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Overflow

Overview

Overflow is a cooperative strategy game about building a network of aqueducts using cards, they intersect, overlap and collide! There are two game modes built in: one option is to play the campaign mode, where players will challenge themselves by building a system of aqueducts which grows as the game progresses. Another option is to solve puzzles, where a situation is presented to players and they must do their best to solve it. Overflow can be played with any number of players due to its collaborative nature, but my suggestion is to play with groups between 1 and 4.

Gameplay

The main objective of Overflow's campaign mode is to build a network from the game's source, sink, node and edge cards. Players have a collective pool of resources which they use to build and expand their network. When specific metrics are met by the network (metrics the players must figure out if their network fulfills), the pool of resources grows slightly, with larger milestones providing more resources.

Overflow's puzzles provide another way to play the game, a "regular" Overflow puzzle consists of setting up a specific network, finding some extra cards and using those cards to alter or expand the network to meet a given goal, hence solving the puzzle. Other styles of puzzles also exist, an example is where players must instead analyse the network to discover and prove properties regarding the network and its structure.

Learning Objectives

The learning objectives of Overflow are included in the rulebook. The first is to understand the graphs made by playing the game; the rulebook explains how they function so a good understanding of the rules means that any player should gain this knowledge. The next asks players to think critically and make efficient networks while playing; the extent to which

players fulfil this lies entirely on how they decide to approach the game. Within the campaign mode, the players should be constructing their network in a way which allows lots of further expansion while using a suitable amount of their resources, perhaps saving some to use later. The final learning objective is a more technical and niche one, the rulebook introduces a new concept called a network cut and a statement to go alongside it, these can be used alongside the existing knowledge of the game to allow players to know when a Flow in a network is the maximum possible with their network. The way the rulebook proposes this learning objective be met is either through puzzles designed specifically to test this, or while playing the campaign mode, utilising the statement once each goal is met.

Design of the Game

Overflow is a relatively simple game with only a handful of different simple components, each of them is crucial to how the game functions. The source, sink and node cards are all very intuitive, with 4 connection points on each side and no other information required for their intended function. The edge cards are slightly more complex with a specified set of connections communicated through the iconography on the card, as well as a number or numbers in the corners to indicate the maximum capacity (see appendix for exact counts). The small and easy to digest information on each card is based on cognitive load theory (Sweller), so my goal is to not overwhelm players with complex components when the game itself is already intricate.

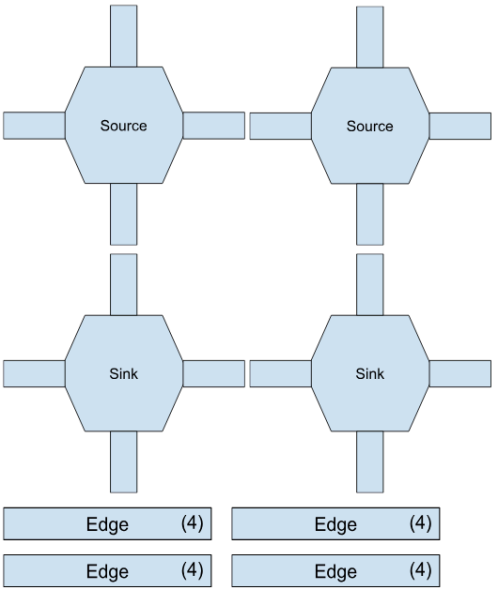
Beginning the Campaign Mode with a small pool of resources and an easy to achieve goal eases players into the mechanics and decision making of Overflow before slowly ramping up in difficulty.The core reasoning behind this is drawing from theory of flow (Csikszentmihalyi), with a consistent goal which slowly gets more difficult to achieve as the players get more experience with the game. Overflow’s Campaign has cooperation, teamwork and communication baked into its design; the core idea is players working as a team to construct something together, while the challenge constantly increases. This is to appeal to the Bartle player types (Bartle) of Achievers, Explorers, and Socialisers. I feel as if Campaign Mode itself balances input and output randomness (Kocurek) quite well, with

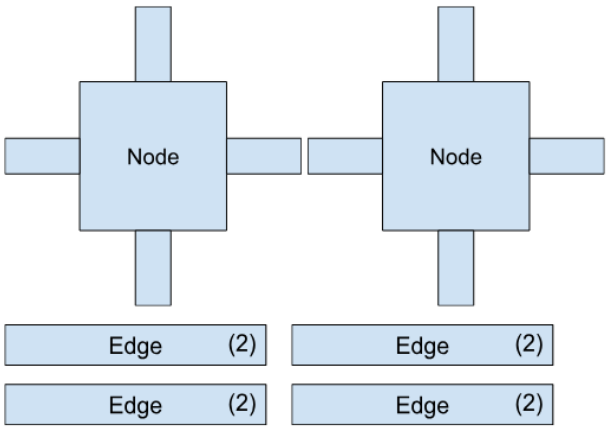
the players' decisions as to how they build their network comprising the input randomness, and the deck of shuffled edge cards providing output randomness. By design, the edge deck does not have any obviously negative outcomes which could impact motivation for learning as well as decision making, the deck contains only challenges for players to consider such as edge shapes and low capacity edge cards.

An interesting note I made during playtesting was, as there were 5 of us, it was a slight struggle to make sure that all players had their ideas heard, therefore I suggest this game be played in groups of 1 to 4. With other groups such as a classroom setting or just a group of more than 4 people the game still works as intended but the communication and teamwork aspects of Overflow should be taken note of.

Prototyping

The initial prototype of Overflow was made by printing out basic shapes to represent sources, sinks, nodes and edges. The edges were limited at this time to either straight or single corners and were not printed in a way which allowed them to be randomised, so during playtesting we randomly took them from a pile instead of shuffling and drawing cards. My next prototype was of the same paper form, however a wider variety of edges had now been conceptualised, so these were included. I also had more edges with a wider range and better distribution of capacities.





These images are the source for the printing of my prototypes, note how the sources and sinks are easily distinguishable from the nodes due to the differing shapes.

Playtesting

Through playtesting with my initial prototype in a group of 5, I identified a good number of issues with the version of Overflow's campaign mode which existed at the time, these included:

1. The scaling of the Flow goals was too fast to keep up with.
2. We had too few edge cards to build an ever expanding network, we had a situation where there were not enough edge cards to construct another edge let alone meet the next Flow goal.
3. There wasn't enough variety of edge shapes.
4. We did not have a wide enough range of edge card capacities.

I implemented many changes as a result of this playtesting, each detailed in the associated number to the problem which motivated it:

1. I changed the Flow scaling from 3 per round to 2.
2. I added extra edge cards gained as goals were reached, as well as slowly increasing the number of edge cards gained as larger and larger goals were achieved.
3. I expanded the number of edge shapes, adding the double cornered, bridge, and t-junction.
4. I altered the edge cards, having the edge capacity range go from 2-4, to 2-8.

My fellow players and I spent some time with the initial prototype and were dissatisfied with the campaign mode so decided to set puzzles for one another, using our existing knowledge on the subject to inform puzzle building decisions. We found this to be an incredibly enjoyable setting for the existing prototype, hence I decided to create the Overflow Puzzle mode. This allowed me to illustrate concrete graph theory concepts through the game and in a setting of low-pressure puzzles, utilising cognitive load theory (Sweller), this game mode removes the need to think about network construction principles during puzzles so that players can focus on the ideas behind the puzzles themselves.

Further Development

If I was to spend more time developing Overflow, I would continue to playtest the Campaign Mode; the numbers could do with more refinement to make the game feel slightly more balanced. The Puzzle Mode functions very well, however I would like to have been able to write a larger number of puzzles across a range of difficulties. Adding more puzzles also allows me to demonstrate more concepts within the field of graph theory that the game already explores. Furthermore the number of connections only being 4 on each source, sink and node presents a challenge when considering long term campaign mode play. An idea I've had to solve this issue is by introducing a connection on the corners of each of the cards, this way the sources, sinks and nodes would all have 8 connections. I believe that this would help solve a few of the issues which have been identified by allowing more complex networks in a small area. Another idea I have to allow compact networks like this is to introduce a separate set of "power up" cards used primarily during campaign play; they would also introduce another interesting layer to the puzzles. Some ideas for these cards I have are:

- Edge expander: All edge cards between a node and either another node or source or sink have a permanent +2 to their capacity.
- Double edge: Place an edge card in the same location as an existing edge card. They act as if both edge cards are in that location (their flow does not interact).
- Emergency repairs: Replace any edge card with another of a higher capacity, add the replaced edge to your resources, it can be a different type of edge card so long as the network still "makes sense".
- Well that's unnecessary: Replace any edge card with another of a lower capacity, add the replaced edge to your resources, it can be a different type of edge card so long as the network still "makes sense".

Appendix

There are 52 Edge cards which form the Edge deck (quantity x capacity)

- Straight
    - 1x8

    - 1x7
    - 1x6
    - 1x5
    - 2x4
    - 3x3
    - 5x2
- Corner
    - 1x8
    - 1x7
    - 1x6
    - 2x5
    - 3x4
    - 5x3
    - 7x2
- Double corner
    - 1x6
    - 1x5
    - 1x4
    - 2x3
    - 3x2
- Crossover
    - 1x6
    - 1x5
    - 1x4
    - 2x3
    - 3x2
- T-junctions
    - 1x6
    - 1x5
    - 1x4
    - 2x3

- 3x2

References

Mihaly Csikszentmihalyi. *Optimal Experience : Psychological Studies of Flowin Consciousness*. Cambridge, Cambridge Univ. Pr, 1988. Accessed on 16th Jan 2026.

Bartle, Richard. "Hearts, clubs, diamonds, spades: Players who suit MUDs." *Journal of* MUD research 1.1 (1996): 19. Accessed on 16th Jan 2026.

Kocurek, Carley. “Uncertainty in Games. Greg Costikyan. Cambridge, MA: The MIT Press, 2013. 152 Pp. $19.95 Cloth.” The Journal of Popular Culture, vol. 47, no. 1, Feb. 2014, pp. 220–222, https://doi.org/10.1111/jpcu.12119. Accessed on 16th Jan 2026.

Sweller, John, and New South Wales. Department Of Education. Research Applications Committee. Cognitive Load during Problem Solving : Effects on Learning. Sydney, J. Sweller, 1988, pp. 257–285. Accessed on 16th Jan 2026.