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CSCI 345
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6 March 2020

Homework 2

1. Cryptography
    1. DES
        a. If you use the key above and encrypt the message a second time, the attacker will be able to see the encrypted text in plain text (see Figure 1 and Figure 2).This is due in part to DES performing exclusive or (XOR) operations on half of the message, which is then swapped throughout the encryption algorithm. This affects DES implementations that take into account the parity bits of the cipher text, in most cases. There are also keys that apply to implementations that do not take into account the parity bits.
        b. Other Weak keys (in hex, including the parity bits):
            i. 0x0101010101010101
            ii. 0xFEFEFEFEFEFEFEFE
            iii. 0xE0E0E0E0F1F1F1F1
            iv. 0x1F1F1F1F0E0E0E0E
    2. RSA
        a. For any value of p and q, where p and q are both prime numbers, (p mod 3) nor (q mod 3) will be equal to zero because only (3 mod 3) will result in zero. Due to the definition of prime numbers, no other number is divisible by that given number. Coupling this with the constraint stating that the prime number must be larger than five leads us to conclude that (p mod 3) nor (q mod 3) will ever equal zero.
        b. e is considered a good exponent for RSA if it is an integer and is not a factor of n. This exponent must be within the bounds of $1 < e < (p-1)*(q-1)$. If the exponent does not satisfy these requirements, the integrity of the encryption is jeopardized due to one of the primes for n being transmitted with the public key since RSA is asymmetric encryption.
        c. In order for the key to be considered secure, t (or phi) which equals (p-1)*(q-1) must be co-prime with e. By being co-prime to e, the greatest common denominator between t and e must be 1. With e = 3, there are certain prime numbers that do not satisfy this principle.
            i. For example when p = 7 and q = 19:
            ii. (p - 1) % 3 and (q - 1) % 3 both should not equal 0

iii. Substituting the values of p and q we get: (7 - 1) % 3 = 0 and (19 - 1) % 3 = 0

iv. Therefore, (p - 1) % 3 = 0 and (q - 1) % 3 = 0

v. However, the values of p = 7 and q = 19 do not produce a gcd with e that equals 1 when multiplied together as: t = (p - 1) *(q - 1) and gcd (t, e) != 1

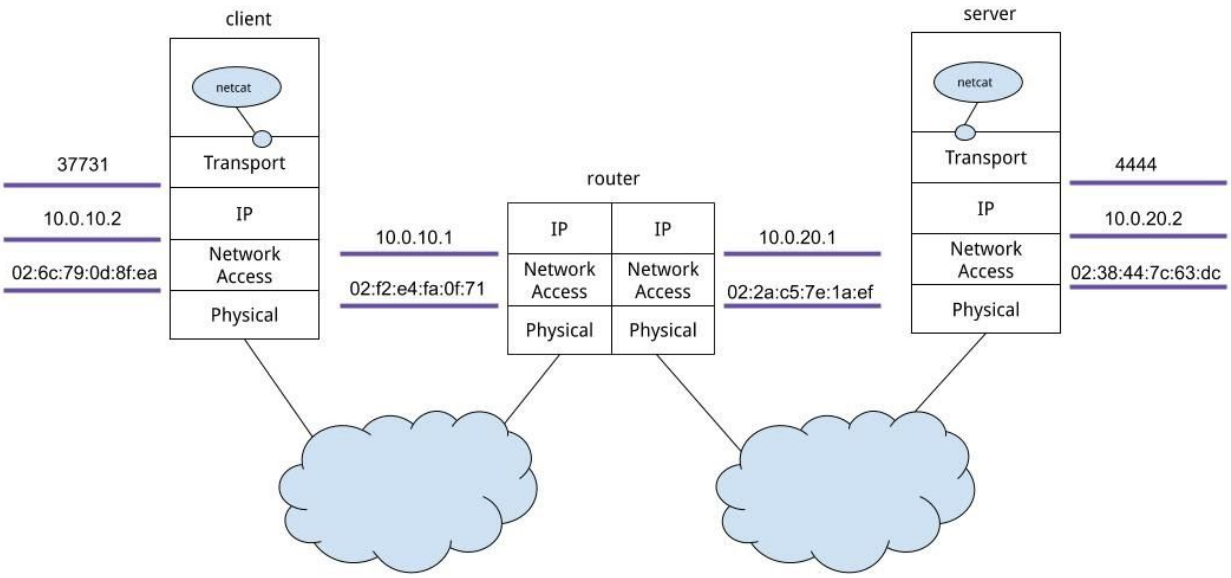
vi. Therefore, these values of p and q are not valid under the current constraints with e = 3

d. With the constraints of e = 3, gcd(t, e) = 1, and n % e != 0, p % 3 and q % 3 will always be equal to 0 when e = 3. When e = 3, the first possible combination of p and q to satisfy the rule would be p = 11 and q =17. When substituted into p % 3 = q % 3 = 2, 11 % 3 = 2 and 17 % 3 = 2.

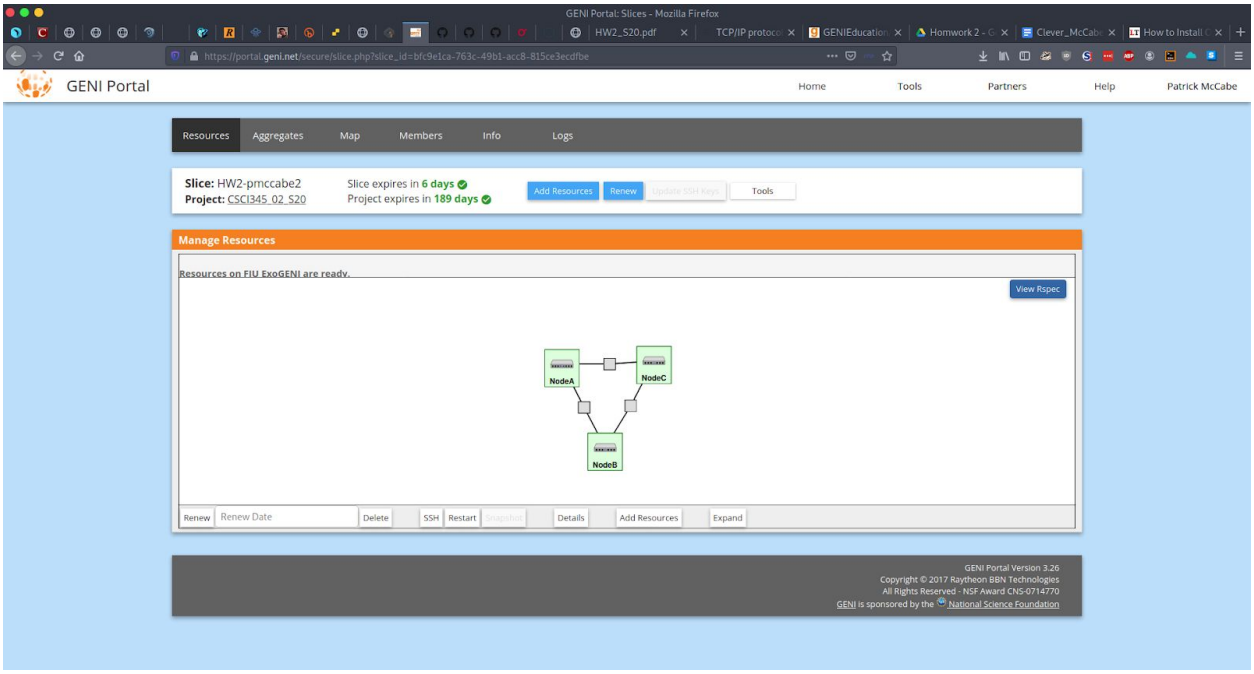
e. n = p * q, which then translates to n = 11 * 17, n = 187, and 187 % 3 = 1.

2. TCP/IP Stack

a. See the picture below for the lab exercise



3. IP Routing
    a. Ready status:



    b. Questions:
        i. It gets 4 hops away then it can't resolve the host

        Output for traceroute to C:

        traceroute to 192.168.2.12 (192.168.2.12), 30 hops max, 60 byte packets
        1 10.10.11.1 (10.10.11.1) 0.271 ms 0.244 ms 0.235 ms
        2 cr1.cs.fiu.edu (131.94.144.4) 0.477 ms 0.469 ms 0.461 ms
        3 fw1.cs.fiu.edu (131.94.131.92) 0.315 ms 0.354 ms 0.335 ms
        4 br1.cs.fiu.edu (131.94.134.134) 0.491 ms 0.491 ms 0.563 ms
        5 * * *
        6 * * *
        7 * * *
        8 * * *
        9 * * *
        10 * * *
        11 * * *
        12 * * *
        13 * * *
        14 * * *
        15 * * *
        16 * * *

17 * * *
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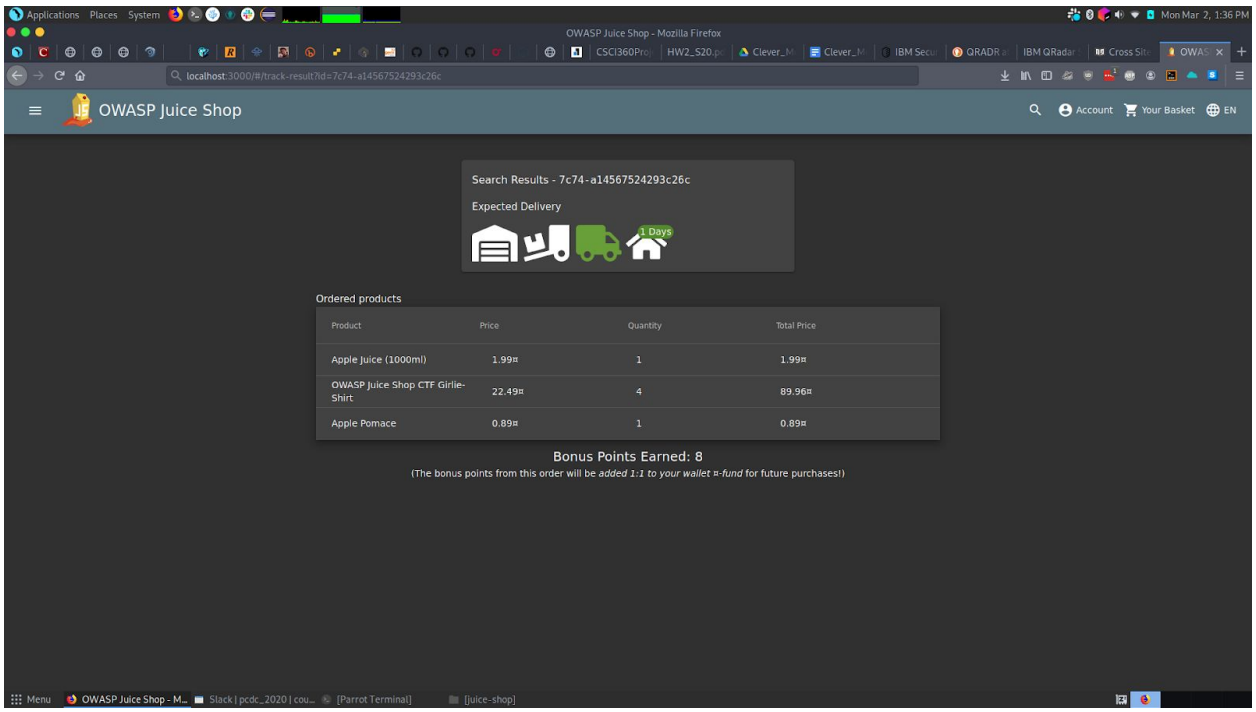
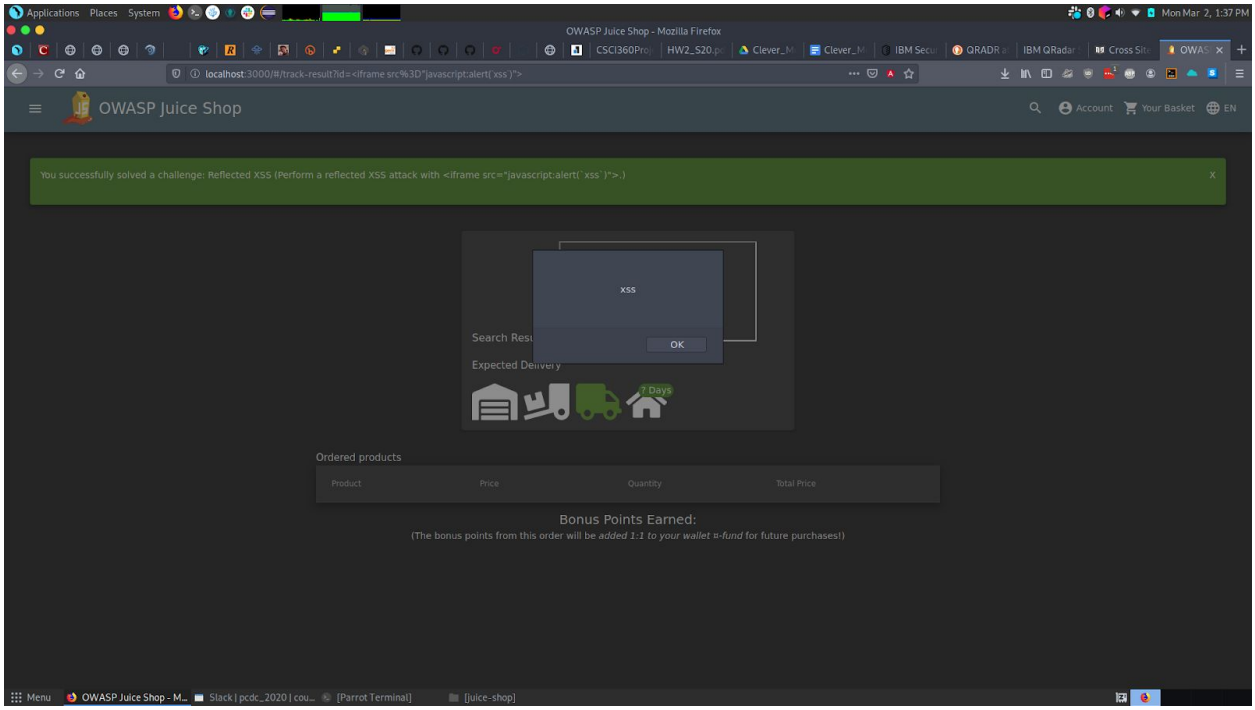
30 * * *

c. We got stuck when trying to route from the 10.0.1.0/24 subnet to the 10.0.2.0/24 subnet. We tried altering the routing tables. We tried the old and new commands for IP routing to no avail.

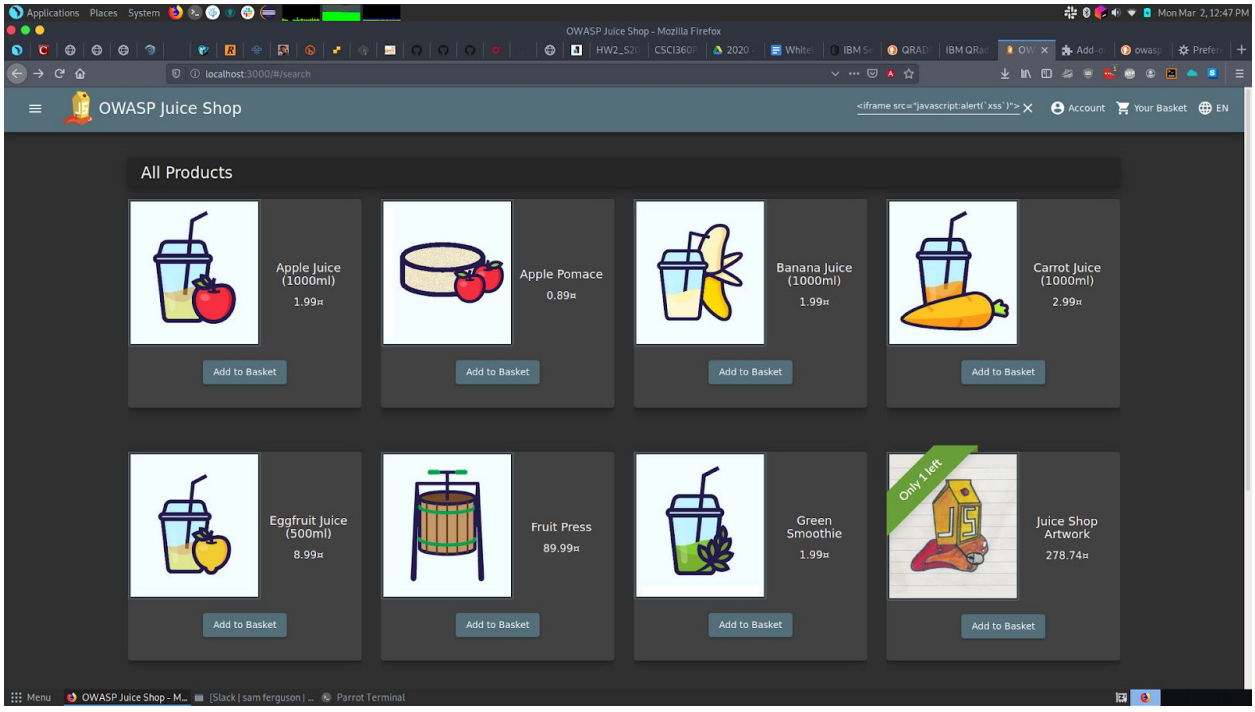
4. OWASP Juice Shop
   a. Reflected XSS (before)



   b. Reflected XSS (After)

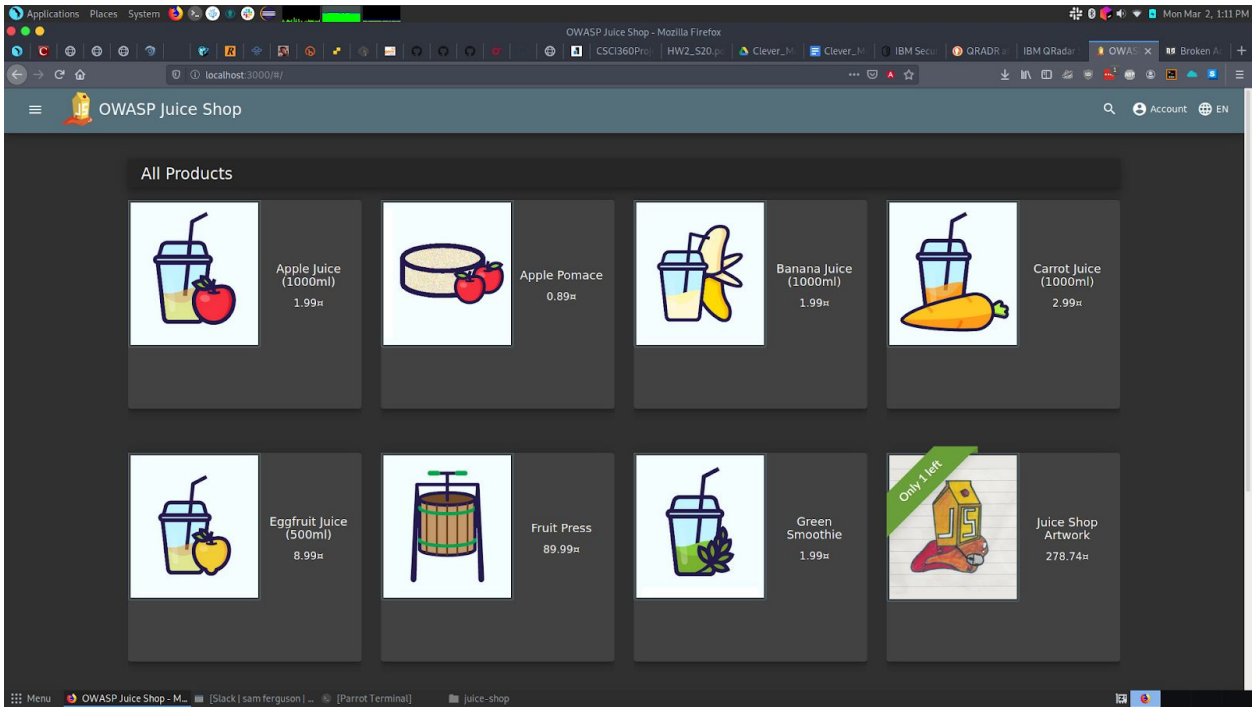


c. Administration page

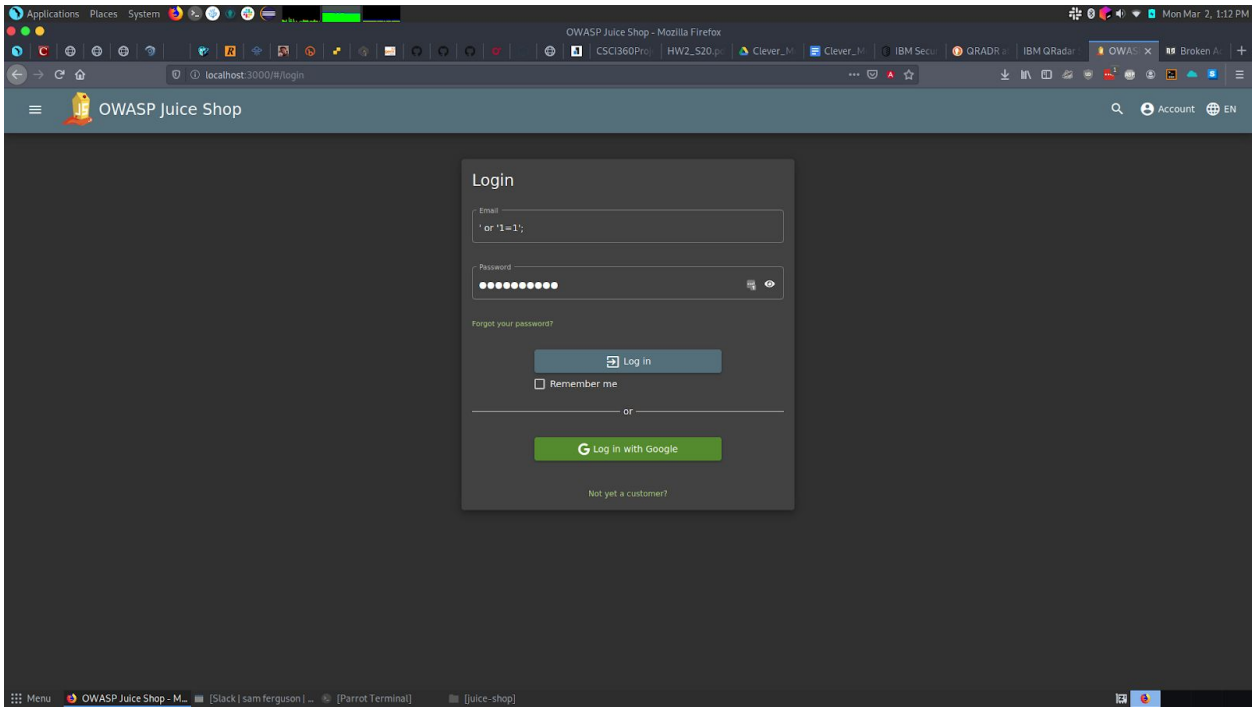


i.

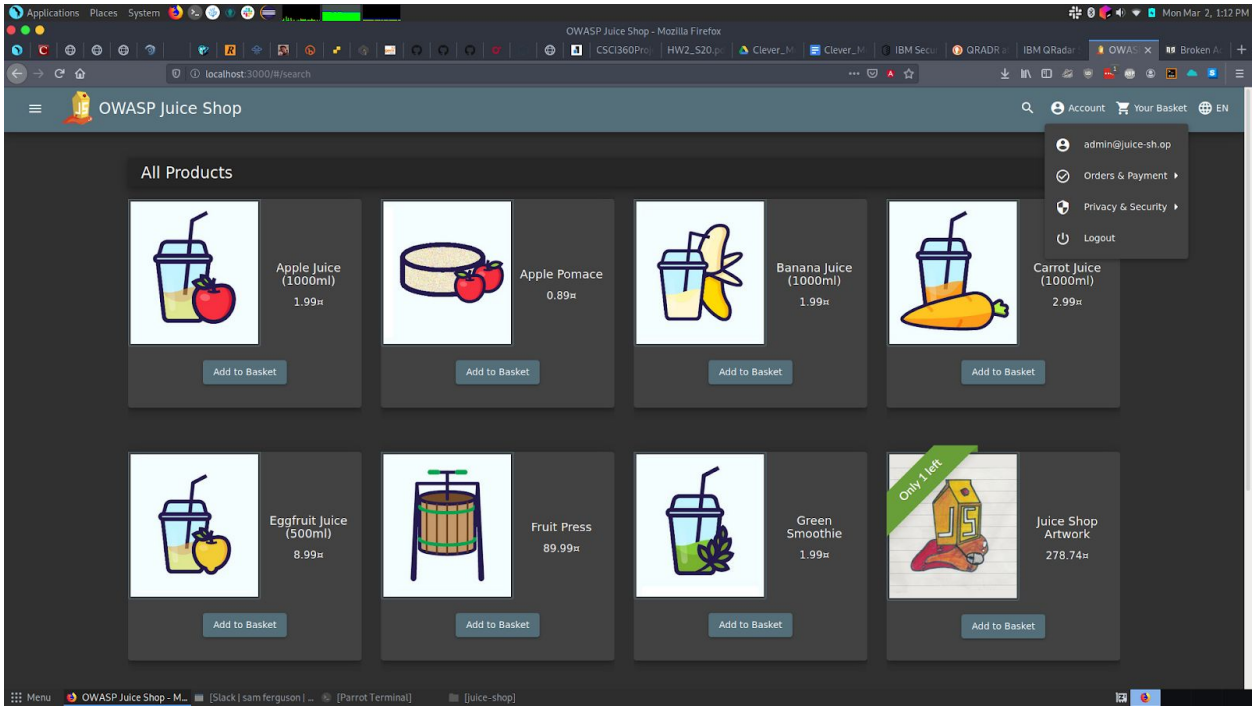
Before Admin page



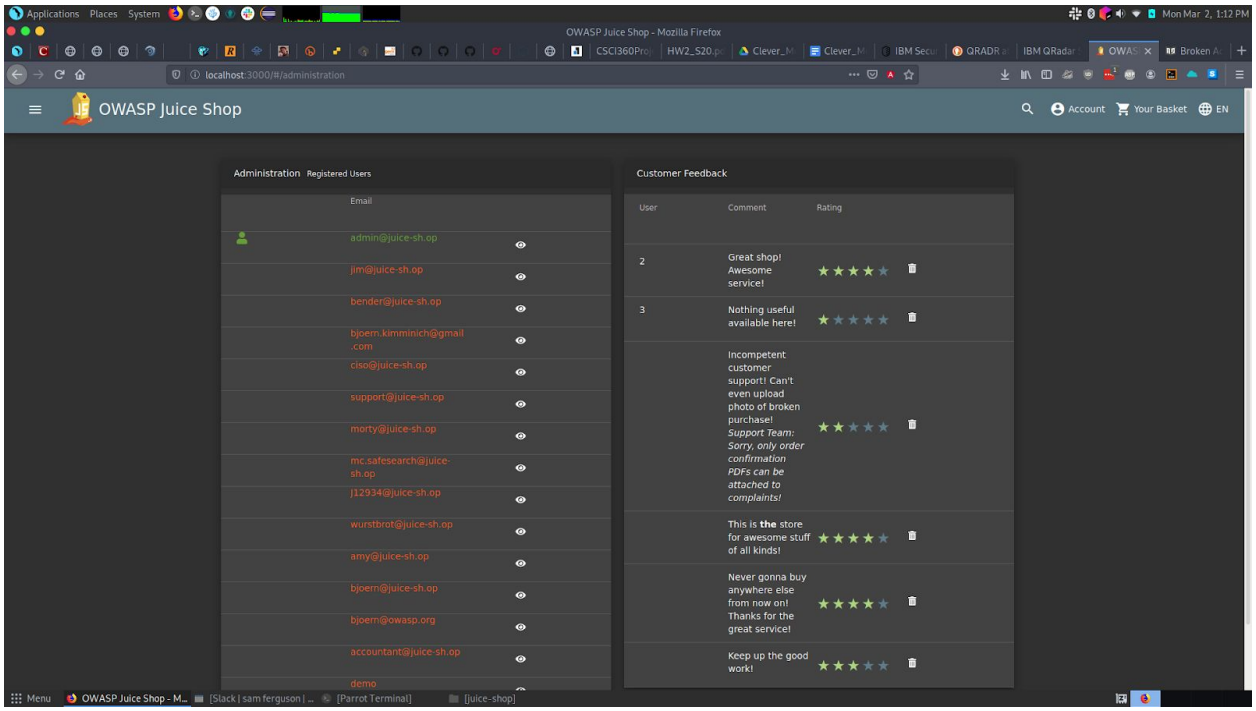
ii. Login to admin with SQL injection



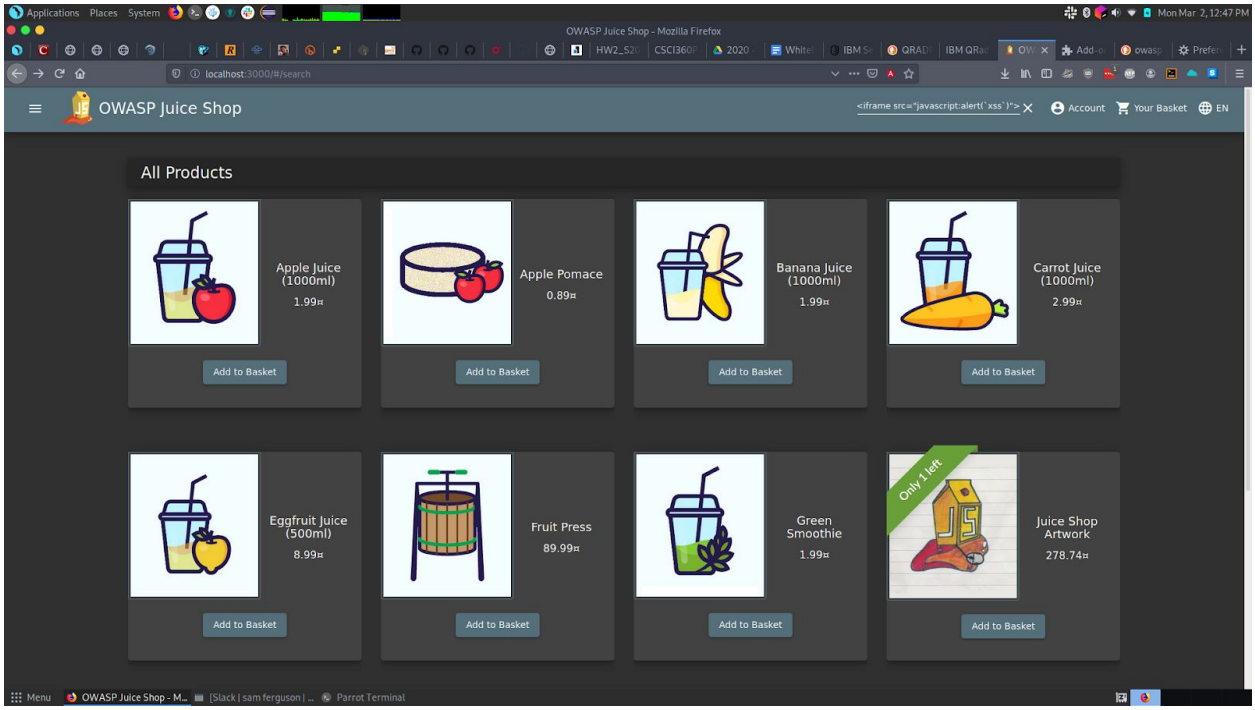
iii. Admin page



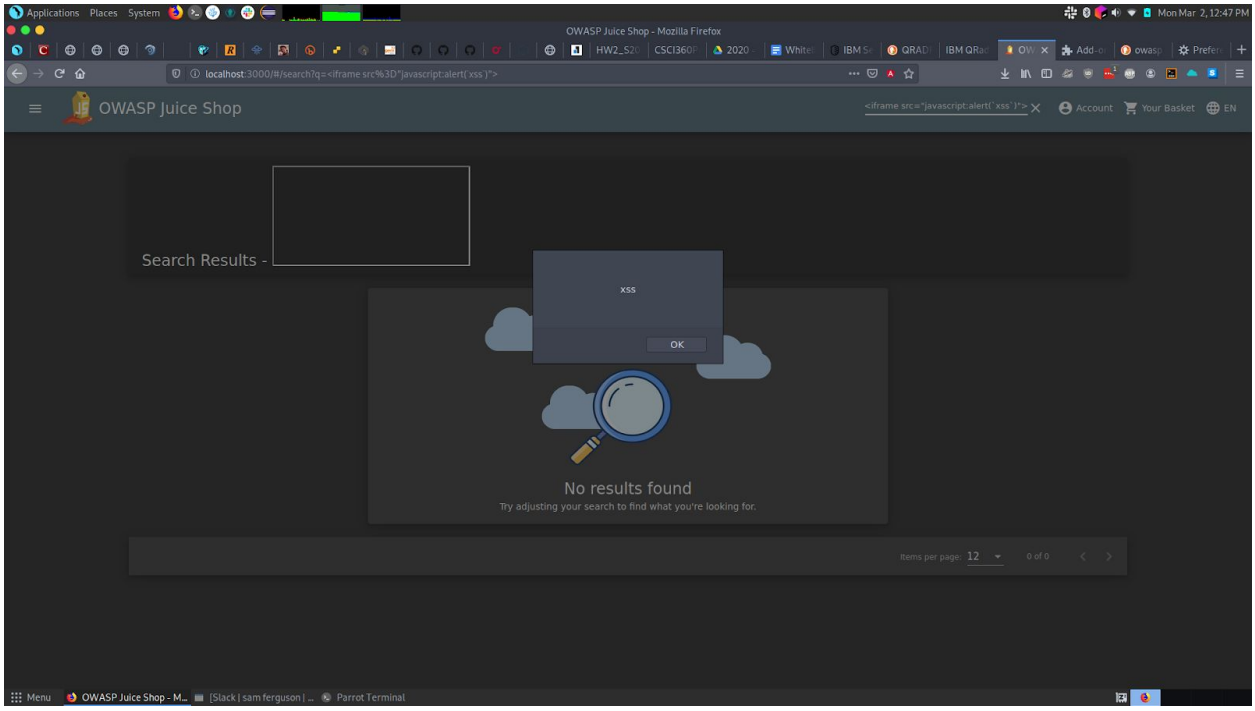
iv. Administration Page



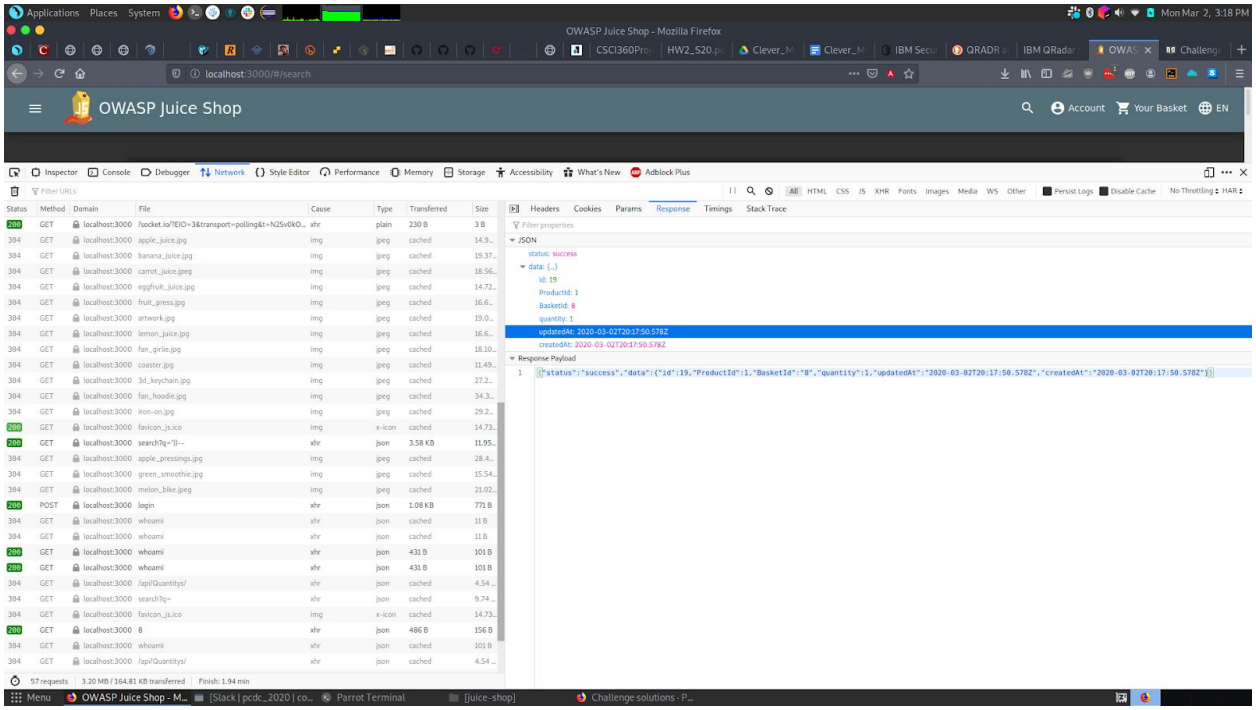
d. Before Persistent XSS



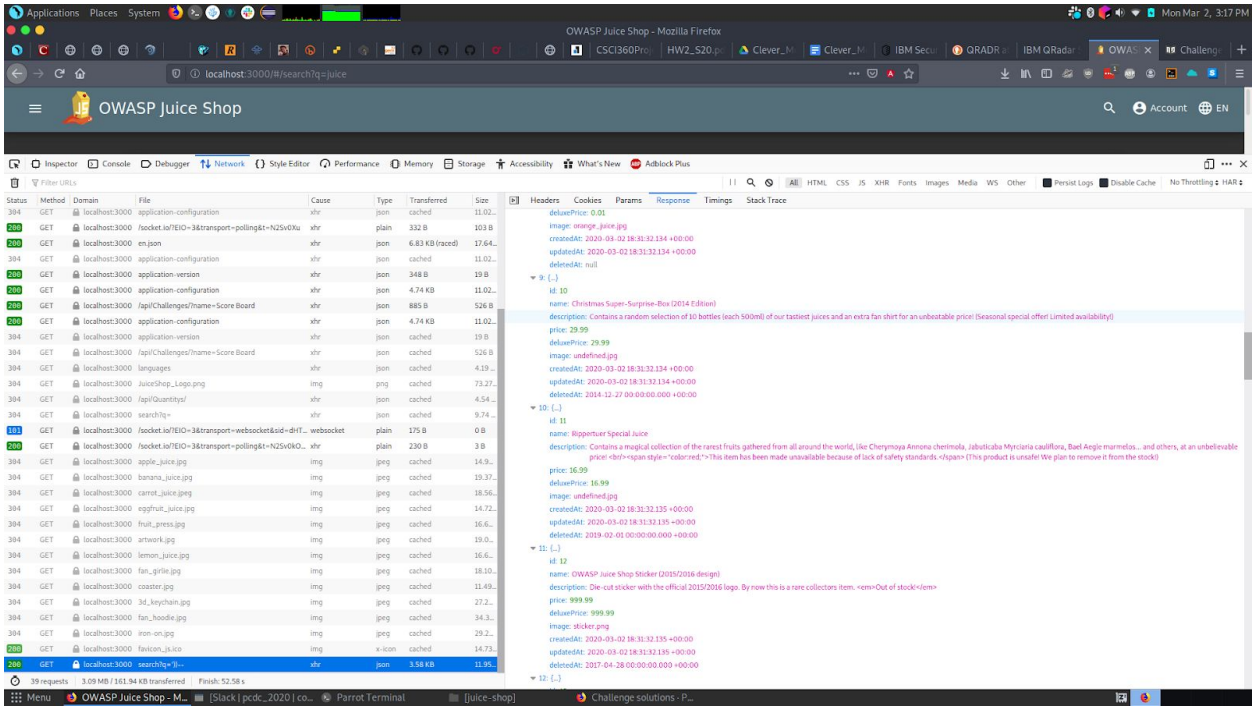
e. After Persistent XSS



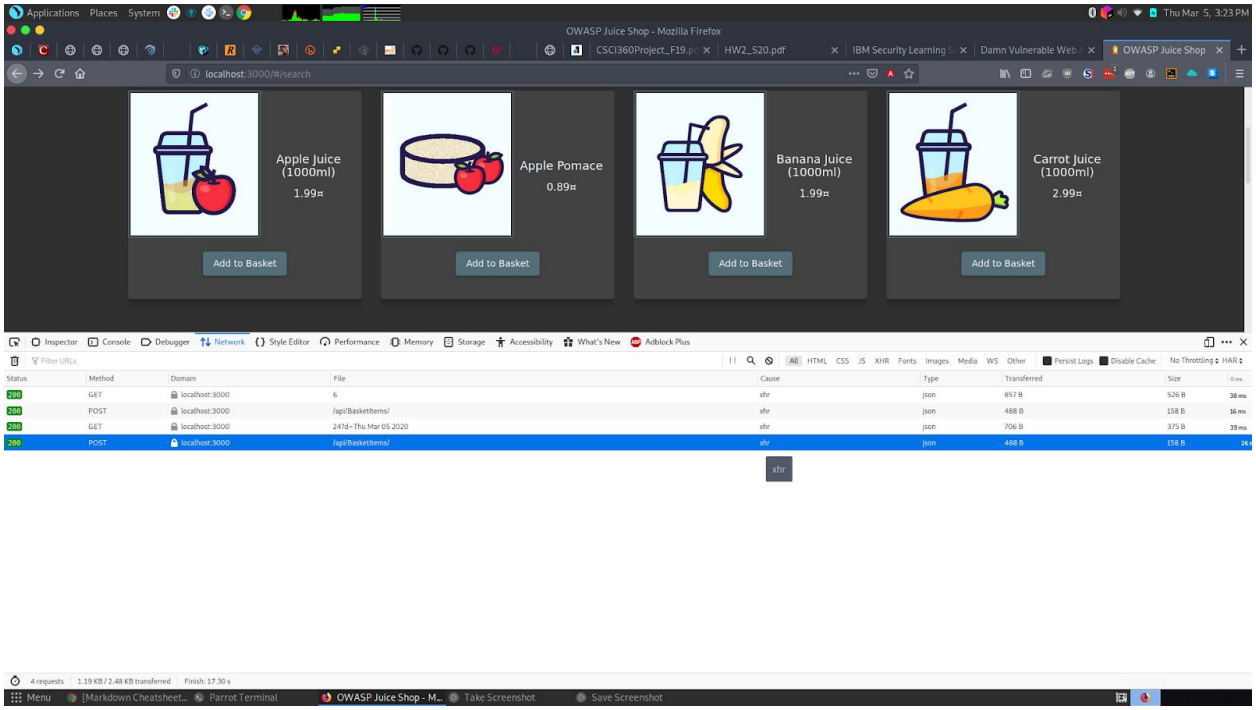
f. Christmas Package (Normal POST request)



g. Proof of Christmas Items



h. Our way of modification ofPOST



Cart after POST Request: