

Simple KernelCI Labs with Labgrid

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Agenda

- labgrid introduction
- scenarios with KernelCI
- example & discussion



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labgrid

- python-based lab control framework
- automated testing (pytest)
- interactive developer access
- low-level bootstrap (incl. bootloader)



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Layers

Protocol

CommandProtocol

Driver

Bootloader
Driver

Shell
Driver

Console
Driver

`/dev/ttyUSB4`

Resource

Serial



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Client-Side Configuration

YAML

- describes “Targets” with
- “Resources”
- “Drivers”
- HW/SW-specific parameters

⇒ The “Environment”

```
targets:  
  main:  
    resources:  
      RawSerialPort:  
        port: "/dev/ttyUSB0"  
    drivers:  
      ManualPowerDriver:  
        name: "example"  
      SerialDriver: {}  
      BareboxDriver:  
        prompt: 'barebox@[^:]+:[^ ]+ '  
      ShellDriver:  
        prompt: 'root@\w+:[^ ]+ '  
        login_prompt: 'login: '  
        username: 'root'  
      BareboxStrategy: {}
```



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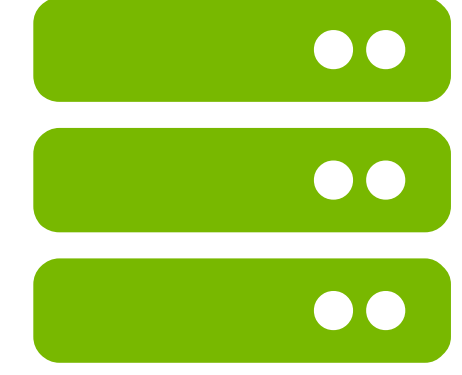
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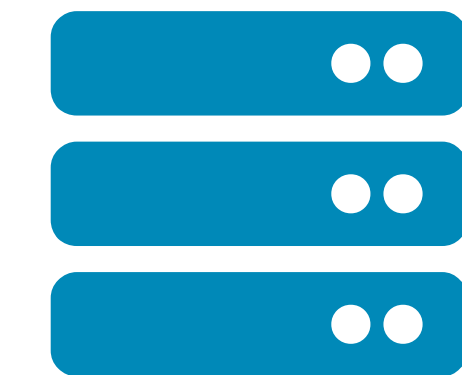


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Client



Client





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PowerProtocol



ConsoleProtocol



DigitalOutputProtocol



BootstrapProtocol



Power Protocol



ConsoleProtocol



DigitalOutputProtocol



BootstrapProtocol

Resources



Exporter



Exporter



Coordinator



Client



Client





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PowerProtocol



ConsoleProtocol



DigitalOutputProtocol



BootstrapProtocol

Place



Power Protocol



ConsoleProtocol



DigitalOutputProtocol



BootstrapProtocol

Place



Exporter



Coordinator



Client



Exporter



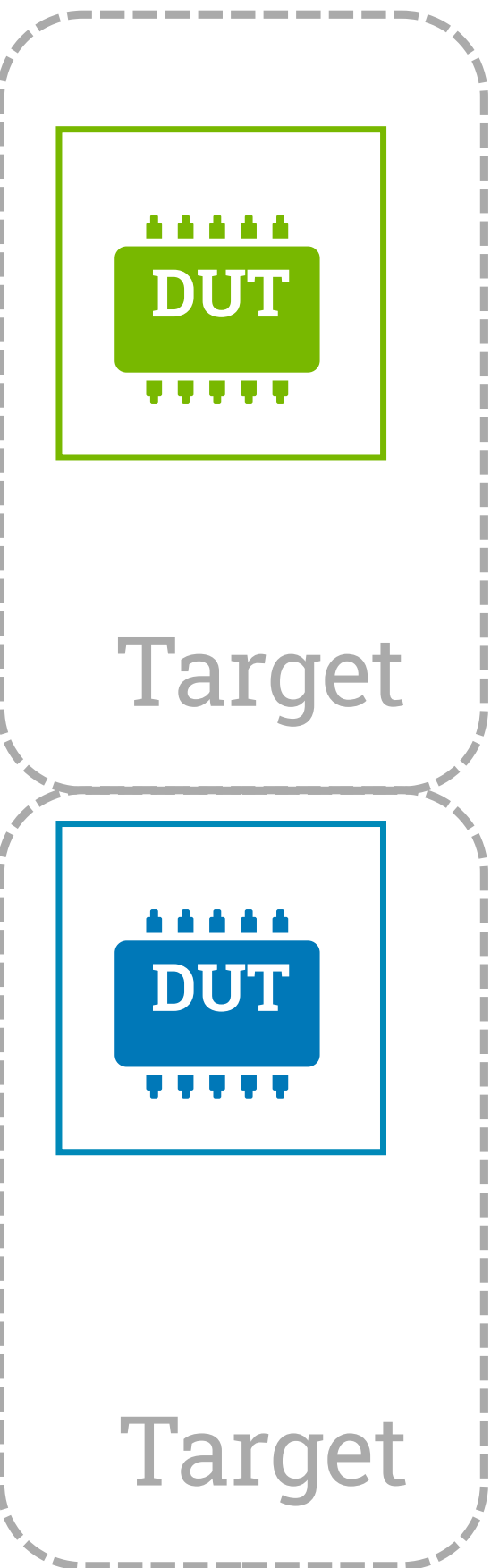
Client













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-  PowerProtocol
-  ConsoleProtocol
-  DigitalOutputProtocol
-  BootstrapProtocol

-  Power Protocol
-  ConsoleProtocol
-  DigitalOutputProtocol
-  BootstrapProtocol



Test-Cases with pytest

- Test execution, selection and reporting is provided by pytest
- Fixtures provide access at different levels (command, strategy, target, env)
- pytest (and Python libs) makes it easy to prepare test data and analyze results
- Easy to integrate into other tools and CI

```
def test_hwclock_rate(command):  
    """Test that the hardware clock rate is not too inaccurate."""  
    result = command.run_check('hwclock -c | head -n 3')  
    hw_time, sys_time, freq_offset_ppm, tick = result[-1].strip().split()  
    assert abs(int(freq_offset_ppm)) < 1000
```



KernelCI & labgrid

use KernelCI builds on hardware in local lab to

- find regressions (features & performance)
- give earlier feedback for upstream changes

add incentive to get defconfigs to work on custom HW



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Proposed Workflow

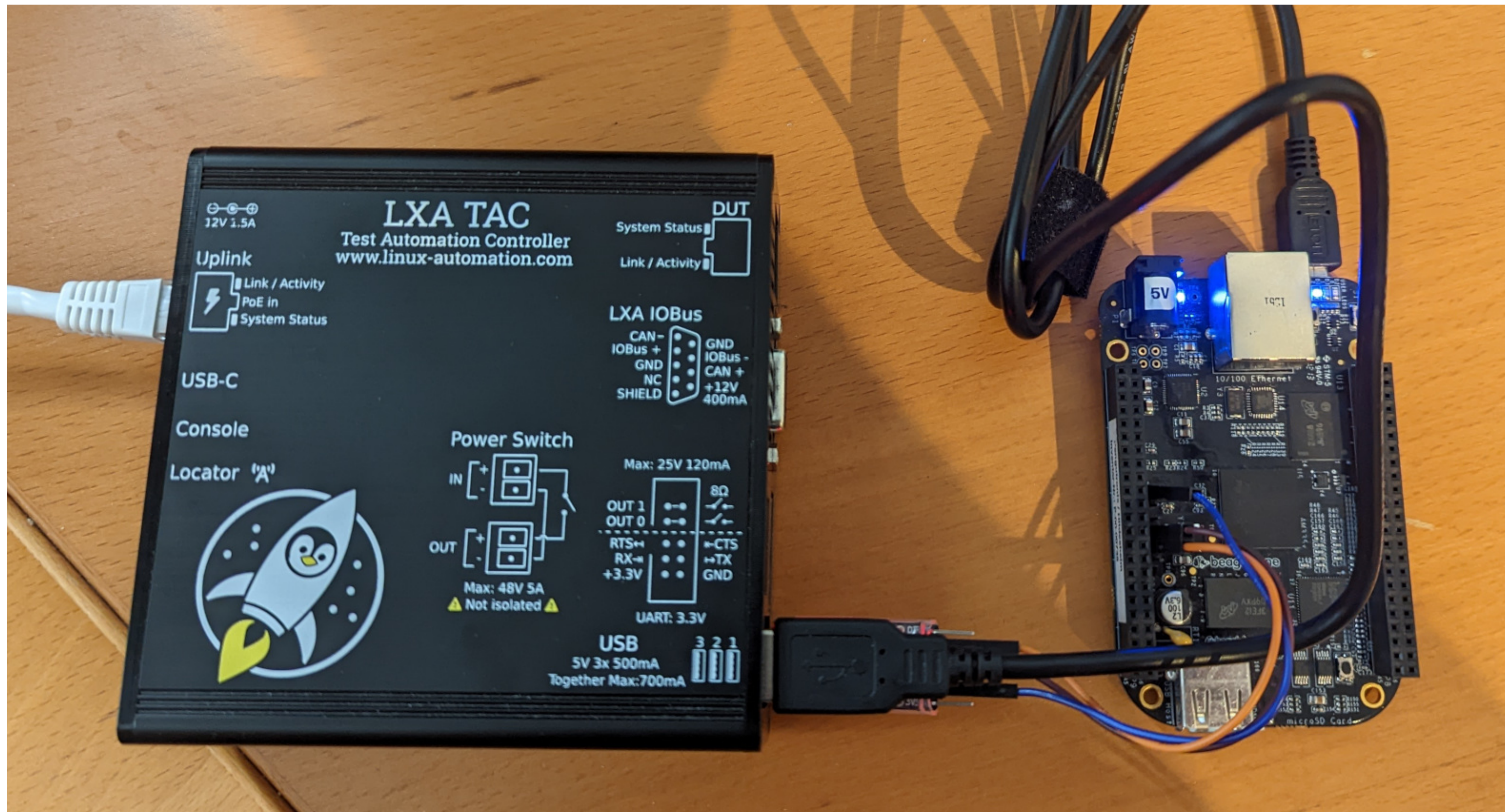
- filter KernelCI builds and download artifacts
- run tests/benchmarks in the lab
- report results / compare with baseline



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Example on BeagleBone Black



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Example on BeagleBone Black

- upload kernel+dtb+initramfs via fastboot
- boot to shell
- run test cases



```
targets:
  main:
    resources:
      RemotePlace:
        name: 'bbb'
    drivers:
      - USBPowerDriver:
          delay: 3.0
      - SerialDriver: {}
      - BareboxDriver:
          prompt: 'barebox@[^:]+:[^ ]+ '
          autoboot: 'stop autoboot'
          bootstring: 'commandline: '
      - ShellDriver:
          prompt: '/.* # '
          login_prompt: ' login: '
          login_timeout: 120
          username: root
      - AndroidFastbootDriver:
          sparse_size: '64M'
      - BBFastbootStrategy: {}
    images:
      kernel: ./kernel
      initramfs: ./initramfs.cpio.gz
      dtb: ./am335x-boneblack.dtb
    imports:
      - bbfastbootstrategy.py
```


Compare to Baseline

```
(labgrid-venv) jluebbe polaris:~/ptx/labgrid-kernelci [10008]% ./report.py test_lat_pipe v5.4-20187-g5734bb3b197e
v5.4-20187-g5734bb3b197e      staging-stable-20220909.0      multi_v7_defconfig      70.417      100.0%
v5.4-20187-gac1844124765    staging-stable-20220910.0      multi_v7_defconfig      70.819      100.6%
v6.0-rc3-4736-ge47eb90a0a9a  next-20220901                  multi_v7_defconfig      34.798      49.4%
v6.0-rc4-206-gbfb8bcb45634  staging-mainline-20220909.8    multi_v7_defconfig      34.659      49.2%
v6.0-rc4-286-gb5021cff88d3  staging-mainline-20220910.0    multi_v7_defconfig      34.612      49.2%
v6.0-rc4-304-g516609f26401  staging-mainline-20220911.0    multi_v7_defconfig      34.630      49.2%
v6.0-rc4-5671-g35e245acbcbf  staging-next-20220907.0        multi_v7_defconfig      34.590      49.1%
v6.0-rc4-5854-g7172196f4de0  staging-next-20220908.0        multi_v7_defconfig      35.167      49.9%
(labgrid-venv) jluebbe polaris:~/ptx/labgrid-kernelci [10008]% █
```



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Open Questions

- Should these results be submitted to KernelCI?
- Which use cases/features would be useful for the KernelCI community?



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Links

GitHub: <https://github.com/labgrid-project/labgrid>

Docs: <https://labgrid.readthedocs.io/en/latest/>

Chat: #labgrid on libera.chat, bridged to #labgrid:matrix.org

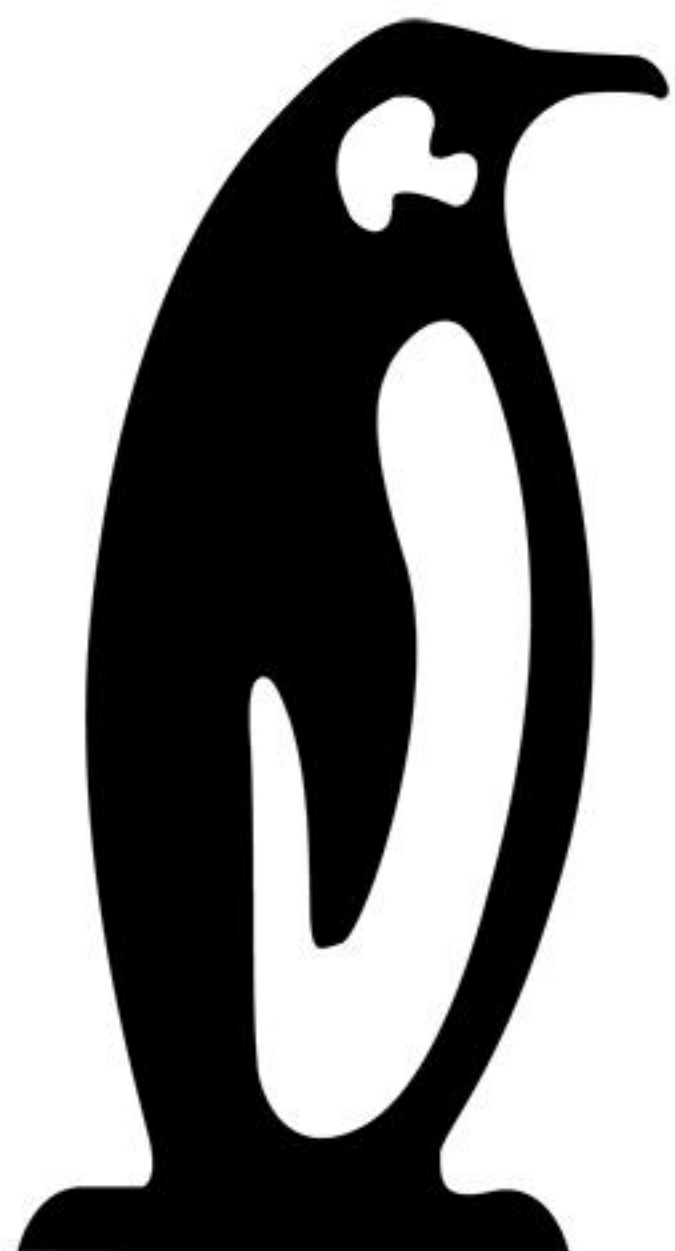
YouTube tutorials:

<https://youtube.com/playlist?list=PLPy6BX4pJosCEq7CIU06bt2WM7IFAy1CF>



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