

# Students Attendance System Using Qr Code

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**Abstract:** *Smartphones are becoming more preferred companions to users than desktops or notebooks. Knowing that smartphones are most popular with users at the age of around 26, using smartphones to speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process. This paper proposes a system that is based on a QR code, which is displayed for students during or at the beginning of each lecture. The students will need to scan the code to confirm their attendance. The paper explains the high-level implementation details of the proposed system. It also discusses how the system verifies student identity to eliminate false registrations.*

**Keywords:** *Mobile Computing; Attendance System; Educational System.*

## 1. INTRODUCTION

Taking students' attendance with the aid of using college teachers throughout every magnificence is a time-eating procedure in particular while instructions are big. Some school guidelines require this challenge to be done with the aid of using the trainer in every lecture. In different words, out of the entire hours which might be assigned to a given course, which is commonly forty-5 hours per semester, up to eight hours may be lost to perform this process which usually takes around ten minutes per lecture. Statistics in [1] show that 42% of smartphone users have an average age of 26 years old. Thus, with the vast of smartphones among college students, this paper addresses the trouble of such a waste of lecture time and proposes a system that offers to reduce it by almost 90%. The proposed solution offers a QR code for the students to scan via a specific smartphone application. The code alongside the pupil identification taken via way of means of the software will verify the student's attendance. This way, the system will save not only time but also efforts that were supposed to be put in by instructors during each lecture. It will accelerate the system of taking attendance and go away a good deal of time for the lecture to take delivery properly. The proposed device additionally looks after stopping unauthorized attendance registration and

the usage of multi-thing authentication. That is, it considers “Something you know”, “Something you have”, and “Something you are” to confirm the student’s identity. In what follows, we can about speak a few associated paintings in segment 2. In section 3, we will give an overview of QR codes. In phase exhalation for how the gadget works, and finally, in phase 5, we can finish the paper.

## **2. Related Approaches/Work and Literature Survey**

There are many proposals for Automatic Attendance Systems within side the literature and the market. Most of them do focus on applications to be installed on the lecturer’s device, whether a smartphone or a laptop. In this section, we will mention briefly a few of these proposals. Reference [2] proposes software to be installed on the instructor's mobile telephone. It enables it to query students' mobile telephones via Bluetooth connection and, through the transfer of students' mobile telephones' Media Access Control (MAC) addresses to the instructor's mobile telephone; the presence of the student can be confirmed. Reference [3] is another example of a proposal that uses real-time face detection algorithms integrated into an existing Learning Management System (LMS). It routinely detects and registers college students attending a lecture. The device represents a supplemental device for instructors, combining algorithms utilized in machine-gaining knowledge with adaptive strategies used to music facial adjustments at some stage in an extended period. On the other hand, in [4], the proposal uses a fingerprint verification technique. They propose a system in which fingerprint verification is done by using the extraction of the via-me method and the gadget that automates the complete method of taking attendance. Since biometrics are worried about the measurements of particular human physiological or behavioral characteristics, the era has been used to affirm the identification of the user It is turning vital so that you can reveal the presence of the authenticated person at some point in the session. Thus, another proposal [5], discusses a prototype system that uses facial recognition technology to monitor authenticated users or students. A neural network primarily based tot of rules becomes applied to perform face detection, and an eigenface approach becomes hire become necessary out of facial recognition. The experimental effects display the feasibility of near-real-time non-stop person verification for high-degree safety statistics systems.[5] We observed that maximum proposals do contain programs being utilized by the teacher at some point in class. Hence the, if the attendance machine calls for a few motions from the instructors, then the class time may be disturbed whenever the trainer permits a few overdue college students into the class. On the alternative hand, our concept does require the trainer to do not anything more past offering the slides of the path to the students. Hence, college students can also additionally check in their presence at any time they want for the duration of the elegance while at the same time having thoughts that registration instances are recorded.

## **3. QR Code: Quick Response Code**

QR code (abbreviated from Quick Response Code) is the trademark for a kind of matrix barcode (or two-dimensional barcode) first designed for the automobile enterprise in Japan. Bar codes are optical machine-readable labels connected to objects that file facts associated with the item. It became, to begin with, patented; however, its patent holder has selected now no longer to work out the one’s rights. Recently, the QR Code gadget has grown to be a famous outdoor car enterprise due to speedy clarity and extra garage capability as compared to traditional UPC barcodes. The code includes black modules (rectangular dots) organized in a rectangular grid on a white background. The statistics encoded can be made of 4

standardized types ("modes") of data (numeric, alphanumeric, Byte/binary, Kanji) or, thru supported extensions, definitely any form of data A QR code, as proven in Fig.1 is read by an imaging device, such as a camera and data is then extracted from patterns present in both horizontal and vertical components of the image. The QR capabilities are indexed in Table 1. The figure shows a sample of an unencrypted QR code that will be needed by the proposed system.



Fig.1 Quick Response Code

A Quick Response code (QR- code) is a two-dimensional bar code designed with the aid of using Denso Wave in 1994 in Japan. A QR code is arranged in rows and columns of black and white and has been designed to be read by a smartphone. A QR code can hide a large amount of data, numeric and alphanumeric. Thus, they have become popular all over the world. Moreover, QR codes are widely used in telecommunication due to the increased popularity of smartphones, which typically contain software that can read QR-code images. A QR-code photograph incorporates a purposeful sample and an encoding location as may be visible in Fig. 1. The patterns included in a QR-code image are the finder, alignment, timing, and separator patterns. Each of these patterns has its functionality. These are as follows:

**1. Finder sample:** This sample may be observed at the rims of a QR code image. The finder pattern is a square block that contains a black square. There are 3 finder styles on each QR code image; on the pinnacle left, pinnacle right, and backside left. There is no finder pattern at the bottom right. The primary function of the finder pattern is to tell a scanner or decoder that the image that has been encoded is a QR-code image. No statistics are saved with inside the finder pattern.

**2. Alignment pattern:** Similar to the finder, there's no information saved within side the alignment pattern; however, It presents statistics scanner gadgets to effectively function the records within side the region of the encoded records. The alignment sample is placed among encoded statistics and is generally within side the middle of the image. The shape of this sample includes a small rectangular with a tiny dot inside. In addition, the variety of alignment styles can range for special QR codes.

**3. Timing sample:** This sample lies in finding patterns. Timing styles are organized vertically and horizontally. There is a black dot internal every timing pattern. The foremost motive of the timing sample is to accurately the important coordinate for every information molecular whilst any distortion occurs during the decoding of symbols or when an error is found in any cell pitch in the QR code. No facts are saved within side the timing pattern. 4. Encoded data: This sample is positioned in the middle of the image. Data is saved inside this pattern. In addition, while records are inserted, their miles are transformed into tuitionary records. This binary data is converted back to normal text when the image is decoded by a scanner.



Fig.2 QR Code Generation

From the above figure, it is concluded that the QR code is generated by entering the QR CODE generator in the search bar and then by using the first website which is “Online QR code generator” and then you can generate the QR code. Using that website you have to simply create an URL that is simply generated in different forms such as URL and multi URL as per client’s requirements. The code can modify in different ways such as colors and patterns.

#### 4. The Proposed System

The gadget lies among online getting-to-know and conventional getting-to-know as a facilitation for the attendance record-maintaining process, in a manner that enriches the lecture time so that it can better be utilized in giving useful materials rather than wasting time taking attendance. The machine calls for an easy login system with the aid of using the elegance trainer via its Server Module to generate an encrypted QR code with particular information. This may be completed at any time earlier than the class. During the class, or at its beginning, the teacher shows an encrypted QR code to the students. The college students can then test the displayed QR code for the usage of the gadget Mobile Module, furnished to them via the phone marketplace via way of means of the university. When the student scans the QR code by the mobile application at the time of the Scan, the Mobile Module will then speak the records amassed to the Server Module to affirm attendance. The entire technique has to take much less than a minute for any scholar in addition to for the entire magnificence to finish their attendance confirmation. Smartphones can also additionally speak with the server thru both the nearby Wi-Fi insurance supplied with the aid of using the group or thru the Internet.

	QR Code
Developer (Country)	DENSO (Japan)
Numeric	7,089
Alphanumeric	4,296
Binary	2,953
Kanji	1,817
Major Features Standards	Large capacity small printout size High speed scan
Standards	AIM International JIS ISO

Table I. Capacity, Features, And Standards For Qr Code

As mentioned earlier, the system is composed of two modules: the Server and the Mobile Modules. The following subsection will describe the tasks for each module.

### A. Server Model

The Server Module performs the following tasks:

- Mediates students' attendance requests
- Generates a QR code for the instructor
- Runs Identity check
- Runs Location check

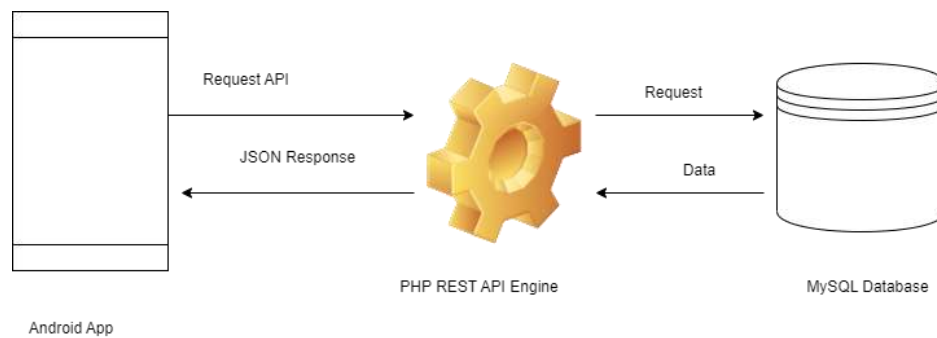


Fig. 3. The proposed system infrastructure

Application is used to collect information from students. Among its capabilities is Taking Attendance. It allows the instructors to take attendance online by calling names and checking online the appropriate checkbox next to the student's name. When you mark your attendance after scanning, a small success message will be popped up on the screen which displays "Your attendance added successfully" with time, day, and date. When a scholar sends his/her data through the Mobile Module to the server, as proven in Figure 3, the server, in turn, sends the Student ID, the lecture date and time, and the attendance status. This way, the application will save the transaction as well as register the appropriate attendance status.

The instructor may choose then to encrypt this code depending on the level of protection needed. The QR code, with or without encryption, will include the following information:

- Course and section ID
- Date and beginning time of the lecture
- Instructor name

The information in Fig.1 can be interpreted as shown in Table 2:

Table 2. Text Extracted From A Qr Code

<p><b>Course: Subject 1</b>  <b>Instructor: Prof. Sayantan Nath.</b>  <b>Date: 1/5/2023</b>  <b>Begin Time: 10:00AM</b></p>
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The teachers in Flip replica this QR code and paste it on the primary slide to be displayed withinside the lecture. If the instructor's policy is to allow late students in his class and would like to mark them as present or late, Then the QR code needs to additionally be copied on one of the 4 corners of as many slides as the trainer wishes. When the scholars are in class, the primary component that has to be performed is to tug out their smartphones, open the Mobile

Module, and scan the QR code. Figure three indicates the QR code in one of the slides of the lecture.



Fig. 4. Scanning the QR code

The 1/3 undertaking of the Server Module is to run an identification test on the registered students. This is performed with the aid of using evaluating the facial picture dispatched consistent with the transaction and that saved picture on the document for the scholar in question. A matching rating could be delivered to the attendance sheet so the trainer may want to carry out a guide test both throughout the lecture or after the lecture. The identification check, or picture comparisons, may be finished as soon as the attendance registration transaction is received, or at a later scheduled time. Although it's far encouraged to carry out the activity as soon as the pupil's symptoms and symptoms in with the machine are marked as present if the number of students and concurrent lectures are large compared to the speed of the Server, then the process might be accomplished say at a random immediate within side the 2nd 1/2 of the lecture. The motive of this process is to permit the trainer to test the outcomes of the identification test earlier than the top of the lecture if he/she desires to do so.

Finally, a location check will be performed. This task will be discussed later.

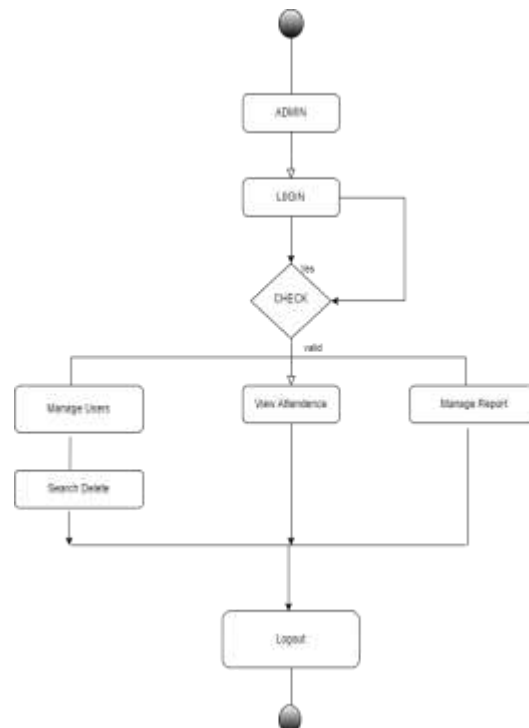


Fig. 5. Admin Activity Diagram

It seems like you're asking about a system or process related to administering attendance. Based on the limited information provided, I can provide a general overview of how such a system might work.

1. **Admin Login:** The system would have a secure login mechanism specifically designed for administrators. Administrators would have unique credentials (username and password) to access the system.

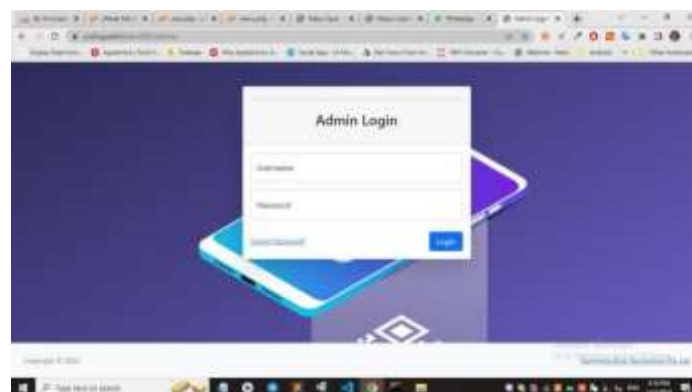


Fig. 6. Admin Login Page

2. **Check Attendance:** Once logged in, the admin would have access to various functions, including the ability to view attendance records. This could involve selecting a specific date range or a particular group of individuals to display their attendance data.
- **Manage Users:** In addition to checking attendance, the admin can also manage user accounts. This functionality would typically involve tasks like creating new user accounts, modifying existing user information (e.g., name, contact details), and disabling or deleting user accounts as needed.

1. **Search Users:** Within the "Manage Users" section, the admin can utilize a search feature to find specific users based on various criteria. This can include searching by username, name, email address, or any other relevant information associated with the user accounts. The search functionality allows the admin to locate specific users quickly.
  2. **Delete User Accounts:** Once the admin has located the user account they wish to delete, they can select the corresponding option to delete that account. A confirmation prompt would typically be presented to ensure the admin's intention to delete the user account. Once confirmed, the system would remove the user account and associated data from the system.
  - **View Attendance:** After selecting the desired parameters, the system would display attendance information, typically in a tabular format. This information may include the date, time of entry, time of exit, and any additional relevant details for each individual.
  - **Manage Report:** The system would provide a feature to generate attendance reports. Admins could specify the desired date range, group, or individual for which they want to generate the report. The report might include statistics such as total attendance hours, absences, tardiness, or any other relevant metrics. These reports can be used for analysis, record-keeping, or sharing with other stakeholders.
4. **Logout:** When the admin has finished using the system, they can choose to log out, which would terminate their session and return them to the login screen.

It's important to note that the actual implementation of an attendance system can vary significantly depending on the context, such as the type of organization or institution involved, the technology used, and the specific requirements or features desired. The above description provides a general outline of the process, but the details may differ depending on the specific system in question.

### Mobile Module

The Mobile Module is the part that students usually install on their smartphones. This could also be integrated with the Mobile part of the eLearning platform, or a standalone application that communicates with the Server Module. As mentioned earlier, the communication will be through the local Wi-Fi network, or it could be through the Internet.

As depicted in Figure 4, once the student sees the QR code on the screen, he/she opens the Mobile application. If it is the first time for the Smartphone, the system requests the instructor to register a username and password during registration. Once the student registered the details on the website, the system prompts the student to scan the QR code.

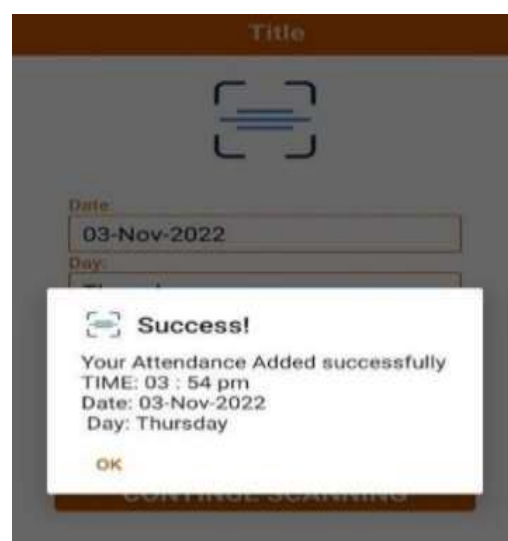


Fig. 7. Added Attendance



The system will then capture the scan of the student. The username and password will be checked against saved data and information during registration.

When a student wants to scan the QR code for attendance then the student needs to log in through a mobile application by entering username and password during the lecture. Once the QR code is scanned, the system sends the information to the server and resumes working in the background. With that, the process is considered completed. The server in turn will send back an acknowledgment that the process is complete. Such as a message pop up on the screen “Your attendance was added successfully” with time, date, and day and the student can not mark attendance twice as the message will be prompt “Your attendance already exists”.

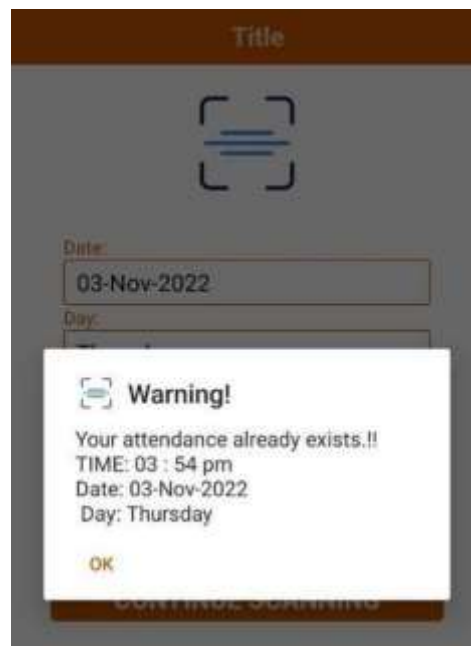


Fig. 8. Error in Adding Attendance



Fig. 9. User activity Flow Chart

The instructor may recheck any of the student's presence during the lecture by manually checking the updated attendance list that shows the matching weights during or after class.

## 5. Analysis

Standard security procedures require a simple username and password. Such information is called "Something you know" or "What you know". Thus, it is easy for unauthorized users to gain access to a user's private data such as personal and financial details, and then use that information to commit fraudulent acts.

Using a username and password together with a piece of hardware or device that only the user has makes it harder for potential intruders to gain access and steal that person's data or identity.

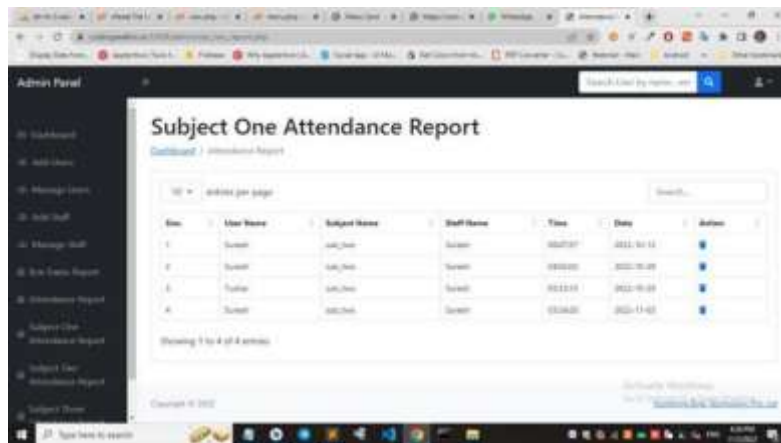
The proposed system will need three steps from each student and instructor. These steps from the instructor such as are registering the student details, staff details, and subject details concerning allocated staff, creating the mobile application for students to download on their mobile phones, and scanning the QR code. The steps from the student tend such as downloading the mobile application and scanning the QR code. The system uses multi-factor authentication to authenticate students. These are "something you know" represented by username and password, and "something you have" represented by the Smartphone owned by the student. Thus, unauthorized users are not easy to get access to change the presence status of one student.

However, for taking attendance, the challenge is in the fact that the system must guarantee that such a process does take place within the classroom and not outside. The only fraudulent act that may happen is when a student sitting outside a classroom scans the QR code by getting the QR code from other students sitting inside, via some communication medium such as WhatsApp and email. This may be enough to simulate the process as if it had taken place inside the classroom. To prevent this, there is one solution students cannot log in through another mobile device except there. In this way, students have to present in the classroom as the instructor can manually count the total number of students present in the classroom. The location of the Mobile phone information will accompany the information sent to the server.

Once the attendance information is sent to the server, the center of the class will be calculated for all the smartphone locations received until the time of the check. This will allow the instructor to check on the awkward positions of the phones or awkward matching weights during class. In other words, the following information will be communicated to the server per transaction:

- Student ID from application account
- Class and time details from the QR code
- Smartphone location from the device

The list of attendance that shows the status of the student attendance can be presented through the admin login to the instructor upon his/her request. Figure 5 shows an updated attendance list after scanning the QR code of each subject.



The screenshot displays a web interface for an attendance report. The title is 'Subject One Attendance Report'. Below the title, there is a search bar and a table with the following data:

Slm	User Name	Subject Name	Staff Name	Time	Date	Action
1	Suresh	Maths	Suresh	08:00:00	2023-10-11	
2	Suresh	Maths	Suresh	08:00:00	2023-10-11	
3	Suresh	Maths	Suresh	08:00:00	2023-10-11	
4	Suresh	Maths	Suresh	08:00:00	2023-10-11	

Below the table, it says 'Showing 1 to 4 of 4 entries'. The interface also includes a sidebar with navigation options like 'Dashboard', 'Add Users', 'Manage Users', 'Add Staff', 'Message Staff', 'Staff Entry Report', 'Attendance Report', 'Support User', 'Attendance Report', 'Support User', 'Attendance Report', and 'Support User'.

Fig. 10. Updated Attendance Sheet

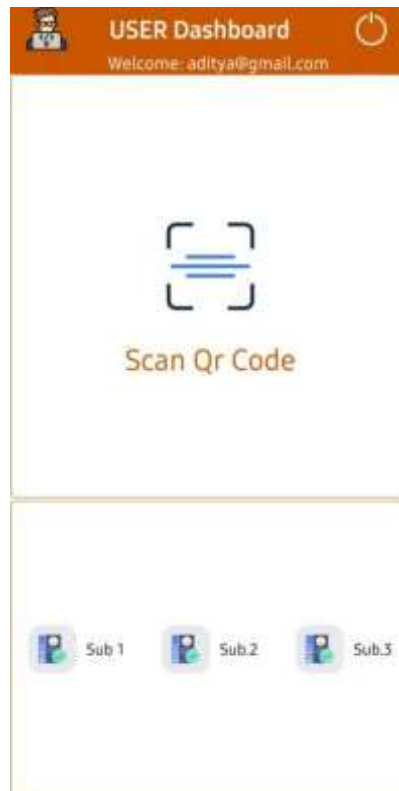


Fig. 11. Snapshots of the Mobile Module

## 6. Conclusion

These days it's far required to hold up with cutting-edge technologies, mainly within side the area of education. Educational establishments were seeking out approaches to decorate the instructional system with the usage of ultra-modern technologies. Looking at the existing situation, we have thought of using mobile technology to efficiently benefit from the complete assigned time assigned to a lecture. Time taken by instructors to take attendance may be viewed sometimes as a waste of lecture time, especially when classes are big. For that, we have proposed a way to automate this process using the students' devices rather than the instructor's devices. In other words, the instructor need not do anything extra during the

class beyond presenting the slides of the subject to be taught to the students. The proposed system allows fraud detection based on the IP address taken for each student.

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