# Implementing Security Control Loops in Security Autonomous Response Networks

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# Introduction

Imagine your banking website or application does not work!

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**ANNOYING!!!**

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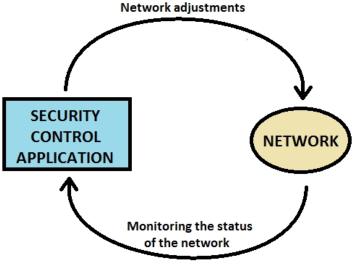
Imagine your banking website or application does not work!
**ANNOYING!!!**

- A way for adopting **the best countermeasures technologies** which are available
- Support for very **complex networks**
- Easier **organizing the security** of company networks
- **Faster response** times

# Introduction

- **Software Defined Networks (SDNs)** are out there...
- Implementing **Security as a Service (SaaS)**
- By using **control loops**
- **Share security modules** with other companies and organizations


Network adjustments
SECURITY CONTROL APPLICATION
NETWORK
Monitoring the status of the network

# Introduction

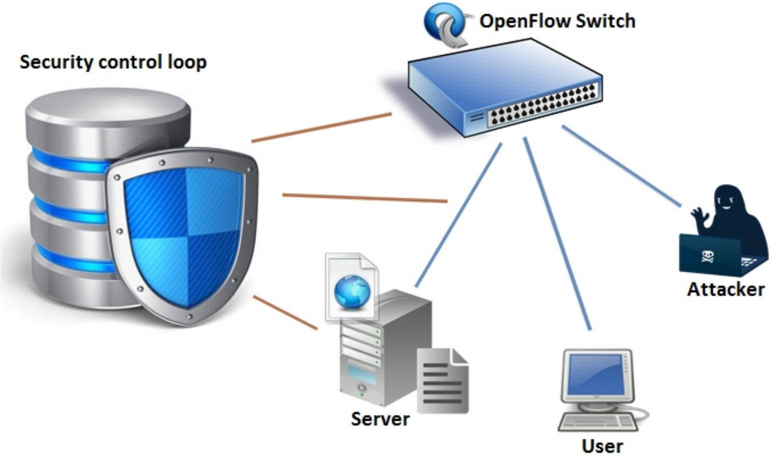
**Security Autonomous Response Networks** - Software Defined Networks that adjust themselves in order take care of security threats and risks

# Research Questions

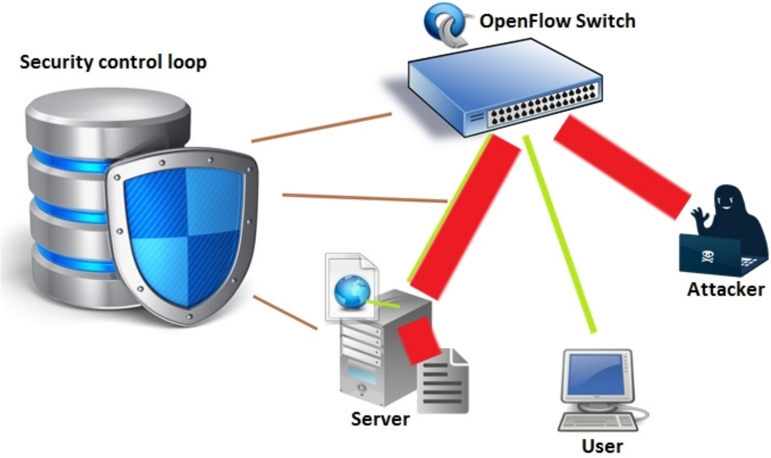
**How could a security control loop be implemented as a software solution?**

- *What properties should the implementation of a Security Autonomous Response Network have, in order to make it beneficial and effective against security threats?*
- *How can a Security Autonomous Response Network decide on which response will be better to execute in a given situation?*

# Attack Isolation Control Loop



# Attack Isolation Control Loop



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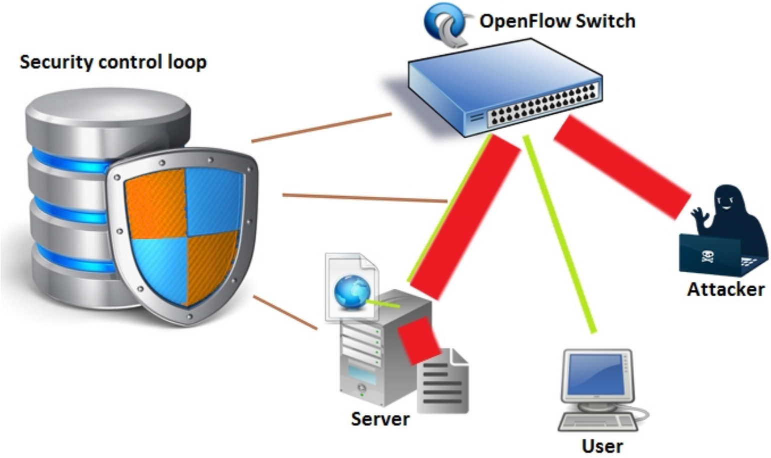

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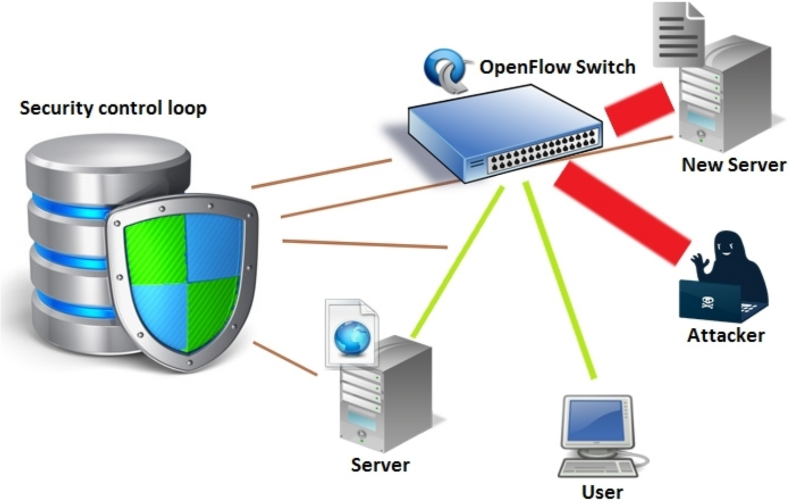
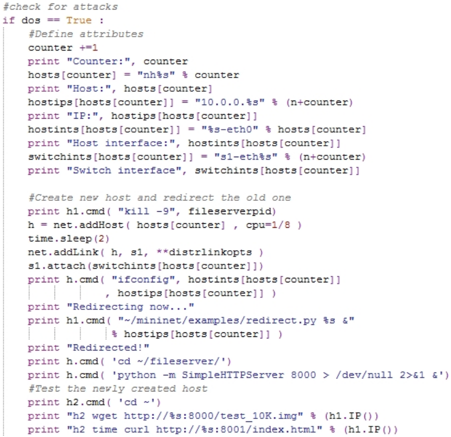


# Attack Isolation Control Loop

- Creating topology
- Testing the Network
- Start Services
- Start Control Loop
    - Collect TCP Connections Statistics
    - Check Number Of Connections
    - (Determine Potential Attacks)
    - **(Create New Server)**
    - **(Redirect Traffic To It)**

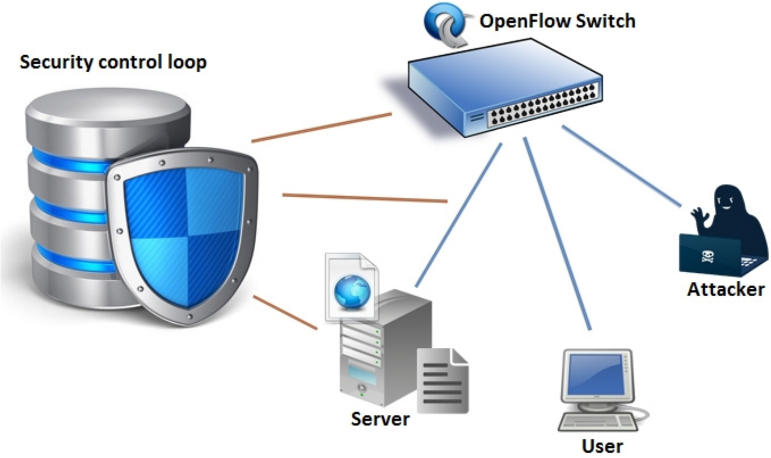


```
#check for attacks
if dos == True :
    #Define attributes
    counter +=1
    print "Counter:", counter
    hosts[counter] = "nh%s" % counter
    print "Host:", hosts[counter]
    hostips[hosts[counter]] = "10.0.0.%s" % (n+counter)
    print "IP:", hostips[hosts[counter]]
    hostints[hosts[counter]] = "%s-eth0" % hosts[counter]
    print "Host interface:", hostints[hosts[counter]]
    switchints[hosts[counter]] = "s1-eth%s" % (n+counter)
    print "Switch interface", switchints[hosts[counter]]

    #Create new host and redirect the old one
    print h1.cmd( "kill -9", fileserverpid)
    h = net.addHost( hosts[counter] , cpu=1/8 )
    time.sleep(2)
    net.addLink( h, s1, **distrlinkopts )
    s1.attach(switchints[hosts[counter]])
    print h.cmd( "ifconfig", hostints[hosts[counter]]
                  , hostips[hosts[counter]] )
    print "Redirecting now..."
    print h1.cmd( "~/mininet/examples/redirect.py %s &"
                   % hostips[hosts[counter]] )
    print "Redirected!"
    print h.cmd( 'cd ~/fileserver/')
    print h.cmd( 'python -m SimpleHTTPServer 8000 > /dev/null 2>&1 &')
    #Test the newly created host
    print h2.cmd( 'cd ~')
    print "h2 wget http://%s:8000/test_10K.img" % (h1.IP())
    print "h2 time curl http://%s:8001/index.html" % (h1.IP())
```

*Moving resources to new server*

# Attack Limiting Control Loop



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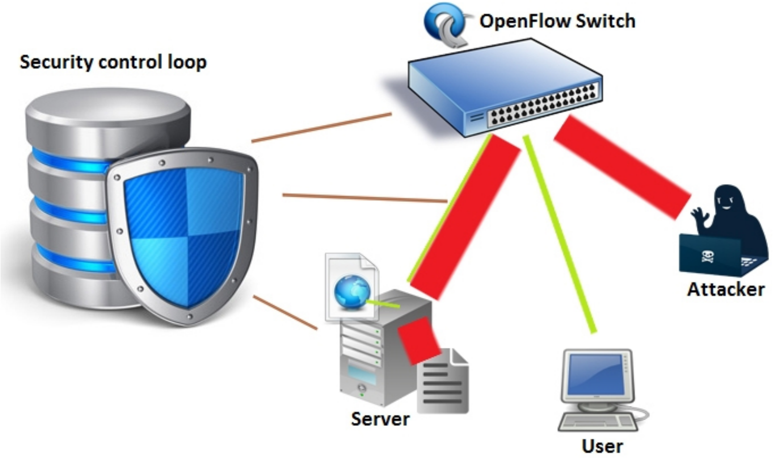

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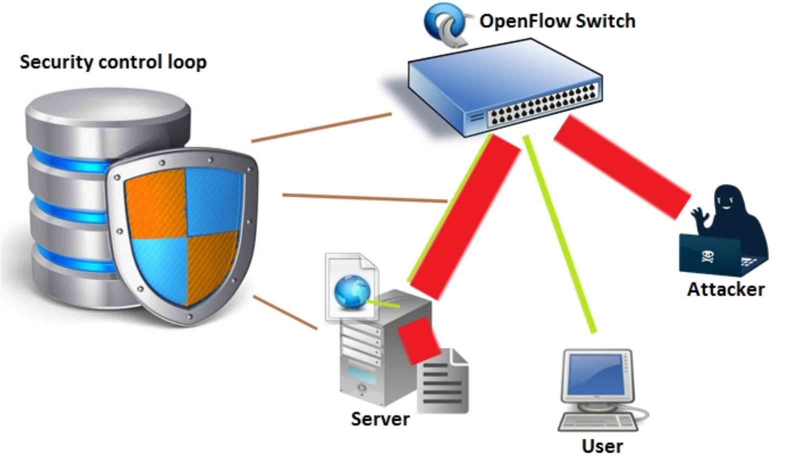

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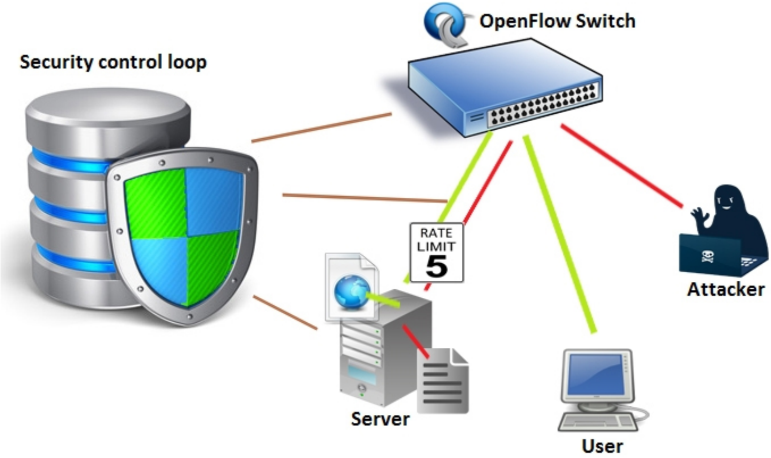

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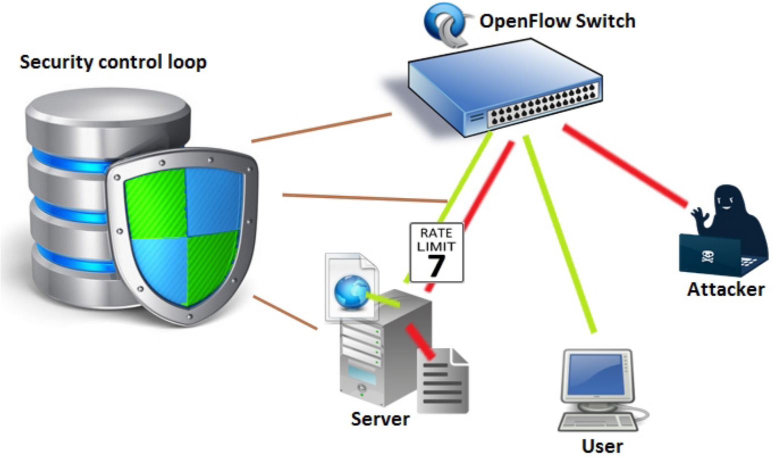

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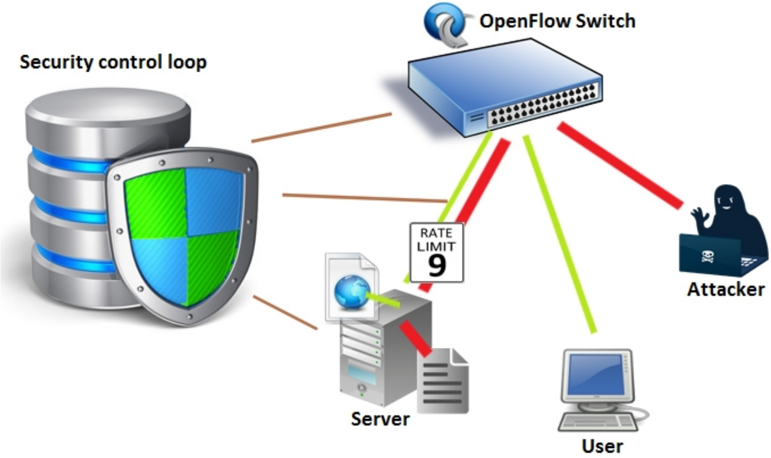

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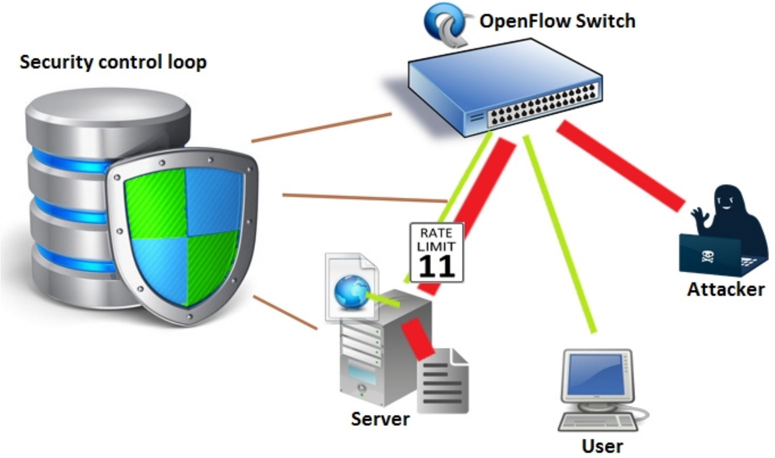
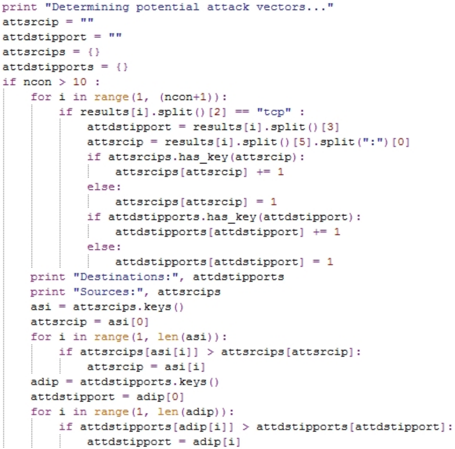


# Attack Limiting Control Loop

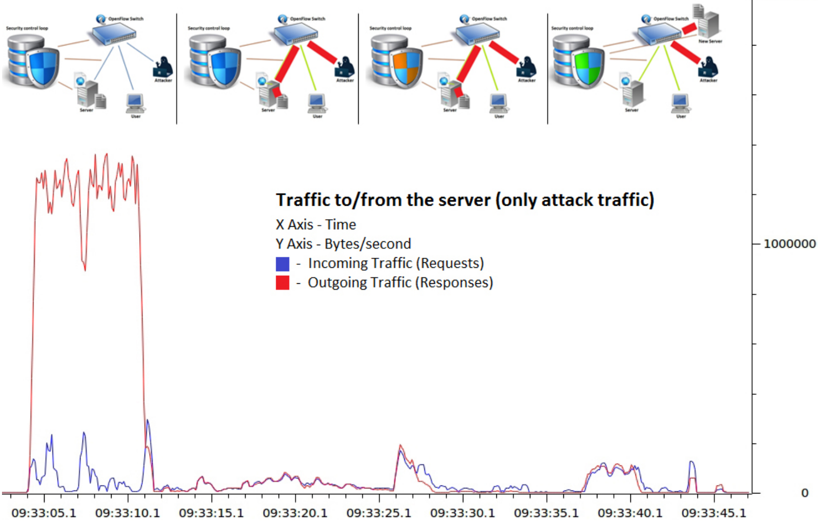
- Creating topology
- Testing the Network
- Start Services
- Start Control Loop
    - Collect TCP Connections Statistics
    - Check Number Of Connections
    - **(Determine Potential Attacks)**
    - (Collect Bandwidth Statistics)
    - (Adjust Rate Limits)
    - (Implement New Rate Limits)



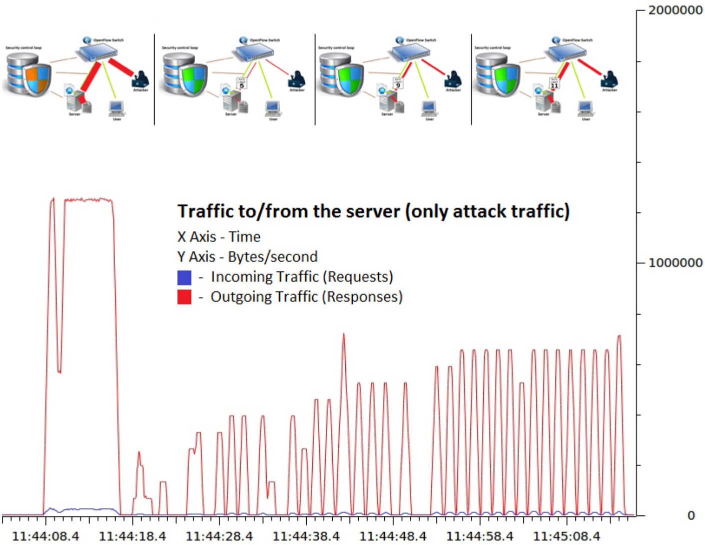
```
print "Determining potential attack vectors..."
attsrcip = ""
attdstipport = ""
attsrcips = {}
attdstipports = {}
if ncon > 10 :
    for i in range(1, (ncon+1)):
        if results[i].split()[2] == "tcp" :
            attdstipport = results[i].split()[3]
            attsrcip = results[i].split()[5].split(":")[0]
            if attsrcips.has_key(attsrcip):
                attsrcips[attsrcip] += 1
            else:
                attsrcips[attsrcip] = 1
            if attdstipports.has_key(attdstipport):
                attdstipports[attdstipport] += 1
            else:
                attdstipports[attdstipport] = 1
    print "Destinations:", attdstipports
    print "Sources:", attsrcips
    asi = attsrcips.keys()
    attsrcip = asi[0]
    for i in range(1, len(asi)):
        if attsrcips[asi[i]] > attsrcips[attsrcip]:
            attsrcip = asi[i]
    adip = attdstipports.keys()
    attdstipport = adip[0]
    for i in range(1, len(adip)):
        if attdstipports[adip[i]] > attdstipports[attdstipport]:
            attdstipport = adip[i]
```

*Determine potential attacks vectors*

# Attack Isolation Results



# Attack Limiting Results



# Conclusions

*(What properties should the implementation of a Security Autonomous Response Network have, in order to make it beneficial and effective against security threats?)*

- **Software Modularity** - Scalability, Reusable and pluggable modules
- **Company Infrastructure Modularity** - Flexibility, More options for responses to security threats

# Conclusions

*(How can a Security Autonomous Response Network decide on which response will be better to execute in a given situation?)*

**Responses to security threats should be:**

- **Classified** - based on which problems they can solve
- **Rated** - based on their effectiveness

# Questions

**Please ask your questions now, thank you!**