A Screening Survey

NOTE: We only performed screening on Upwork, MTurk and Prolific.

S1.A. (*In case of Upwork*) Do you have experience as a software developer? [free text]

S1.B. (*In case of MTurk and Prolific*) Do you have experience as a software developer? [single choice]

[Yes, No]

S2. (*In case of MTurk, Prolific and Upwork*) What is your current main occupation? (e.g. student, developer, freelancer, etc.). [free text]

S3.A. (*In case of MTurk and Prolific*) Please indicate the response below that most closely matches your software development skill level: [single choice]

[Expert (recognized authority); Advanced (applied theory); Intermediate (practical application); Novice (limited experience); Fundamental awareness (basic knowledge)]

S3.B. (*In case of Upwork*) Please indicate the term that most closely matches your software development skill level: Expert (recognized authority), Advanced (applied theory), Intermediate (practical application), Novice (limited experience), Fundamental awareness (basic knowledge). [free text]

S4.A. (*In case of MTurk and Prolific*) What is your gender? We use this information to be able to describe differences between genders and to increase visibility of less represented genders. [single choice]

[Woman; Man; Non-binary; Prefer not to disclose; Prefer to self-describe [free text]]

S4.B. (*In case of Upwork*) Please tell us your gender: We use this information to be able to describe differences between genders and to increase visibility of less represented genders. [free text]

S5. (*In case of MTurk and Prolific*) Please look at the code snipped below to answer the questions that follow:

```
main{
 print(func("hello world"))
}

String func(String in){
    int x = len(in)
    String out = ""
    for(int i = x-1; i >= 0; i--){
        out.append(in[i])
    }
    return out
}
```

S5.A. (*In case of MTurk and Prolific*) What is the parameter of the function? [multiple choice]

[String out; String in; I don't know; `int i=x-1; i>=0; i--`; Outputting a String; int x = len(in)]

S5.B. (*In case of MTurk and Prolific*) Please select the returned value of the pseudocode above: [multiple choice]

[hello world; hello world 10; dlrow olleh; world hello; HELLO WORLD; I don't know; hello world hello world hello world hello world]

B Survey

NOTE: We translated the survey to German for the German students.

Introduction.

Q1. Please check all that apply. [multiple choice]

[I have (some) experience as a reverse engineer; I have (some) experience as a network practitioner; I have (some) experience as a vulnerability researcher; I have (some) experience as a software tester; I am not experienced in these areas]

Q2. Which of the following job roles describe you? Please select all that apply. [multiple choice]

[Developer; Administrator; DevOp; Academic researcher/Scientist; Data Science/Machine Learning specialist; Educator; Engineer; CEO/-Manager/Team lead; None; Other (please specify:) [free text]]

Software Development Background.

Q3. How did you learn to code? [multiple choice]

[Self-taught; Online class; College/University; On-the-job training; Professional certification program; Coding bootcamp; I did not learn to code; Other (please specify:) [free text]]

Q4. How do you rate your proficiency in the following development areas? Please select all that apply. [Likert scales with the options *Extremely proficient*, *Moderately proficient*, *Somewhat proficient*, *Slightly proficient*, *Not at all proficient* and *I don't know*.]

[Backend development; Frontend development; Full-stack development; Desktop or Enterprise application development; Embedded application or device development; Game or graphics development; Mobile development; Quality assurance or testing; Security development; Data science or machine learning; Data or business analysis; UI/UX design; Data engineering; Penetration testing; Security engineering; System architecture; Other (please specify:) [free text]]

Q5. What features have you previously used in your code? [multiple choice]

[API keys; Authorization / Authentication; Encryption / Decryption; Fraud prevention; Input validation; Key management and generation; Secure network connections and communications; Signature generation and validation; Store and authenticate user names and passwords; Transfer files securely; I did not use any of these features; Other (please specify:) [free text]]

Q6. How often do you need to integrate security mechanisms (such as the ones from the previous question) into your code? [single choice]

[Frequently - I use security mechanisms in more than 66% of my development tasks; Occasionally - I use security mechanisms in more than 33% but less than 66% of my development tasks; Rarely - I use security mechanisms in less than 33% of my development tasks; Never - I never use security mechanisms in any of my development tasks]

Q7. Including any education, how many years have you been coding in total? (e.g. "12") [integer input]

Q8. NOT including education, how many years have you coded professionally (as a part of your work)? Please enter -1 if you do not have any professional coding experience. [integer input]

Q9. Please select the range that most closely matches the amount of time you typically spend performing software development tasks per week. [single choice]

[$<$ 5 hours; 5-10 hours; 10-20 hours; 20-30 hours; 30-40 hours; $>$ 40 hours; I do not perform software development]

Q10. Have you contributed to the following types of software projects in the past year? Please select all that apply. [multiple choice]

[Open source project; Commercial (closed source) software; None; Other (please specify:) [free text]]

Q11. How do you rate your knowledge of software security? [Likert scale with the options *Very High*, *Above Average*, *Average*, *Below Average* and *Very Low*.]

Q12. How much do you use each of the following techniques to find security problems in your code? [Likert scales with the options *Every build*, *Every release*, *Once or occasionally*, *Do not use* and *Haven't considered it*.]

[Producing a threat assessment for the software; Scanning code with an automatic code review tool; Using a tool to scan for libraries with known vulnerabilities; Code review by someone other than the developer; Penetration testing; Other (please specify:) [free text]]

Organizational.

Q13. Approximately how many people are employed by the company or organization you currently work for? [single choice]

[Just me - I am a freelancer, sole proprietor, etc.; 2 to 9 employees; 10 to 19 employees; 20 to 99 employees; 100 to 499 employees; 500 to 999 employees; 1,000 to 4,999 employees; 5,000 to 9,999 employees; 10,000 or more employees; I don't know]

Q14. Please estimate the number of co-workers in your team. If you work alone, please enter '0'. [integer input]

Q15. On average, how many hours per week do you work? Please enter a whole number in the box. [integer input]

Q16.A [If number of co-workers given in Q14 is 0] Do you have a security focus in your current field of activity? [single choice]

[Yes; No; Partially; I don't know; Prefer not to disclose]

Q16.B [If number of co-workers given in Q14 is greater than 0] Does your team have a security focus in its current field of activity? [single choice]

[Yes; No; Partially; I don't know; Prefer not to disclose]

Q17.A [If number of co-workers given in Q14 is 0] Do you also have to work on security-relevant tasks in your field of activity? [single choice]

[Yes; No; Partially; I don't know; Prefer not to disclose]

Q17.B [If number of co-workers given in Q14 is greater than 0] Does your team have to work on security-relevant tasks in your field of activity? [single choice]

[Yes; No; Partially; I don't know; Prefer not to disclose]

Q18. [Only if more than 0 co-workers were stated in Q14] Do you have a security champion within your team? A security champion – or security hobbyist – is a non-expert, who takes a particular interest in security. [single choice]

[Yes; No; I don't know; Prefer not to disclose]

Q19. When you are confronted with security-critical decisions, how do you make them? [single choice]

[Mostly alone; Mostly with my team (Only if more than 0 co-workers were stated in Q14); Mostly with the help of external security experts; Prefer not to disclose; Other (please specify:) [free text]]

Programming.

Q20. Please rate your level of confidence in completing the software development tasks given below. [Likert scales with the options *I am absolutely confident*, *I am moderately confident*, *I am somewhat confident*, *I am slightly confident* and *I am not confident at all*.]

[I can perform a threat risk analysis (e.g., likelihood of vulnerability, impact of exploitation, etc.); I can identify potential security threats to the system; I can identify the common attack techniques used by attackers; I can identify potential attack vectors in the environment the system interacts with (e.g., hardware, libraries, etc.); I can identify common vulnerabilities of a programming language; I can design software to quarantine an attacker if a vulnerability is exploited; I can mimic potential threats to the system; I can evaluate security controls on the system's interfaces/interactions with other software systems; I can evaluate security controls on the system's interfaces/interactions with hardware systems]

Q21. How do you rate your proficiency with the following programming, scripting and mark-up languages? Please select all that apply. [Likert scales with the options *Extremely proficient*, *Moderately proficient*, *Somewhat proficient*, *Slightly proficient*, *Not at all proficient* and *I don't know*]

[JavaScript; HTML/CSS; SQL; Python; Java; Bash/Shell/PowerShell; C#; PHP; TypeScript; C; C++; Rust; Go; Kotlin; Ruby; Assembly]

Q22. Which of the following statements describe the security-related training you have received? [multiple choice]

[I received security-related training through an event organized by my employer; I learned security-related concepts while working; I received security-related training at school/college/university; I received security-related training at a workshop/seminar; I received security-related training with online courses; I am self-taught; I have never received security-related training]

Q23. How many total years of experience do you have in computer security? 'Experience' includes years at work or studying in a security-related field. [integer input]

Q24. In the past, did you receive security-related certifications? [single choice]

[Yes; No]

Q25. Which security-related certifications have you received? Please list all you can remember. [Only if "Yes" was chosen in Q24; free text]

Q26. In the past, did you attend security-related events? [single choice]

[Yes; No]

Q27. Which security-related events have you attended? Please list all you can remember. [Only if "Yes" was chosen in Q26; free text]

Q28. In the past, did you take part in one or multiple Capture the Flag (CTF) contests? A CTF contest is a security-related competition that typically includes solving different hacking or scripting tasks. [single choice]

[Yes; No]

Q29. Which CTF contests did you take part in? Please list all you can remember. [Only if "Yes" was chosen in Q28; free text]

Q30. In the past, did you disclose a software vulnerability you found? [single choice]

[Yes; No]

Q31. In the past, did you submit bugs in bug bounty programs? [single choice]

[Yes; No]

Q32. Which bug bounty programs did you submit bugs to? Please list all you can remember. [Only if "Yes" was chosen in Q31; free text]

General Demographics.

Q33. What is your gender? We use this information to be able to describe differences between genders and to increase visibility of less represented genders. [single choice]

[Woman; Man; Non-binary; Prefer not to disclose; Prefer to self-describe [free text]]

Q34. What is your age in years? [integer input]

Q35. Which of the following describe your race and ethnicity, if any? Please check all that apply. [multiple choice]

[White or of European descent; South Asian; Hispanic or Latino/a/x; Middle Eastern; East Asian; Black or of African descent; Southeast Asian; Indigenous (such as Native American, Pacific Islander, or Indigenous Australian); Prefer not to disclose; Prefer to self-describe [free text]]

Q36. Which of the following describe you, if any? Please check all that apply. [multiple choice]

[I am blind / have difficulty seeing; I am deaf / hard of hearing; I am unable to / find it difficult to type; I am unable to / find it difficult to walk or stand without assistance; Prefer not to disclose; None of the above; Other (please specify:) [free text]]

Q37. What is your native spoken language? You can also start typing inside the drop down for a quicker search. [drop down]

Q38. Please specify your native spoken language. [Only if "Other" was chosen in Q37; free text]

Q39. How comfortable are you taking this survey in English? [Likert scale with the options *Very comfortable*, *Somewhat comfortable*, *Neither comfortable nor uncomfortable*, *Somewhat uncomfortable* and *Not comfortable at all*.]

NOTE: This question was not asked in the German version of the survey.

Q40. Where do you live? You can also start typing inside the drop down for a quicker search. [drop down]

Q41. Please specify the country where you live. [Only if "Other" was chosen in Q40; free text]

Q42. Which of the following best describes the highest level of formal education that you've completed? [single choice]

[I never completed any formal education; 10th grade or less (e.g. some American high school credit, German Realschule, British GCSE); Secondary school (e.g. American high school, German Realschule or Gymnasium, Spanish or French Baccalaureate, British A-Levels); Trade, technical or vocational training; Some college/university study without earning a degree; Associate degree (A.A., A.S., etc.); Bachelor's degree (B.A., B.S., B.Eng., etc.); Master's degree (M.A., M.S., M.Eng., MBA, etc.); Professional degree (JD, MD, etc.); Other doctoral degrees (Ph.D., Ed.D., etc.); Prefer not to disclose; Other (please specify:) [free text]]

Q43. What was your primary field of study? [single choice]

[Computer science (such as computer engineering, software engineering, web development, etc.); IT security/Cyber security; Other engineering disciplines (such as civil, electrical, mechanical, etc.); I never declared a major; Other (please specify:) [free text]]

Q44. Which of the following best describes your current employment status? [single choice]

[Employed full-time; Employed part-time; Independent contractor, freelancer, or self-employed; Homemaker; Not employed, but looking for work; Not employed, and not looking for work; Unable to work; Student; Retired; Other (please specify:) [free text]]

Q45. Are you a primary caregiver for someone? [multiple choice]

[Yes, children; Yes, elderly or disabled family members; No; Prefer not to disclose]

Q46. Please state to which of the following platforms you login to or check at least once a week, if any. Please select all that apply. [multiple choice] [GitHub; Facebook; Twitter; Reddit; LinkedIn; Prolific; UpWork; Amazon MTurk; Online forums on technology-related topics; Mailing lists on technology-related topics; I do not use any of these platforms]