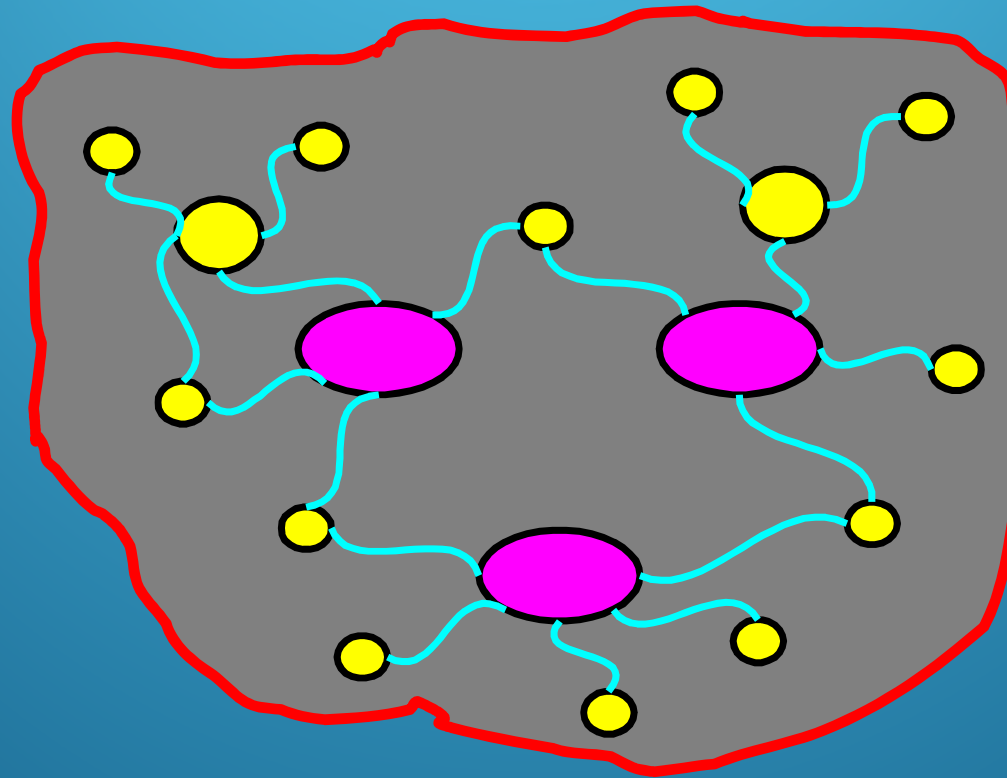


Chapter 2

Design of System Architectures

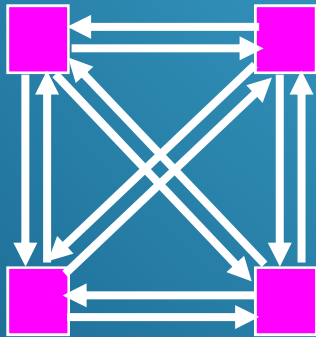


A system is a set of interrelated elements (parts), each of which is related directly or indirectly to every other part, and no subset of which is unrelated to any other subset.

What is a System?

- Each part affects the whole set
- Parts affect each other
- Whole set affects parts
- Whole set cannot be decomposed into independent sub-sets
- Whole set properties different from part properties (emergent properties)

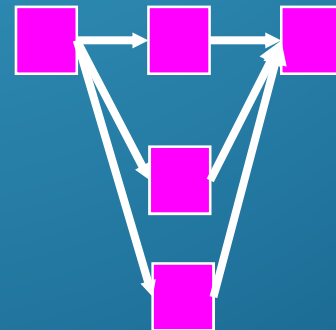
Examples of Systems



a: fully connected system



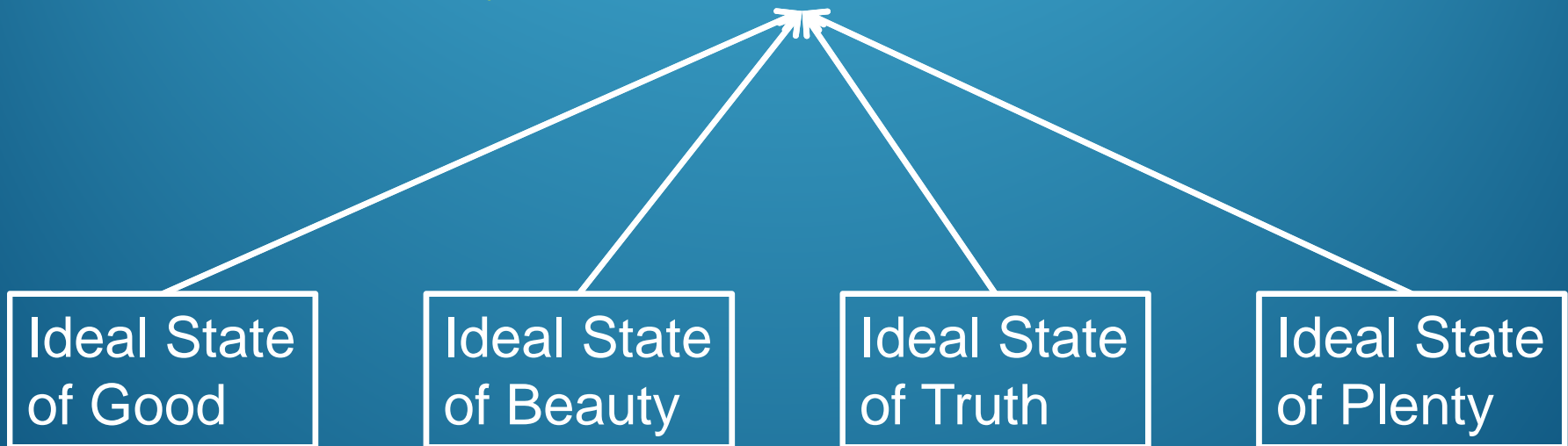
b: serial system



c: parallel system

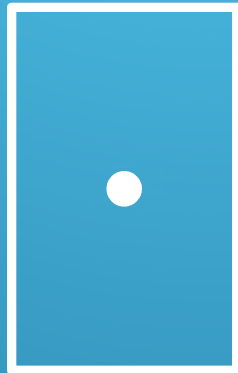
System Philosophy Ideals

Ideal State of Omnicompetence
(ability to desire and attain one's desires)

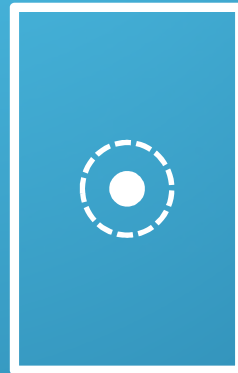




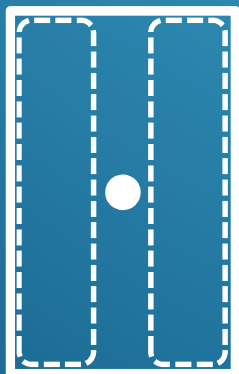
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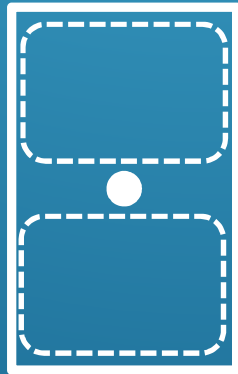
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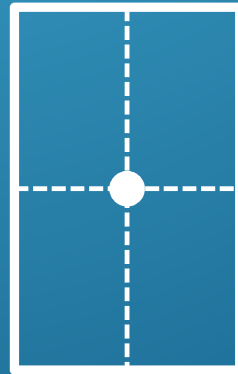
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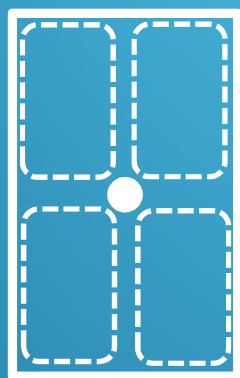
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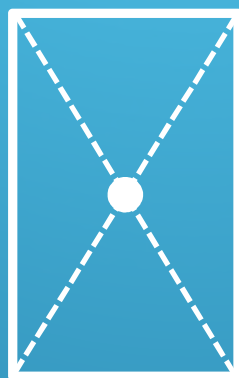
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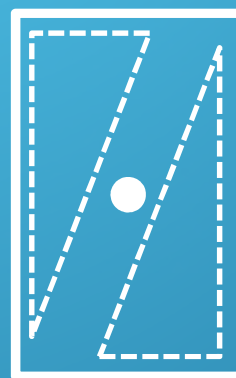
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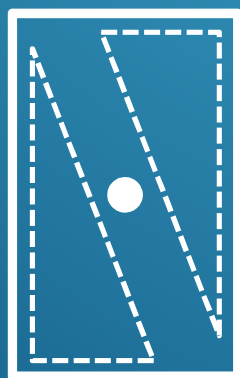
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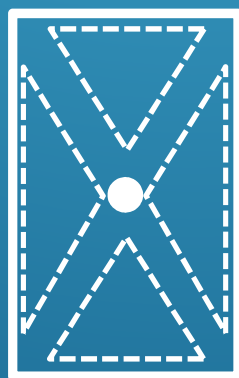
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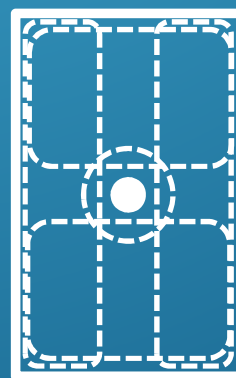
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j



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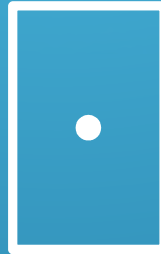


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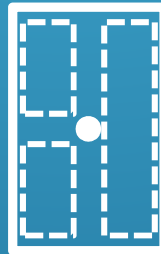
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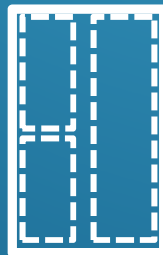
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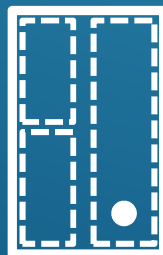
c



d₁



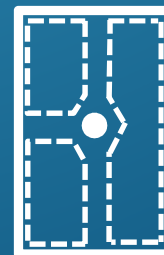
e₁

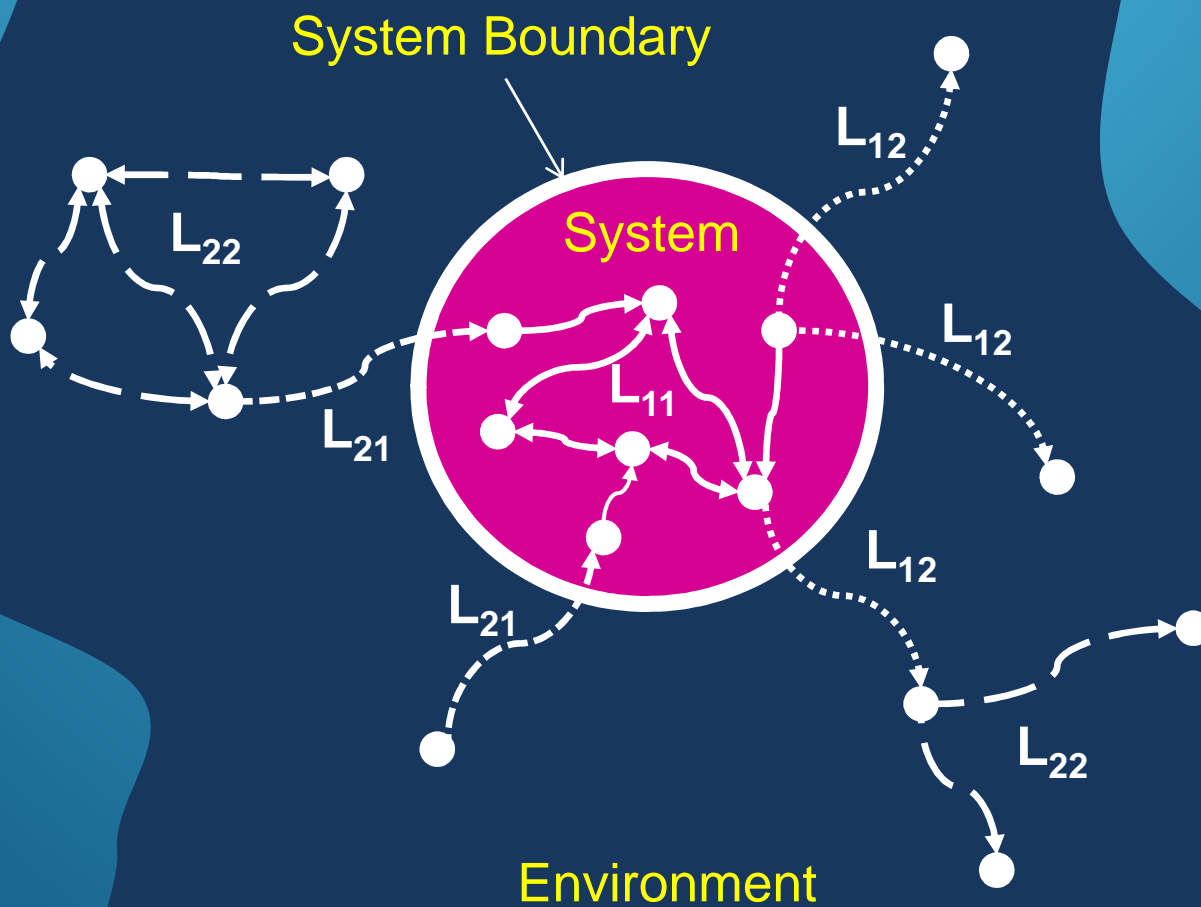


d₂



e₂





Architectural Models

- **Concept or Function architecture** – description in functional terms.

Examples:

- Functional flow diagrams
- Linked N^2 diagrams
- Layer diagrams
- Tree diagrams
- Interaction Matrices
- Topological graphs

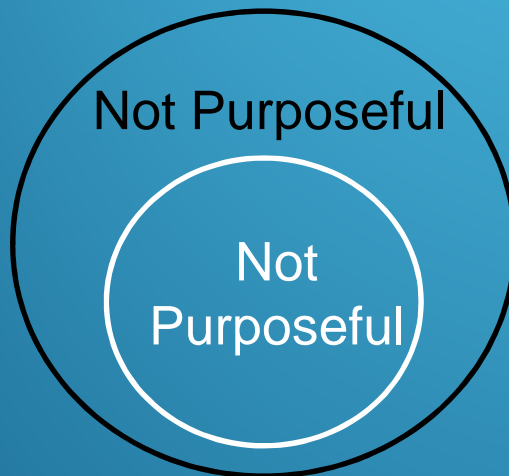
Architectural Models

- **Embodiment or physical architecture** – description in physical terms.

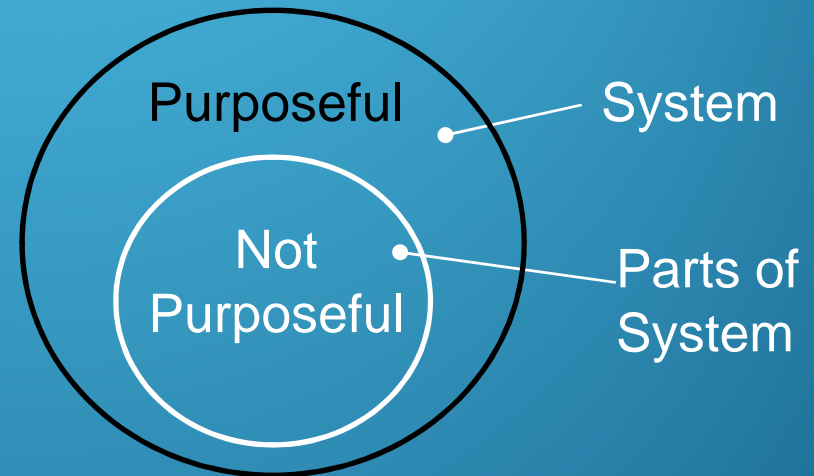
Examples:

- Flow diagrams
- Tree diagrams
- Network graphs
- Schematic diagrams
- Assembly diagrams
- Design matrices
- Cross-relationship charts
- Layout plans

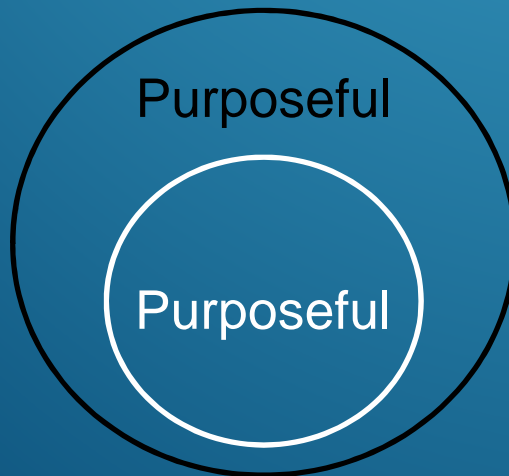
Deterministic



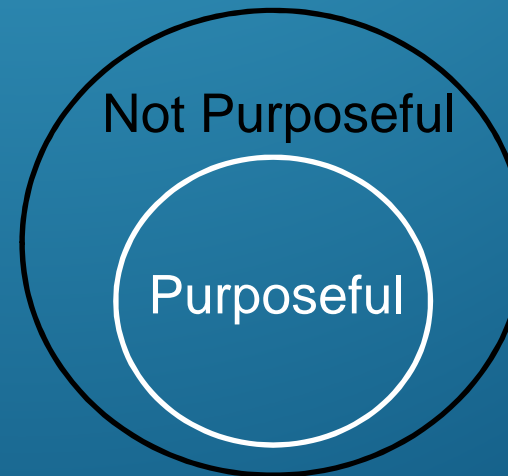
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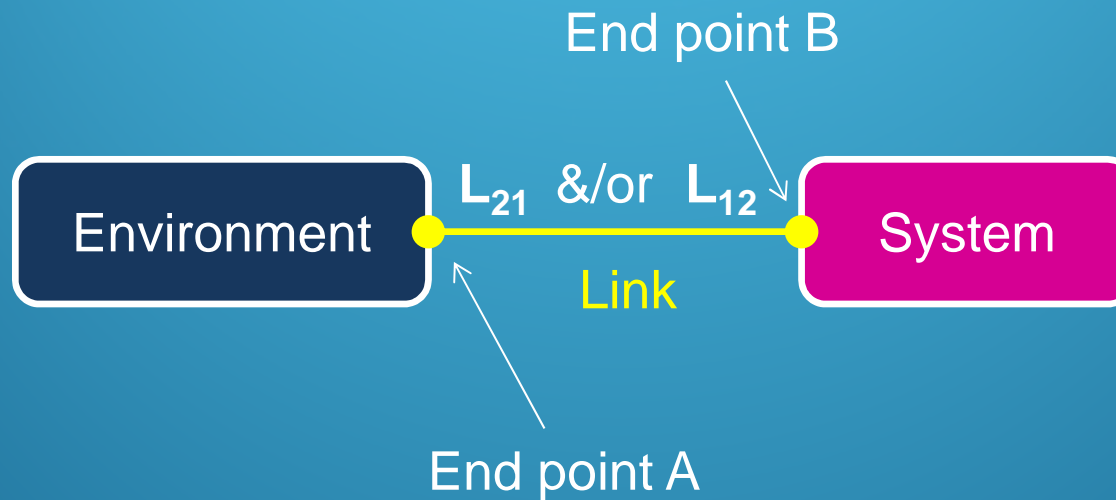


Social



Ecological





The boundary of a system is an imaginary line, area or volume that demarcates a system from its environment.

Describing Environments

- Natural
- Hostile
- Non-cooperative
- Cooperative
- Induced

Architectural Design Methodologies

- Normative
- Rational
- Participative
- Heuristics
- Patterns

Verifying System Architectures

- **Validation:** an assessment process to prove that the right system is being built; that design requirements are correct.
- **Verification:** an assessment process to prove that the system-as-built satisfies the design requirements.

Validation Techniques

- **Market Feasibility:** proving requirements are necessary.
- **Technical Feasibility:** proving a system can be built to requirements.
- **Environmental Feasibility:** proving a system has minimal impact on or will not harm the environment.

Verification Methods

- Similarity
- Analysis
- Demonstration
- Simulation
- Examination
- Test
- Review of Records