

In SQL Server, **Hotfixes**, **Cumulative Updates (CUs)**, and **Service Packs (SPs)** are all types of updates released by Microsoft to address issues, improve performance, or enhance security. Here's a detailed explanation of each:

1. Hotfix (QFE - Quick Fix Engineering)

A **hotfix** is a small, targeted software update intended to fix a specific problem or bug in SQL Server. Typically, it addresses an urgent issue affecting certain environments or features, such as:

- Critical security vulnerabilities.
- Severe bugs causing data corruption or system crashes.
- Other high-priority issues.

Characteristics of Hotfixes:

- **Quick and Specific:** Released to address a particular problem affecting a small number of customers.
- **Not Comprehensive:** Unlike other updates, hotfixes don't undergo extensive testing for broad scenarios.
- **Request Basis:** Typically, hotfixes are not publicly available unless specifically requested via Microsoft Support or through Knowledge Base (KB) articles.
- **Rapid Deployment:** Meant for immediate resolution, often before a more formal update or cumulative update is released.

Example:

A critical security vulnerability might be fixed with a hotfix before it's included in a future cumulative update or service pack.

2. Cumulative Update (CU)

A **Cumulative Update (CU)** is a more comprehensive update than a hotfix. It contains a collection of fixes, enhancements, and security updates that have been released since the last Service Pack or Cumulative Update.

Characteristics of Cumulative Updates:

- **Cumulative Nature:** Each CU includes all previous fixes and enhancements from earlier CUs and hotfixes. You only need to install the latest CU to get all prior updates.
- **Released Periodically:** CUs are typically released on a regular schedule (every 2-3 months).
- **Thorough Testing:** CUs undergo more rigorous testing than hotfixes, ensuring better reliability in various SQL Server environments.

- **Recommended for Production Environments:** Microsoft encourages customers to stay updated with CUs, as they contain important fixes for known issues.

Example:

If CU7 is released, it will contain all fixes from CU1 through CU6, as well as any new bug fixes or security patches.

3. Service Pack (SP)

A **Service Pack (SP)** is a larger, more significant update that rolls up many hotfixes, cumulative updates, and sometimes new features. Microsoft historically used Service Packs to bundle fixes and deliver major updates to SQL Server, though starting from SQL Server 2017, Microsoft has moved away from Service Packs and focuses more on Cumulative Updates.

Characteristics of Service Packs:

- **Major Release:** Contains a large number of fixes, including all hotfixes and Cumulative Updates released up to that point.
- **New Features and Enhancements:** Sometimes, service packs introduce new features or enhancements to existing features, providing a substantial update to the product.
- **Stable and Tested:** Service Packs undergo extensive testing and are considered very stable, making them suitable for production environments.
- **Less Frequent:** They are released less frequently than Cumulative Updates (typically every year or more).

Example:

SQL Server 2016 SP2 would include all fixes and updates from the initial release of SQL Server 2016 and any subsequent CUs or hotfixes prior to the SP2 release.

Comparison of Hotfixes, Cumulative Updates, and Service Packs:

Feature	Hotfix	Cumulative Update (CU)	Service Pack (SP)
Purpose	Urgent, specific fixes	Collection of fixes and enhancements	Comprehensive, often includes new features
Scope	Narrow, issue-specific	Includes multiple fixes since the last CU/SP	Roll-up of all previous updates and often new features
Release Frequency	As needed, urgent	Regular (every 2-3 months)	Infrequent (every 1-2 years historically)
Testing	Limited testing	More extensive testing	Very thoroughly tested
Cumulative	No	Yes	Yes
Recommendation	For immediate or specific needs	Regularly apply to stay updated	Apply to ensure long-term stability

Microsoft's Shift in Approach:

Starting from **SQL Server 2017**, Microsoft transitioned from using Service Packs to focusing more on **Cumulative Updates**. All updates, including new features, are delivered through Cumulative Updates, with no Service Packs released for versions beyond SQL Server 2016. This change emphasizes more frequent, incremental improvements and bug fixes, reducing the need for massive, less frequent Service Packs.

Summary:

- **Hotfix:** A quick, narrowly targeted update for critical issues.
- **Cumulative Update (CU):** A periodic release that consolidates all previous updates and new fixes.
- **Service Pack (SP):** A larger, more comprehensive release that includes multiple fixes and often introduces new features (more relevant for versions up to SQL Server 2016).

For SQL Server versions 2017 and later, you should prioritize keeping up with the latest Cumulative Updates to ensure security, performance, and reliability.