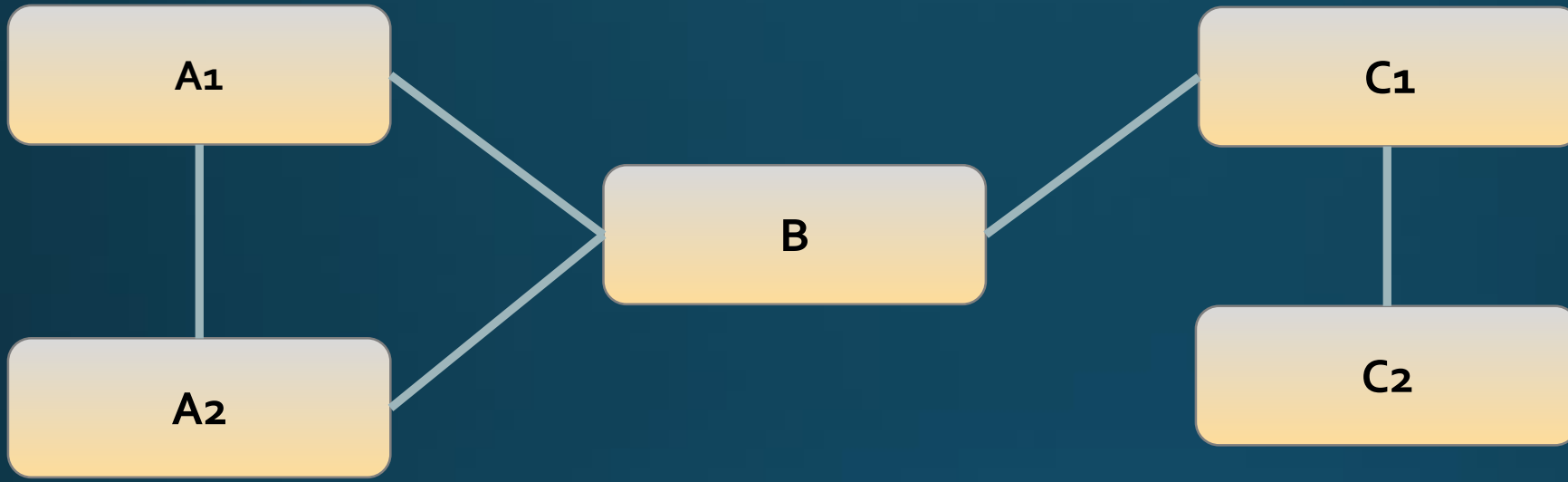


Auction Design:

Indirect Contention

Updated Example for Complex Set

December 2015

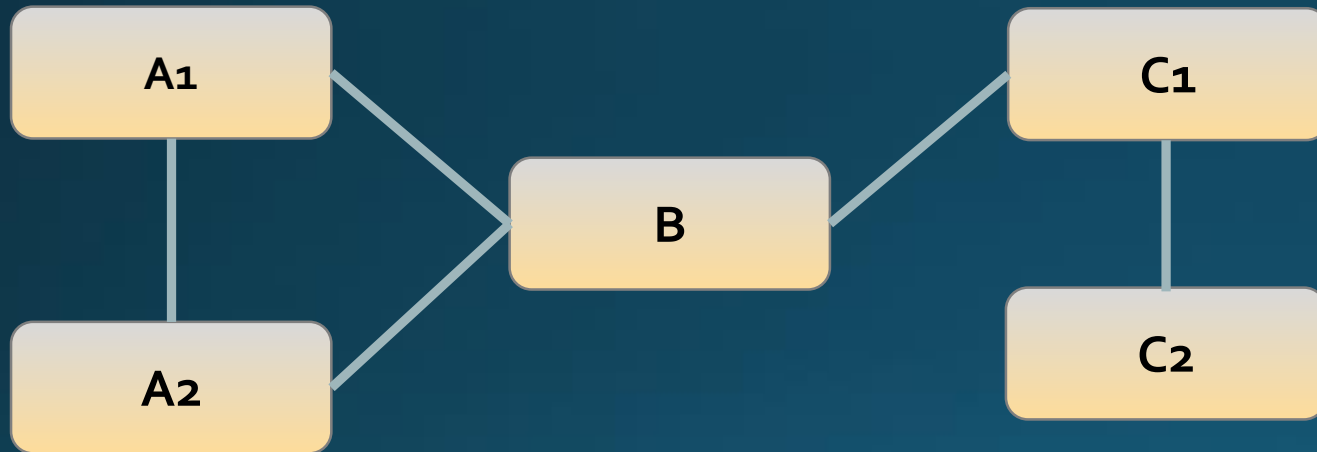


Updated

Complex Set

Updated

Feasible Sets



$B + C_2$

or

$A_1 + C_1$

or

$A_1 + C_2$

or

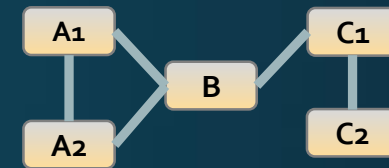
$A_2 + C_1$

or

$A_2 + C_2$

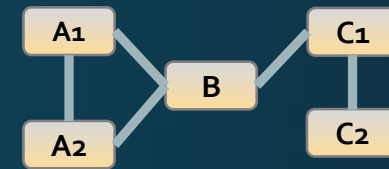
Updated Complex Example 1

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2						
3						
4						
5						
Results						



Round 1: Enduring Applications:
 A1, A2, and B bid the End of Round Price
 C1 and C2 did not meet the End of Round Price; however, are in a Feasible Set {A1,C1}, {A1,C2}, {A2,C1}, {A2,C2} and {B, C2}

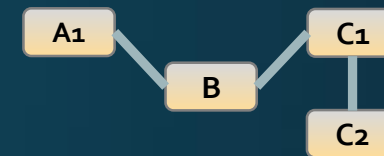
Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3						
4						
5						
Results						



Round 2: Enduring Applications: A1, and B met the End of Round Price
 C1 and C2 did not meet the End of Round Price; however, are in a Feasible Set {A1, C1},
 {A1,C2}, and {B, C2}

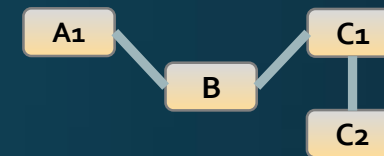
Eliminated: A2 did not meet the End of Round Price while A1, positioned the same, bid more

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4						
5						
Results						



Round 3: Enduring Applications: A1 and B met the End of Round Price
 C1 and C2 did not meet the End of Round Price; however, are in a Feasible Set {A1, C1},
 {A1,C2} and {B, C2}

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4	\$2.2m	\$2.2m	Eliminated	\$1.75m	\$500k	\$400k
5						
Results						



Round 4: Enduring Applications: A1 met the End of Round Price
 C1 did not meet the End of Round Price; however, was in the Feasible Set {A1, C1}
 C2 did not meet the End of Round Price; however, was in the Feasible Set {A1, C2}
 Eliminated Applications: B did not meet the End of Round Price

Winning Application: A1

Winning Payment for A1: \$1.75 m (the greater of A2's final Exit Bid (\$800k) and B's final Exit Bid (\$1.75m))

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4	\$2.2m	\$2.2m	Eliminated	\$1.75m	\$500k	\$400k
5	\$3.0m	Prevailed	Eliminated	Eliminated	\$600k	\$500k
Results						

A1

C1

C2

Round 5: Enduring Applications: None

Eliminated Applications: C2 did not meet the End of Round Price and C1, positioned the same, bid more

Winning Application: C1

Winning Payment: C1 will pay \$500k (C2's Exit Bid Price)

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4	\$2.2m	\$2.2m	Eliminated	\$1.75m	\$500k	\$400k
5	\$3.0m	Prevailed	Eliminated	Eliminated	\$600k	\$500k
Results		Prevailed	Eliminated	Eliminated	Prevailed	Eliminated

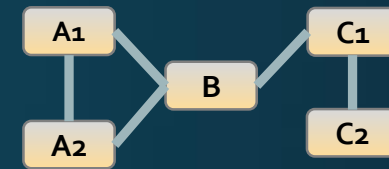
A1

C1

Results: **Winning Payments:**
 A1 will pay **\$1.75m** (the greater of A2's final Exit Bid (\$800k) and B's final Exit Bid (\$1.75m))
 C1 will pay **\$500k** (C2's Exit Bid Price)

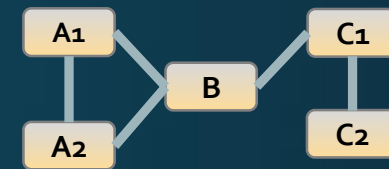
Updated Complex Example 2

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$200k
2						
3						
4						
Results						



Round 1: Enduring Applications:
 A1, A2, and B bid the End of Round Price
 C1 and C2 did not meet the End of Round Price; however, are
 in a Feasible Set {A1,C1}, {A1,C2} {A2,C1}, {A2,C2} and {B, C2}

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$200k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$301k
3						
4						
Results						



Round 2: Enduring Applications: A1 and B met the End of Round Price

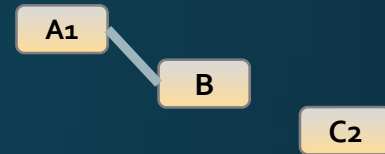
Eliminated Applications: A2 did not meet the End of Round Price while A1, positioned the same, bid more;

C1 did not meet the End of Round Price while C2, positioned the same or better, bid more

Winning Application: C2

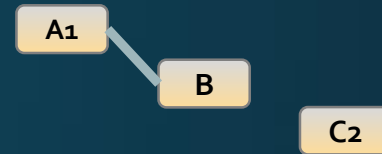
Winning Payment for C2: \$300k (C1's exit bid)

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$200k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$301k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	Eliminated	Prevailed
4						
Results						



Round 3: Enduring Applications: A1 and B met the End of Round Price

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$200k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$301k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	Eliminated	Prevailed
4	\$2.2m	\$2.2m	Eliminated	\$1.75m	Eliminated	Prevailed
Results						



Round 4: Enduring Applications: A1 met the End of Round Price

Eliminated Applications: B did not meet the End of Round Price

Winning Application: A1

Winning Payment for A1: \$1.75 m (the greater of A2's final Exit Bid (\$800k) and B's final Exit Bid (\$1.75m))

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$200k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$301k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	Eliminated	Prevailed
4	\$2.2m	\$2.2m	Eliminated	\$1.75m	Eliminated	Prevailed
Results		Prevailed	Eliminated	Eliminated	Eliminated	Prevailed

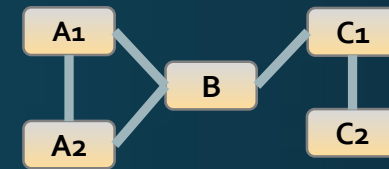
A1

C2

Results: **Winning Payment:**
 A1 will pay **\$1.75m** (the greater of A2's final Exit Bid (\$800k) and B's final Exit Bid (\$1.75m))
 C2 will pay **\$300k** (C1's Exit Bid Price)

Updated Complex Example 3

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2						
3						
4						
Results						

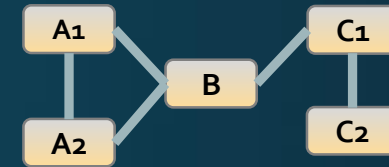


Round 1: Enduring Applications:

A1, A2, and B bid the End of Round Price

C1 and C2 did not meet the End of Round Price; however, are in a Feasible Set {A1,C1}, {A1,C2}, {A2,C1}, {A2,C2} and {B, C2}

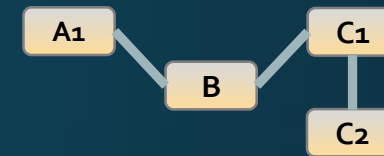
Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3						
4						
Results						



Round 2: Enduring Applications: A1, and B met the End of Round Price
 C1 and C2 did not meet the End of Round Price; however, are in a Feasible Set {A1, C1},
 {A1,C2}, and {B, C2}

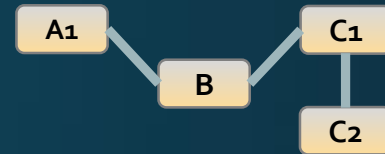
Eliminated: A2 did not meet the End of Round Price while A1, positioned the same, bid more

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4						
Results						



Round 3: Enduring Applications: A1 and B met the End of Round Price
 C1 and C2 did not meet the End of Round Price; however, are in a Feasible Set {A1, C1},
 {A1, C2} and {B, C2}

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4	\$2.2m	\$1.75m	Eliminated	\$2.2m	\$400k	\$300k
Results						



Round 4: Enduring Applications: B met the End of Round Price
 C2 did not meet the End of Round Price, however is part of Feasible Set {B, C2}, which did meet the End of Round Price

Eliminated Applications: A1 did not meet the End of Round Price; C1 did not meet the End of Round Price

Winning Applications: B and C2

Winning Payment for B: $\$1.892\text{m} \left(\frac{2.2\text{m}}{2.2\text{m}+300\text{k}} \right) * (1.75\text{m}+400\text{k})$

Winning Payment for C2: $\$258\text{k} \left(\frac{300\text{k}}{2.2\text{m}+300\text{k}} \right) * (1.75\text{m}+400\text{k})$

Round	End of Round Price	A1	A2	B	C1	C2
1	\$400k	\$400k	\$400k	\$400k	\$200k	\$100k
2	\$900k	\$900k	\$800k	\$900k	\$300k	\$200k
3	\$1.5m	\$1.5m	Eliminated	\$1.5m	\$400k	\$300k
4	\$2.2m	\$1.75m	Eliminated	\$2.2m	\$400k	\$300k
Results		Eliminated	Eliminated	Prevailed	Eliminated	Prevailed

B

C2

Results: **Winning Payments:**
 B will pay: $\$1.892\text{m} \left(\frac{2.2\text{m}}{2.2\text{m}+300\text{k}} \right) * (1.75\text{m}+400\text{k})$
 C2 will pay: $\$258\text{k} \left(\frac{300\text{k}}{2.2\text{m}+300\text{k}} \right) * (1.75\text{m}+400\text{k})$