This research serves the solution for the problem of interoperability between different devices, on the fly device can be made in a matter of seconds [16]. For instance, this necessity is completed progressively with goals such that decision choices as information in movement and diagnostic handling is required to be considered for real-time analytics purposes where information is considered [15]. Streaming such real-time data to cloud servers and processing can make breakdown calls when suitable, gathering information about the end illuminate the astute route frameworks to recourse the way to tell the other automobiles behind if there is a mischance, and this will in when there is a congested driving condition, the first automobile might have better traffic perceivability for its service and subsequently to enhance traffic safety and give short-range inter-communicative devices to give vehicle-to-vehicle communication industry to furnish vehicles with dedicated internet based solution of such problems lies in the internet of things (IoT) empowered and avoiding mishaps [11]. The developing pattern for figuring out the as far as possible in giving ongoing traffic updates to ease traffic clogs and avoiding mishaps [11]. The developing pattern for figuring out the solution of such problems lies in the internet of things (IoT) empowered automotive industry to furnish vehicles with devoted internet based short-range inter-communicative devices to give vehicle-to-vehicle correspondences and subsequently to enhance traffic safety and give better traffic perceivability for its administration [12-14]. Case in point, when there is a congested driving condition, the first automobile might tell the other automobiles behind if there is a mischance, and this will in the end illuminate the astute route frameworks to recourse the way to another less swarmed street. These IoT-enabled automobiles or busses can make breakdown calls when suitable, gathering information about the encompassing infrastructures, for example, traffic lights and building structures, and about itself (for example, the broken parts in the vehicle and kind of load/stock/cargo it is hauling) in the occasion of a crisis [15]. Streaming such real-time data to cloud servers and processing it for real-time analytics purposes where information is considered as information in movement and diagnostic handling is required to be completed progressively with goals such that decision choices can be made in a matter of seconds [16]. For instance, this necessity is normal in the transportation sector where intercommunication between vehicles regarding the onward speeding vehicle shall be intimidated or in situations concerned with ongoing traffic data enable drivers to enhance their courses and voyaging times. Vehicles gradually get to be "smart things" which can respond to the situations, taking into account ongoing circumstances in traffic, enhances transport utilization, automated monitoring of carbon emissions, drop in rate of traffic accidents, oversee traffic load and add to a more secure traffic system. In this study, we present the cognitive architecture for IoT-based intelligent transportation system by avail solution for interoperability between devices for M2M communication and availing cloud services on streaming data.

INTRODUCTION

The provision of an efficient intelligent transport systems (ITS) communications infrastructure requires the deployment of multiple devices across the urban area at fixed locations such as bus stations, intersections, or along the roads, but also within the transportation vehicles such as buses, taxis, bikes, or even users’ vehicles [1-4]. From a transportation service provider’s perspective, such dense network is used for different ITS applications such as providing transport information (bus schedule, bikes’ availability, incidents, etc.). The same infrastructure augmented with the appropriate sensors can be used by a governmental organization for applications such as (1) congestion map computation/forecast [5,6], (2) vehicles classifications for statistics purposes [7], or (3) monitoring (air pollution, road quality, etc.) [8-10]. In today’s transportation sector, the traffic conditions are monitored by cameras and motion sensors set along significant road intersections and thruways. On the other hand, with growing street activity and confined spaces for road expansion, these detecting innovations are coming as far as possible in giving ongoing traffic updates to ease traffic clogs and avoiding mishaps [11]. The developing pattern for figuring out the solution of such problems lies in the internet of things (IoT) empowered automotive industry to furnish vehicles with devoted internet based short-range inter-communicative devices to give vehicle-to-vehicle correspondences and subsequently to enhance traffic safety and give better traffic perceivability for its administration [12-14]. Case in point, when there is a congested driving condition, the first automobile might tell the other automobiles behind if there is a mischance, and this will in the end illuminate the astute route frameworks to recourse the way to another less swarmed street. These IoT-enabled automobiles or busses can make breakdown calls when suitable, gathering information about the encompassing infrastructures, for example, traffic lights and building structures, and about itself (for example, the broken parts in the vehicle and kind of load/stock/cargo it is hauling) in the occasion of a crisis [15]. Streaming such real-time data to cloud servers and processing it for real-time analytics purposes where information is considered as information in movement and diagnostic handling is required to be completed progressively with goals such that decision choices can be made in a matter of seconds [16]. For instance, this necessity is

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INTRODUCTION

The objective of this study is to develop the design of a generic infrastructure for on demand applications for intelligent transport systems in an urban area.

Methods: The main idea of the study is to allow seamless service composition and consumption but also to allow rapid deployment of new services through the pooling of different devices and access networks that may be owned and operated by different actors such as telecom operators, transportation service operators, and governmental organizations.

Results and Discussion: This research serves the solution for the problem of interoperability between different devices, on the fly device reconfiguration and service discovery.

Keywords: Internet of things, M2M communication, Intelligence Transportation system.
number of devices be $v_e$. Similarly, the average packet arrival density per device $S$ is divided into two classes: Initial $i_s$ and operational denoted as $u_s$. By considering the criss-cross interaction availability of devices and packet arrival density, the equations that describe the spread of the signals can be written as:

\[
\begin{align*}
\frac{di}{dt} &= \mu_i + A - k_{1i} \epsilon - c(S)i \epsilon u_i \delta v_e \\
\frac{du}{dt} &= c(S)i \epsilon u_i - \gamma u_s - k_{1u} u_e \\
\frac{dv}{dt} &= k_{1u} (u_e - k_{1v} v_e - \delta v_e) \\
\frac{de}{dt} &= \mu_e + A - k_{1e} e \\
\frac{di}{dt} &= \mu_s - k_{1s} \epsilon - \beta \epsilon u_e - \beta d \delta v_e \\
\frac{du}{dt} &= -k_{1s} \epsilon u_s + \beta \epsilon u_e + \beta d \delta v_e \\
\frac{dv}{dt} &= k_{1s} \epsilon u_s + \beta \epsilon u_e + \beta d \delta v_e \\
\frac{de}{dt} &= \mu_s - k_{1e} e \\
\frac{dS}{dt} &= -k_{1s} \epsilon u_s + \beta \epsilon u_e + \beta d \delta v_e \\
\end{align*}
\]

Where, $e = i_e + u_e$ and $S = i_s + u_s$.

In the system (1.1), $\mu_i$ is priority index, $A$ is the maximum delay threshold and $k_{1e}$ is forward reaction rate constant. $c$ is the total concentration of the enzyme-substrate complex. $\gamma$ is the recovery rate and $\delta$ is the parameter denotes the flow rate such that the $v_e$ will join the $u_e$ class. $\mu_e$ is probability that the preceding delay threshold is violated and $k_{1e}$ is its reverse flow rate of signals. $\beta$ and $\beta_d$ are the interaction rates of operational number of devices with the initial and recovered classes of the M2M devices, respectively ($\beta > \beta_d$).

The model gives following two cases to be analyzed:

a. The waiting time for a queued packet of the operating M2M devices with the infective M2M devices is a constant [19], and

b. It depends on the initial values of operational M2M units [20]. For positive constants $a_0$ and $a_1$, thus $c$ takes the form

\[ c = a_0 + a_1 S. \]

Case b is impractical at high numerical values such as ours. Therefore, we shall exempt rest of the calculation for this case.

Case A: When $c = c_f$; $c_f$ is a constant.

Since $i_s u_e + v_e = e$ and $i_s u_s = S$, the system (1) can be reduced to the form:

\[
\begin{align*}
\frac{du}{dt} &= c_0 (e \cdot u_e \cdot v_e) u_e (1 + k_{1e}) u_e \\
\frac{dv}{dt} &= \gamma (u_e \cdot (k_{1e} + \delta) v_e \\
\frac{de}{dt} &= \mu_e + A - k_{1e} e \\
\frac{du}{dt} &= -k_{1s} \epsilon u_s + \beta_i (S \cdot u_s) u_e + \beta_d (S \cdot u_s) v_e \\
\frac{dS}{dt} &= -k_{1s} \epsilon u_s \\
\end{align*}
\]

The region of attraction of the above system is:

\[ T_1 = \left\{ (u_e, v_e, e, u_s, S) \vert 0 \leq u_e + v_e \leq N_1 \leq N_0 \leq S \leq S \right\} \]

Where, $\overline{e} = \lim_{t \to \infty} \sup e$ and $\overline{S} = \lim_{t \to \infty} \sup S$. 

There exist the following three equilibria corresponding to the system (2), namely:

\[
\begin{align*}
E_0 &= \left( 0, 0, \frac{\mu_e + A}{k_{1e}}, 0, 0 \right) \\
E_1 &= \left( 0, 0, \frac{\mu_e + A}{k_{1s}}, 0, \frac{\mu_s}{k_{1s}} \right) \quad \text{and} \\
E_2 &= \left( \overline{u_e}, \overline{v_e}, \overline{e}, \overline{u_s}, \overline{S} \right). \\
\end{align*}
\]

Where, $\overline{u_e} = \frac{c_0 \gamma S (k_{1s} + \delta)}{\beta_i + \beta_d \gamma} \frac{1}{k_{1s} + \delta}$ and $\overline{S} = \frac{N_1}{1 + \gamma (k_{1s} + \delta)}$.
The equilibrium $E_0$ exists if

$$R_o = \frac{\beta \gamma}{k_1(\gamma + k_1)} < 1$$

(4)

We state the local stability of the three equilibria $E_0$, $E_1$, $E_2$ in the following theorem.

The equilibrium $E_0$ is stable. The equilibrium $E_1$ is stable if $R_1 < 1$, otherwise if $R_1 > 1$, it is unstable and the equilibrium $E_2$ exists and is stable if $q_1, q_2, q_3 > 0$.

The general variational matrix $M$ corresponding to the system (2) is

$$M = \begin{pmatrix} -\gamma & -c_0 & -c_0(\tau - u - v) & 0 \\ \gamma & -(k_1 + \delta) & 0 & 0 \\ 0 & 0 & -k_1 & 0 \\ \beta_2 & \beta_3 S & 0 & -(\beta_2 u e + \beta_3 v e + k_1) & (\beta_2 u e + \beta_3 v e) \\ \beta_2 & \beta_3 & 0 & 0 & 0 & -k_1 \\ 0 & 0 & 0 & 0 & -k_1 \\ \end{pmatrix}$$

At the equilibrium point $E_0(0,0, \frac{\mu_e + A}{k_1}, 0,0,0)$, the variational matrix $M_o$ is given by

$$M_o = \begin{pmatrix} -\gamma (k_1 + 1) & 0 & 0 & 0 \\ \gamma & -(k_1 + \delta) & 0 & 0 \\ 0 & 0 & -k_1 & 0 \\ 0 & 0 & 0 & -k_1 \\ \end{pmatrix}$$

The characteristic polynomial corresponding to the above matrix is

$$(k_1 + \lambda)(k_1 + \lambda)^2(k_1 + \lambda)^2(\lambda + \gamma + \lambda) = 0$$

which gives all the negative roots of $\lambda$.

Thus, the equilibrium $E_0$ is stable.

At the equilibrium point $E_2(0,0, \frac{\mu_e + A}{k_1}, 0,0,0,0)$, the variational matrix $M_2$ is given by

$$M_2 = \begin{pmatrix} -\gamma (k_1 + 1) & 0 & 0 & 0 \\ \gamma & -(k_1 + \delta) & 0 & 0 \\ 0 & 0 & -k_1 & 0 \\ 0 & 0 & 0 & -k_1 \\ \end{pmatrix}$$

The characteristic polynomial corresponding to the above matrix is given by

$$(k_1 + \lambda)(k_1 + \lambda)^2(\lambda + p_1, \lambda^2 + p_2, p_3) = 0$$

(5)

Where,

$$p_1 = 2k_1 + k_1 + \delta + \lambda$$

$$p_2 = -c_0 \beta_2 \gamma S - c_0 \beta_2 e S (k_1 + \gamma) + k_1 (\gamma + k_1)$$

We find that the Eigenvalues of (1.5) are $-k_1$, $-k_1$, and the roots of the polynomial $\lambda^2 + p_1, \lambda^2 + p_2, p_3$.

The above polynomial has roots with negative real part if $p_1, p_2, p_3 > 0$.

Hence,

$$p_1 p_2 - p_3 = (\gamma + k_1)^2(k_1 + \delta)(k_1 + \gamma + k_1) + c_0 \beta_2 \gamma (\mu_e + A)$$

$$k_1 + \lambda > 0.$$
Table 1: Ted bed parameters

| Parameter                          | Value                   |
|------------------------------------|-------------------------|
| Ovenill LTE+M2M bandwidth          | 22 MHz                  |
| M2M bandwidth                      | 3 MHz                   |
| LTE frame duration                 | 1.3 ms                  |
| Number of M2M devices              | 100, 500, 900, 1500     |
| Average packet arrival rate        | 0.02/0.04 packets/TTI   |
| Scheduling period                  | 27-43/12-24 TTI s       |
| Network realizations               | 100                     |
| Realization length                 | 1000 s                  |
| Number of M2M classes              | 6 (HP/LP)               |
| Average HP-class packet arrival rate| 0.04/0.01 packets/TTI  |
| HP-class scheduling period         | 35/55 TTI s             |
| Average LP-class packet arrival rate| 0.06-0.075/0.026-0.037  |
| LP-class scheduling period         | 17/25 TTI s             |
| Network realizations               | 15                      |
| Realization length                 | 500 s                   |

HP: High priority, LP: Low priority, LTE: Long-term evolution, M2M: Machine to machine, TTI: Transmission time interval

Such a broad configuration space clearly makes IoT application advancement an entangled procedure. One methodology might be to make the configuration for the most probative point in the outline space, e.g. least thing capabilities, high mobility and so on. Be that as it may, regularly there it might be attractive to misuse the attributes of the different focuses in the configuration space. This infers that no single equipment and programming stage will be adequate to block the entire outlined configuration. Unpredictable and heterogeneous systems will be a characteristic prerequisite. Thus, ZigBee-based wireless networks are the best choice for modeling a communication architecture. Here, each ZigBee devices sends the sequence of streaming information in the form of two local posteriors which is given by: \( P_1 = \{X_1^1 Z_1^1 \} \) and \( P_2 = \{X_1^2 Z_2^2 \} \) which are represented in the form of random finite sets with multi object densities of \( Z_1^1 \) observed sites. For illustration, here ZigBee devices 1 transmits its posterior to consecutive nodes where its posteriors are fused with local posterior of form a joint sequence network for sensor fusion. Here, the synchronization between such posterior is maintained as:

\[
P_1(X_1^1 Z_1^1 Z_2^2) = P_0(X_1^1 Z_1^1 + Z_2^2)
\]

Now, to overcome the problem of unknown correlation between no two distributions of independent variables the solution to the fusion problem is:

\[
P_\alpha(X_1^1 Z_1^1 Z_2^2) = \frac{P_\alpha(X_1^1 Z_1^1 + Z_2^2)}{P_1(X_1^1 Z_1^1 + Z_2^2)}
\]

Hence, the generalized posterior for the scalable drone service can be represented in the form of geometric mean:

\[
P_\alpha(X_1^1 Z_1^1 Z_2^2) = \frac{\int_{P_0} P_\alpha(X_1^1 Z_1^1 Z_2^2 + Z_2^2) d\theta}{\int_{P_0} P_\alpha(X_1^1 Z_1^1 + Z_2^2) d\theta}
\]

Where, \( \alpha_1, \alpha_2 (\alpha_1 + \alpha_2 = 1) \) the parameters determining the relative fusion weight of each nodes.

Cloud-based service layer for cloud two cloud interaction

The composition and deployment of these new services will be possible through the use of cloud to cloud technologies. The cloud approach will ease the reuse of data provided by different devices. A simple view of the infrastructure is given to existing but also new service provider.
ITS station. Both M2M and ITS architectures may lead to understanding architecture defines the following functional components as part of an unit or several units. As in the M2M architecture, the standard ITS subsystems. Each of these ITS subsystems contain an ITS station. The domain. The basic unit of an ITSC is the station and 4 functional a clear distinction is made between the ITS domain and the generic domain. The notions of conflict probability of cloud-to-cloud system: $S_{\text{int}} = \sum_{(i,j) \in E} a_{ij}(v_i - v_j)$

Where the conflict matrix is represented by $S$, whose size is $n \times n$, is the vector of control vertices of the streaming data and its division point. The control vertices can be precisely illustrated for the $i^{th}$ row and $j^{th}$ column streaming element of $S$, $a_{ij}$ as:

$$A_{ij} = \begin{cases} \int_{TD}(V_{\varphi_i}, V_{\varphi_j})dTD, & i=\text{or} (j) \in E \\ 0, & \text{otherwise} \end{cases}$$

Using finite differences in time, the multicast distribution of streaming data of the model can be iteratively represented as:

$$\frac{V(t) - V(t-1)}{\Delta t} = A(V(t-1), V(t-1))\Delta t$$

Where $V(t)$ is the vector of the model's vertices at the $t^{th}$ position, and $\Delta t$ is the time step size. Upon combining the effects of both external and internal cloud negotiation bid profiles, we get the final combined effects of conflict probability of cloud-to-cloud system:

$$\frac{V(t) - V(t-1)}{\Delta t} = A(V(t-1), V(t-1))\Delta t$$

The above model will support an extensive variety of uses and address common necessities from an extensive variety of industry sectors and in addition the requirements of nature, society, and individual natives. Through accord forms including different partners, it will be conceivable to create standardized semantic information models and ontologies, common interfaces and protocols, at first characterized at a dynamic level, then with case bindings to particular cross-platform, cross-language technologies, for example, XML, ASN.1, web services and so forth. Instead of utilization of semantic ontologies, we used mathematically modeled machine-coherent codification which ought to overcome ambiguities because of human error or conflicts and confusion because of various programming languages and in addition assisting with cross-referencing to extra information accessible through different systems. Standards are required for bidirectional communication and information trade among things, their surroundings, their advanced partners in the cloud-to cloud-communication, stream distribution and substances that have an enthusiasm for monitoring, controlling or assisting the IoT.

RESULTS AND DISCUSSION

Platform interoperability is currently based on non-standardized solutions which make it difficult to propose new services involving different business domains. To overcome this issue, we formulated the model for M2M and cloud to cloud communication which is defined on horizontal end-to-end M2M services platform. This platform is based on existing and well-established communication standards and norms. It has been designed to support multiple services independently from the underlying networks or the considered business domain. This M2M high-level system architecture embraces the principle of services exposed to applications. These services can be located in a network, a device, or a gateway. A notable aspect of this view is the provision of an end-to-end representation of the M2M + cloud-to-cloud system, where other elements of this architecture such as the distributed management of the streaming data and are integrated under the same study.

The proposed work enabled ITS. This architecture defines mandatory and optional elements and interfaces of an ITSC. In this architecture, a clear distinction is made between the ITS domain and the generic domain. The basic unit of an ITSC is the station and 4 functional subsystems. Each of these ITS subsystems contain an ITS station. The functionality of an ITS station may be implemented in a single physical unit or several units. As in the M2M architecture, the standard ITS architecture defines the following functional components as part of an ITS station. Both M2M and ITS architectures may lead to understanding that each architecture is dedicated to specific scenarios. However, for the delivery of new and rich applications, interoperability between different platforms is needed. Such interoperability presented in this work will pave the way to a whole new business model with new actors' roles such as communications provider, sensors provider, and data mules providers but also application providers. The innovation of this project consists on augmenting ETSI standardization works in the fields of M2M and ITS and proposing new functionalities.

CONCLUSION

The significance of conjuring M2M and intercloud communication is two-fold. First, it enables intelligent interactions between cloud-to-consumer for several IoT applications such as intelligent transportation system and the other is to model the economics of cloud services. Being this work first to model the coalition between multiple devices and multiple cloud based on the stream distribution with approximation to achieve perfect equilibrium has high payoff. This game-theoretic approach for modeling such a vast system will lay the foundation of IoT economics.

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