SUSE

Make livepatch callbacks, shadow variables and states work together

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Livepatch features

- Using ftrace to redirect functions (basic)

- 4 callbacks: pre-patch, post-patch, pre-unpatch, post-unpatch (optional)

- Shadow variables to extend structures, global variables

- States for managing the lifetime and compatibility of callbacks and shadow variables
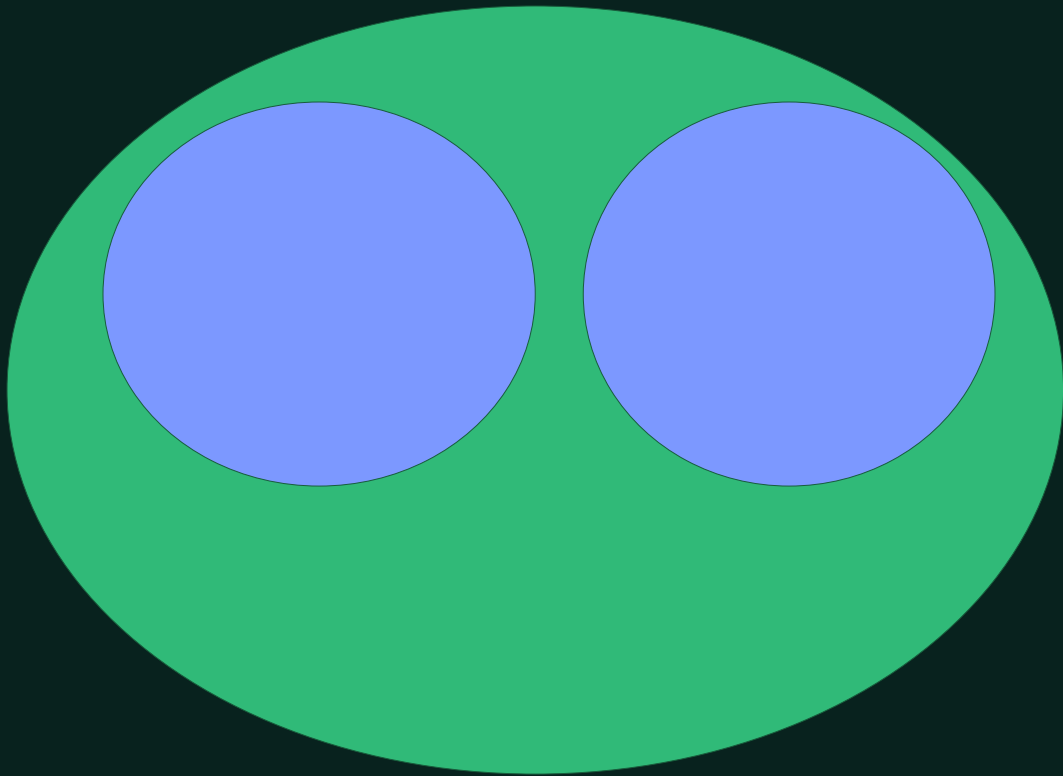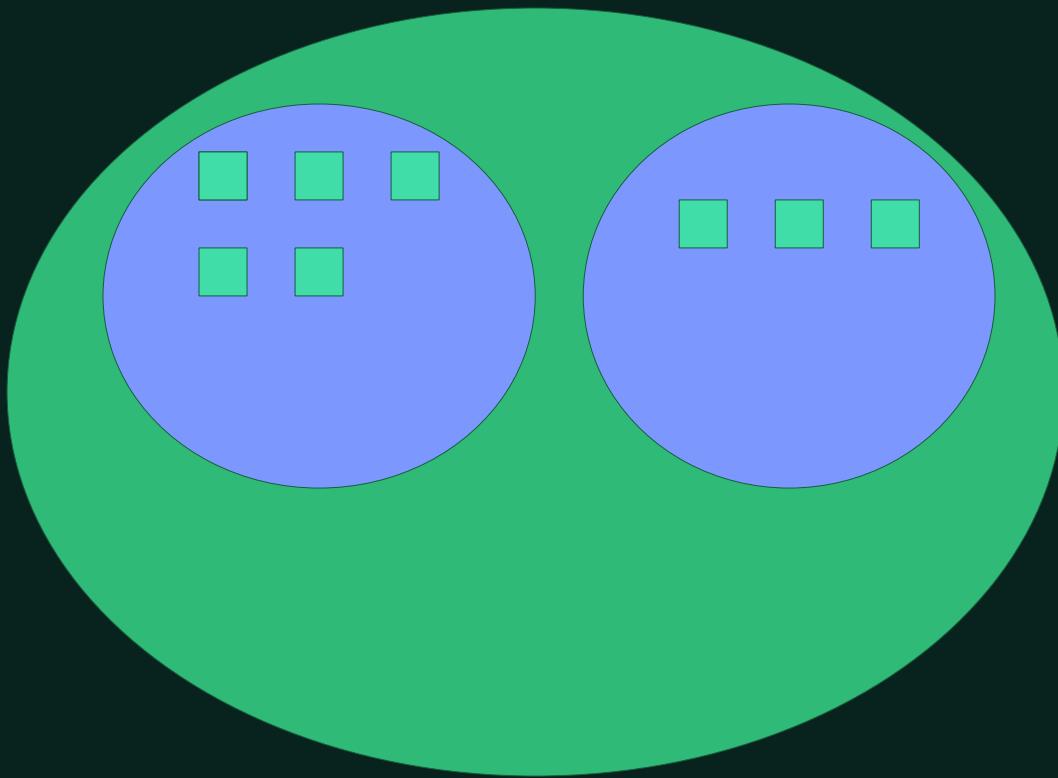
Livepatch structure

Livepatch structure

- Patch
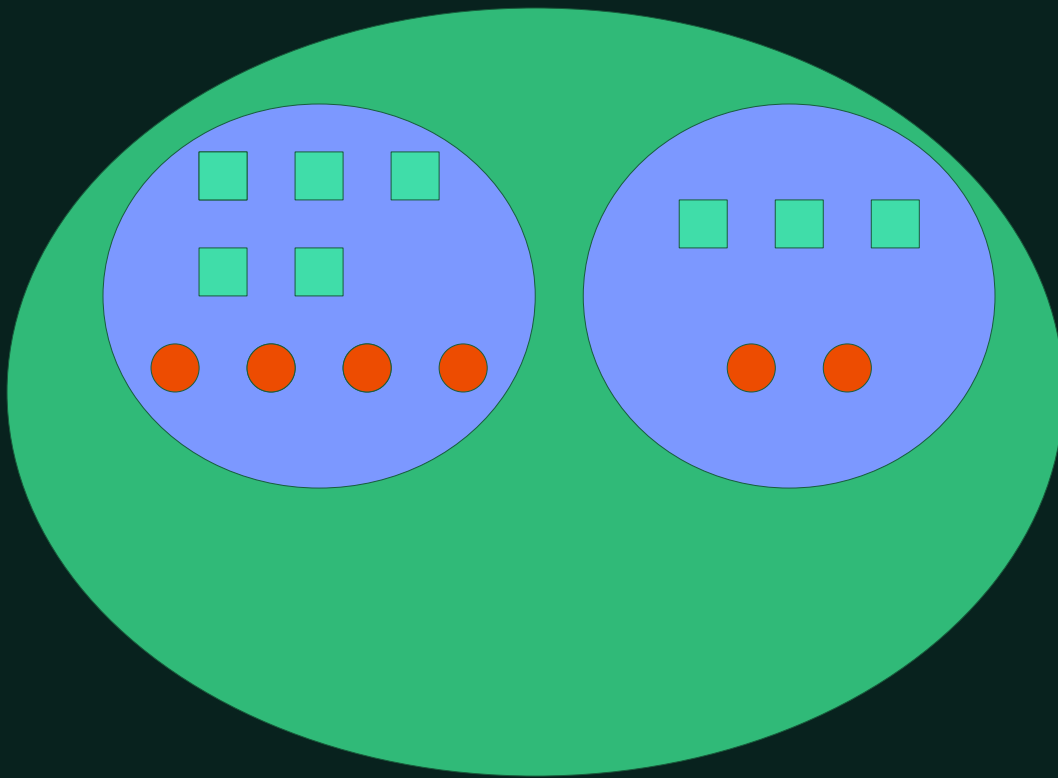
Livepatch structure

🟢 Patch   🔵 Object

Livepatch structure

Patch · Object · Func

Livepatch structure

Patch   Object   Func   Callback

Livepatch structure
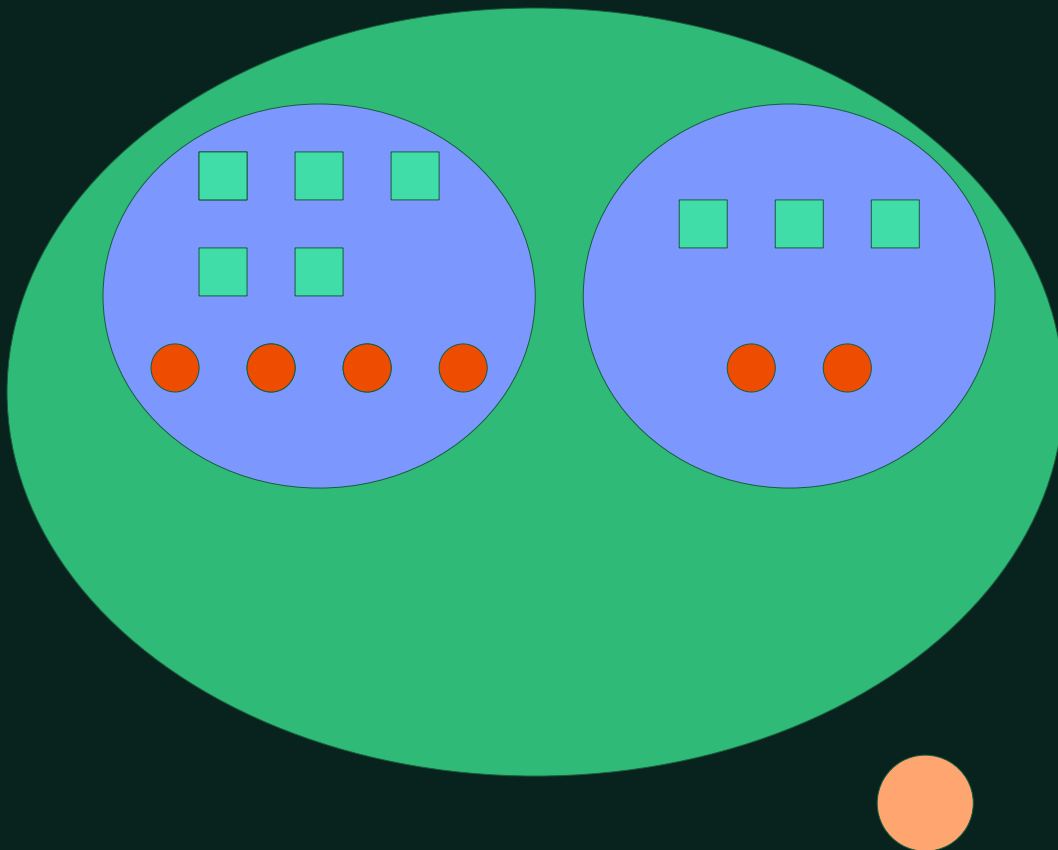
Livepatch structure

Patch   Object   Func   Callback   Shadow Variable   State

Livepatch structure

Patch · Object · Func · Callback · Shadow Variable · State
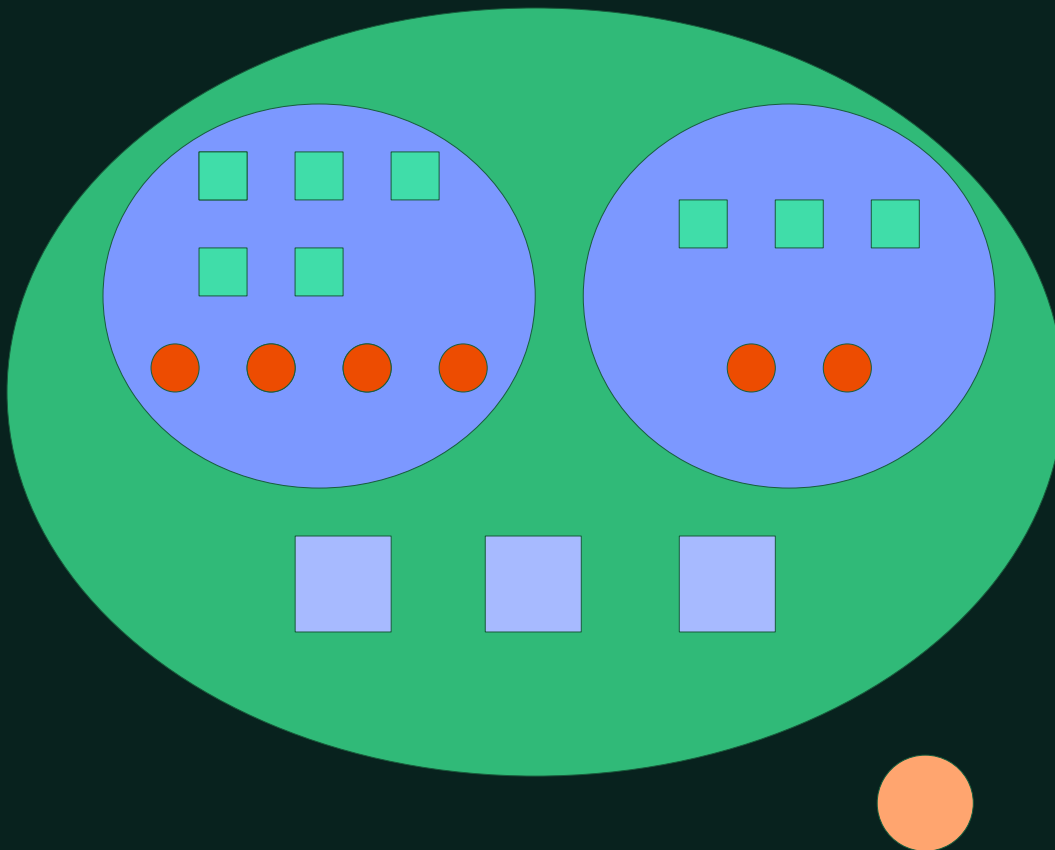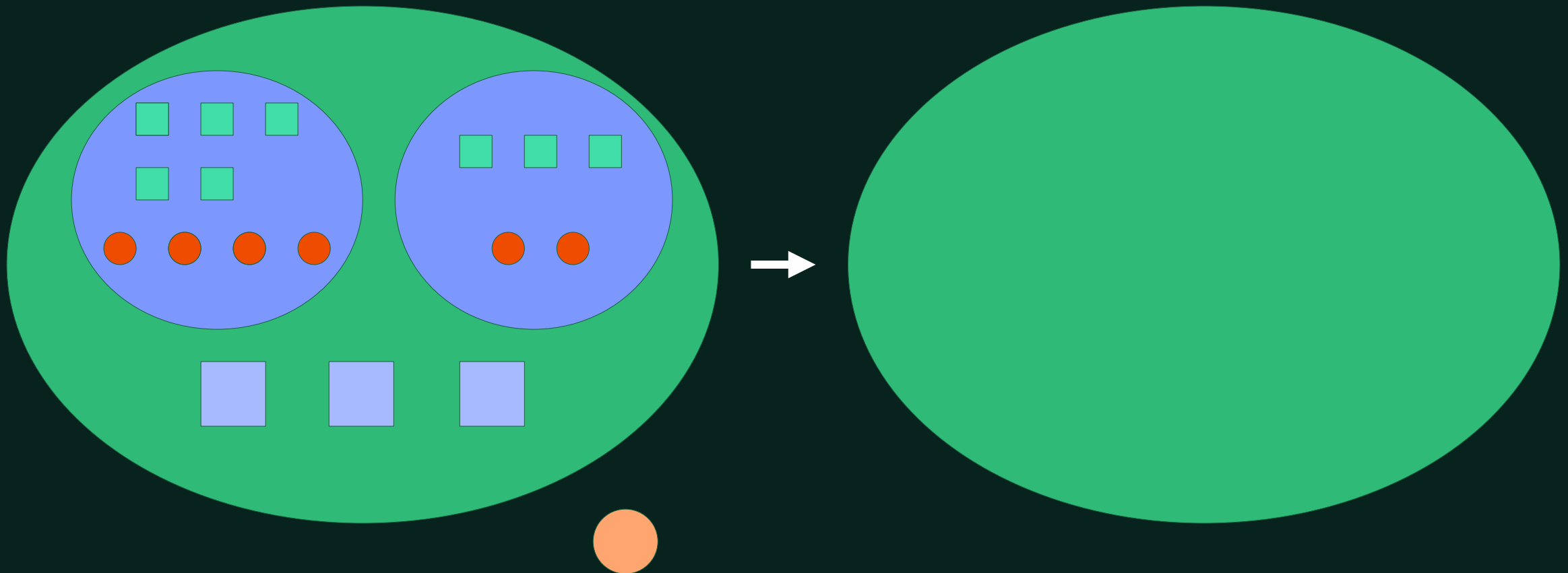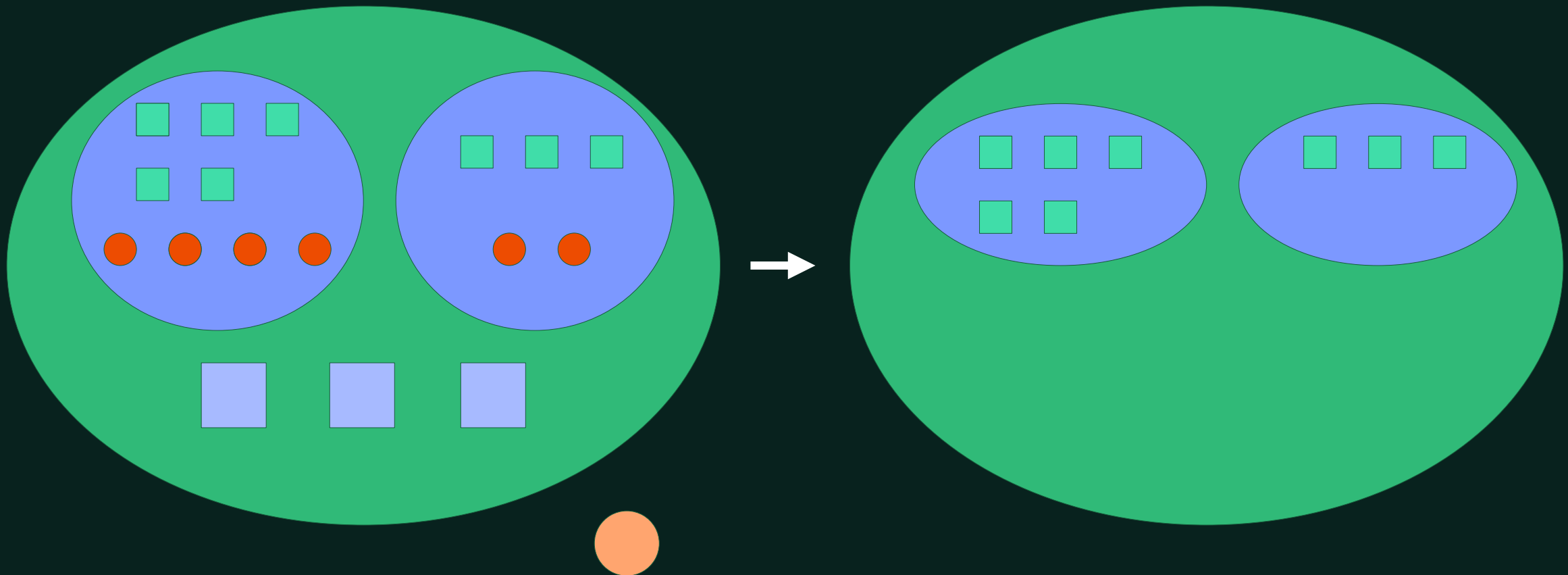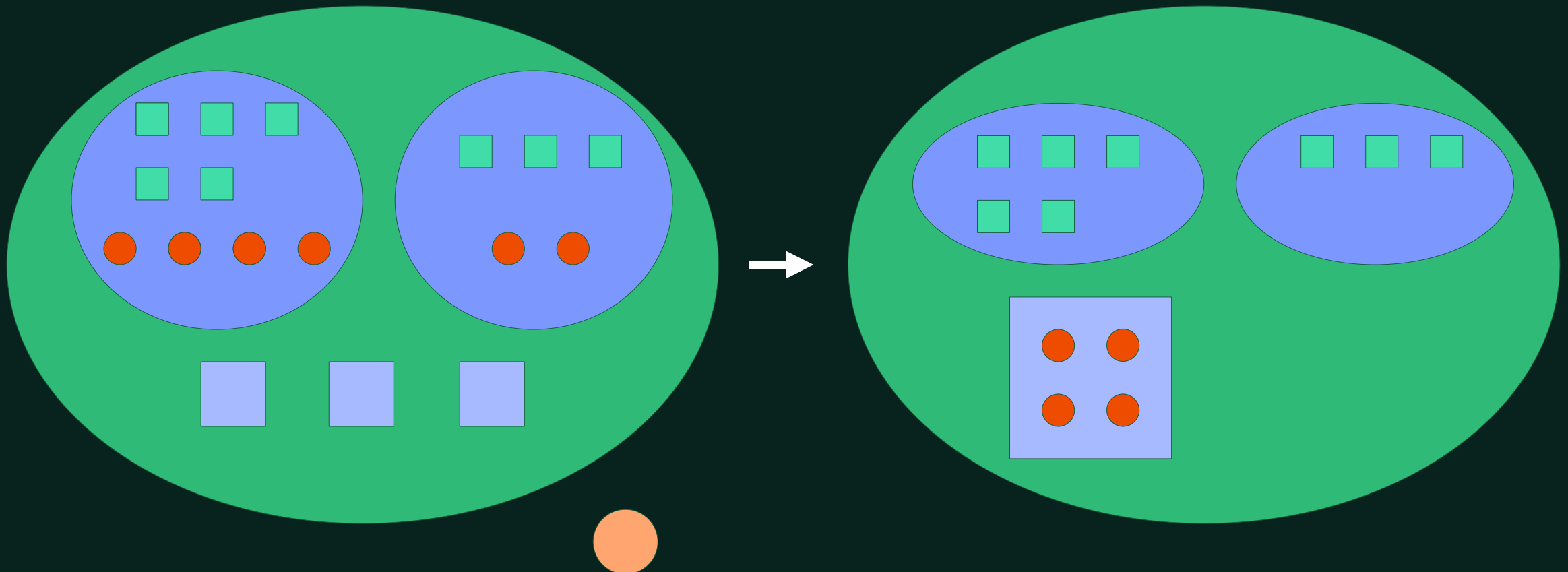
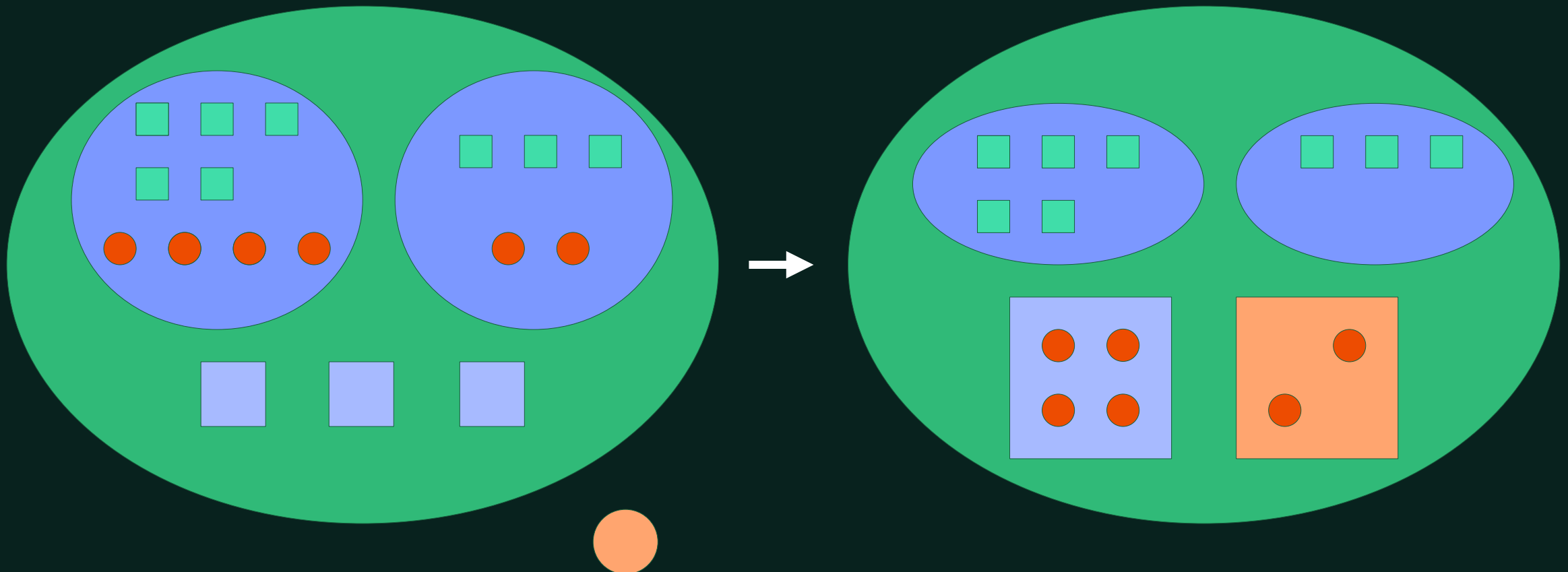# Livepatch structure

Patch ● Object ■ Func ● Callback ● Shadow Variable ■ State

Livepatch structure

Patch ● Object ● Func ■ Callback ● Shadow Variable ● State ■

Livepatch structure

Patch   Object   Func   Callback   Shadow Variable   State

More Changes

- Calling callbacks when using atomic update:

    - Current: only from new livepatch

    - Newly: when the state is introduced or removed (safe dowgrade)

- Garbage collection of shadow variables (simple)

- Replace "state→version" with "state→block_disable"

Summary

- Allows to manage callbacks and shadow variables reasonable way

- Per-object callbacks are no longer supported (rare, custom notifiers)

- Livepatch API changes (patches are version specific anyway)

POC: https://lore.kernel.org/lkml/20231110170428.6664-1-pmladek@suse.com/

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Thank you

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