Praveen Madupu
Mb: +91 98661 30093
Sr. Database Administrator

Backup and retention strategies should **scale with database size, criticality, and business RPO/RTO requirements**.

Let's break this down for **small, high, and very large databases** with detailed recommendations, examples, and best practices.

🛠️ 1. Key Considerations Before Designing the Strategy

- **RPO (Recovery Point Objective):**
  How much data loss is acceptable? (Minutes, hours, or a day)
- **RTO (Recovery Time Objective):**
  How quickly must the database be restored?
- **Database Size:**
  Small (<100 GB), Large (100 GB–1 TB), Very Large (>1 TB)
- **Workload Type:**
  OLTP (frequent transactions) vs OLAP (read-heavy)
- **Storage & Network:**
  Disk space, IOPS, throughput available for backups/restores
- **Compliance Requirements:**
  Retention period (30 days, 1 year, 7 years for audit?)

📁 2. Backup Strategy by Database Size

DB Size	Backup Strategy	Why This Works
Small (<100 GB)	- **Full Backup:** Nightly (or weekly if size allows) - **Differential Backup:** Every 4–6 hrs - **Log Backup:** Every 15–30 mins (if FULL recovery model)	Small DBs have shorter backup windows and fast restores.
Medium/High (100 GB – 1 TB)	- **Full Backup:** Weekly - **Differential Backup:** Daily (except full backup day) - **Log Backup:** Every 10–15 mins	Saves space and time — differentials reduce I/O overhead of frequent fulls.
Very Large (>1 TB)	- **Striped Full Backup:** Weekly (to multiple files) - **Differential Backup:** Daily - **Log Backup:** Every 5–10 mins - **File/Filegroup Backup:** Optional for very large partitioned DBs - **Backup Compression + Encryption** enabled	Full backups can take hours — striping + compression optimizes backup/restore. Filegroup backups speed up recovery for large data warehouses.

🔑 Example SQL Server Backup Command (Striped & Compressed)

```
BACKUP DATABASE [SalesDB]
TO DISK = 'E:\SQLBackups\SalesDB_1.bak',
   DISK = 'F:\SQLBackups\SalesDB_2.bak'
WITH INIT, COMPRESSION, CHECKSUM, STATS = 10;
```

✅ **Striping** spreads I/O load across multiple drives.
✅ **Compression** reduces backup size by 40–70%.
✅ **Checksum** ensures backup integrity.

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3. Retention Strategy by Database Size

DB Size	Retention Recommendation	Storage Best Practices
Small DB	- Keep **7 daily fulls**, 4 weekly, 12 monthly - Keep logs for last 14 days	Can afford to store many copies due to smaller size.
Medium DB	- Keep **last 1–2 full backups**, 2–4 weeks of differentials/logs - Archive monthly backup to cheaper storage (NAS/Cloud)	Rotate backups to avoid consuming expensive SAN space.
Very Large DB	- Retain **only last 1 full backup + differentials/logs** on local storage - Move older full backups to Azure Blob/Glacier/cheap cold storage - For compliance, keep yearly snapshots offline	Saves expensive storage, but still meets audit/compliance needs.

Key Retention Rules:

- Use **maintenance cleanup jobs** or Ola Hallengren's @CleanupTime parameter.
- Move old backups to **offsite storage** (cloud, tape, or external disk).
- Periodically **test restores** — retention policy is meaningless if backups are corrupt or restore takes too long.

4. Performance Optimization for Large Backups

- **Backup Compression:** Reduces size & improves speed.
- **Backup Encryption:** Use AES_256 for security.
- **Striping:** Use multiple backup files on different drives for faster writes.
- **Backup to URL:** Directly write to Azure Blob Storage for long-term archival.
- **MaxTransferSize & BufferCount tuning:** For VLDBs, tune parameters for optimal throughput.

5. Restore Strategy

Your backup plan is only as good as your restore plan. Test:

- **Point-in-time restores** using log backups.
- **Partial restores** (file/filegroup for VLDB).
- **Disaster recovery simulations** at least quarterly.

Example Strategy Summary Table

Size	Full Backup	Differential	Log Backup	Retention
Small (<100 GB)	Daily	Every 4–6 hrs	15–30 mins	30 days on-disk, monthly archived
Medium (100 GB–1 TB)	Weekly	Daily	10–15 mins	14–30 days on-disk, monthly archived
Very Large (>1 TB)	Weekly (Striped + Compressed)	Daily	5–10 mins	7–14 days on-disk, monthly/yearly archived to cheaper storage

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🏆 **Best Practices**

✅ Automate backups using SQL Agent or Ola Hallengren's DatabaseBackup job
✅ Use **CHECKSUM + VERIFYONLY** after backups
✅ Monitor backup job failures with alerts (email/Teams/Slack)
✅ Document **RPO/RTO expectations** with business owners
✅ Periodically test **full restore time** to ensure it meets RTO