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Bypassing License Checking Using *Dyninst*

Mihai Christodorescu

mihai@cs.wisc.edu

Computer Sciences Department

University of Wisconsin

1210 W. Dayton St.

Madison, WI 53706-1685

USA

Outline

- Background on *Dyninst*
- Bypassing License Checking
  - Why? [motivation]
  - How? [approach]
  - Example [Adobe FrameMaker]
  - What? [tools / techniques]
- Future work
- Conclusion

Binary Code Rewriting

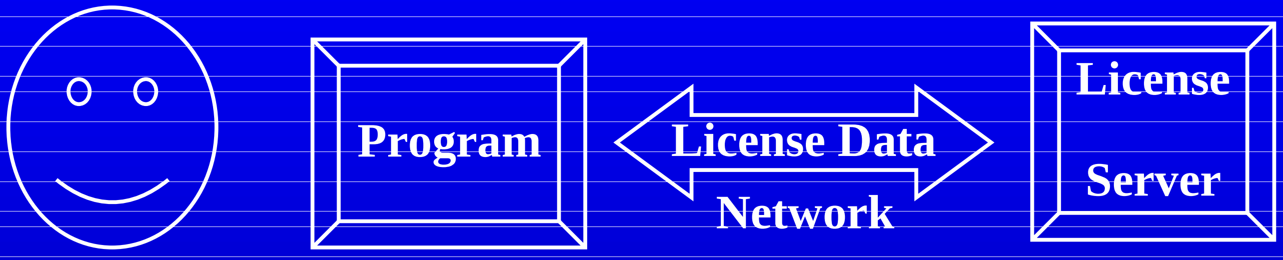
- Executables are no longer black boxes
  - binaries can be modified safely at runtime
- Without access to source code
  - optimize a binary for a given input
  - change program behavior on the fly
- Open-source? What about:
  - long-running programs
  - legacy programs

Dyninst - Overview

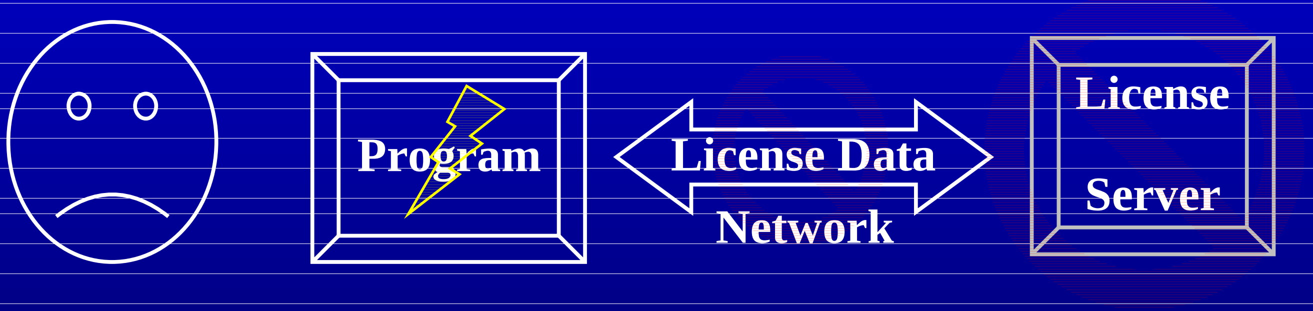
- API to:
  - Control a process (start, stop, pause).
  - Insert code in a process.

- Current capabilities:
  - Code insertion happens at function-level (entry, exit, call site).
  - Is instruction-level granularity needed?

Why Bypass the License Check?



Normal: licensed program runs after communicates with license server.



Undesired: licensed program refuses to run if license server does not respond.

How to Bypass License Checking?

- Program = Code + Data
- Option 1: feed synthesized license data to the program
- Option 2: remove all the code that performs license checks

How…?

- Faking the license data
  - “clean” solution: capture the data once, reuse it over and over
  - problem: requires reverse engineering of client-server protocol
  - problem: license data might be time-stamped
  - problem: license data might be encrypted with a session key

How…?

- Removing the license checking code
  - removes the need of running a license server
  - problem: (very) complicated
  - problem: might alter program functionality
  - problem: not possible with current Dyninst capabilities

How…?

- Middle ground solution:

  Controlled Failure

  - allow program to try to contact license server
  - if data is OK, then nothing needs to be changed
  - otherwise, force program to believe license data is OK
  - limited scope of changes

Example: Adobe FrameMaker

- 2 step license verification:
  - retrieve license data from server [once]
  - check license data for correctness [often]

- allow FM to time out waiting for server
- allow FM to attempt to go into demo mode
- switch FM back to full-functionality mode
- later license checks always “succeed”

Strategies & Tools

- Complete reverse engineering:
  - not an option
    - legal problems
    - complexity (FrameMaker is a 7 MB binary!)
- Focus on certain characteristics:
  - I/O traffic
  - execution trace

I/O Monitoring

- Reduced overhead
- Low interactivity
- Can generate large amounts of data
- Cannot provide the timing information needed to modify program behavior

Function Tracing

- Fairly high overhead
- Can be interactive and incremental
  (… pause trace - change - continue trace …)
- Determining where to apply changes:
  - get trace for a successful run
  - get trace for a (forced-)failure run
  - compare to find differences
  - repeat as needed

Future Developments

- Monitor 2 processes (one successful, one failing) in parallel, and make one behave like the other one

Project Team

- Rob Iverson **`riverson@cs.wisc.edu`**
- Tevfik Kosar **`kosart@cs.wisc.edu`**
- Mihai Christodorescu **`mihai@cs.wisc.edu`**

Conclusions

- *Dyninst* is a powerful and flexible tool
- Unlimited applicability:
  - dynamic optimizations

    (measure with *Paradyn*, optimize with *Dyninst*!)
  - enhance program behavior

    (load new dynamic library, change calls while program is running)