SAND2020-8232C

CONNECTIONS
2020

APPLYING AND REPRESENTING
A.I. / MACHINE LEARNING IN
WARGAMING

AUG. 10-14TH
connections-wargaming.com

SIGNAL Post-Mortem: Lessons Learned Building an Online Experimental Wargaming Platform

CONNECTIONS-US

Presented by:

Jon Whetzel (Sandia National Laboratories)

August 11, 2020

Who Am I?

Outline

1. What is PoNG, SIGNAL, and Experimental Wargames?

2. How Did We Make It?

3. Lessons Learned

4. How Do I Get Started?

What is the Project on Nuclear Gaming?

Researchers Charged With Answering:

- How can experimental (war)games be constructed and executed to place players in abstract and hypothetical situations to model escalation challenges, including threats of nuclear use?

- What impact might different weapon capabilities have on deterrence and strategic stability?

Partnering and Mentoring Objectives:

- Strengthen and leverage existing partnerships between National Labs and Universities

- Engage the next generation of scientists, analysts, and researchers on nuclear matters
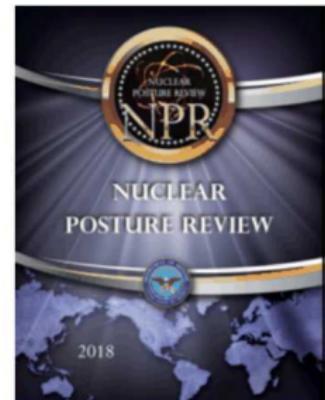
What is SIGNAL?

- 3-player game where players compete across multiple objectives

- Game divided into a series of three phases (*Signaling*, *Action*, and *Upkeep*)

- Players use diplomatic, economic, and military means to achieve victory

- Treat game as an experiment
  - Different game conditions to answer research question(s)
  - Analyze results to test hypotheses
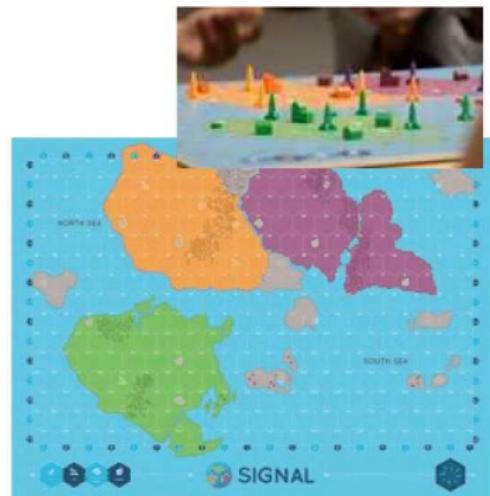
What is SIGNAL?

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- Expensive conducting game events

- Data allocation is lossy and time-consuming

- **Result**: Few, reliable data points for meaningful comparisons

What are Experimental Wargames?

- Computer-based games for creating human-derived, large-n datasets for replicable, quantitative analysis

- Rely on scientific methodology for creating various game conditions that isolate variables of interest

How do we create experimental wargames?

- Leverage commercial game development technologies to quickly generate scenarios with reduced financial and time costs ("sandbox")

- Allow for personnel from a variety of backgrounds to play simultaneously across the world

- Record data from all games to generate data-driven insights on how emergent capabilities impact decision-making

Result: SIGNAL Video Game

- Browser-based game available at
  http://pong.berkeley.edu/signal

- Over 1,100 players who signed up to
  play worldwide

- 900 games played over six months
  (~430 usable for analysis)

- Developed largely by student team at
  University of California, Berkeley and
  University of New Mexico

- Attend talks by Josh Letchford &
  Andrew Reddie on SIGNAL design
  and SIGNAL data analysis
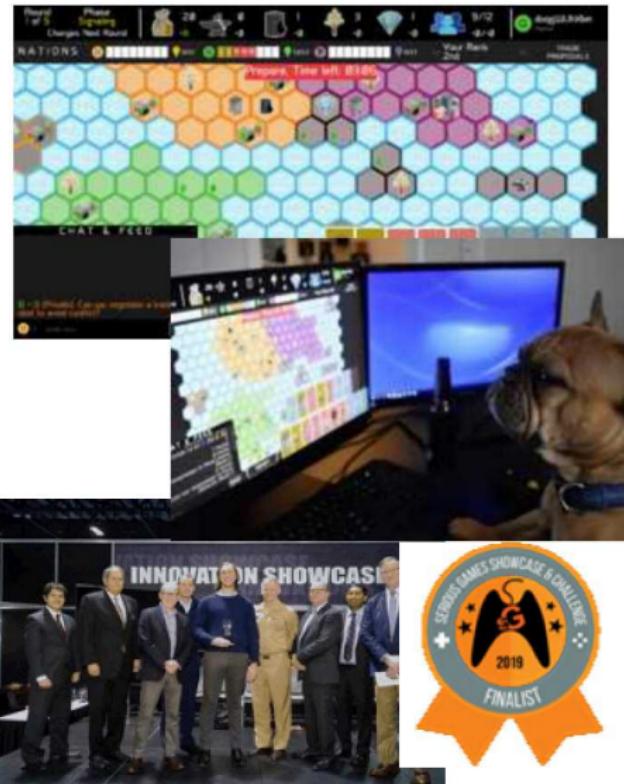
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Requirements:

- Need for game availability 24/7

- Need to ensure game could scale to hundreds of concurrent players

- Need game to be built and ready to ship in ~12 months

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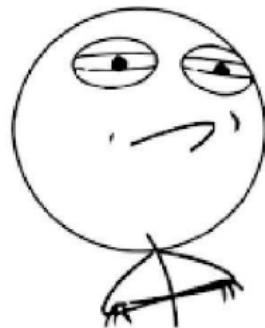
CHALLENGE ACCEPTED

More like this

How Did We Make It?

Problem: Largely student team with little game development experience


Students: Sorvais Prakkamakul, Jake Tibbetts, Roshan Krishnan, Roshni Iyer, Vamshi Balanaga (UCB), Allie Valdez (SNL/UNM).
Mentors: Jon Whetzel & Nathan Fabian (SNL/UNM)

How Did We Make It?

Solution: Off-the-shelf tools

- **Game client**: Unity3D (WebGL build)

- **Networking**: Nakama by Heroic Labs

- **Backend**: Amazon Web Services

Began with example game and built upward from there (Turn Based Strategy Framework - $15)

https://assetstore.unity.com/packages/templates/systems/turn-based-strategy-framework-50282
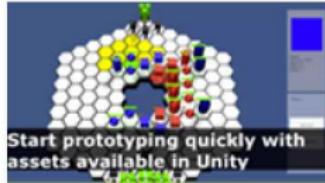
Start prototyping quickly with assets available in Unity

Customize the project easily to fit your needs
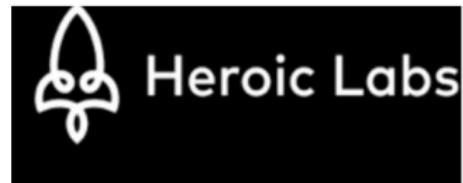
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**Problem**: Making best game possible while adhering to tight schedule
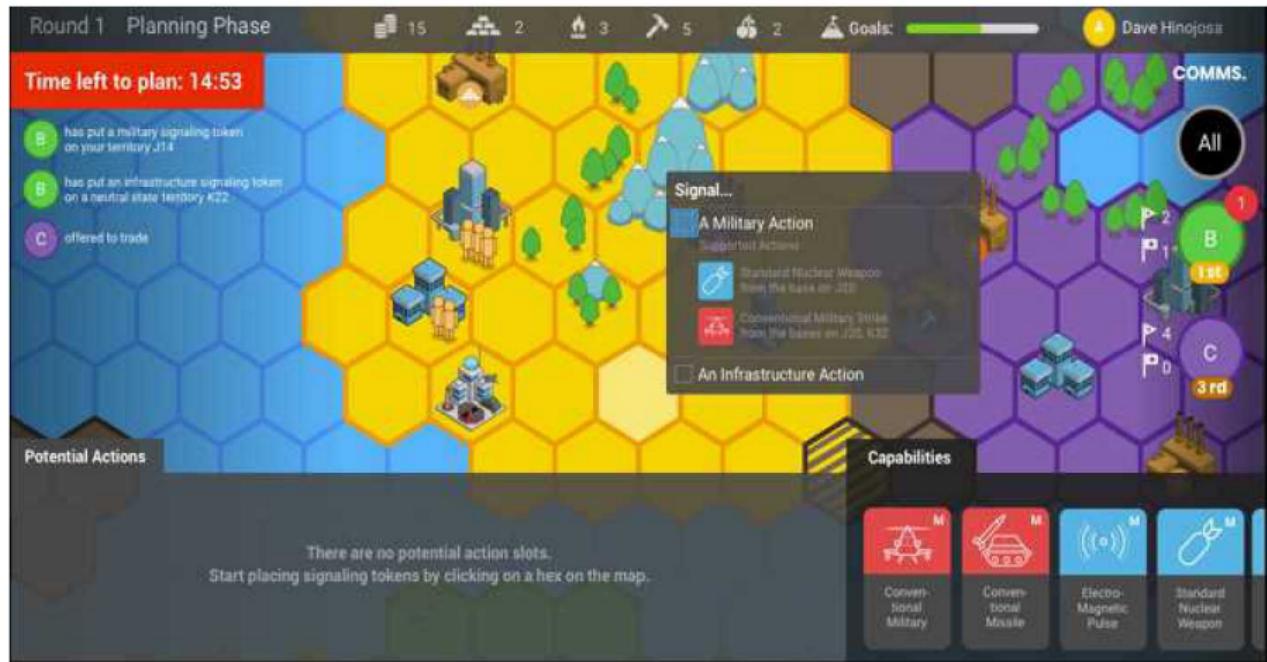
Invision Game Sketch: May 2018

How Did We Make It?

Solution: Simple SW design and leveraging board game as test environment
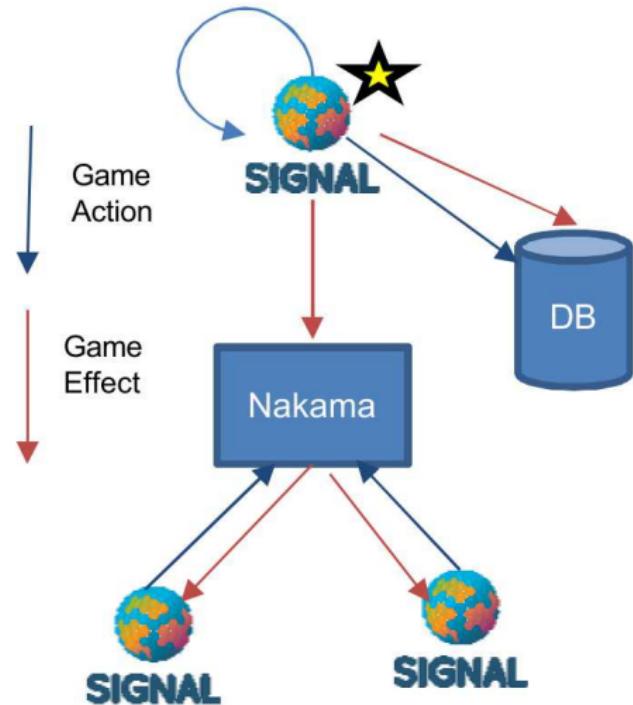
Lessons Learned

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    - *What happens when a player unexpectedly quits?*
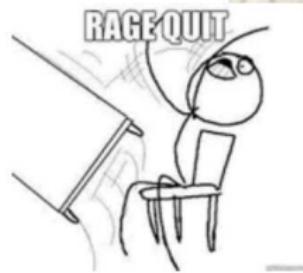
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- In-game bug reporting is your friend … use it generously
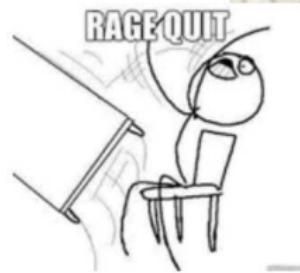
Lessons Learned

Know your audience and design for them

Image Sources
https://warontherocks.com/2019/08/wargaming-has-a-place-but-is-no-panacea-for-professional-military-education/
https://nps.edu/-/nps-operation-research-department-conduct-wargaming-exercises

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Know your audience and design for them

- Audience is more than personal demographic information

- Questions we should have asked:
  - *What PC specs and browser preferences do our players have?*
  - *What percentage of our players want to play on a mobile device?*
  - *Where will they be playing (e.g., home, office)?*

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Lessons Learned

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'SIGNAL' is an interesting, if flawed, multiplayer game that tries to simulate decision-making in the high stakes scenario of nuclear war for research purposes.

https://www.vice.com/en_us/article/8xwmja/scientists-want-you-to-play-a-video-game-to-help-them-understand-nuclear-war

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- People have expectations for online games that we didn't fulfill
  - *Player lobby information*
  - *Custom matches*
  - *AI players to make quicker matches*

- Some of our functionality outside the game could have used improvement
  - *Easier web interface*
  - *More informative tutorial*

How Do I Get Started?

… when I don't have the staff or budget

How Do I Get Started?

I can't do this … it's way too expensive

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- Costs are much cheaper nowadays for game development tools
    - **Unity 3D**: $1500 per seat
    - **Amazon Web Services**: $1500 (3 years) for server, $60 / month for miscellaneous fees
    - **Nakama**: Open-source … free!

- Larger upfront cost in first-time development, but vastly reduced cost in future games and distribution

How Do I Get Started?

I can't do this … making video games is hard

How Do I Get Started?

I can't do this … making video games is hard

- Tools are available to minimize programming overhead

- Online visual and audio content available

- Board game simulators are easier way to prototype idea

Bolt for Unity
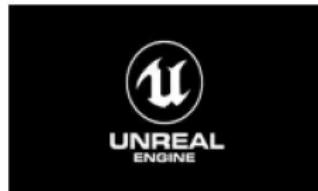
Conclusions

- Transitioning traditional wargames to online environment now a more feasible approach than in recent past

- Constructing an online game provides new development challenges

- Benefits of online wargames do outweigh the costs

Questions?

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