

# DodOrg Project Overview

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# DodOrg

## Nervous System

**Brain Level**

## Heart

**Organ Level**

## Myocardial Cell

**Cell Level**

### Biological Concepts (Prof. Kurt Brändle)

- Decentral control using messengers (data packets)
- Packets reach (every) cell of the architecture
- Target OPC alone decides whether it reacts
- Controlled by decentral feedback loops.

### Organic Robot Control (Prof. Heinz Wörn)

- Development of a configuration system in order to configure robot controllers on the fly (self-configuration)
- Applicable to many different robot types
- Reduce time and effort to develop new robot control systems

Organic Robot Control Architecture

Organic Robot Control Configurator

### Organic Monitoring (Prof. Wolfgang Karl)

**Aim**

- Enable & Support Self-X Capabilities
- Focus on Increased Self-Awareness

**Requirements**

- Sustained System Monitoring
- Real-time Data Analysis & Evaluation
- Semantic Data Compression
- Adaptivity (Reconfiguration)
- Interfacing with other DodOrg Layers

### Ultra Low Power Processing (Prof. Jörg Henkel)

- Power efficient heterogeneous task scheduling
- Simulation results (right table) show a good utilization (in Percentage) for varying task graphs.

Test Nr.	Organic Processing Cell				Utilization in [%]
	I	II	III	IV	
1	24	24	5	25	
2	41	43	35	50	
3	49	68	53	57	
4	76	79	66	79	
5	76	79	85	118	

Task Distribution, Config., Optimization, Healing

### Organic Middleware (Prof. Uwe Brinkschulte)

TIG (task interaction graph)

Task distribution on the OPCs by the Organic Middleware

Time for distribution (in cycles) vs. Number of OPCs

Time for distribution (in cycles) vs. Number of Tasks

### Hierarchical Monitoring Infrastructure

High-level Monitoring: Monitor Cell, Ultra Low Power PI, Middleware, Statistics, OS

Low-level Monitoring: OPCs, Monitor Cell, OS/External, Config, Event Data

### Swapping-on-the-fly: Concept (above) and case-study (beneath)

Time: Task A, Task A', Start A', Transfer context

Decision to swap, Overlap, Passing Control

Power Manager: Swap Scheduler, Swap Manager

Swap Execution: Migration, Morphing

### Organic Processing Cells (Prof. Jürgen Becker)

**Challenge**

- Multiple configuration access ports on cell level
- No central control instance
- Support frequent reconfiguration
- Distributed sources/instances

**Aim**

- Unified configuration interface (protocol) on cell-level
- context sensitive self-configuration, cell builds up its infrastructure

Cell-Configuration Architecture

Low-Power Manager, Middleware, Master Configuration Sequence, Sub Configuration Sequence

Cell: State Interface, Configuration Control, Cell unit, Configuration Bitstream

### Hardware Monitoring

Network Interface, Config. Data, Config. Control, Observer, Data Transmitter, Cell Functionality (Memory Cell)

Filter Unit: Filter Rule Programs, Filter Config., Packet Filter Statistics Synchronization

Status Analysis: System Status / Predef'd Cond't'n