s…)
11 Mode of public transport (t…)
12 Vehicle (c…)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | N | T | E | L | I | I | G | E | N | C | E | E | Q |
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| N | A | V | E | Y | A | F | D | E | I | G | Y | C | A |
| M | C | E | D | U | N | G | D | S | C | U | U | B | R |
| J | B | L | I | I | T | N | I | X | K | E | Y | V | T |
| U | M | J | U | O | E | U | P | C | E | I | I | U | C |
| C | O | M | M | U | N | I | C | A | T | I | O | N | A |
| A | M | O | Q | O | N | O | P | V | | I | K | A | R |
| R | M | O | O | H | A | S | S | L | E | K | L | X | T |

## TEXT 8

## ON THE RIGHT WAVELENGTH

As the world economic situation continues to seemingly decline on a daily basis, and issues surrounding climate change and future scarcity of natural resources continue to hover near the top of the media agenda, it would seem fairly obvious to transport professionals that consumers should decide to switch to public transport for economic and/or environmental reasons.

Frequently, there is some weakness due to a lack of confidence in timetables and schedules and to an overall lack of reliable information. To address these information issues, transport authorities and governments are placing, increasing reliance on real-time passenger information (RTPI) systems. The prime purpose is, naturally, to provide information which the travelling public can rely on, but there are also three other key drivers behind the adoption of such systems:

- Regulatory bodies often require detailed information on timetable adherence, and an RTPI system can provide a lot of useful data
- Health and safety regulations are omnipresent in most industries these days, and knowing the precise location of a public transport vehicle at any given moment in time can be very useful, both with regard to incidents involving the vehicle itself, and also in relation to other events which may necessitate knowledge of the

vehicle's precise location

- Internet can be used so widespread that consumers in developed countries have become used to having information on all sorts of activities no more than three mouse clicks away. Passenger transport needs to meet customer expectations that up-to-the-minute data will be readily available.

Much attention is rightly focused on the media used – web, information displays, mobile telephony and so on – for actually delivering the information.

Processing and interpreting the data is the role of companies, most of whom are reasonably well-known specializing in RTPI solutions, but actually transmitting the data between vehicle, control center and information display is an element that is often forgotten.

Tait Radio Communications has been supplying professional mobile radio solutions for 40 years and is well-versed in the various requirements of the different modes of public transport. For most of that time, voice communication has been the focus, with improvements in voice quality, equipment functionality and operational range having been achieved gradually. The advent of RTPI systems over recent years has brought about the need for data to be transmitted. A number of potential data transmission solutions were developed, using a range of technologies, but it soon became clear that there were several challenges to overcome:

- The number of devices in cabs is proliferating, causing maintenance, space and operational issues.
- Achieving total reliability is difficult, particularly if a system is susceptible to external (and therefore uncontrollable) events
- The need for voice communications had not disappeared, but its importance is frequently disregarded,
- Cost is at the center of most facets of life – and the public transport industry can ill-afford expensive but incomplete or unreliable solutions.

Tait decided to take up the challenge of developing a solution

which offered reliable data transmission, reliable voice communications within the same system, excellent data rates, and independence from third-party influences.

The result, after an extensive customer consultation exercise and some innovation research and development at Tait`s headquarters in New Zealand, is the TaitNet Data System (TNDS). This is based on Tait`s existing trunked (also known as MPT 1327) radio technology, with which many public transport operators around the world are familiar.

TNDS offers public transport and RTPI operators, systems integrators and RTPI suppliers' voice and data transmission within the same system, a capability of polling up to 900 vehicles per minute per data channel, and a system which is independent of third-party influences.

By using a trucked radio solution, TNDS allows operators to fit their data transmission into their existing frequency allocation.

As demands and requirements of public transport communications systems grow, operators and their systems integrators need to pay even greater attention to their technology choices. In some business sectors, such as the utilities, there has been a marked move back towards PMR (professional mobile radio)-based solutions, because of the independence and control that they offer, particularly in civil emergency situations, when public networks can become overloaded or be switched off. In some countries, public transport operators have been lured towards adopting the "latest" digital radio technology, without truly considering the cost and the data and frequency limitations. Selecting the tool that is best for the job may be a wiser move than adopting the most theoretically advanced or easier solution. TNDS is an innovative solution that uses tried and tested technology to meet new communications challenges in public transport.

**Exercise 1**
**Study the following words and word-combinations.**

**Decline** - занепад,
**seemingly** - очевидно,
**a scarcity** - дефіцит, недостатня кількість,
**Agenda** - порядок денний,
**prime purpose** - головна мета,
**timetable adherence** - суворе додержання розкладу,
**to be omnipresent** - бути повсюдним, всеохоплюючим,
**precise location** - точне місцезнаходження,
**to be available** - бути доступним,
**to be focused on** - концентрувати увагу на …,
**up-to-the-minute data** - новітні дані,
**to deliver** - доставляти,
**to interpret data** - пояснювати дані,
**to advent** - прихід, поява,
**a challenge** - виклик, вимога,
**to overcome** - подолати, перемогти,
**to proliferate** - швидко збільшуватися, поширюватися,
**total reliability** - повна надійність,
**uncontrollable events** - неконтрольовані випадки,
**to be disregarded** - бути ігнорованим,
**a facet** - аспект, грань,
**to take up** - обговорювати, приймати (пропозицію тощо),
**Trunk** - головний, магістральний,
**integrator** - інтегратор, математичний компонент з 2-ма змінними,
**Supplier** - постачальник,
**a capability of polling** - можливість автоматичного з`єднання,
**data transmission** - передача даних,
**frequency allocation** - розподіл частот,
**Utilities** - комунальні підприємства,
**overloaded** - перевантажений,
**to switch off** - вимикати струм, роз`єднувати,
**to be lured** - бути привабливим.

**Exercise 2**

**Give Ukrainian equivalents to the English word-combinations from the text:**

Daily basis, climate changes, economic and/or environmental reasons, transport authorities, real-time passenger information systems, travelling public, detailed information, health and safety regulations, all sorts of activity, professional mobile radio solution, potential data transmission solution, voice communication, a third-party influence, extensive customer consultation exercise, public transport communication systems.

**Exercise 3**

**Make up 10 questions to the text and answer them.**

**Exercise 4**

**Read and translate the following confirmations. Think whether they are true or not. If not give the right version.**

1 Climate changes and future scarcity of natural resources stop to hover near the top of the media agenda.

2 Frequently, there is some weakness due to a lack of confidence in timetables and schedules.

3 RTPI system can't provide a lot of useful data.

4 Tait Radio Communications has been supplying amateur mobile radio solutions.

5 TNDS is based on the Tait`s existing trucked radio technology.

6 TNDS prevents operators to fit their data transmission into their existing frequency allocation.

7 As demands of public transport communications systems grow, operators and their systems integrators need to pay more attention to their technology choices.

**Exercise 5**

**Transform the following sentences according to the model:**

*Model: The experts understand well features of trunked analogue radio.*

*Features of trunked analogue radio are well understood by the experts.*

1 The passengers need to make the journey with confidence and security. 2 The communication infrastructure meets the demands of a modern, integrated public transport operation. 3 The public transport operation often outstrips the capacity and ability of the existing infrastructure. 4 A number of factors drive the adoption of GPS technology and passenger information systems. 5 Operators need to relay timetable information to onboard and platform information displays. 6 Upgraded information systems must provide passengers with a level of information which was unthinkable just a few years ago. 7 Modern demands have changed the way we pay for public transport. 8 Drivers still need to contact the control room. 9 Tait focused on retaining the existing trusted signaling standards. 10 Tait has developed a hybrid of analogue radio technology.

**Exercise 6**
**Work in pairs**

a) discuss with your partner the necessity of such technologies as real-time passenger information systems (RTPI);

b) you are a journalist of the "Times". Your task is to analyze of prospective of Tait Radio Communications;

c) prove the necessity of developing public transport communications systems.

**Exercise 7**
**Write an annotation to the text.**

## TEXT 9

## CHANGING CHANNELS

Ensuring passengers have the information they need to make their journey with confidence and security is an essential element of good customer service in rail industry. However, the communications infrastructure required to meet the demands of a modern, integrated public transport operation is highly complex and often outstrips the capacity and ability of the existing infrastructure.

There are a number of factors driving the adoption of GPS technology and passenger information systems across Europe, of which legislation, regulatory controls, consumer expectations, and government initiatives are among the most significant drivers. These factors mean that operators need to relay timetable information to onboard and platform information displays, monitor their own performance against timetables and provide passengers with a level of information which was unthinkable just a few years ago.

Demand for real-time passenger information (RTPI) is driven from three angles. From a government perspective, the need to develop and deliver integrated transport systems is high on the agenda. This can be implemented through careful coordination of infrastructure and the accurate delivery of information to passengers. Both of these facets require the efficient and timely delivery of data, although passenger information is clearly crucial in terms of gaining and maintaining consumer trust and confidence. From an operator`s viewpoint, up-to-date travel information is essential for increasing passenger confidence. Consumer demand for RTPI comes as from the desire for travel information as it does from the overall trend within society for information to be readily available, accessible and, primarily, accurate. Getting this data to all the relevant devices, such as platform indicators, is a major challenge and requires a rapid and robust solution.

As the way we pay for public transport has changed, access to the ticketing system to monitor activity and travel pass updates and revisions is another feature that needs to be handled by the onboard

radio, provided the radio infrastructure has the right data handling capacity and the radio has the physical interfaces to allow easy connectivity.

Lastly, it must handle the aspect of communications systems which if often overlooked in this age of intelligent systems and data transmission – verbal communication. Drivers still need to contact the control room to alert them to issues or communicate on other matters, and a communication system needs to facilitate this requirement in a way which does not preclude the efficient functioning of all the other demands placed upon it.

To allow operators to approach this issue in a more coordinated way, Tait decided to re-think the way a bus-radio system is defined, and this can be applied to rail. Tait focused on retaining the existing and trusted MPT1327 and MPT1343 signalling standards so that networks running now remain at the heart of future services and, in association with a range of prominent system developers, looked at the way systems are developed.

**Taitnet.** The result is Taitnet Data System (TNDS), a hybrid of analogue radio technology and high performance DPS-based core technology. This system is based on Tait`s existing trucking infrastructure because it is considered to be the best way of keeping the cost low for existing and new users.

Trunked analogue radio is well understood and much of the hardware can be made very economically using components which have stood the test of time. TNDS also differs from other offerings on the market as its voice and data are fully integrated and to offers much faster polling rates. Regular polling of data channels is fully automatic and TNDS has been designed to ensure compatibility with existing RTPI systems. The radio interface is software-defined and can be configured by Tait or the integrator. Furthermore, existing analogue radio systems can be easily upgraded to handle dedicated TDMA data channels. These are fast enough to support the most advanced realtime AVL and passenger information services.

TNDS alleviates many of the operational burdens on radio

systems which, despite the amount of data they need to carry, must also accommodate voice applications.

**Exercise1**
**Study the following words and word-expressions:**

| | |
|---|---|
| **to outstrip** | - перевершувати, обганяти, |
| **to relay timetable information** | - передавати інформацію за розкладом, |
| **to be implemented through** | - бути виконаним, здійсненим, |
| **accurate delivery** | - точна доставка, |
| **in terms of** | - стосовно, |
| **to be accessible** | - бути доступним, |
| **a relevant device** | - придатний прилад, |
| **a robust solution** | - правильне рішення, |
| **interface** | - взаємодія, місце з`єднання, |
| **Radio interface** | - взаємодія мобільної станції з обладнанням радіомережі, |
| **easy connectivity** | - просте підключення, |
| **intelligent system** | - розумна система, |
| **verbal communication** | - голосовий зв`язок, |
| **control room** | - центр керування, |
| **to preclude** | - перешкоджати, запобігати, |
| **a prominent system developer** | - розробник визначної системи, |
| **trunking infrastructure** | - головна інфраструктура, |
| **polling rates** | - норма опитування, |
| **to ensure compatibility** | - забезпечити конкурентоспроможність, |
| **software** | - програмне забезпечення, |
| **hardware** | - апаратне забезпечення, |
| **to be upgraded** | - бути вдосконаленим, покращеним, |
| **to alleviate** | - полегшувати, |
| **operational burden** | - експлуатаційні навантаження, витрати, |
| **amount of data** | - кількість даних. |

**Exercise 2**
**Answer the questions according to the text:**

1 What is the essential element of good customer service in rail industry?
2 Which factors driving the adoption of the GPS technology and passenger information systems across Europe are there?
3 What do these factors mean?
4 Which three angles are the demands for real-time passenger information (RTRI)?
5 Which objectives does Tait focus on?
6 What can you tell about Taitnet Data System (TNDS)?

**Exercise 3**
**Give Ukrainian equivalent to the following English word-combinations:**

Good customer service, essential element, integrated public transport operation, consumer expectation, governmental initiatives, real-time passenger information, integrated transport systems, timely delivery of data, maintaining consumer trust and confidence, from an operator's viewpoint, up-to-date travel information, age of intelligent systems, hybrid of analogue radio technology.

**Exercise 4**
**Match up the couples of synonyms:**

Accurate, to be concentrated, transmission, protection, accessible, schedule, intelligent, exact, to upgrade, smart, to be focused, in connection with, essential, transference, timetable, security, to improve, obtainable, important, protection.

**Exercise 5**
**Read and translate the following confirmations. Think**

**whether they are true or false ( read the text attentively). If not give the right variant.**

1 Ensuring passengers have the information they need to make their journey with confidence and security is not an essential element of good customer service in rail industry.

2 The communications infrastructure is required to meet the demands of a modern, integrated public transport operation.

3 There are a number of factors driving the adoption of GPS technology and passenger information systems across Europe.

4 The way we pay for public transport hasn't changed yet.

5 Drivers of locomotives still need to contact the control room.

6 The hybrid of analogue radio technology is based on Tait`s existing trucking infrastructure.

7 Trunked analogue radio isn't well understood yet.

8 TNDS must also accommodate voice applications.

**Exercise 6**
**Transform the sentences according to the model:**

*Model: They sent me to University, they wanted me to study law.*
*They sent me to University to study law.*

1 It was obvious to transport professionals; they switched to public transport for economic and environmental reasons. 2 Transport authorities are placing real-time passenger information (RTDS) systems; they want to increase reliance on them. 3 Regulatory bodies require detailed information on timetable architecture; they provide a lot of useful data. 4 Internet can be used widespread in developed countries; they have information on all sorts of activities. 5 Much attention are focused on the web, information displays, and mobile telephony and so on, they actually receive the information. 6 Transmitting the data between vehicle, control center and information display is a major element it is often forgotten.

**Exercise 7**
**Write the annotation of the text.**

## TEXT 10

## MODEL SOLUTION

Until now, the majority of software engineers have written their embedded applications manually, but in a world of increasingly complex systems, this approach is not considered to be ideal by many experts.

Recently, model-based development methodologies have emerged and started to change the processes in the aerospace, automotive and transport industries. In general, model-based tools allow designers to describe the behavior of their system, but do not typically lower the burden of testing once the code has been written. Correcting the bugs when the code is already written is the cause for very long change cycles in process-driven projects, and in the worst case, the reason for unmanageable reliability issues.

Like the aerospace and automotive industries, the railway industry is facing a challenge imposed by reliability, availability, maintainability and safety objectives (RAMS), with respect to the development of electronic and software systems.

**Better safety**. In railway applications, there is a mandatory requirement to fulfill the objectives of transport-specific safety standards. In Europe, the relevant standard is Cenelec EN 50128, which can be seen as a domain-specific tailoring of the more generic international standard IES 61508. The two standards share fundamental principles, including classification of systems according to four distinct safety integrity levels (SIL1-SIL4).

EN 50128 mandates the demonstration of specific activities in

order to prove compliance with RAMS objectives, which imposes strict and extremely costly requirements on the software development process.

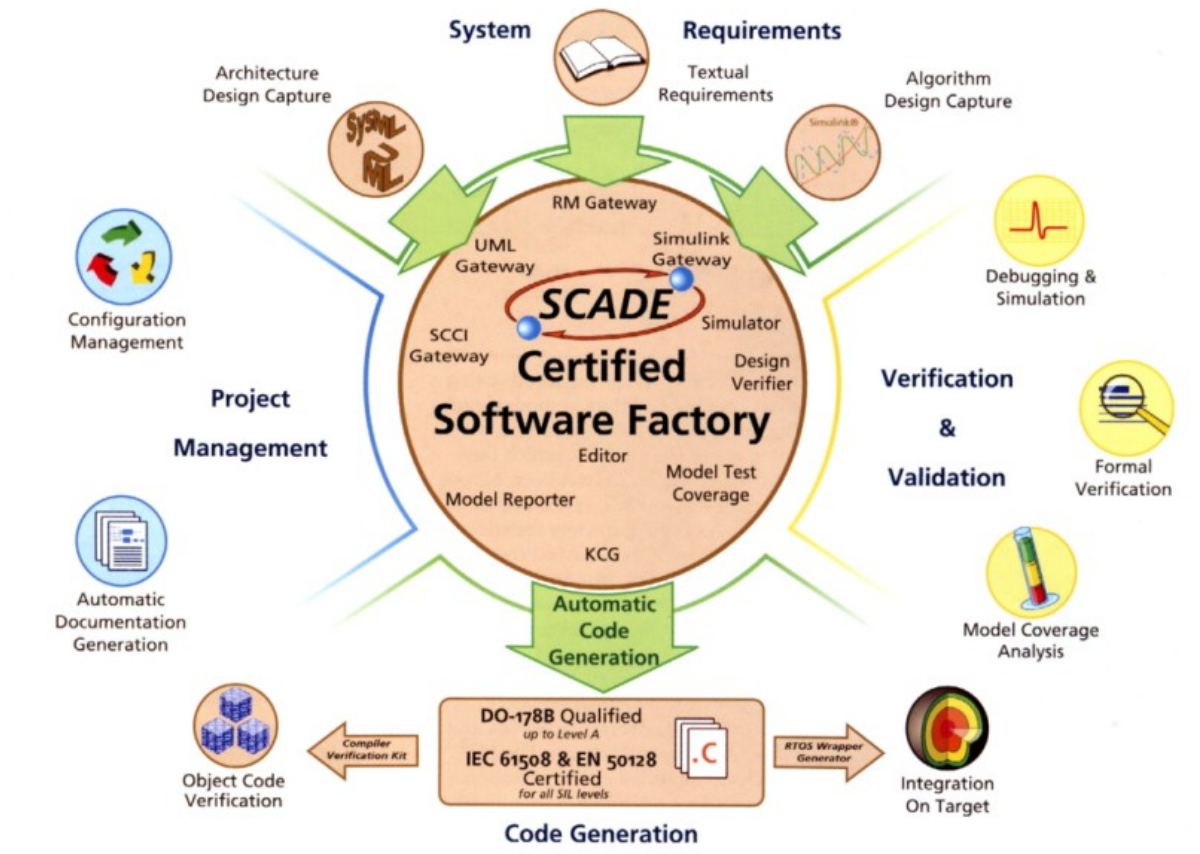
Practice and standards for software safety describe in detail how to achieve safety objectives for a given safety integrity level (SIL). The SIL or a given system is derived from a safety analysis and is intended to prove the absence of systematic errors in the software development process, giving sufficient confidence that the software application will provide the intended functionality and protection from hardware problems of safety hazards.

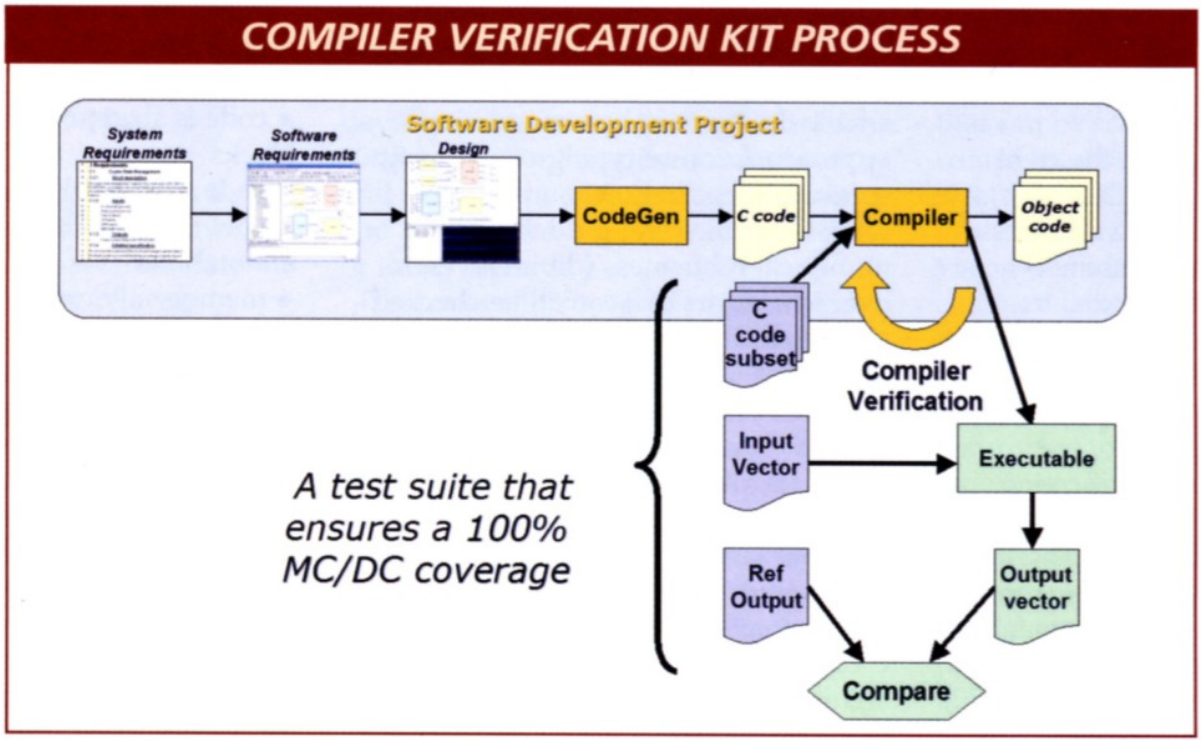
To achieve this level of confidence, the developer needs to demonstrate full traceability from the system requirements through software architecture and software design down to the embedded code. All requirements need to be tested on architecture, design, module and integration level: this test, verification and validation effort constitutes about half of total software development cost.

In the past, software has been seen as a piece of art. Each software system was created by a team of coders, and only understood by them. Costs were high, and the real functionality of software from those times is still a secret of the developers, and this can cause problems.

Nowadays we are in the era of software manufacture. Artisans are building beautiful, yet unique systems that can be scaled to impressive complexity, but become in a safety-driven process such as EN 50128. With Esterel`s Scade software suite, the vision of a safety-driven “certified software factory” (CSF) has become reality.

As with every real factory, it consists of different modules, assembly lines and robots that automate complex but repetitive tasks. There are modules to help the transfer of written requirements specifications of semi-formal specification models into the formal Scade executable specification, to provide tracking, tracing and coverage analysis of those requirements, and assembly lines to help the composition of complex systems from prefabricated and pre-certified functional software modules.




Finally, there is a smart robot called KCG, which is a certified automatic C code generator that transforms the executable specification into a piece of software readily integrated with the safe

hardware/software platform as specified by the developer.

**Combined testing process**. The Scade design and verification methodology has been integrated into the combined testing process. This allows for complete verification and validation of the entire development and its documentation.

The Scade model test coverage (MTC) module enables a systematic approach to access the coverage achieved with a given set of test vectors at model level. The result of such an assessment is a statement of the extent to which the structure of the model has been covered by the tests, and if the specification model has been completely tested with respect to the requirements. When using MTC, it can be assumed that all requirements have been covered by the model and that the model contains neither deactivated nor dead specifications.

The user gets a detailed report concerning the coverage achieved and can analyze the test session. The MTC reporter is qualified as a verification tool according to DO178-B (qualification in progress). Using this MTC approach, he user achieves a full verification of the Scade model versus the higher-level requirements.

In recent years, point tools for formal verification have emerged. Most of them extract information from a model and translate it into their own notation, or even do an interpretation of the generated code. The Scade Design Verifier relies on the mathematically unambiguous Scade model to formally check user-defined properties. This can be used to automatically verify functional consistency of the software requirements with the higher level safety relevant functional requirements.

Static checks on the formal model enable the “correct by construction” approach, because typing consistency, software specification completeness, modeling rules and guidelines, and numerical robustness (divide-by-zero, overflow errors etc) can all be checked automatically and completely by the tool. If the tool detects for example a potential divide-by-zero hazard, it will notify the user of this fact and automatically provide him with a set of input vectors to

reproduce the problem with the Scade simulator.

The Scade code generator automatically generates the complete C code implementing the software architecture and design defined in Scade for both data flows and state machines. It is much more than just a generation of code skeletons: the complete dynamic behavior is implemented.

It is important to understand that the Scade code generator has been developed with IEC 61508 and EN 50128 objectives. Certification includes an assessment of the development process, an analysis of the design philosophy and an assessment of the verification done:

- code is portable (compiler, target and operating system (OS) independent)
- code is structured by function or by blocks
- code is readable and traceable to the model through the use of names and annotations
- memory allocation is always static
- there is no pointer arithmetic
- there is no recursion, no loop
- execution time is bounded.

Only a formal software specification model as input for a qualified/certified code generator enables model-based software design in full and brings the benefits of a seamless design flow from requirements to code.

The generated code is fully compliant to software architectures based on abstraction layers such as Arinc 653 for aerospace and the safe SIL4 platforms used by the big rail transport OEMs such as Siemens, Thales and Alstom. The code generator provides a cyclic function; the OS-specific glue code is also being automatically built. This approach facilitates optimum portability because only the glue code changes from platform to platform. OS-specific made files and configuration files can also be automatically generated.

The code generation is completely formalized so that the code architecture, structure and patterns are well-defined and directly

related to the input model. Based on the formal language definition of the Scade language, the possible combination of language constructs in the generated C code is therefore completely defined and described.

That way, it is possible to define a Scade sample model covering all possible combinations of Scade constructs and to be completely sure that the generated C code will also reflect all possible constructs.

Based on this approach, a compiler verification kit has been designed, which provides the user with the Scade sample, C sample, test cases and reference test results. Run on the target, the test cases will ensure 100% modified condition/decision coverage of the executable and can therefore give high confidence in the compiler/linker/execution process in case of a positive pass.

The combined testing process enables an integrated design and verification approach, from high level requirements to execution of the code on the target and is the perfect complement to the upcoming safe partitioned platforms.

**Exercise 1**

**Study the following words and words-expressions:**

**approach** - підхід, наближення,
**to emerge** - виявлятися, з`ясовуватися,
**Bug** - технічний дефект,
**unmanageable** - некерований, важкий для контролю,
**mandatory requirement** - обов’язкова вимога,
**relevant** - доречний, той, що стосується справи,
**domain** - галузь,
**distinct** - різний,
**to impose** - накладати, оподатковувати,
**compliance** - згода,
**to derive from** - походити, здобувати,
**hazard** - небезпека, ризик,
**verification** - підтвердження, перевірка,
**validation** - затвердження, легалізація,
**complexity** - складність,
**smart robot** - розумний робот,
**unambiguous** - ясний, чіткий,

**consistency** - послідовність, сумісність,
**completeness** - завершеність, повнота,
**guideline** - керівний принцип, офіційний норматив,
**robustness** - ясність, твердість,
**compiler** - компілятор, програма, яка упорядковує та компонує програмний код,
**pointer** - покажчик,
**recursion** - рекурсія, метод визначення класу об`єкта,
**Loop** - петля,
**Input** - вхідні дані, введення,
**seamless** - без шва, суцільний,
**compliant** - поступливий, податливий.

**Exercise 2**
**Translate the following word-expressions into Ukrainian:**

World of increasingly complex systems, model-based development methodologies, transport-specific safety standards, distinct safety integrity levels, certified software factory, semi-formal specification models, prefabricated and pre-certified functional software modules, certified automatic C code generator, combined testing process, higher level safety relevant functional requirements, software specification completeness.

**Exercise 3**
**Find couples of synonyms:**

Bug, domain, right, mandatory, demand, distinct, hazard, scheme, aim, to divide, unambiguous, obligatory, different, fault, clear, branch, danger, correct, requirement, pattern, target, to partition.

**Exercise 4**

**Answer the questions according to the text:**

1 Which benefits of model-based tools for software engineers are there?

2 Which challenges is the railway industry facing?

3 Which relevant standard of transport-specific safety is there in Europe?

4 Which objectives are practice and standards achieved for software?

5 What is SIL (safety integrity level) intended to?

6 What main disadvantages of software system in the past were there?

7 Which principal features of modern software systems can you tell about?

8 What does MTC (model test coverage) mean?

9 Which challenges did Tait decide to take up?

**Exercise 5**

**Read and translate the following sentences paying your attention to the functions of the verb "to have and to be".**

1 The majority of software engineers have written their embedded applications manually. 2 Model-based development methodologies have started to change the processes in transport industries. 3 The railway industry is facing a challenge imposed by reliability, availability and safety objectives. 4 Two standards of safety have to share fundamental principles. 5 RAMS objectives are to impose strict and extremely costly requirements. 6 Practice and standards for software safety have to describe in detail how to achieve safety objectives. 7 The software application will be to provide the intended functionality and protection from hardware problems of safety hazards. 8 A software system was created by a team of coders. 9 Artisans are building beautiful, unique systems.

**Exercise 6**

**Read and translate the following confirmations. Think whether they are true or false (read the text attentively). If not give the right variant.**

1 Until now, the majority of software engineers have written their embedded applications manually.

2 Recently, model-based development methodologies haven't started to change the processes in transport industries.

3 In general, model-based tools don't allow designers to describe the behavior of their system.

4 Correcting the bugs when the code is already written is the cause for change cycles in process-driven projects.

5 In railway applications there is no mandatory requirement to fulfill the objectives of transport-specific safety standards.

6 In the USA, the relevant standards are CENELEC EN 50128.

7 Practice and standards for software safety describe in detail how to achieve safety objectives.

8 There are modules to help the transfer of written requirements specifications of semi-formal specification model into the formal Scade executable specification.

9 The Scade design and verification methodology hasn't been integrated into combined testing process.

***Exercise 7***
***Work in pairs.***

a) discuss with your partner the new challenges facing the railway industry.

b) you are a journalist from "International Railway Journal". Make up a short review about CENELEC safety standards in Europe.

**Exercise 8**
**Write the annotation of the text.**

**TEXT 11**

**RAILWAY RECORDING SYSTEMS AND SAFETY**

Almost half of the world's locomotives operate in Europe. It is therefore not too surprising that Europe leads the way in defining new requirements and standards and, moreover, is able to implement them internationally. The expansion of the European Union due to the opening of its eastern borders and eastward enlargement means that the railways – the most environmentally-friendly means of mass transport – have to improve their performance with new rolling stock and through automation. This is also applicable to urban transport. Both finance and new technologies have to be made available. Trains must operate at shorter headways, higher speeds, beyond national borders and be safe.

CENELEC (Comite Europeen de Normalisation Electrotechnique), whose member countries are Austria, Belgium, Cyprus, Czech Republic. Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom, Iceland, Norway and Switzerland has defined the term "safety" in its EN 50126, EN 50129, EN 50128 and EN 50159 standards. The objective of these standards is to avoid putting human life and limb at danger due to a technical malfunction. Member countries have mutually decided to accept these standards as national ones and to declare them as legal documents. Already several functions such as roll-back protection for metros and mountain railways with a defined safety integrity level (SIL) are required by different countries. All these applications require a modular and flexible system allowing simple and cost-efficient adaptation to the corresponding requisites.

Installing a simple "Black Box" in a vehicle to comply with legal requirements and only analyzing the data in case of an accident is neither reasonable nor economically desirable, despite the comparative low cost of such solutions. It is more sensible to use the received data regularly. In this way it can analyze data during operation to assure such safety related functions as roll-back protection, deadman-pedal (SIFA), etc.

To help customers in the design of new applications and modernization projects and to simplify the certification for an entire system, HaslerRail has developed the safety board (SABOA). SABOA has been developed according to the most stringent CENELEC standards in order to reach up to SIL4 certification for the following functions:

- **Rollback Protection**: Monitors the direction of travel. The brakes are activated if the train travels in the wrong direction – SIL4.
- **Driver Safety Device**: Monitors the driver (also called the dead-man control, SIFA or VACMA). If the driver lacks vigilance the brakes are activated. This function can fulfill the requirements according RF136:2002 and UIC641 when correctly configured – SIL4.
- **Speed Threshold**: Monitors the vehicle's speed. If the speed exceeds a pre-defined value, the brakes are activated. Useful for mountain railways and metros – SIL4.
- **Zero Speed Detection**: Monitors the vehicle's speed. If the vehicle is stopped, the signal to open the doors is activated – SIL2.
- **Speed Indicator Check**: Monitors the speed indicator. A pre-defined deviation between the present vehicle speed and the indicated speed activates the brakes –SIL2.

Based on the successful assessment by TUV Suddeutschland, the certificate with number Z10 05 07 was issued on July 21 2005.

What began more than 100 years ago with simple speed recording in the case of an accident, has developed into a complex and most important system. The systems record, monitor and control train processes in the locomotive and produce valuable data to help to optimize operations, reduce costs and increase safety.

**Exercise 1**
**Study the following words and words-expressions:**

**enlargement** - збільшення, розширення,
**to be applicable to** - бути придатним,
**limb** - кінцівка, частина тіла,

**malfunction** - аварійний режим, несправна робота,
**requisite** - необхідна річ, щось потрібне,
**to comply** - виконувати, погоджуватися,
**deadman-pedal** - важіль, вмонтований у важку плиту,
**direction** - напрямок,
**threshold** - поріг, ліміт,
**pre-defined value** - значення, встановлене заздалегідь,
**to monitor** - контролювати, перевіряти,
**valuable** - важливий, корисний,
**data** - дані, інформація,
**performance** - технічна характеристика,
**environment** - навколишнє середовище,
**integrity** - цілісність,
**mutual** - взаємний, двосторонній,
**stringent** - точний, обов'язковий, вагомий,
**deviation** - відхилення,
**roll-back** - відкочування у зворотному зв`язку.

**Exercise 2**

**Translate the following English word-expressions into Ukrainian:**

Half of world's locomotives, defining new requirements and standards, environmentally-friendly means of mass transport, safety integrity level, cost-efficient adaptation, economically desirable, to use the received data regularly, safety related functions, simple speed recording.

**Exercise 3**

**Make up 10 questions to the text and answer them.**

**Exercise 4**

**Read the following confirmations. Think whether they are true or false (read the text attentively).**

1 Almost half of the world's locomotives operate in Europe.

2 The railways have to deteriorate their performance with new rolling stock and through automation.

3 Trains must operate at shorter headways, higher speeds, beyond national borders and be safe.

4 The objectives of safety standards are to provoke putting human life and limb at danger due to a technical malfunction.

5 Installing a simple "White Box" in a vehicle to comply with legal requirements.

6 To help customers in the design of new applications and modernization projects Hasler Rail has developed the safety board (SABOA).

7 What began more than 20 years ago with simple speed recording in the case of an accident, has developed into a complex and most important system.

8 The systems record, monitor and control train processes in the locomotive and produce valuable data to avoid optimizing operations, reducing costs and increasing safety.

**Exercise 5**

**Read and translate the following sentences paying attention to the functions of the verb "have".**

1 The expansion of the European Union due to the opening of its eastern borders and eastward enlargement mean that the railways have to improve their performance with new rolling stock and through automation. 2 Both finance and new technologies have to be made available. 3 Trains have started to operate at shorter headways, higher speeds, beyond national borders. 4 CENELEC has defined the term "safety" in its EN 50126, EN 50129, EN 50128 and EN 50159 standards. 5 Member countries have mutually decided to accept these standards as national ones. 6 To help customers in the design of new applications and modernization projects Hasler Rail has to develop the safety board (SABOA). 7 SABOA has been developed according to the most stringent CENELEC standards. 8 The systems have to record, monitor and control train processes in the locomotives.

**Exercise 6**
**Work in pairs.**

a) you are a representative of a big British railway company. Prove the necessity of adopting new standards of safety by member countries of CENELEC;

b) discuss the functions of the safety board (SABOA).

**Exercise 7**
**Crossword. Find the hidden word. Words can be arranged in any direction.**

*управляти (c…)*
*дані (d…)*
*записувати (r…)*
*безпека (s…)*
*межа (l…)*
*контролювати (m…)*
*гальма (b…)*
*залізниця (r…)*
*захист (p…)*
*швидкість (s…)*
*аварія (a…)*
*автоматика (a…)*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| W | Q | M | R | A | I | L | W | A | Y |
| J | C | O | N | T | R | O | L | R | M |
| B | H | N | D | G | U | F | L | E | M |
| R | Z | I | M | P | D | I | L | C | O |
| A | U | T | O | M | A | T | I | O | N |
| K | B | O | B | S | T | K | L | R | K |
| E | U | R | V | P | A | K | I | D | P |
| S | S | A | F | E | R | Y | M | H | G |
| P | R | O | T | E | C | T | I | O | N |
| A | C | C | I | D | E | N | T | O | O |

**TEXT 12**

**THE INTERNET SPAWNS A SECURITY REVOLUTION**

Sending security camera footage to a central control centre using Internet technology is increasingly important for transport operators. Bosch has installed two comprehensive systems in Germany and Portugal.

The ready availability of Local Area Network (LAN) connectivity based on the new universal Internet Protocol (IP) is creating something of a revolution in security and surveillance. One of the major contributors to this revolution is Video Communications Systems (VCS), part of the Bosch Security Systems Division.

Benefits of IP to the security world include easy installation and scalability, wide-area connectivity and cost-effectiveness, thanks to the use of simple LAN infrastructures and global IP standards.

Two flagship examples graphically illustrating these benefits are the new CCTV systems recently installed on lines in the Aachen area of the German Rail (DB) network and the Lisbon Metro in Portugal.

Security and surveillance systems are crucially important for rail networks – not just as a deface against terrorism and crime, but also to ensure maximum passenger safety and comfort, and smooth, efficient operation of the network. A continuous record of events is also important from the legal perspective, since it can provide a defense in law if an event (such as an accident) occurs for which a rail authority may be held liable.

Security systems must include CCTV surveillance cameras, public announcement and alarm systems, and public information and help points. With the legacy of past developments, these systems mostly operate on separate networks and are based on different technologies, resulting in decentralization and inefficiency. They are also often difficult and expensive to install and expand as a rail network grows. This is changing with the growing use of IP-based security systems. Here CCTV cameras, information points, alarm and announcement systems are integrated into a LAN, each with its own IP address and all overseen and managed from a central control room. Once the network is established, plug-and-play functionality means

that IP-enabled units can easily be added or removed.

With around 5600 stations throughout the country, Germany`s rail network is the largest in Europe. As a first step on the route to a fully-integrated IP security system throughout the entire network, DB started a pilot project on 90 km of lines radiating from Aachen in 2003. This includes Aachen Central station and 22 regional stations handling about 100,000 passengers daily.

One of the prime requirements was for around-the-clock surveillance at every station and along the track on the Aachen network. This was provided by 150 CCTV cameras each connected to a Bosch VideoJet 1000 single-channel digital video recorder/transceiver unit. Eight cameras were installed in Aachen Central, one each at the 22 regional stations, and the rest were located along the track, the VideoJet 1000 units providing IP connectivity to the control room at Aachen Central Station via an existing optical fiber LAN.

The units also feature a new codec developed by Bosch with the unique capability of offering both MPEG-2 and MPEG-4 video compression. This allows DVD-quality video to be transmitted live via the IP network to the control room while simultaneously recording the video using the less space-hungry MPEG-4 compression. The codec also introduces a delay of just 100 milliseconds to the video transmission. This is exceptionally low compared with the delays of around 500 to 1000 milliseconds introduced by competitor codecs and allows for easy zooming to follow events in real-time captured on camera.

Stringent electromagnetic safety requirements near railway tracks forbid the use of any equipment with moving parts, which includes hard-disk storage media. To accommodate this, a tailored solution was developed in which the Video Jet units record locally onto 128 MB internal memory, providing about 15 minutes of recording time.

The entire network was implemented and integrated into DB`s own software environment using Bosch`s software development kit

(SDK). Written as a Microsoft Windows ActiveX library, this provides easy access to Bosch networked video, allowing customers to control, record and view video from within their own programs.

**Portuguese Experiment**. Prompted by the summer's 2005 European football championship in Portugal, Lisbon Metro decided to install a new IP-based CCTV surveillance system to monitor the movement of football fans travelling to and from the stadium. The company responsible for implementing the new system, ENT-Grupo Efacec, Portugal, chose Bosch as system provider.

The system was based around the new Video Jet 8000 digital video recorder/transmitter unit. This is capable of processing eight independent, non-multiplexed MPEG-2 video streams simultaneously over gigabit Ethernet (Ethernet supporting data rates up to1 gigabit/s). Moreover, with a maximum data rate of 480 fully-interlaced DVD-quality fields per second, the unit provides superb video with best use of bandwidth.

Lisbon Metro uses 45 Video Jet 8000 units located in stations, each receiving streaming video from eight CCTV cameras. The video is transmitted via LAN to the control room where it is monitored live on a bank of four split-screen monitors each displaying the video from four cameras.

The screens continuously switch between stations to allow for constant real-time monitoring. With integrated hard disk storage, each Video Jet 8000 also simultaneously makes a continuous three to five day recording. This is backed up at the control room on a high-capacity network video recorder that provides storage for all 45 units for more than 30 days.

For extra security, the system also features a salvo function in which all 16 pictures displayed on the monitors automatically switch from station to station as a train passes along the line.

Besides these two examples, Bosch has also been chosen for many others such as the Munich U-Bahn with 600 cameras, a line in Italy with 200 codecs and the light railways of Strasbourg and

Valenciennes in France, scheduled to be installed with more than 50 and 300 cameras respectively.

**Exercise 1**
**Study the following words and word-expressions:**

| | |
|---|---|
| **surveillance** | - нагляд, |
| **scalability** | - пристосованість до високих вимог, |
| **flagship** | - головний, |
| **crucial** | - вирішальний, критичний, |
| **Alarm system** | - система оповіщення, |
| **pilot project** | - експериментальний проект, |
| **around-the-clock surveillance** | - цілодобове спостереження, |
| **digital** | - цифровий, |
| **Codec** | - електронне приладдя, що перетворює відео сигнал у цифровий, |
| **Delay** | - затримка, |
| **optical fiber** | - оптичне волокно, |
| **zooming** | - масштабування, |
| **stringent** | - суворий, точний, обов`язковий, |
| **to forbid** | - забороняти, |
| **a tailored solution** | - відповідне рішення, |
| **hard-disk** | - жорсткий диск, |
| **Ethernet** | - локальна мережа, Ethernet, |
| **superb** | - чудовий, грандіозний, |
| **bandwidth** | - діапазон радіочастот, |
| **to spawn** | - викликати, породжувати. |

**Exercise 2**
**Answer the following questions according to the text:**

1 What are the major contributors to a revolution in security and surveillance in transport industry?

2 Which benefits of Internet Protocol are there?

3 Why are security and surveillance systems crucially

important for rail networks?

4 Which components must security systems include?

5 When and where did the pilot project of a fully-integrated IP security system start?

6 What does safety requirement forbid to use?

7 When did the Lisbon`s Metro authorities decide to install a new IP-based CCTV surveillance system? Why was it used for?

8 What main features of this new system do you know?

**Exercise 3**

**Translate the following word-expressions from English into Ukrainian.**

Central control center, video communication system, security systems division, cost-effectiveness, maximum passenger safety, IP-based security system, fully-integrated IP security system, stringent electromagnetic safety requirements, constant real-time monitoring, integrated hard disk storage.

**Exercise 4**

**Match pairs of the synonyms.**

Security, to occur, to allow, contributor, to use, flagship, to install, benefit, easy, crucial, to ensure, to establish, to remove, safety, to take place, to change, to found, to fit, advantage, to utilize, to permit, to provide, simple, leader, assistant, decisive.

**Exercise 5**

**Read and translate the following sentences paying attention to the function of the verb "be".**

1 Sending security camera footage to a central control center using Internet technology is increasingly important for transport operators. 2 Bosch was to install two comprehensive systems in Germany and Portugal. 3 The ready availability of Local Area

Network (LAN) connectivity based on the new universal Internet Protocol (IP) is creating something of a revolution in security and surveillance. 4 One of the major contributors to this revolution is Video Communications Systems. 5 Security and surveillance systems are crucially important for rail networks. 6 These systems are also often different and expensive to install. 7 Cameras information points, alarm and announcement systems are to be integrated into a LAN. 8 One of the prime requirements was to be for around-the-clock surveillance at every station. 9 This was provided by 150 CCTV cameras. 10 Eight cameras were to be installed in Aachen Central and the rest were located along the track. 11 The video is transmitted via LAN to the control room where it is to be monitored live on a bank of four split-screen monitors each displaying the video from four cameras.

**Exercise 6**
**Work in pairs.**

a) you are a journalist of the "International Railway Journal". You are to meet and interview Business Development Manager, David Lenot about using internet technology for transport operators. Use the facts from the text.

b) discuss with your colleagues advantages of security and surveillance systems for rail network.

**Exercise 7**
**Write an annotation to the text.**