3D and Usability

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Motivation

- explore usability of 3D interface components
  - mixing with current 2D interfaces
- explore usability of 3D animations
  - may help users understand what is going on
  - feedback for users' actions
- simple testing of 3D-enhanced interfaces
  - provide appropriate tools

Usability

- ISO 9421-11
- efficiency
  - accuracy and quality of achieved results
- productivity
  - time and effort devoted for achieving a goal
- comfort
  - “pain” a user has to go through
- user’s relation to a product

Virtual Reality vs. 2D

- virtual reality
  - mimics the real world - metaphors
  - environment familiar to unexperienced users
  - special input/output devices may be required
- 2D interfaces
  - designed to be highly effective for particular tasks
  - provide a level of abstraction
  - may contain 3D elements

Interfaces in 3D

- text in 3D is less readable
  - anti-aliasing
- icons are less readable as well
- lower information density
  - not relevant for some applications

VR Input/Output

- input
  - Space Pilot
  - Flystick
  - Wiimote
  - gestures
- output
  - stereo displays
  - 3D displays
- hard to interact without special HW

Human Factors

- people not always good in 3D
  - may be further influenced by input/output HW
  - in most common tasks people need only 2D
- spacial memory similar in 2D and 3D
- people tend to interact with visible objects
  - very preferred
  - navigation to partly occluded objects
- walking vs. teleporting

Degrees of Freedom

- 6 degrees of freedom unnecessary in most cases
  - full 3D navigation
  - hard use for most users
- 2.5+2 degrees of freedom
  - forward, backward, to sides, jump, crawl, looking around
- 2+2 degrees of freedom
  - flying in constant altitude
- no degrees of freedom
  - user does not move in the scene

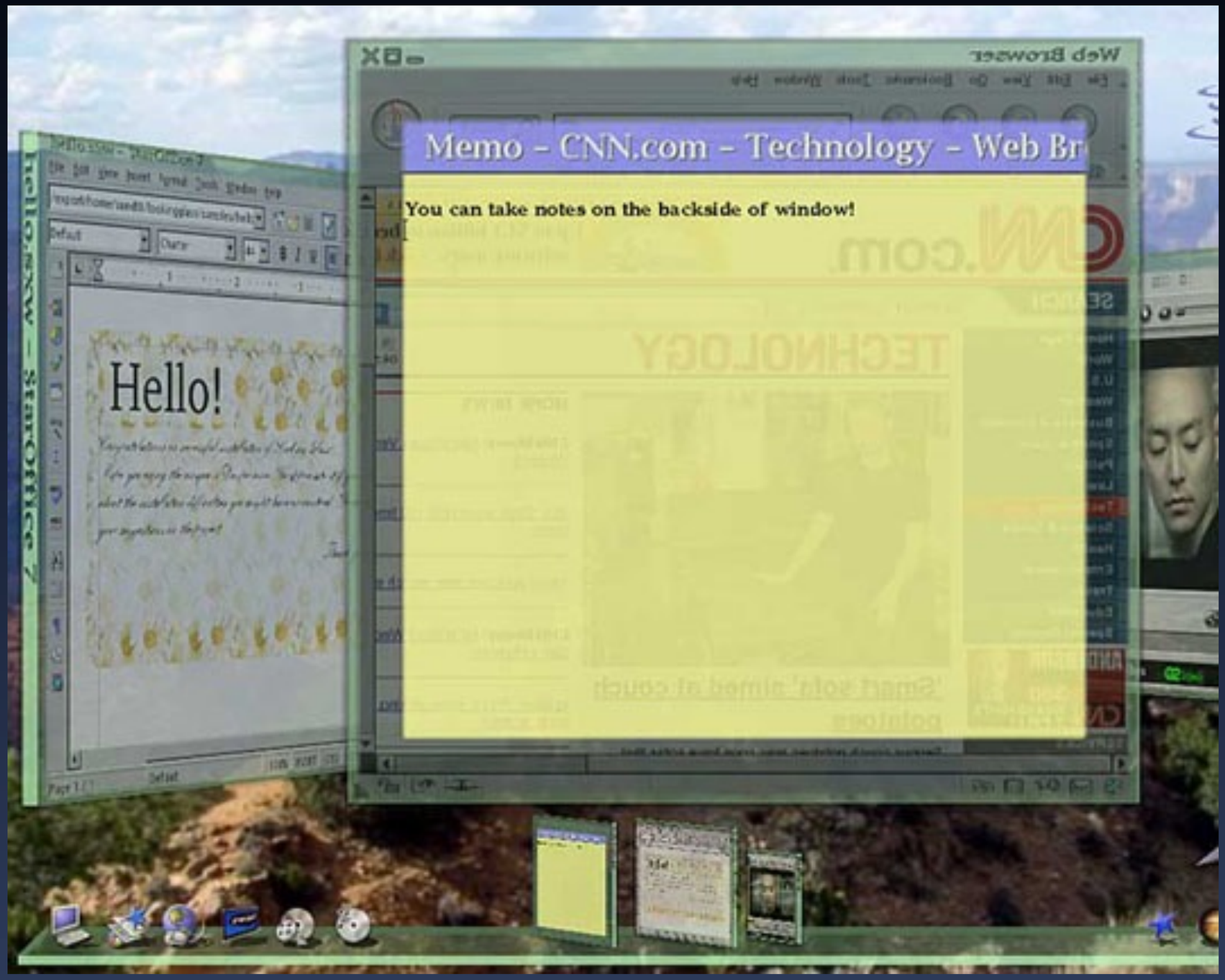
Usage of 3D Interfaces

- games
  - HUD overlays
- virtual worlds
  - Second Life, project Wonderland, PlayStation Network etc.
- special tools
  - 3D modeling tools
- VR/AR systems
- general purpose graphic interface toolkits
  - Quartz, Compiz Fusion etc.

Project Looking Glass

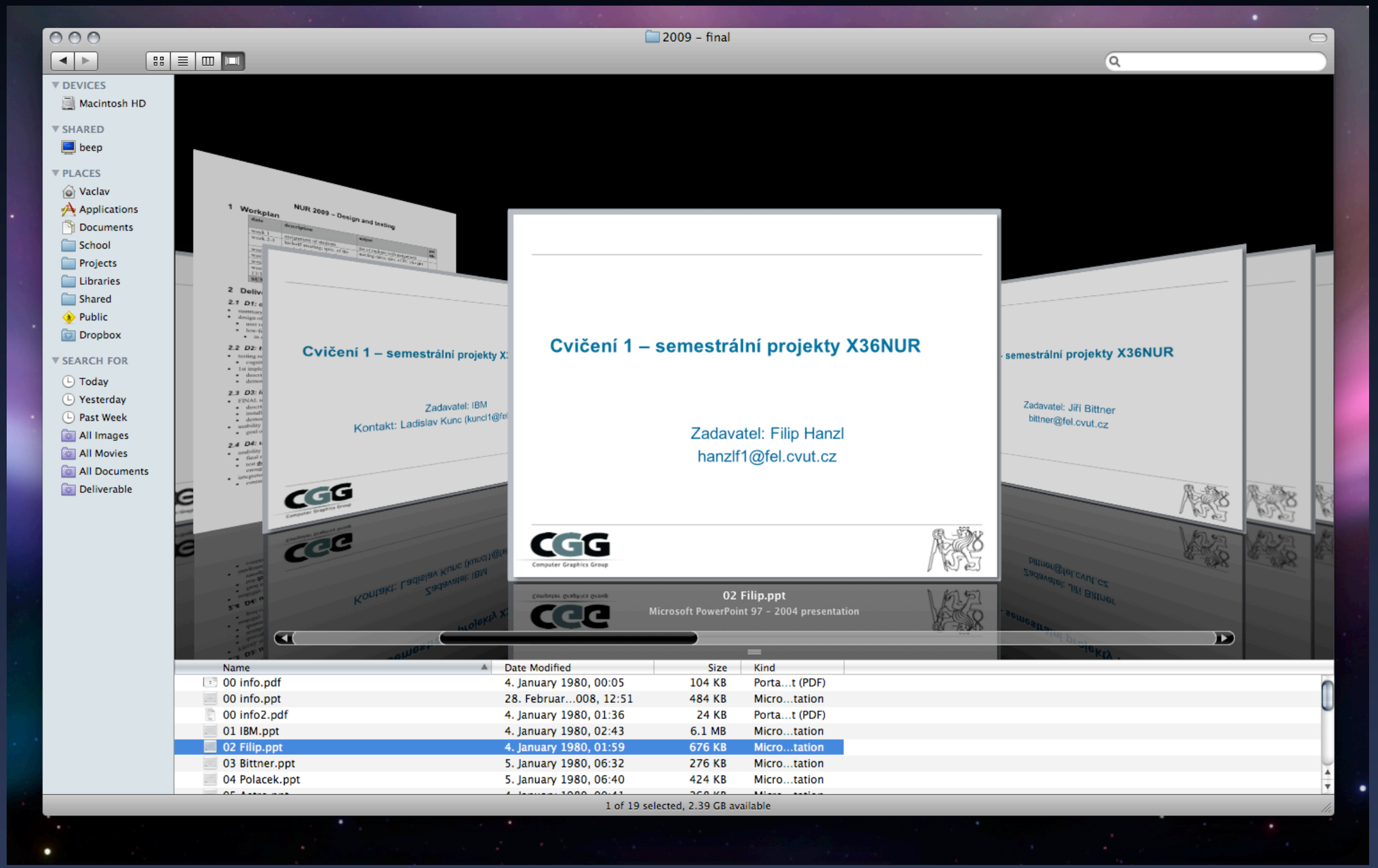
Project Looking Glass

Project Looking Glass



Project Looking Glass

Mac OS X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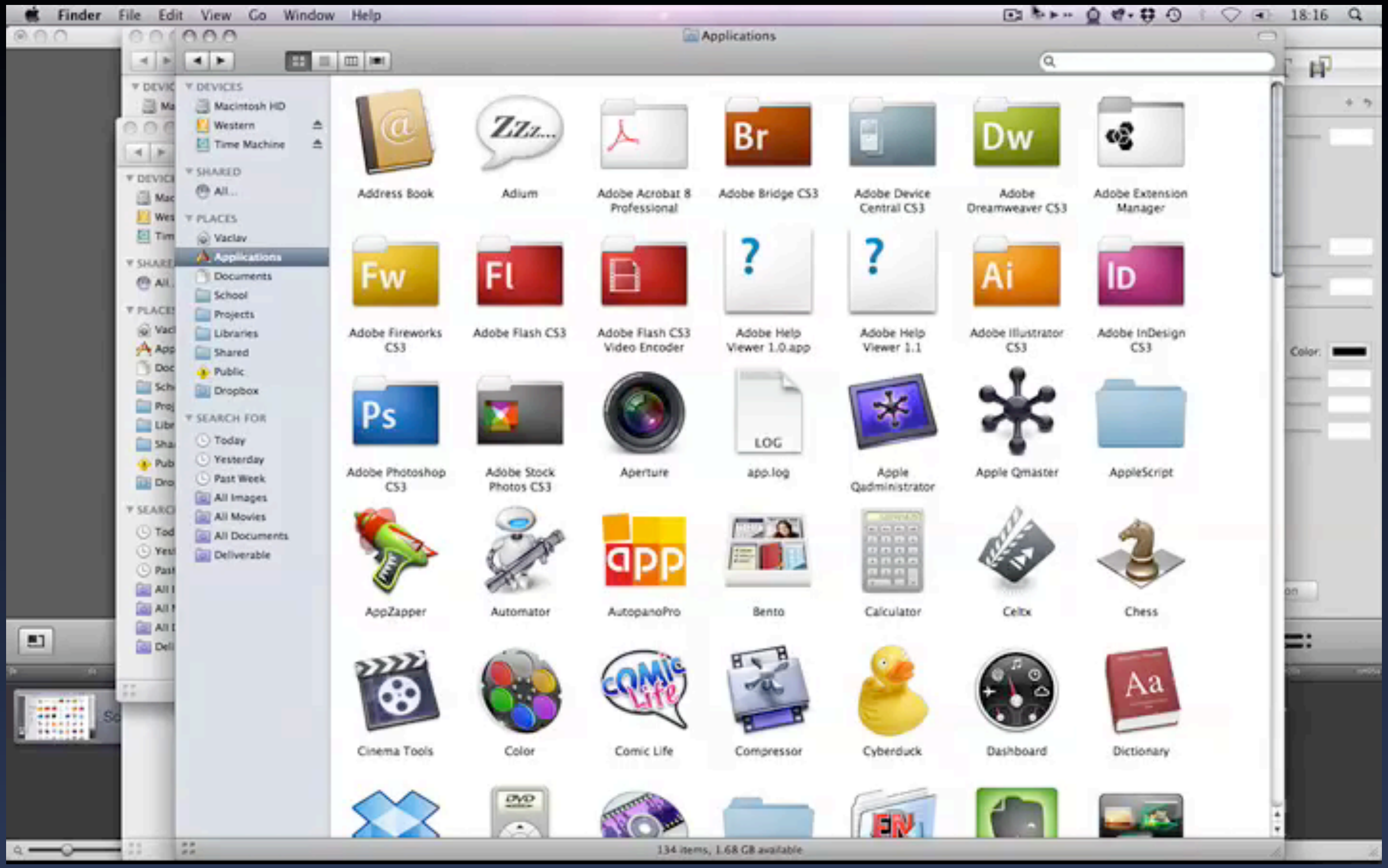
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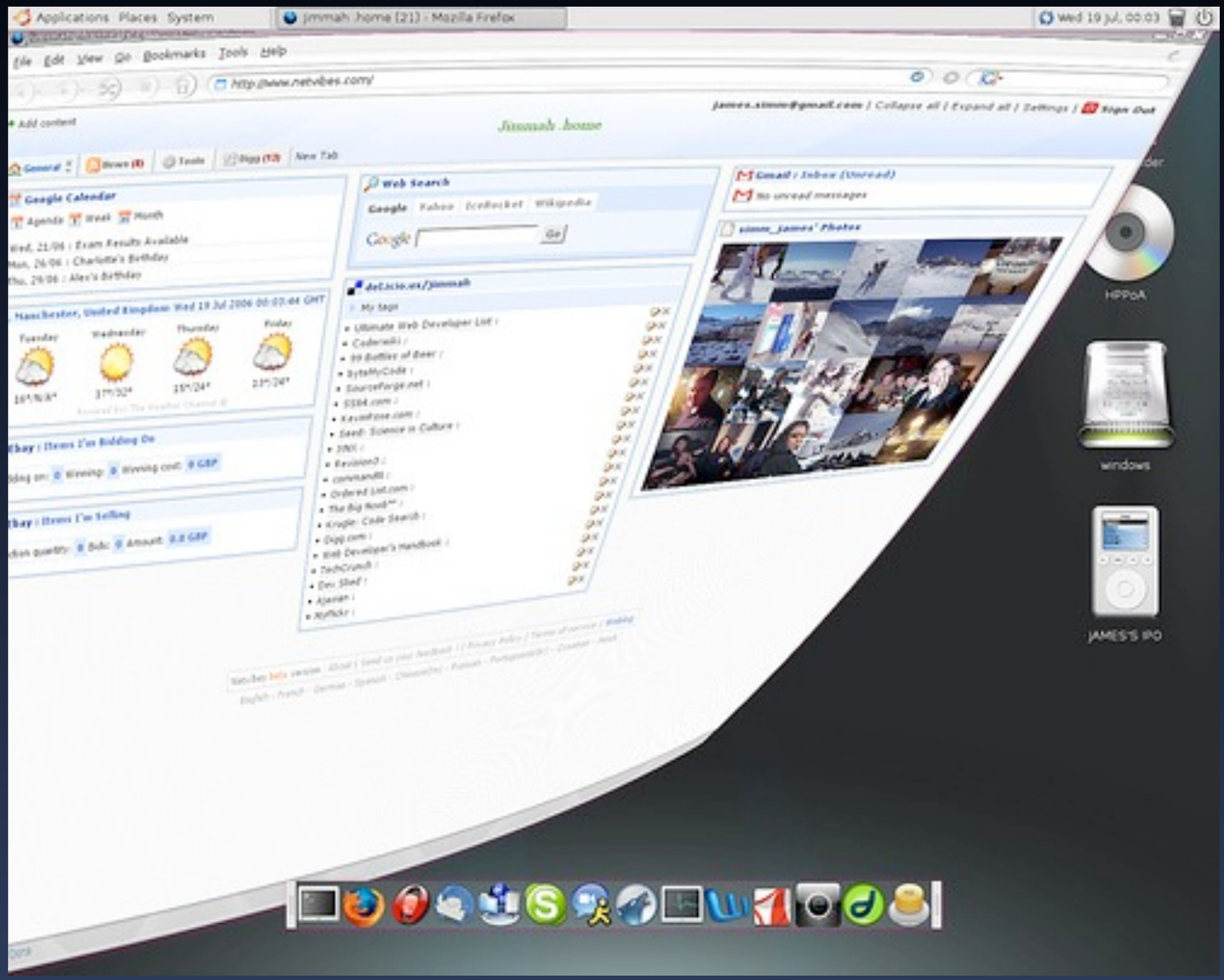
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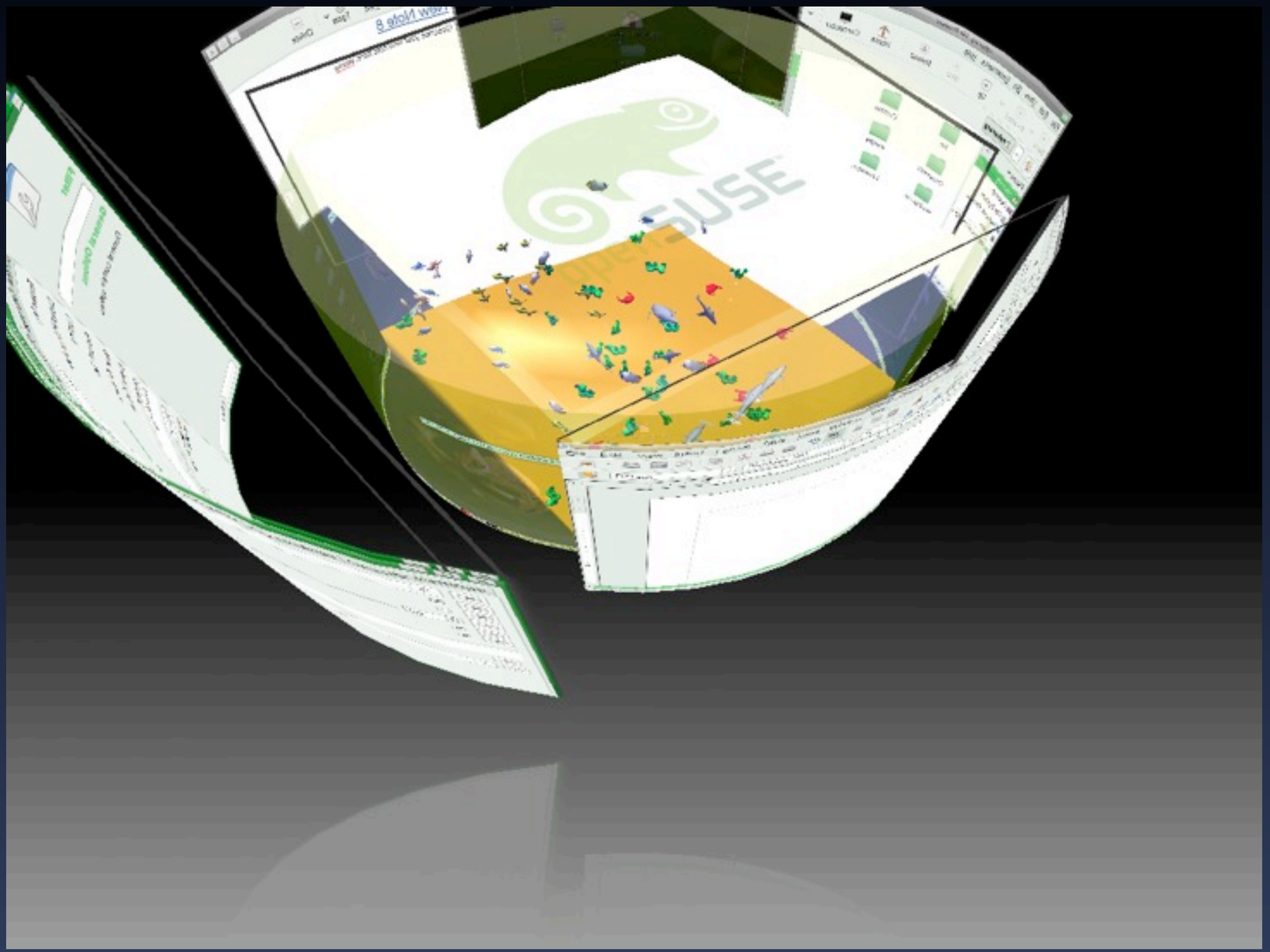

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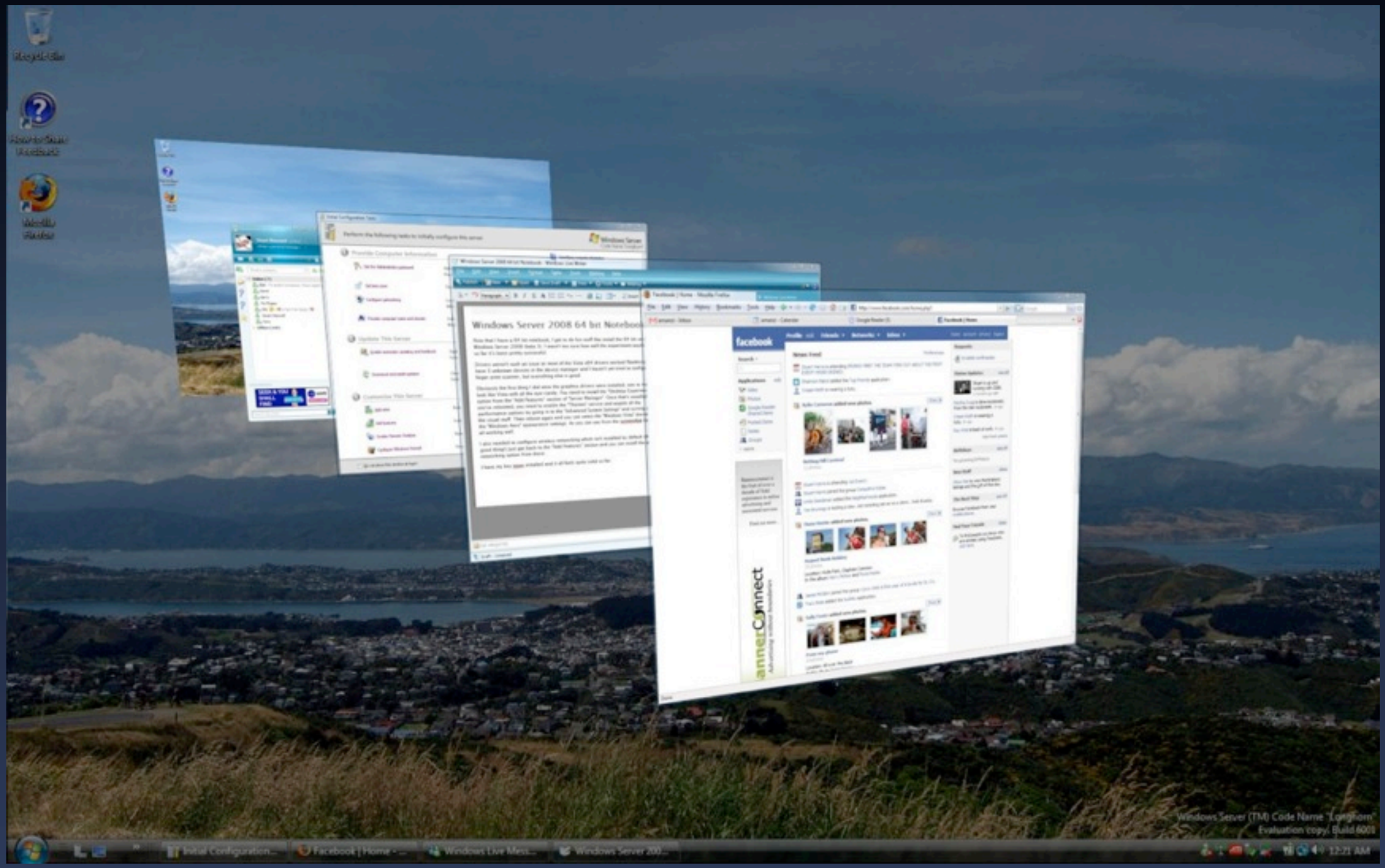
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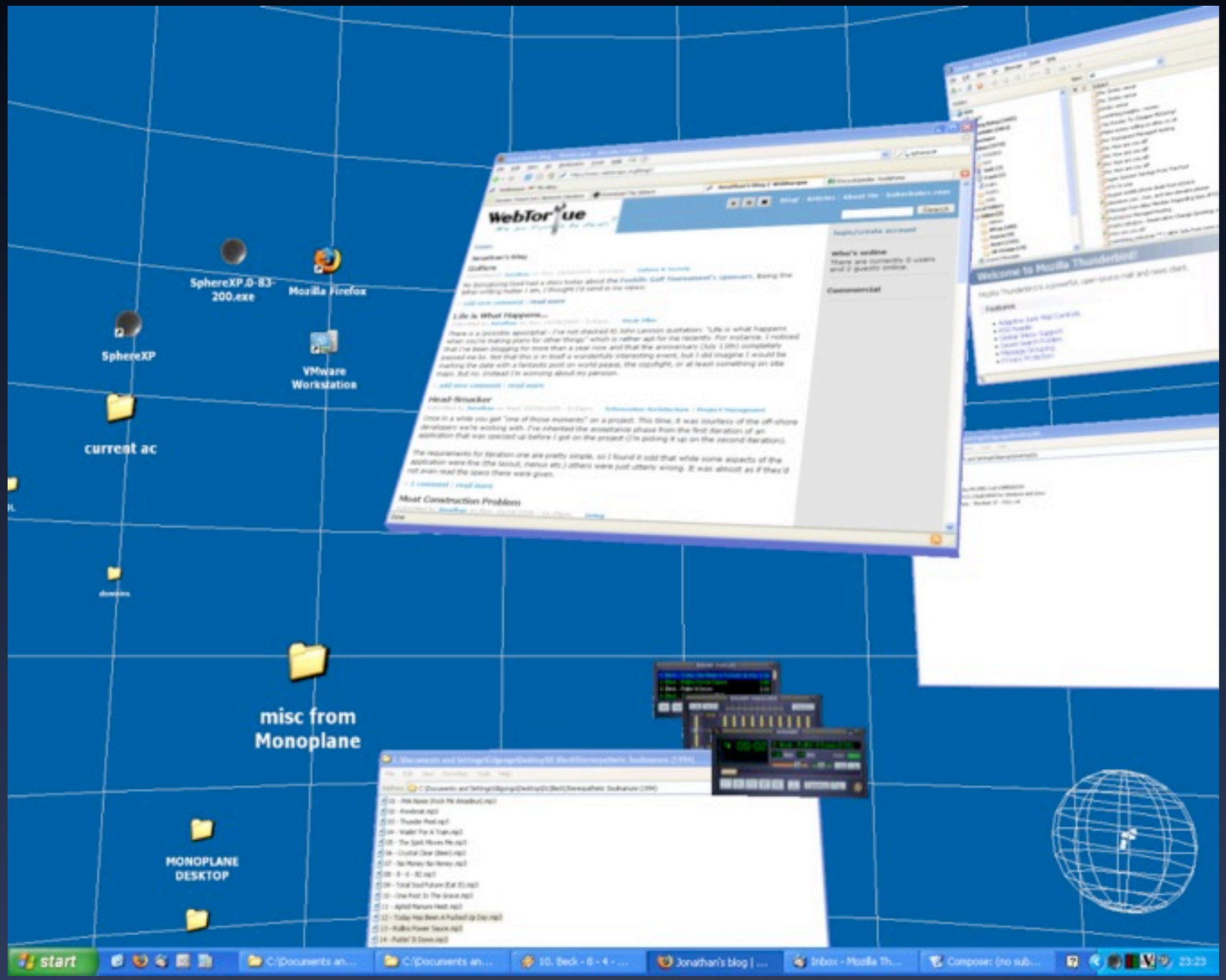
Add-ons

Add-ons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Add-ons

Collaboration Tools

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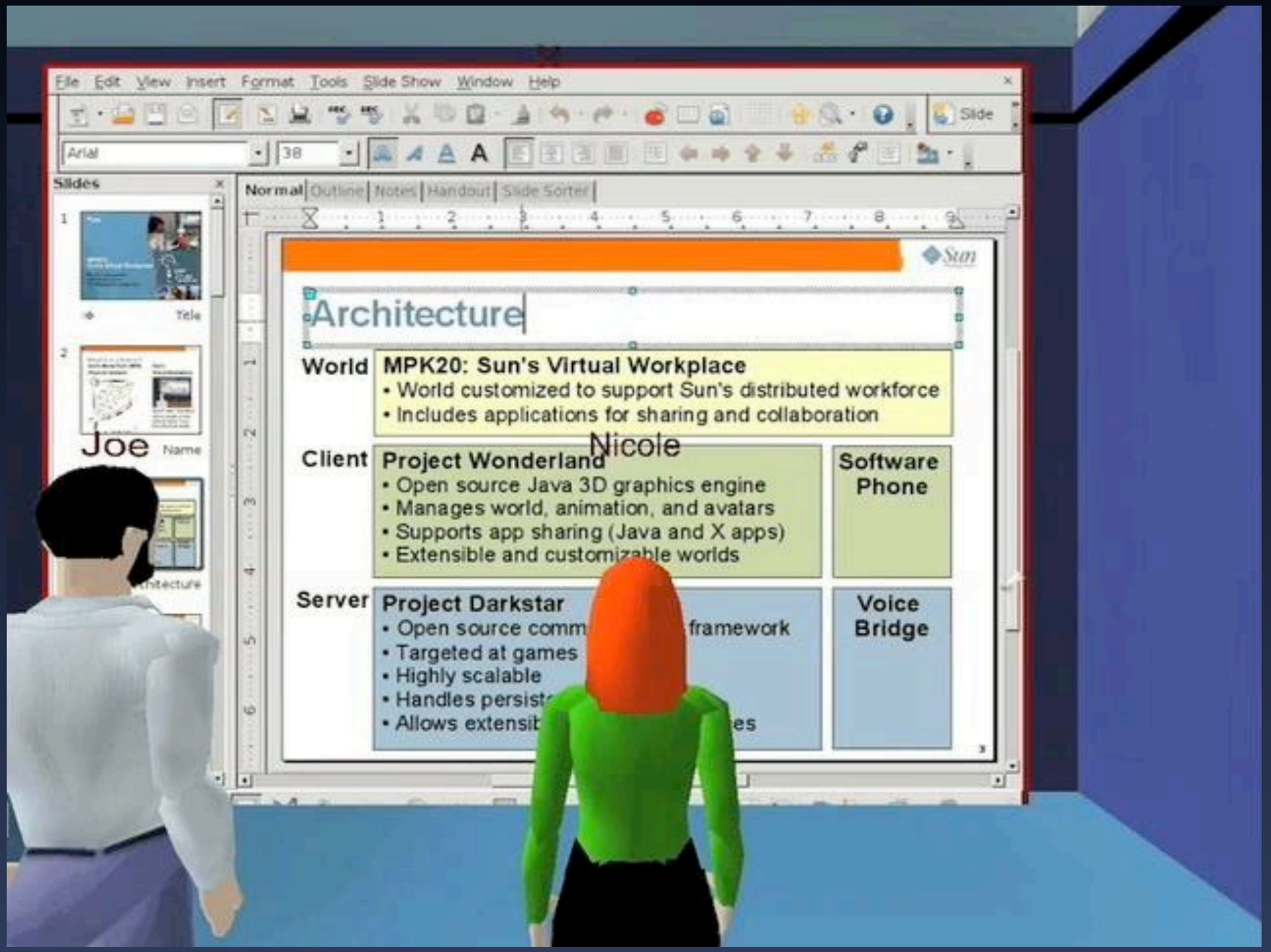

Collaboration Tools

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Virtual Worlds

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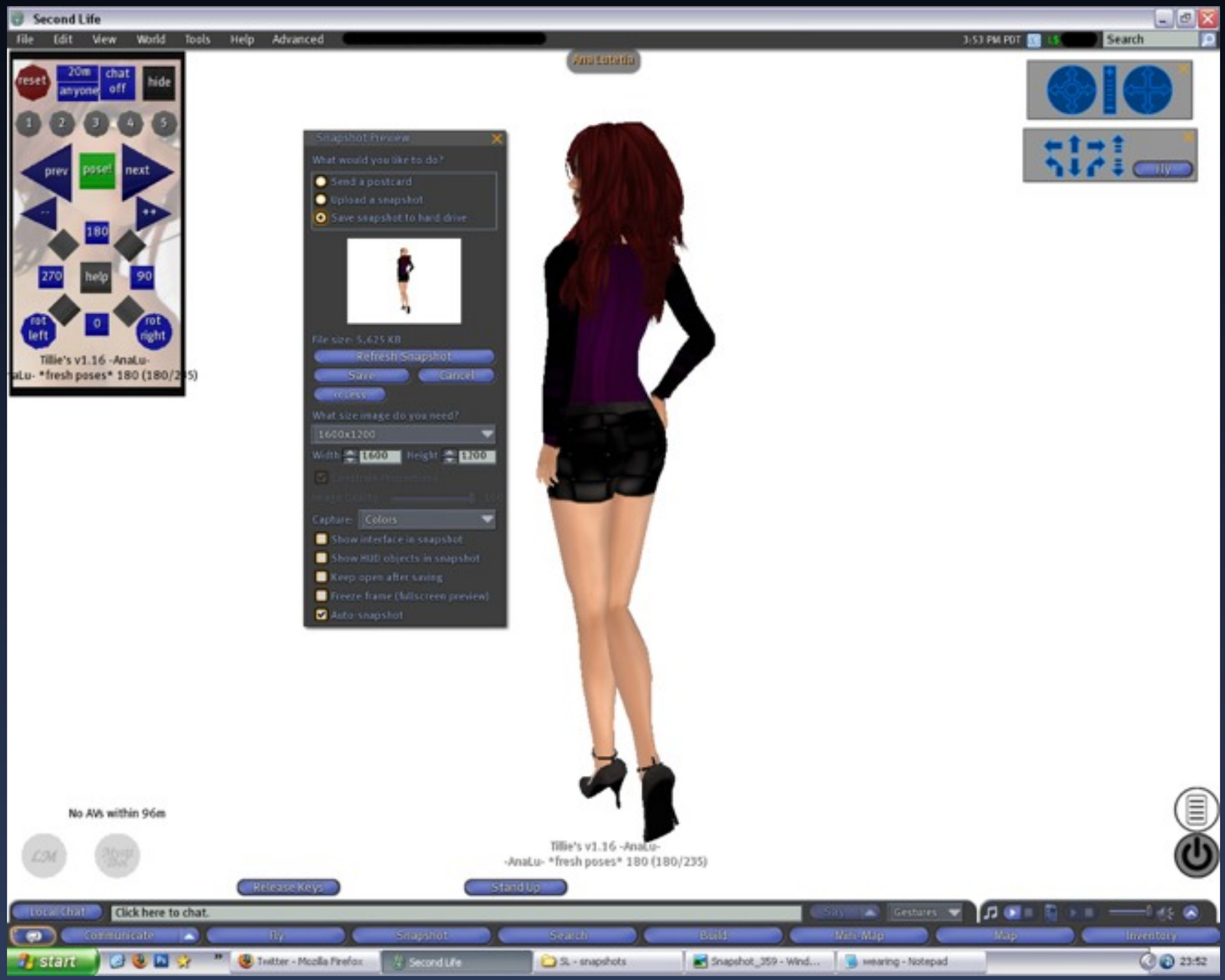
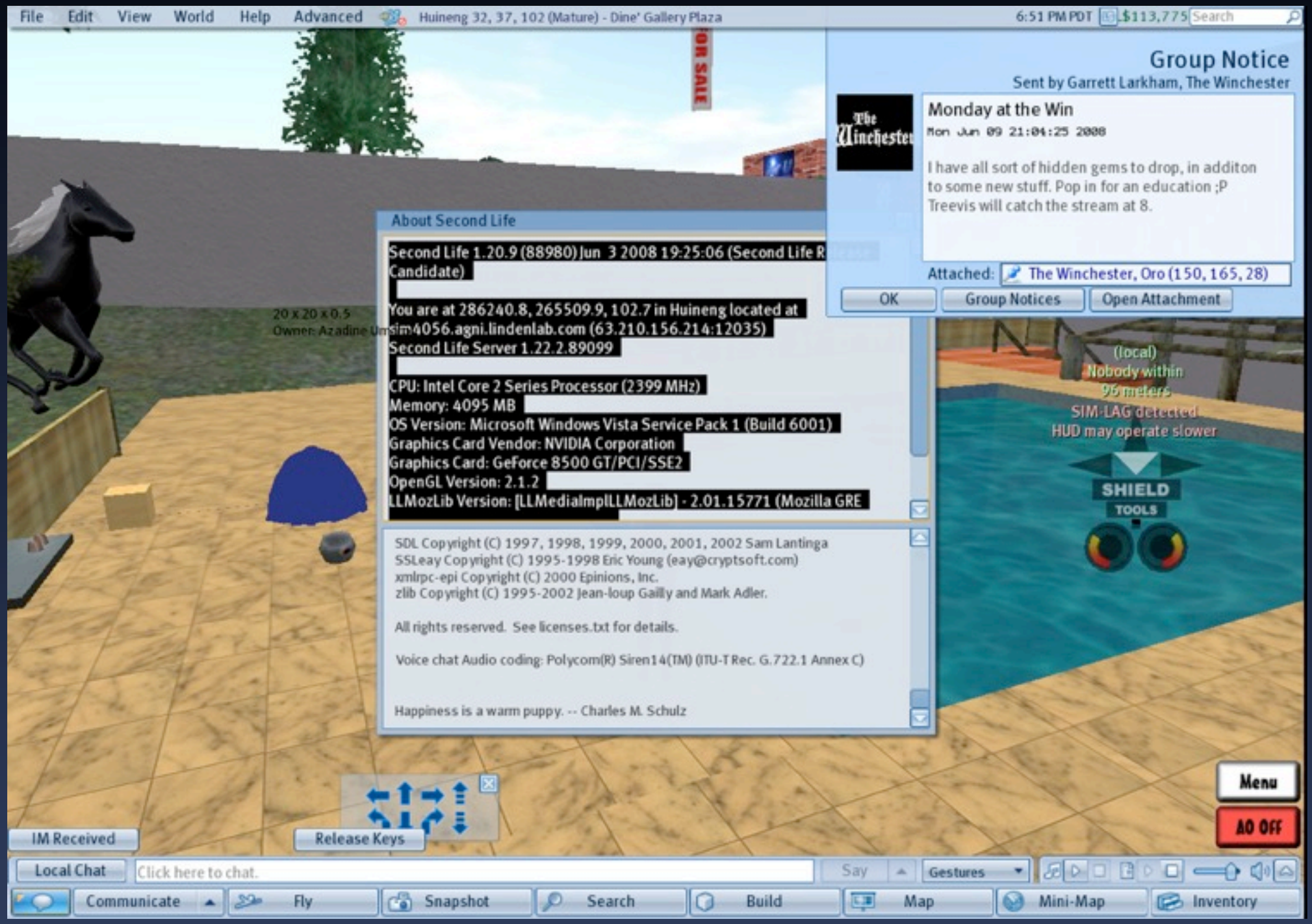


Virtual Worlds



Virtual Worlds

Current products

- no limitation in technology
  - technology available for years
  - close to photorealistic quality
- world rendered in 3D, but UI mostly in 2D
  - limited usage of 3D in menus etc.
- 3D does not often improve usability
  - more display space used
  - worse orientation
  - additional management of navigation in 3D

Focus

- delivering 3D into user interfaces is not the goal
- exploring use cases in which 3D is useful
  - navigation, feedback etc.
- environment without special hardware
  - commonly available input/output devices
  - 2D display and remote control
- testing difference between 3D and 2D animations
  - additional useful information in 3D

i2home Framework

- UIProtocol
  - rapid development of user interfaces
  - separation of user interface, data and application logic
  - platforms agnostic
- end-user features
  - animations
  - media
  - maps
  - charts
  - system integration

Future Features

- voice based interfaces
  - already included in UIProtocol specification
  - no implementation yet
- 3D
  - freely combine 2D and 3D
  - embedded 3D models and scenes
  - 2D interfaces rendered as texture
  - 3D animations

Designing 3D UI

- most guidelines used for 2D apply
  - error prevention, error recovery, feedback etc.
- objects floating in the air
  - not common in real world, makes depth perception harder
- interpenetration
  - avoid by collision detection, layout algorithm
- navigating to partially occluded objects
  - very common operation

Evaluation

- integration into i2home
  - easy to add or remove 3D elements and transitions
- user group not experienced with electronics
  - feedback is important
  - understanding navigation is important
- usability testing
  - only way how to know for sure

Conclusion

- 3D interface often less usable than 2D
  - 2D better than limited 3D, limited 3D better than full 3D
  - depends on application
  - see references
- may be useful in some use cases
  - reducing level of abstraction
- may be useful for navigation
  - 2D vs. 3D transitions

Q&A

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Thank you

for your attention

References

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