Technical English

Third Generation Wireless Networks

概述

- 第一代移动通信系统从80年代中期开始，以模拟传输和采用频分复用（FDMA）这样的简单复用技术为特征。
- 第二代系统使用数字技术，出现于90年代初，通过语音压缩使容量增加三倍左右。
- 第三代系统是对第二代系统的扩展，系统容量扩大到原来第一代系统的10倍以上。

单词

infrastructure	基础设施
multipath	多径
multiplex	复用
inter-symbol	码间
immunity	免疫力
channelization	信道化
orthogonal	正交的
cellular	蜂窝状的
video conferencing	电视会议
reveal	披露，显示
connectivity	互联性
downfall	衰败，跌落
deployment	部署
paging	寻呼
converge	收敛，汇集于一点
in-building	建筑物内的

单词

on-demand	按需的
teleservice	远程服务
tolerance	允差，宽容度
surveillance	监视，监督
pedestrian	行人
pico-cell	微微蜂窝网格
trade off	折衷，妥协
undergo	经历
substantial	实质性的
hybrid	混合的
aeronautical	航空的
maritime	航海的
terrestrial	地面的
virtually	事实上的
roll out	展开
coverage	覆盖

用户稀少

The telecommunications industry faces the problem of providing telephone services to rural areas, where the customer base is small, but the cost of installing a wired phone network is very high. One method of reducing the high infrastructure cost of a wired system is to use a fixed wireless radio network. The problem with this is that for rural and urban areas, large cell sizes are required to get sufficient coverage. This presents extra problems as there are long delay times in multipath signal propagation.

降低有线电话高昂基础设施费用的一个方法

Currently Global System for Mobile telecommunications (GSM) technology is being applied to fixed wireless phone systems in rural areas of Australia. However, GSM uses time division multiplex access (TDMA), which has a high symbol rate leading to problems with multipath causing inter-symbol interference.

这种技术的符号速率很高，会导致多径引起码间干扰的问题

目的是改进蜂窝单元的容量、抗多径干扰以及灵活性

Several techniques are under consideration for the next generation of digital phone systems, with the aim of improving cell capacity, multipath immunity, and flexibility. These include CDMA and COFDM. Both these techniques could be applied to provide a fixed wireless system for rural areas. However, each technique has different properties, making it more suited for specific applications.

各自分别适合于不同的具体应用

COFDM is currently being used in several new radio broadcast systems including the proposal for high definition digital television (HDTV) and digital audio broadcasting (DAB).

However, little research has been done into the use of COFDM as a transmission method for mobile telecommunications systems.

而对COFDM作为一种移动通信系统的传输方法却研究甚少

In CDMA, all users transmit in the same broad frequency band using specialized codes as a basis of channelization. Both the base station and the mobile station know these codes used to modulate the data sent.

用于调制发送数据的码对于基站和移动站而言都是已知的

每个用户分配到若干载波在其中发送数据。

OFDM/COFDM allows many users to transmit in an allocated band, by subdividing the available bandwidth into many narrow bandwidth carriers. Each user is allocated several carriers in which to transmit their data. The transmission is generated in such a way that the carriers used are orthogonal to one another, thus allowing them to be packed together much closer than standard frequency division multiplexing (FDM). This leads to the high spectral efficiency of OFDM/COFDM.

传输以这样的方法进行：载波之间相互正交因而 …

导致了设计大容量通信网络的需要

The expansion of the use of digital networks has led to the need for the design of new higher capacity communications networks. The demand for cellular-type systems in Europe is predicted to be between 15 and 20 million users by the year 2000, and is already over 30 million (1995) in the U.S. Wireless services have been growing at a rate greater than 50% per year, with the current second-generation European digital systems (GSM) being expected to be filled to capacity by the early 2000s.[1]

以每年超过50%的速度

目前的第二代欧洲数字系统（GSM）预期在21世纪初达到饱和

The telecommunications industry is also changing, with a demand for a greater range of services such as video conferencing, Internet services, data networks, and multimedia. This demand for higher capacity networks has led to the development of third generation telecommunications systems.

随着更广泛的业务需求如视频会议、互联网服务、数据网络、多媒体等

One of the proposed third generation telecommunications systems is the Universal Mobile Telecommunications System (UMTS), with the aim of providing more flexibility, higher capacity, and a more tightly integrated service. This section focuses on the services and aims of the UMTS. Other systems around the world are being developed, however many of these technologies are expected to be combined into the UMTS.

其目标是提供更大的灵活性，更大的容量，以及更紧密集成的业务

The World Wide Web (WWW) has become an important communications media, as its use has increased dramatically over the last few years. This has resulted in an increased demand for computer networking services. In order to satisfy this, telecommunications systems are now being used for computer networking, Internet access and voice communications. A WWW survey revealed that more than 60% of users access the Internet from residential locations, where the bandwidth is often limited to 28.8kbps.

60%以上的用户从他们的居住地访问互联网，那里的带宽常限于28.8kbps

This restricts the use of the Internet, preventing the use of real time audio and video capabilities. Higher speed services are available, such as integrated-services digital network (ISDN). These provide data rates up to five times as fast, but at a much increased access cost. This has led to the demand of a more integrated service, providing faster data rates, and a more universal interface for a variety of services.

这就需要有更加集成化的业务，提供更快的速度，以及对于各种业务更通用的界面。

The emphasis has shifted away from providing a fixed voice service to providing a general data connection that allows for a wide variety of applications, such as voice, Internet access, computer networking, etc.

The increased reliance on computer networking and the Internet has resulted in an increased demand for connectivity to be provided “any where, any time”, leading to an increase in the demand for wireless systems. This demand has driven the need to develop new higher capacity, high reliability wireless telecommunications systems.

通过提供大容量和综合无线网络
克服现有无线系统的缺点

The development and deployment of third generation telecommunications systems aim to overcome some of the downfalls of current wireless systems by providing a high capacity, integrated wireless network. There are currently several third generation wireless standards, including UMTS, cdmaOne, IMT 2000, and IS-95.

Many mobile radio standards have been developed for wireless systems throughout the world, with more standards likely to emerge.

看来还会出现更多的标准

以模拟传输和采用频分复用（FDMA）这样的简单复用技术为特征

Most first generation systems were introduced in the mid 1980's, and can be characterized by the use of analog transmission techniques, and the use of simple multiplex access techniques such as Frequency Division Multiple Access (FDMA).[2] First generation telecommunications systems such as Advanced Mobile Phone Service (AMPS) only provided voice communications. They also suffered from a low user capacity, and security problems due to the simple radio interface used.

还存在用户容量小的问题，同时由于所用的无线电接口简单，也不够安全

Second generation systems were introduced in the early 1990's, and all use digital technology. This provided an increase in the user capacity of around three times. This was achieved by compressing the voice waveforms before transmission.

使容量增加了三倍左右

是在复杂性方面对第二代系统的扩展

Third generation systems are an extension on the complexity of second generation systems and are expected to be introduced after the year 2000. The system capacity is expected to be increased to over ten times original first generation systems. This is going to be achieved by using complex multiplex access techniques such as Code Division Multiplex Access (CDMA), or an extension of TDMA, and by improving flexibility of services available.

系统容量预计将扩大到原来第一代系统的10倍以上。

Table 10.1 and Table 10.2 show some of the major cellular mobile phone standards in North America and Europe.

Figure 10.1 shows the evolution of current services and networks to the aim of combining them into a unified third generation network. Many currently separate systems and services such as radio paging, cordless telephony, satellite phones, private radio systems for companies, etc., will be combined so that all these services will be provided by third generation telecommunications systems.[3]

现有业务和网络向融入统一的第三代网络这一目标的发展

当今许多分离的系统和业务如…将互相结合，因而…

在无线和有线环境下提供更加统一的大容量网络

The main aims of the Universal Mobile Telecommunications System is to provide a more unified high capacity network, in wireless and wired environments. UMTS will enable fixed and wireless services to converge. They are to be three main channel capacity connections: a mobile rate of 144kbps, a portable rate of 384kbps and an in-building rate of 2Mbps.

使固定业务和无线业务融合在一起

根据所要求的数据率、服务质量、可靠性和允许的误码率（BER）、实时传输速率来分类

Many services have been identified for the UMTS, which can be categorized based on the data rate required, quality of service, reliability and allowable bit error rate (BER), and real time transfer rate. Each of the services has different characteristics in terms of delay tolerance and allowable bit error rates. Table 10.3 shows characteristics for some of the UMTS services.

在延迟宽容度和允许的误码率方面

The data characteristics will determine the most suitable transmission methods. The type of data associated with each service determines the type of environment in which the service can be supported.

业务所支持的环境类型

“任何地点、任何时间”的服务

The aim of the UMTS systems is to provide an “any where, any time” service, thus the operating environment will vary depending on the user location. The environment in which the wireless system must operate affects the system capacity and type of services that can be provided. Table 10.4 lists some of the environments in which UMTS will be required to provide coverage.

The maximum supported data rate for each environment is related to the cell size required to provide adequate coverage for the environment.

A cellular network is required to ensure that the UMTS can provide a high capacity network. As with any cellular system, the total capacity of the network is dependent on the size of the cells used. The smaller the cells are made, the larger the total capacity. However, the cell size is limited by the amount of infrastructure that can be set up. The cell size also determines the maximum channel capacity for each cell, as propagation effects such as multipath and fading force large cells to have a lower data rate.

因为传播效应如多径和衰落迫使大的单元只能使用较低的数据率

大的单元还必须为大量用户服务

Large cells also have to service a large number of users, and since the cell capacity is approximately fixed, each user can only have a reduced data rate, with respect to a smaller cell. In order to optimize the cellular network three cell types are used. These are the pico-cell, micro cell, and macro-cell. The three cell types trade off cell size with total capacity and services. Table 10.5 shows the three cell types used in the UMTS system and some of the cell characteristics.

每个用户只能使用相应于小单元的低数据率

每种蜂窝单元的覆盖范围大小和类型
导致所面临的无线电传播问题

The size and type of coverage of each cell type effects the radio propagation problems that will be encountered. This will determine the most suitable radio transmission technique to use.

在一个大范围无线环境中提供灵活、按需分配的2Mbps宽带业务的要求

One of the aims identified for UMTS is to provide a wireless interface comparable to wired connections. The requirement to provide wide band services up to 2Mbps, with flexible, on demand allocation of transmission capacity in a large range of radio environments, will call for a revolution in the radio access techniques used.

将要求无线电接入技术方面的变革

涉及到对CDMA和TDMA性能比较的研究

The radio interface is currently undergoing substantial research, with the relative performance of CDMA and TDMA being investigated. Currently CDMA appears to be the most likely candidate for supporting the high data rate required. However, other techniques such as COFDM and hybrid solutions may also be appropriate for UMTS.

看来CDMA最有可能成为支持所要求高数据率的候选技术

限于高昂的基础设施成本，蜂窝网络只能覆盖有限区域

One of the aims of the UMTS is to provide access “any where, any time”. However, cellular networks can only cover a limited area due to the high infrastructure costs. For this reason, satellite systems form an integral part of the UMTS network. Satellites will be able to provide an extended wireless coverage to remote areas and to aeronautical and maritime mobiles.

一个完整的集成解决方案将要求移动电话是双重模式的，同时允许与轨道上运行的卫星和地面上的蜂窝式系统通信。

The level of integration of the satellite systems with the terrestrial cellular networks is under study. A fully integrated solution will require mobiles to be dual mode terminals that would allow communications with orbiting satellites and terrestrial cellular networks. Low Earth Orbit (LEO) satellites are the most likely candidates for providing worldwide coverage.

向全世界实际上所有地方提供具有极大带宽的（high bandwidth）双向通信

Currently several low earth orbit satellite systems are being deployed for providing global telecommunications. These include the Teledesic System, which is scheduled to begin operation by the end of 2002 with 288 satellites, to provide high bandwidth two-way communications to virtually anywhere in the world. However, the Teledesic System will not be able to meet even 20% of the demand, thus the need for broadband wireless networks.

因此也无法满足宽带无线网络的需求

建立系统并投入运行

Across the globe, each region is moving to make third generation systems happen. Japan is looking at having a system up and running by year 2000. This is driven by the fact that demand for mobile communications has been so great that their second generation cellular networks are starting to run out of capacity. It is expected that Europe will have a wide band CDMA system by the year 2005. The U.S. is expected to implement a third generation system somewhere from 2000 to 2010.

正在开始超出容量极限

Manufacturers are creating several standards to meet requirements in each sector of the world. To date, the majority of systems are based on CDMA standards. Before infrastructure rolls out, third generations will be developed on a regional basis.

在基础设施方案公布以前

This process is being guided by the International Telecommunications Union's (ITU) effort to create the IMT 2000 standard. ITU will produce the IMT 2000 standard by the year 2000, with the aim of combining the regional systems into a unified standard.

其目的是将地区性系统纳入统一的标准

Future communications will be driven by the need to provide a more integrated high capacity, wide coverage service. For the 21st century user there should ideally be no distinction in service capability between mobile or fixed network access. This will be achieved using a variety of technologies including satellite communications, advanced radio networking techniques, and high speed fixed networks.

对于21世纪的用户，理想的情况是在移动和固定网络接入的服务能力方面应该没有区别。

结合课文的思考题

- What are the main characteristics of the third generation communication systems?
- What are the principal aims of the UMTS?
- How can less inhabited areas be covered in an “any where, any time” communication network with reasonable cost?

Exercises

- **The System-on-Chip (SoC) technology is the next step in the evolution of computer science. Unlike a big chip stuffed mainly with random logic, SoC is designed as a programmable platform that integrates most of the functions of the end product in a single chip.**
- 片上系统（SoC）技术是计算机科学的下一步进展。不同于一个充塞随机逻辑的大芯片，SoC被设计成一个可编程平台，在一块芯片上集成了最终产品的大部分功能。

Exercises

- **It incorporates at least one processing element (microprocessor, DSP, etc.) that runs the system's embedded software. SoC includes peripherals, random logic and interfaces to the outside world and employs a bus-based architecture. It may contain both memory and analog functions.**
- 它至少包含一个处理单元（微处理器、DSP等），运行系统的嵌入软件。SoC包括外围设备、随机逻辑、与外界的接口，并使用基于总线的结构。它可能包含存储器和模拟功能。

Exercises

- **The ability to produce SoCs is a result of new manufacturing techniques that are capable of producing ever-smaller transistors and putting more of them on a single chip — Moore's Law in action — and the development of new tools that make it possible to automate the design and verification of such complex devices.**
- 生产SoC的能力是新型制造技术的结果，这种制造技术能生产出愈来愈小的晶体管并将更多的晶体管放进单个芯片（Moore定律的实现）；生产SoC的能力也是新工具开发的结果，这些新工具使得自动设计和验证如此复杂的器件成为可能。

Exercises

- **It has now become possible to create complex electronic systems that are very small and portable, use very little power and are very reliable. Miniature cell phones and digital cameras are good examples.**
- 现在已经可以造出尺寸很小而且可携带、功率极低、非常可靠的复杂电子系统。小型蜂窝式电话和数字照相机就是很好的例子。

Exercises

- **Thus far, SoCs have been used almost exclusively in high volume consumer applications, since they are the ones that have the armies of engineers and can afford the burden of time, cost and risk involved in the traditional development of SoC based systems.**
- **迄今为止SoC几乎无一例外地用于大批量消费产品中，因为正是这些应用领域才拥有大量的工程师，并能承受基于SoC系统传统开发中的时间、成本和风险负担。**

Exercises

- **Operation of the radar is based on the measurement of the time it takes for a pulse transmitted from an antenna to get reflected by the object to be detected and to return at the antenna and the receiver.**

  雷达的工作是基于对天线发出的脉冲被所要探测的目标反射，（然后）回到天线和接收机所需时间的测量。

Exercises

- **The degradation of the transmitted signal is a result of signal distortion due to imperfect response of the channel and due to undesirable electrical signals (noise) and interference. Noise and signal distortion are two basic problems of electrical communication.**

  传输信号的退化是信号失真的结果，而这种失真又是由信道的非理想响应及不想要的电信号（噪声）和干扰引起的。噪声和信号失真是电子通信的两个基本问题。

Exercises

- **A desired output power spectrum can be obtained by quickly moving through frequencies where the desired power spectrum is low, and slowly moving through frequencies where the desired power spectrum is high.**

  要求的输出功率谱可以这样来获得：迅速地扫过要求功率谱较低的频段，缓慢地扫过要求功率谱较高的频段。

Exercises

- **A very commonly used method of microwave measurements is based on the study of a standing wave pattern formed along the line because of the interference of incident and reflected waves.**

  一个很常用的微波测量法是基于对驻波波型的研究，这种驻波由入射波和反射波之间的干涉而沿着传输线形成。

Exercises

- **In the beginning, computers were used to process only numerical information, but majority of our information is non-numerical in nature and very little is known about its description and processing.**

  一开始计算机只是被用来处理数值信息，而我们的大多数信息都是非数值性质的，而且人们对这些信息的描述和处理所知甚少。

Exercises

- **It is rare that the optimization will be achieved in only one step, and usually many iterations around the analysis-error-adjustment loop will be required for obtaining a satisfactory result.**

  只经一步就达到优化的情况是罕见的，为得到满意的结果通常要围绕“分析－误差－调节”的循环进行多次迭代。

Exercises

- **The preceding chapters have described how the automatic computer performs, but have not described how the automatic computer can be put to use to do data handling work to serve an organization, nor why such work is done in the way that it is.**

  前面的章节讲述了自动计算机是如何工作的，但没有讲述自动计算机如何能用于数据处理来为一个机构服务，也没有讲为什么要用这种方法来完成这一任务。

Exercises

- **Electronic communications is the transfer and movement of data between locations through the use of computers. An electronic communication system includes the equipment needed to support the movement of information, the communication lines and media to carry the information, the computer software and programs to control the flow of information, the personnel to plan, implement, and operate communications, and the management of all these resources.**

  电子通信就是通过使用计算机在不同的地点之间传输数据。一个电子通信系统包括：支持信息流动所需要的设备，承载信息的通信线路和媒体，控制信息流的计算机软件和程序，计划、实施、操作通信系统的人员，以及对所有这些资源的管理。

Exercises

- **In FDMA each user is typically allocated a single channel, which is used to transmit all the user information. The bandwidth of each channel is typically 10kHz-30kHz for voice communications. However, the minimum required bandwidth for speech is only 3kHz. The allocated bandwidth is made wider than the minimum amount required to prevent channels from interfering with one another.**

  在典型的**FDMA**中，每个用户分配到一个信道用于传输所有的用户信息。每个信道的典型带宽是用于语音通信的**10kHz~30kHz**。然而语音要求的最小带宽只要**3kHz**。分配的带宽大于最低要求的带宽以防止信道之间的干扰。

Exercises

- **This extra bandwidth is to allow for signals from neighboring channels to be filtered out, and to allow for any drift in the center frequency of the transmitter or receiver. In a typical system up to 50% of the total spectrum is wasted due to the extra spacing between channels. This problem becomes worse as the channel bandwidth becomes narrower, and the frequency band increases.**

  多余的带宽是为了能将相邻信道的信号过滤掉，并能容忍发射机和接收机中心频率的漂移。在一个典型的系统中，由于信道间多余的间隔使高达50%的总频谱被浪费掉。当信道带宽变窄而总频带增大时情况更加严重。

Exercises

- **In a properly designed DC amplifier the effect of transistor parameter variation, other than Ico, may be practically eliminated if the operating point of each stage is adjusted so that it remains in the linear operation range of the transistor as temperature varies.**
  - **A. transistor**
  - **B. amplifier**
  - **C. Ico**
  - **D. parameter**

Exercises

- **Not until recently had anyone demonstrated a unified approach that not only allows previously obtained complicated results to be simplified both analytically and computationally but also permits new results to be obtained for special cases that had resisted solution in a simple form.**
  - **A. that had resistance against formality of sample solutions**
  - **B. that had prevented people from obtaining simple-form solutions**
  - **C. that had restricted solution to a simple form**
  - **D. that had resolved in the form of simplified solution**

Exercises

- **Off-the-shelf multimedia platforms reduce various tailor made components facing end users by packaging the needed functionality into a single product.**
  - **A. Specially manufactured multimedia platforms**
  - **B. Multimedia platforms mounted on the shelf**
  - **C. Readily available multimedia platforms**
  - **D. Multimedia platforms that are taken from the shelf**

Exercises

- **One possible way of classifying multimedia hardware is to differentiate the hardware into media-specific and non-media-specific.**
  - **A. special media and ordinary media**
  - **B. with and without media specifications**
  - **C. media-dependent and media-independent**
  - **D. media available and media in need**

The End