# Transfer and Translation of Computer Vision Research

Dr. Abhishek Dutta
Senior Research Software Engineer
Visual Geometry Group (VGG)
adutta@robots.ox.ac.uk

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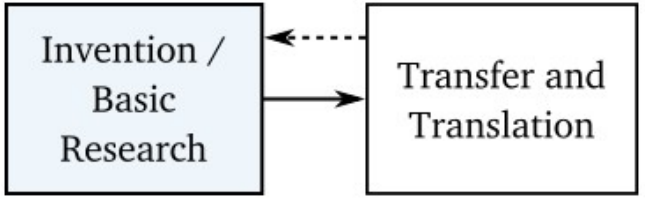
# What is “Transfer and Translation”?

- Build research software tools based on research outcomes.
- Showcase these advanced tools and support their integration in academic and industrial projects.



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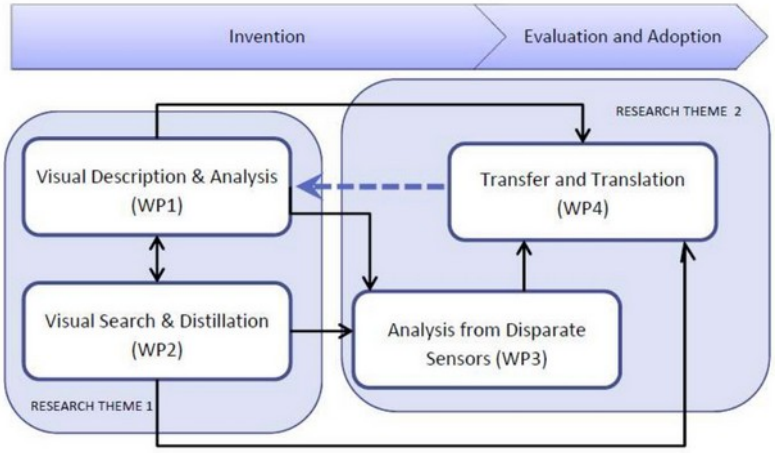
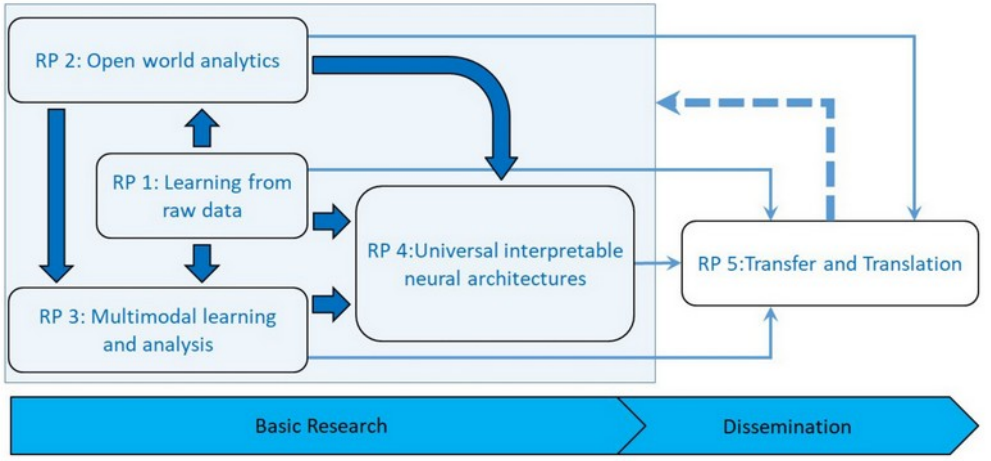



Seebibyte Work Packages (WP)
2016 to 2020




Visual AI Research Projects (RP)
2021 to 2026

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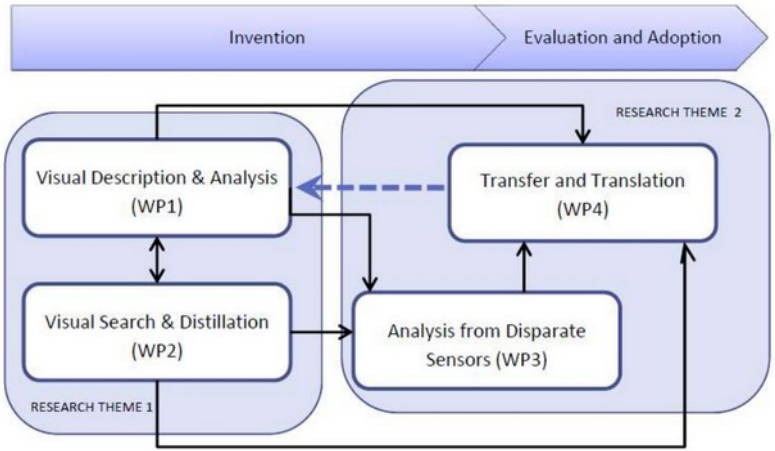


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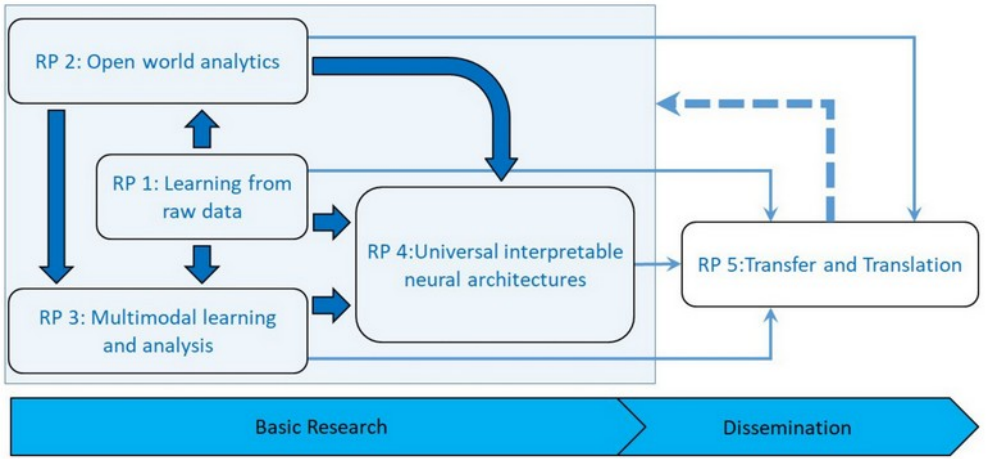


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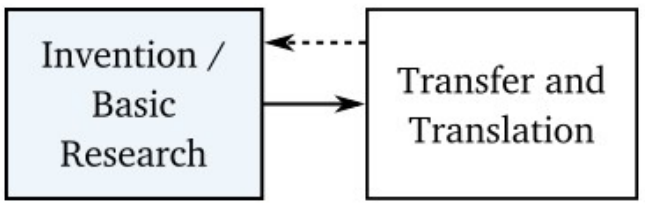


Simplified View

# Outline of this talk

- Overview* of how we pursued “Transfer and Translation” for the Seebibyte project (2016 to 2020).
- Proposal for how we should pursue “Transfer and Translation” for the VisualAI project (2021 to 2026).

* based on my perspective and experiences, my colleague (Ernesto Coto) will share his thoughts in the next talk.

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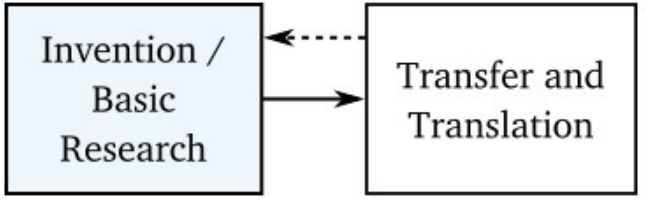

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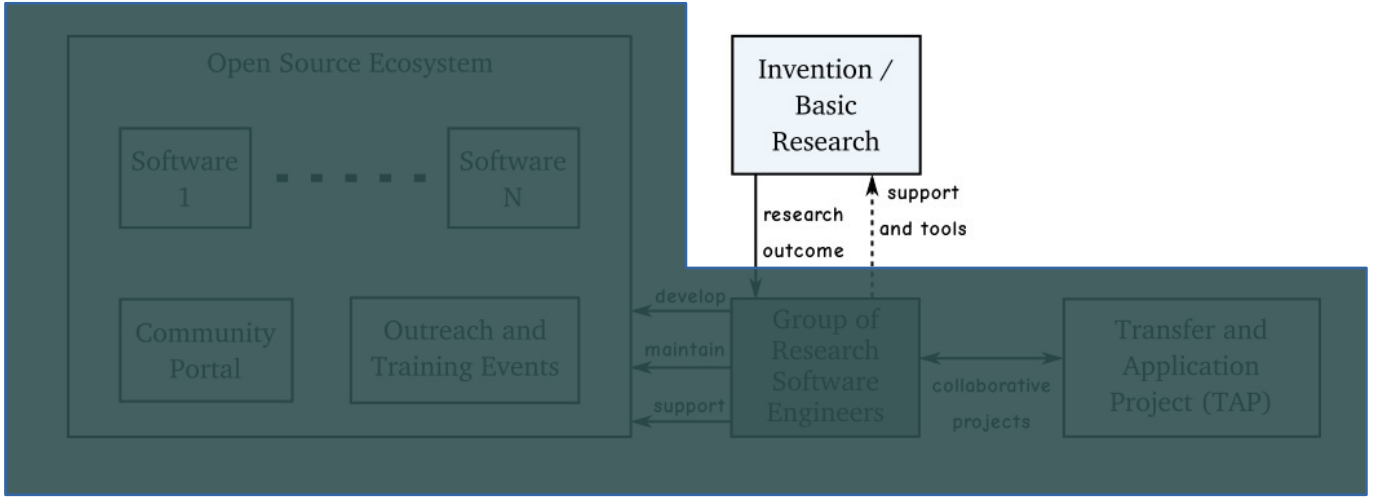


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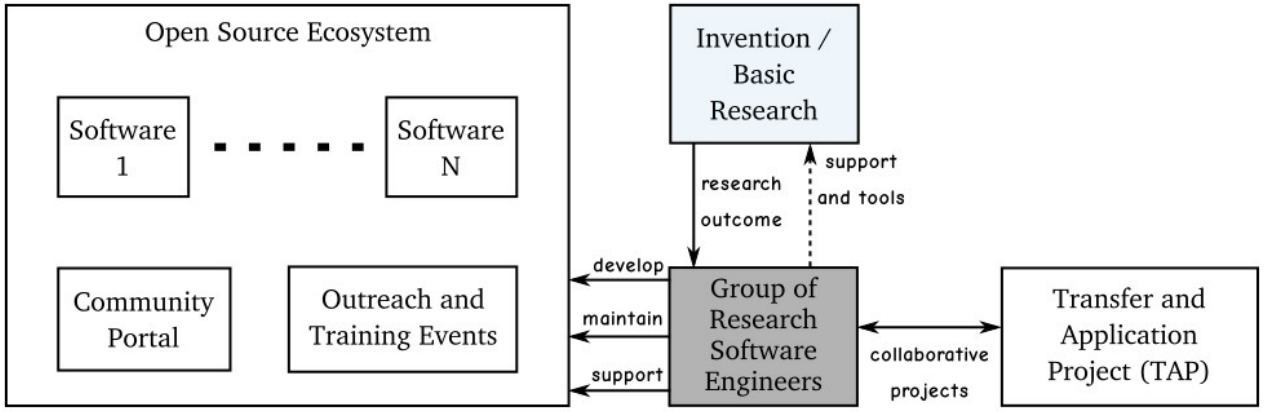

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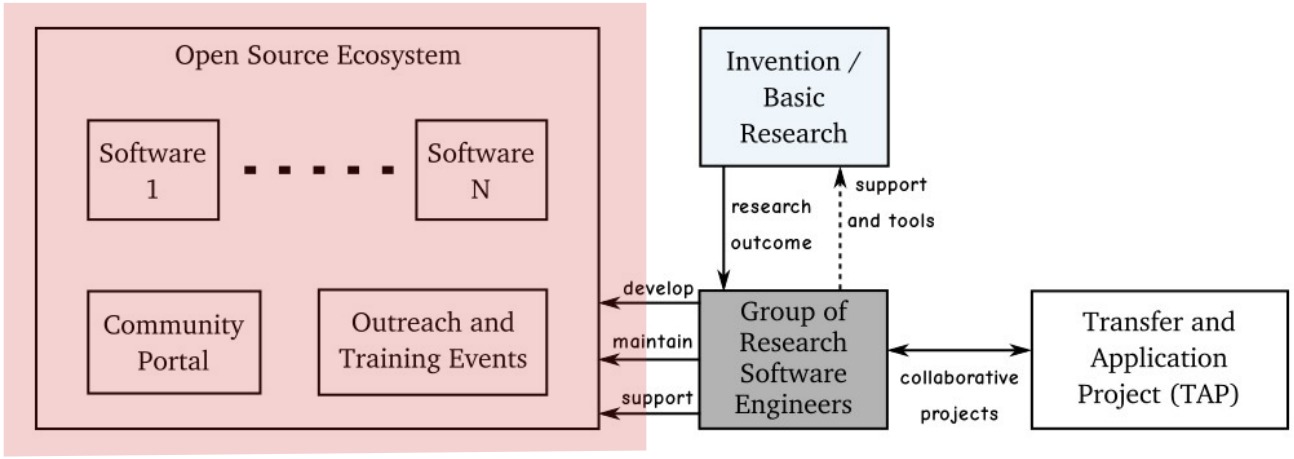


- We developed, maintained and supported many open source software tools based on research outcome of our team's inventions and basic research.
- We nurtured an open source ecosystem around these software tools
  - Community portal : report feedback and issues, contribute code, …
  - Showcase: show and tell events, summer school, workshop, conference, etc.

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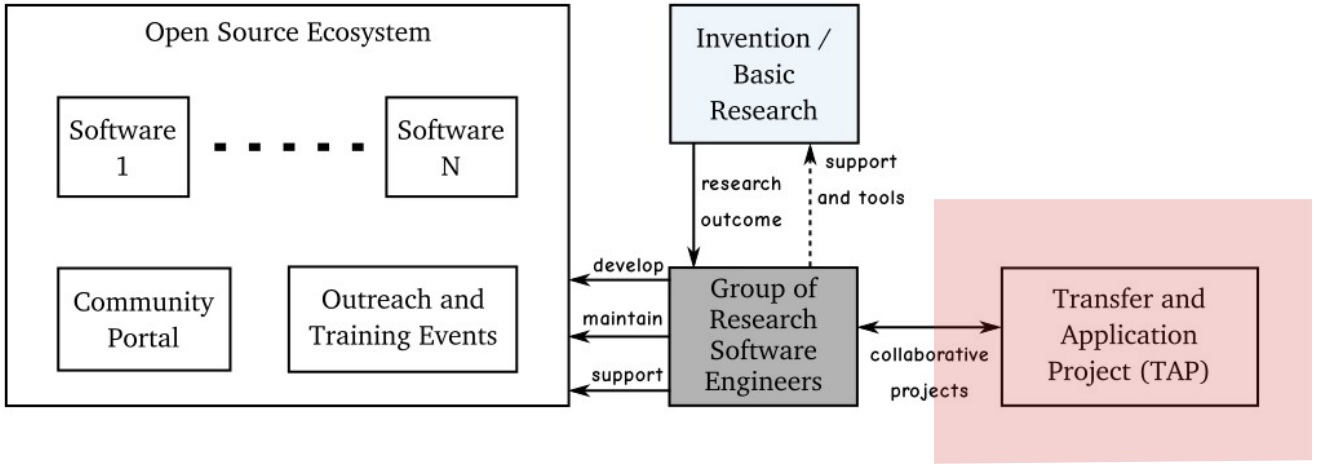


- We collaborated on a large number of interdisciplinary academic projects that applied our software tools to answer novel research questions.
- Multiple companies benefited from our support in managing their digital assets (e.g. images)
- We authored blog posts, case studies, conference and journal papers describing these collaborations.

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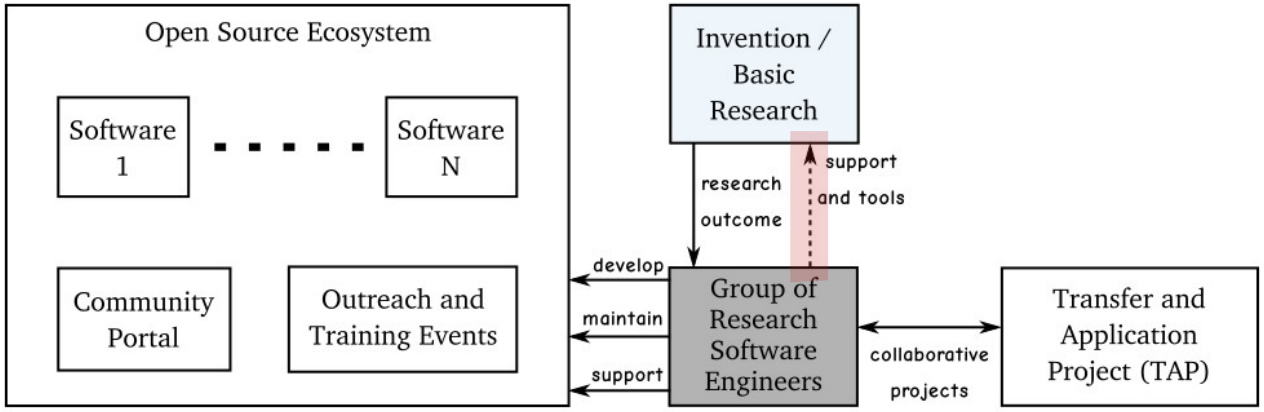


- Some of our tools also helped support invention / basic research:
  - Our object tracking software is being used in multiple projects,
  - Our manual annotation tools (e.g. VIA, LISA) enabled creation of many datasets in computer vision.

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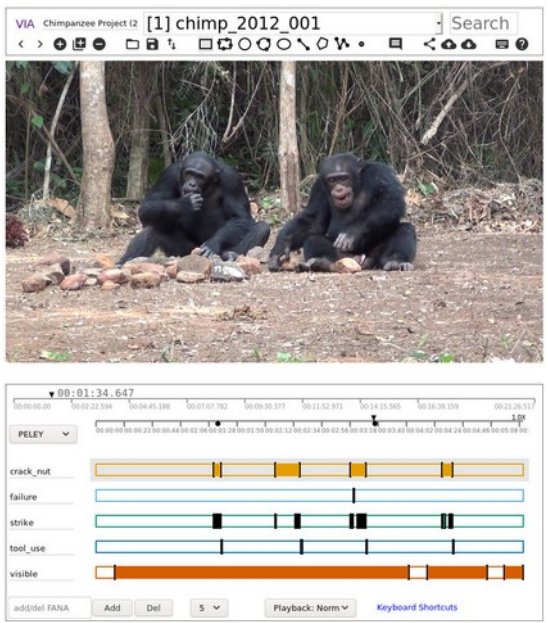
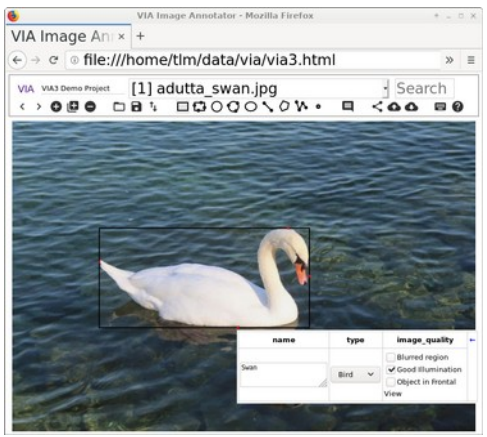
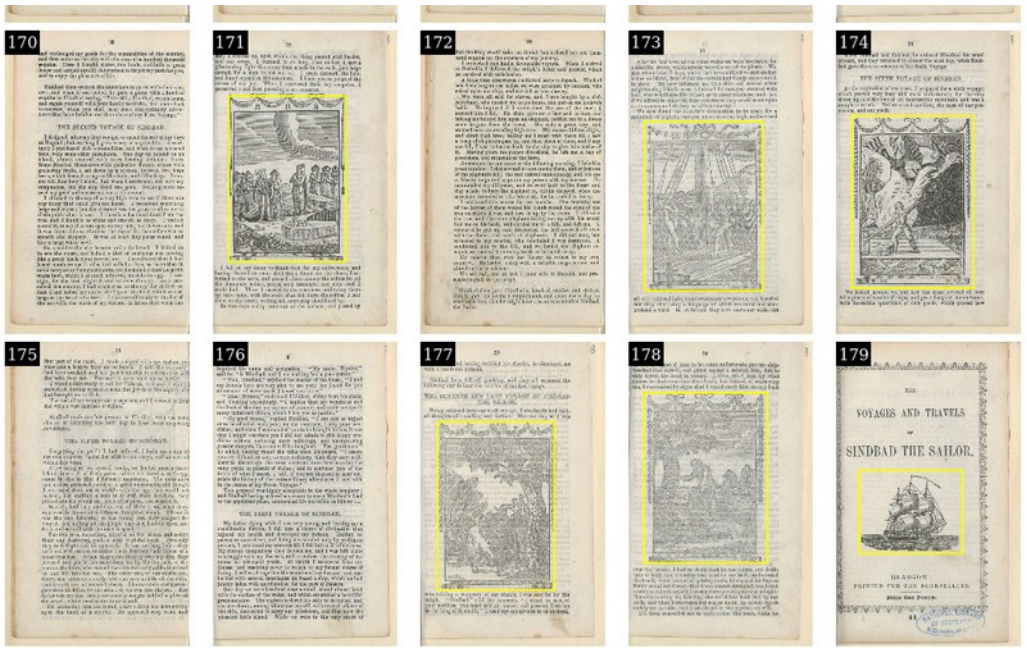



VIA Video Annotator




VIA Image Annotator




List Annotator (LISA)

VIA suite of tools have been used more than _____ times since its public release in 2017.

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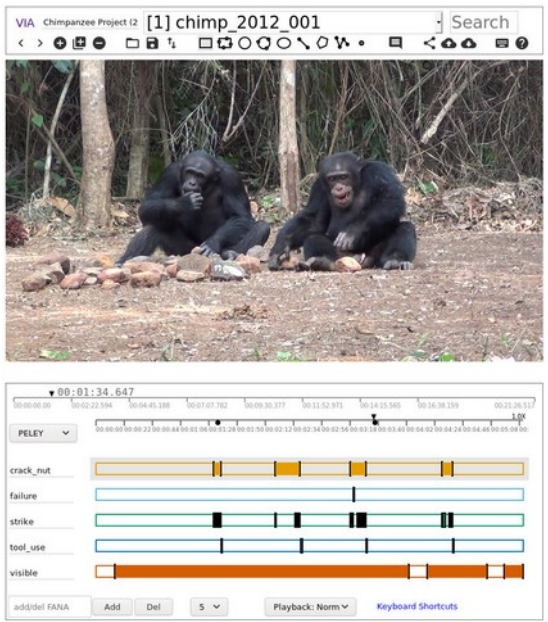


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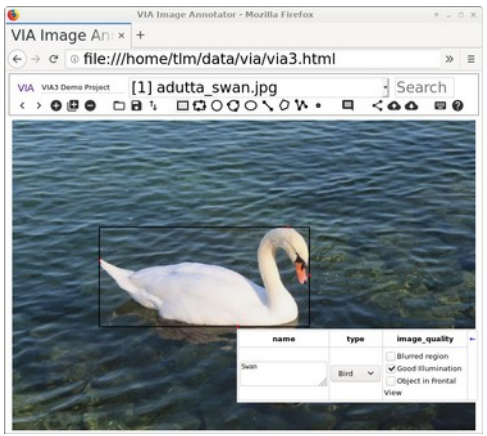


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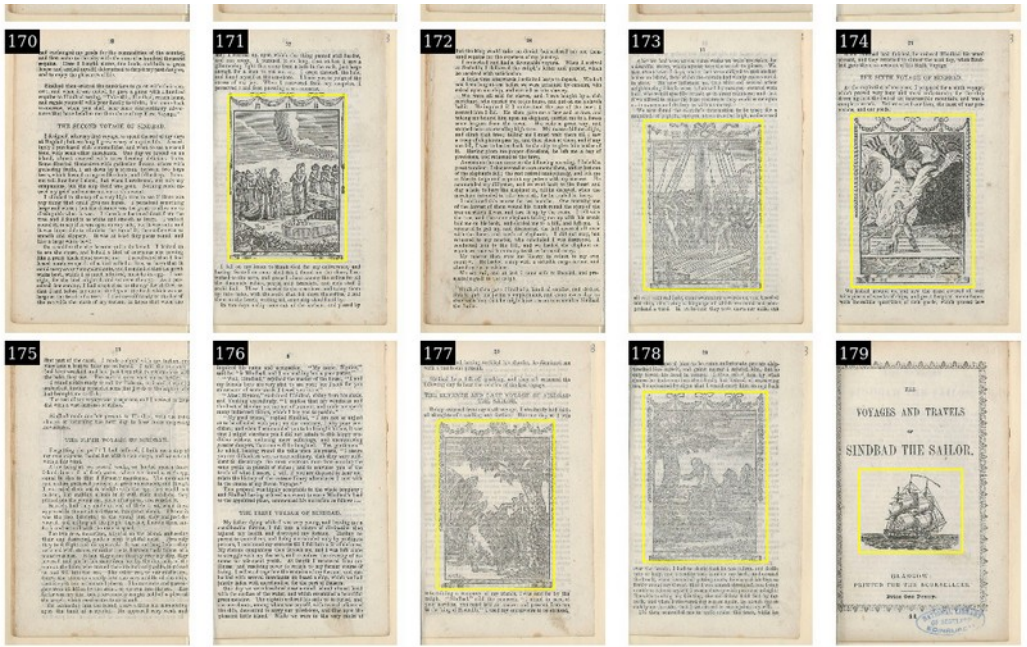


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VIA suite of tools have been used more than 4,000,000 times since its public release in 2017.

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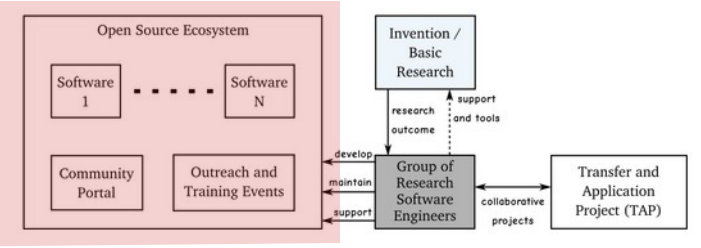


## Learnings from our success

## Learnings from our failure

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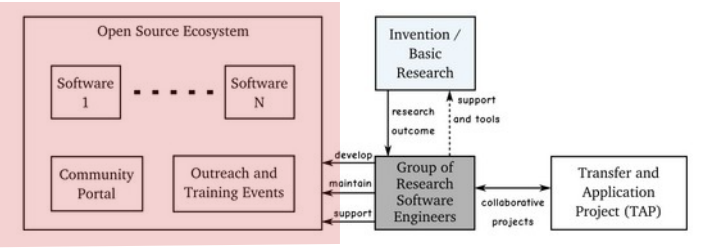


## Learnings from our success

- Impact and adoption of research software tools can be improved by making them:
  - Easy to install and setup,
  - Stable and easy to use,
  - Easy to fix, modify and extend.
- You don’t always need the state-of-the-art algorithms to enable revolutionary workflow changes in other academic disciplines:
  - Hessian-Affine, SIFT, RANSAC, thin plate spline, Bag of visual words, …
  - We will retain them as we introduce state-of-the-art methods in our tools.

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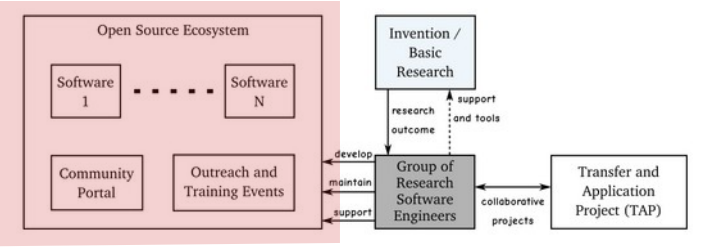


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## Learnings from our failure

- Installation, setup and user interface of one of our image search software was very complex and the software was unstable.
- We still managed to use it for a large number of collaborative projects by isolating our collaborators from all technical aspects of the software.
  - While you work to improve your software, try to shield users from all the complexities by providing full technical support.
  - It drained a lot of our time and resources that could otherwise have been used to improve our software.

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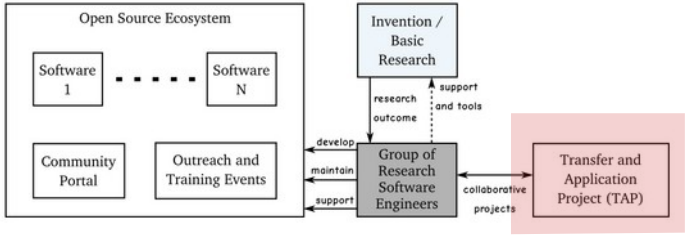


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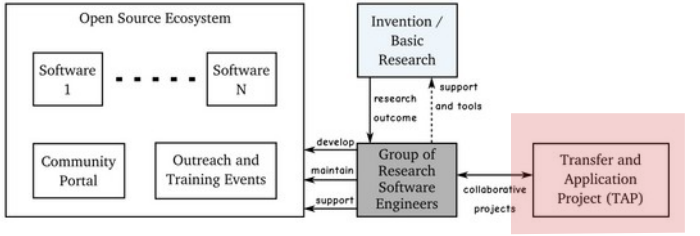


## Learnings from our success

- Our ambassadors are:
  - the key to unlock new collaborations,
  - the bridge to reach new communities.
- It is very important to write (blog, papers, etc.) and engage with users through workshop, summer school, conferences, open source community events, etc.
- There are long term benefits of gaining the trust of our users through continued support and high quality software.

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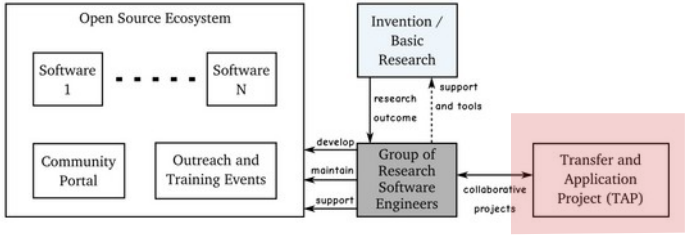


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## Learnings from our failure

- Everything we do (software, support, etc.) are available for free. People often wonder why and how. We could communicate this more clearly in our events and website.
- We had less collaboration with the industry. I do not fully understand why. Possible reasons may be:
  - Industry prefers production ready software and relies on availability of professional support
  - Different priorities and constraints
  - We need new contacts and new ways to build closer relationship with industry

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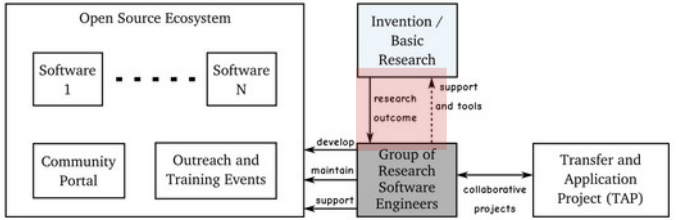


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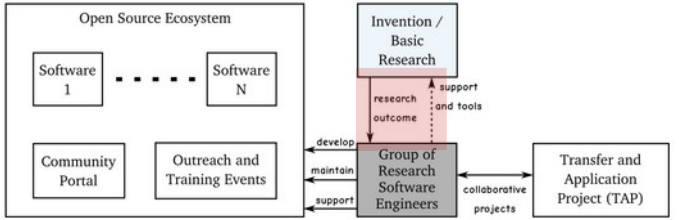


## Learnings from our success

- It is important to have a symbiotic relationship between researchers and research software engineers (RSE)
  - We don’t only take from researchers but also give back our support and tools to help with their basic research
  - Such healthy, sustainable and a balanced relationship is a source of immense satisfaction for the RSEs

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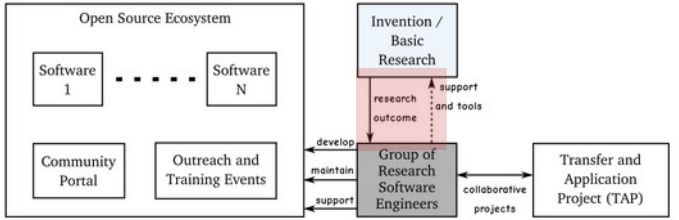


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## Learnings from our failure*

- Provide an independent set of eyes on the research code:
  - This will help ensure that any programming issues can be identified and reported timely.
  - We have a large and vibrant open source community around our tools. Our users are always happy to test our tools and provide feedback in a very polite manner.

* : got to learn to this recently from Sam Albanie’s talk last week

# Outline of this talk

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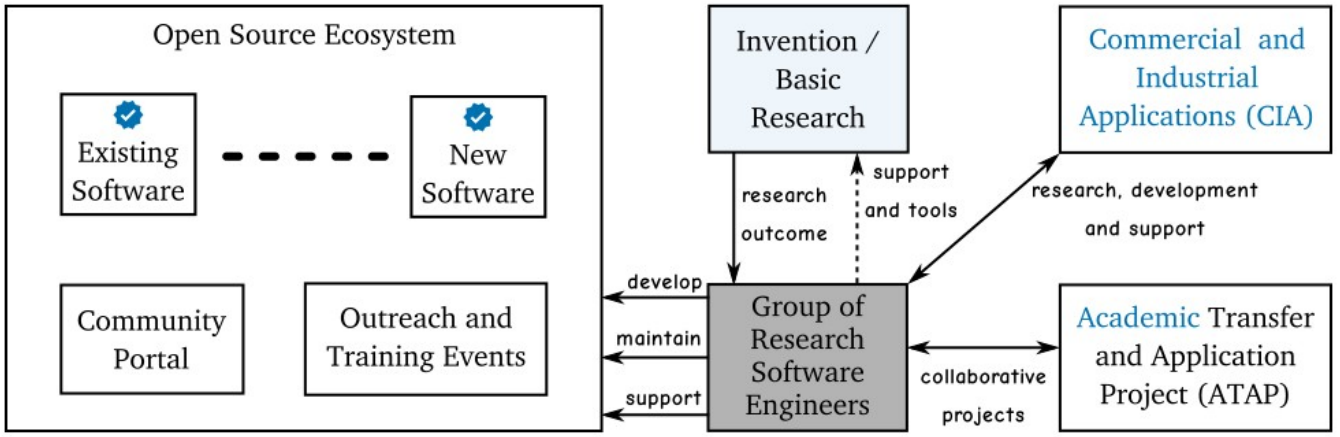

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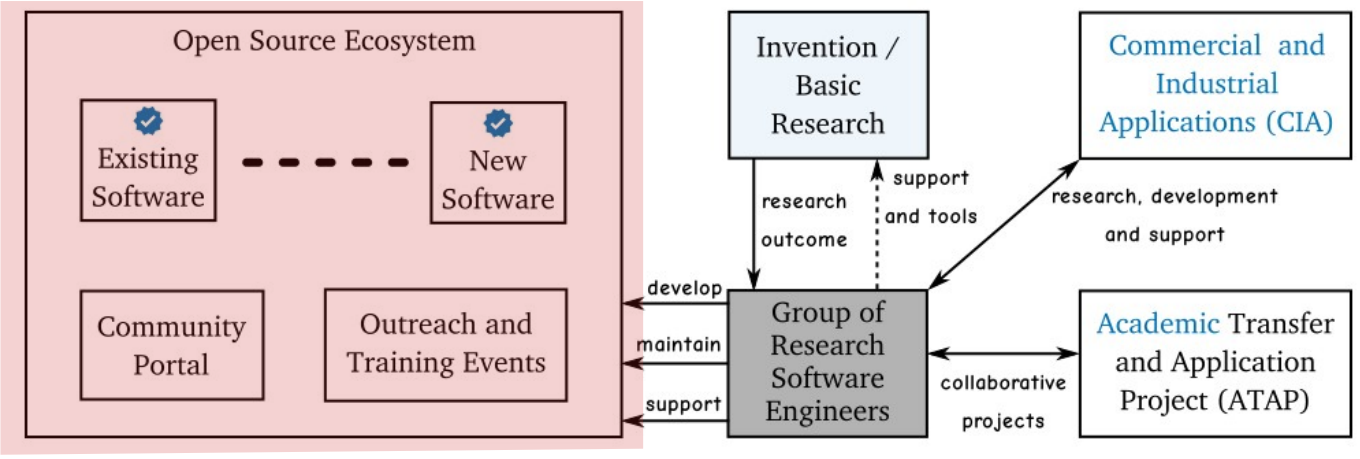


- Allocate more resources for developing test suites and systematic testing of both existing and new software tools to make them production ready
  - For example openresty, sqlite, …
  - It is a lengthy process and requires consistent effort in the next 5 years.
  - We want to be known for developing high quality and robust software tools.

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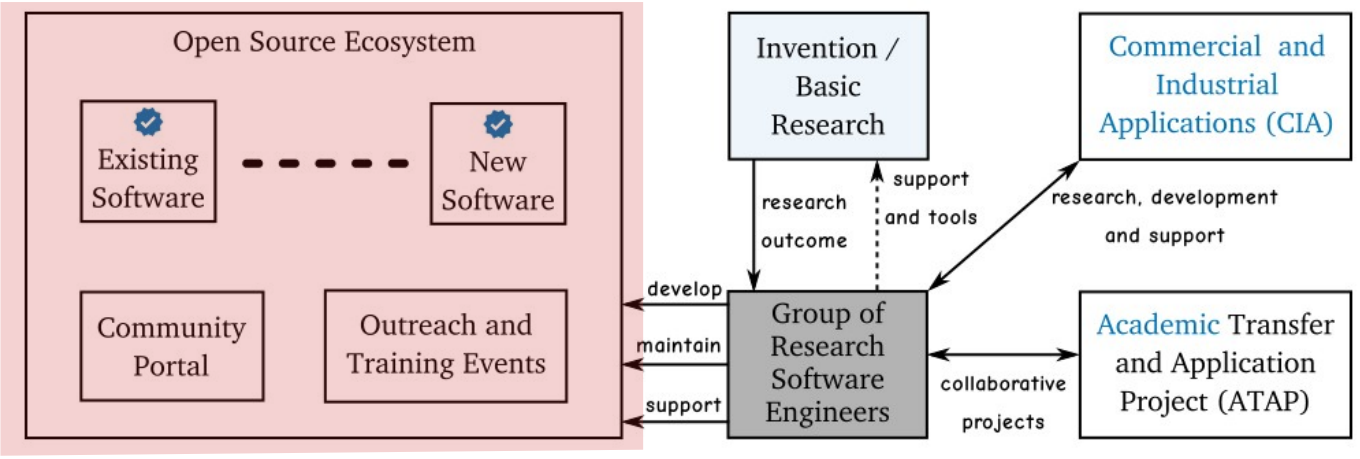


- Improve the capability of existing tools by exploiting new developments in computer vision
  - e.g. better performing region detectors and feature descriptors, faster methods for nearest neighbour search, etc.
- Develop new tools based on research outcome (e.g. visual transformer)

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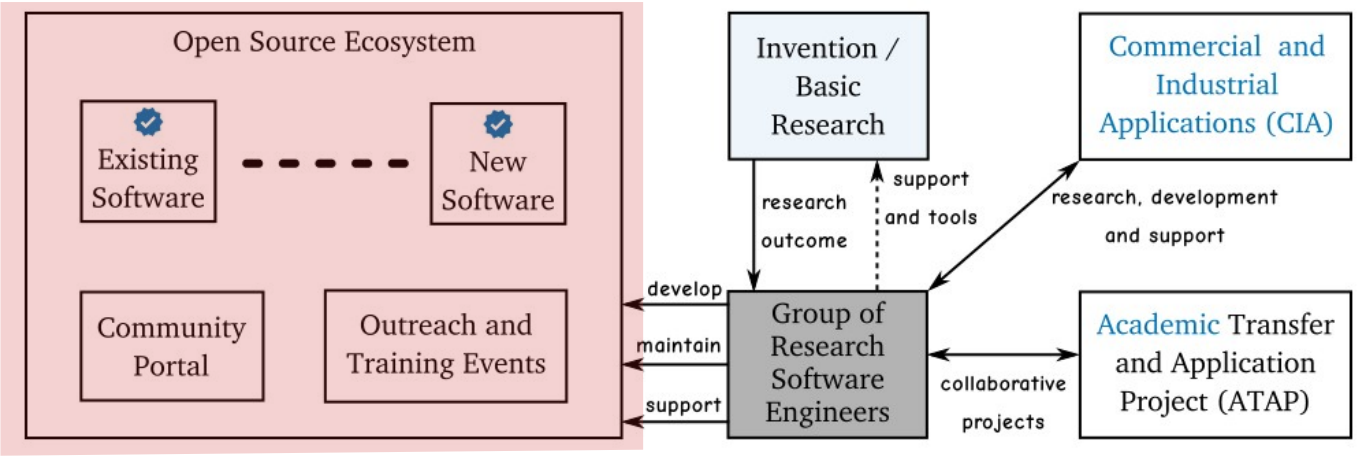


- Continue nurturing open source community with the following in mind: Can the open source project sustain if we suddenly stop contributing to it?
- Outreach
  - Encourage our collaborators to spread the word about our software tools by writing (e.g. blog posts, papers, etc.) about our collaborations.

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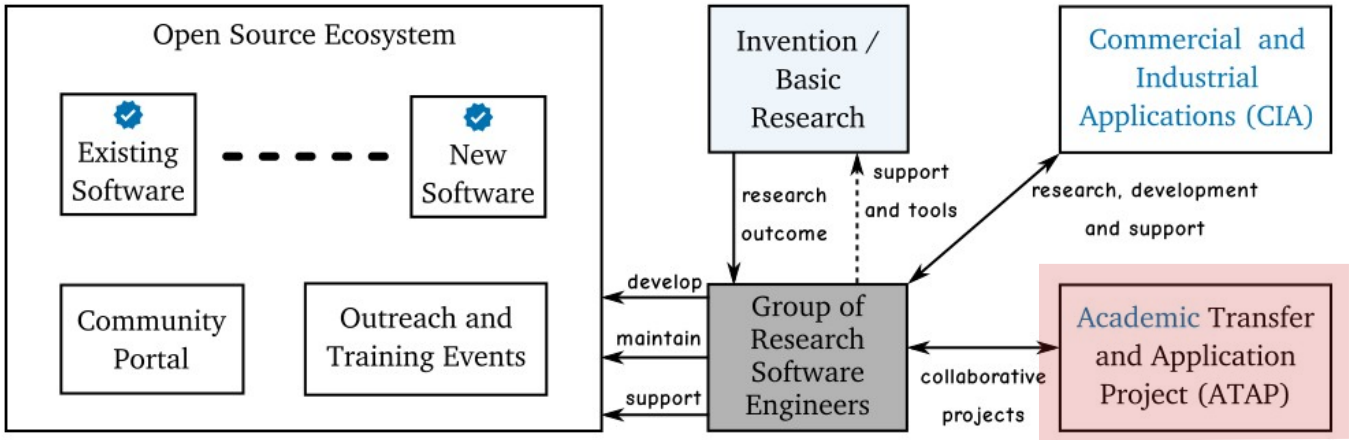


- We can be proactive in seeking new collaborations.
- For example, when we develop a new capability (e.g. accurate search of videos using keywords or automatic transcription of video, etc.):
  - We should brainstorm on who will be able to use these capabilities for their academic research or industrial projects (e.g. BFI, British Pathé, BBC, etc.)
  - Reach out to those communities and understand if they really want it.
  - Develop tools to bring those new capabilities to their computing devices (desktop, mobile, etc.)

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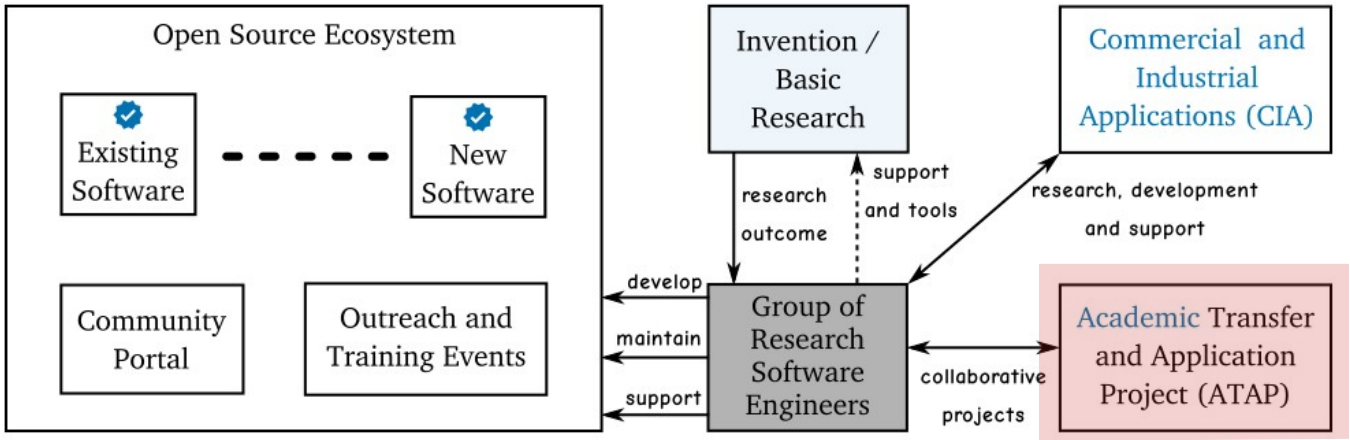


- Detect → Identify → Track is a common workflow in many research discipline (e.g. Zoology, Entomology, etc.). If we can build an easy to install and easy to use tool to address this workflow, we can already reach many more new academic research communities.
  - if our software can detect a fish (or an insect), mark it as a novel category if unseen during initial training, allow users to retrain the system incrementally, ...

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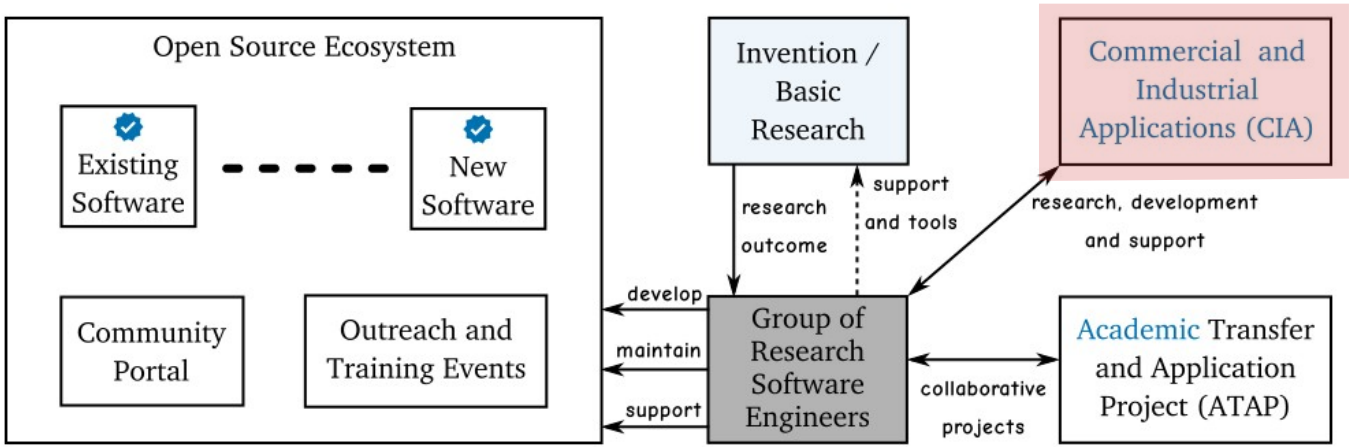


- Why doesn’t the BBC (or any other company which has lots of images or videos) not use our software to manage and search their video collection?
  - Can we provide quality assurances to show that our software is production ready? Can we provide professional support for our tools?, ...
- Or, why doesn’t a company that develops tools to manage digital assets use our software as libraries in their software?

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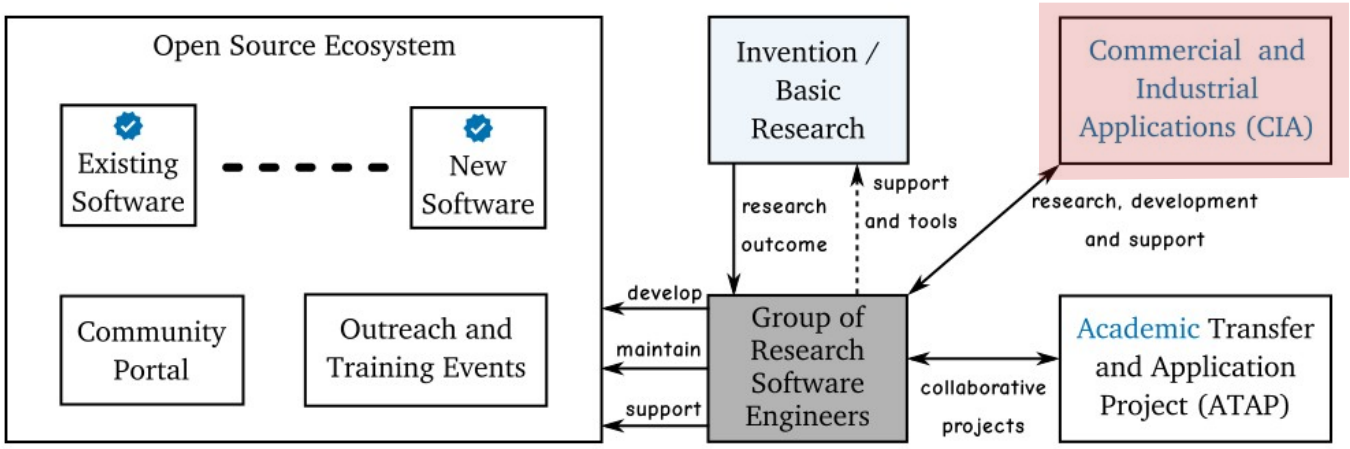


- If they don't come to us, let us go to them and learn what is stopping them from coming to us:
  - Organize show and tell or a workshop in the R&D lab of a company
  - Send a research software engineer on a day's visit to their R&D lab,
  - ...

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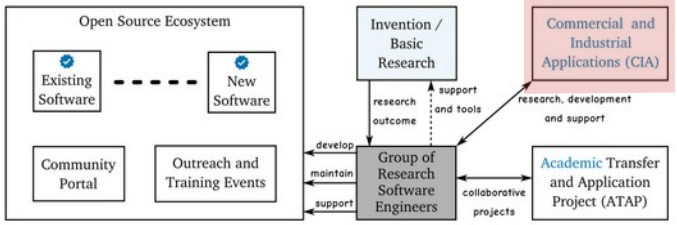
- Often, it is something trivial that is causing the friction. Here is an interesting story from our deduplication project with the Ashmolean museum in 2019:
  - Several TB of images, easiest solution was to network transfer their files, required granting access, deduplication had to complete in 2 months time because they were migrating their data to a new system.
  - During the meeting, the data access permission sounded like a complex process that could last several weeks (if not months). We also faced the famous question, "*What is in it for you? Why are you doing this for free*". (though a more polite version)
  - To speed up the process, we offered two things:
    - Gave them our hard disks in which their technician can copy the files manually
    - Offered a written commitment (over email) that the images will only be used for this project and nothing else (I have already deleted all the images)
  - Data transfer took 10 days and required two cycling trips to the Ashmolean museum.
  - We identified duplicate and transformed image copies and shared our results well before the deadline.



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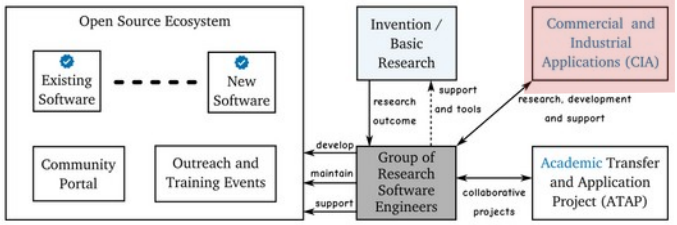
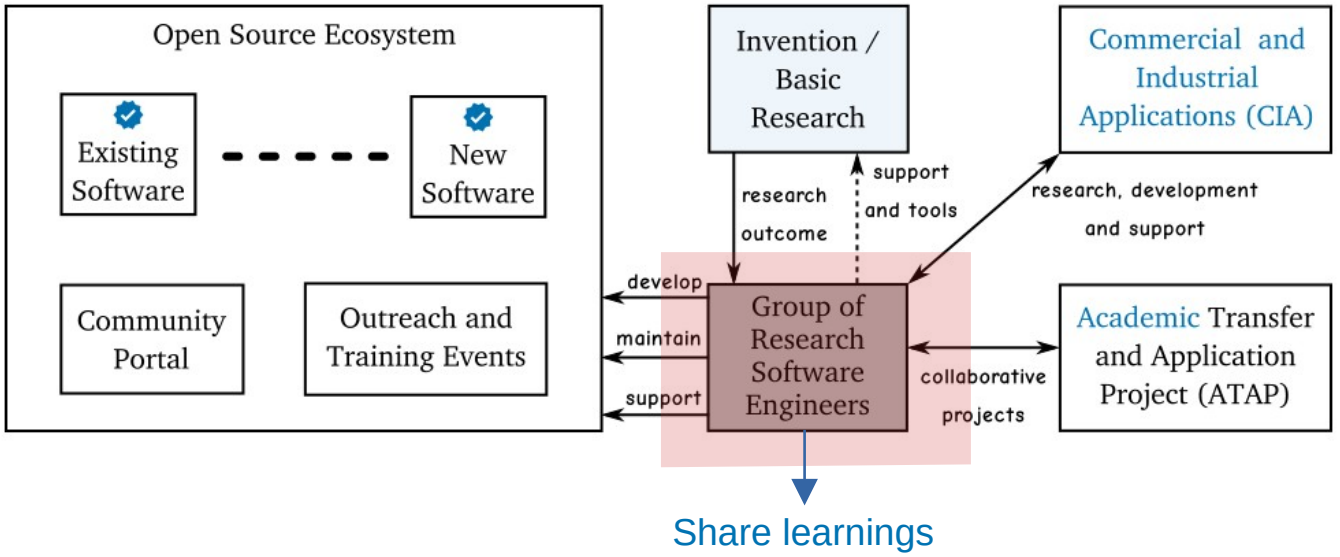



"… this results in approximately a 1Tb saving in storage requirements. … this is a significant saving in time and effort for the Ashmolean made possible by the VGG" – Chris Powell, Nov. 2020

# Contribute to Research Software Engineering




- We are uniquely placed to experience, observe and contribute to the software engineering practices for research software development.
- We will also share our learnings in the form of blog posts, research papers, etc.

# Thank You

Jenny Hu
Senior Research Manager

Ashish Thandavan
Senior HPC Systems Administrator

- Jenny:
  - shields us from all the administrative complexities and
  - ensures that we get everything we need on time and without much friction.
- Ashish:
  - ensures that our computing requirements are ready before we need them and
  - shields us from the technical complexities of a large scale computing infrastructure

# Questions