

# ***DEVELOPMENT OF MOBILE APPLICATIONS USES GEOFENCING AND BEACON AS A MEDIA OF INFORMATION AND ORDER TRANSPORTATION IN TAHURA IR. H. DJUANDA***

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## **ABSTRACT**

This study aims to explain the utilization of Beacon technology as a means to assist visitors in finding out information about a tourist attraction and can make transportation reservations that exist in the area of Forest Park Ir. H. Juanda. The data used in this research is data taken in Forest Park Ir. H. Juanda in a way to provide questionnaires to visitors Tahura, observations on Tahura area and also a review of literature supports the theory of problem solving in this study. Problems arise with small information boards at several attractions that lead visitors difficulty in seeing the information on the bulletin board if the number of visitors which led to queue to get their turn, and also absence of sarana booking transport to be able to facilitate the exit of the Forest Park neighborhood Ir. H. Juanda if there is something very important. One solution to help visitors to make it easier to get information on attractions in Forest Park Ir. H. Juanda is by utilizing Beacon technology that uses Bluetooth Low Energy to send a beacon to the visitor's device if at a certain distance, and also take advantage of geofencing for determining the point of pick-up at the time of booking transport.

**Keywords :** *Beacon*, Geofencing, transportation, attractions, Forest Park Ir. H. Juanda.

## **1. INTRODUCTION**

### **1.1 Research Background**

Forest Park Ir. H. Juanda is an integrated conservation area anantara secondary nature with forest plants with species of Pinus. Forest Park Ir. H. Juanda located in Tahura Complex, Jl. Ir. H. Juanda No. 99, Ciburial, Cimenyang, Bandung, West Java, with an area beginning in 1965 at only 10 hectares, but now vast forest reserves reached 528.39 hectares, equivalent to 28.32 Km stretching from Curug Dago, Dago Pakar until Maribaya Lembang.

Forest Park Ir. H. Juanda is part of the Bandung basin area which has a historical background that is closely related to the ancient times to the present. Geologically the area is

experiencing changes caused by natural fluctuation over a long period during the process of formation of the universe. Forest Park Ir. H. Juanda originally part of a group of Protection Forest area Pulosari which by the Minister of Agriculture No. 575 / kpts / Um / 8/1980 changed its function into the Nature Park (TWA) Curug Dago.

At the main door there is a plan of Forest Park Ir. H. Juanda who provide information on the location and attractions in Forest Park Ir. H. Juanda and distances from one attraction to the other attractions. There are many attractions in Forest Park Ir. H. Juanda including the Netherlands Goa, Goa Japan. Curug Omas, Lalay Curug, Curug Dago, Tebing Keraton, Captive Deer, Monument Ir. H. Juanda, Museum Ir. H. Juanda. There is a signpost on the path that passes through each attraction.

Attraction on board contained information about the history of the attraction, but when the visitor attraction in crowded conditions, it will be difficult to see directly from the nearby information in the history information boards about the tourist attraction.

Forest Park Ir. H. Juanda itself is open from 6 am to 6 pm, there is a problem when the visitors still located in the area of Forest Park Ir. H. Juanda at 6 pm and the weather showed no sign of rain, visitors will be confused to contact the transportation is in the entrance area to pick up.

From the description above problems, we need a tool that can be a solution of the above problems, one of them with the tools in the form of mobile applications. Rapid technological developments change the phone functions that were previously only as a communication tool that is now a computational tool that has a system like computer operat. One of the operating system in the phone is Android. Android is an operating system is a complete, open and free. Next is the use of technology

beacon, beacon technology developed by large companies Apple called iBeacon,

By using technology beacon, visitors can view information about the attraction easily by simply using a smartphone that he had, without having to wait in line if the condition attractions were crowded, and visitors can book / call transport in the form of 2-wheel vehicles that are near entrance to pick up if you want to get out of the area of Forest Park Ir. H. Juanda.

## 1.2 Purpose and objectives

The purpose of this research is to build an application that allows visitors to get information about tourist destinations and transportation reservations in the area of Forest Park Ir. H. Juanda. While the purpose of this research is:

1. Make it easy for visitors to get information about tourist attraction in Tamah Hutan Raya Ir. H. Juanda.
2. Booking transport in the form of a motorcycle that exist in the area of Forest Park Ir. H. Juanda.

## 2. THEORETICAL BASIS

### 2.1. Beacon

BLE or Bluetooth Low Energy is an increase in the existing Bluetooth specification that is designed for operation with lower power. BLE beacons transmit identifying information it can use to identify the type of space where the beacon is installed. iBeacon is part of the Beacon BLE specification [1]. With a low emittance, energy consumption is low enough beacons. Beacon can function in the long term by using battery power. Beacon also does not require Internet access to function. Beacon has protoko simple and easy and can be embedded in the application so it can run without continuous Internet connectivity. Although the beacon does not require internet connectivity, applications that utilize the beacon will require internet if needed.

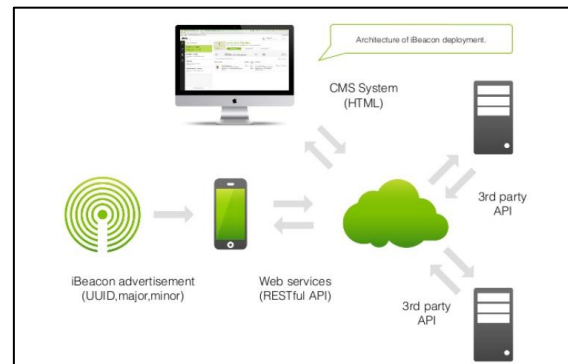
### 2.2. Cubeacon

Cubeacon is a tool BLE small cubes which nowadays has evolved in the form of cards and also of course have to follow the standards of iBeacon. Cubeacon developed by a company in Indonesia called PT. Eyro Digital Technology derived from Surabaya, East Java.

### 2.3. How to Work Cubeacon

With a data unique to broadcast beacons (UUID, Major and Minor) via Bluetooth to a smartphone network. Then the smartphone will continue to translate unique backend to the data. After the backend will return the results of the translation to smartphones, can include Image, Video, or URL, depending on the determination of

the id Cubeacon with the type of notification that has been set on the backend.



**Figure 1.** Architecture Cubeacon

1. Universal Unique Identifier (UUID) (128 bits)  
In general, uuid transmitted by iBeacon is a 128-bit identifier that uniquely identifies the organization the beacon. when ibeacons used by, for example, by a store, uuid will induce flare run by the company.

2. Major (16 bits)

Bluetooth specification and ibeacon not put the structure on the use of large and small numbers, but there is a hierarchy in the API used. Major used to identify large groups flare owned by one entity.

3. Minor (16 bits)

Figures minor is used to identify the lowest hierarchy level in a set of beacon. back to the example of a chain of shops, the minor will be used for individual beacons in one store location, perhaps to identify the products displayed [12]

### 2.4. Information

In general, the information can be interpreted as a message that consists of the order sequence of symbols or meanings that could be interpreted in a message or set of messages. Information can also be interpreted as a set of data or facts that have been processed first, and also managed in a way that it becomes something that is easy to understand and useful for the recipient [3]. Meanwhile, according to Romney and Steinbart (2009) information as data that has been processed and organized, so as to give meaning or benefit to the person using it.

### 2.5. Android

Android is a Linux-based operating system designed for touch screen mobile devices such as smart phones and tablet computers [4]. Android is open or open source that lets developers create their own apps. At first Android was developed by Android Inc., and Google bought it in 2005. The operating system was released in 2007 in conjunction with the establishment of the Open Handset Alliance. The first Android phones sold in 2008. There are two types of distributors operating system Android is the first fully supported by Google or Google Mail Services (GMS) and the second is

completely free distribution without the support of Google's otherwise known as the Open Handset Distribution (OHD ). Android was developed privately by Google to recent changes and updates are ready to be released, and information about source code also began publicly disclosed. Source code will only run without modification on a specific device, usually in the Nexus series. By providing a facility open source, Android offers developers the ability to build applications that are extremely rich and innovative. The developers are free to take advantage of the hardware, access location information, run background services, set alarms, and much more. Android offers developers the ability to build applications that are extremely rich and innovative. The developers are free to take advantage of the hardware, access location information, run background services, set alarms, and much more. Android offers developers the ability to build applications that are extremely rich and innovative. The developers are free to take advantage of the hardware, access location information, run background services, set alarms, and much more.

## 2. 6. geofence

Geofence is a virtual perimeter on geographic areas that are real. Merging the user's position and the perimeter of the geofence is used to determine whether the user is inside or outside the geofence or even to find out if users exit or enter the area [10].

One way to do geofencing by installing GPS receivers to be tracked to the object and use the data from the GPS receiver to determine where the object is compared with the location geofencing. Geofencing variety of techniques have been developed for different needs [11], among which:

### 1. Geofenced Area

This technique provides automatic monitoring of mobile objects moving around or are in geofence area. The alarm will sound when a mobile device enters or out of a predetermined limit.

### 2. Proximity With a Point Of Interest

In this technique, there are two parameters, namely the center point coordinates and distance radius which is intended to detect objects within the proximity of mobile point of interest.

### 3. Route adherence

This technique relates to monitoring mobile objects along the way, from the time of departure to arrive at the final destination. Geofence allows mobile objects do not deviate from the predetermined route.

### 4. Route and schedule adherence

This technique consists of route and schedule adherence. This technique is used in particular to follow the movement of mobile objects to the route is set, in relation to the schedule set.

## 2. 7. Javascript

Javascript is a scripting language that is based on objects that allow users to control many

aspects of user interaction in an HTML document. The object can be a window, frame, URLs, documents, forms, buttons, or other items. All these objects each have properties that are interconnected with each other, and each has a name, location, color values and other attributes [7].

## 2. 8. Unified Modeling Language (UML)

Unified Modeling Language is a standard modeling language that includes an overview, visualization, specification, construction and documentation for software development and system-based OO (object-oriented) [6]. There are some very basic things in UML models include the Classes described as a group of objects that have attributes, operations and semantic relationships, Interfaces which is an interface that connects between classes and or elements, Collaboration which is defined by the interaction of a set consisting of classes / elements that work together, Use cases which is a description of a group of interrelated and form a system of regularly performed or supervised by an actor, and Nodes which are physical elements that exist at the time of exercise of a system, for example, is a computer, usually has at least a memory and a processor. There are four kinds of relationships in UML use some of them are Dependency, Association, generalization, and Realization.

## 3. RESEARCH METHODS

### 3. 1. Method of collecting data

Methods of data collection that supports this thesis is to do a literature study, questionnaires and direct observations to the court described as follows:

#### a. Study of literature

The study of literature is a way of collecting data by collecting literature that originates from the articles, books, journals, papers, and readings that have anything to do with the title of the study.

#### b. questionnaires

In this research, questionnaires appropriate data needed to visitor Forest Park Ir H Juanda. The questionnaire was conducted to analyze the respondents to the application needs to be made.

#### c. Observation

Data collection techniques by conducting research and direct observation of the problems taken.

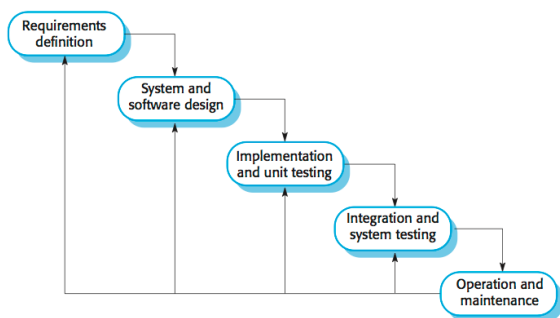
### 3. 2. Software Development Methods

Software development methods used in this study is the waterfall method. In this method has several stages that include:

#### 1. Requirements Analysis and definition

At this stage the service system, constraints, and goals are determined in consultation with the users of the system are then defined in detail and serves as a system specification.

2. System and software design  
Stages allocate system design system requirements both hardware and software to form the overall system architecture. Software design involves the needs that have been analyzed in the previous stage and the depiction of the basic system software abstraction and relationship.
3. Implementation and unit testing  
At this stage, the system was first developed in a small program called the unit, which is integrated in the next stage. Each unit developed and tested for functionality referred to as unit testing.
4. Integration and system testing  
The entire unit was developed at the implementation stage integrated into the system after testing conducted each unit. After integrate entire system was tested to check for any failures or mistakes.
5. Operation and maintenance  
This stage is the end of the waterfall model. The software is already finished, run and do maintenance. Maintenance included in fixing errors that are not found in the previous step. Repair system implementation and enhancement services unit system as a new requirement.



**Figure 2.** Model scheme *Waterfall by Sommerville* [2]

## 4. RESULTS AND DISCUSSION

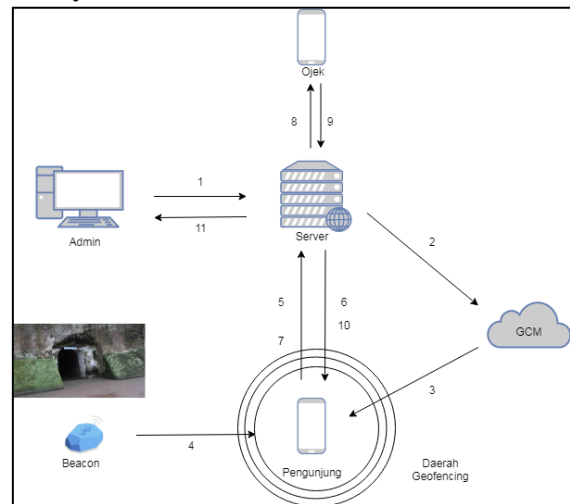
### 4. 1. Discussion

Forest Park Ir. H. Juanda has a large area is 528.39 hectares, and has 10 attractions spread over Tahura region Ir. H. Juanda. To get information about the attractions found in the region Tahura Ir. H. Juanda, visitors are required to come to each attraction there and look directly at the information board is available at the tourist attraction. However, if the attraction destination in crowded conditions, for at some point in the attraction visitors are required to stand in line to see information about the attraction. Therefore, visitors often pass intended attraction because too crowded and reluctant to stand in line.

In addition, concerning to see information about the history of a tourist attraction, visitors will also find it difficult to access information about emergency transport is ready for pick up in case the unexpected and plan, which requires visitors as soon as possible out of the area Tahura Ir. H. Juanda.

To meet these needs, the meal will be built a system that can make it easier for visitors to view information historians of an attraction and availability of information for emergency transportation reservations if you want as soon as possible out of the area Tahura Ir. H. Juanda.

### 4. 2. System Architecture



**Figure 3.** System Architecture

Here is a description for the system architecture to be built in this study:

1. Admin entering data Attraction information, make the adjustment to geofencing area by specifying latitude and longitude geofencing system and create notification messages GCM.
2. Web server sends a notification message to GCM
3. GCM provides a notification message to the visitor, to turn on Bluetooth and use the application.
4. Beacon provides broadcast data such as UUID, Major and Minor
5. Applications visitor receives a broadcast from the object beacon wisatam then request permission application access to the server
6. The response from the server in the form of access status, and attraction information
7. Through features on the app, visitors sending requests to the server to order a motorcycle
8. The server sends data to the visitor orders a motorcycle applications
9. Applications motorcycles receive orders and send order confirmation
10. The server sends order confirmation motorcycles to apps visitors
11. Admin manage existing data on the server.

### 4. 3. Beacon Analysis Used

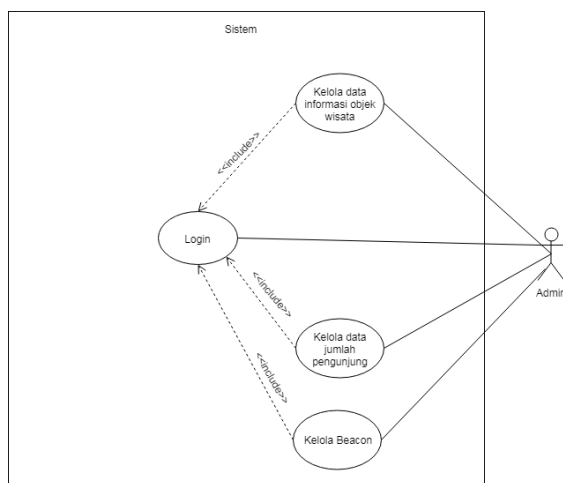
In this study beacons used is Cubeacon iBeacon the form of cards produced by PT. Eyro Digital Technology. Which has the following specifications:

**Table 1.** specifications Cubeacon

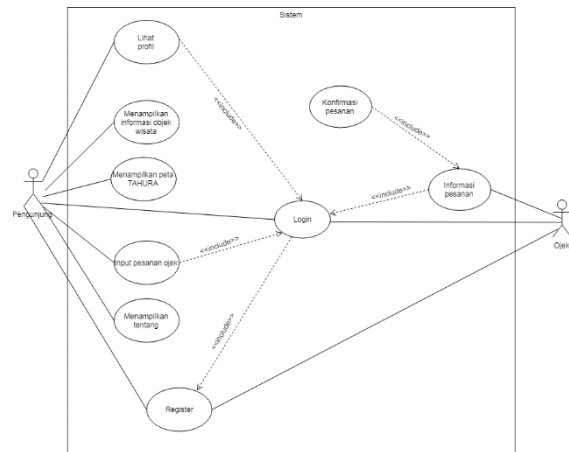
Power supply	3.3 VDC Max
	1.8 VDC Min
Current	0.1 mA Max
	50 uA Min
RF Power	-93 dbm
Working Frequency	2.4 GHz ISM Band
operating Temperature	C Min-5 <sup>0</sup>
	65 <sup>0</sup> C Max
firmware	open Beacon
advertising interval	128 ms
Battery Model	CR2477 1000 mAh
Range Broadcast	20 meters
Compatible OS (Min)	IOS 7 & Android 4.3
BLE Chip	nFR51822
Bluetooth Version	4.0
height	37mm
Weidth	37mm
Length	37mm
weight	42 grams

### 4. 4. Use Case Diagram

Use case diagrams are used to describe the functional requirements of the system to be built. Use case diagram describes the interactions that occur between one or more actors with the system being designed, a use case is represented by a sequence of simple steps. Use case diagrams are used to determine what function is in a system as well as anyone who is entitled to use these functions.



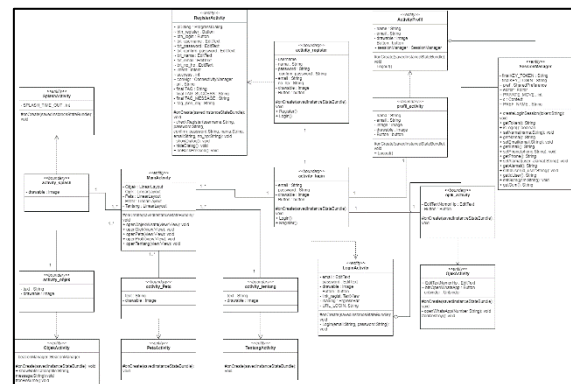
**Figure 4.** Use Case Admin



**Figure 5.** Use Case Visitors and Ojek

### 4. 5. Class Diagram

Class diagram is a specification that if diinstansiasi will produce an object and is the essence of an object-oriented design and development. Class describes the state (attributes or properties) of a system, and can also be used to manipulate the situation.



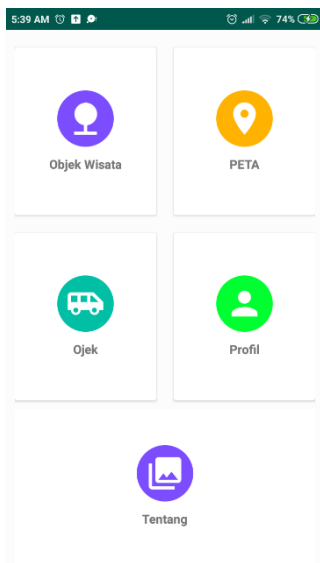
**Figure 6.** Class Diagram

### 4. 6. Implementation interface

Implementation of the interface describes the implementation of a component or part of the web and android. Implementation of the interface is represented by the interface name along with the name of the file.



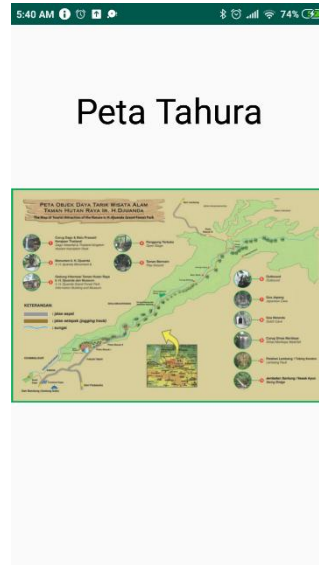
**Figure 7.** SplashScreen Interface



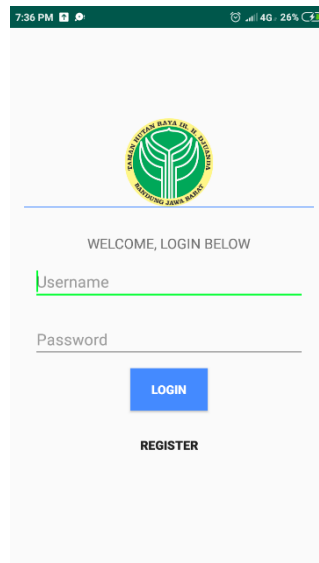
**Figure 8.** Home Interface



**Figure 9.** Information Page Attractions Interface

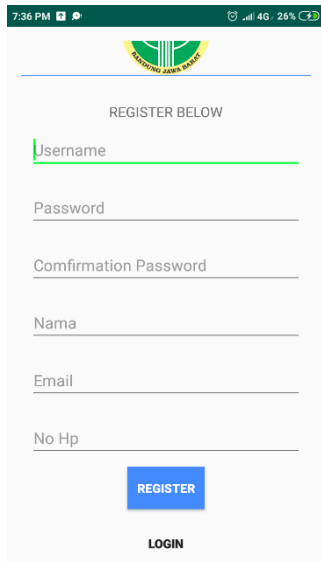


**Figure 10,** Ir. H. Djuanda Forest Map Interface



**Figure 11,** Login Interface





**Figure 12.** Registration Interface

#### 4. 7. Testing Systems

The testing phase is done to ensure that all functions in the system that has been built to run well and look for errors that could occur on the system. Tests on this thesis conducted a functional alpha and beta. The method used in these tests blackbox testing method that focuses on the functional requirements of the system built.

#### 4. 8. Alpha testing

The case of alpha testing is used to determine the functionality of the application has been made is in conformity with the already expected or not.

**Table 2,** Testing Attractions

Kasus dan hasil uji (data normal)			
Data masukan	Yang diharapkan	Pengamatan	Kesimpulan
Data Informasi Objek Wisata	Menampilkan tampilan berisi informasi objek wisata dalam bentuk gambar dan teks	Informasi objek wisata muncul pada layar	Diterima

#### 4. 9. Beta testing

Beta testing is done to determine the extent to which the quality of applications that have been built have been met or not. In this beta test data collection on respondents, or users of the system by questionnaire. Beta testing is done on mobile applications and web. Testing for web applications

is done by way of an interview with a person designated as an admin, while testing for mobile applications and motorcycles visitors using questionnaires distributed to 20 respondents as a mobile application users visitors and 5 respondents for mobile app users motorcycles. Based on interviews with respondents untu web applications (web admin) is as expected.

The method used in the calculation of the questionnaire using Likert scale. Likert scale method is a psychometric scale commonly used in the use of questionnaires. When answering questions in a Likert scale, respondents specify their level of agreement to a statement by choosing one of five options. There are five options that scale is generally have the following format:

1. Strongly Disagree
2. Disagree
3. quite Agree
4. Agree
5. Strongly agree

Questionnaire for users of mobile application users consists of 5 questions. The questions are as follows:

1. Smart Tahura application easy to use.
2. With the availability of these applications can meet the information needs attractions in Tahura Ir. H. Juanda.
3. This application helps in booking transportation if you want to quickly exit the area Tahura Ir. H. Juanda.
4. This application helps to know users are on the attractions which.
5. Smart application's display Tahura interesting.

## 5. CLOSING

### 5.1 Conclusion

With applications built Smart Tahura to access information and perform the calling or booking transportation in Tahura Ir. H. Juanda utilizing Beacon and Geofencing built on the Android platform can be concluded that:

1. The use of technology for sending a signal beacon uuid, major, and minor can help users to find attractions is at what
2. This application can provide information description of attractions visited by the user.

### 5.2 Suggestion

This application is still far from perfect and there are still many shortcomings, therefore it is necessary once made the development for these applications can be better. The suggestion that this application could be better, namely:

1. In the transportation reservations should be developed in the form of additional features of distance, time and cost is predetermined.
2. Displays information about distances between attractions in the attraction information.

Similarly, conclusions and suggestions to the authors give, hopefully these suggestions can be used as inputs which can be useful especially for writers and generally for the public.

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