

Structural Mapping Between Human Behaviour Models and Autonomous System Architectures

Using **ABRFA**

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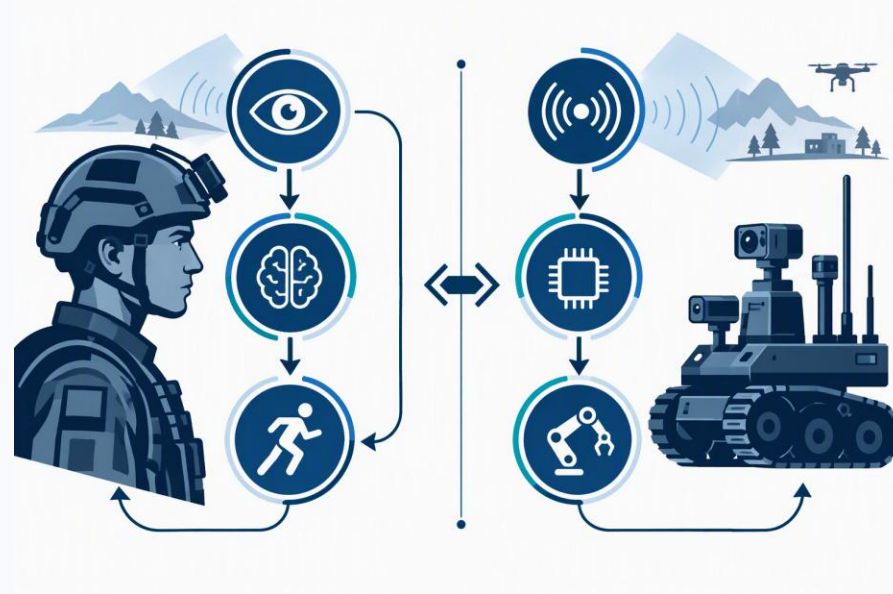
Behaviour → Architecture

Human Behaviour Modelling

- Perception
- Cognition & decision
- Action

Autonomous Systems

- Sensing
- Decision & control
- Execution



Similar functions — different architectures

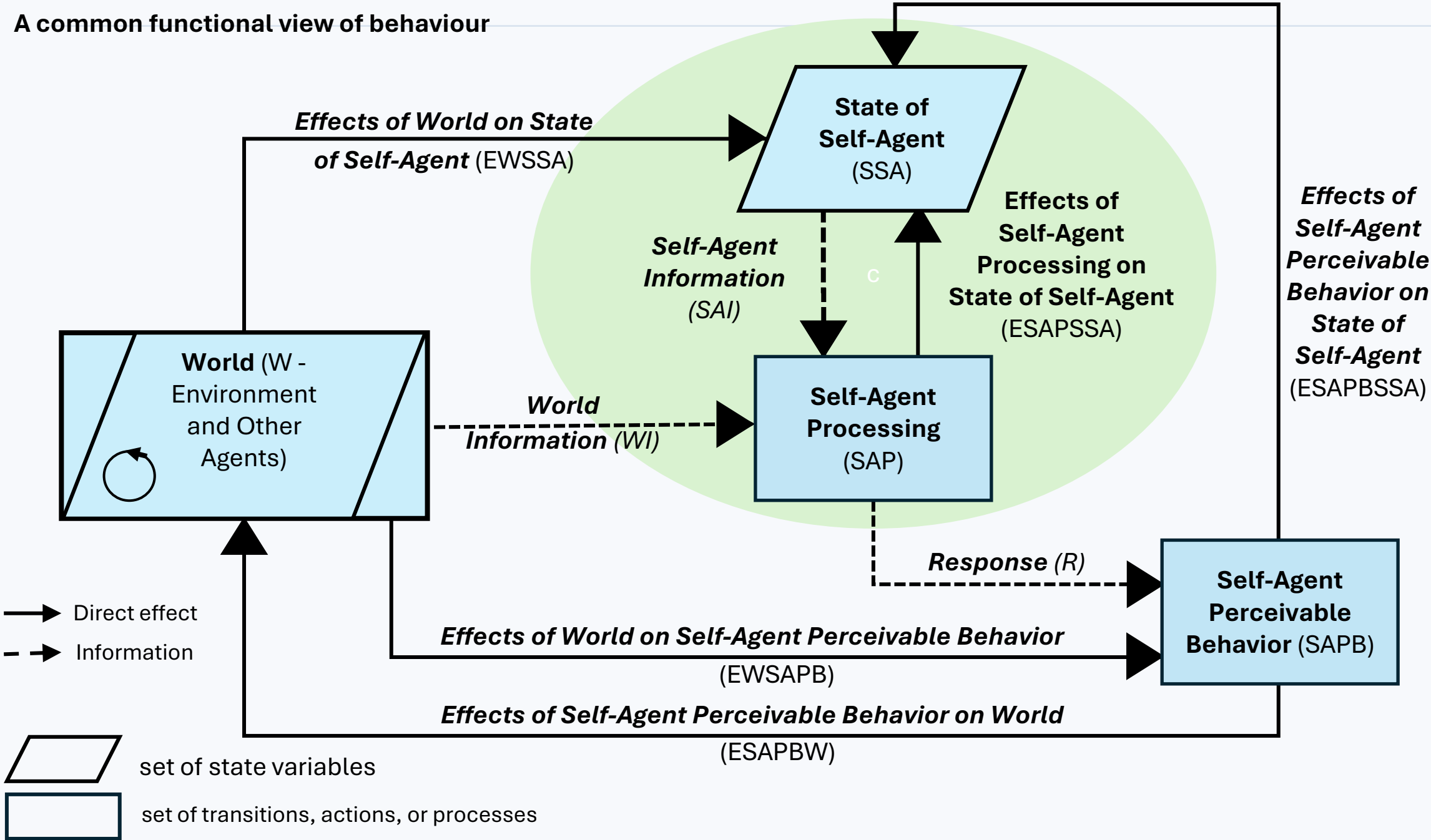
Agent Behavior Reference Framework (ABRF)

- a tool to aid in simulation **conceptual model** documentation
- support of communication, collaboration
- design of new models
- behaviour theory and implementation independent
 - developed by NATO STO MSG-222 „Representing Human Behavior and Decision-Making in Modelling and Simulation“

What the agent does — not how it does it

ABRF Functional Structure

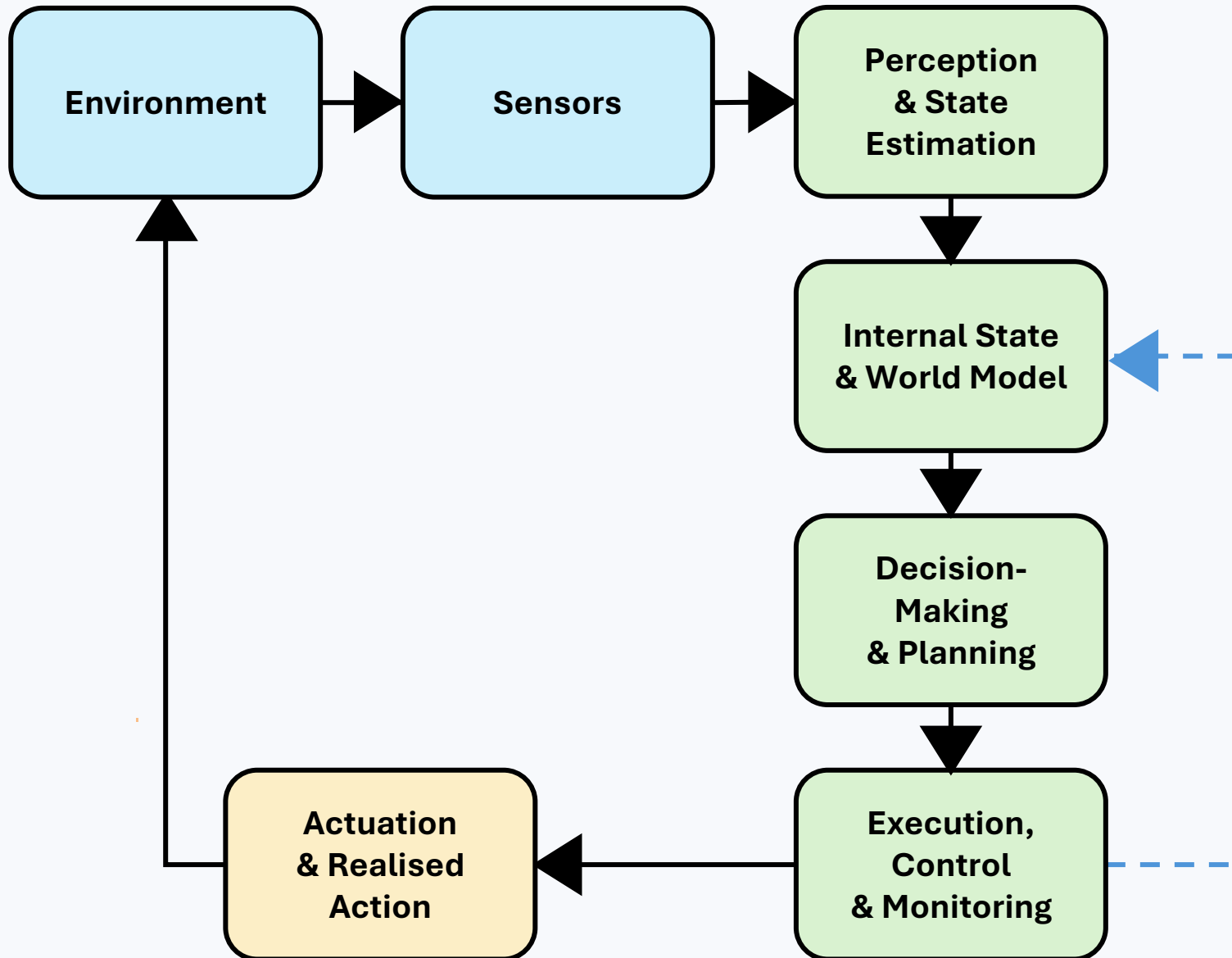
A common functional view of behaviour



Autonomous-System Functional Architecture

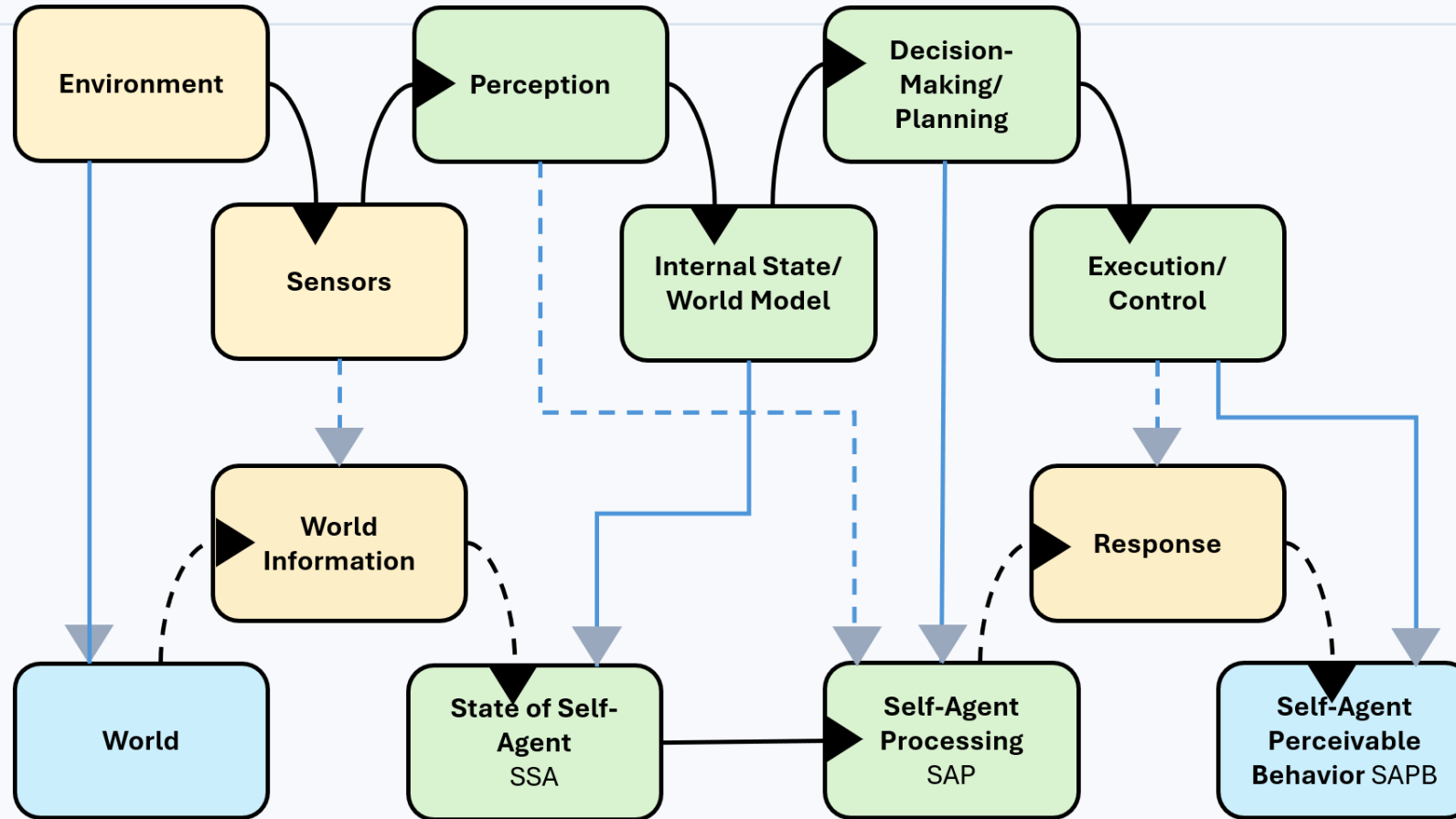
MESAS 2026

A comparable functional cycle



Structural Mapping: ABRF ↔ Autonomous Architecture

MESAS 2026



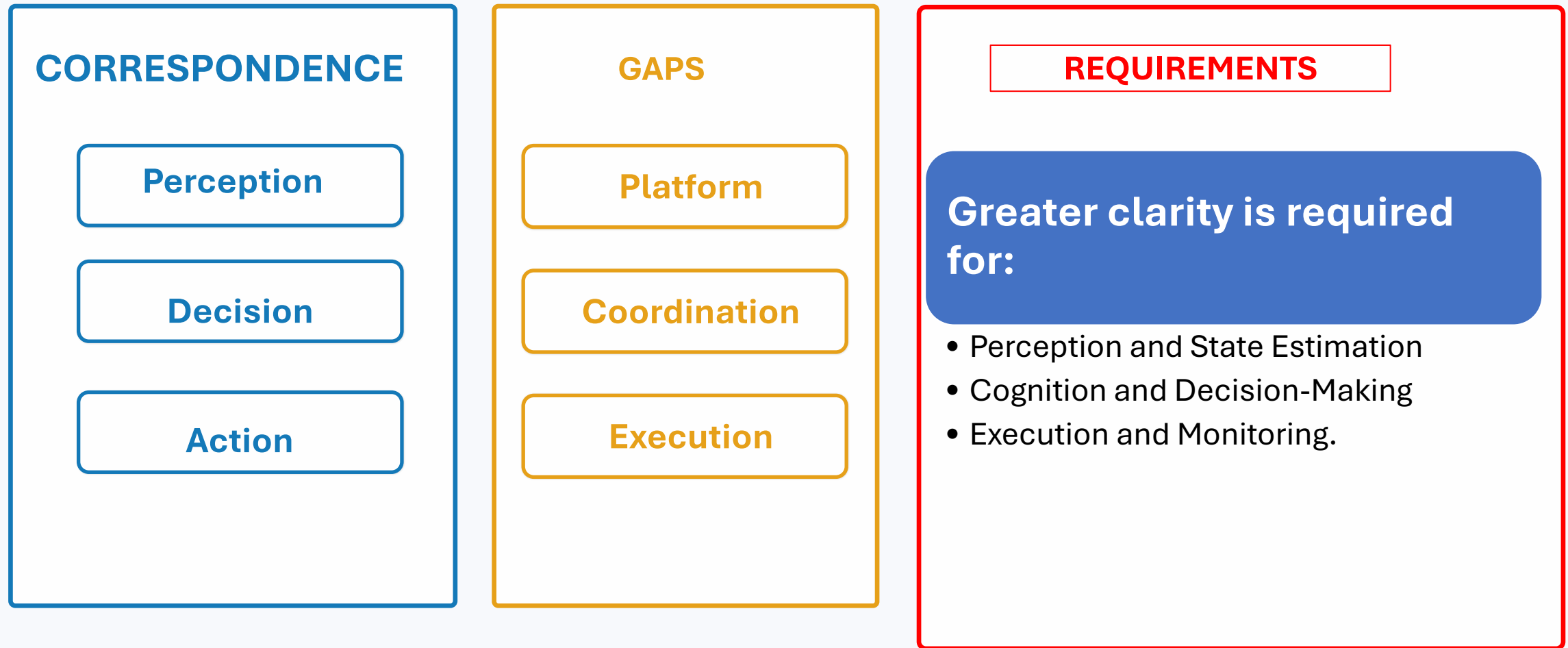
Mapped

Perception ↔ Sensing
Decision ↔ Decision & Control
Action ↔ Execution

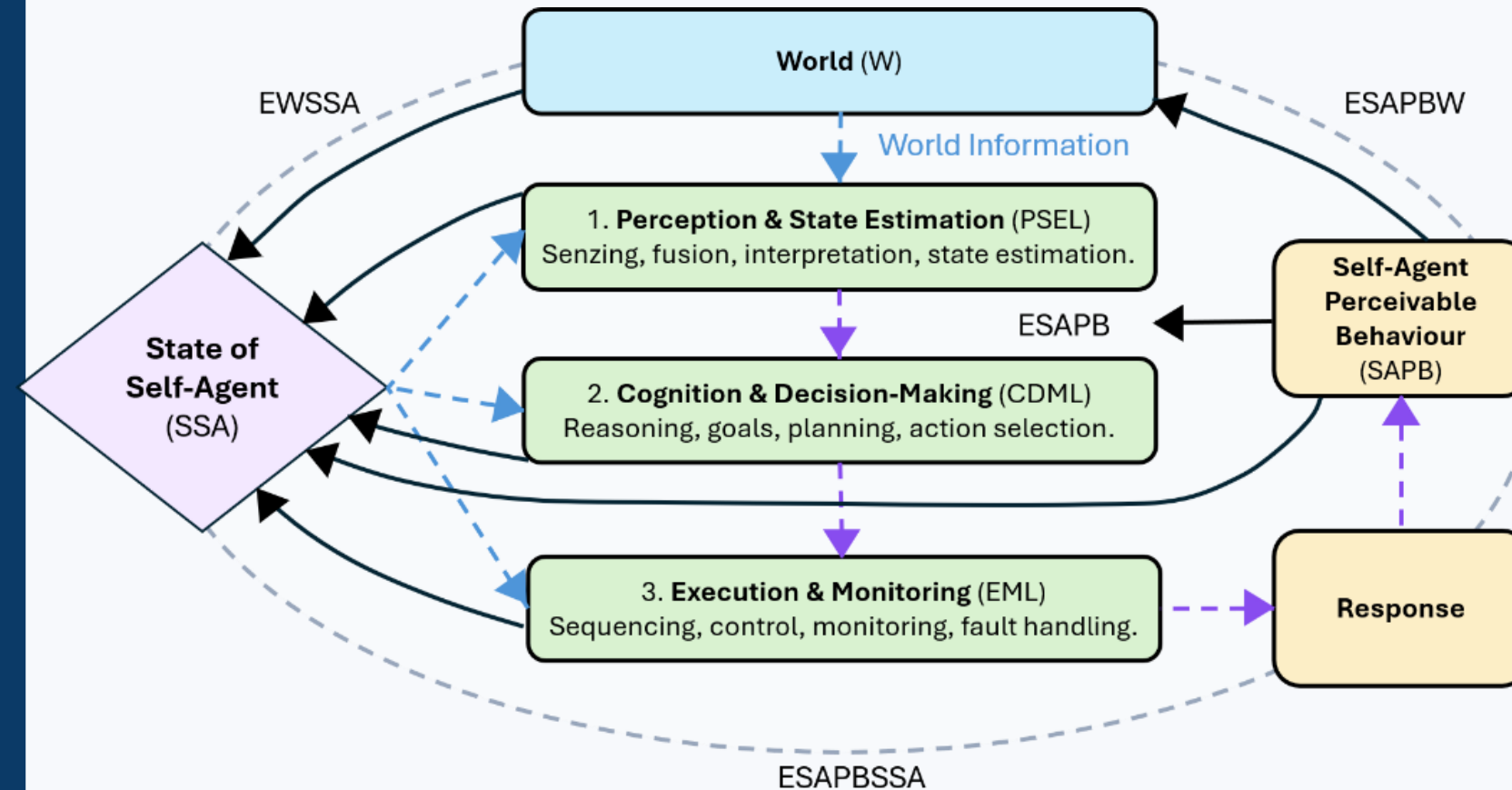
Unmapped

Platform / System Interaction
Command & Decision Coordination
Execution Management

ABRF aggregates self-state, world model, goals, plans, execution status, and learned knowledge within one state component



The mapping also reveals architectural gaps



$$\text{SAP} = \text{PSEL} \cup \text{CDML} \cup \text{EM}$$

Design follows five principles:

1. compatibility with ABRF,
2. theory neutrality,
3. functional explicitness,
4. scalability across autonomy paradigms and aggregation levels,
5. support for interoperability
 - clear inputs, outputs, state dependencies, and boundaries

From behavioural framework to reference architecture

Common functional architecture for

- Human agents
- Autonomous agents
- Hybrid human–autonomy systems

Supporting points

- Common functional vocabulary
- Explicit allocation of responsibilities
- Human–machine functional relationships

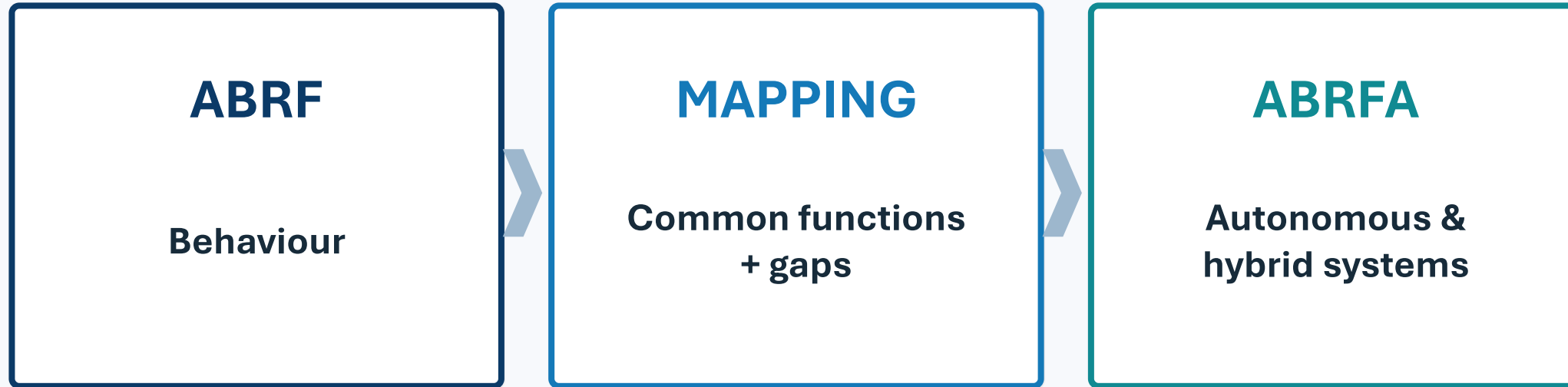


One functional view — different agents

ABRFA can support

- . Functional decomposition
- . Allocation of responsibilities
- . Architecture comparison
- . Integration & composability reasoning

Reason about architecture before implementation



**From modelling agents to architecting
human–autonomy systems**

Thank you — Questions?

ABRF provides the behavioural foundation

ABRFA extends it towards autonomous-system architecture

Structural mapping creates the bridge

**From modelling agents to architecting
human–autonomy systems**

Thank you — Questions?
