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## **MSSEG-2: A medical imaging challenge on VIP**

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# MSSEG-2: A medical imaging challenge on VIP

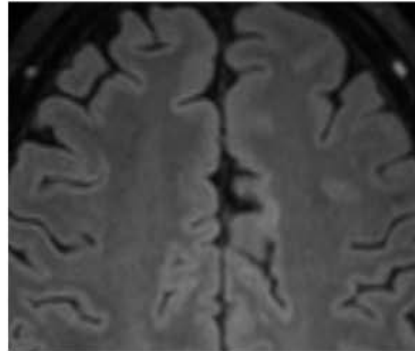
Sorina Camarasu-Pop, Axel Bonnet, Arthur Masson, Michael Kain, Michel Dojat, Olivier Commowick, Frédéric Cervenansky

EGI Conference 2021, 21/10/2021

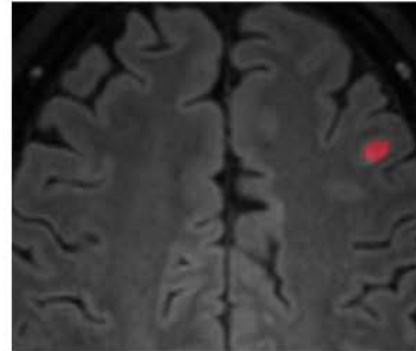
# What is MSSEG-2?

- A scientific challenge
  - Research teams work on solving a common scientific hard problem
  - Their solutions are evaluated on a given set of data according to the guidelines given by the organizers
- MSSEG-2
  - 2<sup>nd</sup> Multiple Sclerosis (MS) Segmentation (Seg)
  - Automatic segmentation of tissues and lesions in MRI brain scans
  - Detection of lesions appearing between two patient's visits
  - <https://portal.fli-iam.irisa.fr/msseg-2/>

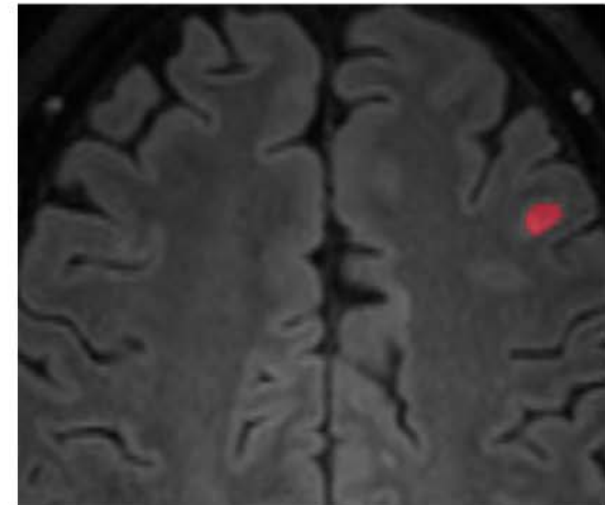
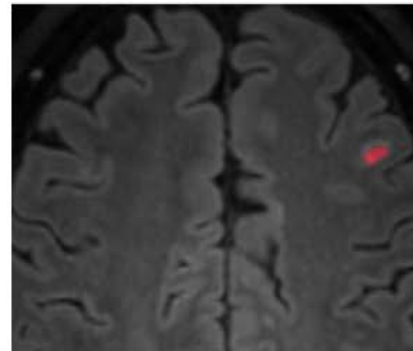
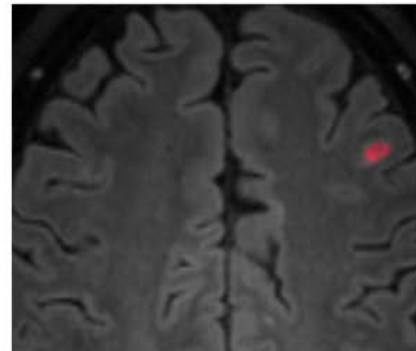
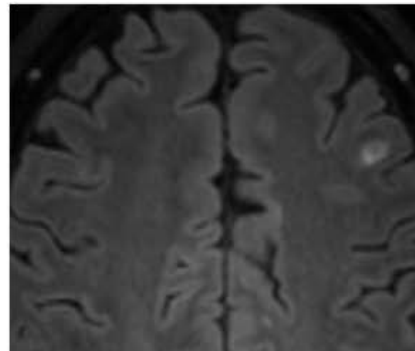
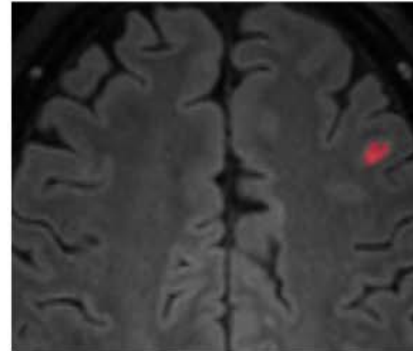
# An example dataset



Time points



Expert neuroradiologists delineations



Consensus

# The Challenge Partners

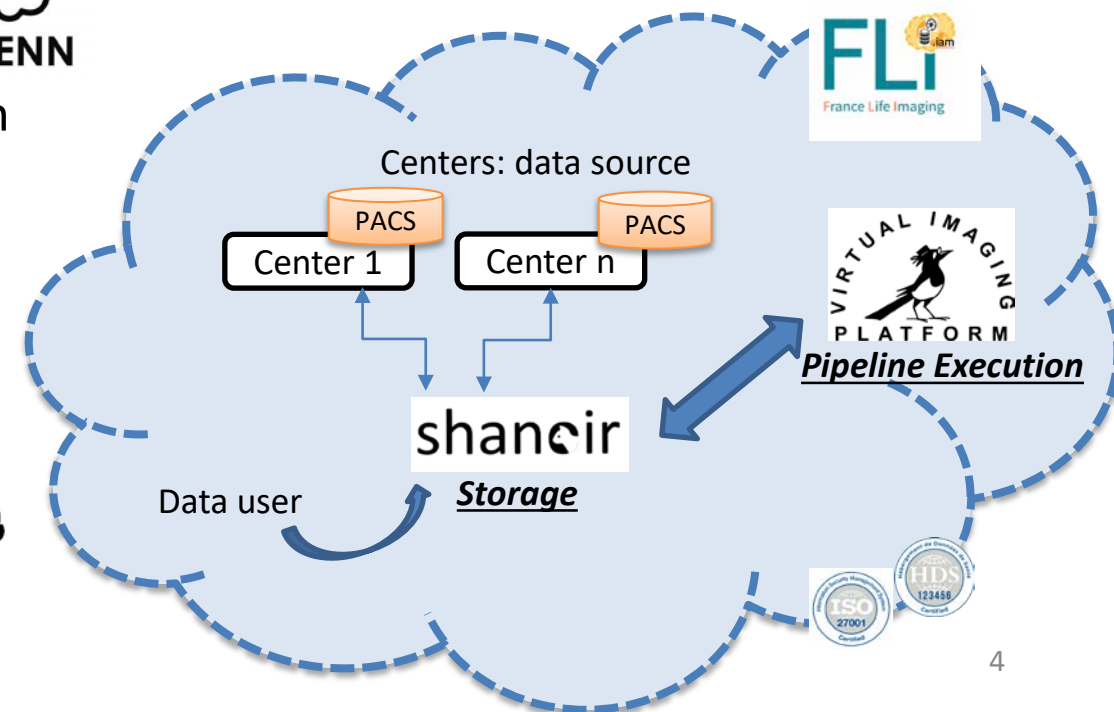
- OFSEP (<https://ofsep.org/en>)
  - The French MS registry (gathering clinical, imaging and biological data), ~30,000 patients
  - Interest in automated methods to apply over the database



- Empenn
  - <https://team.inria.fr/empenn>
  - Inria team working on MS for a long time
  - Interest in evaluating state-of-the-art segmentation



- France Life Imaging
  - <https://portal.fli-iam.irisa.fr>
  - Coordinated and harmonized network of biomedical in vivo imaging in France
  - Challenges support



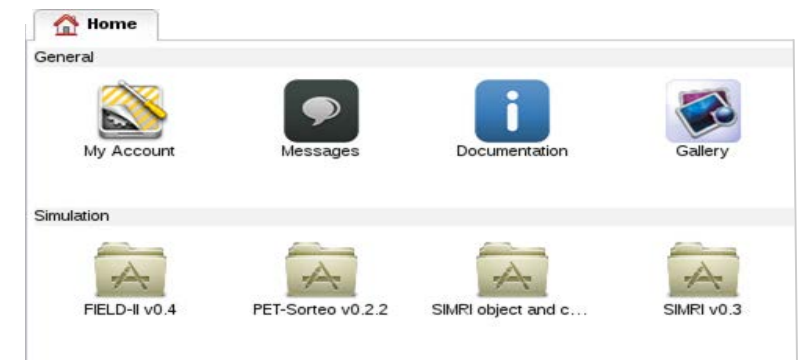
Web  
 portail

# VIP

- Scientific applications as a Service
  - More than 20 applications publicly available
- Transparent access to computing resources
  - 395 CPU years (EGI biomed VO) used in 2019-2020
- Large community
  - More than 1300 registered users
- Open and reproducible science
  - Zenodo, DOIs, Containers, Boutiques



<https://vip.creatis.insa-lyon.fr/>



# Challenge Organization

- Dataset
  - 40 images released to challengers in March for training
  - 60 images used for testing (evaluation of submitted pipelines)
- Pipeline integration, execution and evaluation
  - [https://gitlab.inria.fr/amasson/lesion-segmentation-challenge-miccai21/-/blob/master/SUBMISSION\\_GUIDELINES.md](https://gitlab.inria.fr/amasson/lesion-segmentation-challenge-miccai21/-/blob/master/SUBMISSION_GUIDELINES.md)
    - build a Docker or Singularity image containing the segmentation method
    - create a Boutiques descriptor
    - make the image and descriptor available to the VIP team
  - Challengers to submit their method by end of June
  - Most evaluations executed on VIP by the VIP team in July

# VIP and the challenge

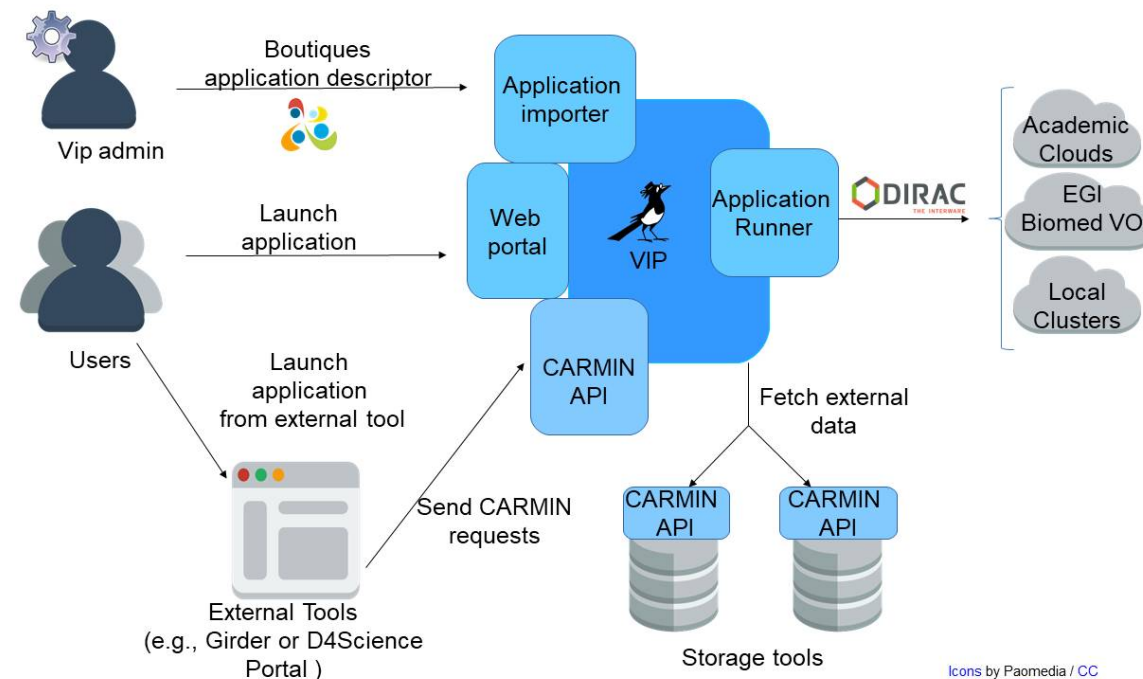
- 31 pipelines integrated in VIP for the challenge (24 teams)
- Very heterogeneous requirements
  - CPU time: from 2 minutes to 6 hours per patient
  - RAM: up to approx 64 Go RAM
  - CPU versus GPU
  - Size and availability (private/public access) of Docker images

- VIP used

- The DIRAC EGI Workload Manager Service
- EGI Cloud resources within the Biomed VO (IN2P3 IRES, CESNET, SAVBA).

The resources were « booked » during the testing duration

- A few local (Creatis) VMs



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# Handling of Docker images

- udocker
  - Very easy set-up on EGI WN
    - git clone <https://github.com/indigo-dc/udocker>
    - udocker pull camarasu/demo:0.1
  - Using CVMFS for deploying images
    - udocker import \${CVMFS\_IMAGEPATH}/demo.tar docker.io/camarasu/demo:0.1
  - Some issues with certain images, probably depending on how they were created by the challengers
    - Enforce good practices in the future
- Docker on Cloud VMs
  - Private and public images copied on the VMs
  - Docker installation according to the needs (GPUs vs CPUs)



# Wrap-up

- MS new lesions detection and segmentation: a very difficult task
- Info on pipeline evaluation and results <https://portal.fli-iam.irisa.fr/msseg-2/challenge-day>
- Pipeline integration and execution on VIP
  - 31 pipelines integrated using Docker images and Boutiques descriptors
  - Challengers tested and validated the pipeline execution on training images
    - Simple and user-friendly access through the VIP Portal
  - VIP team executed pipelines over the 60 patients of the testing set
    - Automation using of the CARMIN API
  - Use of Dirac and EGI Cloud resources

# Acknowledgments

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- CVMFS: Jose Caballero Bejar
- Dirac: Andrei Tsaregorodtsev, Vanessa Hamar

