NVIDIA APEX: From Mirror's Edge to Pervasive Cinematic Destruction

Anders Caspersson, DICE
Monier Maher, NVIDIA
Jean Pierre Bordes, NVIDIA

Agenda

- Mirror's Edge Case study (Anders Caspersson)
  - PhysX in Mirror's Edge
- Introduction to APEX
  - A Scalable Dynamics Framework
- APEX Destruction Module
  - In-depth Demonstration
- APEX Turbulence Module
  - Sneak Preview

PhysX in Mirror's Edge

Mirror’s Edge PC Trailer

Background

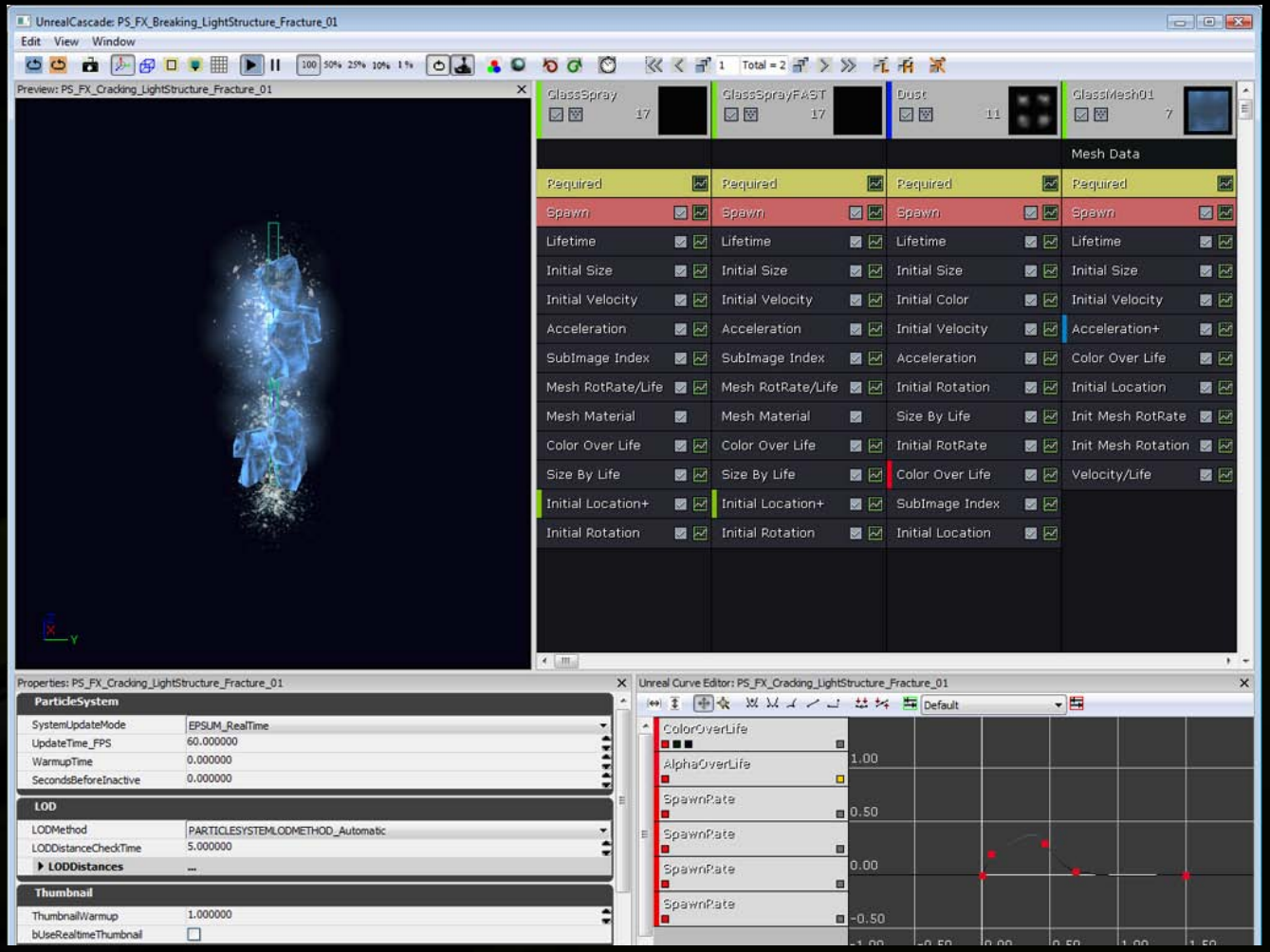
- PC version gets pushed out
- How can we enhance it?
- Problem: The game world felt very static
- PhysX would help to bring life and immersion

Challenges

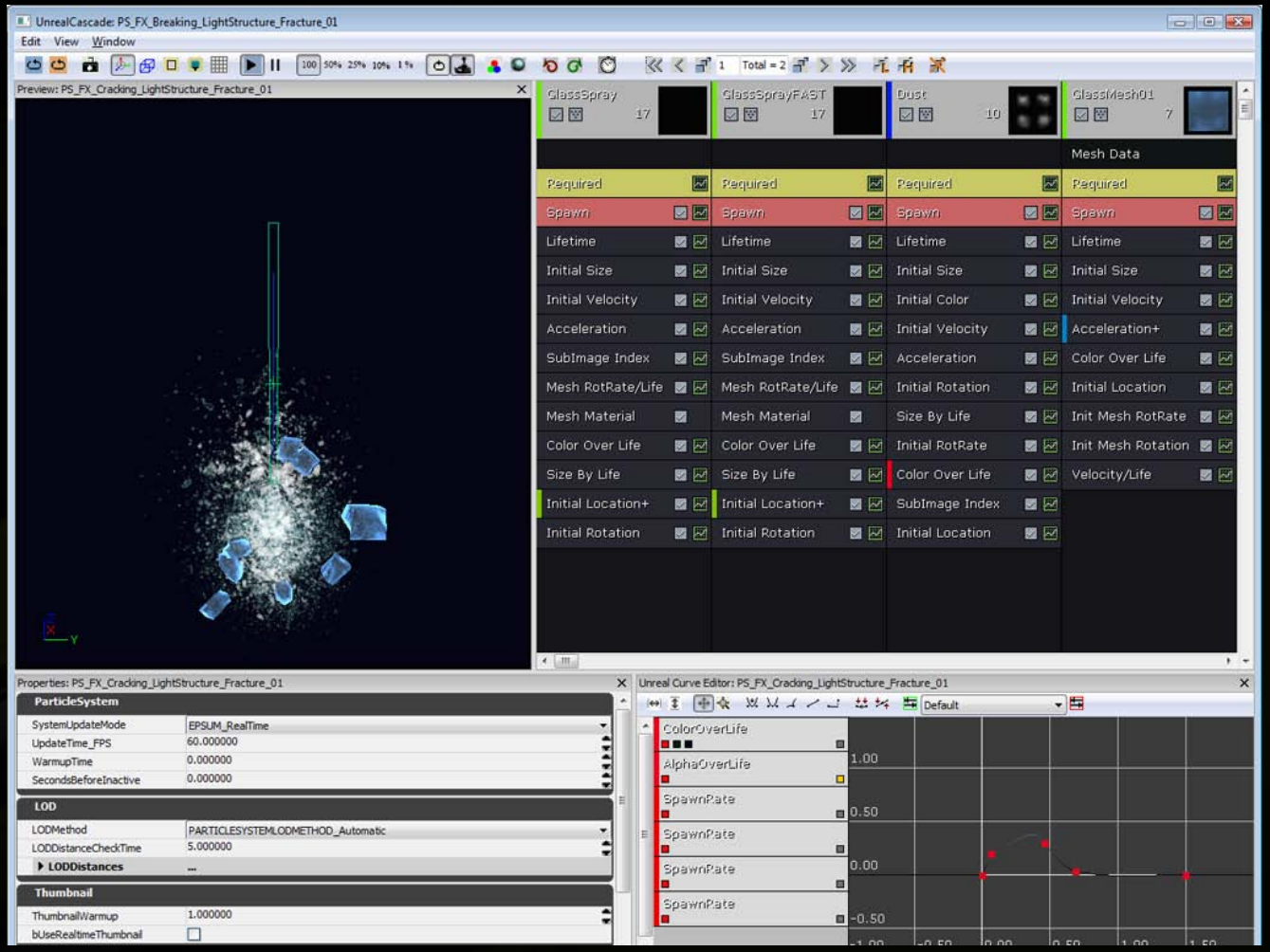
- Time – 5 weeks from start to 0 bugs
  - We could not get everything we wanted
- We did not want to affect the game play
  - We had to restrict ourselves to visual enhancements
- Matching the static lighting
  - We ended up lighting each asset individually in separate lighting channels
- The art direction
  - Everything should be stylish and clean

The glass sculpture

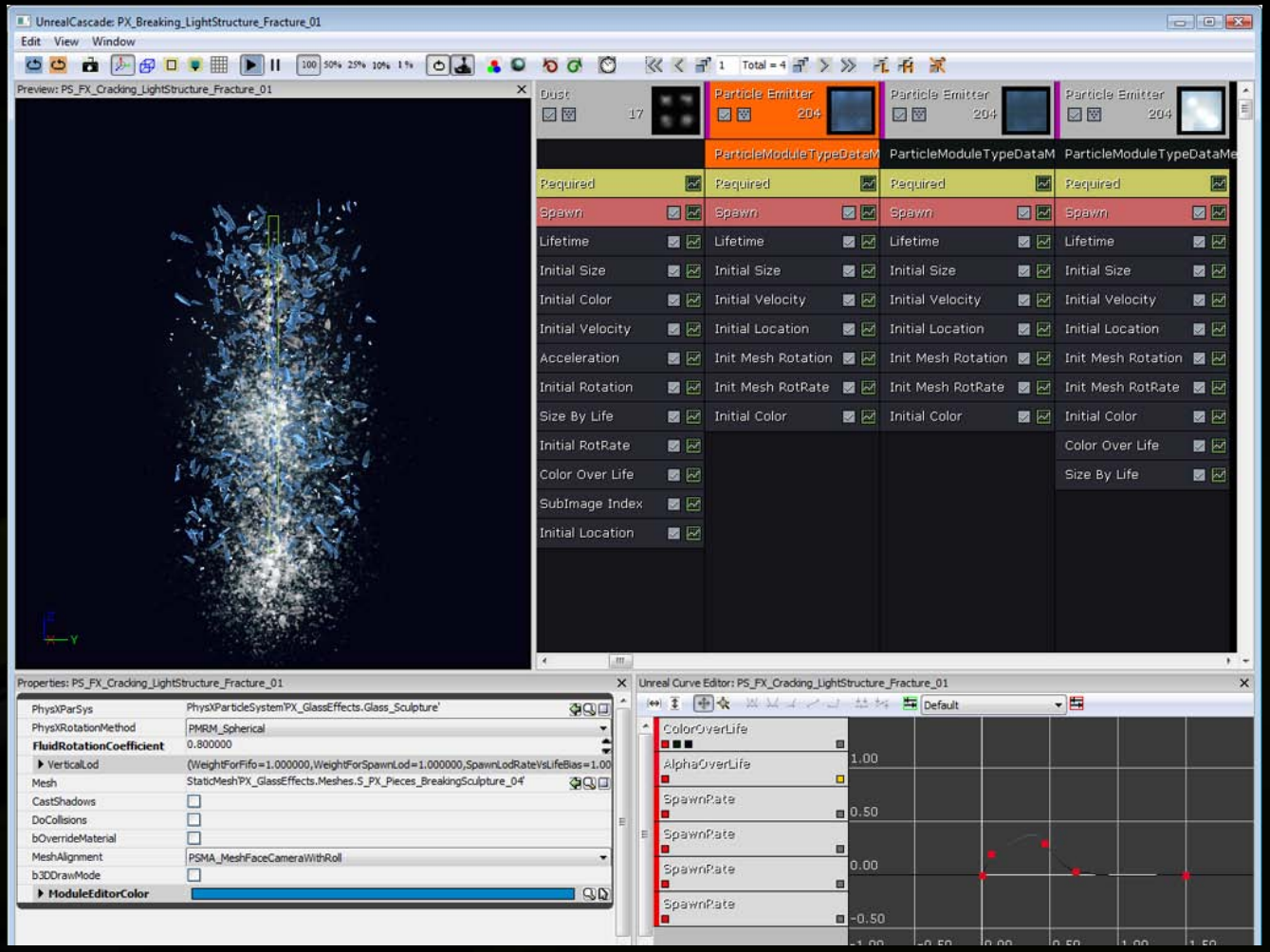
The glass sculpture



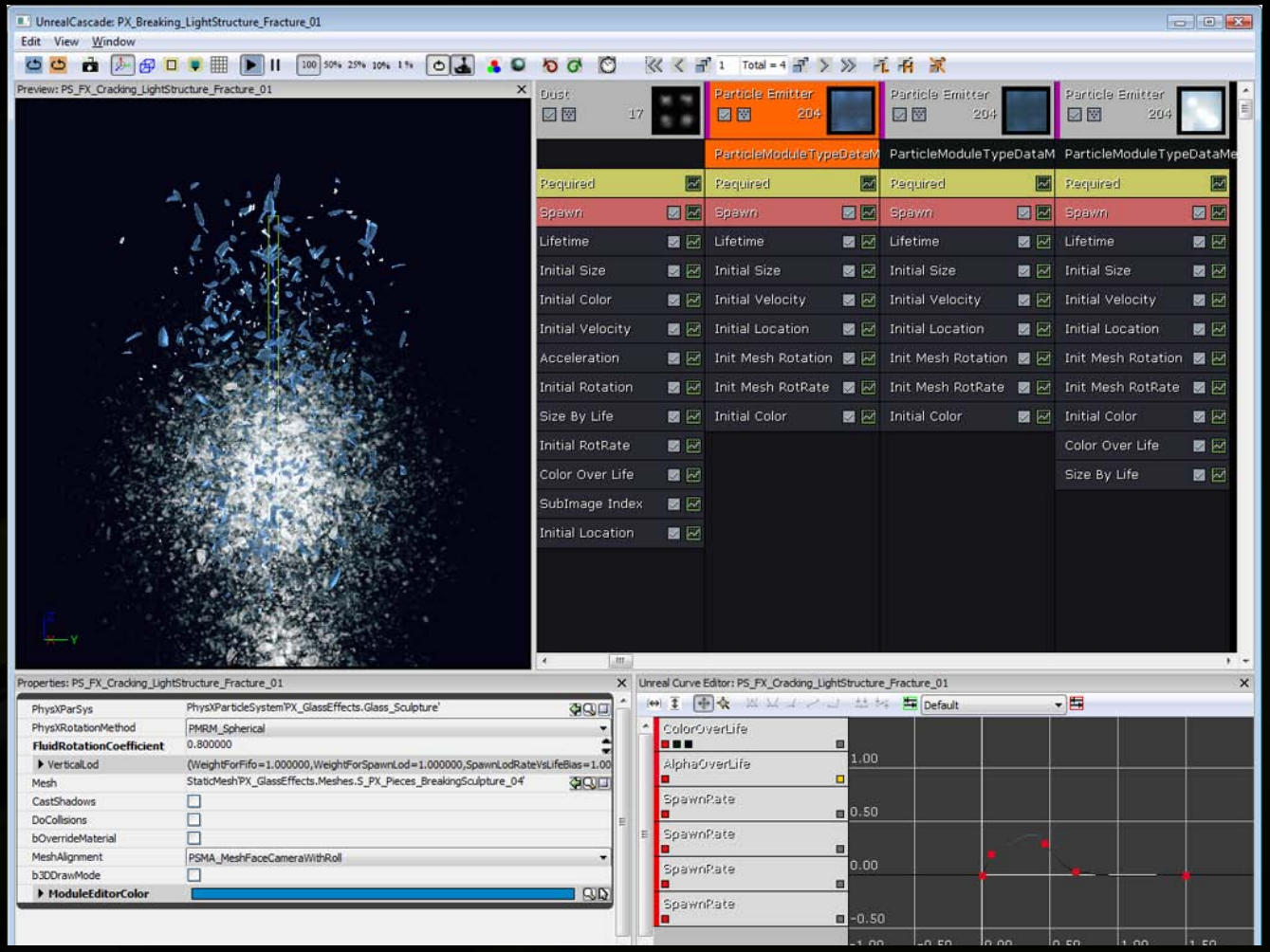
The glass sculpture



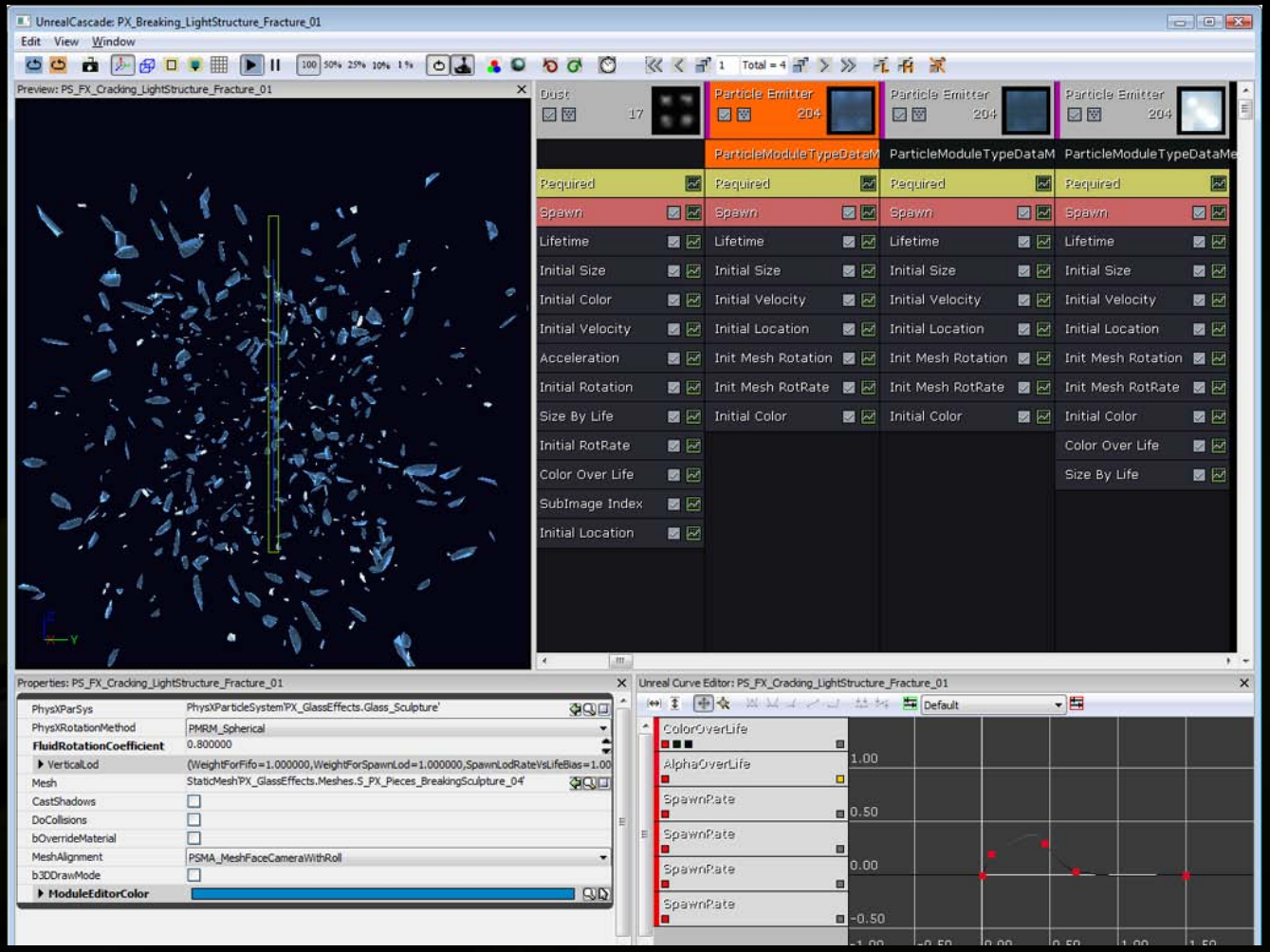
The glass sculpture



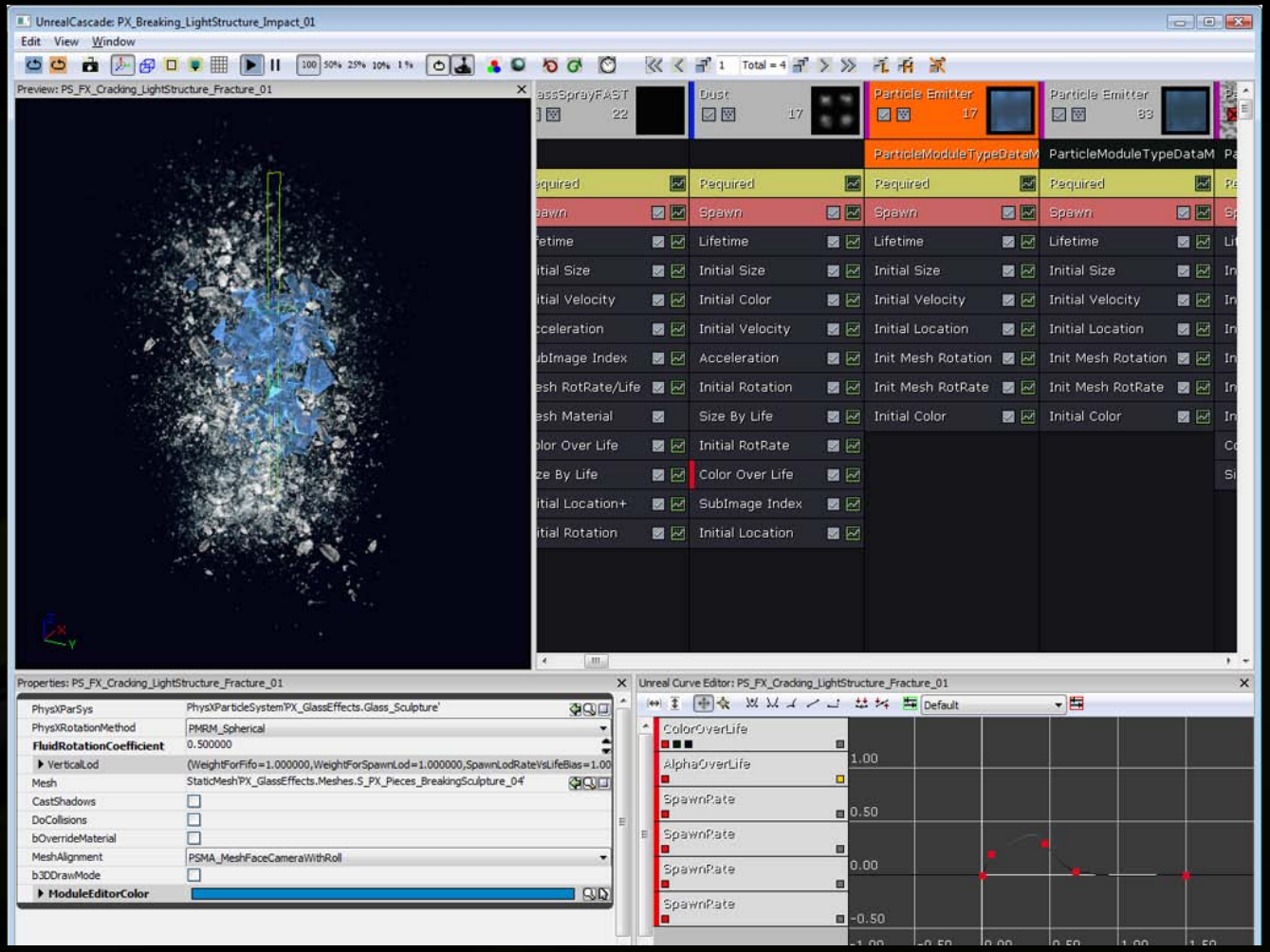
The glass sculpture



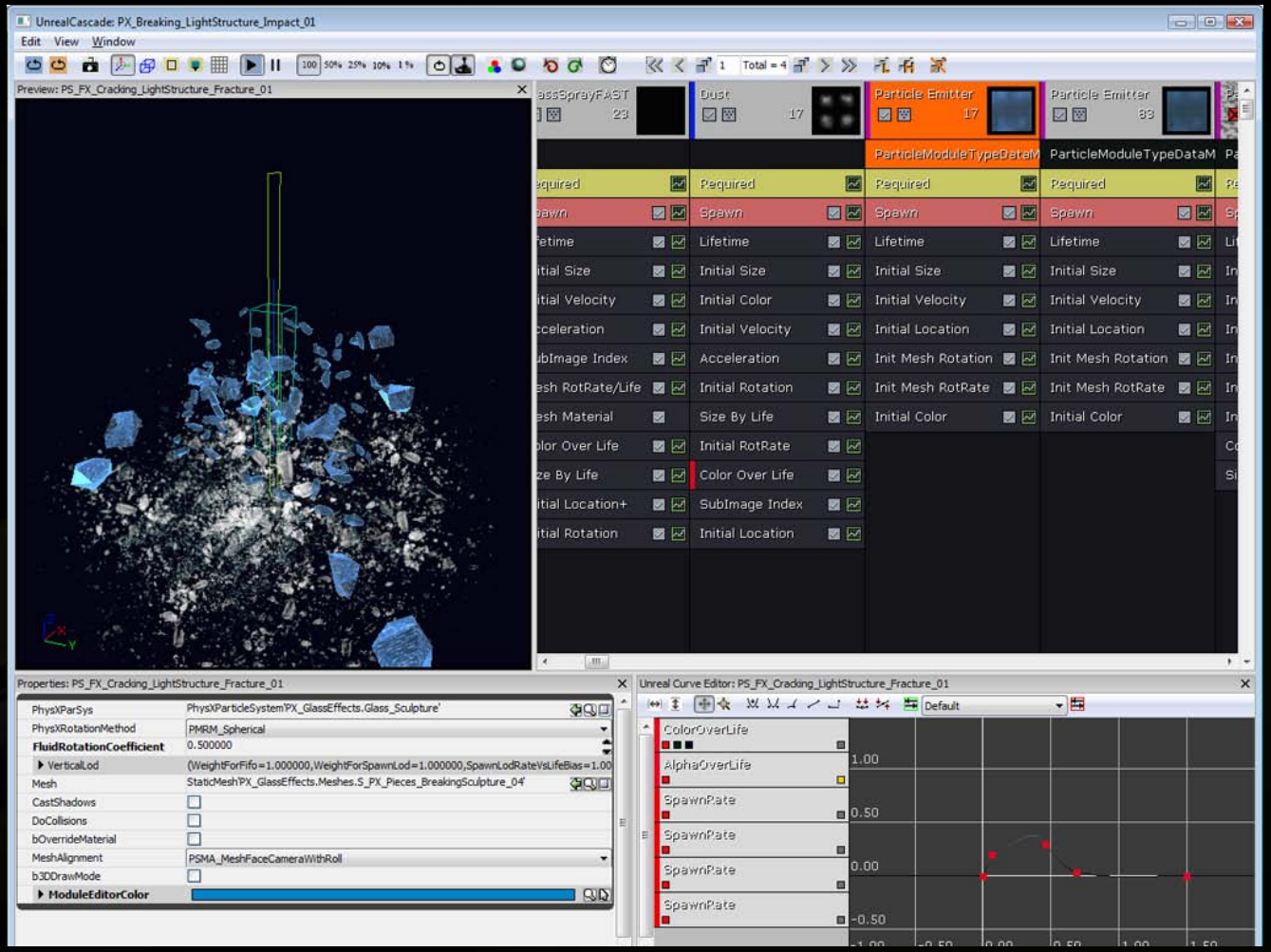
The glass sculpture



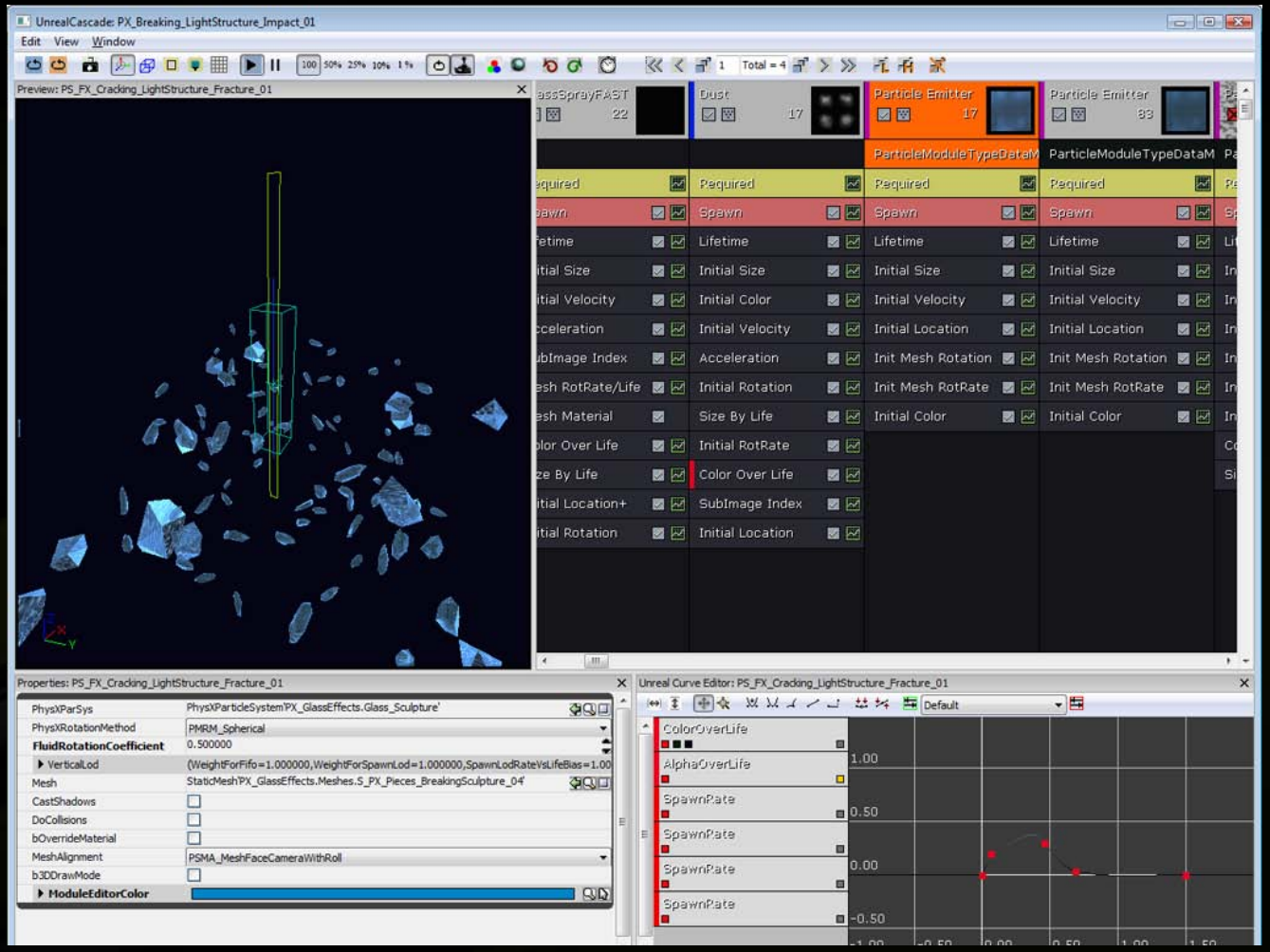
The glass sculpture



The glass sculpture



The glass sculpture

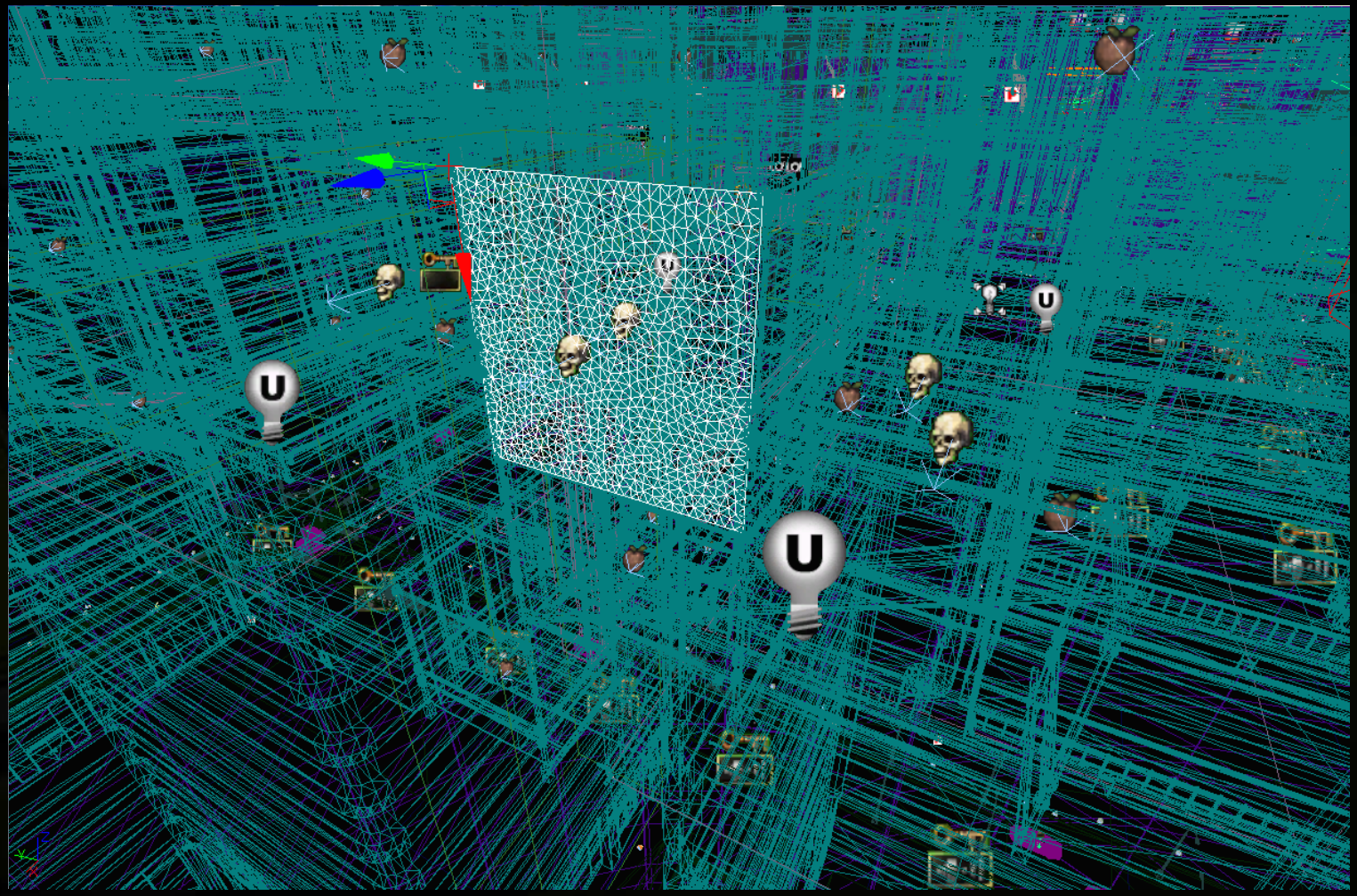


Particles summary

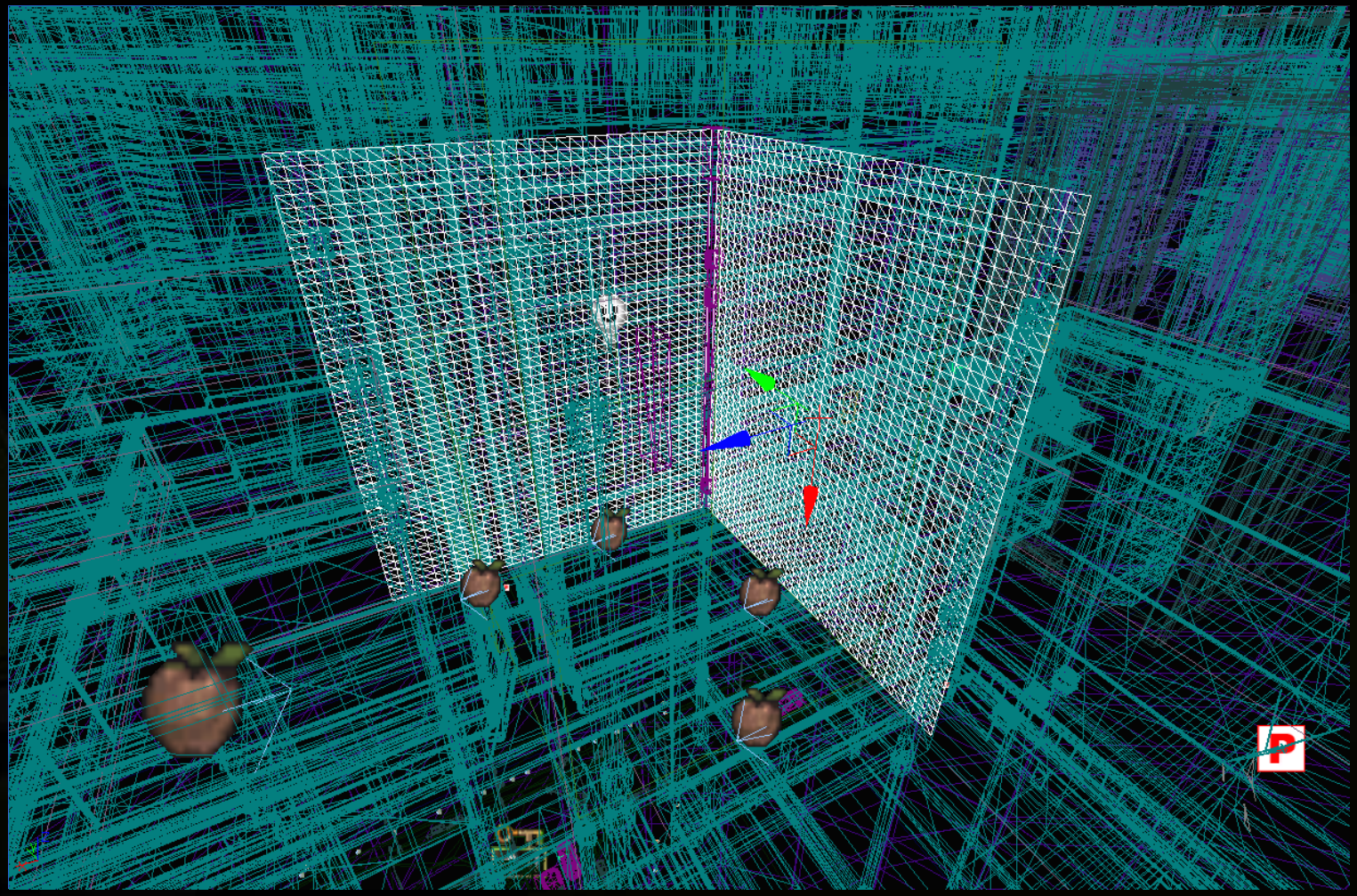
- Huge number of mesh or sprite particles
- Full physical interaction with world and player
- Edited as usual in Unreal Cascade
- Used for
  - Impact effects
  - Glass destruction
  - Trash
  - Smoke

“Heat” Level

“Heat” Level



“Heat” Level



Cloth summary

- 1000 – 1500 vertices
- Tearing
- Skeletal meshes created in Max, Maya
- Edited in Unreal AnimSet Editor
- Used for
  - Tarp
  - Plastic sheets
  - Plastic curtains
  - Banners
  - Paper stuck in vents

Before / After

Conclusions

- PhysX enabled us to quickly enhance the visuals of the game and make the world come alive
- The user immersion was greatly enhanced
- Could have played a bigger part if implemented earlier
- Scaling would have helped
  - We had to tune the effects for low spec hardware
  - We could have had even more detail on high end machines
- We wish APEX had been available

Introduction to APEX

Pervasive Cinematic Destruction: UT3 + APEX

Scalable Dynamics Content

APEX Destruction

APEX Vegetation

APEX Clothing

APEX Turbulence

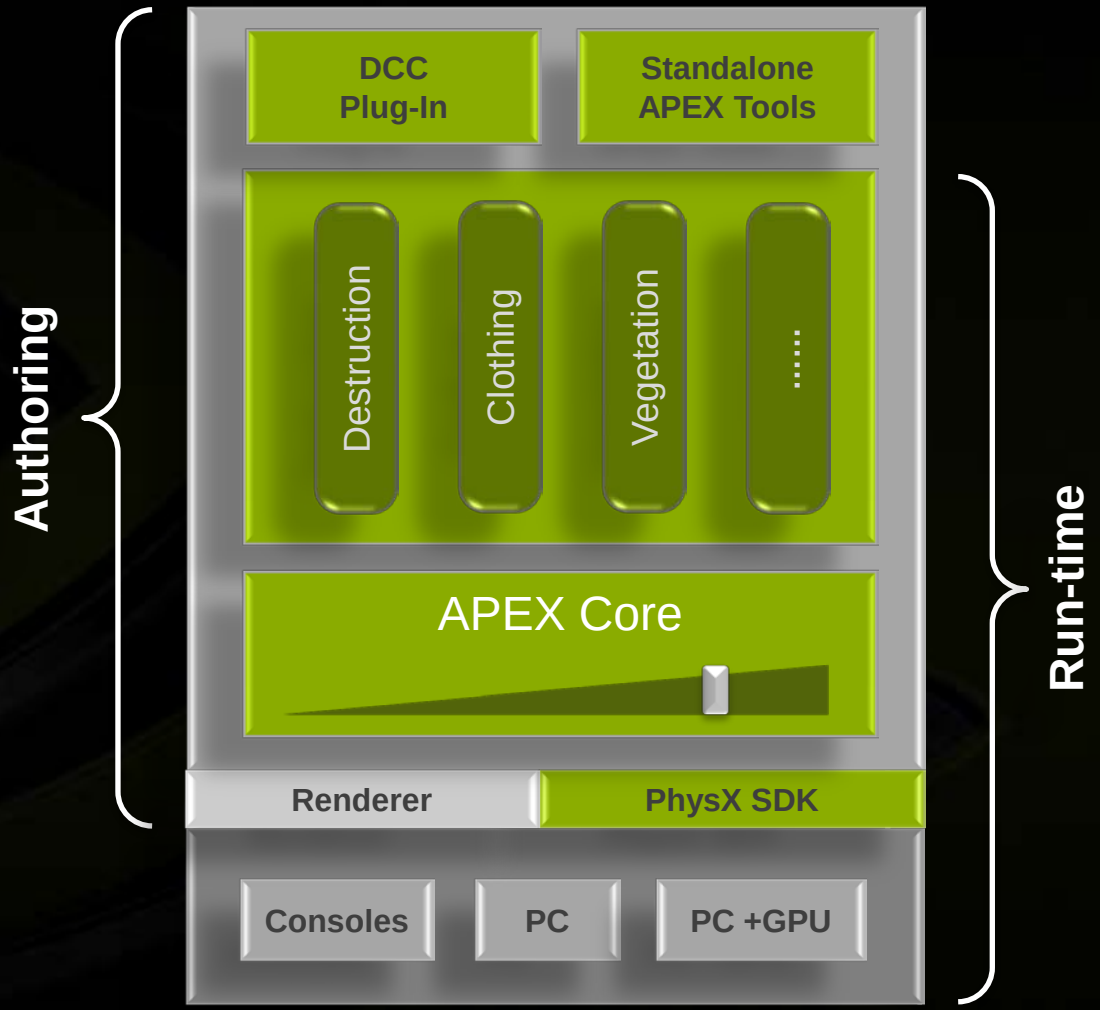
APEX Vegetation

APEX Clothing

What is APEX?

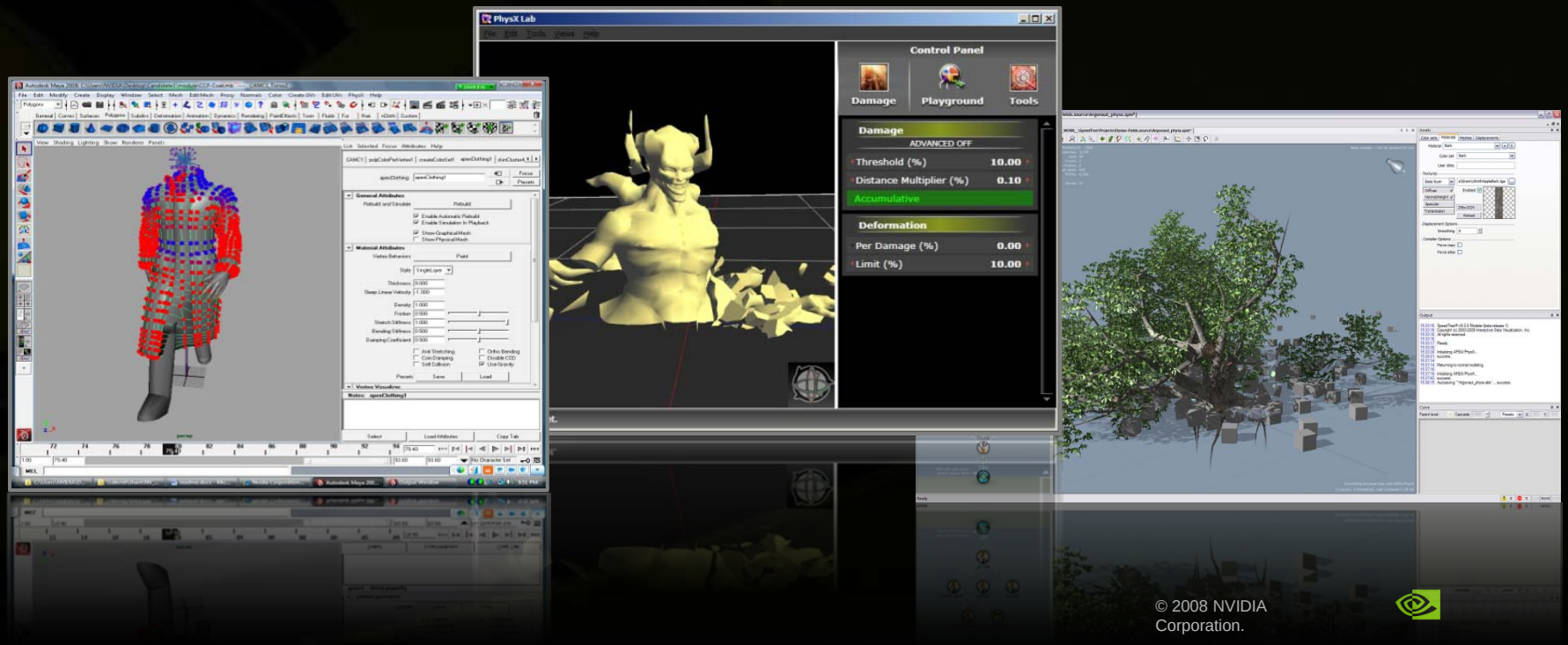
- APEX is a “Scalable Dynamics Framework”
  - *Scalable*: Content adapts to different hardware capabilities
  - *Dynamics*: The way things move and interact
  - *Framework*: A structured environment
- APEX consists of two major components:
  - Authoring:
    - High-level authoring of dynamic systems
    - DCC plugins, standalone tools, and game engine plugins
  - Runtime:
    - A modular SDK – minimal integration into game engine
    - Leverages PhysX for simulations

APEX Architecture



APEX is Artist Focused

- Artist level abstractions of dynamic systems
  - “Destructible bunker” vs. “collection of bricks”
- Intuitive and easy to use



APEX Solves Problems

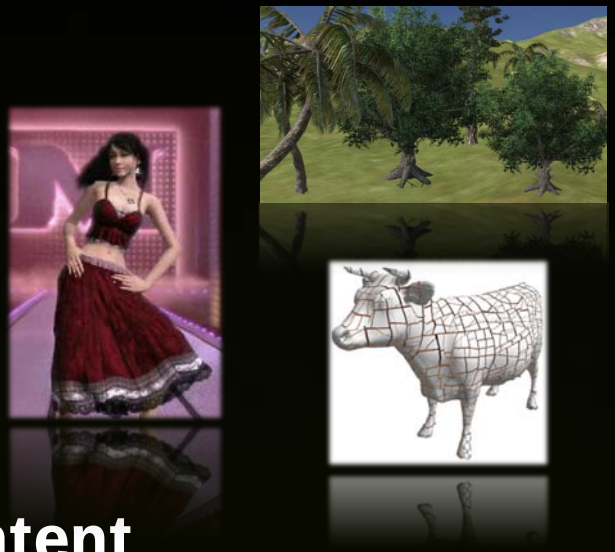
- Requirement for significant programmer involvement limits artists' productivity
- APEX Solution: Provide a "high-level" interface to artists which allows for turnkey content creation

- Customizing content to different platforms is expensive
- APEX Solution: All modules provide built-in content scaling

- Cross-functional issues can severely limit the amount of dynamic content
- APEX Solution: Framework provides rendering "fast path" and manages complex dynamic content

APEX is easy to integrate

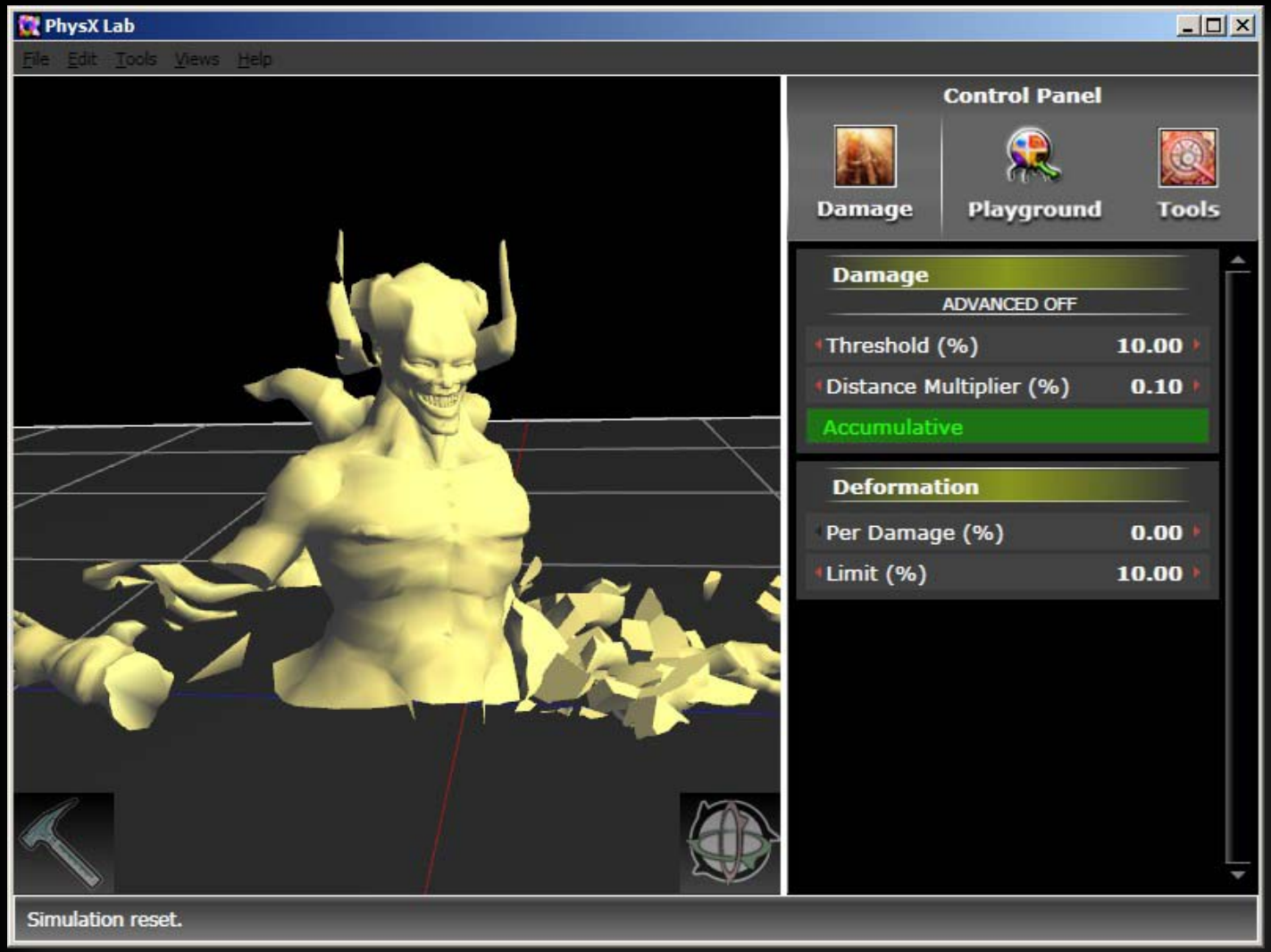
- Already integrated into leading game engines
  - UE3, Gamebryo, Hero Engine, …
- APEX modules are Plug & Play
  - Clothing, Vegetation, Destruction
  - More modules in development



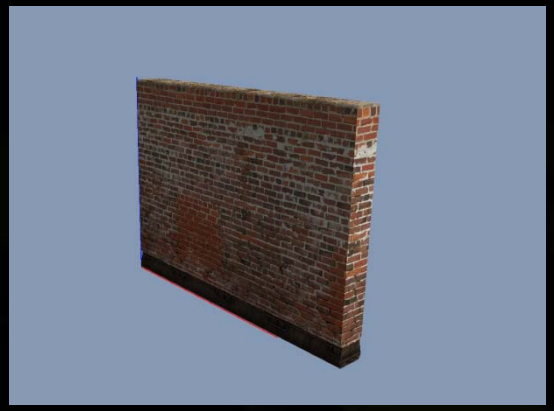
- APEX is already used for AAA content
  - Licensed by major publishers
  - NVIDIA developed APEX modules are free for PhysX developers

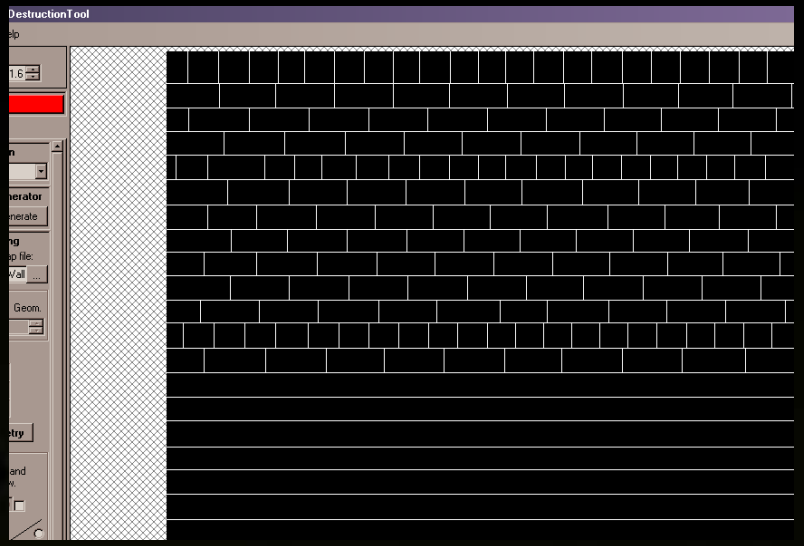

APEX Destruction Module
In-Depth Demonstration
NVIDIA

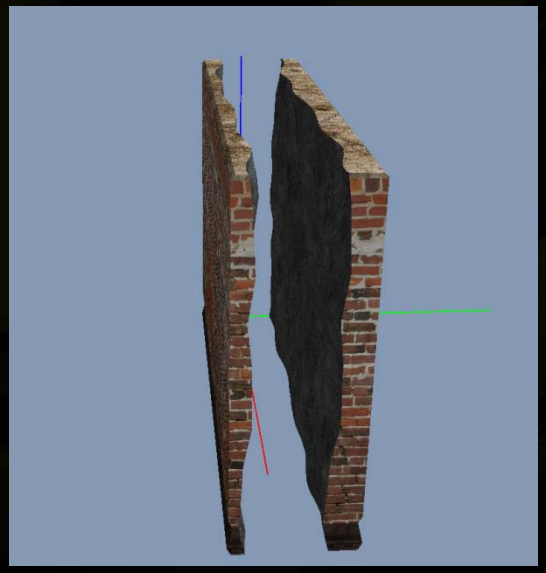
PhysX Lab

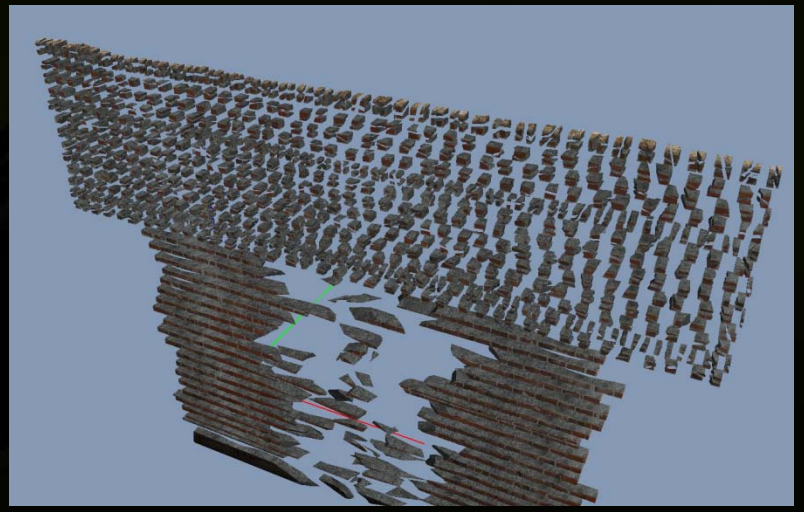

PhysX Lab
File Edit Tools Views Help
Control Panel
Damage
Playground
Tools
Damage
ADVANCED OFF
Threshold (%) 10.00
Distance Multiplier (%) 0.10
Accumulative
Deformation
Per Damage (%) 0.00
Limit (%) 10.00
Simulation reset.

Authoring - Fracture Maps







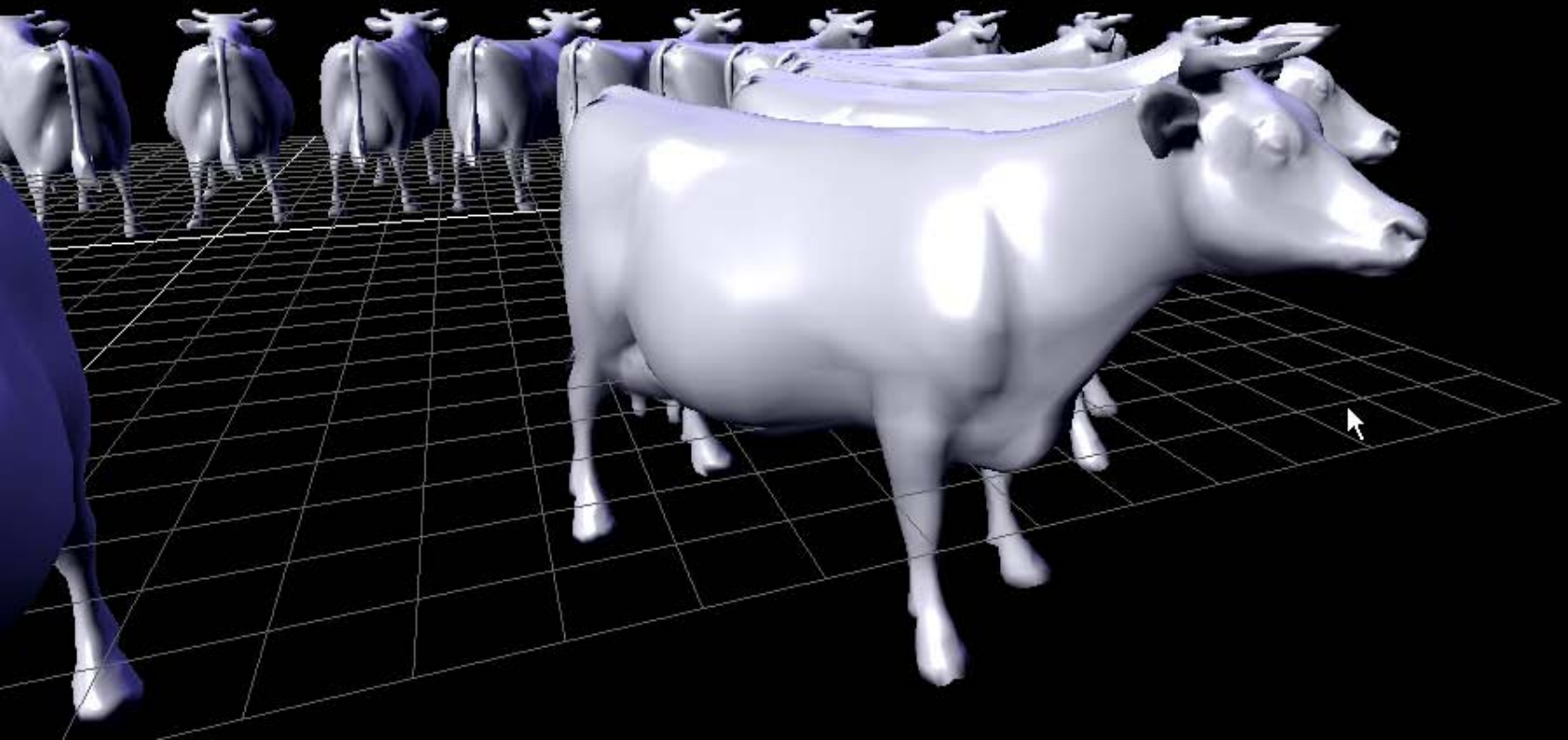


UE3 Testlevel – Various Destruction

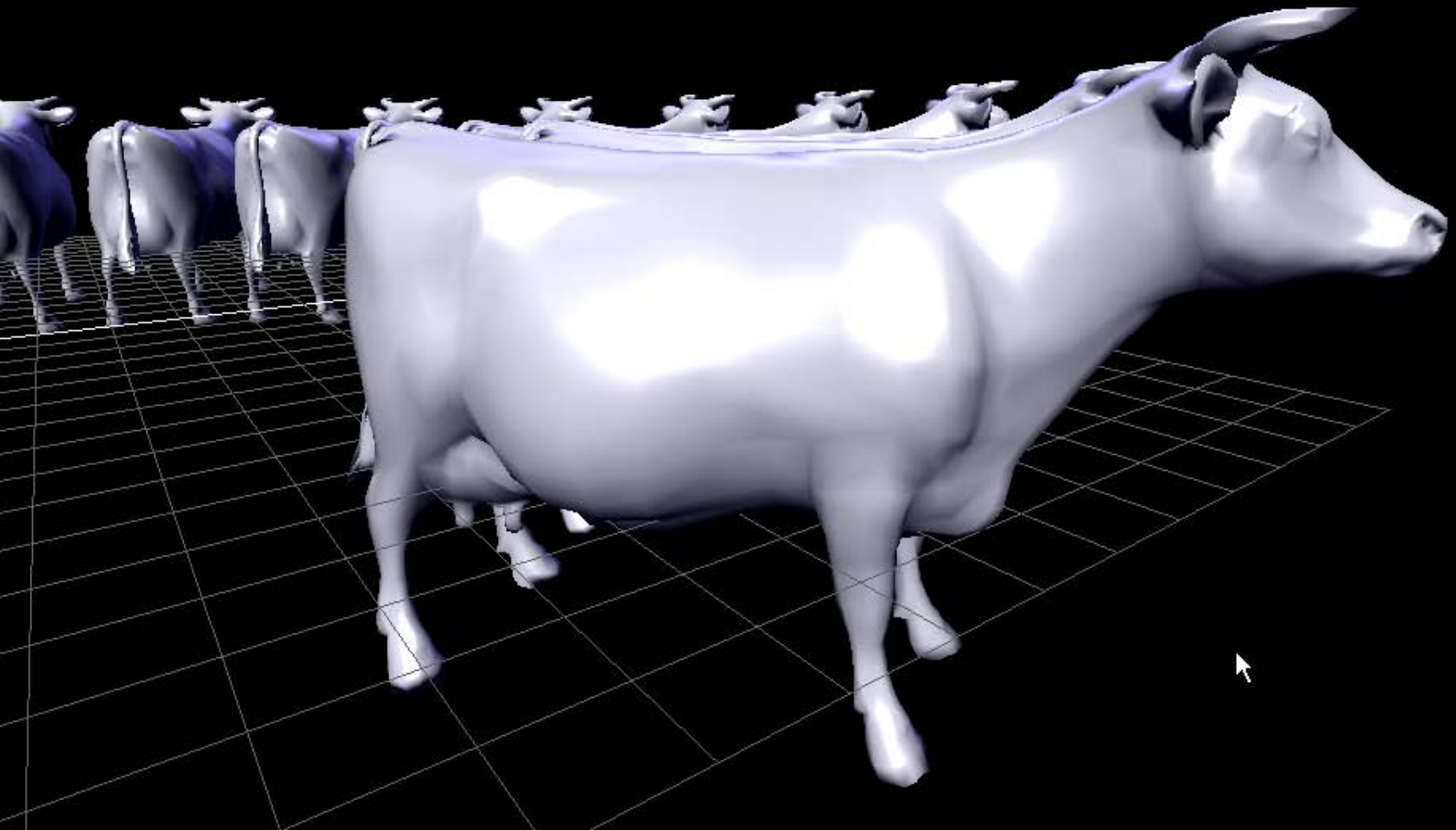
UE3 Testlevel – Wooden Fence

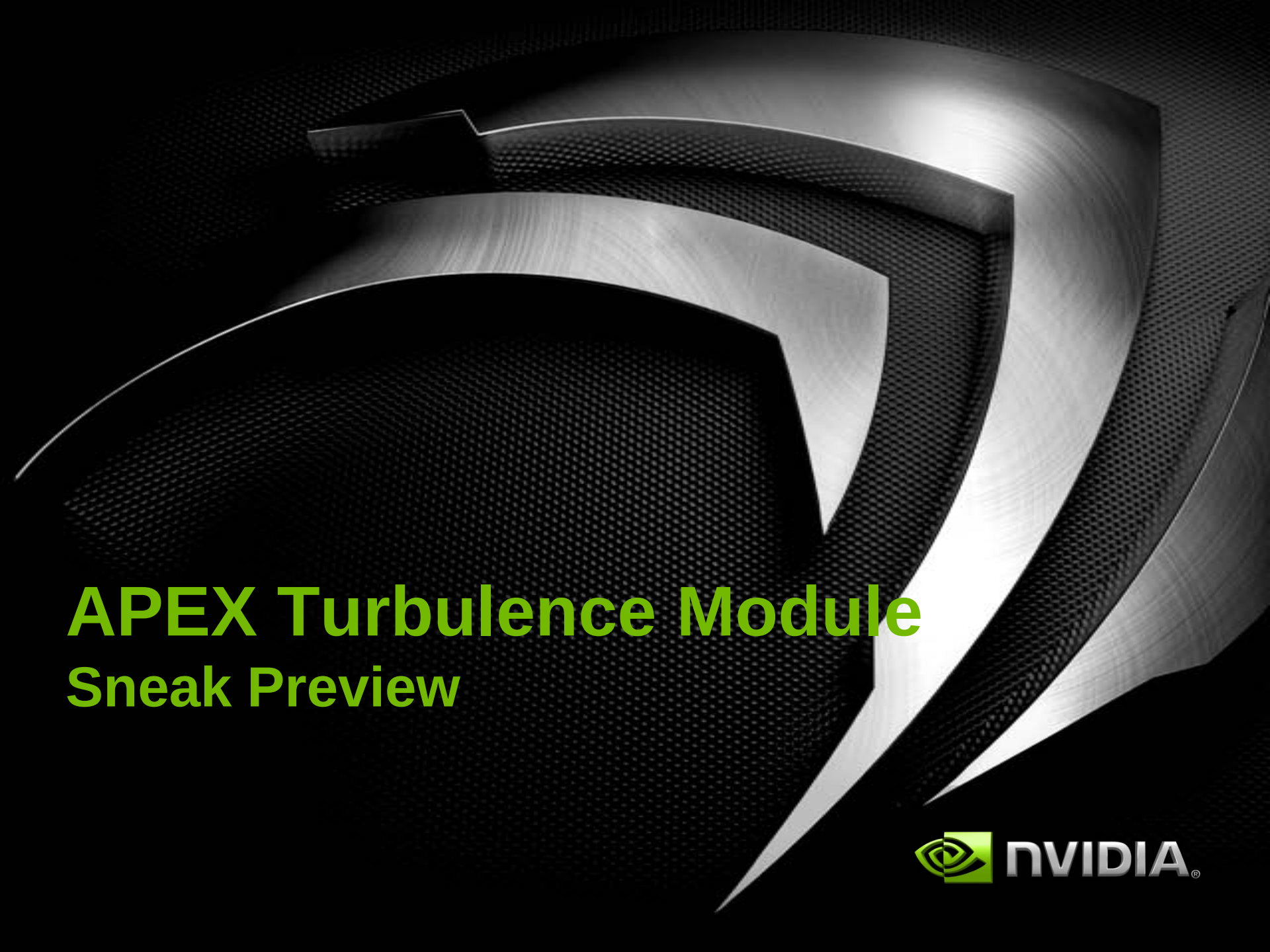
UE3 Testlevel – Complex Buildings

Scalability: “Low Setting”



Scalability: “High Setting”



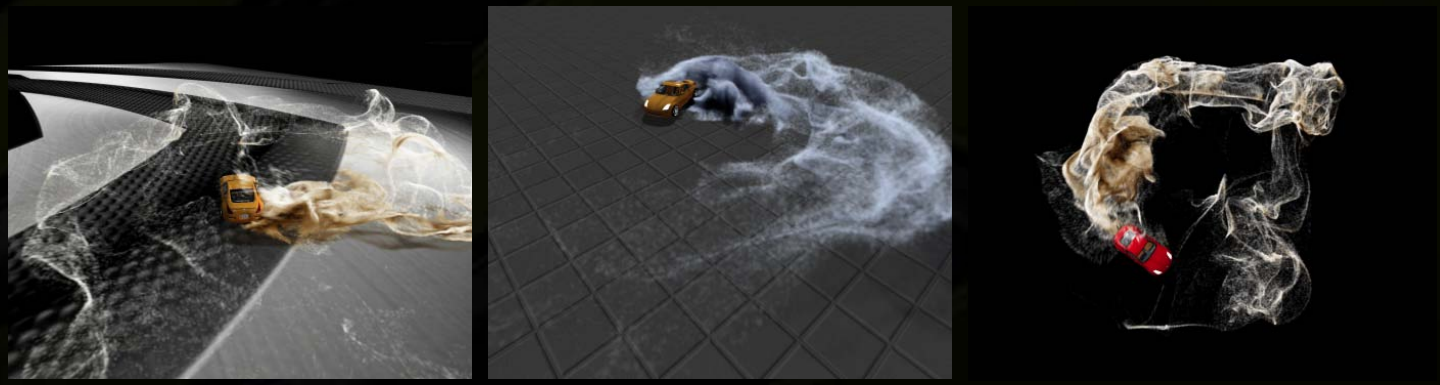

APEX Turbulence Module
Sneak Preview
NVIDIA

SPH Particle Smoke

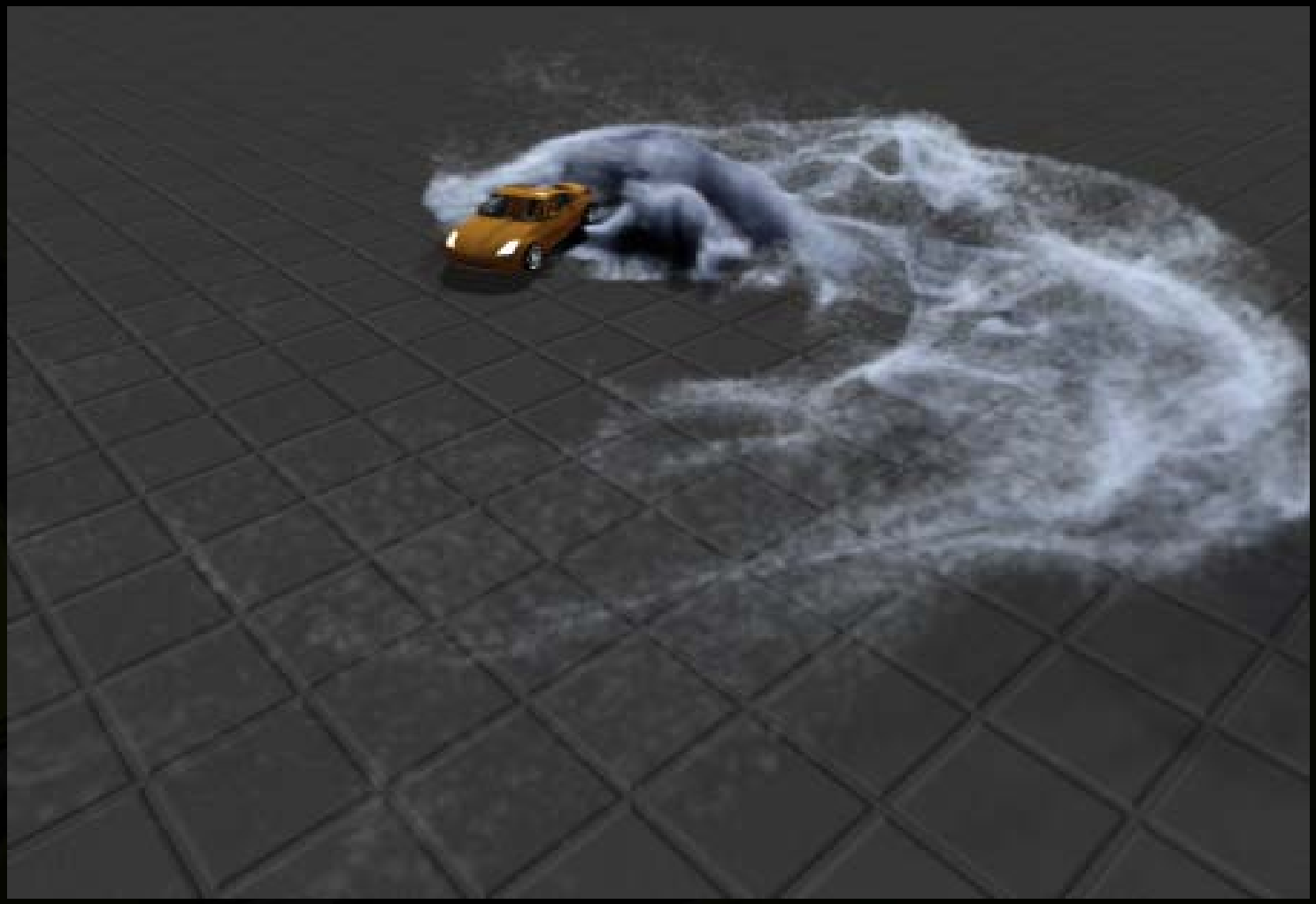
- Already in games, e.g. Mirror’s Edge
- Integrated into UE3

APEX Turbulence

- High definition Turbulence
  - Residual dust from destruction
  - Smoke Grenades and other weapon effects
  - Supernatural effects – e.g. ghost like
  - Snow storms or snow trails
  - Exhaust smoke from car or spinning/braking tires



APEX Turbulence – Live Demo



APEX Summary

- APEX is a Scalable Dynamics Framework
- APEX is artist focused
- APEX is easy to use
- APEX is modular
- APEX solves problems
- APEX is easy to integrate
- APEX is already used to create AAA content

- Start using APEX now:
  - Sign up today for the Beta program
    - *Come to our special session*
    - *Tonight, 6:00 p.m.*
  - Email us: *devrel@nvidia.com*

How To Reach Us

- During GDC
  - Expo Suite 656, West Hall
  - Developer Tool Open Chat, 1:30 to 2:30 pm (25th-27th)
  - Come to our special session on APEX:
    - *Wednesday, March 25th, 6:00 – 8:00 p.m.*
- Online
  - Twitter: nvidiadeveloper
  - Website: http://developer.nvidia.com
  - Forums: http://developer.nvidia.com/forums