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普通高等教育物联网工程专业规划教材

物联网专业英语教程

Internet of Things English

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内 容 简 介

本书是物联网专业英语教材，选材广泛，覆盖通信技术、网络技术、软件与硬件等各个方面，同时兼顾了相关的发展热点。本书内容包括物联网基础、体系与技术、标准与协议，因特网及其设备，泛在网与虚拟专用网络，条形码技术，RFID 与 EPC 网络，WiFi 与蓝牙，无线传感网络与应用，云计算与物联网未来等。

本书力求体例创新，适合教学。每一单元包含以下部分：课文——选材广泛、风格多样、切合实际的两篇专业文章；单词——给出课文中出现的新词，读者由此可以积累物联网专业的基本词汇；词组——给出课文中的常用词组；缩略语——给出课文中出现的、业内人士必须掌握的缩略语；习题——既有针对课文的练习，也有一些开放性的练习；短文翻译——培养读者的翻译能力；参考译文——让读者对照理解和提高翻译能力；难点脚注——即时讲解，注释宽广，具有开放性。附录 I 的“自测题”可以检查学习效果；附录 II 的“物联网英语词汇的构成与翻译”，揭示新词的构成方法，提供翻译技巧，对读者“破译”新词大有裨益；附录 III 的“词汇总表”既可用于复习和背诵，也可作为小词典供长期查阅。

本书吸纳了作者近 20 年的 IT 行业英语翻译与图书编写经验，与课堂教学的各个环节紧密切合，支持备课、教学、复习及考试各个教学环节，有配套的 PPT、参考答案、参考试卷等。

本书既可作为高等本科院校、高等专科院校物联网相关专业的专业英语教材，也可供从业人员自学。作为培训班教材，亦颇得当。

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前　言

物联网是继互联网之后的又一次技术革命，它把网络延伸到物的层面。物联网比互联网更有增长潜力，有可能成为信息产业中继计算机、互联网之后的第三次浪潮。我国物联网已经进入高速发展期，许多高校开设了物联网专业，培养急需的专业人员。由于物联网有极高的发展速度，从业人员必须掌握许多新技术、新方法，因此对专业英语要求较高。具备相关职业技能并精通外语的人员往往会赢得竞争优势，成为职场中不可或缺的核心人才与领军人物。

本书的特点与优势如下：

(1) 选材全面，包括通信技术、网络技术、软件与硬件等各个方面，同时兼顾相关的发展热点。书中许多内容非常实用，具有广阔的覆盖面。作者对丰富的课文素材进行了严谨推敲与细致加工，使其具有教材特性。

(2) 内容全面，包括物联网基础、体系与技术、标准与协议，因特网及其设备，泛在网与虚拟专用网络，条形码技术，RFID 与 EPC 网络，WiFi 与蓝牙，无线传感网络与应用，云计算与物联网未来等。

(3) 体例创新，非常适合教学，与课堂教学的各个环节紧密切合，支持备课、教学、复习及考试各个教学环节。每个单元均包含以下部分：课文——选材广泛、风格多样、切合实际的两篇专业文章；单词——给出课文中出现的新词，读者由此可以积累物联网专业的基本词汇；词组——给出课文中的常用词组；缩略语——给出课文中出现的、业内人士必须掌握的缩略语；习题——既有针对课文的练习，也有一些开放性的练习；短文翻译——培养读者的翻译能力；参考译文——让读者对照理解和提高翻译能力；难点脚注——即时讲解，注释宽广，具有开放性，是对课文的延伸与扩展。

(4) 习题量适当，题型丰富，难易搭配，便于教师组织教学。

(5) 附录 I 的“自测题”可以检查学习效果；附录 II 的“物联网英语词汇的构成与翻译”揭示新词的构成方法，提供翻译技巧，对读者“破译”新词大有裨益；附录 III 的“词汇总表”既可用于复习和背诵，也可作为小词典供长期查阅。

(6) 教学支持完善，有配套的 PPT、参考答案、参考试卷等。

(7) 作者有近 20 年 IT 行业英语图书的编写经验。在作者编写的英语书籍中，

有三部国家级“十一五”规划教材，一部全国畅销书，一部获华东地区教材二等奖图书。这些编写经验有助于本书的完善与提升。

在使用本书的过程中，有任何问题都可以通过电子邮件与我们交流，我们一定会给予答复。邮件标题请注明姓名及“索取物联网英语参考资料”字样。我们的 E-mail 地址为 zqh3882355@sina.com 和 zqh3882355@163.com。

如本书有任何不妥之处，望大家不吝赐教，让我们共同努力，使本书成为一部“符合学生实际、切合行业实况、知识实用丰富、严谨开放创新”的优秀教材。

作　者

2012 年 10 月

目　　录

Unit 1 Internet of Things

Text A

Internet of Things

The Internet of Things refers to uniquely identifiable objects (things) and their virtual representations in an Internet-like structure. The term Internet of Things was first used by Kevin Ashton[①] in 1999. The concept of the Internet of Things first became popular through the Auto-ID Center[②] and related market analysts publications. Radio-Frequency IDentification (RFID) is often seen as a prerequisite for the Internet of Things. If all objects of daily life were equipped with radio tags, they could be identified and inventoried by computers. However, unique identification of things may be achieved through other means such as barcodes or 2D-codes as well.

With all objects in the world equipped with minuscule identifying devices, daily life on Earth would undergo a transformation. Companies would not run out of stock or waste products, as all involved parties would know exactly which products are required and consumed. Mislaid and stolen items would be easily tracked and located.

1. Alternative definitions

Different definitions for the Internet of Things have appeared and the term is evolving as the technology and implementation of the ideas move forward. Here are several partially overlapping definitions.

1.1 CASAGRAS

A global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities. This infrastructure includes existing and

① Kevin Ashton (born in 1968 in Birmingham, England) is a British technology pioneer ([ˌpaiəˈniə]n.先驱，倡导者) who cofounded the Auto-ID Center at the Massachusetts Institute of Technology, which created a global standard system for RFID and other sensors.

② Auto-ID Center to design the architecture for the Internet of Things together with EPCglobal.

evolving Internet and network developments. It will offer specific object-identification, sensor and connection capability as the basis for the development of independent cooperative services and applications. These will be characterized by a high degree of autonomous data capture, event transfer, network connectivity and interoperability.

1.2 SAP[①]

A world where physical objects are seamlessly integrated into the information network, and where the physical objects can become active participants in business processes. Services are available to interact with these 'smart objects' over the Internet, query and change their state and any information associated with them, taking into account security and privacy issues.

1.3 EPoSS

The network formed by things/objects having identities, virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate with the users, social and environmental contexts.

1.4 CERP-IoT

Internet of Things (IoT) is an integrated part of Future Internet. It could be defined as a dynamic global network infrastructure with self configuring capabilities based on standard and interoperable communication protocols. In the IoT, physical and virtual 'things' have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network. In the IoT, 'things' are expected to become active participants in business, information and social processes. They are enabled to interact and communicate among themselves and with the environment by exchanging data and information 'sensed' about the environment, while reacting autonomously to the 'real/physical world' events and influencing it by running processes that trigger actions and create services with or without direct human intervention. Interfaces in the form of services facilitate interactions with these 'smart things' over the Internet, query and change their state and any information associated with them, taking into account security and privacy issues.

1.5 Other

The future Internet of Things links uniquely identifiable things to their virtual representations in the Internet containing or linking to additional information on their identity, status, location or any other business, social or privately relevant information at a financial or non-financial pay-off. It exceeds the efforts of information provisioning and offers information access to non-predefined participants. The provided accurate and appropriate information may be accessed in the right quantity and condition, at the right time and place at the right price. The Internet of Things is not synonymous with ubiquitous/pervasive computing, the Internet Protocol (IP), communication technology, embedded devices, its applications, the Internet of People or the Intranet/Extranet of Things, yet it relies on all of these approaches. The

① SAP is a German software corporation that makes enterprise software to manage business operations and customer relations.

association of intelligent virtual representations (e.g.: called avatars and embedded, hosted in the Cloud or centralized) and physical objects are sometimes called "cyberobjects". Cyberobjects are then considered as autonomous actors of the value chains they are involved in: able to perceive, analyze and react in various contexts; although acting under the guidance of human beings as programmed. Cyberobjects can then be assistants, advisors, decision makers, etc; and can be considered as true agent (economics)[①], helping to change existing economic or organization models. In such a scenario, the conception of avatars refers to Artifical Intelligence[②] and complex system.

2. Unique addressability of things

The original idea of the Auto-ID Center is based on RFID-tags and unique identification through the Electronic Product Code[③].

An alternative view, from the world of the Semantic Web[④], focuses instead on making all things (not just those electronic, smart, or RFID-enabled) addressable by the existing naming protocols, such as URI[⑤]. The objects themselves do not converse, but they may now be referred to by other agents, such as powerful centralized servers acting for their human owners.

The next generation of Internet applications using Internet Protocol version 6 (IPv6)[⑥] would be able to communicate with devices attached to virtually all human-made objects because of the extremely large address space of IPv6. This system would therefore be able to identify any kind of object.

A combination of these ideas can be found in the current GS1/EPCglobal[⑦] EPC Information Services specifications. This system is being used to identify objects in industries ranging from Aerospace to Fast Moving Consumer Products and Transportation Logistics.

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① In economics, an agent is an actor and decision maker in a model. Typically, every agent makes decisions by solving a well or ill defined optimization/choice problem.

② Artificial Intelligence (AI) is the intelligence of machines and the branch of computer science that aims to create it. AI textbooks define the field as "the study and design of intelligent agents" where an intelligent agent is a system that perceives its environment and takes actions that maximize (['mæksmaiz]vt.取……最大值，最佳化) its chances of success.

③ The Electronic Product Code (EPC) is designed as a universal identifier that provides a unique identity for every physical object anywhere in the world, for all time.

④ The Semantic Web is a collaborative movement led by the World Wide Web Consortium (W3C) that promotes common formats for data on the World Wide Web (万维网). By encouraging the inclusion of semantic content in web pages, the Semantic Web aims at converting the current web of unstructured documents into a "web of data".

⑤ In computing, a Uniform Resource Identifier (URI) is a string of characters used to identify a name or a resource on the Internet.

⑥ Internet Protocol version 6 (IPv6) is a version of the Internet Protocol (IP). It is designed to succeed ([sək'si:d]v.继……之后) the Internet Protocol version 4 (IPv4). The Internet operates by transferring data between hosts in small packets that are independently routed across networks as specified by an international communications protocol known as the Internet Protocol.

⑦ EPCglobal is a joint venture between GS1 (formerly known as EAN International) and GS1 US (formerly the Uniform Code Council, Inc.). It is an organization set up (建立) to achieve worldwide adoption and standardization of Electronic Product Code (EPC，电子产品编码) technology.

3. Trends and characteristics

3.1 Intelligence

Ambient Intelligence① and Autonomous Control are not part of the original concept of the Internet of Things. Ambient Intelligence and Autonomous Control do not necessarily require Internet structures, either. However, there is a shift in research to integrate the concepts of the Internet of Things and Autonomous Control. In the future the Internet of Things may be a nondeterministic and open network in which auto-organized or intelligent entities (Web services②, SOA③ components), virtual objects will be interoperable and able to act independently (pursuing their own objectives or shared ones) depending on the context, circumstances or environments.

Embedded intelligence presents an "AI-oriented" perspective of IoT, which can be more clearly defined as: leveraging the capacity to collect and analyze the digital traces left by people when interacting with widely deployed smart things to discover the knowledge about human life, environment interaction, as well as social connection/behavior.

3.2 Architecture

The system will likely be an example of Event-Driven Architecture④, bottom-up made (based on the context of processes and operations, in real-time) and will consider any subsidiary level. Therefore, model driven and functional approaches will coexist with new ones able to treat exceptions and unusual evolution of processes.

3.3 Complex system

In semi-open or closed loops, it will therefore be considered and studied as a Complex system due to the huge number of different links and interactions between autonomous actors, and its capacity to integrate new actors. At the overall stage (full open loop) it will likely be seen as a chaotic⑤ environment.

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① In computing, Ambient Intelligence (AmI, 环境智能) refers to electronic environments that are sensitive and responsive to the presence of people. In an Ambient Intelligence world, devices work in concert to support people in carrying out their everyday life activities, tasks and rituals in easy, natural way using information and intelligence that is hidden in the network connecting these devices.

② A Web service is a method of communication between two electronic devices over the web. The W3C defines a "Web service" as "a software system designed to support interoperable machine-to-machine (机器对机器) interaction over a network".

③ In software engineering, a Service-Oriented Architecture (SOA) is a set of principles and methodologies ([meθə'dɔlədʒi]n.方法学, 方法论) for designing and developing software in the form of interoperable services. These services are well-defined business functionalities that are built as software components (discrete pieces of code (代码段) and/or data structures (数据结构)) that can be reused for different purposes. SOA design principles are used during the phases of systems development and integration.

④ Event-Driven Architecture (EDA) is a software architecture pattern promoting the production, detection, consumption of, and reaction to events.

⑤ Chaos theory (混沌论) is a field of study in mathematics, with applications in several disciplines including physics, economics, biology, and philosophy. Chaos theory studies the behavior of dynamical systems that are highly sensitive to initial conditions, an effect which is popularly referred to as the butterfly effect (蝴蝶效应).

3.4 Size considerations

The Internet of Objects would encode 50 to 100 trillion objects, and be able to follow the movement of those objects.

3.5 Time considerations

In this Internet of Things, made of billions of parallel and simultaneous events, time will no more be used as a common and linear dimension but will depend on each entity (object, process, information system, etc.). This Internet of Things will be accordingly based on massive parallel IT systems (Parallel computing①).

3.6 Space considerations

In an Internet of Things, the precise geographic location of a thing — and also the precise geographic dimensions of a thing — will be critical. Currently, the Internet has been primarily used to manage information processed by people. Therefore, facts about a thing, such as its location in time and space, has been less critical to track because the person processing the information can decide whether or not that information was important to the action being taken, and if so, add the missing information (or decide not to take the action). (Note that some things in the Internet of Things will be sensors, and sensor location is usually important.) The GeoWeb② and Digital Earth③ are promising applications that become possible when things can become organized and connected by location. However, challenges that remain include the constraints of variable spatial scales, the need to handle massive amounts of data, and an indexing for fast search and neighbour operations. In the Internet of Things, if things are able to take actions on their own initiative, this human-centric mediation role is eliminated, and the time-space context that we as humans take for granted must be given a central role in this information ecosystem. Just as standards play a key role in the Internet and the Web, geospatial standards will play a key role in the Internet of Things.

4. Frameworks

Internet of Things frameworks might help support the interaction between "things" and allow for more complex structures like distributed computing④ and the development of distributed applications. Currently, Internet of Things frameworks seem to focus on real time data

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① Parallel computing is a form of computation in which many calculations are carried out simultaneously, operating on the principle that large problems can often be divided into smaller ones, which are then solved concurrently ([kən'kʌrənt]adj.并发的) ("in parallel").

② The Geospatial Web or Geoweb is a relatively new term that implies the merging of geographical (location-based) information with the abstract information that currently dominates the Internet. This would create an environment where one could search for things based on location instead of by keyword only – e.g. "What is here?"

③ Digital Earth is the name given to a concept by former US vice president Al Gore in 1998, describing a virtual representation of the Earth that is spatially ([ˈspeiʃəli]adv.空间地) referenced and interconnected with the world's digital knowledge archives.

④ Distributed computing is a field of computer science that studies distributed systems. A distributed system consists of (由……组成) multiple autonomous computers that communicate through a computer network.

logging solutions like Pachube[①]: offering some basis to work with many "things" and have them interact. Future developments might lead to specific software development environments[②] to create the software to work with the hardware used in the Internet of Things.

New Words

uniquely	[ju:'ni:kli]	adv. 独特地，唯一地
identifiable	[ai'dentifaiəbl]	adj. 可以确认的
virtual	['və:tjuəl]	adj. 虚拟的，实质的
representation	[ˌreprizen'teiʃən]	n. 表示法，表现
popular	['pɔpjulə]	adj. 流行的，受欢迎的
publication	[ˌpʌbli'keiʃən]	n. 出版物，出版，发行，发表
prerequisite	['pri:'rekwizit]	n. 先决条件 adj. 首要必备的
tag	[tæg]	n. 标签，标识
identify	[ai'dentifai]	vt. 识别，鉴别
inventory	['invəntri]	vt. 编制……的目录；盘存，清查 vi. 对清单上存货的估价 n. 详细目录，存货，财产清册，总量
barcode	['bɑ:kəud]	n. 条形码
2D-code		n. 二维码
minuscule	[mi'nʌskju:l]	adj. 极小的
undergo	[ˌʌndə'gəu]	vt. 经历，遭受，忍受
stock	[stɔk]	n. 库存，原料
misland	[mis'lænd]	vt. 放错，遗失
alternative	[ɔ:l'tə:nətiv]	adj. 选择性的，二中择一的
definition	[ˌdefi'niʃən]	n. 定义，解说，精确度
evolve	[i'vɔlv]	v. (使)发展，(使)进展，(使)进化
overlapping	['əuvə'læpiŋ]	n. 重叠，搭接
infrastructure	['infrəstrʌktʃə]	n. 基础，下部构造，基础组织
exploitation	[ˌeksplɔi'teiʃən]	n. 使用
communication	[kəˌmju:ni'keiʃn]	n. 通讯
capability	[ˌkeipə'biliti]	n. (实际)能力，性能，容量，接受力
specific	[spi'sifik]	adj. 详细而精确的，明确的，特殊的

① Pachube is an on-line database service provider allowing developers to connect sensor data to the Web and to build their own applications on it.

② An Integrated Development Environment (IDE，集成开发环境) (also known as integrated design environment, integrated debugging environment or interactive development environment) is a software application that provides comprehensive ([ˌkɔmpri'hensiv]adj.全面的，广泛的) facilities to computer programmers for software development.

sensor	['sensə]	n. 传感器
independent	[indi'pendənt]	adj. 独立的
cooperative	[kəu'ɔpərətiv]	adj. 合作的，协力的
application	[ˌæpli'keiʃən]	n. 应用，应用程序
participant	[pɑ:'tisipənt]	n. 参与者，共享者
available	[ə'veiləbl]	adj. 可用的，有效的
query	['kwiəri]	v. 询问，查询
state	[steit]	n. 情形，状态
security	[si'kjuəriti]	n. 安全
privacy	['praivəsi]	n. 秘密
issue	['isju:]	n. 问题，结果
identity	[ai'dentiti]	n. 身份，特性
personality	[ˌpə:sə'næliti]	n. 人格，人物，人名
environmental	[inˌvaiərən'mentl]	adj. 周围的，环境的
dynamic	[dai'næmik]	adj. 动态的
configure	[kən'figə]	vi. 配置，设定
interoperable	[ˌintər'ɔperəbl]	adj. 能共同操作的，能共同使用的
attribute	[ə'tribju(:)t]	n. 属性，品质，特征
exchange	[iks'tʃeindʒ]	vt. & n. 交换，调换，兑换，交易
sense	[sens]	vt. 感知，感到，认识
react	[ri'ækt]	vi. 起反应，起作用
influence	['influəns]	n. 影响，(电磁)感应 vt. 影响，改变
interaction	[ˌintər'ækʃən]	n. 交互作用，交感
facilitate	[fə'siliteit]	vt. 使便利，帮助，使容易，促进
location	[ləu'keiʃən]	n. 位置，场所
relevant	['relivənt]	adj. 有关的，相应的
predefine	['pri:di'fain]	vt. 预先确定
accurate	['ækjurit]	adj. 正确的，精确的
access	['ækses]	n. & vt. 访问，存取
pervasive	[pə:'veisiv]	adj. 普遍深入的
embedded	[em'bedid]	adj. 植入的，嵌入的，内含的
intranet	['intrənet]	n. 内联网
extranet	['ekstrənet]	n. 外联网
association	[əˌsəusi'eiʃən]	n. 协会，联合
avatar	[ˌævə'tɔ:]	n. 化身，天神下凡，具体化
centralize	['sentrəlaiz]	vt. 集聚，集中
host	[həust]	n. 主机 v. 做主机