

Research on a Web-based Programming Learning Environment

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Web-based programming learning support systems offer the following benefits.

- For learners, no installation or configuration is required.
- For teachers, it is easy to update the content.

On the other hand, existing systems have disadvantages such as limitation of supported programming languages and libraries. Actually, Web-based learning support systems are necessary for minor programming languages. To overcome this difficulty, we have developed systems called WappenLite (<http://guppy.eng.kagawa-u.ac.jp/WappenLiteVer2/>) and WappenLiteDocker (<http://guppy.eng.kagawa-u.ac.jp/WappenLiteDocker/>).

WappenLite enables Java virtual machine-based programming language processors to be manipulated from a browser; WappenLiteDocker uses Docker to securely run programs created by learners (Figure 1).

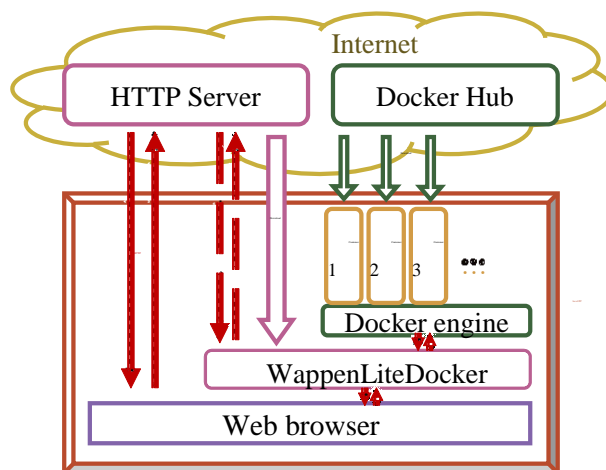


Figure 1: Structure of WappenLiteDocker

WappenLite supports various Java virtual machine-based languages. WappenLiteDocker, on the other hand, supports programming languages (C, Python, Haskell, Scheme, Prolog, etc.) that run on Docker containers. Both systems share the following features.

- The user interface is written in HTML + CSS + JavaScript and can be easily customized by teachers.
- The language processor can be executed on the client PC side as well, so there is less burden on the server.

We also utilize Blockly (<https://developers.google.com/blockly/>) (Figure 2) for the user interface.



Figure 2: Screenshot of Blockly Editor

We designed some Blockly blocks for minor programming languages.