Summary on" Resource Management in Cloud Networking Using Economic Analysis and Pricing Models: A Survey"

1. Mechanism design: $\mathcal{B} \rightarrow (f^1, f^2)$

$\mathcal{B}$ -message/bids (demand, preference, etc) submitted /reported by the buyers

f^1 - the winning probability of each agents (buyers)

f^2 -paying rules for the winners (who finally get the resources)

2. Two well-known auctions (single-item market)
   a. First-price sealed auction (maximize the seller's profit): the buyers with the highest bid (price) win and pay such highest bid to the seller
   b. Second-price sealed auction(incentive compatibility, avoid cheating bids of the buyers): the buyer with the highest bid win but pay the second-highest bid to the seller

3. Revelation Principle (do not understand)

4. Incentive compatibility/bid truthfully/truthful/strategy-proof: the buyers report/bid their demand truthfully without cheating
   a. Dominant strategy: a dominant strategy for a player refers to a strategy that is better off than the other feasible strategy of the agent regardless of the strategies of the other players.
   b. Nash equilibrium: no player can gain profits by deviating from the current strategy alone

c. Bayesian Nash equilibrium: for Bayesian game (the players do not have complete information about the other players but know a common prior distribution information). A Nash equilibrium evaluated under the expectation.
d. Bayesian-Nash incentive-compatible: each player can maximize their profit by biding truthfully if the other players bid truthfully.
e. Dominant-strategy incentive compatible: the player achieve the highest profit by bidding truthfully regardless of how the other players bid.

5. Individual Rationality/voluntary participation: the buyers can gain profit through bidding

6. Economic Efficiency: the buyers who value the resources most get the resource. This is to guarantee the best utilization of the resource (from the viewpoint of the system operator or society). This can be achieved by selecting the social welfare as the objective function while designing the market.

7. Budget Balance
    a. Strong Budget Balance: no intermediate agent gain profits from the market. The market does not make money or lose money. The money paid by all the buyers exactly equals to the money received by the seller.
    b. Weakly Budget Balance: some money will be delivered to the intermediate agent. The money received by the seller is less than the total amount paid all the buyers.

8. Optimal Mechanism
    a. Social surplus: maximize the social welfare (do not need to consider or investigate the price among the sellers and the buyers if we have the strong budget balance)

b. Profit surplus: maximize the profit of the seller

9. Generally, designing social surplus mechanism is simper and easier than designing profit surplus market. This may be due to the difficulties to determine the price between the sellers and the buyers.