Universität der Bundeswehr München

MOSAIC

A Concept for a Multi-Resolution Geo-Strategic Simulation

Sebastian Erasmus, Vardan Nazaretyan, Leon Becker, Falk Stefan Pappert, Oliver Rose

Strategic Simulation

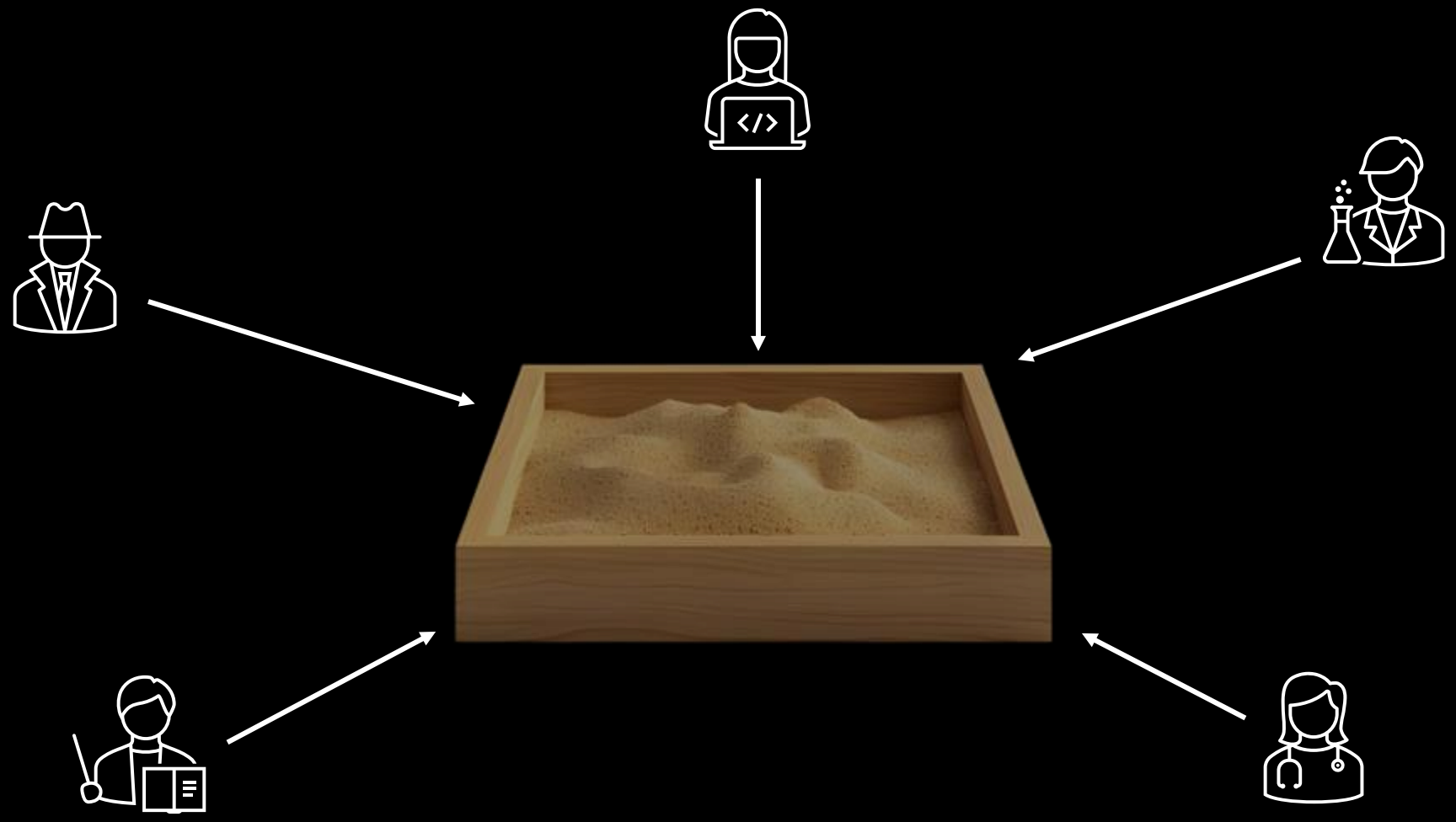
der Bundeswehr
Universität München

Sebastian Erasmus, Vardan Nazaretyan, Leon Becker,
Falk Stefan Pappert, Oliver Rose

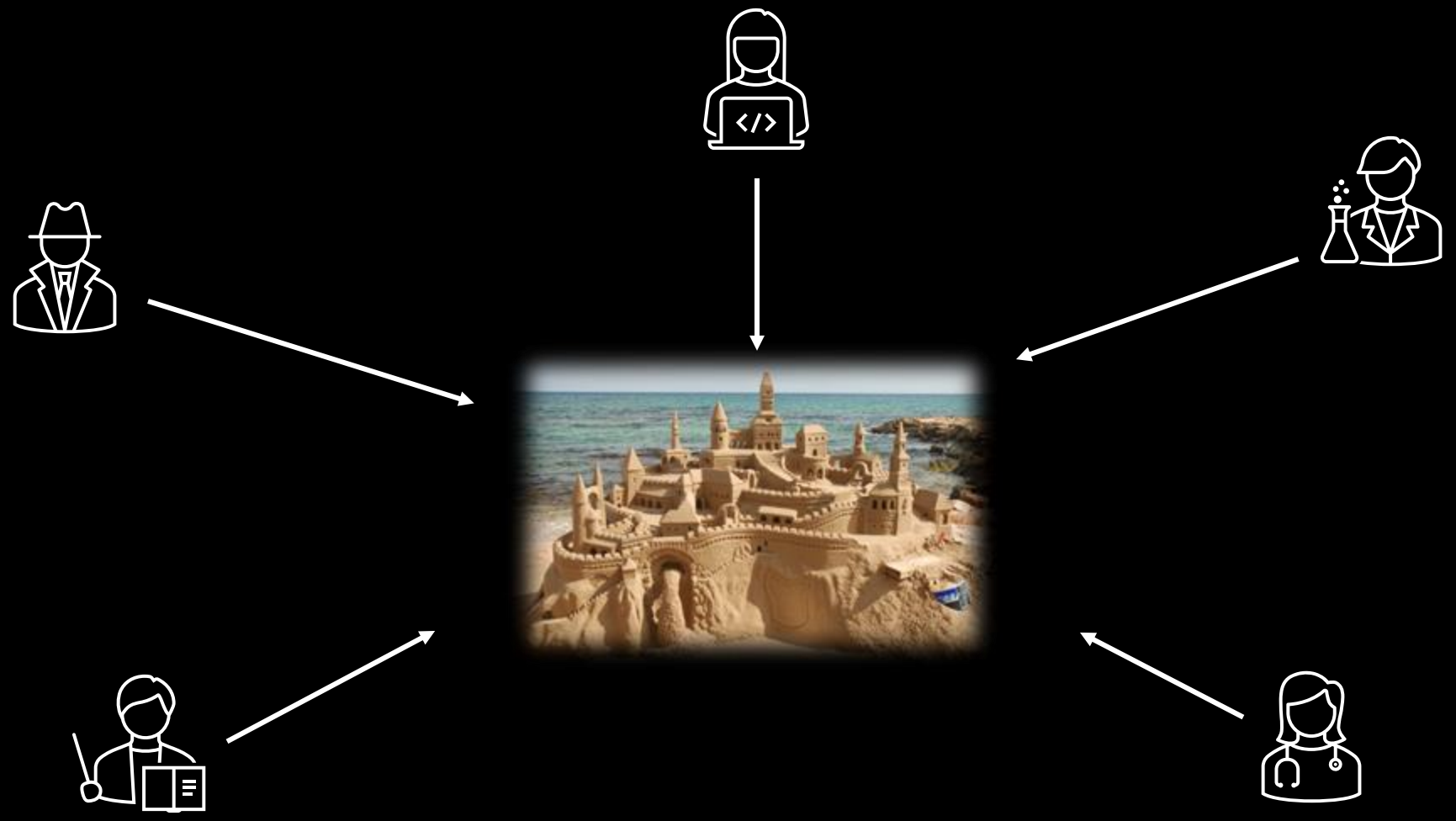
PMESII-ASCOPE Matrix

	Political	Military	Economic	Social	Infrastructure	Information
Areas	District Boundaries	LN bases	Markets	Parks	Irrigation networks	Radio
Structures	Town halls	Military HHQ	Banks	Churches	Roads	TV towers
Capabilities	Insurgent capabilities	Strengths and weaknesses	Access to banks	Strength of national ties	Build roads	Literacy rate
Organizations	Political parties	Units of military	Banks	Youth groups	Infrastructure Operators	News groups
People	Governors	Leaders from coalition	Bankers	Religious leaders	Builders	Media owners
Events	Elections	Kinetic events	Drought	Holidays	Road construction	IO campaign

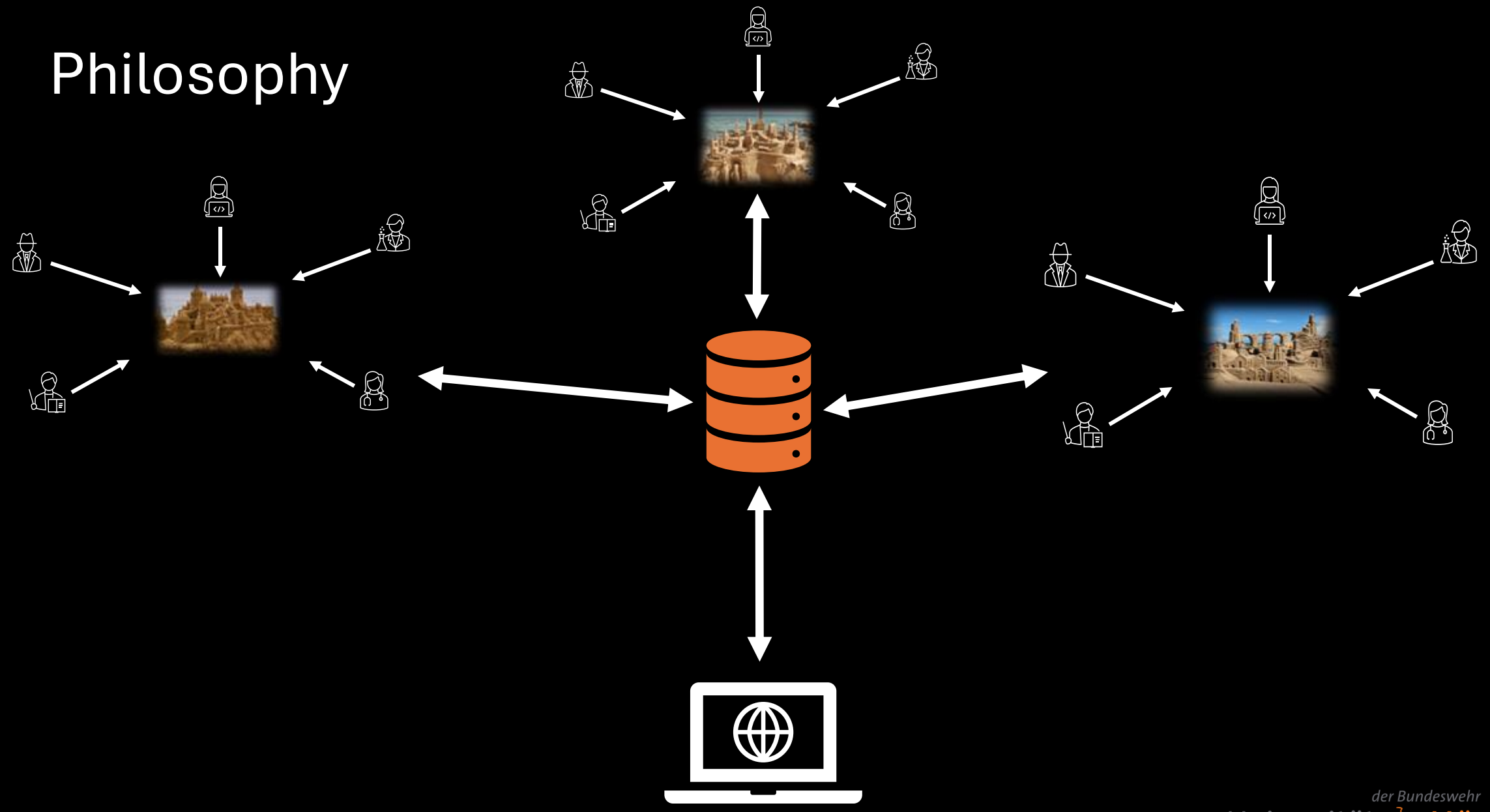
Philosophy

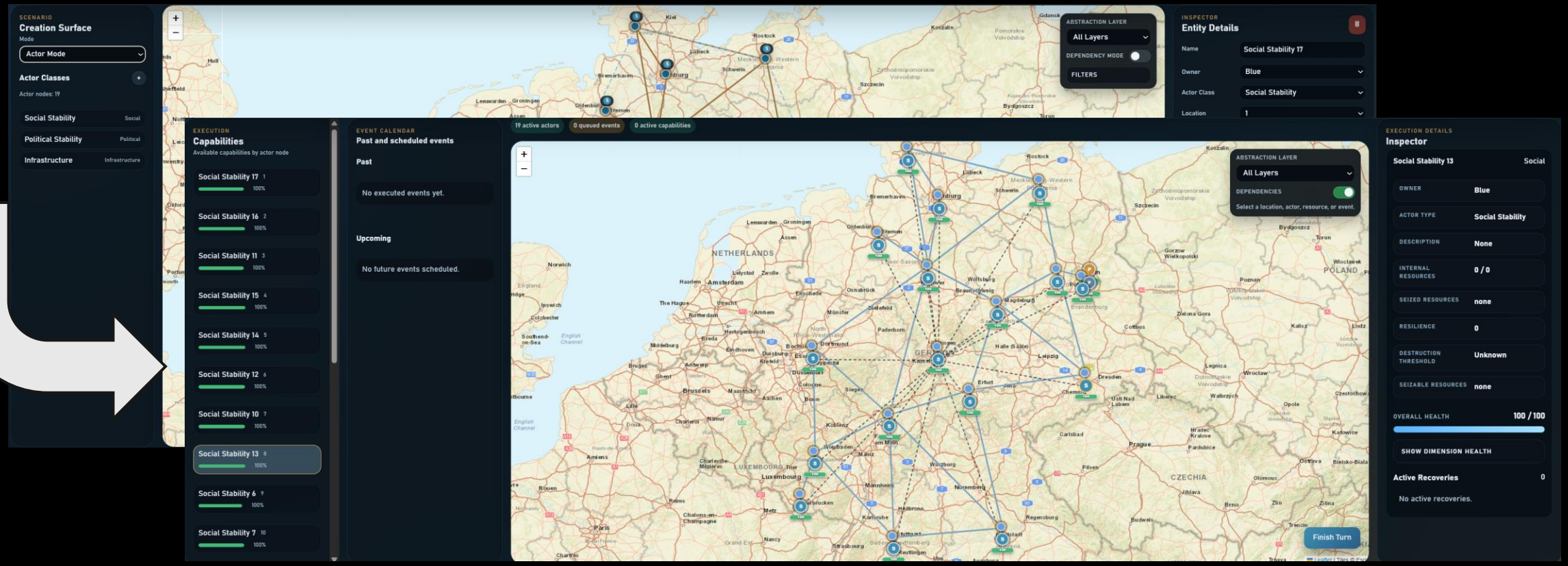


Philosophy



Philosophy





der Bundeswehr
Universität München

Sebastian Erasmus, Vardan Nazaretyan, Leon Becker,
Falk Stefan Pappert, Oliver Rose

PMESII-ASCOPE Matrix

	Political	Military	Economic	Social	Infrastructure	Information
Areas	**Actor / Location Nodes**					
Structures	**Actor Nodes**					
Capabilities	**Actor Capabilities**					
Organizations	**Actor Nodes** *Abstraction Layer 1*					
People	**Actor Nodes** *Abstraction Layer 0*					
Events	**Pre-Defined Events & Capability Events**					

PMESII-ASCOPE Matrix

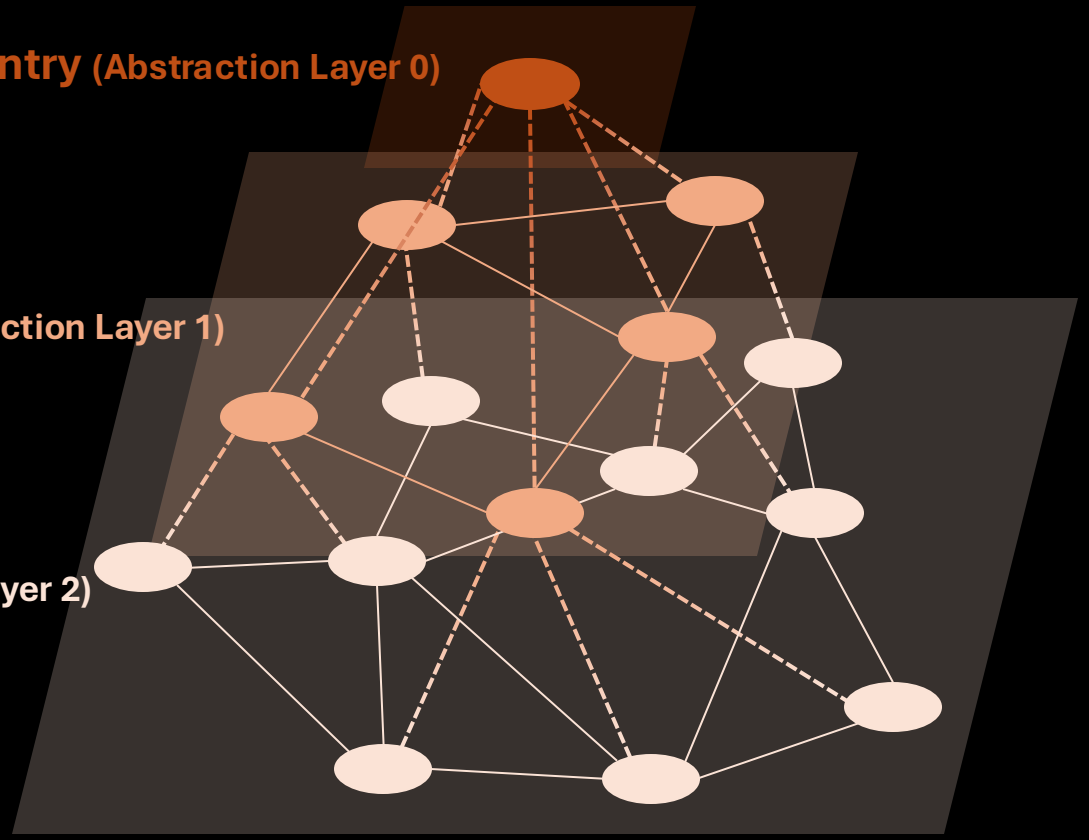
	Political	Military	Economic	Social	Infrastructure	Information
Areas	Actor / Location Nodes					
Structures	Actor Nodes					
Capabilities	Actor Capabilities					
Organizations	Actor Nodes *Abstraction Layer 1*					
People	Actor Nodes *Abstraction Layer 0*					
Events	Pre-Defined Events & Capability Events					

Dimension Agnostic

Location Graph

Screenshot from Scenario Creation UI

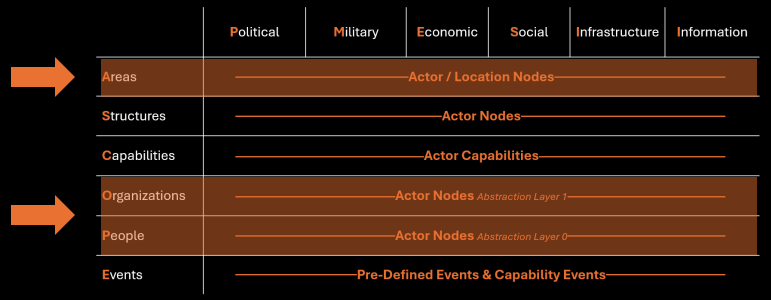
	Political	Military	Economic	Social	Infrastructure	Information
Areas	Actor / Location Nodes					
Structures	Actor Nodes					
Capabilities	Actor Capabilities					
Organizations	Actor Nodes *Abstraction Layer 1*					
People	Actor Nodes *Abstraction Layer 0*					
Events	Pre-Defined Events & Capability Events					



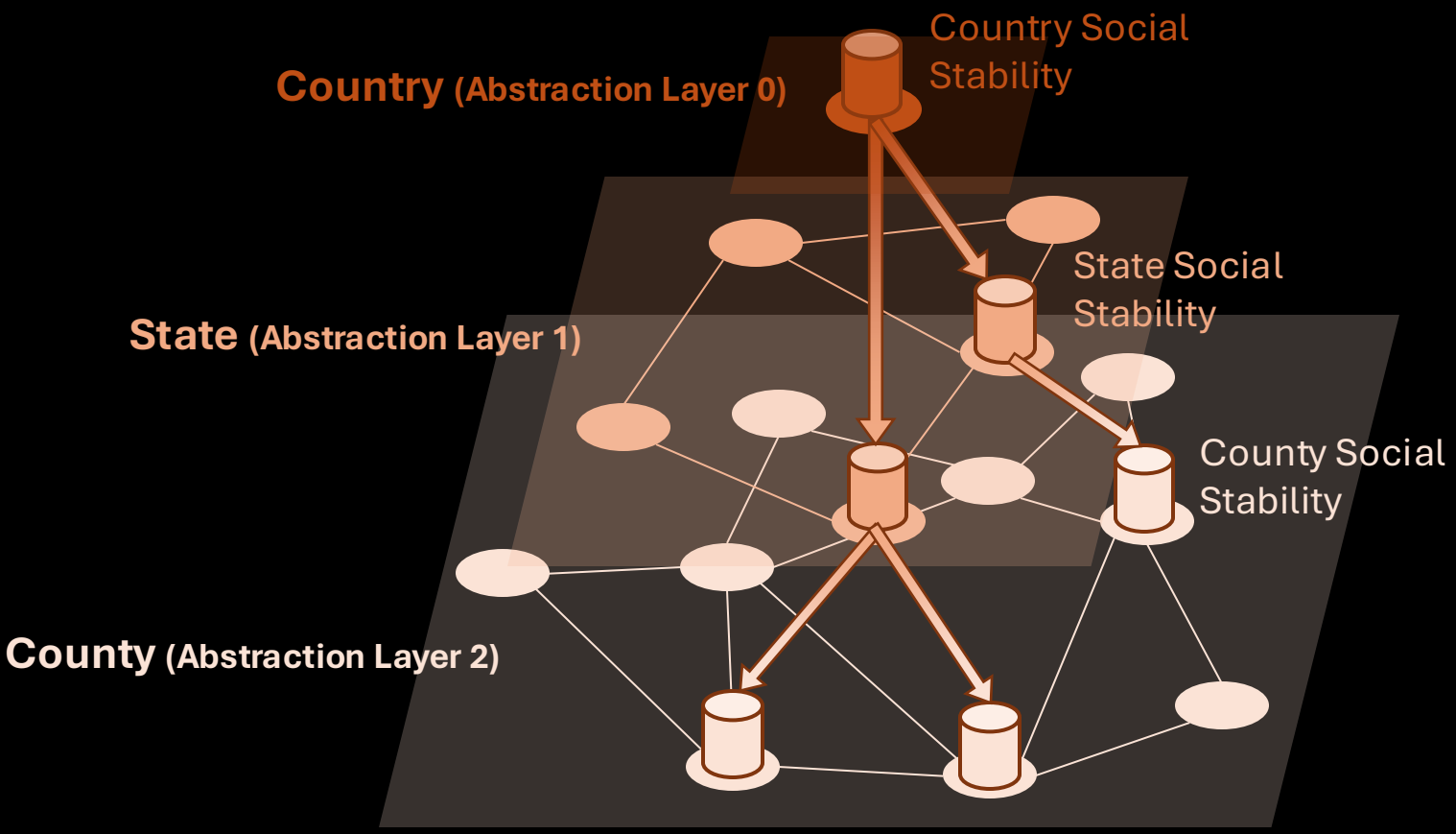
Sebastian Erasmus, Vardan Nazaretyan, Leon Becker,
Falk Stefan Pappert, Oliver Rose

Universität der Bundeswehr München

Actors



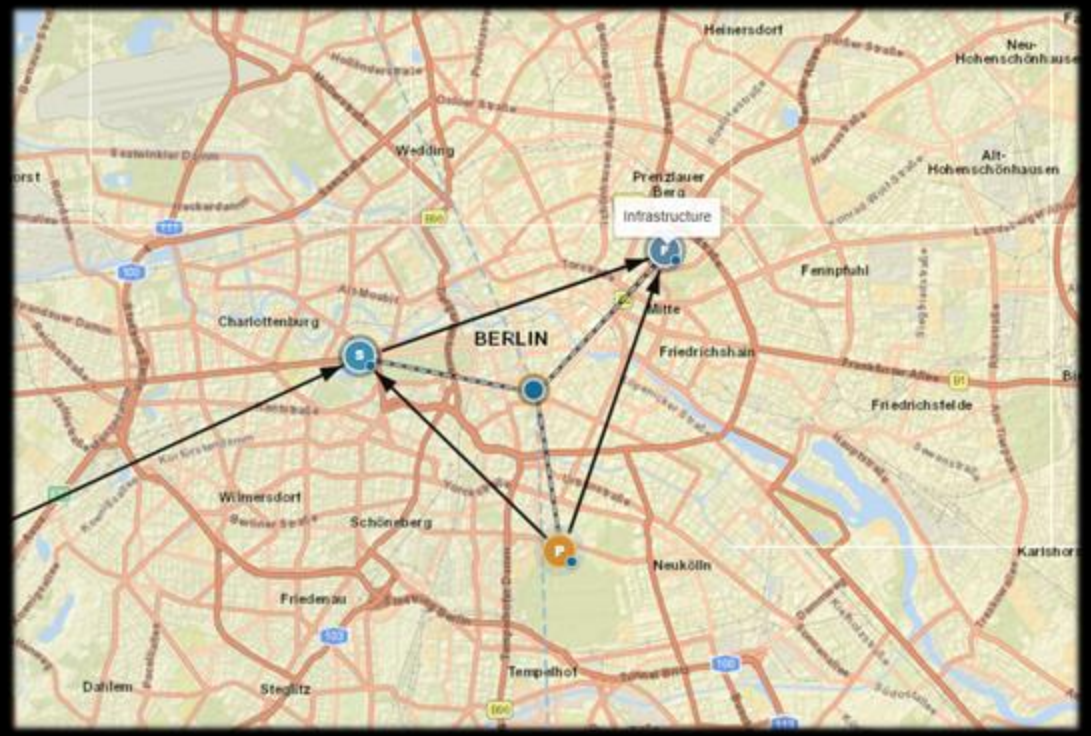
Screenshot from Scenario Creation UI



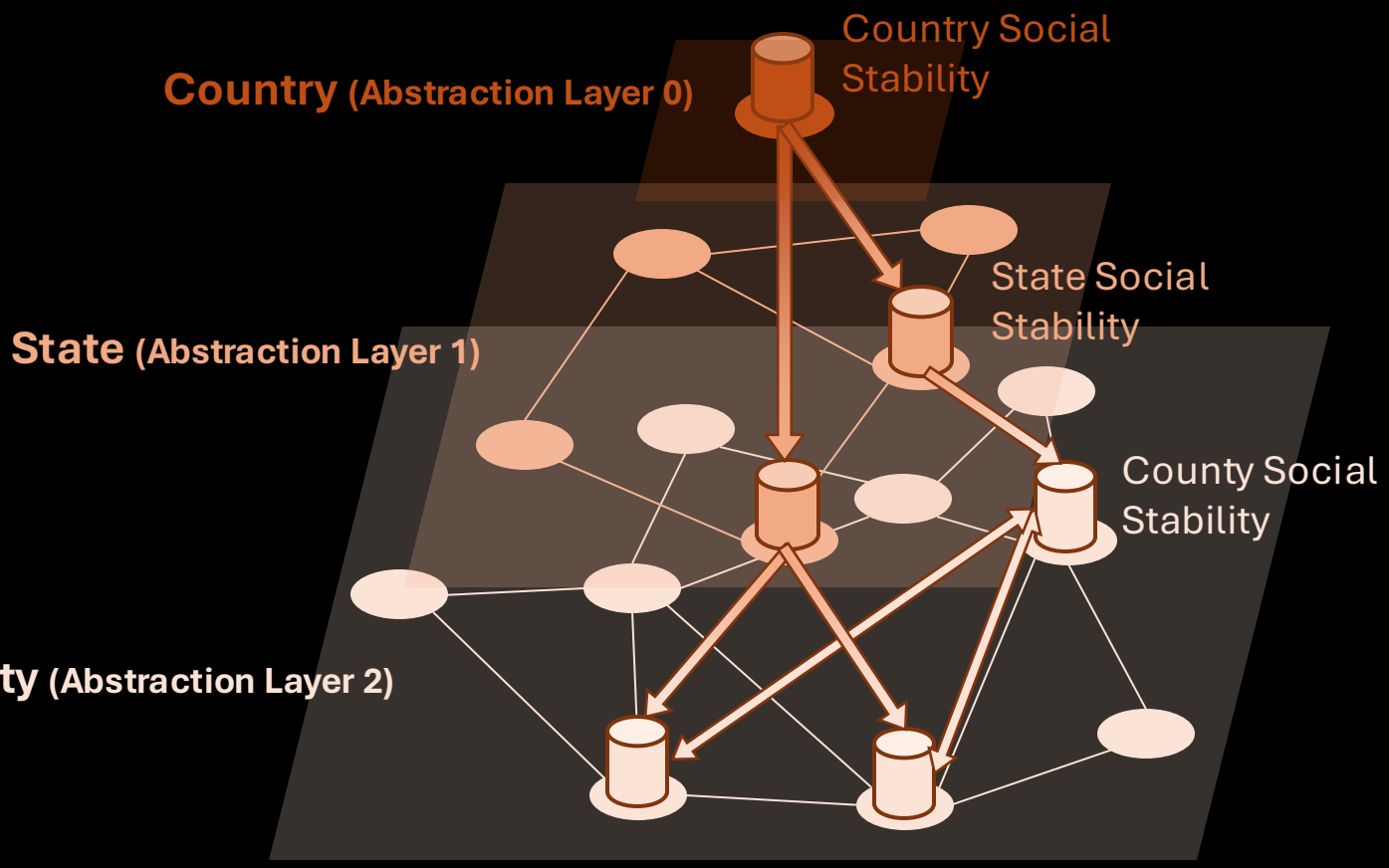
der Bundeswehr Universität München

Sebastian Erasmus, Vardan Nazaretyan, Leon Becker, Falk Stefan Pappert, Oliver Rose

Actors



	Political	Military	Economic	Social	Infrastructure	Information
Areas	Actor / Location Nodes					
Structures	Actor Nodes					
Capabilities	Actor Capabilities					
Organizations	Actor Nodes *Abstraction Layer 1*					
People	Actor Nodes *Abstraction Layer 0*					
Events	Pre-Defined Events & Capability Events					



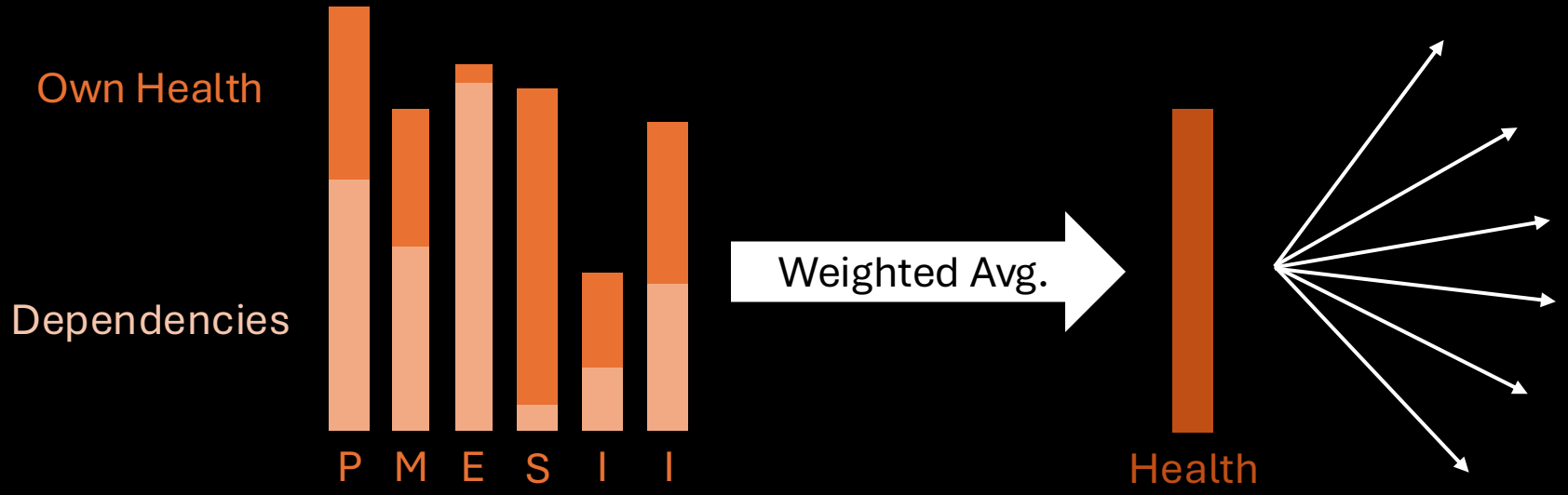
Universität der Bundeswehr München

Screenshot from Scenario Creation UI

Actor Health

Screenshot from Scenario Creation UI

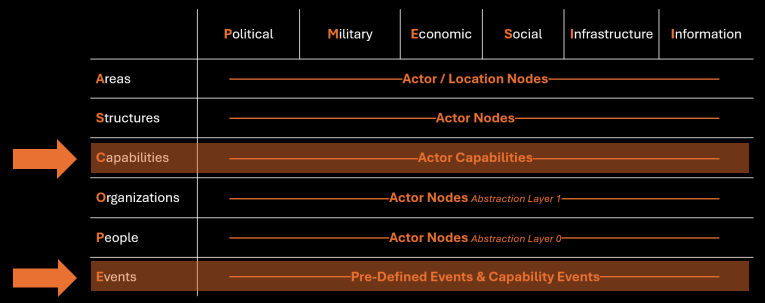
	Political	Military	Economic	Social	Infrastructure	Information
Areas	Actor / Location Nodes					
Structures	Actor Nodes					
Capabilities	Actor Capabilities					
Organizations	Actor Nodes *Abstraction Layer 1*					
People	Actor Nodes *Abstraction Layer 0*					
Events	Pre-Defined Events & Capability Events					



Sebastian Erasmus, Vardan Nazaretyan, Leon Becker,
Falk Stefan Pappert, Oliver Rose

Universität der Bundeswehr München

Capabilities & Events

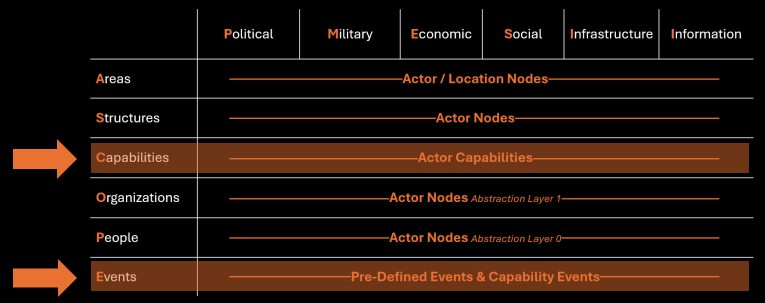


Effect Types:

Health Change:	Deal / Heal Damage
Recovery:	Boost Recovery Process
Movement:	Change Location
Production:	Produce Actor or Resource Node
Counter:	Prevent advisory capability

Sebastian Erasmus, Vardan Nazaretyan, Leon Becker,
Falk Stefan Pappert, Oliver Rose

Capability Example

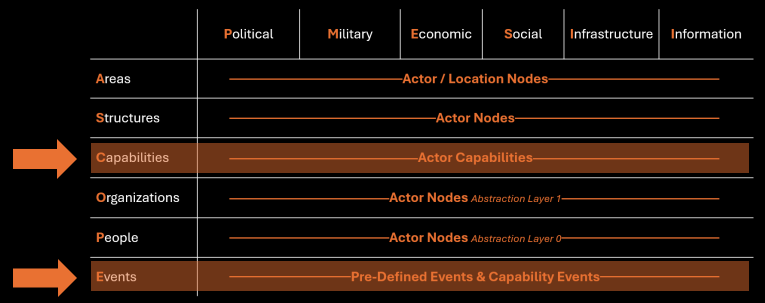


Military Offensive

Airstrike

Attack
Infrastructure Damage
Political Damage
Social Damage

Capability Example



Military Offensive

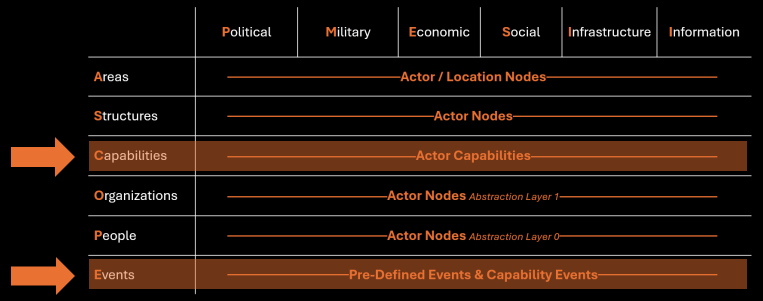
Airstrike

Attack
Infrastructure Damage
Political Damage
Social Damage

Mobilization

Movement
Military Actor changes
Location

Capability Example



Military Offensive

Airstrike

Attack
Infrastructure Damage
Political Damage
Social Damage

Mobilization

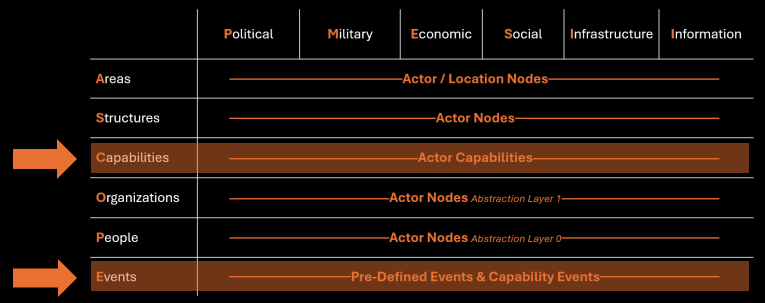
Movement
Military Actor changes
Location

Ground Assault

Attack
Military Damage

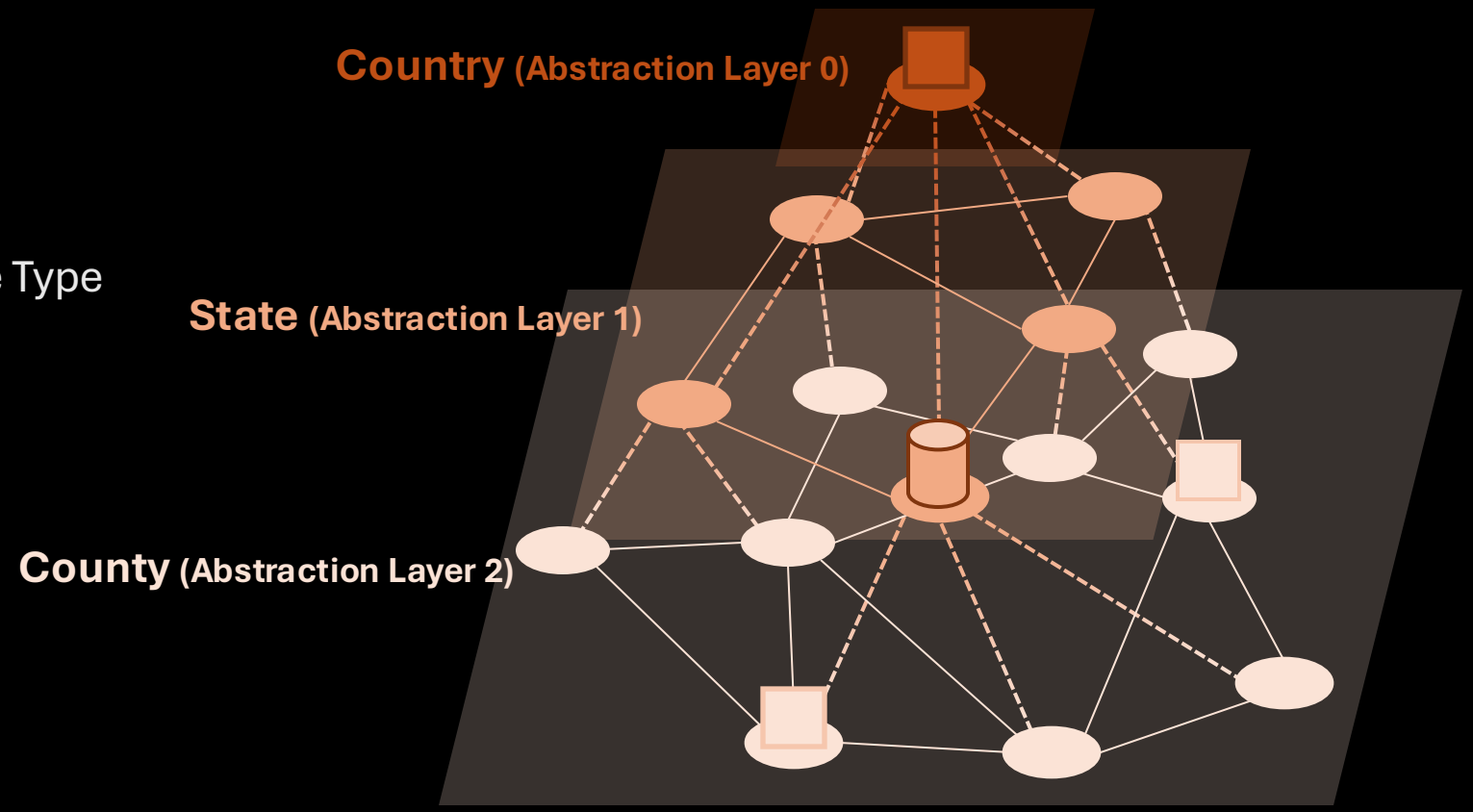
Capabilities & Events

Resource Cost



Resource Nodes:

- Define the base unit of the Resource Type
- Can have movement capabilities
- Can be claimed by actors



Research Directions

Data Import
- Data extraction from public sources
- Data interpretation
- Encoding into simulator

Strategic Simulator

Training and Evaluation of Intelligent Agents
- Heuristics
- World Models
- Reinforcement Learning
- LLMs

Strategic Simulator Development
- System validation & verification
- Requirement analysis
- Extensions with new features