Green Software Engineering for Airbus Avionics

Presentation by
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Why Green Software Engineering?

Key Messages

• Software Engineering without sustainability requirements = significant risk

• United Nations Sustainable Development Goals (SDGs) = strong, holistic sustainability agenda to 2030

• How can we de-risk avionics software engineering through full traceability to SDGs?
PhD Research Project starting

Ian Brooks

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- BSc Software Engineering
- IT and Business Strategy consultancy with PricewaterhouseCoopers and IBM
- IBM’s Sustainability leader on Defra IT outsourcing
- MSc Environmental Consultancy
- Senior Lecturer in Sustainable IT, University of the West of England
- Starting PhD research Autumn 2016.
- Industrial case study with Airbus. Industrial Supervisor: Mario Kossmann mario.kossmann@airbus.com
Terms: Green, Eco, Sustainable?

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

*Brundtland Commission 1987*

Sources: World Commission on Environment and Development, 1987
Software Engineering without sustainability requirements = significant risk
Green damage from Software Engineering?

- Sept – Oct 2015. Volkswagen lost over $30 bn market capital after news broke that some diesel engines had software engineered to defeat air quality / emissions testing.
- “this was a couple of software engineers who put this in, for whatever reasons.” Michael Horn, CEO Volkswagen Group of America

Risk management is also about securing green benefits

• Delivering aviation customer value. Lower emissions => lower payments to Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

• Green Regional Aircraft Avionics Architecture for Mission and Trajectory Management (GRA3M)

• Power consumption reduction e.g. CleanSky2 - cooling systems for embedded power electronics

• IEC 62239-1:2015 Process management for avionics. lead-free (but no recycled components)

United Nations Sustainable Development Goals (SDGs) = strong, holistic sustainability agenda to 2030
Millennium Development Goals - Success

• Adopted by World Leaders at the United Nations in 2000
• 8 goals with a 2015 target
  o Goal 1: Eradicate extreme poverty and hunger
  o Goal 2: Achieve universal primary education
  o Goal 3: Promote gender equality and empower women
  o Goal 4: Reduce child mortality
  o Goal 5: Improve maternal health
  o Goal 6: Combat HIV/AIDS, malaria and other diseases
  o Goal 7: Ensure environmental sustainability
  o Goal 8: Develop a global partnership for development

• “the most successful anti-poverty movement in history” Ban Ki-Moon

Sources: United Nations, 2015
Sample SDGs

8.7 Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour […] and by 2025 end child labour in all its forms

12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, […]

13.2 Integrate climate change measures into national policies, strategies and planning

Sources: United Nations General Assembly, 2015
How can we de-risk avionics software engineering through full traceability to SDGs?
Prior Green Software Engineering Research

- Greensoft – Stefan Naumann. What is energy-efficient software?

- Software Engineering for Sustainability SE4S - Birgit Penzenstadler. Taking responsibility for the long-term impacts we create.

Sources: Naumann et al., 2011, Penzenstadler, 2015, Becker et al., 2014
OntoREM: ontology-based requirements methodology

Sources: Kossmann and Odeh, 2010
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References


