UNIVERSITÀ DEGLI STUDI
DI MILANO

Researching Games

Open Issues and Challenges

PONG
Playlab fOr inNovation in Games

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We said …

- Computer scientists creating games must know technical aspects and, at the same time, understand what is going on on the other side of the table

- Doing research is about understanding problem before they do!
  - Remember, gaming industry main keywords: *exploit* and *workaround*

Research … what ?

1. Performances
   - Is my connection good enough to play?
2. New communication paradigms
   - Client-Server is getting boring
3. Completely new concept of “scalability”
   - Zounds of users assaulting your server
4. Way to support gamification of legacy service
   1. Learning and exercising on a distance

Network Quality of Service

- It is the capability of a network to provide better service to selected network traffic over various technologies
  - Of course, a little help is welcome
    - Circuit switching
    - Reserved resources
    - Int/Diff-serv
    - MPLS
- What the heck, it’s a game! We have to serve a player not a video client streaming over DSL!

Never Underestimate Players

300 APM → One click every 200 ms (or less)

QoS For User Experience

- Network QoS must be able to deliver an enjoyable experience to the overall feeling the player is perceiving from being in the flow
  - Read: must be good enough to make me LIKE the game despite delay and packet loss

… too bad gamers' experience is running at 300 APM

Everything is About Timing (not Bandwidth)

- Games are designed to use bandwidth sparingly
  - To save on the bill
- We do not need to send much over the Internet
  - All assets are local
- Ongoing research is currently focusing on three subjects
  - Understanding how network unfairness effects gameplay
  - Expanding games scalability
  - Games inter-operability
- What do we know ? … NOTHING!

The NORT project (Network-Oriented Reliable Tester)

- Testing game playability in a standard way is unreliable
  - You cannot ask beta testers to play 48 hours no-stop
    - They get bored
    - They get tired
    - They get sick
    - They might just do not like the game
    - They will “take revenge” on the previous winner
  - Humans (unconsciously) self-adjust to the network conditions
  - I won → it was playable

NORT Goal

- The create a testbed with synthetic players
  - They never tire
  - Experiments can run forever
  - They do not need to like the game
  - They are all the same
- Playing tons of matches under different network conditions will let us understand how the gameplay get affected
- We have this working on a FPS game

First Testbed (circa 2008)

Results

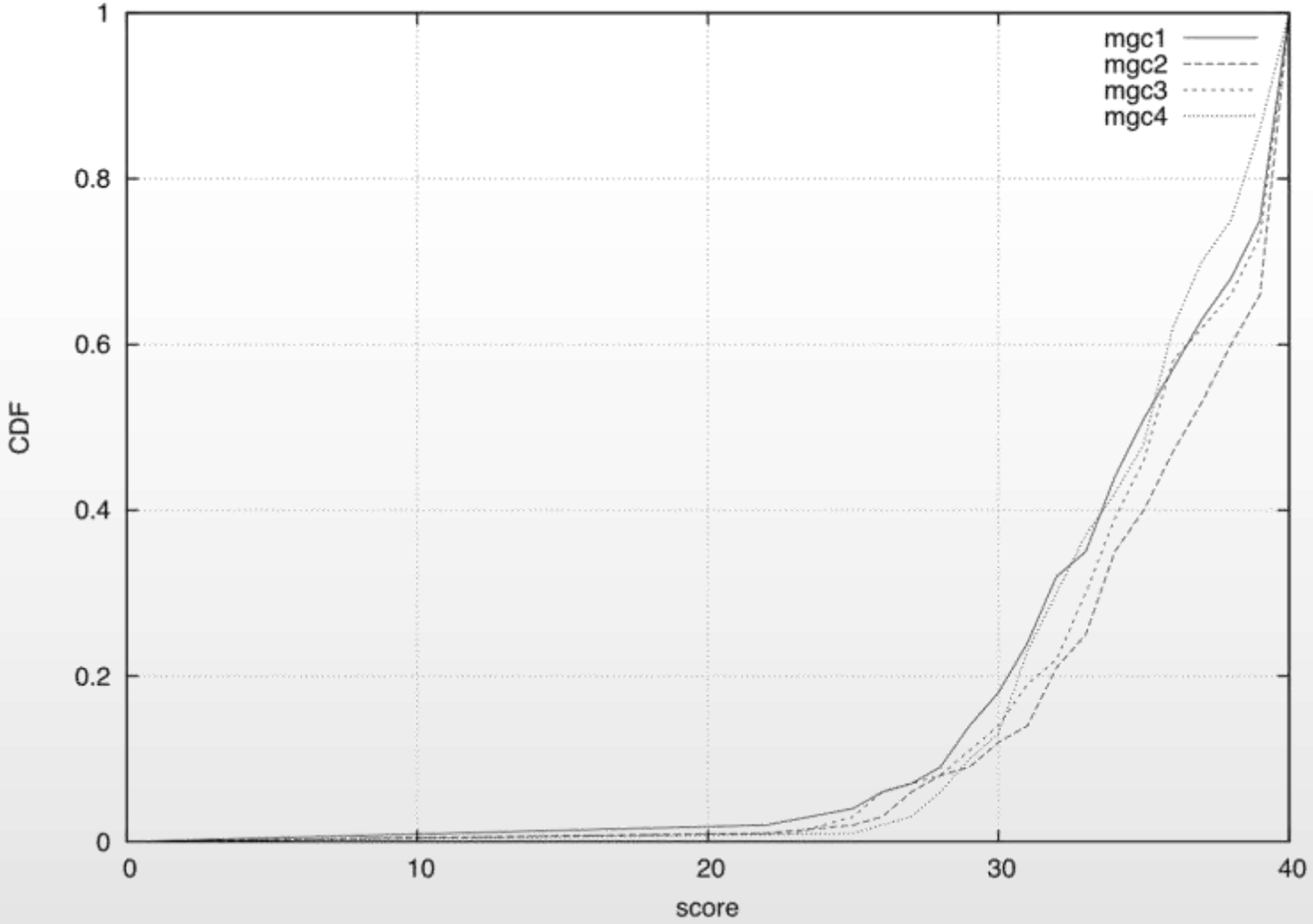
- We try to answer the following questions:

1. How sensible are we to the network conditions ?

1. Are the currently adopted solutions and metrics meaningful ?
   - Turns out that score is not enough and rank is even worst

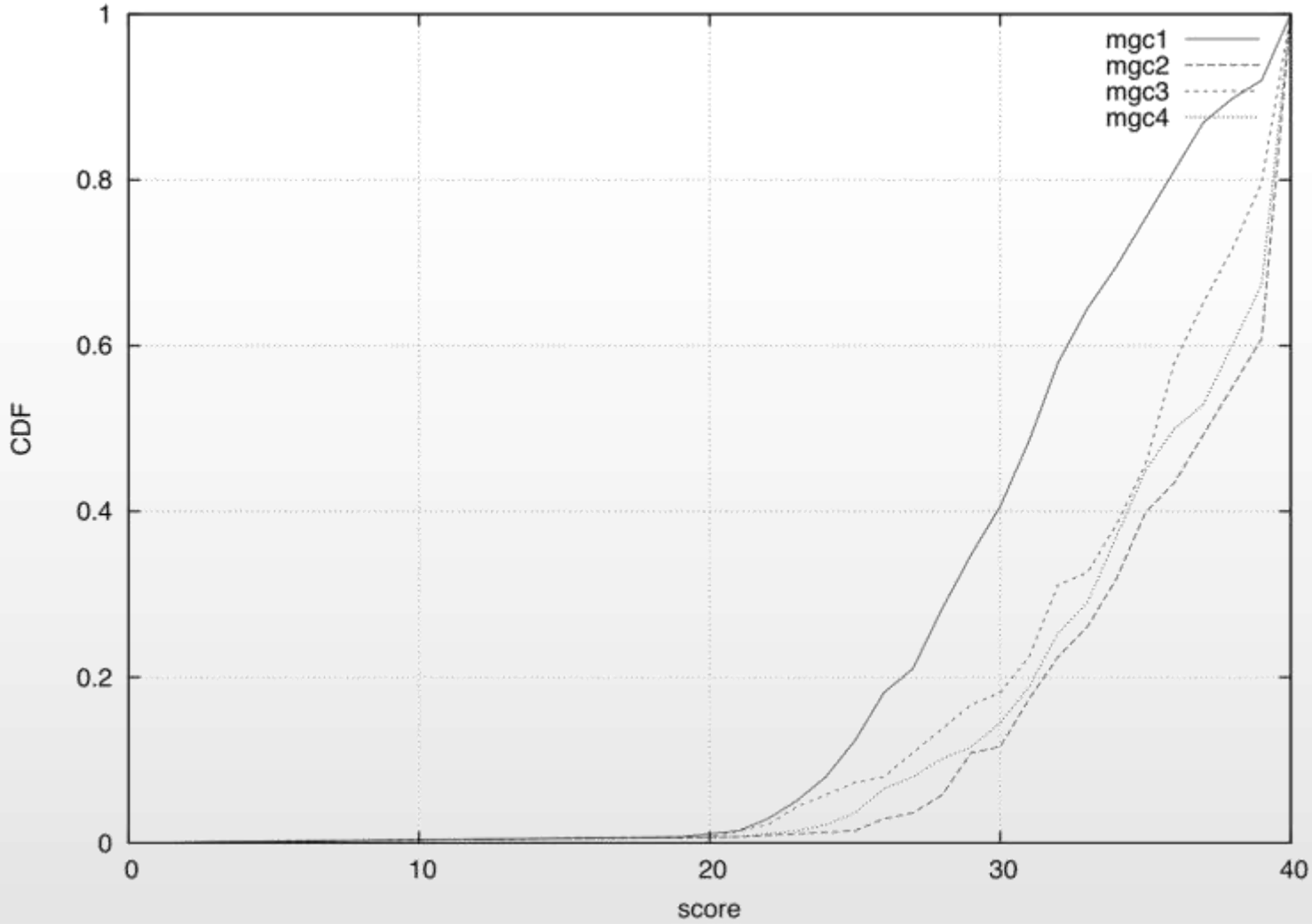
Score

No delay for anyone



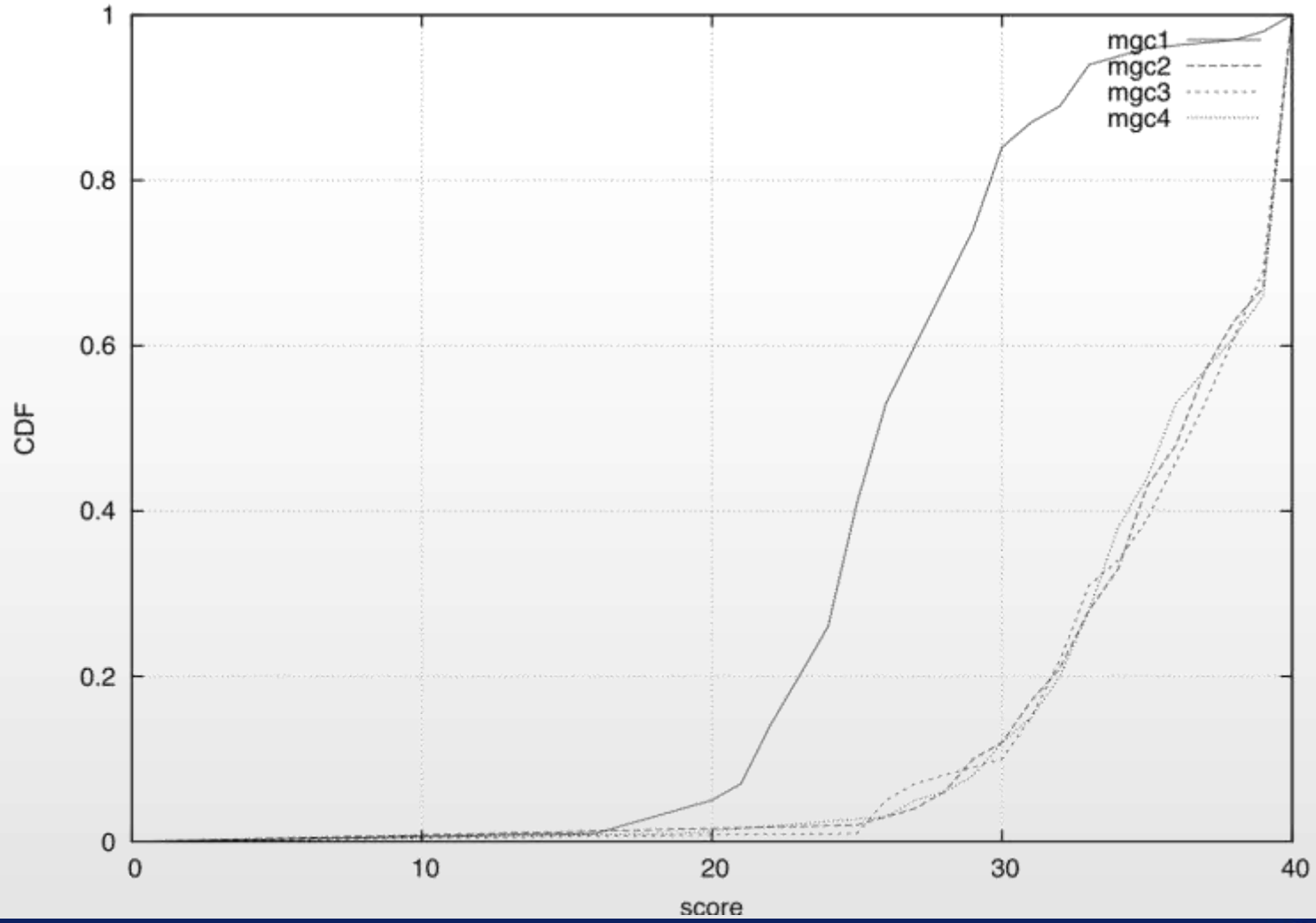
Score

One player penalized by 25 ms



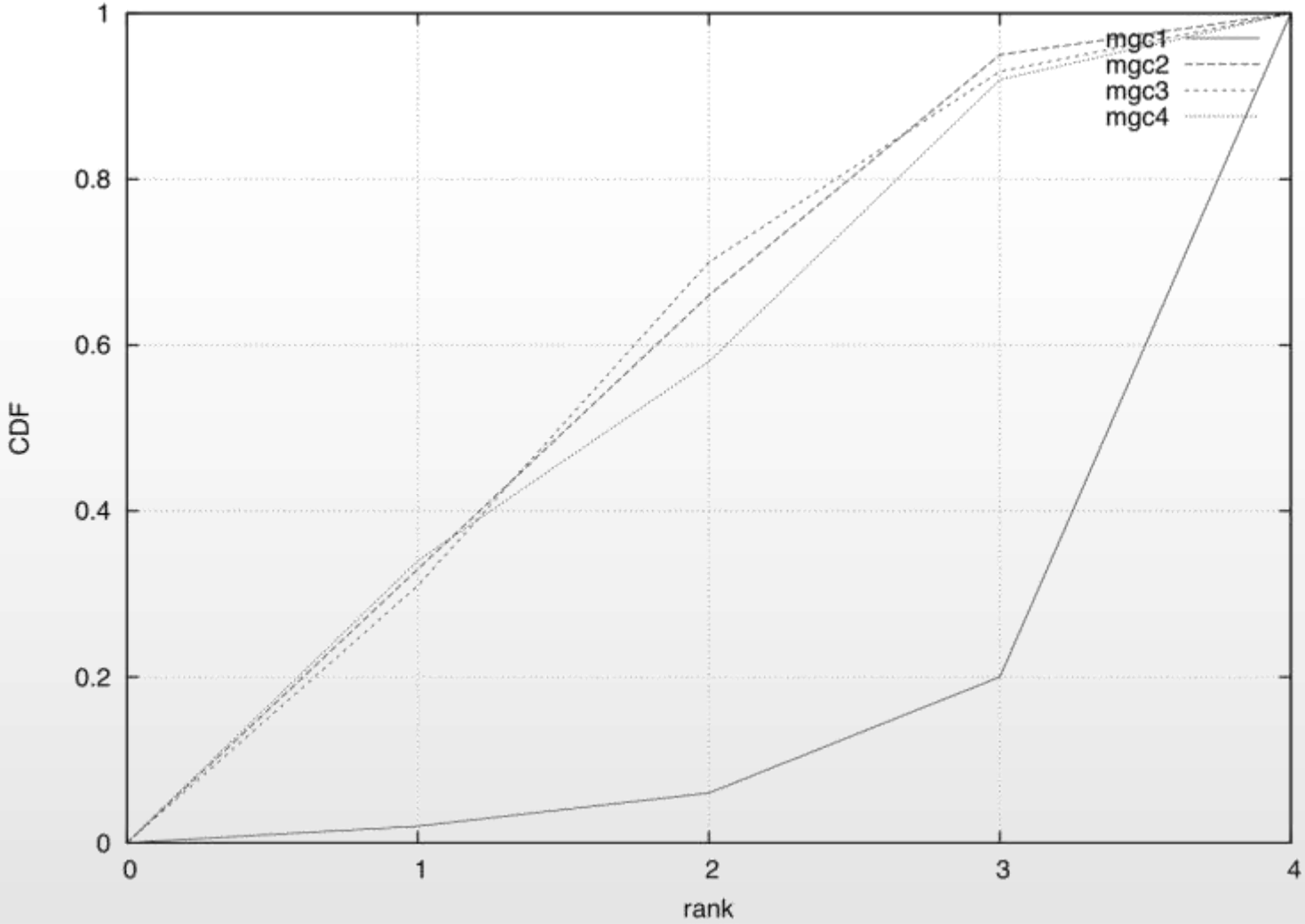
Score

One player penalized by 50 ms



Rank

One player penalized by 50 ms

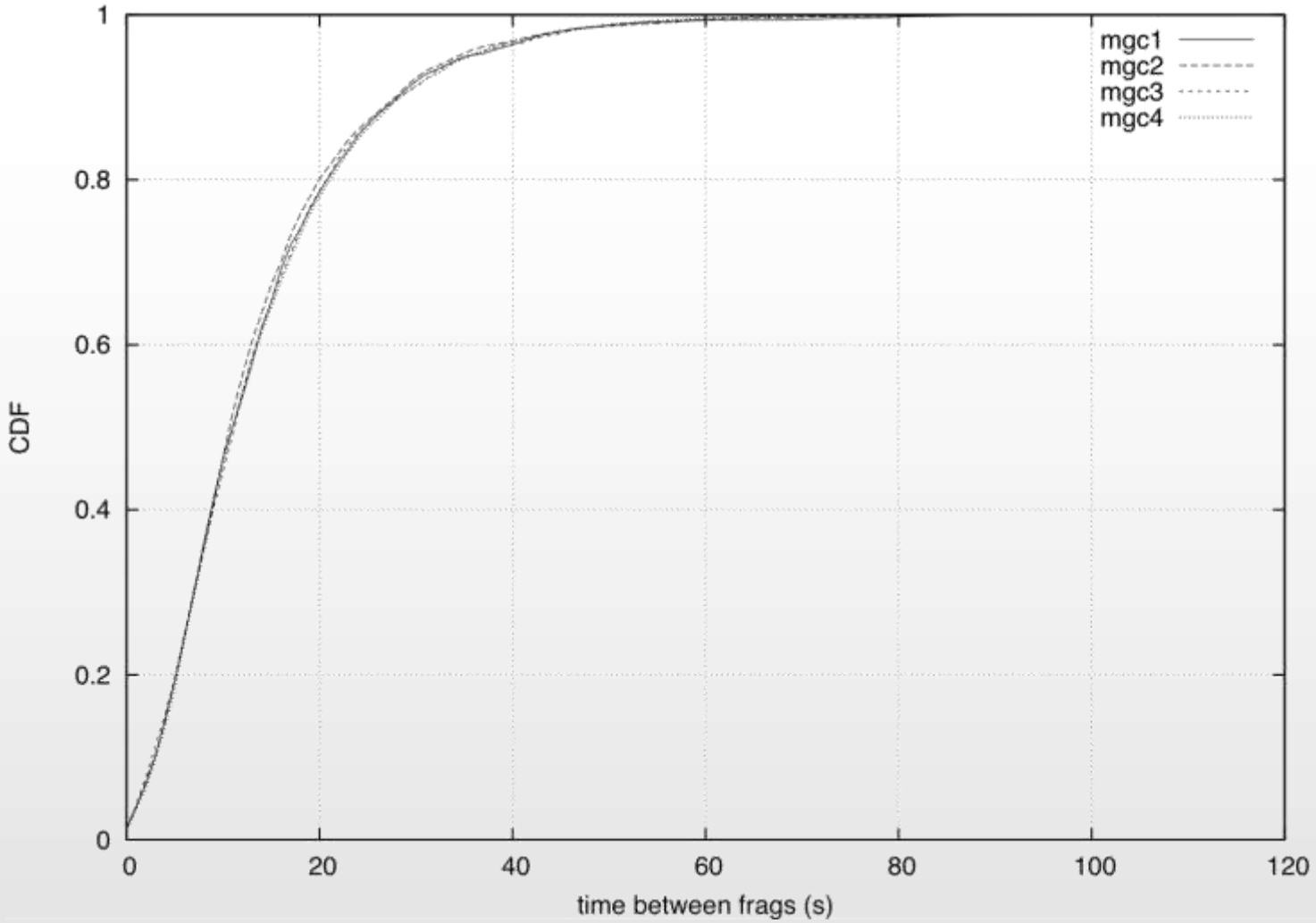


Wait a Sec!

- FPS providers usually tell us that:
  "The game is playable with a delay up to 150 ms"
- So, either they are all liars or the player is having fun despite the "bad" graphs
- Or, maybe, these metrics are completely wrong
- Q: How to measure a player happiness ?
- A: Count the times he/she is doing something rewarding for his/her self-esteem
  - What about counting Frag Per Minute (FPM) then ?

FPM

No delay for anyone



FPM

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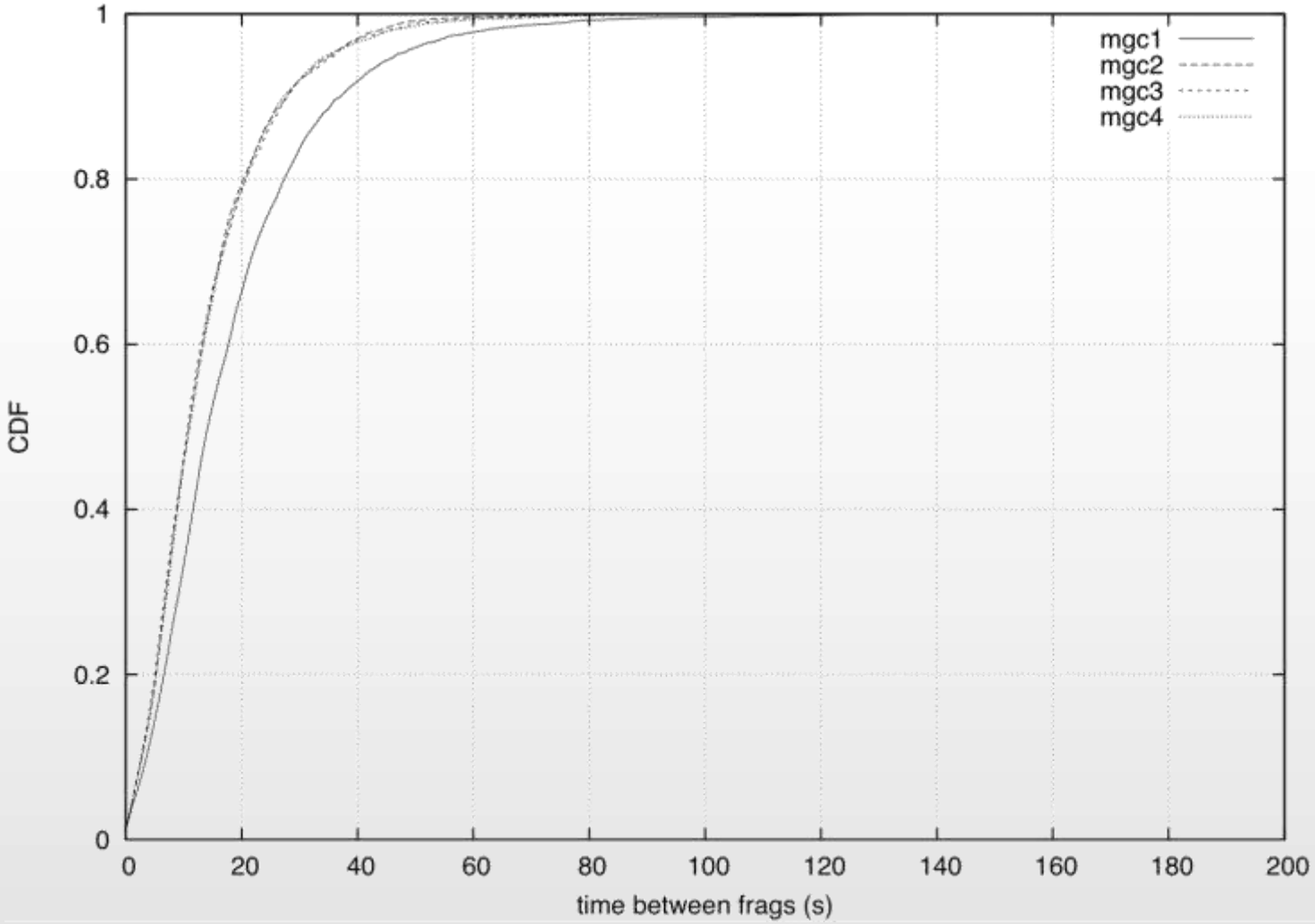
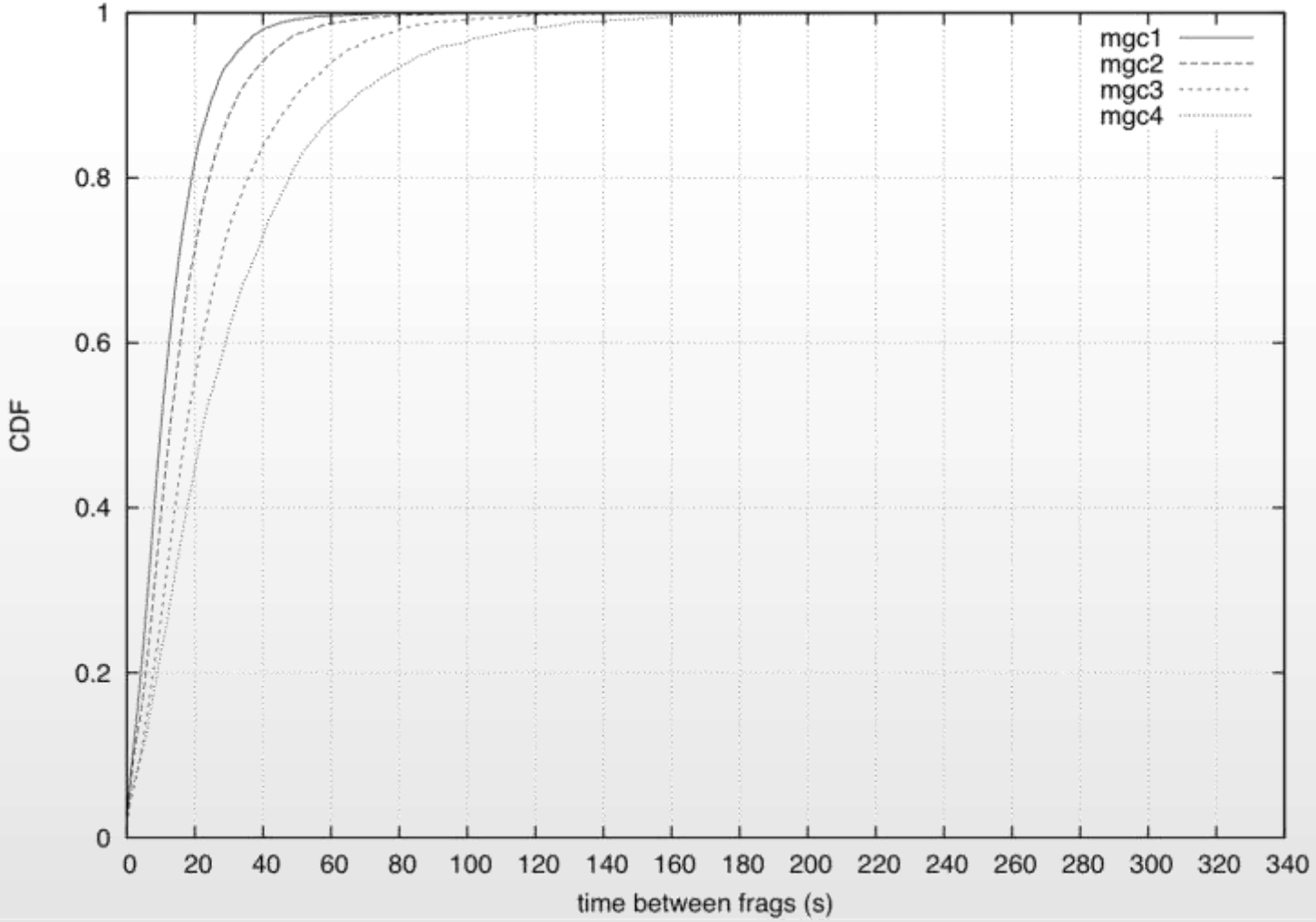


FPM
All different delays

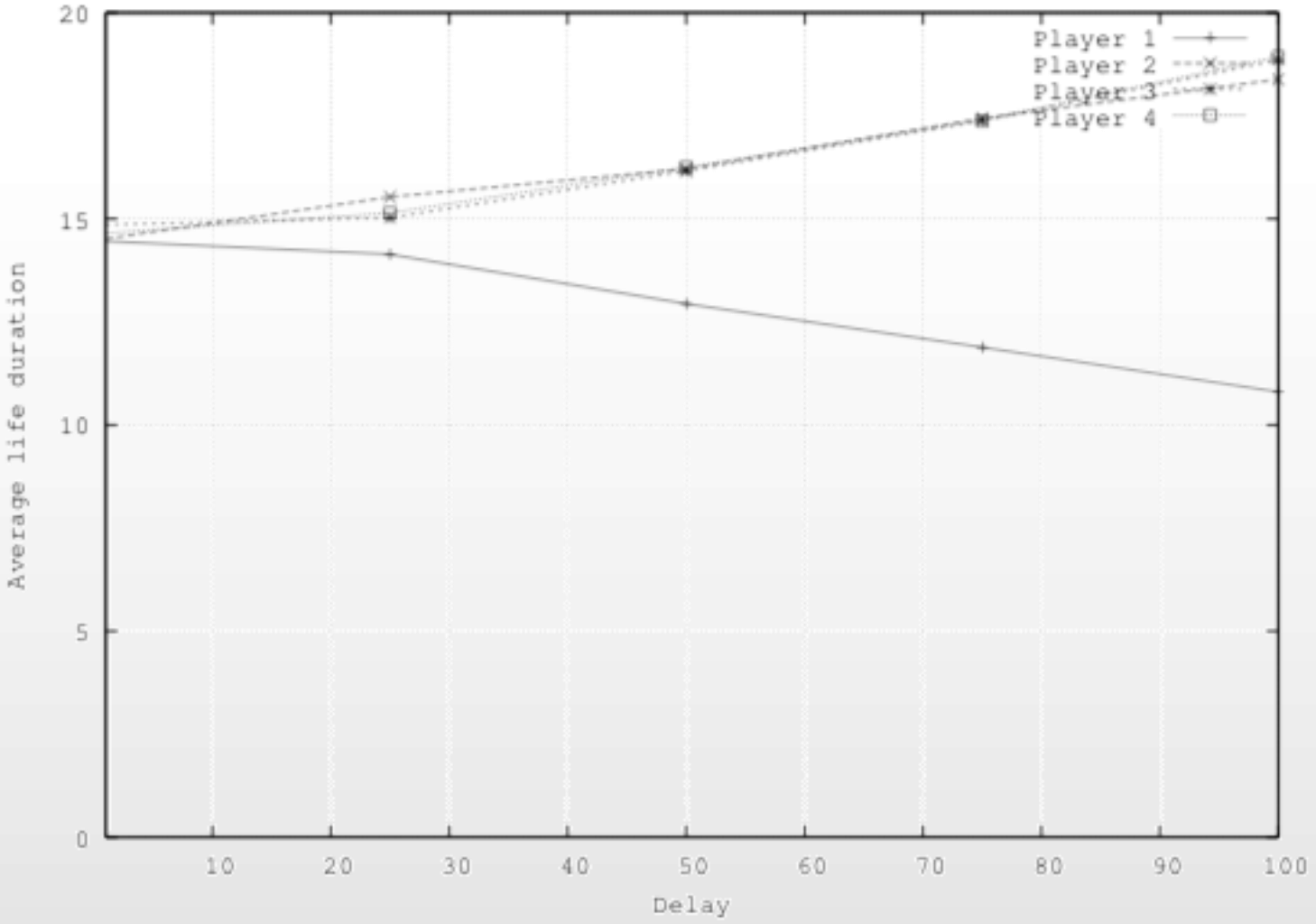


Does “Playable” Means “Fair”

- It is a common understanding that a FPS is playable when delay is below 150 ms

- It is playable, but is it still fair ?

Nope!


Player 1
Player 2
Player 3
Player 4
Average life duration
Delay
0
5
10
15
20
10
20
30
40
50
60
70
80
90
100

Lag Compensation Will NOT Help Us

- If the lag is (fairly) increasing (too much) for everyone the game is perceived as playable but we might see some nasty side-effect

Ubiquitous Gaming

- Ubiquitous computing
  - Computer power everywhere, at every time, no matter what
- Ubiquitous network access
  - Data access everywhere, at every time, no matter what
- What is so wrong in “playing everywhere, at every time, no matter what” ?
  - With a decent (ubiquitous) computing
  - With a decent (ubiquitous) network access

Where is the Problem ?

- No one likes to pay bills
  (teenagers are no exception)

- Game designers address the problem by means of the near-field short-range communication paradigm we usually call MANET
  - Good on the small scale
  - Unsuitable on the large scale (where is my MMO?)

- Possible solution: to implement games over Opportunistic Delay Tolerant Networks

A Word About Scalability

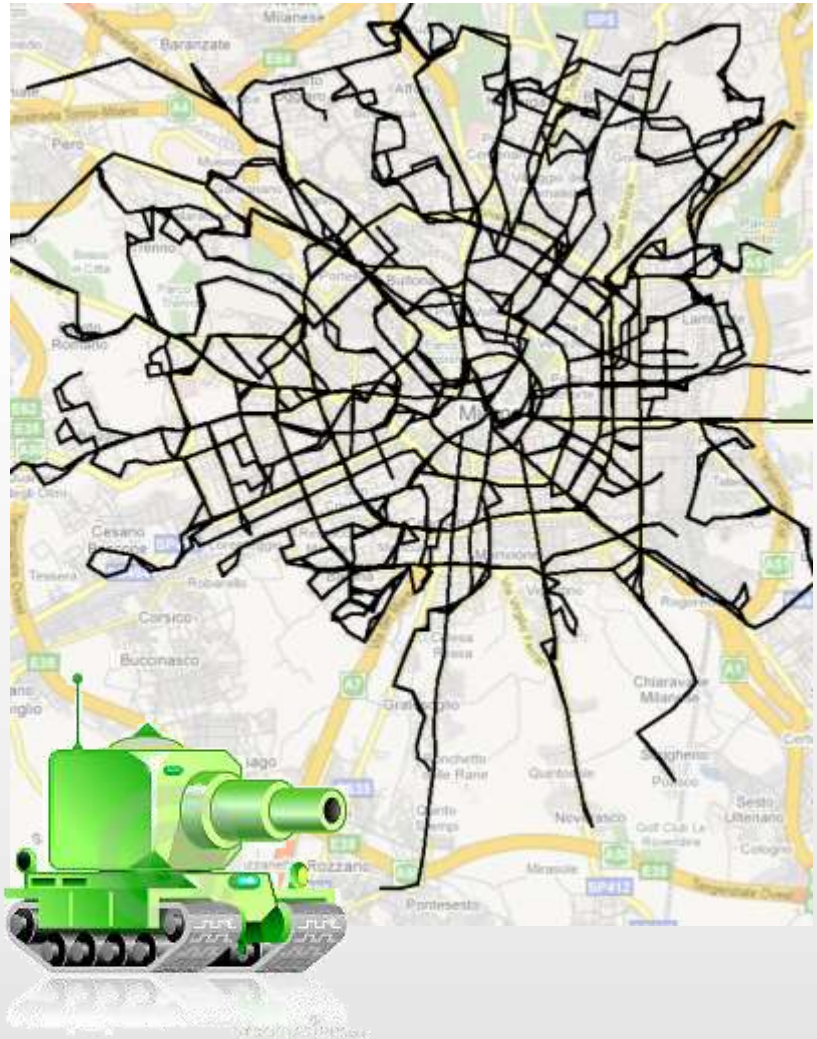
- Scalability is the ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth

- With games … we play on different terms!

Games Scalability

- Scalability is a “downward” problem
  - Keep the game entertaining with few players is more important that withstand the onslaught of a huge number of users
- What is the definition of “popularity” ?
  - 20,000 downloads in a city -> the game is a blockbuster
  - 20,000 users in a city -> 1% (or less) of commuters
- Players will need offline content to play alone at times
  - Game mechanics must provide synchronization mechanisms between users
  - Game design must balance power between hard-core players mostly playing alone and casual ones always playing in groups

Our Battleground



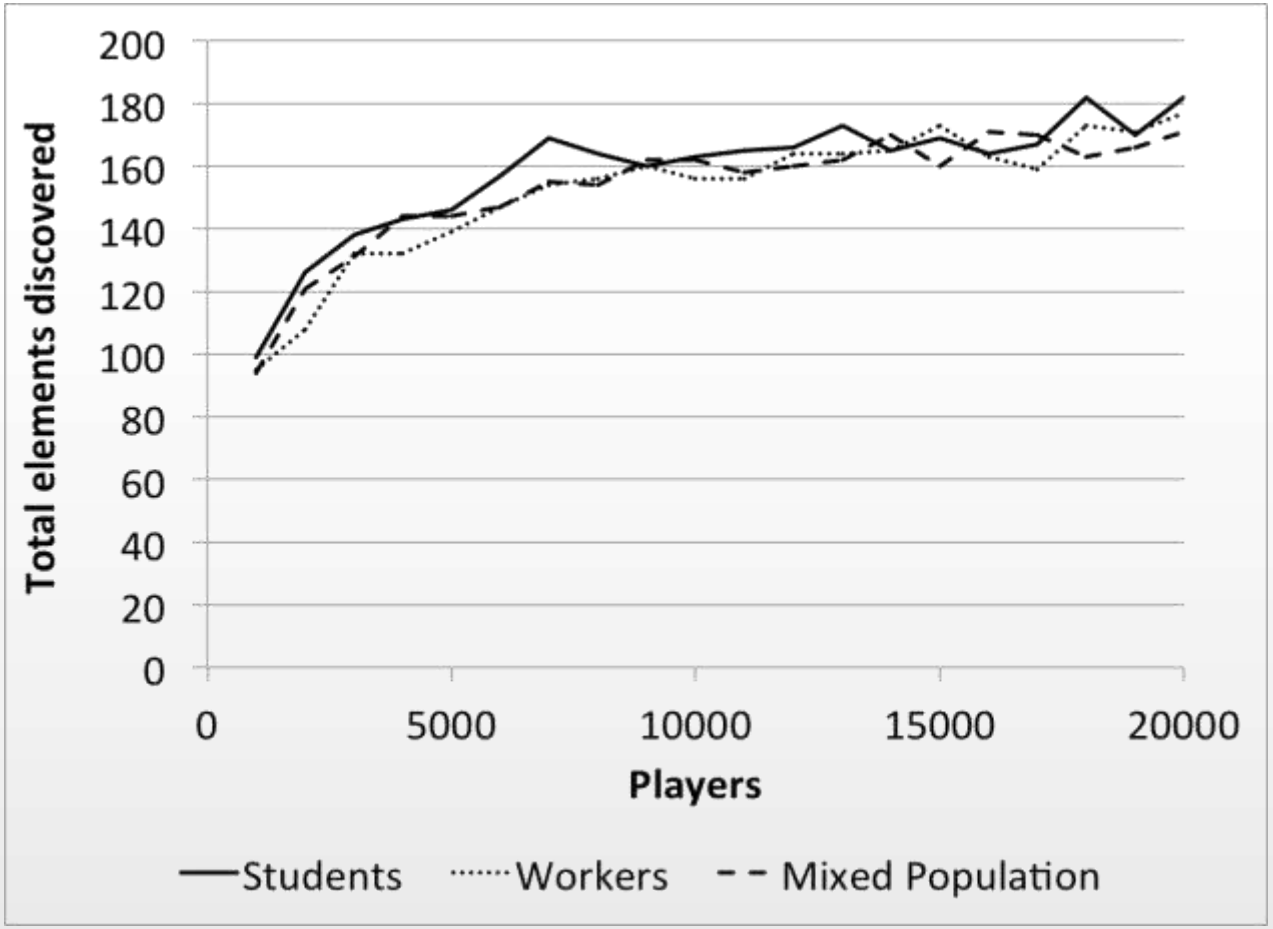
- 69 lines
- 49 square miles
- a total paths length of 683 miles
- 13.85 path miles for every square mile

The Mobile Alchemy Game

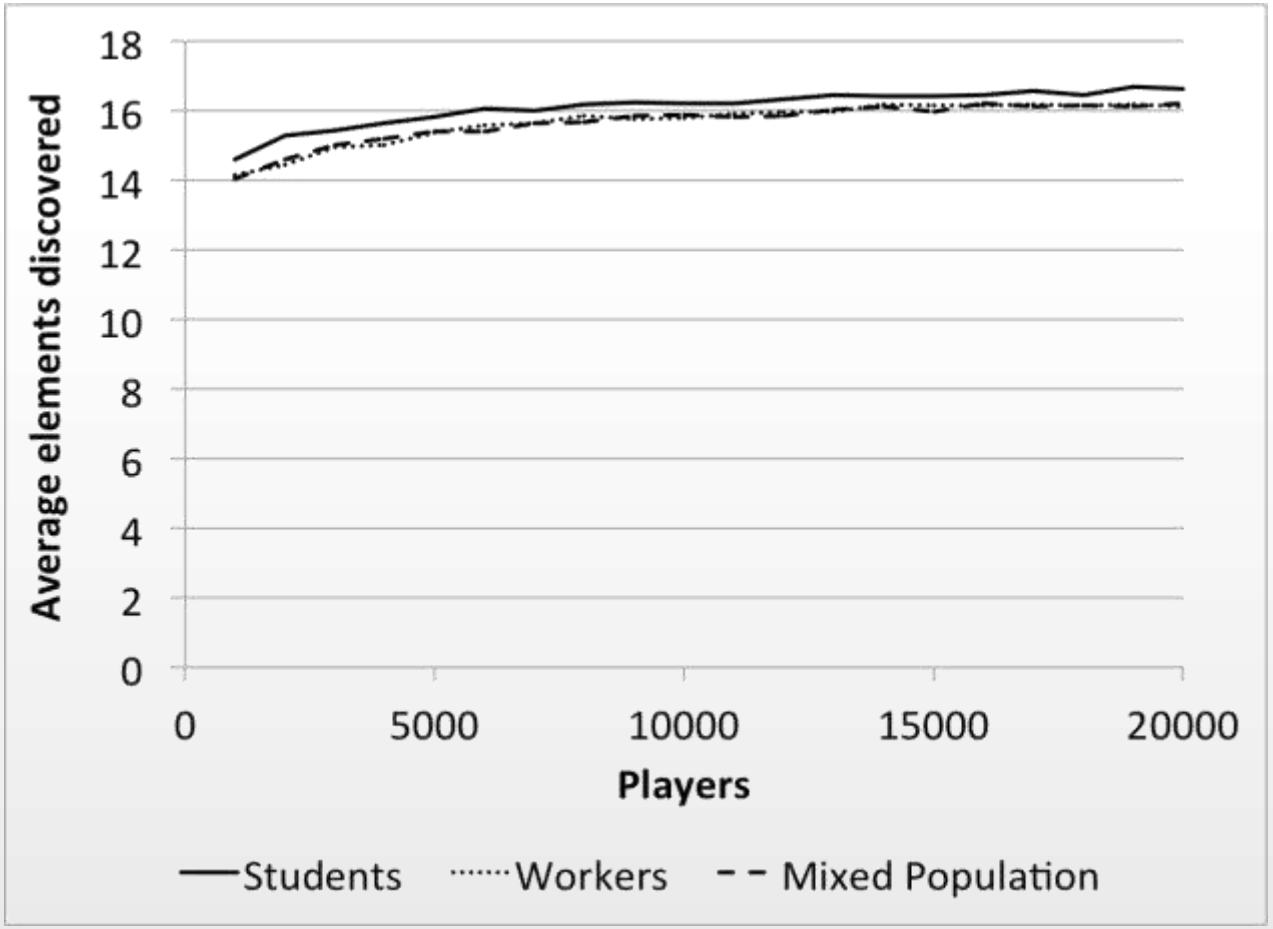
- Mobile Alchemy is an opportunistic collaborative game inspired by a game for mobile devices

- 380 elements
- Goal: to discover all possible combinations

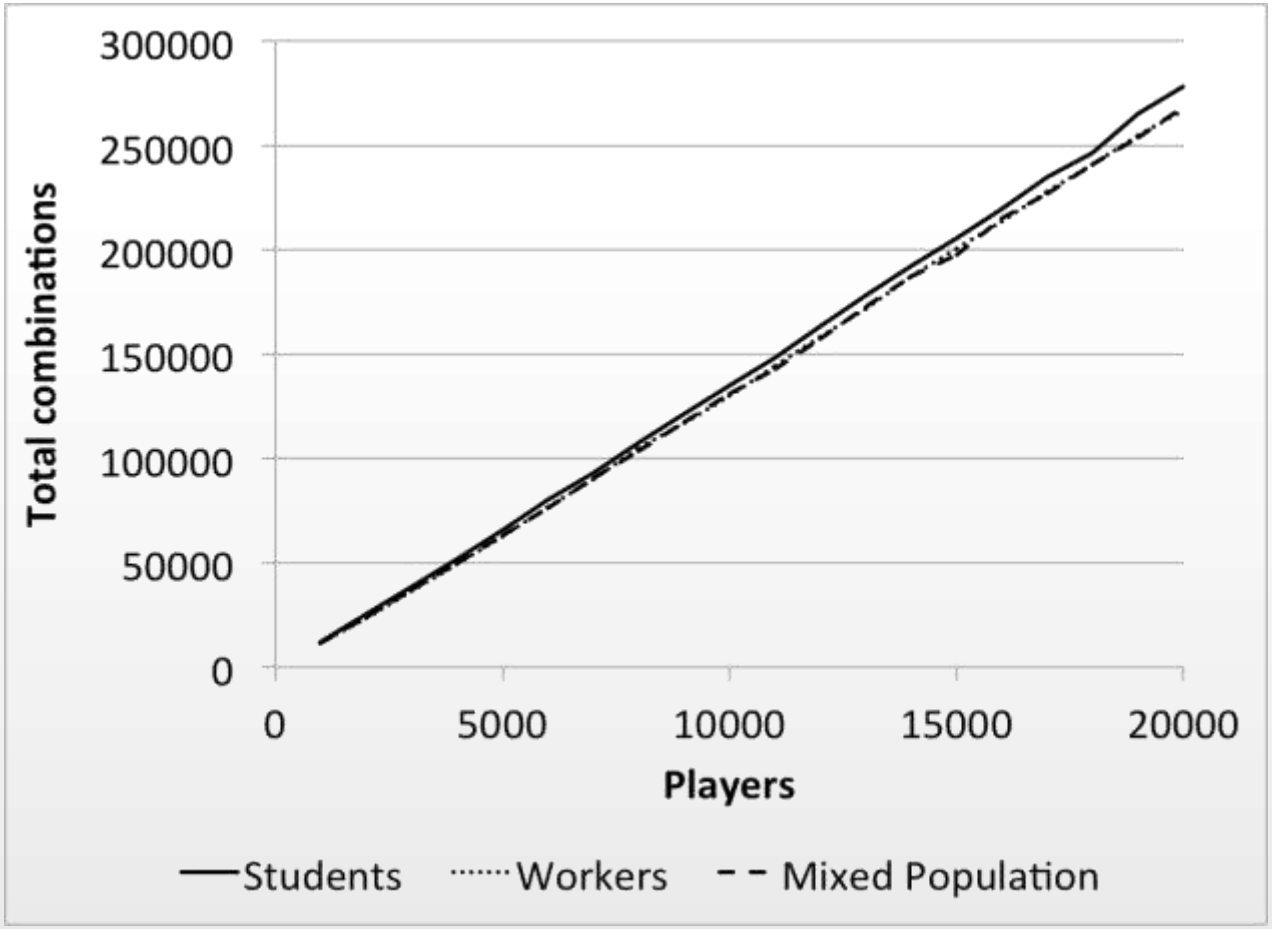
Habits are not an issue



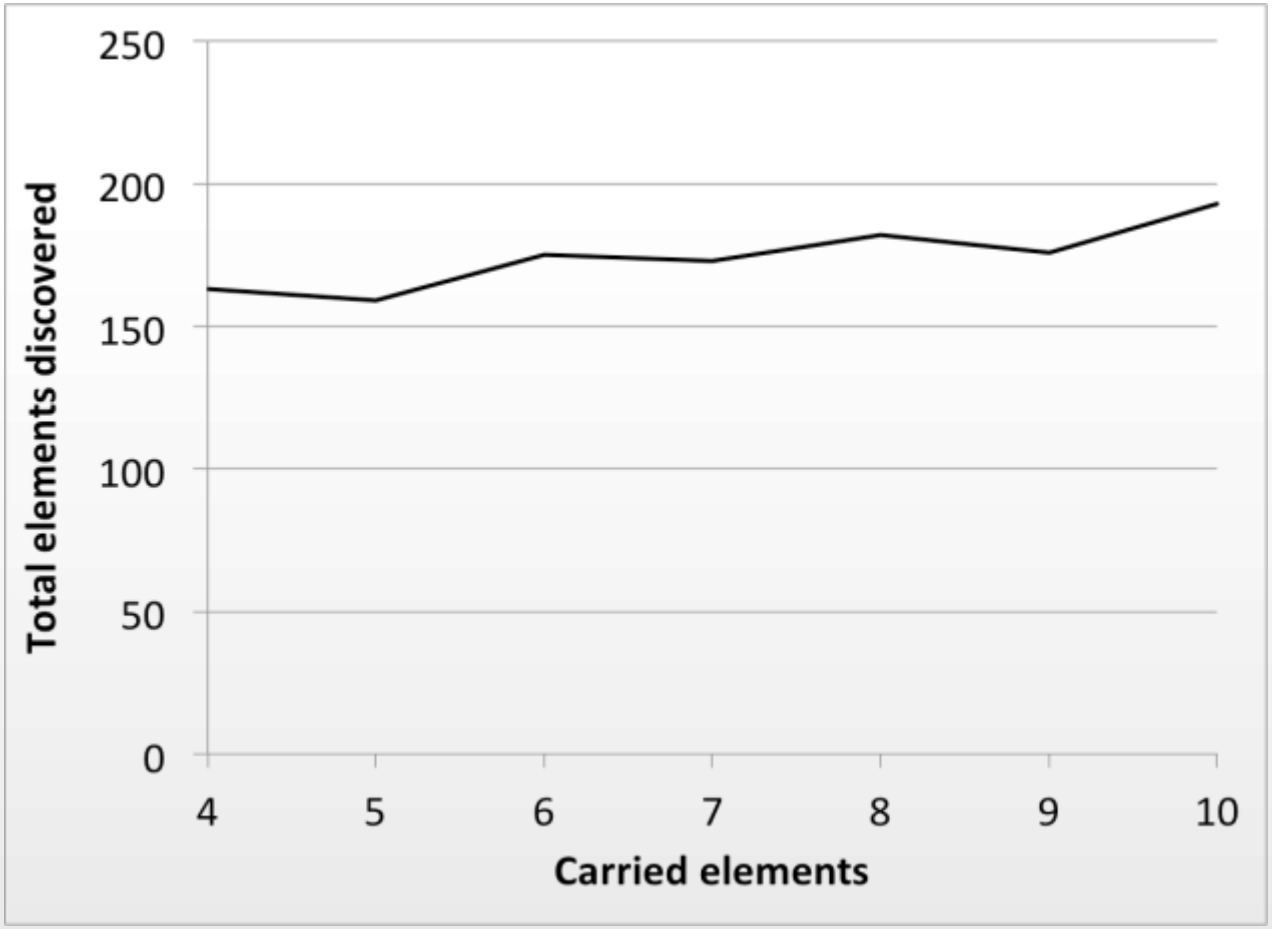
Do Not Count on Too Much Activity



System is NOT Saturated



More Options Improve the Situation



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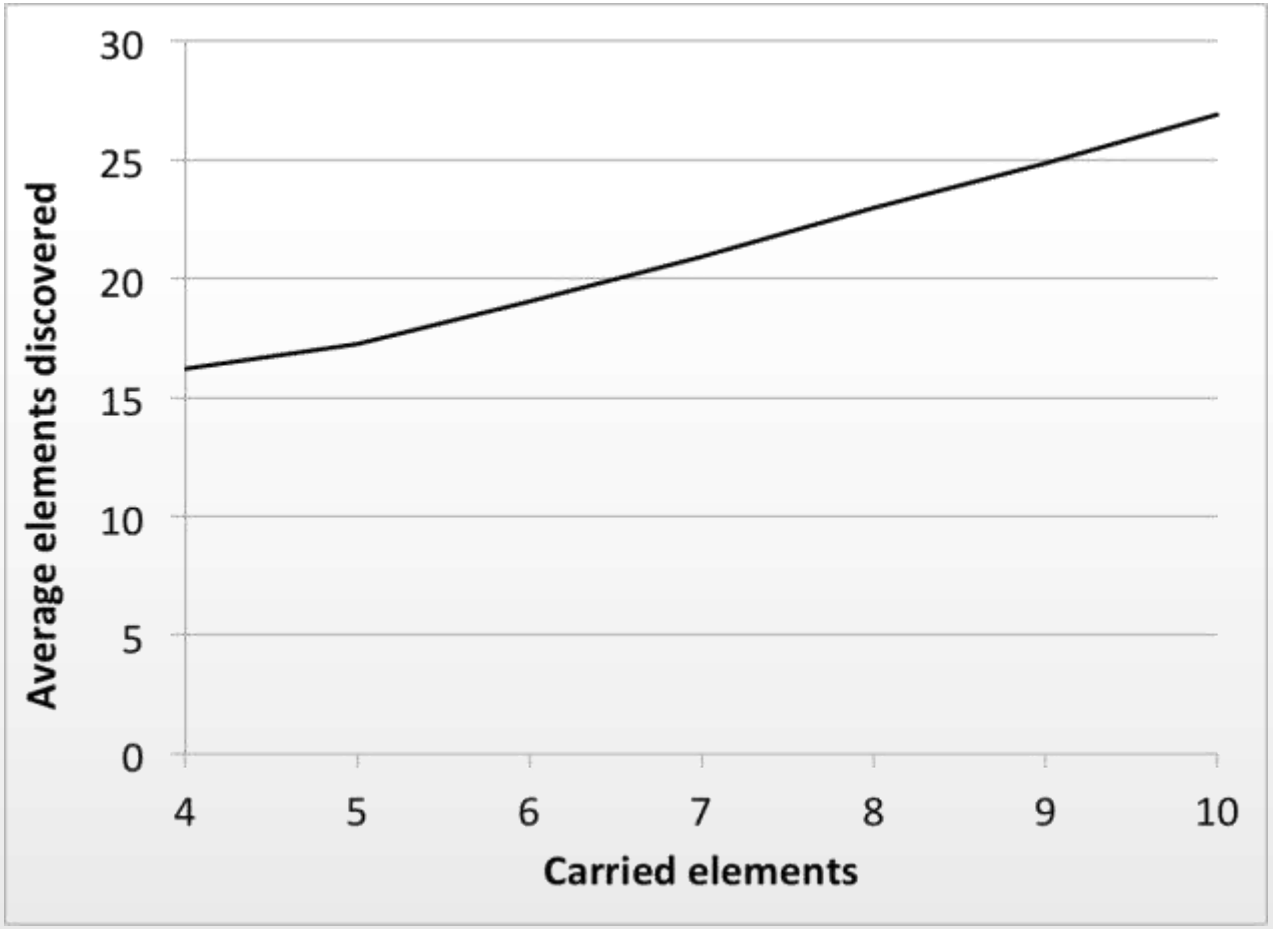
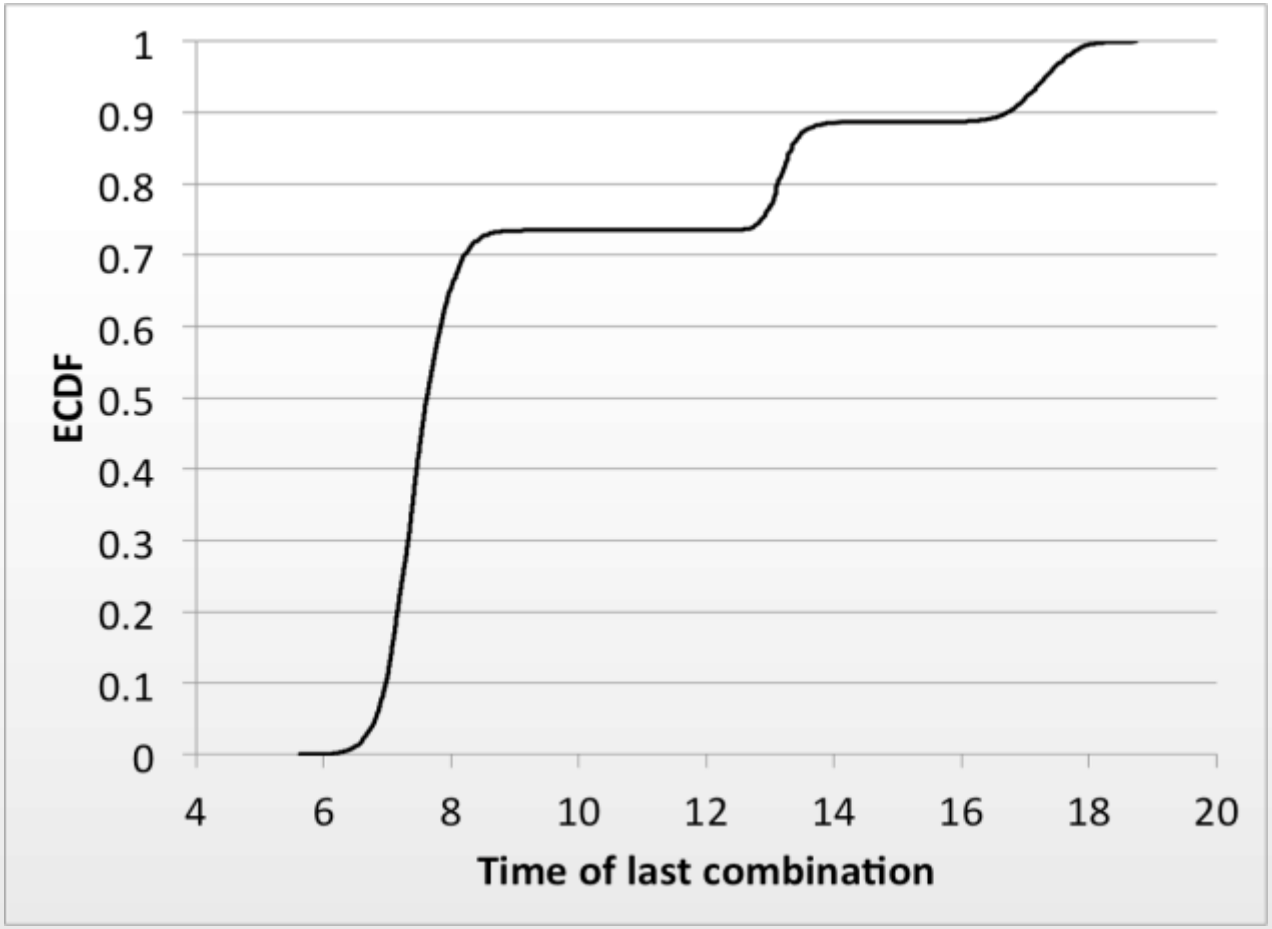


Keep Streaming Content!



Average User's Behaviors

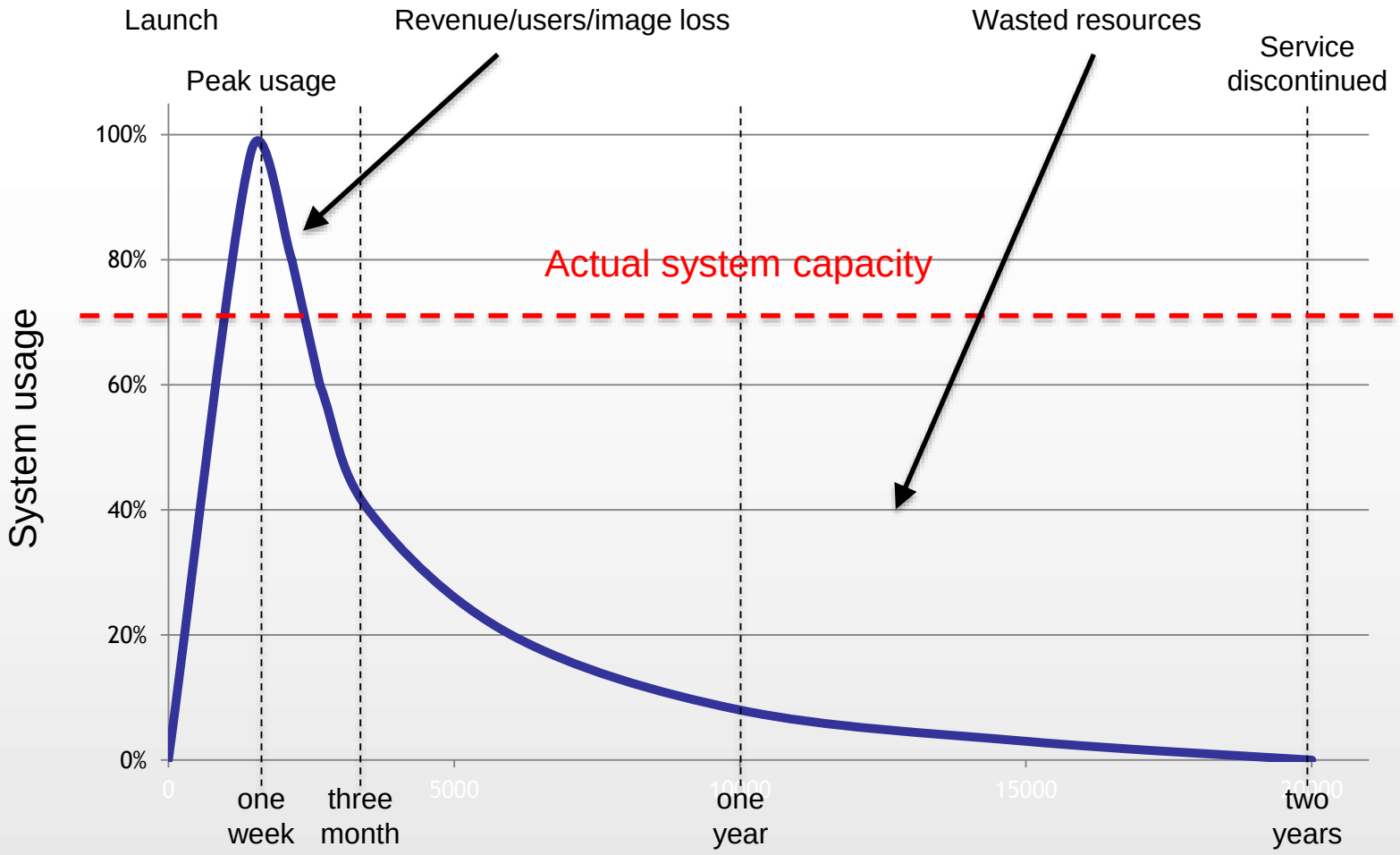
1. Buy the game
2. Run home
3. Open the box
4. Install
5. Play insanely for one week
6. Come back to real life
7. Play moderately until content is expended
8. Wait for the first extension

Effects on Infrastructure

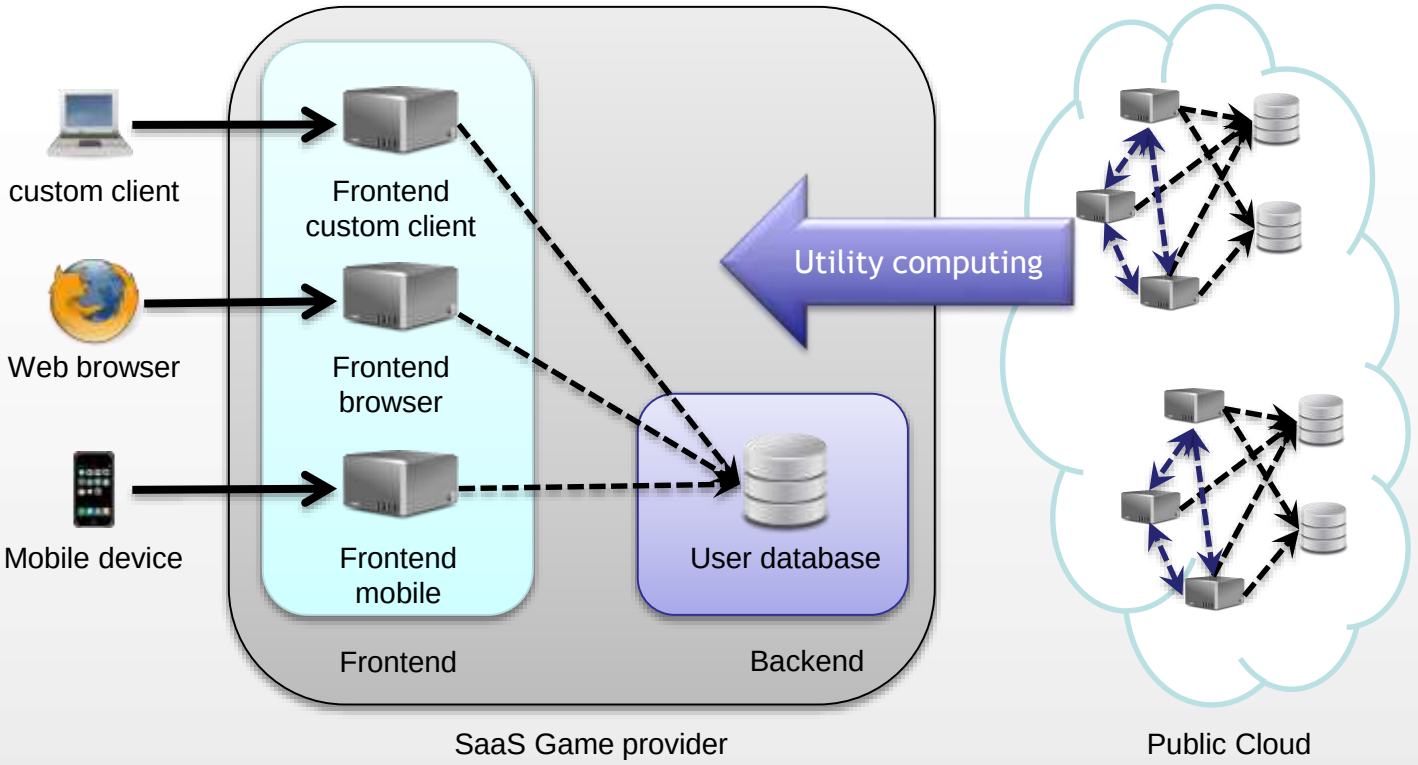
- If all players are doing so at the same time, 90% of you total cumulative system workload will be on the first week
  - And … in the entry areas (not evenly distributed)

- To buy or not to buy ?
  - Will you buy other hardware knowing it will obsolete in 6 months and you might never need it again ?

System (Over)Load Evolution



Software as a Service for Gaming



Next Generation Gaming Infrastructures

User

Plays

Game Provider
and Cloud User

Uses

Cloud Provider

- A huge company may have its own private cloud
  - Feasible only if it has many games sharing resources
- Independent developers will get service from third parties

Where is This Cloud You are Talking About?

- Today's cloud is not ready
  - Quality of Service
  - Real-time constraints
  - Multi-party synchronization

- Research Challenges
  - Extend web services
  - Design open and extendible platforms
  - Define inter-operability strategies
  - What about privacy ?
  - What about IPs ?

Legacy Services

- Legacy services are often gamified
  - Do NOT ask me about gamification, you will not like the answer
- As a matter of fact, we start having game-like feature in many “standard” services
- How does the way we are managing the network is changing?
  - Simply put, we must start asking out architects game-like questions (and performance, and scalability)

Care@Home