Composing the Industrial Internet of Things (IIoT)

[Marc-Oliver Pahl](#)

pahl@s2o.net.in.tum.de

Technische Universität München

Fakultät für Informatik

IoT Smart Space Team

Lehrstuhl für Netzarchitekturen und Netzdienste

Prof. G. Carle

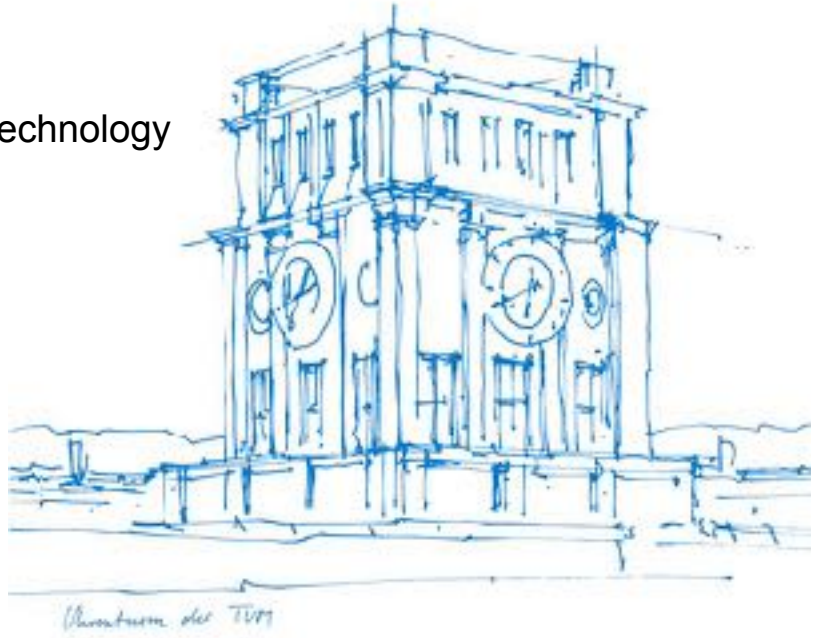
Arne Bröring

arne.broering@siemens.com

Researcher in IoT

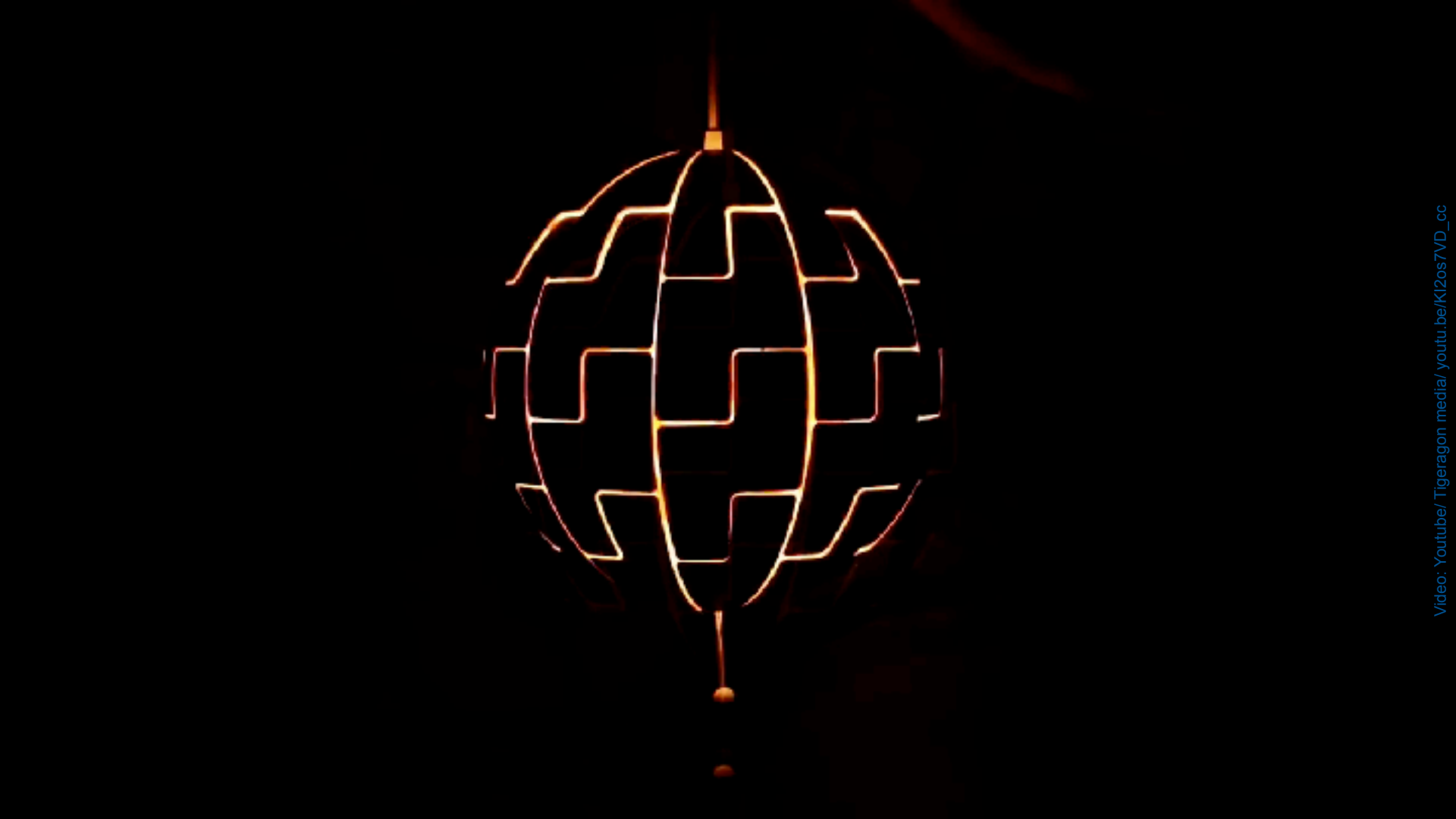
Siemens Corporate Technology

München, 04. April 2019



Some Projects

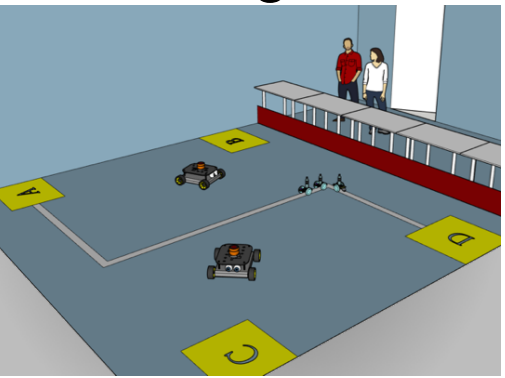
- Autonomic Home Networking
- Building as a Service
- SCHEIF - Smart Cyber-pHysIcal Environments for Industry of the Future
- Decentralized Cross-Commodity Energy Management (https://decent.future-iot.org/)
- …



Video: Youtube/ Tigeragon media/ youtu.be/Kl2os7VD_cc

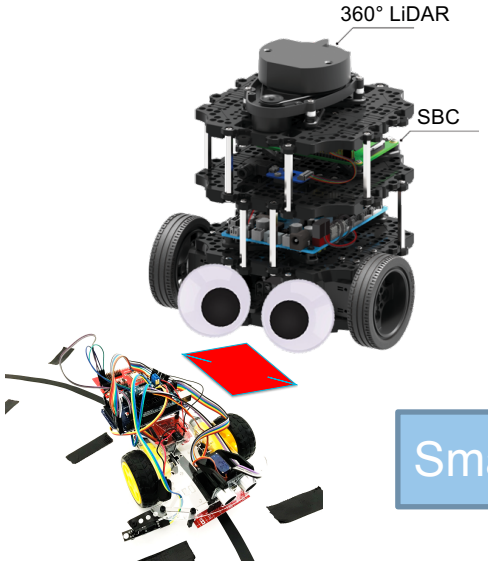
SensorGateway
ControlLogic
Reasoner
Actuator
Video: Youtube/ Tigeragon media/ youtu.be/Kl2os7VD_cc

Guiding IIoT Example: Distributed Softwarized Control



CollisionAvoidance

RobotMover



Localization

BigRobotGateway

SmallRobotGateway

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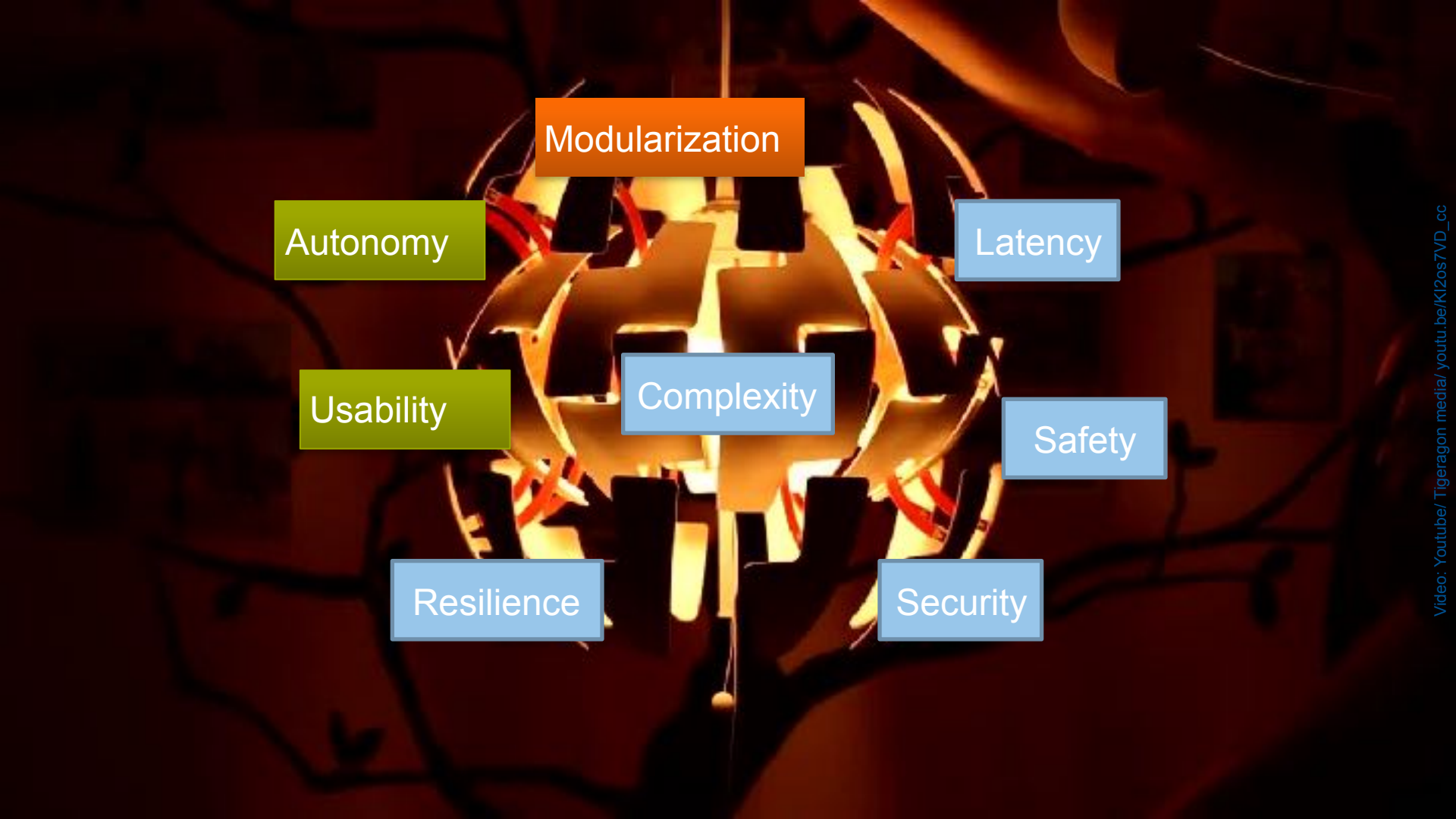
Modularization
Autonomy
Latency
Usability
Complexity
Safety
Resilience
Security
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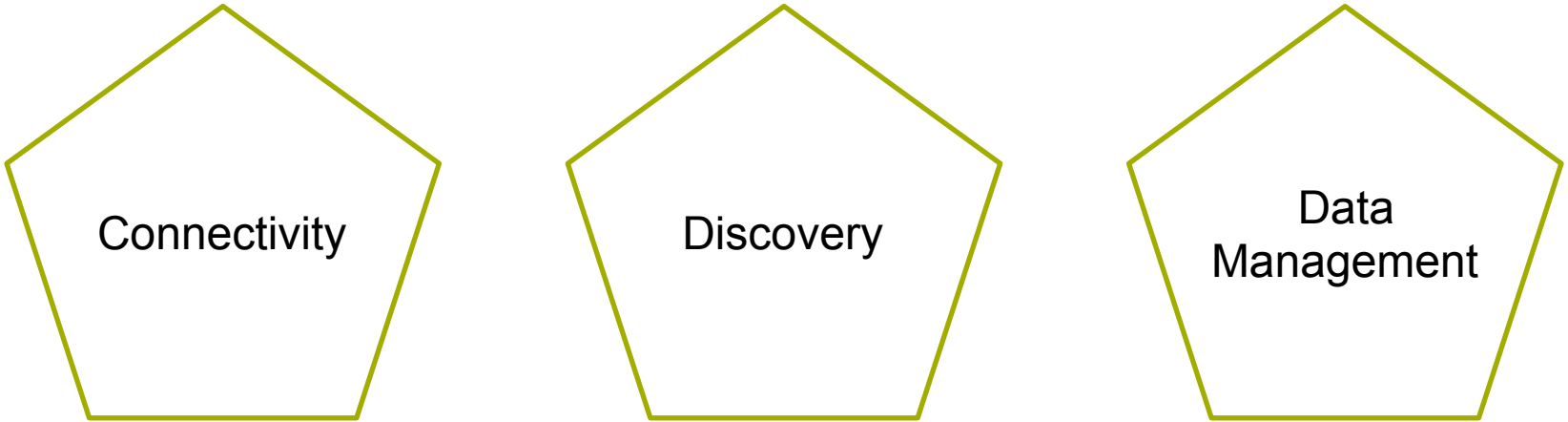
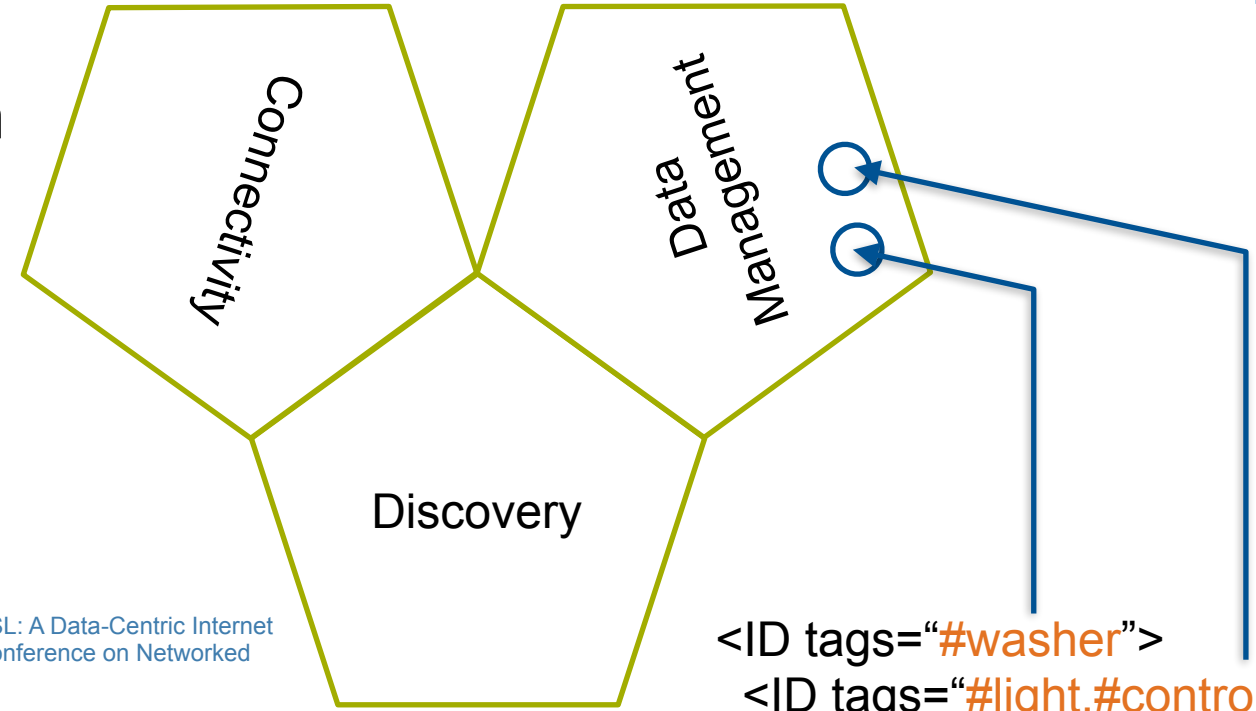
Modularization



Modularization

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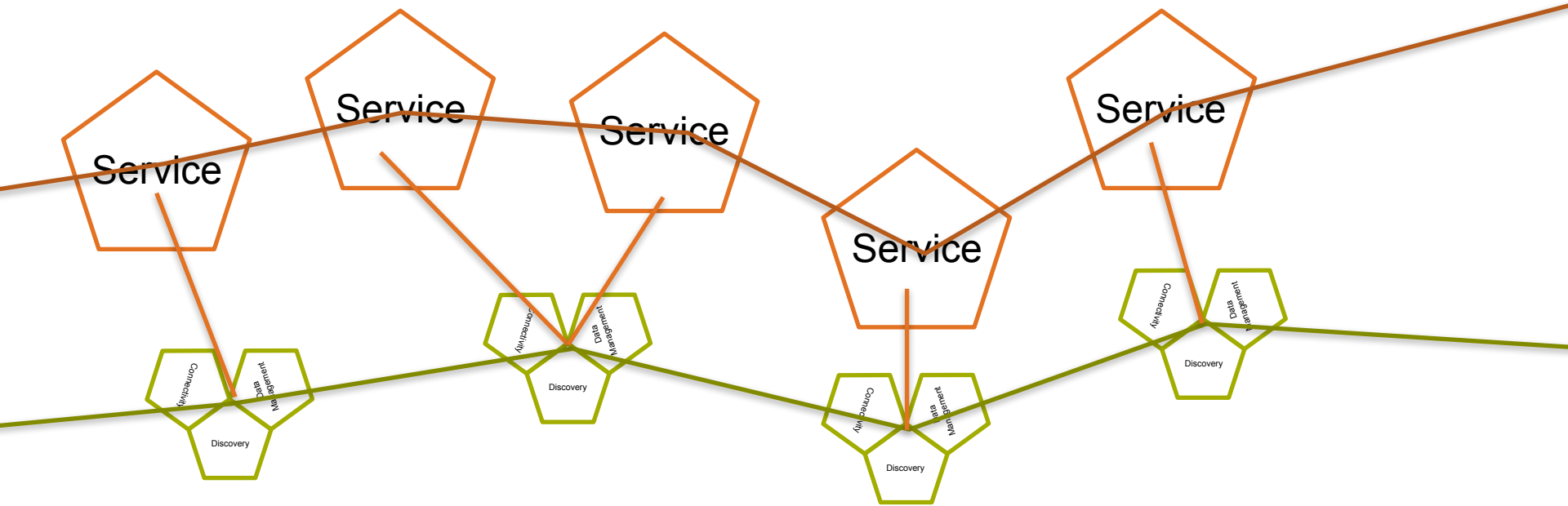
M.-O. Pahl, S. Liebald, and C. Lübben, "VSL: A Data-Centric Internet of Things Overlay," presented at the Int. Conference on Networked Systems (NetSys), 2019.

M.-O. Pahl and S. Liebald, "A Modular Distributed IoT Service Discovery," presented at the Int. Symposium on Integrated Network Management (IM), 2019.

M.-O. Pahl and G. Carle, "Crowdsourced Context-Modeling as Key to Future Smart Spaces," presented at the Network Operations and Management Symposium 2014 (NOMS 2014), 2014, pp. 1–8.

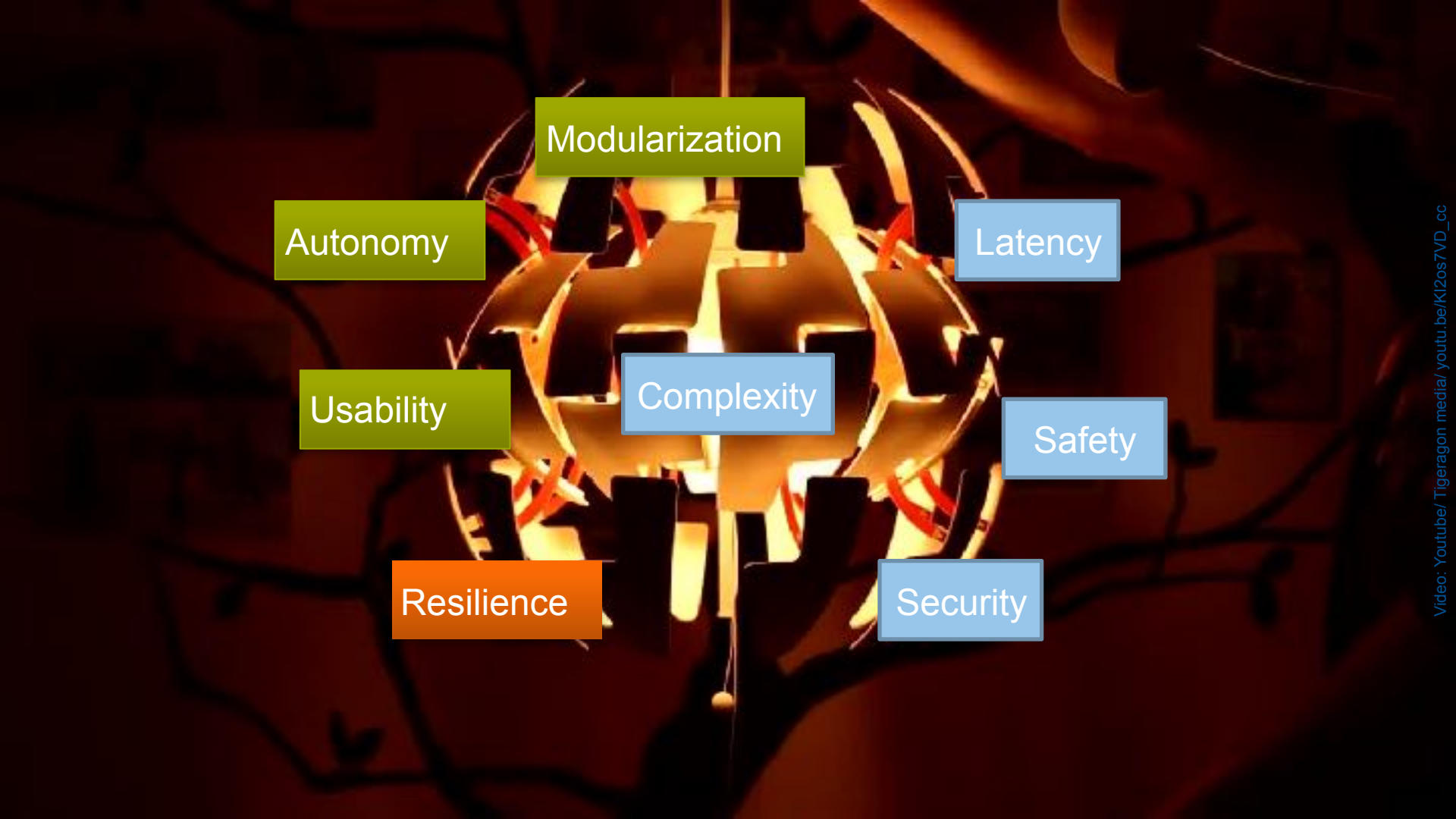
Modularization



M.-O. Pahl and S. Liebald, “Designing a Data-Centric Internet of Things: VSL,” presented at the Int. Conference on Networked Systems (NetSys), 2019.

M.-O. Pahl, “Data-Centric Service-Oriented Management of Things,” presented at the Integrated Network Management (IM), 2015 IFIP/IEEE International Symposium on, Ottawa, Canada, 2015, pp. 484–490.

M.-O. Pahl and G. Carle, “The Missing Layer - Virtualizing Smart Spaces,” presented at the 10th IEEE International Workshop on Managing Ubiquitous Communications and Services 2013 (MUCS 2013, PerCom 2013 adjunct), San Diego, USA, 2013, pp. 139–144.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Security
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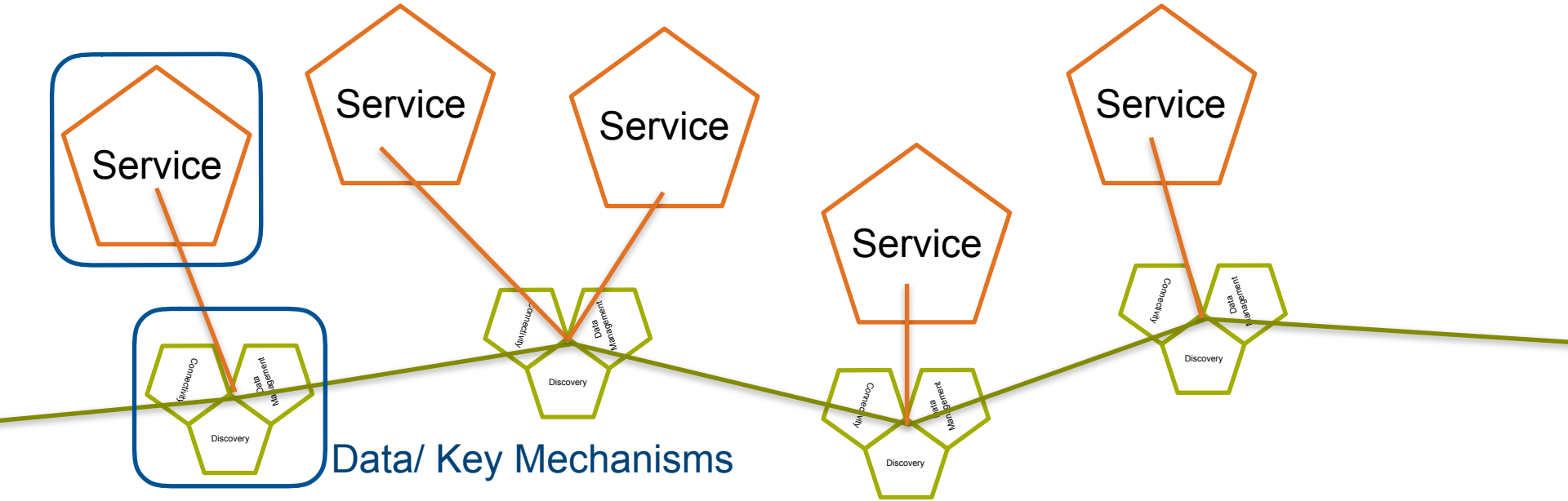
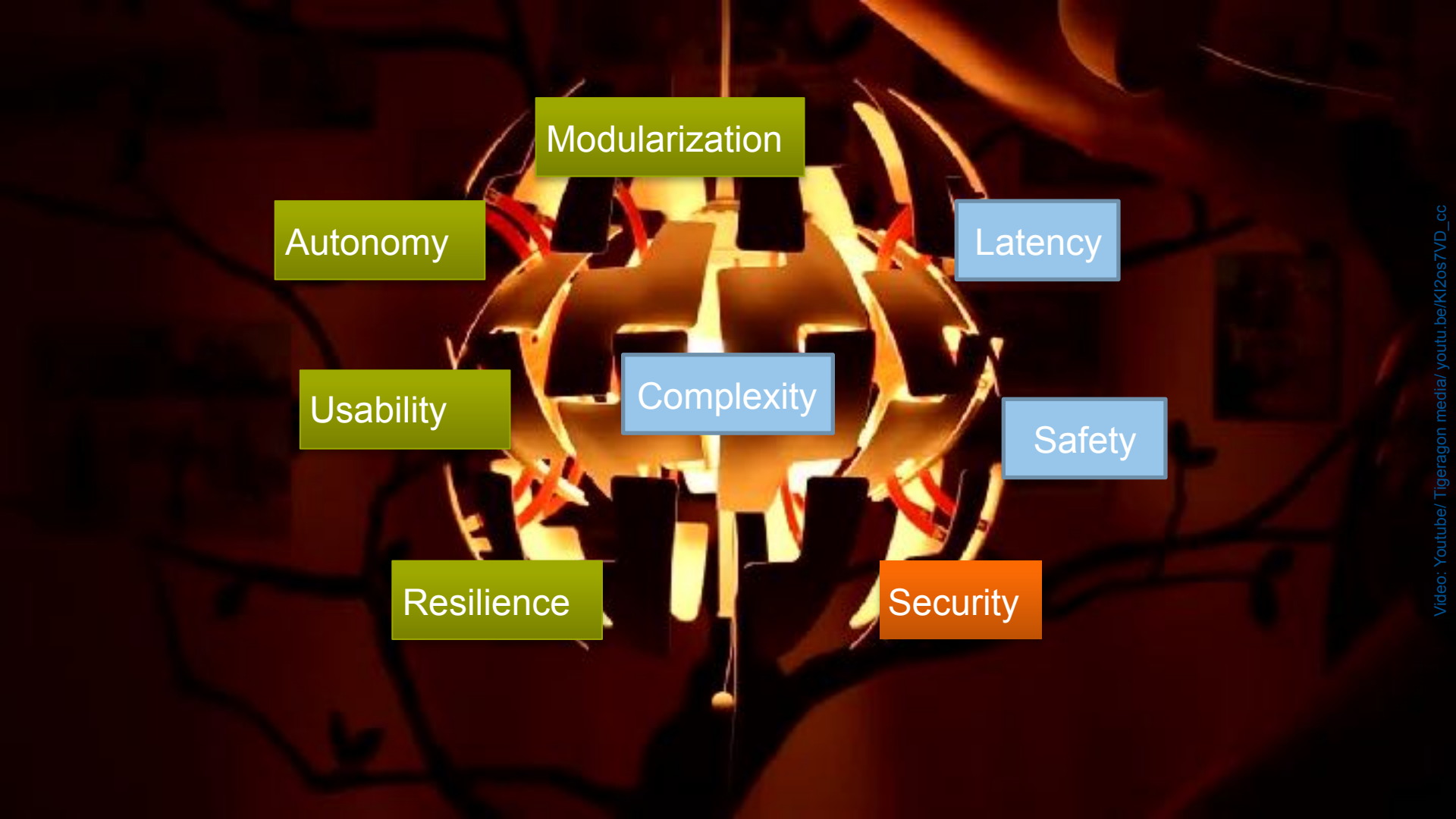
Resilience: Replication



M.-O. Pahl, S. Liebald, and L. Wüstrich, “Machine-learning based IoT Data Caching,” presented at the Hot Topics in Network and Service Management (HotNSM) at International Symposium on Integrated Network Management (IM), Washington DC, USA, 2019.

M.-O. Pahl, “Multi-Tenant IoT Service Management towards an IOT App Economy,” presented at the Hot Topics in Network and Service Management (HotNSM) at International Symposium on Integrated Network Management (IM), Washington DC, USA, 2019.

M.-O. Pahl and S. Liebald, “Designing a Data-Centric Internet of Things: VSL,” presented at the Int. Conference on Networked Systems (NetSys), 2019.



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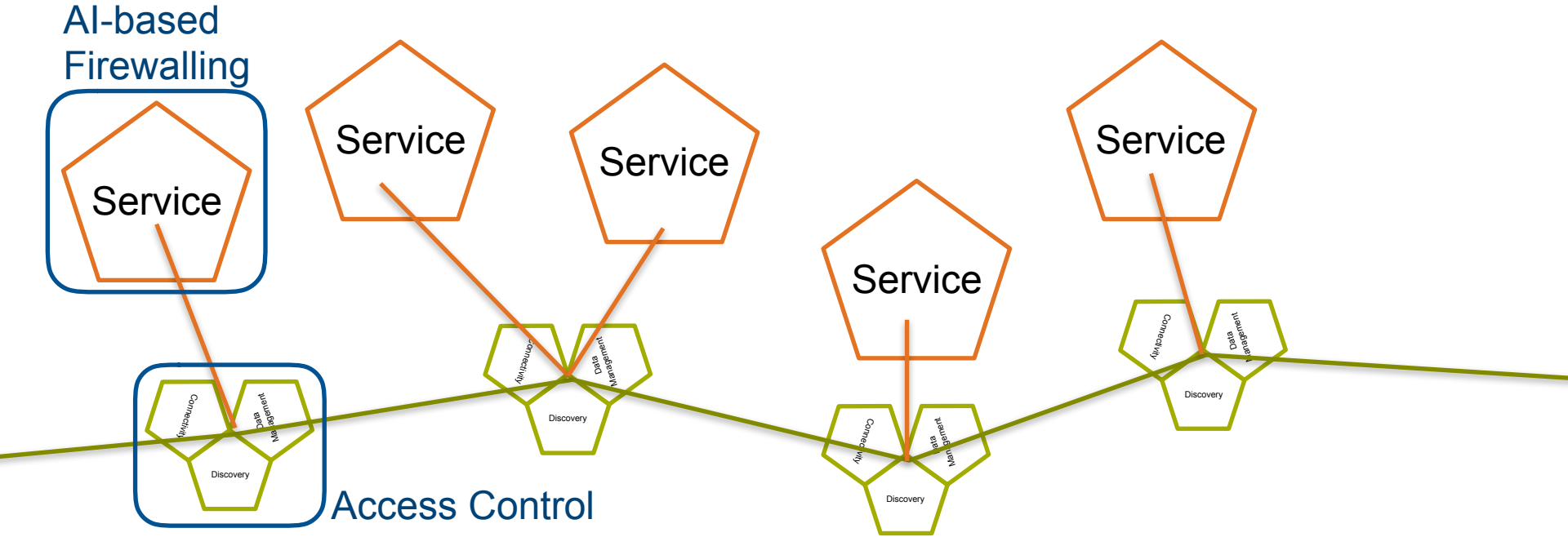
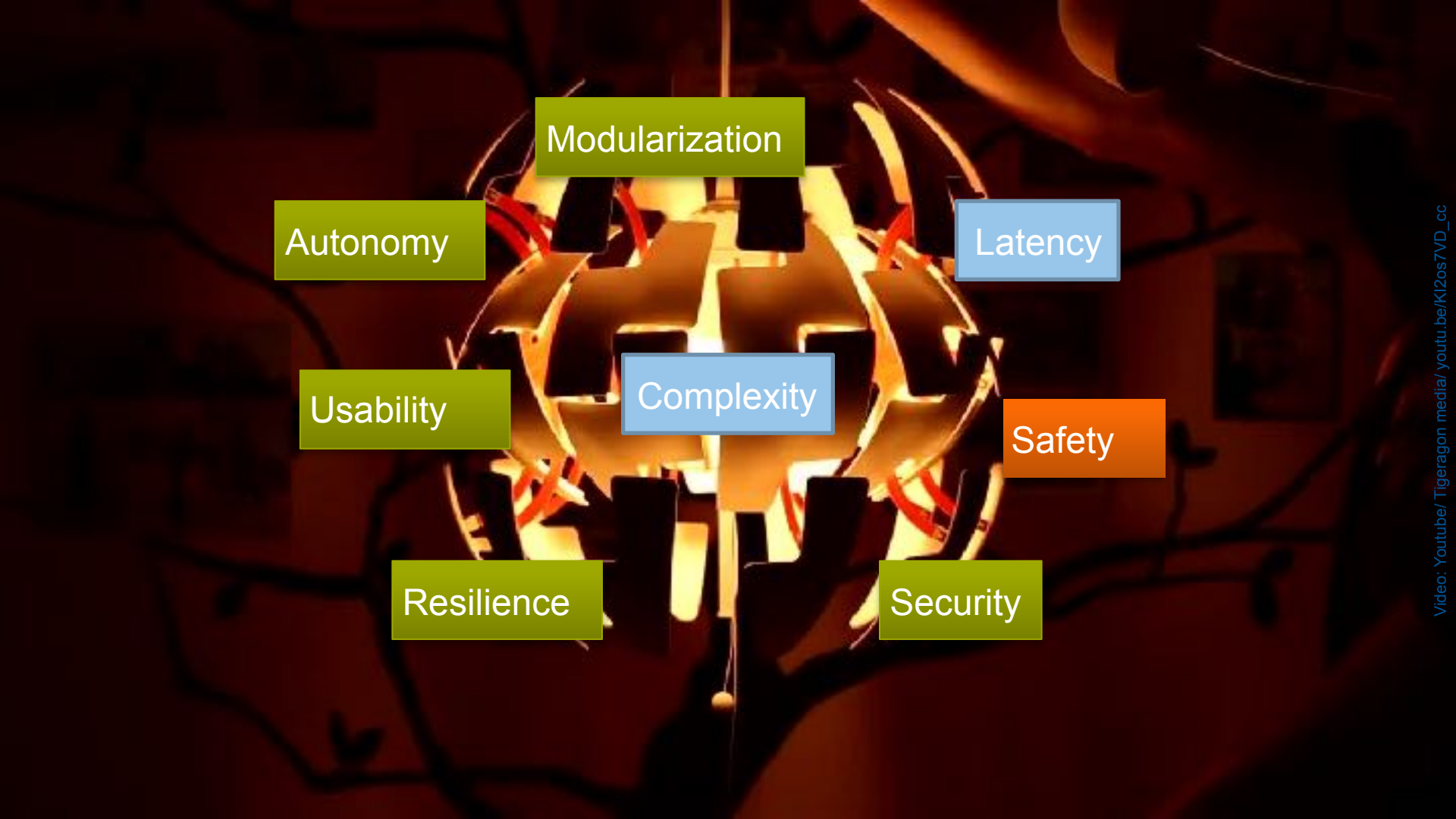
Security: Group Based Access Control / Firewalling



M.-O. Pahl and L. Donini, “Giving IoT Edge Services an Identity and Changeable Attributes,” presented at the Int. Symposium on Integrated Network Management (IM), 2019.

M.-O. Pahl and F.-X. Aubet, “All Eyes on You: Distributed Multi-Dimensional IoT Microservice Anomaly Detection,” presented at the 2018 14th International Conference on Network and Service Management (CNSM) (CNSM 2018), Rome, Italy, 2018.

M.-O. Pahl and M. Loipfinger, “Machine Learning as a Reusable Microservice,” presented at the Network Operations and Management Symposium (NOMS), 2018.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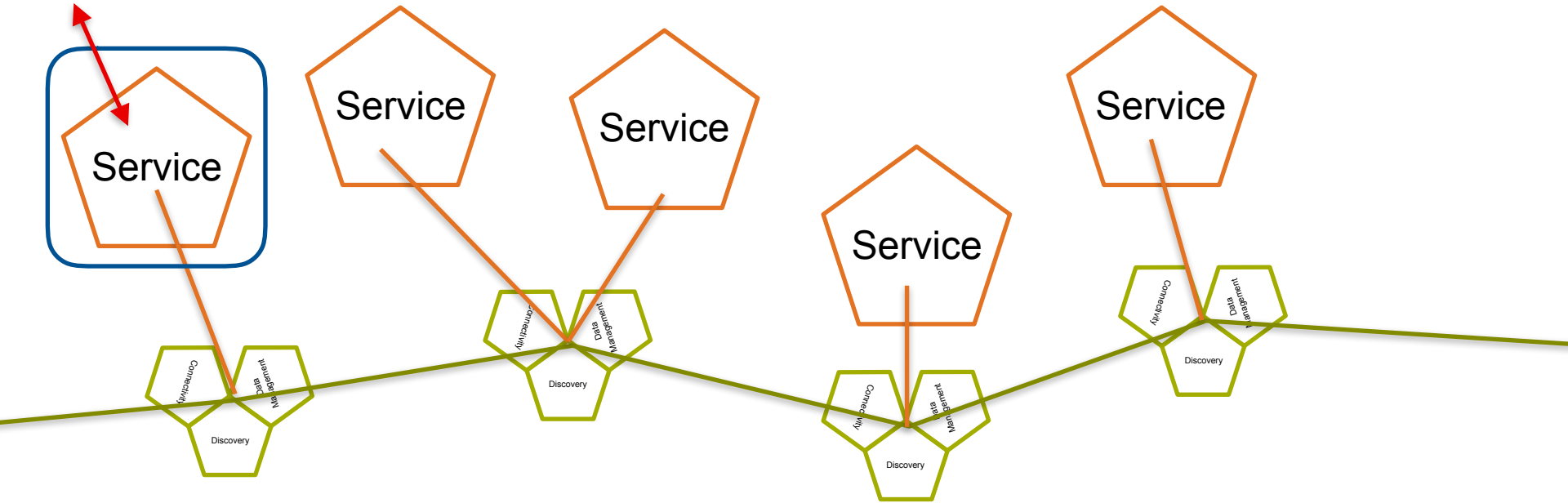
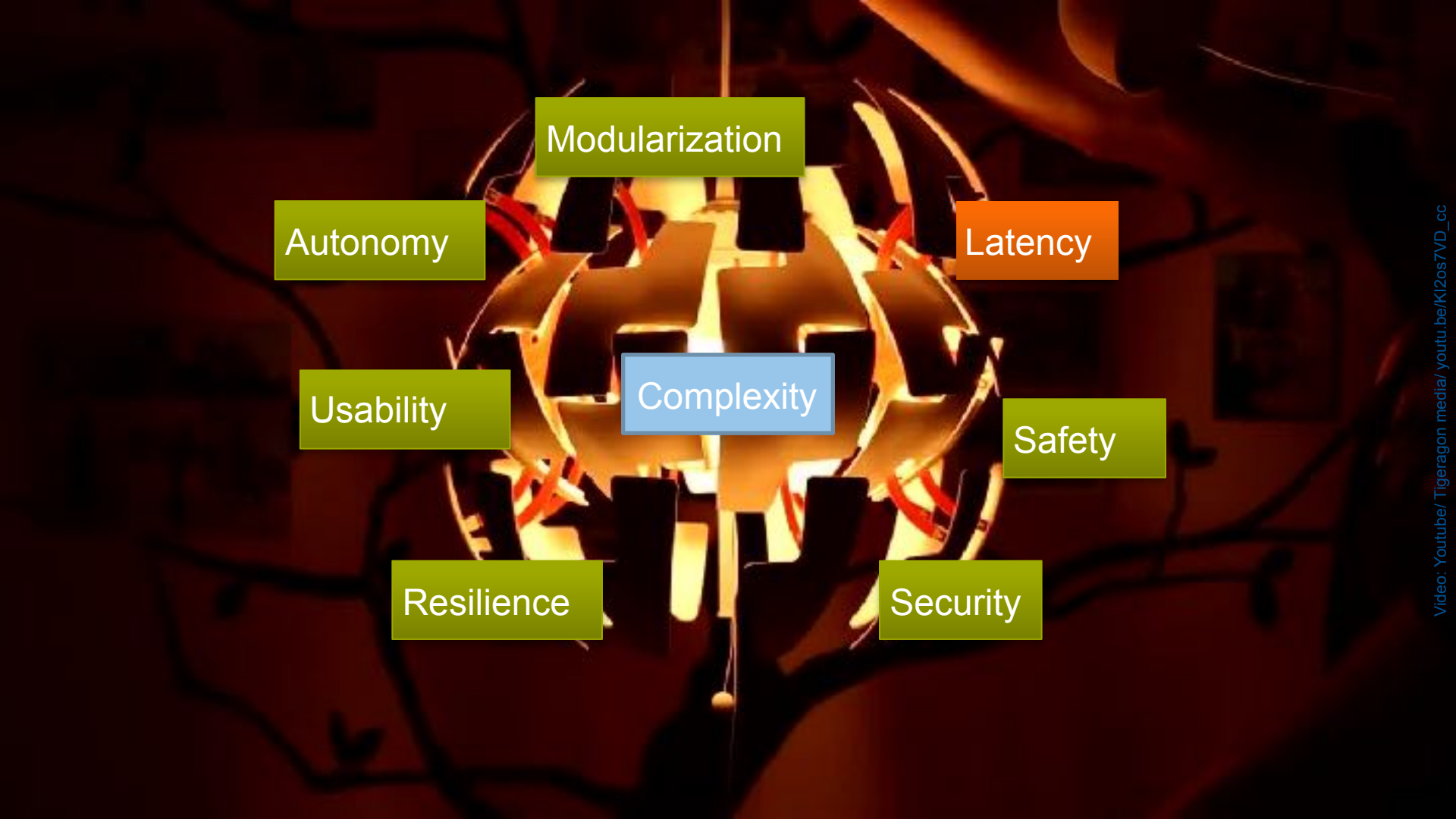
Safety: Formal Modeling / Watermarking



M.-O. Pahl and F.-X. Aubet, “All Eyes on You: Distributed Multi-Dimensional IoT Microservice Anomaly Detection,” presented at the 2018 14th International Conference on Network and Service Management (CNSM) (CNSM 2018), Rome, Italy, 2018.

M.-O. Pahl, F.-X. Aubet, and S. Liebald, “Graph-Based IoT Microservice Security,” presented at the Network Operations and Management Symposium (NOMS), 2018.

F.-X. Aubet, M.-O. Pahl, S. Liebald, and M. R. Norouzian, “Graph-based Anomaly Detection for IoT Microservices,” presented at the Passive and Active Measurement Conference (PAM), 2018.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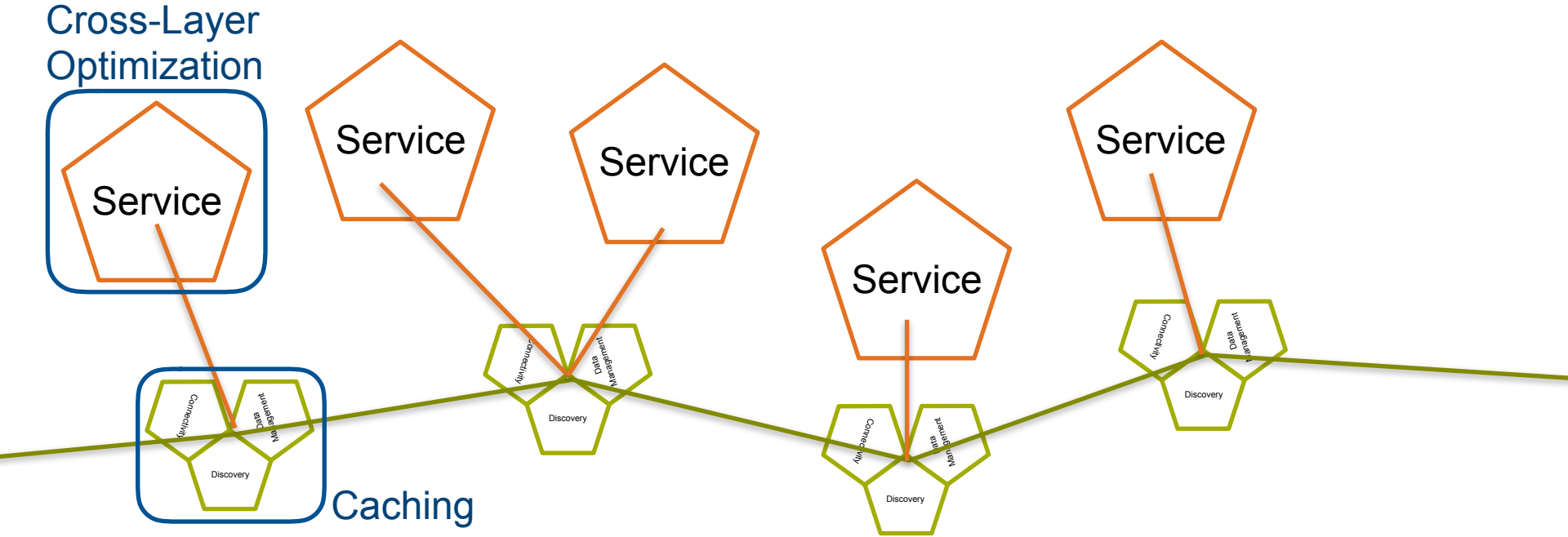
Latency: Caching / Cross-Layer Optimization



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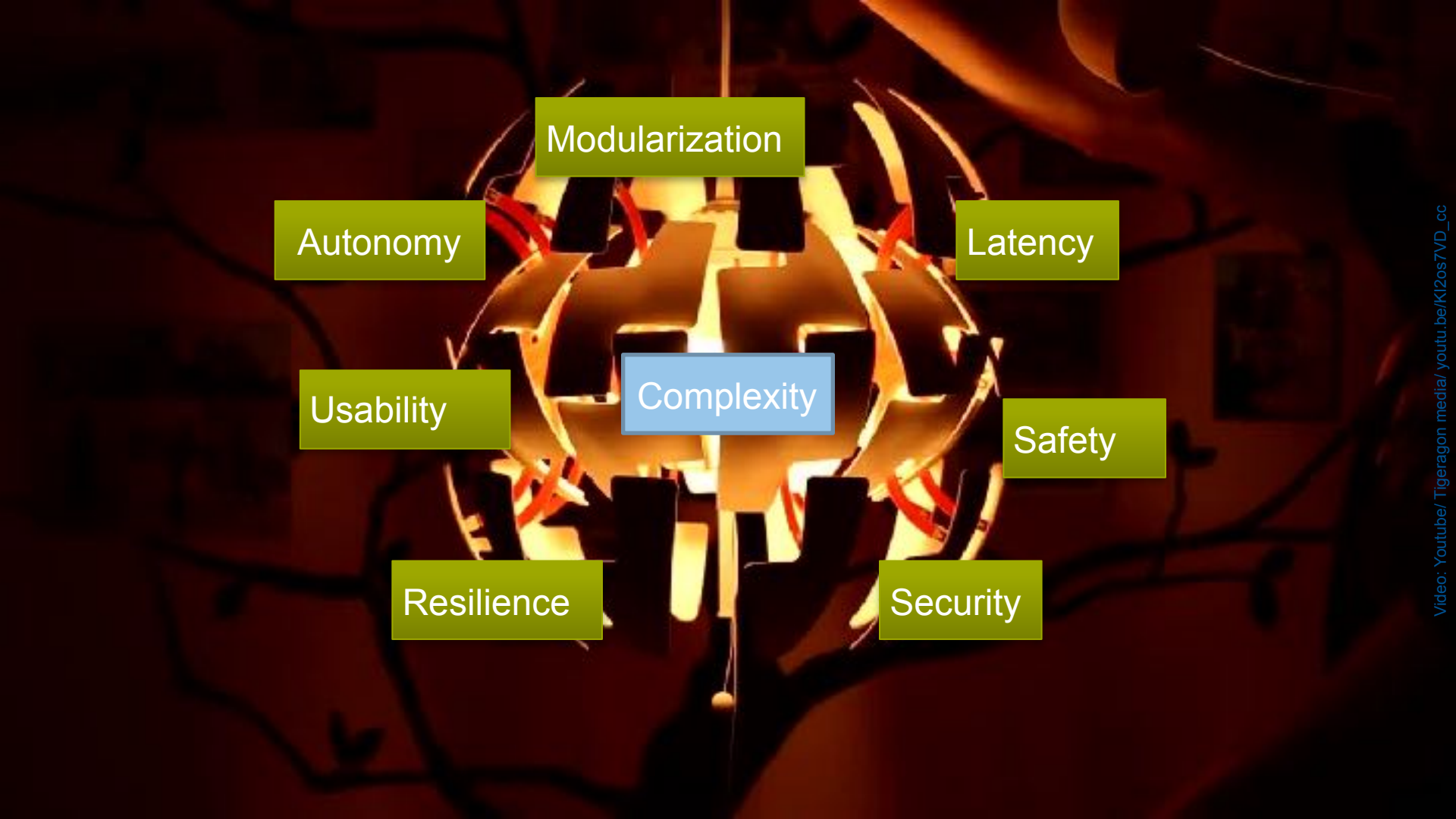
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Continuous Cooperation

- Joint **projects**, e.g.
  - Building as a Service (BaaS/ ITEA2)
    The BaaS project targeted a *softwarization of building automation systems* in the professional domain. A tooling for model-based generation of services for building automation was developed.

- Joint supervision of **students**
  - Ph.D.
    - e.g., Jan Seeger: Creating Reliable IoT Automation Environments
  - B.Sc. & M.Sc.
    - areas: Networking / Distributed Systems / IoT semantics

- Joint **Education**
  - Académie Franco-Allemande
    - Joint creation of professional training materials
  - Summer School with Hackathon on **IoT meets AI** early September 2019!
    - Students work on IoT/AI challenges with Siemens devices
    - winterschool18.future-iot.org

german-french academy
for the industry of the future
founded by IMT and TUM

pahl@s2o.net.in.tum.de / arne.broering@siemens.com