

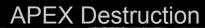
#### **Agenda**



- Introduction to APEX
- APEX Destruction Module
- APEX Clothing Module
- APEX Vegetation Module
- APEX Particle and Turbulence Module

## **Scalable Dynamics Content**







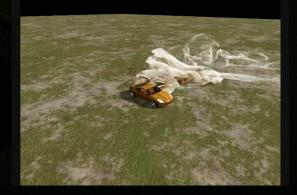
APEX Vegetation



**APEX Clothing** 



**APEX Turbulence** 





#### 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**

Authoring

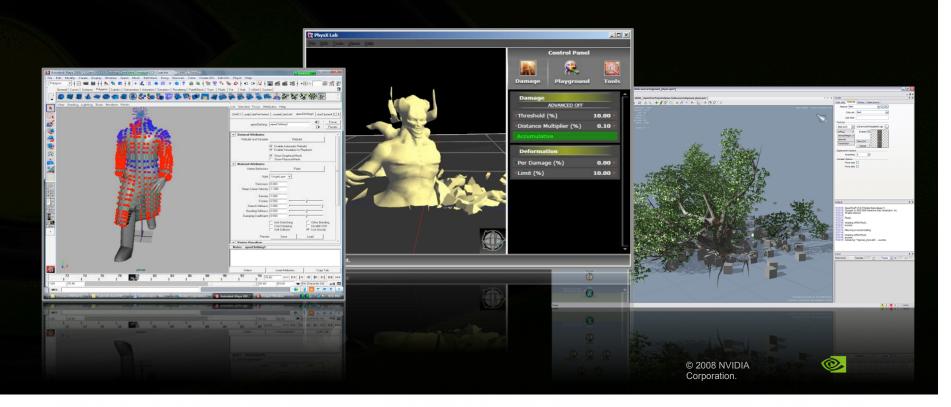
DCC Standalone Plug-In **APEX Tools** Destruction Vegetation Clothing **APEX Core** Renderer PhysX SDK PC +GPU PC Consoles

Run-time

#### **APEX** is Artist Focused



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



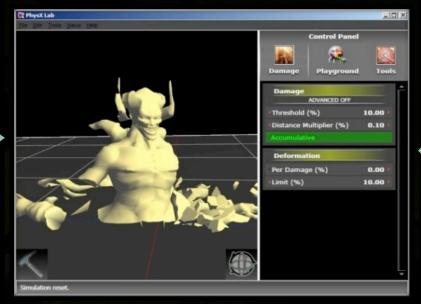


## **Authoring Pipeline**













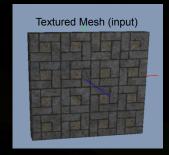
## **Destruction Authoring Tool**

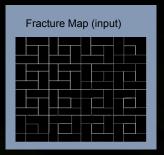




## **Authoring – Chippable Destruction**







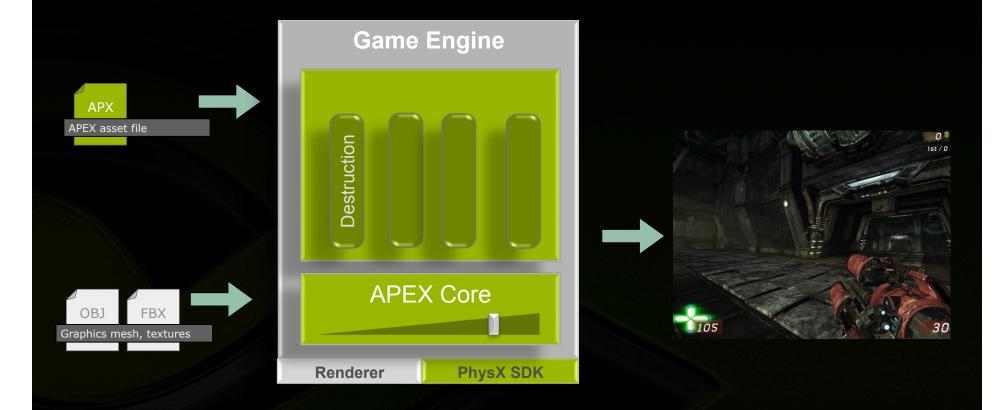






## **Run-Time Pipeline**





### **APEX Destruction - Runtime**







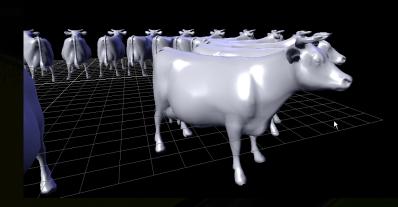
# **Test Level – Concrete Walls**



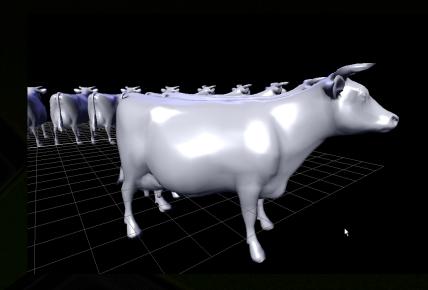


# Scalability





Low Setting



High Setting



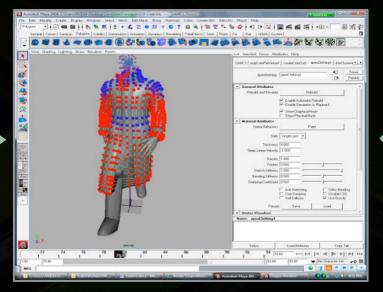


## **Authoring Pipeline**









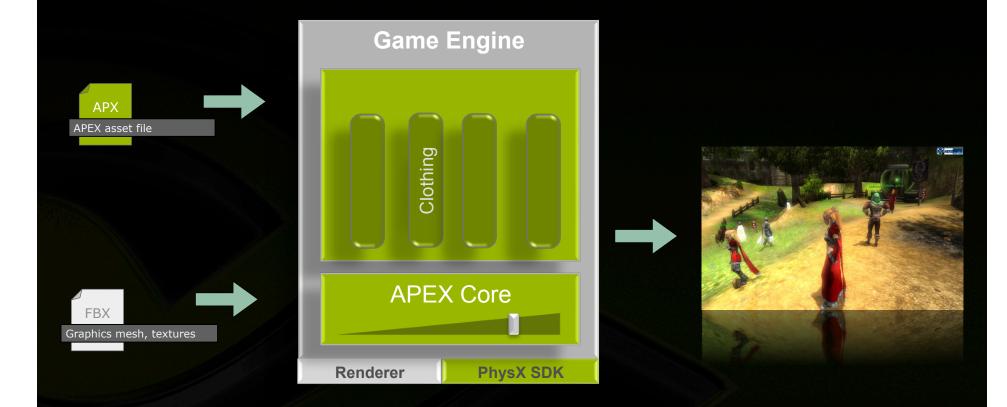






## **Run-Time Pipeline**

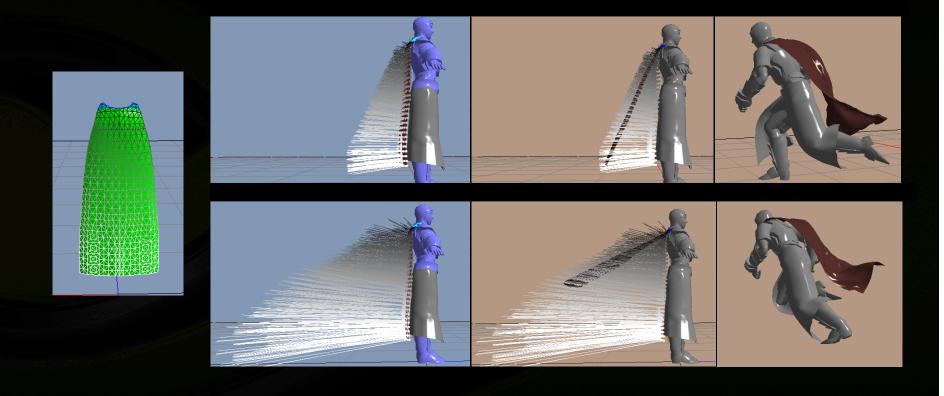




#### **Motion Radius**



• Allows the artist to constrain the simulation



#### A – Collision

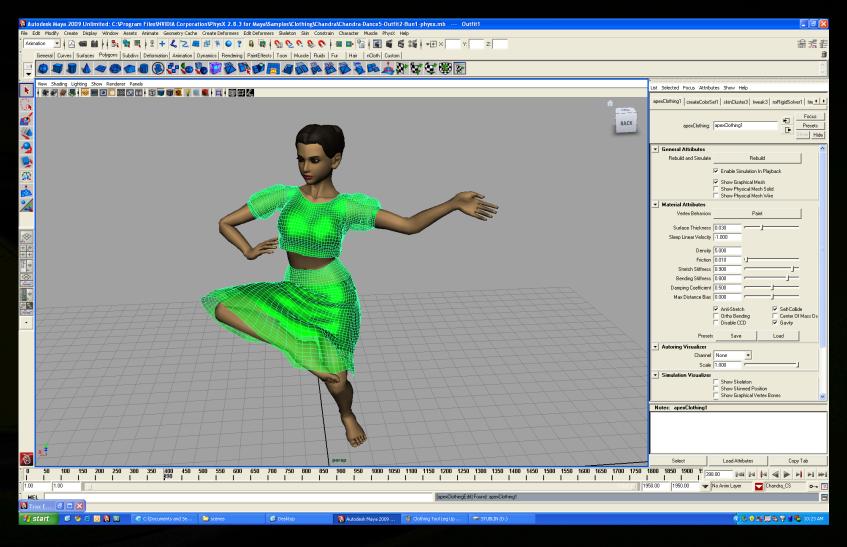


Use animation mesh as a collision mesh



## **Clothing Authoring Tool**





# **APEX Clothing**





# **Soft Body Characters**



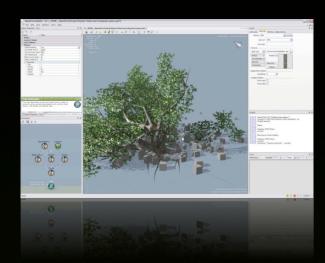


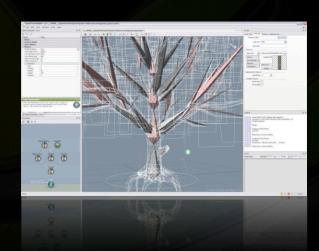


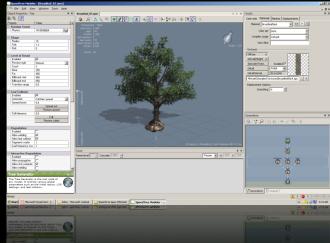
## SpeedTree and APEX



- Dynamics directly integrated into SpeedTree modeling tool
- Compiler tool creates all required APEX assets



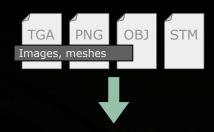




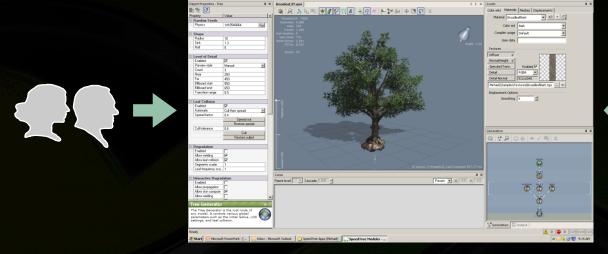
Seamless, comprehensive path to dynamic trees

## **Authoring Pipeline**





Procedural Files



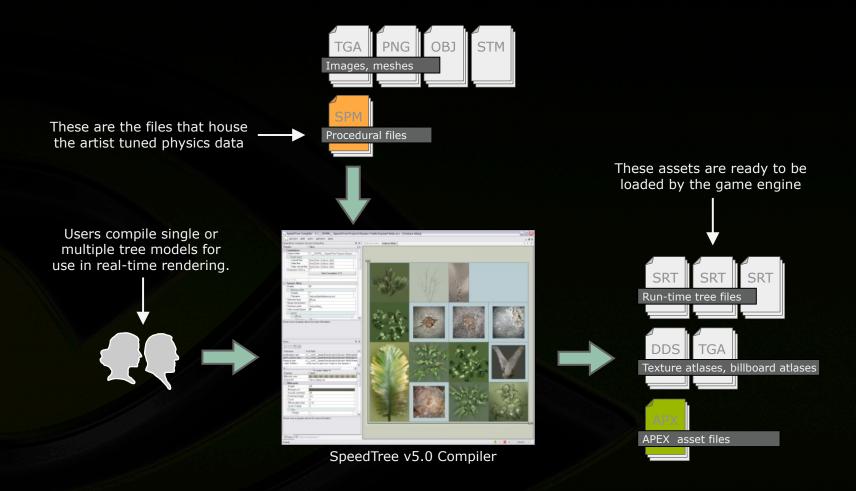




The Modeler interacts with APEX and PhysX to provide an exact preview of in-game behavior.

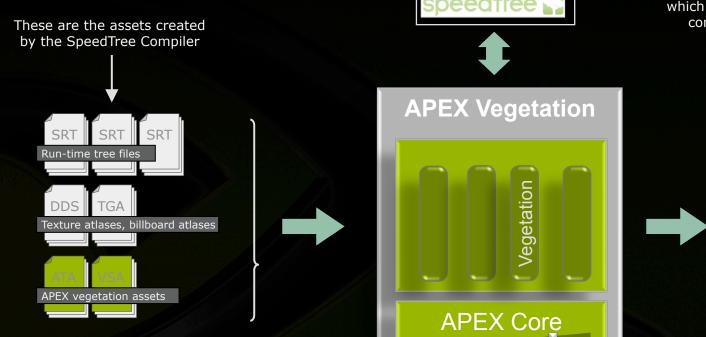
## **Compilation Pipeline**





## **Run-Time Pipeline**





Renderer

PhysX SDK

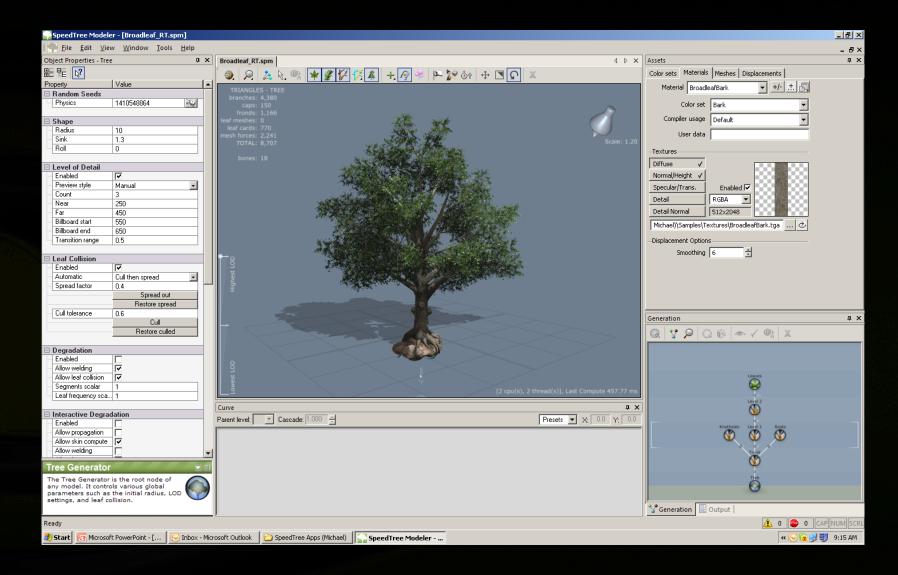
SpeedTree SDK

APEX uses the SpeedTree SDK to manage large groups of trees and abstracts which are physical and which are not. APEX acts as the common render interface.

Game Engine

#### **SpeedTree Authoring Tool**

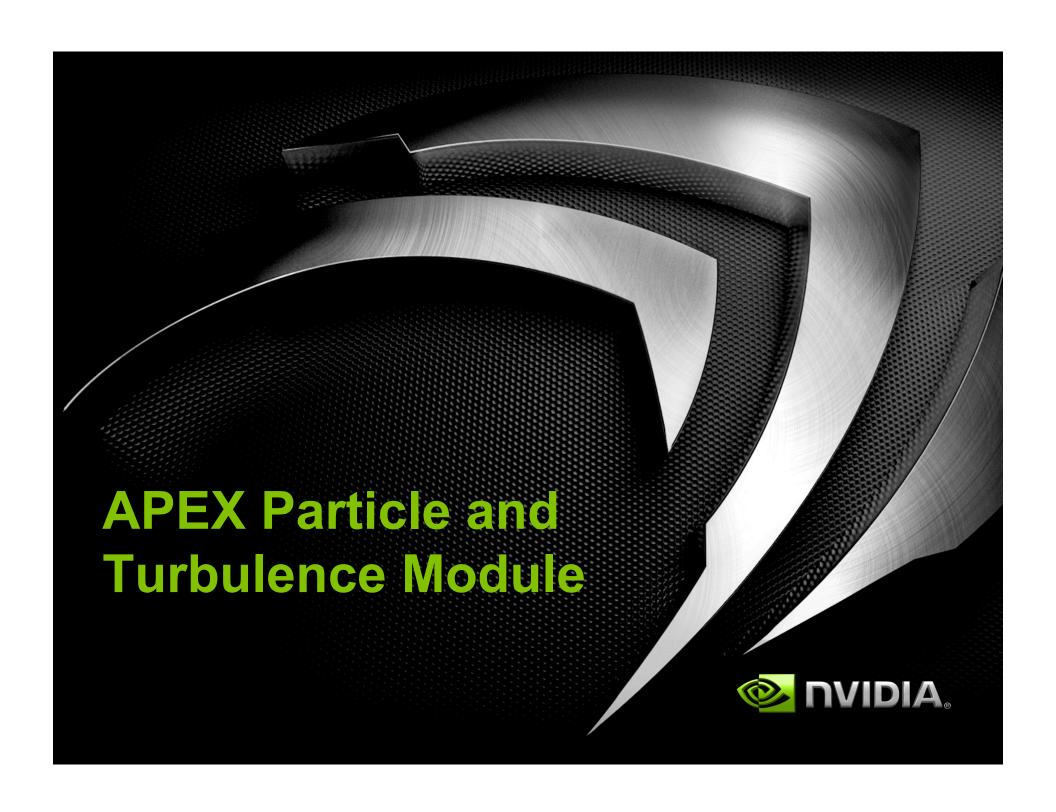




#### **APEX Vegetation – Sample Applications**







## **Particle Game Examples**







Terminator Salvation - PhysX

# **APEX Turbulence**





#### **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 tonight for the Beta program
  - Email us: devrel@nvidia.com

# **Backup Slides**



#### **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

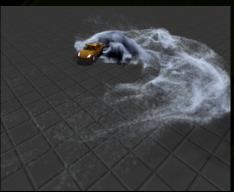


#### **APEX Turbulence**



- 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





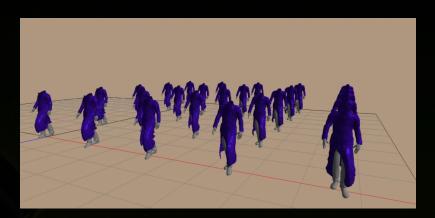


#### **Scalability**



Number of physically simulated characters





Number of simulated verts





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







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



#### **Massive Amounts of Rigid Bodies**



www.fraps.com Particle based rigid body sample