JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

JAVA RING

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In

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the technical seminar entitled **"JAVA RING"** is a bonafide work carried out by **M. Niharika (17H71A0433)** in a partial fulfillment for the award of degree of Bachelor of Technology in **Electronics and Communication Engineering** from **Jawaharlal Nehru Technological University Kakinada** during the academic year 2020-2021.

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(Seminar Coordinator) **(Head of the Department)**

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ABSTRACTS

Password is a common mean of implementing security. Dallas Semiconductor has developed a new Java-based, computerized ring that will automatically unlock doors and log on to computers. This java based technique overcomes the deficiencies of the secret password. A Java Ring is a finger ring that contains a small microprocessor which runs JVM and is preloaded with applets. The jewel of Java Ring is Java iButton, which is a microchip enclosed in a secure package.

INTRODUCTION

It seems that everything we access today is under lock and key. Even the devices we use are protected by passwords. It can be frustrating trying to keep with all of the passwords and keys needed to access any door or computer program. Dallas Semiconductor is developing a new Java-based, computerized ring that will automatically unlock doors and log on to computers.

This mobile computer can become even more secure. You can keep the iButton with you wherever you go by wearing it as a closely guarded accessory - a watch, a key chain, a wallet, a ring - something you have spend your entire life practicing how not to lose. Here are a few reasons why you might want to wear the iButton in the accessory that best fits your life style :
It is a safe place to keep the private keys to conduct transactions.
It overcomes the deficiencies of the secret password.
You eliminate keystroke with a quick, intentional press of the Blue Dot.
You keep your computer at hand versus lugging your everywhere you roam
You become part of the network economy
This steel-bound credential stands up to the hard knocks of everyday wear, including sessions in the swimming pool

What is Java Ring?

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 Microsystem's Java Ring was introduced at their JavaOne 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.
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.
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.

Fig1 : JAVA RING

HISTORICAL BACKGROUND

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 With one of these rings a user could communicate with the computers at the Hackers' Lab, help build a large fractal image at the show, or even get a cup of his or her favorite coffee.
Built by Dallas Semiconductor, the durable, wearable Java Ring is practically

indestructible but not heavy or clumsy.
At the conference, the Java Rings were preloaded with applets that could communicate with corresponding host applications on various networked systems installed at the show.
The first time an attendee snapped the ring's iButton into a ring reader attached to a workstation, an applet on the ring communicated with the host application on the system. The applet in turn downloaded the user's personal information from the conference registration system and allowed the user to select their preferred type of coffee (a process they called "personalizing" the ring). From there, the user could walk over to a "coffee factory," snap the ring into another reader, and the robotic coffee machine would make the brew based on the user's preference stored in the ring.

3.1 i-BUTTONS

An iButton is a microchip similar to those used in a smart card but housed in a round stainless steel button of 17.35mm x 3.1mm - 5.89mm in size (depending on the function).

3.11 The Can and Grommet

An iButton uses its stainless steel 'can' as an electronic communications interface. Each can has a data contact, called the 'lid', and a ground contact, called the 'base'. Each of these contacts is connected to the silicon chip inside. The lid is the top of the can; the base forms the sides and the bottom of the can and includes a flange to simplify attaching the button to just about anything. The two contacts are separated by a polypropylene grommet.

Fig:2

On top of these features, the ring provides a rugged environment, wear-tested for 10-year durability. You can drop it on the floor, step on it, forget to take it off while swimming and the data remains safe inside. Today iButtons are primarily used for authentication and auditing types of applications. Since they can store data, have a clock for time-stamping, and support for encryption and authentication, they are ideal for audit trails.
Every iButton product is manufactured with a unique 8-byte serial number and carries a guarantee that no two parts will ever have the same number. In addition to these, there are iButtons with password-protected file areas for security applications, iButtons that count the number of times they have been rewritten for securing financial transactions, iButtons with temperature sensors (for food storage and transport), iButtons with continuously running date/time clocks, and even iButtons containing powerful microprocessors. There are iButtons that have an electronic ID (for physical access to buildings); and store e-cash (for purchases both in stores and via the web). iButtons have an advantage over conventional smart cards in term of durability and longevity.

3.12 The 1-Wire Interface

By simply touching the iButton to the two contacts described above, you can communicate with it through our 1-Wire protocol. The 1-Wire interface has two communication speeds: standard mode at 16kbps, and overdrive mode at 142kbps.

Fig:3

3.13 The Address

By simply touching the iButton to the two contacts described above, you can communicate with it through our 1-Wire protocol. The 1-Wire interface has two communication speeds: standard mode at 16kbps, and overdrive mode at 142kbps.

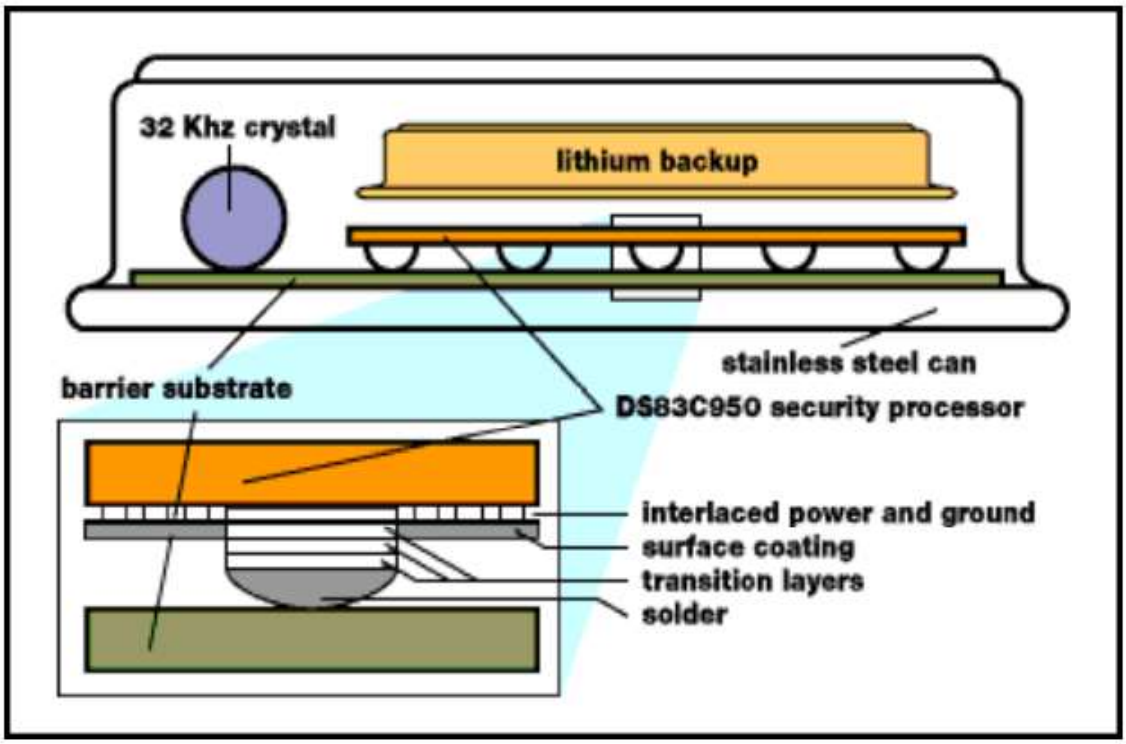

Fig4:Layout of iButton structure

3.2 BLUE DOT RECEPTOR

Information is transferred between your iButton and a PC with a momentary contact, at up to 142kbps. You simply touch your iButton to a Blue Dot receptor or other iButton probe, which is connected to a PC. The Blue Dot receptor is cabled to a 1-Wire adapter that is attached to the PCs serial or parallel port.
The DS1402 Blue Dot receptor provides a convenient pipeline into the PC for iButton-to-PC communication. The receptor's cable connects to either a serial or parallel port, according to which adapter you choose. The receptor itself easily affixes to any accessible spot on the front of the PC. The user can elect a quick information transfer with a momentary touch of the iButton to the Blue Dot. Alternately, the iButton can

be snapped into the Blue Dot and remain there, allowing hands-free operation. Each receptor contains two Blue Dots to accommodate instances where multiple iButtons are required to complete a transaction. For example, a company's policy may require both an employee and a supervisor to authenticate access to sensitive information stored on a network server.

Wire Interface

By simply touching each of the two contacts we can communicate to any of the iButtons by using 1-Wire protocol. The 1-Wire interface has two communication speeds. Standard mode are at 16kbps and overdrive mode at 12kbps. 1-wire protocol is used for communication between PC and the blue dot receptor over the 1-wire Network. 1-Wire Network includes a system with a controlling software, wiring and connectors and iButtons.

3.21 USB Port Adapters

The DS9490R USB Port Adapter and the DS1402D-DR8 Blue Dot Receptor connect to any standard universal serial bus (USB) port. The DS9490R connects to the USB port and then the DS1402D-DR8 connects to the DS9490 through an RJ-11 connection.

The DS9490 USB Port Adapter comes with the following features:

- USB port
- Internal 64-bit address
- Communicates to all iButtons; can read but not write to DS198x EPROM iButtons

Fig:5

3.22 Serial Port Adapters

The DS9097U RS-232 Serial Port Adapters and the DS1402D-DR8 Blue Dot Receptor connect to any standard RS-232-C serial port. The DS9097U connects to the serial port and then the DS1402D-DR8 connects to the DS9097U through a RJ-11 connection. The DS9097U is not a pass-through device. A serial port must therefore be dedicated to perform iButton communication.

• The DS9097U RS-232-C COM Port Adapter comes in three versions: DS9097U-S09

i. 9-Pin RS-232-C port
ii. Communicates with all iButtons, can read but not write to DS198x EPROM iButtons

• DS9097U-009

i. 9-Pin RS-232-C port
ii. Has internal 64-bit address
Communicates with all iButtons, can read but not write to DS198x EPROM iButtons.

• DS9097U-E25

i. 25-Pin RS-232-C port
ii. Communicates with all iButtons
Has 12V—power port to enable writing to DS198x EPROM iButtons

Fig:6

3.33 Parallel Port Adapters

The DS1410E Parallel Port Adapter and the DS1402D-DB8 Blue Dot Receptor combine to form a PC interface that consumes no other resources. The parallel-port signal lines pass through the DS1410E when iButton communication is not occurring. Peripherals, such as printers, can be reattached by first connecting the DS1410E to the PC parallel port, and then connecting the peripheral cable to the other end of the DS1410E.

Fig:7

3.3 Java Virtual Machine

A Java virtual machine (JVM), an implementation of the Java Virtual Machine Specification, interprets compiled Java binary code (called bytecode) for a computer's processor (or "hardware platform") so that it can perform a Java program's instructions. Java was designed to allow application programs to be built that could be run on any platform without having to be rewritten or recompiled by the programmer for each separate platform. A Java virtual machine makes this possible because it is aware of the specific instruction lengths and other particularities of the platform. The Java Virtual Machine Specification defines an abstract -- rather than a real -- machine or processor. The Specification specifies an instruction set, a set of registers, a stack, a "garbage heap," and a method area. Once a Java virtual machine has been implemented for a given platform, any Java program (which, after compilation, is called bytecode) can run on that platform. A Java virtual machine can either interpret the bytecode one instruction at a time (mapping it to a real processor instruction) or the bytecode can be compiled further for the real processor using what is called a just-in-time compiler.

3.4 RAM and ROM

- Java ring contains 134kb of non volatile random access memory. Program and data is stored in this NVRAM.
- High security is afforded by the ability to erase the contents of NVRAM extremely quickly.
- The java ring contains 32kb of ROM.

- Ecommerce operating system is stored in ROM because it is not Supposed to be altered by the user.

3.5 Real Time Clock

- In the java ring real time clock gives the exact time of the day.
- A 32-kilohertz crystal oscillator is used in the java iButton to operate the time-of-day

4 WORKING

Primarily the Java ring is your key to completely reliable identification for access to computers, networks, e-mail and so on. The Java Ring can give secure access to Internet accounts and e-mail, Automatic Teller Machines, restricted areas, and can also contain information on inventory, processes, maintenance, and delivery.

The heart and soul of the Java powered ring is the iButton developed by Dallas Semiconductor. The ibutton is a small chip contained in a protective case such as the Java Ring, a keychain, bracelet, watch, wallet, or badge.

The identification is based on two important elements: possession of the ibutton and the entering of a Personal Identification Number (PIN). You press your ring to the reader and the ring provides its own PIN, which even you don't know. The ring's key number is a 1024 bit piece of mathematical data that includes 308 decimal digits, too hard for even Einstein to crack on a good day.

If the compartment containing the iButton is tampered with, data is subsequently erased. The validation system currently works like ATM validation in that no entry, access, or transactions are permissible until the PIN number is validated. Besides personal computer access, many companies currently utilize the iButton technology to control physical access to restricted areas within their facilities. These companies include hospitals, laboratories, offices and banks. Transit fare carriers in Turkey use iButtons, Ryder keeps track of truck maintenance with iButtons, the U.S. Postal Service uses iButtons for mailbox identification, and cows in Canada wear them to keep track of vaccination records. To use this technology yourself, you primarily need an iButton, which can be contained in a number of

aforementioned devices (the Java Rings are available in many custom sizes for about $65, which you can order). Next, you need the Connectivity Pack, which consists of a Blue Dot Receptor which can be connected via a serial or parallel port on your computer. These Blue Dot Receptors are available for less than $20. Finally, you need the software, which you can download free of charge

5 APPLICATION

- 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.
- Personalized services.
- Providing security.

5.1 e-Banking

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. Since all bank data must be treated confidential, the bank server interacts with the security infrastructure that is installed at the bank, before it responds to the application. The bank's security infrastructure demands that the user must authenticate herself to get the permission. Therefore an authentication scheme is started at user side that asks the user to push her Java Ring on the Java Ring reader. Inside the Java Ring resides a Java interpreter that executes cryptographic routines to perform that task. After the authentication process on the Java Ring, the bank knows the identity of the user and that she is really the one, she pretends to be. Then the bank service can send the confidential and personalized data to the e-banking application that displays the current account balance.

5.2 Providing security

The Java Ring implements one of the best security techniques known. Security is enhanced if it is supplied by something you have and something you know - in the way bank cards and PINs combine to get money from a cash point. Sun was trying to drive home the point that Java programmers could write small applications - applets - that

could be loaded into the ring and used to support a wide variety of security applications such as digital signatures. The Java Ring is far more than a hacker's fashion statement. More than 21 million iButton devices are currently in use around the world. They can be found in medical information bracelets, in Schlage locks, in Ryder rental trucks, in every US postbox, in the cash safes of Taco Bell stores and in Federal Reserve banks in the US. Other applications are in the vending machines of Canada, the gas stations of Mexico City, the parking lots of Buenos Aires and the buses and ferries of Istanbul, according to Oliver Mills of Topsoft, UK agents for Dallas Semiconductor security devices. "They are inexpensive and rugged and offer almost uncrackable security for the data held within," Mills says. Sun's downsized computing phenomenon, which it has christened "knuckletop computing", could open the door for many new personal cyber devices, including key chains, watches, pendants or anything wearable that could contain a chip. They are nearly indestructible - you can take then swimming or run them through the laundry - and they will remain unscathed, unlike smart chips on credit cards. The iButton has a 10-year lifespan and if anyone tries to pry it open to get at your digital signature or other secrets, the memory in the chip automatically zeros itself. Importantly, you won't need more than one. The iButton supports multiple applets that can be loaded dynamically as you need them - to log into your PC, to get money from an ATM, to start your car or to exchange contact data with a business acquaintance. This Java Ring lets you roam both the real world and cyberspace with your personal preferences and personal data if not at your fingertips then at least close to your third knuckle. Sun provided the scenario of starting your car with a Java Ring: the seats and mirrors would adjust automatically to the right position, your favourite radio station would tune in, and the car would compensate for your individual driving style, providing economy or performance as you prefer. With the combined ingenuity of Java developers, the number of uses for Java-enabled personal accessories seems limitless.

5.3 Car Security

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. Sun representatives are also talking to automakers who are ring to access a vehicle and simply leave it when done. Billing, reservations, vehicle

monitoring, vehicle location, and all other functions are done via wireless communication. The net result is a very inexpensive rental car for local use by residents and tourists. This will create a new business for rental car companies competing for business travelers in the saturated airport rental car market.

5.4 The Postal security device

For over 10 years, Dallas Semiconductor also has been designing, making, and selling a line of highly secure microprocessors that are used in satellite TV descramblers, automatic teller machines, point-of-sale terminals, and other similar applications requiring cryptographic security and high resistance to attack by hackers. The U.S. Postal Service's (USPS) Information Based Indicia Program Postal Security Device Specification, intended to permit printing of valid U.S. postage on any PC, provided the first opportunity to combine two areas of expertise when a secure microprocessor was designed into an iButton. The resulting product, named the Crypto iButton, combines high processor performance, high-speed cryptographic primitives, and exceptional protection against physical and cryptographic attack. For example, the large integer modular exponentiation engine can perform 1024-bit modular exponentiations with a 1024-bit exponent in significantly less than a second. The ability to perform large integer modular exponentiations at high speed is central to RSA encryption, Diffie-Hellman key exchange, Digital Signature Standard (FIPS 186), and many other modern cryptographic operations.

An agreement between Dallas Semiconductor and RSA Data Security Inc. provides a paid-up license for anyone using the Crypto iButton to perform RSA encryption and digital signatures so that no further licensing of the RSA encryption technology is required. High security is afforded by the ability to erase the contents of NVRAM extremely quickly. This feature, rapid zeroization, is a requirement for high security devices that may be subjected to attacks by hackers. As a result of its high security, the Crypto iButton is expected to win the FIPS 140-1 security certification by the National Institute of Standards and Technology (NIST). A special operating system was designed and stored in the ROM of the Crypto iButton to support cryptography and general-purpose financial transactions -- such as those required by the Postal Service program.

SECURITY

- 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.

- Java rings are authorized through Personal Identification Numbers (PINs) so that no one can steal a person's ring and use that ring.

JAVA RING - THE TIDAL WAVE OF FUTURE

Cute trick or tidal wave of the future Just think of the possibilities. A Java Ring (and potentially any of several personal devices, such as a key chain or watch) contains a processor compatible with Java Card 2.0, a Java Virtual Machine, sizeable RAM and ROM memory capacity, and a real-time clock. Most importantly, the iButton supports multiple applets that can be loaded dynamically. Freed from the usual constraints of connectivity, this ring lets you roam the world and bring with you your personal preferences--your computing environment, your medical information, your choices of colors or coffee.
For example, imagine starting your car with your ring: the seats and mirrors adjust automatically, your favorite radio station begins to play, and when you pull out into the street, the car "knows" your driving habits. A Java Ring--and any related device that houses an iButton with a Java Virtual Machine--goes beyond a traditional smart card by providing real memory, more power, and a capacity for dynamic programming. On top of these features, the ring provides a rugged environment, wear-tested for 10-year durability. You can drop it on the floor, step on it, forget to take it off while swimming, and the "knuckletop" remains safe inside.

ADVANTAGES

- very easy and convenient way for users.
-More secure than using passwords.
-Portable.
-Ruggedness.
-Wearable.
-Provides authentication to users which is crucial for many applications.

-Easier for administrator to maintain the security infrastructure.
-Provides real memory, more power, and a capacity for dynamic programming.

DISADVANTAGES

-Parents and teachers will have less control over children and students
-Loss of privacy

CONCLUSION

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 themselves 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, keyfobs, wallets, bracelets, and necklaces, so the user can select a variation that suits his or her lifestyle.

Mobile computing is beginning to break the chains that tie us to our desks, but many of today's mobile devices can still be a bit awkward to carry around. In the next age of computing, we will see an explosion of computer parts across our bodies, rather than across our desktops. Digital jewelry, designed to supplement the personal computer, will be the evolution in digital technology that makes computer elements entirely compatible with the human form.

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