

Improving the Reliability of Smart Grid: A Perspective from Software Design

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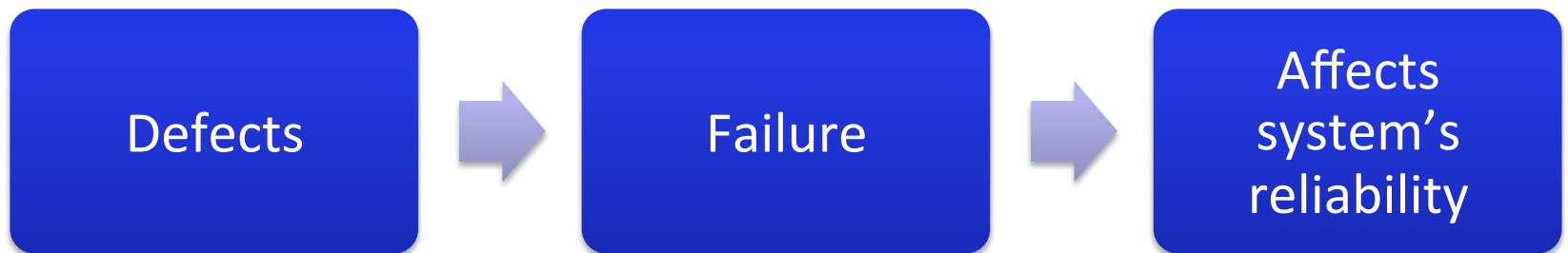
NTNU

Smart Grid Conference

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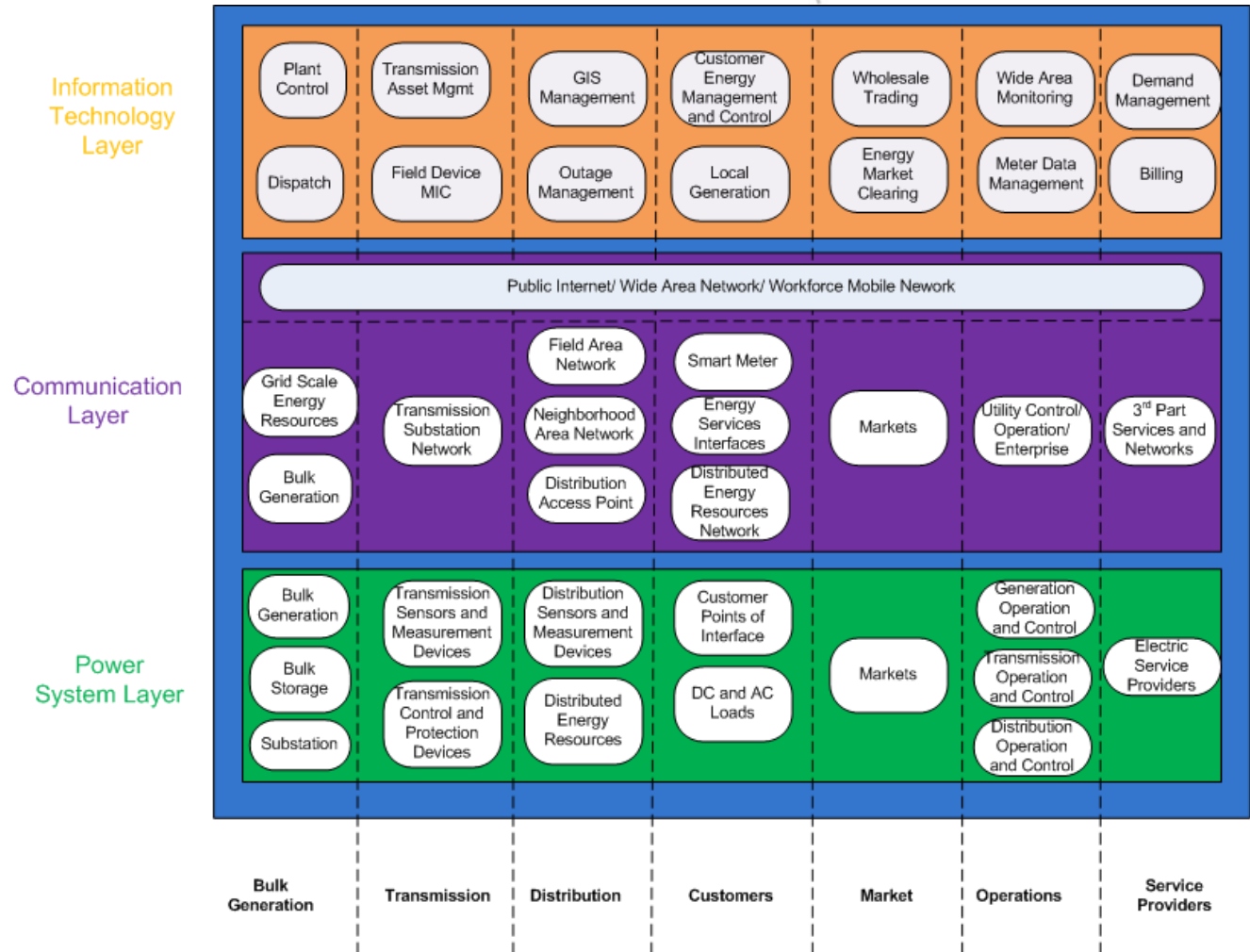
Motivation

- Large applications such as Smart Grid applications have tendencies to grow in complexity and decrease in reliability if left unmanaged



Smart Grid Applications as System of Systems

- A failure in a part of the system-of-systems can cascade to other parts.

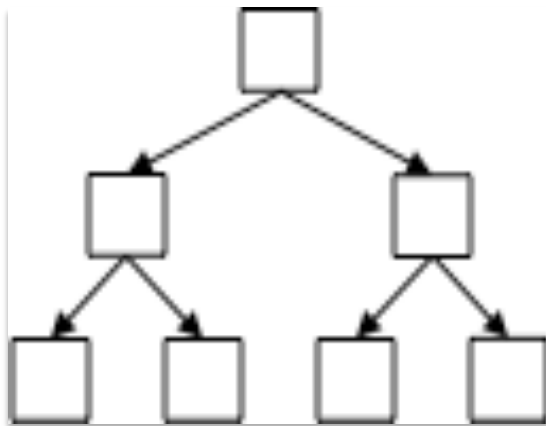


Software Engineering support for Smart Grid Applications: Focus

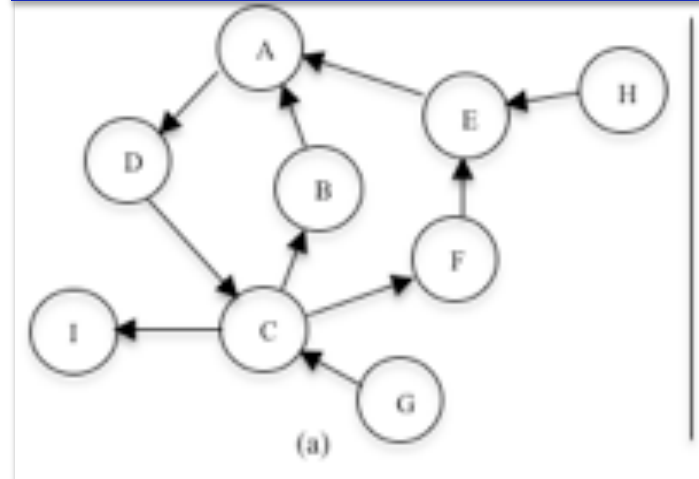
- We need to quickly monitor the quality of software (and its internal components) being developed for the Smart Grid
- Improve the management of software evolution in Smart Grid
- Identify architectural “hot spots” and area that should be focused for refactoring/testing in order to build resilient Smart Grid systems.

Architectural hotspots in Software

a) Hierarchical structure

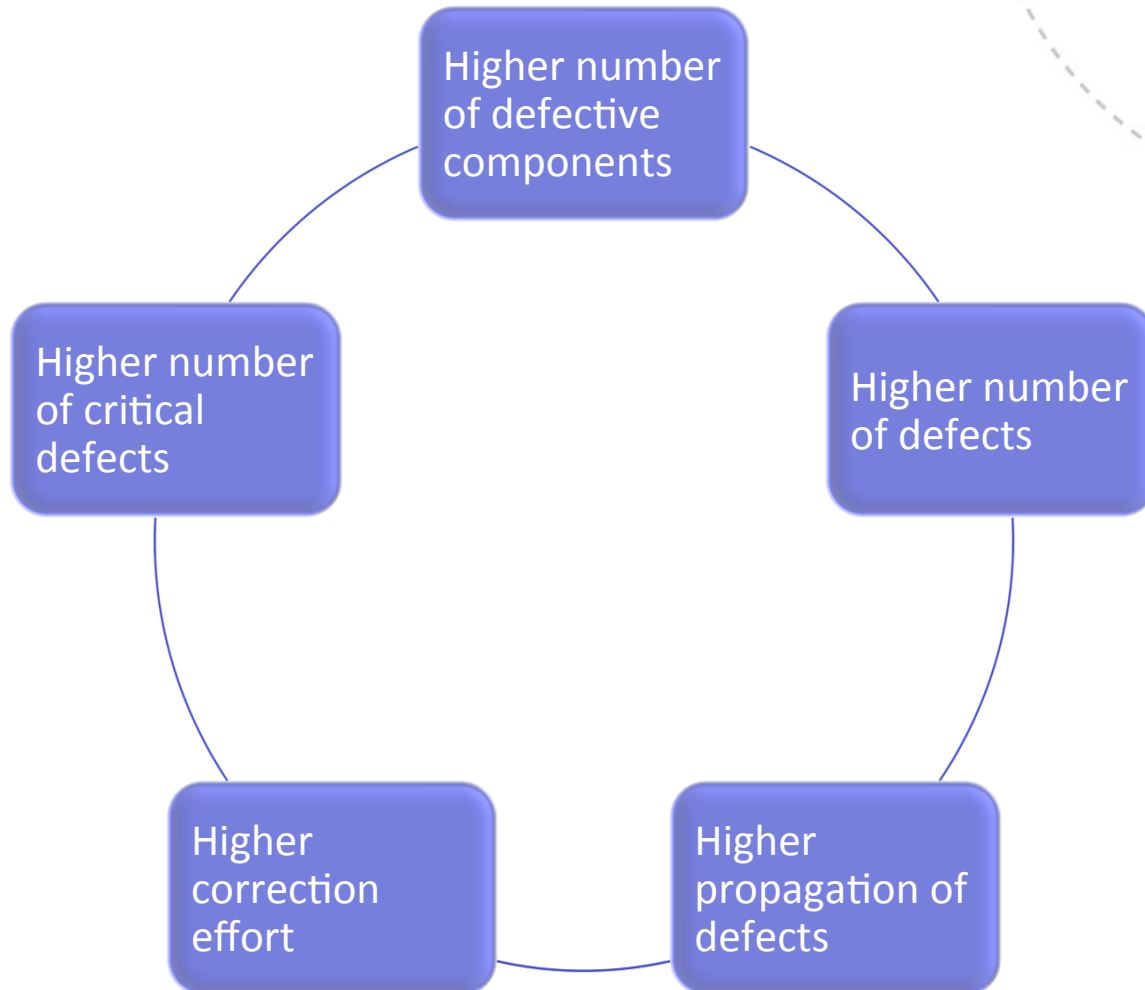


b) Cyclic structure



Cyclic structure among components in software is a well known design problem

Cyclically connected components have significantly:



Conclusion and Next Steps

- Cyclic structure is a design smell and has the possibility to reduce system's reliability
- Related Smart Grid software and components need regular quality check to reduce the probability of failure
- Next Steps
 - Refactor those “hotspots” in the software structure
 - Tool assistance for automatic breaking of complex cyclic structures

References

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- Oyetoyan, T.D., Conradi, R., Cruzes, D.S., Can Refactoring of Cyclic Dependent Components Reduce Defect-Proneness, *29th IEEE International Conference on Software Maintenance (ICSM'13)* 22 - 28 September 2013 - Eindhoven, The Netherlands (Short Paper)
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THANK YOU