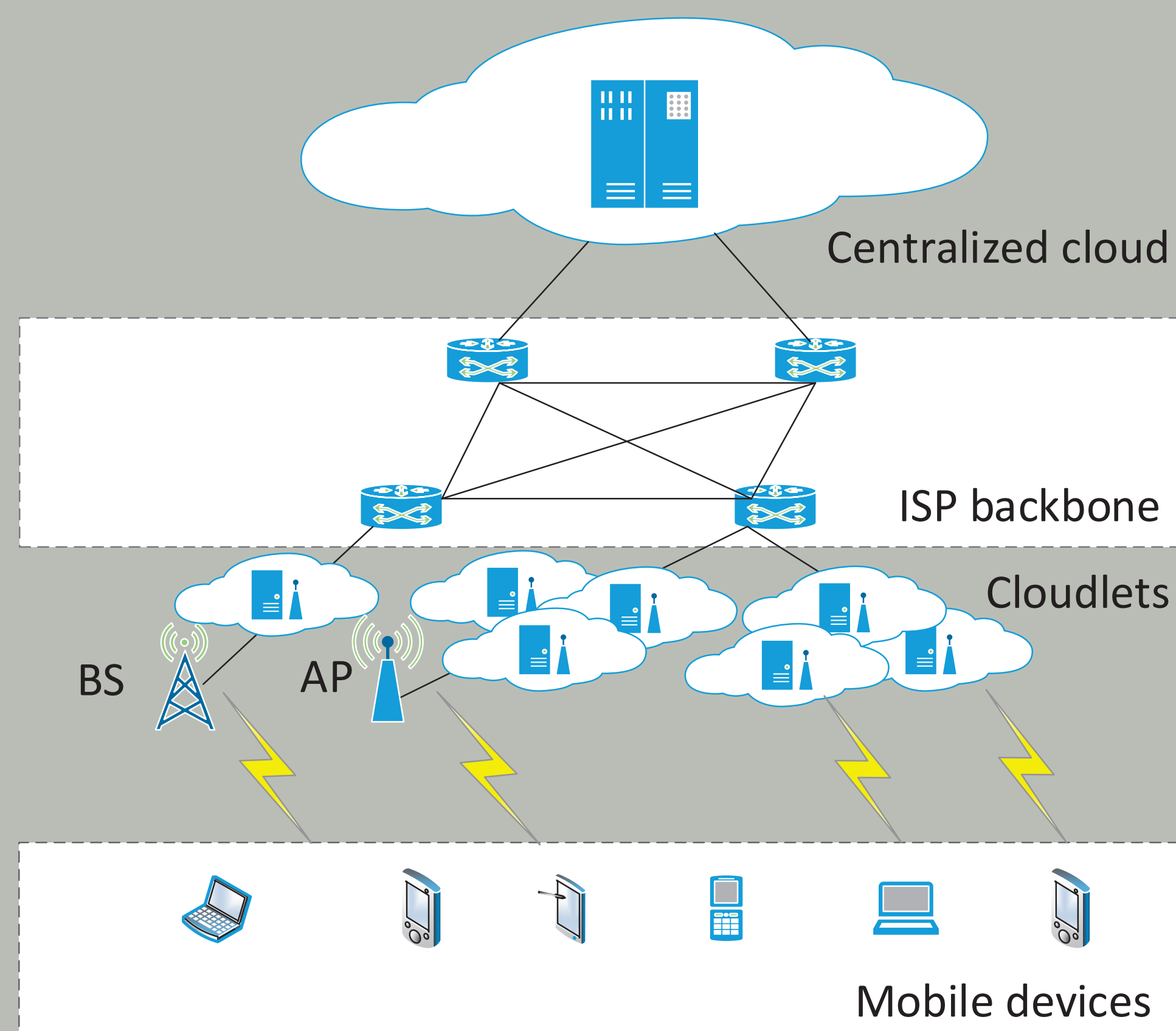# Incentive Design for Mobile Cloud Computing

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1. Architecture

2. Motivation

▸ Mobile devices prefer cloudlets over centralized cloud:
  ▸ Lower communication latency
  ▸ Lower energy consumption
▸ Cloudlets need to cost their own resources, e.g., energy
▸ Thus, there exists a trade between cloudlets and mobile devices

3. Auction Model

Single-round multi-item double auction:
▸ Auctioneer: base station or access point
▸ Buyers ($\mathcal{B}$): mobile devices
▸ Sellers ($\mathcal{S}$): cloudlets
▸ Bids (D): value that buyers are willing to request services
▸ Asks (A): value that sellers are willing to provide services

Given $\mathcal{B}$, $\mathcal{S}$, D and A, the auctioneer decides:
▸ Winning buyer set $\mathcal{B}_w$ ($\mathcal{B}_w \subseteq \mathcal{B}$)
▸ Winning seller set $\mathcal{S}_w$ ($\mathcal{S}_w \subseteq \mathcal{S}$)
▸ Mapping $\sigma(\cdot)$ between $\mathcal{B}_w$ and $\mathcal{S}_w$
▸ Price charged to winning buyers P^b
▸ Payment rewarded to winning sellers P^s

Desirable properties of the auction model:
▸ Computational efficiency
▸ Individual rationality
▸ Budget balance
▸ Incentive compatibility

4. Incentive Design

Incentive Compatible Auction Mechanism (ICAM):
▸ Step 1: winning candidate determination
▸ Step 2: assignment & pricing
▸ Step 3: winner elimination
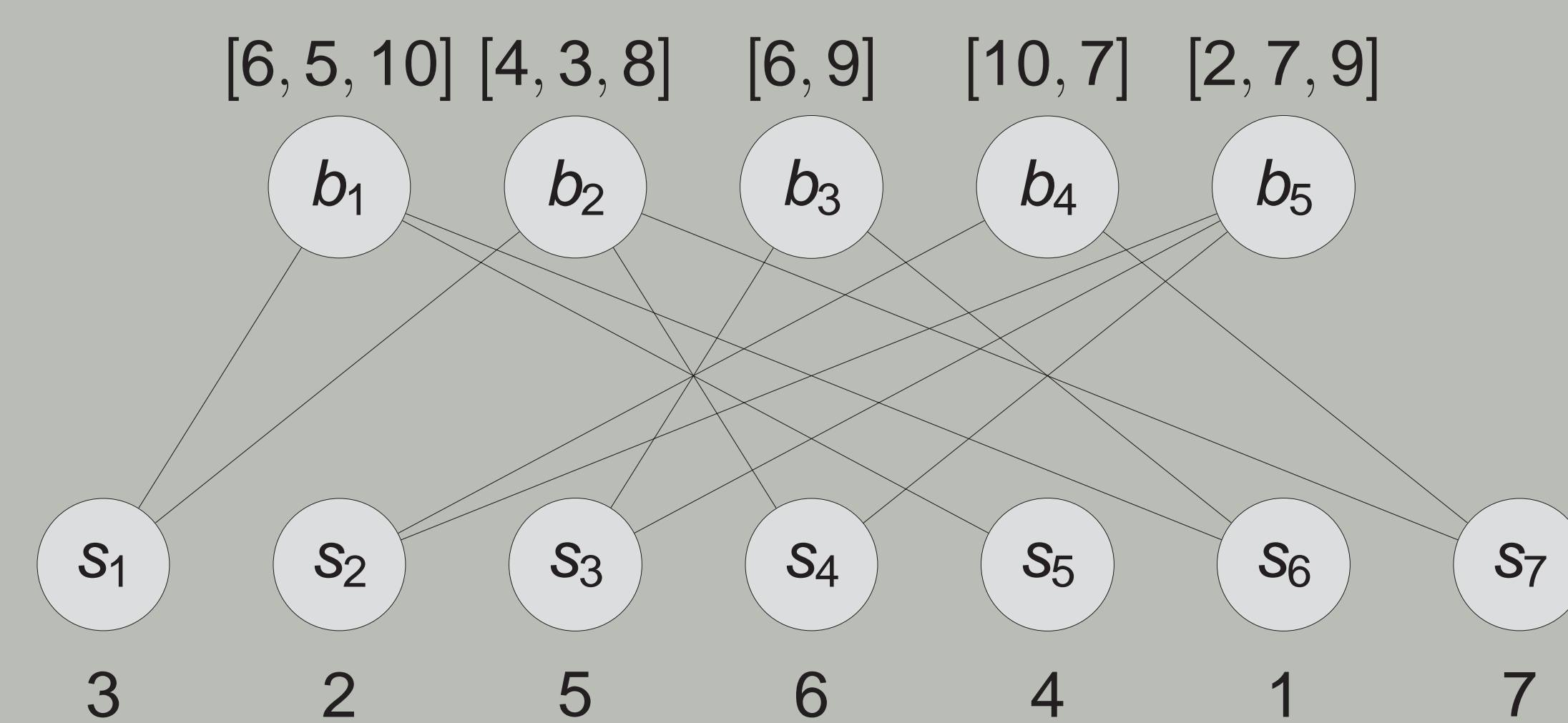
5. Walk-Through Example
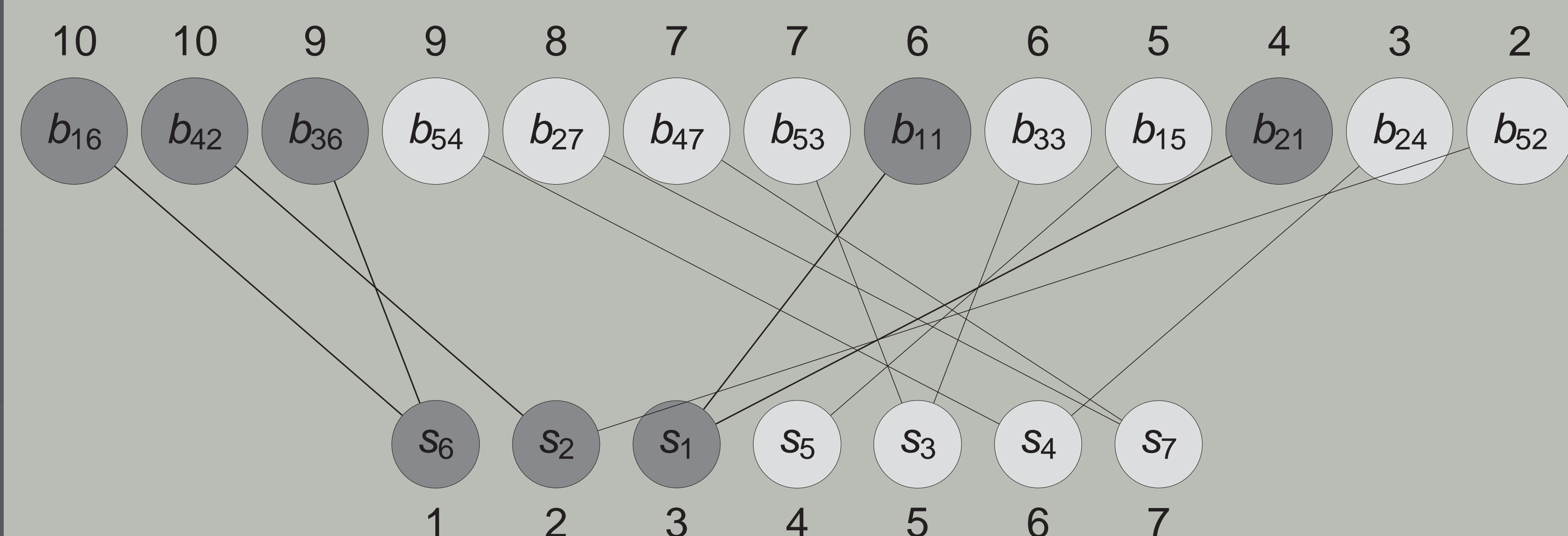

Fig. 1: Buyers with bids and sellers with asks

Fig. 2: Winning candidate determination
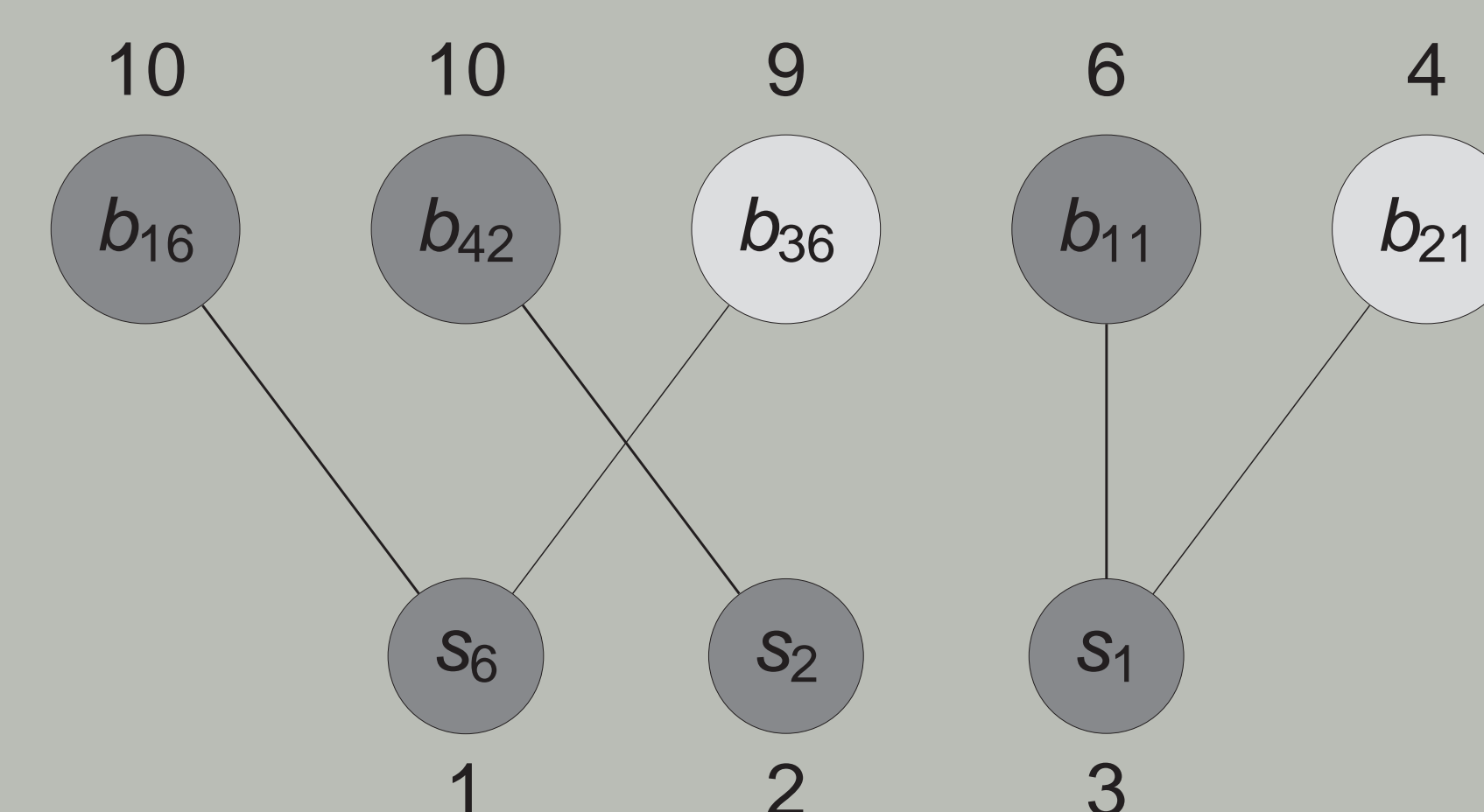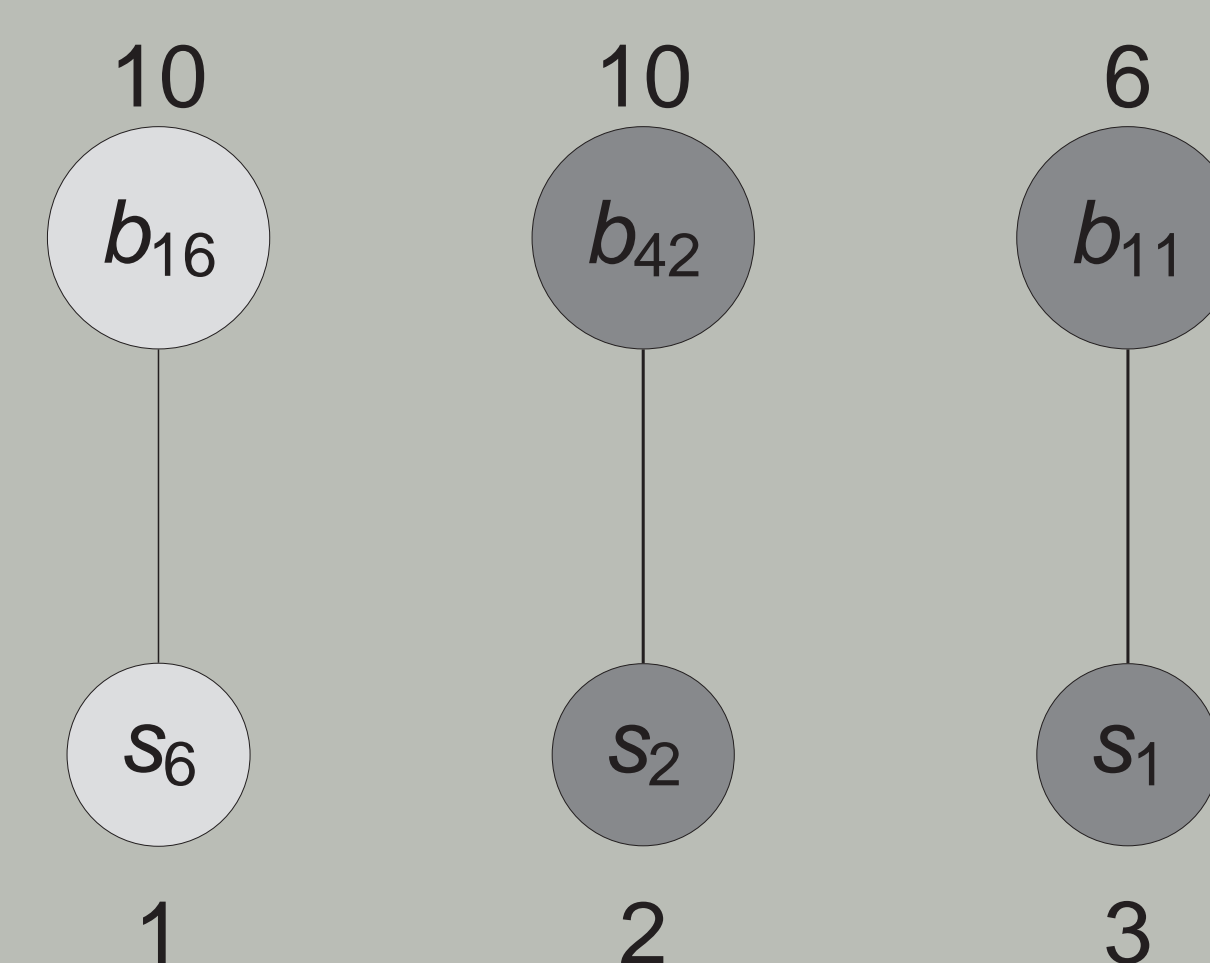

Fig. 3: Assignment and pricing

Fig. 4: Winner elimination

6. Conclusion

▸ ICAM can achieve the desirable properties
▸ Cloudlets are willing to provide services to nearby mobile devices
▸ Mobile devices are willing to request services from cloudlets