

# Kernel Live Patching in SUSE Linux Enterprise Server for SAP applications

## WAS?

Verstehen und Verwenden von Kernel Live Patching in SUSE Linux Enterprise Server.

## WARUM?

Weil Sie unternehmenskritische Systeme ohne Ausfallzeiten sichern wollen.

## AUFWAND

20 Minuten Lesedauer.

## ZIEL

Verstehen, wie Kernel Live Patching funktioniert.

## ANFORDERUNGEN

- Arbeitsfähiges Verständnis von Linux.

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# 1 Einführung in Kernel Live Patching

Mit Kernel Live Patching (KLP) können die neuesten Sicherheitsaktualisierungen ohne Neustart auf Linux-Kernel angewendet werden. So erzielen Sie die maximale Betriebszeit und Verfügbarkeit des Systems, was insbesondere bei unternehmenswichtigen Systemen von Bedeutung ist. KLP bietet daher mehrere Vorteile.

- Wenn Unternehmen bestimmte Compliance-Zertifizierungen beantragen oder beibehalten möchten, sind sie darauf angewiesen, eine große Anzahl an Servern automatisch auf dem neuesten Stand zu halten. KLP kann dazu beitragen, die Compliance zu erzielen und gleichzeitig den Bedarf an Wartungsfenstern zu senken.
- Unternehmen, die mit Verträgen zur Vereinbarung zum Servicelevel arbeiten, müssen für Ihr System ein bestimmtes Maß an Verfügbarkeit und Betriebszeit garantieren. Mit Live Patching ist es möglich, Systeme ohne Ausfallzeiten zu patchen.
- KLP ist Teil des standardmäßigen Systemaktualisierungsmechanismus, sodass keine besondere Schulung oder Einführung zusätzlicher Wartungsroutinen anfällt.

## 1.1 Umfang des Kernel Live Patching

SUSE Linux Enterprise Server for SAP applications Live Patching umfasst Fehlerbehebungen für SUSE-Sicherheitsanfälligkeiten (Common Vulnerability Scoring System, CVSS) ab Stufe 7 sowie Fehlerbehebungen hinsichtlich der Systemstabilität oder Datenbeschädigung. Es ist jedoch nicht in jedem Fall technisch praktikabel, Live-Patches für alle Fehlerbehebungen in den angegebenen Kategorien zu erstellen. SUSE behält sich daher das Recht vor, Fehlerbehebungen in Situationen zu überspringen, in denen ein Kernel-Live-Patch aus technischen Gründen nicht möglich ist. Derzeit werden mehr als 95 % der geeigneten Fehlerbehebungen als Live-Patches bereitgestellt. SUSE CVSS basiert auf dem CVSS v3.0-System. Weitere Informationen zum CVSS finden Sie unter [Common Vulnerability Scoring System SIG \(https://www.first.org/cvss/\)](https://www.first.org/cvss/).

## 1.2 Einschränkungen des Kernel Live Patching

Kernel Live Patching (KLP) umfasst das Ersetzen von Funktionen und das ordnungsgemäße Verarbeiten des Austauschs von voneinander abhängigen Funktionssätzen. Hierbei werden Aufrufe von älterem Code an aktualisierten Code weitergeleitet, der sich an einem anderen Speicher-

ort befindet. Änderungen in den Datenstrukturen erschweren die Situation, da die Daten beibehalten werden und nicht erweitert oder neu interpretiert werden können. Es gibt zwar einige Methoden für die indirekte Veränderung von Datenstrukturen, doch bestimmte Fehlerbehebungen können nicht in Live-Patches konvertiert werden. In dieser Situation ist ein Neustart des Systems die einzige Möglichkeit, die Fehlerbehebungen anzuwenden.

## 2 Verstehen von Kernel-Live-Patches

Kernel-Live-Patches werden im Rahmen von regulären Systemaktualisierungen installiert. Kernel-Live-Patches werden in Form von Paketen mit modifiziertem Code bereitgestellt, die vom Kernel-Hauptpaket getrennt sind. Die Live-Patches sind kumulativ; der jeweils neueste Patch enthält also alle Fehlerbehebungen aus den vorhergehenden Patches für das Kernel-Paket. Jedes Kernel-Live-Paket ist an die genaue Kernel-Version gebunden, für die es ausgegeben wird. Die Versionsnummer des Live-Patch-Pakets erhöht sich bei jedem Hinzufügen von Fehlerbehebungen. Um den Kernel-Patching-Status zu bestimmen, verwenden Sie das Kommando `klp -v patches`.

Live-Patches enthalten nur wichtige Korrekturen und ersetzen keine regulären Kernel-Updates, die einen Neustart erfordern. Betrachten Sie Live-Patches als vorübergehende Maßnahmen, die den Kernel schützen, bis ein ordnungsgemäßes Kernel-Update und ein Neustart vorgenommen werden.

Das folgende Diagramm veranschaulicht die allgemeine Beziehung zwischen Live-Patches und Kernel-Updates. Die Liste der CVEs (Common Vulnerabilities and Exposures) und Fehlerberichte, die vom derzeit aktiven Live-Patch behoben wurden, kann mit dem Kommando `klp -v patches` angezeigt werden.

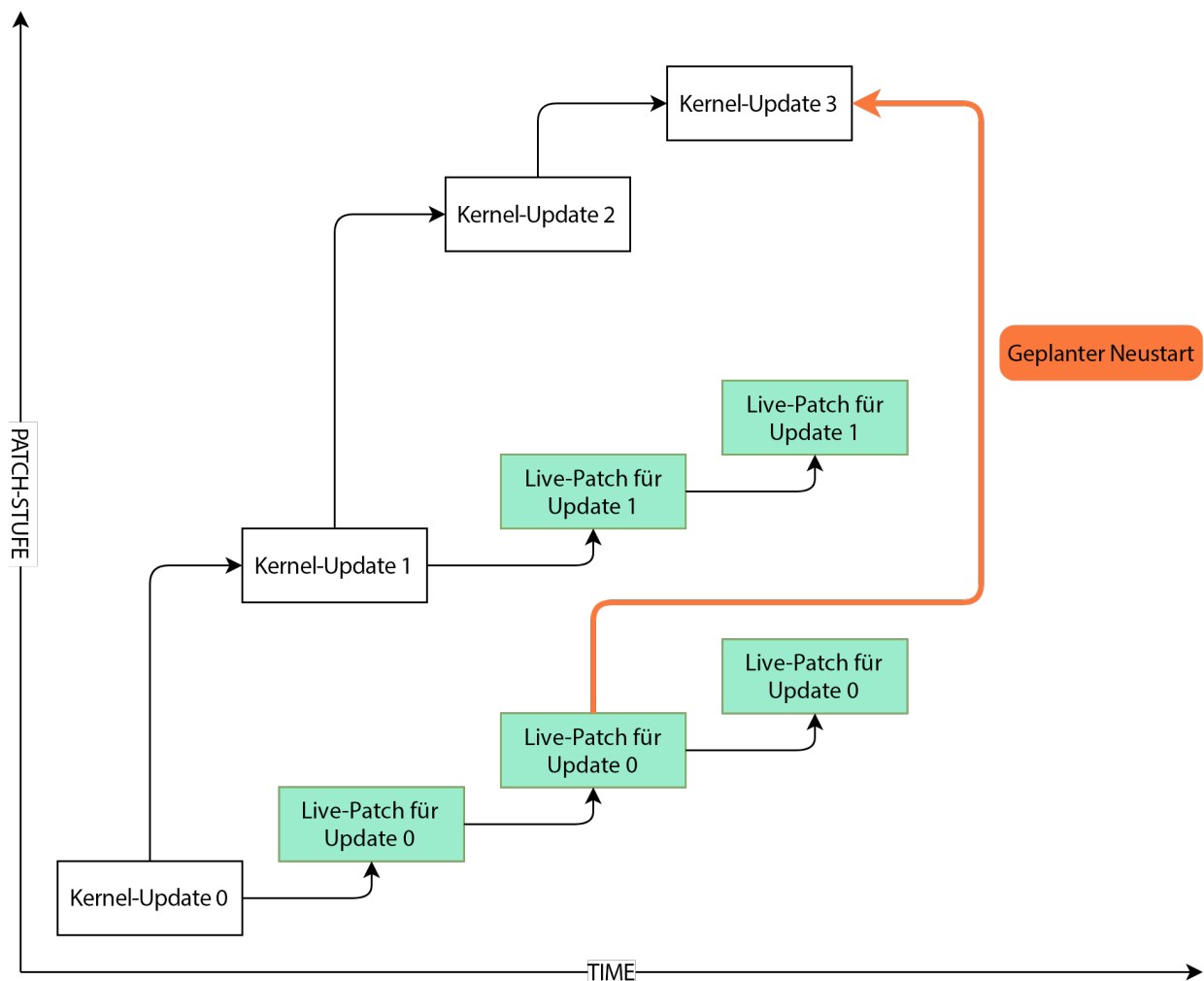


ABBILDUNG 1: BEZIEHUNG ZWISCHEN LIVE-PATCHES UND KERNEL-UPDATES

Es ist möglich, mehrere Versionen des Kernel-Pakets zusammen mit den jeweiligen Live-Patches zu installieren. Diese Pakete lösen keine Konflikte aus. Sie können aktualisierte Kernel-Paket zusammen mit Live-Patches für den ausgeführten Kernel installieren. In diesem Fall werden Sie möglicherweise aufgefordert, das System neu zu starten. Benutzer mit SUSE Linux Enterprise Server for SAP applications Live Patching-Abonnements haben Anspruch auf technischen Support, solange Live-Patch-Aktualisierungen für den ausgeführten Kernel vorliegen.

Wenn KLP aktiviert ist, umfasst jede Kernel-Aktualisierung auch ein Live-Patch-Paket. Dieser Live-Patch enthält keine Korrekturen und dient als Seed für zukünftige Live-Patches für den entsprechenden Kernel. Diese leeren, grundlegenden Patches werden als initial patches bezeichnet.

Denken Sie daran: Es können zwar mehrere Kernel-Pakete auf dem System installiert sein, doch es kann immer nur eines dieser Pakete ausgeführt werden, nicht mehrere Pakete gleichzeitig. Ebenso können mehrere Live-Patch-Pakete installiert sein, doch es wird immer nur ein Live-Patch in den Kernel geladen.

Der aktive Live-Patch ist in der `initrd` enthalten. Bei einem unvorhergesehenen Neustart fährt das System also mit den angewendeten Live-Patches hoch, sodass Sie das Patching nicht wiederholen müssen.

## 3 Aktivieren von Kernel Live Patching über die Kommandozeile

Kernel Live Patching ist im standardmäßigen SUSE Linux Enterprise Server for SAP applications-Abonnement enthalten. Um die Funktion zu verwenden, müssen Sie das folgende Schema installieren:

```
# zypper install -t pattern lp_sles
```

Zu diesem Zeitpunkt sind die Live-Patches für das System bereits angewendet.

So funktioniert der Prozess hinter den Kulissen: Wenn das Paketinstallationssystem erkennt, dass ein installierter Kernel vorhanden ist, der live gepatcht werden kann, und dass ein Live-Patch dafür im Software-Kanal vorhanden ist, wählt das System den Live-Patch für die Installation aus. Der Kernel erhält dann die Live-Patch-Fehlerbehebungen *als Teil der Paketinstallation*. Der Live-Patch für den Kernel wird noch vor Abschluss der Produktinstallation durchgeführt.

## 4 Fehlerbehebung bei Kernel Live Patching-Problemen

### 4.1 Prüfen des Ablaufdatums des Live-Patches

Stellen Sie sicher, dass das `lifecycle-data-sle-module-live-patching` installiert ist, und führen Sie dann das Kommando `zypper lifecycle` aus. Im Abschnitt `Package end of support if different from product` der Ausgabe sehen Sie das Ablaufdatum für den jeweiligen Live-Patch.

Jeder Live-Patch wird 13 Monate ab Veröffentlichung des zugrunde liegenden Kernel-Pakets aktualisiert. Auf der Seite [Maintained kernels, patch updates and lifecycle \(https://www.suse.com/products/live-patching/current-patches/\)](https://www.suse.com/products/live-patching/current-patches/) können Sie das Ablaufdatum anhand der ausgeführten Kernel-Version prüfen, ohne die Produkterweiterung zu installieren.

## 4.2 Prüfen der installierten Kernel-Live-Patch-Pakete

Der Kernel ist live-gepatcht, wenn ein `kernel-livepatch-*`-Paket für den aktuellen Kernel installiert wurde. Mit dem Kommando `zypper se --details kernel-livepatch-*` können Sie prüfen, welche Kernel-Live-Patch-Pakete auf Ihrem System installiert sind.

## 4.3 Verhindern eines Neustarts

Wenn das Paket `kernel-default` installiert ist, fordert der Update-Manager Sie auf, das System neu zu starten. Damit diese Meldung nicht angezeigt wird, können Sie Kernel-Aktualisierungen aus dem Patching-Vorgang herausfiltern. Hierzu können Sie Paketsperren mit Zypper hinzufügen.

## 4.4 Patching-Status prüfen

Sie können den Patching-Status mit dem Kommando `klp status` prüfen. Zur Untersuchung installierter Patches führen Sie das Kommando `klp -v patches` aus.

## 4.5 Downgrade eines Kernel-Patches

Wenn der neueste Live-Patch Probleme verursacht, können Sie ein Downgrade des aktuell installierten Live-Patches auf die vorhergehende Version durchführen. Denken Sie daran, dass ein System mit Kernel-Warnungen oder Kernel-Fehlerspuren im Systemprotokoll unter Umständen nicht für das Patch-Downgrade-Verfahren geeignet ist. Wenn Sie nicht sicher sind, ob das System die Anforderungen für ein Patch-Downgrade erfüllt, fragen Sie den technischen Support von SUSE.

Verwenden Sie das Kommando `klp downgrade`, um ein Downgrade für den neuesten Kernel-Live-Patch durchzuführen. Dieses Kommando erkennt automatisch die Version des letzten Live-Patches und installiert den vorhergehenden.

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