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An Intelligent Technique for Improving DataAccess Based on Merging Some of Protocols package using P2PDelayedNetworks

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Abstract —This paper presents a new approach for analyzing and exploring the performance of a time dynamical model with delays transmission among peer to peer's transactions based on an intelligent learning technique in the presence of time delays factors. These factors presented in a P2P networked system may degrade significantly its performance which may lead to improper operating conditions. To deal with this issue, an analytical alternative and exact alternative model is introduced and used to develop a new technique to overcome the drawbacks due to the presence of these delays elements that exit in the transmission transactions. This introduces an Enhanced Randomized Broadcast Algorithm (ERBA) which canbe easily implemented on overlay networks without extra cost. Including the dynamical delay factor in the process is shown to strengthen our work based on a new novel approach in P2P network with dynamical delayed time transmission elements. A new development of a platform that would be suitable for P2P network is implemented. The qualitative performance analysis is easily studied using some dynamical models for a new inelegant routing algorithm.A new package is achieved based on NS-2. It is shown that using this package is helped in obtaining the best secured reputation shortest path including the effect of transmission delays. The performance of transactions among P2P nodes based on the proposed algorithms is introduced using both theoretical analysis and simulation.

Index Terms —Merging protocols, P2P delayed network, time delays factors, NS-2 simulation package.

1 Introduction

THIS paper discusses an intelligent technique for improving data access based on merging some of protocols package using p2p delayed networks. Since a few years and due to a lack of standards and toolkits, early peer-to-peer(P2P) applications like KaZaA, Napster, and SETI have come into attention in the literature and demonstrated the true power of the Internet where millions of information stores in common PCs and sitting idle on desks around the world[1-12]. It is well known that, the P2P technology has the ability to establish virtual overlay networks where there is no central authority or infrastructure that could coordinate the behaviors of the peers. We note that, a peer can act both as a server and a client since it can provide services to other peers as well as request services from other peers. The functionality of P2P networks is structured in two phases. In the first phase, a host is allowed to find other P2P connected host is enabled to search for files by broadcasting hosts and connect to the network, while in the second phase, this queries and test them for reputation based on some security rules to allowthem to be downloaded. Any peer can arbitrarily join or leave the network at any time and each peer itself is responsible for making local autonomous decisions based on information received from other peers in the network [12-20]. The P2P technologies exploit the CPUs and storage devices of these PCs to produce and exchange huge data stores, communications systems, and processing engines. Therefore, an open P2P network is highly dynamic and autonomous. The protocols that are used with this overlay network designed for resource sharing across the global Internet.

Recently, [8], introduced P2P network in his work as being treated as a network that is used to present a new service and function that are built completely at the application layer where its nodes interact via client programs running on their local machines irrespective of the underlying physical network. The resource searching, connectivity, routing, and other real applications are handled in a complete distributed way where every node nominally equal to every other recent client. The P2P is not more than just the universal file-sharing model (such as Napster…etc), but it is also has a complete self organizing which requires no need for central instances to manage the network. Accordingly, the computation that occurred among P2Pworking groups, business applications fall into a number of scenarios and more details can be found in [4]. It should also be noted that, since peers are heterogeneous in their natural construction specially in both network and system capacity, then all other peers can be subsided with all their needs through thetransactions

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that take place among themselves.

2 Literature Review

The researches on dynamical behavior of the effects of social interaction and imitation processes has received a lot of attention in the literature [3],[4]. W. Yang, et al in [3] presented a dynamical trust construction schema based on Fuzzy decision and extended automated trust negotiation (EATN) where they adopt Fuzzy trust graph to describe the trust information in the P2P systems and showed that trust relationship among peers can be constructed by the combination of the fuzzy trust graph, fuzzy path search algorithm and EATN. G. Carofiglio, et al in [11] introduced a study of P2P concepts using statistical physics and devised an approximate model that described the dynamics of large peer-to-peer networks, based on fluid-diffusive equations. They end up with a model that showed the effects related to resources distribution among peers, user behavior, resource localization algorithms and dynamic structure of the overlay topology. F.Liu, et al in [4] also showed that the dynamics governing the evolution of P2P network, starting from fundamental individual level of trust and ended up with a mode based on game theory and used to have a specific trust game to analysis the evolutionary dynamics of trust computing. All of these researches[4-11], haven't covered by any mean the effect of the transmission delays that occur during the transactions that occurred among peers. They ignored completely facing the effect of these delayed factors in the transmission processes in P2P network on its dynamic performance. Indeed, this kind of dynamics with delayed transmission which fall into general classes of evolutionary game need to be studied and explored the effect of these time- delayed factor. Studying, analyzing, and exploring the effect of these transmission delay's factor on the performance of transmission data among peer to peer's transactions based on an intelligent learning technique have also received no attention in the literature due to its complex analysis. We note that, the presence of these kind of delay's factor in the system may degrade significantly its stable performance which may lead to improper operating conditions[32]. In our analysis in this paper, we study the effect of transmission delays on the dynamical behavior of transmission data of P2P systems which are based on the concept of evolutionary dynamics such as replicator dynamics[4]. It is well known that the replicator dynamics can receive various interpretations in terms of the following items:

i-Biological selection of the fittest individuals through reproduction[4] .

ii--Psychological reinforcement by one player of the actions which were experienced as having good consequences.

iii-Sociological reinforcement by imitation of the fellow individuals whose behavior appears to be efficient.

We Notice also that, this kind of replicator dynamics cannot be considered as a stable behavior for one individual engaged in repeated interactions among the peers that take place in the delayed system. In the presence of time delays elements , many researchers have not obtained a strategic configuration for the delayed systems regarding the asymptotic stability.

3Dynamical Model of Trusted P2P Transactions with Fuzzy Reputation Aggregation with delays Transmission

It is noted that in the trust game for a given interacting periods τ and within provider-consumer game perspective, each peer can be described by his mode of behavior in the provider as well as in the Consumer role. That is, after each period τ, each peer is described by his dispositions (x, 1-x) and (y1 ,1- y1) or (y2, 1-y2). So, we consider a large number of providers and a large number of consumers. Providers and consumers meet and play by pair, frequently and randomly. The state of nature is also chosen at random again each time the game is played. At any point in time t , the population of providers is characterized by the fraction of providers who use each of the pure strategies which are available to them and so is the population of consumers. A reinforcement rule specifies how these fractions evolve[4]. A typical rule is the replicator dynamics, which for delay signal τ can be written as follow:

$$\dot{x}(t) = A\,x(t) + A1\,x(t-\tau) + B\,u(t) \qquad (1)$$

Where $x \,\varepsilon\, R^n$, n is the total number of all the fraction of i- peers, A's and B are matrices of appropriate dimensions and their parameters contained all differences between the average utility of an i- peer when meeting a randomly chosen j –peer and the averaged utility obtained by all peers [4]. To conclude some information about (1), we need to put it in the regular dynamical state form. The following theorem transforms (1) into a classical form by moving the delay element τ from the states to the system parameters.

Theorem1: For the linear time-invariant system with delay elements in the states described by (1), there always exit a linear transformation that moves the delays element from the state variables to the system parameters of the form

$$\dot{x}(t) = A\,x(t) + B\,u(t) \qquad \text{for} \quad 0 \le t \le \tau \qquad (2\text{-a})$$

and

$$T(\tau)\dot{x}(t) = \hat{A}\,x(t) + T(\tau)\,B\,u(t) \text{ for } \quad t \ge \tau \qquad (2\text{-b})$$

With initial value $x(\tau)$ for $t \ge \tau$ is obtained from (2-a) at $t = \tau$

Where (2-b) is a unique and exact alternative model in the form of generalized state space system,

$T(\tau) = I + A_1\,A(\tau)$, and

$A(\tau) = \int_0^\tau e^{-A\theta} d\theta$, $\hat{A} = A + A_1$

Proof: We prove this theorem by introducing the linear transformation introduced by Saidahmed [32], [33] of the form

$$w(\tau, s) = e^{\tau s} x(s) \qquad (3)$$

with initial value $w(0,s)$ is given by

$$w(0, s) = x(s)$$

By taking Laplace transform of (1) and applying the linear transformation given in (3), results in

$$\frac{dw(\tau,s)}{d\tau} = Aw(\tau,s) + e^{\tau s}x_0 + A_1 x(s) + e^{\tau s}Bu(s) \qquad (4)$$

Solving (4) with respect to $w(\tau, s)$, yields

$$w(\tau,s) = e^{A\tau}x(s) + \left[\int_0^\tau e^{A(\tau-\theta)}d\theta\right] A_1x(s) + \left[\int_0^\tau e^{A(\tau-\theta)}e^{\theta s}d\theta\right]Bu(s) + \left[\int_0^\tau e^{A(\tau-\theta)}e^{\theta s}d\theta\right]x_0 \quad (5)$$

It is an easy task that the most right hand term of (5) can be rewritten to have the form

$$\left[\int_0^\tau e^{A(\tau-\theta)}e^{\theta s}d\theta\right]x_0 = (sI - A)^{-1} * \left[e^{s\tau}I - e^{A\tau}\right]x_0 \quad (6)$$

Similarly, integrating the third term on the right hand side of (5) by part. We get

$$\left[\int_0^\tau e^{A(\tau-\theta)}e^{\theta s}d\theta\right]Bu(s)= (sI-A)^{-1} [e^{s\tau} I - e^{A\tau}] Bu(s) \quad (7)$$

Substituting (7) into (6) and, converting the result into the time domain, we obtain

$$x(t) = \left[e^{A\tau} + \int_0^\tau e^{A(\tau-\theta)}A_1 d\theta\right] * x(t-\tau)u_s(t-\tau) + e^{At}x_0 \quad [u_s(t) - u_s(t-\tau)] + \int_0^t e^{A(t-\theta)}Bu(\theta) * \quad [u_s(t) - ust-\tau-\theta]d\theta \quad (8)$$

where $u_s(\,.\,)$ stands for a unit step function .

It is clear from examining (8) that for $0\le t\le\tau$, we get

$$x(t) = e^{At}x_0 + \int_0^t e^{A(t-\theta)}Bu(\theta)\, d\theta,\quad 0\le t\le\tau \quad (9\text{-a})$$

Obviously, (9) is in the solution form of the linear differential steady state

$$\dot{x}(t) = A x(t) + B u(t) \quad \text{for} \quad 0\le t\le\tau \quad (9\text{-b})$$

and for $t\ge\tau$ with initial value $x(\tau)$ obtained from the solution of (9-b) at $t=\tau$, we have

$$e^{-A\tau}x(t) = (I + A(\tau)A_1)x(t-\tau), \quad (10)$$

Substituting (10) into (1) and collecting similar terms, results in

$$A(\tau)\dot{x}(t) = x(t) - x(t-\tau) + A(\tau)Bu(t), \quad t\ge\tau \quad (11)$$

Premultiplying (11) by A_1, using (1) and collecting similar terms, we end up with singular time invariant system of the form

$$T(\tau)\dot{x}(t) = \hat{A}x(t) + T(\tau)Bu(t) \quad \text{for} \quad t\ge\tau \quad (12)$$

Obviously, (12) is in the form of linear time-invariant generalized system which contains the non-delay system as special case see [33] for more information about (12). To see this, let $\tau = 0$ in (12), yields

$$\dot{x}(t) = \hat{A}x(t) + Bu(t) \quad t\ge 0 \quad (13)$$

which shows direct verification of the present approach. It should be mentioned that (12) is also called a unique alternative representation of (1) in the sense that the behavior of the system is uniquely determined by (12). On the other hand and as seen by(9-b), the dynamical behavior of the system for $0\le t\le\tau$ with $\tau > 0$ takes the expected form that can be derived directly from(1) as

$$\dot{x}(t) = Ax(t) + B u(t) \quad (14)$$

Which means, we could have been obtained (14) by inspection from (1) by knowing that $A_1x(t-\tau)u_s(t-\tau) = 0$ from $0\le t\le\tau$ This strengths theorem (1) and supports the idea that (14) describes completely the behavior of the system for $0\le t\le\tau$. This completes the proof.

It is important to note that, in most practical cases the matrix $T(\tau)$ in (12) is invertible and this reduces the difficulty which usually encountered when dealing with states-delay systems. As proved in (33) and in case of having (12) as a singular system which must be checked first for solvability, then (12) can be divided into two essential subsystems: slow and fast subsystems. The slow part contains all the dynamical information about system (1) for $t\ge\tau$ while the fast part include impulsive modes due to the existence of algebraic behavior only at $t=\tau$.

Accordingly, the slow part of our general imitation model gives rise to dynamics which fall into a standard class of models that are considered in evolutionary game theory namely regular, payoff-monotone dynamics. We note that [4] there are various properties of payoff monotone dynamics; where most results focus on the case of single population continuous time dynamics. As it is well known, the stability properties obtained for continuous-time dynamics(12) in general do not directly translate to discrete time formulations; because in discrete-time overshooting phenomena might destabilize equilibrium that are stable with respect to corresponding continuous-time dynamics [4]. To see the usefulness of the preceding approach let us examine the following the differential equation of replicator dynamics for provider as shown in Fig.1[4]. Our attention here will be focused on the effect of delayed signals on the behaviors of peer to peer dynamical interactions and the interested people in analysis of trust computing evolution in P2P networks are advised to see [3],[4]. For the sake of testing the exactness and uniqueness solution introduced by theorem (1), we introduce the following example.

Example1: Let a replicator dynamics state-delay system for either providers or consumers be described by

$$\dot{x}(t) = 1/4 \;\; x(t-\tau) + u(t), \quad x(0) = 2.0 \quad (15)$$

With transmission delay $\tau = 1$, using theorem (1) for $0\le t\le 1$, we have

$$\dot{x}(t) = u(t) \quad \text{with } x(0) = 2.0 \quad \text{for} \quad 0\le t\le 1 \quad (16)$$

Using a feedback u =kx with k= - 1 to stabilize (16), thus we get

$$\dot{x}(t) = -x(t)\,, \quad x(0) = 2.0 \quad (17)$$

Which has a solution given as

$$x(t) = 2.0e^{-t}, \quad 0\le t\le 1 \quad (18)$$

The initial value $x(\tau)$ to be used with the second part of theorem (1) for $t\ge\tau$ is obtained from (18) at $t=\tau=1$ as

$$x(1) = 0.736 \quad (19)$$

The second part of theorem (1) is obtained from (5-b) for $t\ge 1$

which is a unique and exact alternative form of (15) can also be obtained as

$T(\tau)\dot{x}(t) = \hat{A}\, x(t) + T(\tau)\, B\, u(t) \quad \text{for} \quad t \geq \tau$ (20)

By using A=0, $A(\tau=1) = A(1) = \int_0^1 e^{-A\theta} d\theta = 1$, $\hat{A} = 1/4$, u(t) = -1, $T(1) = I + A_1 A(1) = 1.25$, $\hat{A} = 1/4$, then (20) reduces to

$\dot{x}(t) = -0.8\, x(t)$ (21)

with initial value x(1) = 0.736, as obtained in (18) at t = 1, $t \geq 1$

It is clear from (21) that the unstable networked P2P systems with delayed-transmission with a controller u= k x based on the state feedback has been stabilized by the proper choice of the feedback gain k based on the same technique used with the conventional state space design approach for controlling the LTI systems. This results support the effectiveness of our approach introduced in this paper. Next we show how to establish trust relationship in P2P Systems based on an inelegant technique.

4 An Intelligent Technique for Improving Data Access Based On Dynamical Trust Construction Schema for P2P Systems

Recently, It is well known that P2P security issues has received considerable attention in the literature[13-24]. These issues have been raised due to uncertainty as well as the presence of the nullity of any trusted authority among providers and consumers connecting through P2P system. Therefore, we need to build a new rule to be used for constructing trust schema relationship among agents in the P2P system. In recent work of Blaze et al. In [4], a trust technique based on management history was presented and had been done among P2P users so as to enforce the security of decentralized systems [1]. Another treatments to improve the behaviors of the distributed trust model have been made by many authors in [13-24]. However, these trust models are not well-suited for dynamic P2P environment, because most peers need to connect and interact without being previously known to each other [3]. Another proposed technique called Automated trust negotiation (ATN) has been established by[3] to increase the trust relationship among the agents in P2P and to overcome some of the drawbacks that appeared in distributed trust model. This method has also shown an increased competition in the networktraffic and consequently decreases the system performance [20-24]. Another researchers [3] established a trust relationship among agents in P2P systems by combining both ATN and Fuzzy decision technique together to get trust relationship among peers. They adopt these concepts of the local fuzzy trust graph (LFTG), global fuzzy trust graph (GFTG), and peer fuzzy trust path (PFTP) and extend the ATN so as to implement their proposed schema. However, their technique lack to address the problems that appeared among users of P2P due to the delayed appeared due to transactions processes which means that these trust models are also not well-suited for dynamic P2P environment, because most peers need to be connected and interacted with each other without being waited long time. In this work, it is assumed that control policies and credentials can be expressed as finite sets of statements in a language so that all peers agree on the interpretation of a credential or policy. We also use the recommendation that is assumed in [3] where each peer stores its LFTG within itself. When the PFTP exits in P2P system the transaction that takes place between two peers need to conduct the transaction. On the other hand, in case PFTP is no longer exist a new automated trust negotiation (ATN)should be established, for more detailed analysis on this topic it can be found in [3].

5 Fuzzy Decision for Trust Evaluation Using Dynamic Trust Relationship

When dealing with Fuzzy trust evaluation{21-31] we need to have some metric tools to describe the trust status. These metric tools often involves many effective factors to help deriving mathematical computing technique to deal with trust evaluation. It well known that Fuzzy decision approach is considered as an effective tool for trust evaluation. In the following we introduce a mathematical computational model that can be used as a metric tool to describe the trust status based on Fuzzy decision. Firstly, we propose the dynamic trust relationship model and secondly, we apply Fuzzy decision for trust evaluation based on this dynamic trust relationship. Our goal here in this work is to modify this last technique introduced in [3] and introduce a new proposed technique that encapsulates and evolves the delay factor that appeared due to the delayed transactions. The following topic introduced next will establish a new dynamical trust relationship model including the effect of this delay factor.

Next, we present an intelligent technique for improving data access through dynamical trust construction to improve the security issues among transactions that take place in P2P systems. The security problems of P2P systems has been gradually considered as an important topic in the literature. Recently, there exists many solution to deal with P2P security issues, specially, the way in how to establish trust relationship among peers. This work introduces Fuzzy decision and extended automated trust negotiation technique based on dynamical trust construction schema [3]. The technique uses an approach for adopting Fuzzy trust theory to deal with the trust information in the P2P systems which can be constructed using some different combinations of algorithms which are based on Fuzzy sets trust techniques that are available in the literature[21-31]. To support the importance of this proposed intelligent technique, a relevant application case in presented which indicates its feasibility in the reality.

6 Modeling of Dynamic Trust Relationship

In recent work of WANG Yang et al [3], they showed that If two peers have no interaction for a long time, trust value will decay with a time attenuation function in the form of an exponential time decay factor without showing the dynamical phenomena of this decay. The presence of this time delays in P2P Interaction processes haven't handled in the literature. Therefore, it is our intention in this work to focus on this issue by introducing a new dynamical model to start tackling this condition and to cope with the delayed peers that have no interaction with others for a long time and to show how to deal with the trust value under this unknown decision. It is well known that dynamic trust relationship reflects that trust changes over time and space which means the trust value does not hold for all moments. For this reason, we introduce next a dynamic trust model to relate the processes as shown in Fig.5. So, we propose a dynamical model with delayed factors to cope with the delayed peer that have been sleeping for long time and get a dynamical relation in the form that relates both the new and old trust grades. The proposed dynamical relation that contains the delayed signals of the sleeping peers as an essential parameter may take the form

$$\dot{\psi}_i(t) = \alpha\, \psi_i(t) + \sum_{j=1}^{j=m} uj(t-\tau_j)\, b_j,\ i=1\ldots.n\text{-}m, t \geq t_o \qquad (22)$$

Where ψ_i is the new trust grades and $u_j(t)$ is the trust grades for the sleeping peers with delayed factor τ_j , j=1…..m , α denotes a factor related to the quantified trust grades and depending on the old trust value , b_j is a weighted factor to adjust the validity of the sleeping peers and to is last updating time, t is the current time.

Theorem 2: Let a dynamical trust function with delayed sleeping signal be described by (22) with sleeping peers, $u_j(\,.)$, such that its first derivative exists, then the following dynamical equation

$$\dot{\psi}_i t) = \alpha\, \psi_i(t) \quad , \quad i= 1\ldots\ldots\ldots n\text{-}m,\ \ to \leq t \leq \tau j \ , \qquad (23)$$

$$\dot{\psi}_i(t) = \alpha\, \psi_i(t) + \sum_{j=1}^{j=m} u_j(t)\, bj + \sum_{j=1}^{j=m} \dot{u}_j(t) b_j(\tau_j)$$

,

$$i= 1\ldots\ldots\ldots n\text{-}m,\ \ t \geq \tau_j \ , \qquad (24)$$

is a unique and exact alternative representation of (22), where

$$b_j(\tau_j) = b_j \int_0^{\tau j} e^{-\alpha\theta}\, d\theta = (b_j /\alpha)\, [\, 1\text{-}\ e^{-\alpha\tau j}] \qquad (25)$$

The detailed proof of this theorem can be easily obtained by following similar procedure introduced in the theorem (1) above.

Although, it is assumed in the theorem's context that the first derivative of uj(.) should be existed for the sake of proofing the theorem, but this condition is not a big problem since it can beeasily removed in the real application by introducing the following linear relation:

$$w_j(t) = \psi_j \text{-} \sum_{j=1}^{j=m} u_j(t) b_j(\tau_j)\ ,$$

Then (24) can be rewritten as

$$\dot{w}j(t) = \alpha\, wj(t) \quad + \sum_{j=1}^{j=m} uj(t)\, dj\ ,\ i= 1\ldots.n\text{-}m,\ \ t \geq \tau_j, \qquad (26)$$

where

$$d_j = b_j + \alpha\, b_j(\tau_j)$$

It is noted that the constructed dynamic trust management system based on theorem (2) can provide network nodes with trust value effectively, objectively and dynamically, which can ensure the security and the stability of information systems.

Since the key problem of dynamic trust management is to show how to get recommended trust of nodes by effective calculations so as to build stable and reliable trust relationship, theorem (2) can be used to find recommended trust chain and finally calculate recommended trust degree. Another use of theorem (2) its ability to deal with Routing Information Protocol (RIP) where a router is a network node specialized in packet switching and processing. It determines the next node to which a packet will be forwarded in order to reach the destination. The dynamical nature of (26) helps the RIP style to be used to obtain the routing tables of the PLAN node that can be used in the static routing table. The advantages of RIP its ability to discover its neighbors and learning their network addresses and measuring the delay elements due to the sleeping peers and updating the initial values for the dynamical model given in Eq.(24) to each of its neighbors. This helps in computing the shortest path to every other router and sends this packet to all other routers where the shortest path depends on the distance metric. In the proposed active secure routing, calculating the distance metric depends on the distance and reputation value. The reputation value is calculated also by using theorem(2). It should be mentioned that calculations of many formulas used with global reputation have received a lot of attentions in the literature and interested people can be advised to see[3] , [4].

To construct dynamic trust relationship to be used in theorem (2), we construct an algorithm based on the flow chart shown in Fig. 1 For constructing this algorithm we need to use some terminology already existed in the literature [3] which can be summarized as follows:

i-- Direct Trust Value (d): Reflects the evaluation of a certain interaction which means a node can trust the other in a specific time due to previous interactions between them with no symmetry of d among peers nodes i.e d_{12} (from node 1 to node 2) $\neq$ d_{21}(from node 2 to node 1).

ii-- Trust Degree Space (TDS) : Indicates the range space that contains all trust values and can be defined within [-1,1] where d=1 denotes complete trust among users, d=0 indicates there are no interactions occurred among peers for long time, and for d = -1 denotes malicious nodes and should be rejected.

iii-- Direct Trust Degree (DTD): Defined the evaluation of a node to another depending upon their previous direct contacts and the evaluation of peer 1 to other n-1 is called Neighbor Nodes Vector which can be used to construct what so called Neighbor Nodes Matrix (NNM) [3].

iv-Direct Trust Network (DTN): [3] It is defined as a weighted directed graph which combines both direct trust relationship as well as direct trust degree as weight to construct its branches.

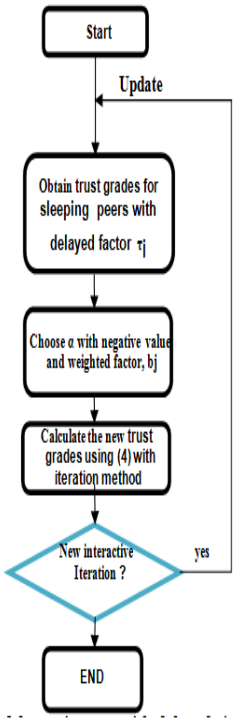

Fig.1. The computing process of dynamic trust with delayed sleeping peers

Using the above definitions, we develop a P2P dynamic trust management system based on trust network that covers aggregation computation of trust degree based on theorem (2). The selection of trust chains and the assessment of overall trust can be easily computed form the dynamical relation in (22). Therefore, the new direct trust value that peer i gives to peer j can be obtained from the above algorithm based on theorem (2) within the time $[t_o, t]$ and all other neighbor nodes can also be obtained similarly. It should be mentioned that our work here focused on the expression of a kind of continuity and avoid to use any assumption like those given in [3] which they consider the attenuation as just related to the number of transactions with some recursive relation to define their attenuation function. In general , the neighbor nodes vector which means the direct trust degree of peer i to other n-1 peers can be used to build a neighbor nodes matrix (NNM) [3] where all its elements represent direct trust degree of peer i to j. Therefore, with the aid of theorem (2) and its regular solution the trust networkcharacteristics can be developed to get the more intuitive behavior of the transactions that occurred among P2P. Therefore, trust network can be easily constructed according to theorem (2). For example, the NNM for a certain trust network can be constructed as.

$$NNM = \begin{bmatrix} 1 & 0 & 0 & 0.6 & 0.9 \\ 0 & 1 & 1 & 0 & 0 \\ 0.6 & 0.7 & 0 & 1 & 1 \\ 0.8 & 0.6 & 1 & 0 & 0.9 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix} \quad (27)$$

where 1 means fully trusted, 0 shows no previous interaction occurred, and all other values are good trusted.

It is an easy task to see that using the values in NNM and theorem (2) one can easily construct the required P2P dynamic trust management system for these values given in NNM. In addition, it should be mentioned that there are other types of trust relationships such as

1-- recommender trust ($\lambda(t)$).
2-- direct trust($D(t)$) for active peers
3-- direct trust($S(t)$) for sleeping peers that are disconnected for long period.

Where the valueof a recommending trust obtained by comprehensive fuzzy decision introduced in [3] while the direct trust for both active and sleeping peers rely solely on the interaction with history recorded among peers which can be used as a metric measure for the direct trust value. So, we need to establish a new Fuzzy trust path for the sleeping peers denoted by PFTPS. Next, We modify the total trust value at time t given in [3] to update the user's synthesized trust value including the effect of sleeping peers to be in the form

$$T(t) = \theta \times \lambda(t) + (1-\theta)(D(t)) + S(t-\tau)) \qquad (28)$$

Where $\lambda(t)$ and $D(t)$ denote local peer's trust values of recommending trust and direct trust in the t time respectively. The factor $S(t)$ appeared in (28) is invoked in the trust value $T(t)$ to compensate for the sleeping peers when they decide to be active again in the network with τ as its long time delayed element. $T(t)$ is the total trust value at time t, θ's is a weighting factor to denote the preference for both direct trust or recommending trust.

7 Modeling of the Content dynamics

Dealing with content dynamic and from the point of view of contents in the network, we are going to treat the number of copies of each content that are stored by both active and sleeping users at a given point in time as a dynamical variable in a way similar to those given for users' dynamics. So, we model contents' dynamics through linear state system each content in the system is modeled as a moving particle whose instantaneous position $x(t)$ represents the number of available copies at time t (i.e., the number of active users who are storing a copy of the considered content). Similarly, the effect of sleeping users ismodeled in the system as a moving particle whose instantaneous position $v(t)$ represents the number of available copies at a delayed time $t = t-\lambda$, where λ is the delay factor (i.e., the number of sleeping users who arrived lately at the system and storing a copy of the considered content). We note that users hold the copy of their contents for a time period and make new contents available to the community at a rate varying with time. We remark also that these contents are allowed to vary over time according to given functions of time. This is indeed one of the main strengths of our work here, i.e., the ability to study the transient behavior of non-stationary P2P systems. In[11] it has been reported a measurement study of user dynamics that provides useful indications on how to set the above parameters(i.e. the number of stored contents). In the following we introduce a global modified dynamics of the entire population for both active and sleeping peers as well as new arrival peers in dynamical relation based on the notion introduced by G.Carofiglio et al [11]. Without loss of generality and for the sake of simplicity, we assume that new comers u(t) join the system in the active phase without storing any content. Therefore, the entire population for both active and sleeping peers as well as new arrival peers in dynamical relation with delay elements in the states of sleeping peers for P2P network can be put in a proposed linear statespace relation that describe the evolution of the number of contents available in x copies in the system. From this point of view of contents in the network, we will be interested in dealing with the number of copies of each content that are stored by active users at a given point in time. Similarly to users' dynamics, we model contents' dynamics through a dynamical model whose instantaneous position x(t) represents the number of available copies at time t (i.e., the number of active users who are storing a copy of the considered content). Hence, we can describe the evolution of the number of contents available in x copies in the system by the dynamical relationship

$$\dot{x}(t) = Ax(t)u_s(t)+\sum_{j=1}^{j=m} A_j v(t-\lambda_j)u_s(t-\lambda_j)+Bu(t)u_s(t), \quad t\geq 0 \qquad (29)$$

Where x (t) ε R^n be the contents stored at the active users varying with time t, R^n is the real space, n is the overall active entities, m is the number of sleeping entity. A's ε R^{nxn} and BεR^{nxp} are weighting constant matrices of appropriate dimensions and represent the number of all available contents in both the users dynamic sides as well as the discovery stored sides in the system, and p is the number of new arrival entity. The matrix A_j ε R^{nxq}denotes a weighted matrix to adjust the availability of these sleeping entities that suppose to be available at the network at $0\leq\lambda 1\leq\lambda 2\leq\lambda 3\ldots\ldots\leq\lambda m$ with stored contents with delay number represented by v(t- λj) ε Rq j=1, .…m and has a sleeping time delay elements starting at time t= λj due to its sleeping period, where $0 \leq \lambda_1 \leq \lambda_2 \leq \lambda_3\ldots\ldots\leq\lambda_m$ represents the delay transmission content discovery of the sleeping peers that takes place from overlay topology to active users. The rate at which new users subscribes the system is denoted by u (t) ε $R^p$and also denotes rate at which new contents are made availableto an active user which can be treated here as an input to the system, and u_s (t) is a unit step function. The matrix B is a weighted matrix to adjust the availability of these new entities u(t) which may involved in the system at time t. We should also mentioned that the variable x(t) can also be defined as the difference between the rate at which a user gains new contents and the rate at which the user disregarded the contents. It should also be noted that (29) is in the form of state space system with general delays in the controls. Solution of (29) has been introduced in the work of Saidahmed [32].

7.1 Some Remarks*:*

It is our intension to conclude some observation on the remarkable model obtained in (29). First, We do not ignore the content diffusion among the sleeping users and we do not resort to any kind of approximation in model (29) to compensate for their contribution. Indeed, we have considered the evolution of the number of contents stored by both the active and sleeping users in the dynamic (29) which is in the form of a generalized state space system. When all of the random variable describing the user's behaviors are controlled by an exponential distribution, the exact and unique alternative form is obtained using similar proofing lines that are used in deriving theorem (1) and also in Saidahmed [32]. This new model can be used to determine the behavior of the populations process. Therefore, the numerical solution of the resulting unique model can be easily calculated with no extra computational expenses (especially when transient solutions are required). For this reason, the proposed model obtained in (29) can also be used to cope with the dynamical behavior of content's users in large P2P networks. It should be noted here that the effective rate used in (29) is given by the sum of two rates: one rate at which new copies of the considered contents are made available by active users retrieving them and second rate at which new copies of the considered contents become available when sleeping users storing them and passing them to the active peers through the network making their contents again available to the community. The following theorem concludes our combination of the above relations among variables in the following theorem.

Theorem3:For the entire population that contain the contents stored at both active and sleeping peers as well as new arrival peers in dynamical relation with delay elements in the states of sleeping peers for p2p network and varying with time t as described by (29), then there always exit a linear transformation

$$z = e^{s\lambda} x(\lambda), \qquad (30)$$

that moves the delays element from the states of sleeping peers to the system parameters in the form,

$$\dot{x}(t) = Ax(t)u_s(t) + \sum_{j=1}^{m} A_j v(t-\lambda_j)u_s(t-\lambda_j) + Bu(t)u_s(t) \quad \text{for } 0\leq t\leq \lambda_1\ldots\ldots\leq \lambda_q, \qquad (31\text{-a})$$

$$\dot{x}(t) = Ax(t) + \tilde{A}v(t) + \tilde{A}(\lambda)\dot{v}(t) + Bu(t), \quad t\geq\lambda_1\geq \lambda_2\ldots\ldots\geq \lambda_m \qquad (31\text{-b})$$

Where s is a complex linear transformation in the complex plan (31-b) is a unique and exact alternative model in the form of regular state space system, and (31) is a unique and exact alternative representation of (29), where $\dot{v}(\ )$ denotes the first derivative of the input and

$$\tilde{A} = \sum_{j=1}^{m} A_j \text{ and } \tilde{A}(\lambda) = \sum_{j=1}^{m} A_j(\lambda_j) \qquad (32\text{-a})$$

$A_j(\lambda_j) = \int_0^{\lambda_j} e^{-A\theta}\, d\theta A_j$ (32-b)

For the sake of brevity, we omitted the proof of this theorem and the interested people seek more details should see the proof introduced in the work of Saidahmed [32]. Although, it is assumed in the theorem's context that the first derivative of $v_j(\,.)$ should be existed for the sake of proofing the theorem, this condition is not a big problem and can be easily removed in the real application by introducing the following linear relation:

w (t) = x(t) - $\tilde{A}(\lambda\;)$v(t) , (33a)

Then (3) can be rewritten as

$\dot{w}(t) = Aw(t) + A(\lambda)v + Bu(t)$ (33b)

Where

$A(\lambda) = (\tilde{A} + \tilde{A}(\lambda\;))$,

Solution of (31) and (33) can be easily obtained in the regular sense, that means system (33) is in the form of regular state space and its solution is well known in the literature and the specification of number of contents available in the system for both active and sleeping users should be defined to complete the solution of (33) with the aid of some given parameters that Characterize Users dynamic behaviors. These parameters can be Characterized using some relations given in [11], where the number of active users at time t is defined as $Q_a(t) = \int G_a(x, t)dx$, whereas the number of sleeping users at time t is defined as $Q_s(t) = \int G_s(x, t)dx$ and the total number of users is represented as:

$Q(t) = Q_a(t) + Q_s(t)$

We also note that the total number of copies stored by active users is given by $Q_a(t) = \int xG_a(x, t)dx$ while the total number of copies stored by sleeping users $Qs(t) = \int xGs(x, t)dx$ where G(x, t) is the density of users storing x contents at time t [11], the subscripts a & s denote the active and sleeping peers respectively.

To support our claim, we start using (31) with parameters taken from [11] to show the dynamics of a large population of users to determine the dynamical behavior of the system using the following parameters:

1--The average duration of the active period = 2 Hrs. i.e. t=2 Hrs.
2--The average duration of the sleeping period = 14 hours
3--The average content holding time = open
4--A new user subscribe the system at a rate = 1/hours i.e. u=1
5--The average stay into the system is assumed open.
6—User starts holding zero contents, and do not add new content itself.
7-All sleeping peers are assumed to be activated at λ_1=4 Hrs, λ_2 =5 Hrs, λ_3 =6 Hrs, λ_4 =7 Hrs, λ_5=8 Hrs.

We assume, for now, that all requests are successful and that users eventually download the requested files, where the estimate number of active or sleeping users are storing a given number of contents. Using the above assumed parameters Eq.(29) takes the form

$\dot{x}$= Ax(t) u_s (t) + $\sum_{j=1}^{m} A_j$v(t)u_s (t-λ_j) + B u(t) u_s (t) (34a)

We choose the weighting factor A = -1, the weight B to be equal one and the transmission delay as defined in the lines above with x(0)=0 . Using the superposition approach for solving (34a), we end up with a unique and alternative for $0 \le t \le \lambda_1 .. \le \lambda_m$ as
$\dot{x}$= - x(t) u_s (t) + $\sum_{j=1}^{m} A_j$v(t)u_s (t-λ_j) + u(t) u_s (t) ; x(0)= 0.0.

$0 \le t \le \lambda_1 \ldots\ldots.. \le \lambda_q$ (34b)

Where u_s (t) is a unit step function, thus , we get the solution of (34b) in the form

x(t) = $\prod_{j=0}^{m}$ u_s(t-λ_j) - $e^{-t}\sum_{j=0}^{m} e^{\lambda j}$ u_s(t-λ_j) for $0 \le t \le \lambda_1 .. \le \lambda_q$,
λ_0 =0(35)

Choosing initial value of the delay factor λ_1 = 4Hours and q = 5 as defined in the lines above , we have the transient and the steady state of the dynamical process that represent the dynamical behavior of the moving contents in the P2P network including the effect of delay elements that appeared due to the presence of sleeping peers at λ_1=4 , λ_2=5, λ_3=6 λ_4=7, λ_5=8 Hours as shown in Fig.8a. The overall dynamical contents x(t) including the effect of all delayed sleeping peers is shown in Fig.8b, where it is clear that as sleeping content decided to engage again , the rate of exchanged content increases as expected. On the other hand, with the same delay factors λ_1=4 , λ_2=5, λ_3=6 λ_4=7, λ_5=8, the second part of theorem (3) fort $\ge \lambda_i$, j=1,2,3,4,5 is obtained from (36) which is a unique and exact alternative form of (35), thus we end up with:

$\dot{w}$(t) =Aw (t) + A(λ_i)v(t)+ Bu(t), t $\ge \lambda_1 \ldots\ldots \ge \lambda_5$, i=1,2,3,4,5 (36)
where
A(λ_i)= $\tilde{A}$ + $\tilde{A}$ (λ_i) , $\tilde{A}$ = 1 , i=1,2,3,4,5
$\tilde{A}$ (λ_1)= 53.5755, $\tilde{A}$ (λ_2)= 147.3362,$\tilde{A}$(λ_3)=402.1779,
$\tilde{A}$ (λ_4)= 1095.8,$\tilde{A}$ (λ_5)= 2977.5
A(λ_1) = 54.6,A(λ_2)=148.3,
A(λ_3) = 403.2,A(λ_4) = 1095.8,
A(λ_4) = 1095.8, A(λ_5) = 2978.5
$\dot{w}_1$(t) = -w_1(t) + 56 u_s(t) , t $\ge \lambda_1 \ge 4$
$w_1(\lambda_1)$ = x(λ_1) - $\tilde{A}$ (λ_1) v(λ_1) =-52.5938,
since, w (t) = x(t) - $\tilde{A}(\lambda\;)$v(t) , then we get
x_{11} (t) = w_1(t) + $\tilde{A}$ (λ_1) v_1(t),
$\dot{w}_2$(t) = -w_2(t) + 148 u_{stp}(t) , t $\ge \lambda_1 \ge 5$
$w_2(\lambda_2)$ = x(λ_2) - $\tilde{A}$ (λ_2) v(λ_2) = -146.7109 ,
x_{22} (t) = w_2(t) + $\tilde{A}$ (λ_2) v_2(t)

$\dot{w}_3$(t) = -w_1(t) + 403u_{stp}(t) , t $\ge \lambda_1 \ge 6$
$w_3(\lambda_3)$ = x(λ_3) - $\tilde{A}$ (λ_3) v(λ_3) = -401.6837
x_{33} (t) = w_3(t) + $\tilde{A}$ (λ_3) v_3(t)

$\dot{w}_4$(t) = -w_1(t) + 1096u_{stp}(t) , t $\ge \lambda_1 \ge 7$

$w_4(\lambda_4) = x(\lambda_4) - \tilde{A}\,(\lambda_4)\, v(\lambda_4) = -1096,$
$x_{44}(t) = w_4(t) + \tilde{A}\,(\lambda_4)\, v_4(t)$

$\dot{w}_5(t) = -w_5(t) + 2979\, u_{stp}(t)\,, \qquad t \geq \lambda_1 \geq 8$
$w_5(\lambda_5) = x(\lambda_5) - \tilde{A}\,(\lambda_5)\, v(\lambda_5) = -2979$
$x_{55}(t) = w_5(t) + \tilde{A}\,(\lambda_5)\, v_5(t)$

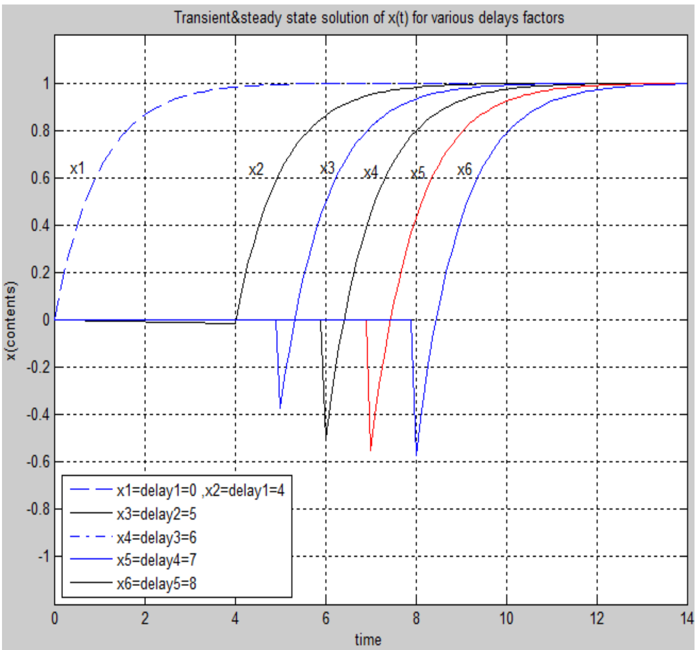

Fig. 2a. shows the transient and the steady-state distribution of the number of active users storing a given number of contents for various combinations of the above time delays factor due to the sleeping peers coefficients for $0 \leq t \leq \lambda_1 \ldots \leq \lambda_5$

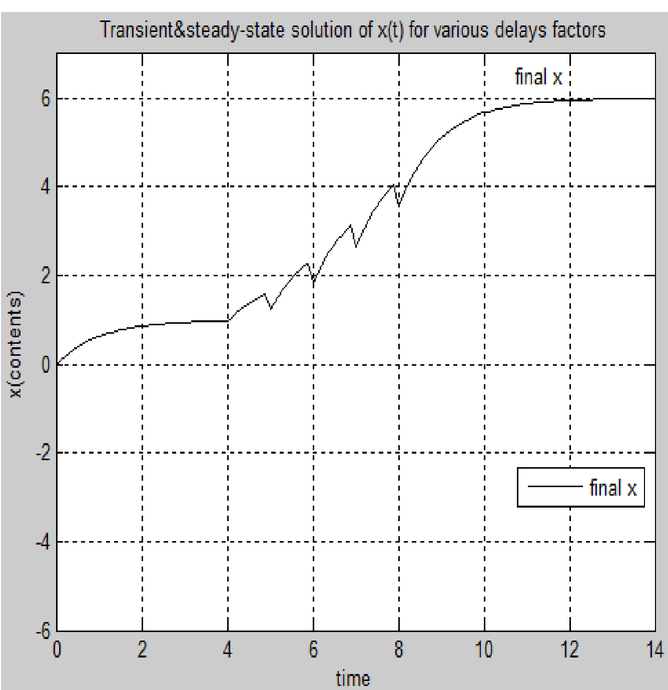

Fig. 2b. shows the total transient and the steady-state distribution of the number of active users storing a given number of contents for various combinations of the above time delays factor due to the sleeping peers coefficients for $0 \leq t \leq \lambda_1 \ldots\ldots\ldots\ldots \leq \lambda_5$

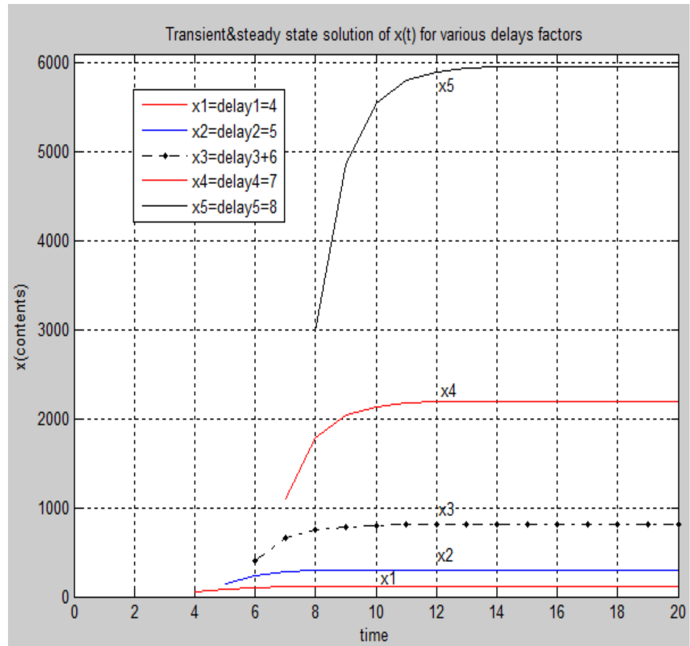

Fig. 2c. shows the transient and the steady-state distribution of the number of active users storing a given number of contents for various combinations of the above time delays factor due to the sleeping peers coefficients for $t \geq x_{1 \ldots\ldots\ldots} \geq x_5$.

Fig. 2a shows the transient and the steady-state distribution of the number of active users storing a given number8 of contents for various combinations of the above time delays factor for the sleeping peers coefficients for $t \leq \lambda_1 \ldots \leq \lambda_5$ be reconnected again to the P2P network. It is clear from Fig.2a that (5-a) allows to estimate the number of active users storing a given number of contents which are increasing exponentially with a rate affected by time delays factor due to the sleeping peers coefficients for $t \geq \lambda 1 \ldots\ldots \geq \lambda 5$. In particular, it permits to account for the effect proceedings of different distributions of the inter-arrival time between successive content requests and of the content holding time with no existence of the sleeping peers. From curves in Fig 2a-c it can also be observed that distribution of active contents is strongly influenced by coefficients of various combinations of the above time delays factor due to the sleeping peers coefficients. Although they are different, but the average number of contents stored by a user can vary exponentially and increasing to its contents as expected. In particular, it is strongly affected by the coefficient of variation of the holding time, whereas it does not depend on the variation coefficient of inter-request time. An accurate prediction of the distribution of the number of contents available at a user is important because it directly affects its load and thus the download time of other users requesting contents from it. The exact and alternative model (31) based only on average values of content holding time and inter request can fully characterize the resulting user behavior. On the other hand, the contents of active peers started to gain new contents when the sleeping peers reentered the network again for various combinations of the above time delays factor due to the sleeping peers coefficients for t ≥ λ1…λ5 as shown in Fig.2c.Based on all previous topics that are used to construct an inelegant technique for improving data access through merging some of protocols package using P2P networks, We present next a platform known as AgentJ that uses the NS-2 platform to support the simulation and performance analysis of Java network applications. Our work is particularly focused on the simulation of P2P networks. It is well known that AgentJ is used to facilitate the passing of real data among NS-2 nodes that ends up with creating a platform for simulating the stored contents in peers and their usage in the real applications. For this reason, we introduce next some remarks on NS-2.

8 Some Remarks on NS-2

It is well known that NS-2[26] is a discrete event simulator and was developed to support applications in the open source domain for a wide range of transport and routing protocols over both wired and wireless networks. The major application of NS-2 is its ability to be used in computer networking , specially, for MANET routing, wireless communications, sensor networking, P2P networking, and various tools for post-processing simulation results. The packet-based computer networks can be easily modeled and treated through simulating them on NS-2 platform. This platform consists of components in object-oriented Tcl (OTcl) and C++. The OTcl portions aredesigned to provide a user interface to the simulation executive where simulations can be setup in a scriptable manner without the need for recompiling. The simulations of computer networks using the existing NS-2 modules are setup with Tcl scripts, where nodes, data flows, applications, underlying networking protocols, as well as every other aspect of a network can be configured while the C++ portions are designed to maximize run-time speed of the NS-2 executive and its network models.

8.1 The NS-2 Simulator and AgentJ

It is well known that the big advantages of AgentJ is its ability to provide NS-2 users with the capability of simulating real-world Java network applications where it can create an interface for users to control Java applications from TCL scripts. This interface open the way for the user to hook the user's control capabilities through three main different languages such as OTCL to C++ to Java. The existence of a single Java Virtual Machine (JVM) helped the users to interpret the Java applications and tracks their state on behalf of the NS-2 C++ executive. This is achieved by extending the core NS-2 framework to provide an interface to Java code for each node in the distributed simulation. Although the implementation of AgentJ within the NS-2 framework is very complex, it is designed to have a nonintrusive impact on users of NS-2 and developers of Java network applications. In this way, the simulation of Java applications in NS-2 follows the same conventions lines as those used with the simulation of traditional C++ applications for NS-2, and the development of Java network applications follows the same conventions lines as those used with the standard java.net classes[29]. In this work our protocols will be implemented on the notion introduced in Xu Xiang et al [10] approaches.

8.2 Merging and Splitting Structured Peer-to-Peer Systems

It is well known [6] that P2P systems can be classified into two main types : unstructured and structured. The splitting and merging protocols become a crucial issue for practical structured P2P systems . The p2p system split into two P2P sub systems when the number of nodes in the network exceeds the maximum allowed boundary nodes. On the other hand, if the number of nodes in a P2P system drops below the minimum allowed boundary nodes, it must merge into another. Splitting and merging operations in P2P systems are necessary for some practical applications . This can be seen easily in the case when two structured P2P systems are created independently, and they are interested to exchange their contents with themselves so they will merge due to overlapping interests.

To deal with this issue, we introduce anEnhanced Randomized Broadcast Algorithm named XRBA to compensate for the sleeping peers as well as the time delay due to testing reputation based on Fuzzy decision for trust evaluation. ByXRBA we mean that all nodes of a P2P system can be informed whether they can be merged into another or split into two parts. To accomplish this notion a complete knowledge of topology of P2P systems must be acknowledge. Then following the same lines reported in [6] a proposed efficient protocol for merging P2P systems with testing reputation based on Fuzzy decision can be obtained where nodes have to retain their current logical links table (i.e., fingers) during the merging period with no need to reconstruct new fingers tables that leads to keep the network topology without reconstruction. In [6] it is shown that Chord [34] constitutes the majority of structured P2P systems. Therefore, this modified algorithm for distributed merging protocols for structured P2P systems using testing reputation based on Fuzzy decision can be easily implemented on Chord [34] without extra cost. It will be shown that these protocols can perform faster and reduce the cost of merging P2P systems. To support the usefulness of these algorithms simulated processes have been used to be compared with theoretical analysis.

8.3 Analysis and performance of the proposed XRBA foractive and sleeping peers using testing reputation based on Fuzzy decision

It is well known that operations of splitting and merging overly are described In the literature[4],[6]. However, most of them had discarded the influence of sleeping peers on the performance of the P2P network. In this section, we show how to implement the XRBA with the existence of sleeping peers as well as testing reputation based on Fuzzy decision. The outline of our approach follows similar linens as those presented in [6] for merging protocols. The design processes for XRBA algorithm for active and sleeping peers is introduced next.

8.3.1 Designing XRBA algorithm for active and sleeping peers

As it mentioned above, we propose XRBA by knowing that when a node starts sending its message through the network, it chooses q nodes randomly in uniform and then sends the broadcast messages to them. Consequently, those nodes received the broadcast message repeat the same steps once again. This XRBA algorithm can be shown as follows:

i. XRBA algorithm for active nodes using testing reputation based on Fuzzy decision

1. Choose an active node y in P2P
2. Let this active node y sends a message to active q nodes randomly in uniform and then sends the broadcast messages to them
3. For each node in P2P receives a broadcast message at the first time , it first checks for testing reputation based on Fuzzy decision and then chooses another q nodes randomly in uniform and sends broadcast messages to them.

ii. XRBA algorithm for sleeping nodes using testing reputation based on Fuzzy decision

1.Lat a sleep node y be first activated again in P2P network.
2. Choose an sleeping node y to be activated in P2P.
3. Let this activated node sends a message to m active nodes randomly in uniform and then sends the broadcast messages to them
4. For each node in P2P receives a broadcast message at the first time, it first testing reputation based on Fuzzy decision and then chooses another m nodes randomly in uniform and sends broadcast messages to them

8.4 Performance Analysis

For achieving the preceding algorithms, it is important to have a definition to help analyzing the upper bound of them and show how to choose the value for both q and m randomly in uniform.

Theorem 4 :Let an active node in the P2P system is chosen to broadcast a message. Then, the dynamical activation of an active node can be given by

$$\dot{q}_1(t) = \eta\, q_1(t-\lambda) + bu(t) \qquad (37)$$

Where all possible solutions of (37) are affected by the transmission delay element λ due to the influence of sleeping peers on the performance of the P2P network.

Where $q(t) \in R$ be an active user varying with time t, R is the real space .$\eta \in R$is a weighting constant value to be chosen later, $q_1(t-\lambda)$ ε R represents the active user decision to cope with delay factor λ at time t= λ due to the reputation decision delay period, $u(t) \in R$ is a rate at which new users subscribes the system, and the matrix b is a weighted matrix to adjust the availability of the new entity u(t) which may involved in the system at time t. It should also be noted that Eq.(37) is in the form of state space system with a delay element in the state. Solution of Eq.(37) has been introduced in the work of Saidahmed [33].

Following similar lines of those given in proof of theorem1 above, and after solving Eq.(37) to have the characteristic behavior of q_1 in the presence of delay factor λ due to the reputation decision delay period based on Saidahmed [33], one can easily show that with some stochastic processing all nodes will receive the broadcast message at least once from q_1. On the other hand, theorem 3 can be easily extended to include the sleeping nodes with one exception that another new factor would be added to the analysis which is due to the presence of the delay time of generated by sleeping nodes themselves. The proof of this extended theorem (3) can be easily obtained following the same lines that are applied in theorem 3. Again, every activated sleeping nodes in P2P receives a broadcast message at the first time and will first test it for reputation based on Fuzzy decision which takes a delay time λ and afterthat it chooses q nodes randomly in uniform and then sends these broadcast messages to them.

We may give some remarks on theorem that XRBA is a modified version of RBA reported in [6] where the effect of delay factor due to testing process for reputation was not taken into consideration. We conclude some remarks regarding theorem3, so all nodes in the system would receive the broadcast message and fault-tolerance has equally received the broadcast message treatment even in the case of having node that failed during the broadcast period.

8.5 Merging Protocols

Based on the preceding section, It is our intension to present a new efficient and distributed merging protocols. The main idea behind this protocols is to search correct fingers along the ring without establishing or reconstructed them. To accomplish these merging protocols, we assume that we have three Chord [34] systems namely, q with dimension n , q_1 with dimension n_1, and q_2 with dimension n_2 which use the same size of identifier space, where q_1 nodes chosen uniformly at random from q. According to these assumptions and without loss of generality in our merging protocol, when the number of peers become below the lower bound of the network , then the present system will be consisted of merging q_2 with q_1 to generate a new system denoted by q and is referred to as the next generated system. That is to say when q_2 merged into q_1 we end up with a new merging system called q. Finally, based on Chord [34], the following notation will also be needed in our study and similar to those given in [10]:

1. finger table denotes y as an active node that maintains a finger table for routing called a finger table.
2. The i-th entry in the finger table contains y node that succeeds active node by at least 2^{i-1} in the identifier ring where the i-th is entry element of a finger table.
3. The successor of active node y denotes the first node that immediately succeeds y in the p2p network.
4. A predecessor of node y represents the node that immediately precedes y in the the ring.
5. nextsys(x) is the name deserved for the next system that node y belongs to.

8.6 Merging Protocol based on Fuzzy Decision for Trust Evaluation

As it is mentioned in the preceding discussion for merging protocol based on Fuzzy decision for trust evaluation and without lose of generality, it assumed that active nodes in q_2 will join in with q_1. To achieve our proposed merging protocol each node in P_2 calls Pseudocode join() and Pseudocode search merging finger(i), while each node in q_1 just invokes search merging finger(i) [6]. These join() and serach merging finger(i) codes follows similar lines to those reported in[6] with somemodification to compensate for the delay effect due to sleeping nodes. This algorithms can be concluded in the following lines:

i. Pseudocode join( ) code algorithm for active peers with delayed time factor due to searching

1. active y.join(y)
2. asuccessor = y_.find _asuccessor(y) with delayed time factor

ii. Pseudocode for active y.find_asuccessor(z) with delayed time factor

1. active y.find_asuccessor(z)
2. if (zε(y, asuccessor)
3. return asuccessor ;
4. else r = closet _preceding node(z);
5. return r.find_ asuccessor(z);

iii. Pseudocode for active search_amerging _finger(i)

1. y. active search amerging finger(i)_delayed
2. z = finger[i].apredecessor;
2. while (z < y + 2^{i-1})
3. z = z.apredecessor;
4. returnz.asucessor;

It is an easy task to see that Pseudocode for active peers introduced above is used in the design process of merging protocols where its output decision is so important and requires no additional construction of all fingers for the next P2P systems. This Pseudocode lead also to save some costs when compared with those covered by other protocols introduced in the literature[10,60].

9

values of active nodes q / %sleeping nodes	50	55	60	64	68
15	78	10	1	0	0
25	143	23	2	0	0
35	195	31	4	0	0
45	217	35	7	0	0
55	269	39	8	1	0
65	300	42	9	1	0
75	320	47	11	2	0

Simulation results of Merging Protocol

To validate the usefulness of our active merging protocol , we use a discrete event simulator to evaluate various aspects of performance of XRBA for the merging protocols. The simulator is written in C++ and executed as a single process with some

values of active nodes q	50	55	60	64	68
number of active M-nodes	43	7	0	0	0
% coverage	99%	99.9%	100%	100%	100%

limited number of both nodes and size of the identifier space of the P2P system. The XRBA are simulated for the extended randomized broadcast algorithm such that the node which starts broadcasting uniformly at random q and then every node that receives the broadcast message at the first time uses reputation based on Fuzzy decision algorithm with delayed factors for testing the reputation and then uses its output results to choose q_1 nodes uniformly at random, and then sends the broadcast message to them. The coverage peers are calculated by counting the percentage of nodes that received a broadcast message at least once. Tabel-1 shows the convergence with several values of q nodes as well as nodes denoted by M that do not receive any message at all and are used to show their influence on the convergence with several values of q_1. All these results is summarized in the following table-1:

Table-1. Convergence of number of active M-nodes

17 Impact of Sleeping nodes on the XRBA

By sleeping nodes we mean those nodes that produce no output for specific period of time delay. To see the influence of those nodes that fail during the broadcast period on XRBA, we studied the fault tolerance of XRBA by allowing nodes to fail with probabilityP. We take the range of P to be between 0.1 to 0.7. The sleeping nodes are implemented as the fail-stop model where each sleeping node simply stops producing any output for specific period of time delay [6]. Those sleeping nodes are generated after the failure occurs in the discrete event simulator. It is an easy task to count the number of q_2-nodes that produce no outputs on the simulator model. The following table-2 shows the number of q_2-nodes with several values of active nodes q , i.e, 50,55, 60, 64, 68. Although, for sleeping nodes located in fault tolerance region within the range of 60% of the total nodes, most active nodes receive the broadcast message when the value of q beyond 64.

Table-2. Effect of sleeping q_2-nodes, q with dimension n , $q_1$ith dimension n_1, and q_2 with dimension n_2 which use the same size of identifier space

9.1 Results of Merging Protocol that improves the performance of data access in P2P network

To evaluate the effect of merging Some of Protocol packages on the performance of data access through P2P, we compute the efficiency of our merging protocols introduced in this work. To see this, let r represents the ratio n_1/n_2 as

$$r = n_1/n_2$$

to be used as a measure for evaluating the performance of data access in P2P network due to merging process. Let us also introduce the probability density function η as a normal (Gaussian) distribution for number of hops required in merging some of protocol packages in the P2P process as

$$\eta = \sigma e^{-\theta t}, \text{ with } \theta = r^2, \text{ and } \sigma = 1/(\xi\sqrt{2\pi}) \quad (38)$$

where t denotes the number of required hops in the merging protocol for active peers, ξ is a weighing factor chosen as 2.5, 1.5, 1.25 for r1, r2, and r3, respectively.

Fig.3 shows the probability density function η given in Eq. (38) as a normal (Gaussian) distribution of the number of hops required for theexecution of Pseudocode active search_amerging _finger(i). It should be noted that the maximum number of hops for the merged system requires no more than 10 hops for different cases of r i.e. r1 =0.8, r2= 0.6, and r3=0.5 in the experiments as shown in Fig.10 and sharing almost 2 hops for η = 0.15. We should mentioned also that the curves shown in Fig.3 showedthatthecost ofPseudocode active search_amerging _finger(i) is close to the result obtained by the executing search merging finger reported in [6], where amerging protocols at least reduce the cost of creating fingers to about 25% compared with those reported in [6]. This improved results are due to including the effect of delay element in our dynamical modeling represented in Eq. (29).

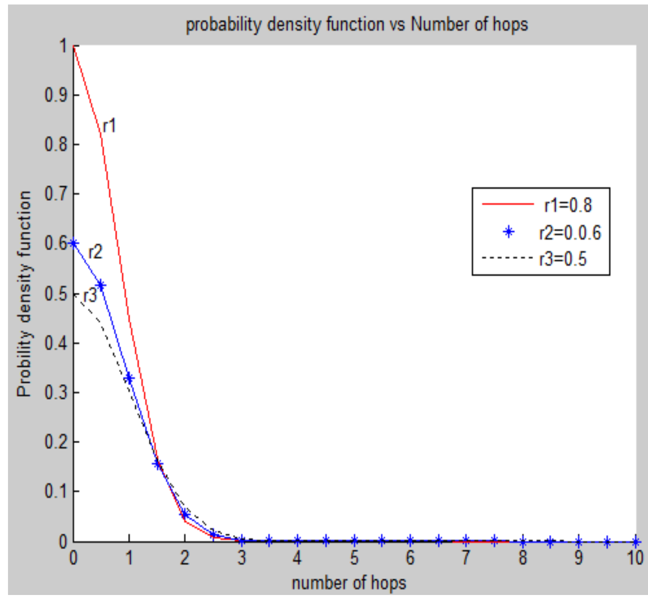

Fig.3. The probability density function vs No of hops for merging protocol.

9.2The implementation of a New Inelegant Technique for Improving Data Access Through Merging Some of Protocols package using P2P Networks

In this section we are utilizing the preceding inelegant technique of merging Protocols package to give us a new concept of secure routing stack to be implemented in Linux operating system with NS-2 discrete simulator as well as the AgentJ[26] which is used to get a simplified algorithm to give a pure real P2P environment system. To complete our proposed work to implement this Inelegant Merging Protocols package, we augment another optimal algorithm named AntNet [30] in our process to determine some optimal paths for improving data access of the real P2P environment. After completing building of this intelligent system , we ended up with a new modified system that uses routing protocol based on reputation based on Fuzzy decision which takes a delay time reputation values of the nodes into the computation. The augmentation of these new factors in the process gave a new platform for merging some of Protocols package for P2P Networks. The simulation Results of a new platform for merging some of Protocols package for P2P Networks is shown to gauge the behavior of the proposed routing algorithm for P2P network, the construction of the network has been implemented using a directed graph with N nodes. All the links in the network are considered bidirectional with both the transmission capacity and the transmission delay being augmented in the design process. In this platform each node is treated as a double agent either a communication end-point (host) or a forwarding unit (router) and these node in the network is assumed to maintain an input buffer composed of a single queue and an output buffer composed of a high priority queue and a low priority queue for each neighbor or outgoing link where the high priority queue is served first before handling the low priority queue. Both data packets and mobile agents that taken place along the network are specified in the regular sense as in the literature [5].

10 CONCLUSION

This paper introduced the problem of merging some protocols used in the structure of P2P systems. The work introduced tackles this problem by first introducing a dynamical platform model that was shown to be suitable for the P2P network platform to cope with the presence of sleeping peers as well as transaction delays in the P2P network. This platform had been used to design an enhanced randomized broadcast algorithm (ERBA) which was easily implemented on overlay networks without extra cost. Including the dynamical delay factor in the process has strengthen our work based on a new novel approach that helped in improving the stability and robustness of the transaction process as well as overcoming many drawbacks issues that appeared in P2P network with dynamical delayed time transmission elements. This delayed time elements have been utilized in deploying a fault tolerant extended broadcast algorithm in P2P systems. Depending on this and for the first time, a proposed merging protocols based on Fuzzy decision fortrust evaluation have been obtained for both active and sleeping peers. We showed that both of them are treated using some innovative techniquethat has ledto improve protocols performance which has shown to be faster than previous protocols in terms of the number of hops. It should be mentioned also that, some experiments have been studied and implemented to support these claims. Based on these dynamical models, the development of a platform that would be suitable for its intended application inthe P2P network has been implemented. The qualitative performance analysis was easily studied using these dynamical models for the implementation of a new inelegant routing algorithm that has improved data access through merging some of protocol packages using P2P networks. These packages have been achieved based on the NS-2 simulation package which is considered as the best popular simulation package.Using this package has helped us in obtaining the best secured reputation shortest path including the effect of transmission delays, where the performance of transactions among P2P nodes have been greatly improved. The great achievement in this work is its new treatment of the presence of transmission delays due to the presence of sleeping peers where all delayed elements have been completely removed to the system's parameters that has led to get the most secured trust evaluation algorithms based on Fuzzy decision approach. These secured reputation algorithms have prevented the malicious nodes from being penetrated through P2Pnetwork where the reliability of the transactions have increasingly improved.

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