1. Написал key-gen и бинпатч:

```
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ls
hack_app  hack_app_patched_2  keygen.py  libssl1.1_1.1.1f-1ubuntu2.24_amd64.deb  test.txt
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$
```

2. Код keygen:

```python
import hashlib

def calc_md5_16bytes(hwid_16: str) -> str:
    data = hwid_16.encode("ascii")
    digest = hashlib.md5(data).digest()
    digest_reversed = digest[::-1]

    return ''.join(f"{b:02x}" for b in digest_reversed)


if __name__ == "__main__":
    hwid = input("Введите HWID (ровно 16 символов ASCII): ").strip()

    if len(hwid) != 16:
        print("HWID должен быть ровно 16 ASCII символов")
    else:
        result = calc_md5_16bytes(hwid)
        print("MD5 (как в приложении):", result)
```

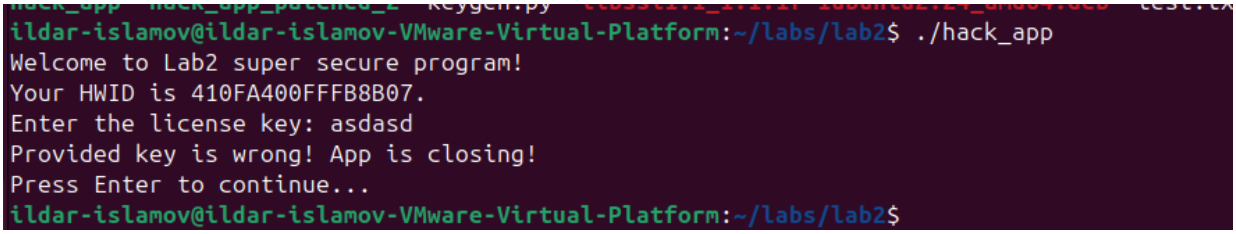
3. Чтобы сделать бинпатч, заменил инструкцию JNZ (0010159e) на просто JMP на блок, где работает 'защищенная' часть приложения (вывод в консоль, что приложение лицензировано на вашем пк):
   Было:

Стало:

4. Код для бин-патча:

```rust
use std::fs::{OpenOptions, File};
use std::io::{Seek, SeekFrom, Write};

fn main() -> std::io::Result<()> {
    let path = std::env::args().nth(1).expect("Укажите путь к бинарному файлу");
    let mut file = OpenOptions::new()
        .read(true)
        .write(true)
        .open(&path)?;

    // Патч 1
    file.seek(SeekFrom::Start(0x0000159E))?;
    file.write_all(&[0xEB])?;

    // Патч 2
    file.seek(SeekFrom::Start(0x0000159F))?;
    file.write_all(&[0x00])?;

    println!("Патч применён: 0x159E=0xEB, 0x159F=0x00");
    Ok(())
}
```

3. Тесты:
    1. Само приложение



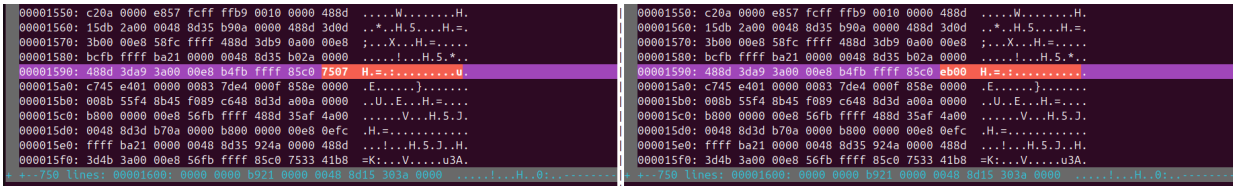
2. keygen:

```
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ python3 keygen.py
Введите HWID (ровно 16 символов ASCII): 410FA400FFFB8B07
MD5 (как в приложении): ad3d64c16baedfd58828bfed13a22c0a
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ./hack_app
Welcome to Lab2 super secure program!
Your HWID is 410FA400FFFB8B07.
Enter the license key: ad3d64c16baedfd58828bfed13a22c0a
Now you app is activated! Thanks for purchasing!
Press Enter to continue...
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ./hack_app
Welcome to Lab2 super secure program!
Your app is licensed to this PC!
Press Enter to continue...
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ getfattr -x user.license hack_
app
getfattr: invalid option -- 'x'
Usage: getfattr [-hRLP] [-n name|-d] [-e en] [-m pattern] path...
Try `getfattr --help' for more information.
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ getfattr hack_app -h
# file: hack_app
user.license
```

3. Бин патч:

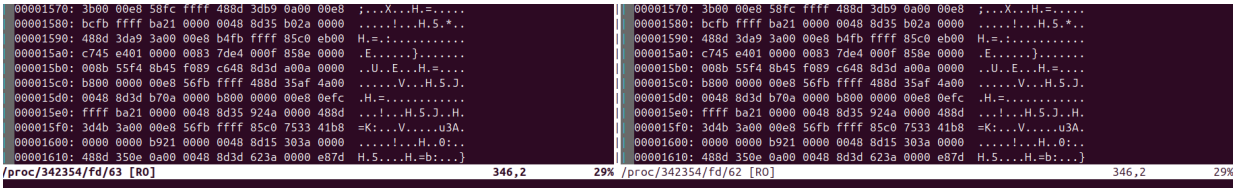
До:

```
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ls
bin-patcher  hack_app  hack_app_patched_2  hack_app_unpatched  keygen.py  lab2_patcher  libssl1.1_1.1.1f-1ubuntu2.24_amd64.deb  test.txt
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ vimdiff <(xxd hack_app_unpatched) <(xxd hack_app_patched_2)
2 files to edit
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$
```



После:

```
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ vimdiff <(xxd hack_app_unpatched) <(xxd hack_app_patched_2)
2 files to edit
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$
```



Два теста:

```
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ vimdiff <(xxd hack_app_unpatched) <(xxd hack_app_patched_2)
2 files to edit
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ chmod +x hack_app_unpatched
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ./hack_app_unpatched
Welcome to Lab2 super secure program!
Your app is licensed to this PC!
Press Enter to continue...
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ cp hack_app hack_app_unpatched1
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ./lab2_patcher hack_app_unpatched1
✅ Патч применён: 0x159E=0xEB, 0x159F=0x00
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ chmod +x hack_app_unpatched1
ildar-islamov@ildar-islamov-VMware-Virtual-Platform:~/labs/lab2$ ./hack_app_unpatched1
Welcome to Lab2 super secure program!
Your app is licensed to this PC!
Press Enter to continue...
```