HP Nonstop Advanced Architecture (NSAA):-

- built to mitigate / tolerate the fault
- Same files are replicated across all the other nodes
- any changes are applied on all the nodes

Active - Active system:
You build a cluster of at least two nodes in the following fashion:
✓ Both nodes always process transactions, normally sharing the load.
✓ Both nodes carry a full local copy of the same database, which are kept in sync. The synchronization is done using replication software, typically available from third parties.
✓ If one of the two nodes fails, the other takes up processing of all transactions.

Disaster recovery:
Disaster recovery in HP NonStop server architecture refers to the comprehensive strategies and mechanisms designed to ensure business continuity and data protection in the event of system failures, natural disasters, or other catastrophic events that could disrupt critical business operations.
HP NonStop systems are uniquely positioned for disaster recovery due to their inherent fault-tolerant architecture. Here are the key aspects:

- Built-in Fault Tolerance
- Geographic Distribution and Remote Database Facility (RDF)
- Application-Level Recovery
- Network and Communication Resilience

- Hot Standby and Takeover Capabilities

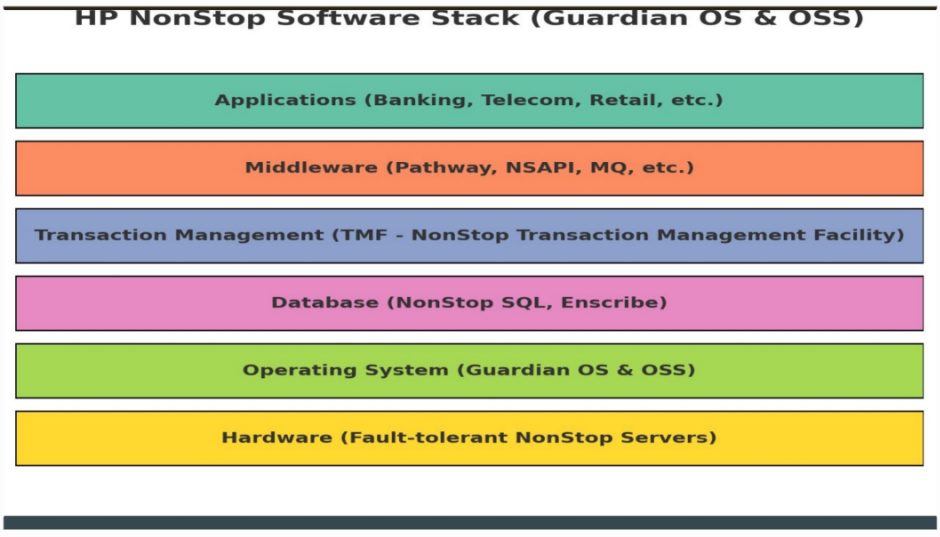
The disaster recovery approach in NonStop environments typically involves multiple tiers of protection, from automatic failover within a single system to coordinated failover between geographically distributed data centers, all designed to minimize recovery time objectives (RTO) and recovery point objectives (RPO) for mission-critical applications.

Linear Scalability:
Linear scalability in HP NonStop server architecture refers to the system's ability to increase performance proportionally with the addition of hardware resources. This means that when you add processors, memory, or I/O capacity to a NonStop system, you get a corresponding increase in throughput and processing capability without diminishing returns.

Use cases:

- Banking and Financial Services
- Telecommunication
- Retail & Payments

Fail Over:
Failover is the automatic and transparent process by which a NonStop system maintains continuous service availability when hardware or software components fail, by instantly transferring active processes, transactions, and system resources to backup components without interrupting user operations or compromising data integrity.



Process pairs:
Process pairs are a fundamental fault-tolerance mechanism in NonStop systems where two identical processes run simultaneously - a primary process that handles active work and a backup process that remains ready to take over instantly if the primary fails.

Normal Operations

- Primary process - Handles all client request and performs actual work
- Backup process - Runs on a different CPU/ node, Stays synchronised but remains passive
- Checkpointing - Primary continuously sends state updates to backup

Failure Scenario

When the primary process or its CPU fails

1. **Detection:** system detects failure within milliseconds
2. **Promotion:** Backup automatically becomes the new primary
3. **Recovery:** New backup process is spawned on another

CPU

4. **Continuity:** client see no interuption in service

Advantage -

- Hardware independence
- State synchronisation
- Automatic management
- Transaction integrity

Transaction:
A transaction is a logical unit of work consisting of one or more operations that must be executed as an indivisible unit - either all operations complete successfully (commit) or none of them take effect (rollback), ensuring data consistency and integrity.

ACID Properties in NonStop Transactions
Atomicity - all steps in a transaction must complete successfully, or all changes are rolled back completely. No partial execution is allowed.
Consistency - Transactions must leave the database in a valid state, respecting all defined rules, constraints, and relationships.
Isolation - Concurrent transactions don't interfere with each other - each transaction appears to execute in isolation even when multiple transactions run simultaneously.
Durability - Once a transaction commits successfully, its changes are permanently stored and survive system failures.

TMF (Transaction Management Facility) NonStop systems use TMF to coordinate transactions across multiple databases, processes, and even multiple systems. TMF ensures ACID properties are maintained even in distributed environments.

Two-Phase Commit - For transactions spanning multiple databases or systems, NonStop uses two-phase commit protocols to ensure all participants either commit or rollback together.

Automatic Recovery - If a failure occurs during transaction processing, the system automatically determines which transactions were in progress and either completes them or rolls them back based on their state at the time of failure.