



A Software Architecture Framework for Quality-Aware DevOps

*D. A. Tamburri, E. Di Nitto, M. Guerriero,
P. Jamshidi, I. Spais*

DICE

Horizon 2020 Research & Innovation Action

Grant Agreement no. 644869

<http://www.dice-h2020.eu>



Funded by the Horizon 2020
Framework Programme of the European Union

What are we up to, today?



- Architecture Frameworks, bits and pills
- Quality-Aware DevOps Concerns
- Quality-Aware DevOps Architecture Descriptions & Requirements
- What's missing from the state of the art
 - Our research solution, SQUID!
 - SQUID implementation and usage in Data-Intensive Architectures (DIA)

- The ISO/IEC/IEEE 42010 Conceptual Model of Architecture Description^[1] defines the term **architecture framework** as:

“a (set of) common practice(s) for creating, interpreting, analyzing and using architecture descriptions within a particular domain of application or stakeholder community”

- The ISO/IEC/IEEE 42010 Conceptual Model of Architecture Description^[1] defines the term **architecture framework** as:

*“a (set of) **common practice(s)** for creating, interpreting, analyzing and using **architecture descriptions** within a particular **domain of application** or stakeholder community”*



- The ISO/IEC/IEEE 42010 Conceptual Model of Architecture Description^[1] defines the term **architecture framework** as:

*“a (set of) **common practice(s)*** for creating, interpreting, analyzing and using **architecture* descriptions*** within a particular **domain of application*** or stakeholder community”*

*** Continuously!**



- The ISO/IEC/IEEE 42010 Conceptual Model of Architecture Description^[1] defines the term **architecture framework** as:

*“a (set of) **common practice(s)*** for creating, interpreting, analyzing and using **architecture* descriptions*** within a particular domain of **application*** or stakeholder community”*

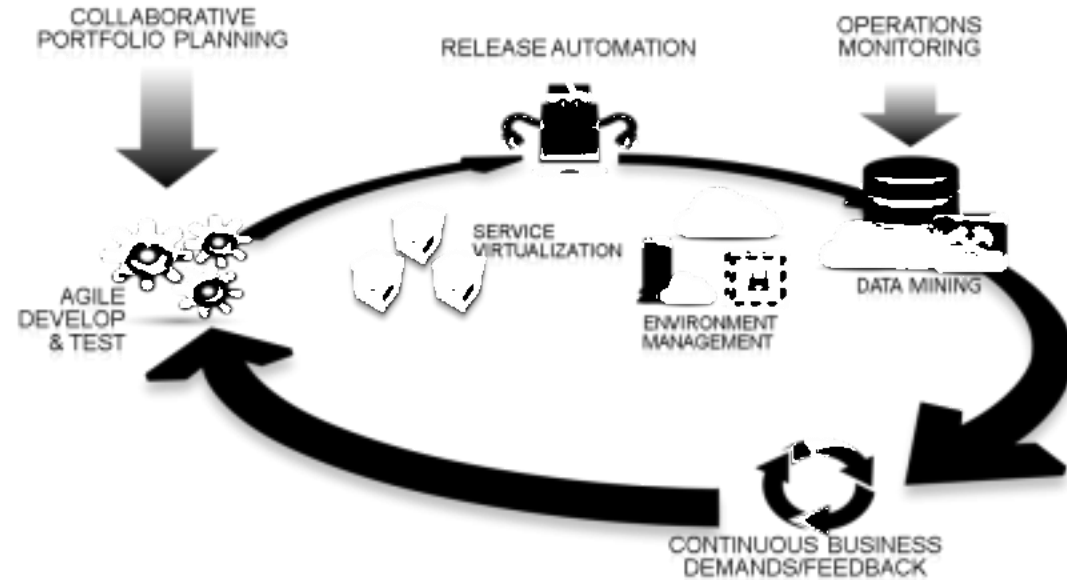
**** With Quality! * Continuously**!**

Quality-Aware DevOps Concerns*



○ Concerns

- Automation
- Heterogeneous maturity (systems & orgs.)
- End-to-end Architecting
- QoS-, Business- and Technical-driven Continuous Architecting



○ Practices

- Trial-and-error!
- ...

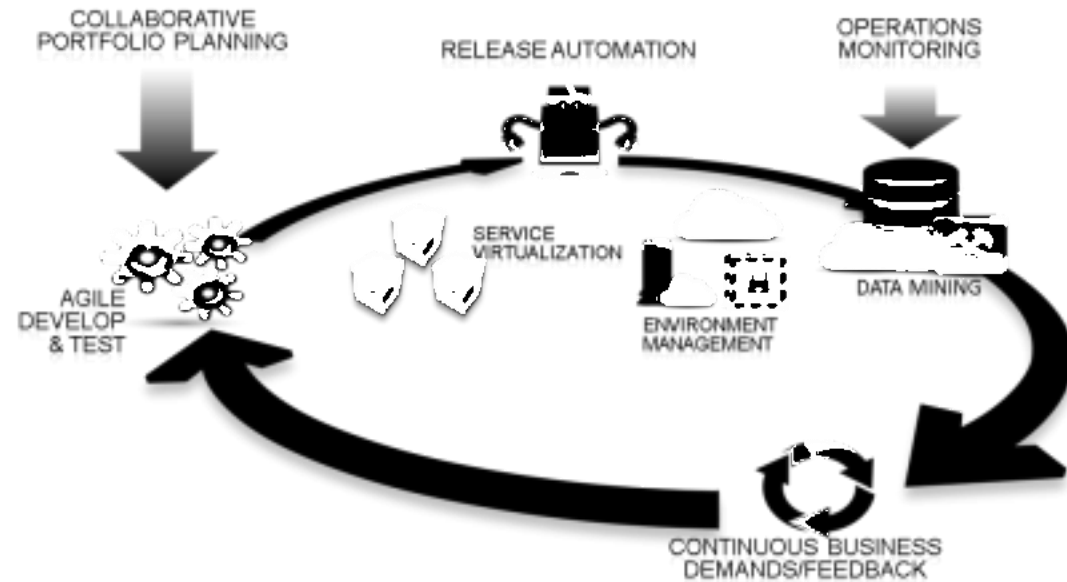
*** 30+ Interviews and 7 Focus-Groups with industrial partners in the EU H2020 DICE and other industrials**

Quality-Aware DevOps Architecture

Descriptions: Requirements!



1. Fine-grained architecture descriptions specific to DevOps frameworks and middleware;
1. Architecture blueprints with infrastructure, platform and application topology specs;
2. Model-based synch of all of the above;





- Comparative evaluation of previous well-known/established arch. Frameworks:
 - MODAF
 - RM-ODP
 - DODAF
 - TOGAF
 - 4+1-Views
 - ...

Systematic mapping of previous architecture frameworks^[2]



- Comparative evaluation of previous well-known/established arch. Frameworks:
 - MODAF
 - RM-ODP
 - DODAF
 - TOGAF
 - **4+1-Views**
 - ...

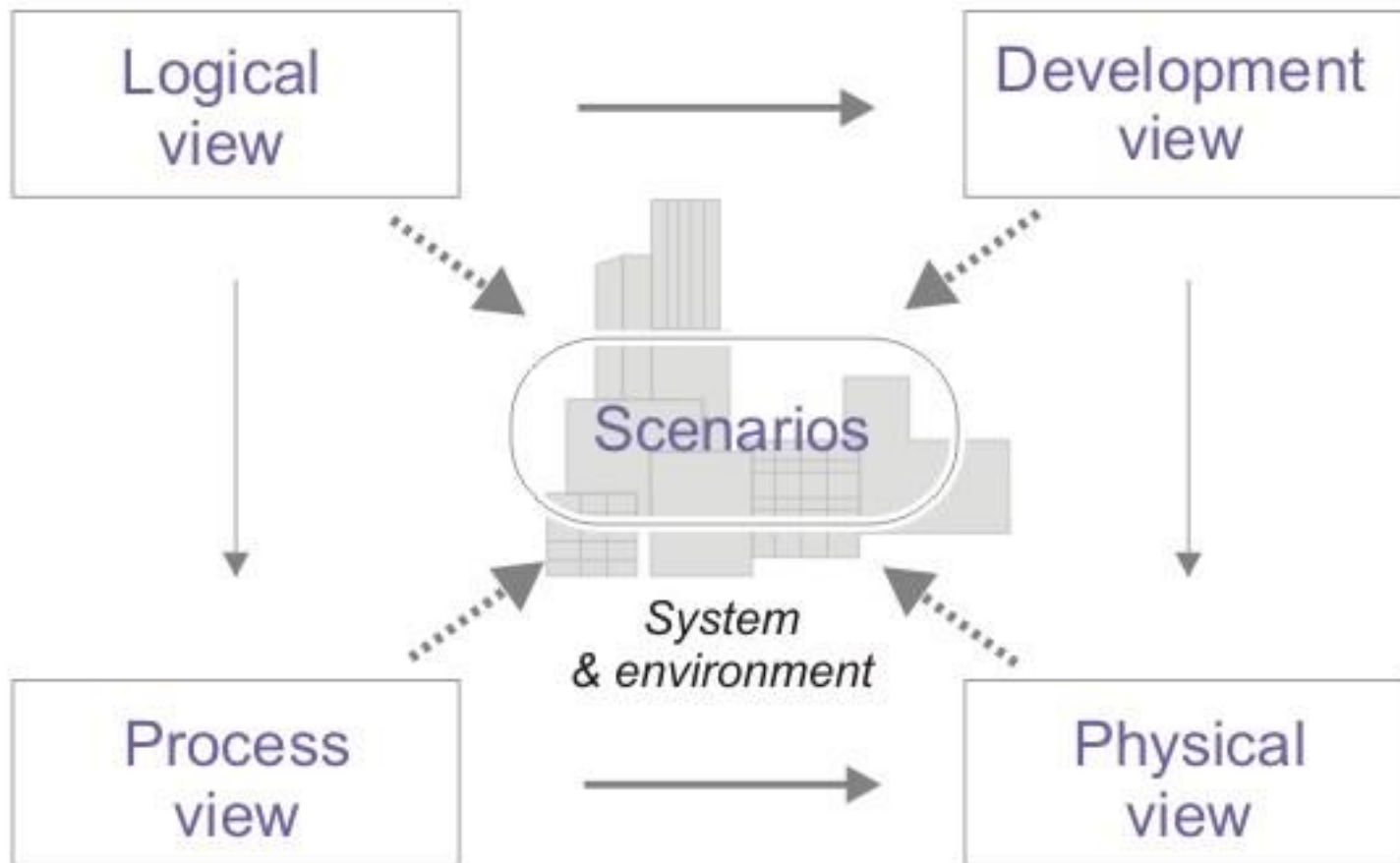
Systematic mapping of previous architecture frameworks^[2]

Quality-Aware DevOps Architecture

Descriptions



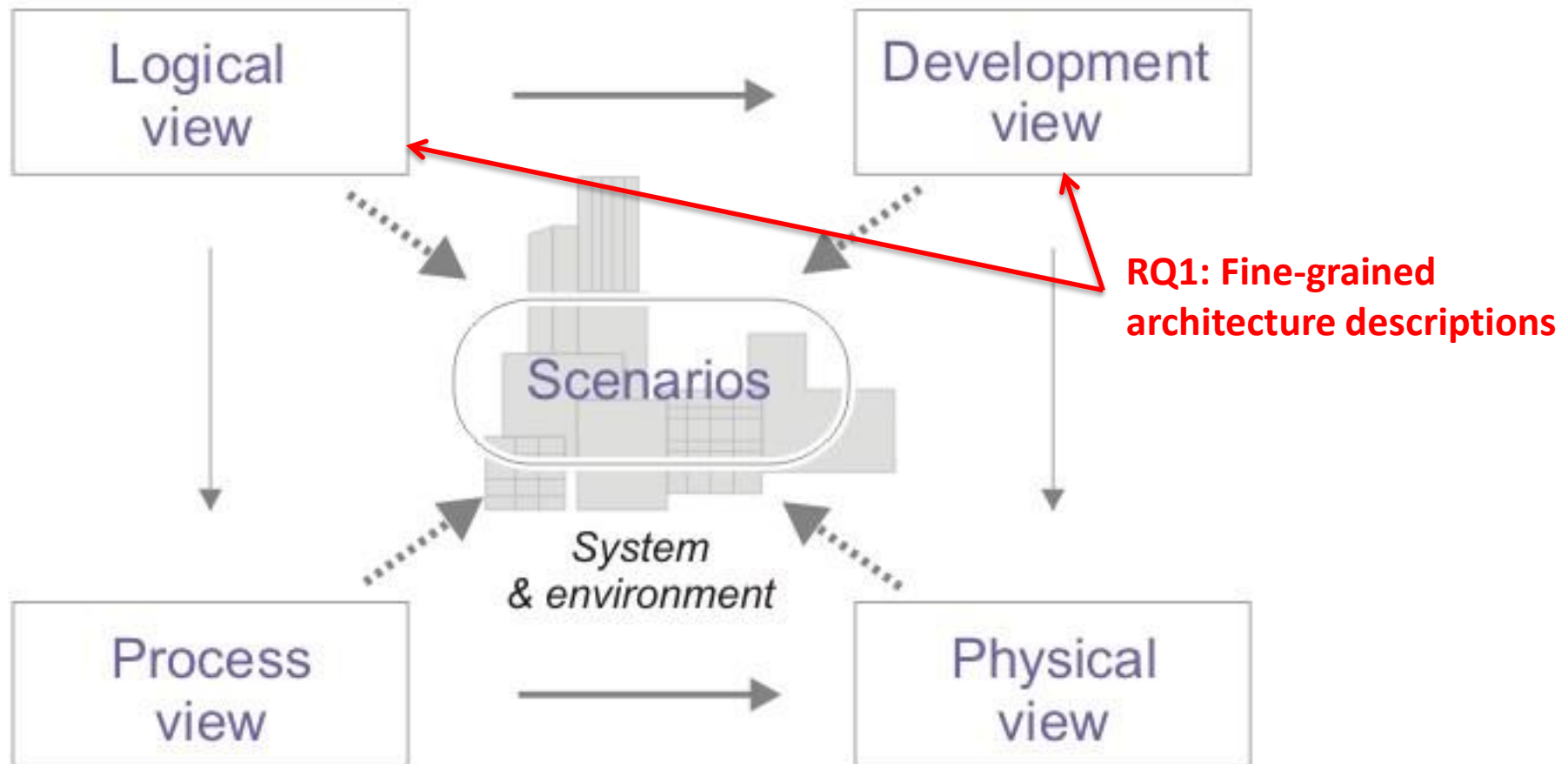
The 4+1 Views^[3] model offers a basis consistent with the identified stakeholders and concerns for quality-aware DevOps...



Quality-Aware DevOps Architecture Descriptions



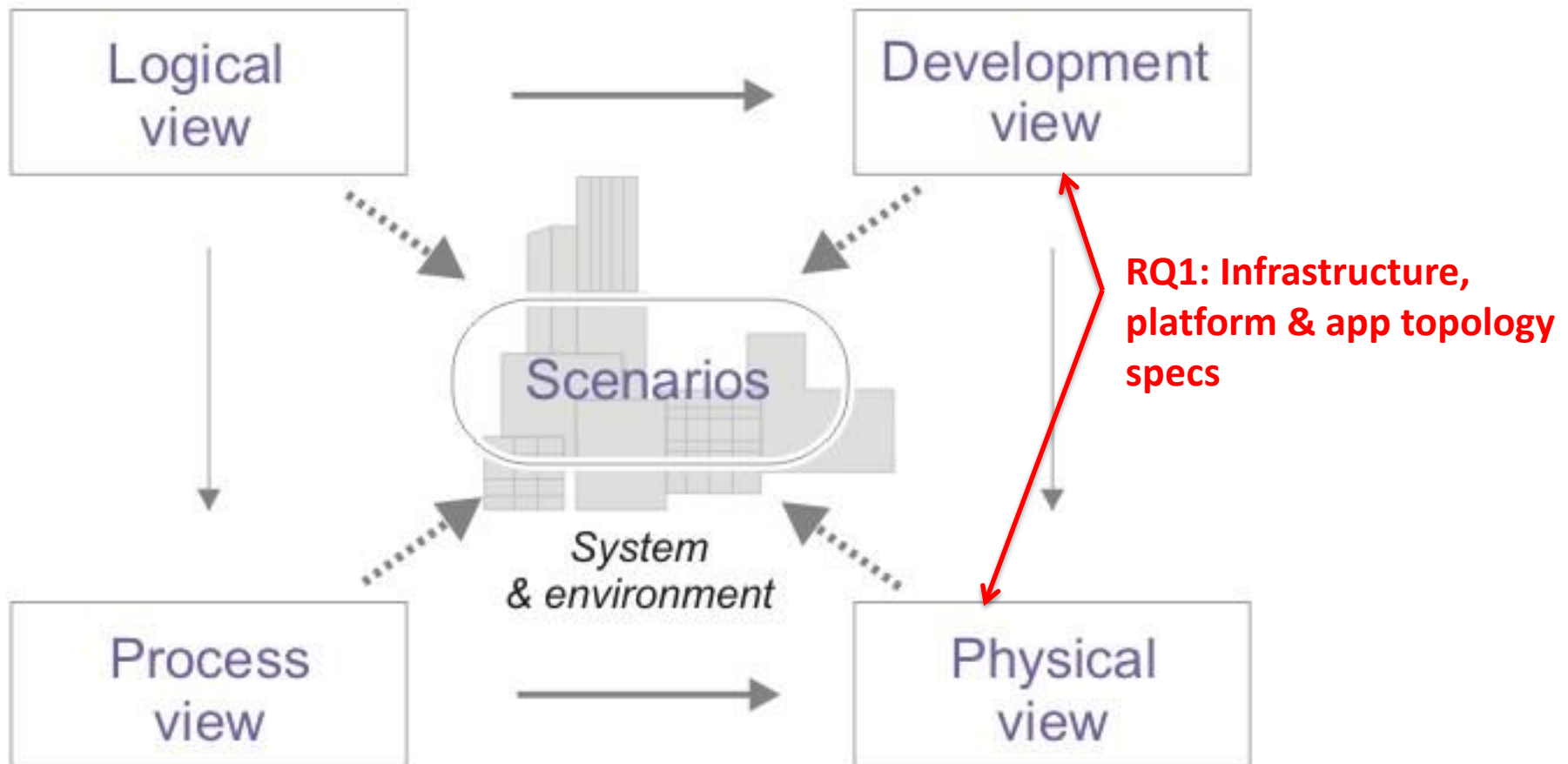
The 4+1 Views^[3] model offers a basis consistent with the identified stakeholders and concerns for quality-aware DevOps...



Quality-Aware DevOps Architecture Descriptions



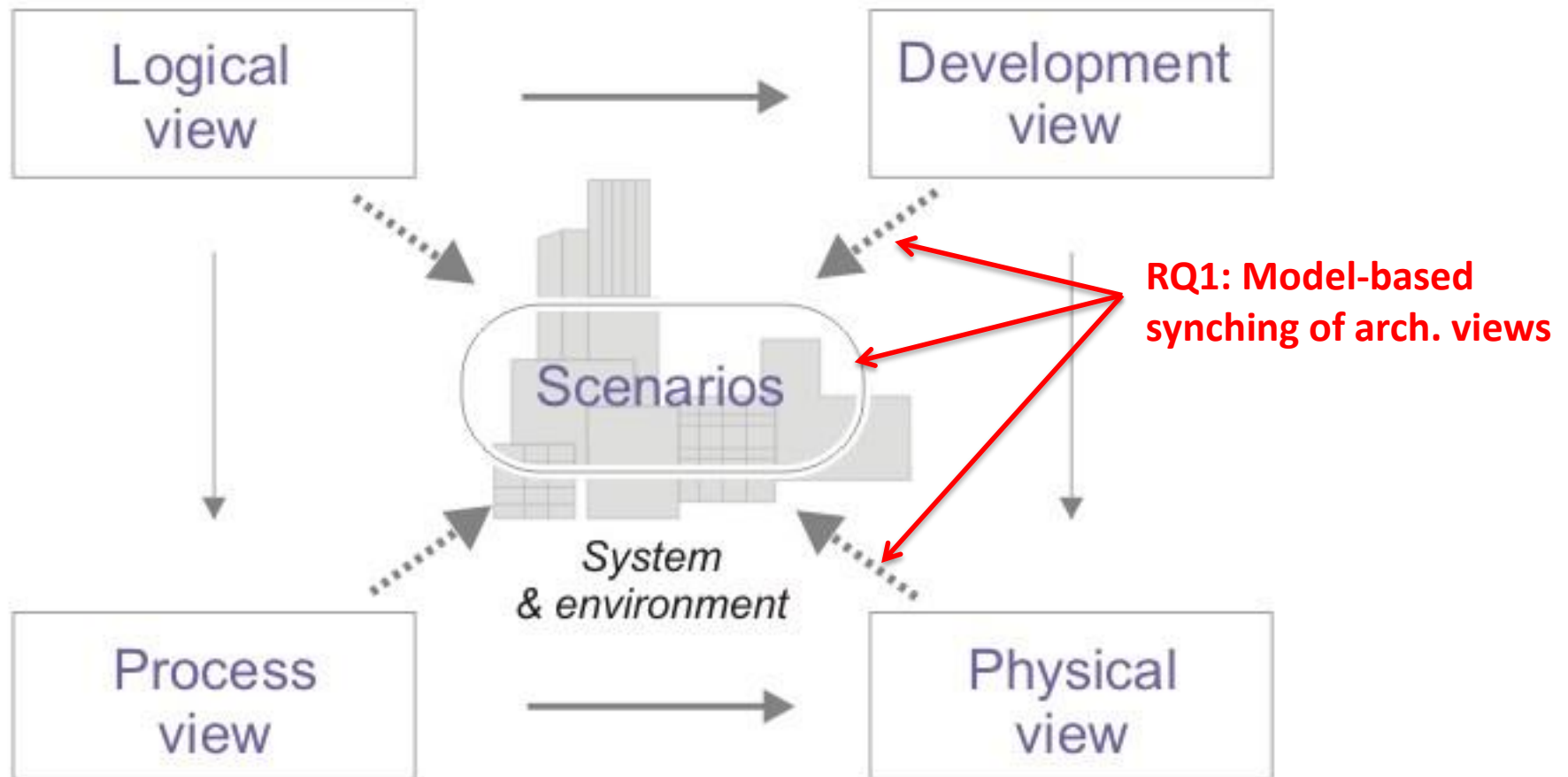
The 4+1 Views^[3] model offers a basis consistent with the identified stakeholders and concerns for quality-aware DevOps...



Quality-Aware DevOps Architecture Descriptions



The 4+1 Views^[3] model offers a basis consistent with the identified stakeholders and concerns for quality-aware DevOps...





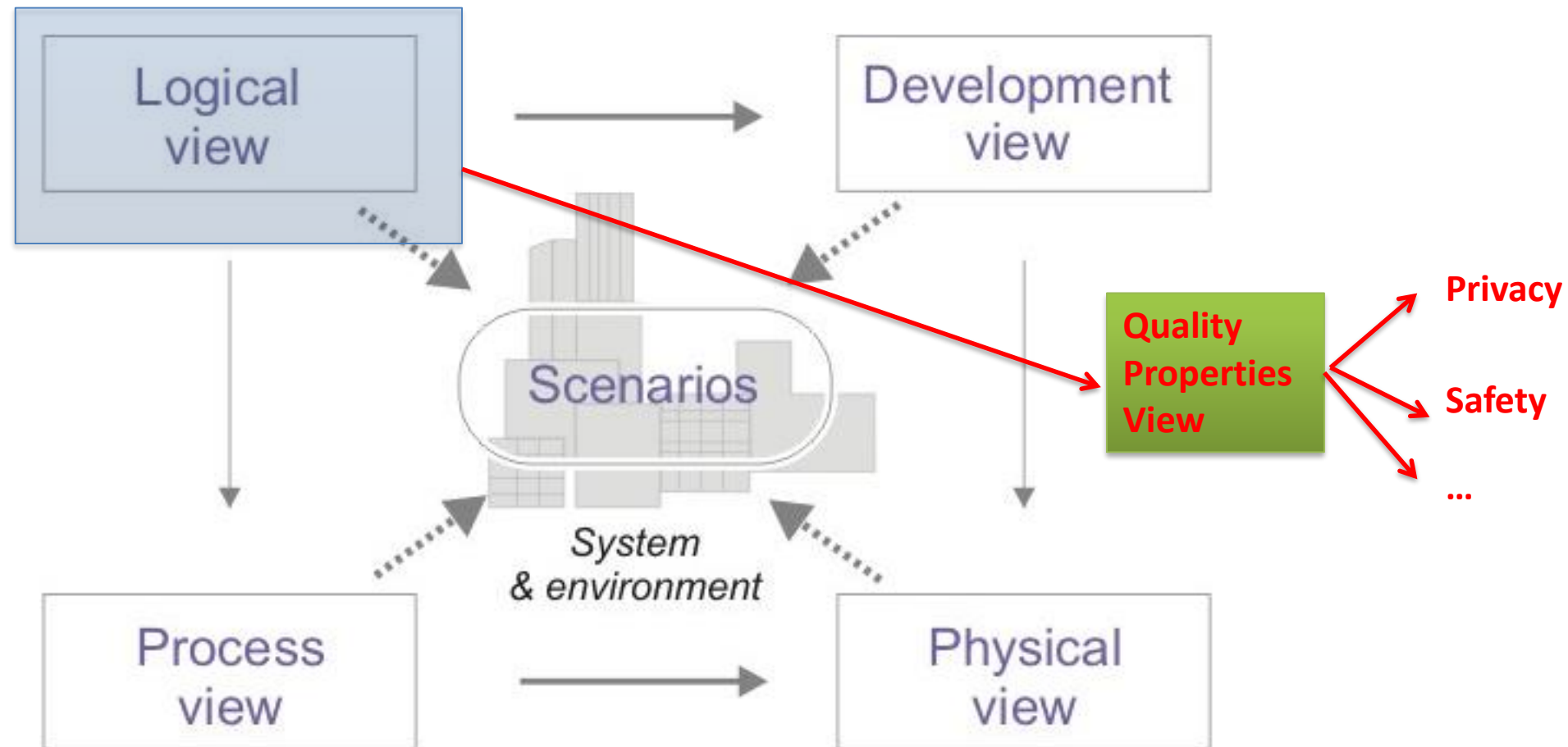
But...

<...moment of suspense...>

Something is missing, for example...



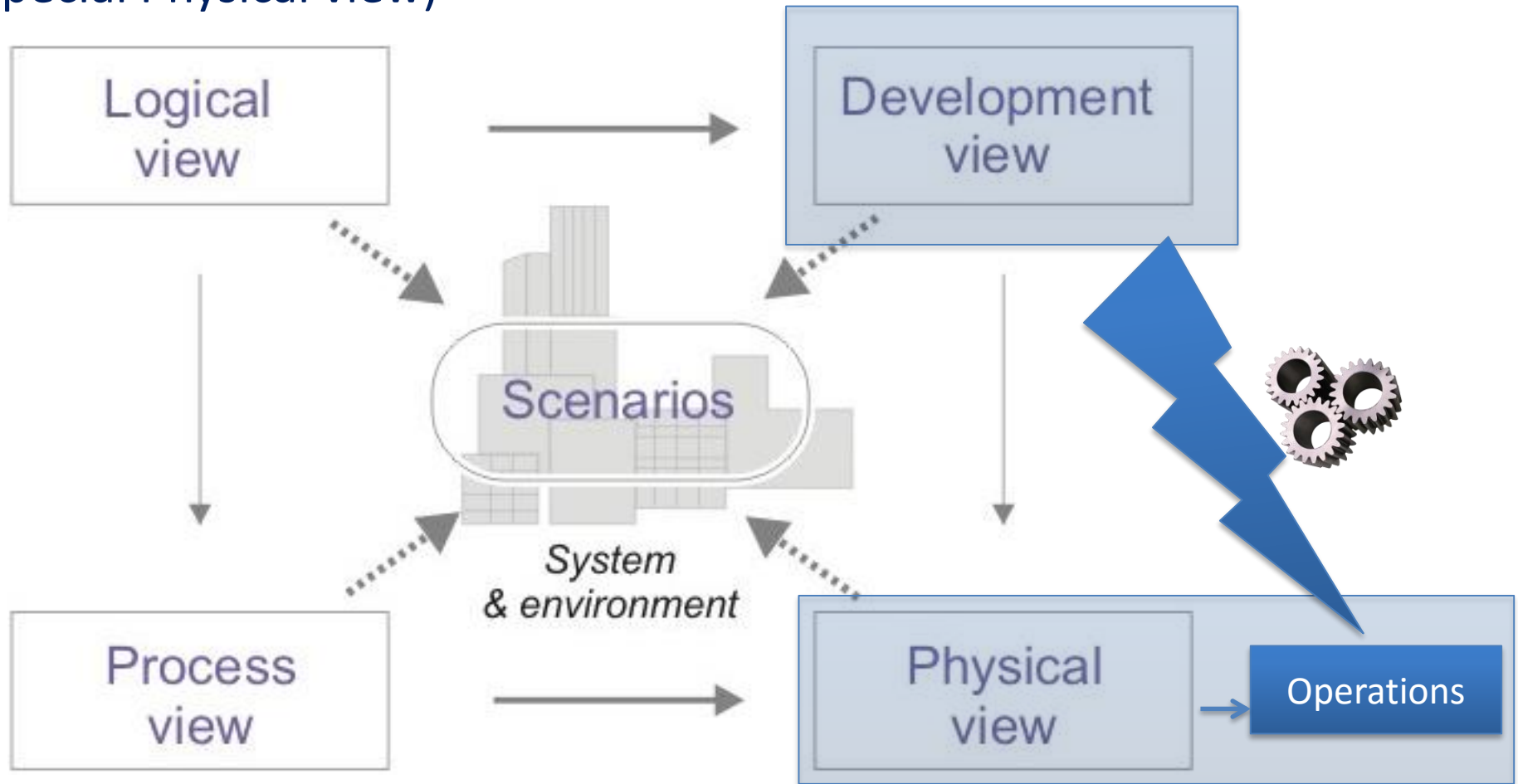
1. The Logical architecture view needs synch with quality properties verification views



Something is missing, for example* ...

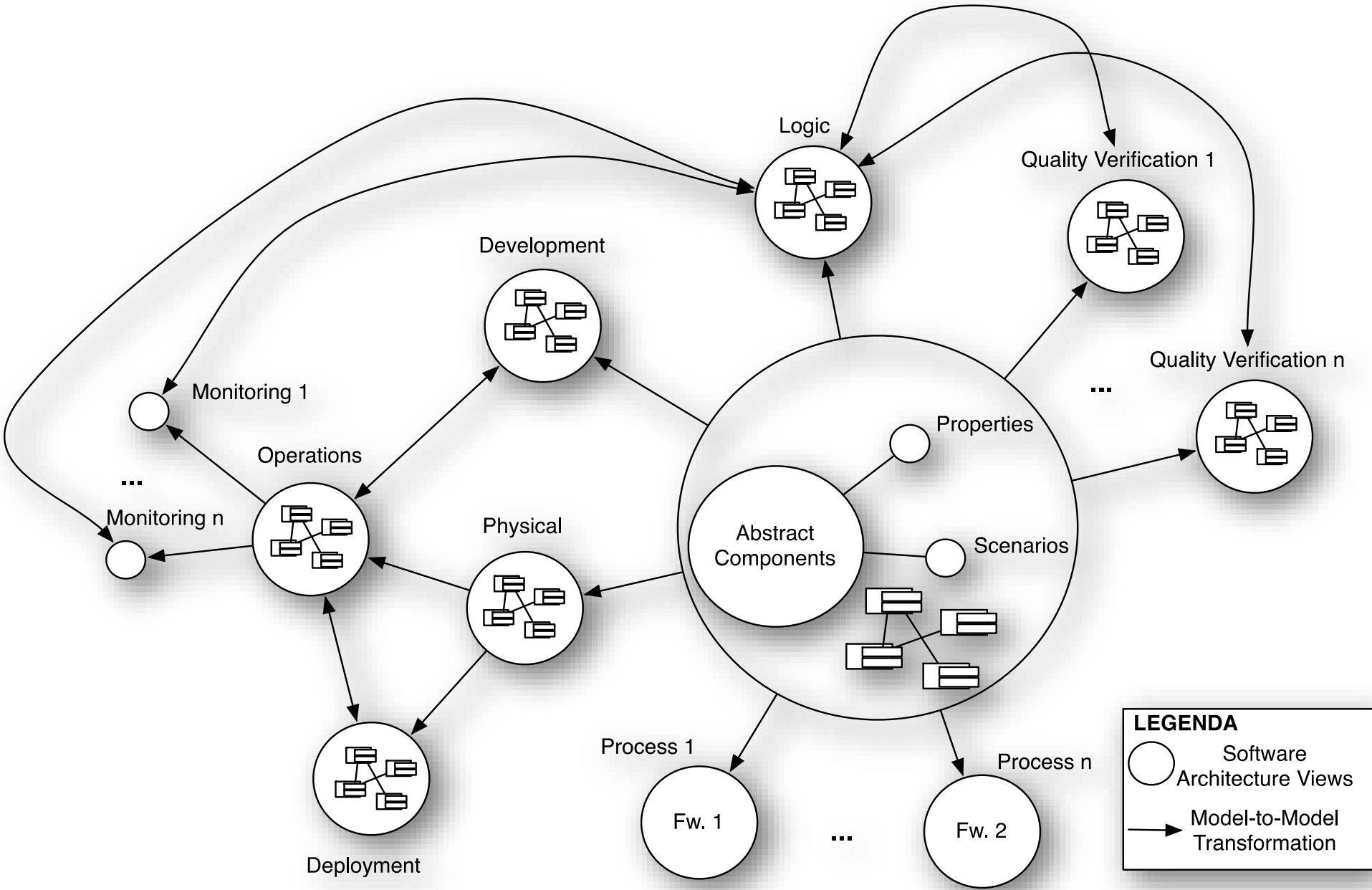


2. The Dev- architecture view needs synch with the -Ops view (i.e., special Physical view)



* More on the paper

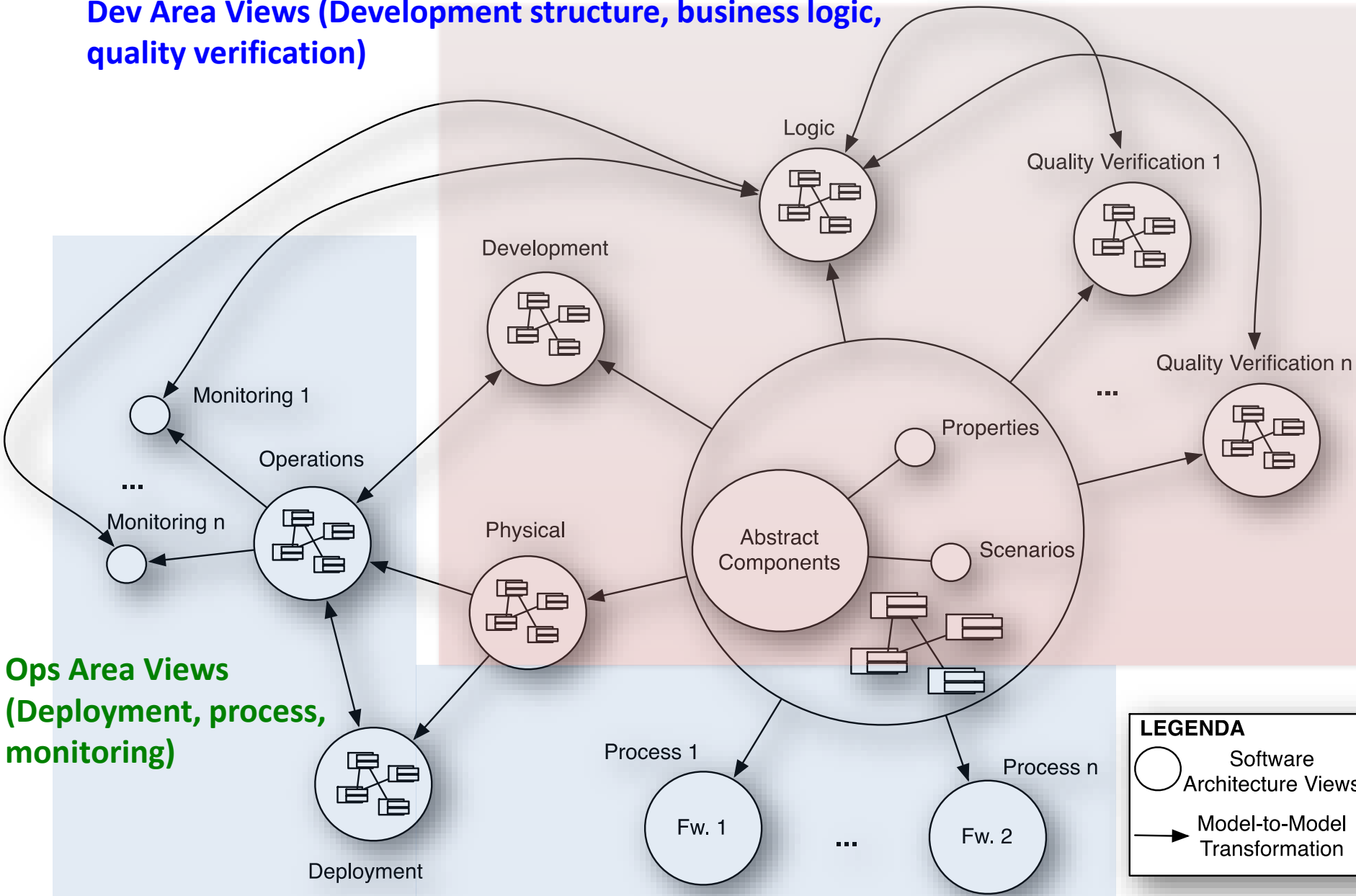
Summing it all up: SQUID Views and Transformations



Summing it all up: SQUID Views and Transformations



Dev Area Views (Development structure, business logic, quality verification)

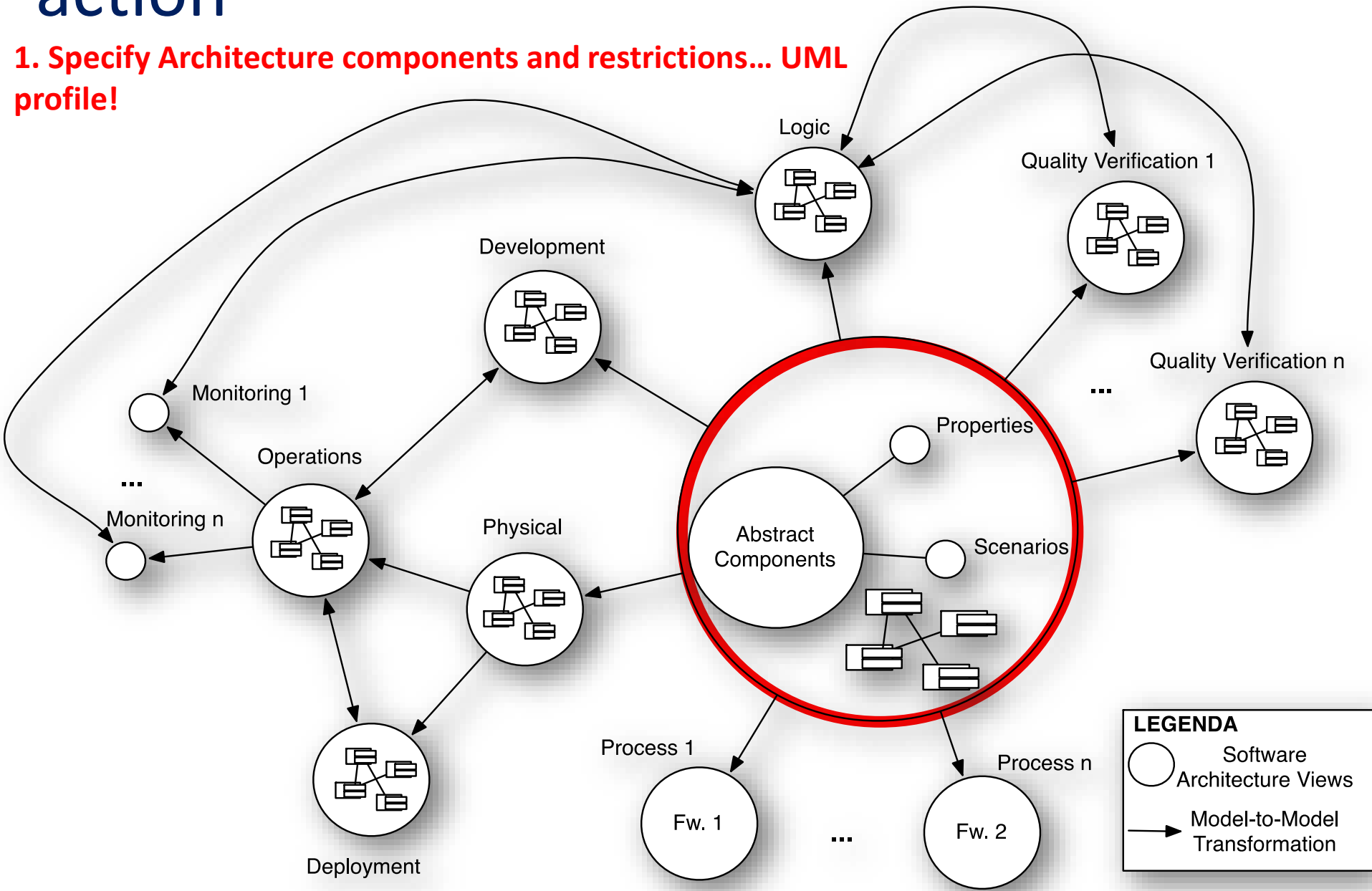


Ops Area Views (Deployment, process, monitoring)

SQUID continuous architecting in action



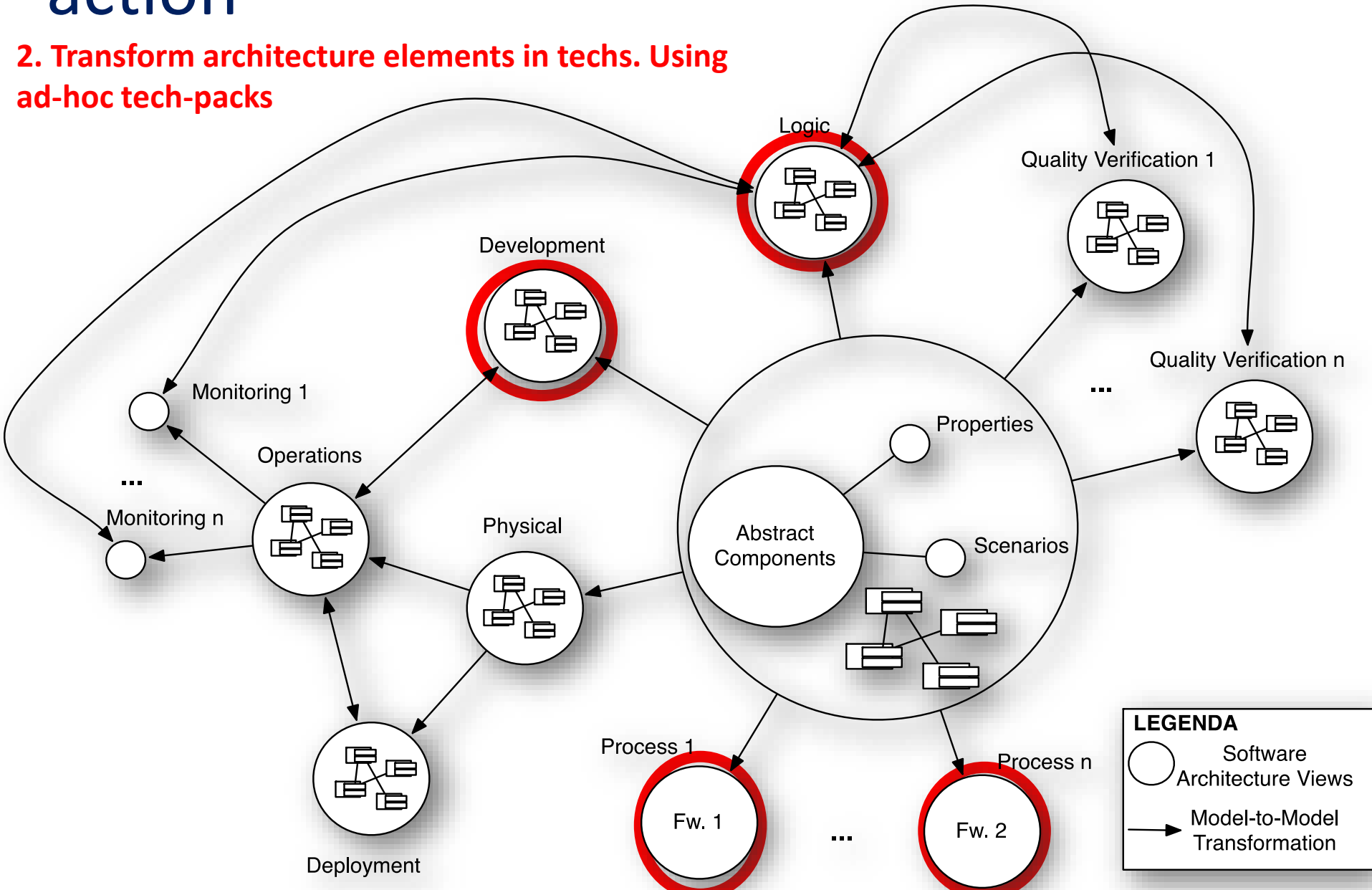
1. Specify Architecture components and restrictions... UML profile!



SQUID continuous architecting in action



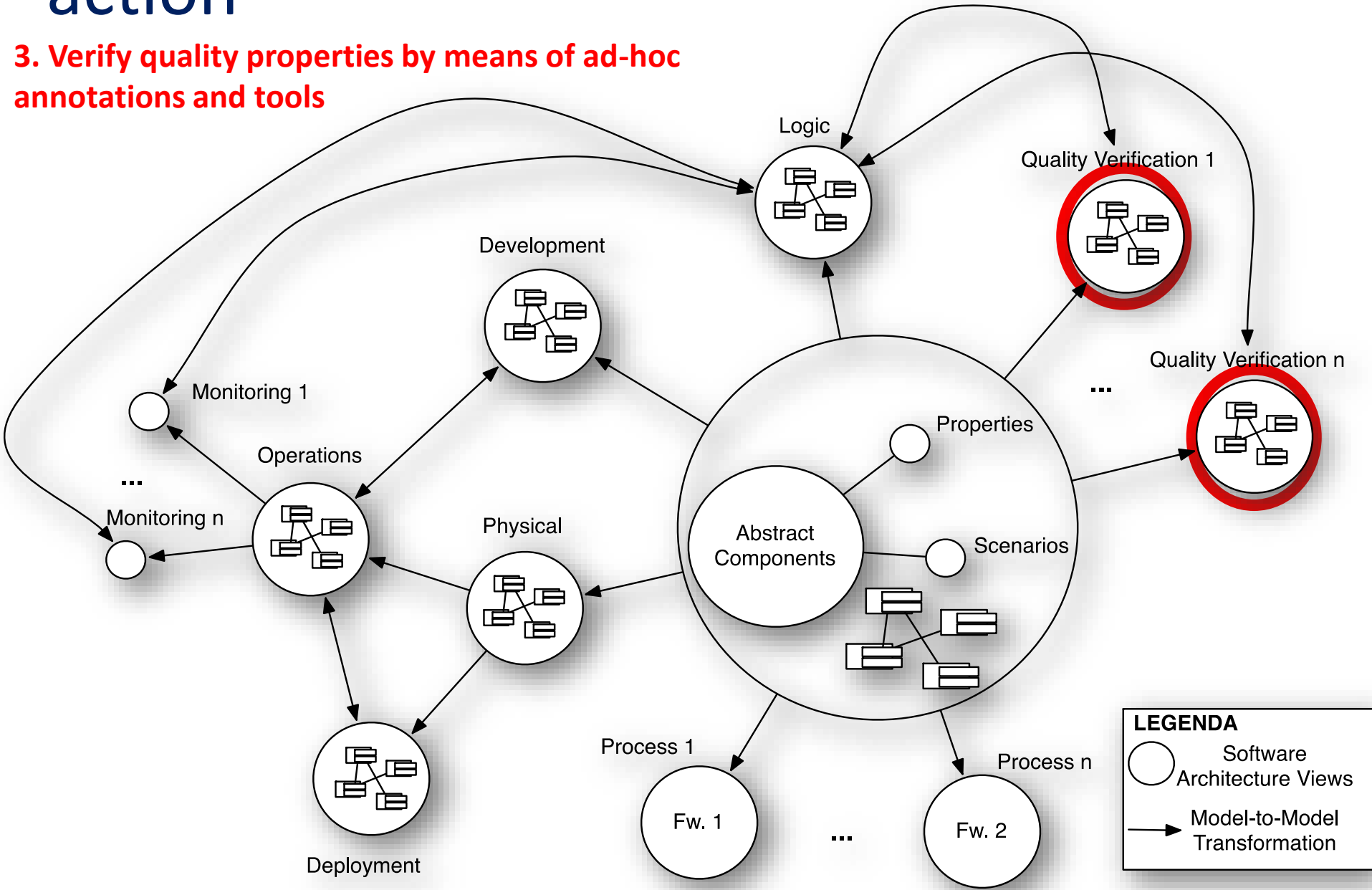
2. Transform architecture elements in techs. Using ad-hoc tech-packs



SQUID continuous architecting in action



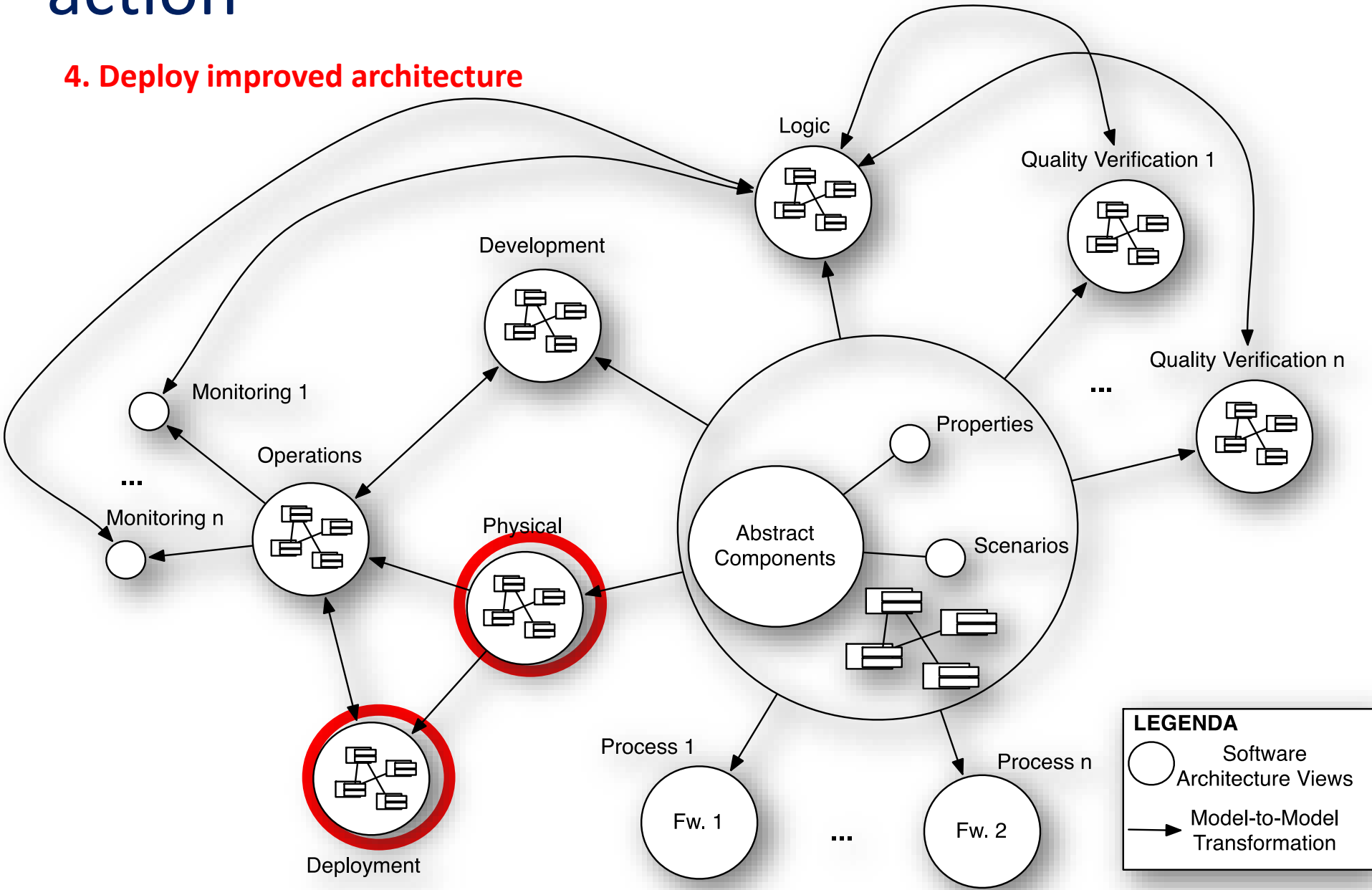
3. Verify quality properties by means of ad-hoc annotations and tools



SQUID continuous architecting in action



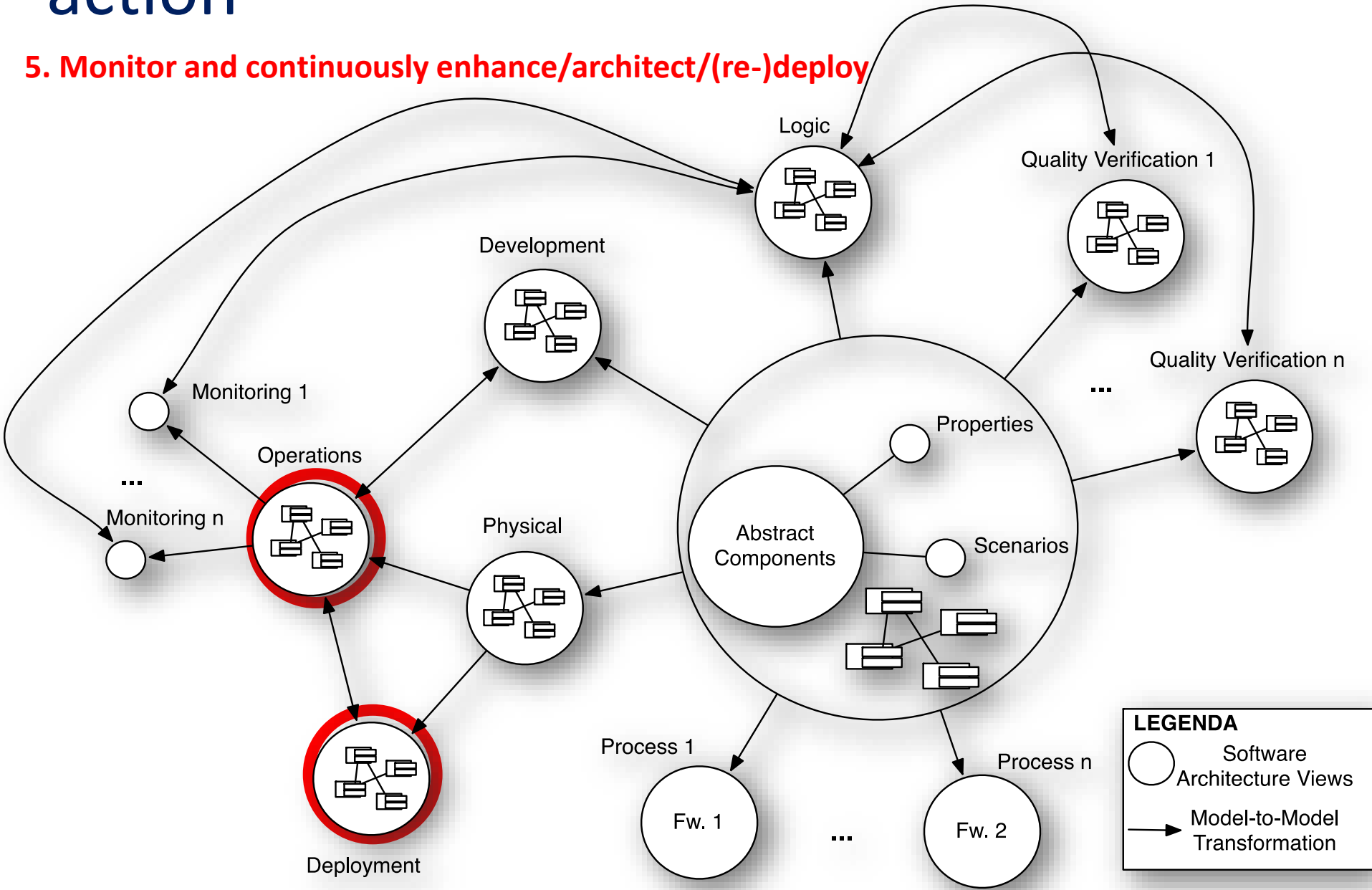
4. Deploy improved architecture



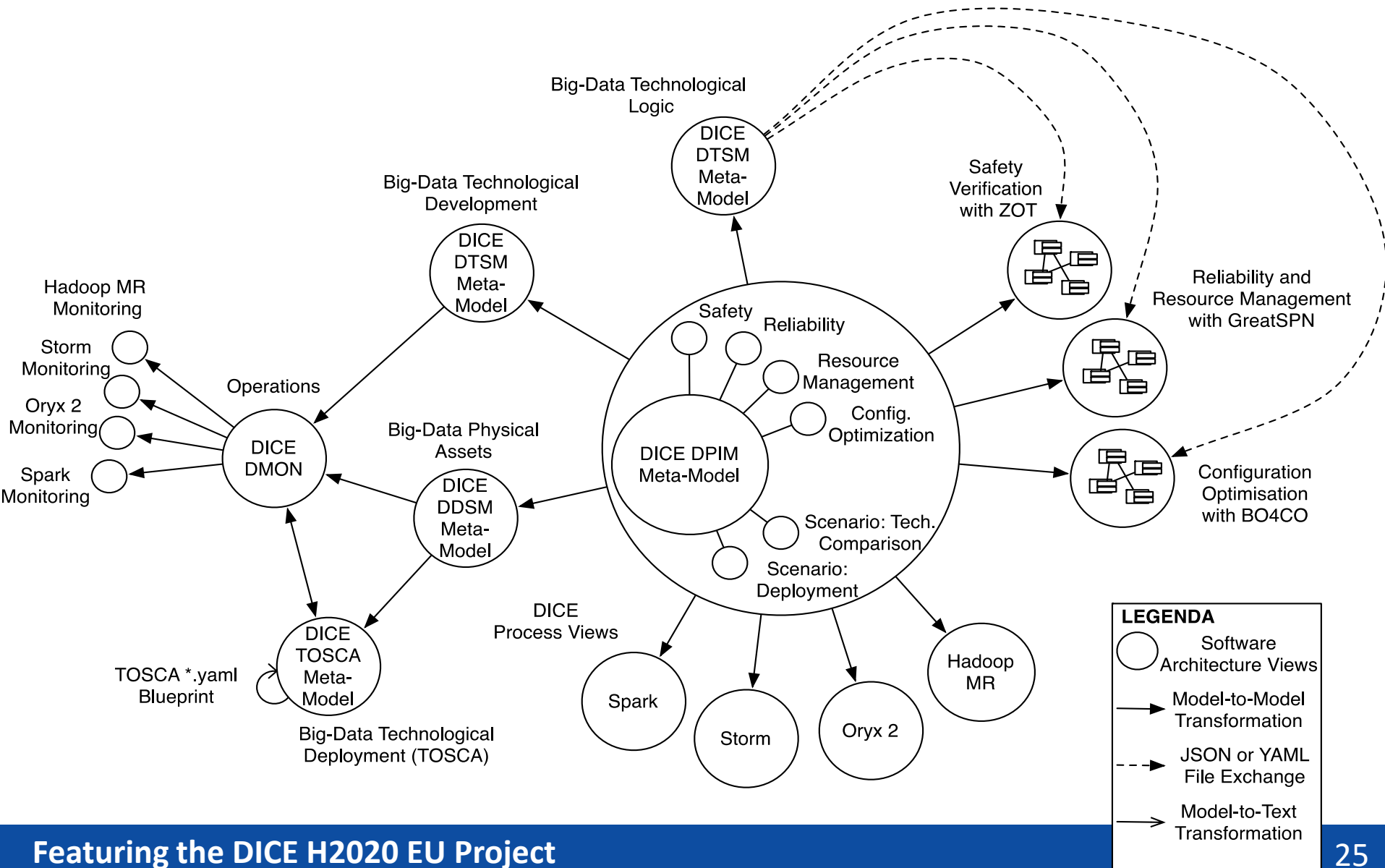
SQUID continuous architecting in action



5. Monitor and continuously enhance/architect/(re-)deploy



For example* ...



In conclusion... Take-home messages!



- MDE and DevOps are made for each other
 - SQUID offers a complete approach for Quality-Aware MDE-based continuous architecting (e.g., of DIAs)
 - Heavy use of M2M and M2T transformations
- Needs in DevOps rotate around multi-view and continuous-architecting
 - Speedy modeling, synch and (re-)deployment are critical



- [1] Group, I. A. W. (2000), 'IEEE Std 1471-2000, Recommended practice for architectural description of software-intensive systems' , Technical report, IEEE , IEEE , i--23 .
- [2]<http://www.iso-architecture.org/42010/afs/frameworks-table.html>
- [3] Kruchten, P. (1995), 'Architectural Blueprints: The "4+1" View Model of Software Architecture', *IEEE Software* **12** (6), 42-50.