Research Article

ENCRYPTED QR CODE GENERATOR

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ABSTRACT

QR code stands for 'Quick Response' code. It was developed by Denso Wave Corporation in Japan. QR code is a two-dimensional barcode which is able to encode more information than one-dimensional barcode. Also, QR codes are fast readable codes. The emergence of smartphones increases the use of QR code because a smart phone has features of scanning and decoding a QR code. The emergence of technology in the area of mobile internet access encourages the online marketers, newspapers and magazines to use QR codes for the advertisement of their products. These codes have various significances over traditional barcodes like greater storage capacity, fast readability, 360 degree reading, small print size, error correction, support for more languages and durability against soil and damage. Due to these benefits, the use of QR code has spread all over the world. In this paper we are generating QR code using Elliptical Curve Cryptography (ECC) in node js server.

INTRODUCTION

At the time of high economic growth period of Japan in the 1960s, the supermarkets were selling a wide range of goods that are foodstuff, clothing, household accessories etc. At the cash counters, the price of these goods had to enter manually in the cash registers. Consequently, many cashiers faced the wrist problems and carpal tunnel syndrome. So the cashiers wanted to find some way to reduce the burden of this manual typing. The invention of barcodes was the first step towards the solution of this problem and the use of barcodes gave a relief to the cashiers. When the codes printed on the product were scanned by optical sensor then the price and other basic information of that product was automatically displayed on the cash register.

As the use of barcodes spread, one of the prominent limitations came in the way that a barcode can only store 20 alphanumeric characters of information. But the users were demanding more storage capacity in the barcodes and then after many years of research, Denso Wave Corporation developed a new type of code which has greater storage space than earlier barcodes and has fast readability also. Hence the code was named as "Quick Response code" (i.e. QR code) [1].

What is Qr Code

QR code is a 2D encoding of information and it is also called matrix code. This matrix code is machine-readable that consists of black and white squares. It can store information in the form of URL (Uniform Resource Locator), contact information, link to videos or photos, plain text and much more.

QR Code Architecture

QR code symbol looks like a square pattern. The square pattern consists of two regions: encoding region and function patterns. The function patterns concentrate on the positioning where the encoding region represents the data encoding.
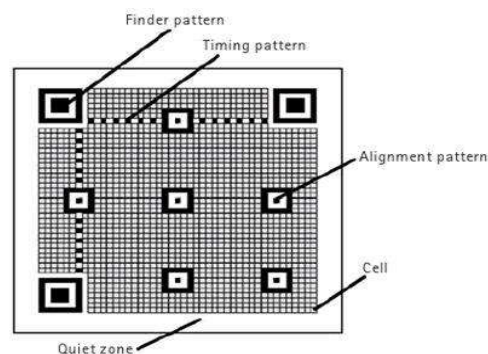

Figure 1 Architecture of QR Code

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Fig. 1 shows the structure of QR code symbol. The function pattern consist of finder patterns, timing patterns and alignment patterns. Three common structures on the three corners of QR code symbol are called finder patterns. Finder pattern is used for deciding the correct orientation of the symbol. Timing patterns are used by the decoder software to identify the side of pattern. Alignment patterns are used in the case of distorted image to correctly decode the symbol by decoder software. The rest of the region i.e. other than function pattern is the encoded region where data code words and error-correcting code words are stored. The Quiet zone is the spacing provided to distinguish between QR code and its surrounding. It is important for the scanning program [2].

Characteristics of QR Code

High Storage Capacity

A QR code symbol can store up to 7,089 characters of information, which is a huge amount as compared to 1-D barcode.

Encodable Character Set

- Numeric data (Digits 0-9)
- Alphanumeric data (upper case letters A-Z; Digits 0 - 9; nine other characters: space, : % * + - / _ $)
- Kanji characters

Small Printout Size

The information in QR code is stored in both horizontal and vertical directions. Due to this feature, for the same amount of data, space acquired by QR code is one fourth times less than the space acquired by 1-D barcode.

360 Degree Reading

QR code is readable from any direction. This feature is provided by the finder patterns present at three corners of the symbol. The finder pattern helps to locate the QR code.

Capability of Restoring and Error Correction

If the part of code symbol is damaged or dirty, data can be recovered. The error detecting procedure can focus on the region of correct information. There are four levels of error correction of QR code that are L, M, Q and H. The level L has the weakest and level H has the strongest error correction capability [1].

Working of Qr Code

Main objective of QR code development is encrypting the user data. The working of QR code includes encrypting and scanning the encrypted data.

Generating an encrypted QR code

The Program for generating QR code is done in node js server. We have implemented the program in javascript language. The generated QR code is displayed on a web browser.
For encrypting the QR code we have used Elliptical Curve Cryptography (ECC) [3],[4].

Figure 2 Displaying Encrypted QR code

Scanning an encrypted QR Code

To scan or read a QR code, user is required to install a QR code scanner app on his smartphone. A number of QR code scanner apps are there on app stores for free. After installation, start the application and bring the camera of smartphone in front of the QR code to scan it. It will automatically display the content of QR code scanned.
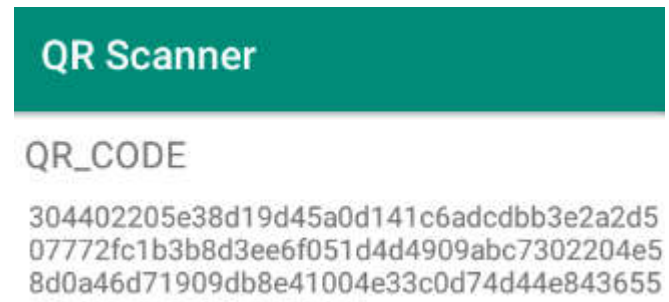

Figure 3 Displaying Encrypted Message

Application of Encrypted qr code

The above Encrypted qr code can be used in

In Banking Application

Banks can send a confidential message to their customers regarding their accounts Which can be embedded in QR code.

Storing Encrypted Information

For Connecting to private wi-fi networks in company, organisations we can use QR code to store the password for accessing the networks.

Defence organization

Arm forces can store their nuclear missile launch codes in QR code.

Equipment Manufacturers

Product manufacturer can add QR code to store their machine launch key.

RESULTS

In our proposed system we have successfully implemented the QR code generation in node js server. We have used Elliptic Curve Digital Signature Algorithm (ECDSA) Which uses

Elliptical Curve Cryptography that consists of 256 bit private key and SHA-256 hash algorithm to generate digital signature of 568 bit. Which is encoded in QR code.

CONCLUSION

In cryptography the process of securing data has been improved dramatically in the last few years. In our proposed method we use 256-bit ECDSA encryption to digitally sign the file. The primary benefit promised by ECC is a smaller key size, reducing storage and transmission requirements, i.e. an elliptic curve group provides the same level of security provided by an RSA-based system with a large key size: for example, a 256-bit ECC public key provides comparable security to a 3072-bit RSA public key.

References

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