

# Cloud-based Collaborative Development Environments for Research Software Tools and Applications

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Software industry has started adopting cloud-based development environments, such as Eclipse Che and Amazon Cloud9, for collaborative software development, documentation, debugging and testing. Source files, documents and program results can be combined with Jupyter notebook accessible from web browsers. Google doc and overleaf have gained their popularity with features of co-editing, i.e. allowing multiple persons working on the same document and one can see editing and cursors of others from remote locations. Tools for continuous integration, such as Travis CI, also become cloud-based such that testing is triggered on cloud servers when commits are pushed to the source code repository. Those tools significantly improve development productivity and reduce the amount of human involvement for routine setup and maintenance tasks.

Due to the collaborative nature, software tools and applications for scientific research should consider cloud-based development, documentation and testing. While there are concerns of using a cloud-based IDE such as the cost of using commercial cloud services and the privacy of codes stored in public cloud, the benefits are tremendous, such as:

1. Enabling real-time co-development on the same project, reproducing results, and co-debugging of a problem from the same session;
2. Enabling access to a development environment using a web browser from anywhere;
3. Improving the productivity by using and sharing of complex scientific software/hardware stack needed to develop tools and applications;
4. Facilitating training of students and new developers;
5. Enabling quick access to special hardware (such as latest GPUs) without paying the cost of buying the hardware;
6. Enabling seamless connection with other cloud-based services such as source code; hosting, continuous integration, and deployment of tools as cloud-based service.

We plan to present an online demo using a Cloud IDE for the audience. We would like to bring attention to the community this trend in software industry and generates discussion about the following topics:

1. If you already use cloud-based developments, what are your experiences?
2. The pros and cons of using cloud-based environments for CDI software and tools?
3. Would you or your group consider to experiment cloud-based IDEs such as Cloud9 or others?
4. If we agree that cloud-based IDE would (significantly) help improve research productivity, what actions we should take to help the community to adopt?
5. Do we need to bring the attention to the funding agency to support these actions, and what kind of support do we need?