Backup System Requirements (Revision 12)

Must■have
1. **Prefer best■tested, proven tools & techniques** — default choice unless documented reason to diverge
2. Automatic local snapshots (hourly/daily).
3. Off■site copy (second USB or strongly■encrypted cloud) for full 3■2■1 coverage.
4. Btrfs subvolumes for logical separation (`@rootA`, `@rootB`, `@home`, `@snapshots`).
5. Boot continuity via the factory ESP on Disk 0.
6. Redundant ESP on Disk 1 kept in sync automatically.
7. Incremental send/receive replication to the USB backup disk.
8. Clear retention policies on both the internal and backup disks.
9. Automatic tolerance & catch■up for the USB disk (queue while away, flush on return).
10. Single shared 64■GB swap partition with safe `resume=` handling.
11. Monthly `btrfs scrub` with alerting.
12. Strong encryption for **all** backup targets.
13. Automatic health monitoring / push alerts (mail, SMS, etc.).
14. GitHub repository to store **all** docs, scripts, and timers.

Should■have
1. **Minimal configuration** — use distro defaults when they satisfy specs; document every deviation.
2. Per■subvolume quotas (qgroups).
3. Swing■space layout on the backup disk.
4. Convertible encryption path for the internal Linux disks.
5. Multi■machine sharing safeguards (per■host subvolumes & retention).
6. Inexpensive providers that still meet the strong■encryption rule.

Nice■to■have
1. Quarterly maintenance checklist.
2. Tool■set documentation (`tool-set.md`).
3. Provider anonymity / privacy extras.
4. GUI rollback tool **(prefer Qt over GTK)**.
5. Automated swing■space reclaim script.
6. Design notes include how well■tested / battle■proven each technique is.

Implementation Requirements

General
1. **Early subsystem testing** — implement and test each major component (snapshots, USB backup, cloud
2. **Small, independent steps** — break work into atomic tasks to avoid leaving Atlantis in a half■working s

Situation■specific (Fedora 40 → Fedora 41 transition)
1. **Automatic snapshots on current Fedora 40 Btrfs root** — use btrbk timers (or Snapper if simpler) so you
2. **Temporary automatic backups to existing NTFS USB drive** — prove the backup flow even on a non■B
3. **Upgrade to Fedora 41 once backups validated** — proceed only when at least one successful snapshot
4. **Enable automatic encrypted uploads to cloud (Wasabi default)** — start with weekly cadence; documen

These requirements merge operational safety with learning goals and will drive the step■by■step Implemen