define EA (Encrypt Algorithm), KS (Key Size), and R (the number of Round).
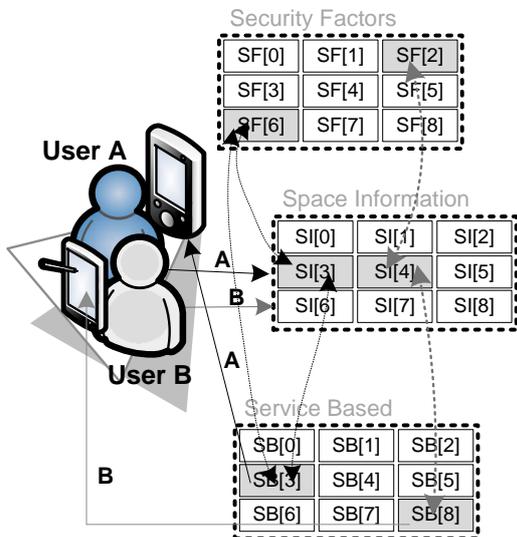

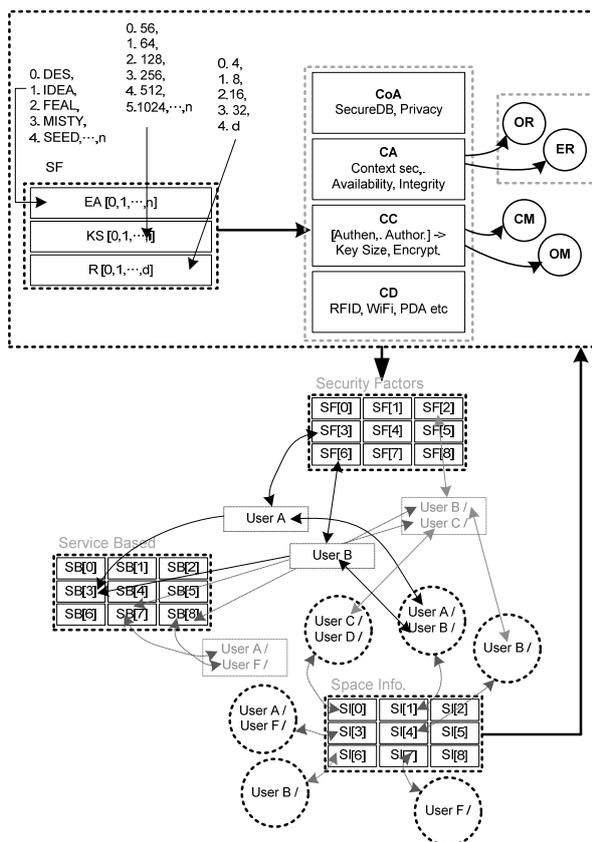**Figure 3. Service of User A and User B**

Figure 4. User Social Relation (not pointing fully)

Users, who have same service, can make social relation after reference service information (the purpose of service) of the located place of users. Also, they can share their information with their agreement. Therefore, User A shares 'SB [3]' with User B. However, User A and User B process with each way for security. 'SB [8]' will be shared User B and User F (see Table 2). The result of Table 2 is from figure 4. User A has two SBs; 'SB [3]' and 'SB [7]', each has difference space information for each service. We can define for User A like that, *[User A: SB[3], SI[1], SF[3].0.1.2: SB[7], SI[0], SF[1].1.2.2]*. User A keeps 'SI [1]', then receives the service 'SB [3]' in area of User A. Also, User A takes a service 'SB [4]'. At that time, the security set encrypt algorithm is DES (0), Key size is 64 bits (1), and the number of round is 16 (2). Therefore security factors, SF [#] is (0,1,2). We can understand the rest of them (SF[1].1.2.2) with the same way (see Table 2).

Table 2. Each Definition

Type \ User	SB	SI	SF	
			Name	Matrix(Contents)
User A	SB[3]	SI[1]	SF[3]	0, 1, 2
	SB[7]	SI[0]	SF[1]	1, 2, 2
User B	SB[3]	SI[1]	SF[6]	4, 2, 1
	SB[5]	SI[2]	SF[6]	4, 2, 1
	SB[8]	SI[1]	SF[2]	2, 1, 3
User C	SB[7]	SI[0]	SI[0]	0, 0 ,0
User D	SB[6]	SI[3]	SI[0]	0, 0 ,0
User E	SB[0]	SI[3]	SI[3]	0, 2, 2
	SB[2]	SI[5]	SI[6]	4, 2, 1
User F	SB[6]	SI[3]	SI[2]	2, 1, 3
	SB[8]	SI[8]	SI[1]	1, 1 ,1

Also, UrC can dynamically compose the cyber society. Analyzing Table 2, cyber society can be organized by users, who has same configuration / same purpose according 'SB', 'SI', and 'SF', the result are in Table 3. For example, who can get the cyber society by service based [6] are User D and User F.

Table 3. Society Composition

Type Index	SB	SI	SF
[0]	User E	User A User C	User C User D
[1]	-	User A User B * 2 User F	User A User B User F
[2]	User E	User B User F	User F
[3]	User A User B	User E	User A User E
[4]	-	-	-
[5]	User B	-	-
[6]	User D User F	User E	User B * 2 User E
[7]	User A User C	-	-
[8]	User B User F	-	-

In other example, if we reference on Table 3, User A and User C are able to make a cyber society with 'SI [0]' and 'SB [7]'. And, considering 'SF', User A, User B and User F shares 'SF [1]', therefore they can organize a cyber society based on 'SF [1]'.

4. Discussion

4.1. User Profiling using Security Cost

Table 4 is a notation for experiment in this article.

Table 4. Notation (Reference [11] for simulation)

Symbol	Contents
SI	Space Information
SF	Security Factors
SB	Services
$U_{[1,2,3,....Un]}$	Users
ΔJ_{st}	The change from Time t-1 to t in number of jobs in a area s
C_{st} or C	Total cost in area s
$J_{s(t-1)}$	Set of all jobs in area s in Time t-1
$F_{s(t-1)}$	Set of jobs in flux in area s in Time t-1
$CP_{[1,2,3,....CPn]}$	Contents Providers
T_i	Transmission Time (a:ask, r: reply)
P_j	Processing Time
W	Weight
R	Set of jobs

The time for taking a service in present location of user is defined as $User.profile.vector[U.pv] =< SI, SF, SB, CP_{[1,2,...,n]} >$. And we call the expression is as *user. profile*.

$$User.profile.vector[U.pv] =< SI, SF, SB, CP_{[1,2,...,n]} >$$

$$C(si) = T_{si} \cdot (w_{si} \cdot P_{si}) \quad \cdots\cdots\cdots (1)$$
$$C(sf) = T_{sf} \cdot (w_{sf} \cdot P_{sf}) \quad \cdots\cdots\cdots (2)$$
$$C(sb) = T_{sb} \cdot (w_{sb} \cdot P_{sb}) \quad \cdots\cdots\cdots (3)$$
$$C(cp_1) = \{T_{cp1.a} \cdot (w_{cp1} \cdot P_{cp1})\} + T_{cp1.r} \quad \cdots\cdots (4)$$

Basically, the cost, which be processed in user location, defines like (1) (2) (3), then it will be recognized to user location through processing of (1) (2) (3), and finally users get contents by (4). Variables in each expression are the number of CP, transmission time, the number of user's devices etc [Figure 5]. w_{si}, w_{sf}, w_{sb}, which was defined in each expressing get same value since using by same user. Also, T_{si}, T_{sf}, T_{sb} are able to definition same value for processing by same user and same device (5).

$$C(U) = [\sum_{i=1}^{T_n} f(T_i) + \sum_{j=1}^{P_n} f(P_j) \cdot w] + (\sum_{k=1}^{CP_n} f(CP_k)) \quad \cdots\cdots (5)$$

4.2. User Modelling

Figure 5 is the experimental model for one user. User has some digitals devices at that same time, each device can receive different contents and can ask to different CP. User usually can use a normal senor (Sensor can be involved each digital device or user can keep as integrated sensor). Generally the current system takes sensor's task by sending the signal from each digital device of users. When each digital device sends the signal to CP, SF already defined in Table 1, which is security factor for each device, will be transferred in concurrent. And, each job dynamically can be generated and removed (destroyed).

$$\Delta J_{st} = C_{st} - |J_{s(t-1)}|, \quad \cdots\cdots\cdots\cdots (6)$$

We define notation (7) as the set (6) for all tasks. We are able to reference notation (7) with new generated task, or in working task [11].

$$J_{st} = \begin{cases} J_{s(t-1)} \cup F, & if \Delta J_{st} > 0, \\ J_{s(t-1)} & if \Delta J_{st} = 0, \\ J_{s(t-1)} - F_{st}, & if \Delta J_{st} < 0, \end{cases} \quad \cdots\cdots (7)$$
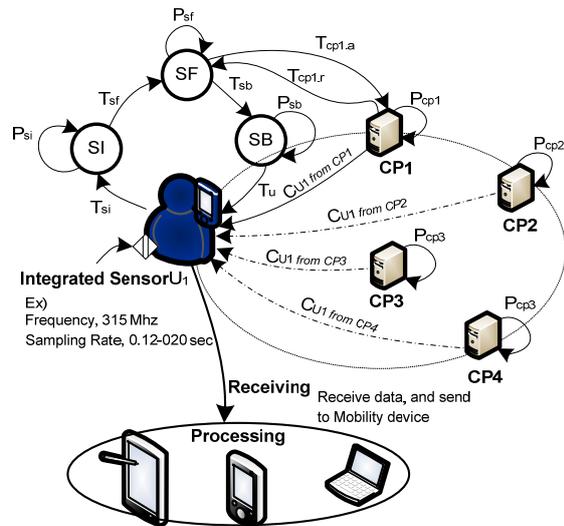
Figure 5. Experiment Model of U1

And, (8) and (9) are defined with processed job in only one device of user [11].

$$F_{s(t-1)} = \{ j \in J_{s(t-1)} \}, \quad \text{………….……….. (8)}$$

$$\left| F_{s(t-1)} \right| = \left| \Delta J_{ss} \right|, \quad \text{………………….…… .(9)}$$

If there be happened new task, ex, adding or removing, in that model [Figure 5], notation (9) would be changed in real time. However, notation (9) has no security module. Therefore, if we put security module into notation (9), then we get notation (10).

$$\left| F_{s(t-1)} \right| = \left| \Delta J_{ss} \times SF \right| \quad \text{…………..……... (10)}$$

4.3. Experiment

We took a simulation with MATLAB and set the configuration for experiment (Table 5). And we also set average 2.5 km through 3.5 km for user moving speed, two devices for one user. Each device has three services.

Table 5. Experiment definition

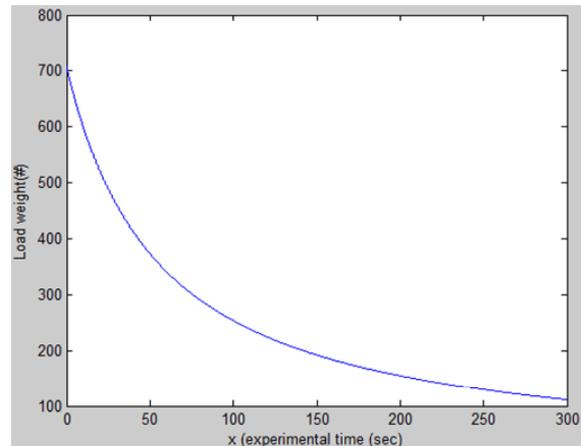| Definition	Value
Experiment Time	300 sec
The number of User	30
Walking Speed	2.5-3.5 km
The number of device a user	2
The number of service a device	3
The number of area in section	4

Figure 6. Load Weight of Notation (4)

We are not sure the security definition size, that is, a storing bucket size or key storing module for encryption module, therefore we assume that the size for one processing is 1k. When it begins first simulation, because it has to take a security process for 30 user's devices, approximately the load weight almost reaches 700. However, whenever time passed, the result was decreased step by step. I set all users quit to get service or get to be out of service area depending on time flowing for simulation. Figure 7 shows us the result of utilization. Slight increasing means the result of not taking security processing, sudden increasing means the processing with security. Before, we make an experiment, we set 100 for utilization and that value is to be not using security module.
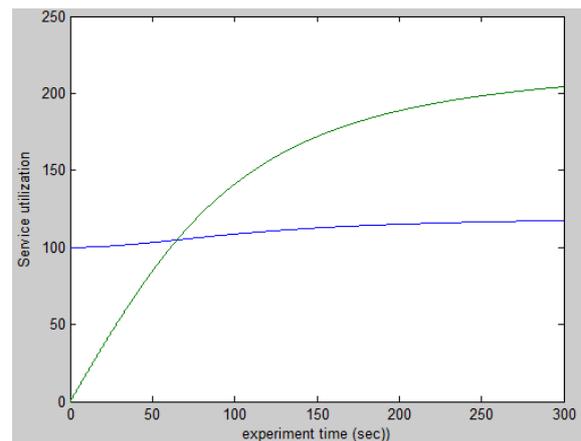

Figure 7. Service Utilization

The reason of rush increasing was for set to make a temporary society, who among users with common purpose, who has to get security processing for society

organization, during experimentation time. In addition, some of the reasons are kind of security factors changing, or real time reacts to context alteration by users changing, etc. All of that make an affection to service utilization.

4.4. Situation in Urban Life (in CSI NY S6, E2)

Scene #1

A driver drives toward his destination. Because it's the first time to visit, he uses GPS. However, GPS give him wrong direction information. (Originally, he is supposed to go Luxury Hotel in midtown.). After notice this strange situation, the driver urgently calls the service center. But, the voice from telephone is strange also, and the strange guy already knows the driver's name. The attacker who has strange voice had hijacked 911, and then he remotely let ring, turn on/off the driver's car. Certainly, the driver exactly put the destination's information to GPS. Nevertheless, he arrived the strange area where is dark and dangerous. Surely there is no problem in his computer, his GPS, and his Car. What happened?

How Attack?

CSI (Crime Scene Investigator) found out the wrong signals from GPS, who operated the GPS to control by attacker, through their analysis. Finally, the illegal operate made the wrong signal. Also, they knew some problem from one of BTS (Base Transceiver Station) before the driver's accident. Also, the attacker already let operate a micro-process beneath bonnet of the car. Finally, the recovery system in car found unauthorized signal. Then the attacker could control the car after using this signal.

Context Analysis

We put all kinds of contexts into Table 6 from Scene #1. As all authors see them, there are various contexts, ex., contexts of user devices, context of car, contexts of networks, contexts of street, context of destination, and all user contexts (see Table 6), around the driver. And they need to be protected among their relations from all attacks. Because the driver didn't process any security module for all contexts during his trip, the put into dangerous situation.

One of Solutions

We usually define Scene#1 is in Ambient Intelligence (AmI). AmI can apply all users take a reaction to dynamic changing in all situations without hesitation. Finally, in this case, all contexts will be recommended to use ISyRAmI SF for security.

Table 6. Context Classification

User	Application	Security
Car	**a.Dest_Car.#1**::=[Speed:Car.Tem:Distance:Fuel:Remain.Time:]	**Sec.Policy**::=[Car:Users:Devices:Road:Dest],
User / Devices	**a.Driving.#1** ::=[User.D:User.Voice] **a.Device.#1** ::=[User.Info.#:Meeting.Time:...]	**Car.Sec.#1**::= [Auth.T:Author_T:Issued.Date:Key]
Road	**a.Loc.#1** ::= [GPS#:Dev.ID.#:Time:Brightness **a.Traffic.#** ::=[	**Devices.Sec.#1**::= [Auth.T:Author_T:Issued.Date:Key]. **Devices.Sec.#..**::= [Auth.T:Author_T:Issued.Date:Key]
Destination	**a.Dest.#1**::=[GPS#:Temperature:Latitude:Longitude:...] **a.Dest.#2**::=[d.name:d.Room#.d.R_conditions...] **a.Dest.#3**::=[users.info:..]	**Devices.Sec.#n**::= [Auth.T:Author_T:Issued.Date:Key] //Same with Users **Road.Sec.#1**::= [Auth.T:Author_T:Issued.Date:Key]
Users .1,,,n	**a.User.#1**::=[:::] **a.User.#2**::=[User.a:User.b:User.C...]	**Destination.Sec.#1**::= [Auth.T:Author_T:Issued.Date:Key]

5. Conclusion

We studied how use this kind of context with safe by users and by user devices in urban environment. To use them in urban space, we also researched the security factors changing, that is, the way to react in real time against whenever context changing. Also, this character belongs to urban space. In this paper, we studied the react way for an authentication of real time services and for user with real-time including service changing, security factors changing. Those can by objects changing which is organized in urban environment, users object (user, user devices) etc, in future. As we see figure 6 and figure 7, there give some affection to utilization and load weight according to security processing. Above all, it is the most important to make a light security module or light security factors for users safe using. UrC offers more dynamic environment than Ubiquitous Computing. Therefore, In future, we need to study more to make light security module, for example, light encryption algorithm and light key size etc.

Acknowledgments

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