Science & Technology Facilities Council
Rutherford Appleton Laboratory

RAL MSC Services for UK Universities
UK Design Forum 2008

John Morris

Microelectronics Support Centre

Rutherford Appleton Laboratory

♦ **The Microelectronics Support Centre:**

- ► **Who are we**

- ► **What is our mission**

- ► **Procurement and Related Services**

- ► **One-to-one assistance and guidance for UK universities**

- ► **Summary**

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♦ **The Microelectronics Support Centre**

Research Councils UK	Arts & Humanities Research Council
	bbsrc biotechnology and biological sciences research council
	EPSRC Engineering and Physical Sciences Research Council
	E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL
	MRC Medical Research Council
	NATURAL ENVIRONMENT RESEARCH COUNCIL
	Science & Technology Facilities Council

♦ **All are**

- ► **Non-Departmental Public Bodies**
- ► **Established by Royal Charter**
- ► **Accountable to Parliament**

Microelectronics Support Centre

Microelectronics Support Centre

- ♦ **The Microelectronics Support Centre**
  - ► **Team of dedicated microelectronics engineers**
  - ► **Working promote and support**
    - • **Modern design techniques**
    - • **In microelectronics, in the widest sense**
  - ► **Providing guidance on design methodology and best practice**

  for the academic community

- ♦ **Have been doing this job for ~25 years**

- ♦ **Based at RAL, working closely with**
  - ► **The RAL Microelectronics Design Group**
  - ► **UK's largest non-commercial microelectronics design group**
  - ► **Using similar design flows to universities**
  - ► **Designing advanced microelectronic systems for scientific instrumentation**

- ## Historically
  - ► UK has been very active in microelectronics
  - ► UK has had a large slice of the independent European microelectronics design market

- ## Supply of well-trained engineers is essential for this to continue

- ## Universities have a vital role in this supply chain:
  - ► Teaching and training
  - ► Research output
  - ► Knowledge Exchange

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- ◆ **Universities active in the microelectronics field need:**
  - ► **Access to industry-standard design environments and facilities**
  - ► **Comparable to those used by the top multi-national companies**

  to produce relevantly trained engineers and research

- ◆ **Rapidly evolving requirement**
  - ► **Expensive and challenging to keep pace with this**

- ◆ **The Microelectronics Support Centre is here to help by providing**
  - ► **Cost-effective academic access to this infrastructure**
  - ► **Advice and guidance in using it effectively**

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♦ **To provide a continuously evolving industry-standard design platform must**

▶ **Keep the vendors involved interested**

▶ **Maintain access to the tastiest design tools**

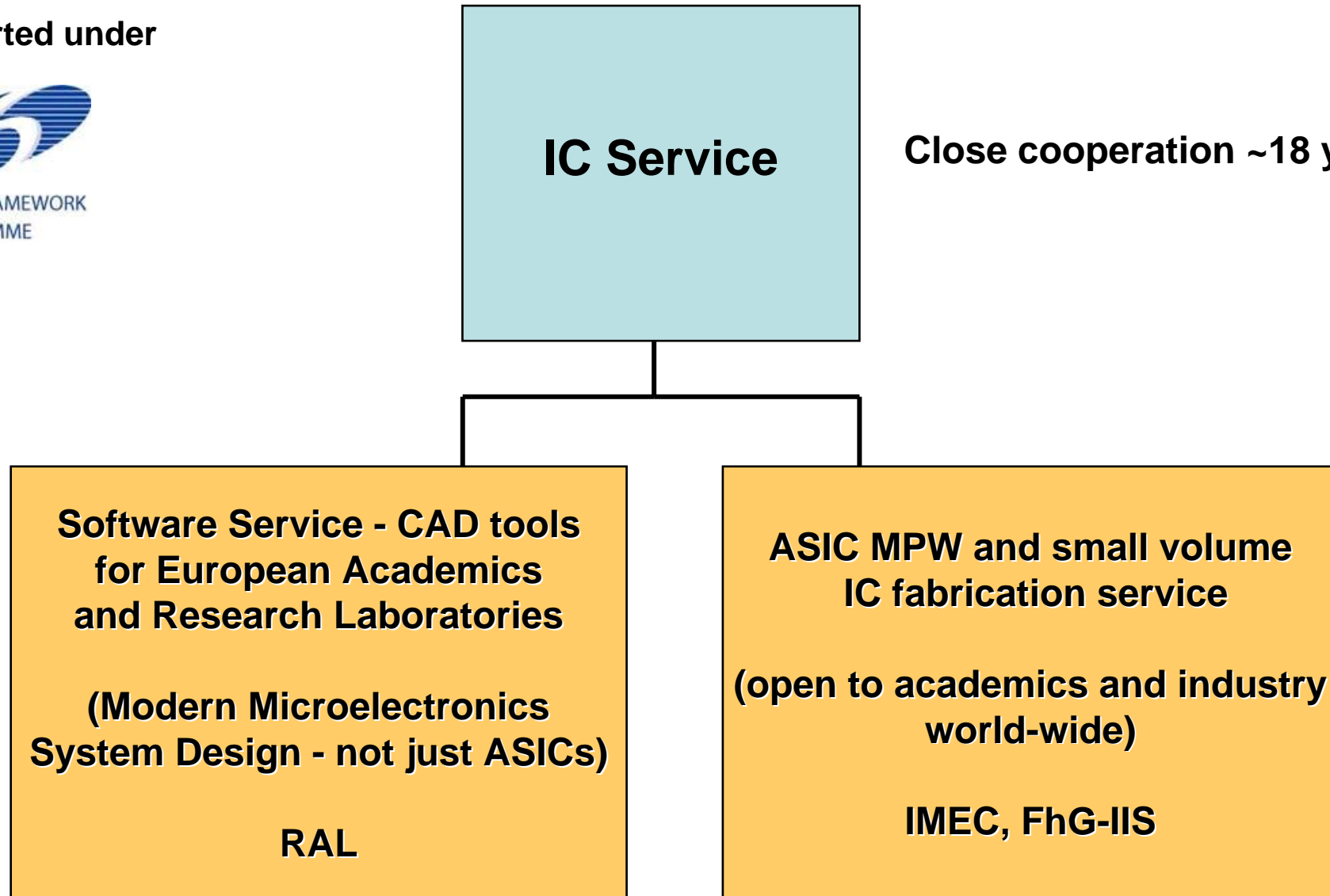▶ **Maintain access to frequent fabrication runs in varied processes**

⇒ **ongoing injection of Government funding to fund bulk purchases**

or large enough customer-base to be economically viable

♦ **Today, this means a European (or wider) customer-base for infrastructure provision**

♦ **Complementary guidance services on national basis**

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Supported under

SIXTH FRAMEWORK PROGRAMME

IC Service

Close cooperation ~18 years!

Software Service - CAD tools for European Academics and Research Laboratories

(Modern Microelectronics System Design - not just ASICs)

RAL

ASIC MPW and small volume IC fabrication service

(open to academics and industry world-wide)

IMEC, FhG-IIS

EUROPRACTICE
S O F T W A R E   S E R V I C E

Software Service

**CAD tools
for European Academics
and Research Laboratories**

**(Modern Microelectronics
System Design - not just ASICs)**

RAL

also 18 years

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- ......
- **Multi-site design**
- **Package analysis**
- **Thermal analysis**
- **Off-chip interconnect analysis**
- **Multi-chip modules**
- **Sensors - image, pressure, fluidic, …**
- **RF**
- **Design for testability and yield optimisation**
- **Verification**
- **Synchronous / asynchronous**
- **Application specific processors**
- **Hardware software co-design**
- **Embedded processors**
- **Design reuse – IP blocks**
- **Mixed-signal design**
- **Digital synthesis from HDL**
- **Transistors**
- **Process layers**
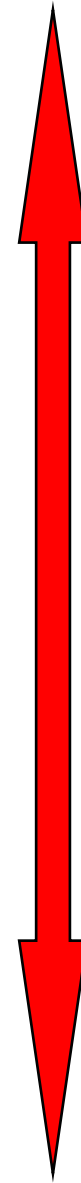
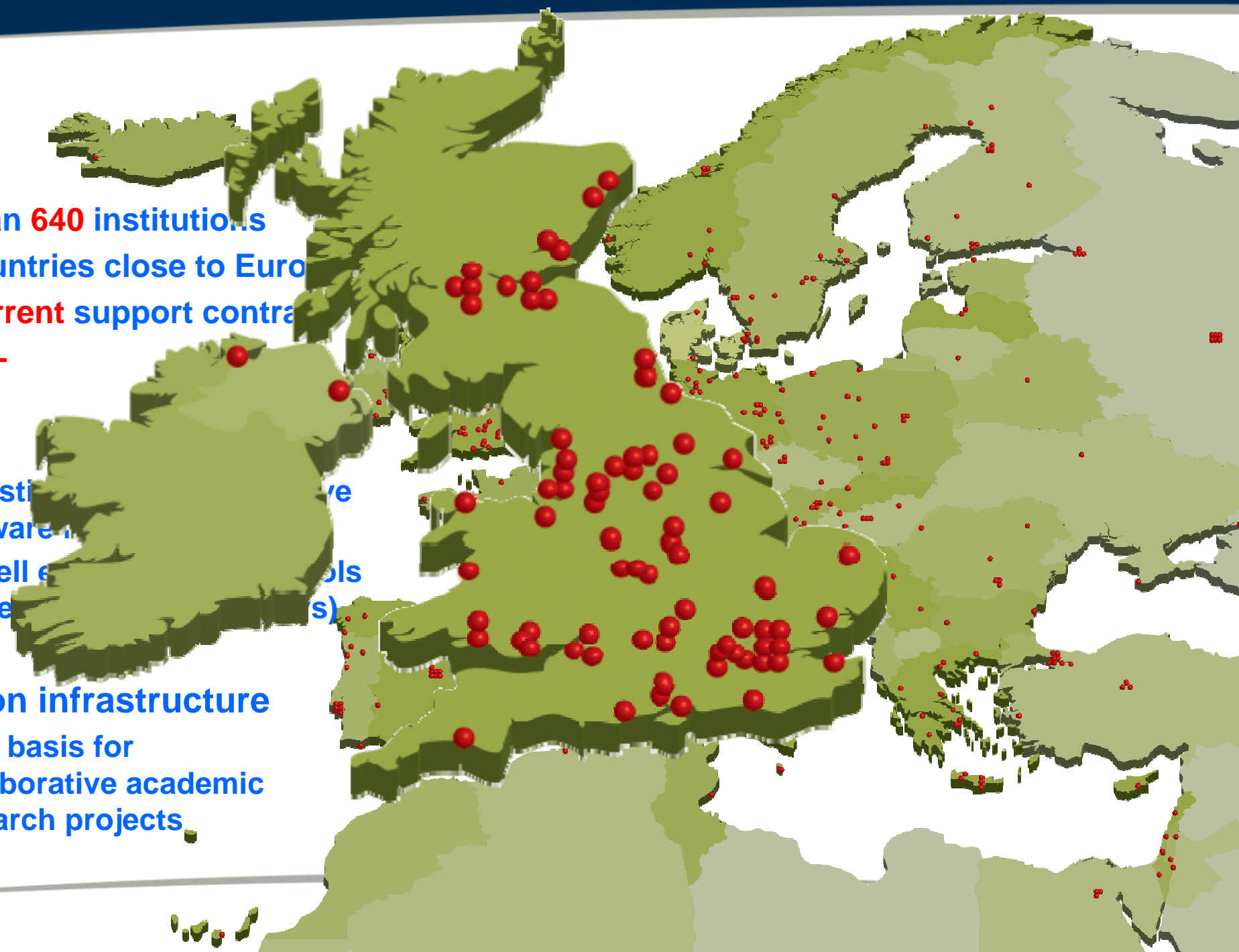**Well-enabled to 65nm since December 2007 licence updates!**

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- **More than 640 institutions**
- **In 37 countries close to Euro**
- **Have current support contra with RAL**

- **In UK**
  - ► **77 insti** **ve software**
  - ► **58 well e ols (Cade s)**

- **Common infrastructure**
  - ► **Ideal basis for collaborative academic research projects**

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♦ **Default EUROPRACTICE Software licences**

  ► **Academic use only**

  ► **Exceptions can only be with vendor approval**

♦ **Special licence extensions with some vendors**

  ► **Experienced university to use existing licence working with designated, inexperienced SME**

  ► **For designated project**

  ► **For designated period**

  ► **Subject to vendor approval**

  ► **With modest supplementary payment**

  for the purpose of technology transfer

♦ **RAL always reviewing other possible extensions with vendors**

♦ **RAL also willing to mediate with universities and vendors**

  ► **On one-off exploitation arrangements**
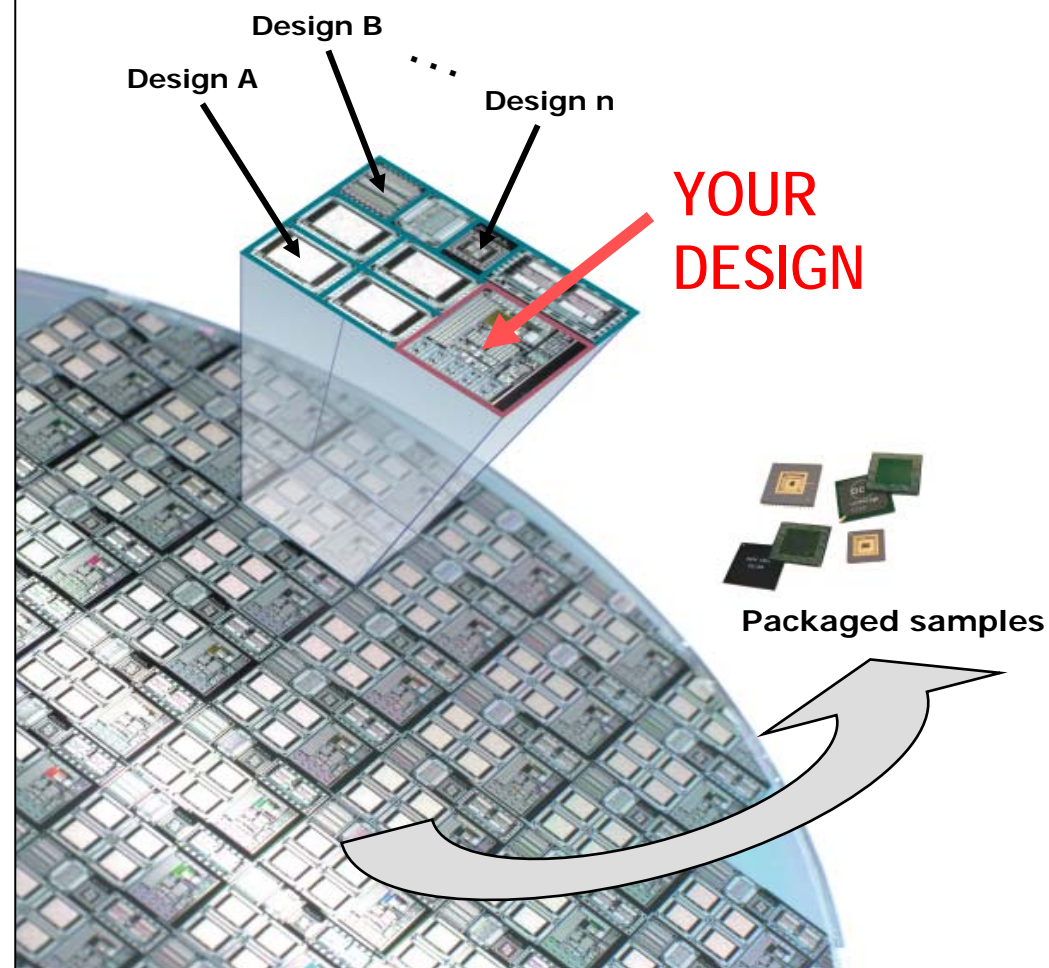
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EUROPRACTICE
I C   S E R V I C E

**ASIC MPW and small volume
IC fabrication service**

**(open to academics and industry
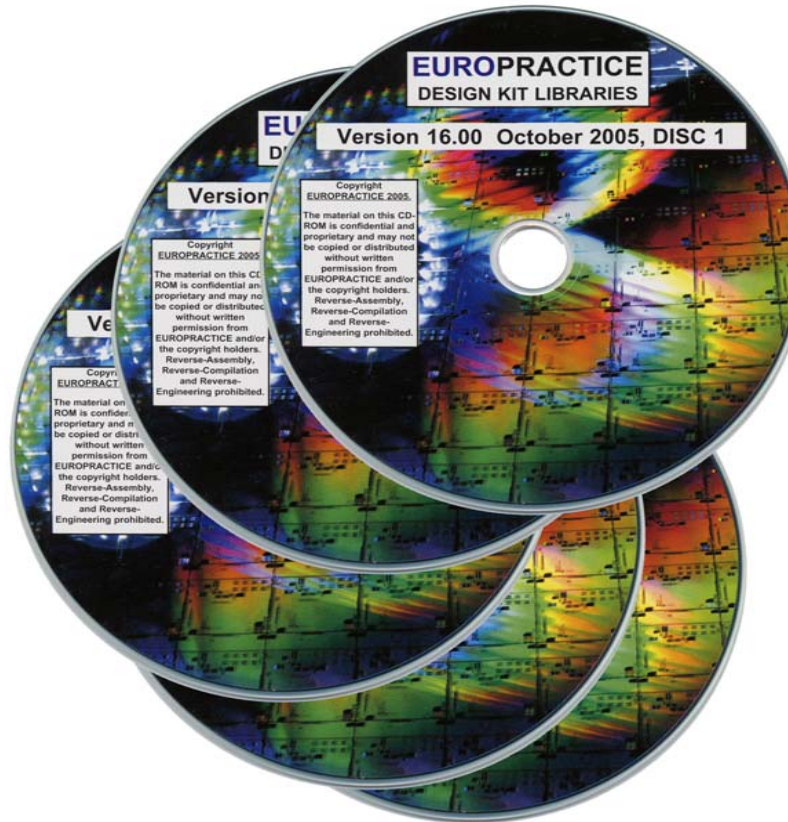world-wide)**

IMEC, FhG-IIS

MPW Principle

Design B

Design A

Design n

**YOUR
DESIGN**

Packaged samples

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AMIS (Belgium)

0.7µ CMOS A/D 2M (B)
0.5µ CMOS A/D 3M (B)
0.35µ CMOS A/D 5M (B)
0.7µ CMOS A/D I2T 100V (B)
0.7µ CMOS A/D I2T 30V (B)
0.35µ CMOS A/D I3T80 80 V (B)
0.5µ CMOS C5 EEPROM (US)

IHP (Germany)

0.25µ SCG25B SiGe:C 120GHz
0.25µ SCG25C SiGe:C 200GHz
0.25µ SCG25VD SiGe:C 30GHz, BVCEO>7V

austriamicrosystems (Austria)

0.8µ CMOS A/D
0.6µ CMOS A/D 3M
0.35µ CMOS A/D 4M
0.8µ CMOS 50V
0.35µ SiGe BiCMOS 4M
0.35µ CMOS 50V
0.35µ CMOS OPTO

UMC (Taiwan)

0.25µ CMOS D
0.25µ CMOS MMC/RF
0.18µ CMOS D
0.18µ CMOS MMC/RF
0.13µ CMOS D
0.13µ CMOS MMC/RF
90nm CMOS D

TSMC (Taiwan)

0.25µ CMOS D
0.25µ CMOS MMC/RF
0.25µ CMOS Flash
0.18µ CMOS D
0.18µ CMOS MMC/RF
0.18µ CMOS Flash
0.13µ CMOS D
0.13µ CMOS MMC/RF
90nm CMOS (industry only)
65nm CMOS (industry only)
+ specific technologies
upon request for industry

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EUROPRACTICE IC Design Tools
EUROPRACTICE Design Kits
EUROPRACTICE MPW Service

- **Support full custom and cell based design**

- **50 design kits (all encrypted) on current 5 CD set**
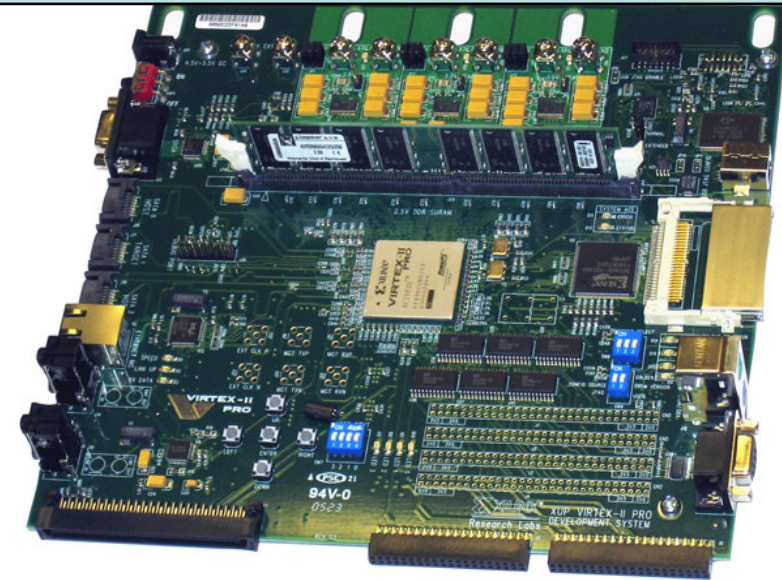
- **Interim updates via www**

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EUROPRACTICE
System & Physical Design
Tools

EUROPRACTICE
IC Design Kits

EUROPRACTICE
MPW
Service
(IMEC & FhG IIS)

EUROPRACTICE
Design Kit Libraries

Version 16.00
October 2005

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**RAL Supported
IC Design
Tools**

**EUROPRACTICE
Design Kits**

**EUROPRACTICE
MPW
Service**

(IMEC / FhG IIS)

**Design
Kits**

**CERN
MPW
(Particle
Physics)**

**Design
Kits**

**MOSIS
MPW
(USA)**

**Design
Kits**

**CMP
MPW
(France)**

**Design
Kits**

**Direct
Foundry
Access**

IBM

0.13

e.g. TSMC

**(now in
Europractice)**

e.g. ST

**e.g. AMIS, AMS, TSMC,
UMC**

e.g. MEMs foundry
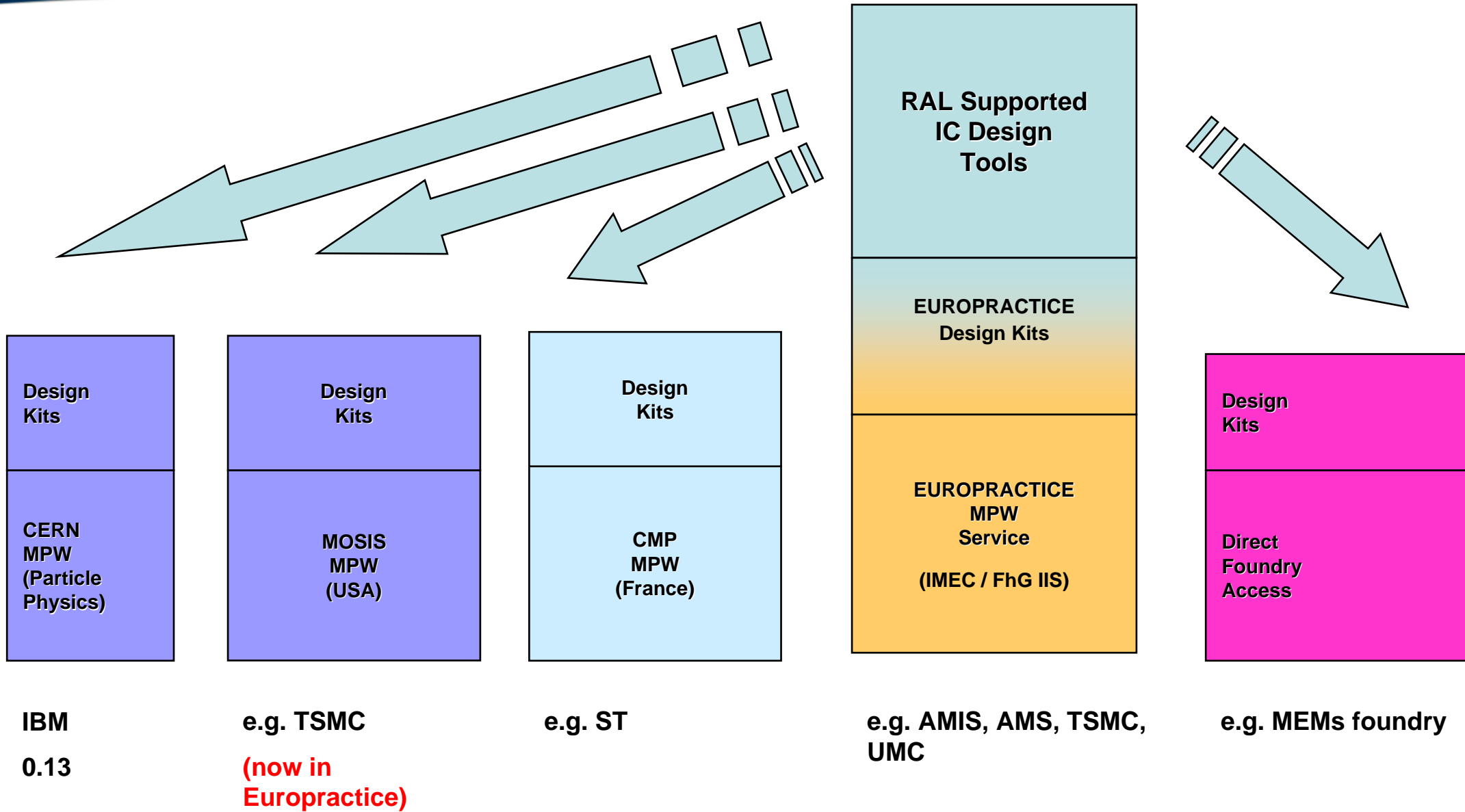
- ◆ **Very low level of submission of academic designs for fabrication < 180nm although**
  - ► **EUROPRACTICE tools well capable at 90nm**
  - ► **EUROPRACTICE MPW fabrication available with subsidy**
  - ► **mini@sic service**
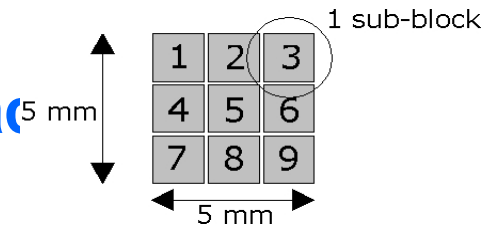- ◆ **Need identified for training ac** at 90nm
  - ► **Industry wanted 65nm**
  - ► **Thought to be too big a jump for most universities**
- ◆ **Compromise with**
  - ► **Training Courses on 90nm**
  - ► **Seminars on 65nm/45nm topics**
  - ► **Annual workshop**
- ◆ **2 Years project duration**
  - ► **Hope to address 65nm in successor project!**

1 sub-block

1	2	3
4	5	6
7	8	9

5 mm

5 mm

Train-the-trainer Courses

- ▶ **4 types ~5 days each**
  - Advanced analogue implementation flow (7 instances)
  - Advanced RF implementation flow (7 instances)
  - Advanced digital physical implementation flow (7 instances)
  - Design-for-manufacturing implementation flow (7 instances)
- ▶ **Run at various European institutions with suitable infrastructure**
- ▶ **Hands-on sessions based on EUROPRACTICE tools (e.g. Cadence, Mentor, Synopsys) and technology (e.g. TSMC)**
- ▶ **Attendees take away material/lab examples to run at home institution, in same environment**

Seminars (65nm/ 45nm)

- ▶ **Series on issues and examples to be made available on DVD**

Annual workshop

- ▶ **Academic attendees to report successful adoption of 90nm design**
- ▶ **Design competitions**
- ▶ **Foster exchange of ideas/experiences – productive collaboration**

- **Very low level of academic MEMS design submission for fabrication**

- **Co-ordinated action to remove obstacles to fabless design**

- **Capable MEMS tools already in EUROPRACTICE portfolio (Coventor, SoftMEMS, Tanner)**

- **Enhancement of Design Kits**

- **Introduce MEMS fabrication**

  - ► **MEMS processes – EUROPRACTICE MPW**

  - ► **MEMS packages – EUROPRACTICE framework packaging contracts**

- **Targeted MEMS design training**

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STIMESI
Stimulation Action on MEMS and SiP

♦ **STIMESI Launched in January 2006**

♦ **Following a similar campaign (as per IDESA 90nm)**

♦ **Significant Design Kit Development phase**
  - ► **To make existing foundry kits easily usable by 3rd parties**

♦ **4 Main Training Courses (MEMS)**
  - ► **Infineon (SensoNor) process**
  - ► **Tronics process**
  - ► **Memscap processes**
  - ► **QinetiQ processes**

♦ **4 Years project duration**
  - ► **7 of each course type moving around Europe**

imec

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Infineon

QinetiQ

tronics microsystems

MEMSCAP
The Power of a Small World™

6 SIXTH FRAMEWORK PROGRAMME

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New - Operational mid-2008

Established 1994 (Eurochip 1989)

Design Tools

Europractice Service

RAL

IMEC

FhG-IIS

Fabrication Packaging

IMEC + RAL
EPFL (Lausanne)
TU Delft
STU Bratislava
Warsaw UT
KU Leuven
CEA

IDESA – IC Training

STIMESI – Microsystems Training

IMEC + RAL
Infineon (SensoNor)
Memscap
Tronic's
QinetiQ
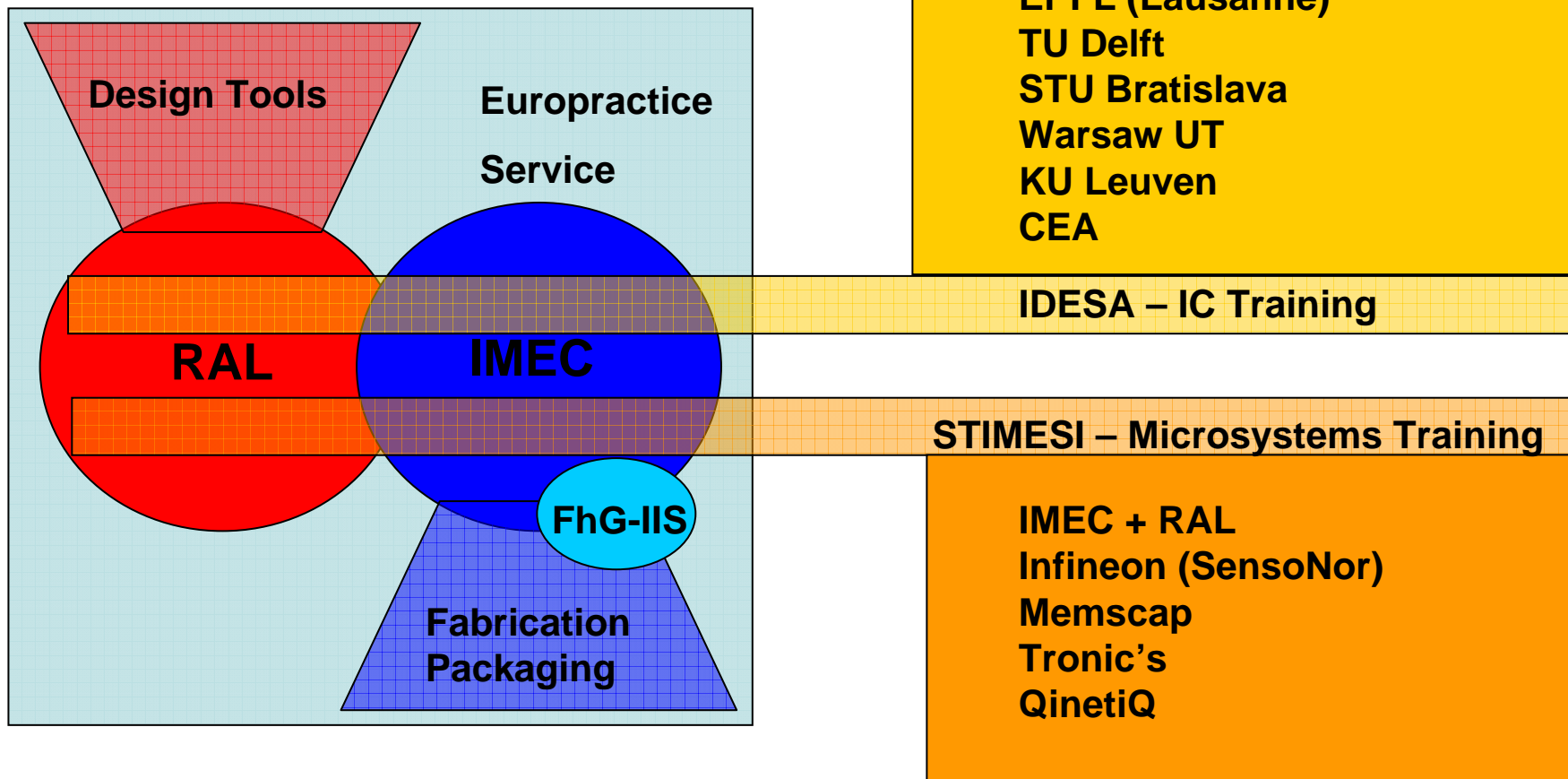
Existing - Operational mid-2006

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♦ **RAL Microelectronics Support Centre and its partners have successfully secured 21 years of continuous funding for the Eurochip/Europractice projects**

♦ **Proposals for the continuation of Europractice Services and IDESA 90nm Training Action ranked #1 & #2 respectively within the sector after evaluation of last EC Call for Proposals**

♦ **Friends and colleagues joined us in November at the NMI Annual Dinner to celebrate these milestones**

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- ◆ **Our design flows for academic use**
  - ► **Same as those used by the largest multinational companies**

- ◆ **Those companies establish design flows to use**
  - ► **Dedicated design methodology groups**
  - ► **On-site vendor application engineers**

- ◆ **For universities, without this infrastructure, it can be a hard road to becoming productive with these flows**

- ◆ **The Microelectronics Support Centre (MSC) at RAL is there to help the UK universities with these issues**

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♦ **The RAL MSC offers:**

♦ **Advice on selecting viable design flows**

  ► **Design flow most appropriate for the project**

  ► **Compatibility of tools from different vendors**

  ► **Compatibility of tools with design kits**

  ► **Platform support**

  ► **…**

♦ **Wide-ranging technical support**

  ► **From proper installation through advanced usage issues**

  ► **Telephone**

  ► **E-mail**

  ► **Remote login**

  ► **…**

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♦ **The RAL MSC also offers:**

♦ **Site visits**

- ► **RAL staff to university locations**
- ► **University researchers to RAL**
- ► **To deal with problems that can't be solved remotely**
- ► **To demonstrate advanced usage of the design flows**
- ► **To give bespoke demos on applying design flows to particular projects**
- ► **…**
- ► **Recent engagements of this sort with Manchester, Newcastle, …**
- ► **Visits to university sites often attract a wide gathering from different departments**

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◆ **"Seminar" workshops**
  ▶ **Dissemination events**
  ▶ **Review/Update of services available to UK universities**
  ▶ **Talks by RAL staff on selected topical design flows**
  ▶ **Normally followed by live demo**
  ▶ **Workshops offered once/twice per year**
  ▶ **Each one offered at a number of locations**

  ▶ **New topics covered at each workshop**

  ▶ **Many opportunities for informal discussion in the margins**

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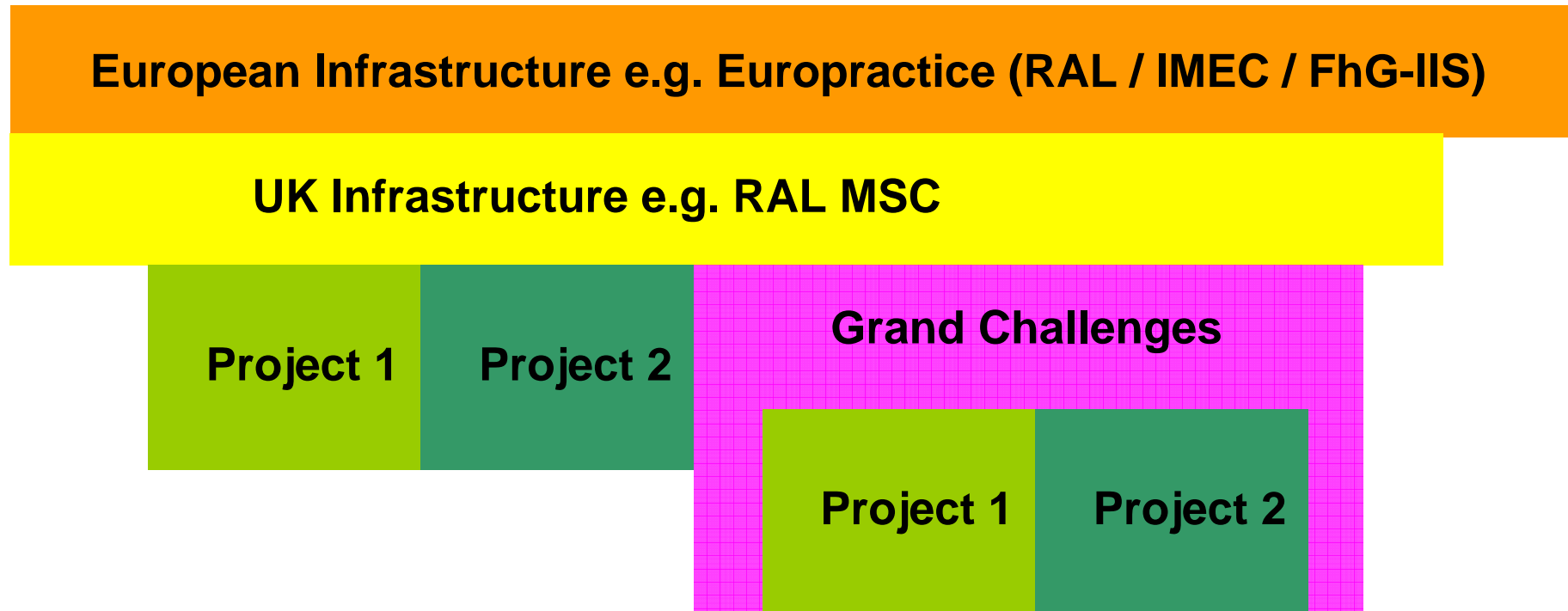**Rutherford Appleton Laboratory**

♦ **"Tutorial" workshops**

- ► **Hands-on training**
- ► **Presentations by RAL staff**
- ► **Typically on one selected design flow**
- ► **Hands-on lab exercises**
- ► **Workshops run periodically**

- ► **Recent examples**
  - • **C-Based Design for FPGAs**
  - • **Analogue IC Design Flows**

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- ♦ **RAL MSC provides range of complementary microelectronics services for academia**
  - ► **European level**
  - ► **UK national level**
- ♦ **Cost-effective access to leading edge design flows for all areas of microelectronics**
- ♦ **Accompanying training, guidance and support actions**
- ♦ **Controlled possibilities for knowledge exchange to SMEs**
- ♦ **Common infrastructure of advanced design flows in academia**
  - ► **Ideal foundation for multi-institute collaborative research projects**
- ♦ **Services being continuously developed**
  - ► **To meet evolving microelectronics needs**

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European Infrastructure e.g. Europractice (RAL / IMEC / FhG-IIS)

UK Infrastructure e.g. RAL MSC

Project 1	Project 2	**Grand Challenges**

Project 1	Project 2

♦ **If RAL gets early visibility of Major Design Project requirements e.g. those associated with future microelectronics Grand Challenges, RAL can endeavour to evolve the European and UK infrastructure to best support these projects!**

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If you need further Information, then please contact us:

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