

# Distribute Command and Organizational Situation Awareness

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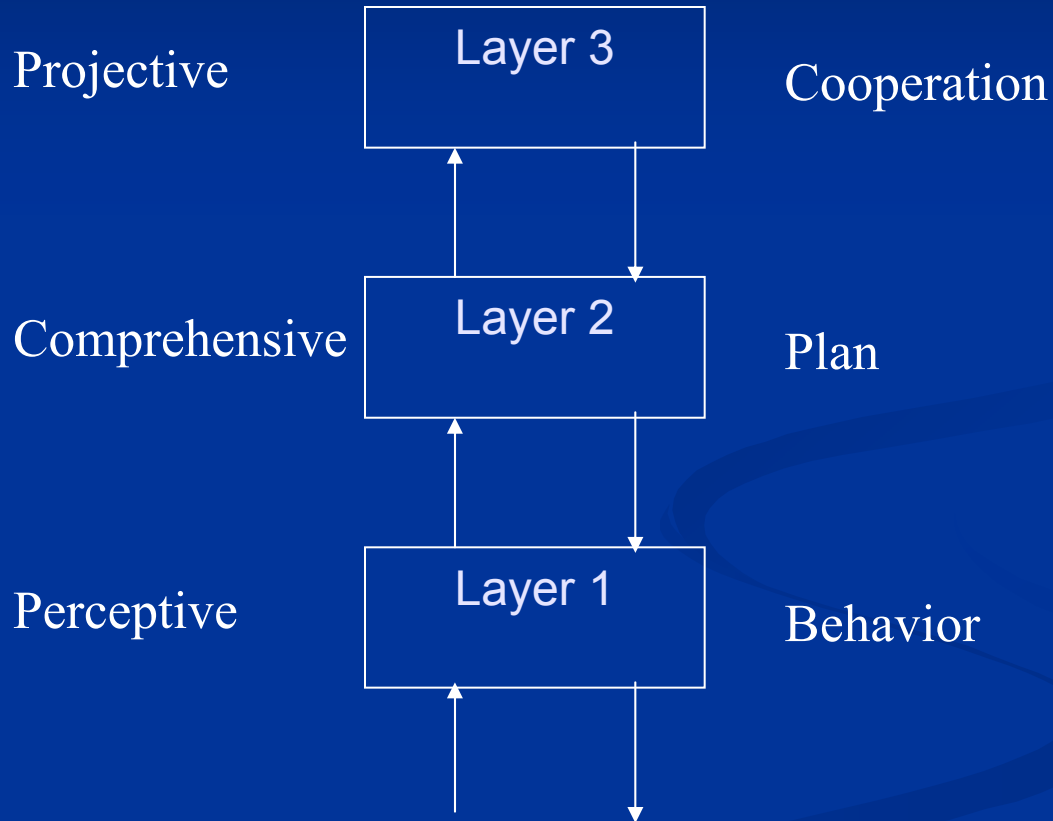
# Measurement of SA

- $M : SA \rightarrow R$
- Measurement maps a situation to a number or categorical value.
  - $M : SA \rightarrow r$  in  $\{0..100\}$
  - $M : SA \rightarrow r$  in  $\{\text{None, Partial, Full}\}$
  - $M : SA \rightarrow r$  in  $\{S1, S2, S3, S4, S5\}$

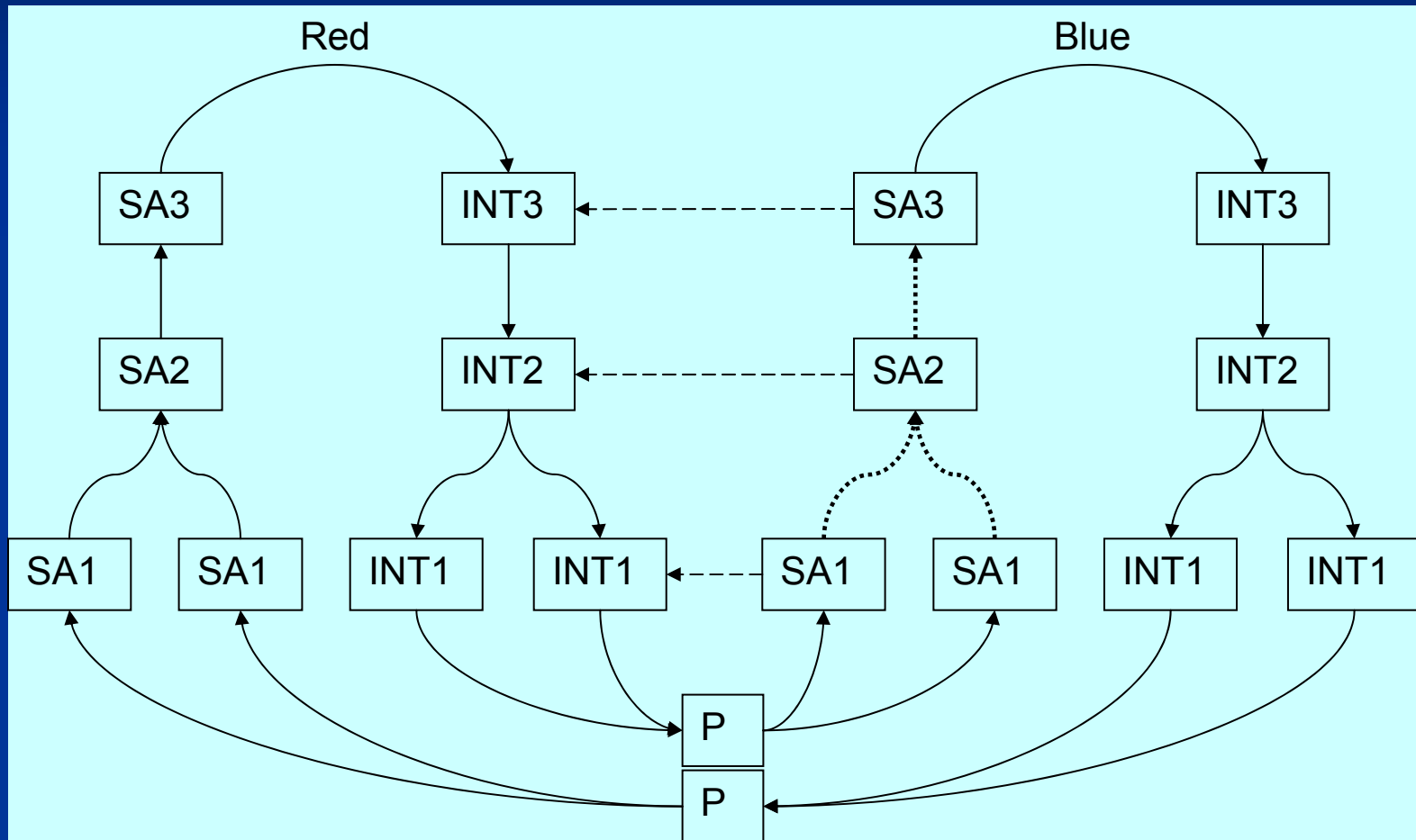
# Combination of SA

- Organization is composed of entities E1, E2, and E3.
- Individual SAs are E1=Full, E2=0.7, E3=Partial.
- How to combine individual SAs to form an organizational SA?
- Would {Full, 0.7, Partial} be acceptable as the organizational SA?

# SA Hierarchy



# Organization SA



# Modal Logic

- Can be used to represent belief, intention, possibilities, and self-knowledge.
- More representative than first generation AI representational language.
- “If the information that can identify the target cargo container was sent via email in the last 48 hours, then I know I have the means to find the target container.”
- $K(\text{Phi}) \rightarrow K(K(\text{Phi}))$

# Utility of Organization SA

- $U(\text{OSA}) > \text{Sum} (U (\text{SA} (\text{entity})))$ 
  - E1 knows Phi
  - E2 knows  $\text{Phi} \rightarrow \text{Tau}$
  - Combine E1 and E2's awareness, the combined knowledge  $\{\text{Phi}, \text{Phi} \rightarrow \text{Tau}, \text{Tau}\}$  is greater than individual knowledge  $\{\text{Phi}, \text{Phi} \rightarrow \text{Tau}\}$

# An Example of Utility of Combined SA

- Event1: General Tsao's army stops at the sight of Lord Jeang's castle. The castle's gate is open with no significant activities seen within. Tsao's observer reports seeing Lord Jeang playing nonchalantly with his pet parakeet in the observation tower.
- Is this a trap?



- Event 2: General Tsao receives a report from an intercepted messenger returning to Lord Jeang's castle. The message says, "The deal has been accepted; reinforcements will arrive within a day's time."
- Combine Event 1 and Event 2 awareness reduces ambiguity and risk resulted in effective action.

# Conclusion

- Combining localized situation awareness can produce better awareness that could disambiguate opponent's intention.
- Modal Logic is a richer language that can represent concept such as *necessarily*, *possibly*, and *knows*.