Lecture 23

Kerberos

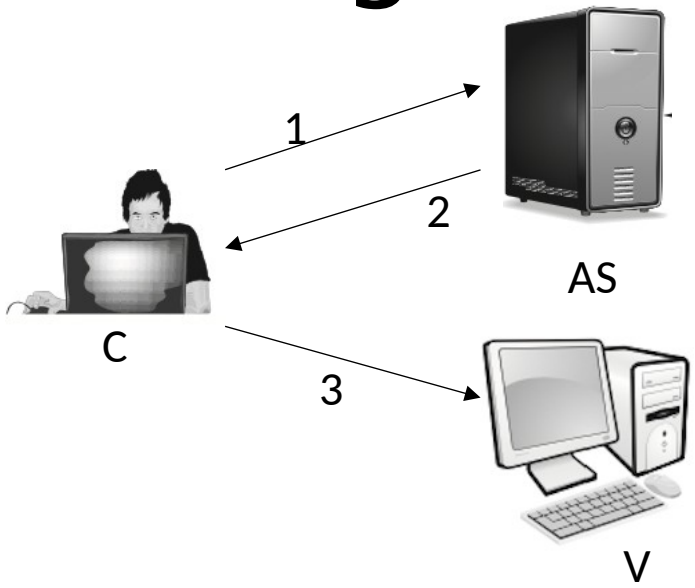
- scenario: users at workstations wish to access services on servers distributed throughout the network – many to many authentication

Kerberos

- a centralized authentication server provides mutual authentication between users and servers
  - a key distribution and user authentication service developed at MIT
  - works in an open distributed environment
- client-service model
- Kerberos protocol messages are protected against eavesdropping and replay attacks
- Kerberos v4 and v5 [RFC 4120]

A Simple Authentication Dialogue

- 1. C —>AS: ID_C ||P_C ||ID_V
- 2. AS —> C : Ticket = E(K_V, [ID_C ||AD_C ||ID_V])
- 3. C —> V: ID_C || Ticket



- AS – authentication server
- ID_* - identifier
- P_C - password of user
- AD_C - network address of C
- K_V - secret encryption key shared by AS and V

Advantage

- Client and malicious attacker cannot alter ID_C (impersonate), AD_C(change of address) , ID_V
- server V can verify the user is authenticated through ID_C , and grants service to C
- guarantee the ticket is valid only if it is transmitted from the same client that initially requested the ticket

1. C —>AS: $ID_C \,||\, P_C \,||\, ID_V$
2. AS —> C : Ticket = $E(K_V, [ID_C \,||\, AD_C \,||\, ID_V])$
3. C —> V: $ID_C \,||$ Ticket

Secure?

- Insecure: password is transmitted openly and frequently
- Solution: no password transmitted by involving ticket-granting server (TGS)

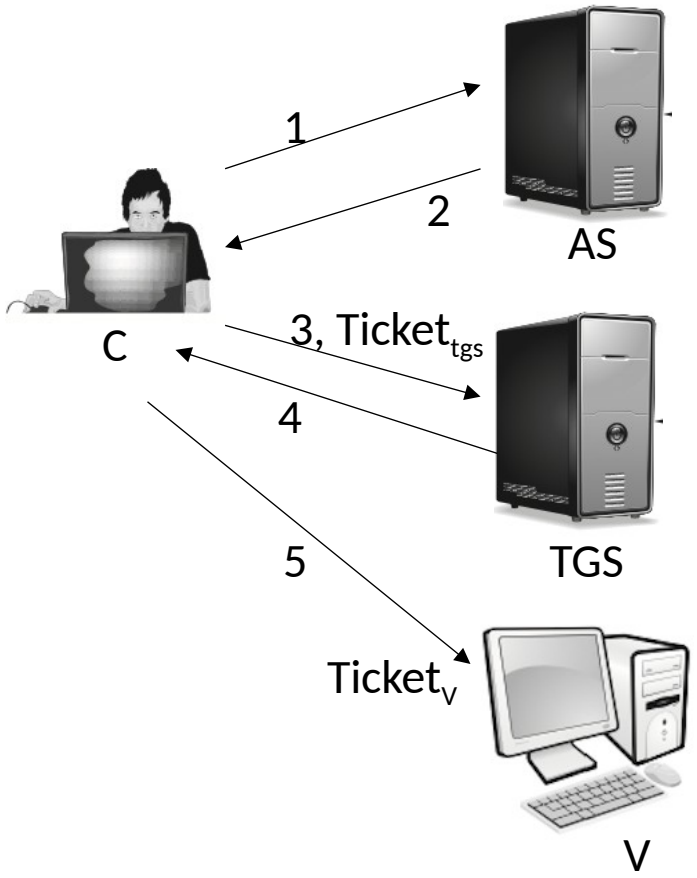
1. C —>AS: $ID_C || P_C || ID_V$
2. AS —> C : Ticket = $E(K_V, [ID_C || AD_C || ID_V])$
3. C —> V: ID_C || Ticket

A More Secure Authentication Dialogue

- Once per user logon session
  - (1) C —>AS: $ID_C || ID_{tgs}$
  - (2) AS —> C: $E(K_C, Ticket_{tgs})$
- Once per type of service:
  - (3) C —>TGS: $ID_C || ID_v || Ticket_{tgs}$
  - (4) TGS —> C: $Ticket_V$
- Once per service session:
  - (5) C —> V: $ID_C || Ticket_v$

$$Ticket_{tgs} = \mathrm{E}(K_{tgs}, [ID_C \| AD_C \| ID_{tgs} \| TS_1 \| Lifetime_1])$$

$$Ticket_v = \mathrm{E}(K_v, [ID_C \| AD_C \| ID_v \| TS_2 \| Lifetime_2])$$



1. C —>AS: $ID_C || P_C || ID_V$
2. AS —> C : Ticket = $E(K_V, [ID_C || AD_C || ID_V])$
3. C —> V: $ID_C || Ticket$