



Multiple-Access Space-Time Coding Testbed

Project No. IST-026905 MASCOT

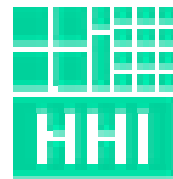
Overview

Participants



1. Forschungszentrum Telekommunikation Wien
2. Nokia Corporation
3. Fraunhofer Gesellschaft Heinrich-Hertz-Institut
4. Politecnico di Torino
5. Technische Universität Wien
6. Eidgenössische Technische Hochschule Zürich
7. Fundacio Barcelona Media Universitat Pompeu Fabra

NOKIA



ftw.



Barcelona Media

ETH zürich

Centre
d'Innovació

Coordinator



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Main objectives



- Develop, analyse, and implement generic techniques for

Multi-User Multiple-Input Multiple-Output (MU-MIMO) wireless systems

- Ultimate goal is the implementation and testing of selected MU-MIMO techniques on the MIMO testbed of ETH Zürich.

MASCOT research aspects



- Code and algorithm design
 - Multi-user space-time codes
 - Link adaptation
 - Baseband transceiver processing
- VHDL reference designs and testbed integration
 - VHDL library of reference designs
 - MIMO testbed extension
 - Measurements and demonstration
- Performance limits
 - Information-theoretic aspects
 - System design guidelines
 - Ad hoc networking: cooperative MIMO networks and relaying

Duration and budget

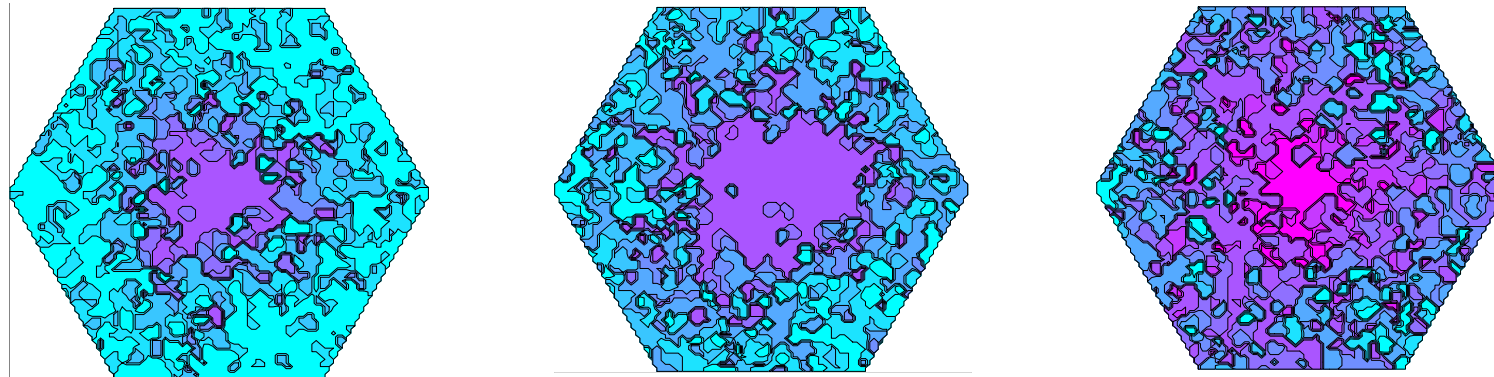


- Duration: 36 months
- Jan 01, 2006 – Dec 31, 2008

- Total eligible costs: 3,96 M€
- Total requested EC contribution 3,09 M€

- Total Effort: 374 person months

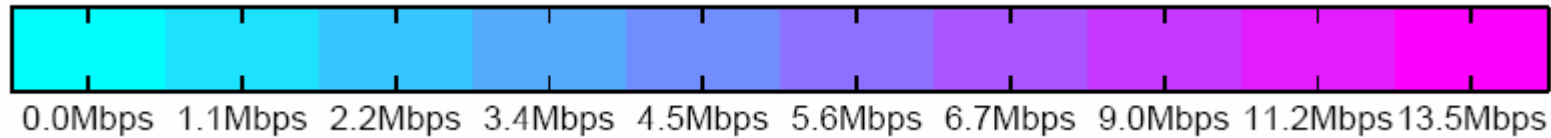
State of the art



1 × 1

1 × 2

2 × 3



**Colour-coded throughput in a MIMO cellular system.
Short-term average throughputs achievable in the downlink
in a 2MHz channel with various antenna configurations**

Key issues



1. What is the system capacity?
2. What are the user capacity and link reliability?
3. How many users can simultaneously be reliably supported with MU-MIMO communications?
4. What are the coverage improvements achievable through MU-MIMO?
5. What must be altered in the existing cellular infrastructure to deploy MIMO?

Key issues



6. Can MU-MIMO be implemented in a practical system (computational complexity)? What is the cost?
7. How flexible and scalable are MU-MIMO wireless networks?
8. Can we upgrade current standards and systems to MU-MIMO?
9. Under what channel conditions are MIMO gains realisable?
10. What is the optimal antenna array configuration at the base station and the subscriber unit?

Workpackage list



Work-package No ¹	Work package title	Lead contractor ID/No ²	Person-months ³	Start month ⁴	End month ⁵	Deliverable No ⁶
1	Space-Time Code Design and Baseband Transceiver Algorithms	VUT/5	142	1	36	D1.1.1 D1.2.1 D1.3.1 D1.3.2
2	VHDL Reference Designs and Testbed Integration	ETHZ/6	90	1	36	D2.1.1 D2.1.2 D2.2.1 D2.3.1 D2.3.2
3	Performance Limits	PoliTo/4	93	1	24	D3.1.1 D3.1.2 D3.2.1 D3.2.2
4	Dissemination and Exploitation	FTW/1	23,5	1	36	D4.1 D4.2 D4.3 D4.4 D4.5 D4.6 D4.7
5	Project Management	FTW/1	20	1	36	D5.1 D5.2 D5.3 D5.4 D5.5
	TOTAL		368,5			

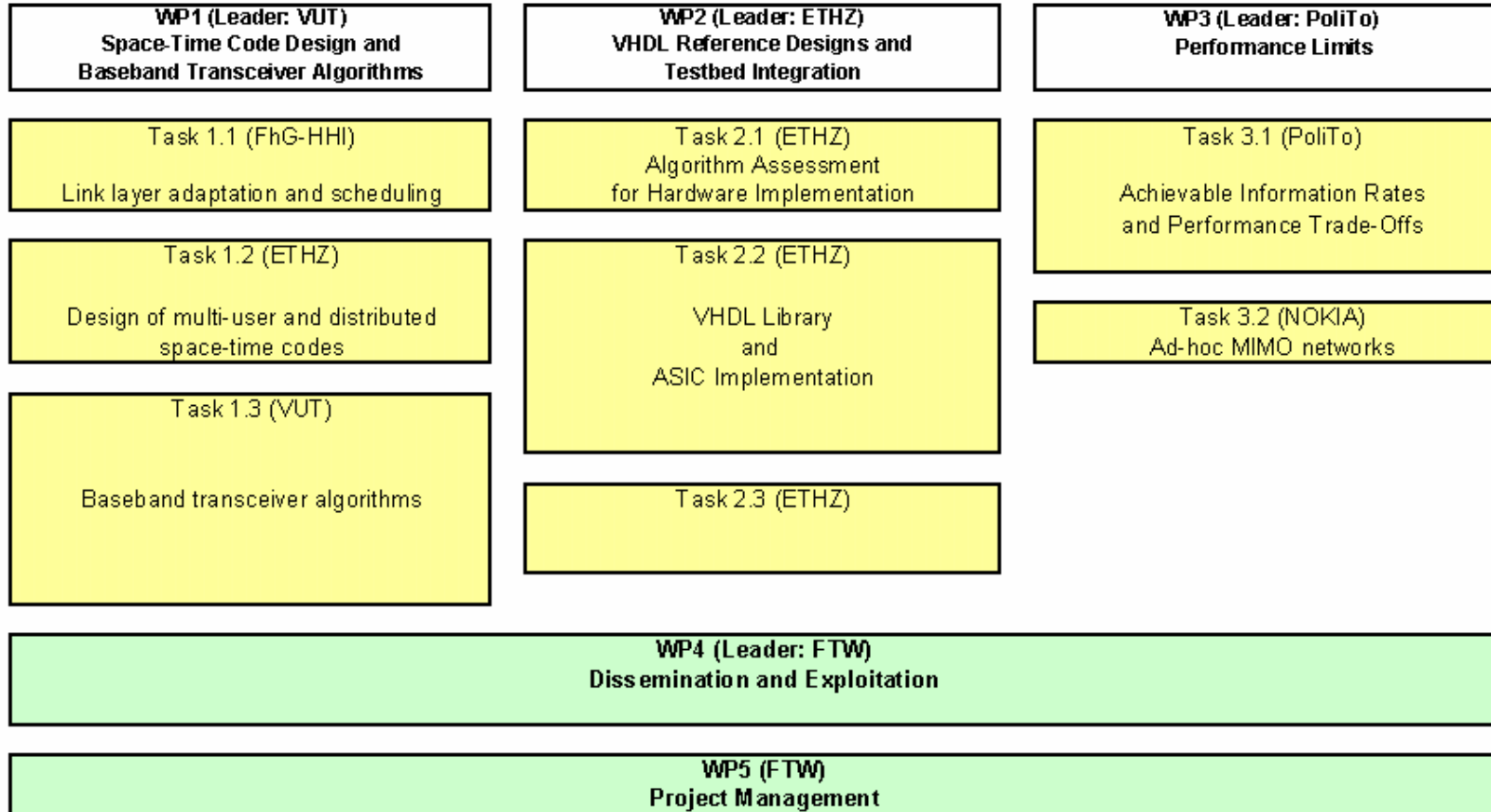
Table 1: List of work packages.

WP leaders

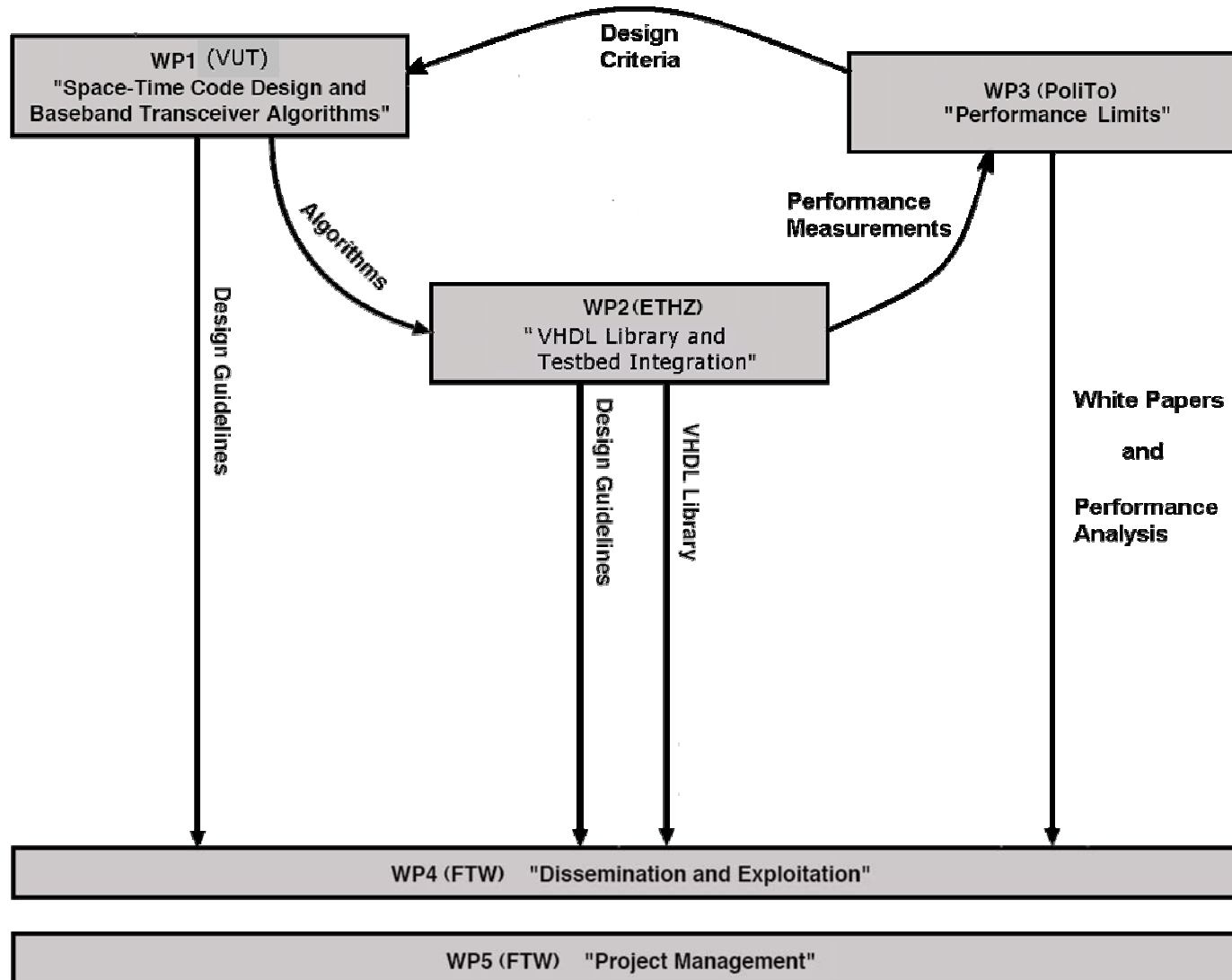


- Gerald Matz (VUT) for WP1 "Space-Time Code Design and Baseband Transceiver Algorithms"
- Helmut Bölcskei (ETHZ) for WP2 "VHDL Reference Designs and Testbed Integration"
- Giorgio Taricco (PoliTo) for WP3 "Performance Limits"
- Christoph Mecklenbräuer (FTW) for WP4 "Dissemination and Exploitation" and WP5 "Project Management"

Workpackages and tasks



Interactions



Time table



MASCOT	Year 1												Year 2												Year 3											
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
WP1: Space-Time Code Design and Baseband Transceiver Algorithms	Task 1.1: Link Layer Adaptation and Scheduling Task 1.2: Design of Multi-User Space-Time Codes Task 1.3: Baseband Transceiver Algorithms																																			
WP2: VHDL Reference Designs and Testbed Integration							Task 2.1: Algorithm Assessment for Hardware Implementation Task 2.2: VHDL Reference Designs Task 2.3: MIMO Testbed Extension, Measurements and Demonstration																													
WP3: Performance Limits	Task 3.1: Achievable Information Rates and Performance Tradeoffs Task 3.2: Ad-hoc MIMO networks																																			
WP4	Dissemination and Exploitation																																			
WP5	Management and Quality Assurance																																			

Expected impact



- Contributions to
 - scientific journals
 - conferences
 - standards, e.g. 3G, 4G, IEEE 802.11 x , IEEE 802.16 x

- Open House Events: Tutorials and Demo

- Strengthening the European Information Society 2010 objectives by targeting *scalable* data rates for
 - wireless broadband access and
 - stable link quality for multiple users.