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USE OF RELATIONAL ALGEBRA WITH RESPECT TO ACCESS CONTROL MECHANISM FOR RISK PATTERN IN THE OPERATING SYSTEM

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Abstract:

The access control mechanism on the Unix operating system is the main subject and emphasis of this research article. The risk analysis is a continual process that evaluates how successfully an operating system controls access to users, files, and applications. This is why, in order to accomplish our goal, we must constantly monitor, identify, and correct our operations, resources, and technology. As a result, the suggested ACM technique will be extremely helpful in preventing access from illegal outside sources. Through access control methods that demand Read, Write, and Execute across a UFS on a real-time operating system, this accountability is deployable. With pervasive, ubiquitous, and self-autonomous system resources for accountability and actionability to prevent our system, this algebraic relational mechanism would remove the disorder and uncertainty. The Algebraic Relational Logic (RFOS) suggested here has significant control over business, technology, and resources to address uncertainty in an organised manner at the appropriate moment. The objects, subjects, input, output, domain, and range would be systematically mapped to resource integration, communication, and synchronisation. Through the use of this algebraic ACM, which would benefit BCP and DRP, we must safeguard our secure business.

Keyword:Algebraic relational function, Real time operating system, Function Relation Operation Services, Ordinary Directory &Spl File,UserGroup Other, Read,Write, Execute,Prevent Detect & Correct; Access control; Unix file system.

1. Introduction

The theft of information and services has escalated in the twenty-first century due to the growing demand for system security on business, computer, and communications technologies. A crucial risk assessment tool for safeguarding system devices is the advanced Unixoperating system control and audit (users, files, kernel). The most crucial component of transmission and communications security, with an ever-rising danger, is the preventative audit. While system control is directly related to the quality of standards and services, this access control method is inversely proportional to risk. Individuals who access sensitive information on files, directories, applications, system software, servers, and networks are held accountable by the access control mechanism. The Unix access control mechanisms used for this authentication require availability, reliability, and integrity through the real-time audit process. We have to develop the method & mechanism for risk managementon the operating system based on available product,process, technology, business & resources.

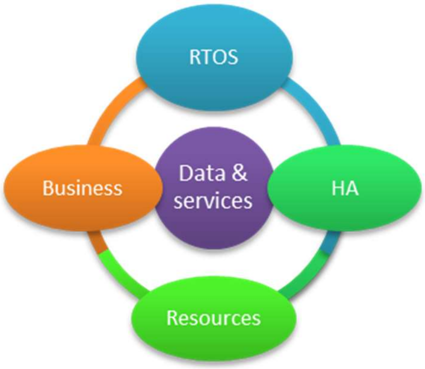


Figure 1. Technology, Business & Resources Protecting data & services on HA

1.1 Relational Algebra

An unordered collection of unique things is how we defined a set. The sets {u, g, o} and {g, o, u} both represent the same set because the sequence is irrelevant. An ordered collection of unique things is referred to as an ordered set. Let's take a look at the Unix file system. Its properties are {o, d, s} and { r, w, x} respectively. Many modern computer languages, such as LISP, are instances of ordering sets.

An ordered pair of objects is a pair of objects arranged in some order. Thus, in the set {U, G} of two objects u is the first and g is the second objects of a pair, therefore, (u,g) and(g,u) are two different ordered pairs.

An ordered triple is ordered triple of objects (u, g, o) that can be written as another form of an ordered pair as {(u, g), o} and the file system attributes can be represented as an ordered pair as (r, w, x) can be written as {(r, w), x}.

A set of order pair is called a finite set, if there is one-to-one correspondence between the elements in the set and the elements in some set { u, g, o} and { r, w, x } respectively. These relations and function may be happened as one to one, one to many and many to many or revered ordered. We have to mapping the domain & Range through ACM of RWX, because we have to prevent, detect & correct the UFS form uncertainty.

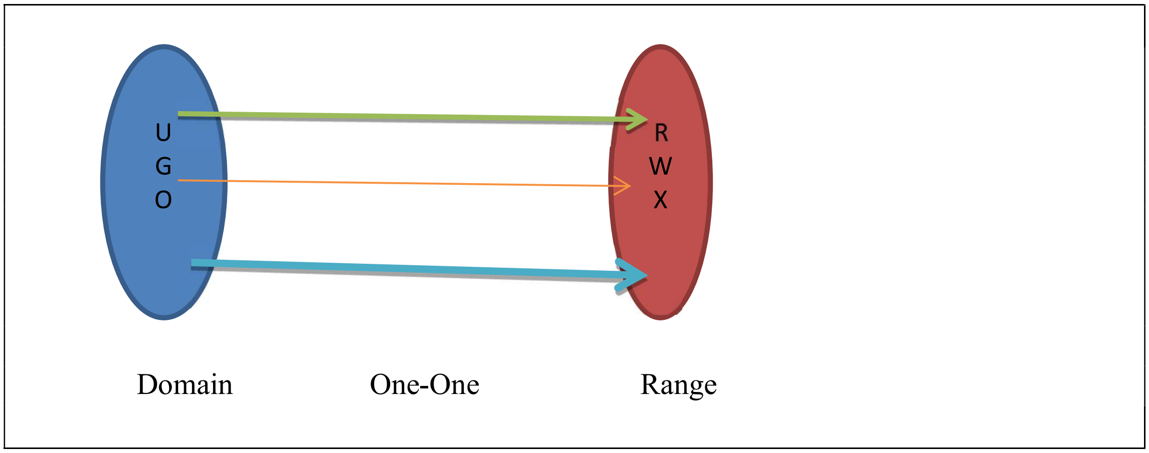


Figure2.One-One mapping withUGO & RWX

We have to mapping one-one (Domain & Range) through ACM of RWX, because we have to prevent, detect & correct the UFS form uncertainty.

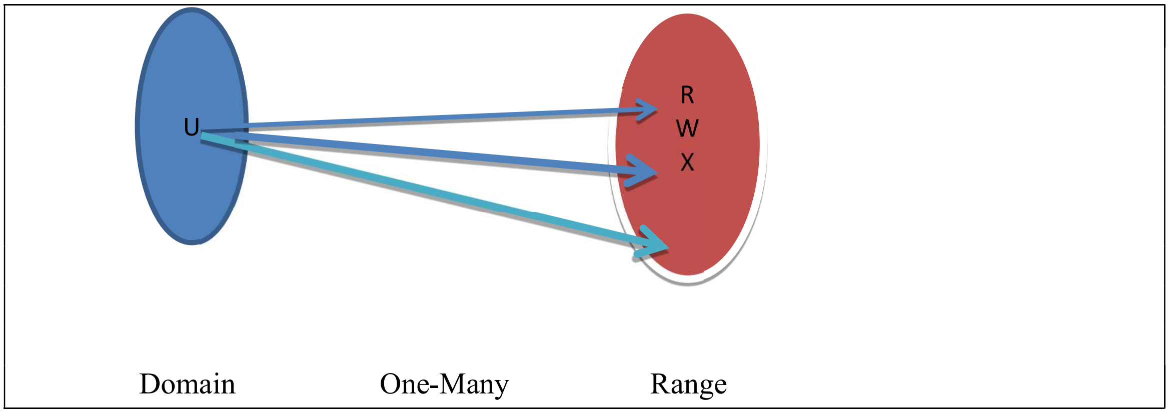


Figure3.One-Many mapping withU & RWX

We have to mapping one-many (Domain & Range) through ACM of RWX, because we have to prevent, detect & correct the UFS form uncertainty.

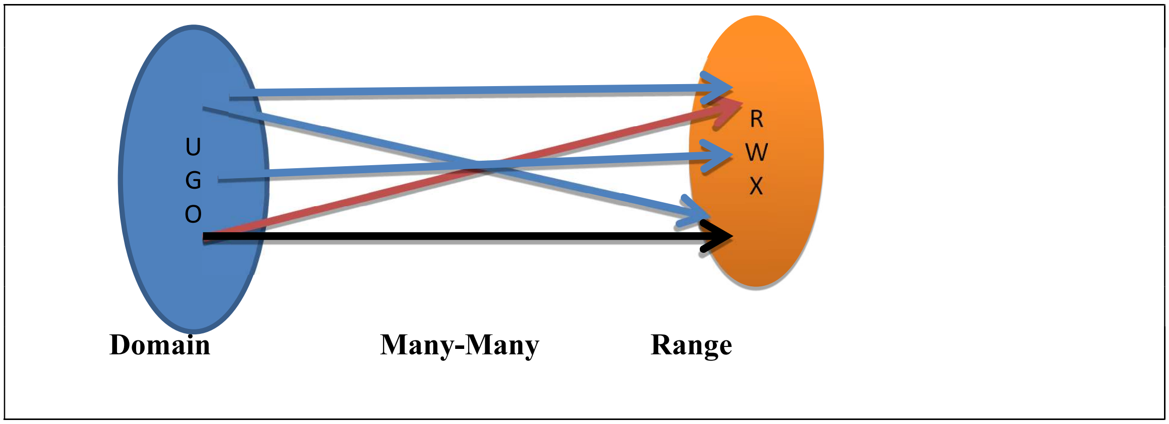


Figure 4. Many-Many mapping with UGO& RWX

1.2 Real Time Operating System

The highly secure operating system of a computer depends on a variety of technologies.
Tools and utilities that operate effectively and consistently all around the world. The current operating system gives users access to a variety of resources and gadgets that are useful for both internal system software and external gadgets like LAN/WAN communication networks. The most significant and widely used system software (programme) that runs on the processor of the computer is the sophisticated operating system (kernel). An operating system is required for every general-purpose computer system in order to execute additional various application programmes (Das, 2009; Sun-Microsystems,2002).

The advanced operating system chooses which applications should run in what orders and how much time should be allowed for each application before giving another application a turn in the large scale operating system, the multitasking, multiuser, time sharing operating system where multiple programmes can be running at the same time. It controls how several apps share internal memory. It manages input and output to and from connected hardware devices, including dial-up ports, hard discs, and printers. An operating system can decide how to divide a programme to run on several processors at once on computers that support parallel processing (Das, 2009; Sun-Microsystems,2002). The users are accessing the shell, then preventing the UFS through ACM (RWX), that graphical diagram presented here to co-op with relational algebra.

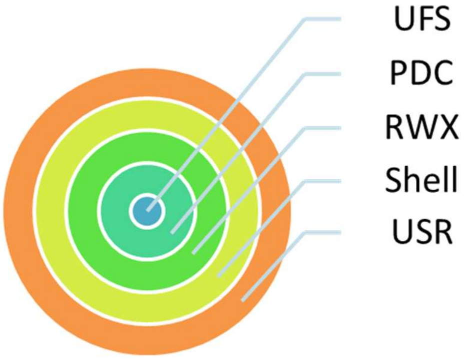


Figure 5.USR Preventing the UFS

1.3 Risk Analysis

The first step in the risk management technique is the analysis and identification of risks. Today, every firm uses risk analysis to ascertain the scope of any potential threats and the risk involved with each stage of the life cycle of an IT system and its subsystems. As mentioned in the risk mitigation model & approach, the output of this process aids in the identification of relevant controls (PC, DC, & CC) for decreasing or eliminating risk during the risk mitigation process. The risk analysis technique consists of the following eleven major steps, in that order: System characteristics, Risk identification, vulnerability identification, risk analysis, risk mitigation, control analysis, likelihood determination, impact analysis, risk determination, control recommendations, and results documentation are the steps in the risk management process (Kramer, 2003; Weber, 2002).

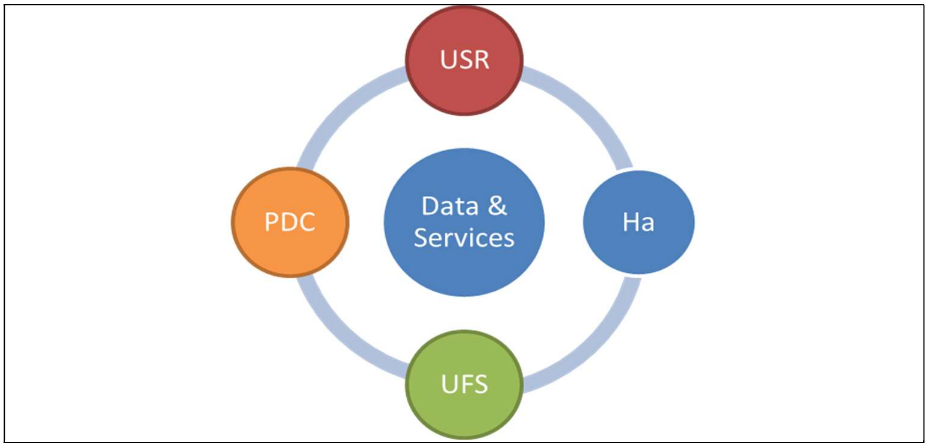


Figure 6.USR, PDC & UFS Preventing Data & Services

2. Background (Access Control Mechanism)

An essential preventative control and audit process is the access control mechanism. Protecting system resources from unauthorised or unwanted user access is a common way to characterise the goals of an access control system (FS, OS,Database). This goal could just as well be defined in terms of the best information sharing from a business standpoint. Since making information accessible to users and applications is the primary goal of IT (Kai, 2008; William, 2009; Tanenbaum, 2010). The more resources are shared, the more likely it is that resource protection will be compromised; nevertheless, a well-managed and efficient access control system actually encourages sharing. In its absence, sharing of data may be considered too, but this is a suitable fine-grained access control system can enable selective sharing of data. The access control mechanism is concerned with determining the allowed activities of users, mediating every attempt by other user to access a resource in the system.The complex information technology (IT) infrastructure can implement access control systems in many places and at different levels. The real time operating systems use access control to protect files RTS (Das, 2009; O' Reilly, 1995; Sun-Microsystems, 2002).

3.Techanical Literature Review

It is highly helpful to get real-world facts and proof by conducting a real-time UNIX operating system, UFS ACM book study, and survey on system security and risk management. It is one of the procedures that is ongoing continuously. Analyzing and judging real-time data takes a lot of time. Numerous text and reference books aid in helping us identify the true problem. To analyse this fundamental data, reference works like The Sun Microsystem UNIX SUN Solaris system Administration guide: Vols. 1 & 2 and O' Reilly, Essential of System Administration are highly helpful. For our business and resources to be secure, dependable, and highly available, we must concentrate on system-specific RTS like UNIX OS. Therefore, the top management have to decide& develop the ACM model on Development, Deployment & Production level of UNIX Machine. We must concern with dig out the security mechanism & model for risk analysis based on technology survey and data collection.

3.1 Data Collection(Technical Survey)

We need to gather the following information and conduct the technical study in order to identify, analyse, and reduce the real-time operating system risk. While waiting for technology to become available, we must evaluate and validate the operating system's integrity, high availability, dependability, scalability, authentication, authorization, and confidentiality of the three primary operating system components: file, shell, and kernel. On a daily basis, we can use several review techniques on the internal UNIX operating system to aid in our risk assessments (Das, 2009; Sun-Microsystems,2002).

Table 1.Sample of RTOS UFS data (DSS)

ACM	**InodeSubject Link U G Date Stamp UFS(Object)**	Risk-Pattern
777	134208 -rwxrwxrwx 1 plpl 727 2014-11-08 16:02 menu1.sh 141049 -rwxrwxrwx 1 plpl 461 2014-11-08 16:17 menu4.sh 141050 -rwxr-xr-x 1 plpl 547 2014-11-08 16:37 menu5.sh 140886 -rwxrwxrwx 1 plpl 505 2014-11-09 16:52 menu	H
701	123901 -rwx-----x 1 plpl 727 2014-11-08 16:02 menu1.sh 765234 -rwx-----x 1 plpl 461 2014-11-08 16:17 menu4.sh 875431 -rwx-----x 1 plpl 547 2014-11-08 16:37 menu5.sh 213456 -rwx-----x 1 plpl 505 2014-11-09 16:52 menu.sh	M
777	213456 –rwxrwxrwx 1 plpl 727 2014-11-08 16:02 menu1.sh 654123 -rwxrwxrwx 1 plpl 461 2014-11-08 16:17 menu4.sh 908761 -rwxrwxrwx 1 plpl 547 2014-11-08 16:37 menu5.sh 123456 -rwxrwxrwx 1 plpl 505 2014-11-09 16:52 menu.sh	H
555	213456 -r-xr-xr-x 1 plpl 727 2014-11-08 16:02 menu1.sh 213452 -r-xr-xr-x 1 plpl 461 2014-11-08 16:17 menu4.sh 456123 -r-xr-xr-x 1 plpl 547 2014-11-08 16:37 menu5.sh 234561 -r-xr-xr-x 1 plpl 505 2014-11-09 16:52 menu.sh	M
444	123412 -r--r--r-- 1 plpl 727 2014-11-08 16:02 menu1.sh 321456 -r--r--r-- 1 plpl 461 2014-11-08 16:17 menu4.sh 751231 -r--r--r-- 1 plpl 547 2014-11-08 16:37 menu5.sh 432123 -r--r--r-- 1 plpl 505 2014-11-09 16:52 menu.sh	M
333	345621 -wx-wx-wx 1 plpl 727 2014-11-08 16:02 menu1.sh 123112 -wx-wx-wx 1 plpl 461 2014-11-08 16:17 menu4.sh 456731 -wx-wx-wx 1 plpl 547 2014-11-08 16:37 menu5.sh 432123 -wx-wx-wx 1 plpl 505 2014-11-09 16:52 menu.sh	H
222	456321 -w--w--w- 1 plpl 727 2014-11-08 16:02 menu1.sh 342123 -w--w--w- 1 plpl 461 2014-11-08 16:17 menu4.sh 453215 -w--w--w- 1 plpl 547 2014-11-08 16:37 menu5.sh 342123 -w--w--w- 1 plpl 505 2014-11-09 16:52 menu.sh	H
111	---x--x--x 1 plpl 727 2014-11-08 16:02 menu1.sh ---x--x--x 1 plpl 461 2014-11-08 16:17 menu4.sh	L

	---x--x--x 1 plpl 547 2014-11-08 16:37 menu5.sh ---x--x--x 1 plpl 505 2014-11-09 16:52 menu.s	
000	---------- 1 plpl 727 2014-11-08 16:02 menu1.sh ---------- 1 plpl 461 2014-11-08 16:17 menu4.sh ---------- 1 plpl 547 2014-11-08 16:37 menu5.sh ---------- 1 plpl 505 2014-11-09 16:52 menu.sh	Access Deny

4. Problem statements

The distribution and allocation of resources for USR, the business owner, across diverse roles, rights, and resources at different management levels is a significant problem (Top, Medium & Low).The automated control of the most recent RTOS is not available, according to the data collected above, and the corrective action and reaction on file systems, applications, and resources are major concerns in today's security-conscious environment. On a complex heterogeneous IT infrastructure, different relationships, functions, operations, and services are occurring amongst various clients, businesses, applications, and resources. Therefore, the main problem with a complicated network, platform, and user application is resource conflicts. As a result, there is no appropriate balance between business, technology, and resources. The PDC is submitting its application using Unix scripting on a UFS ACM.There is a vital issue regarding the resource allocations of the multiple ROLES, RIGHT on UFS at various level of resources management (Developer, Top, Medium & Lower mgmt.)

5. Research Methodology

For better, more dependable, and highly available operation and services, we must define, design, develop, and deploy a variety of ACM approaches. To preserve the preventative access control mechanism while maximising risk management and decision-making, relational algebra methods and processes can be applied at the operating system level. On the basis of the relational mechanism, we must maintain the risk-free environments at the hardware, software, and application level.

5.1 Define

The senior management must establish, plan, and create the necessary policies and procedures to run the company efficiently on an as-needed basis. Lower management is always in charge of operations and services, but middle management must coordinate with and communicate with top and lower management. The relational ACMcontrols for risk analysis that are being offered can be defined and created to guard against specific dangers, unauthorised users, and ambiguity.

Table 2.ALLOCATION OF UFS ATTRIBUTES

Octal	RWX	Attributes-Pattern	Role &Right	USR	RISK-Pattern
0	000	None/Blank (-)	Nil	No Body	Nil
1	001	execute only(x)	Any One	Any	L

2	010	write only(w)	Reserved	R	H
3	011	write and execute(w-x)	Reserved	R	H
4	100	read only(r)	Top Mgmt	UG	M
5	101	read and execute (r x)	Top Mgmt	UG	M
6	110	read and write (r w)	Developer	UG	H
7	111	read, write, and execute (full permissions) (r w x)	Developer	UGO	H

5.2 Development (MPL-Multilayer Propagation)

We are going to develop this relation algebraic logic for betterment of management decision support system

(a) Composition of Relation RoS.

Let A ={U, G, O}, B ={F1, F2, F3}, and C={r, w, x}. Consider the following Relations R and S from A to B and from B to C, respectively:

R={(U, F2),(G, F1), (G, F3)} and S ={(F1, w),(F2, r), (F3, w), (F3, x)}

(b)Matrices Relationship M_R,M_S and M_{R0S} of the respective relations R,S and R0S, and compare M_{R0S} to the product M_R M_S.

Draw the arrow diagram of the relation R and S as in figure.

Observe that U is connected to F2and F2 is access r (Read).

G is connected to F1 & F3, F1 is access to w (Write), meanwhile F3 is access to w(Write)

Now F1 & F2 are facing dead lock (Exclusive Lock), we can avoid this exclusive lock by FCFS

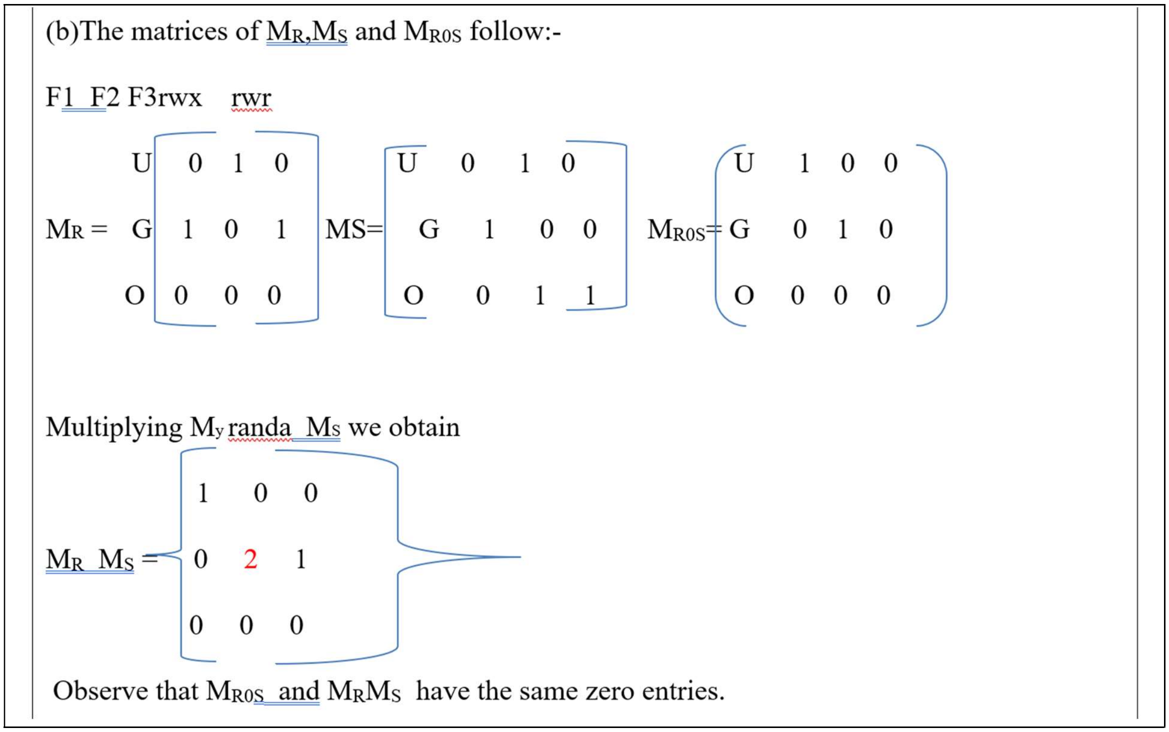
First come & First Serve (Round Robin Principle)

We have R0S ={(U, r),(G, w),(G, wx)}. Now G is getting Read & Write Lock (Share-Exclusive lock)

The User, Group, Others have multiple capabilities of role & right to access multiple resources simultaneously, this graphical diagram is self-adjustable with real time process oriented algebra as mentioned above for risk optimization.

1 NF

Now we are going to established the Matrix Relation among UGO with UFS with associates attributes(rwx) and detected middle element of Row & Column as follow:



(b)The matrices of M_R,M_S and M_{R0S} follow:-

F1 F2 F3rwx rwr

$$M_R = \begin{array}{c|ccc|} U & 0 & 1 & 0 \\ G & 1 & 0 & 1 \\ O & 0 & 0 & 0 \end{array} \quad MS= \left[\begin{array}{cccc} U & 0 & 1 & 0 \\ G & 1 & 0 & 0 \\ O & 0 & 1 & 1 \end{array}\right] \quad M_{R0S}= \left(\begin{array}{cccc} U & 1 & 0 & 0 \\ G & 0 & 1 & 0 \\ O & 0 & 0 & 0 \end{array}\right)$$

Multiplying M_y randa M_s we obtain

$$M_R \ M_S = \left\{\begin{array}{ccc} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 0 \end{array}\right\}$$

Observe that M_{R0S} and $M_R M_S$ have the same zero entries.

1NF. Matrix relation R0S

2 NF [From 1NF we detected the Reserved element 2 which is already defined on Table]

Multiplying M_R and M_R Ms we obtain

$$M_R \, Ms = \left\{\begin{array}{ccc} 1 & 0 & 0 \\ 0 & W & 0 \\ 0 & 0 & 0 \end{array}\right\} = \left[\begin{array}{ccc} 1 & 0 & 0 \\ 0 & R & 0 \\ 0 & 0 & 0 \end{array}\right]$$

Where, W value is already defined as 2 and that one is Reserved (Referred to Table N)

5.3 Deployment (MPL-Multilayer Propagation-Risk Pattern)

We have to prove these above Normal Form that anyone can executes (X) the any of UFS on all the time and any time, which is satisfying to our Anti-Fragile Technology as well as cloud computing. Furthermore, we have to prove this Normal Form as a Graphical Methods as follows:

How is the millions of users accessing the same piece of data and services on real time environment?

How is multiple domain & range of multiple feed forward engine sworking on real time environment?

Now we have remove the W & PDC, Forother world only need X for anywhere, anytime & any things.

For better, stronger, reliable &highlyavailability service, the USR, GRP, OTHERS can able to read & execute only without any problem.RX Graph (Theory)

Table 4. RX (Experiment)

chmod 555 menu*.*

555	213456 -r-xr-xr-x 1 plpl 727 2014-11-08 16:02 menu1.sh 213452 -r-xr-xr-x 1 plpl 461 2014-11-08 16:17 menu4.sh 456123 -r-xr-xr-x 1 plpl 547 2014-11-08 16:37 menu5.sh 234561 -r-xr-xr-x 1 plpl 505 2014-11-09 16:52 menu.sh	Risk Pattern

We conclude that the RX Graph & RX Table are matched with each other

In the cloud services anyone can execute(access) any UFS on every time & all the time.

Graph X (Theory)

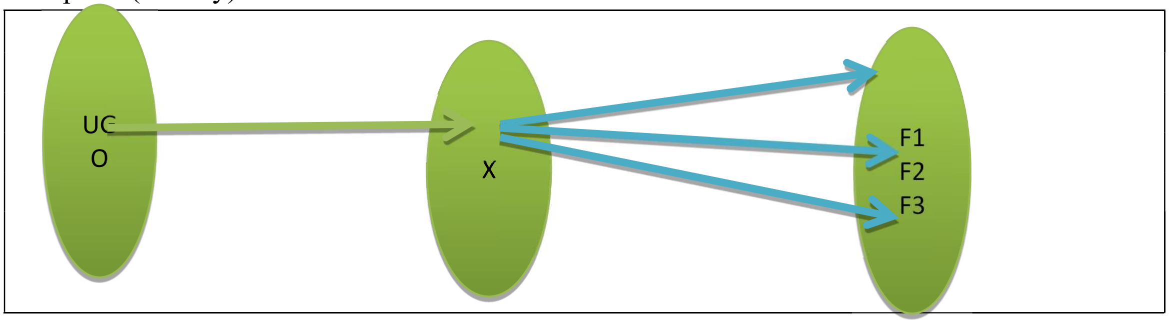


Figure .Multiple USR Capability of R & W over UFS

We conclude that the X Graph & X Table ismatched with each other and performing the process of normalization (1 NF-3 NF).Theory & practice makes man perfect.

Deployment of ACM

Table 5. X (Experiment)-Risk Analysis Pattern.

chmod 111 menu*.* Table X (Experiment)

111	**---x--x--x 1 plpl 727 2014-11-08 16:02 menu1.sh** **---x--x--x 1 plpl 461 2014-11-08 16:17 menu4.sh** **---x--x--x 1 plpl 547 2014-11-08 16:37 menu5.sh** **---x--x--x 1 plpl 505 2014-11-09 16:52 menu.s**	**Low Risk**	**Any one UGO**
000	chmod 000 menu*.* ---------- 1 plpl 727 2014-11-08 16:02 menu1.sh ---------- 1 plpl 461 2014-11-08 16:17 menu4.sh ---------- 1 plpl 547 2014-11-08 16:37 menu5.sh ---------- 1 plpl 505 2014-11-09 16:52 menu.sh	Access Deny	Reserved for BCP

6. Results

This suggested ARF mechanism is a distributed system that operates continuously and achieves our goal flawlessly in terms of mathematics, physics, logic, and algebra. This clever approach aids in continuously providing services in a parallel and distributed computer environment.

This is not the only service model; there are others operating as a fault tolerance method everywhere. We may use this text to learn how to deal with many ACM in any business setting and to use what we learn to many other aspects of our business and technology. The formula is [R+F+O=S=>R].

To maintain a low degree of risk, we must demonstrate the effectiveness of our theoretical and practical technique, model, mechanism, services, and major automated ACM. By using this ARF model, a mechanism for real-time operating system level decision management, we may maintain the preventive system control while achieving the highest technical and commercial goals. By applying this ARF method for total quality management, return on investment, and total cost ownership, we must maintain the balance between business, resource, and technology (RTOS). Prioritizing, assessing, and putting into practise the right risk-optimizing model and mechanism suggested from the risk analysis process are all part of the risk analysis and mitigation process. For the benefit of any company, our suggested ARF algebraic model & technique will unquestionably address our security issue. This suggested model and mechanism will unquestionably optimise time and cost while maximising the performance of the technology, enterprise, and resources. We need to acquire total quality management (TQM) for any firm, wherever in the world, at any time.

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