

Game Engineering

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Science (Theory):

Understanding Natural or Social Processes

Engineering:

Using Theory to design practical devices



Game Theory:

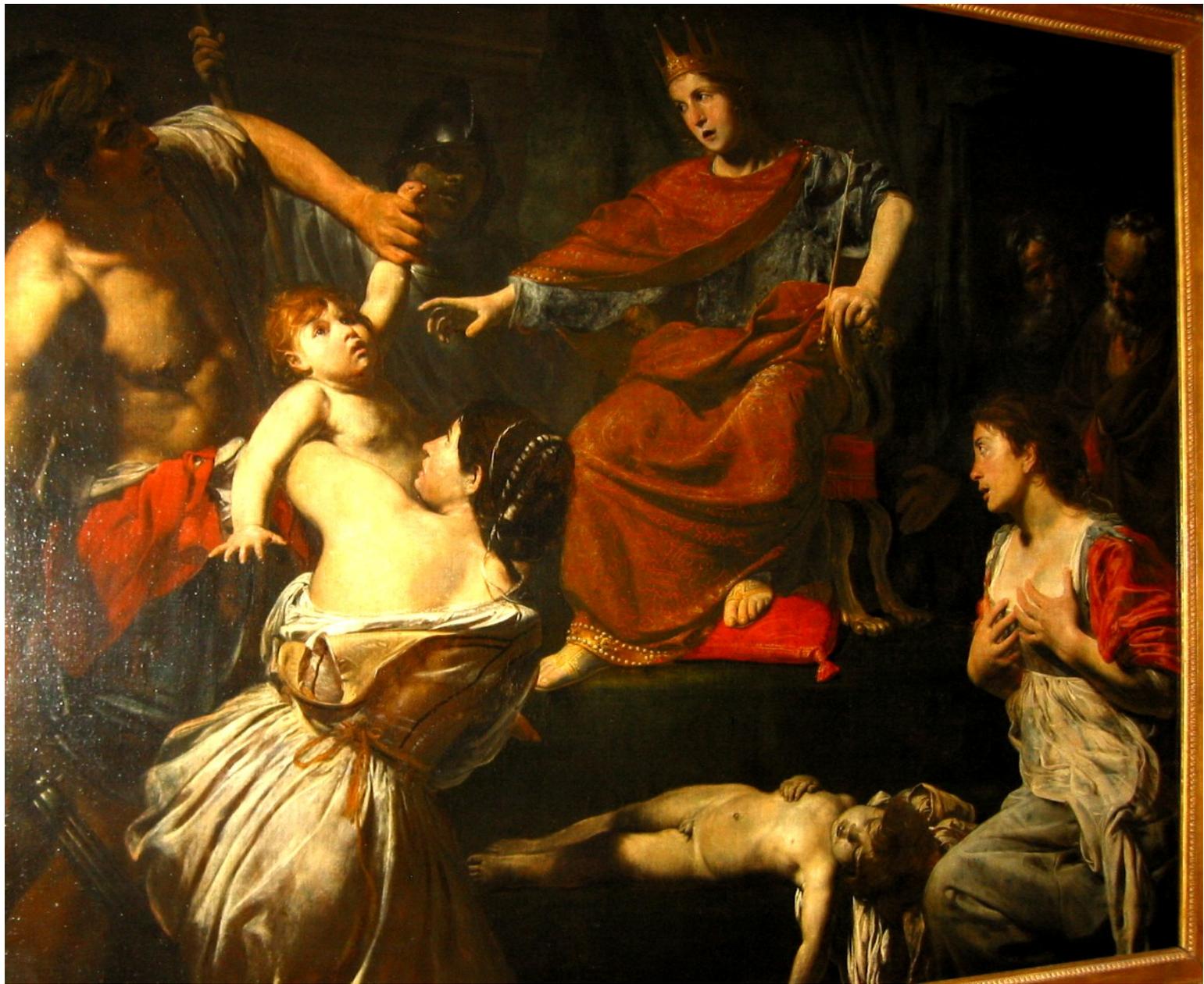
Understanding Strategic Interaction

Game Engineering:

Using Game Theory to design
practical interactive systems

Game Engineering in one word:

Incentives



4024

Valentin de BOULOGNE,
dit LE VALENTIN

Coulommiers (Seine-et-Marne), 1591 -
Rome, 1632

Le Jugement de Salomon. Vers 1625

Devant reconnaître la mère d'un
enfant que deux femmes se
disputaient, le roi Salomon ordonna
de le couper en deux et d'en donner la
moitié à chacune. Salomon vit ainsi
en celle qui y renonça la vraie mère.

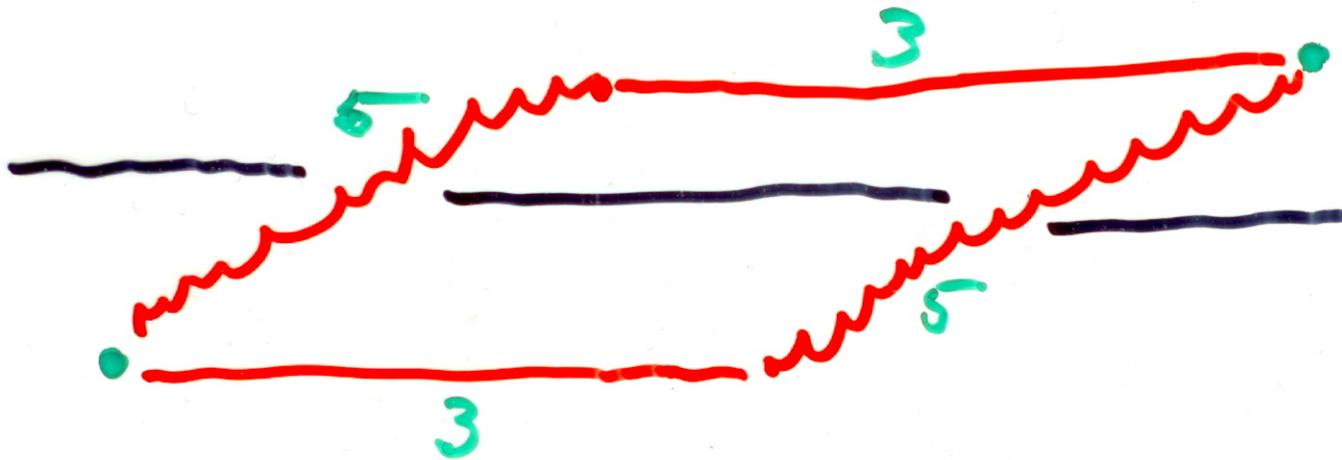
Collection de Louis XIV (acquis des héritiers
du cardinal Mazarin en 1661)

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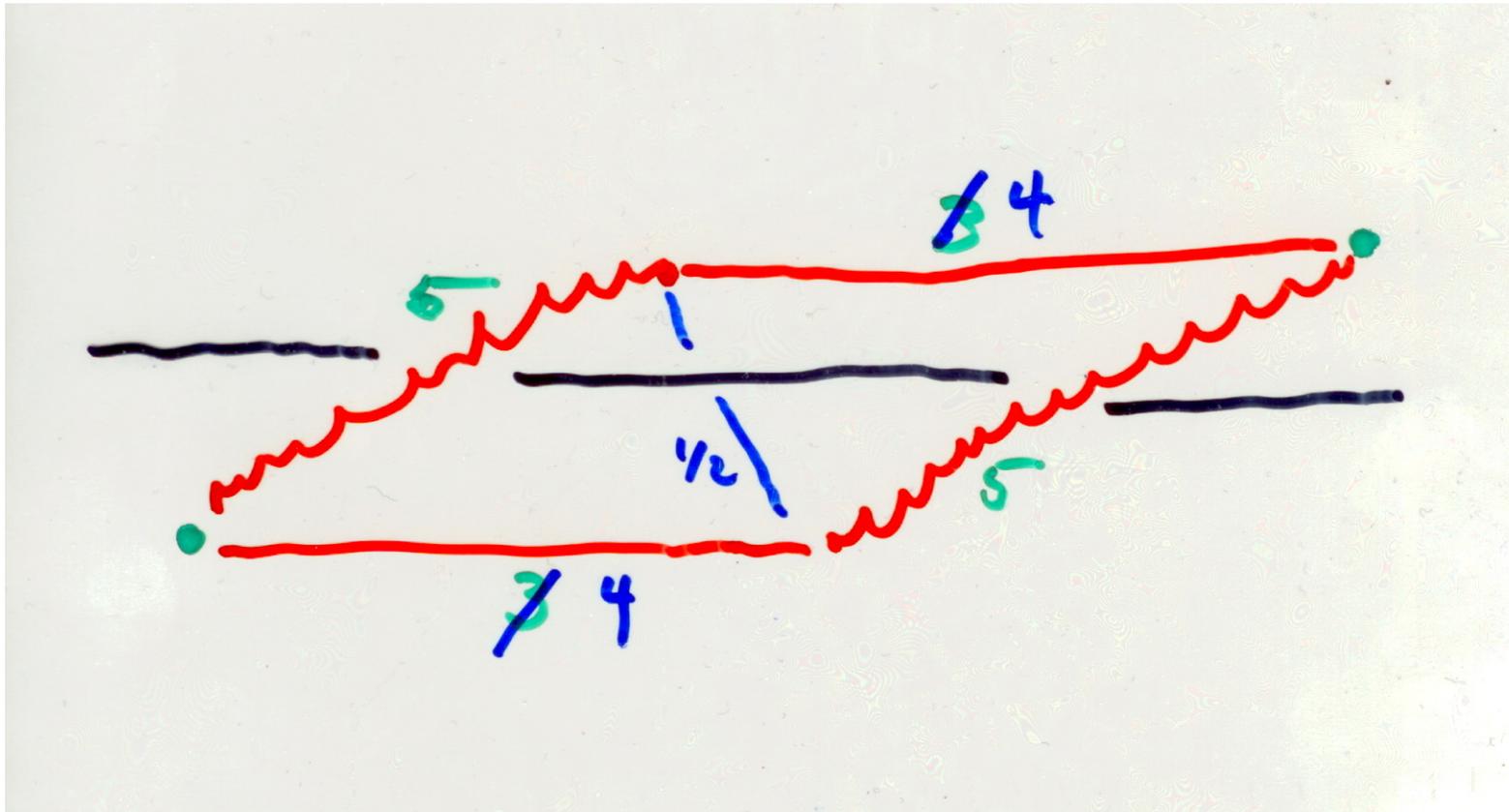
Other Examples of Game Engineering

- Final offer arbitration
- Auctions
 - Strategy
 - Design
- Matching
- Traffic
 - Strategy
 - Design
- Elections
- Asset Division

Traffic - Design



Traffic - Design



Matching

20 men

20 women

Each man has a preference order on the women.

Each woman has a preference order on the men.

A **matching** is an assignment of men to women.

A matching is **unstable** if there is a couple who are **not** matched, and **prefer each other** to their partners.

Otherwise, it is **stable**.

Matching

FACT (Gale & Shapley, 1962)

There is always a stable matching.

(The number 20 is not important;
it is true for any number.)

Applications:

Hospital Interns, Kidney Donations, High Schools

Matching: Two sexes needed

Adam

Bryce

Charles

Donald

Bryce

Charles

Adam

Adam

Charles

Adam

Bryce

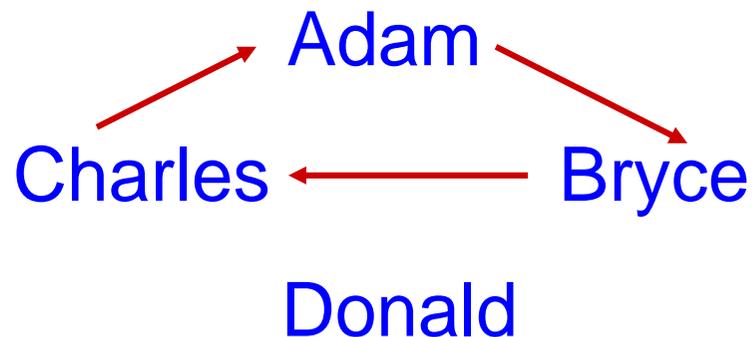
Bryce

Donald

Donald

Donald

Charles



Cake Cutting (Asset Division -- Steven Brams)

(1) One child: S/he gets it all.

(2) Two Children:

One cuts, the other chooses

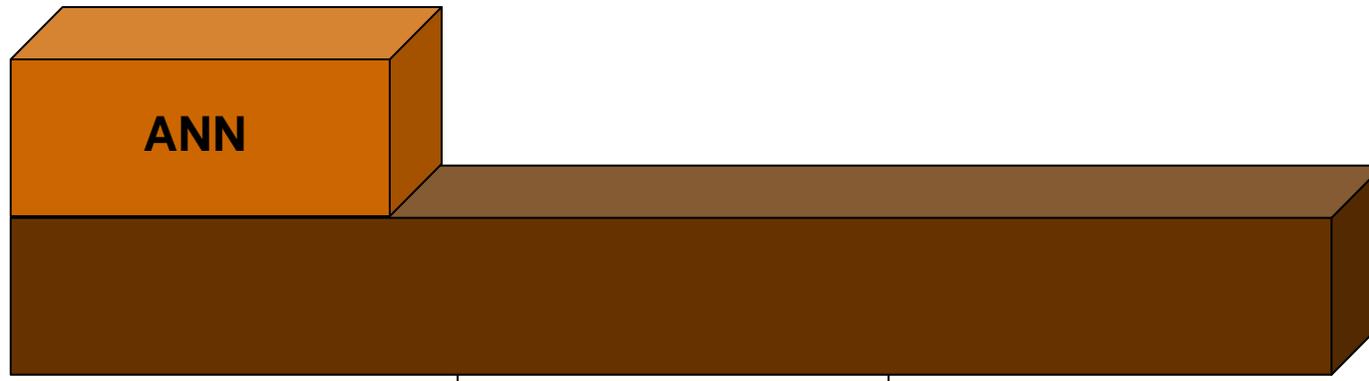
(3) Three Children (Ann, Bob, Cal):

- i. Ann cuts a piece of the cake.
- ii. Bob can leave it, or make it smaller.
- iii. Cal can leave the remaining piece, or make it smaller.

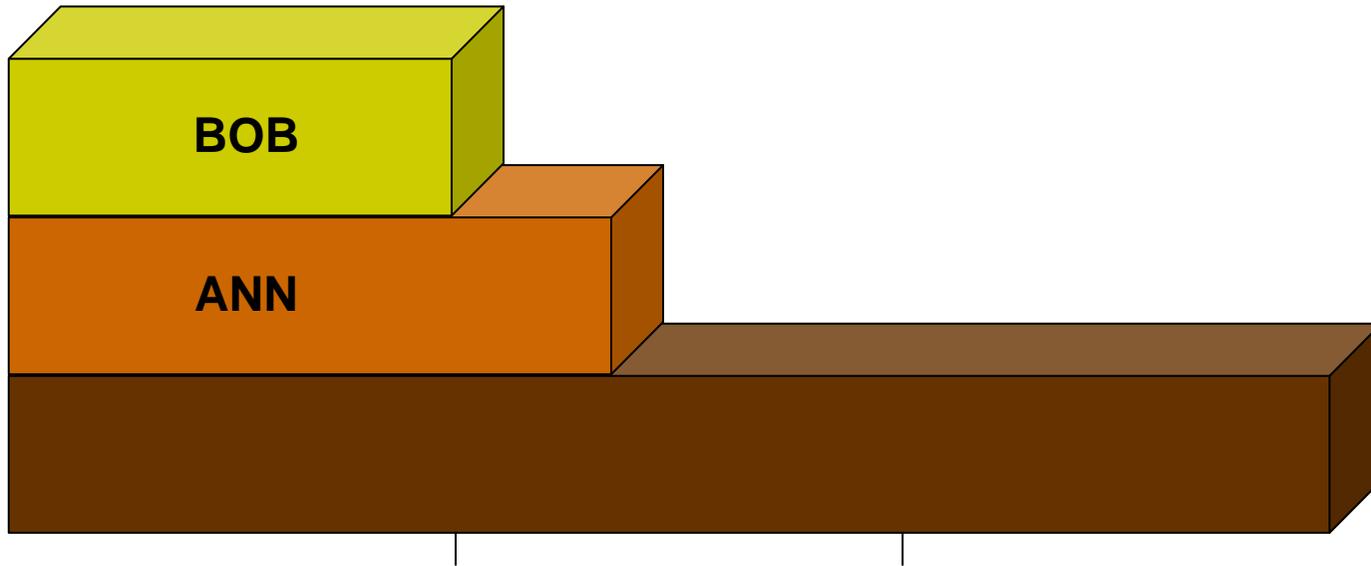
Whoever cuts the cake last, gets the remaining piece.

The rest is divided between the other two children as in (2).

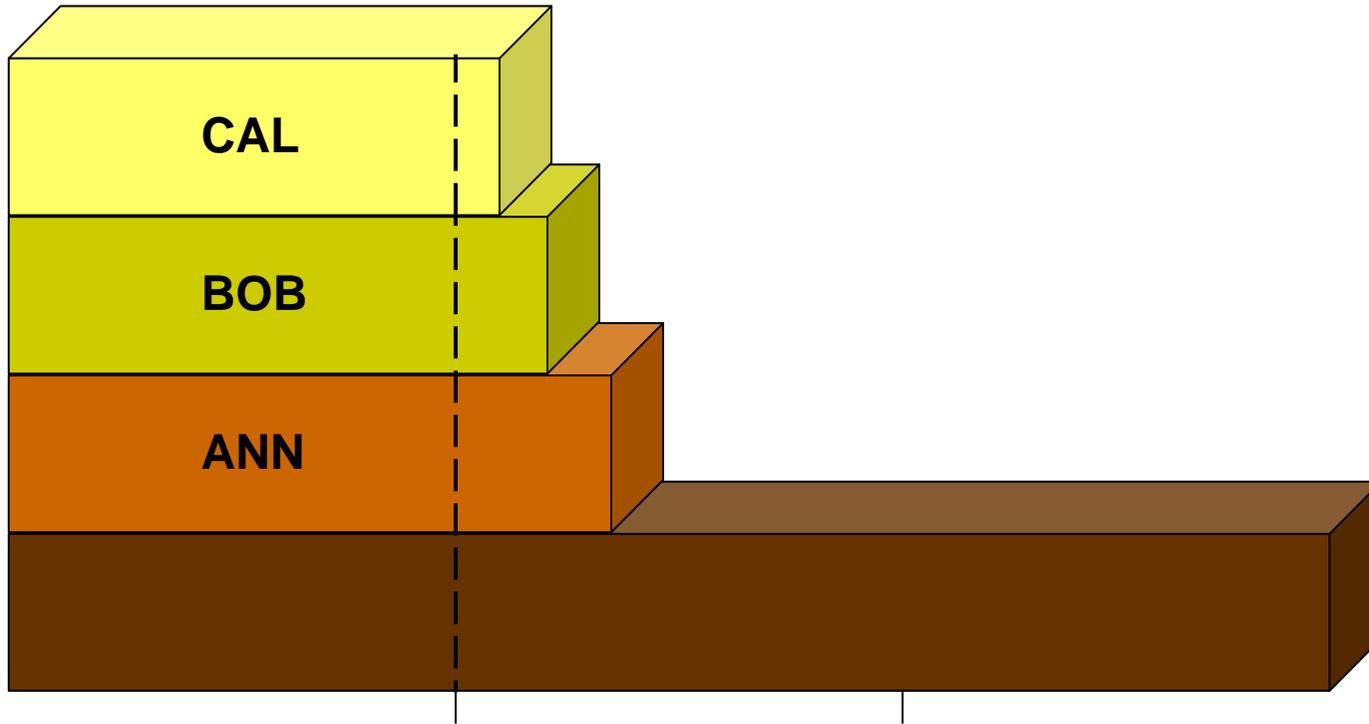
Cake Cutting



Asset Division



Asset Division



Cake Cutting (Asset Division)

(n) n children:

The children take turns. The first cuts a piece of the cake. The second can leave it, or make it smaller. Each successive child can leave the remaining piece, or make it smaller.

Whoever cuts the cake last, gets the remaining piece. The rest is divided between the remaining children as in $(n-1)$.

Thank You!