

开源自动化测试工具 openQA 在 openEuler RISC-V 测试中的使用

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openQA 简介



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Welcome to openQA

Life is too short for manual testing!

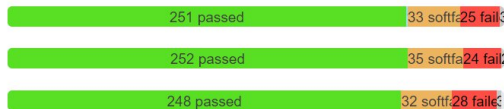
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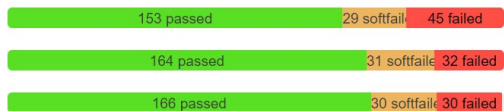
openSUSE Tumbleweed

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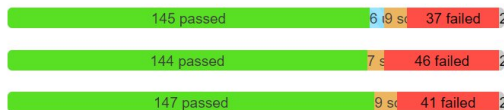
openSUSE Tumbleweed AArch64

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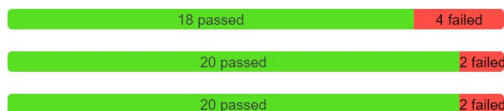
openSUSE Tumbleweed Kernel

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openSUSE Tumbleweed Legacy x86

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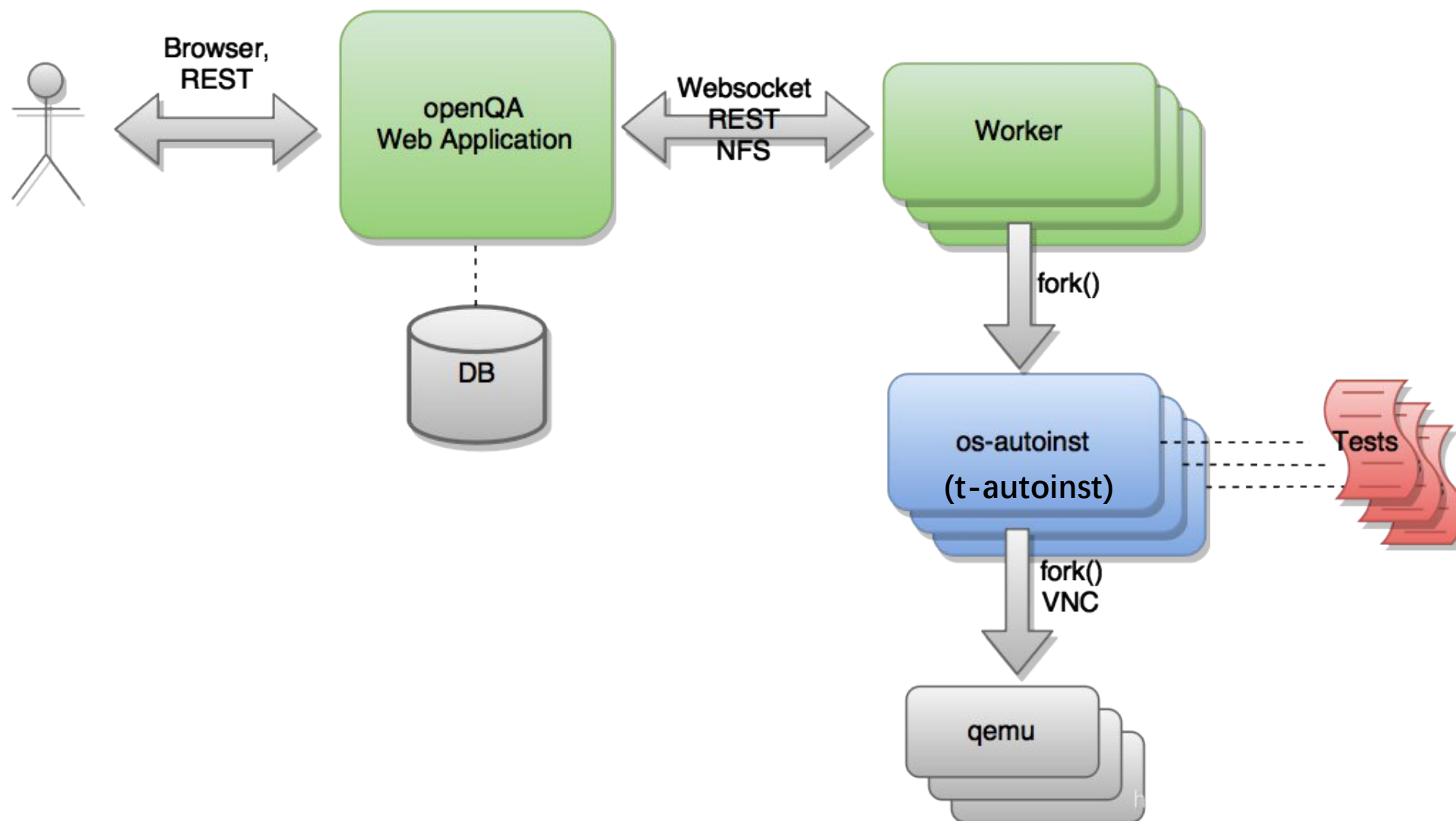


- openQA 是一个自动化测试框架，允许一方面测试 GUI 应用程序，另一方面测试引导加载程序和内核。在这两种情况下，都很难编写测试脚本和验证输出。输出可以是弹出窗口，也可以是早期引导中的错误，这个早期甚至在执行 `init` 之前。

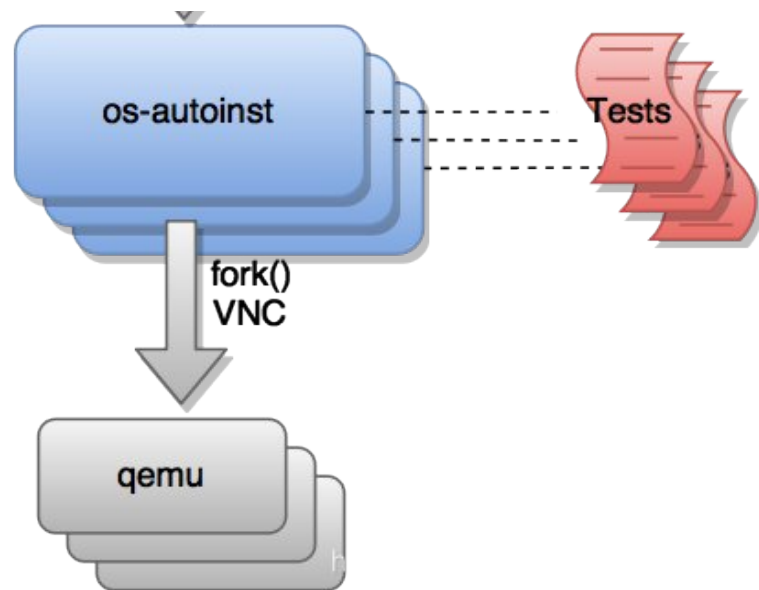
openQA 简介

- 与部分软件自带的单元测试相比，openQA 可以模拟真实用户操作自动化进行测试，属于 E2E / 端到端测试，此外，由于用户系统环境与构建环境存在不同，采用模拟用户操作的方式进行测试更贴近最终用户的使用场景，可以排查其他测试中难以发现的错误，包括一些不存在于测试目标软件本身，而是系统环境中的问题。

openQA 工作原理



openQA 工作原理



os-autoinst 定义了一系列 console 终端
大致分为以下两类:

1. serial

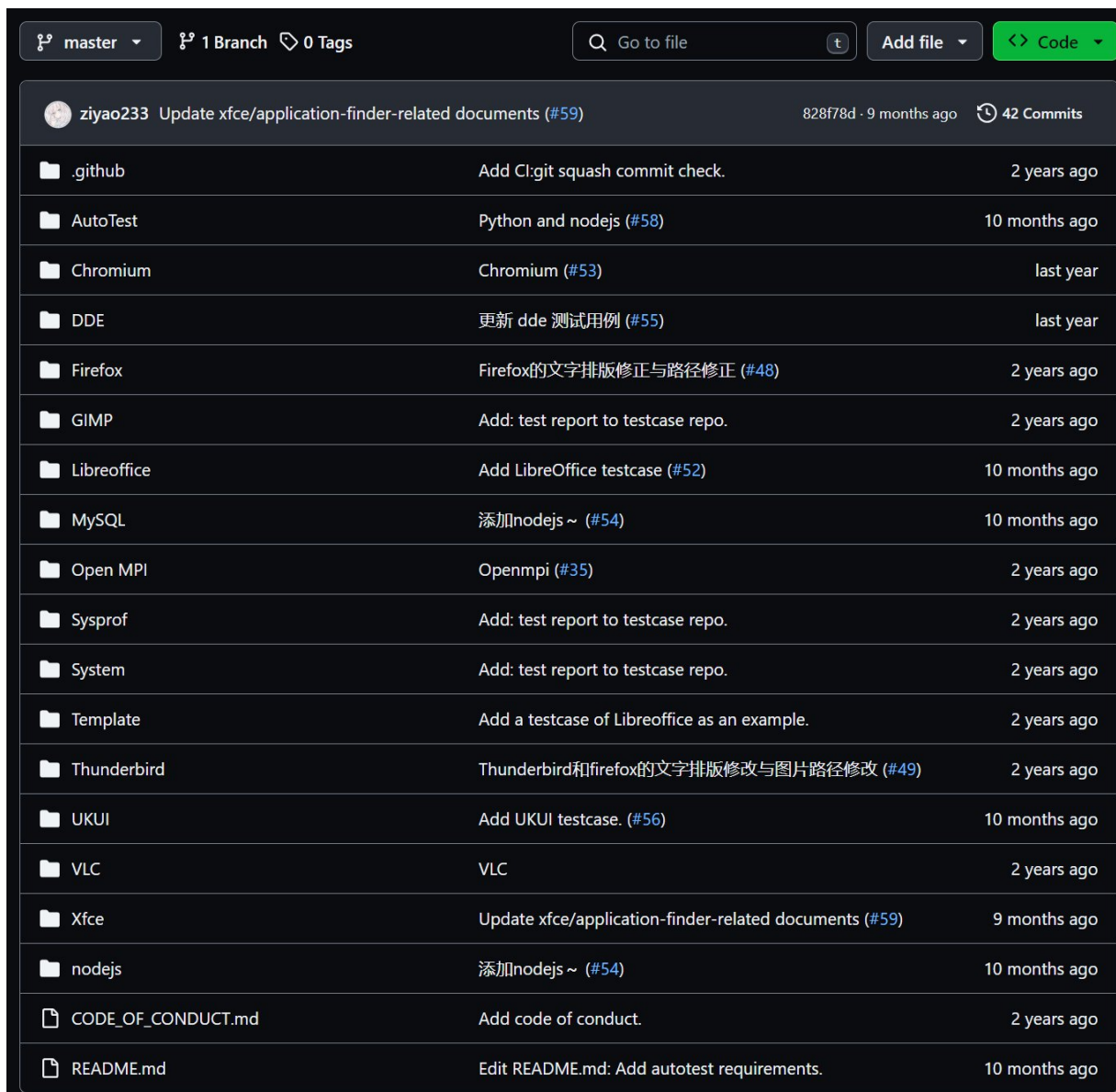
- 串口
- ssh 终端

2. video_base

- vnc
- ffmpeg 录屏

os-autoinst 通过 console 与测试机器交互, 例如读写串口, 向 qemu (运行有 vnc server) 发送符合 RFB 协议的请求模拟鼠标键盘操作

openQA 测试实例



The screenshot shows a GitHub repository interface. At the top, it indicates the current branch is 'master', there is 1 branch and 0 tags. A search bar is present with the text 'Go to file'. To the right are buttons for 'Add file' and 'Code'. Below this, the repository name 'ziyao233' and the description 'Update xfce/application-finder-related documents (#59)' are shown, along with the commit hash '828f78d' and the commit date '9 months ago'. The main content is a list of files and folders, each with a commit message and a timestamp.

File/Folder	Commit Message	Timestamp
.github	Add CI:git squash commit check.	2 years ago
AutoTest	Python and nodejs (#58)	10 months ago
Chromium	Chromium (#53)	last year
DDE	更新 dde 测试用例 (#55)	last year
Firefox	Firefox的文字排版修正与路径修正 (#48)	2 years ago
GIMP	Add: test report to testcase repo.	2 years ago
Libreoffice	Add LibreOffice testcase (#52)	10 months ago
MySQL	添加nodejs ~ (#54)	10 months ago
Open MPI	Openmpi (#35)	2 years ago
Sysprof	Add: test report to testcase repo.	2 years ago
System	Add: test report to testcase repo.	2 years ago
Template	Add a testcase of Libreoffice as an example.	2 years ago
Thunderbird	Thunderbird和firefox的文字排版修改与图片路径修改 (#49)	2 years ago
UKUI	Add UKUI testcase. (#56)	10 months ago
VLC	VLC	2 years ago
Xfce	Update xfce/application-finder-related documents (#59)	9 months ago
nodejs	添加nodejs ~ (#54)	10 months ago
CODE_OF_CONDUCT.md	Add code of conduct.	2 years ago
README.md	Edit README.md: Add autotest requirements.	10 months ago


- 测试用例库：
<https://github.com/ArielHel eneto/RISCV-testcase>
- 覆盖常用桌面软件
 - Chromium
 - Firefox
 - GIMP
 - LibreOffice
 - . . .

openQA 测试实例

trdthg fix: trinity 6ceccbb 2个月前		application_finder_Remember_last_sele...	add xfce case
← ...		application_finder_Text_Beside_Icons.pm	add xfce case
compiler	fix: set compiler timeout	application_finder_centre_window.pm	add xfce case
function	feat: add post_fail_hook to LTP	application_finder_clear_custom_comma...	add xfce case
kernel	fix: trinity	application_finder_fold_unfold.pm	Add xfce tests
long_stress	fix: trinity	application_finder_hide_category_pane.pm	Add xfce tests
mugen	feat: move barrier to init.pm	application_finder_icon_display_mode.pm	Add xfce tests
performance	fix 20231009	application_finder_icon_size.pm	Add xfce tests
init.pm	fix: install git make at init.pm	xfce_applications.pm	add xfce testcases
reboot.pm	refactor: use oerv tests	xfce_arrange_desktop_icons.pm	add xfce testcases
success.pm	refactor: use oerv tests	xfce_create_document.pm	add xfce testcases
		xfce_create_folder.pm	add xfce testcases
		xfce_create_launcher.pm	add xfce testcases
		xfce_create_url_link.pm	add xfce testcases

- os-autoinst 自动化测试用例库：<https://gitee.com/yunxiangluo/os-autoinst-distri-openeuler>
- 覆盖大量常用软件以及系统基础组件

openQA 测试实例

 trdthg feat: add login prompt b6cad86 3个月前	📄 51 次提交
⚠️ 文件数量太多, 仅显示 1000 文件	
📄 alignmenttest-output-pdf-20230718.j...	
📄 alignmenttest-output-pdf-20230718.p...	
📄 alignmenttest-output.pdf-icon-20230...	
📄 alignmenttest-output.pdf-icon-20230...	
📄 application-finder-Education-category...	
📄 application-finder-Education-category...	
📄 application-finder-Education-category...	
📄 application-finder-Education-category...	
📄 application-finder-Text-Beside-Icons-...	

- os-autoinst needles: <https://gitee.com/yunxiangluo/os-autoinst-needles-openeuler>
- 测试用例 570 个

测试使用场景1——图形化应用

- 创建 needles
 - 使用 Needle Editor （图形化界面）创建，可通过 Flatpak 安装
- 创建测试用例
 - 在 `/var/lib/openqa/tests/openeuler/tests` 目录下新建 perl 模块，在 run 函数中按照测试步骤编写
- 创建测试套
 - 编写对应的测试套 schedule 文件，存入对应目录，之后在 WebUI 中创建测试套即可

测试使用场景1——图形化应用



- 绘制选取
- 添加标签
- 添加选区
- 保存 needle 配置文件
- 部署 needle

测试使用场景1——图形化应用

```
---
name: firefox_bookmark
schedule:
  - installation/oerv_first_boot
  - wrapper_testsuite/wrapper_package_install
  - x11/firefox/firefox_bookmark_new
  - x11/firefox/firefox_bookmark_edit
  - x11/firefox/firefox_bookmark_tags
  -
x11/firefox/firefox_bookmark_toolbar_only_show_on
_new_tab
  -
x11/firefox/firefox_bookmark_toolbar_always_show
  -
x11/firefox/firefox_bookmark_toolbar_never_show
  - x11/firefox/firefox_bookmark_suggest
  - x11/firefox/firefox_bookmark_add_to_toolbar
  - x11/firefox/firefox_bookmark_separator
  - x11/firefox/firefox_bookmark_tabs
  - x11/firefox/firefox_bookmark_delete_all
  - x11/firefox/firefox_bookmark_backup
  - x11/firefox/firefox_bookmark_import
  - shutdown/shutdown
```

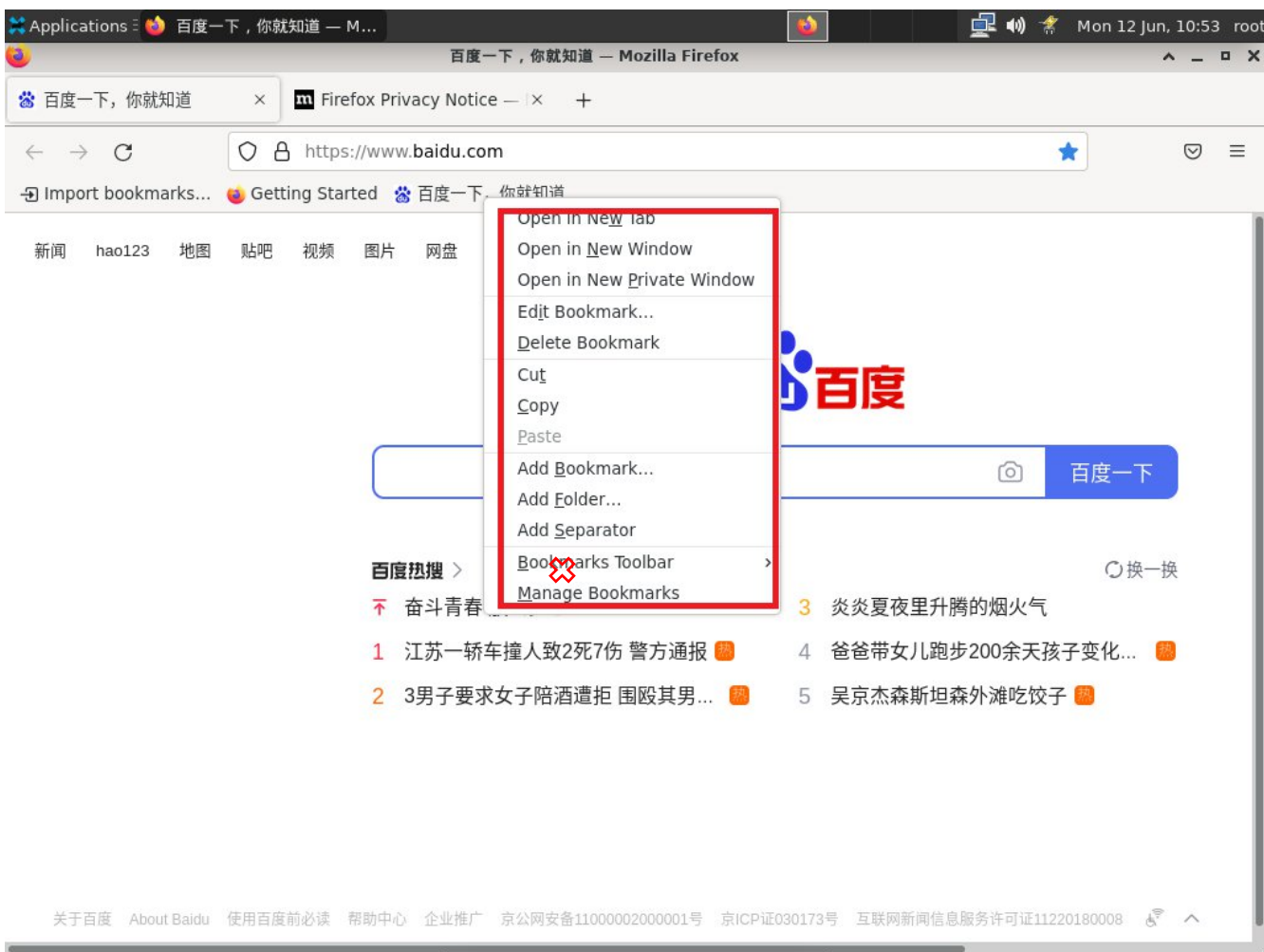
```
use base "x11test";
use strict;
use warnings;
use testapi;
sub run() {
    my ($self) = shift;
    #start firefox to baidu
    $self->start_firefox;
    wait_still_screen;

    #open two page and bookmark all tabs
    assert_and_click 'firefox-open-new-tab';
    $self->firefox_open_url("https://www.openeuler.org/zh/");
    assert_and_click ('firefox-tab-baidu', button=>'right');
    assert_screen 'firefox-tab-menu';
    send_key "ctrl-s";
    assert_and_click ('firefox-tab-baidu', button=>'right');
    assert_screen 'firefox-tab-menu';
    send_key "ctrl-b";
    assert_screen 'firefox-new-bookmarks';
    type_string 'test folder';
    wait_still_screen(2);
    assert_and_click 'firefox-new-bookmarks-select-location';
    assert_and_click 'firefox-new-bookmarks-location-other';
    assert_and_click 'firefox-new-bookmarks-save';

    #delete folder and bookmarks
    $self->firefox_manage_bookmarks;
    assert_and_click ('firefox-manage-bookmarks-library-test-folder');
    assert_screen 'firefox-manage-bookmarks-library-test-content';
    assert_and_click('firefox-library-organise');
    send_key "ctrl-d";
    assert_screen("firefox-library-no-bookmarks");
    if (check_screen 'firefox-manage-bookmarks-library-test-folder') {
        die 'delete folder failed';
    }
    send_key "alt-f4";
    wait_still_screen;
}
```

测试使用场景1——图形化应用

```
{
  "area": [
    {
      "type": "match",
      "ypos": 163,
      "height": 321,
      "xpos": 402,
      "width": 216,
      "click_point": {
        "xpos": 54,
        "ypos": 286.5
      }
    }
  ],
  "properties": [],
  "tags": [
    "firefox-bookmark-toolbar-menu",
    "firefox-bookmark-toolbar-menu-
bookmarks_toolbar"
  ]
}
```



测试使用场景2——开发板启动和功能

- 目前依赖 SSH 和 VNC 接入
- 前置条件
 - 设置好防火墙
 - 配置 SSH 访问
 - 安装开启 VNC （对于图形化应用）
- 硬件开发板串口接入：开发中（t-autotest）

测试使用场景2——开发板启动和功能

修改 worker.ini 配置

开发板编写部分脚本

- 开发板重启控制脚本
- 编写 serial 抓取脚本
- 编写自动烧录脚本
- 配置 VNC 相关配置

后续和图形化测试相同

```
[global]
GENERAL_HW_CMD_DIR =
/var/lib/openqa/share/tests/openeuler/data/generalhw_scripts
[21]

# 重启脚本
GENERAL_HW_REBOOT_CMD = reboot_SUT_via_SSH.sh
GENERAL_HW_REBOOT_ARGS = 192.168.0.44

# 串口连接
GENERAL_HW_SOL_ARGS = ttyUSB1
GENERAL_HW_SOL_CMD = get_sol_dev.sh

# 烧录脚本
GENERAL_HW_FLASH_ARGS = 192.168.0.44:~/
GENERAL_HW_FLASH_CMD = flash_ssd.sh

# VNC 连接
GENERAL_HW_VNC_IP=192.168.0.44 #桌面测试时需要配置
GENERAL_HW_VNC_PASSWORD=123456 #桌面测试时需要配置
GENERAL_HW_VNC_PORT=5901 #桌面测试时需要配置
SUT_IP = 192.168.0.44

WORKER_CLASS = generalhw_unmatched # 修改测试对象类型
```


挑战和尝试

- os-autoinst 存在的问题:
- 对硬件开发板适配不好
- 十年老库，代码库复杂，基于多进程架构
- 基于 Perl 语言及其生态，可维护性差
-
- 基于 Rust 重写的 os-autoinst:
- <https://github.com/trdthg/t-autotest>
- 解决开发板串口接入问题

今后的工作

- 继续改进测试用例库，丰富测试用例
- 改进 `os-autoinst` / 推进重写工作
- 改善对 RISC-V 开发板的支持，解决串口接入问题