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HELLO
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March 12, 2009

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(not much here..)

http://odots.org

(not here either)

UNIVERSITAS OSLOENSIS

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UNIK

Overview

- Security in online games
  - Online Games?
  - Motivation
  - Why cheat or “hack” games
  - Security problems in games
  - Protecting your games

Overview

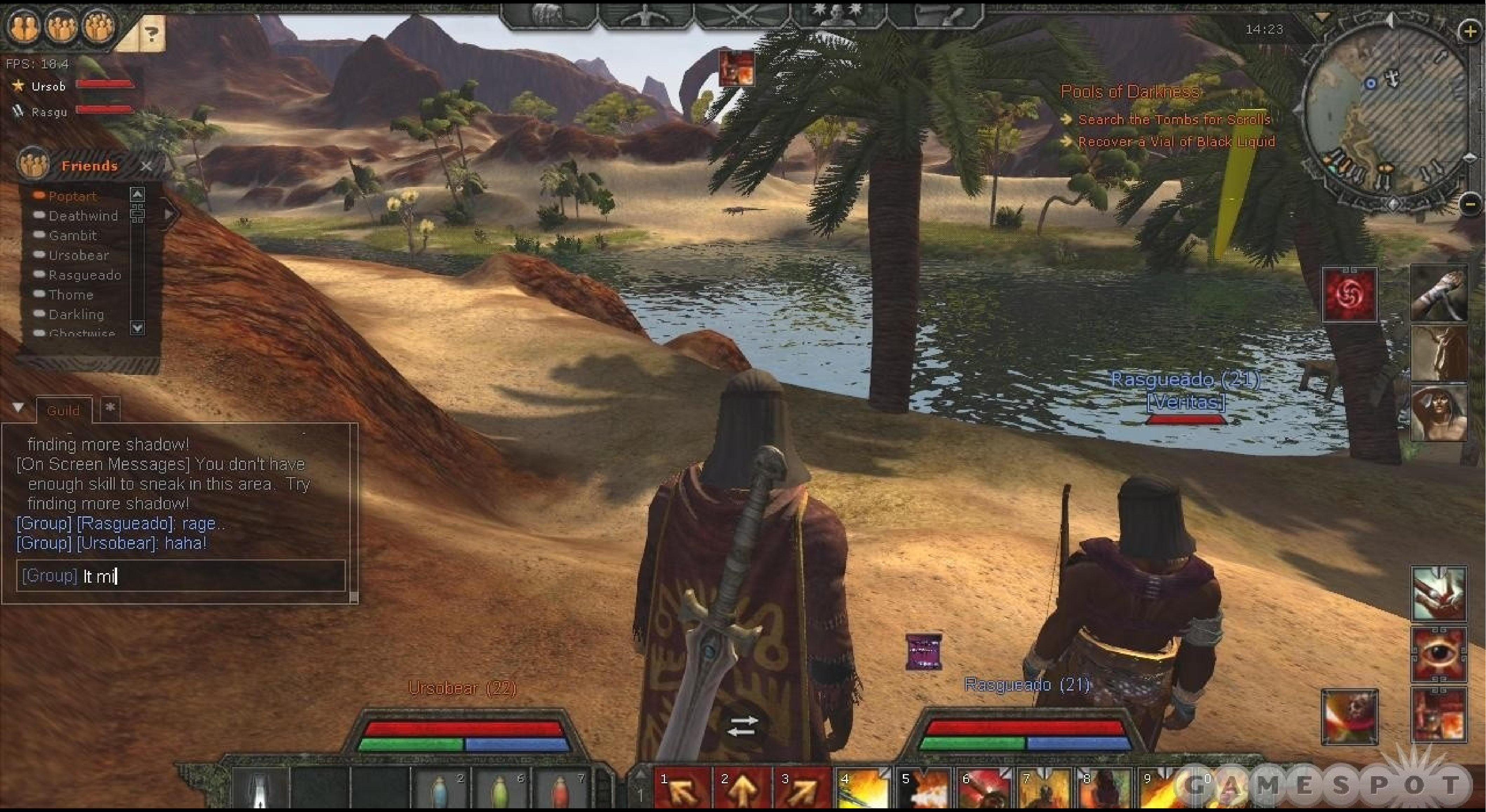
- Trusted Computing
  - The Trusted Computing Group
  - Promises
  - Can the TPM fix gamesecurity?
  - TPM Problems

Online games?

- MMO:
  - Massively multiplayer online game
  - Online: As oppose to playing by them self “against” the computer, the players interact with each other.
  - Massively multiplayer: Large number of players the same virtual “world”. In most MMO's a couple of thousand players at a time is nomal, but Eve Online peaked at 51,675.

Online games?

Almost always characters interacting in a 3D world of some sort



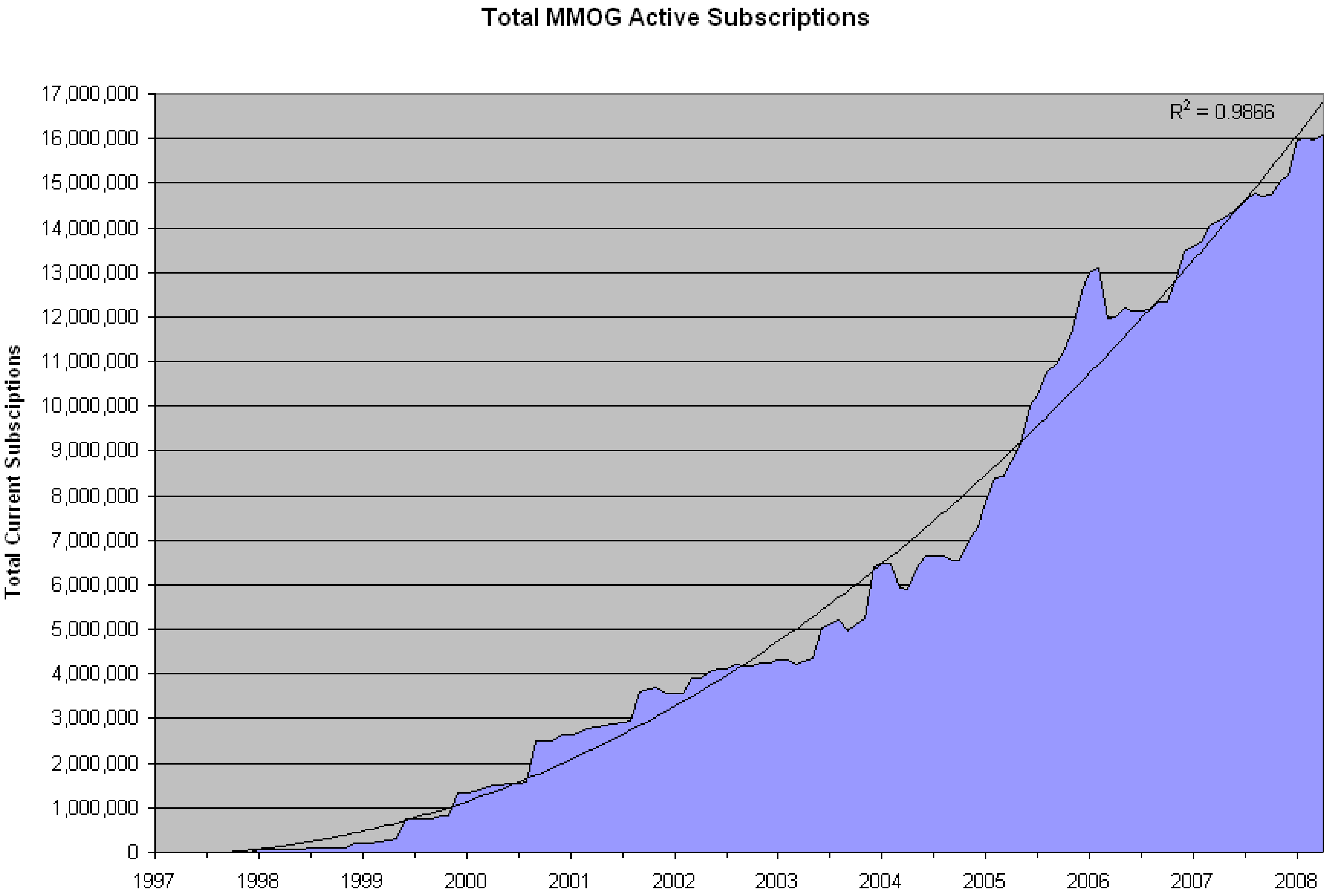
finding more shadow!
[On Screen Messages] You don't have enough skill to sneak in this area. Try finding more shadow!
[Group] [Rasgueado]: rage..
[Group] [Ursobear]: haha!

[Group] It mi

Age of Conan: http://www.ageofconan.com/

Motivation

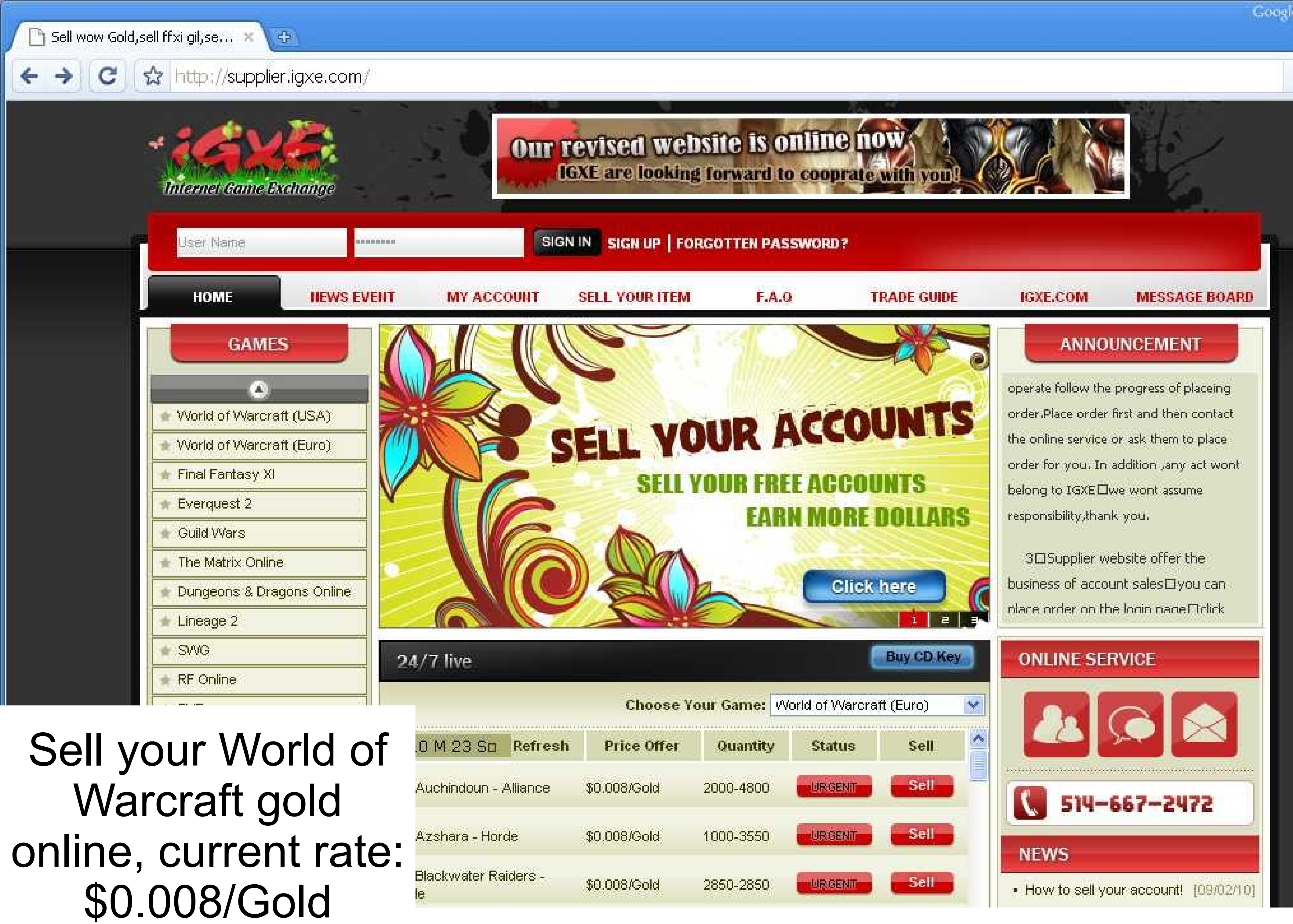
- Complex, online, massively distributed systems
  - Some estimate ~400 000 people playing World of Warcraft at any given time!
  - How do you share the state of the virtual world?
  - Complicated programs, fat clients
- Gaming is big business
  - World of Warcraft alone have at least 10 million subscribers worldwide, paying either by the hour or a monthly fee.
- Related to online gambling / betting / poker
- Fresh topic, games are fun :)



http://www.mmogchart.com

Why cheat or “hack” games

- Challenging, fun(?), get ahead, avoid boring tasks
- For money
  - Virtual money, gold and items can be exchanged into “real” money.
  - Strategy: Find a bug, duplicate game money, convert to dollars
  - “The wealth in some MMO worlds are greater than some small “real” countries” (Hoglund)
  - IGE one of the largest middlemarkeds for virtual items. They made about 400 million dollars in 2006 (McGraw).



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GAMES

- World of Warcraft (USA)
- World of Warcraft (Euro)
- Final Fantasy XI
- Everquest 2
- Guild Wars
- The Matrix Online
- Dungeons & Dragons Online
- Lineage 2
- SWG
- RF Online

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Choose Your Game: World of Warcraft (Euro)

0 M 23 S□ Refresh	Price Offer	Quantity	Status	Sell
Auchindoun - Alliance	$0.008/Gold	2000-4800	URGENT	Sell
Azshara - Horde	$0.008/Gold	1000-3550	URGENT	Sell
Blackwater Raiders - le	$0.008/Gold	2850-2850	URGENT	Sell

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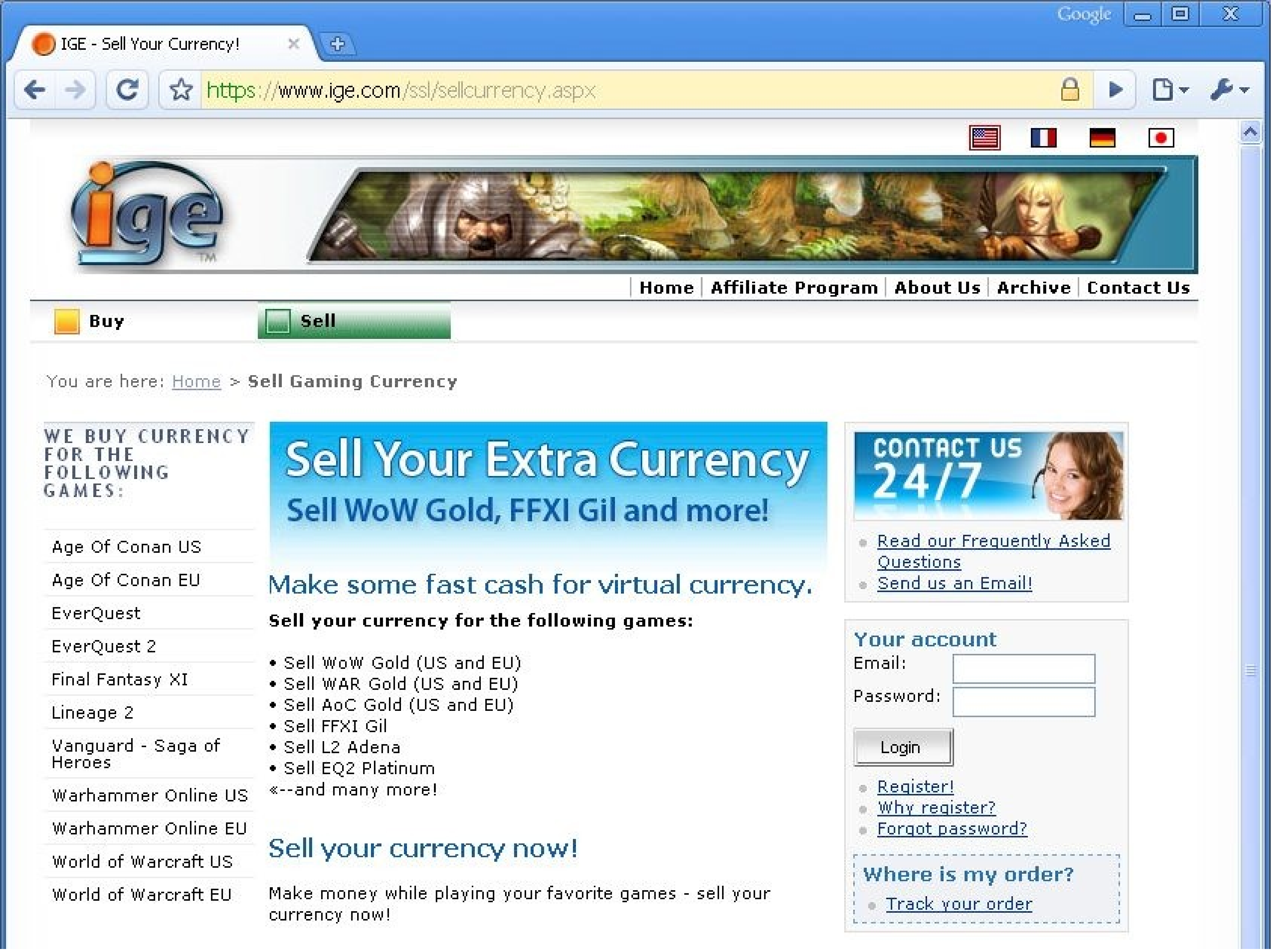
NEWS

- How to sell your account! [09/02/10]

Sell your World of Warcraft gold online, current rate: $0.008/Gold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WE BUY CURRENCY FOR THE FOLLOWING GAMES:

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- Age Of Conan EU
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- World of Warcraft US
- World of Warcraft EU

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- Sell L2 Adena
- Sell EQ2 Platinum

«--and many more!

Sell your currency now!

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CONTACT US 24/7

- Read our Frequently Asked Questions
- Send us an Email!

Your account

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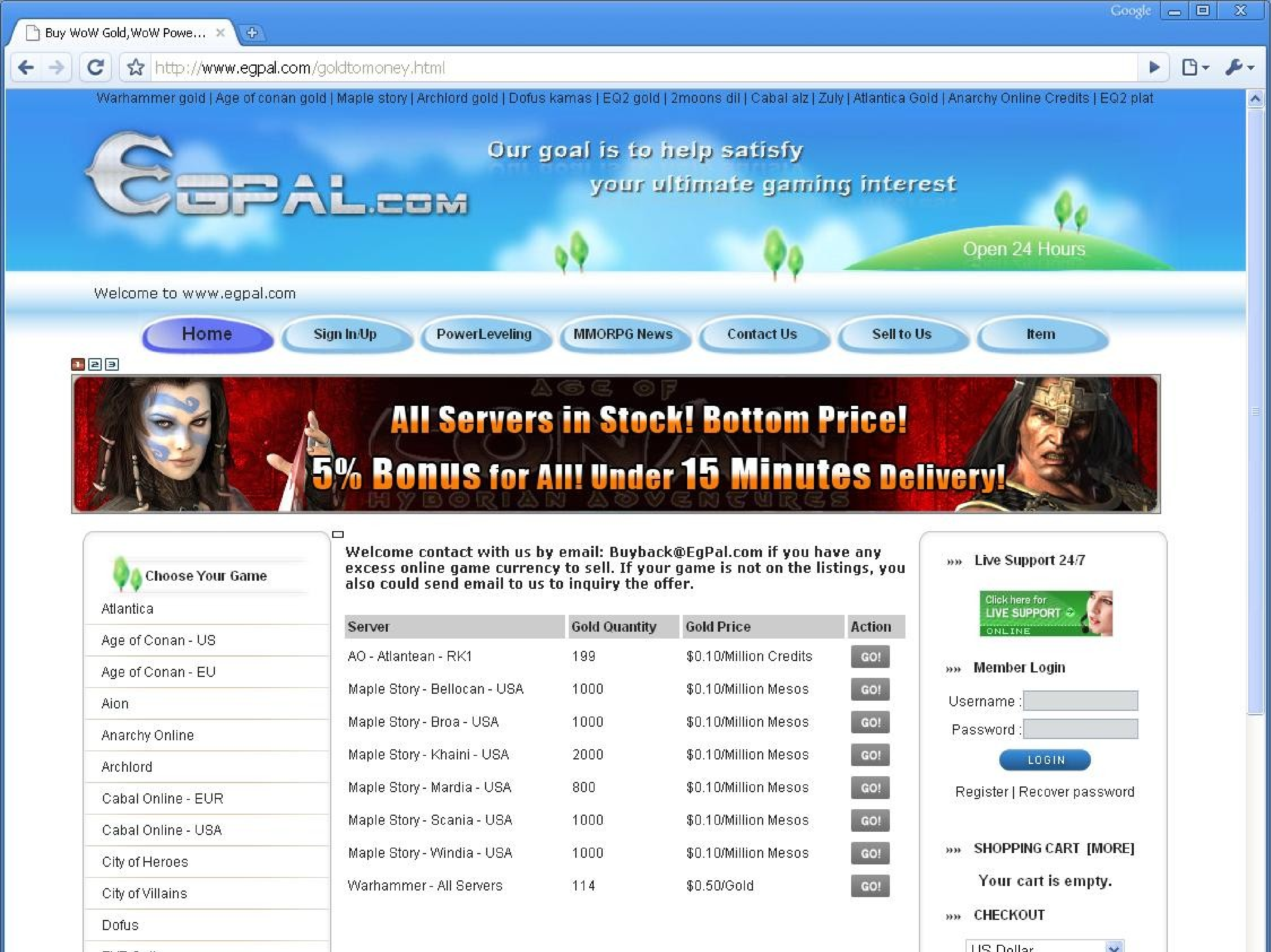
Password:

- Register!
- Why register?
- Forgot password?

Where is my order?

- Track your order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- Cabal Online - EUR
- Cabal Online - USA
- City of Heroes
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- Dofus

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Server	Gold Quantity	Gold Price	Action
AO - Atlantean - RK1	199	$0.10/Million Credits	GO!
Maple Story - Bellocan - USA	1000	$0.10/Million Mesos	GO!
Maple Story - Broa - USA	1000	$0.10/Million Mesos	GO!
Maple Story - Khaini - USA	2000	$0.10/Million Mesos	GO!
Maple Story - Mardia - USA	800	$0.10/Million Mesos	GO!
Maple Story - Scania - USA	1000	$0.10/Million Mesos	GO!
Maple Story - Windia - USA	1000	$0.10/Million Mesos	GO!
Warhammer - All Servers	114	$0.50/Gold	GO!

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»» Member Login

Username :

Password :

Register | Recover password

»» SHOPPING CART [MORE]

Your cart is empty.

»» CHECKOUT

US Dollar

Why cheat or “hack” games

- Free for all
  - Try getting the police to investigate the theft of your “Arthas’ Frostmourne” Sword
  - Laws deal with copying and piracy, not cheating
  - The worst thing that can happen is your account being banned and you have to buy a new one.. unless you do something really stupid..

Security problems in games

- As games become more popular, chances are some users do things they are not “suppose to”

Security problems in games

- Different ways to attack games:
  - Controlling the userinterface to automate playing
    - Mimic input normally coming from the mouse & keyboard
    - Avoid boring tasks
    - Play 10 characters at once
      - While you do something else
      - exchange gold and other items for real money

Security problems in games

- Different ways to attack games:
  - Modifying the game, either in memory or on disk
    - Scan memory for known data and change it
      - With WoW it used to be possible to find “your” location in the 3D world in ram.
      - Changing this triple would “teleport” your character to anywhere in the virtual world
        - A big deal because these worlds are huge
        - and walking for an hour is boring
    - The server trusts the client. Not a great idea

Security problems in games

- Different ways to attack games:
  - Using the layer below
    - Like most software, games rely on other software
    - Modify drivers (as seen in the “wallhack”)
    - Hook windows libraries, and other “rootkit technologies”

Security problems in games

- Different ways to attack games:
  - Modifying or generating network traffic
    - Replay attacks
    - Generate all the traffic the server expects
      - As long as its valid, the server can't tell the difference
    - “Proxy” the traffic and change it when needed
    - Encryption is possible, but
      - Resource intensive
      - Including the key in the client kind of ruins the point.

Protecting your games

- The Game client software runs in a potentially hostile environment
- Users have full control over their system
  - Can be considered as the enemy with respect to game client security
    - Different from the traditional scenario where the user wants to protect his own computer and information

Protecting your games

- Clientside, software only protection
  - Software surveillance
    - Blizzard, the company behind World of Warcraft, installs a type of spyware
      - Scans memory to find suspicious code and data
      - Runs in user space, can be circumvented by kernel space code.
      - Can be spoofed
  - Quickly turns into an arms race
    - The “hacker” has the upper hand since he controls the system and the software running

Protecting your games

- Serverside checks
  - Is the client input valid and possible?
    - The gameworld, like the real world, have rules
    - The server can check if the the client breaks the rules or does something impossible
      - Like move across the gameworld in a second
  - Suspicious behavior
    - Not behaving as a “normal player”
    - Keep tabs on
      - Gold movement
      - Users movement and interaction
      - Talk to you in-game to check if you are human

Trusted Computing Group

- The Trusted Computing Group (TCG) is a not-for-profit organization.
- Their original goal was to develop the Trusted Platform Module (TPM). They have later expanded their scope

Trusted Computing Group

They have some well known members:

Microsoft®

IBM

intel®

Trusted Computing Group

and some unknown:

SONY
symantec™
LEXMARK™
hp
DELL
Sun® microsystems
BOEING
Seagate
American Megatrends
AMD
Juniper® NETWORKS
NOKIA
FUJITSU

SAMSUNG

NVIDIA®

ERICSSON

THALES

NEC

SanDisk®

Trusted Computing Group

And about 100 others..

Trusted Computing Group

Trusted Computing != TPM

- Trusted Computing implies much more than just the TPM chip
  - Trusted boot with a special BIOS
  - Trusted Operation System
  - Probably other hardware changes
- Probably not going to be commonplace anytime soon - don't hold your breath :)
- The TPM on the other hand is in most laptops and some workstations
  - “embedded into most newer enterprise PCs” according to TCG

Trusted Boot

- Trusted (or authenticated) Boot is often assumed when talking about Trusted Computing
  - TPM checks the BIOS (CRTM) and the OS kernel
  - The kernel checks other software
- Problems:
  - Requires a “trusted OS” “without” bugs
  - creating such an OS that can run complex games seems impossible
  - Cant rely on it any time soon

Software only solutions are doomed

- Using software to check software to check software
- Proven to be less-than-perfect
  - Case in point: the antivirus and virus arms race
  - Much worse with games because the “bad guy” has total control over the computer
    - Local access control becomes useless
- TPM gives a hardware based “base” to build upon. Maybe not perfect, but better

Promises

“

Trusted platforms identify:
1. Themselves (via cryptography); and
2. The software in use (via measurements)

“

(http://www.isg.rhul.ac.uk/files/Lecture2_EimearGallery_TCMastersCourse_2009.pdf)

Promises

- Trusted Computing Group ~~propaganda~~ information promises a lot:
  - Authentication of the platform to a remote party without privacy concerns for the user
  - Attestation of one computers integrity to another
    - Both hardware and software (?)
  - “Sealing” of data to a platform configuration
    - The data is encrypted and is impossible to decrypt unless the platform is in the correct state / configuration.
  - Protected storage
    - “Store digital credentials such as passwords in a hardware-based vault”

Promises

- Random number generation, SHA-1 hashing, HMAC and RSA operations in dedicated hardware
  - Certified and “correct” implementations of these crypto operations
  - Can operate on keys that are “non-migratable” - they can't leave the TPM
  - Symmetric encryption (AES) is used only internally

Can the TPM fix gamesecurity?

- Secure the network traffic
  - Let the TPM sign or encrypt all traffic before going out on the network
    - Defeats modification of traffic on the wire (proxying)
    - Possibly also replay attacks using purposes counter implementations
    - Requires authentication of the platform / TPM (e.g shared secret or public key)

Can the TPM fix gamesecurity?

- Use integrity attestation on selected code / meassurements
  - Affirm to the server that drivers are not modified
    - Limited number of official drivers
  - Same with windows kernel
    - Makes userland checking more reliable (like the warden for WoW)
    - Changes too often?
  - And with the game itself
    - Must be able to handle updates to the game

Can the TPM fix gamesecurity?

- Use integrity attestation on selected code
  - Integrity checking even possible without a trusted OS / authenticated boot?
  - Technical information seems sparse
  - Cant check everything.. changes are too frequent
  - Inject code after the program has loaded

Can the TPM fix gamesecurity?

- Authenticating the platform
  - Help the client and the server know who they are communicating with

TPM Problems

- The TPM is not designed to be tamper resistant
  - But generally hardware is harder to tamper with than software
  - Some protections are in place
- SHA-1 is broken and should probably not be used anymore (since 2005?)

TPM Problems

- Operations require trust in the TPM
  - It could be a “fake” chip or a software emulator
  - This fake chip could do evil things, like revealing all keys or simply not encrypting (Lie, lie, and lie some more)
  - Trust is suppose to be gained through a hierarchy of public keys and certificates, where the trusted manufacturer signs and stores a special asymmetric keypair (EK) in the TPM.
  - But to actually check these signatures and certificates some sort of PKI needs to be in place, and as far as I can tell, it is not.

TPM Problems

- Direct anonymous attestation (DAA) to the rescue?
  - From a TC course at Royal Holloway University in London:
  - *“DAA removes the necessity to disclose the public value of the endorsement key to a P-CA”*
    - They assume a Privacy- Certificate authority, but don't explain how the validation would be performed

http://www.isg.rhul.ac.uk/files/Lecture3_EimearGallery_TCMastersCourse_2009.pdf

TPM Problems

- Direct anonymous attestation (DAA) to the rescue?
  - *“DAA is based on a family of cryptographic techniques known as zero knowledge proofs. DAA allows a TPM to convince a remote ‘verifier’ that it is indeed valid without the disclosure of the TPM public endorsement key”*

    http://www.isg.rhul.ac.uk/files/Lecture3_EimearGallery_TCMastersCourse_2009.pdf
  - DAA does not require a third party
  - Sounds great.. does it work?
  - Still the same problem with validating keys and certificates?

TPM Problems

- Complexity, lack of understanding and “real world” usage
    - There can be many contributing factors to the lack of usage
        - T.C. is associated with DRM and privacy concerns
        - Bad security solutions are very profitable :)

TPM Problems

- Many T.C. Concepts can be hard to understand
  - More confused now than ever
  - At least I'm not alone: "*The complexity of this process (attestation) troubles us. In security, one should be careful about trusting something that is too big to fit into one's head*" (http://www.ists.dartmouth.edu/library/263.pdf)

Credits where credit's due

- Bruce Potter: “The Trusted Computing - Could it be…. SATAN?” (presentation held at defCon & shmoocon)
- Greg Hoglund and Gary McGraw:
  Book: “Exploiting online games”
  Presentations “Exploting online games” (16th Usenix security symposium)
  and “Exploiting online games for cash” (DefCon 15)
- http://projects.csail.mit.edu/tc/
- http://www.ists.dartmouth.edu/library/263.pdf
- http://www.isg.rhul.ac.uk/msc/teaching/iy5608

http://www.flickr.com/photos/sheila_blige/2573517272/

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