COM S 413/513: Homework 1 [interview] - reproducing a bug

August 24, 2023

Learning Objectives:

In this homework, you will

1. exercise and understand terminologies related to bugs

2. gain hands-on experience on real-world bugs in open source projects

3. gain code review experience

Instructions:

1. Total points: 20 pt

2. Deadline: Sep 1 (Fri) 3 pm, Atanasoff 210

3. This homework is accomplished by the team of 2 students

4. How to submit:

   - Bring your computer that is ready to demo.
   - Demo the bug and patch (8 pt)
   - Answer questions (12 pt)

1 Description

In this homework, you are going to exercise your code inspection skills to analyze and understand bugs. As a first step, you will download the DBG benchmark located here: `https://dbgbench.github.io/`. This benchmark documented a set of real-world bugs from Unix utilities `find` and `grep`. Here are some guidance on how you can explore this website effectively:

- You can start under "Use and reproduce", and follow "Step-by-Step instructions". The website also lists a set of links on setting up the provided docker containers to easily reproduce the bugs (under "Execute w/ Docker").

- Clicking on "Data for find" and "Data for grep" on the website, you will find detailed explanations of the bugs, including the root causes, symptoms and the tests that can trigger the bugs. There are also a set of patches for each bug developed by different participants of the research as well as the patch from the developer. You can find further information about the benchmark following the paper "Where is the Bug and How is it fixed? An experiment with practitioners" `https://dl.acm.org/citation.cfm?id=3106255` (Also linked on the website).

Bug Selection: You will select one of the bugs from the following list that are of your interest.

Find: Grep:

1. find.6e4cecb6   1. grep.9c45c193

2. find.091557f6   2. grep.5fa8c7c9

3. find.ff248a20   3. grep.54d55bba

2 Deliverables and Grading Criteria

1. Demo the bug and one patch: a total of 8 pt. (Estimated 2 minutes)

   (a) Use the failure inducing input to trigger the bug.

   (b) Find a patch (can be developers own patch or one of the participants patch), apply the patch to the buggy version and run with the failure inducing input to compare with the buggy run.

   Criteria

   - (4 pt) Successfully reproducing a bug with failure inducing input. This includes setting up any environment or additional files required to reproduce the bug.
   - (4 pt) Successfully patch the bug and show the problem is fixed.
   - You get 0/4 pt if the bug is not reproduced. You get 0/4 pt if the patch is not successful. If the reproduction requires additional time and help from the TA, you will get 2/4 pt.

2. Answer questions. Please have any source code or patch needed to answer these questions open and ready. TA will select 12 pt questions from below: (Estimated 3 minutes).

   (a) (2 pt) At which source code line, the failure occurs?
   (b) (4 pt) What is the fault condition? At which program point?
   (c) (4 pt) Explain what is the root cause of this bug?
   (d) (4 pt) Explain why did your patch fix the bug?
   (e) (2 pt) What is the type of the bug?
   (f) (6 pt) Find an incorrect patch from the participants' patches. Explain why it is incorrect.

   Criteria: you get 0 pt if you provide no answers or wrong answers. You get the half credit if your answer somewhat makes sense but is not very clear or it takes you a very long time to answer the question.