

Core Layer

Ⓢ RuntimeManager

▢ _instances: Dict[str, Any]

▢ _classes: Dict[str, Type]

▢ _thread_locks: Dict[str, Lock]

○ set(service, *args, **kwargs): None

○ get(service, *args, **kwargs): T

○ exists(service): bool

○ get_all_instances(): List[Any]

○ clear(): None

Ⓢ FinalClass

«metaclass»

○ __new__(mcs, name, bases, dct): type

Service Locator Pattern:

- Lazy initialization

- Thread-safe caching

- Named registration

- Constructor arg forwarding

Ⓢ FinalSingleton

▢ _instances: Dict[type, Self]

▢ _lock: RLock

○ __new__(cls, *args, **kwargs): Self

○ async_init(): None

○ shutdown(): None

Protected Construction Pattern:

- Prevents direct instantiation

- Enforces RuntimeManager usage

- Thread-safe singleton creation

Ⓢ RuntimeControl

▢ _shutdown_event: Event

▢ _lock: Lock

○ signal_shutdown(): None

○ is_shutting_down(): bool

○ wait_for_shutdown(timeout): bool

manages

prevents inheritance

uses