the student's home directory, are automatically packaged when the student completes the lab. These packages of artifacts are then transferred to the instructor, (e.g., via email or a LMS), and ingested into the instructor's system where lab assessment occurs. Timestamped stdin and stdout files are captured in `$HOME/.local/result`

By default, stdin and stdout for all non-system programs is captured, e.g., the results of an "ls" command are not captured. The stdin and stdout of system programs[14] will be captured if the program names appear at the beginning of a line in the *treataslocal* file at

> `$LABTAINER_DIR/labs/[labname]/[container name]/_bin/treataslocal`

The basename of the treataslocal entries are compared to the basename of each command. [15]

Non-system programs can be excluded from stdin/stdout capturing by including their names in a "ignorelocal" file in that same directory. [16]

The student commands are parsed to first account for the use of `sudo`, `time`, `python` or `python3`. The commands are also processed to account for the use of pipes and redirection.

6.1.2 Capturing program file output

Sometimes program file output is of interest to automated assessment, e.g., the program may not have useful stdout. The treataslocal entries can include optional output file identifiers that cause timestamped copies of specified files to be made whenever the named program terminates. If program file output from local programs is to be captured in timestamp files (in addition to the stdout and stdin), simply include those program names in the treataslocal file. These output file identifiers are of the form:

```
program    delim_type:delim_value
       where delim_type is one of:
           starts -- the output file name is derived from the
           substring following the given delim_value within the
           command line typed by the student.  For example,
           "dd starts:of=" for a command line of
           "dd in=myfs.img of=newfile" would yield an output
           file name of "newfile".

           follows -- the output file name is the command line
           token following the given delim_value.  For example,
           "myprogram follows:myprogram" for a command line of
           "myprogram outfile" would yield "outfile" as the output
            file name.

           file -- the delim_value is the output file name
```

The resulting timestamped files are located with the stdin and stdout files in .local/result

6.1.3 Bash History

The framework collects all student bash history into the `$HOME/.bash_history` and `/root/.bash_history` files. These files are available for reference as an artifact file.

---

[14]The "source" directive is not a system program, and should not be included in a treataslocal file.

[15]In other words, if the treataslocal entry is: `usr/bin/nmap`, the path leading to nmap is ignored.

[16]These should not include path information, just the program name.