

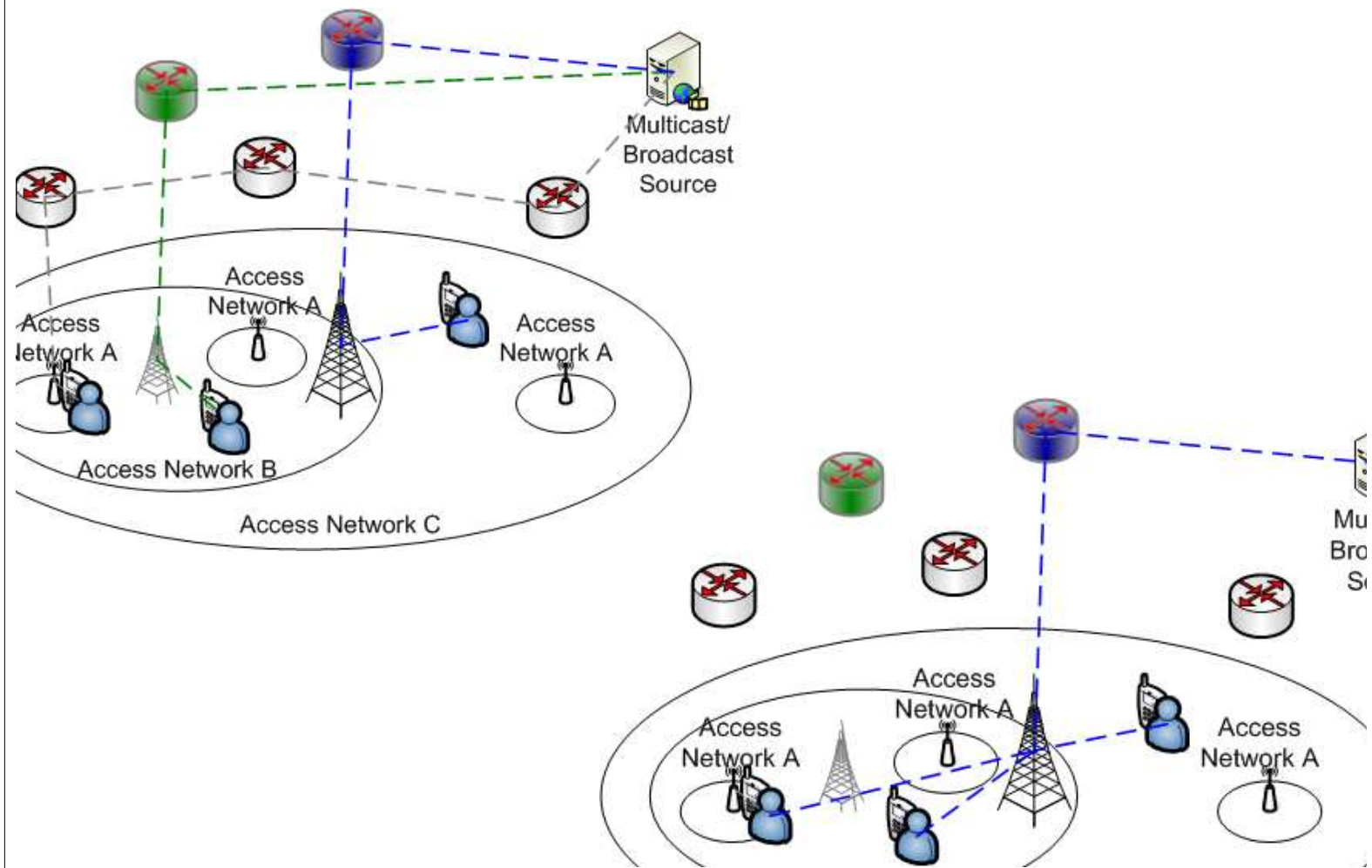
Wireless Access Network Selection for Live Streaming Multicast in Future Internet

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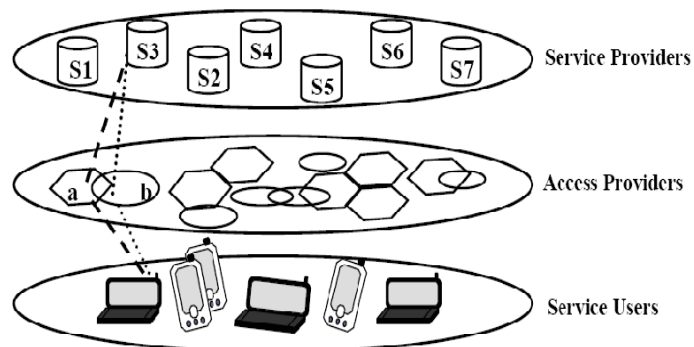
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- Main Driving Forces for Multicast
 - Effective utilization of bandwidth
 - live-streaming, IP-TV, S/W updated, on-line game, video conferencing
 - Introduction of E-based service
 - ✓ E-government, E-health, E-learning
 - ✓ A huge amount of information should be delivered to many receivers
 - Consensus on Future mobile environments
 - Coexistence of various wireless technologies
 - Multimode user terminal
 - Higher mobility



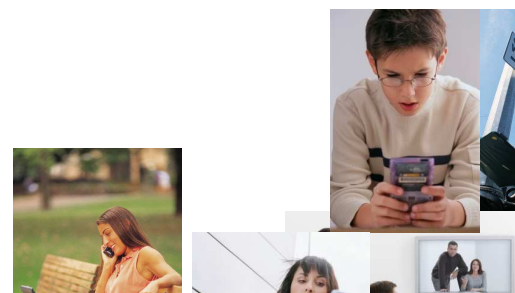
❖ Existing approaches

- User-centric approach (network selection for unicast)
- Choose most profitable access network according to:
 - ✓ QoS profile
 - ✓ User preference
 - ✓ Price model
 - ✓ Network conditions



❖ Network Selection for Live Streaming Multicast

- ISP's profit
 - ✓ Efficient use of network resources
- User satisfaction
 - ✓ Reduce service disruption
 - ✓ Increase user satisfaction



❖ An assignment strategy based on network resource and user satisfaction

➤ A metric for the network resource

$$R = \text{Session Bandwidth} / \text{Network Capacity} \cdot \text{Cell Coverage} / \text{Number of Users}$$

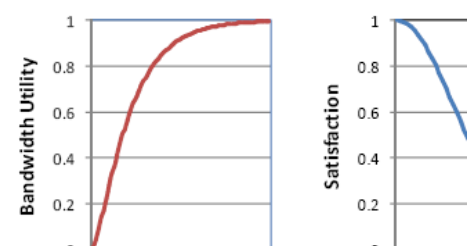
➤ User satisfaction

$$S = \begin{cases} U(b) \dots \dots \dots \text{normal_service} \\ U(b) \times \prod_{i=1}^n S_d(t_{iH}) \dots \dots \dots \text{horizontal_handoff} \\ U(b) \times S_d(t_V) \times \prod_{i=1}^{n-1} S_d(t_{iH}) \dots \dots \dots \text{vertical_handoff} \end{cases}$$

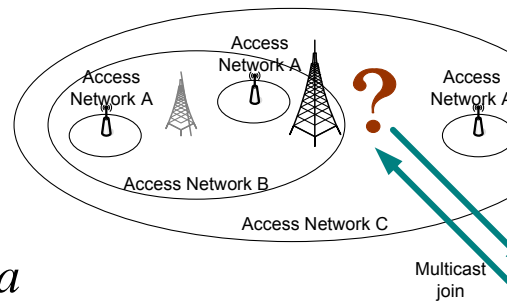
where

$$U(b) = 1 - e^{-\frac{b^2}{K+b}}$$

$$S_d(t_h) = e^{-\frac{t_h^2}{2\sigma^2}}$$



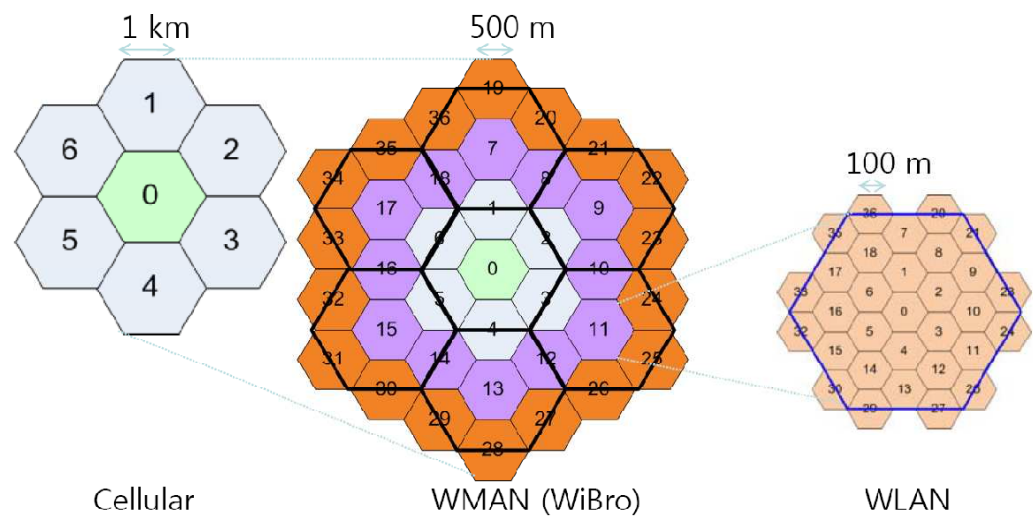
When a multicast join request (including user preferences (Max/Min bandwidth, expected average moving speed)) arrives, find the available access networks (ANs) and calculate User Satisfaction (S) and Network Resource Metric (R)



- if (there's no existing multicast session)
 - select an AN that maximizes (S/R)
- else if (there's an existing multicast session only in a specific AN)
 - if (S >= S_lower_bound) select this AN
 - else select an AN that maximizes (S/R)
 - end if
- else if (there's an existing multicast session through multiple ANs)
 - select AN for maximum S

Profile	Average Speed of users	Number of Users in a multicast session
A	6 km/h	10
B	6 km/h	100
C	120 km/h	10
D	120 km/h	100

< User Profile >



❖ Our Proposed Scheme

❖ MaxUtility Scheme

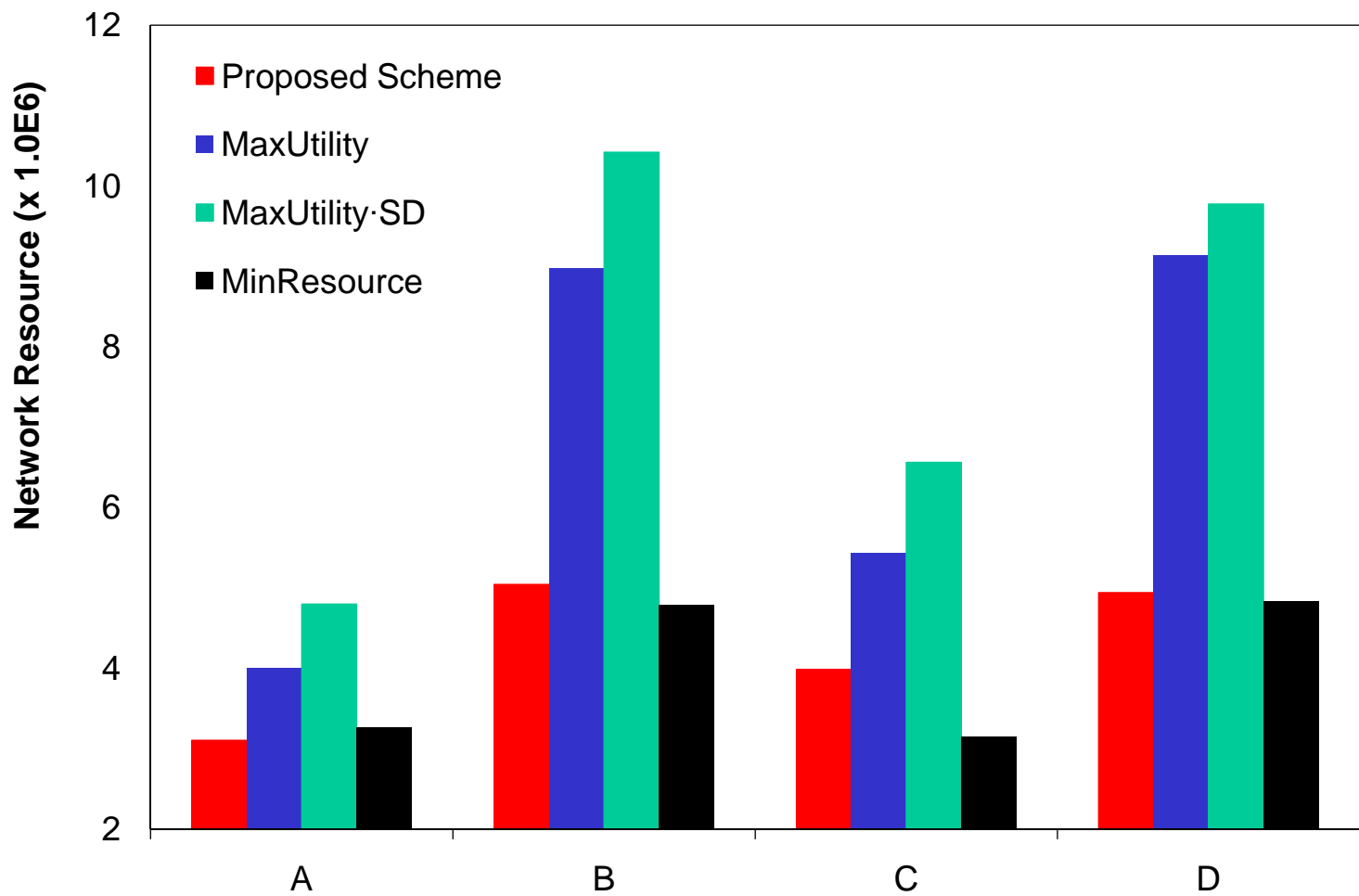
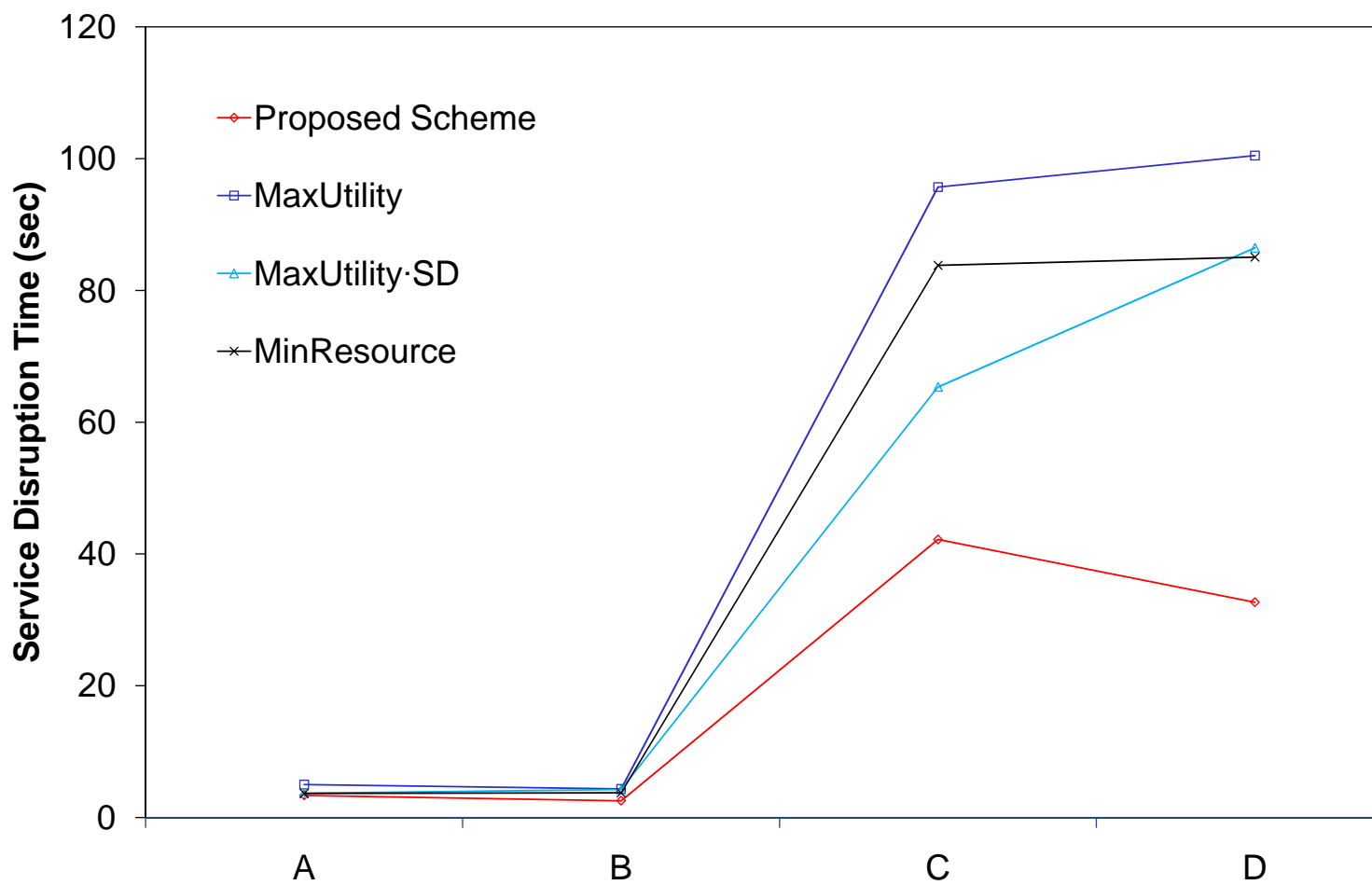
- selects the network which maximizes bandwidth utility function

❖ MaxUtility-SD Scheme

- considers bandwidth utility and service degradation by handoffs at the same time

❖ MinResource Scheme

- selects the network which minimizes the network resource



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- ❖ One of Killer applications in Future Internet
 - Live streaming by the support of multicast
 - ❖ Heterogeneous Wireless Access Networks Environment
 - ❖ A new scheme for wireless access network selection
 - Network Resource & User satisfaction
 - ❖ Outperforming service disruption time & near-optimal network resource consumption