

Automated Detainee Management and Tracking System

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1. Summary

Working title: Automated Detainee Management and Tracking System

This system is going to be implemented for Department of Sri Lanka Police and Department of Prisons, Sri Lanka. As all of the operations are done manually, it is proposed to implement a system which has its main functionalities automated along with an Detainee Tracking system using a prediction algorithm.

2. Introduction

2.1 Background

2.1.1 Orientation of component proposed to the Department of Sri Lanka Police

With the definition of civil force of the national or local government, responsible for the prevention and the detection of crime and the maintenance of public order and the mission of committed and confident to uphold and enforce the law of the land, to preserve the public order, prevent crime and Terrorism with prejudice to none – equity to all, the Sri Lanka Police was officially established in 1806 under Act No 14. The Colombo city had been divided to fifteen divisions and the police constables were appointed to supervise those divisions. The services provided by the Sri Lanka police to community are as below.

- Emergency Services to public
- Island wide Policing
- Entertaining complaints of the general public.
- Tourist Police
- Issue of extracts of complaints.
- Issuing of clearance certificates.
- Issuing of police clearance certificates for employment
- Issue of accident report.
- Loud Speaker Permits
- Gun / Explosive
- Processions
- Traffic Division
- Police Narcotic Bureau

It has been founded through the literature review that the service of entertaining complaints of the general public is being done manually. It is thought that it has been the high time to get automated the particular service since Sri Lanka is being developed extremely. It is proposed to be surrounded with Software Engineering research component, which is the automation and prediction of tracking criminal activities by mobile technology, in aid of advancing the efficiency of the service. [12]

2.1.2 Orientation of the component proposed to the Department of Sri Lanka Prisons

By enacting the first prison ordinance in 1844 under Act No 18, the Welikada Prison was established. With the vision of making the Sri Lanka Prison service the best prison service in South East Asia, it has been intended to create a good relationship between the prison officers and the inmates in order to achieve the main objectives of custody, care and corrections and thereby improve the job satisfaction of the officers and buildup positive attitudes among officers and regulate the welfare of the prisoners, utilizing their productivity of labor for the benefit of the country. The key functions of the prison are as below.

- The reception of Prisoners of every description committed or remanded under the authority of any court in the country and the provision of security
- nutrition and maintenance for them in accordance with prison rules
- The escorting of remand prisoners to and from courts.
- Provision of training in the fields of industry, agriculture and animal husbandry and vocational training for the inmates in all prisons and reformatories.
- Provision of welfare services in prisons and reformatories and after care services for prisoners released from prisons and reformatories.
- Provide for research and training in the field of correction. [11]

2.2 Significance of the study

It has been found that all the above functions are being done manually in present. It is proposed to make them automated including the software engineering research component, which is tracking escape attempts of prisoners with introducing a simple device-free motion detector and a distributed E-Mail gateway.

3. Problem definition and research questions

3.1 Problem definition

3.1.1 Literature Review

3.1.1.1 Distributed Mail Gateway

CRONEYMAIL.COM – by Vineetha Patel for Bharat Institute of Technology

It is an internet based mailing web site designed to help users to maintain existing relationships as well as establishing almost new relationships. It provides users to create email account, changing passwords, composing new mails, inbox, outbox, send documents, Images, ability of creating mails on their own and strong security model.

Technologies used – ASP.NET, Structured testing tools.

Distributed Mail (Distributed asynchronous message service) – by J.H. Bosuwa and R.M. Visser for University of Amsterdam, Netherlands

It describes about the possibility of creating a distributed mail service, which could run in distributed environment like peer to peer and assuring privacy and security of such an environment.

3.1.1.2 Finding prisoner escape attempts

RASID (A Robust WLAN Device-free passive motion detecting system) – by Ahamed E. Cosba, Ahamed E. Saeed, Mouestafa Yusef for Alexandria University- Egypt

It has been presented dfp (device free passive) system for human motion detection. It combines different modules for statistical anomaly detection while adapting to changes in the environment to provide accurate, robust, and low-overhead detection of human activities using standard Wi-Fi hardware.

FIMD (Fine-grained Device free Motion Detection) by Jiang Xiao, Kaishun Wu*, Youwen Yi, Lu Wang and Lionel M. Ni for Guangzhou HKUST Fok Ying Tung Research Institute, The Hong Kong University of Science and Technology

It monitors the position changes of entities without actively carried a physical device. It has been designed as an indoor device-free Motion Detection system (FIMD) to overcome

the preceding RSS-based limitation. FIMD explores properties of Channel State Information (CSI) from PHY layer in OFDM system. FIMD is designed based on the insight that CSI maintains temporal stability in static environment, while exhibits burst patterns when motion takes place. Motivated by this observation, FIMD uses a novel feature extracted from CSI to leverage its temporal stability and frequency diversity. The motion detection is conducted with outliers' identification from normal features in continuous monitoring using density based DBSCAN algorithm

3.1.1.3 Criminal location tracking

CCNTS - This stands for crime and criminal tracking networking system.

In this system the infrastructures are set in every police station and each and every police station is connected to a centralized framework. The system also includes a biometric profile creation of the convicts which includes fingerprints, birthmarks and blood groups. Other than the above it includes functions such as recording details of the arrested, kidnapped or missing people in order to track them down.

Geographic profiling – In this technique it provides the most probable residence of a criminal by analyzing locations and committed crimes by the particular person. This system assesses the offender's residence, work places and traveling routes to provide the most likely location.

It uses scientific geographic techniques and subjective components and the geographic technique used here is CGT (criminal geographic targeting). The process used in CGT is generating a three-dimensional model of a map called jeopardy surface by using the available data on the particular convict or a crime scene.

Predicting crime tracking using mobile phones – This system is also called mobility pattern and it tracks potential criminals by their mobile phones. The algorithm uses call history, text messages, phone numbers and GPS data for the tracking purpose and it also uses cell tower information to be more precise and reliable.

3.1.1.4 Fingerprint recognition

Fingerprint recognition using Image segmentation

According to this research they have studied and implemented a fingerprint recognition system based on Minutiae based matching. The approach mainly involves extraction of minutiae points from the sample fingerprint images and then performing fingerprint matching based on the number of minutiae pairings among two fingerprints.

Integrated Automated Fingerprint Identification System

This system is maintained by the FBI in the US since 1999. In this system also they have used fingerprint matching using minutiae-based approach.

A correlation-based fingerprint verification system

This system directly uses the richer gray-scale information of the fingerprints. The correlation-based fingerprint verification system first selects appropriate templates in the primary fingerprint, uses template matching to locate them in the secondary print, and compares the template positions of both fingerprints. Unlike minutiae-based systems, the correlation-based fingerprint verification system is capable of dealing with bad-quality images from which no minutiae can be extracted reliably and with fingerprints that suffer from non-uniform shape distortions. Experiments have shown that the performance of this system at the moment is comparable to the performance of many other fingerprint verification systems.

3.2 Research problems

- The entertaining complaints of the general public service are not automated in Department of Prisons.
- No automated criminal tracking and detection system implemented though everything is done manually.
- No way of tracking and notify escape attempts of prisoners.

4. Theoretical framework

4.1 State of Art

4.1.1 The Department of Police

In present, divisions belong to the Sri Lanka police, the service of entertaining complaints of the general public is being done manually. The noting of the plain, evidence and statements are done using the police book (GCR) from the past which is very inefficient for the today Sri Lanka. To identify the accused uniquely they use NIC number, name and address of the accused. Until it becomes a major case and special need, the finger prints are not taken from the accused. No computing facility is provided for police stations to trigger this service. Every case is identified by a unique case number in GCR. To track the crimes by mobile technology, they contact the relevant service provider manually and get the contacting details. The prediction is done by their own experience.

Various techniques have been developed to do the criminal tracking and most of the systems that use similar algorithms are able to provide a specific area of interest about the tracked person using the available data. In the current systems the data needed is derived from the available manual reports

4.1.2 The Department of Prisons

The current situation inside the prison too the similar. The profiles of prisoners or the any above mentioned functions are not automated in the prison. A book keeping system is being used to overcome these situations. If any prisoner escapes, they are no way to get notified any relevant officer that they are dodging out from the prison unless they found the particular prisoner is missing in the premises. There is no way to identify a prisoner uniquely other than maintaining his/her personal details. No database is used to retrieve details about the prisoners.

4.1.3 Proposed Solutions

4.1.3.1 For the Department of Police

- Automate the service entertaining complaints of the general public by using a Database with higher security.

- Proposed an algorithm for tracking calls in crimes.
- Finger Print matching system to identify any accused uniquely.

4.1.3.2 For the Department of Prison

- Automate all the current services in prison and introduce a database to maintain and retrieve details of the prisoners and their history.
- Special feature to detect prisoner escape attempts.
- Using a distributed email service to notify the public and relevant authorities about the escaped prisoners.

5. Research Design

For the both systems which are developed for Police and Prison, the database will be designed in Object relational manner. Both will be stand alone desktop applications.

5.1 Prisoner Escape Attempts

- Enable the system when user wants to use it.
- Detect a movement
- Send an alarm notification to the relevant officer's mobile

Device free sensor will be used to detect motions. Relevant user can enable it in any time. Whenever it is enabled, if a prisoner tries to escape, an alarm notification will be sent to the relevant officer.

Ideally, an appropriate motion detection system should be able to provide high detection accuracy, low latency, while can be spread scalable. To this end, the concept of device-free motion detection is proposed and developed with growing interest. The popularity of WLAN has opened up a chance for research community to develop device-free motion detection systems with well established WLAN infrastructure. In these WLAN based Device free motion detection systems, researchers utilize the existing access points (Aps) to capture and process RSS when received a packet. They explore the motion-dependent characteristic of RSS for indicating the motion behavior. This is due to the fact that RSS will become anomalous when the environment changes. [7]

5.2 Finger Print Matching

Human fingerprints are rich in details called minutiae, which can be used as an identification mark for fingerprint verification because the number of locations of the minutiae varies from finger to finger in a particular person and from person to person in a particular finger. The precise locations of the minutiae are also recorded, in the form of numerical coordinates, for each finger. The result is a function that can be entered and stored in a computer database. A computer can rapidly compare this function with that of anyone else in the world whose finger image has been scanned [5].

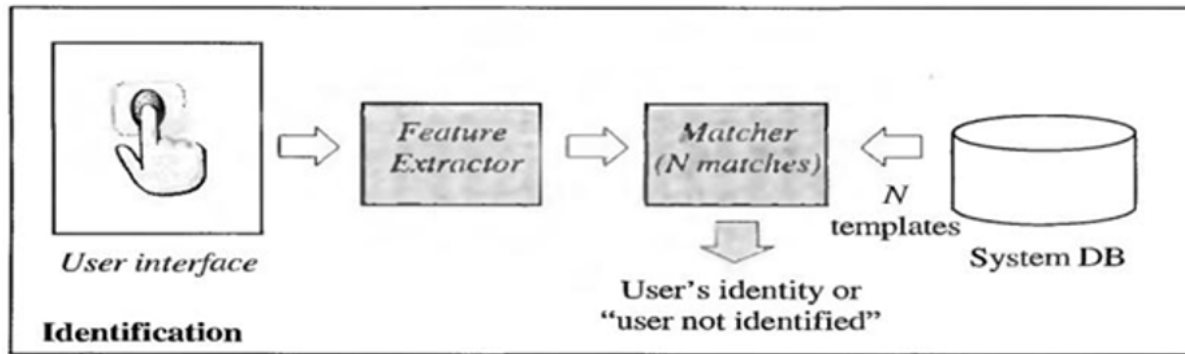


Figure 5.1: process of identifying a fingerprint

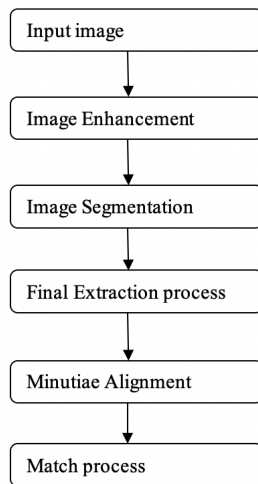


Figure 5.2: process of matching fingerprint

The following process can be used to achieve the above objective.

- Histogram Equalization
- Fast Fourier Transformation
- Image Binarization
- Ridge flow Estimation
- Extract Region of Interest
- Ridge Thinning
- Minutiae marking
- Remove False minutiae

- Find Reference Minutiae Pair
- Transform minutiae sets

5.3 Distributed Email System

- Create a distributed mail server.
- Configure it.
- Retrieve the images of the prisoners who have already escaped from the prison premises.
- Create a detailed mail using the images and the relevant information with predictive areas.
- Send that to the relevant authorities and to the general public. [8,9]

5.4 Criminal Location Tracking

When a convict escapes first her details are acquired including the telephone numbers used by her and her known associates and these details should be pre-acquired while she is in the remand. Then through a service provider get all the details of the relevant phone numbers and their most frequently contacted phone numbers with their details. After getting the phone numbers a network is created connecting those numbers together.

When the network is created relevant data from the connected phone numbers are derived such as the most frequently dialed contacts and the locations of the caller and reception at the moment of contact. In the next step the phone numbers are replaced by the information derived from the phone numbers. Then after that using a tracking algorithm the most probable locations where the prisoner can be are identified. The main purpose of the algorithm is to predict the most accurate area where the particular convict would be in the present.[?]

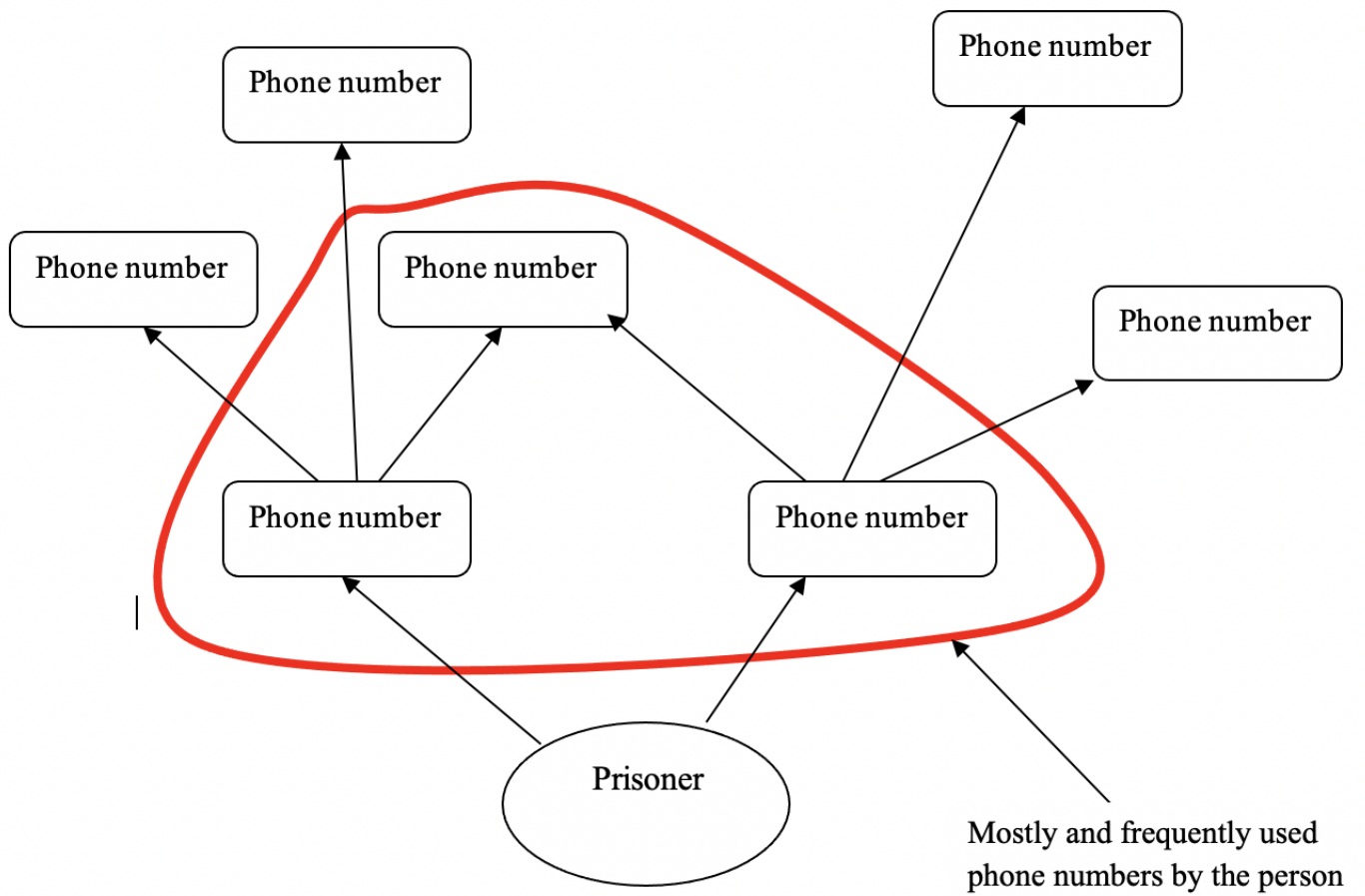


Figure 5.3: How the predictions are done through the phone numbers network

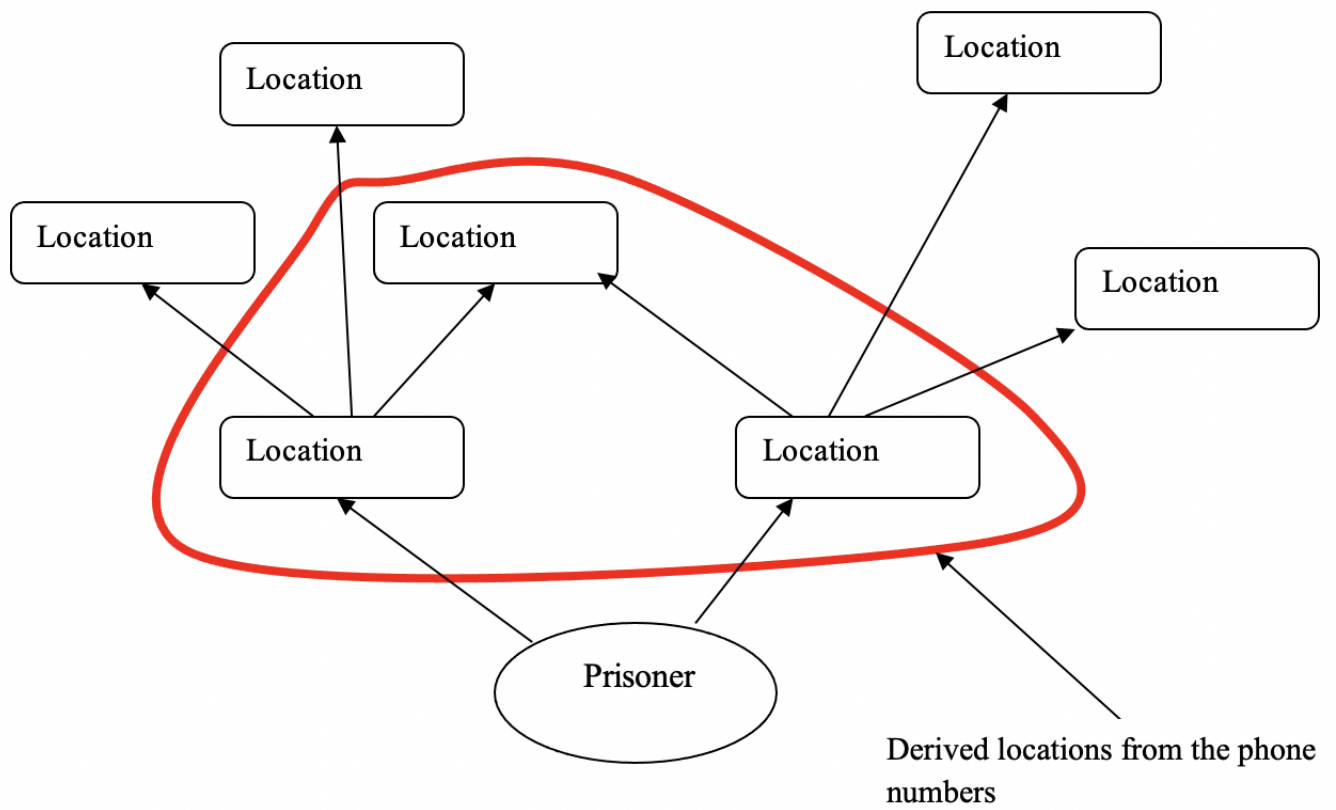



Figure 5.4: How the predictions are done through the locations

6. Resource requirement



Resource	Description
I7 Computer to develop the system	To develop the web application and testing
Web Application Server	To host in develop system in a cloud environment
Fingerprint Scanner	To do the fingerprint detection




Figure 6.1: Resource requirements

7. Research Plan

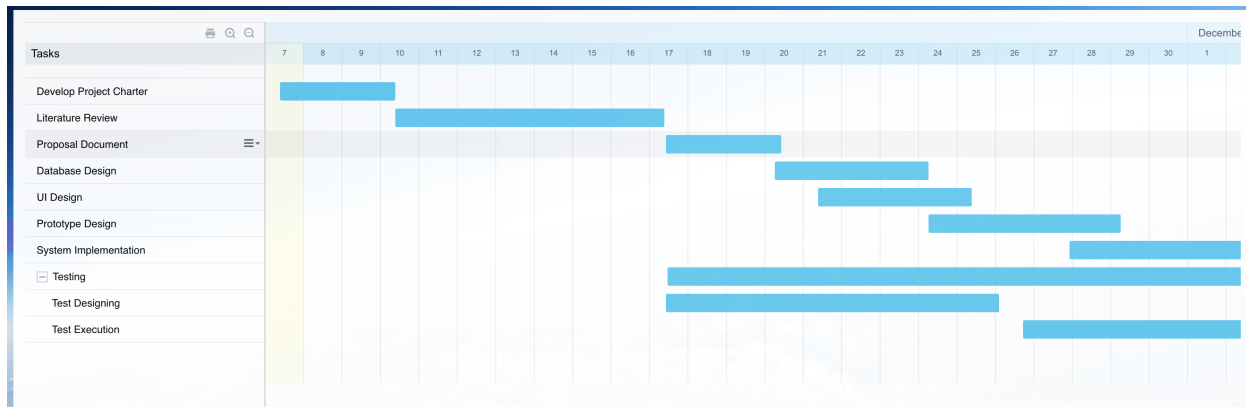


Figure 7.1: Gantt chart

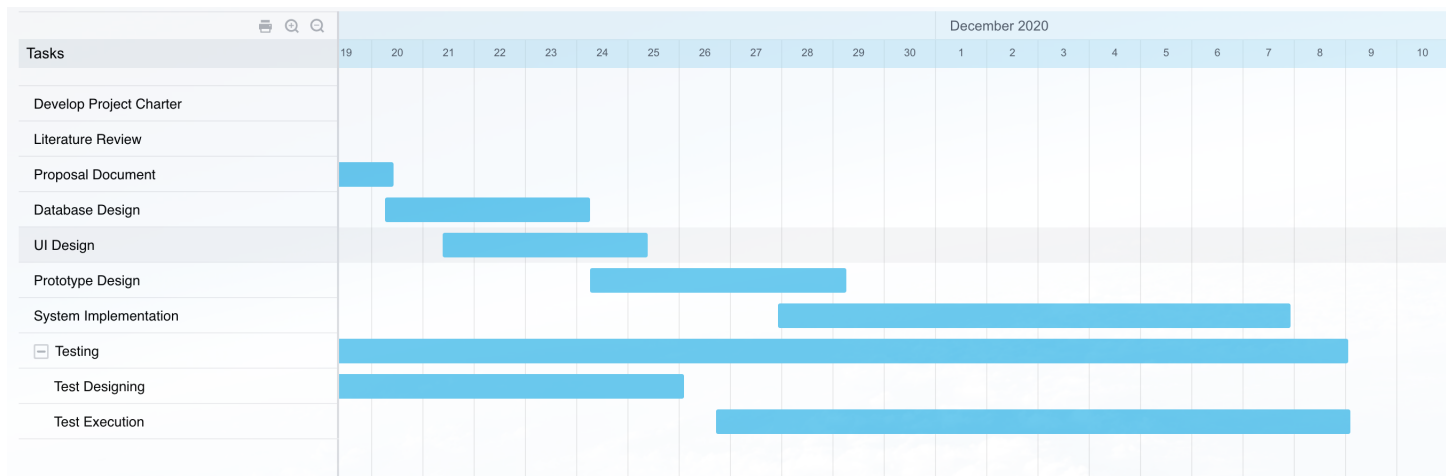


Figure 7.2: Gantt chart

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