A TRUST-BY-DESIGN FRAMEWORK FOR THE INTERNET OF THINGS

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  - Trust
  - Internet of Things
- Architecture Framework
  - K Model
  - Transversal Activities
- Use Case Scenario
- Conclusion

Introduction

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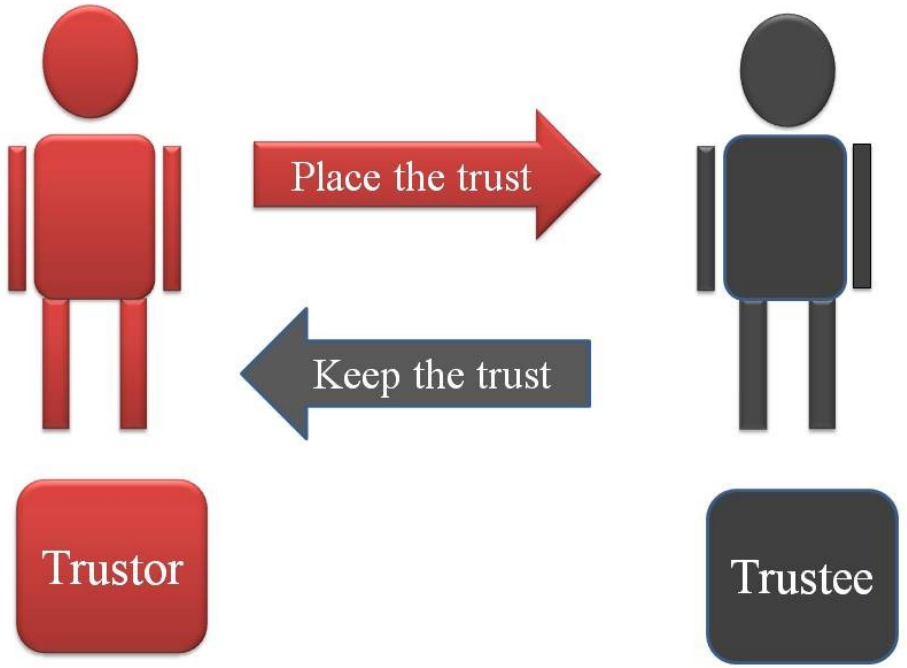
Trust

Trust is difficult to define because:

- “To believe that someone is good and honest and will not harm you, or that something is safe and reliable”.

- Trustor and Trustee



Internet of Things

- 20.4 billions of devices will be connected by 2020 (https://www.gartner.com/newsroom/id/3598917)
- Heterogeneity
- Dinamicity
- Communication
- Trust is **needed**

Architecture Framework

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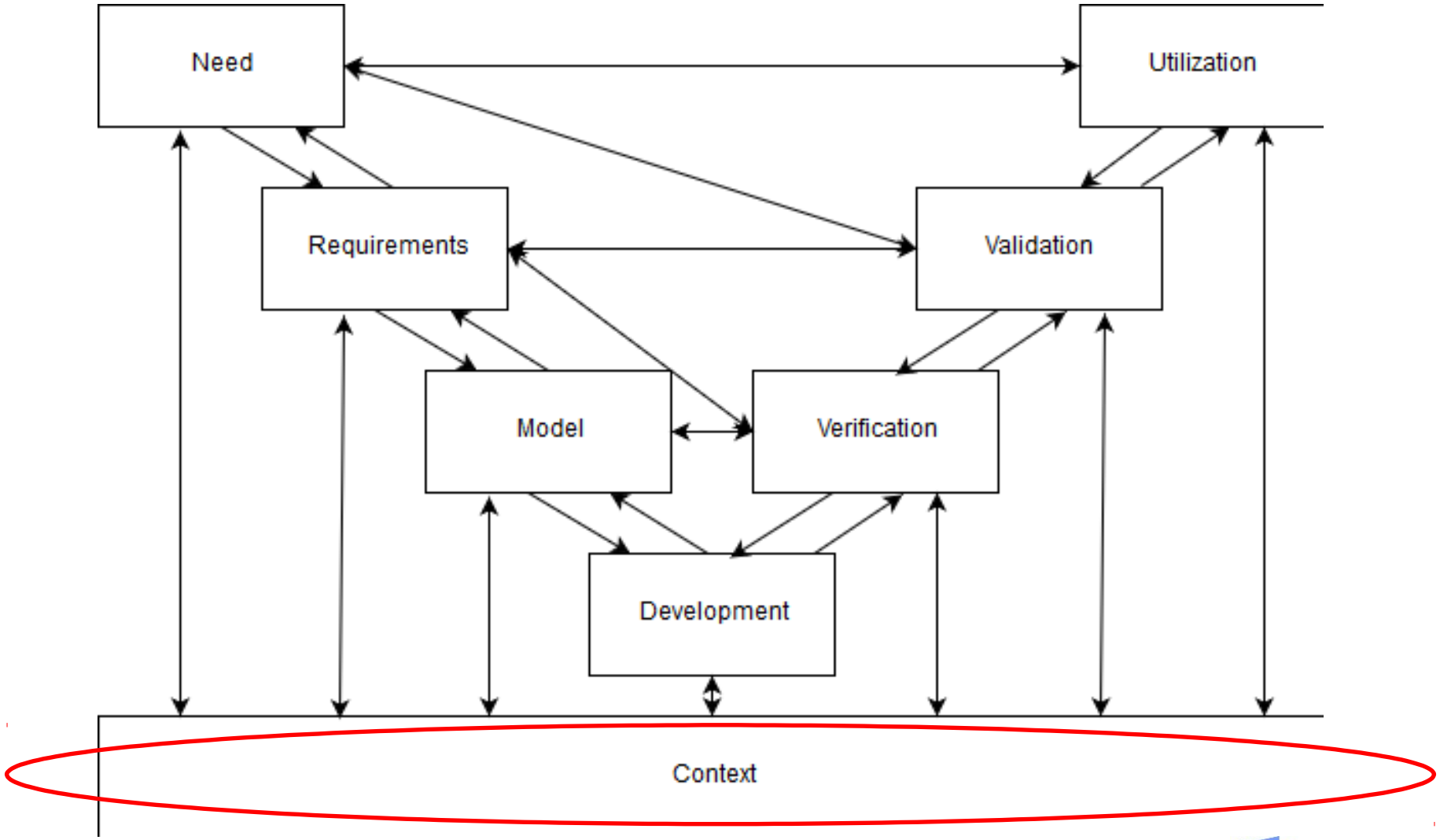
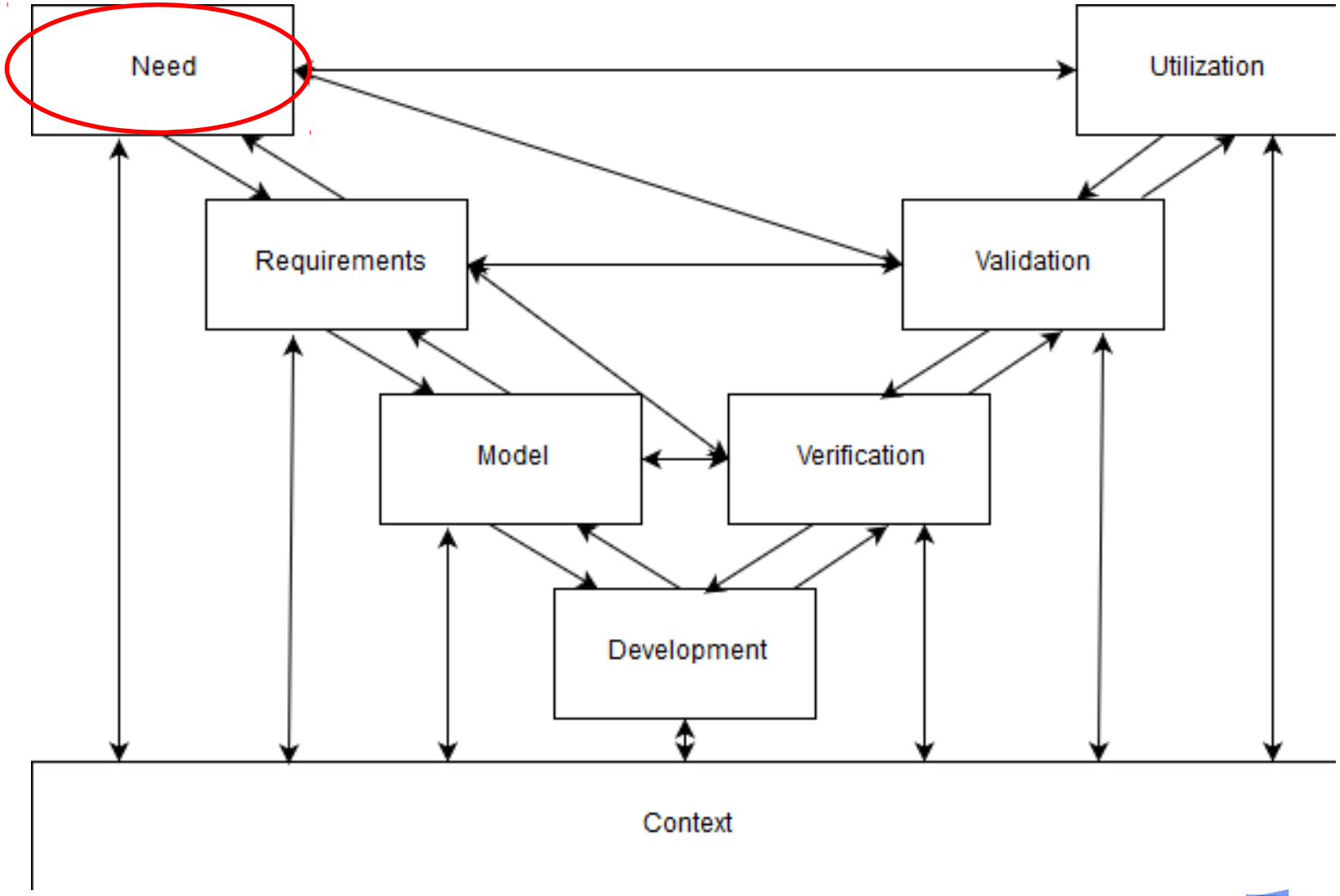
K Model


Need
Utilization
Requirements
Validation
Model
Verification
Development
Context

Context

- **Always** present
- Environment
- Services
- Properties (alone or composition)
- Dynamic

K Model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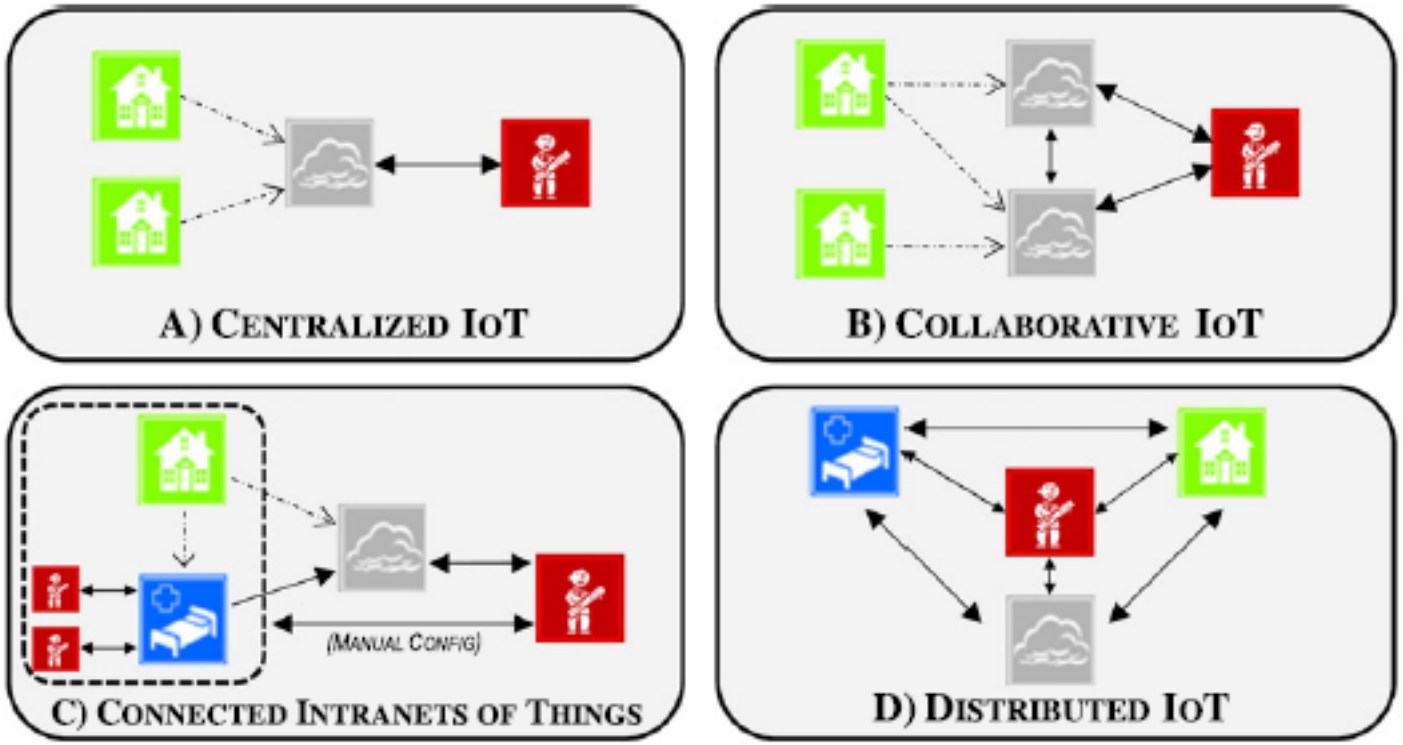
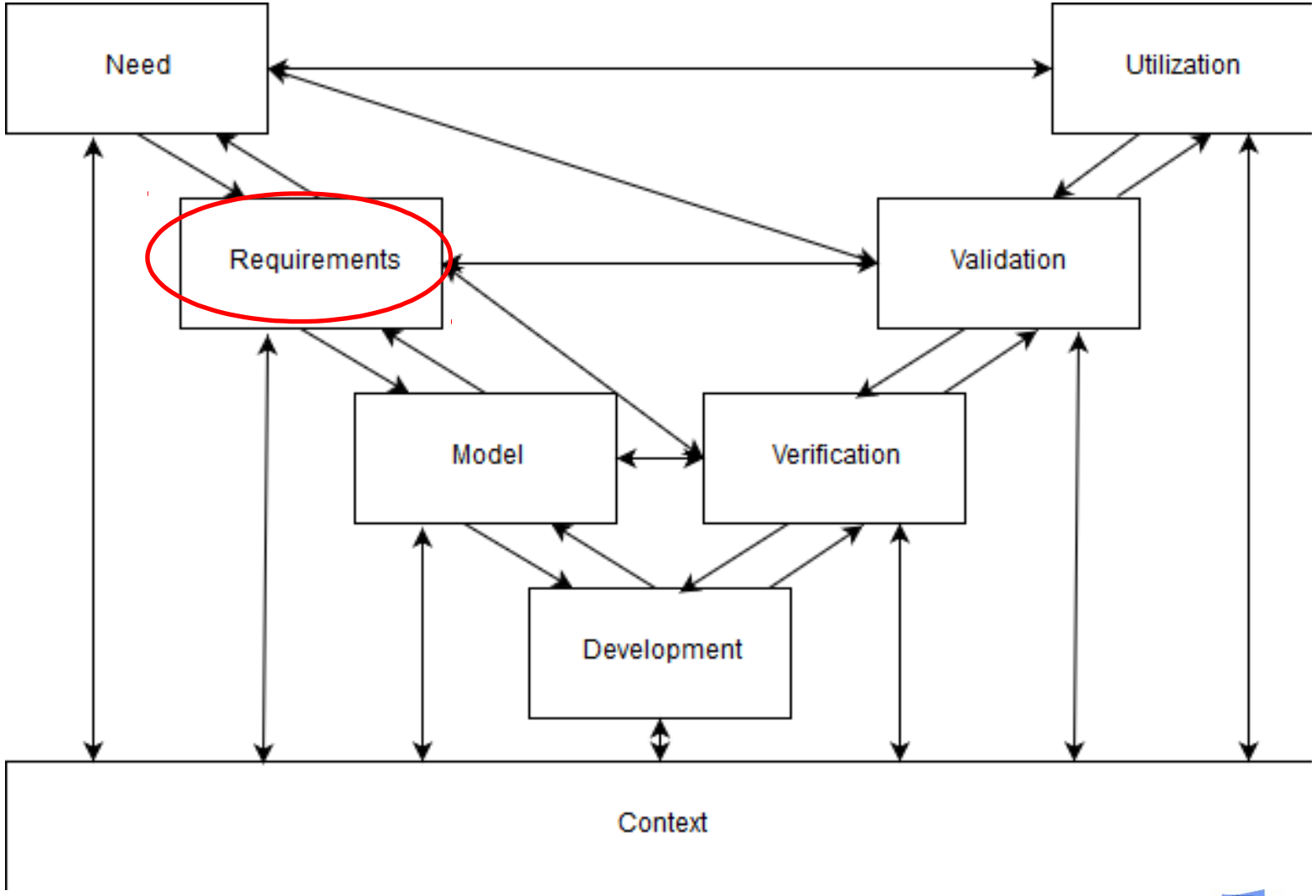
Need

- Characteristics of trust
- Type of Architecture
- Protocols



K Model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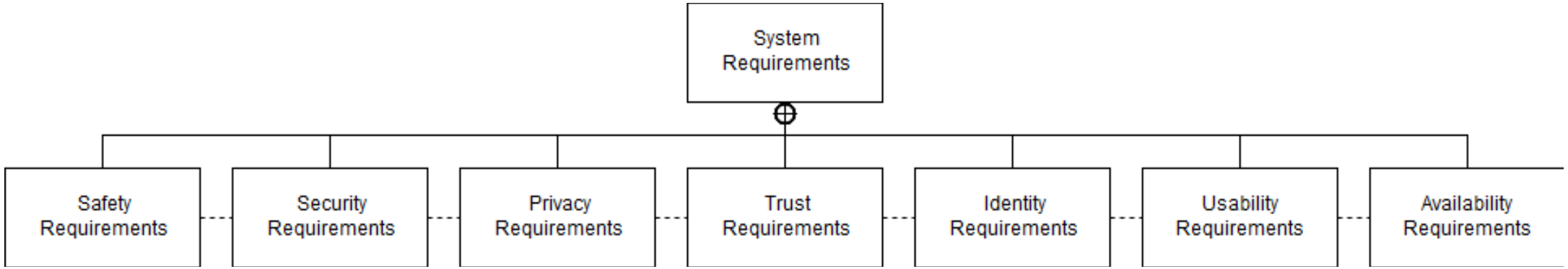
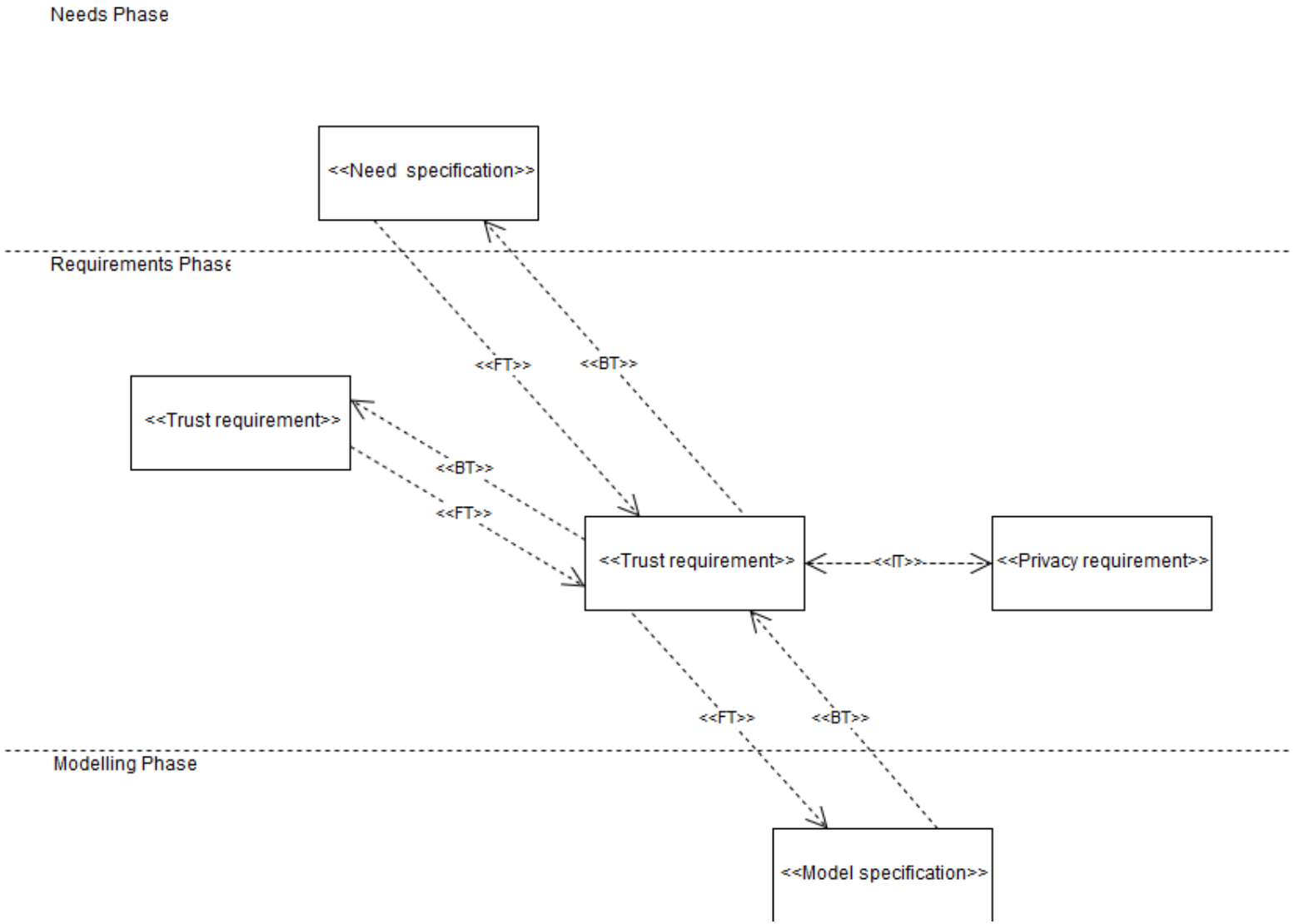
Requirements

- IEEE 830-1993 specification

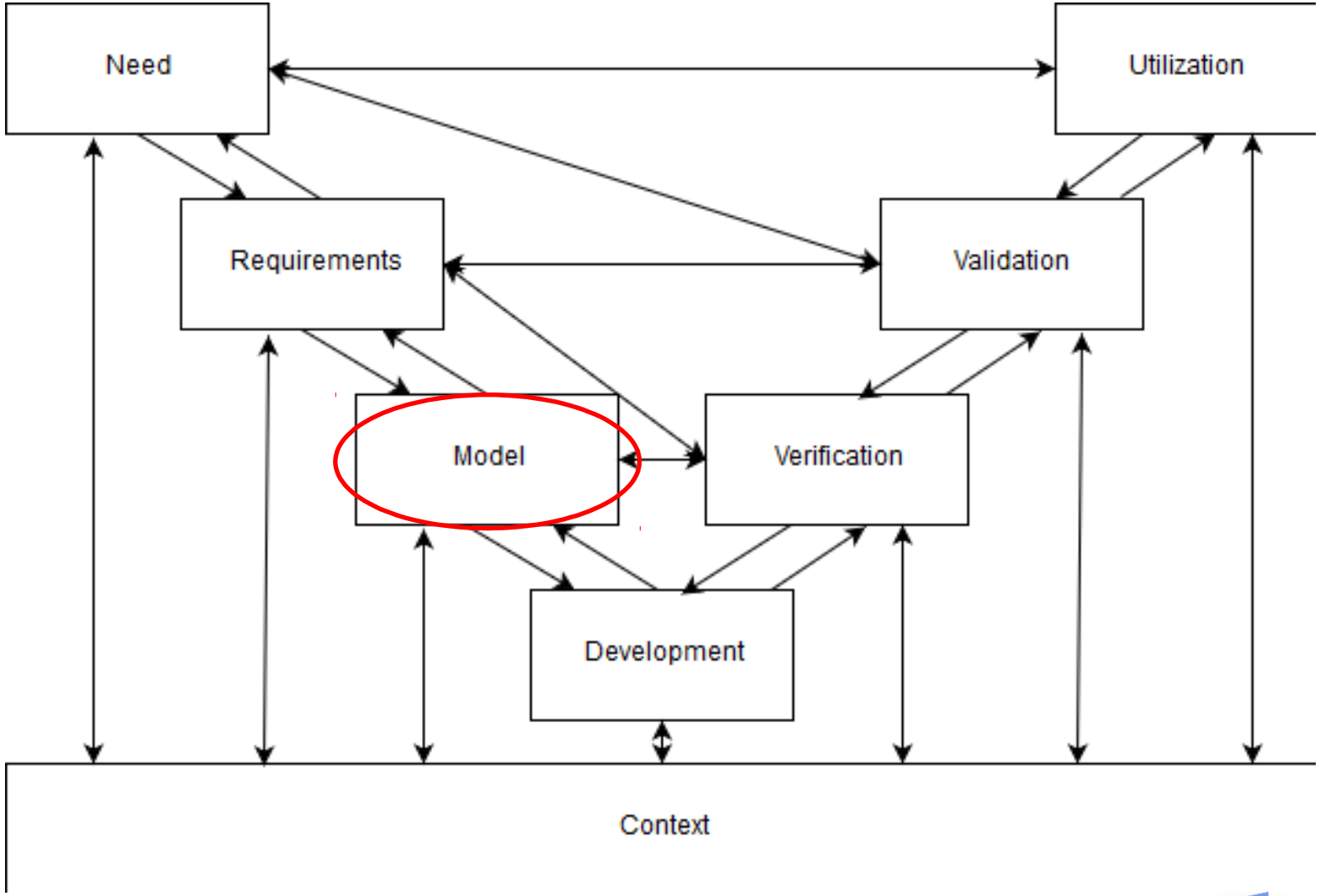
ID	Requirement specification	BT	FT	IT



Requirement Specification



K Model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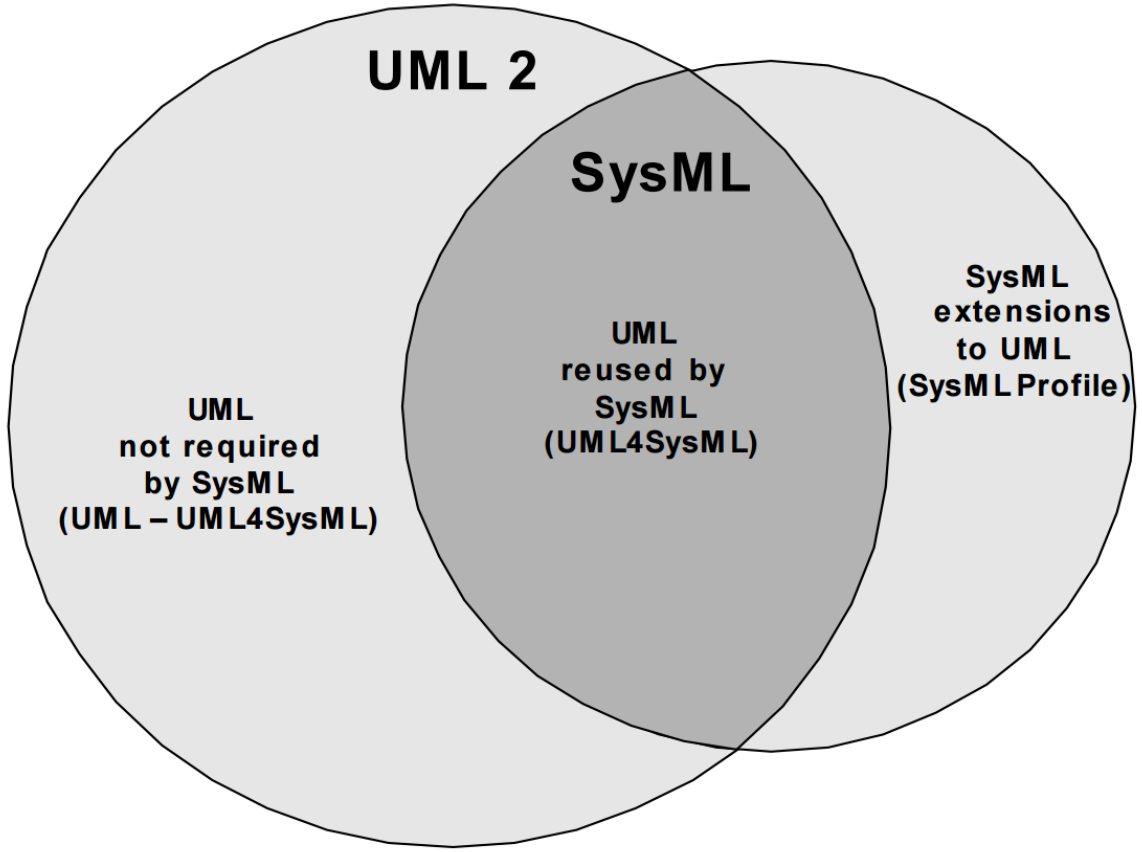
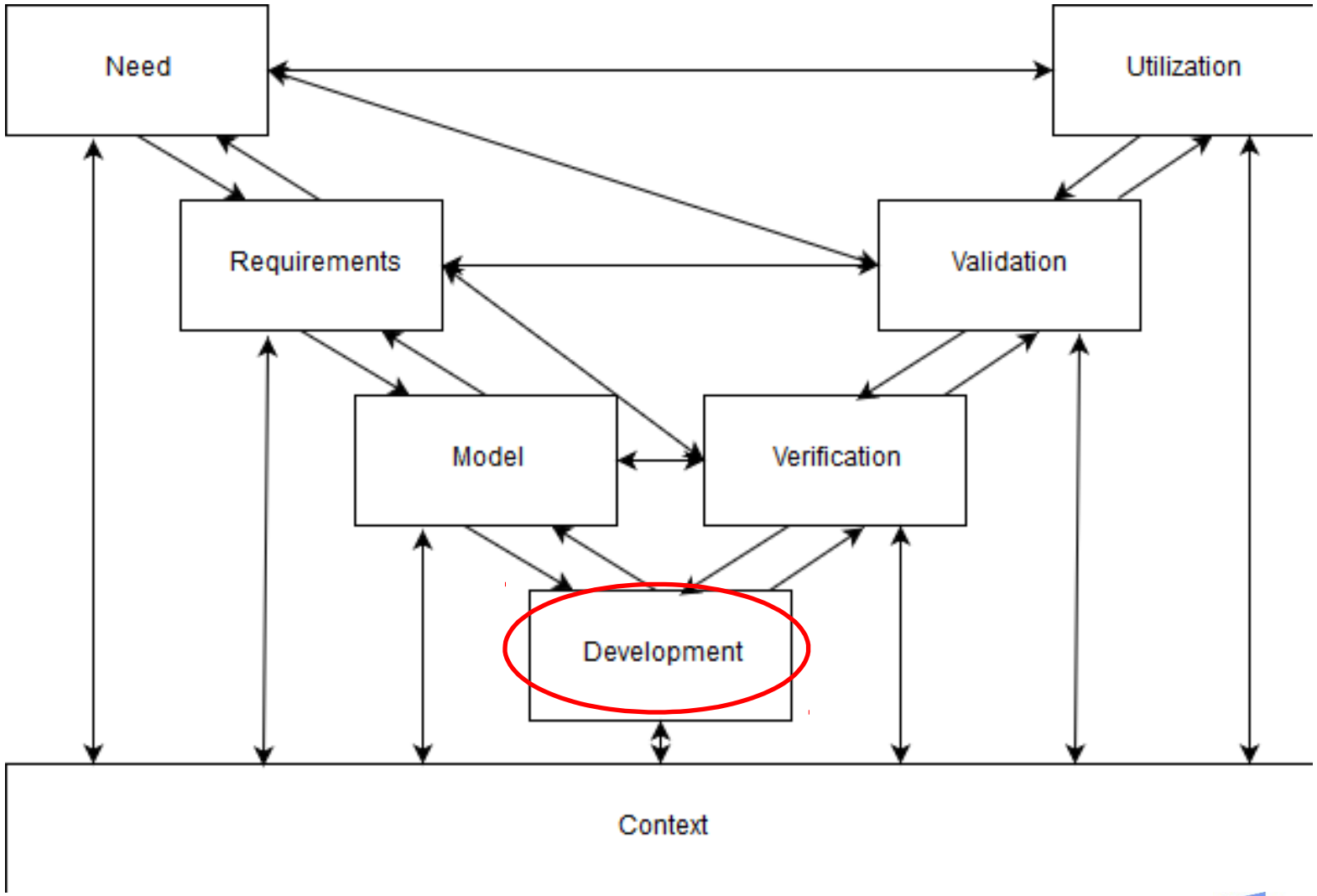
Model

- SysML
- Trust Models
  - Evaluation
  - Decision



K Model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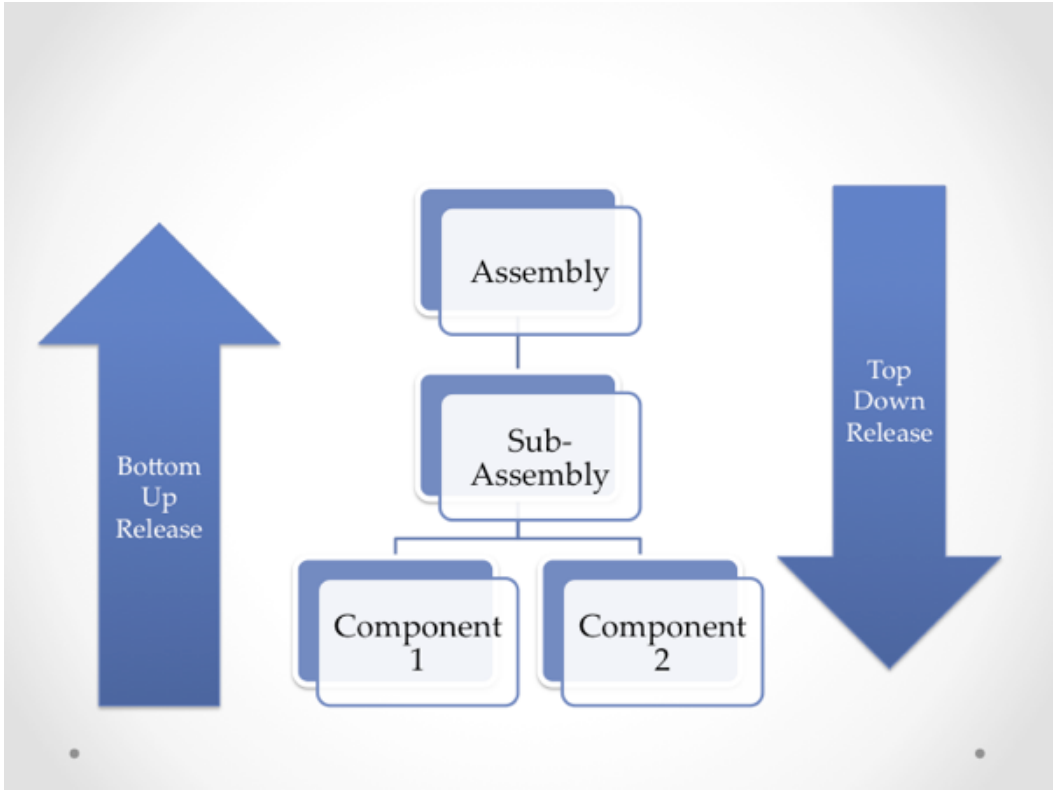
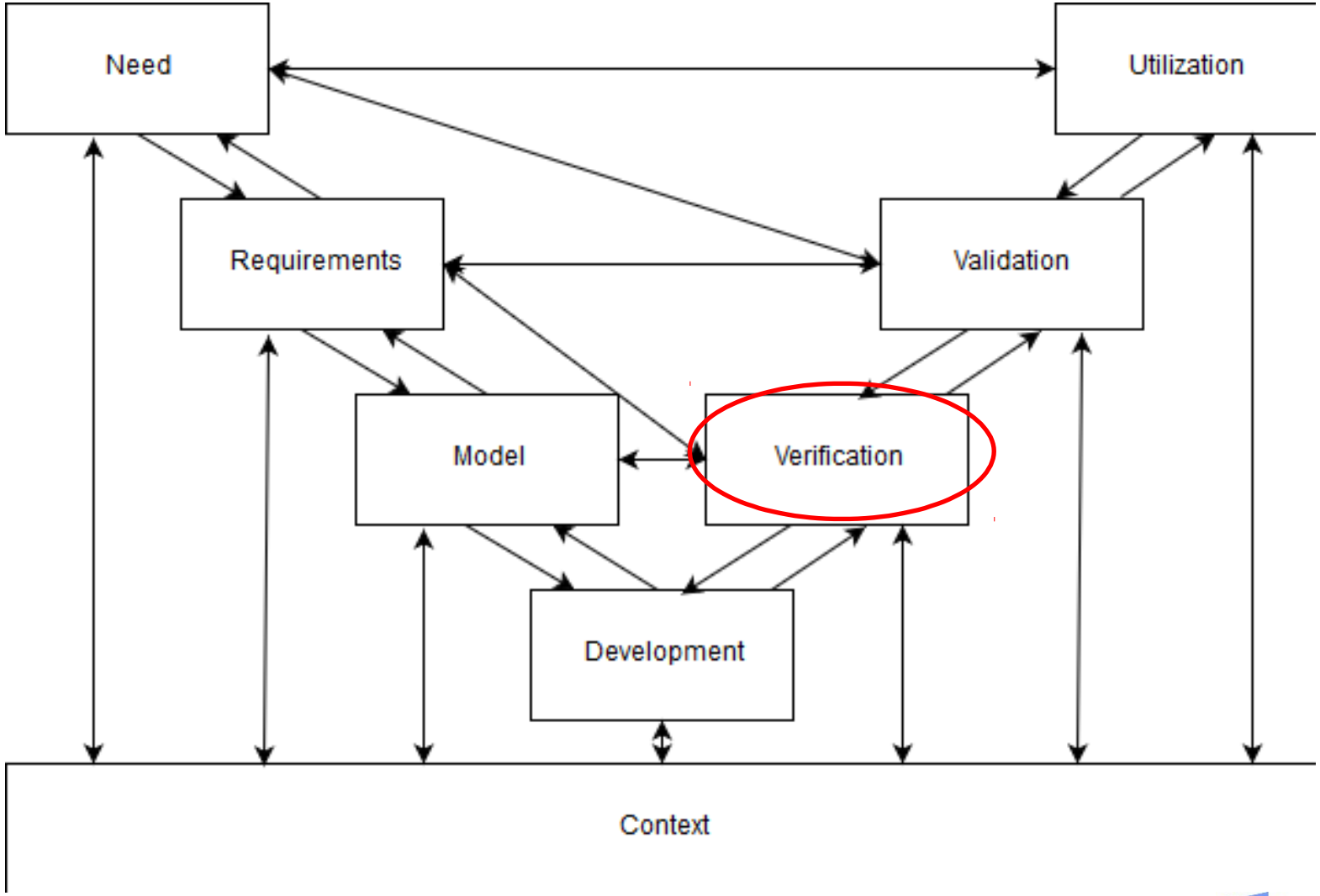
Development

- Top Down approach
- Bottom Up approach
- Depending on the previous and following phases
- Core of the framework
- Developer centric approach



K Model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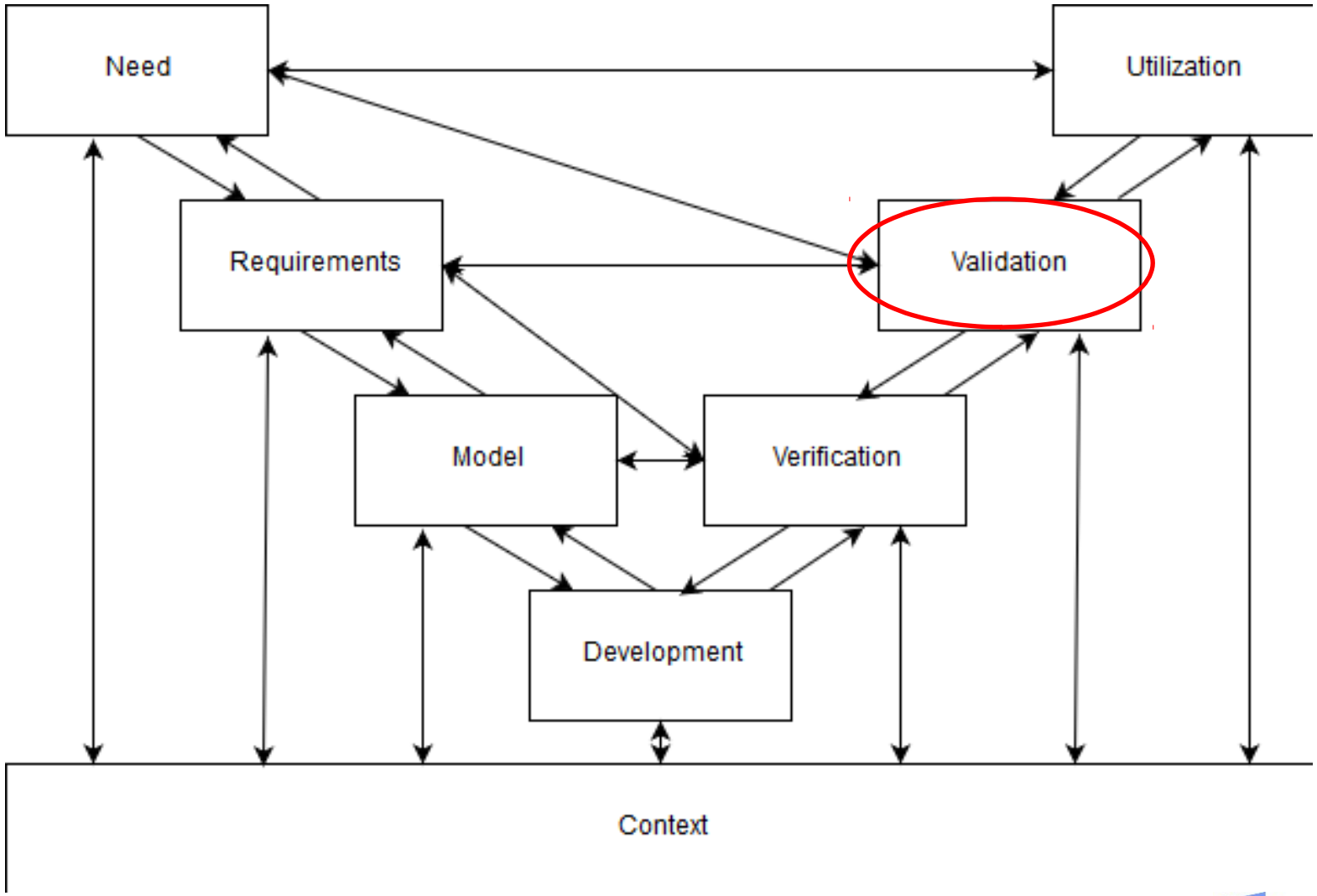
Verification

- Check if “the entity has been built right”
- Verification of the functionalities
- Verification of the requirements related to the system
- Developer point of view
- Intermediate product

K Model


Need
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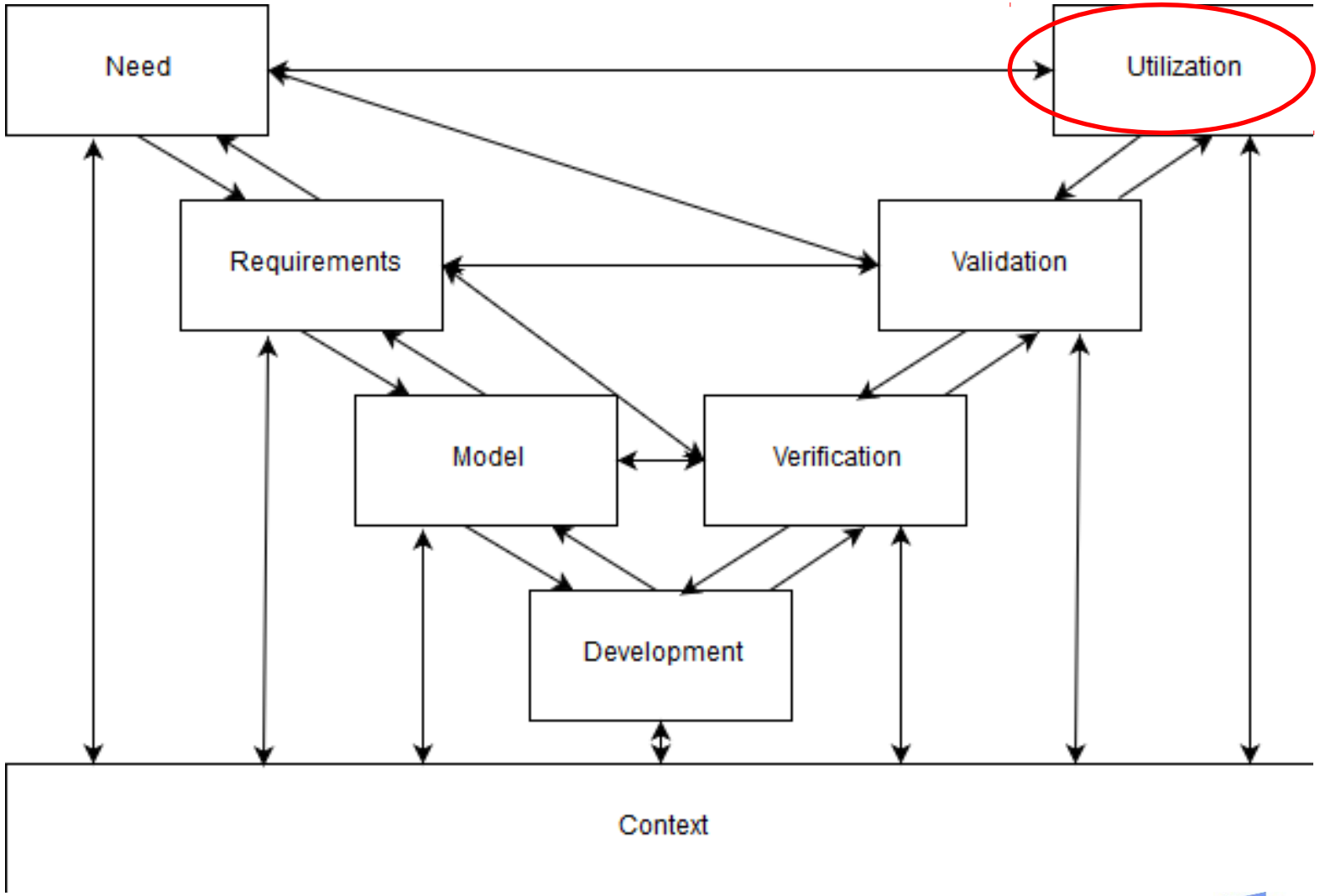
Validation

- Check if “the right entity has been built”
- The need must be met
- Validation of the requirements related to Real system environment
- Customer point of view
- Final product

K Model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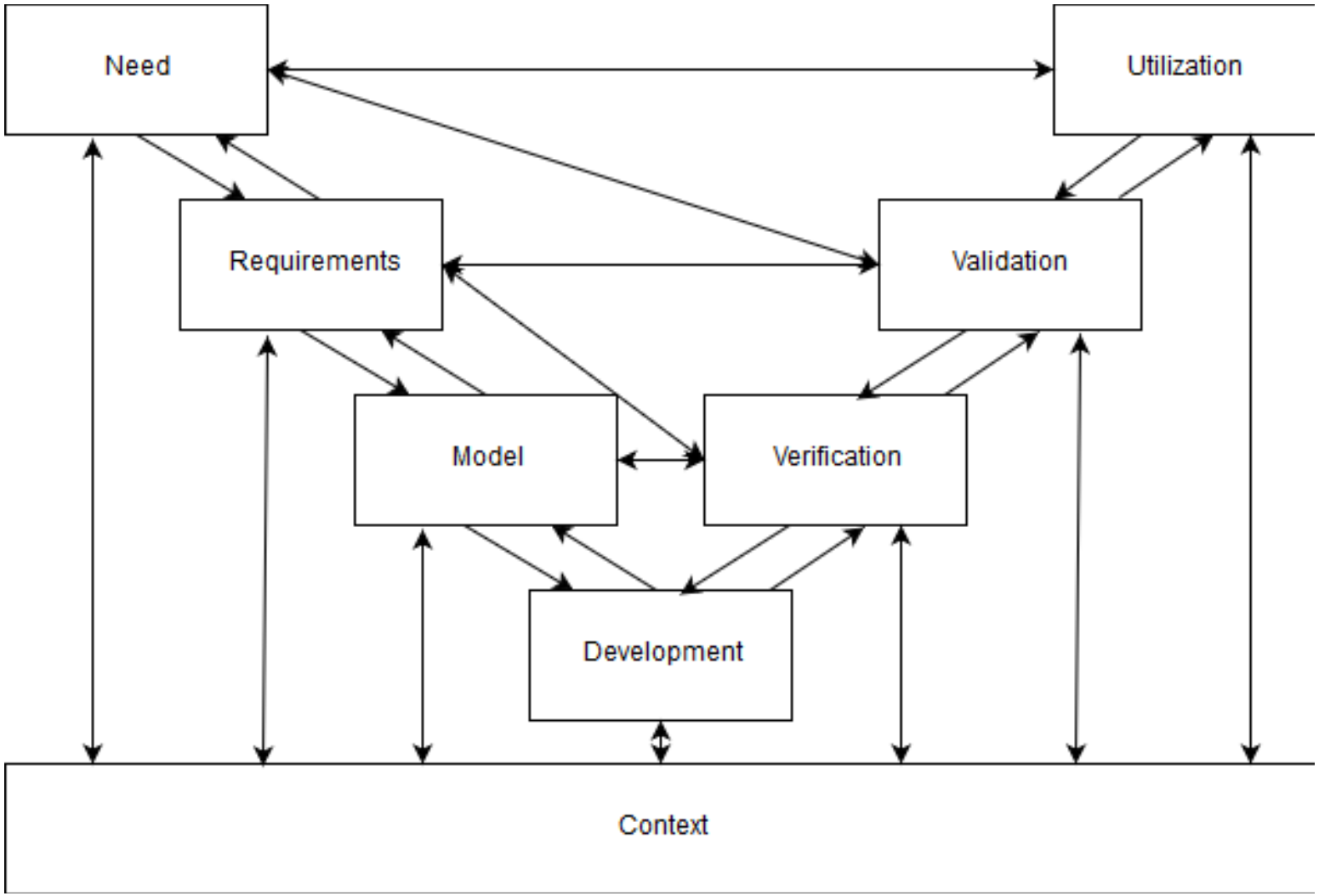
Utilization

- Trust@run.time
- Dynamicity of IoT must face with devices that (Join, Stay, Leave) the System

K Model (links)



Architecture Framework

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Transversal Activities

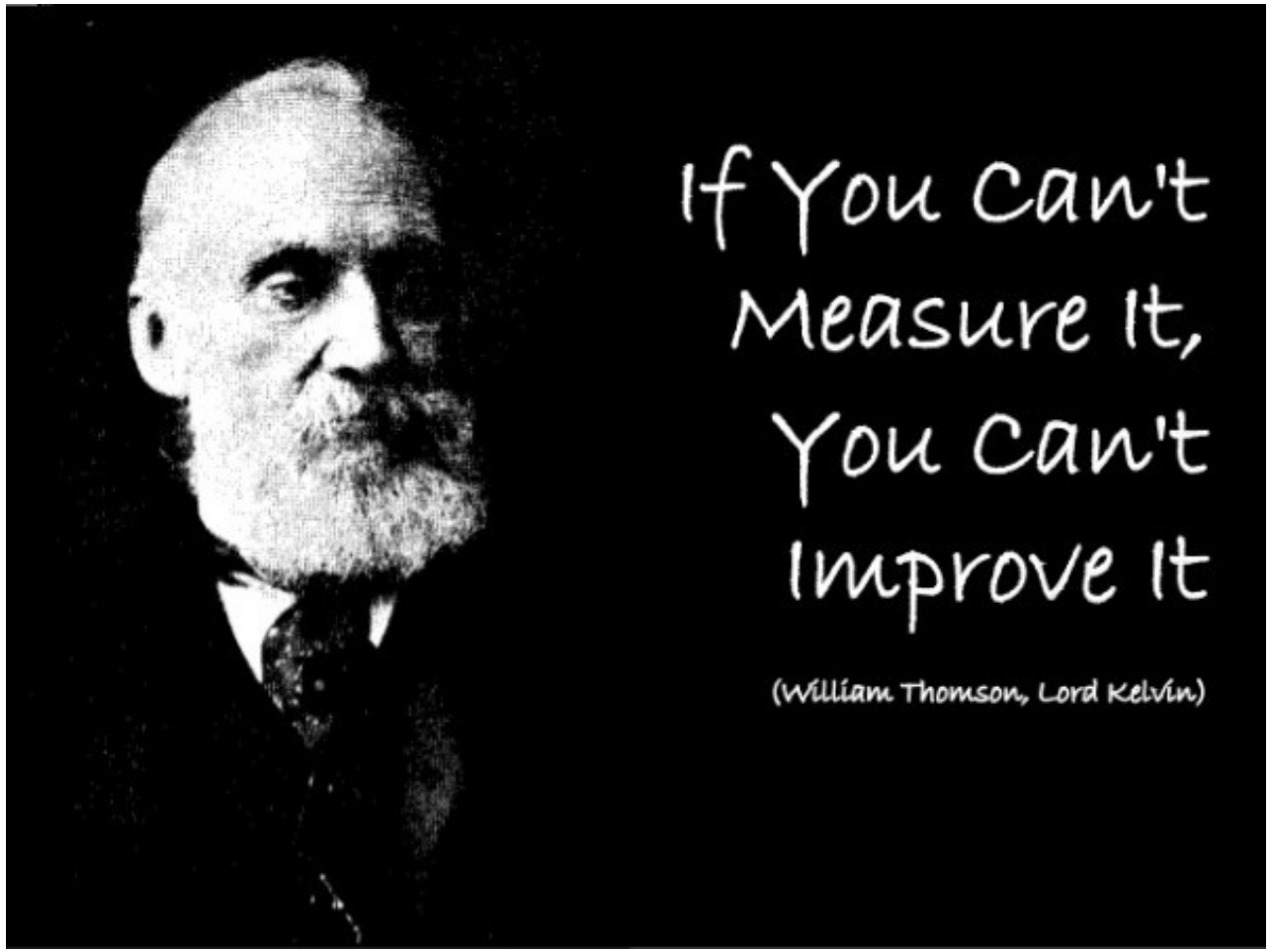
- Documentation
- Metrics
- Decision Gates
- Traceability
- Threat Analysis
- Risk Management
- Decision-Making

Documentation

- Connection
- Justification
- Procedures
- Guide
- *“Verba volant, scripta manent”*

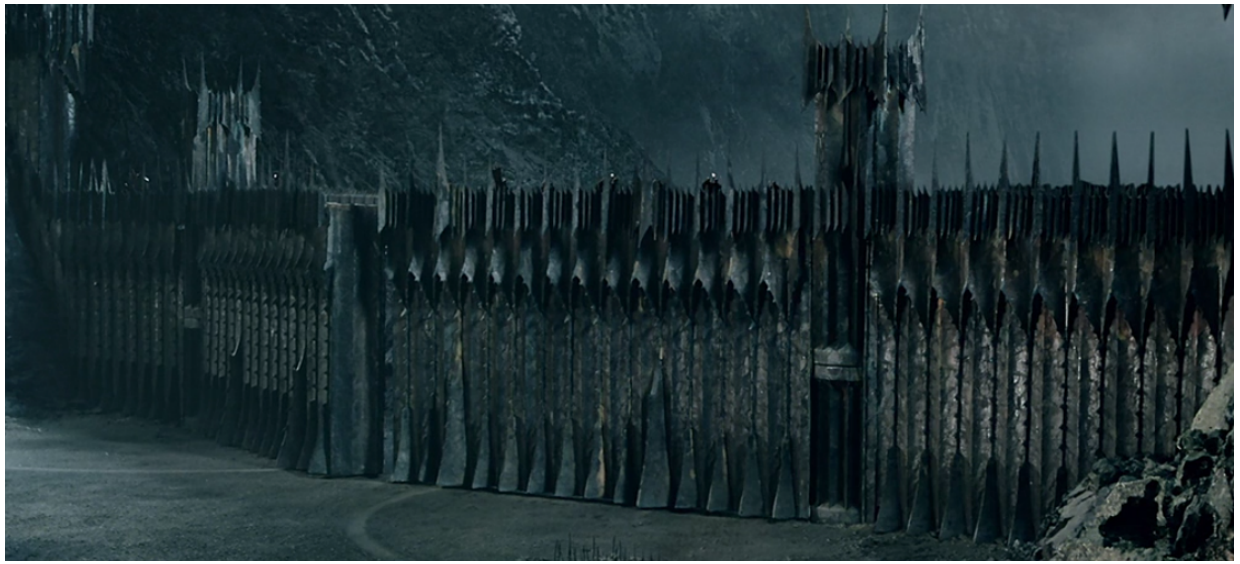
Metrics

- Trust Metrics
- Performance
- Efficiency
- Measures



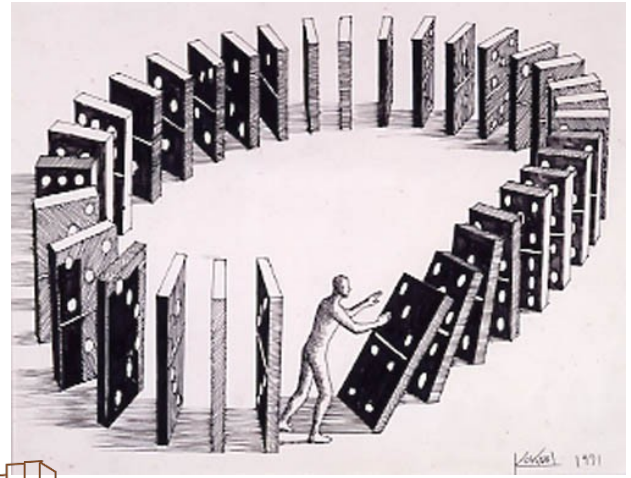
Decision Gates

- They permit to move between phases
- Back-Up in case something goes wrong



Traceability

- Connection between
  - Phases
  - Requirements
  - Activities and Phases
- Control Domino effects
- Help against Unintended Consequences

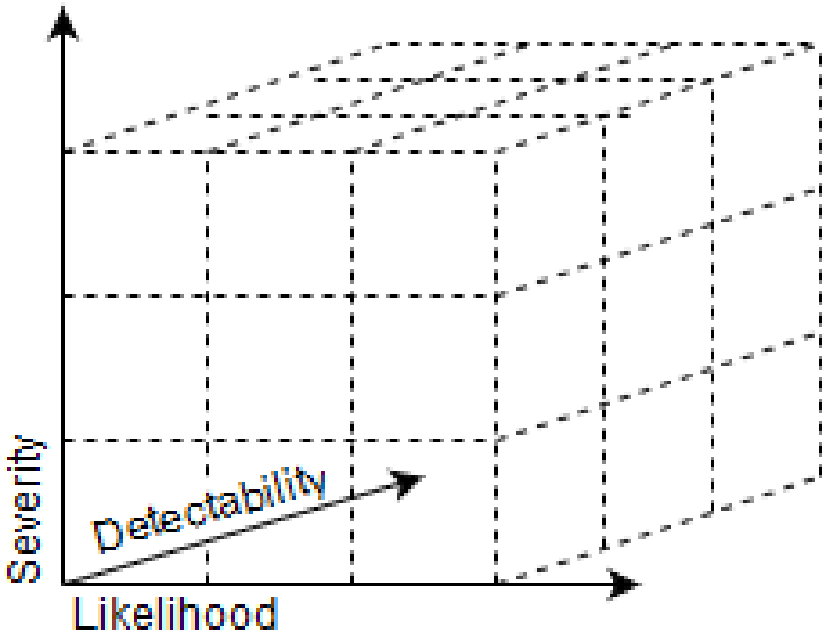


Threat Analysis

- Attacks
  - Internal
  - External
- Malfunctions
- Malwares

Risk Management

- Likelihood
- Severity
- Detectability



Decision Making

- Connected to many phases
  - Requirement
  - Model
  - Development
  - Utilization

Use Case Scenario

- Introduction
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Smart Cake Machine

Smart Hub

Smart Supermarket

Smart Fridge

Smart Cake Machine

Smart Cake Machine

- Context
  - Smart Home
  - Trusted Smart entities
- Need
  - Smart Cake Machine
- Requirements
  - Security Requirement
  - Trust Requirement
  - Usability Requirement
- Models
  - Trusted ClassDiagram
  - Trusted RequirementDiagram

Smart Cake Machine

- Development
  - Top Down
- Verification
  - Verify the correct functionalities of the Smart Cake Machine
- Validation
  - Validate it in the cooperation with Smart Fridge and Smart Supermarkets
- Utilization
  - Join the Smart Home
  - Deal with join and leaving Smart devices

Conclusion

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Conclusion

- IoT has brought new security challenges
- Trust as a key
- Software, Security and System Engineering approach to ensure trust in an entity
- Trust and other security properties are included in the whole life cycle
- K-Model
- Transversal Activities

Future Work

- Validation of the Framework
- We will expand the phases of the framework
- Application to a real complex IoT scenario
- Application in an IoT System

Questions?

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