AI use in Automated Disaster Recovery for IT Applications in Multi Cloud

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ABSTRACT

Artificial intelligence (AI) has significantly impacted various industries, including disaster recovery (DR) planning for IT Applications, virtualization, and Databases. With the growth of servers, Data, and advancements in AI, real-time analytics and time-sensitive applications are now feasible. In disaster recovery, AI can automate processes, initiate DR plans swiftly during untimely downtimes in the IT industry whether it is enterprises, BFSI, manufacturing, or health care IT applications, and provide critical insights. This paper discusses use cases for AI in the DR workflow: pre-disaster, implementation, and aftermath. The benefits and challenges of AI adoption in disaster management are also highlighted.

INTRODUCTION:

Application Disaster recovery consists of a set of defined policies, tools, procedures & workflows that enable the recovery for all or few applications as per customer requirements or continuation of indispensable IT infrastructure, systems, Applications, Web, and Databases following natural calamities like flood, fire, earthquake or human-induced disaster. Hyper-scalars like AWS, Azure & Google have built-in guards against a single failure. For example, in a region, availability zones have different power sources to guarantee that a single power loss will not shut down a region. However, looking at the history of Hyper-scalars cloud region failures can happen, and the impact of disruption upon an organization can be treacherous.

As businesses prepare for unexpected events like natural disasters or cyberattacks, Human mistakes, network issues, and Security issues, or as part of compliance do regular DR drills. Some prominent IT companies offering disaster recovery Applications for infra, application, and Databases include IBM, VMware, Veeam, Carbonite, NAKIVO, etc., In the case of Hypersclars like AWS, Azure, and Google they have their own DR applications to Ensure business continuity across cloud and physical sites, these services involve data recovery drills, timely patches, operating system management, and intelligent automated processes for data replication and workflow management.

When disaster hits your application, an entire organization panics and gets busy recovering systems and trying to get business as usual as soon as possible so that there should be the minimum impact on business applications as it may lead to revenue leakage for end users and the organization.

Despite technical advancements in IT infrastructure there are monitoring applications that give you the point-in-time status of infrastructure. Still, these applications will not be able to provide a probability of infrastructure failures, log analysis, continuous learning, security, and optimization of resources.

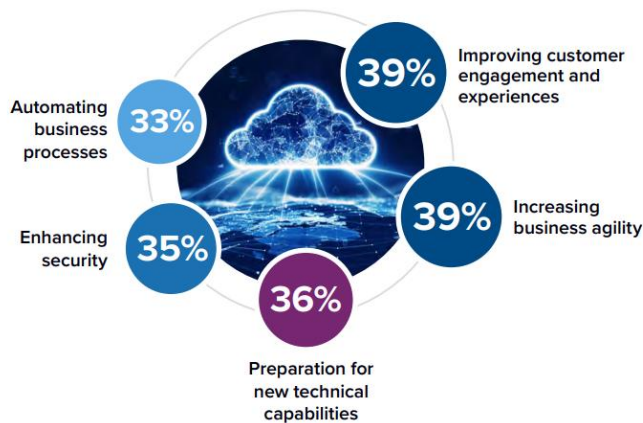Even DRM (Disaster Recovery Management) tools that the IT industry uses are missing.
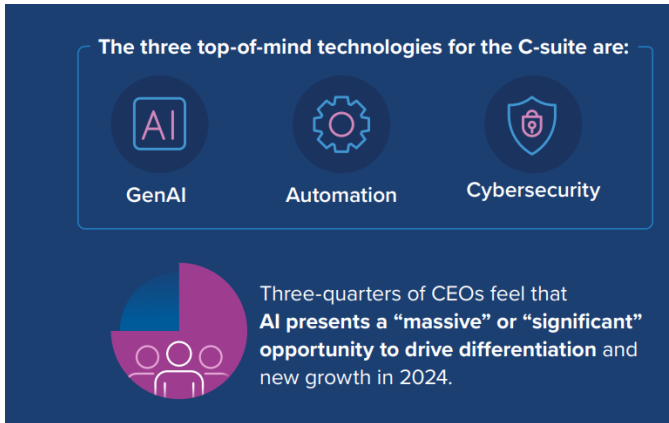
Image Source: IDC

History of Disaster Recovery for IT Applications:

A paradigm shift happened in the late 1970s when the entire world started using computer systems for their business, in1983 USA legislation asked all national banks to have verified backup plans for IT applications if there is any disaster occurred, in early 1990 Disaster Recovery Institute International (DRI) which is the oldest and largest nonprofit that helps organizations around the world prepare for and recover from disasters by providing education, accreditation, and thought leadership in business continuity, disaster recovery, cyber resilience, and related fields introduced DR certifications for IT organizations.

At present the rise of cloud computing, cloud providers, Hybrid cloud, private cloud, and multiple applications that are running across the globe made it more important to have a Disaster Recovery Site.

Challenges customers facing concerning Automated DR

Did you know that 93% of companies without a disaster recovery plan who suffer a major data disaster are out of business within one year? Customers now have diverse workloads, some from Cloud, and some from hybrid environments. Also, many are using DevOps, FinOps, notebooks, DevoSecOps, and cloud natives like dynamo DB, Elastic file system, Glue, etc. in AWS & similarly cloud build, cloud DNS, cloud file store, cloud run, etc in Google Cloud. All automation at primary which they want to be automated during DR situation.

Each customer especially E-commerce has microservices, it's difficult to automate during DR for different applications with different RPO & RTO.

There are multiple components involved for DR like DNS, Interconnects, VPN, Storage, Servers, DB, Load balancer, etc. When you plan DR in hyper-scale everyone has their own components and deployment plans which is cumbersome for IT guys.

Machine Learning how can it get integrated into Automate Disaster recovery; one can use a Supervised Learning Algorithm which can be used to understand servers' behavior by running ML on the server's log and data that is available with its server.

For Application disaster recovery we can use natural language processing (NLP), AI-powered data analytics, AI-driven predictive maintenance, and AI integration in incident response planning, disaster recovery planning, workflow automation, and application risks cyberattack.

AI in workflow automation: This involves integrating artificial intelligence into standard applications, databases, and data processes to streamline automated disaster recovery procedures in enterprises.

AI-enabled workflows can learn from data patterns and previous decisions to automate DR decision-making processes, manage data flows, and provide real-time analytics.

AI in workflow automation can reduce manual or repetitive tasks such as adding, removing servers, and adding new folders, databases, and files this will help DR managers along with operations admins to avoid

mundane tasks and focus on more complex & New challenges in DR drills.

AI can improve efficiency and productivity and reduce errors for your automated DR setup for customers. AI can also help with Data analytics for existing and new data generated for replication between DC & DR.

AI & ML for Predictive Analytics for Disaster Recovery:

Machine learning algorithms can help servers that are hosting applications, web, or Databases with the help of logs analysis can predict future failure of servers, applications, or Databases.

This can help administrators plan any Disaster for IT applications and start working on mitigation plans before the actual disaster hits.

This can be achieved by extreme Gradient boost, gradient boost, random forest, decision tree & logistic regression these are Traditional Machine Learning Algorithms.

Deep Learning Algorithms like single-layer long-short-term memory (LSTM), two-layer (bi-layer) LSTM, and three-layer (tri-layer) LSTM.

AI in Automated Failover and Failback :

Customers are keen to keep RPO as minimal as possible, having said that, RTO in today's 99.99999999 application uptime, automating failover and failback in Disaster recovery as service plays a pivotal.

AI can help customers reduce RTO for customers by helping in decision-making this AI algorithm can analyze real-time data from the server, and application logs and can help admins predict when can primary site needs to failover to the DR site, in this case, one needs to customize parameters like cluster, databases, applications farms servers CPU, RAM, latency, throughput utilization very precisely so that one can avoid failover without proper technical reason, this can be done by AI predictive Analytics.

AI Predictive Analytics can help a hand to future failures in server farms by analyzing past incidents, changes, and problems in IT systems. Predictive analytics can use predictive modeling, data mining &

machine learning for automated failover and failback for disaster recovery.

AI in Monitoring RPO & RTO, Data Lag between Primary and Disaster Recovery Site:

Despite lots of enhancements concerning monitoring IT equipment, network, and bandwidth in current monitoring applications, we can enhance monitoring RPO & RTO in the DRM tool. AI algorithm Page-Hinkley method can help monitor Data Changes ensuring mission-critical data should be available at the DR site during actual disaster, which can help to reduce RPO & RTO.

Natural language processing (NLP) can be used for Monitoring and Automating RPO & RTO and data lag, by which customers can achieve desired outputs from monitoring applications.

AI used for Capacity planning for Disaster Recovery :

In this digitized world where ecommerce organization copes with ever-changing workloads as per customer needs. As customers, they need to focus on Capacity Planning for the production environment as well as the Disaster recovery site, since whatever changes are made at primary need to be replicated to the DR site to avoid disaster. AI predictive analytics can be used for Capacity planning like regression models which can predict future capacity by gathering historical data, A method that often provides accurate and exact forecasts for data is the Holt-Winters, An autoregressive integrated moving average ARIMA & polynomial regression Machine learning Models.

The last thing is the challenges in implementing AI for automated disaster recovery.

AI Implementation few challenges :

Accuracy of Data for prediction: Server failure, Service failure, and application failure AI can predict by running algorithms. As an IT guy, you must have seen that sometimes there is the possibility of false alarms, logs, and information. If such type of data is analyzed by AI it can trigger a false Failover Or Fail back which can disrupt services for your organization.

Complex algorithms need to be developed:

To enable DRM solutions or workflow automation AI ready for disaster recovery needs very complex machine learning algorithms which require skilled resources and continuous upgrade of skills for the development of algorithms. Looking at diverse workloads in this cloud wave and the multiple services that hyper scalars offer is a tedious task.

Factoring extra server resources for AI & ML:

Implementing AI & ML for disaster recovery and automated Disaster recovery needs lots of complex algorithms which need extra resources on each server which can be expensive for organizations like instead of CPU use GPU, All said and done AI implementation and maintenance is an overhead cost.

Conviction & Interpretability in AI for Disaster Recovery:

Interpretability is the degree to which a human can consistently predict the model's result, When a machine learning model is more interpretable, it's easier for people to understand why it makes specific decisions or predictions.

In this IT admins, DR managers, and Project managers will always depend upon the AI model to make predictions about infrastructure which is very dangerous in the long term for IT applications. In some cases, if AI initiates Failover or failback IT admins will not have any ownership for this which can lead to trust issues between humans and AI & ML algorithms.

Conclusion:

AI-enabled Disaster recovery solutions will help in reducing regular repetitive tasks for managing disaster recovery solutions in all types of clouds also in containerization. AI will also help for capacity management of infrastructure along with workflow automation which can help organizations reduce RPO RTO. Fast installation and recovery.

AI also helps organizations by predicting failures along with future readiness.

As advantages are many but few hindrances are also there for AI-enabled disaster recovery which I am sure will be minimized shortly as enhancement and availability of awareness and knowledge about AI will increase in organizations.