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# Overview and new insights of GT9 <sup>2</sup>RM Réseau Métier Roboticiens Mécatroniciens

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# Outline

- ⊙ I. Why a professional network of research engineers in robotics and mechatronics ?
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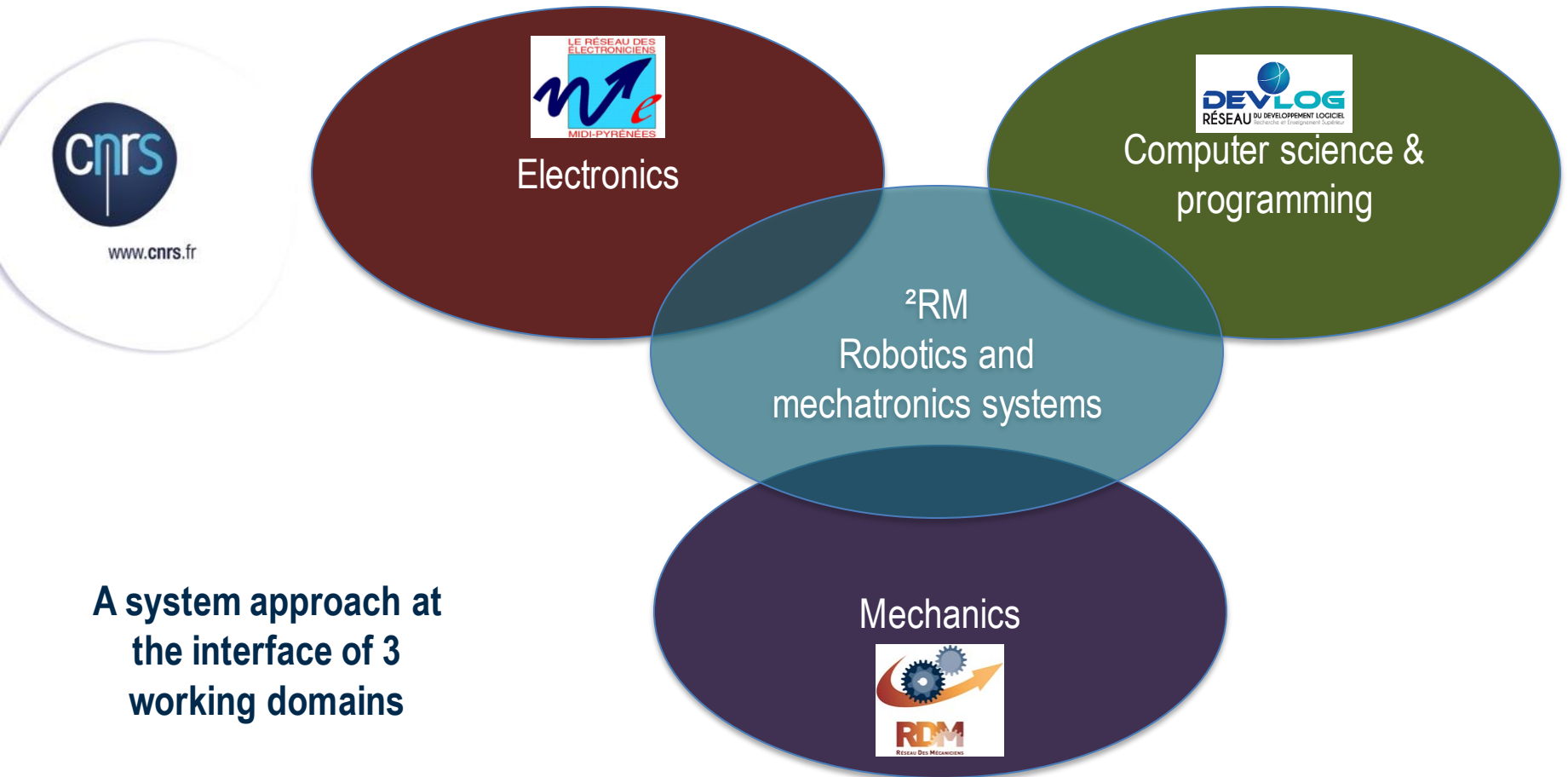
# Why <sup>2</sup>RM ?



- Scientific structuring: GDR robotique
  - 1300 researchers, IT, Phd students
  - ~50 research lab. in robotics
  - 154 companies involved in France
  - <http://www.gdr-robotique.org/>
- Technological structuring of the research platforms:
  - Equipex Robotex
  - <http://equipex-robotex.fr/>
- Before 2016, no professional structuring of robotics engineers in Lab.
  - Need of creation of <sup>2</sup>RM: **R**éseau **M**étier des **R**oboticiens et **M**écatroniciens



# Positioning of $^2$ RM



**A system approach at the interface of 3 working domains**

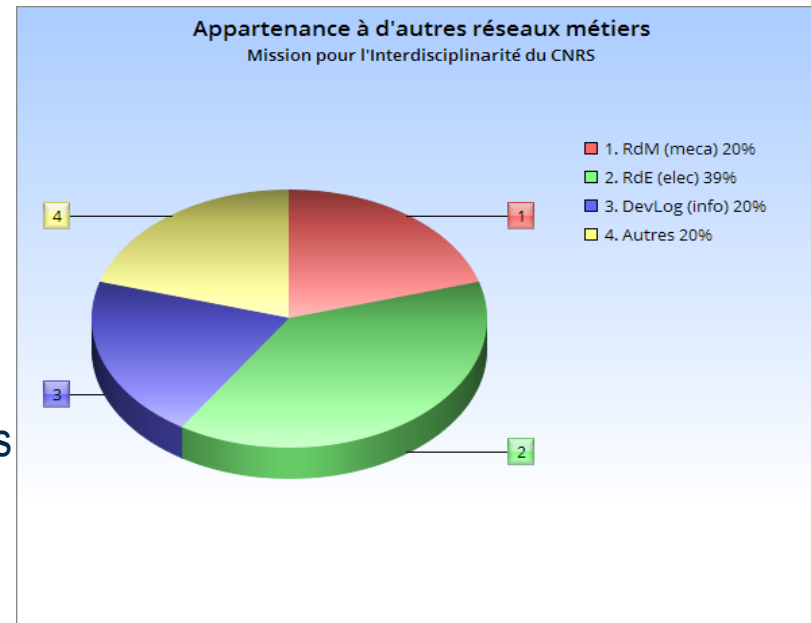


# Objectives



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- Facilitate the exchanges between the members of the network (**sharing knowledge and expertise**)
  - Feedback on equipments and technologies
  - Sharing technical resources (sources codes, CAD designs, doc, savoir-faire, ...)
  - Technical trainings
- Sharing experience with other professional networks
  - Survey about links with other networks



# Community and tools

- Organization and community:
  - Steering committee : **Arnaud Blanchard** (ETIS, Cergy Pontoise), **Gérald Dherbomez** (CRISAL, Lille), **Jean-Pierre Gazeau et Pierre Laguillaumie** (PPRIME, Poitiers), **Matthieu Herrb** (LAAS, Toulouse), **Jean-François Kong** (iCube, Strasbourg), **François Marmoiton** (Institut Pascal, Clermont Ferrand), **Thierry Monglon** (Heudiasyc, Compiègne)
  - 168 subscribers @ 22/11/2018 from several institutions (CNRS, Inria, Universities, IRSTEA, IFSTTAR, CEA, engineers schools, ...)
- Tools :
  - Web site : <http://2rm.cnrs.fr>
  - Wiki : <http://wiki.2rm.cnrs.fr>
  - Mailing list : [2rm@services.cnrs.fr](mailto:2rm@services.cnrs.fr)
  - Messaging Mattermost : <https://framateam.org/cnrs-2rm>
  - A github organization : <https://github.com/2rm-robotics/>



# Main focus

## Working of the robotics platforms

- Mobile robotics : ground, aerial and underwater
- Industrial robotics and manipulator arms
- Humanoid robotics
- Medical robotics
- Micro-nano robotics

## Tools and design methodologies, makershop

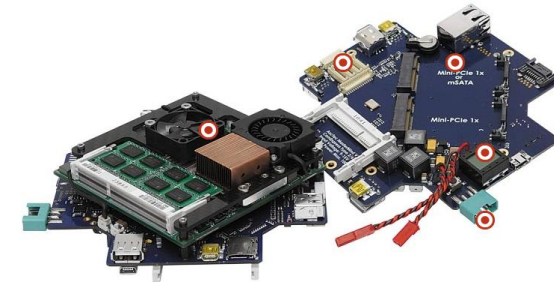
- CAD, 3D printing, rapid prototyping...

## Implementation of software and hardware architectures

- Calculators (CPU, GPU, DSP, ...), data bus and networks
- Embedded systems and real-time problematics
- Middleware, frameworks, ROS, Cloud ...



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# ROS

# Overview of actions in 2017 – 2018

- Increase of the engineers community (70 members in 2016, 168 today).
- In 2 years 11 technical days in link with another WG of GdRRob or with the Equipex Robotex.  
Results:
  - 96 presentations available publicly on the wiki (<http://wiki.2rm.cnrs.fr>)
  - A national conference on ROS (21-22 June 2018 @LAAS Toulouse)
  - Some round tables about the evolution of the network
- Some topics :
  - ROS, UAV and manipulators, Simulation tools for robotics, 3D Printing, Terrestrial mobile robots - ROS on wheels
  - More other topics with Robotex Techdays ...



**UNDER THE HOOD**





# Prospectives (1/3)

## Technical and technological :

- **New technologies for 3D-4D printing (scientific inputs from GT1 - GT6)**
  - Deformable material, shape memory
  - Multi-material printing
  - Metal, alloys
  - Biological tissues
- **Challenge of middleware and frameworks (scientific inputs from GT4)**
  - Is ROS 2.0 the best solution?
  - Adequation of the framework choice with the application
  - Taking into account the strong constraints: real-time, certification, scalability (multi-robots system, swarm robotics, ...)



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# Prospectives (2/3)

## Technical and technological :

- **Recent works in AI and usage onboard the robots (scientific inputs from new GT learning and robotics)**
  - Challenge: how to implement these algorithms on embedded systems (new programming skills).
  - And understand the working of the algorithms to be able to modify them
  - Adapt the computing resources (GPU, NPU, VPU, ... ?)
- **Availability of new huge computing capabilities and use of Cloud (inputs from GT4)**
  - Design problematics: adequation between these new computing systems and embedded constraints (energetics, volume, ...)
  - Problems of telecommunication for egde, fog or cloud computing and for teleoperation of robots.



# Prospectives (3/3)

## Technical et technological :

### Emergence of new sensors (scientific inputs from GT2)

- LIDAR solid state, high dynamic sensors, event cameras, new GNSS, ...

### Multi-robots systems and Internet of Things

- Big data, robotics datasets
- Cyber-security about robotics applications

## Organizational :

- Continue the recognition of the network by the research institutions (CNRS and others)
- Participate to the technical actions of the WG of GDR robotique.
- Initiate collaborations with other engineers networks (mechanical, electronical, computer science).



# Conclusion

- ⦿ Actions planned for 2019 :
  - Techdays Robotex Paris (ISIR), technical days (3) organized by labs, SIDO (IoT, AI, Robotics) event in Lyon, ROSCON FR 2019.
  - Organization of a training session for 30 engineers (ANF) on « deep learning and robotics » (waiting of the GO from CNRS in Dec 2018)



## Bruno Patin, Dassault Aviation

He is project manager at Dassault Aviation since 30 years and he is an expert in Autonomy and Decision for UAS. He contributes to SESAR 2020 for the integration of IFR RPAS\* in the controlled airspaces. His talk today is titled:  
**« Vérification, validation et certification des applications embarquées : quid de la robotique ? »**

\* IFR RPAS : Instrument Flight Rules Remotely Piloted Aerial System