# European Ground Systems – Common Core (EGS-CC) in System Context

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# Background

- Within Europe, different monitoring and control systems are used by different companies/agencies
  - Some of them common to Spacecraft Operations and Spacecraft Assembly, Integration and Testing (AIT), some specific
- Many of the existing systems have reached or are reaching their end of life
  - Become excessively complex with time
  - Use old software technologies and hardware platforms
  - Difficult to modernise
- Compatibility/exchange of information
  - Often multiple systems are used in AIT of a space system by different companies or at different levels (e.g. payload/system) or in different phases
  - Little synergy across missions and mission phases

# *Objectives*

- The EGS-CC Initiative aims at developing a common M&C infrastructure enabling
  - Seamless transition from spacecraft Assembly, Integration and Testing to Mission Operations
  - Enable overall cost reductions by sharing development, sustaining and maintenance of a single infrastructure
  - Facilitate cost and risk reduction when implementing space projects
  - Enable the modernization of legacy Electrical Ground Support Equipment (EGSE) and Mission Control Systems (MCS)
  - Enable the exchange of ancillary implementations across organizations

# Stakeholders

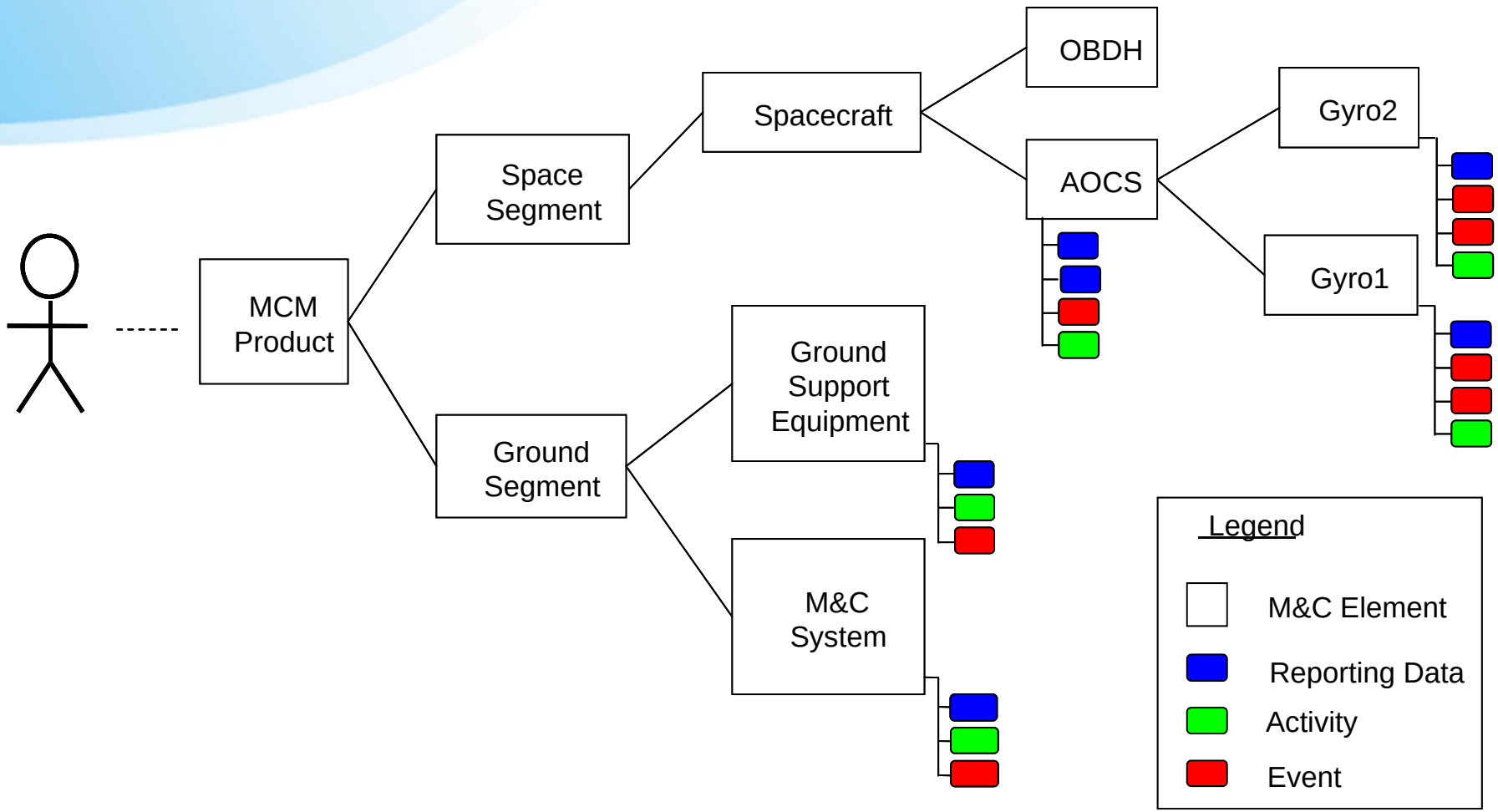
- EGS-CC is a collaboration of European prime industry and space agencies to develop a common core
  - Astrium Satellites
  - Astrium Space Transportation
  - Thales Alenia (France and Italy)
  - OHB System
  - ESA (ESTEC and ESOC)
  - CNES
  - DLR

- Initiative considered strategic by all parties
- Memorandum of Understanding between the EGS-CC partners
  - Development of the EGS-CC in open competition according to ESA contract conditions and processes
  - Adoption of the EGS-CC for institutional missions and then for commercial missions after successful operational validation in institutional missions

# Main System Features

- Scope of the EGS-CC system features is very ambitious
  - Support of all mission types and phases
  - Open, component based, service oriented architecture
  - Generic and extensible functionality
  - Layered implementation
  - Clear separation between generic M&C functions (kernel) and specific features of the controlled system (adaptation layer)
  - Standardised interfaces (as far as possible…)
  - Technology isolation (as far as possible…)
  - Long term maintainability
  - High performance and scalability

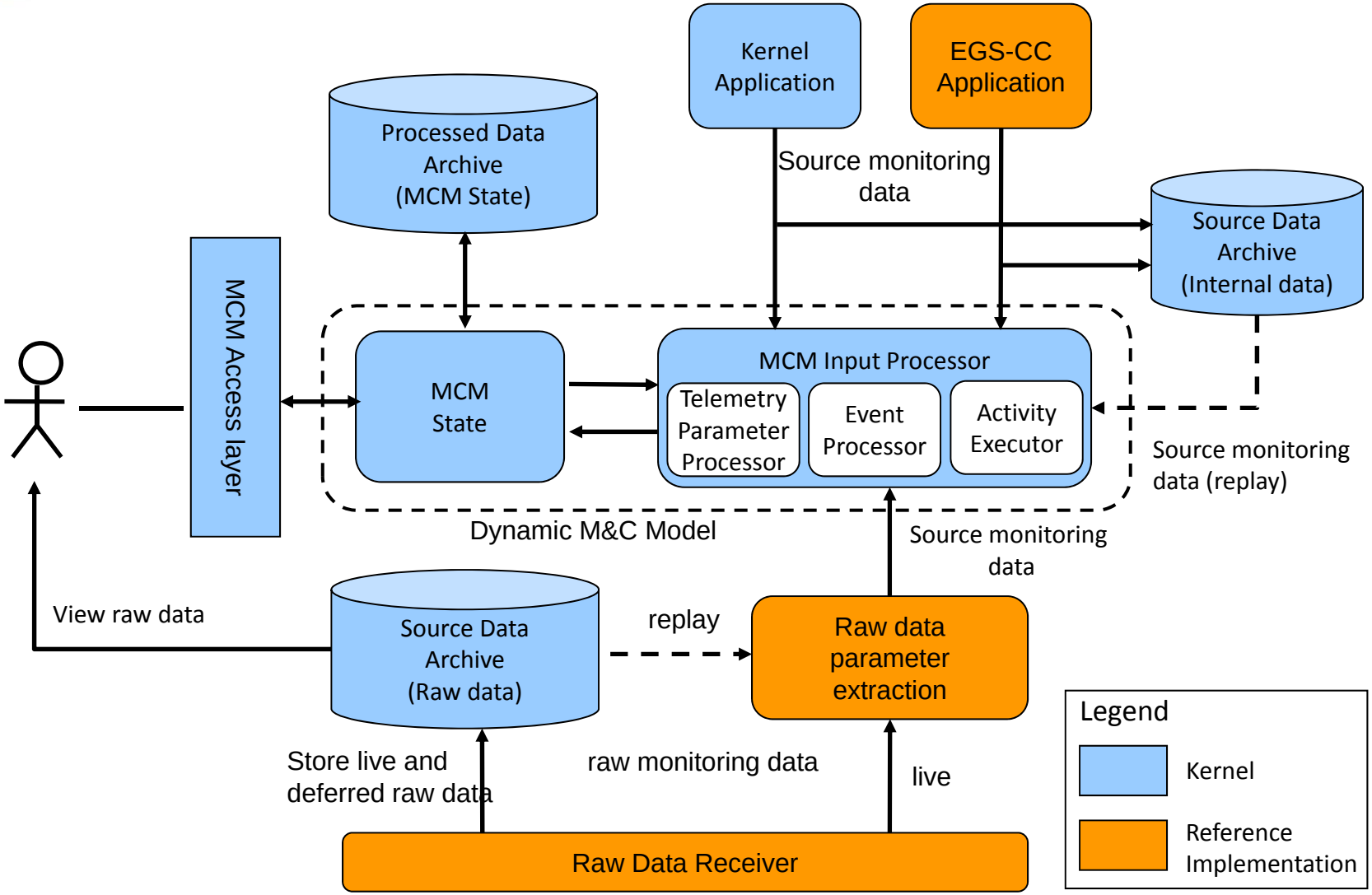
# Monitoring & Control Model



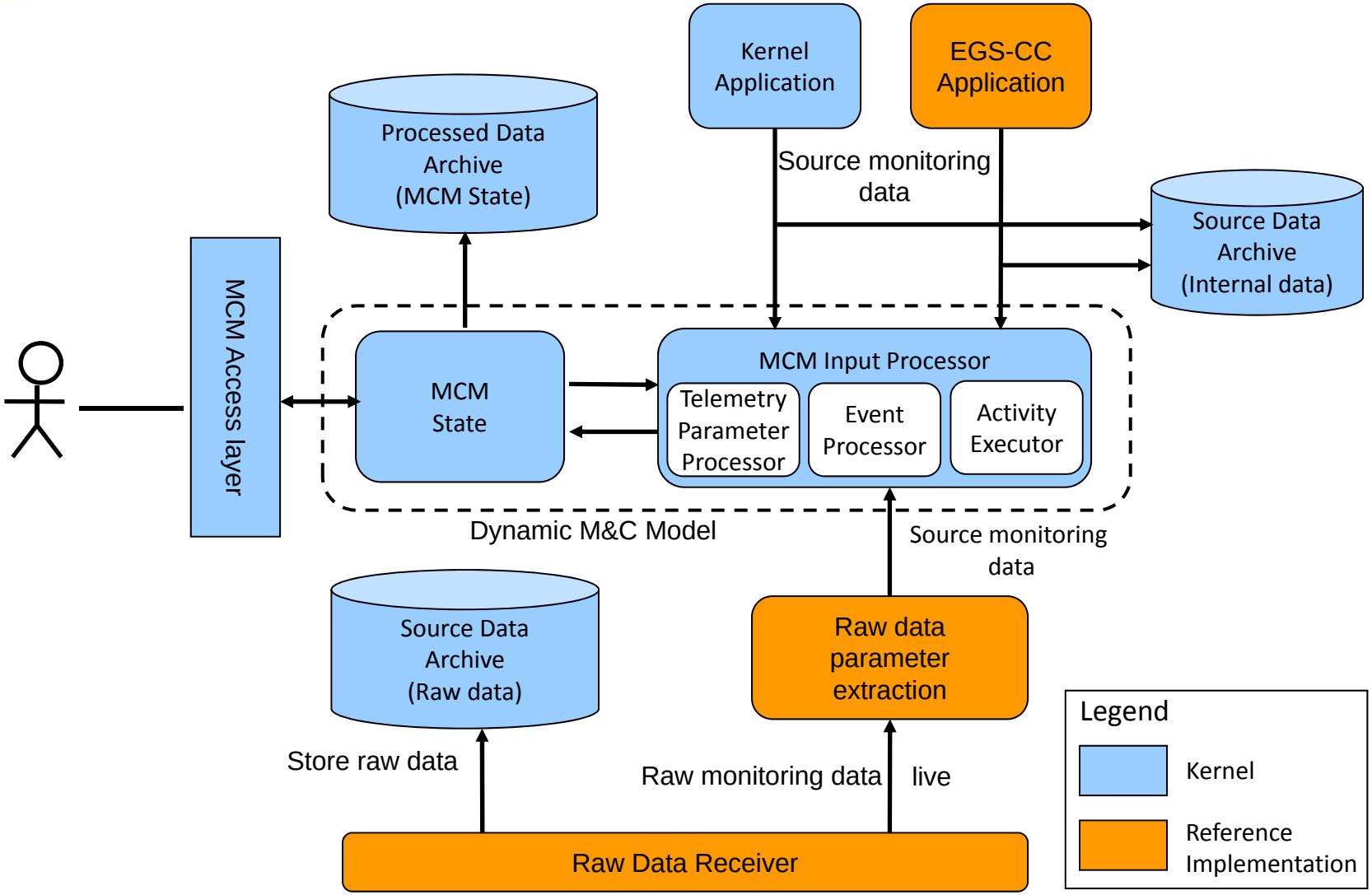
# The Role of the Monitoring & Control Model

- Functional core of the system
- Provides capability to model the complete space system from a monitoring and control standpoint
- Acts as an abstraction layer for monitoring and control operations (through a hierarchy of System Elements based on ECSS E-70-31 concepts)
- Encapsulates the main monitoring and control functions (e.g. telemetry parameter processor, activities executor, events processor)
- Provides access to all data of M&C relevance (static definitions and dynamic state)
- Interacts with the engineering data archive to store all generated data of operational relevance for later retrieval/replay
- Supports the provision of M&C services to external components

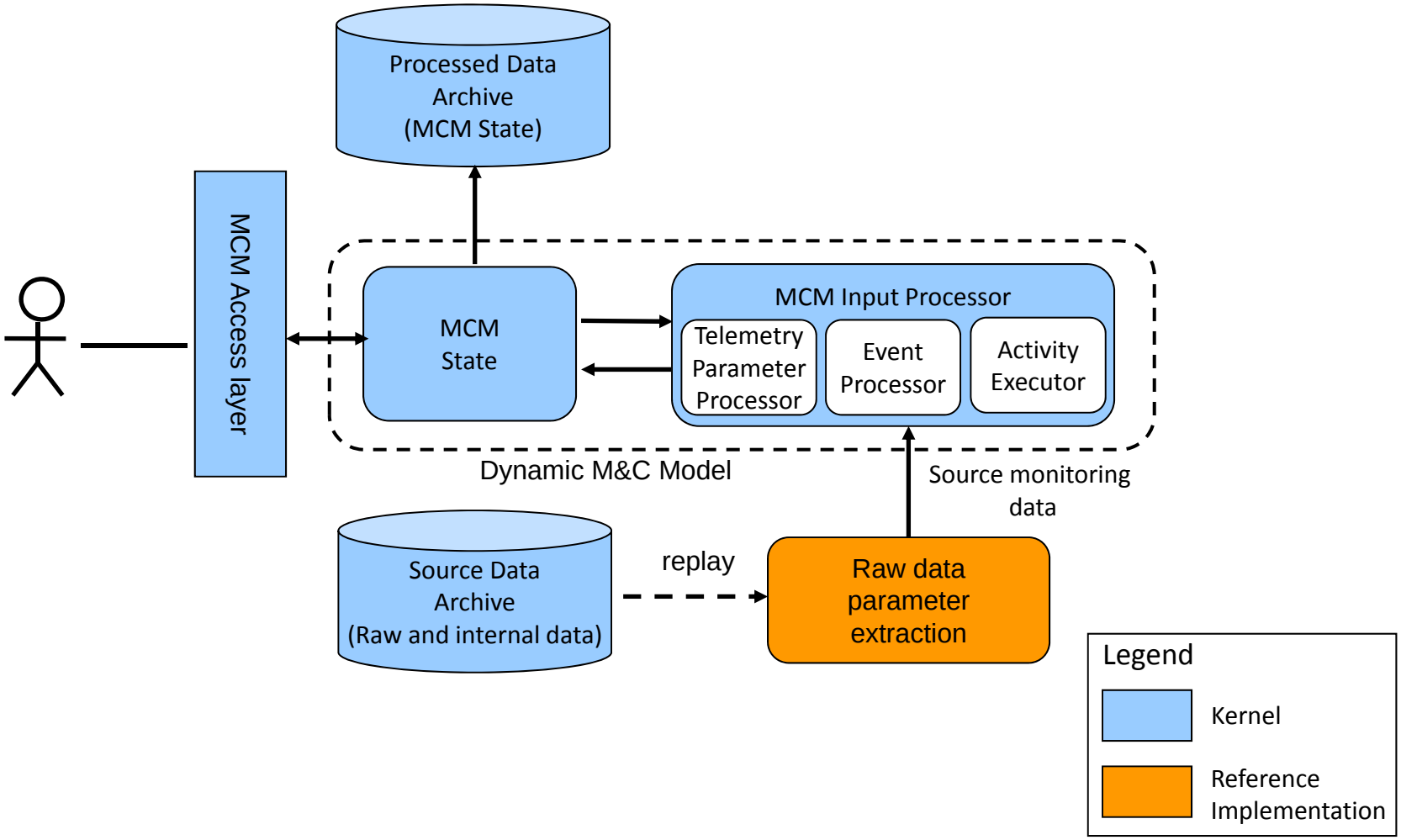
# Data Processing Concept



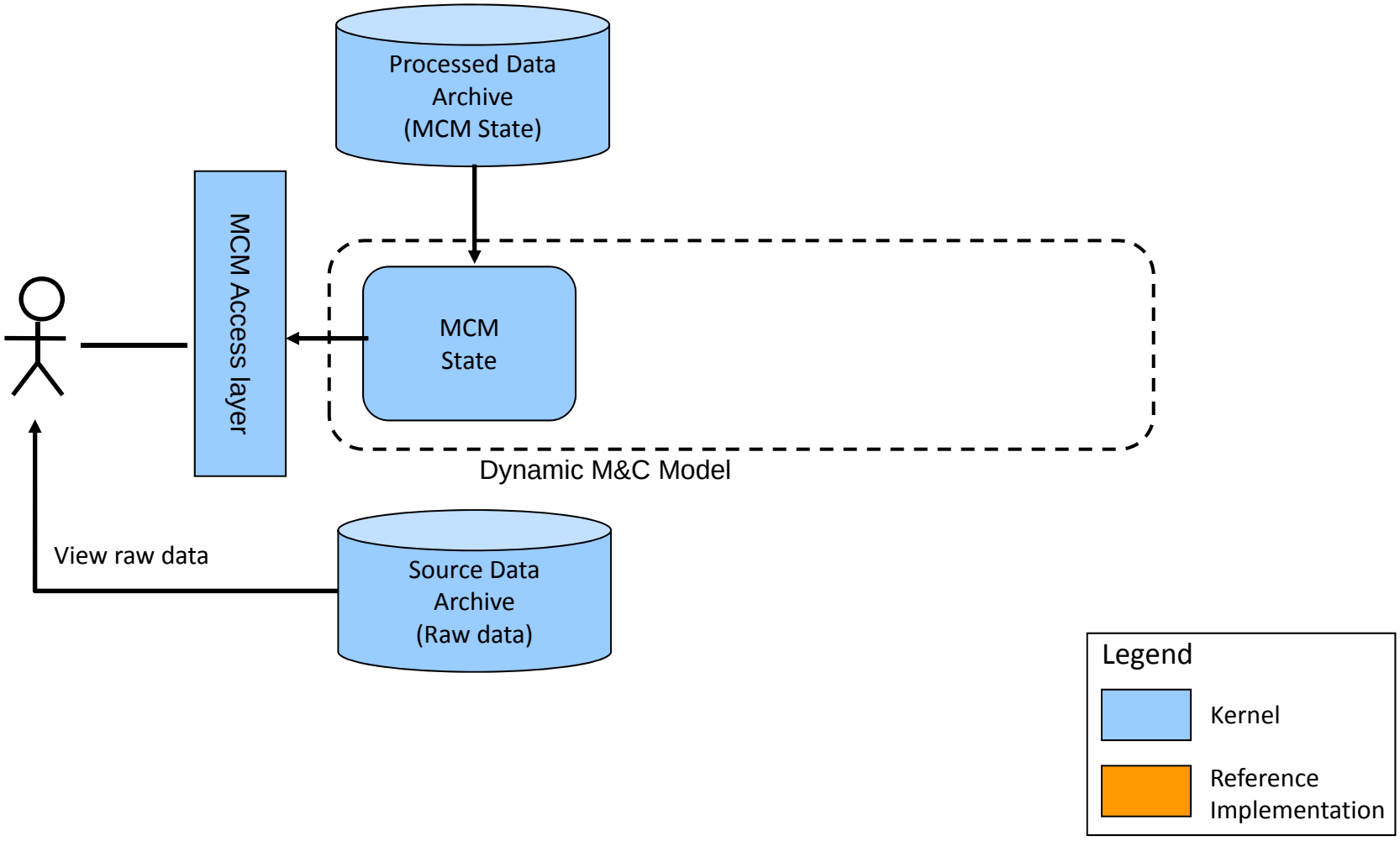
# Data Processing Concept - LIVE



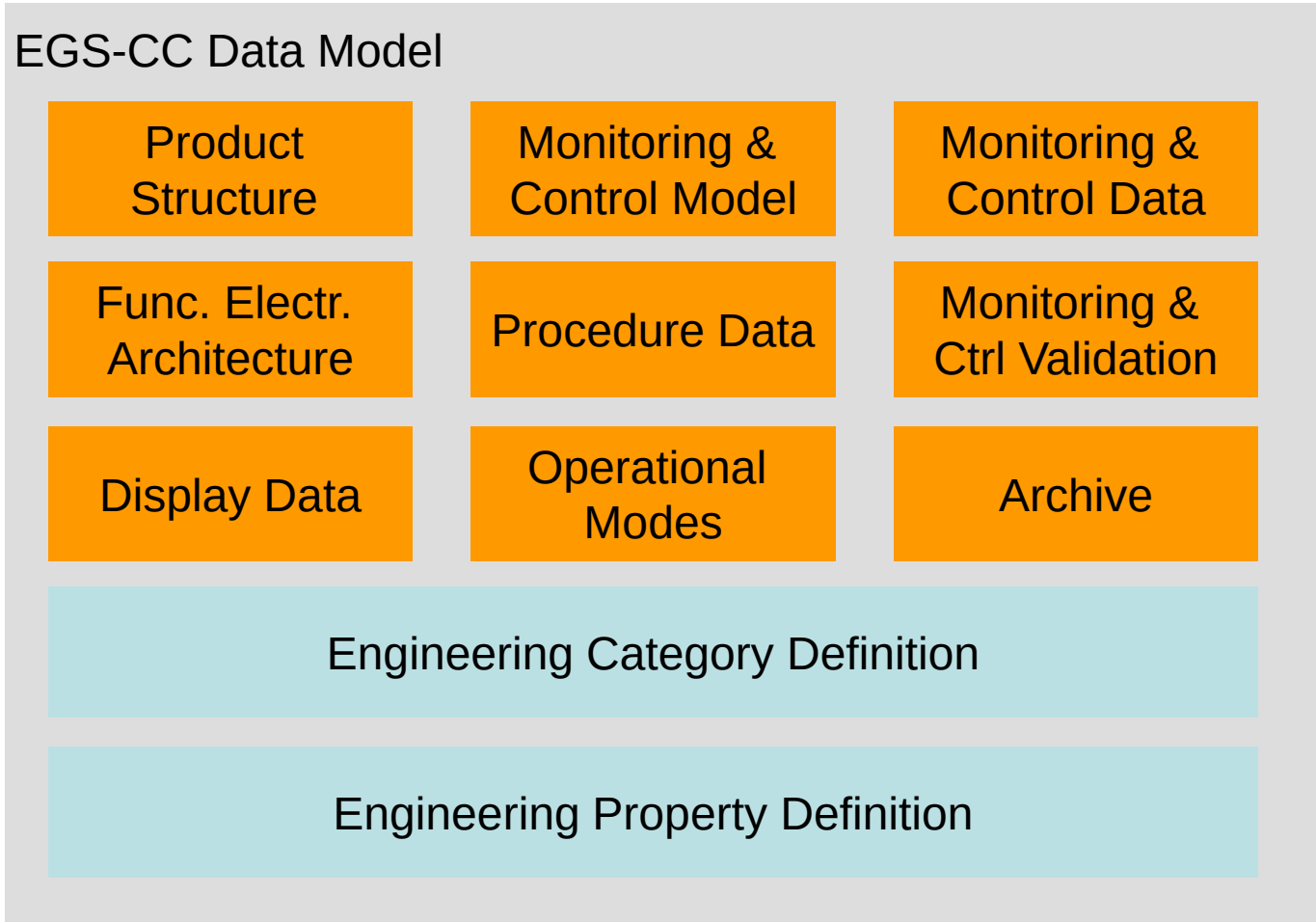
# Data Processing Concept - REPLAY



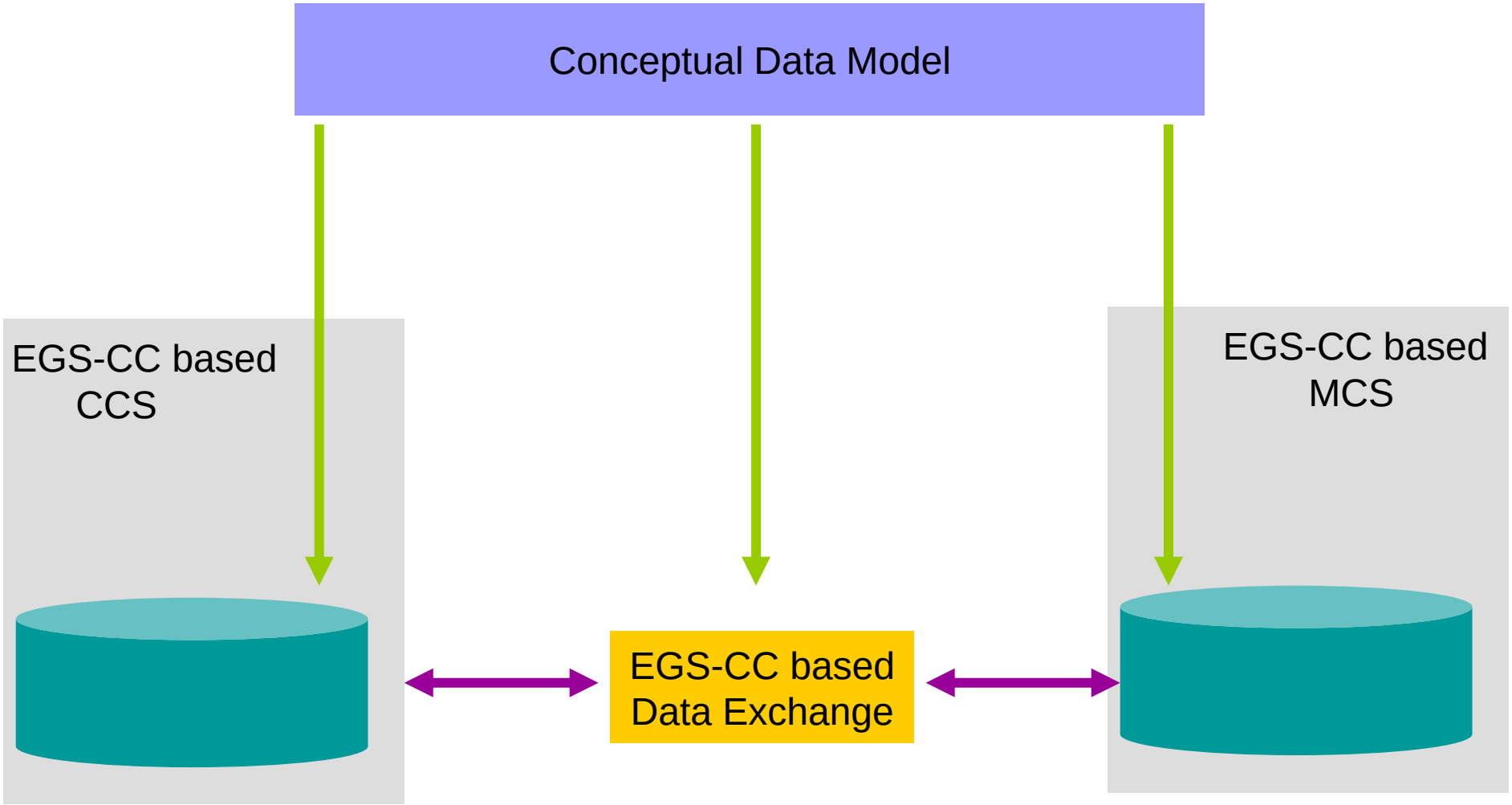
# Data Processing Concept - RETRIEVAL



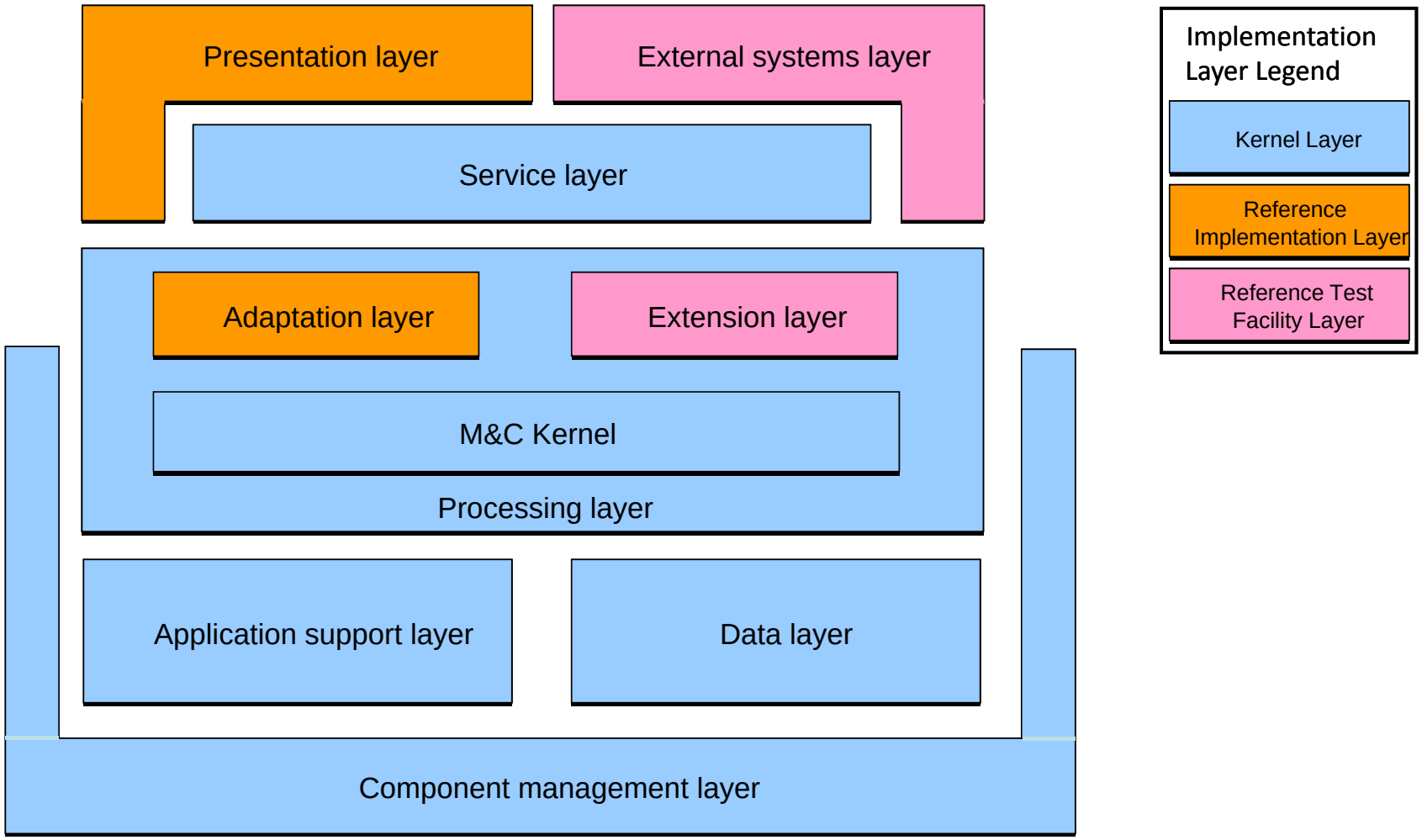
# *Conceptual Data Model*



# *Conceptual Data Model: Application*



# Architectural Layers



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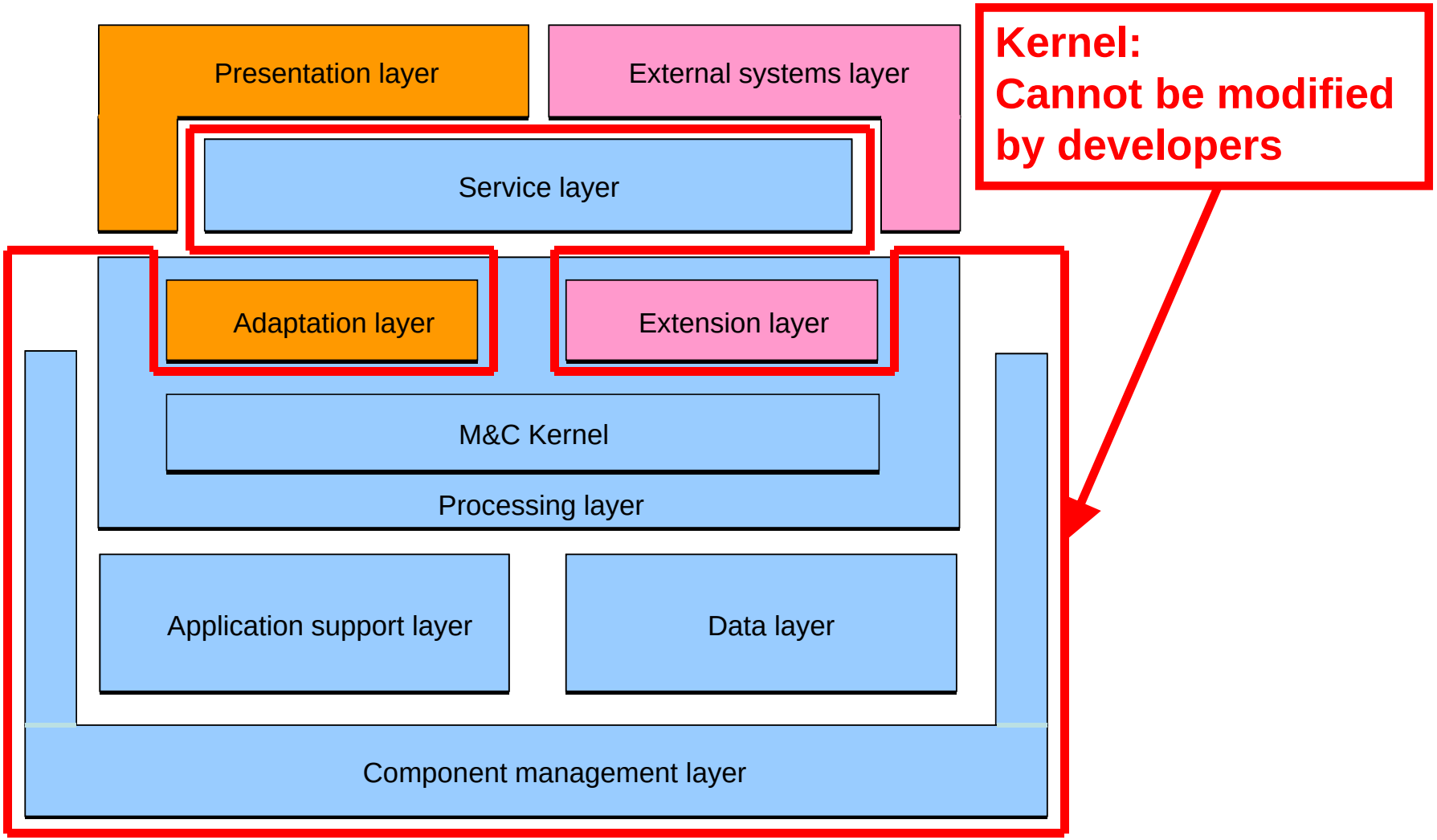

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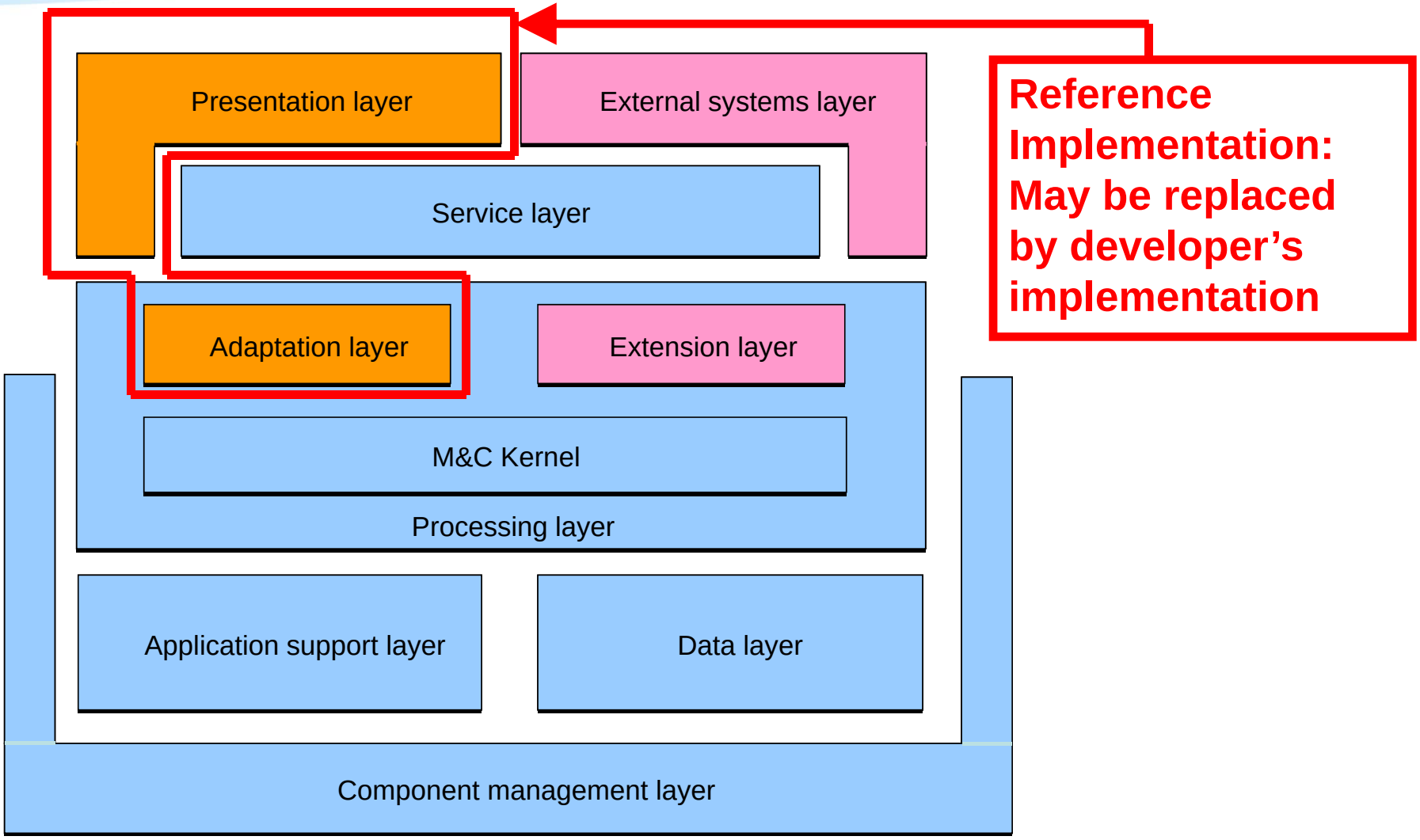

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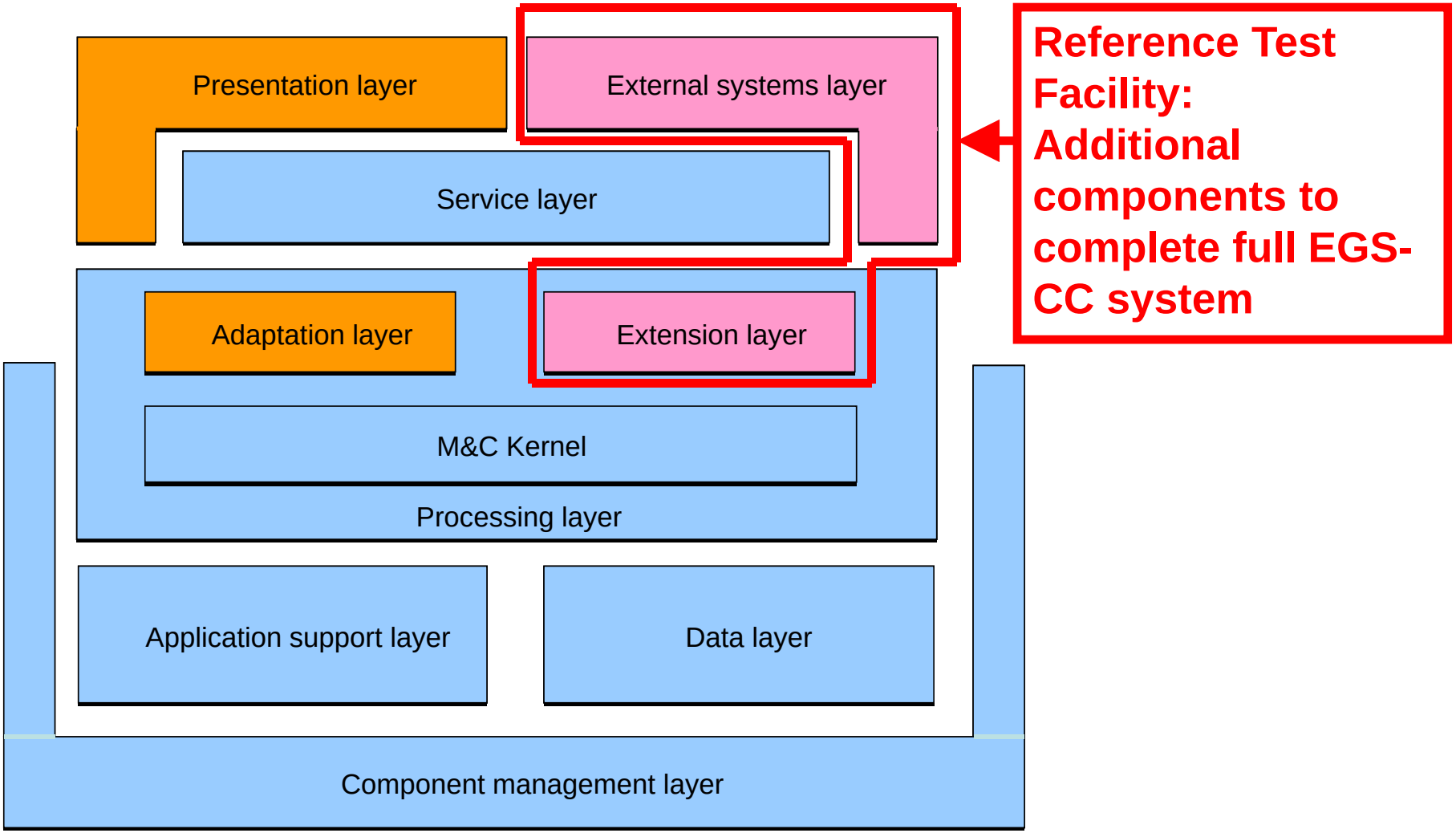
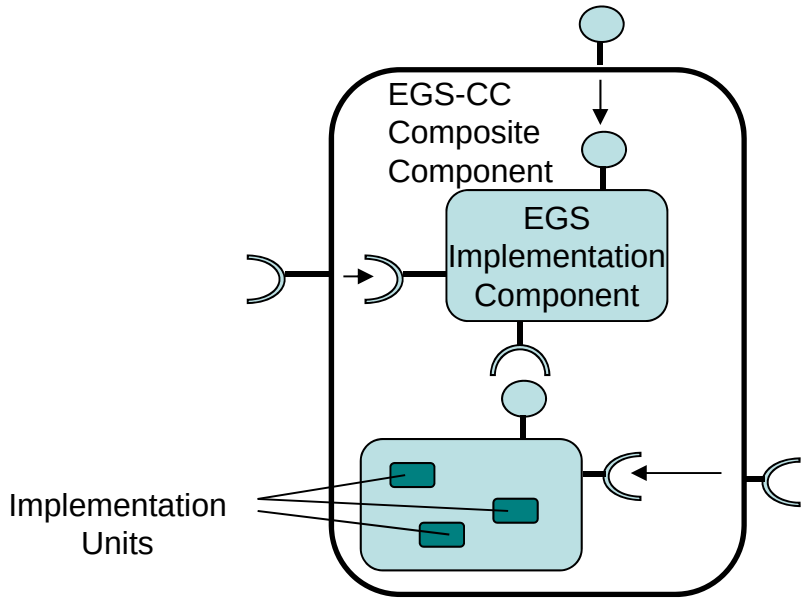


# System Integration Concept

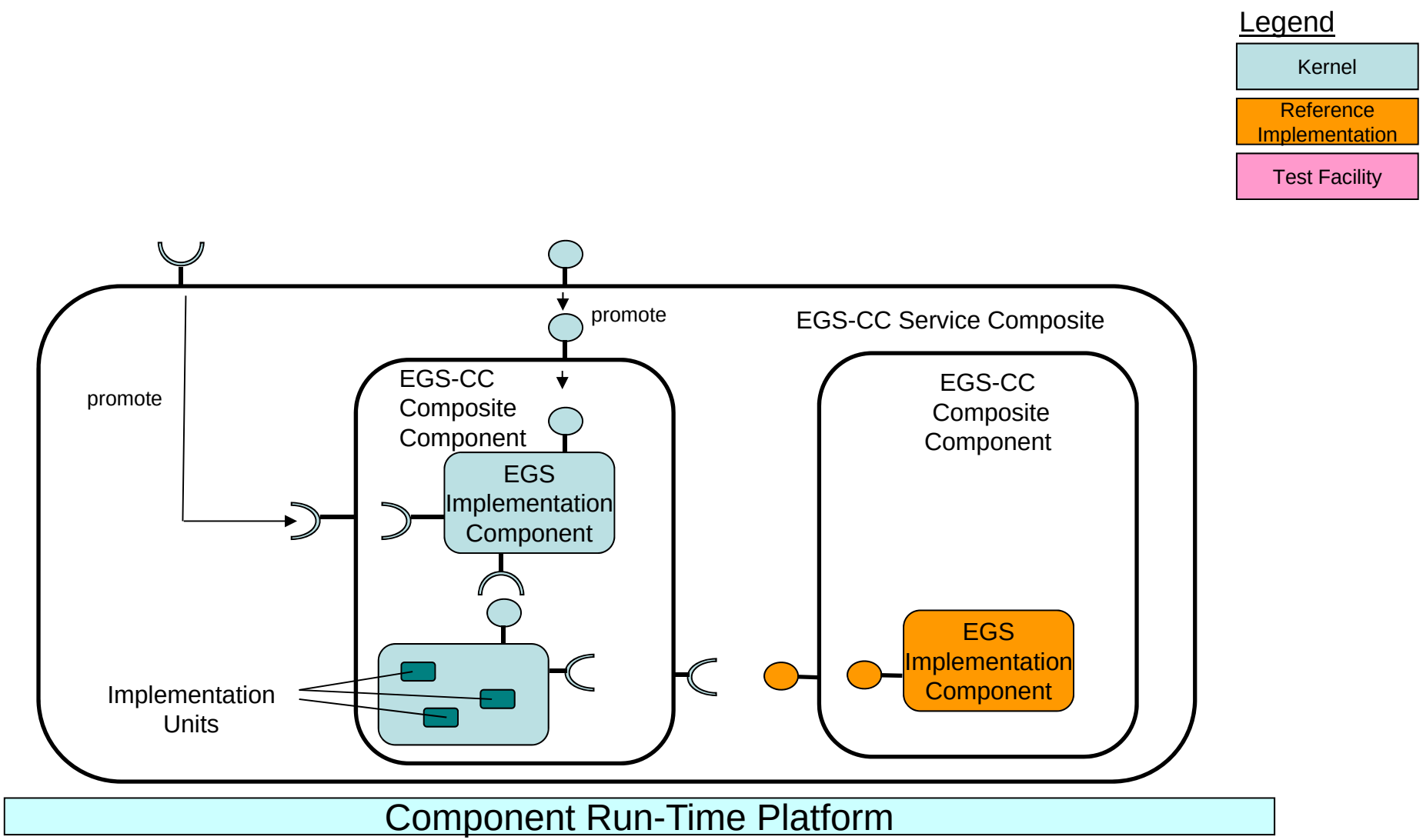
Legend

- Kernel
- Reference Implementation
- Test Facility




Component Run-Time Platform

# System Integration Concept



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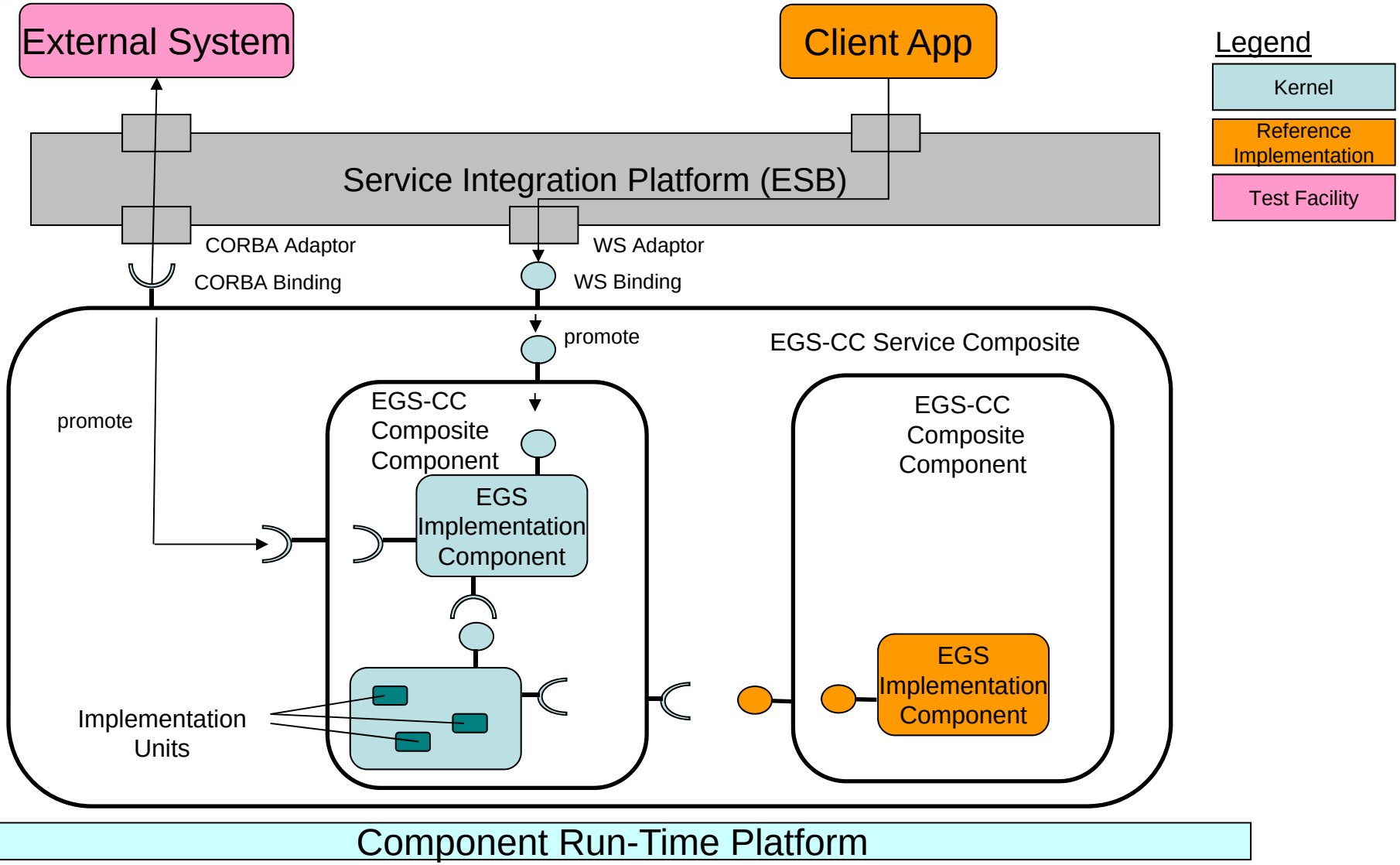
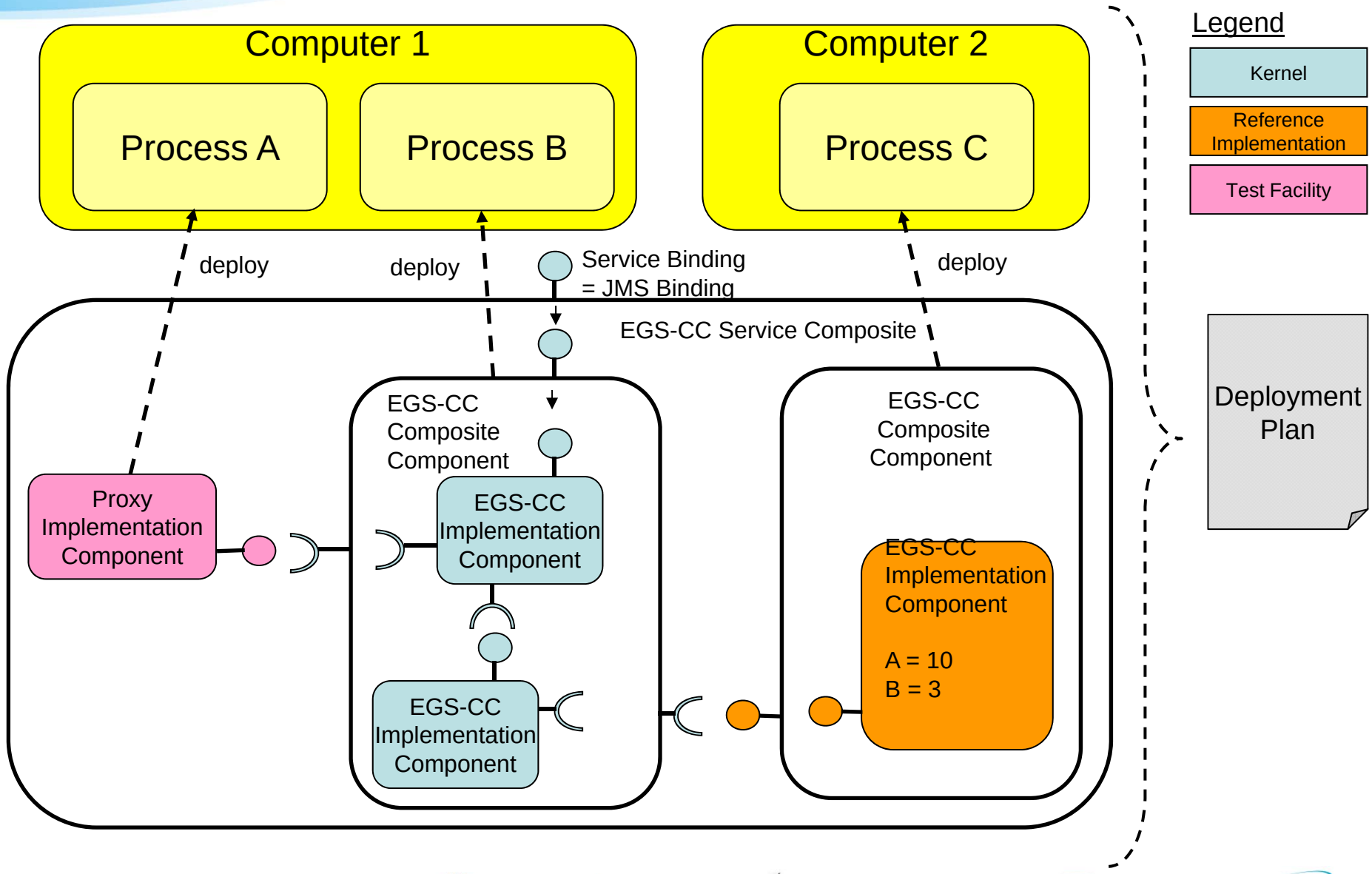
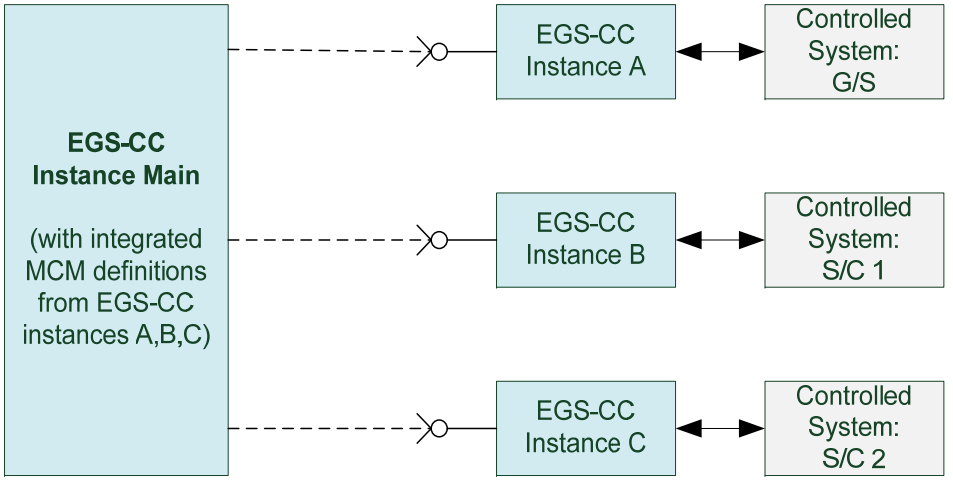


# EGS-CC System Deployment

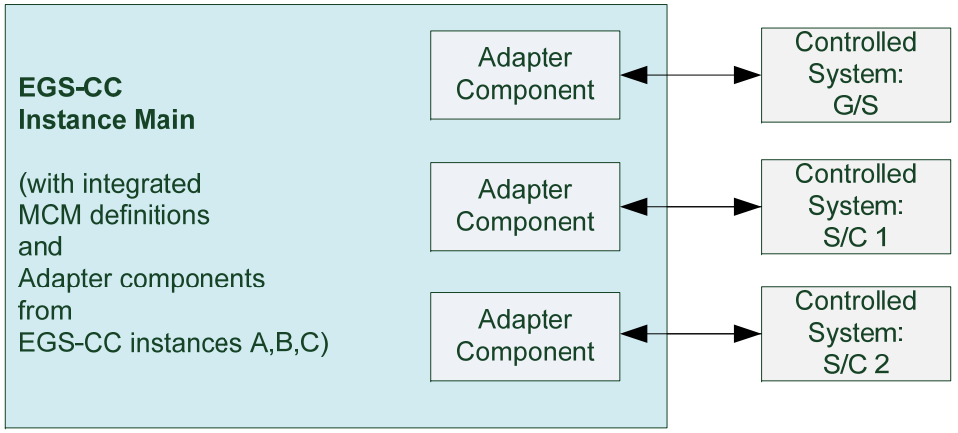


# System of Systems Approaches

- Independent EGS-CC System Instances
- Master / Child setup




- Merged EGS-CC System Instances



# Conclusions

- The EGS-CC initiative is in its early phases
- Strong stakeholders commitment
- Phase A will be completed very shortly – outputs include
  - User requirements, glossary use cases, system concept, conceptual architecture, external interfaces document, technology assessment, domain analysis report
- Phase B (Software Requirements Engineering and Architectural Design) intended to be carried out by industrial consortium (including MCS and EGSE developers)
  - Planned to start at the end of 2012
- Objectives are very ambitious but feasible
- The expected benefits justify the commitment and associated investments