中国游戏开发者大会

CHINA GAME DEVELOPERS CONFERENCE

CLOUD GAMING AND NVIDIA GRID™

Agatha Hu, GRID DevTech Engineer

AGENDA

- Why Cloud Gaming
- Cloud Gaming Architecture
- Register and use AWS
- Onboard Games Onto GRID
- GRID Link SDK

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CLOUD GPUs FOR 6 MARKETS

Cloud Gaming (GRID)

Application Streaming (GRID SDK)

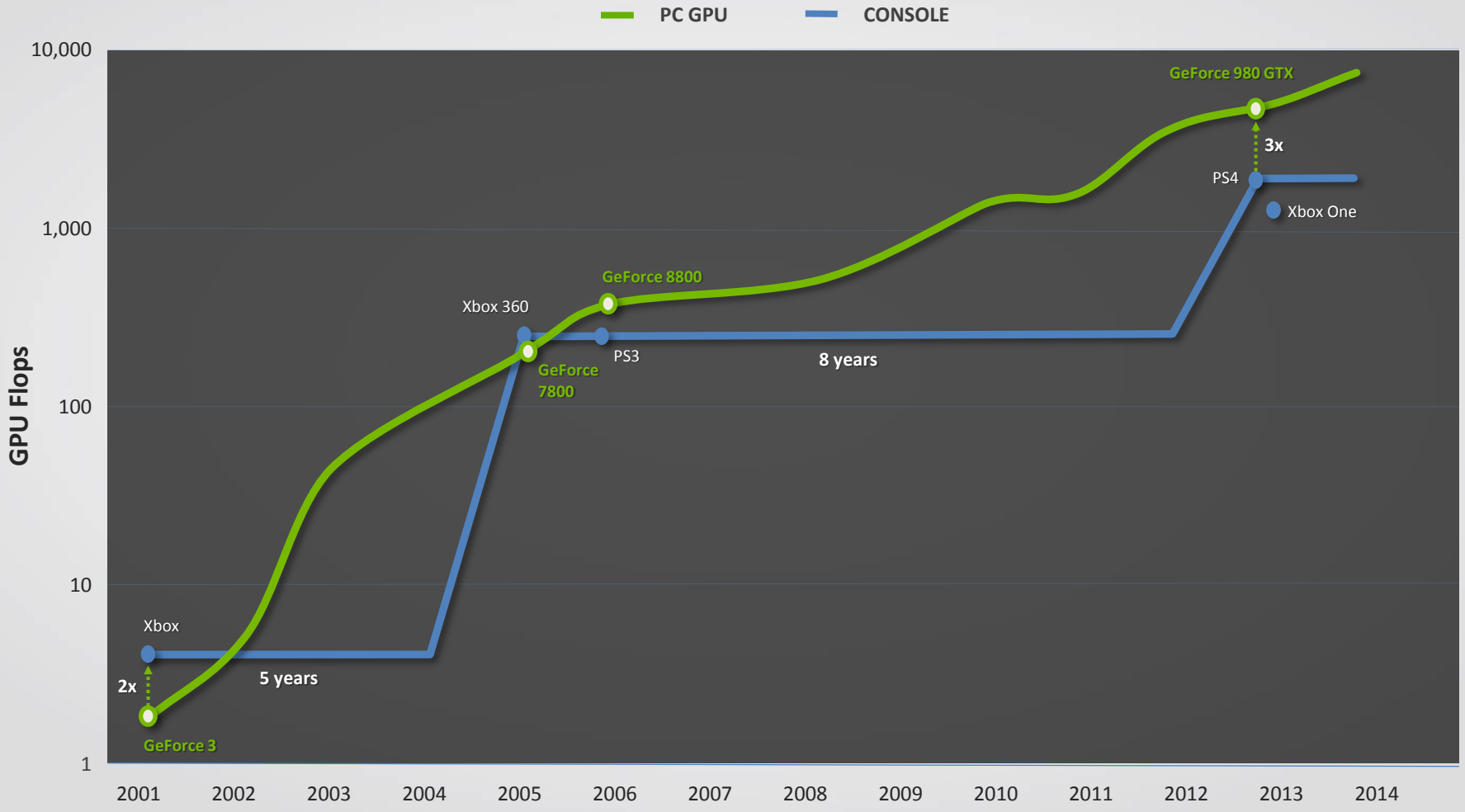
Realtime Encode (NVENC SDK)

Accelerated Virtual Desktops (vGPU)

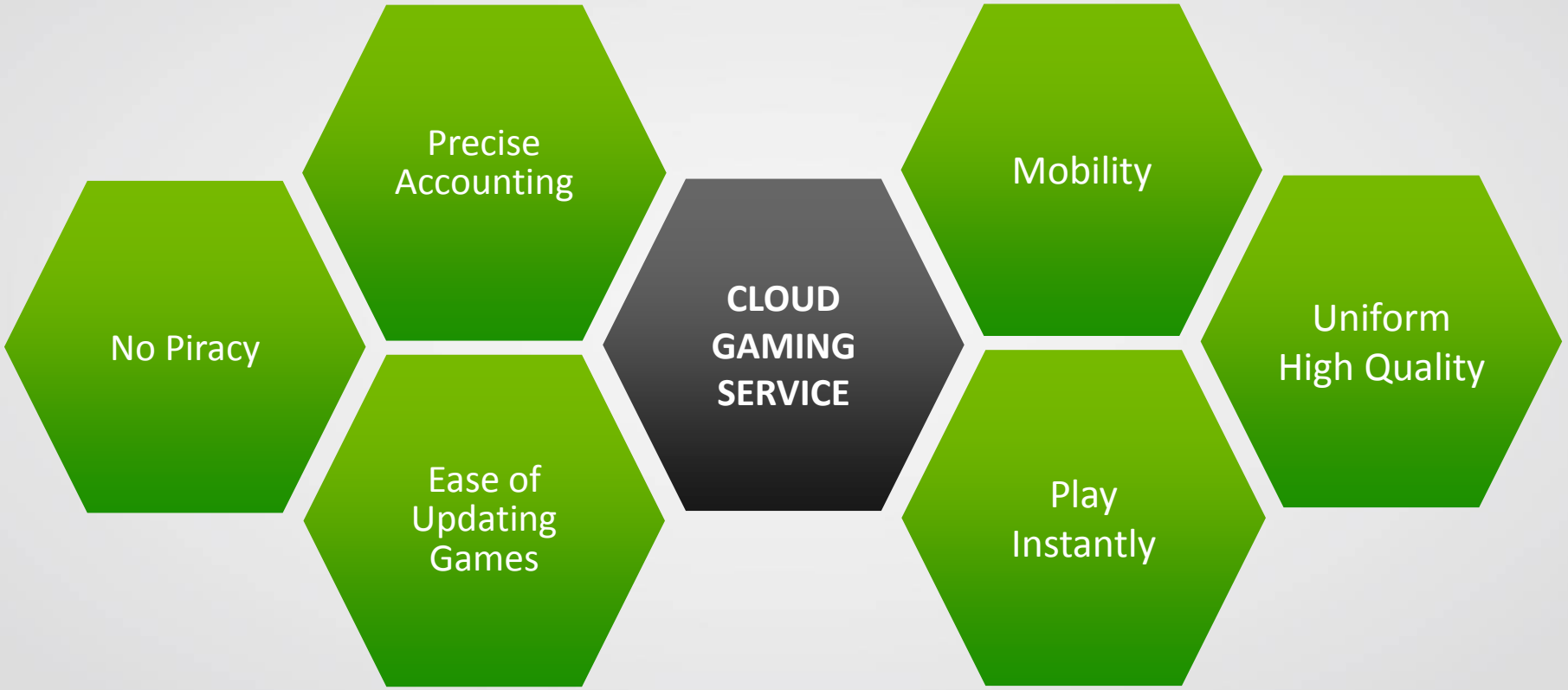
Remote Workstations (Quadro)

High Performance Computing (TESLA)

PC GPU vs CONSOLES



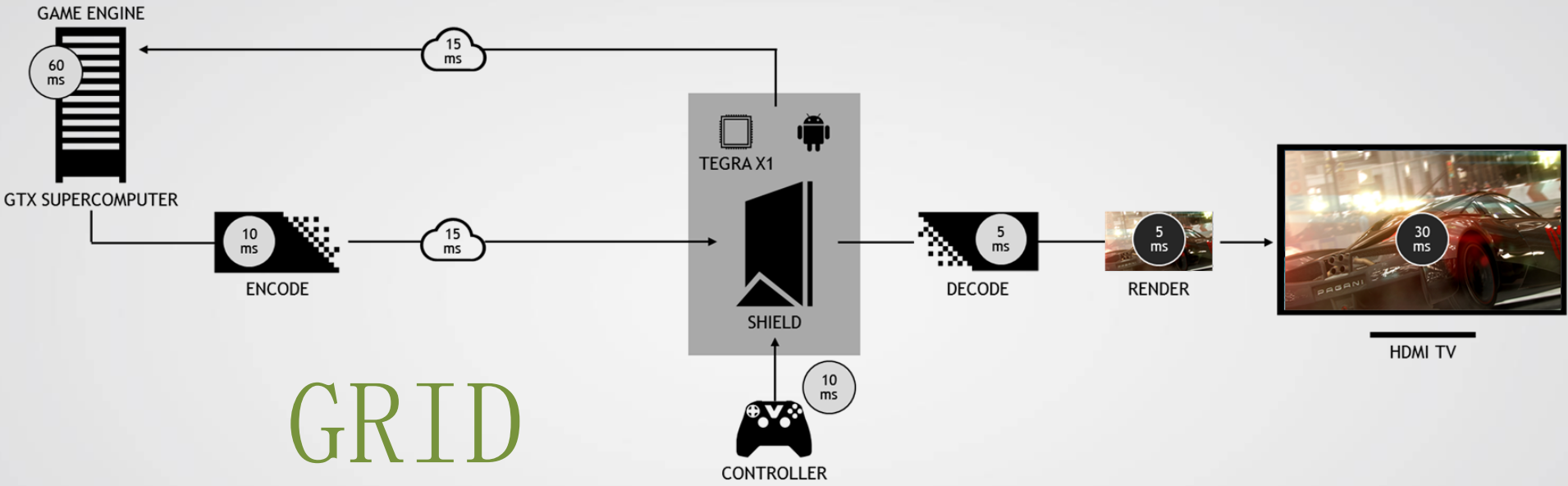
CLOUD GAMING ADVANTAGES



NVIDIA GRID GAME-STREAMING SERVICE

1080p 60 fps • Play in a Minute • AAA titles

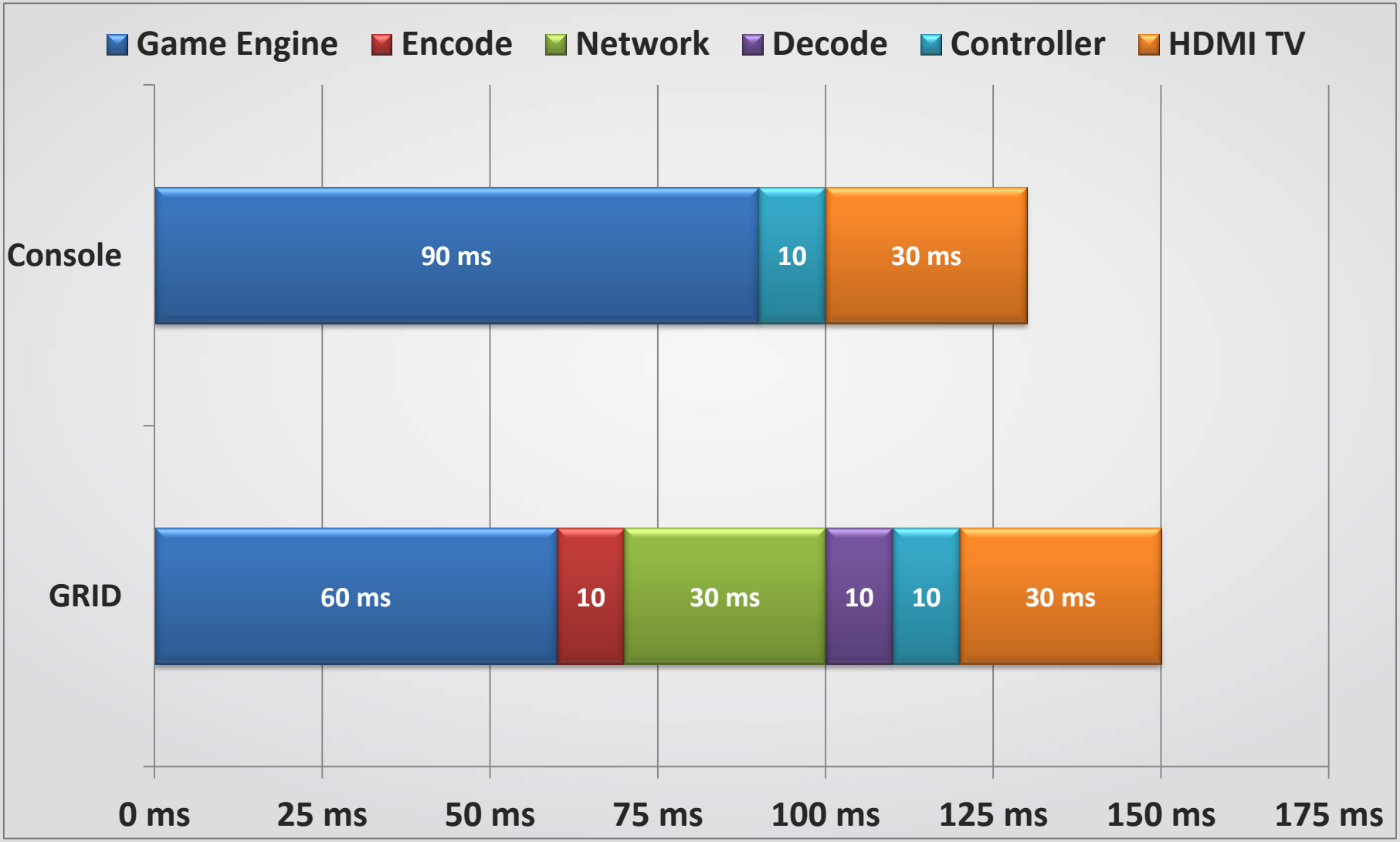
GAME STREAMING ARCHITECTURE



GRID

"HALF THE BLINK OF AN EYE"

Game Input Latency



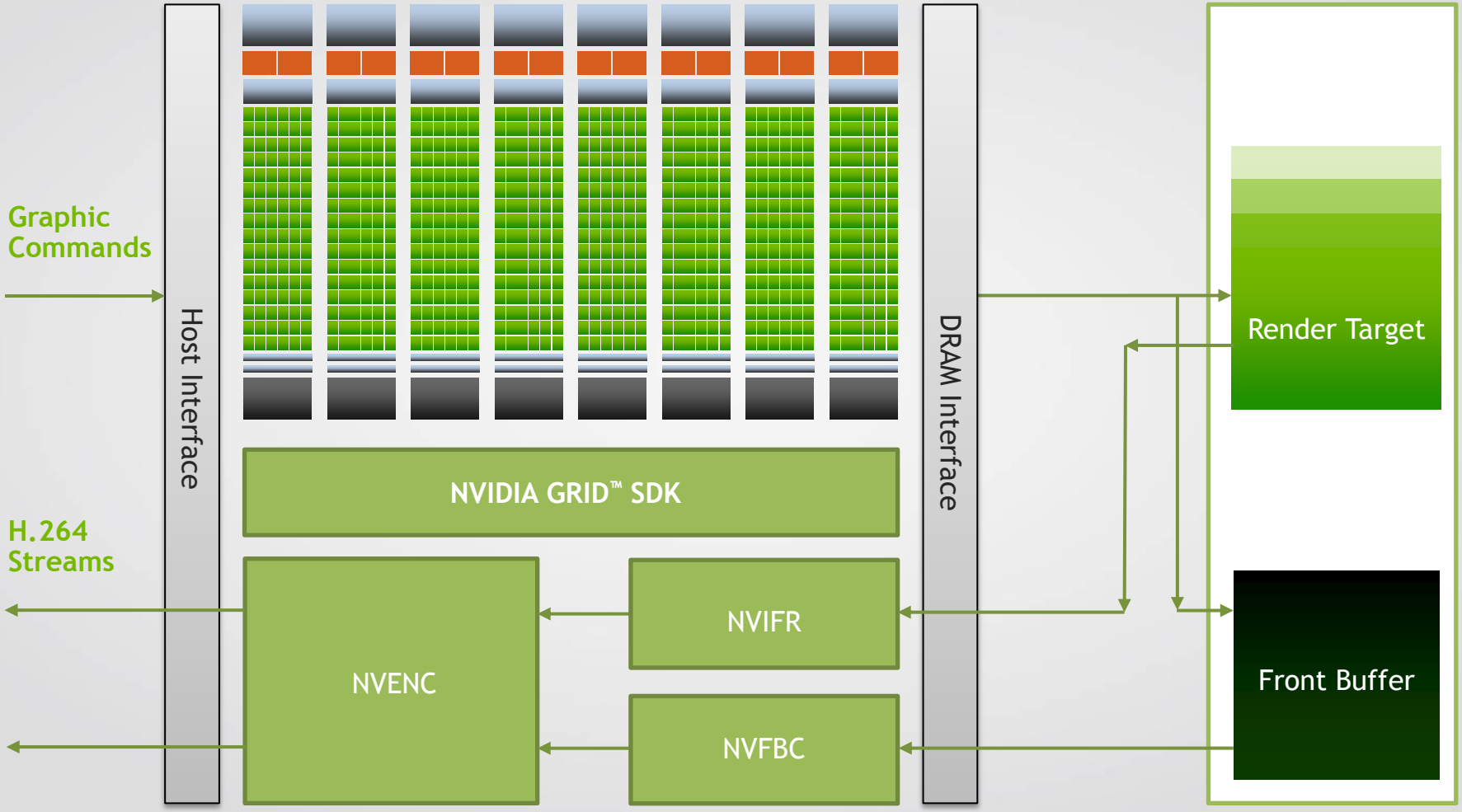
GRID CONTENT

GRID API SUPPORT

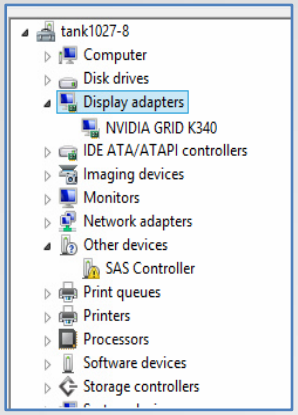
Supported APIs

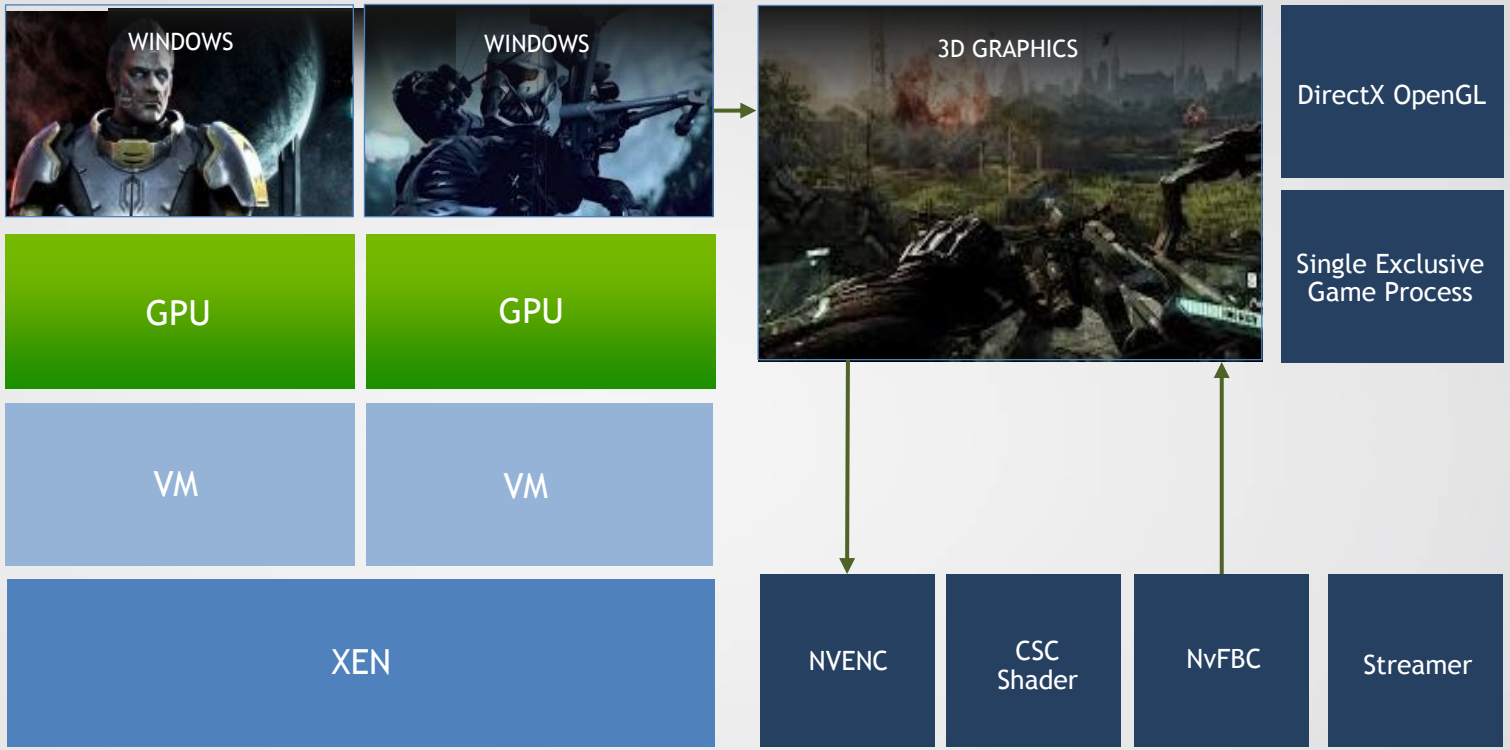
- DirectX
- OpenGL
- PhysX (CUDA)

CAPTURE AND ENCODE



VIRTUALIZED ENVIRONMENT





One Game Stream Per VM Per GPU
One VM Instance Connects to One GPU

KEPLER VS MAXWELL

Key Cloud Metrics

	Kepler GK104	Maxwell GM204	Speed Up
GPU Specs	1536 Cores 800 Mhz	2048 Cores 1100 Mhz	
TFLOPS	2.4	4.8	2X
Texture Fillrate (GT/s)	102	151	1.5X
Video Memory	4GB	8GB	2X
1080p@30fps H.264 streams	8	32	4x

WHERE TO FIND GRID?

NVIDIA

Dedicated Capacity

- Data centers located around the world
- Choose the data center closer to user to cut down on latency

GRID Hardware Available On Amazon Web Services

- Scale on Demand and Flexible to configure
- No initial investment in hardware – Rent what you need
- Lots of Bandwidth from Servers to the Internet Backbone

powered by amazon web services™

Windows Server 2012

Windows Server 2008 R2

ubuntu

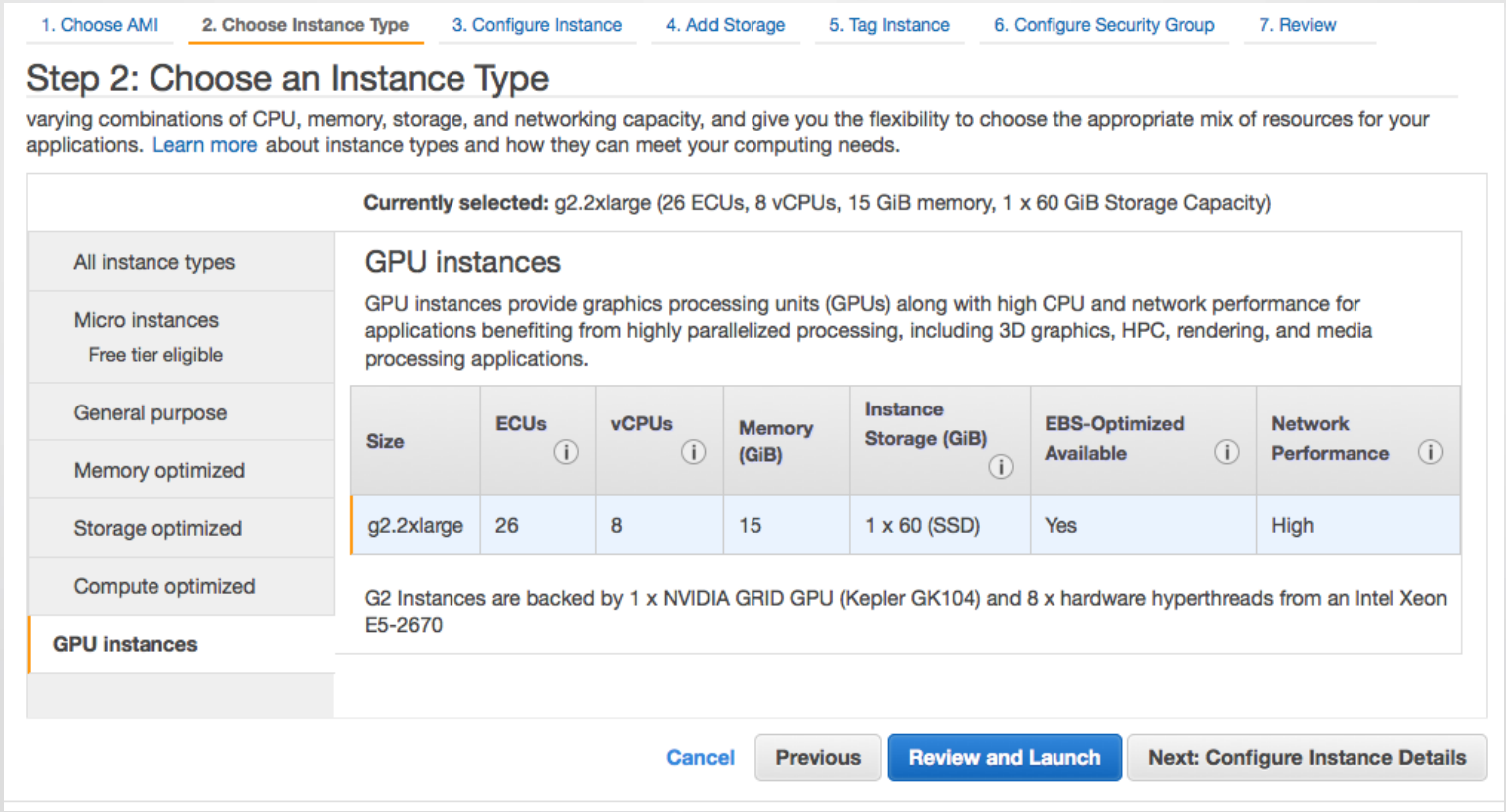
CentOS

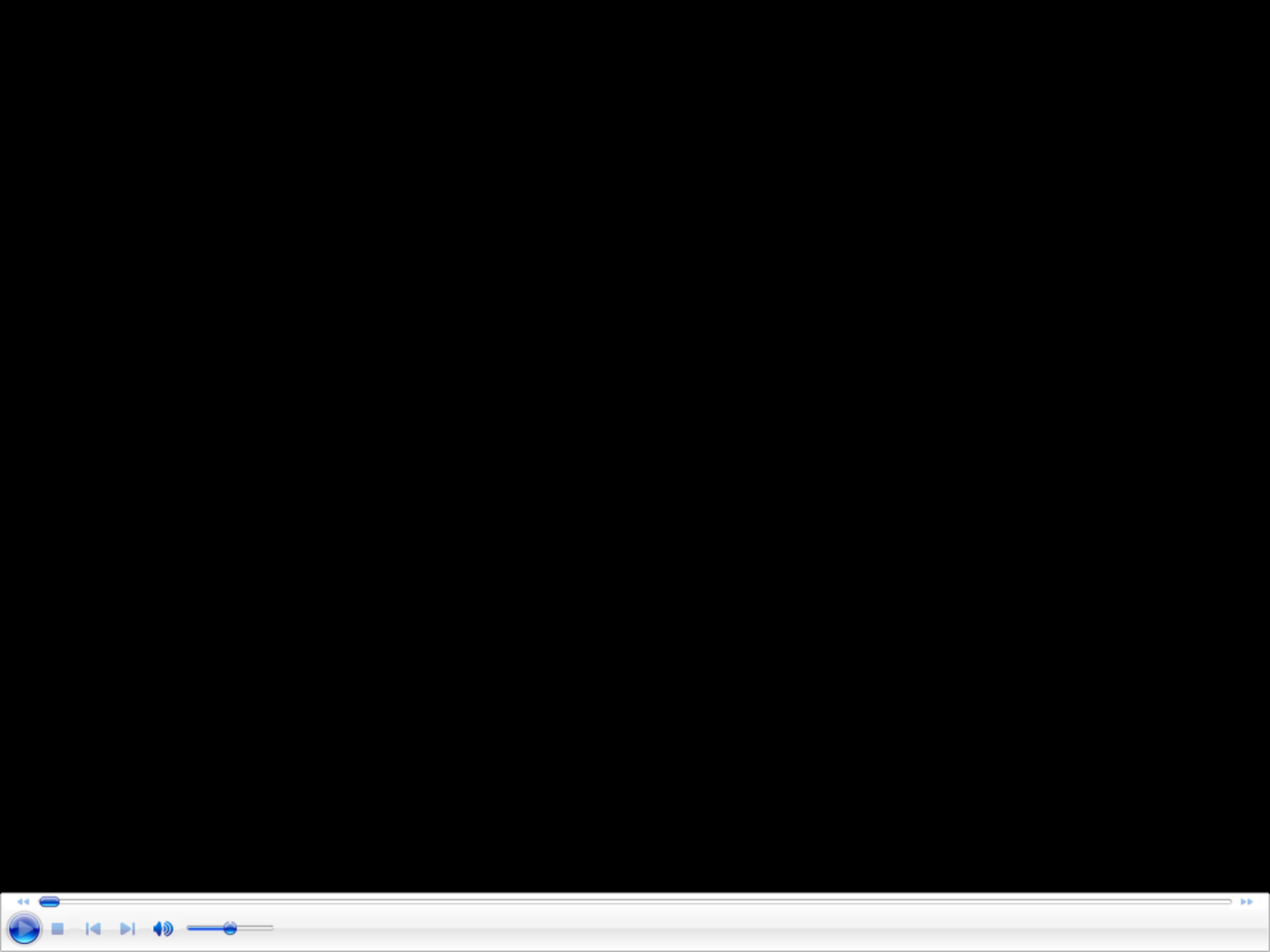
Register and Use AWS

- Register an AWS account (http://aws.amazon.com)

Register and Use AWS

- Choose GPU Instance from EC2 control panel (g2.2xlarge)
- Configure and run the Instance





ONBOARD GAMES ONTO NVIDIA GRID™

Prepare for Game Streaming

- NVIDIA GRID™ Service connected to SHIELD Devices
- Work with us to get your Game on GRID

GAMEPAD SUPPORT!

Add GAMEPAD Controller Support

- Crucial for a good gaming experience on GRID™

Use XINPUT API

- Preferred for Universal Controller Support
- Easily Implemented for
  - Desktops (Windows, Linux, OSX)
  - Consoles (Xbox 360/One, PS3/PS4)
  - Mobile (Android & IOS)

Refer to the **NvGamepad** Library

- API Layer for GamePad support for Windows and Android Games
- http://developer.nvidia.com/cross-platform-gamepad-api

CONFIGURABLE GAME SETTINGS

- Developer: Game's settings must be configurable
  - Use game config files that are modified externally (by GRID)
  - Do not encrypt config files
    - Makes onboarding difficult or not possible
    - Optionally have the video settings reside in a separate config file
- NVIDIA: Game Onboarding process for GRID
  - Tested with different game settings
  - Settings are optimized for GRID
    - Visual Quality (HQ) and Frame rate (30fps & 60fps)
    - Streaming settings (H.264)

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VIDEO SETTINGS ON GRID™

- Target these Screen Sizes and Resolutions
  - Shield screen sizes: 5” to 8” LCD screens
  - Large screen sizes: 32” to 85” TVs
  - Screen resolutions: 720p and 1080p
  - Scale User Interface Elements and Text accordingly

- Add support for HQ Video Settings
  - High resolution textures = images less blurry and stretched
  - Anti-aliasing (TXAA) + more 3D geometry
    - Better H.264 quality (high PSNR & lower bitrate)
  - More Particle Effects
    - Add more emitters, patterns for larger screen
    - Calibrate colors in your game for TVs

VIDEO SETTINGS ON GRID™

- Follow Multiple Screen Size recommendations
  - Screen Sizes Range from 5-8 Inches to 40-65 Ft + Large Screens
  - User Interface Elements and Text Font Sizes Must be Scaled Accordingly
  - Support 16:9 Aspect Ratio = Landscape Orientation
  - Support Overscan = TVs Loose Some Rendered Space Along the Edges

- Refer to These Guides
  - https://developer.nvidia.com/android-tv-developer-guide
  - http://developer.android.com/guide/practices/screens_support.html

OPTIMIZING YOUR GAME FOR GRID™

- Game launch suggestions
  - Games need to be directly launchable (without Game Launcher)
  - Allow pre-game screens & video startups to be skipped by Gamepad buttons

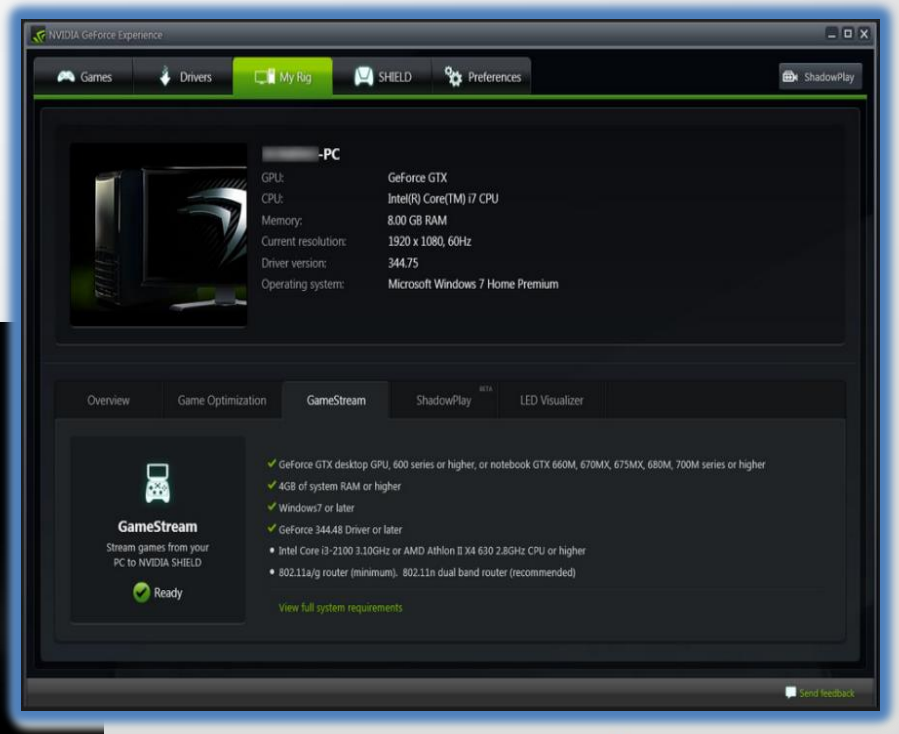
- Some Game Menu options should be hidden
  - Shield X sets the game settings before launch
  - Settings should be hidden from user when running on GRID
  - Hide UI settings for Video, audio, and performance
  - Integrate directly with the GRID Link SDK

HANDLING TEXT INPUT

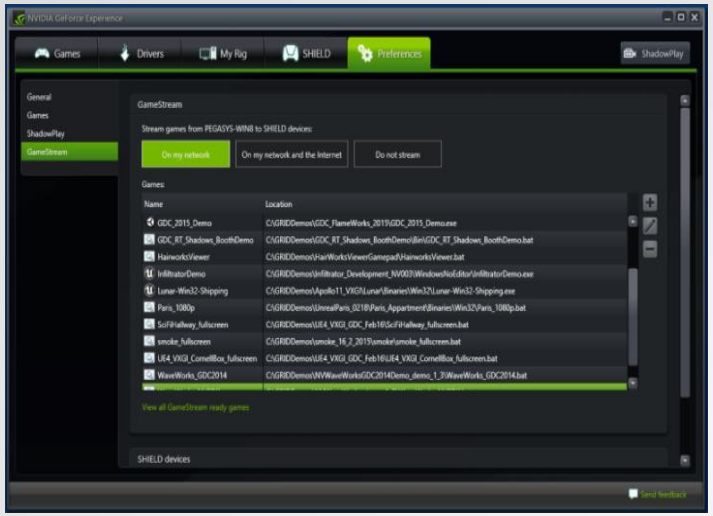
- Text Input
  - If your game has an in-game On Screen (OSC) Keyboard
  - You are GamePad and ready for NVIDIA GRID
- Alternatively refer to GRID Link SDK
  - Text input through a Dialog?
  - A non-native OSC Keyboard = Bad experience for GamePad users
  - Integrate with GRID Link SDK for a better experience
- ALL the Menus & Dialogs Need to be Navigable by Gamepad
  - UI Components should be properly highlighted and resized for visibility
  - UI Elements should be clearly actionable when Selected
  - Do not use Touch Screen controls

VALIDATE WITH GAMESTREAM

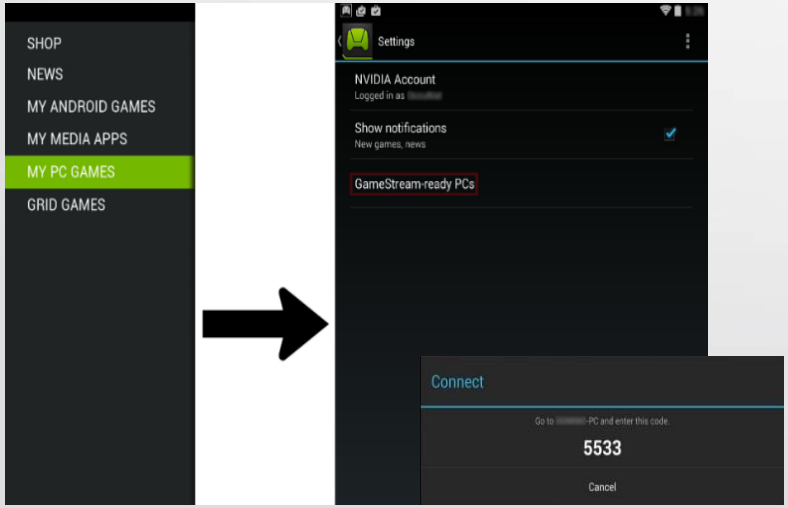
- Test GameStream using a Shield & NVIDIA GPU
  - Windows 7 or 8 PC with NVIDIA GTX 650 or higher
  - Latest NVIDIA GeForce drivers.
  - WiFi Router: 802.11a/g, 802.11n, 802.11ac dual band recommended.
    - 5Ghz wireless recommended
  - A Shield device



VALIDATE WITH GAMESTREAM



- On Your PC, by Windows System
- Open NVIDIA GeForce Experience
- Choose Preference -> GameStream
- Click + to “Add Your Game”



- On Your Shield Launch Shield HUB
- My PC Games -> Settings -> GameStream Ready PCs
- Enter the IP Address of Your PC
- Shield Shows a 4 Digit Code
- Enter on Your PC

NVIDIA GRID™ LINK SDK

- What is it?
  - A C/C++ Library that can be linked into your game to allow integration with the NVIDIA GRID™ Cloud Gaming Platform
- What does it do?
  - Allows us to work with game developers to solve some cloud gaming challenges
- Why do this?
  - Better user experience when playing streaming games
  - Reduced barriers to entry – Higher convergence rates for developers

API MODULES

NVIDIA GRID™ LINK API MODULES

PROGRAM CONTROL

Pause Game
Trigger Game Save
Exit Game

USER DATA

Cloud Save and Restore
of Saved Games and Preferences

GAME SETTINGS

Localization
Disable User Changes
Optimize Graphics Settings

USER INTERFACE

Native Text Entry

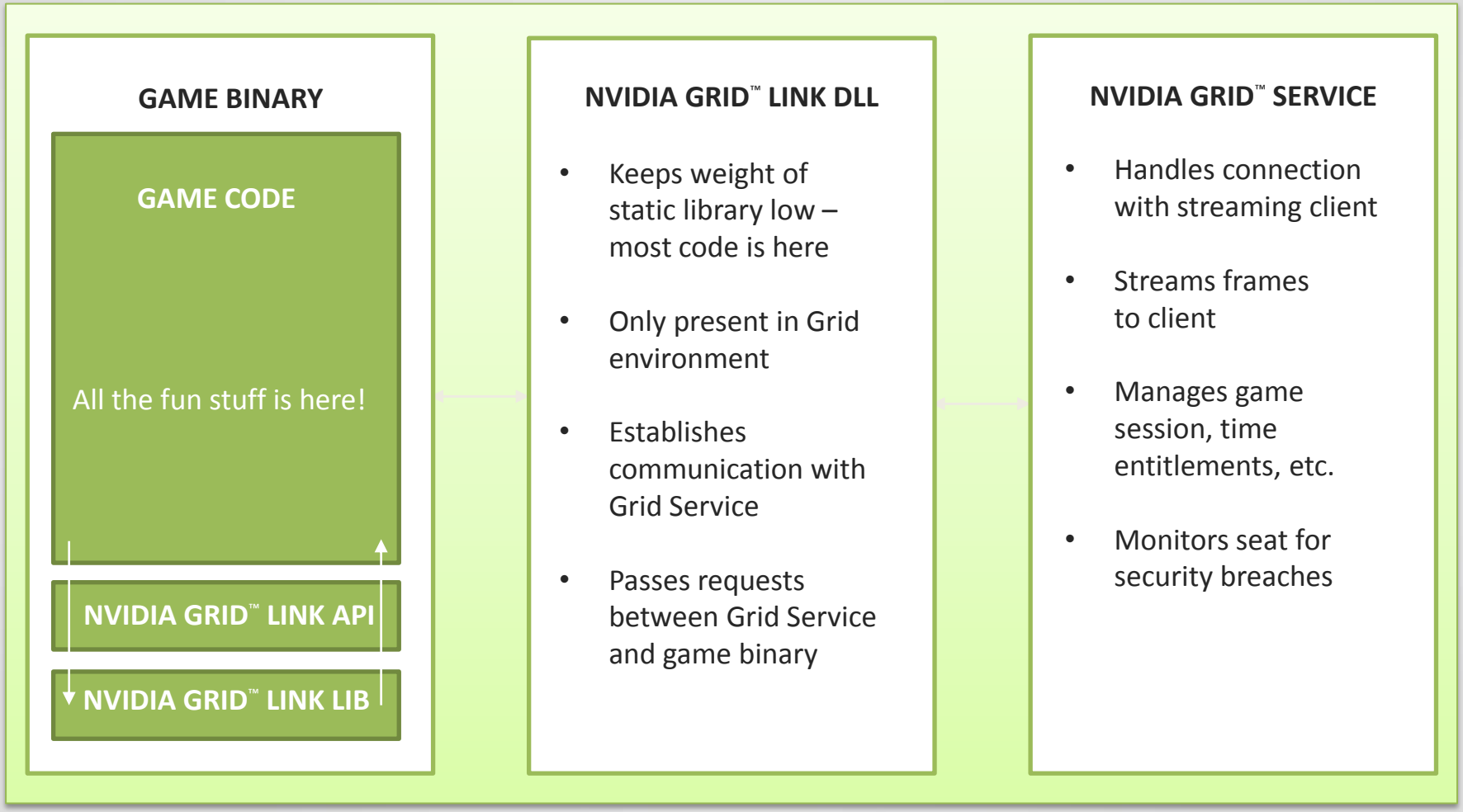
PATCH CONTROL

Check for Required Patches
Keep Game Patched to Newest Version

USER ACCOUNT CONTROL

Account Federation for Seamless
Game Login and Sign Up

ARCHITECTURE OVERVIEW



FRAMEWORK AND STANDARDS

- C/C++ API provided
- Windows only
- Initialized at game startup, shutdown at exit
- ALL methods are safe to call in ALL cases
  - Outside of NVIDIA GRID™ environment API calls are all simply No-ops
- Most API methods return integer results
  - Zero means success, error otherwise
- All developer implemented methods return Success/Fail or not implemented
  - Developer can implement methods incrementally, or not at all if not desired or needed

GENERAL FUNCTIONALITY

- InitializeGRIDLinkSDK()
  - Called once at application start
- ShutdownGRIDLinkSDK()
  - Called once at application exit
- bool IsGRIDEnabled()
  - Returns true if running in NVIDIA GRID™ environment
  - Allows application to make NVIDIA GRID™ streaming behavior modifications if desired

PROGRAM CONTROL

- RequestApplicationPause()
  - Sent if a user pages out of the NVIDIA GRID™ client on client machine or disconnects from the NVIDIA GRID™ session
  - Implemented as a pause for single player games, game specific for multi-player
- RequestApplicationSave()
  - Sent if a NVIDIA GRID™ session is ending for any reason
  - Gives application a chance to save data before exit – generally as an autosave
- RequestApplicationExit()
  - Sent when a NVIDIA GRID™ session ends
  - Gives application a chance to clean up and exit gracefully – task kill otherwise

GAME SETTINGS

- LockUserOptions(UserOptions uoOptions)
  - Tells application to lock certain user options
  - Options will be set optimally for the host VM by NVIDIA's onboarding process
- SetLocale(const char* pchLanguageCode)
  - Informs application of user's language - country preferences

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PATCH CONTROL

- IsUpdateRequired(bool* pbUpdateRequired)
  - Query made by NVIDIA GRID™ service at application start
  - Should return true if application is not usable at current version

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USER DATA

- const Char* GetStorageLocation()
  - Provides the application with a directory path that save games and user preferences
  - Previous saved files will be retrieved and placed here prior to application start

- NotifyFilesUpdated()
  - Notifies the NVIDIA GRID™ Service that the game has completed saving or updating some files
  - Will be done at end of session – this allows on demand updates

USER INTERFACE

- RequestKeyboardOverlayOpen(GridScreenPosition position)
  - Pops up a native text input keyboard for easy text entry on any device
- RequestKeyboardOverlayClose()
  - Closes native text input keyboard

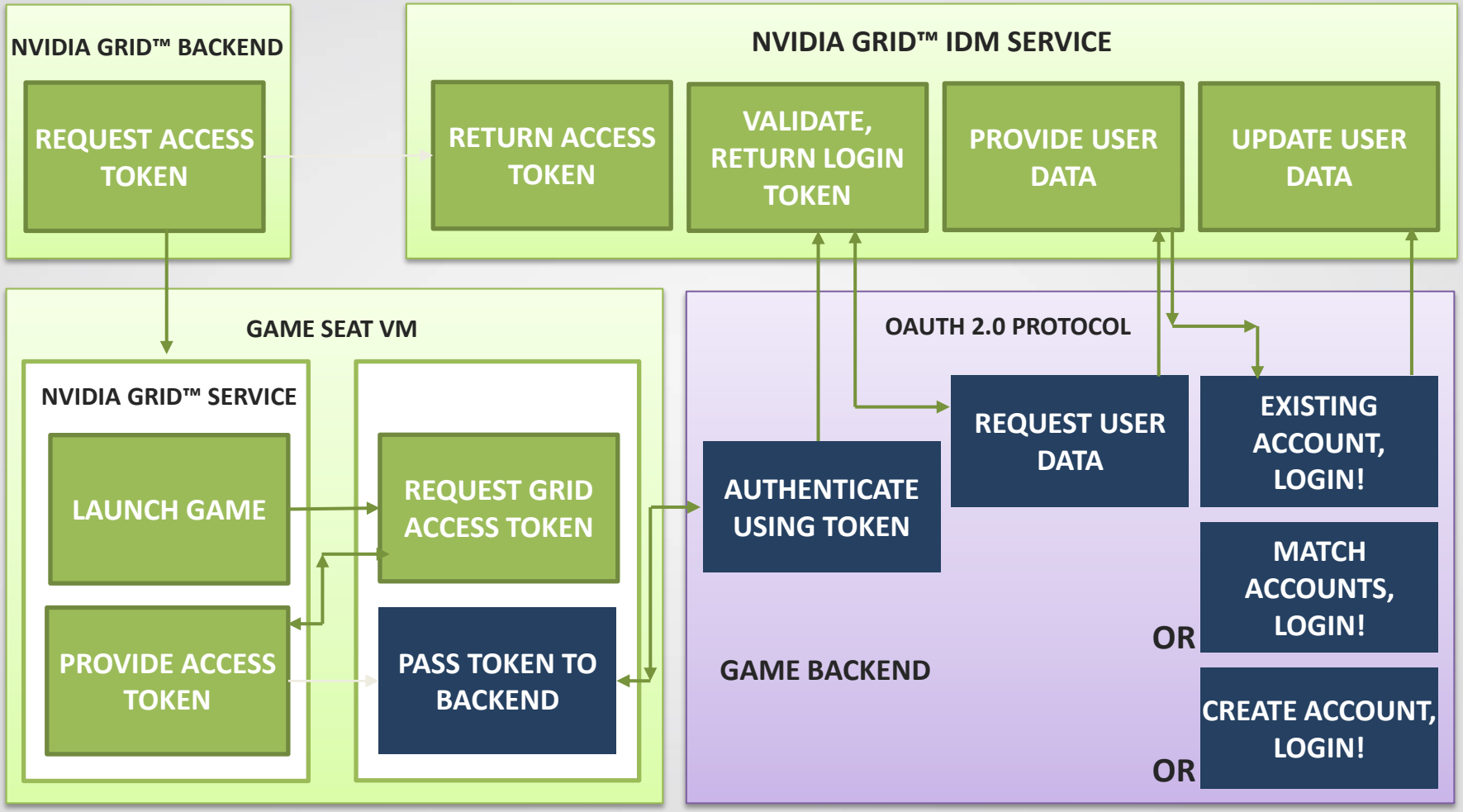
USER ACCOUNT CONTROL

bool RequestGRIDAccessToken(byte** token)

- Obtains a NVIDIA GRID™ access token that can be used by application backend in order to authenticate a user without additional credential entry or account sign up

- Returns true on success, false otherwise. False is only expected in cases where GRID does not have an account federation agreement with the application developer, or if outside of GRID environment

AUTHENTICATION FLOW



TESTING AND DEBUGGING

- NVIDIA GRID™ environment can be simulated and tested through use of a test dll
  - Developer can test all methods locally on their development machine

- Automated Test Application Provided
  - Calls developer implemented methods to test and verify implementation

RESOURCES

- Signup for GameWorks!
  - https://developer.nvidia.com/gameworks-registered-developer-program
- NVGamePad Library
  - http://developer.nvidia.com/cross-platform-gamepad-api
- Contact:
  - GRID-developer-support@nvidia.com
- GRID Link Library:
  - GridLinkSDK-info@exchange.nvidia.com

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LET US SHARE