Reliable and secure communication library for critical autonomous systems

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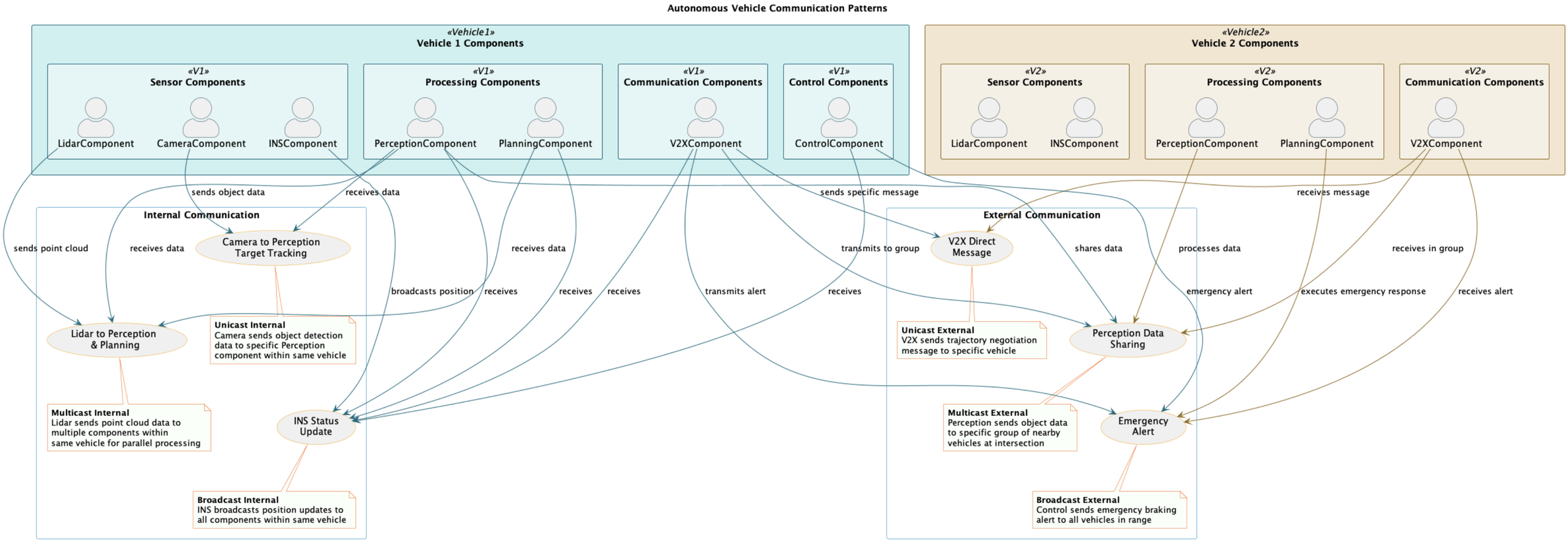
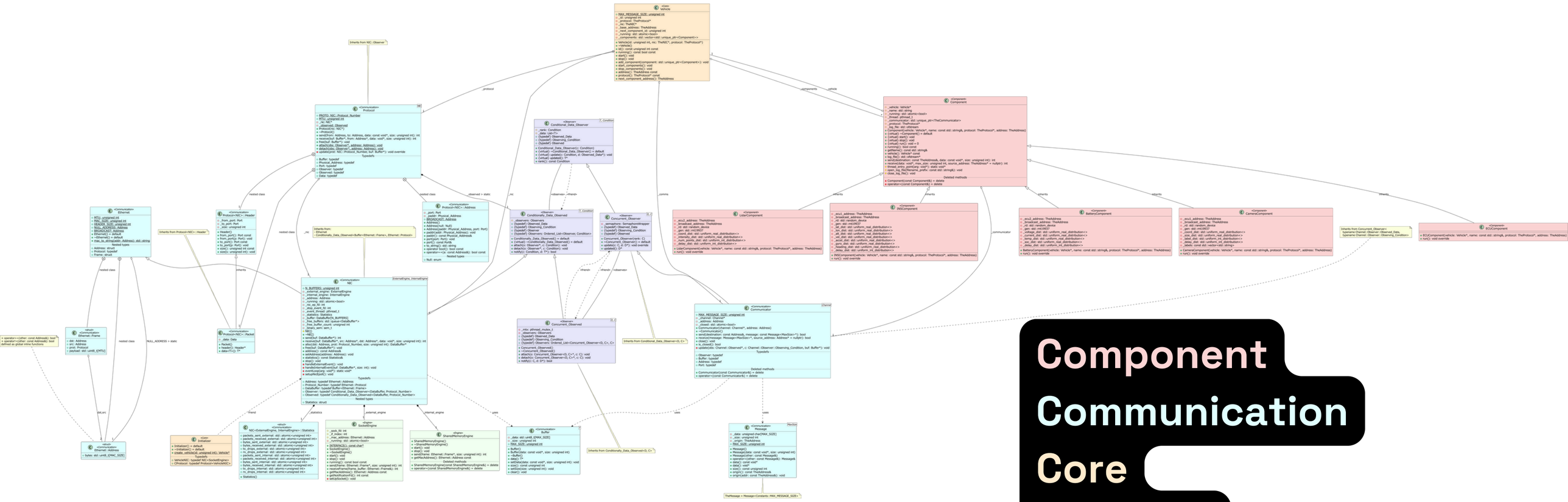
Use Case

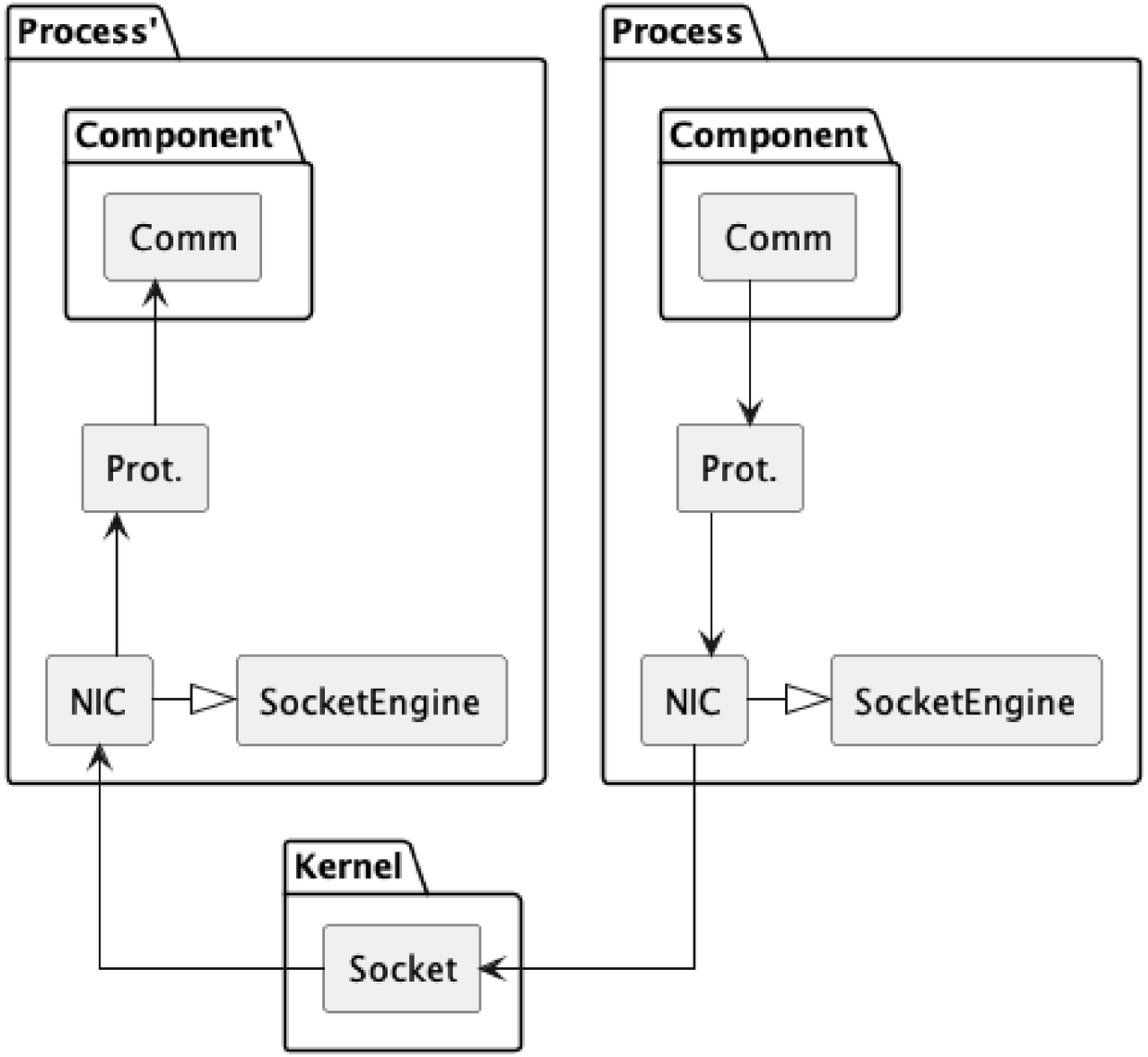

Autonomous Vehicle Communication Patterns
«Vehicle1»
Vehicle 1 Components
«V1»
Sensor Components
LidarComponent
CameraComponent
INSComponent
«V1»
Processing Components
PerceptionComponent
PlanningComponent
«V1»
Communication Components
V2XComponent
«V1»
Control Components
ControlComponent
«Vehicle2»
Vehicle 2 Components
«V2»
Sensor Components
LidarComponent
INSComponent
«V2»
Processing Components
PerceptionComponent
PlanningComponent
«V2»
Communication Components
V2XComponent
sends object data
receives data
sends specific message
receives message
Internal Communication
External Communication
sends point cloud
receives data
Camera to Perception Target Tracking
receives data
transmits to group
V2X Direct Message
shares data
processes data
receives in group
broadcasts position
receives
receives
receives
transmits alert
receives
emergency alert
executes emergency response
receives alert
Lidar to Perception & Planning
Unicast Internal
Camera sends object detection data to specific Perception component within same vehicle
Unicast External
V2X sends trajectory negotiation message to specific vehicle
Perception Data Sharing
Multicast Internal
Lidar sends point cloud data to multiple components within same vehicle for parallel processing
INS Status Update
Multicast External
Perception sends object data to specific group of nearby vehicles at intersection
Emergency Alert
Broadcast Internal
INS broadcasts position updates to all components within same vehicle
Broadcast External
Control sends emergency braking alert to all vehicles in range

Class Diagram



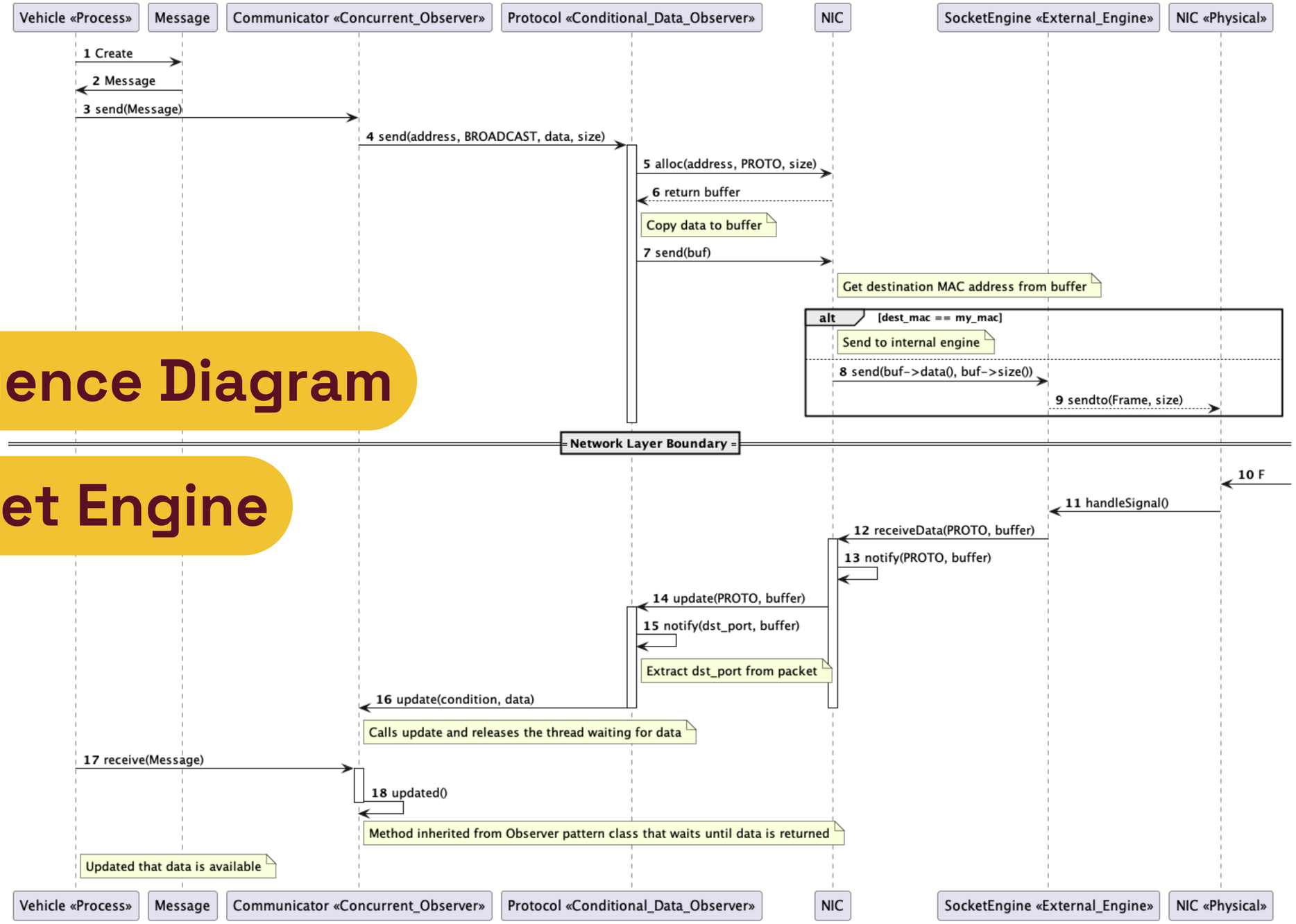
Component
Communication
Core
Observer
Engine

Process Diagram

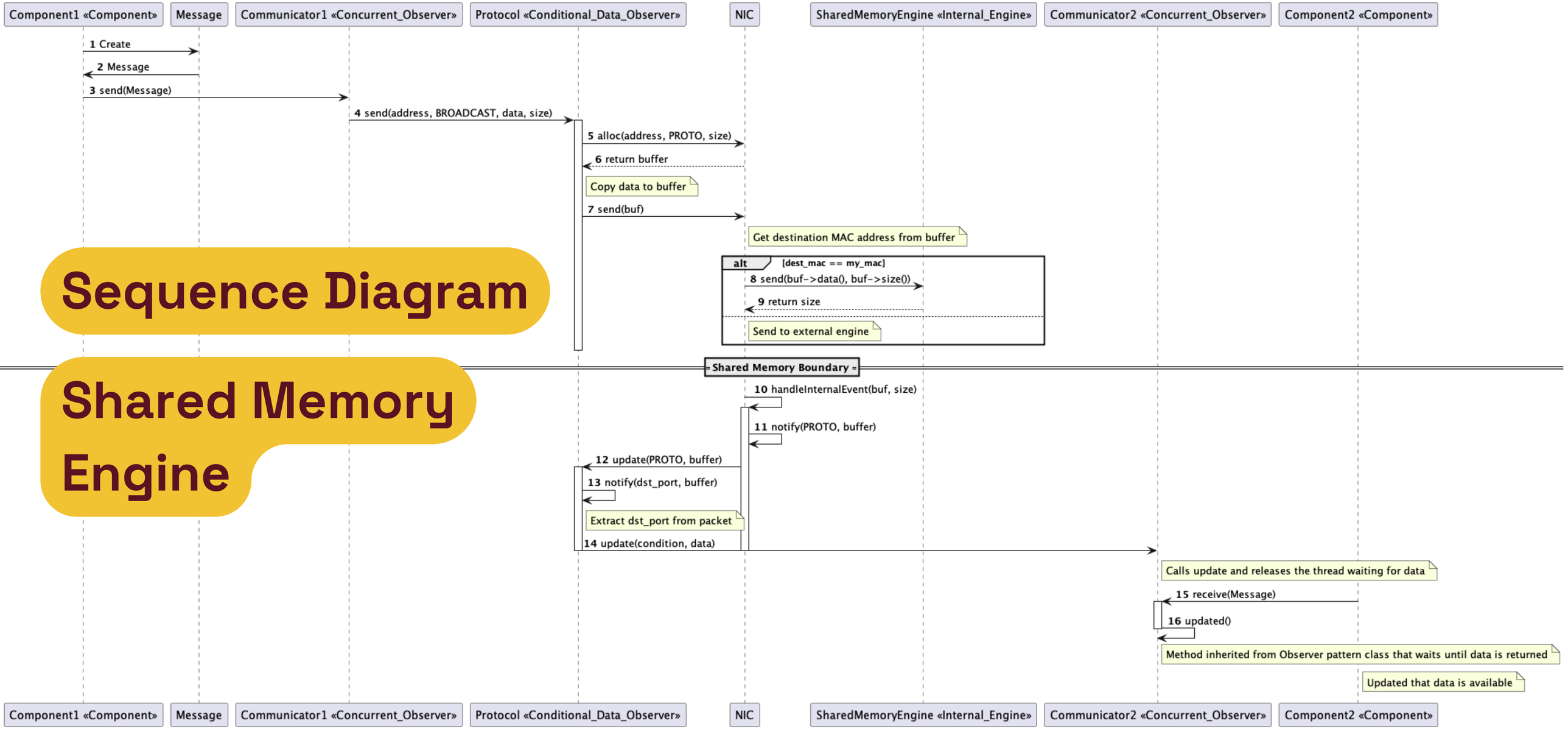


Sequence Diagram

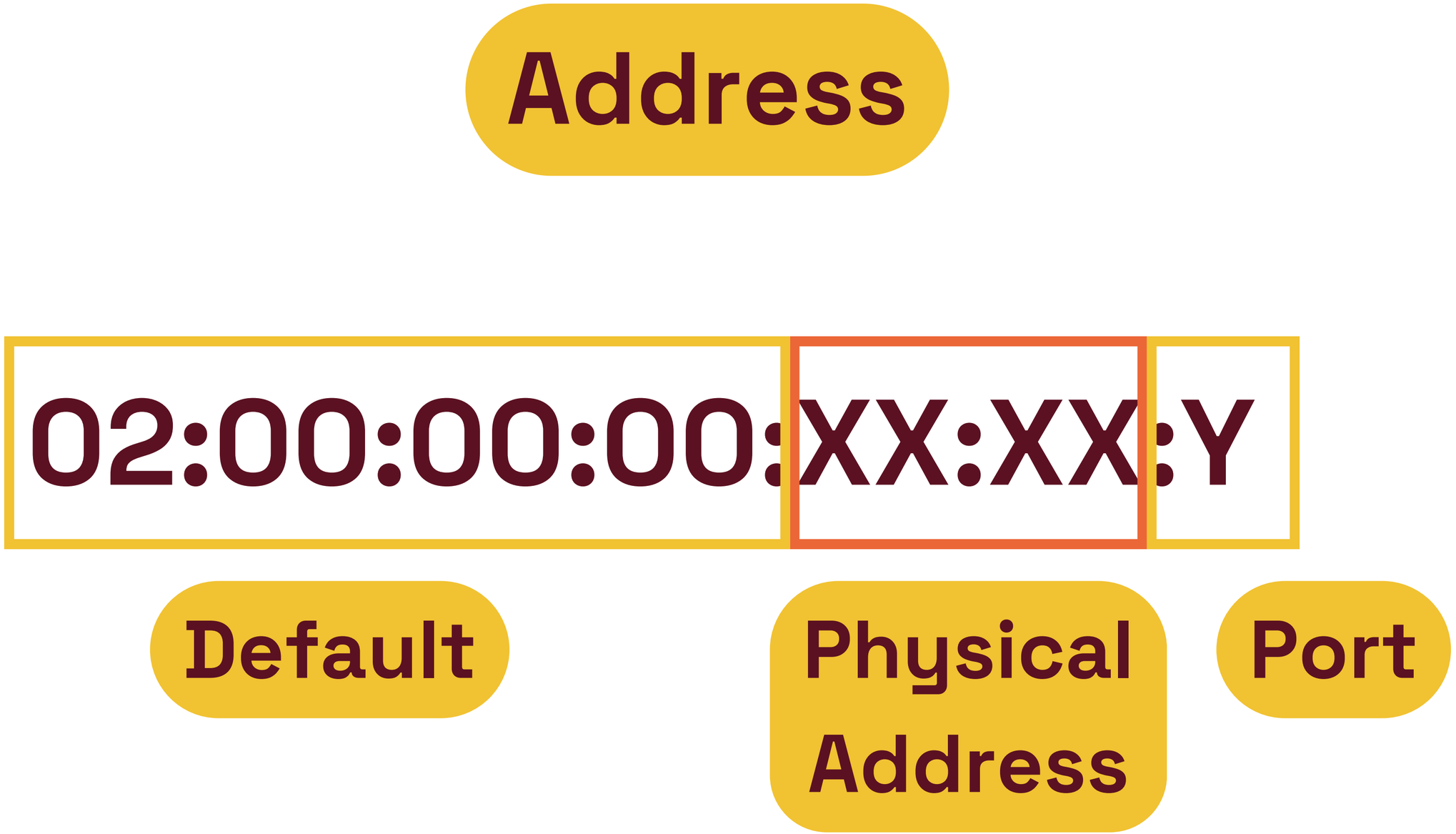
Socket Engine



Sequence Diagram



Shared Memory Engine


Address
02:00:00:00:XX:XX:Y
Default
Physical Address
Port

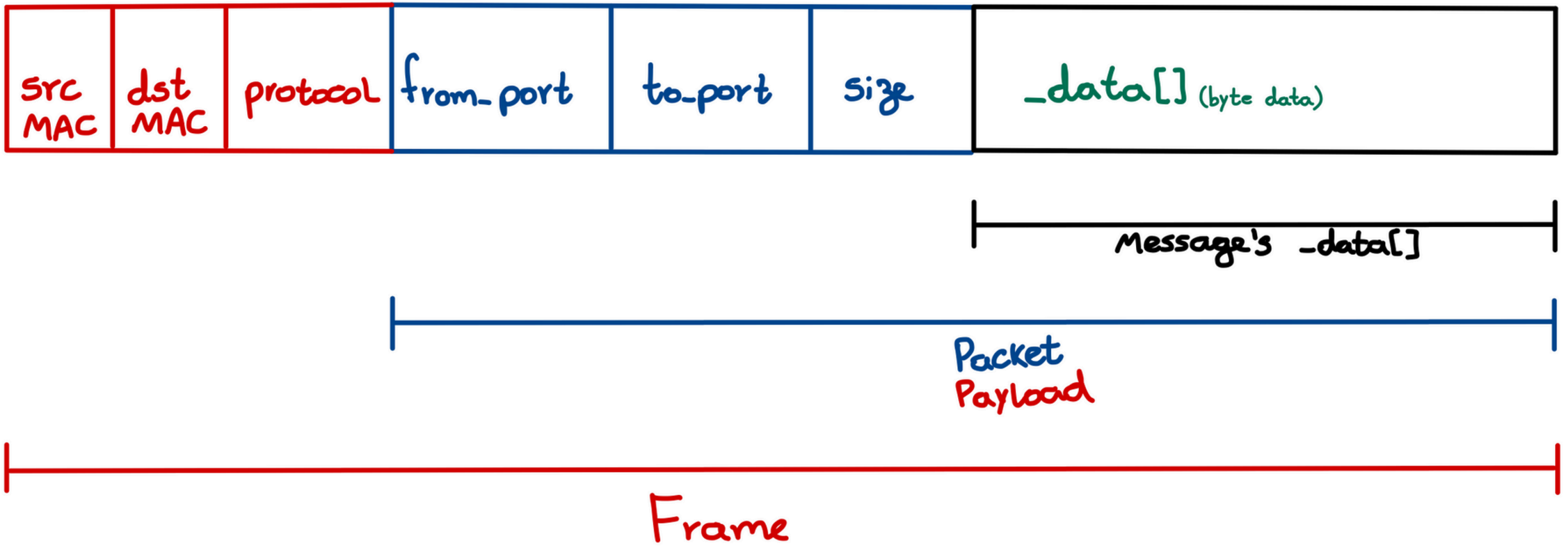
Encapsulation Hierarchy

Application Layer:
- Message<MaxSize>
  - _data[] (actual application data)
  - _size (data size)
  - _origin (source address)

Network Layer (Ethernet):
- DataBuffer
  - Ethernet::Frame
    - Header (src MAC, dst MAC, protocol)
    - payload[] (contains Protocol::Packet)

Transport Layer (Protocol):
- Protocol::Packet
  - Header (from_port, to_port, size)
  - Data[] (contains Message's _data)

Encapsulation



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