Literate Computing for Reproducible Infrastructure

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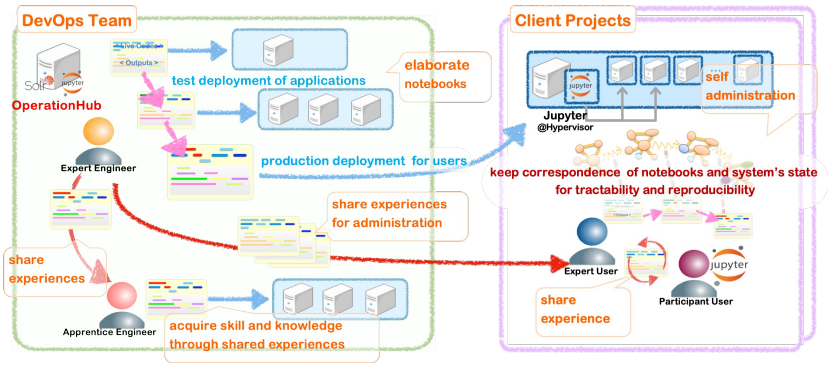
Reproducibility Extensions for Jupyter Notebook

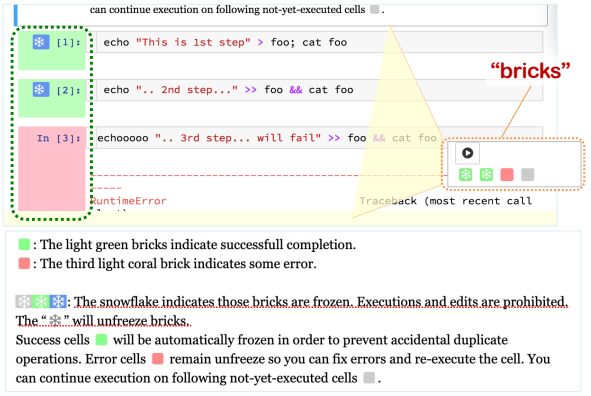
Literate Computing for Reproducible Infrastructure (LC4RI) is our daily practice for managing IT infrastructure. The NII cloud operations team, a small DevOps group, operates over 350 nodes built on OpenStack and provides cloud computing and storage stacks as services. For reproducible research, it is essential to share infrastructure design and detailed IT workflows with participants, as well as to automate complex operations.

LC4RI uses **Jupyter Notebooks** to share reproducible IT workflows, enable collaboration within DevOps teams, and provide reproducible IT environments for research projects.

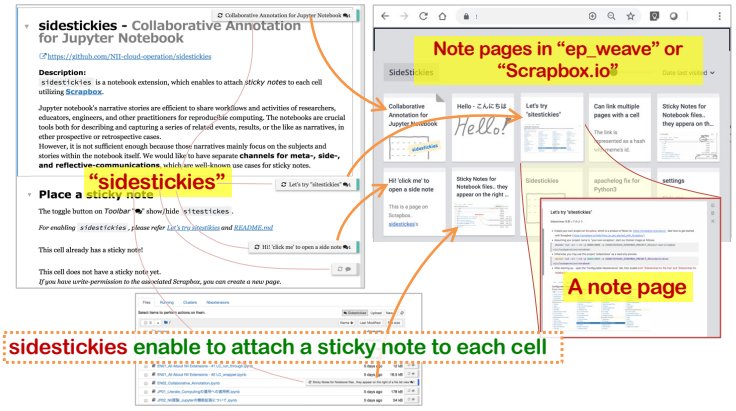


Reproducibility Extensions for Jupyter Notebook: Jupyter Notebook was designed initially as a non-linear explorative computing tool, typically for data-driven scientists. As a countermeasure to ensure robust, traceable, and reproducible IT operations, the "Semi-Linier Extension" constrains arbitrary cell executions into semi-linear orders and records throughout loggings. As for consolidating and flexible remarks, "sidestickes" enable collaborative annotation across notebooks.

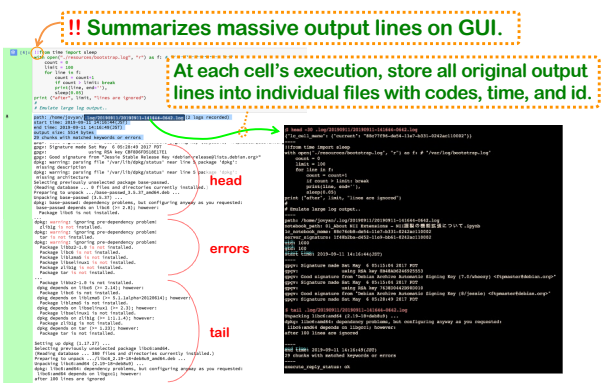
"Semi-Linear Extension" for IT Operation



"sidestickes" Enable Flexible, Collaborative Annotation

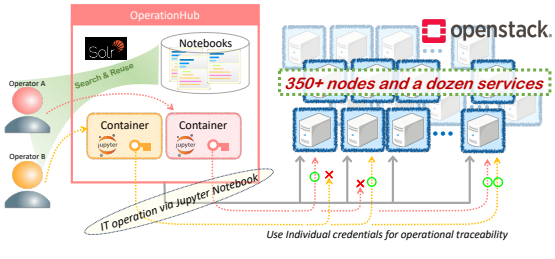


Throughout Loggings for Operation Trails



350+ nodes are managed via OperationHub

OperationHub is a tailored JupyterHub for DevOps instead of *sshd* on the management server. It provides segregated Jupyter containers for individual operators and mechanisms for Notebook sharing and reuse.



Try on MyBinder

https://mybinder.org/v2/gh/NII-cloud-operation/Jupyter-LC_docker/sc-demo?urlpath=tree

National Institute of Informatics
https://literate-computing.github.io/

SC24 Atlanta, GA hpc creates.