



**Cyber Physical Systems:  
Opportunities and Challenges for  
Software, Services, Cloud and Data**

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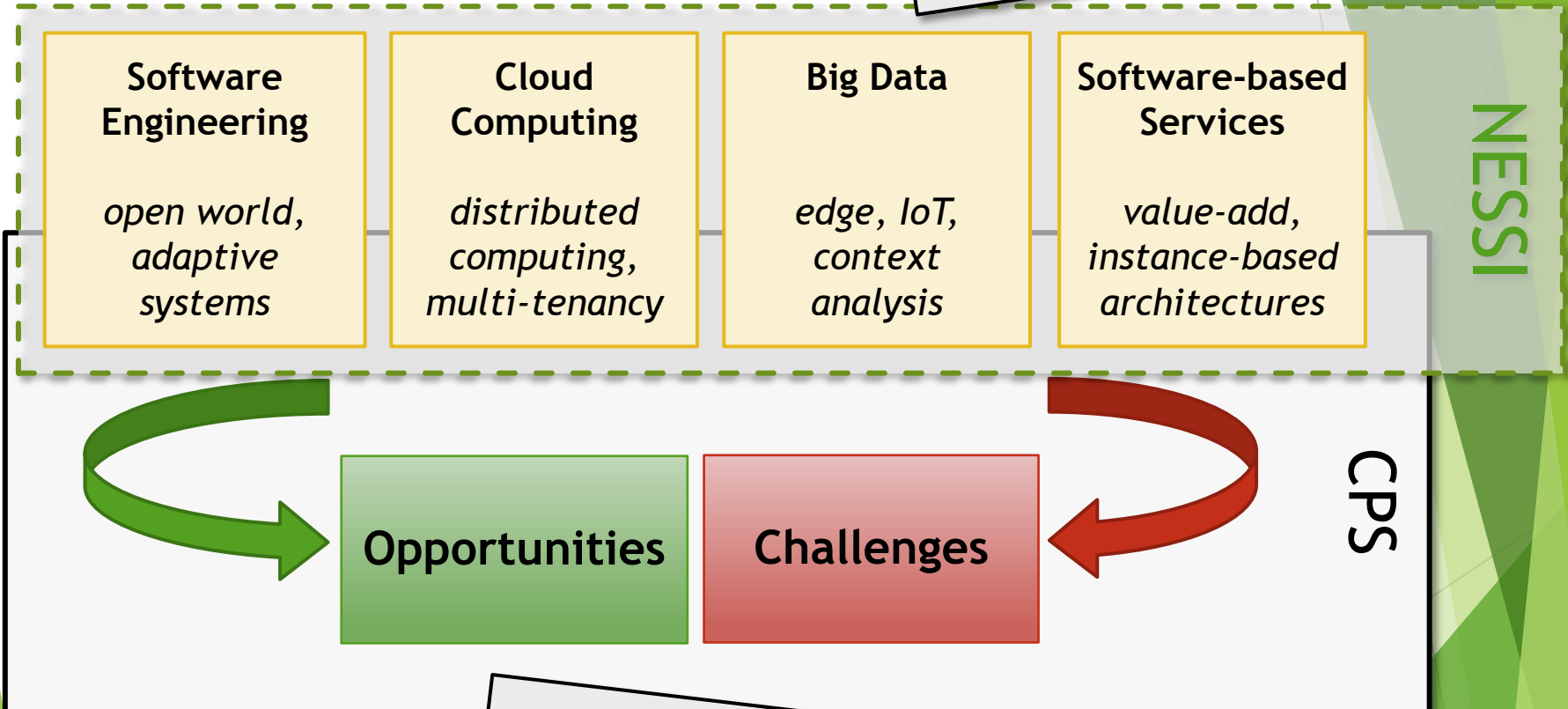
# About NESSI

- ▶ Networked European Software and Service Initiative
- ▶ European Technology Platform dedicated to Software, Services, Cloud and Data
- ▶ Ca. 500 members
- ▶ 22 partners (full members)



# CPS Recommendations

White paper available from  
<http://bit.ly/1Ghof4W>



+++ Security (not in this talk), but, NESSI white paper available from <http://bit.ly/2fpYmY3>

# Software Engineering for CPS

- ▶ **H-CPS: Human-Operators-in-the-loop CPS (“Cockpits”)**
  - ▶ **C-CPS: Crowds-in-the-loop**
  - ▶ **Software innovation (through advanced software engineering methodologies)**
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- ▶ **Quality assurance of CPS in the presence of dynamic adaptation and discovery**
  - ▶ **Middleware and platforms for dynamic evolution and composition of CPS**
  - ▶ **Powerful abstractions for understanding and modelling CPS (e.g., context models)**
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# Cloud for CPS

- ▶ Scalability, elasticity and availability (through cloud, fog and edge computing)
  - ▶ Infrastructure cost reduction
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- ▶ Real-time data collection, analysis, and actuation
  - ▶ **Multi-tenancy in CPS infrastructures**
  - ▶ **Dependable and predictable cloud “SLAs” for CPS**
  - ▶ Cloud services and platforms for CPS construction and deployment
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# CPS and Big Data

- ▶ **Leveraging Big Data analytics for CPS adaptation**
- ▶ Greater customization and smartification in the products and services (customer segmentation, insight on each individual customer, ...)
- ▶ **Assuring CPS assets stay online (predictive maintenance)**

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- ▶ Handling massive data production (volume, velocity, variety)
  - ▶ **Distributed (decentralized) data storage and processing**
  - ▶ Monetizing Big Data stemming from CPS
  - ▶ Data visualization (in a decentralized setting of CPS)

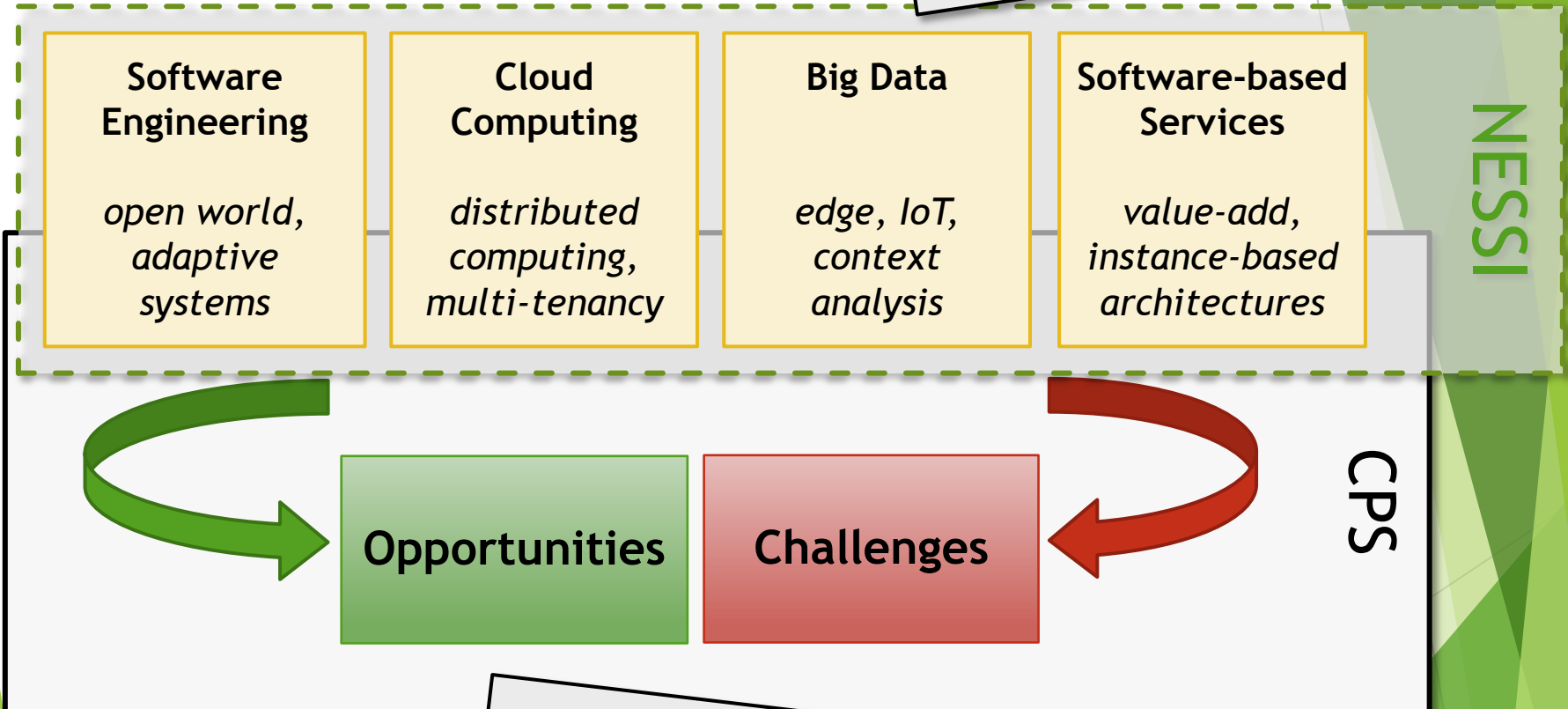
# Software-based Services creating Value with CPS

- ▶ Instance-based architecture for a “true” Business Network of Things
  - ▶ Software-defined Industries (= Digitalization, Industry 4.0, ...)
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- ▶ Service architecture for software-based services on top of CPS
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