Backup System – Architecture Design v2.1

(Matches Priority List rev■11 and latest deltas)

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1 Disk & Partition Layout

Disk	Part	Size	FS	Mount	Purpose
Disk■0 (512■GB)	p1	512■MiB	FAT32	**/boot/efi**	Factory ESP
	p2	~rest	NTFS	—	Windows C:
Disk■1 (2■TB)	p1	512■MiB	FAT32	**/boot/efi2**	Redundant ESP
	p2	1■GiB	ext4	**/boot**	Shared boot slice
	p3	64■GB	swap	—	Single swap
	p4	rest	Btrfs `LINPOOL`	`/` (subvolumes)	Main pool

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2 Subvolume Tree

```
LINPOOL
 ■■ @rootA        (/)
 ■■ @rootB        (alternate distro)
 ■■ @home         (/home)
 ■■ @snapshots    (read■only)
 ■■ Atlantis-meta (scripts/docs)
```

Quotas **disabled by default**; enable only if subvolumes contend for space.

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3 Snapshot & Replication Flow

```
Snapper (openSUSE) / btrbk snapshot  →  @snapshots
      | hourly/daily             |
      +-------------------------------+
      | btrbk send → USB (udev■trigger)  |
      | retention: 12m/3y            |
      +-------------------------------+
      | restic + Wasabi (weekly)      |
      | retention: 52w              |
```

* USB encrypted with LUKS2.
* Cloud encrypted end■to■end (restic).

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4 ESP Synchronisation

Mounted ESPs: `/boot/efi` and `/boot/efi2`
Kernel post■transaction hook:

```bash
rsync -a --delete /boot/efi/EFI/Fedora/ /boot/efi2/EFI/Fedora/
```

UEFI `BootOrder`: primary → Disk■0 ESP, fallback → Disk■1 ESP.

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5 Systemd Timers (cron replacement)

Timer	Service	Function
`btrbk-hourly.timer`	`btrbk-hourly.service`	Create local snapshot.
`btrbk-backup.timer`	`btrbk-backup.service`	Send incrementals to USB/cloud.
`btrfs-scrub.timer`	system service	Monthly scrub, alert on error.

Timers provide logging via `journald`, calendar syntax, and proper ordering.

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6 Cloud×Frequency Cost Matrix

Frequency	Provider	Stored GB	$/mo
Monthly	Backblaze B2	200	\$1.00
Monthly	Wasabi	200	\$1.40
Weekly *(default)*	Wasabi	800	\$5.59
Weekly	Backblaze B2	800	\$4.00
Daily	Backblaze B2	6,000	\$30.00
Daily	Wasabi	6,000	\$41.94

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7 Notifications

* **Mail** via Namecheap SMTP (default).
* **SMS** via carrier e-mail-to-SMS gateway (optional).
* Hooks for Matrix/Pushover documented.

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8 Maintenance & Trip Checklists

* Quarterly: free-space check, enable quotas if >85% used.
* Trip checklist: ad-hoc `btrbk snapshot` & `restic backup` before travel.

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9 Tool Set

Role	Tool (default)
Snapshot (openSUSE)	Snapper
Snapshot (other distros)	btrbk
Replication	btrbk
Off-site backup	restic + Wasabi
ESP sync	rsync hook
Encryption	cryptsetup/LUKS2

All choices are **battle-tested** or distro defaults unless otherwise noted.