

## Agile Hardware and Co-Design

Agile Conference 2011, Salt Lake City  
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Timo?



Agenda for today:

What is happening in R&D

Benefits of agile co-design

What enables agile co-design?

Advice to Agile/Scrum ceremonies

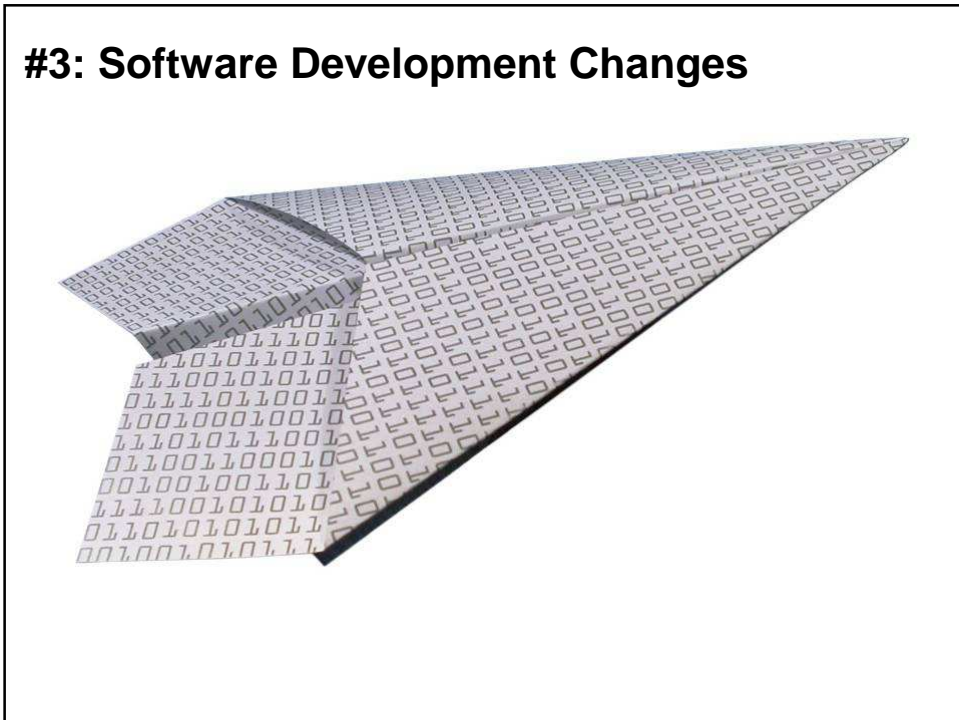
## **#1: Speed of Change**



## **#2: Innovation accelerated by 360**

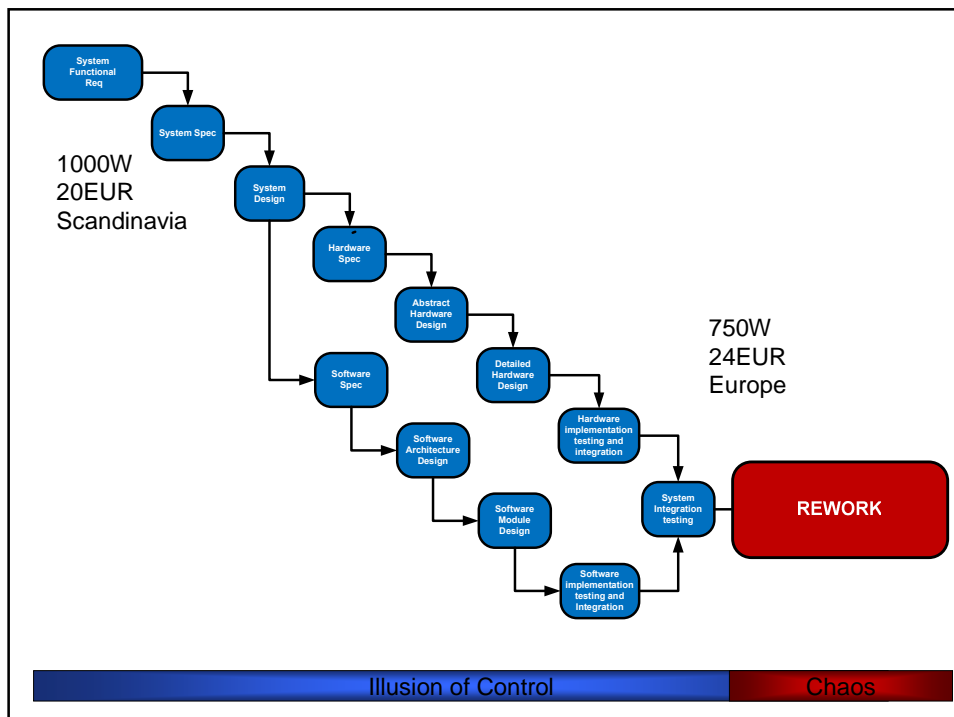


## **#3: Software Development Changes**



## Benefits of Agile Hardware and Co-Design

- Avoiding the big surprises using Up-front Prototyping



**Alternative: Cross-Disciplined Up-front prototyping:**



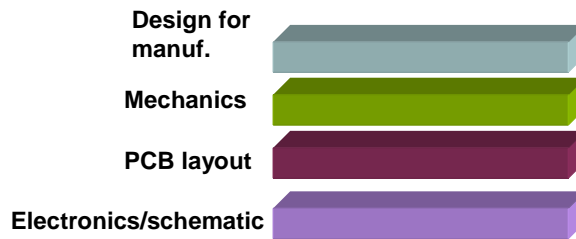
**“Experimenting, not validating”**

**What enables agile hw and co-design?**

- **Vertical slicing**
- **Cross disciplined Whole Team**
- **Customer team**
- **Economics of prototyping**
- **HW Unit Tests**

# Vertical Slicing

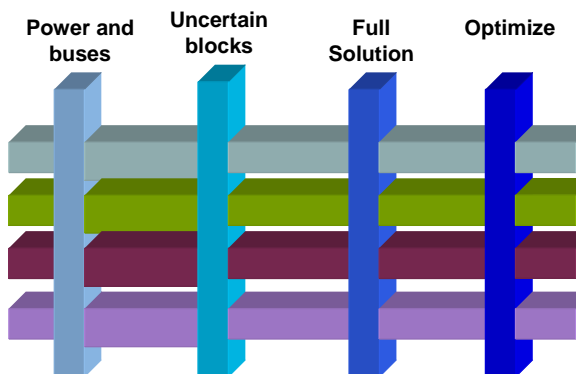
**Think Big,  
Think Horizontal**



Adapted from  
Doing Hard Time, Bruce Douglas

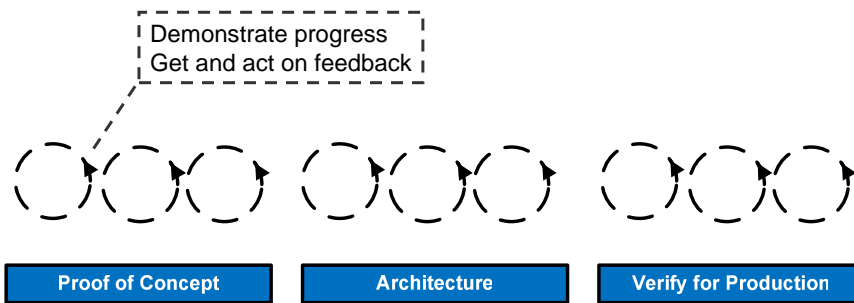
# Vertical Slicing

**Implement Small,  
Implement Vertical**



Adapted from  
Doing Hard Time, Bruce Douglas

## Serial in large, incremental in small



Schematics

3d models

Simulation

Bread board prototypes

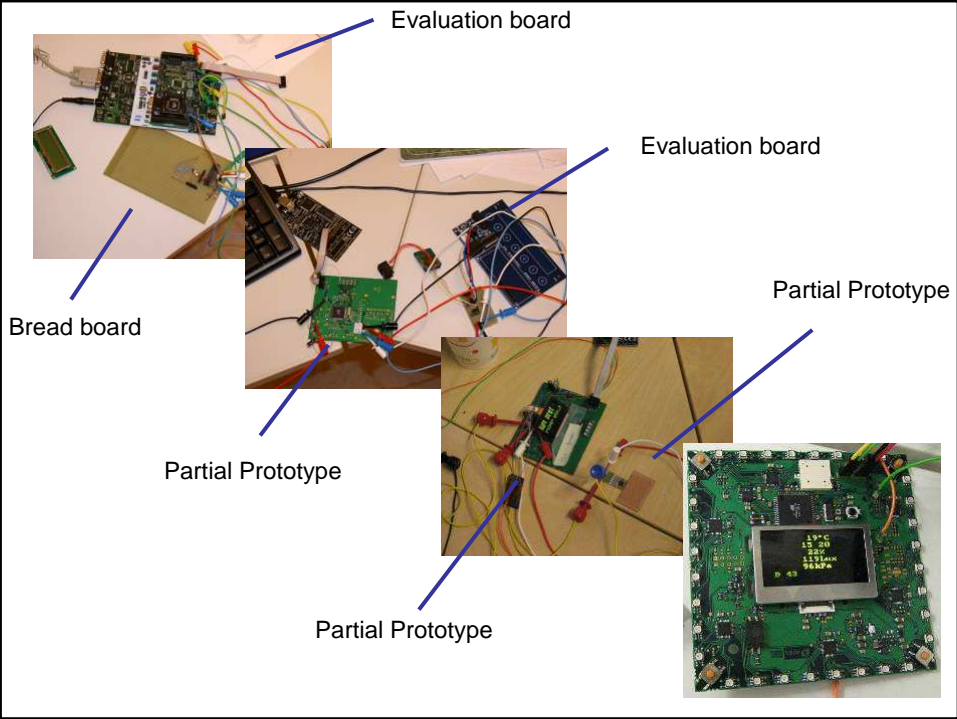
Re-usable generic prototypes

Evaluation boards

Partial prototypes

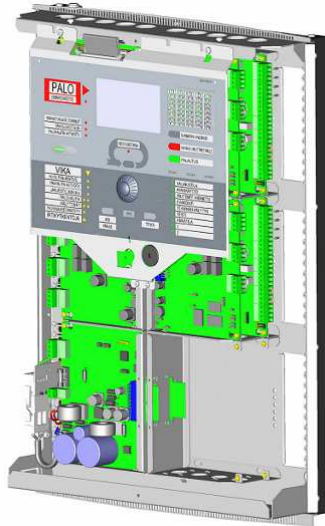
FPGA

3d printers





# Flexible Architecture



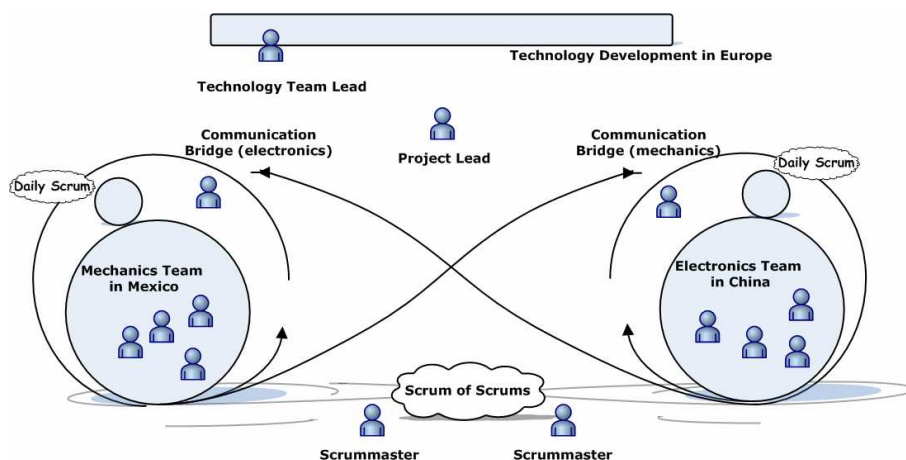
1. **Identify and prioritize uncertainties**
2. **Deal with it:**
  1. **Use focused prototypes to buy uncertainty down**
  2. **Keep options and defer decisions**
  3. **Isolate uncertainty**

**Remember to learn from prototypes!**

## Cross-Disciplined Whole Team approach

Schematics  
PCB layout  
Mechanics  
Industrial design  
Supply chain  
Industrialization  
Launch  
  
Software

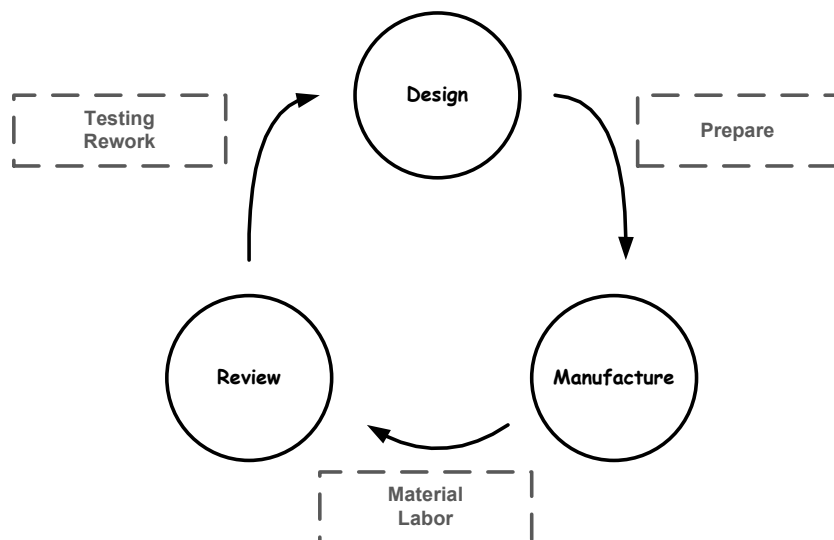
## Cross-Disciplined



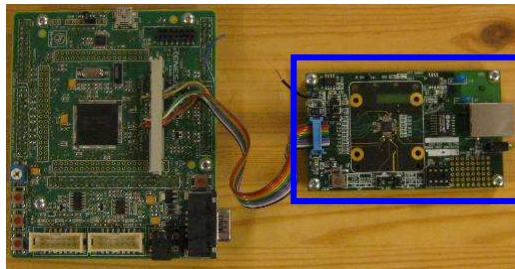
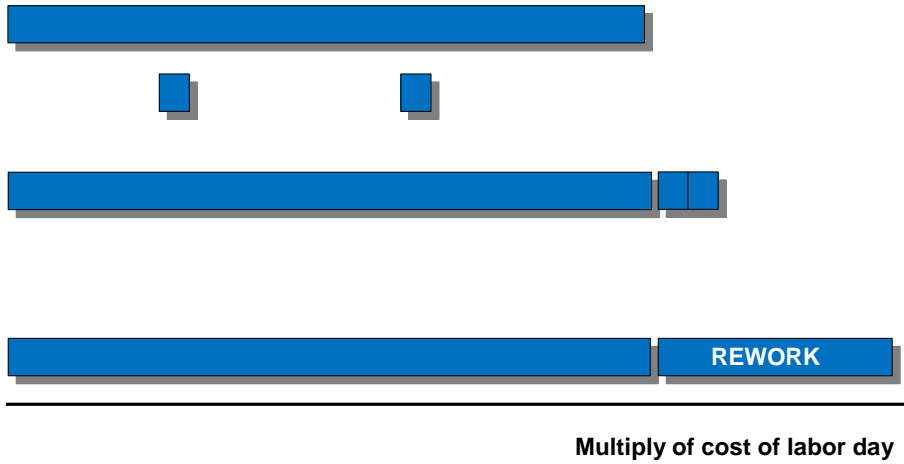
## Customer Team

Domain experts:  
Other disciplines  
Technical lead  
Novel technology provider  
EMC test lab  
Industrialization

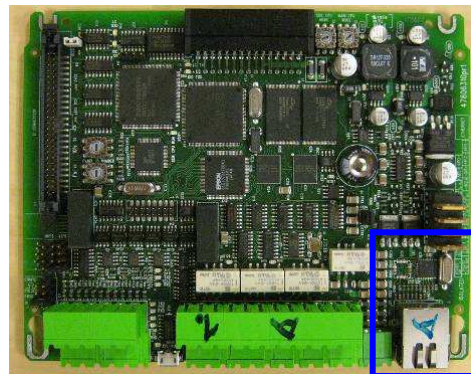
## No Free Prototypes?



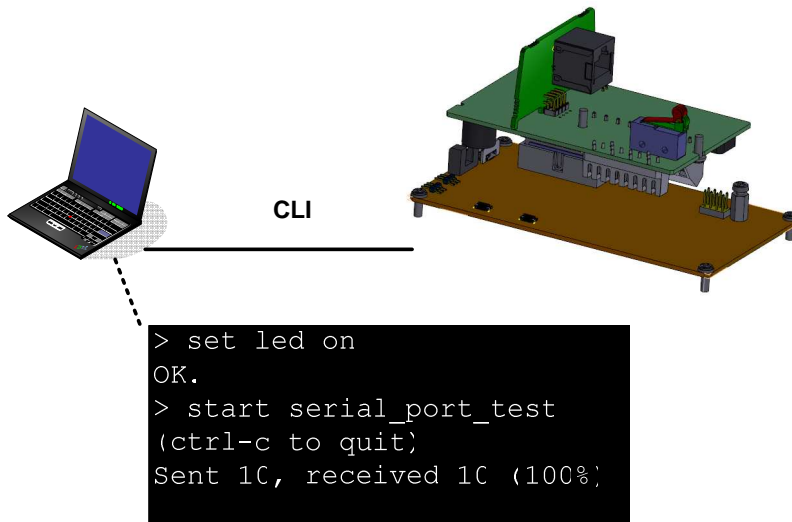
## (Imaginary) True Cost of Prototyping



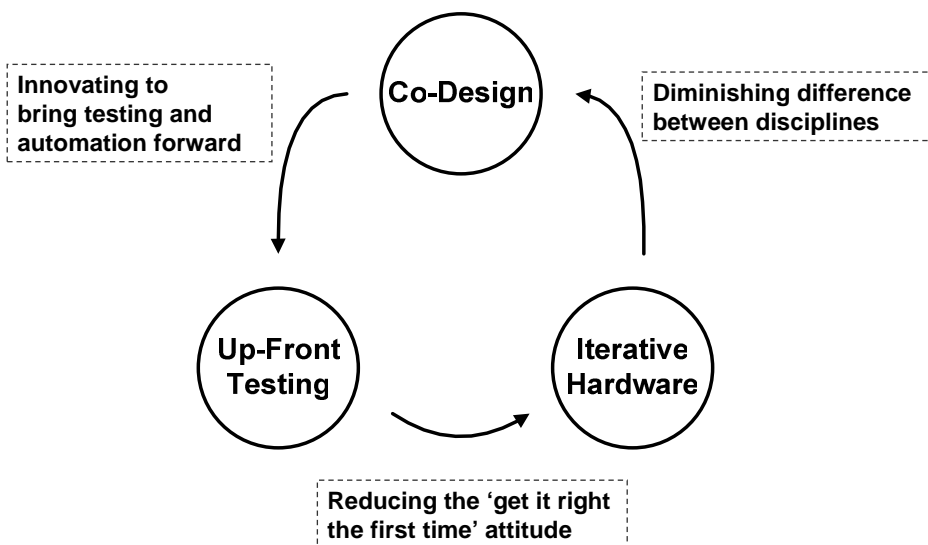
Hardware Unit Tests



## Hardware unit tests



## Positive reinforcing loop of agile co-design



## Tips for ceremonies

- Planning
- Daily Scrum
- Review

## Planning

Release Goal	Proof of Concept [technology]	
* [technology] Prototyped with ceiling mounted relay		
Acc Criteria		Be able to start performance testing

Block diagram for ceiling mounted relay	5
Acc.Criteria: Draft (block diagram) to identify the job to be done.	

Schematics of [technology]	3
Acc.Criteria: Schematic enabling PCB work	



## Daily Scrum

- 3 pieces of information create agenda for latter part
- Find appropriate level of detail
- Creates shared sense of direction

## Review



**IKIWITI**



## Books

