🚀 Part 1: Understanding Percona XtraBackup

Percona XtraBackup is a hot backup tool provided by Percona that allows you to take backups without stopping MySQL.

✅ Step 1: Add Percona Repository

wget https://repo.percona.com/apt/percona-release_latest.generic_all.deb
sudo dpkg -i percona-release_latest.generic_all.deb

sudo apt update

enable the repo:

sudo percona-release setup pxb-80

✅ Step 2: Install XtraBackup

sudo apt install -y percona-xtrabackup-80

✅ Step 3: Verify Installation

xtrabackup –version

✅ Step 4: Create Backup Directory

sudo mkdir -p /backup/mysql
sudo chown -R mysql:mysql /backup/mysql
chmod 750 /backup/mysql

✅ Step 5: Create Backup User in MySQL

mysql -u root -p

CREATE USER 'backupuser'@'localhost' IDENTIFIED BY 'StrongPass@123';

GRANT RELOAD, LOCK TABLES, PROCESS, REPLICATION CLIENT

ON *.* TO 'backupuser'@'localhost';

GRANT BACKUP_ADMIN ON *.* TO 'backupuser'@'localhost';

FLUSH PRIVILEGES;

✅ Step 6: Take Your First Full Backup

```
xtrabackup \
--backup \
--user=backupuser \
--password='StrongPass@123' \
--target-dir=/backup/mysql/full_$(date +%F)
```

✅ Step 7: Prepare the Backup

Befor restore always prepare :

xtrabackup --prepare --target-dir=/backup/mysql/full_2026-02-22

✅ Step 8: Restore (Testing Only – On UAT/Test Server)

⚠️ Do NOT test on production first.

Stop MySQL

systemctl stop mysqld

restore:

xtrabackup \
--copy-back \
--target-dir=/backup/mysql \
--datadir=/var/lib/mysqlfix permission :

chown -R mysql:mysql /var/lib/mysql

start mysql

systemctl start mysql

✅ Why Use XtraBackup?

- No downtime (Hot backup)
- Works for large databases
- Supports Incremental backups
- Industry standard for production

📘 Core Concepts You Must Learn

Topic	Description
Full Backup	Complete database backup
Incremental Backup	Only changed data
Prepare Phase	Makes backup consistent
Restore Phase	Copy back to MySQL
LSN	Log Sequence Number
Redo Logs	Crash recovery

🔹 Basic Full Backup

xtrabackup --backup --target-dir=/backup/full

🔹 Prepare Backup

xtrabackup --prepare --target-dir=/backup/full

🔹 Restore Backup

systemctl stop mysql
xtrabackup --copy-back --target-dir=/backup/full
chown -R mysql:mysql /var/lib/mysql
systemctl start mysql

🔹 Incremental Backup Example

```
# Full

xtrabackup --backup --target-dir=/backup/full

# Incremental

xtrabackup --backup \

--target-dir=/backup/inc1 \

--incremental-basedir=/backup/full
```

Prepare:

```
xtrabackup --prepare --apply-log-only --target-dir=/backup/full

xtrabackup --prepare --apply-log-only --target-dir=/backup/full --incremental-dir=/backup/inc1

xtrabackup --prepare --target-dir=/backup/full
```

🚀 Part 2: Tablespace Management in MySQL / Percona

Tablespace = Where MySQL stores table data physically.

1️⃣ System Tablespace (ibdata1)

Contains:

- Data dictionary
- Undo logs (old versions)
- Some table data (if file_per_table=OFF)

```
SHOW VARIABLES LIKE 'innodb_data_file_path';
```

2️⃣ File-Per-Table Tablespace (.ibd files)

Each table = Separate file.

```
innodb_file_per_table=1
```

Benefits:
✓ Easy space management
✓ Easy restore
✓ Better performance

3️⃣ General Tablespace (MySQL 5.7+)

Shared tablespace for multiple tables.

```
CREATE TABLESPACE ts1 ADD DATAFILE 'ts1.ibd';

CREATE TABLE test.t1 (
id INT
) TABLESPACE ts1;
```

4️⃣ **Undo Tablespace**

Used for:

- Rollback
- MVCC

Check:

SHOW VARIABLES LIKE 'innodb_undo%';

🚀 **Part 3: Table-Level Backup & Restore (Important for You)**

Since you asked about **table restore earlier**, this is critical.

🔹 Backup Single Table

```
xtrabackup --backup \
--databases="mydb mydb.mytable" \
--target-dir=/backup/table
```

🔹 Restore Single Table (Advanced)

1️⃣ Drop table

DROP TABLE mydb.mytable;

2️⃣ Recreate structure

CREATE TABLE mydb.mytable (...);

3️⃣ Discard tablespace

ALTER TABLE mydb.mytable DISCARD TABLESPACE;

4️⃣ Copy .ibd file

5️⃣ Import tablespace

ALTER TABLE mydb.mytable IMPORT TABLESPACE;

⚠️ Works only when innodb_file_per_table=ON

🚀 **Part 4: Production Best Practices (Very Important)**

✅ Backup Strategy

Type	**Schedule**
Full	Weekly

Type	Schedule
Incremental	Daily
Binlog	Real-time

✅ Always Verify Backup

xtrabackup --prepare --export --target-dir=/backup/full

Test restore on UAT (as you prefer 👍).

✅ Monitor Backup Size

du -sh /backup/*

🚀 **Part 5: Learning Plan (7 Days)**

🗓️ **Day 1–2**

✓ Install XtraBackup
✓ Take full backup
✓ Restore on test server

🗓️ **Day 3–4**

✓ Incremental backups
✓ Practice prepare phase
✓ Understand LSN

🗓️ **Day 5**

✓ Tablespace concepts
✓ ibdata vs ibd

🗓️ **Day 6**

✓ Table-level restore
✓ Disaster recovery drill

🗓️ **Day 7**

✓ Automate backup (cron)
✓ Monitoring + alerting

🚀 **Part 6: Automation Example (Cron)**

```
0 2 * * * /usr/bin/xtrabackup \
--backup \
--target-dir=/backup/$(date +\%F)
```

Script to run the full backup restore :

```
# 1. Stop MySQL
systemctl stop mysql

# 2. Clean datadir
rm -rf /var/lib/mysql/*

# 3. Restore
xtrabackup --copy-back \
--target-dir=/backup/mysql \
--datadir=/var/lib/mysql

# 4. Fix permission
chown -R mysql:mysql /var/lib/mysql

# 5. Start MySQL
systemctl start mysql
```