

# AAA SECURITY FRAMEWORK: OVERVIEW

COMPUTER SYSTEMS SECURITY

GORDON | REYNOLDS (2019)

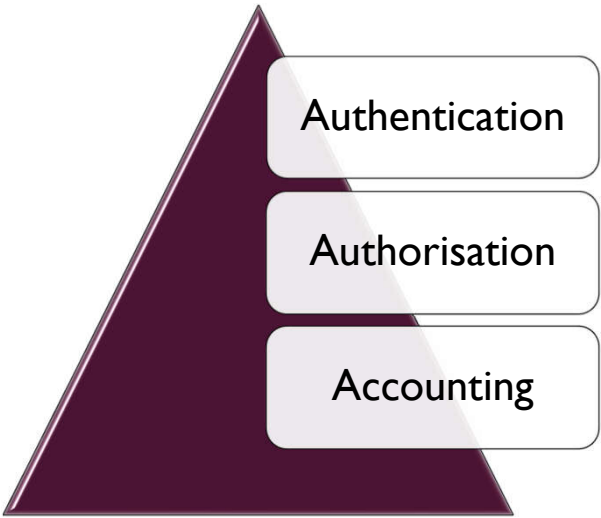
1

## TODAY ....

Today we will overview the AAA Framework Security:

- RADIUS
- TACACS+

GORDON | REYNOLDS (2019)



2

COMPUTER SYSTEMS  
SECURITY

# AAA SECURITY FRAMEWORK: OVERVIEW

GORDON | REYNOLDS (2018)

3

## OVERVIEW

- The AAA (Triple A) framework is a well established security framework.
- This lecture will be delivered in three main sections.
  - An overview and introduction to the AAA security framework.
  - RADIUS, a client/server protocol that uses the AAA framework
  - TACACS+, which is another client/server protocol that uses the AAA security framework. This section will also compare RADIUS with TACACS+.

GORDON | REYNOLDS (2018)

4

## AAA SECURITY FRAMEWORK

- The AAA security framework is a fundamental security framework for:
  - Controlling user access to a network
  - Determining access levels or privileges based on policies and a user's identity
  - Keeping track of a user's activities

GORDON | REYNOLDS (2018)

5

## AAA SECURITY FRAMEWORK

- The AAA security framework has three components:
  - Authentication
  - Authorisation
  - Accounting

GORDON | REYNOLDS (2018)

6

## AAA SECURITY FRAMEWORK

- Authentication:
  - Authentication asks the question 'Who are you?'
  - A user is then required to supply credentials, typically a password, to verify their identity.
- After an identify is verified, the user will be granted privileges.
  - This is the second component – Authorisation.

GORDON | REYNOLDS (2018)

7

## AAA SECURITY FRAMEWORK

- Authorisation
  - The essence of this component is about 'What you can do'
  - Privileges can includes the type of resources and/or services a user can access. That is,
    - The type of tasks that a user can perform
    - When the user can access these resources/services
    - How long the user can use the resources/services
    - .... etc

GORDON | REYNOLDS (2018)

8

## AAA SECURITY FRAMEWORK

- Accounting
  - This component keeps track of a user by creating a log of activities.
  - This log may include:
    - The resources that a user used
    - How much of the resources that a user used (such as bandwidth)
    - How long the user used the resources
    - ... etc

GORDON | REYNOLDS (2018)

9

## AAA SECURITY FRAMEWORK

- Accounting
  - The data collected at this stage could be used for:
    - Controlling
    - Monitoring
    - Billing
    - Statistics
    - .... etc

GORDON | REYNOLDS (2018)

10

COMPUTER SYSTEMS  
SECURITY

## AAA SECURITY FRAMEWORK: RADIUS

GORDON | REYNOLDS (2018)

11

### RADIUS

- Remote Authentication Dial-In User Service (RADIUS)
- RADIUS is a networking protocol that provides centralised AAA management for users who connect and use a network service.
- That is, RADIUS
  - Uses the AAA security framework
  - Is a client/server protocol that enables a Network Access Server (NAS) to communicate with a central server to authenticate dial-in users.
  - Authenticates users to a network
  - Keeps track of a users activities

GORDON | REYNOLDS (2018)

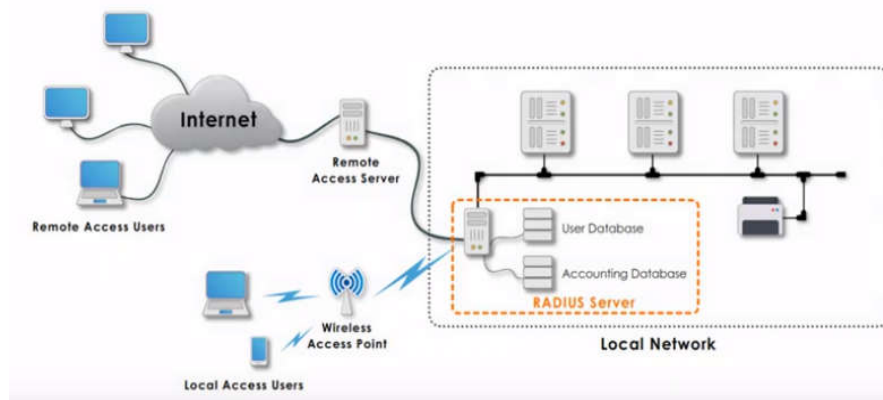
12

## RADIUS

- In RADIUS, a NAS is a connection point between the user and the AAA Servers.
- A NAS can be a remote access server for remote users OR a Wireless Access Point (WAP) for local wireless users.
- Combining RADIUS with a wireless infrastructure is a common approach and technique to manage users accessing a network.
- Rather than the distribution of a wireless key, users can authenticate using their existing credentials.
- Various access levels and privileges can then be applied based on the user's credentials.

GORDON | REYNOLDS (2018)

13



## RADIUS

- The word remote in RADIUS is very misleading as RADIUS is not just for remote users as its name suggests.
- RADIUS can also be used for local users in regards to wireless and/or wired connections.

GORDON | REYNOLDS (2018)

14

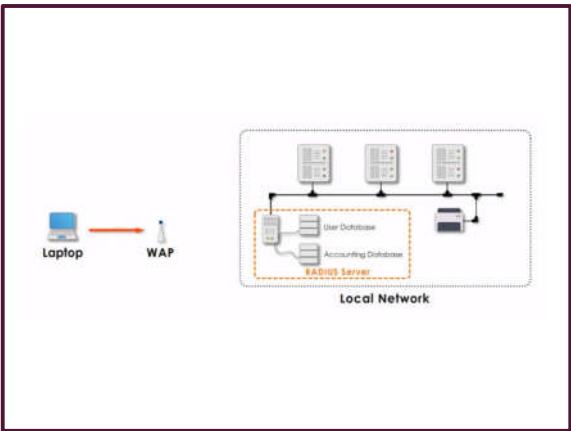
COMPUTER SYSTEMS  
SECURITY

# RADIUS EXAMPLE: WIRELESS ACCESS FOR LOCAL USERS

GORDON | REYNOLDS (2018)

15

## RADIUS WIRELESS EXAMPLE



GORDON | REYNOLDS (2018)

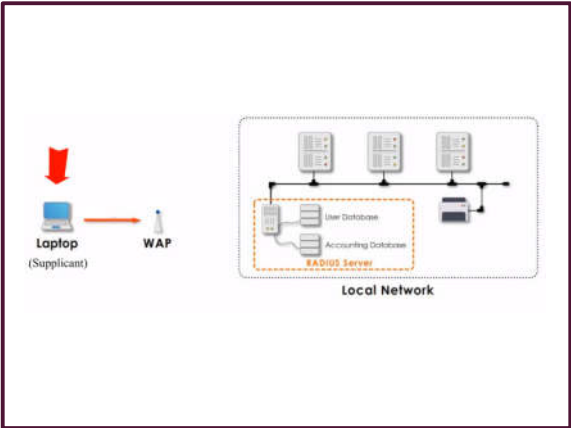
Scenario:

- A user requests access to a local network.

16



# RADIUS WIRELESS EXAMPLE



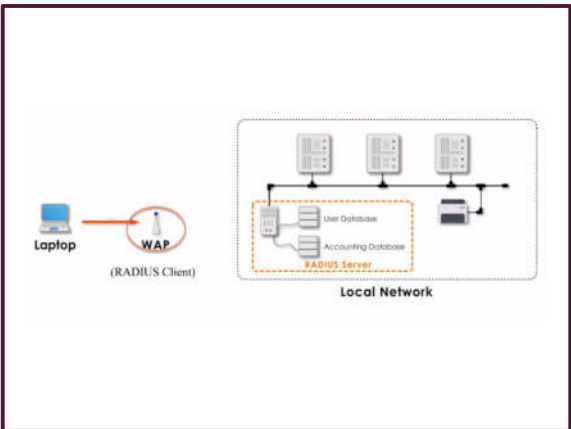
GORDON | REYNOLDS (2018)

## Terminology:

- In RADIUS, the user's device is called a supplicant.

17

# RADIUS WIRELESS EXAMPLE



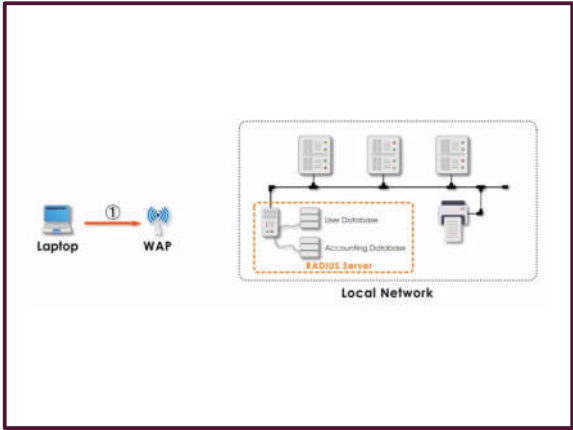
GORDON | REYNOLDS (2018)

## Terminology:

- The Wireless Access Point (WAP) is called a RADIUS Client.
- The WAP is a middle-man between the user and the AAA Server.

18

## RADIUS WIRELESS EXAMPLE



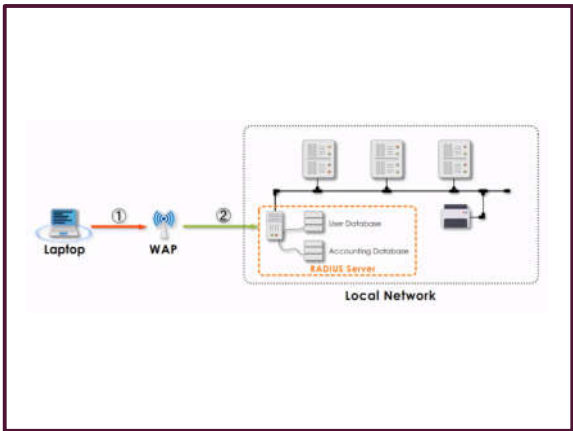
GORDON | REYNOLDS (2018)

### Step1:

- A user connects to the WAP and requests permission to access the network.
- As par of this process, the user supplies their username and password.
- It should be noted, that only the password is encrypted.

19

## RADIUS WIRELESS EXAMPLE



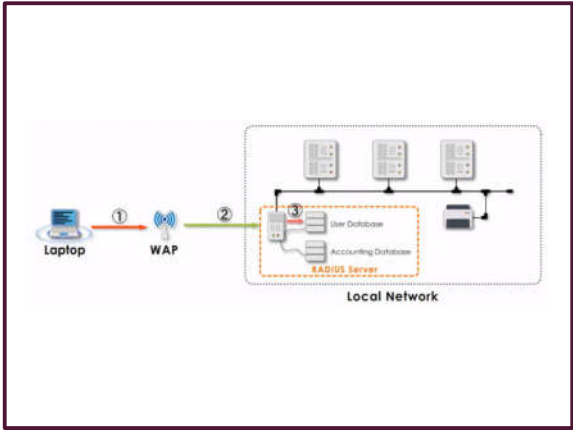
GORDON | REYNOLDS (2018)

### Step2:

- The Wireless Access Point (WAP) contacts the RADIUS Server to see if the user exists in the RADIUS Server's Database as a valid user.

20

# RADIUS WIRELESS EXAMPLE

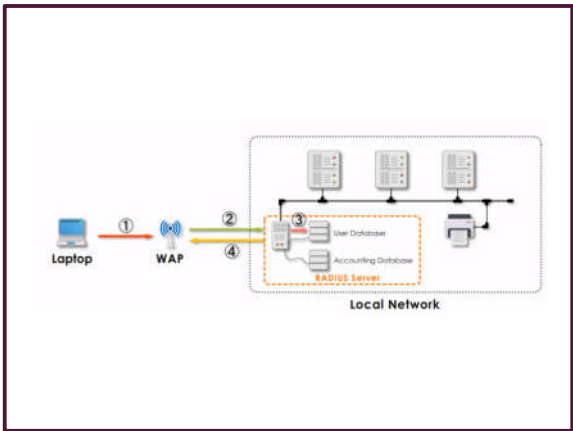


GORDON | REYNOLDS (2018)

- Step3:
- The RADIUS Server checks the user's credentials against its' database.

21

# RADIUS WIRELESS EXAMPLE

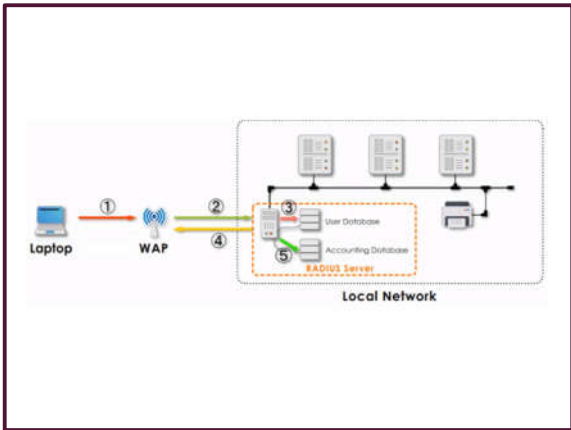


GORDON | REYNOLDS (2018)

- Step4:
- Once the user is verified, the RADIUS server sends a packet back to the WAP containing access permissions and privileges for the user.

22

## RADIUS WIRELESS EXAMPLE



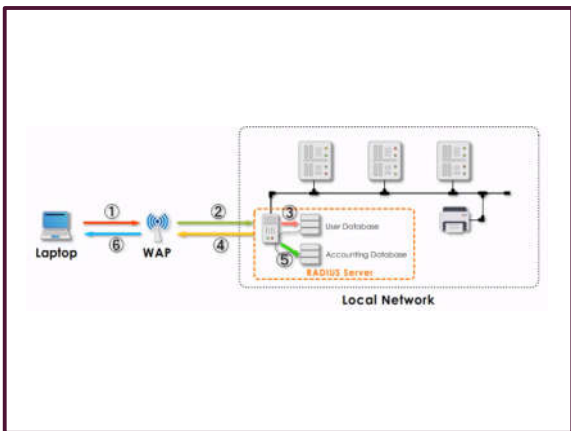
GORDON | REYNOLDS (2018)

### Step5:

- This step refers to the accounting components of the AAA framework.
- The Accounting Database creates a record for the user that keeps track of all the user's activities during their session.

23

## RADIUS WIRELESS EXAMPLE



GORDON | REYNOLDS (2018)

### Step6:

- Finally, the WAP passes the packet to the user.
- It is now possible for the user to access the network and use network resources until the user logs-out or when their session expires.

24

## RADIUS

- In Summary,
  - RADIUS uses the AAA Security Framework which is designed for both local and remote users.
  - It is used to provide centralised access to a network and its' resources.
  - RADIUS allows a company to maintain user profiles in a central database that all remote servers can share.

GORDON | REYNOLDS (2018)

25

## RADIUS WIRELESS EXAMPLE

- Popular RADIUS products include:
  - Radiator
    - (<https://www.open.com.au/radiator/>)
  - OpenRADIUS
    - (<http://openradius.sourceforge.net/>)
  - Microsoft's Network Policy Server (NPS)
    - (<https://docs.microsoft.com/en-us/windows-server/networking/technologies/nps/nps-top>)
  - Aruba's ClearPass Service
    - (<https://www.arubanetworks.com/products/security/network-access-control/>)

GORDON | REYNOLDS (2018)

26

COMPUTER SYSTEMS  
SECURITY

## AAA SECURITY FRAMEWORK: TACACS+

GORDON | REYNOLDS (2018)

27

### TACACS+

- Terminal Access Controller Access-Control System Plus (TACACS+) is a protocol developed by Cisco.
- It was released as an open standard in 1993.
- Although derived from TACACS, TACACS+ is a separate protocol that handles authentication, authorization, and accounting (AAA) services.

GORDON | REYNOLDS (2018)

28

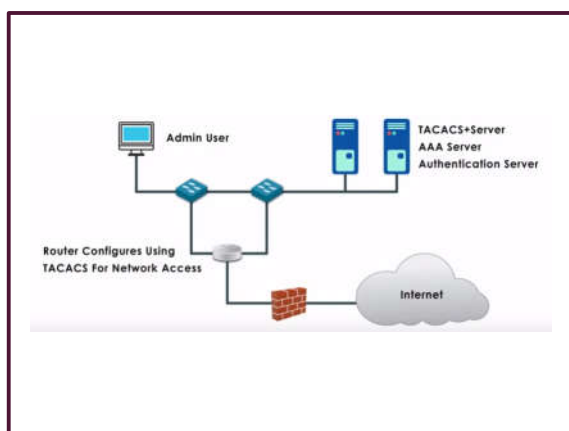
## TACACS+

- Hence, like RADIUS, TACACS+ uses the AAA framework to provide centralised access into a network.
- RADIUS has been designed to authenticate and log remote networks.
- TACACS+ is used for administrator access to network devices such as routers and switches.

GORDON | REYNOLDS (2018)

29

## TACACS+



GORDON | REYNOLDS (2018)

- TACACS+ servers should be deployed in a fully trusted internal network.
- No direct access should be allowed from untrusted or semi-trusted networks.
- Remember, TACACS+ allows administrators to connect to devices such as routers and switches.

30

# RADIUSVS TACACS+

Feature	RADIUS	TACACS+
Transport Layer	UDP	TCP
Port	1645/1646 OR 1812/1813	49
Communications & Encryption	Less Secure, Only password encrypted	More Secure, Encrypts whole package
Can authenticate network devices?	No	Yes
Primary Use	Network Access (Remote User)	Device Administration
Designed for:	AAA User/Clients	AAA Administrators

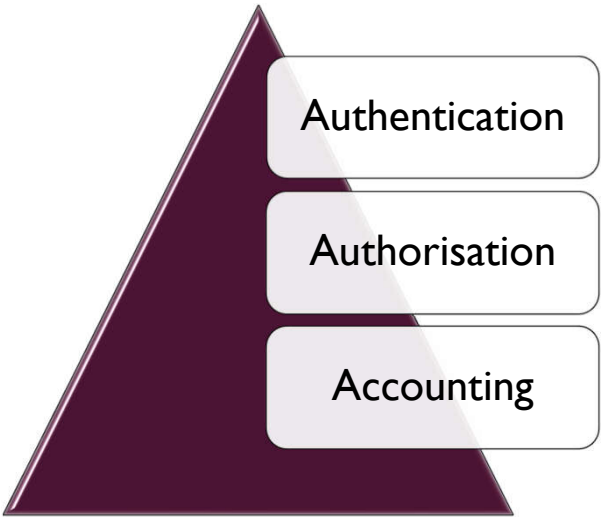
GORDON | REYNOLDS (2018)

31

## SUMMARY ....

Today we overviewed the AAA Framework Security:

- RADIUS
- TACACS+



GORDON | REYNOLDS (2019)

34