Java Ring

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ABSTRACT

A Java Ring is a finger ring that contains a small microprocessor with built-in Capabilities for the user, a sort of smart card that is wearable on a finger. Sun Microsystems's Java Ring was introduced at their Java One Conference in 1998 and, instead of a gemstone, contained an inexpensive microprocessor in a stainless steel iButton running a Java virtual machine and preloaded with applets (little application programs). The rings were built by Dallas Semiconductor. Workstations at the conference had "ring readers" installed on them that downloaded information about the user from the conference registration system. This information was then used to enable a number of personalized services. For example, a robotic machine made coffee according to user preferences, which it downloaded when they snapped the ring into another "ring reader." The Java Ring is an extremely secure Java-powered electronic token with a continuously running, unalterable real-time clock and rugged packaging, suitable for many applications. The jewel of the Java Ring is the Java iButton -- a one million transistor, single chip trusted microcomputer with a powerful Java Virtual Machine (JVM) housed in a rugged and secure stainless-steel case.

1.INTRODUCTION TO JAVA RING

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Sun Microsystem's Java Ring was introduced at their Java One Conference in 1998 and, instead of a gemstone, contained an inexpensive microprocessor in a stainless-steel iButton running a Java virtual machine and preloaded with applets (little application programs). The rings were built by Dallas Semiconductor.

The Java Ring is an extremely secure Java-powered electronic token with a continuously running, unalterable real-time clock and rugged packaging, suitable for many applications. The jewel of the Java Ring is the Java iButton -- a one-million transistor, single chip trusted microcomputer with a powerful Java Virtual Machine (JVM) housed in a rugged and secure stainless-steel case. The Java Ring is a stainless-steel ring, 16-millimeters (0.6 inches) in diameter that houses a 1-million-transistor processor, called an iButton. The ring has 134 KB of RAM, 32 KB of ROM, a real-time clock and a Java virtual machine, which is a piece of software that recognizes the Java language and translates it for the user's computer system.

At Celebration School, the rings have been programmed to store electronic cash to pay for lunch, automatically unlock doors, take attendance, store a student's medical information and allow students to check out books. All of this information is stored on the ring's iButton. Students simply press the signet of their Java Ring against the Blue Dot receptor, and the

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system connected to the receptor performs the function that the applet instructs it to. In the future, the Java Ring may start your car.

Figure 1.1: Java Ring

2. HISTORY

In the summer of 1989, Dallas Semiconductor Corp. produced the first stainless-steel-encapsulated memory devices utilizing the Dallas Semiconductor 1-Wire communication protocol. By 1990, this protocol had been refined and employed in a variety of self-contained memory devices. Originally called "touch memory" devices, they were later renamed iButtons." Packaged like batteries, iButtons have only a single active electrical contact on the top surface, with the stainless steel shell serving as ground.

- In the summer of 1989, Dallas Semiconductor Corp. produced the first stainless-steel-encapsulated memory device called iButton.
- Sun Microsystems Java ring was introduced at Java One Conference in 1998.
- Earlier "touch memory"->"I-button"
- iButton is the main component of java ring.
- Java Ring was introduced at their Java One Conference in 1998.
- Java Ring is a stainless-steel ring, that houses a 1- million-transistor processor, called an iButton . The ring has 134 KB of RAM , 32 KB of ROM .

WHAT IS JAVA RING?

- One of the first impressive devices powered by the Java Card technology came in the form of now famous Java Rings at the Sun's Java One conference, in March 1998.
- The Java Ring is a tiny wearable computer with 6 kilobytes of RAM.
- Six K may not sound like much, but it is 20 percent more memory than the first computer ever used .
- Even 6 K is enough to hold your secret codes, your credit cards numbers, your driver license, other wallet contents, and even some electronic cash. The ring can also store a few important URLs.
- The Java Ring is a wearable computer that can be used to authenticate users to services on the Internet. A user only has to push the ring on his/her finger on a Java Ring reader for about a second.
- The key issue about a wearable computer is not whether it is a ring or another form factor: the deciding point is that we will always have it with us. Many aspects of computing change once there is no need to go to a special room to get at the computer.

Data can be read from or written to the memory serially through a simple and inexpensive RS232C serial port adapter, which also supplies the power required to perform the I/O. The iButton memory can be read or written with a momentary contact to the "Blue Dot" receptor provided by the adapter. When not connected to the serial port adapter, memory data is maintained in non-volatile random access memory (NVRAM) by a lifetime lithium energy supply that will maintain the memory content for at least 10 years. Unlike electrically erasable programmable read-only memory (EEPROM), the NVRAM iButton memory can be erased and rewritten as often as necessary without wearing out. It can also be erased or rewritten at the high speeds typical of complementary metal oxide semiconductor (CMOS) memory, without

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requiring the time-consuming programming of EEPROM.

Applications, iButtons that count the number of times they have been rewritten for securing financial transactions, iButtons with temperature sensors, iButtons with continuously running date/time clocks, and even iButtons containing powerful microprocessors. The java ring was first introduced in the year 1998, in the java one conference .the ring was built by the Dalas semiconductor corporation.

3.COMPONENTS
The main components of the java ring are following:-
- JAVA VIRTUAL MACHINE(JVM)
- 134KB OF RAM
- 32KB OF RAM
- REAL TIME CLOCK
- IBUTTOON
- BLUE DOT RECEPTOR

3.1 JAVA VIRTUAL MACHINE
Java ring is programmed with java application program and applets that communicate with the host application on the networked system. Applets are the small application that is designed to run on the another application system. The java virtual machine is the piece of software that recognizes the java language and translate the byte code ,which is used by the system which is connected to the java ring via ring reader.

3.2 RAM
Java ring contains 134kb of non-volatile random access memory. Program and data is stored in this non-volatile random access memory .This non-volatile random access memory offers high read/write speed and also provides temper resistance through instantaneous clearing of all memory when tempering is detected. This process is called rapid zeroization.The NVRAM iButton memory can be erased or rewritten as often as necessary without wearing out. High security is offered by the ability to erase the content of

NVRAM extremely quickly. The Crypto iButton also provides an excellent hardware platform for executing Java because it utilizes NVRAM for program and data storage.

With 6 kilobytes of existing NVRAM and the potential to expand the NVRAM capacity to as much as 128 kilobytes in the existing iButton form factor, the Crypto iButton can execute Java with a relatively large Java stack situated in NVRAM. This memory acts as conventional high-speed RAM when the processor is executing, and the lithium energy preserves the complete state of the machine while the Java Ring is disconnected from the reader. There is therefore no requirement to deal with persistent objects in a special way -- objects persist or not depending on their scope so the programmer has complete control over object persistence.

3.3 ROM
The java ring contains 32kb of ROM .A special kind of operating system called Ecommerce operating system which is based on java and JVM is stored in the ROM. This operating system handles all the operation which is happening in the iButton. It is stored in ROM because it is not supposed to be altered by the user. The Crypto iButton hardware platform offers a unique set of special features expressly designed to prevent private keys and other confidential information from becoming available to hackers. Figure 1 shows a detail of the internal construction of the Crypto iButton. The silicon die containing the processor, ROM, and NVRAM memory is metallurgic ally bonded to the barrier substrate through which all electrical contacts are made.

3.4 REAL TIME CLOCK
In the java ring real time clock gives the exact time of the day. The real time clock continuously running up to more than 10 years by the energy provided the lithiumnbackup. In addition, the processor itself is driven by an unstabilized ring oscillator operating over a range of 10 to 20 megahertz, so that the clock

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frequency of the processor is not constant and cannot be determined by external means. This differs from the design of alternative devices in which the processor clock signal is injected by the reader and is therefore exactly determined by the host processor. External control of the clock provides a valuable tool to hackers, since they can repetitively cycle such a processor to the same point in its execution simply by applying the same number of clock cycles. Control of the clock also affords a means to induce a calculation error and thereby obtain information that can ultimately reveal secret encryption keys. A 32-kilohertz crystal oscillator is used in the Java iButton to operate the time-of-day clock at a constant and well-controlled frequency that is independent of the processor clock.

3.5 IBUTTON

The jewel of the java ring is the java iButton .It contains the one million transistor processor single chip trusted microprocessor with powerful java virtual machine(JVM) housed in rugged and secure stainless steel case. The Crypto iButton hardware platform offers a unique set of special features expressly designed to prevent private keys and other confidential information from becoming available to hackers.

The fact that the communication path between the Crypto iButton and the outside world is limited to a single data line provides additional security against hardware attacks by limiting the range of signals accessible to the hacker.
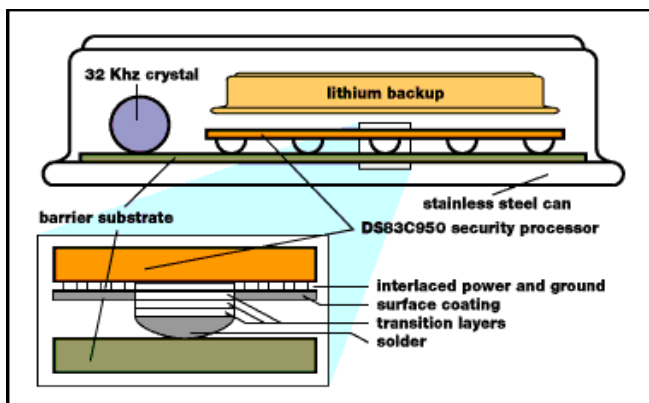

Figure : 3.5.1 structure of the iButton

It is originally called touch memory devices they were later renamed as "iButton packaged" like batteries. IButton have only a single active electrical contact on the top surface and with the stainless steel shell serving as ground. Every iButton product is manufactured with unique 8 byte serial number and carries a guaranty that no two IButtons have same number. Among the simplest iButton are memory devices which can hold files and directories that can be read and written like small floppy disks. An iButton is a microchip similar to those used in smart card but housed in a round stainless steel button of 17.35mm x iButtons have an advantage over conventional smart cards in term of durability and longevity. The stainless steel casing gives iButton a far greater ability to survive in arange of temperatures -- all versions are functional from -40 C to +70 C -- and in a much harsher range of environments than the plastic smart card. For e-commerce and personal ID usage, iButtons can be mounted on a range of personal accessories: watch, ring, key chain, or dog tag.

Figures 3.5.2: different types of iButtons available in the market

3.6 BLUE DOR RCEIPTOR

The read/write operation in the java ring is done by the blue dot receptor provided by the RS232 serial port adapter. The **DS1402D-DR8** is a part of the DS1402 series. It is a 1-Wire network cable designed to connect any serial or USB **1-Wire** port adapter that has a **RJ11 jack** with up to **two iButtons** simultaneously. The DS1402D-DR8 Blue Dot receptor cable can touch

any iButton for reading, but can only retain the F5 version iButtons.

Key Features:-

- Coiled cable for connecting iButtons to 1-Wire networks (8 ft when fullyextended).
- Convenient, off-the-shelf connectivity.
- For momentary (F3/F5 Micro Can) or dwelled contact (F5 Micro Can only).
- Adhesive pad for mounting on objects.
- Supports for up to two iButtons at once.
- Can be used with any EDS host adapter equipped with a RJ11 jack (HA7Net, HA7E, HA5-xxx-R, and HA4B)
- Can be used with any Dallas Semiconductor port adapter. (DS9097E, DS9097U, DS9490R)

The DS1402 series incorporates four basic types of connectors, 1-Wire RJ-11, iButton, Touch-and-Hold Probe, and Blue Dot™ Receptor. The DS1402 series of 1-Wire network cables provides connectivity for iButtons. The cables are designed to connect any USB, serial or parallel port 1-Wire adapter to any iButton. Both, the iButton probe cables and the Blue Dot receptor cables can touch any iButton, but can only hold the F5 version iButtons.

Figure 3.6.1: Different types of blue dot receptor in the market

WORKING

Since java ring is programmed with the applets and the programming is done according to our application and this will specific for the specific user. All information of the user is stored in the java ring.

Figure 4: how java ring is used to open the door

User simply has to press the signet of the java ring against the blue dot receptor and the system connected to the receptor performs the function that the applets instruct it to.java ring has the user profile and the same profile is present in the door embedded system also, when the user press the signet of the java ring against the java ring reader which is embedded at the handle of the door the data is transferred from the ring to door system. if the profile is authentic means user is authentic to open the door the applets president in the ring instruct the door to open. Information is transferred between iButton and a PC with a momentary contact, at up to 142K bits per second. To do that one presses iButton to the Blue Dot receptor, a $15 pipeline into PC.

5.SECURITY

Figure 1 shows a detail of the internal construction of the Crypto iButton. The silicon die containing the processor, ROM, and NVRAM memory is metallurgic ally bonded to the barrier substrate through which all electrical contacts are made. This barrier substrate and the triple-layer metal construction techniques employed in the silicon fabrication effectively deny access to the data stored in the NVRAM. If any attempt is made to penetrate these barriers, the NVRAM data is immediately erased. This construction technique and the use of NVRAM for the storage of private keys and other confidential data provides a much higher degree of data security than that afforded by EEPROM memory. The fact that the communication path between the Crypto iButton and the outside world is limited to a single data line

provides additional security against hardware attacks by limiting the range of signals accessible to the hacker.

5.1. SECURITY THROUGH JAVA RING IN CAR

Figure 5.1: how java ring is used in security of car

The Sun concept car's security is based on a Java ring that contains a profile of the user. You connect the Java ring to a ring receptor in the car, and the car knows, based on your profile, what you are allowed to do. For example, a ring given to a mechanic or valet allows that person to see the dashboard and drive 40 miles per hour within a one block radius, but no faster or farther. In a family where both the husband and wife drive the car, each has individualized settings, so that when they enter the car, their environments are configured to the profiles on their rings. Java rings are authorized through Personal Identification Numbers (PINs) so that no one can steal a person's ring and run off with the car.

6.APPLICATIONS

The java ring is used initially as rugged portable data carriers. often in harsh environmental condition. it is used for many real world application e.g for opening the door ,in the e-banking application for getting the balance in your account. Logging in your personal computer. Providing security in your car. iButton memory devices have been deployed in vast quantities as rugged portable data carriers, often in harsh environmental conditions. Among the large-scale uses are as transit fare carriers in Istanbul, Turkey; as maintenance record carriers on the sides of Ryder trucks; and as mailbox identifiers inside the mail compartments of the U.S. Postal Service's outdoor mailboxes. They are worn as earrings by cows in Canada to hold vaccination records, and they are used by agricultural workers in many areas as rugged substitutes for timecards.

Figure: 6.1 Application of java ring for getting account balance of an user through internet

This demonstration shows how an e-banking application (Jini client) tries to connect to a bank server (Jini service) to retrieve the current account balance of that user. Although Java Rings aren't widely used yet, such rings or similar devices could have a number of real-world applications, such as starting your car and having all your vehicle's components (such as the seat, mirrors, and radio selections) automatically adjust to your preferences.

- Providing security.
- Personalized services.
- For opening the door.
- Authentication is crucial to most applications, since billing and privacy is basedon it.
- A very easy and convenient way for users.
- It is more secure than using passwords, since passwords are short or can be guessed.
- It is easier for administrators to maintain the security infrastructure, since only password can be forgotten.
- A ring is a personal thing that the user and only the user carries along anytime and anywhere, so that she can authenticate herself in every situation.
- It is also possible to use a tag on the key ring or a watch instead of a ring.

7.ADVANTAGES

The Java Ring are very easy and convenient way for users. They are more secure than using passwords since passwords are sort or can guessed. Java Ring provides authentication to users which is crucial for many applications. It is easier for administrator to maintain the security infrastructure. And , it provides real memory, more power, and a capacity for dynamic programming.

Java Ring used widely all around the world for several applications such as Access Control, Assest Management, e-Cash and for many other purpose

- Java Ring is wearable
- Completely controlled by the user. Provides authentication to users which is crucial for many applications.
- Personalization
- Portable
- Easier for administrator to maintain the security for infrastructure.

e-cash:

Java Ring can be an personalized token and acts like a small change purse for one or multiple applications. It enables to complete transactions, like dispensing a candy bar or metering a prepaid volume of water. By using Java Ring, it eliminate the need to carry small amounts of cash, and it can service multiple, independent applications.

They are perfect for a wide variety of e-Cash functions like mass transit systems, parking meters, gaming systems, vending and fleet refueling.

Access Control:

An Java Ring becomes a personalized key to protected assets and information. By touching the correct key to an iButton reader, the desired event, such as, opening a lock is enabled. Java Ring are perfect for various access control functions like access to buildings, computers, vehicles and equipment.

8. DISADVANTAGES

Although, Java Ring can be the most secure storage medium for many industries, the cost of implementing the system could be very high. Even though ibutton can be purchased for cheaper price, in order to function, it needs a receiver such as blue dot receptor which could be very expensive. Also, it needs a high level tools and method in order to program application efficiently, reliably, securely.

The cost of implementing the system is high.

A Java Ring-based system doesn't automatically allow user mobility. The problem with the Java Ring that many of the organization don't even know the existence of Java Ring. User mobility is only possible if every machine that the user accesses has a iButon reader attached. The machine must support the same standard ibutton reader interfaces or use the same proprietary iButton reader.

iButton has a limited processor power and memory. For better performance and scalability it is imperative to move the processing load to the application server.

Also only limited amount of information can be stored which means an individual might need to carry more than one Java Ring. Carrying the Java Ring everywhere could lead to theft issues

9.CONCLUSION

Java ring is highly durable because of its rugged and secure stainless packing. It is used in personal computing. Dallas Semiconductor has produced more than 20 million Physically-secure memories and computers with hard-shell packaging optimized for personal possession. The Java iButton, therefore, is simply the latest and most complex descendant of a long line of products that have proven them to be highly successful in the marketplace. With its stainless steel armor, it offers the most durable packaging for a class of products that likely will suffer heavy use and abuse as personal possessions. The iButton form factor

permits attachment to a wide variety of personal accessories that includes rings, watchbands, key fobs, wallets, bracelets, and necklaces, so the user can select a variation that suits his.

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