



## APPLICATIONS OF IOT IN E-TOILET MANAGEMENT SYSTEM

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**Abstract :** Electronic Toilets (e-toilets), is one of the major innovations in the public health, hygiene and sanitation sector currently in India. It involves a full cycle approach in sustainable sanitation by integrating convergence of electronic and mechanical techniques with multiple revenue options. The insertion of a coin activates the facilities of e-toilets which are not only automatic, but also voice controlled. This is really helpful in providing the citizen with clean sanitation and imbibes good hygiene practices. We propose to develop a cloud-based solution to provide remote monitoring and maintenance capabilities to e-toilets. This will reduce the manpower required and will also improve the time required for maintenance. There are multiple sensors in the installments; the data collected from which, will be cached and processed in the cloud itself to reduce latency and increase efficiency. The data will be available locally for a particular time period. The processing will generate alerts as per the data values and notify the authorities.

**Index Terms** - Remote-monitoring, e-toilet, sensors, alerts, data processing, maintenance

### I INTRODUCTION

According to BORGEM magazine, sanitation is described by UNICEF as a comprehensive term referring to “interventions that reduce human exposure to diseases by providing a clean environment”. It is estimated that 1.4 million children die each year due to diseases caused by unsafe drinking water and poor sanitation. India is the second most populous country with more than 1 billion citizens, of which, a staggering 344 million, practice open defecation. As per an estimate put forth by the world bank, almost 20% of the communicable diseases in India are linked to unhygienic sanitation practices and unclean water.

Various government programs at different levels have brought rapid improvements in sanitation and the drinking water supply. One such effort is the introduction of e-toilets under the “Swachh Bharat Abhiyaan”. It is a relatively new, but massively revolutionary concept in the field of sanitation. E-Toilet is hailed as the next generation solution to solving India’s problem of clean sanitation. E-Toilets aim to solve the problem by automating the process of sanitation, thereby eliminating the human component to an extent. E-toilets implement, what is called a full-cycle approach. They integrate mechanical as well as electronic systems to control the various in-built functions and systems. They not only include multiple revenue options, but also can be programmed to automatically clean the floor after a designated number of usages.

These smart toilets have been deployed across the country and are being helpful in providing clean and hygienic sanitation. However, these installments lack—what is a dire need in today’s world—connectivity. These installments work independently, and store the data collected by the sensors installed, locally. As a result, data needs to be extracted manually; which also means that it might not be periodic and be subject to man-power availability. As a result, the maintenance of these installments might get delayed, discouraging the public from using them. It also increases the cost required to handle such man-power.

If the data is collected over-the-air, not only will it be possible to generate maintenance alerts whenever necessary, but also to reduce the man-power required, and in-turn, the cost. Hence storing all the data centrally on a cloud, from where it will be available anytime and at any location, we aim to overcome the basic shortcomings of the existing model.

The main aim of this paper is to share a detailed architecture of the cloud-based solution which will provide remote monitoring of the data and generate alerts to ease the overall maintenance efforts with bare minimum man-power.

### II BACKGROUND

The field of e-toilet management is comparatively new. Previous works by ERAM Scientific suggest automatic seat covers which bend the seat covers as and when required. It also suggested incorporating automatic sterilization seat covers which was capable of making the seat cover germs free with the help of sterilization technology. It provided no study about communication of admin and the installations. The second study on e-toilets by R. Sujeetha, Abhinav D, Rithik R and Abishek S talks about how data will be collected from the installation and

how it will be stored in a database. The main focus of this study lies in the functioning of micro controllers and sensors. Other studies also suggest methods to collect data from sensors but none of them talk about management of the data and how the system is supposed to work without man-power.

### III PROPOSED METHODOLOGY

Cloud computing is the on-demand availability of computer resources, mainly storage and computational power, without direct continuous management by the end user and a great example of cloud computing is SaaS(Software as a Service).

SaaS means that our local office software and data is not resident on our PC but is available over the cloud which can be accessed by a web browser. Thus we are using the concept of remote monitoring which works on the above principle to develop our solution.

The sensors installed on the e-toilet will measure and record various parameters periodically, which will be our basic requirement provided by the company dealing with the installments and its hardware.

The data will be collected locally. Further data will be cleaned and processed for further use. Now we will apply our customized algorithms on this data to generate alerts for some actions whose response needs to be monitored by the central admin. All this data will be provided centrally on the cloud to the super admin and sub-admins respectively.

The cloud will host not only DBMS, but also the alerts which will be generated. This is the way admins will be alerted via cloud. In case of broken data or missing data, the admin will be contacted to that the process flow continues smoothly.

Once the alert is taken care of, the admin will inform our system about the change/action and the system will change/reset accordingly.

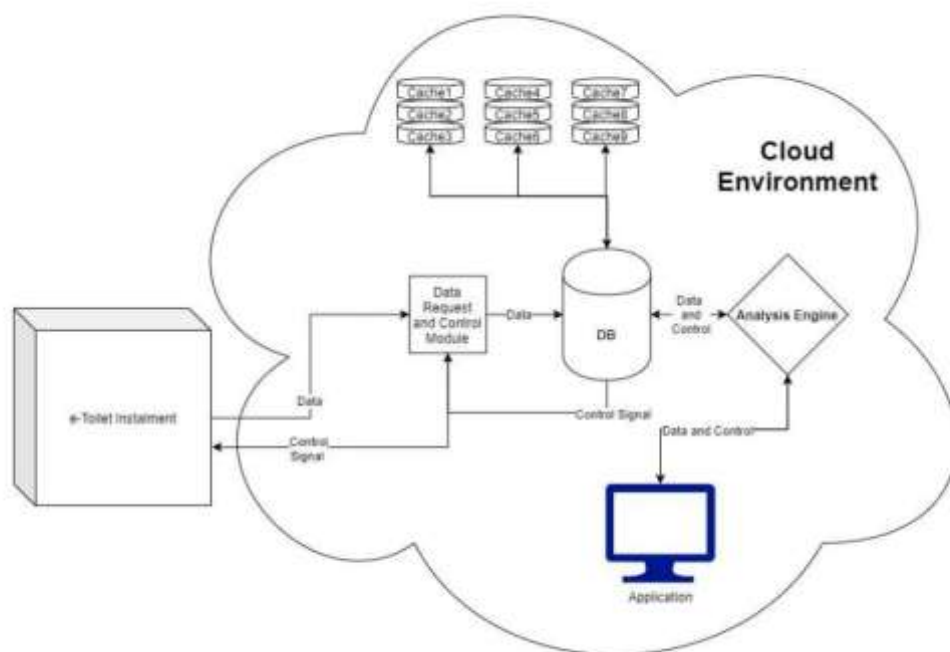


Figure 1: Architecture Diagram of the Proposed Methodology

### IV. CONCLUSION

We have identified the current deficiencies in the e-toilet installments and have proposed a well charted system to work on them. We also have used cloud technologies for the solution to be ubiquitous and have proposed a cross platform app. The suggested system not only aims at providing the users with a better overall experience of using the e-toilet system, but also helps reduce the pressure on civic authorities by automating several of the tasks.

### REFERENCES

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