Wireless technology is a term used to describe a network where there is no physical connection between the sender and receiver. Instead, the sender and receiver are connected by radio.

Wireless technologies are being adopted for many new applications: connecting computer, remote monitoring, data acquisition, security, and providing solutions for environments where wires may not be the best solution.

There are many wireless network based products available today, such as mobile phones, PDA devices, pocket PCs, and digital diaries. These devices can communicate with other wireless devices or access information from a remote server. Such devices use a wireless technology to communicate. Wireless technologies provide a medium to communicate and create wireless applications.

There are various types of wireless technologies, all of which have different capabilities and unique applications.

Most of the wireless technologies are based on the Global System for Mobile Communications (GSM) platform. GSM is the global standard for digital mobile communication.

GSM uses the Time Division Multiple Access (TDMA) technology to transfer data. The TDMA technology enables multiple calls on the same radio frequency.

The various wireless technologies are:

- General Packet Radio Service (GPRS)
- Third Generation GSM (3GSM)
- Enhanced Data rates for GSM Evolution (EDGE)
- Wireless Application Protocol (WAP)

GPRS

GPRS is a data service used to send and receive data across the wireless network. GPRS enables mobile devices to connect instantly to the server so that the application can access the required data. GPRS allows you to download wireless applications on mobile devices. It also provides the facility to deliver textual and visual information, such as sports scores, news headlines, and weather information. In addition, you can also send and receive still and animated images by using GPRS.

3GSM

3GSM is an enhanced version of the GSM platform that provides third generation mobile multimedia services. 3GSM provides high bandwidth and quality for transmitting voice and text across a wireless network.

3GSM uses an additional radio signal, which was not available in the GSM platform. This additional radio signal provides added bandwidth, which enables mobile device subscribers to access high data transmission speed and multimedia data services.

3GSM technology provides advanced multimedia services and greater bandwidth that is not provided by GPRS wireless technology.

EDGE

EDGE is a 3rd Generation (3G) wireless technology that provides broader bandwidth and faster data transfer in mobile devices. This technology enables mobile users to download video and music clips and access high-speed Internet. End users, by using the EDGE

wireless technology, can connect to the Internet and exchange data faster than by using the 2nd Generation (2G) wireless technology.

The first generation of wireless technology, known as 1G, used analog voice signaling to transfer voice-based data in mobile devices.

The second generation of wireless technology, known as 2G, used digital voice encoding to transfer voice-based data.

The third generation of wireless technology, known as 3G, provides advanced features, such as enhanced multimedia, broad bandwidth, and high-speed data access

WAP

Wireless Application Protocol (WAP) is a specification that adapts several data-handling techniques used by Web protocols such as TCP/IP. The development of WAP applications is relatively simple because it reuses existing Web technologies. To generate dynamic WAP content, you can use either Servlets and Java Server Pages (JSP) or Wireless Markup Language (WML).

Although WAP and J2ME are complementary technologies, they operate in different ways. When using the WAP technology, the mobile device runs a browser that accesses the intranet or Internet applications. The mobile device does not contain any other application.

In a J2ME enabled mobile device, you need to download an application and run it locally on the device. You do not need to use a browser to access an application.

Introducing J2ME

Java 2 Platform Micro Edition (J2ME) is a Java-based platform developed by Sun Microsystems. J2ME is used to create mobile applications that are used in mobile devices having limited processor, memory, and display capabilities. This platform includes flexible user interfaces, a robust security model, and built-in network protocols.

Sun Microsystems has released several versions of Java, and they have maintained architectural consistency across the various versions. Several new features have been added in each subsequent version. These versions of Java have been released in a series. However, after the release of Java 1.2, there has been a change in the way Java is packaged and licensed. This has led to the Java platform being split into three editions.

The three platforms of Java that address different computing environments are:

- Java 2 Standard Edition (J2SE)
- Java 2 Enterprise Edition (J2EE)
- Java 2 Micro Edition (J2ME)

J2SE is primarily used to create Java applets and applications that are stand alone and Web-based. It is a core collection of tools and APIs.

J2EE was Java's answer to enterprise computing wherein a single application is scattered across a distributed network and accessed remotely. J2EE contains all the functionality of J2SE and focuses on server programming by using Enterprise Java Beans (EJB), Servlets and Java Server Pages (JSP), and Extensible Markup Language (XML).

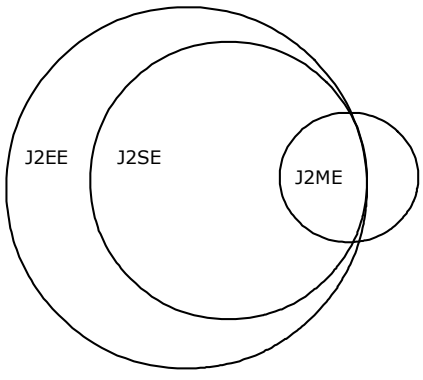
J2ME focuses on the wireless computing environment. One of the major limitations of wireless computing has been the restriction on hardware resources of devices such as mobile phones, Personal Digital Assistants (PDAs), and other electronic and embedded devices.

The Java 2 Micro Edition (J2ME), a modular and customized platform from Sun Microsystems Inc., handles the computing requirements of the above-mentioned devices with as little as 128 KB of RAM and with processors that are less powerful than desktop computers.

J2ME derives most of its features from J2SE. Some of the features of J2ME are:

- Portability
- Built-in consistency across products
- Security over the network
- Compatibility with J2SE and J2EE platforms

The following figure shows the three Java editions in terms of a set diagram:



Library Sets of Java's Editions

The J2ME classes are a subset of J2SE classes, which are a subset of J2EE classes. J2ME also contains its own classes, called Profile APIs, which are not a part of the J2SE and J2EE APIs. MIDP is an example of a J2ME Profile API. J2SE is a simplified version of J2EE and does not have enterprise computing support. Similarly, J2ME is a simplified version of J2SE and contains classes and methods to develop applications for mobile devices.

To support the wide variety of mobile devices, J2ME adopts a layered architecture, which is divided into modules, such as Profiles and Configurations.

The three layers in the J2ME platform are:

- **Kilobytes Virtual Machine (KVM) Layer:** Represents a virtual machine similar to the Java Virtual Machine (JVM). KVM is customized to support the host operating system on a particular device.
- **Configuration Layer:** Defines class libraries for a range of devices that have similar requirements for memory, processing power, and network connectivity. For example, mobile phones, pagers, and PDAs form a range of devices with similar requirements. The two types of configurations in J2ME are Connected Device Configuration (CDC) and Connected Limited Device Configuration (CLDC).
- **Profile Layer:** Defines class libraries for a narrower category of devices within the framework of a chosen configuration. For example, mobile phones form a profile for a range of mobile devices such as mobile phones, pagers, and PDAs. Mobile Information Device Profile (MIDP) is a commonly used J2ME profile.

Why J2ME

Mobile devices support downloading of wireless applications and running them on a mobile device to ensure wireless Internet access. Such wireless applications can be created by using mobile application development languages such as J2ME. J2ME offers various benefits that help to implement J2ME applications on mobile devices.

The benefits of the J2ME platform are:

- Security: Performs a class file verification procedure on the J2ME applications before downloading them on a mobile device. Class file verification ensures that the applications are secure and do not damage the mobile device or the wireless network. In addition, J2ME provides the facility for downloading authenticated wireless applications, such as accessing the transaction server of a bank, to perform secure financial transactions.

  Class file verification is the process of identifying and rejecting invalid class files in a J2ME application. This process is performed in two phases. The first phase is performed before an application is downloaded to a mobile device. The second phase is performed after the downloading application to a mobile device.
- Cross platform compatibility: Provides standardized language features and libraries. These features enable you to transfer applications and information between various devices that support J2ME.
- Dynamic content delivery: Specifies that J2ME applications provide some services and content that can be downloaded over different types of wireless network, such as GSM and CDMA.
- Enhanced User Interface (UI) and Interactive content: Provides packages such as javax.microedition.lcdui to enhance the UI and graphic capabilities in mobile devices.

- Offline access: Enables you to use mobile applications without maintaining a constant connection with the wireless network. After an application is downloaded, it can run offline. As a result, network failures and transport cost are reduced.