greentube
NOVOMATIC GROUP OF COMPANIES

Developing an online distributed 3D casual game (Ski Challenge)

Introduction / About me

- Computer Sciences graduate (Vienna University of Technology)
- Graphics programmer at Rockstar Vienna (XBox360)
- Contractor for NVIDIA Finland (OpenGL API for embedded systems)
- Programmer at Greentube

Introduction / Company facts

- Founded 1998 as "Dürrschmid & Reisinger OEG"
- Transformed into "Greentube I.E.S. AG" in 2000
- Majority bought by Novomatic in 2010, turned into GmbH
- Located in Vienna, ~100 employees
- 3D Department: ~12 employees

2D Games

- Austria's market leader in online gaming (Webschnapsen.com, Bauernschnapsen.com, Skill7, Gametwist, ...)
- Ready-to-use solutions for Internet, mobile devices and iTV
- Skill Games (8-ball Billard, Backgammon, Blackjack, Skat, ...)
- Casino Games backend solutions

3D Games

- Downloadable 3D games since 2004
- Serving millions of players worldwide
- Financed with IGA right from the beginning
  - no traditional developer/publisher scenario
- Sports themed: competitive gaming, yet mass appeal
  - Accessible, but hard to master (physics driven gameplay)
  - Ski Challenge, Football Challenge, Mountain bike Challenge, Moto Race Challenge, VW Polo Cup, Burning Gears
- Tight cooperation with renowned media partners (ORF, SF, Pro7/Sat1, NRK, ...)

Ski Challenge Statistics

- Total of 7 million registrations worldwide
- More than 1 million players per season
- More than 20.000 concurrent players during tournaments
- Every player runs avg. 400 races per season
- Generates billions of Ad Impressions per season

Ski Challenge 05

- 1 media partner (ORF)
- 1 track (Kitzbühl) + 1 add-on track (Bormio)
- 3 programmers, 2 artists
- Windows, OpenGL
- Lines of code:
  - ~15.000
  - Completely written from scratch (no libraries)

Ski Challenge 09

- 8 media partner (AT, DE, CH, IT, CRO, SLO, NOR, FR)
- 6 tracks
- 8 programmers, 4 artists
- Windows, Mac, (Linux,), OpenGL, DirectX
- Lines of Code:
  - Framework: ~270.000
  - SC-specific: ~41.000
  - Tools: ~39.000

Technical Challenges

- Online distribution & updates
  - Updating code & content (new tracks, DIGA)
    - Encryption, signatures used to ensure integrity
    - Flexible deployment system (many countries, even more editions)
    - Reducing traffic as much as possible
- Deterministic physics
  - Dedicated asm mathlib (no MMX/SSE)
  - Replays
  - Prevent cheating by validation of races by server

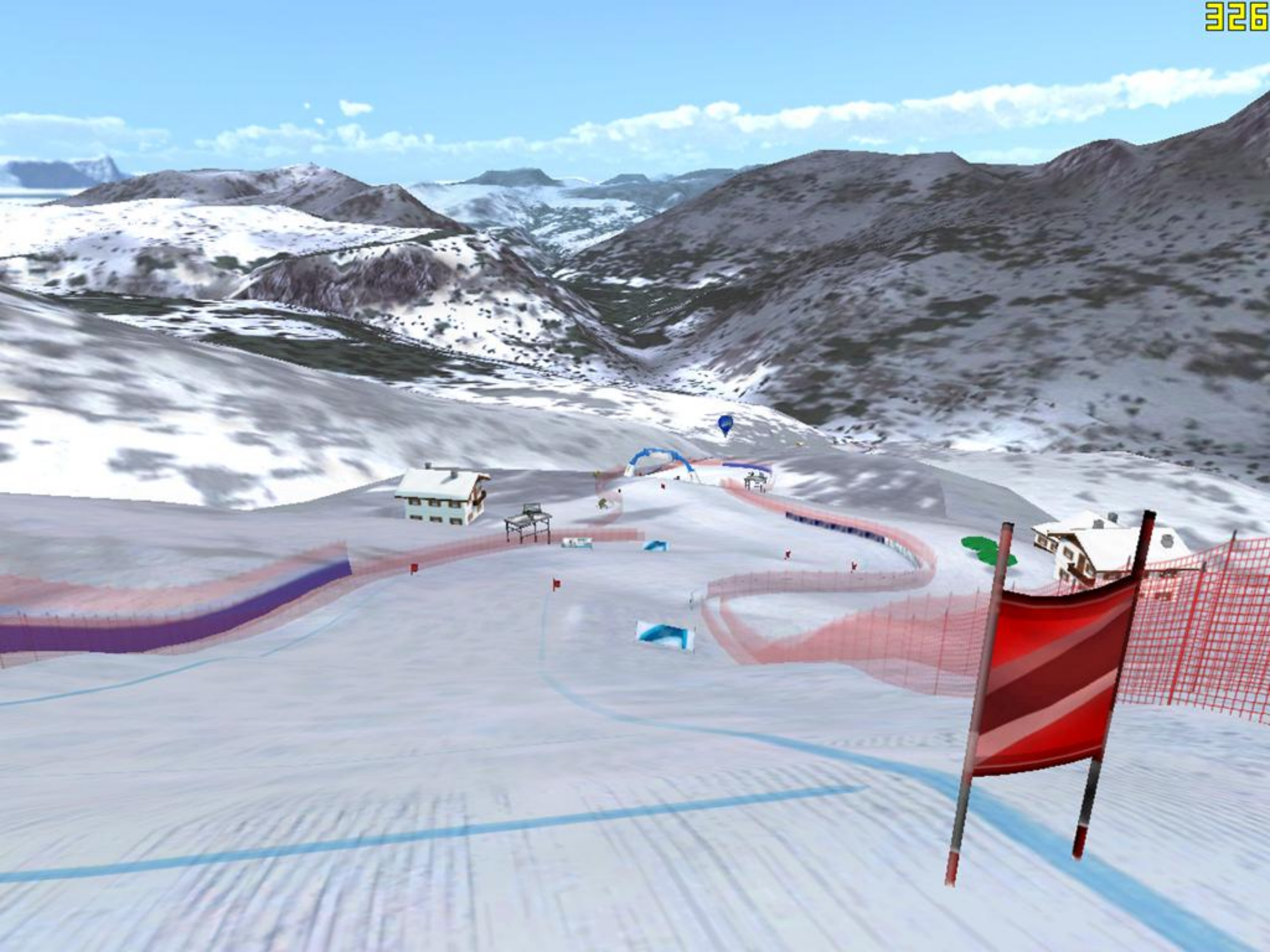
Technical Challenges

- Customers have a huge range of hardware installed
  - E.g. NVIDIA GeForce Series 2 to 9, etc.
  - Same series, huge performance difference (e.g. Memory Bandwidth: 7100 GS: 5.3 GB/s, 7950 GX2: 76.8 GB/s)
- Fallback for insufficient number of texture units
- Slow hardware just does not go away (netbooks, tablet PCs coming next?)
  - Scale CPU, graphics and memory load by reducing effects (eco system, view distance, particles, shadow, ghosts, ...)


164


164


202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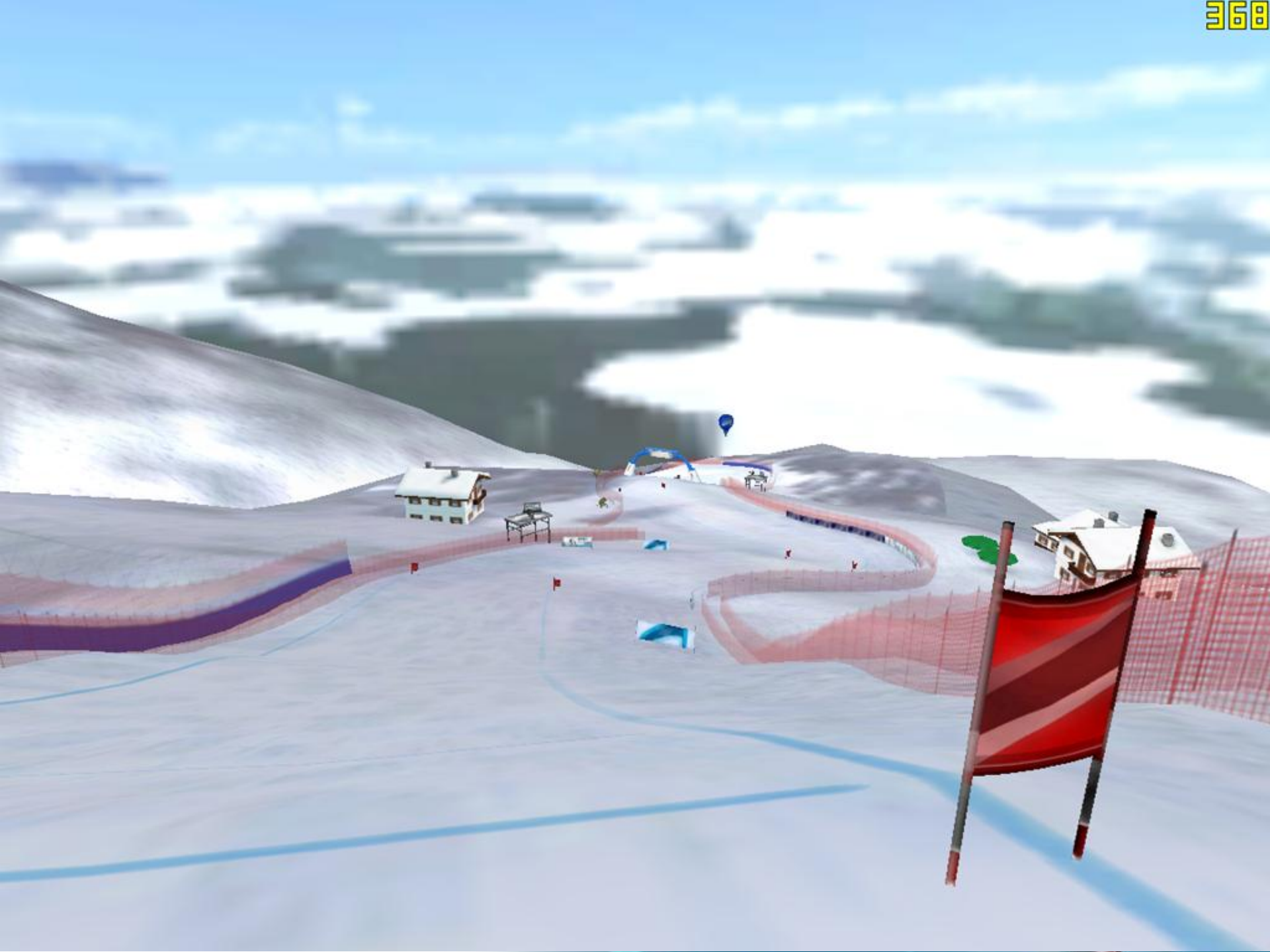
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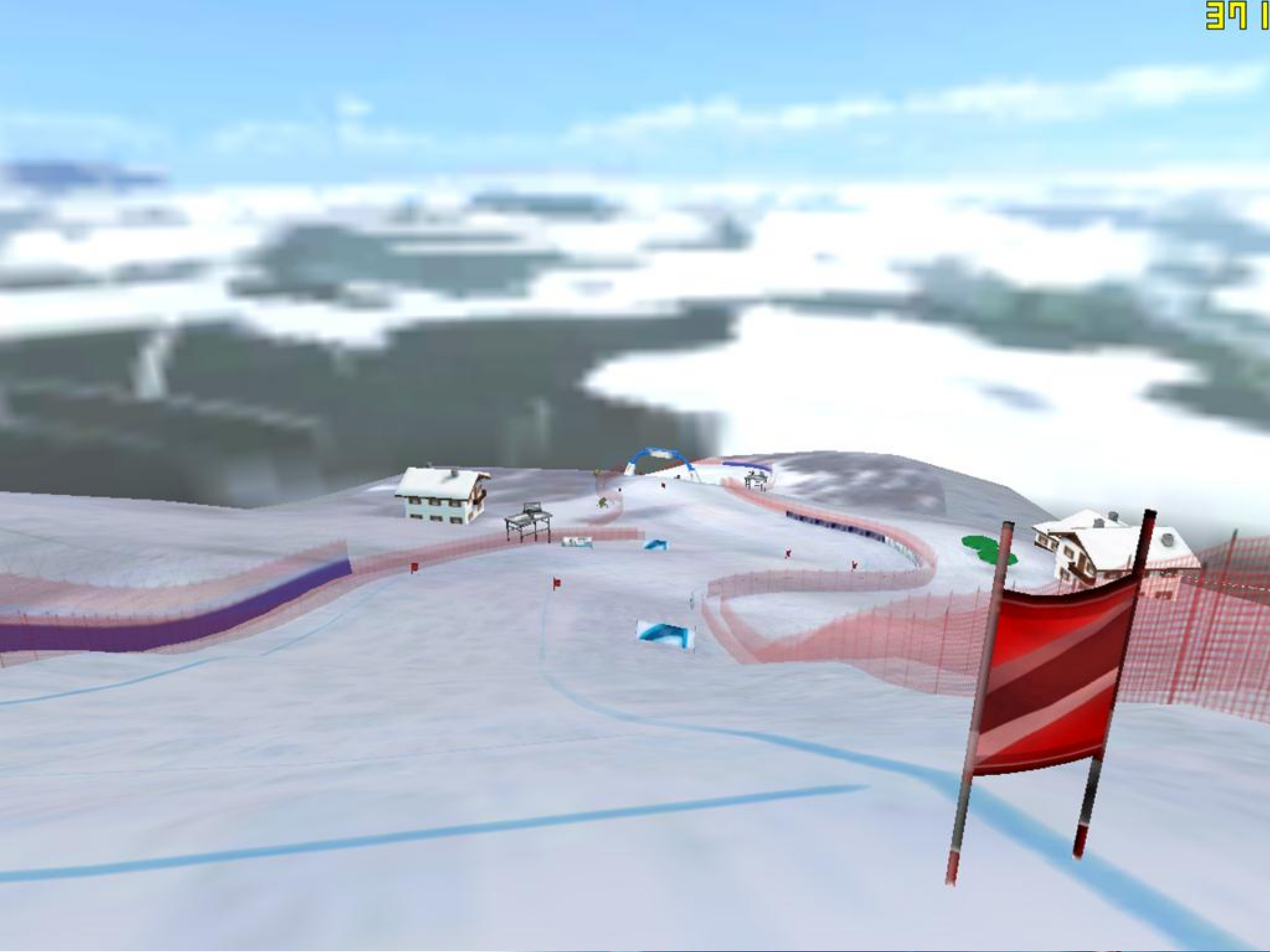

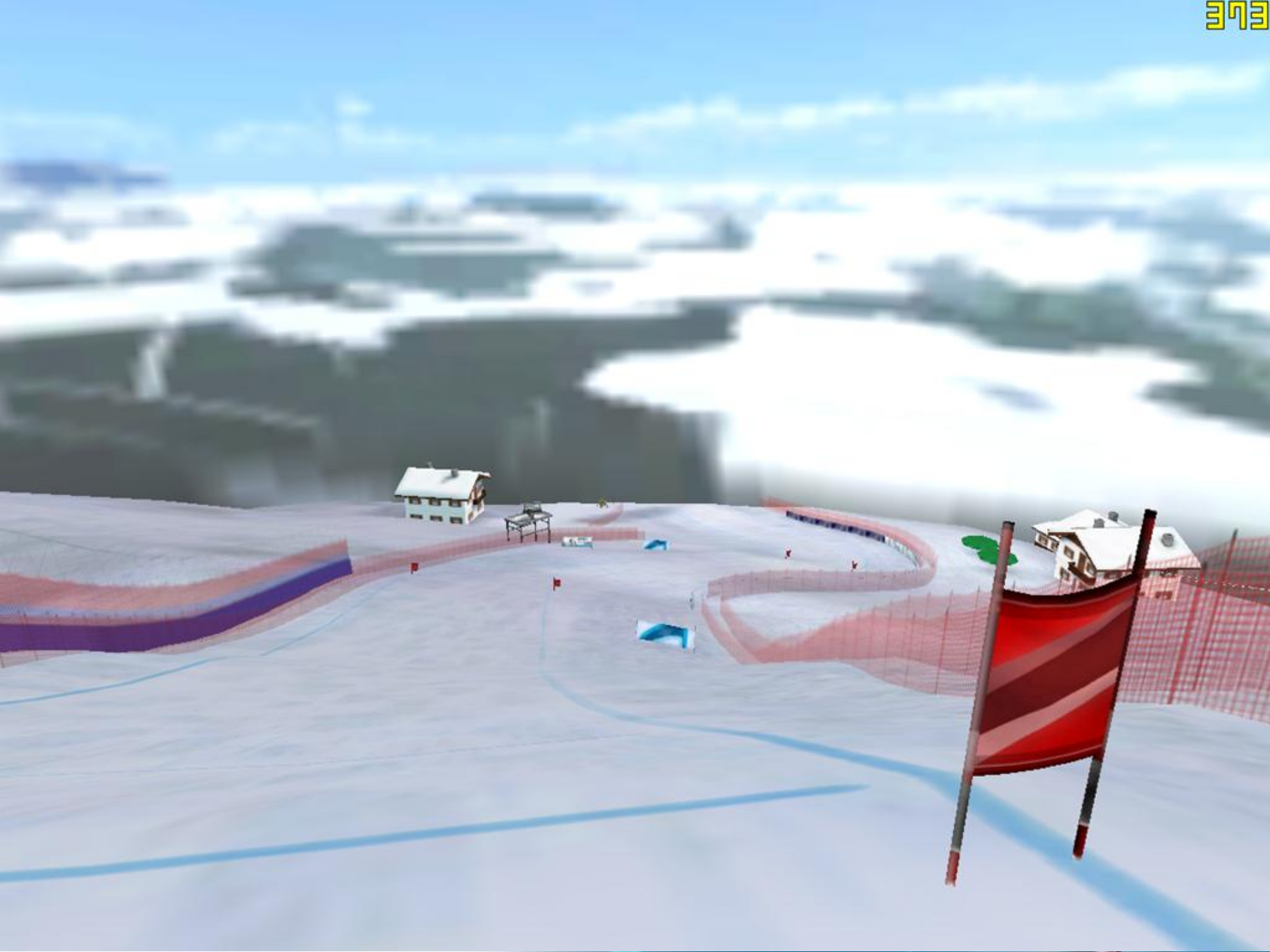
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164

Technical Challenges

- Multitude of ...
  - Operating systems (Win95, Win98, Win2000, WinXP, Win7)
  - Drivers (NVIDIA, ATI, Intel, VIA S3, SiS, Trident, ...)
  - APIs (DX7/8/9, OpenGL 1.3/1.4/1.5/2.0/...)
- Cannot test all combinations
  - Crashes bound to happen
  - Watchdog monitors game, sends logfiles on crash
- Started using rendering middleware to increase stability

Middleware

- Offers structure & defines interfaces
- Supports multiple renderers & platforms
- Alleviates graphics API woes (robustness)
- Support for further middleware integration
- Provides tools (content exporter, editors)
- Sophisticated subsystems & extensible functionality

Middleware

- Graphics
  - Scene hierarchy, culling, LOD, occlusion
  - Lighting, different shadow algorithms
  - Billboards, decals, particle systems
  - Vertex animation, skeletal animation & skinning
  - Shader model, material system
  - Effects system (handling fallback and alternative effects)
  - Actual effects (terrain, vegetation, weather, ...)

Middleware

- Resource Management
  - Asynchronous loading, lifetime, localization
- Object System
  - Name-based, smart pointers, RTTI
  - Serialization system (stream/multistream, sharing) crucial feature in every day's work
- Memory manager
  - Keeping track of all allocations and objects
  - Irreplaceable for finding memory leaks
- Error handling

Ski Challenge Client

- Renderers (3D, Audio, Video)
- Application state handling (menu & game modes)
- Physics
  - Collision detection/response, ragdolls, dynamic muscle simulation as constraints (skier animations), ...
- Gameplay logic
- Network
  - Connects to game server for updates, login, rankings, transmitting races (ghosts)
  - Dynamic in-game advertising (DIGA) system

Multiplayer Game Server

- Connects clients (games) with DB and OpenX (open source advertising server)
- Written in Java
- Needs to be able to handle high loads
- Low latency
- Caching architecture to avoid DB bottlenecks
- Highly multithreaded, complex synchronization issues

Thank you for your attention!

- Questions?

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