

European Service Offers for the Design and Manufacturing of MNT-based Systems

Patric Salomon

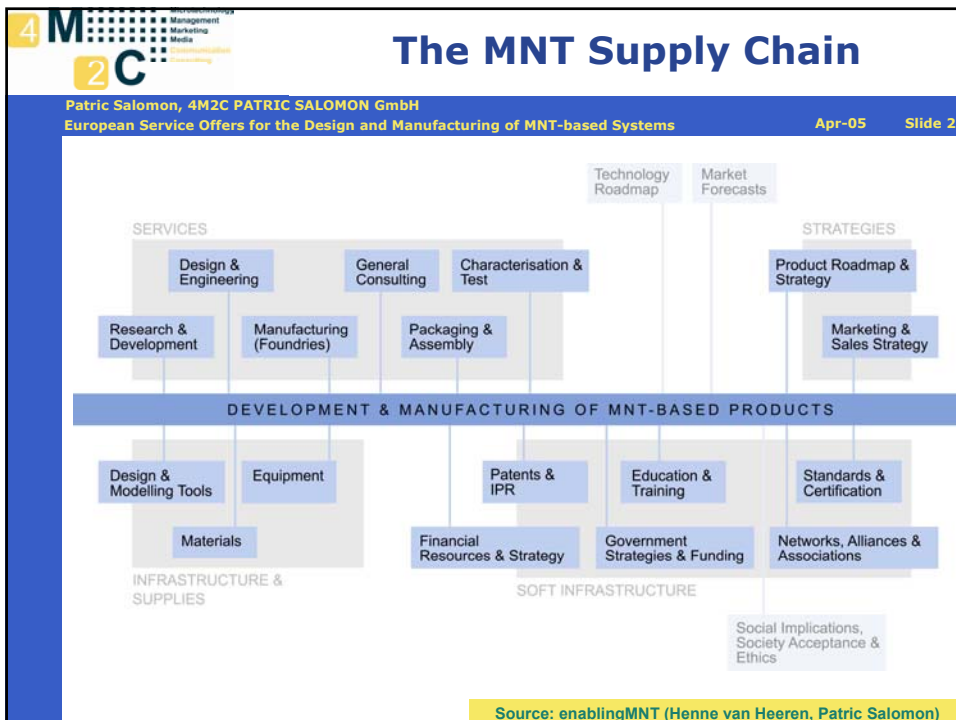
4M2C PATRIC SALOMON GmbH
 Berlin, Germany



April 2005



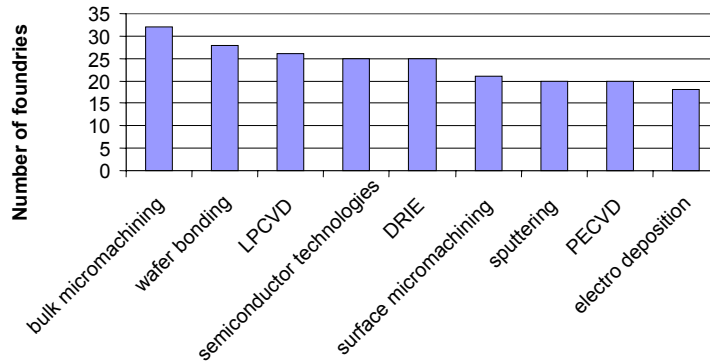
«European Service Offers for the Design and Manufacturing of MNT-based Systems»



Technologies supported by Foundries

Patric Salomon, 4M2C PATRIC SALOMON GmbH
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Apr-05 Slide 3

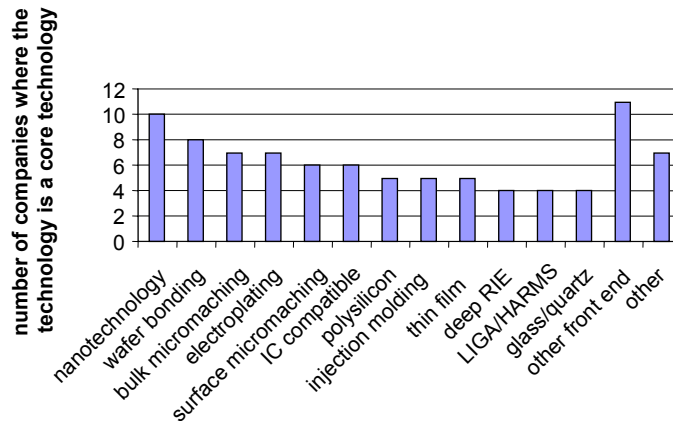


Source: enablingMNT (Henne van Heeren, Patric Salomon)

Technologies supported by Design Houses

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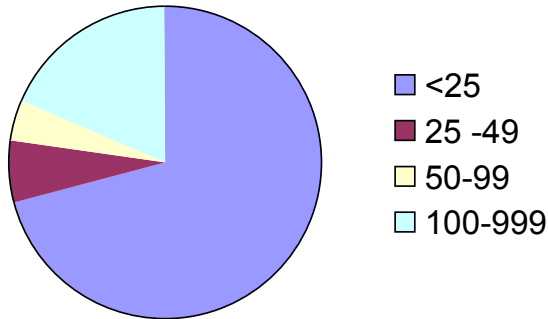


Source: enablingMNT (Henne van Heeren, Patric Salomon)

Staff of Design Houses

Patric Salomon, 4M2C PATRIC SALOMON GmbH
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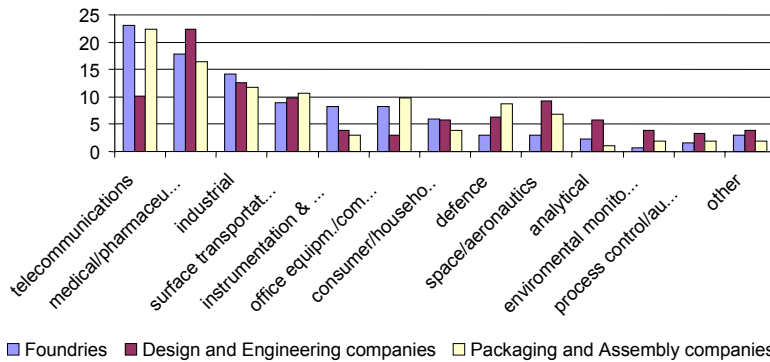


Source: enablingMNT (Henne van Heeren, Patric Salomon)

MNT Service Suppliers for different Application Areas

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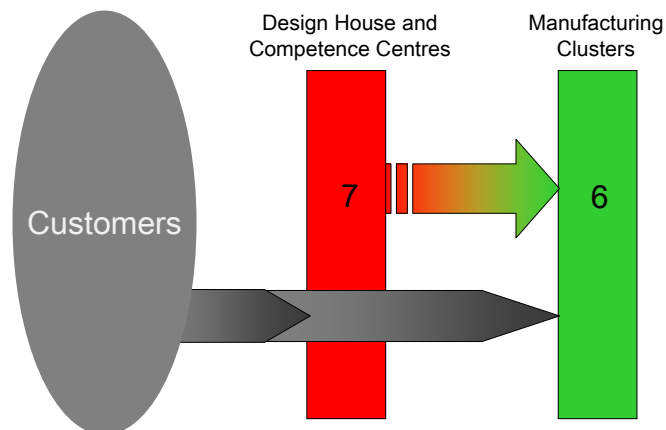


Source: enablingMNT (Henne van Heeren, Patric Salomon)

The Major European Community Programme promoting:

“Access to microelectronics technologies for industrial competitiveness in Europe”

- **Microsystems**
- Training
- Integrated Circuits
- IC & Microsystems Software



AMICUS

- Bosch, HL Planar and ISIT

CEMEMS

- COLIBRYS, Helbling, WTC, Coventor SARL and Mettler-Toledo

INTEGRAM

- QinetiQ, Coventor SARL and Coventor B.V.

MAGSYS

- SENSITEC, AMIC, PARAGON and VVP

MEMSOI

- TRONIC'S Microsystems, ACREO, NMRC, Fraunhofer ISIT, AML, SINTEF, CEA-LETI, CNM and CNRS-LAAS

MultimEMS

- SensoNor, SINTEF, HVE and Microcomponent

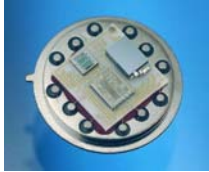


Project: CEMEMS

A complete set of vertical integrated services based on a consortium of service providers:



CEMEMS: Devices and Application Fields

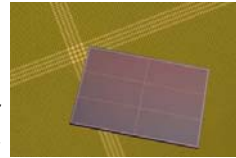


Accelerometers and gyros for navigation systems



Micro-mirror arrays for optical telecom

MEMS for Biotechnology



Liquid Handling Competence Centre

- HSG-IMIT, Cranfield University and IMTEK

MEDICS Biomedical Devices

- Fraunhofer-IBMT, i2m Design, and Zarlink

Microactuator & Non-silicon Centre

- RAL, Fraunhofer-ISiT and SINTEF

Physical Measurement Competence Centre

- Fraunhofer-ISiT, BUTE, Sintef

MST-Design House

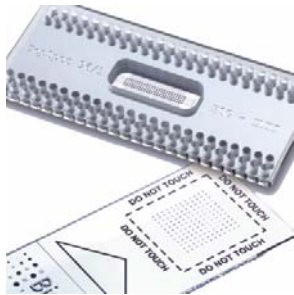
- ETB, Accentus, IMEC, IET, BUTE, KBIC

MOEMS Centre

- CEA-LETI, ARC Fund, CSEM, IET, Sintef, IMM and SSSA Pisa

POLYMICRO

- FZK-IMIT, DAREN, EPIGEM, HEPTAGON and sgt



TopSpot: dosing module for producing biochips

Examples from the „Liquid Handling Competence Centre“



Mass flow sensor

Problem Areas in the Manufacturing of Microsystems

Example 1 – Electronic braking

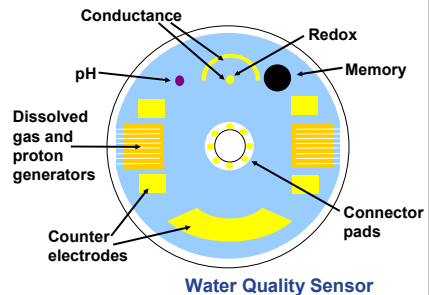
- How do we integrate M&NT technologies into the lid of the unit?
- How do we guarantee low manufacturing costs but meet "zero failure" automotive specifications



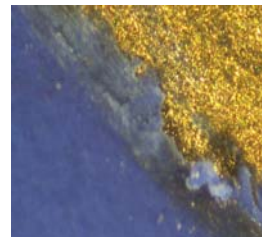
Pictures: TRW

Example 2: Environm. Sensing

- Requires integration of multiple electro-chemical microsensors with electronics at low-cost
- Must operate in a harsh environment
- Must be self-monitoring



Understanding of degradation essential



Pictures: Oxley

Low-cost tag's for maintenance, diagnostics and audit

- Manufacturing issues when:
 - Vibration and temperature sensing are integrated
 - Tags need to operate at 200°C, e.g. on aircraft engines
 - Location where the asset may be subjected to harsh environmental conditions

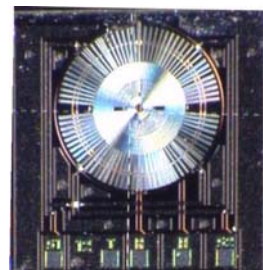
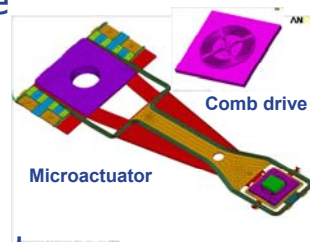


Picture: Oxley

Electronics must compensate for "Harsh Environment" impact on the actuator and read head.

Issues: How can the microactuator and control electronics be manufactured to withstand:

- In unit defects (Open MEMS structure)
- Thermal and vibration effects
- Environmental effects: transmission through anchor points

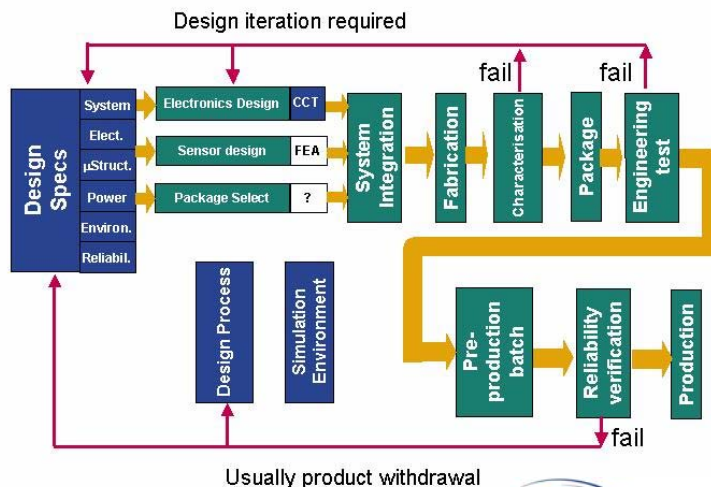


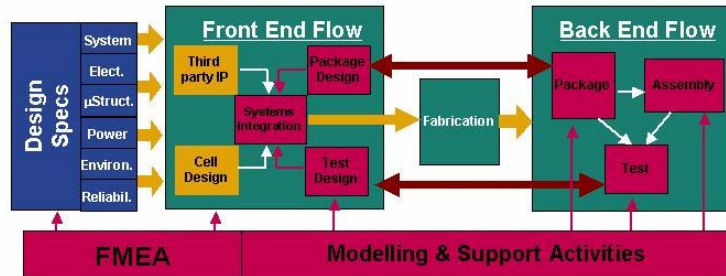
Pictures: ST Microelectronics

Type of MNT innovation years

- new product generation (without new technologies) 1-3
 - new product in existing market 5-10
 - new production technologies 10-15
 - new materials and new production process needed 10-20
- Faster development and better predictability could boost the commercialisation of MNT!

Source: enablingMNT (Henne van Heeren, Patric Salomon)



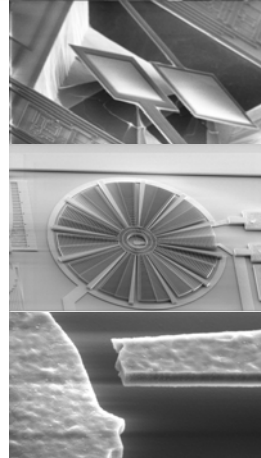


- Cross disciplinary activity
- Novelty in integrating packaging and test across front and back-end processes

- Duration: 1 Jan 2004 – 31 Dec 2007
- EC Budget: 6.2 M€ (over 4 years)
- Partners: 24 (21 research, 3 commercial)
- People: 124 (99 researchers, 25 PhD)
- Industry Advisory Board (IAB):
18 members (Apr 2005)
- open to include further associate partners

WP1 Mission – Develop integrated test and reliability monitoring functions

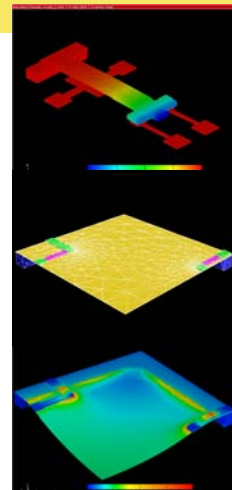
- Investigate self-test, reconfiguration and self-repair strategies for distributed micro & nano system devices.
- Develop integrated process monitors for critical interfacing and packaging processes



Pictures: LIRMM, STM, Polimi

WP2 Mission – Support the process of robust design, packaging and assembly

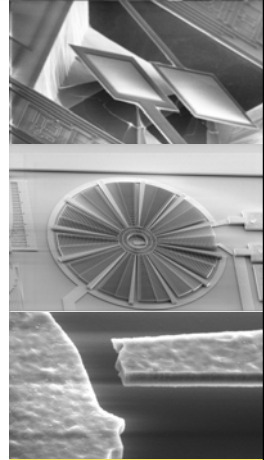
- Integrate environmental variables (eg. package effects) into component models of components with micro & nano feature sizes
- Define a new cross-domain simulation methodology that bridges the gap from physical effects at nanometer dimension to system level behaviour



Pictures: IMT, ISLI

WP3 Mission – Analyse reliability problems - improve robustness and manufacturability

- Develop fault tolerant and redundant architectures for micro & nano technologies for:
 - yield improvement
 - Reliability / on-line monitoring
 - Sensitivity and stability control
 - Compensation and calibration
- Develop a range of interface designs compatible with harsh environments

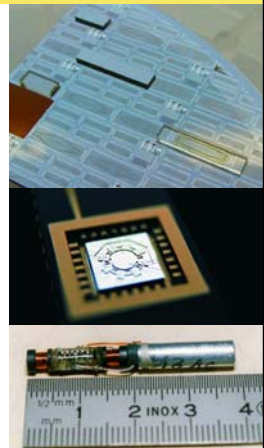


Pictures: LIRMM, STM, Polimi



WP4 Mission – Develop methodologies to support virtual interface and package design and robustness validation

- Develop low-cost high reliability packaging solutions based on degradation and failure prediction methods
- Develop design and test reuse strategies and "in package IP blocks" to aid manufacture and in-field diagnostics.
- Develop simulation methods for modelling micro & nano interfacing and assembly



Pictures: IMEC, QinetiQ, HWU



Dissemination

Training

www.patent-dfmm.org

- The NoE „Design for Micro & Nano Manufacture (PATENT-DfMM)“ approach...
Lowering the Barriers to Commercialisation for the next generation of micro & nano technology based products:
- Predictable route to product
 - Improved yield and cost
 - Quantifiable robustness and reliability
 - Established methodology for all manufacturers and designers
 - **Services to industry**

Workshop at DTIP, Montreux, 30-31 May
DfMM Summer School Montpellier 5-7 Sep

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NoE Design for Micro & Nano Manufacture
 (PATENT-DfMM)



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- MST/MEMS Design & Engineering Companies
- MST/MEMS Packaging & Assembly Providers
- Manufacturing Equipment for MST/MEMS (front-end and back-end)
- Nanomanufacturing Equipment
- Test & Measurement Services & Equipment
- Processing Services
- Design and Modelling Tools

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