**MODERN COMPUTING**

**PRACTICAL SUBJECT CODE:**

**PSIT202**

PSIT20topology2- Modern Computing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No. | Title of Practical | Pg. No. | Date | Sign |
| 1 | Configure IP SLA tracking and path control topology. |  | 17/04/2023 |  |
| 2 | Implementation of BGP using AS\_path attribute. |  | 13/03/2023 |  |
| 3 | Configuring IBGP and EBGP sessions. |  | 08/05/2023 |  |
| 4 | Secure Management Plane. |  | 14/03/2023 |  |
| 5 | Configure and verify path control using PBR (Policy Based Routing) |  | 18/04/2023 |  |
| 6 | Demonstrate inter vlan routing. |  | 11/04/2023 |  |
| 7 | Simulating MP LS environment. |  | 08/05/2023 |  |
| 8 | Simulating VRF (Virtual Routing and Forwarding). |  | 08/05/2023 |  |

**CERTIFICATE**

This is to certify that the practical in the subject of   
**PSIT202 Modern Computing**  
have been completed satisfactorily by

Mr./Ms.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Roll no. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in

practical fulfilment of M.Sc. I.T. degree (Sem II) examination for Academic Year 2022 – 23.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Practical Instructor

Ms.

Date: / / 2022

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| Internal Examiner | External Examiner | Principal  Dr Rohini Kelkar |
| Date: / / 2022 | Date: / / 2022 | Date: / / 2022 |

**PRACTICAL 1**

**Aim: Configure IP SLA tracking and path control topology.**

**Topology:**

Diagram

Description automatically generated

**Steps/Commands:**

**Step1: Configure routers and connect serial links.**

R1# conf t

(config) int s1/0

(config-if) ip add 209.165.201.1 255.255.255.0

no sh

int s1/1

ip add 209.165.202.1 255.255.255.0

no sh

int lo0

ip add 192.168.1.1 255.255.255.0

do sh ip int br | include up

R2# conf t

(config) int s1/0

(config-if) ip add 209.165.201.2 255.255.255.0

no sh

int s1/2

ip add 209.165.200.2 255.255.255.0

no sh

do sh ip int br | include up

R3# conf t

(config) int s1/1

(config-if) ip add 209.165.202.3 255.255.255.0

no sh

int s1/2

ip add 209.165.200.3 255.255.255.0

no sh

do sh ip int br | include up

**Step 2: Configure static routing in branch router and dynamic routing using EIGRP (Enhanced Interior Gateway Routing Protocol) on ISP1 & ISP2 router.**

**(To not sum common IP address headers, use no auto-summary)**

R1> exit

(config) ip route 0.0.0.0 0.0.0.0 209.165.201.0

R2> exit

(config) router eigrp 1

network 209.165.200.0 0.0.0.255

network 209.165.201.0 0.0.0.255

no auto-summary

R3> exit

(config) router eigrp 1

network 209.165.202.0 0.0.0.255

network 209.165.200.0 0.0.0.255

no auto-summary

R2> exit

ip route 192.168.1.0 255.255.255.0 209.165.201.1

R3> exit

ip route 192.168.1.0 255.255.255.0 209.165.202.1

R1> exit

do ping 209.165.200.3

R3> (config)

do ping 209.165.201.1

R2> do ping 192.168.1.1

R3> do ping 192.168.1.1

**Task3: Configure IP SLA probes at branch routers.**

R3> hostname isp2

R2> hostname isp1

R1> hostname branch

branch> (config)

ip sla 11

icmp-echo 209.165.201.2

frequency 10

exit

ip sla schedule 11 life forever start-time now

do sh ip sla configuration 11

do sh ip sla statistics

**ON ALL ROUTERS (to save config):**

do wr

**Output:**

A screenshot of a computer

Description automatically generated with low confidence

Text, letter

Description automatically generated

Text, letter

Description automatically generated

Text

Description automatically generated

Text, letter

Description automatically generated

**PRACTICAL 2**

**Aim: Implementation of BGP using AS\_path attribute.**

**Topology:**

Diagram

Description automatically generated

**Steps/Commands:**

**Step1: Configuration**

R2# conf t

int s1/0

ip add 192.168.1.2 255.255.255.0

no sh

R1# conf t

int s1/0

ip add 192.168.1.1 255.255.255.0

no sh

int s1/1

ip add 172.24.1.1 255.255.255.0

no sh

R3# conf t

int s1/1

ip add 172.24.1.3 255.255.255.0

no sh

**Step2: Loopback**

R2# int lo0

ip add 10.1.1.1 255.255.255.0

R1# int lo0

ip add 10.2.2.2 255.255.255.0

R3# int lo0

ip add 10.3.3.3 255.255.255.0

**Step3: Configure as-bgp**

R2# router bgp 100

neighbor 192.168.1.1 remote-as 300

network 10.1.1.0 mask 255.255.255.0

R1# router bgp 300

neighbor 192.168.1.2 remote-as 100

neighbor 172.24.1.3 remote-as 200

network 10.2.2.0 mask 255.255.255.0

R3# router bgp 200

neighbor 172.24.1.1 remote-as 300

network 10.3.3.0 mask 255.255.255.0

**ON ALL ROUTERS:**

do sh ip route

**Step4: ping routers**

R1#do ping 10.3.3.3 source lo0

R3#do ping 10.2.2.2 source lo0

**Output:**

Text

Description automatically generated Text, letter

Description automatically generated

**PRACTICAL 3**

**Aim: Configuring IBGP and EBGP sessions.**

**Topology:**

A diagram of a network

Description automatically generated with medium confidence

**Steps/Commands:**

**Step 1: Drag and drop R1, R2 and R3; take 3 Ethernet switch and perform configurations on given routers.**

R1# conf t

int f0/1

ip add 192.168.1.1 255.255.255.0

no sh

int s1/0

ip add 172.16.1.1 255.255.255.0

no sh

int s1/1

ip add 172.16.5.1 255.255.255.0

no sh

R2# conf t

int f0/0

ip add 10.10.10.2 255.255.255.0

no sh

int f0/1

ip add 192.168.2.2 255.255.255.0

no sh

int s1/0

ip add 172.16.1.2 255.255.255.0

no sh

R3# conf t

int f0/0

ip add 10.10.10.3 255.255.255.0

no sh

int f0/1

ip add 192.168.3.3 255.255.255.0

no sh

int s1/1

ip add 172.16.5.3 255.255.255.0

no sh

ON ALL ROUTERS:

do sh ip int br | include up

**Step 2: Configure IRP(Interior Routing Protocol [using OSPF]) in autonomous system 65200 (AS65200)**

R2(config)

router ospf 1

network 10.10.10.0 0.0.0.255 area 0

network 192.168.2.0 0.0.0.255 area 1

R3#(config)

router ospf 1

network 10.10.10.0 0.0.0.255 area 0

network 192.168.3.0 0.0.0.255 area 2

ON BOTH ROUTERS:

R3>(config)

do ping 192.168.2.2

R2>(config)

do ping 192.168.3.3

**Step 3: IBGP and EBGP configurations**

R1>(config)

router bgp 65100

network 192.168.1.0

network 172.16.1.0 mask 255.255.255.0

network 172.16.5.0 mask 255.255.255.0

neighbor 172.16.1.2 remote-as 65200

neighbor 172.16.5.3 remote-as 65200

R2>(config)

router bgp 65200

network 172.16.1.0 mask 255.255.255.0

redistribute ospf 1

neighbor 172.16.1.1 remote-as 65100

neighbor 10.10.10.3 remote-as 65200

R3>(config)

router bgp 65200

network 172.16.5.0 mask 255.255.255.0

redistribute ospf 1

neighbor 172.16.5.1 remote-as 65100

neighbor 10.10.10.2 remote-as 65200

**Step 4: Final output:**

(ON ALL ROUTERS)

(config) do sh ip route

(DO THIS ONLY WHEN EXAMINER ASKS)

R1> (config)

do ping 192.168.2.2

do ping 192.168.3.3

**Output:**

A picture containing text, font, screenshot

Description automatically generated

A picture containing text, font, screenshot

Description automatically generated

A screenshot of a computer program

Description automatically generated with low confidence

A screenshot of a computer

Description automatically generated with medium confidence

A screenshot of a computer program

Description automatically generated with low confidence

A picture containing text, screenshot, font, number

Description automatically generated

**PRACTICAL 4**

**Aim: Secure management plane.**

**Topology:**

**Chart, line chart

Description automatically generated**

**Steps/Commands:**

**Step 1: Configure routers.**

R1> conf t

int s1/0

ip add 10.1.1.1 255.255.255.0

no sh

int lo1

ip add 192.168.1.1 255.255.255.0

R2> conf t

int s1/0

ip add 10.1.1.2 255.255.255.0

no sh

int s1/1

ip add 10.2.2.2 255.255.255.0

no sh

R3> conf t

int s1/1

ip add 10.2.2.3 255.255.255.0

no sh

int lo1

ip add 192.168.2.1 255.255.255.0

**Step2: Configure Routing:**

R1> ip route 0.0.0.0 0.0.0.0 10.1.1.2

R2> ip route 192.168.1.0 255.255.255.0 10.1.1.1

ip route 192.168.2.0 255.255.255.0 10.2.2.3

R3> ip route 0.0.0.0 0.0.0.0 10.2.2.2

R1> do ping 192.168.2.1

R3> do ping 192.168.1.1

(START ONLY WHEN 100% SUCCESS ON PING)

**Step3: Secure management access**

R1> (config)

hostname r1

security password min-length 10

enable secret class12345

line console 0

password ciscoconpass

exec-timeout 5 0

login

logging synchronous

exit

line vty 0 4

password ciscovtypass

exec-timeout 5 0

login

exit

line aux 0

no exec

end

do wr

conf t

service password-encryption

banner motd $Unauthorized access not allowed$

exit

R3> (config)

hostname r3

security password min-length 10

enable secret class12345

line console 0

password ciscoconpass

exec-timeout 5 0

login

logging synchronous

exit

line vty 0 4

password ciscovtypass

exec-timeout 5 0

login

exit

line aux 0

no exec

end

do wr

conf t

(config)

service password-encryption

banner motd $Unauthorized access not allowed$

exit

r2> telnet 10.1.1.1

Output:

Text, letter

Description automatically generated

Text, letter

Description automatically generated

Graphical user interface, text, application, email

Description automatically generated

**PRACTICAL 5**

**Aim: Configure and verify path control using PBR**

**(Policy Based Routing).**

**Topology:**

**Diagram

Description automatically generated**

**Steps/Commands:**

**Step1: Perform IP configuration.**

R1> #conf t

hostname r1

int s1/0

ip add 172.16.12.1 255.255.255.0

bandwidth 128

no sh

int s1/1

ip add 172.16.13.1 255.255.255.0

bandwidth 64

no sh

int lo0

ip add 192.168.1.1 255.255.255.0

exit

do sh ip int br | include up

R2> #conf t

hostname r2

int s1/0

ip add 172.16.12.2 255.255.255.0

bandwidth 128

no sh

int s1/2

ip add 172.16.23.2 255.255.255.0

bandwidth 128

no sh

int lo0

ip add 192.168.2.2 255.255.255.0

exit

do sh ip int br | include up

R3> #conf t

hostname r3

int s1/1

ip add 172.16.13.3 255.255.255.0

bandwidth 64

no sh

int s1/2

ip add 172.16.23.3 255.255.255.0

bandwidth 128

no sh

int s1/3

ip add 172.16.34.3 255.255.255.0

bandwidth 64

no sh

int lo0

ip add 192.168.3.3 255.255.255.0

do sh ip int br | include up

R4> #conf t

int s1/3

ip add 172.16.34.4 255.255.255.0

bandwidth 64

no sh

int lo0

ip add 192.168.4.1 255.255.255.0

int lo1

ip add 192.168.5.1 255.255.255.0

exit

do sh ip int br | include up

**Step 2: Configure EIGRP on all routers.**

R1> (config) router eigrp 1

network 172.16.12.0 0.0.0.255

network 172.16.13.0 0.0.0.255

network 192.168.1.0

no auto-summary

R2> (config) router eigrp 1

network 172.16.12.0 0.0.0.255

network 172.16.23.0 0.0.0.255

network 192.168.2.0

no auto-summary

R3> (config) router eigrp 1

network 172.16.13.0 0.0.0.255

network 172.16.23.0 0.0.0.255

network 172.16.34.0 0.0.0.255

network 192.168.3.0

no auto-summary

R4> (config) router eigrp 1

network 172.16.34.0 0.0.0.255

network 192.168.4.0

network 192.168.5.0

no auto-summary

**Step 3: check the network:**

'do sh ip route' on all routers

R1> do ping 192.168.4.1

R4> do ping 192.168.1.1

**USE TRACE ROUTE COMMAND TO VERIFY PATH from R4 to R1 using loopback.**

R4> do traceroute 192.168.1.1 source 192.168.4.1

R4> do traceroute 192.168.1.1 source 192.168.5.1

Step 4: Configure PBR to providepath control all traffic from source 192.168.5.1 should take the path r4 -> R3 -> R1, whereas traffic from 192.168.4.1 should take the path R4 -> R3 -> R2 -> R1

**Step4: Perform PBR on RECEIVING ROUTER**

R3# (config) ip access-list standard pbr-acl

permit 192.168.5.0 0.0.0.255

exit

route-map r3-to-r1 permit

match ip address pbr-acl

set ip next-hop 172.16.13.1

exit

int s1/3

ip policy route-map r3-to-r1

end

R4> do traceroute 192.168.1.1 source 192.168.4.1

R4> do traceroute 192.168.1.1 source 192.168.5.1

**Output:**

Graphical user interface

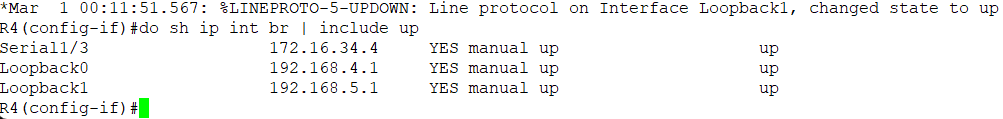
Description automatically generated with medium confidence

Graphical user interface, application

Description automatically generated

Graphical user interface

Description automatically generated with medium confidence



Text, letter

Description automatically generated

Text

Description automatically generated with medium confidence

A picture containing text

Description automatically generated

Text

Description automatically generated

**PRACTICAL 6**

**Aim: Demonstrate inter vlan routing.**

**Topology:**

Diagram

Description automatically generated

**Steps/Commands:**

(CISCO packet tracer)

Goto options -> preferences and check for link lights and port labels

**Step1: check VLAN config in each switch**

type command for all switches:

en

show vlan br

CHECK IF ALL SWITCHES HAVE SAME VLAN (1002,1003,1004,1005...)

**Step2: disable all ports on all the switches.**

commands for all switches:

conf t

interface range fa0/1-24

shutdown

interface range gi0/1-2

shutdown

**Step3: Perform basic switch configurations like assign name to switches, password to switches as well as gateways.**

hostnames: s0, s1 and s2

commands for all switches:

exit

(config)

hostname s0

enable secret class

no ip domain-lookup

ip default-gateway 172.17.99.1

line console 0

password cisco

login

line vty 0 15

password cisco

login

end

**Step4: On the interfaces of the switch 2 connect it to the PCs, configure access mode and enable them.**

commands for s2:

(config)

int fa0/11

(config-if)

switchport mode access

no shutdown

int fa0/12

switchport mode access

no shutdown

int fa0/13

switchport mode access

no shutdown

**Step5: Configure IP addresses on the three PCs and the server.**

PC0-> Desktop -> IP config

IP: 172.17.10.21 255.255.255.0

Default gateway: 172.17.10.1

PC1-> Desktop -> IP config

IP: 172.17.20.22 255.255.255.0

Default gateway: 172.17.20.1

PC2-> Desktop -> IP config

IP: 172.17.30.23 255.255.255.0

Default gateway: 172.17.30.1

Server -> Desktop -> IP config

IP: 172.17.50.254 255.255.255.0

Default gateway: 172.17.50.1

**Step6: Configure VTP protocol on the switches.**

s0 will be VTP server, s1 & s2 will be VTP client

s0:

Password: cisco

en Password: class

en

(#)

Password:

conf t

(config)

vtp mode server

vtp domain vsit

vtp password cisco

s1:

Password:

en

#

Password:

conf t

(config)

vtp mode client

vtp domain vsit

vtp password cisco

s2:

Password:

en

#

Password:

conf t

(config)

vtp mode client

vtp domain vsit

vtp password cisco

**Step7: Configure trunking codes on all connections between switches and enable them.**

s0:

(config)

int range fa0/1-3

(config-if)

switchport mode trunk

switchport trunk native vlan 99

no shutdown

int range fa0/5-6

switchport mode trunk

switchport trunk native vlan 99

no shutdown

s2:

(config)

int range fa0/3-6

(config-if)

switchport mode trunk

switchport trunk native vlan 99

no sh

s1:

(config)

int range fa0/1-4

(config-if)

switchport mode trunk

switchport trunk native vlan 99

no sh

s0:

(config-if-range)

exit

(config)

hostname management

(config-vlan)

vlan 10

name staff

vlan 20

name students

vlan 30

name guests

exit

do sh vlan br (On s0 and s2)

**Step8: Configure interface vlan 99 on all the switches.**

s0:

(config)

int vlan 99

(config-if)

ip add 172.17.99.11 255.255.255.0

end

s2:

(config)

int vlan 99

(config-if)

ip add 172.17.99.12 255.255.255.0

end

s1:

(config)

int vlan 99

(config-if)

ip add 172.17.99.13 255.255.255.0

end

**Step9: Configure vlan 10, vlan 20 and vlan 30 on switch 2.**

s2:

(config)

int fa0/11

(config-if)

switchport access vlan 10

int fa0/12

switchport access vlan 20

int fa0/13

switchport access vlan 30

**Step10: perform configuration on router.**

**First set on R1 f0/0 with 172.17.50.1 and subnet mask and click ‘on’.**

Router:

en

conf t

hostname r1

no ip domain-lookup

line console 0

(config-line)

password cisco

login

line vty 0 15

password cisco

login

end

conf t

(config)

enable secret class

int fa0/1

no sh

int fa0/1.1

(config-subif)

encapsulation dot1q 1

ip add 172.17.1.1 255.255.255.0

int fa0/1.10

encapsulation dot1q 10

ip add 172.17.10.1 255.255.255.0

int fa0/1.20

encapsulation dot1q 20

ip add 172.17.20.1 255.255.255.0

int fa0/1.30

encapsulation dot1q 30

ip add 172.17.30.1 255.255.255.0

int fa0/1.99

encapsulation dot1q 99 native

ip add 172.17.99.1 255.255.255.0

**Step11: ping/deliver packets.**

from PCs to Server

**Output:**

Table

Description automatically generated

Table

Description automatically generated

Table

Description automatically generated with medium confidence

Graphical user interface, text, application, email

Description automatically generated

Graphical user interface, application

Description automatically generated

Graphical user interface, text, application, email

Description automatically generated

Graphical user interface, text, application, email

Description automatically generated

Table

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Table

Description automatically generated

Table

Description automatically generated

**Practical 7**

**Aim: Simulating MP LS environment**

**Topology:**

**(before)**

A picture containing text, screenshot, diagram, line

Description automatically generated

**(after)**

A picture containing screenshot, diagram, line

Description automatically generated

**Steps/Commands:**

**Step 1: Configure routers**

R1> conf t

int lo0

ip add 1.1.1.1 255.255.255.255

ip ospf 1 area 0

int f0/0

ip add 10.0.0.1 255.255.255.0

no sh

ip ospf 1 area 0

R2> conf t

int lo0

ip add 2.2.2.2 255.255.255.255

ip ospf 1 area 0

int f0/0

ip add 10.0.0.2 255.255.255.0

no sh

exit

ip ospf 1 area 0

int f0/1

ip add 10.0.1.2 255.255.255.0

no sh

ip ospf 1 area 0

R3> conf t

int lo0

ip add 3.3.3.3 255.255.255.255

ip ospf 1 area 0

int f0/1

ip add 10.0.1.3 255.255.255.0

no sh

ip ospf 1 area 0

**Step 2: Verify connections.**

R1>(config) do sh ip ospf int br

do sh ip int br include up

do ping 3.3.3.3 source lo0

R3>(config) do sh ip ospf int br

do sh ip int br | include up

do ping 1.1.1.1 source lo0

**Step 3: Configure MPLS**

(On ALL routers R1, R2 and R3)

R1,R2,R3> router ospf 1

mpls ldp autoconfig

R2> do sh mpls interface

do sh mpls ldp neigh

**Step 4: Configuring VPN**

R1> do traceroute 3.3.3.3

router bgp 1

neighbor 3.3.3.3 remote-as 1

neighbor 3.3.3.3 update-source lo0

no auto-summary

address-family vpnv4

neighbor 3.3.3.3 activate

R3> do traceroute 1.1.1.1

router bgp 1

neighbor 1.1.1.1 remote-as 1

neighbor 1.1.1.1 update-source lo0

no auto-summary

address-family vpnv4

neighbor 1.1.1.1 activate

(on R1 and R3)

R1,R3> do sh bgp vpnv4 unicast all summary

(On R1 and R2)

R1,R2,> do sh ip route

Outputs:

A picture containing text, screenshot, font, line

Description automatically generated



A screenshot of a computer program

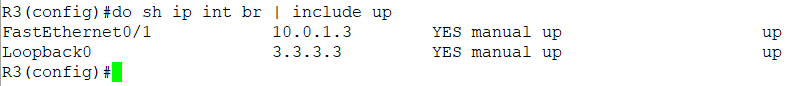
Description automatically generated with low confidence

A white background with black text

Description automatically generated with low confidence

A picture containing text, screenshot, font, line

Description automatically generated



A screenshot of a computer program

Description automatically generated with low confidence

A picture containing text, font, screenshot, line

Description automatically generated

A picture containing text, screenshot, font, line

Description automatically generated

A picture containing text, font, line, screenshot

Description automatically generated

**Practical 8**

**Aim: Simulating VRF (Virtual Routing and Forwarding).**

**Topology:**

**(before)**

A picture containing text, screenshot, diagram, line

Description automatically generated

**(after)**

A picture containing screenshot, diagram, line

Description automatically generated

**Steps/Commands:**

**(Perform MPLS)**

**Step 1: Adding Routers and Configuring VRF (Virtual Routing and Forwarding)**

DRAG & DROP router R4, R5

R1>

int f0/1

ip add 192.168.1.1 255.255.255.0

no sh

exit

ip vrf RED

rd 4:4

route-target both 4:4

int f0/1

ip vrf forwarding RED

int f0/1

ip add 192.168.1.1 255.255.255.0

ip ospf 2 area 2

do sh ip ospf int br

do sh ip int br | include up

R3>

int f0/0

ip add 172.168.1.3 255.255.255.0

no sh

exit

ip vrf BLUE

rd 5:5

route-target both 5:5

int f0/0

ip vrf forwarding BLUE

int f0/0

ip add 172.168.1.3 255.255.255.0

ip ospf 3 area 3

do sh ip ospf int br

do sh ip int br | include up

R4> conf t

int lo0

ip add 4.4.4.4 255.255.255.255

ip ospf 2 area 2

int f0/1

ip add 192.168.1.4 255.255.255.0

no sh

ip ospf 2 area 2

int lo0

ip ospf 2 area 2

do sh ip ospf int br

do sh ip int br | include up

R5> conf t

int lo0

ip add 5.5.5.5 255.255.255.255

ip ospf 3 area 3

int f0/0

ip add 172.168.1.5 255.255.255.0

no sh

ip ospf 3 area 3

int lo0

ip ospf 3 area 3

do sh ip ospf int br

do sh ip int br | include up

**Step 2: Verfiy connection**

R1>(config) do sh ip route vrf RED

R3>(config) do sh ip route vrf BLUE

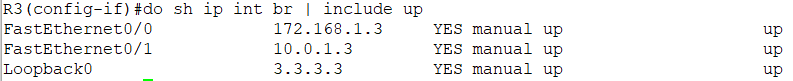
**Outputs:**

A picture containing text, screenshot, font, algebra

Description automatically generated

Chart

Description automatically generated



A picture containing text, screenshot, font, line

Description automatically generated

A picture containing text, screenshot, font, number

Description automatically generated

A screenshot of a computer

Description automatically generated with medium confidence

A screenshot of a computer program

Description automatically generated with low confidence