Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 05, May-2019

# Reliable Array Independent Node and its Implementations

Prof. C. M Mankar, Mohammed Juned Shaikh Shabbir, Virendra Vikramsingh Thakur
Dipartment of Computer Science and Engineering S.S.G.M.C.E Shegaon
Maharashtra, India

***Abstract*— This Paper Was Focused On Evolution Of Rain Technology, Its Requirement, Architecture, Components And Its Implementation On Different Topology. Rain Was Developed For Overcome The Problem Of Current Existing Problem On The Accessing Internet Also Cloud Computing With Help Of Rain Technology Efficient Methods For Fault Tolerances In Different Topology Which Is Not Covered By Cloud Computing. Rain Says That Nodes Will Always Available On Networks And They Use Different Mechanism To Identify Faulty Nodes And Replace Them With Healthy Node. We Will Have Described How Load Sharing, Fault Tolerance That Always Availability Of Node Is Possible In Rain Technology By Implementing Them On Different Topology.**

## I. INTRODUCTION

Rain technology has evolved over the disadvantages of cloud computing and was developed by the California Institute of technology, in collaboration NASA's Jet Propulsion laboratory and the DARPA. The name of the original research project was RAIN, which stands for Reliable Array of Independent Nodes. The RAIN research team in 1998 formed a company called Rainfinit. Rainfinity is a company that primarily deals with creating clustered solutions for enhancing the performance and availability of Internet data centers. RAIN is also called channel bonding, redundant array of independent nodes, reliable array of independent nodes, or random array of independent nodes.

Basically Rain technology has come up with the different network solutions over the internet such as nodes failure, traffic congestion, link failure, data lost. It is a cluster of nodes linked in a network topology with multiple interfaces and redundant storage..RAIN can provide fully automated data recovery in a local area network or wide area network even if multiple nodes fail. Many of the distributed file sharing services such as Gnutella and eDonkey are similar to RAIN systems, but they do not provide adequate redundancy by design—if none of the sharing users online have a copy of some part of a file, the file becomes inaccessible. The RAIN technology concentrates on developing high-performance, fault-tolerant, portable clustering technology, and overcome the problem of eDonkey and Gnutella. Current Existing system of networking has major drawback of single point of failure, client and server architecture and bottlenecks .If some node fails then there is no backup of that node in current existing system, Similarly they do not have enough processing power to handle the traffic they receive .RAIN technology is capable to provide the solution of all the problem of networking which is currently exist . Rain Technology does this by reducing the number of nodes.

## II. ARCHITECTURE

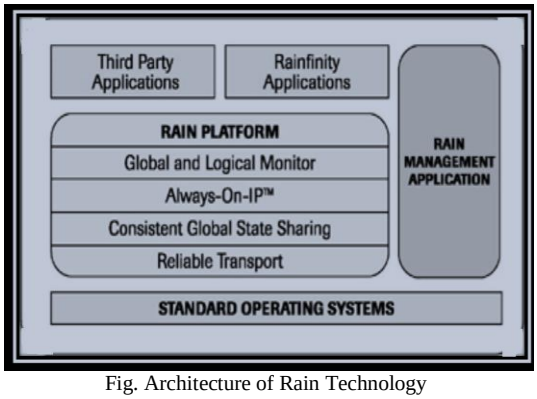


Fig. Architecture of Rain Technology

**A. Reliable transport** Reliable transport ensures the reliable communication between the nodes in the cluster. This transport will ensures reliable packet delivery. It transparently uses all available network links to reach the destination. When it fails to do so, it alerts the upper layer, therefore functioning as a failure detector by fault monitor. This module is portable to different computer platforms, operating systems and Networking environments.

**B. Consistent global state sharing protocol** This protocol provides consistent **group membership**, optimized information distribution and distributed group-decision making for a RAIN cluster. It enables efficient group communication among the computing nodes, and ensures that they operate together without conflict.

**C. Always-On-IP** This module maintains pools of "always-available" virtual IPs. This virtual IPs is logical addresses that can move from one node to another for load sharing or fail-over. Usually a pool of virtual IPs is created for each subnet that the RAIN cluster is connected to. A pool can consist of one or more virtual IPs. In other words, when a physical node fails in the cluster, its virtual IP will be taken over by another Healthy node in the cluster.

**D. Local and Global Fault Monitors** Fault monitors track. the critical resources within and around the cluster network connections, on a continuous or event-driven basis. They are an integral part of the RAIN technology, guaranteeing the healthy operation of the cluster, Basic use of fault monitoring.

**E. Secure and Central Management** This module of Rain Technology offers a browser-based management GUI for centralized monitoring and configuration of all nodes in the RAIN clusters. The central management GUI connects to any node in the cluster to obtain a single-system view of the entire

International Journal of Engineering Research & Technology (IJERT)
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Vol. 8 Issue 05, May-2019

cluster. It actively monitors the status, and can send operation and configuration commands to the entire cluster.

## III. FEATURES

***A. Communication*:** As the network is frequently a single point of failure, RAIN provides fault tolerance in the network through the following mechanisms.

*1)* ***Bundled Interfaces*:** Nodes are permitted to have multiple interface cards. This not only adds fault tolerance to the network, but also gives improved bandwidth.

*2)* ***Link Monitoring*:** To correctly use multiple paths between nodes in the presence of faults, link- state monitoring protocol is used that provides a consistent history of the link state at each endpoint.

*3)* ***Fault-tolerant Interconnects Topologies*:** Network partitioning is always a problem when a cluster of computers must act as a whole. We have designed network topologies that are resistant to partitioning as network elements fail.

***B. Group membership*:** A fundamental part of fault management is identifying which nodes are healthy and participating in the cluster. If any node from group fails, its work is immediately handled by another member from group. Strong group management of Rain Technology gives the different feature of load sharing, handle network congestion and efficiently handle node or link failure.

**C. Data Storage:** Fault tolerance in data storage over multiple disks is achieved through redundant storage schemes like RAID (Redundant array of independent disk). If any node or disk fails then redundant data stored at another node provide the information of failed node.

## IV. TOPOLOGY USING RAIN

Rain technology helps in building the structure of topology in such a manner that it minimizes the number of nodes and removes the extra nodes. It is able to provide the solution by minimizing the total number of nodes in network between client and server. As the total number of nodes is minimum, so the data transmission time will also be reduced from source node to destination node. Secondly, delay factor will also be reduced and data can be transmitted within less period of time.

***4.1*** **Star Topology :** In star topology all the nodes are attached to Central HUB or switch in the figure. All the nodes in network communicate with one another via Central HUB as shown in following figure

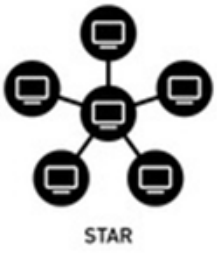


Fig. Star Topology

**4.2 Star Topology Using Rain**: We can place switch at each Node of network and Each node can be connected with few another node in network as shown in Figure apart from central node so if central node fails then node can communicate with rest of node of network by using another path available. If central node fails then node-2 can communicate with another path with node-1 and node-3. Suppose further any one link of node-2 fails even then node-2 can communicate with rest of network. Node-2 will be disconnected if both outgoing link and central hub fails.

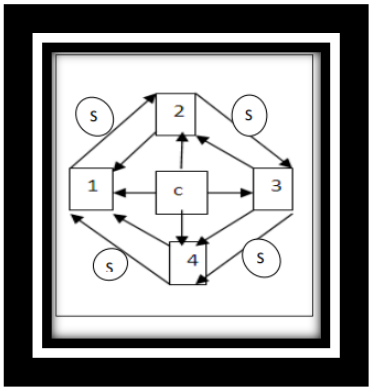


Fig. Star topology using Rain

**4.3 Ring Topology :** In Ring Topology one node is connected with another node and forms a ring like network as shown in Figure.

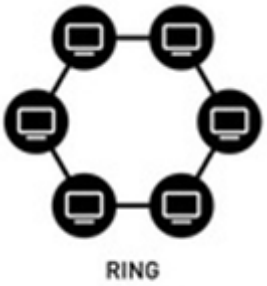


Fig. Ring Topology

There are two Main problem of ring network :

**1.** If one node of network fails then whole network fails.

**2**. **Scalability :** if we add more nodes in network then token needs more time to reach at destination node, thus delay time increase**.**

**Ring Topology Using Rain:** *here C is computing node are* nodes are attached with another nodes of network are connected to switch using diameter method such that in case of node or link failure can communicate with one another. Nodes are connected with other node which is on longest distance, which helps to reduce delay to transfer token.

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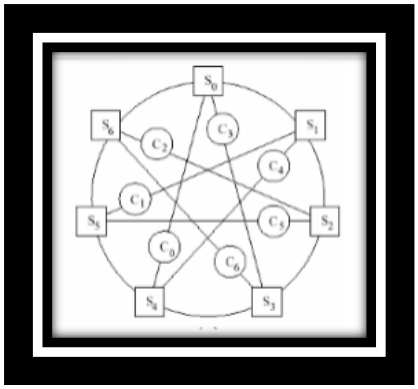

Fig. Ring Topology using Rain

As shown in above Figure every nodes are connected with another node which are far from them and they can suffer upto 2 -3 link failure. If any link in above ring topology fails then via another duplicate path node can communicate with another node in network.

**4.6 BUS Topology Using Rain:** Nodes of Bus Topology are connected through Backbone cable as well as switch, as shown in following in figure. So each node in bus topology can communicate with rest of network by using either switch or backbone cable. Node are connected with different switch so that they can reach to all node of network as in figure.

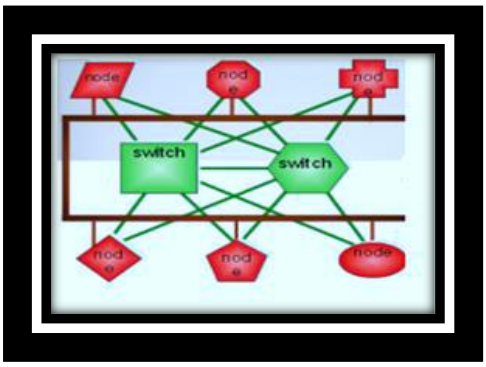


Fig. Bus Topology using Rain

## V. ADVANTAGES

1.The Rain Technology able to solution minimized number of node between client and server for fault tolerance This technology when applied in the different topologies will increase the robustness of each topology. All nodes will be active throughout the topologies and can handle the load balancing.

2. In Rain Technology There is no limit on the size of RAIN cluster. Adding new node in Rain technology does not increase delay.

3. Another advantage of RAIN is its continuous availability. Eg as in case of Rainwall, it detects failures in software and hardware components in real time, shifting traffic from failing gateways to functioning ones without interrupting existing connections.

4. This software technology is open software and highly portable.

5. Rain Technology supports Hot -Swap mechanism.

6. There is no concept of master-slave or client server relationship in Rain technology. In Client server architecture client send request to server for web page and if server is down then communication between them fails. So this problem does not arise in network which used rain concept.

7. It is highly efficient in load balancing, traffic congestion control due to its strong group membership management.

## VI. DISADVANTAGES

1. As the rain technology requires placement of switches in between of structure, so it becomes little expensive.

2. Installation and configuration is time consuming and requires maintenance also.

3. Although if the node of the topology fails, it will not disturb the topology completely as mentioned above but if the switch fails, it affects the network partially and switch has to be repaired as early as possible.

## VII. APPLICATION

Below listed are some of the applications of RAIN:
video server (RAIN Video), a web server (SNOW) ,and a distributed check pointing system (RAINCheck) etc. These applications indicate quick failover response, little overhead and near-linear scalability of the Rain core protocols:

**SNOW (Strong Network of Web servers):** The first application, called SNOW, is a scalable Web server cluster that was developed as part of the RAIN project.

**RAIN Video:** RAIN Video application is a collection of videos written and encoded to all nodes in the system with distributed store operations.

**Rain Wall:** Rain Wall is a commercial solution that provides the fault-tolerant and scalable firewall cluster.

**RAIN Check**: Rain check is a Distributed Check pointing Mechanism; it implements a checkpoint and rollback/recovery mechanism on the RAIN platform based on the distributed store and retrieve operations.

## VIII. CONCLUSION

it can be concluded that rain technology is solution for the disadvantages of Cloud Computing, Rain Technology proven to be the stronger technology when compared to Cloud computing we use Rain technology in all types of topology for fault tolerance but cloud computing can not , Rain technology can be embedded into various layer of OSI model which will definitely removes the problem occurring at different layers such as link break up, point to point failure, traffic congestion, load balancing. Rain technology at data link layer will help in sequencing and time to time delivery of data packets. Although there are some disadvantage of Rain technology which can be overcome by SNOW technology. SNOW (Strong network of web server) is scalable Web server cluster that was developed as part of the RAIN project.

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