NEO Overview

PlayStation

Basic Information

What is NEO?

- NEO is a **high-end version** of the PlayStation®4 console.
- NEO and “original PlayStation®4” will coexist in the marketplace.
  - Same application package
  - Same online community
  - Same store
  - Same system software user experience
- All PlayStation®4 titles released October 2016 or later should support both the original PlayStation®4 system and the NEO system.

New titles play even better on NEO

- 4K display support for UHDTV owners
- Many games will have additional improvements for HDTV owners:
  - Higher framerate
  - More stable framerate
  - Improved graphics fidelity
  - Additional graphics features
  - Etc.

Legacy titles play better too

- "Forward compatibility" done by means of patch
  - Developer/Publisher decision to patch legacy titles - no SCE mandate.
  - Existing titles will run unmodified on NEO systems.
  - Applying the patch enables you to implement native support for NEO features.

NEO Hardware Spec

- CPU: **Uses same "Jaguar" cores** as the original PlayStation®4, at higher frequency
  - Original PS4: 8 cores at 1.6 GHz
  - NEO: 8 cores at 2.1 GHz (**1.3x faster**)
- GPU: **Uses improved version** of **AMD GCN CUs**, more CUs/at higher frequency
  - Original PS4: 18 CUs at 800 MHz
  - NEO: 36 CUs at 911 MHz (**2.3x FLOPs**)
- Memory: **Uses same 8 GB GDDR5** as the original PlayStation®4, at higher bandwidth
  - Original PS4: 176 GB/s
  - NEO: 218 GB/s (**1.24x**)
- HDD: Same as original PlayStation®4

Budget between Game and System

- CPU/GPU Resources: Same per cent as original PlayStation®4
  - CPU: 6.5 cores in 7-core mode.
  - GPU:
    - 0.5 mS for foreground execution
    - 50% for background execution
- Memory Budget for Game
  - Game Budget: + 512 MiB Direct Memory = 5.5GiB (total)
  - Only available for NEO Mode
- Extended Features
  - Some extension of other features might be added, such as 1080p recording (TBD)

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Next steps…

Agenda

- Roadmap
- NEO Game Title Specification
- Upcoming Events

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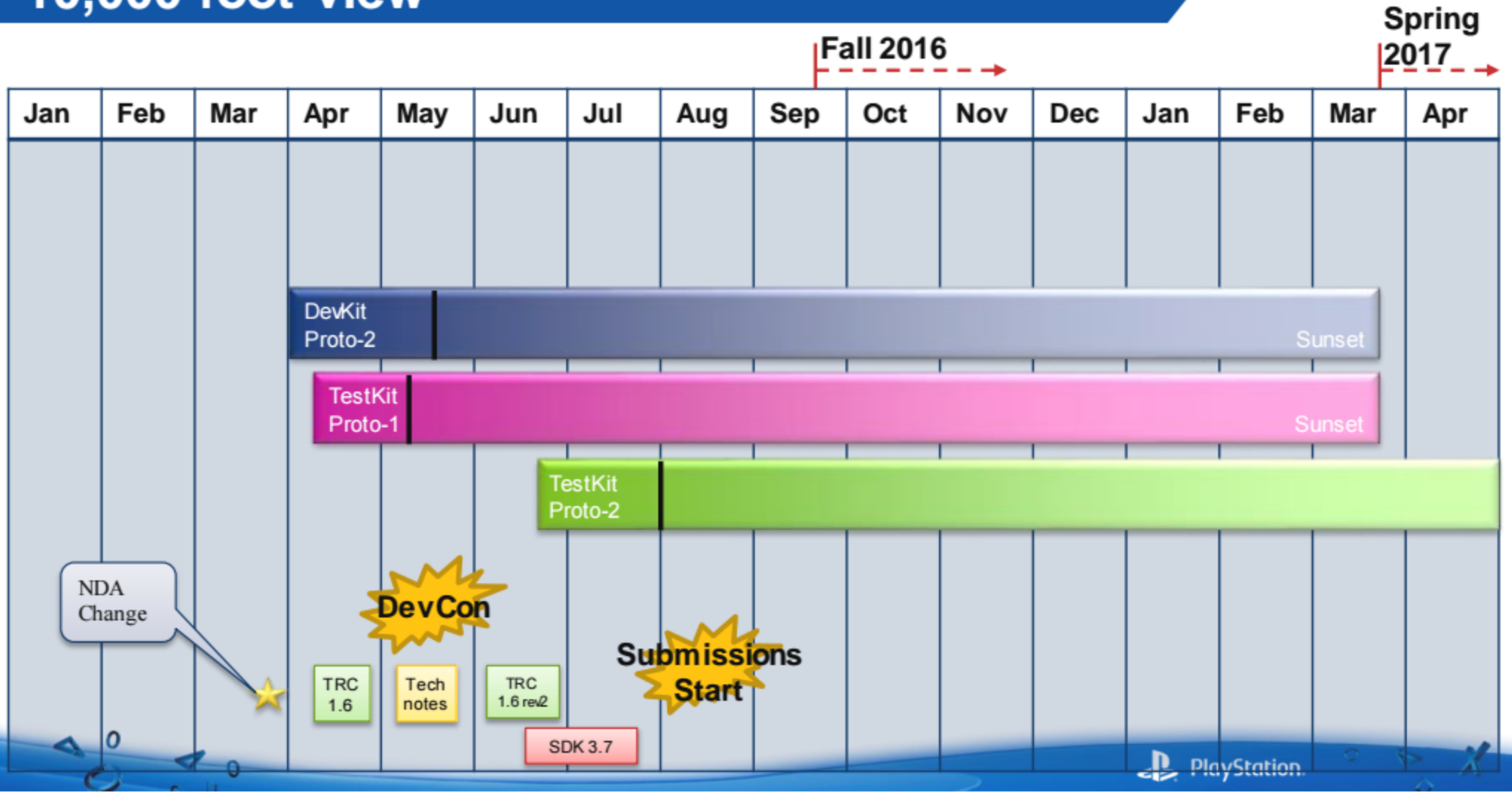
Roadmap

Disclaimer

- All dates and timelines in this presentation are tentative and subject to change

- Consider all dates as internal targets, our best guess, not promises

10,000 foot view



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Roadmap

HARDWARE

DevKit: Proto 2 - Details

- Available early-April to mid-May 2016
- Significantly increased availability
- Support sunset: Spring 2017
- Acceptable for production usage
  - Final spec
- Model number
  - DUT-DBWxxxK-Nx
  - DUT-DBWxxxK-Rx

TestKit: Proto 1 - Details

- Available mid-April to early-May 2016
  - Not coming to SCEE territory
- Support sunset: March 2017
- Suitable for submission testing
- Not final chassis
  - Do not show publicly
- Model number
  - DUT-TVAHxxxK-Gx

TestKit: Proto 2 - Details

- Available late-June to late-July 2016
- World-wide availability in large quantities
- Support sunset: March 2017 (TBD)
- Suitable for submission testing
  - Final Spec
- Not final chassis
  - Do not show publicly
- Model number
  - DUT-TVAHxxxK-Kx

Prototype Hardware Returns

- To begin at the start of 2017
- Mass-produced units will be available prior to prototype returns, but release timing is still TBD

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Roadmap

TRC

TRC 1.6

- Scheduled for end-of-April 2016 release
- No NEO TRC items will be included in this release
  - TRC items for NEO will be available with revised TRC (TRC 1.6 revision 2) at a later date

TRC 1.6 revision 2

- Preliminary information released in May 2016
  - We'd like to discuss with individuals at DevCon
  - Or you can open a private DevNet ticket to discuss
- Final TRC 1.6 revision 2 will be released around June 2016, but subject to change

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Roadmap

Submission Preparation and Testing Requirements

Software requirements

- SDK:
  - 3.50 + NEO submission patch
    - Patch to be released with System Software 3.70 (~July 2016)
- System Software 3.70 or later
- Publishing Tool released with System Software 3.70

Hardware requirements

- NEO DevKit (DUT-DB series) Proto-2
- Developer QA & FQA Environment:
  - NEO Mode: NEO TestKit (DUT-TVAH series) proto-1/proto-2
  - Base Mode: Base PS4 Testkit (DUH-T1xxx series)

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NEO Support Submission

Patching Titles

Submission Requirements – Patching title

- Depending on the submission date of the title, use one of the following:
  1. TRC 1.6 (early-April) + technotes for NEO submission requirements
  2. TRC 1.7 (TRC 1.7 will not be ready for early submission)

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NEO Support Submission

New Release Titles

2016 Holiday title NEO Support

- NEO submissions begin mid-August 2016!
- The process of including NEO support in the submission process will depend on the street date of the title …

NEO Support by Street Date

- Late-September Titles
  - PS4-only submission with NEO Day-1 patch
- Early-October Titles
  - NEO/PS4 submission only
    - It is OK to release NEO-ready titles before NEO launches

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NEO Game Title Specification

Execution Mode and Game Package

Execution Mode on Original PS4/NEO

- Base Mode
  - Mode when title runs on original PlayStation®4 system
  - Mode when title without NEO support runs on NEO system (backward-compatibility mode)
  - All specs that affect title behavior are same as the original PlayStation®4 system
- NEO Mode
  - Mode when title with NEO support runs on NEO system
  - Extended features (higher clock, more SEs, new GPU instructions) are enabled

Single package for Original/NEO Systems

- PS4 SDK supports both original PlayStation®4 system and NEO system
- CPU Binary can run on both systems
  - `/app0/eboot.bin` in the package must be shared for Base Mode and NEO Mode
    - Sharing other CPU binaries is game developer's choice.
  - `sceKernelIsNeoMode()` reports whether title is running NEO mode (so you can change the behavior of the title.)

Single package for Original/NEO systems

- Patch package also must be single.
  - When title supports NEO Mode, later patches must support NEO Mode and Base Mode.
- Save Data must be common for Base Mode and NEO Mode. (No NEO-Mode-only save data.)
  - Save data can be moved between original PlayStation®4 systems and NEO systems
- DLCs must be available for both modes

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NEO Game Title Specification

Display Buffer Resolution

We Heard You!

- We have been discussing with several developers about NEO game development and TRC proposal. Thank you for the feedback regarding the TRC proposal!
- Based on this feedback, and the experiences of a number of developers in supporting NEO, the SDK and overall guidance have been revised as outlined in the next few slides

NEO Support with SDK 350

- One strategy for NEO game development is to detect the resolution of the connected TV, and
  - Prepare a 1920x1080 display buffer when an HDTV is connected
  - Prepare a 3840x2160 display buffer, usually using an efficient rendering technique such as “checkerboard rendering,” when a 4K TV is connected
  - Ensure that the NEO frame rate meets or exceeds the frame rate of the game on the original PlayStation®4
- SDK 3.500 is designed with this strategy in mind
- We will support other strategies as well; the next few pages describe a few of them. *However, we understand that you know your game best and we are happy to engage in conversations about strategies that work for the game but still deliver a great NEO experience for the player.*

Lower resolution strategies

- Some developers have reported that in order to keep the frame rate of the NEO version above that of the original PlayStation®4, the resolution of the display buffer must be reduced.
- In “debug mode,” display buffer resolutions of 3680x2070, 3520x1980, 3360x1890 and 3200x1800 are also supported. You can use one of these, or use an MRT resolution of your choice (e.g. 3200x2160) and scale the final image to one of the supported resolutions. Future SDKs will officially support a broad variety of resolutions.
- To recap, with this strategy, the title might
  - Prepare a 1920x1080 display buffer when an HDTV is connected.
  - Prepare a 3520x1980 display buffer when a 4K TV is connected; NEO will then upscale the image in hardware before outputting to the TV.
  - As with all strategies, it is important to ensure that the NEO frame rate meets or exceeds the frame rate of the game on the original PlayStation®4.

Single mode strategies

- Some developers would like to have one mode of NEO support rather than two.
- Though work is just beginning in this area, some developers are reporting success in creating just a single resolution (e.g. 3520x1980) and scaling it down to 1920x1080 for output to HDTVs
- Though SDK 3.500 does not support this type of downscaling, future SDKs will allow it. For SDK 3.500, you will need to scale down the display buffer in your game engine.
- To recap, with this strategy, the title might
  - Prepare a 3840x2160 (or other) display buffer
  - When connected to an HDTV, scale the image to 1080p before outputting (though future SDKs will accept the image without scaling)
  - When connected to a 4K TV, output the image as normal

Lower resolutions

- Our experience is that using lower resolutions for 4K TV support (such as 1440p) does not create much differentiation from 1080p on an HDTV.
- Our hope is that titles will use checkerboard rendering (and similar techniques) to allow for resolutions much closer to 2160p.
- We are currently researching lower-cost techniques for increasing resolution (such as the geometry rendering described in the original disclosure meetings.) If you are having difficulties achieving resolutions above 1800p, please do contact your regional Developer Technology Group so we can share our latest learnings.

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Upcoming Events

- NEO content will be at upcoming events
  - Post mortems, best practices, round tables

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Appendix

FAQs

Submission Requirements – Patching title

1. If your title was released prior to SDK 3.500…
   - Upgrade to 3.500
   - You'll be granted a TRC waiver for R4083
2. Apply SDK 3.50 NEO submission patch and build CPU/GPU binaries
3. Test with System Software 3.70 or later