Applying a Game Theory Approach to Escalation Control

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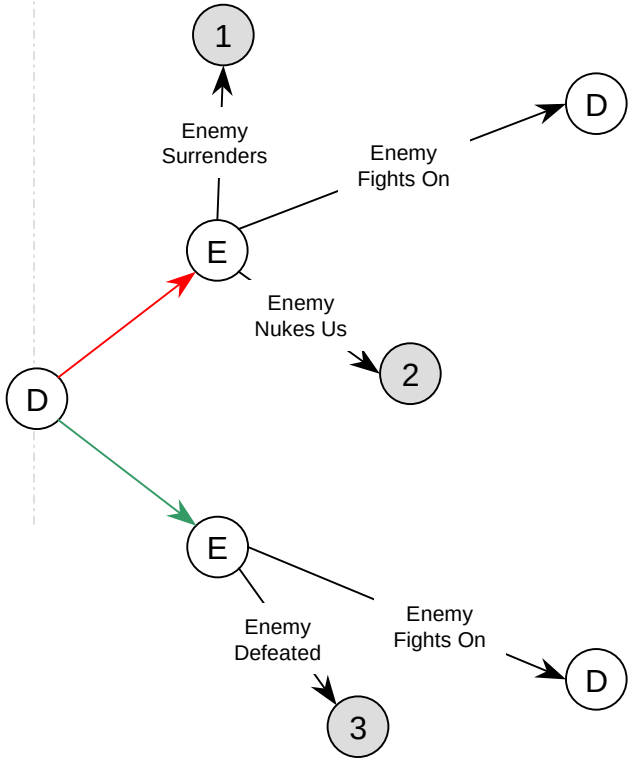
***Note**:*
All data, scenarios, actions, and relationships are strictly notional, represent no real situation, and are used here for illustrative purposes only.

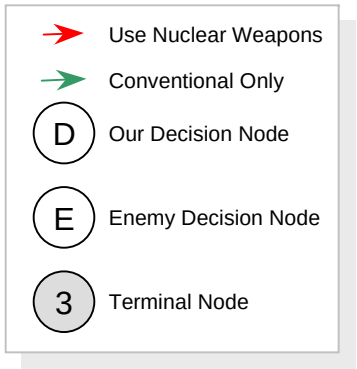
Simplified Adversary Decision Scenario

- Nuclear-armed decision maker intends to invade neighbor, whose defense relies on reinforcements from a distant and powerful nuclear-armed ally
- Overall strategy:
  - Defeat and occupy neighbor before ally can reinforce;
  - Hold enemy at status quo ante if offensive stalls;
  - Prevent regime change if enemy takes offensive
- Decision maker's nuclear weapons question:
  - Whether, and when, to use nuclear weapons
- Calculus involves cost, benefits, consequences of restraint, and uncertainties.

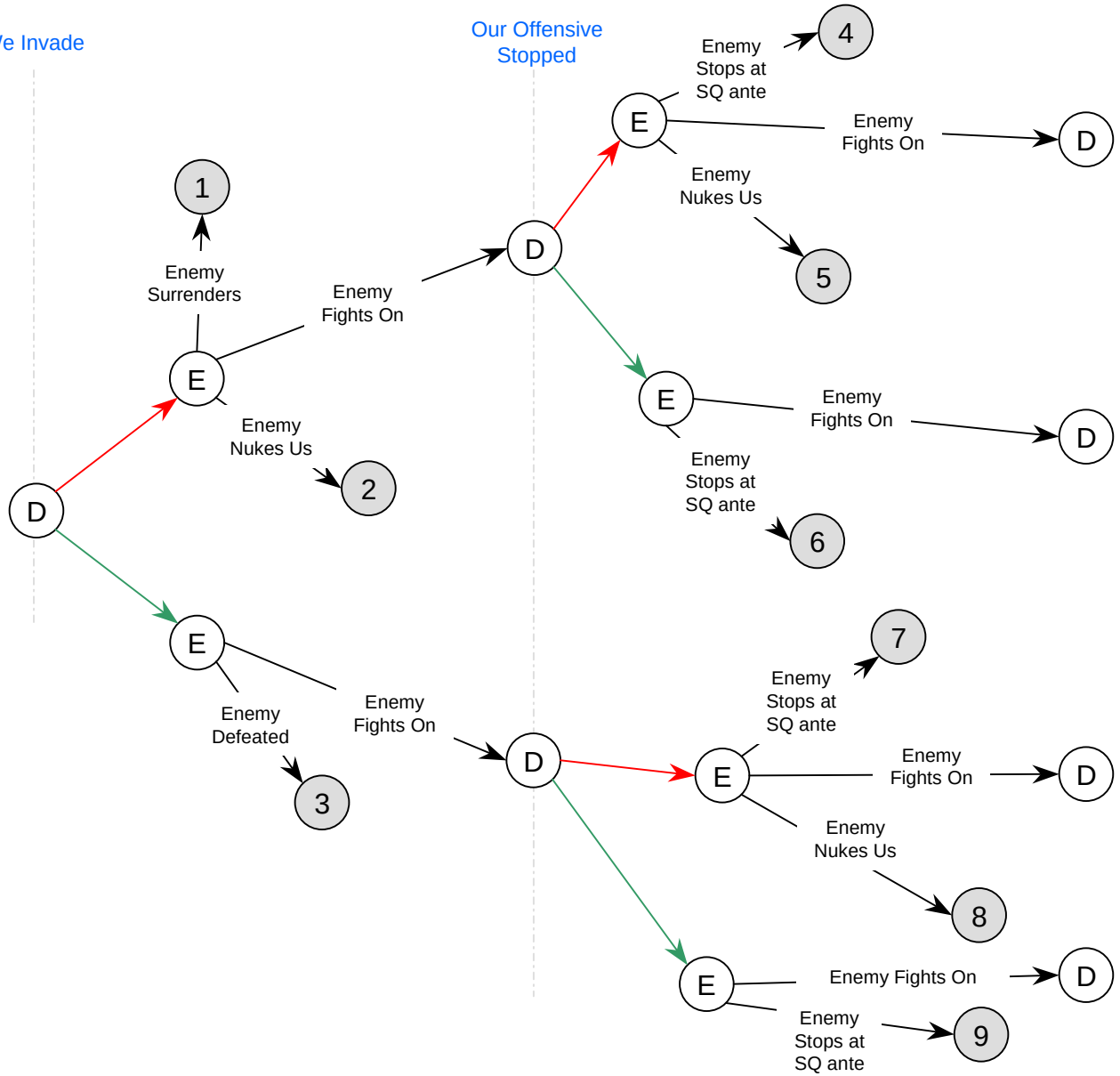
Nominal Game Theoretic Construct

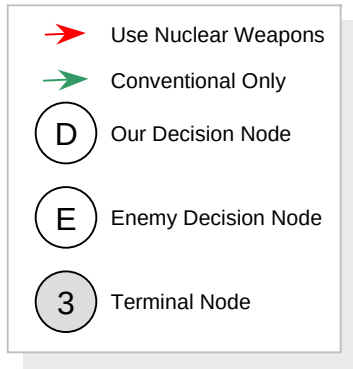
We Invade





Nominal Game Theoretic Construct





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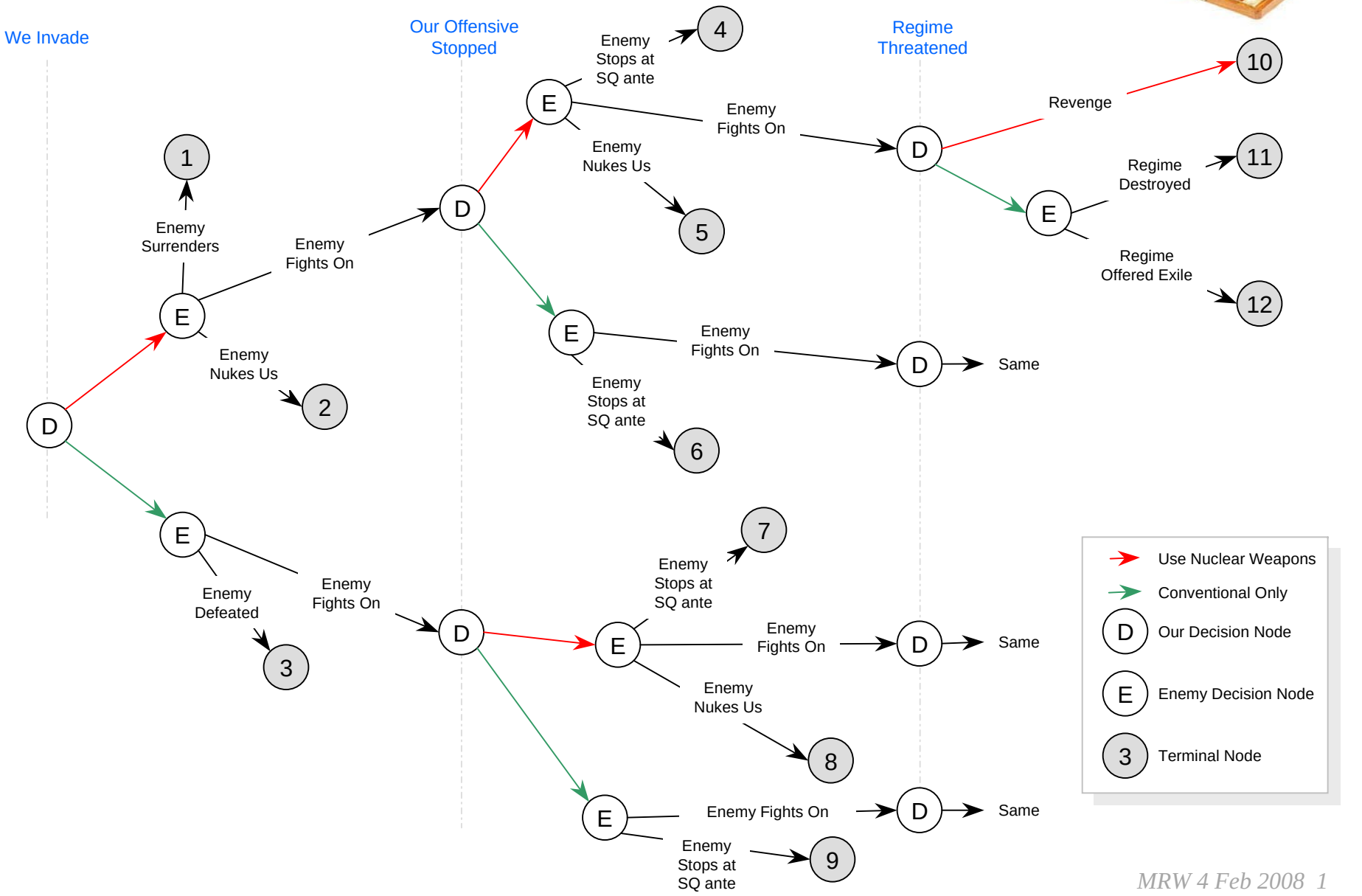


Components of Payoffs

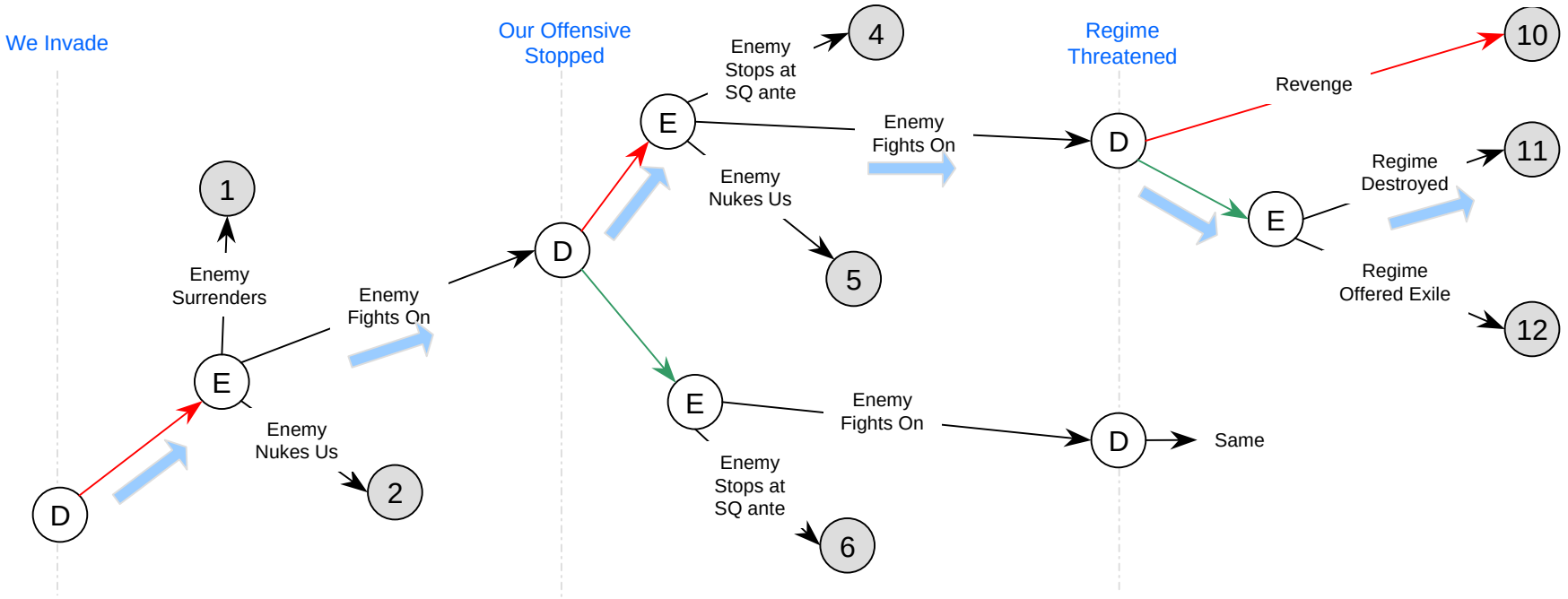
Our Payoffs

- Enemy Defeated 500
- We Get Nuked -500
- Regime Destroyed -400
- Revenge Inflicted 100
- Status Quo 0

Enemy's Payoffs

- Nuked, per instance -300
- Massive Retaliation -200
- Regime Survives -50
- Surrender/Defeat -600
- Prevail 400
- Status Quo 0

Path Dependence of Pay Offs



Node

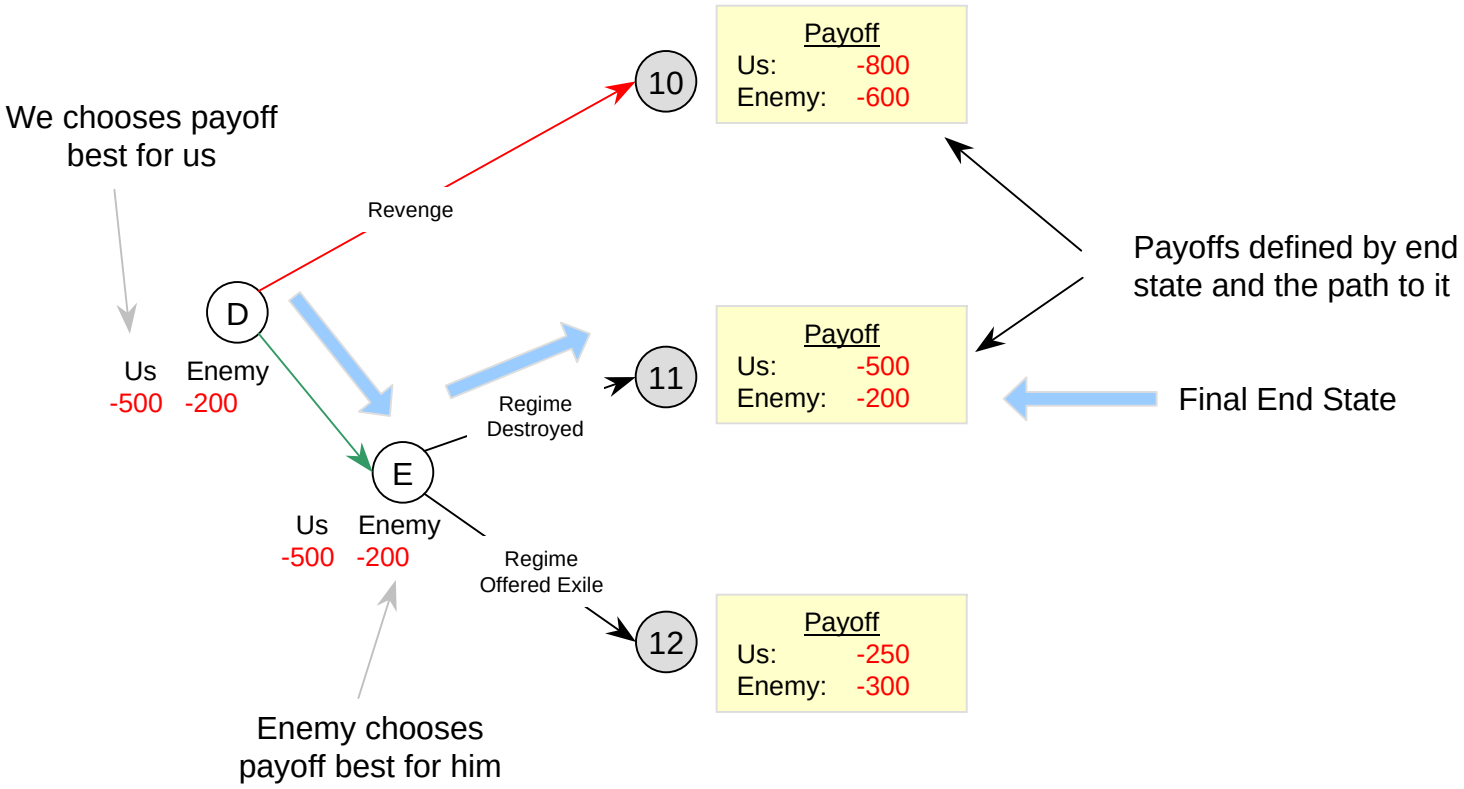
11

Payoff

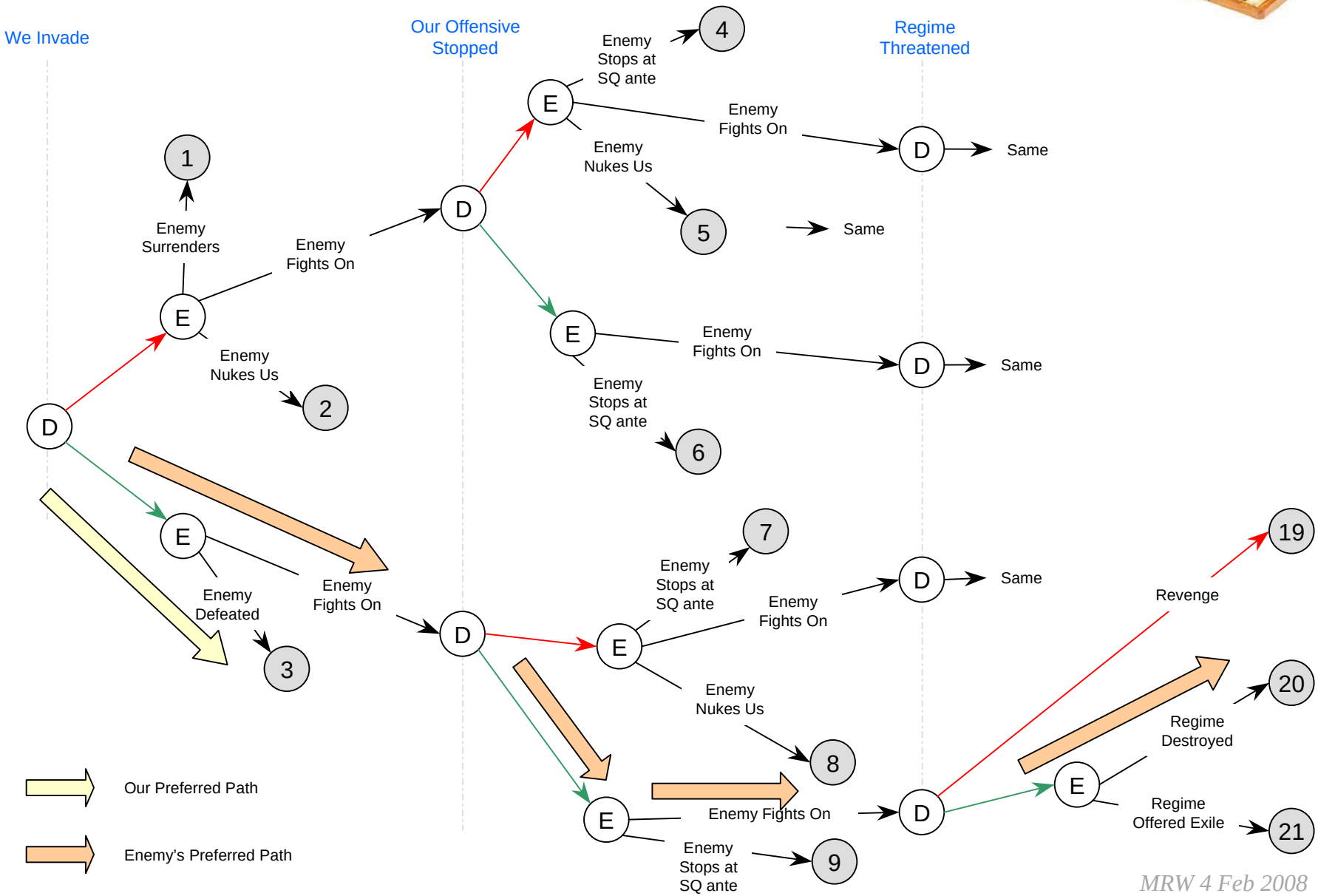
Us: Regime Destroyed = -500

Enemy: Nuked Twice + Prevail = (-300)*2 + 400 = -200

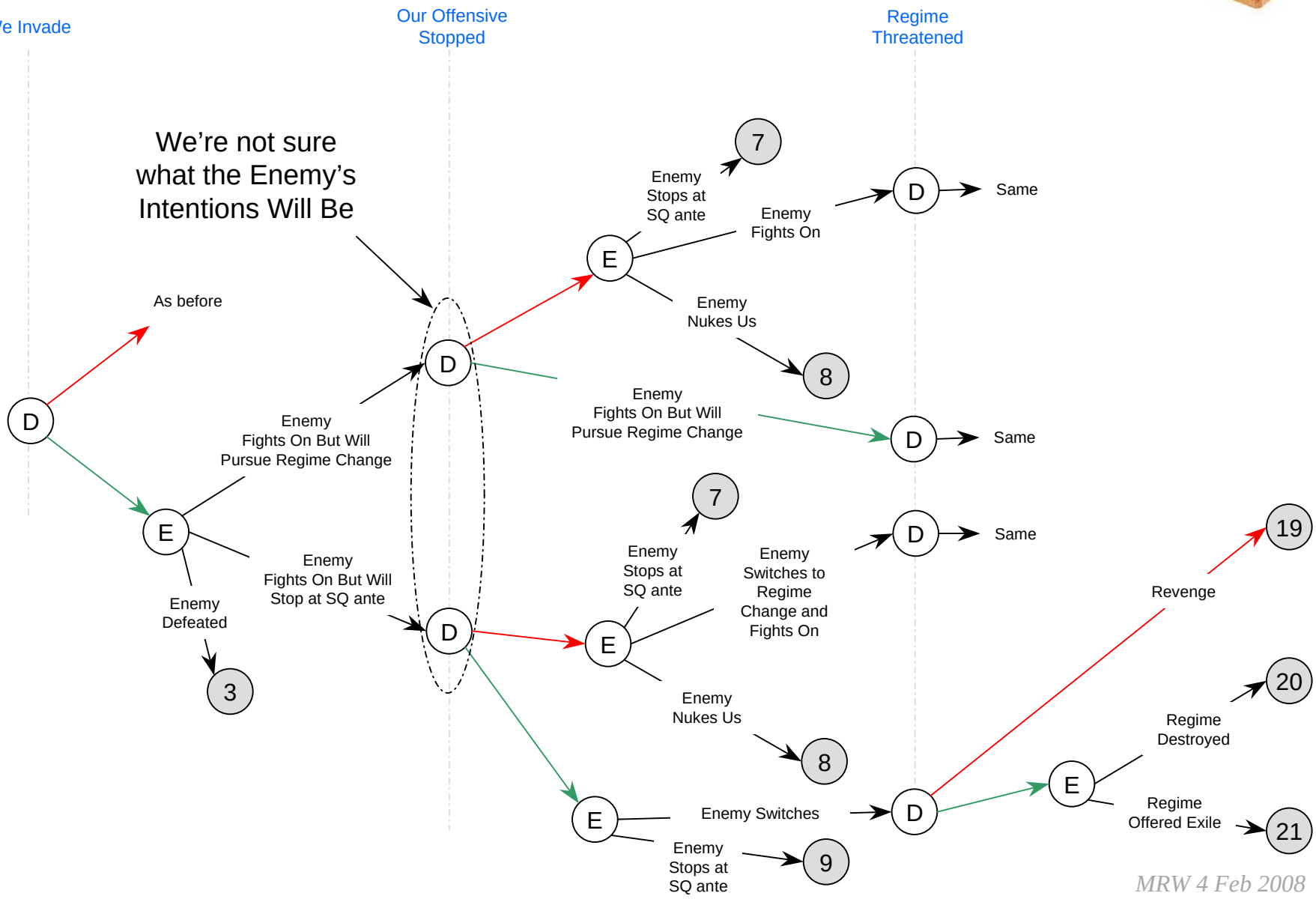
Terminal Payoffs and Propagation



Preferred Paths



Add an Information Set



Use of this Technique from US Perspective

- Estimate baseline payoff values
- Find where the payoff sensitivities are to:
  - Drive adversary to desired path
  - Increase propensity for adversary to stay on desired path by manipulating payoffs
- Brainstorm actions designed to affect payoffs

Next Steps

- Deploy GAMBIT in a classified environment
- Test sensitivities with real data
- Investigate how to integrate benefits, costs, and consequences of restraint into payoffs
- Investigate combining with Bayes approach