Laboratoire d’Analyse et d’Architecture des Systèmes
Historical Perspective

1968  Laboratoire d’Automatique et de ses Applications Spatiales

1973  Laboratoire d’Automatique et d’Analyse des Systèmes

1994  Laboratoire d’Analyse et d’Architecture des Systèmes

- Main Research Areas
  Sciences and Technologies for Information & Communication and Systems Engineering

- Four Domains
  Computer Science, Robotics, Automatic Control, Micro & Nano systems
Missions and Value Chain

**Research**
- Improve Knowledge and State-of-the-Art
- Address Scientific & Technological Barriers
- Disseminate Results (Publications)
- Demonstrate Prototypes on Platforms

**Innovation**
- Anticipate Industrial/Societal Needs
- Identify Real World Issues and Challenges
- Maturate and Transfer

**And also:**
- Training through Research — International Cooperations
- Offer of Scientific & Technological Skills — Hosting on Platforms
- Joint Labs — Start Ups
More about LAAS-CNRS

CNRS Research Unit:
INS2I and INSIS — Sections 06, 07, 08

Convention with founding members of Université de Toulouse

Affiliates Club (1990)
80+ members to date

Involved with
- Network Sciences & Technologies for Aeronautics & Space
- R & D Clusters:
  - Aerospace Valley
  - Cancer Bio Santé
  - Agri Sud Ouest Innovation
  - Eau
  - Derbi
  - System@tic
  - S2e2
  - Capdigital

Carnot Label (2006), reconducted in 2011
**Some Quick Figures**

Built Surface

≈ 12 000 m²

Personnel: 715

Permanent: 308
- Research: 207
  (CNRS: 88; UT: 119)
- Support: 101
  (CNRS: 90; UT: 11)

Temporary: 407
- Post docs: 38
- PhDs: 242
- Contract: 38
- Hosted*: 89

Each year:
- About 60 PhDs defended
- More than 200 Interns/trainees

Offices & Experimentation

≈ 21 000 m²

* Hosted:
  - Emeritus: 11
  - Affiliate: 9
  - Visitors: 7
  - PhDs: 8
  - Partnership: 28
  - RENATECH: 26

≈ 4 Ha

June 30, 2014
Localization of **UFTMP** Partners’ Members

- **IUT Blagnac - UT2J (5;0)**
- **UT1C (2;0)**
- **INPT ENSEEIHT (12;5)**
- **OSE Team (9;4)**
- **INSAT (34;1)**
- **IUT Rangueil + UT3PS (66;5)**
- **LAAS-CNRS 7 av. Col. Roche**

(Faculty; BIATSS)
Research:
Three Interdisciplinary Strategic Axes

- **ADREAM**: Architectures for Dynamic Resilient Embedded Autonomous Mobile systems
  - Ambient Open Networked Embedded Systems, Smart Objects, M2M,
  - Service Robots: Companion (Frailty, Health Care), Co-worker ("Manufuture")
  - Resilience, Security, Privacy,...

- **SYNERGY**: SYstems for smart eNERGY management
  - Energy generation: PV production, conversion, etc.,
  - Integration of alternative energy sources: HVDC-grid, storage management, etc.
  - Renewable & heterogeneous energy management: generic simulation platform for modeling and optimization

- **ALIVE**: AnalYsis of Interactions with liVing entities and the Environment
  - Micro & Nano Systems for and via Biology
  - Instrumentation, Analysis, Diagnosis,
  - Bio-inspired Nanotechnologies,...
## Disciplinary Domains and Scientific Themes

### Computer Science
- Crucial Computing
- Networks & Communications

### Robotics
- Robotics

### Automatic Control
- Decision & optimization

### Micro and Nano Systems
- Microwaves and Optics: From Electromagnetism to Systems
- Nano Engineering & Integration
- Micro Nano Bio Technologies
- Energy Management

(Perm. + Post doc + PhD)

Jan. 2015

Visite Elèves ENS Cachan
**Personnel**

- **Permanent Staff: 308** (119 Faculty, 88 Researchers, 101 TASL staff)

  TASS: Technical, Administrative Support & Logistics

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<table>
<thead>
<tr>
<th>Position</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ass. Prof.</td>
<td>72</td>
</tr>
<tr>
<td>Prof.</td>
<td>47</td>
</tr>
<tr>
<td>Ch. Rech.</td>
<td>51</td>
</tr>
<tr>
<td>Dir. Rech.</td>
<td>37</td>
</tr>
<tr>
<td>TASL Staff</td>
<td>101</td>
</tr>
</tbody>
</table>
An Attractive Lab.

- **Recruitment**
  - **19** CNRS researchers
  - **17** Faculty members (in addition to LATTIS a LOSE members)

- **Senior Scientists Integrated**
  Bernard Legrand (IEMN), Laurent Malaquin (Curie Inst.), Emmanuelle Trévisiol (LISBP), Bruno Watier (PRISSMH)

- **PhDs**

  About 1/2 of the PhD students hosted (a total of 584 over the period) are issued from 51 foreign countries
Over the period LAAS has hosted:

- **320** L1- or M1-level Students
- **520** Master 2 or Engineer Internships
- **584** PhD Students
- **233** Post-docs and Junior Research Engineers

Focus on PhDs

- Repartition among Doctoral Schools

<table>
<thead>
<tr>
<th>Doctoral Schools</th>
<th>GEET</th>
<th>Systèmes</th>
<th>MITT</th>
<th>SDM</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td># Registrations</td>
<td>229</td>
<td>225</td>
<td>71</td>
<td>23</td>
<td>36</td>
</tr>
</tbody>
</table>

Future

![Bar chart showing PhD registrations]

- PhD 2009: 66
- PhD 2010: 69
- PhD 2011: 67

Jan. 2015

Visite Elèves ENS Cachan
More than 5200 publications during the period, among which:

- **Books**: Authored, Edited or Chapter Contributions
- **Journals** International (97%) and National (3%)
- **International Conferences** With Proceedings
- **National Conferences** With Proceedings
- **Invited Contributions** Journals and Conferences Included

Period 2009-14*

≈ 4,000

* Only 1st semester in 2014
Technological Facilities and Platforms

Micro-Nano Systems
- Design & Simulation
- RENATECH (Clean Room)
- Characterization Electrical, RF, Thermal, EMC
- Bio & Chemical Analysis

“Macro-Mini” Systems
- Robotics
- Networking
- Photovoltaic Energy
- Instrumented Building
Initiative for structurating the microfabrication facilities at inter-regional level

- Creation of a federative structure gathering 4 (current) Regions
- Objectives: Research and Training
- 7 Platforms involved:
Operational Budget — 2013

12,852 k€

- CNRS 18%
- ANR 19%
- RTB 3%
- PIA 14%
- Region 4%
- Other (Public) 17%
- Industry 12%
- UT 2%
- Carnot 3%
- Europe 8%

Total RP: 10,503 k€
## Contracts

### 2009-2014 (mid-year)

<table>
<thead>
<tr>
<th>Types of Contracts</th>
<th>Number</th>
<th>Funding (M€)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>538</td>
<td>85.9</td>
</tr>
<tr>
<td>Bilateral Contracts</td>
<td>215</td>
<td>12.9</td>
</tr>
<tr>
<td>CPER ADREAM (Public Contracts)</td>
<td>3</td>
<td>6.7</td>
</tr>
<tr>
<td>Call for Projects Contracts</td>
<td>320</td>
<td>66.3</td>
</tr>
<tr>
<td>ANR</td>
<td>130</td>
<td>22.8</td>
</tr>
<tr>
<td>PIA</td>
<td>12</td>
<td>6.2</td>
</tr>
<tr>
<td>DGCIS/FUI/OSEO</td>
<td>29</td>
<td>10.8</td>
</tr>
<tr>
<td>DGA</td>
<td>6</td>
<td>1.9</td>
</tr>
<tr>
<td>Regional Council</td>
<td>65</td>
<td>4.2</td>
</tr>
<tr>
<td>Fundations</td>
<td>20</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Europe</strong></td>
<td>58</td>
<td>18.4</td>
</tr>
</tbody>
</table>

### RTRA STAE

- **9 new actions** — Projects, Workshops (*Chantiers*), WGs — **supported in the period**
- From the creation (2007)
- 18 actions supported:
  - **Funding:**
    - Operation: ≈ 400 k€
    - Salaries: ≈ 1,200 (in addition)

- **EquipEx LEAF, ROBOTEX & LabEx GANEX**
  - [≈2.1 M€]

- **CORALIE** (CORAC Program — EPICE PF)

- **SVC** (Cloud Computing Program)

- **DIGIDIAG and VIBBNano** (Nano-Biotechnologies Program)

- **TOURS 2015** (Energy Management, STMicroelectronics)

- **OPEN FOOD SYSTEM** (digital cuisine, SEB group) and **ROME0 2** (Aldebaran Robotics) as part of Structuring Projects of the Competitive Clusters (PSPC)
Contracts with Industry Partners

- During the period 400 (~3/4) projects (among 538) involved at least one industry partner:
  - ≈ 3/4 of EU-funded projects
  - ≈ 58% of National Institutional projects

- A Wide Spectrum of Industry Partners
  - Audi, Fujitsu Siemens Computers, Infineon, Kuka, Telefunken
  - Ericsson, Volvo
  - IBM
  - KLM
  - Airbus Group (35 projects), Thales (34), Freescale Semiconducteurs France (18), ST Microelectronics (9), Renault (7),...

- Some other close and long term, or recent partnerships:
  - Actia, Essilor,...
  - Aldebaran Robotics, Innopsys, i-Trust, SigFox, Sterela,...
A 4-year Agreement signed in 2006 (started in 2007)

Pluri-annual research program

Four major topics — contribution to 21 projects over the period

- **Avionics Platform (5)**: Middleware, Security, Reconfiguration, Sensor Networks
- **Cockpit/Flight Control (5)**: Diagnosis, Control, IHM & Resilience
- **System Engineering Workshop (8)**: Model-based SW Engineering and V&V
- **Maintenance (3)**: Diagnosis and Operational Reliability

Including 5 CIFRE conventions

Road Map revisited and Agreement reconducted in 2012 for 4 years
Start-ups (over the period)

**EHTech**: Energy Harvesting (shower water) — 2009

**Epsiline**: Laser Technology-based Anemometers — 2009

**Mapping Consulting**: Targeting the Innovation Ecosystem — 2009

**EXEM**: Monitoring Electromagnetism in Radiocommunications — 2010

**Seeks**: Collaborative Search Engine — 2010

**i Habitation**: Domotics (building restoration and new) — 2012

**WideSens**: Wireless Sensor Networks — 2013

**3dis Technologies**: Cost-effective Circuit Interconnection Technology — 2014
The ROSETTA Mission and the Philae Lander

LAAS has contributed by designing for CNES (SONC — Science Operation and Navigation Center), a scheduling software for optimizing the planning of the experiments to be conducted on the Comet “Tchouri”.

As part of the Mission Operation Sheduling Tool (MOST), the SW package proposes an innovative solution to cope with the on-board limited resources.

Several members of the DO Theme (ROC Team) were “called on duty” at La Cité de l’Espace in Toulouse, during the landing phase on November 12, 2014.

A really good example of transfer of advanced research results applied to a real-world case!

Gilles Simonin, Christian Artigues, Emmanuel Hebrard, Pierre Lopez
Scheduling Scientific Experiments on the Rosetta/Philae Mission
18th Int. Conf. on Principles & Practice of Constraint Programming, Oct. 2012, QC, CA — LNCS 7514, pp. 23-37
On-Going and Emerging Projects

- Joint Labs
  - ANR LabCom with Innopsys
    **BIOSOFT** [Logo] Soft processes for bio-detection
  - New Joint Lab. with **ESSILOR** (End of 2014)

- Pro-active role in the Carnot offer according to Industry Sectors towards SMEs and MMCs (**ETIs**) —> Partner in several proposals for the ANR Call “**Valorisation Instituts Carnot**”
  - **AirCar** – Aeronautical Contruction (incl. more electrical aircraft)
  - **Carnot Numérique** – ITC
  - **Energ’IC** – Industrial Ecology & Energy – incl. sustainable energy management
  - **IMP (Industries Mécaniques et Procédés)** – incl. Factory of the Future
  - **MedTech** – Technology for medical care

- **(COme to WIN): EU Initiative to Facilitate Transfer to Industry at European Level**
Organization of Scientific Events

- **ADREAM Project Building**
  - Foundation Stone — June 2010
  - Formal Inauguration — July 2012
  - Dedication to Georges Giralt — Nov. 2013

- **Georges Giralt Conference Series**
  - Jean Walrand — May 2014
    UC. Berkeley, CA, US
    Sharing Network Resources
  - Normand Mousseau — Oct. 2014
    U. Montréal, QC, CA
    *Faire le grand écart dynamique ou comment suivre en détails la cinétique des atomes sur des temps expérimentaux*
  - **Three speakers are invited for 2015**
    - Dimitris Bertsimas, MIT, MA, US — January
    - Richard Murray, CalTech, CA, US — March
    - Rachid Guerraoui, EPFL, CH — May

- **Some Major International Events, e.g.,**
  - 38th Micro & Nano Engineering — Sept 2012
  - 20th IFAC World Congress — July 2017
Brève visite on LAAS, pas un temps neigeux!

Très heureux d’avoir pu visiter le bâtiment犷
ADREAM : magique !

Le LAAS est un de vos plus beaux fleurons,
je ferme des vœux pour que le reste
longtemps !

Bises cordialement

Alain Fuchs

25/12/2013
Science Festival — Doors-Open Day

- About 700 visitors each year!
Some PhD Student Initiatives

- **PhD Students Coffee Sessions**
  - **Mid-day break**: students briefly expose (via a short 10mn-talk) their research
  - Launched in Jan. 2014
  - -> five sessions during first semester

- **Réunion et Rencontre Sessions** (aka, *Bi-R Sessions*)
  - **End of working day**
    Every couple of weeks on Fridays
  - A relaxed and friendly meeting spot
  - Started mid-2013 (10 sessions in 2013 and 8 more by mid-2014)
The Rugby Jean-Louis Sanchez Trophy
Permanent members vs PhDs & Postdocs

- 2013: 1st Edition
- Renewed in 2014
- ...

Jan. 2015
Visite Elèves ENS Cachan
Diffraction de la lumière par un moule de nano-impression destiné à la fabrication de filtres optiques hyperspectraux. Fabrication : LAAS-CNRS. Application : instrumentation spatiale.

Light Diffraction via a Nanoimprint Mold for Implementing Hyperspectral Optical Filters. Fabrication: LAAS-CNRS. Application: Space Instrumentation © LAAS-CNRS

Et tout le meilleur pour la suite !