

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