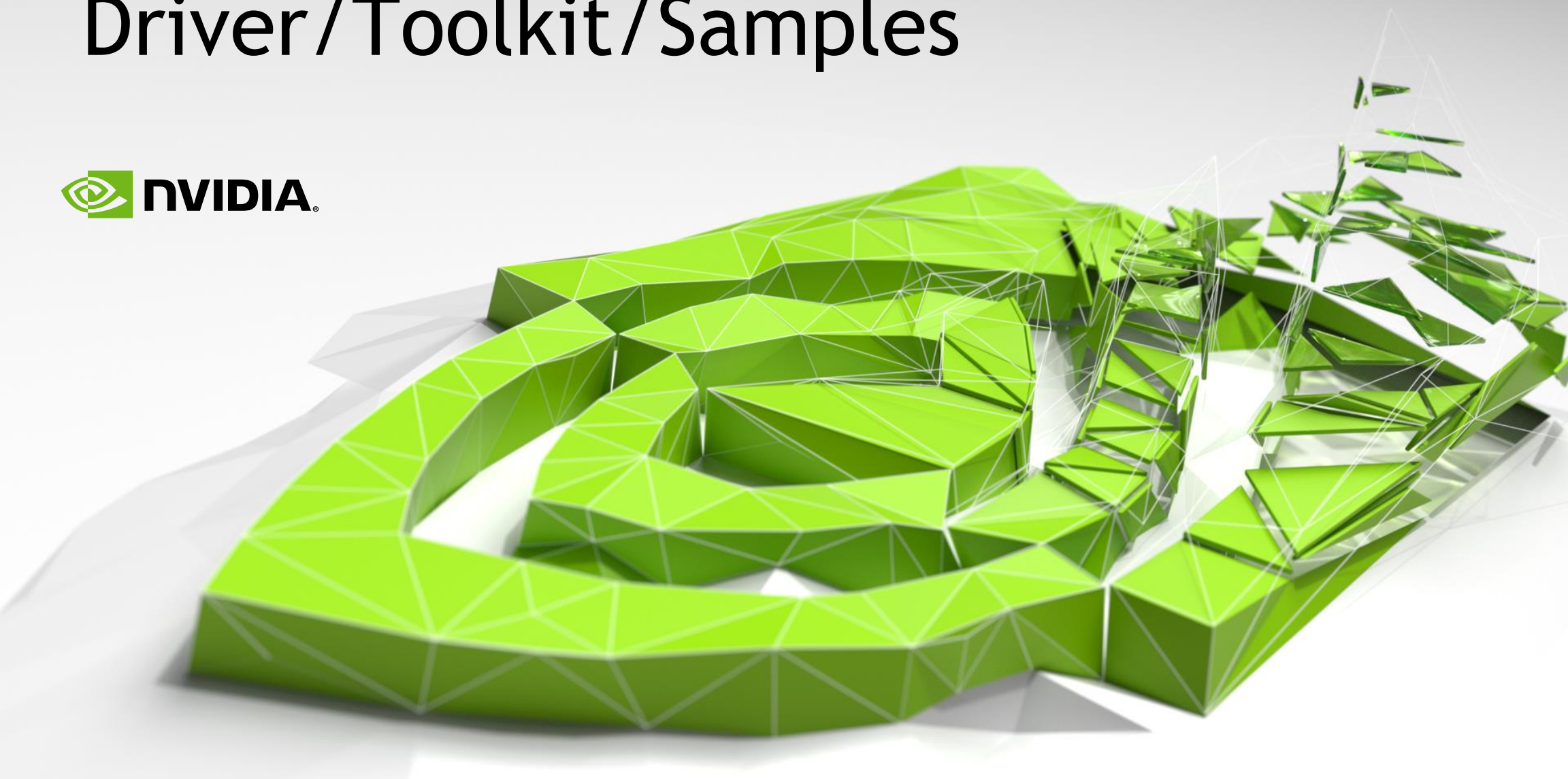


Driver/Toolkit/Samples



Software

- GPU Driver
- CUDA toolkit
 - Includes all the software necessary for developers to write applications
 - Compiler (nvcc), libraries, profiler, debugger, documentation
- CUDA Samples
 - Samples illustrating GPU functionality and performance
 - Examples illustrating important programming constructs and techniques.
- www.nvidia.com/getcuda -- all above software is free

Example GPU hardware and driver

- **`nvidia-smi`**
 - -h for help
 - -q for long query of all GPUs
 - PCIe Bus ID
 - Driver Version
 - ECC state
 - Power State/fans/temps/clockspeed
- **`runit.nvidia-smi`**

nvidia-smi

```
ubuntu@ip-10-97-186-7: ~/gpu-edu-workshops
ubuntu@ip-10-97-186-7:~/gpu-edu-workshops$ nvidia-smi
Wed Sep 23 21:56:15 2015

+-----+
| NVIDIA-SMI 346.46      Driver Version: 346.46      |
+-----+-----+
| GPU   Name                Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf    Pwr:Usage/Cap|      Memory-Usage | GPU-Util  Compute M. |
+-----+-----+
|   0   GRID K520           On          | 0000:00:03.0   Off  |          N/A         |
| N/A   32C    P8      17W / 125W | 10MiB / 4095MiB |      0%      Default  |
+-----+-----+

+-----+
| Processes:                                                       GPU Memory |
|  GPU       PID    Type    Process name                       Usage      |
+-----+-----+
| No running processes found                                         |
+-----+

ubuntu@ip-10-97-186-7:~/gpu-edu-workshops$ █
```

CUDA Toolkit

- Compiler (nvcc)
- Libraries
 - BLAS, FFT, cuSPARSE, cuSOLVER, cuDNN, RNG, NPP
- Debuggers
 - cuda-gdb, cuda-memcheck
- Profilers
 - NVVP (GUI), nvprof (command-line)

bash runit.bandwidth

```
ubuntu@ip-10-97-186-7: ~/gpu-edu-workshops
ubuntu@ip-10-97-186-7:~/gpu-edu-workshops$ bash runit.bandwidth
[CUDA Bandwidth Test] - Starting...
Running on...

Device 0: GRID K520
Quick Mode

Host to Device Bandwidth, 1 Device(s)
PINNED Memory Transfers
  Transfer Size (Bytes)      Bandwidth(MB/s)
  33554432                  9722.8

Device to Host Bandwidth, 1 Device(s)
PINNED Memory Transfers
  Transfer Size (Bytes)      Bandwidth(MB/s)
  33554432                  8895.3

Device to Device Bandwidth, 1 Device(s)
PINNED Memory Transfers
  Transfer Size (Bytes)      Bandwidth(MB/s)
  33554432                  119157.8

Result = PASS

NOTE: The CUDA Samples are not meant for performance measurements. Results may vary when GPU Boost is enabled.
ubuntu@ip-10-97-186-7:~/gpu-edu-workshops$
```

bash runit.query

```
ubuntu@ip-10-97-186-7: ~/gpu-edu-workshops
Device 0: "GRID K520"
  CUDA Driver Version / Runtime Version      7.0 / 7.0
  CUDA Capability Major/Minor version number: 3.0
  Total amount of global memory:              4096 MBytes (4294770688 bytes)
  ( 8) Multiprocessors, (192) CUDA Cores/MP:  1536 CUDA Cores
  GPU Max Clock rate:                        797 MHz (0.80 GHz)
  Memory Clock rate:                         2500 Mhz
  Memory Bus Width:                          256-bit
  L2 Cache Size:                             524288 bytes
  Maximum Texture Dimension Size (x,y,z)      1D=(65536), 2D=(65536, 65536),
3D=(4096, 4096, 4096)
  Maximum Layered 1D Texture Size, (num) layers 1D=(16384), 2048 layers
  Maximum Layered 2D Texture Size, (num) layers 2D=(16384, 16384), 2048 layers
  Total amount of constant memory:             65536 bytes
  Total amount of shared memory per block:     49152 bytes
  Total number of registers available per block: 65536
  Warp size:                                  32
  Maximum number of threads per multiprocessor: 2048
  Maximum number of threads per block:         1024
  Max dimension size of a thread block (x,y,z): (1024, 1024, 64)
  Max dimension size of a grid size    (x,y,z): (2147483647, 65535, 65535)
  Maximum memory pitch:                      2147483647 bytes
  Texture alignment:                          512 bytes
  Concurrent copy and kernel execution:       Yes with 2 copy engine(s)
```

bash runit.matmul

```
ubuntu@ip-10-97-186-7: ~/gpu-edu-workshops
[Matrix Multiply Using CUDA] - Starting...
GPU Device 0: "GRID K520" with compute capability 3.0

MatrixA(320,320), MatrixB(640,320)
Computing result using CUDA Kernel...
done
Performance= 192.73 GFlop/s, Time= 0.680 msec, Size= 131072000 Ops, WorkgroupSize= 1024 threads/block
Checking computed result for correctness: Result = PASS

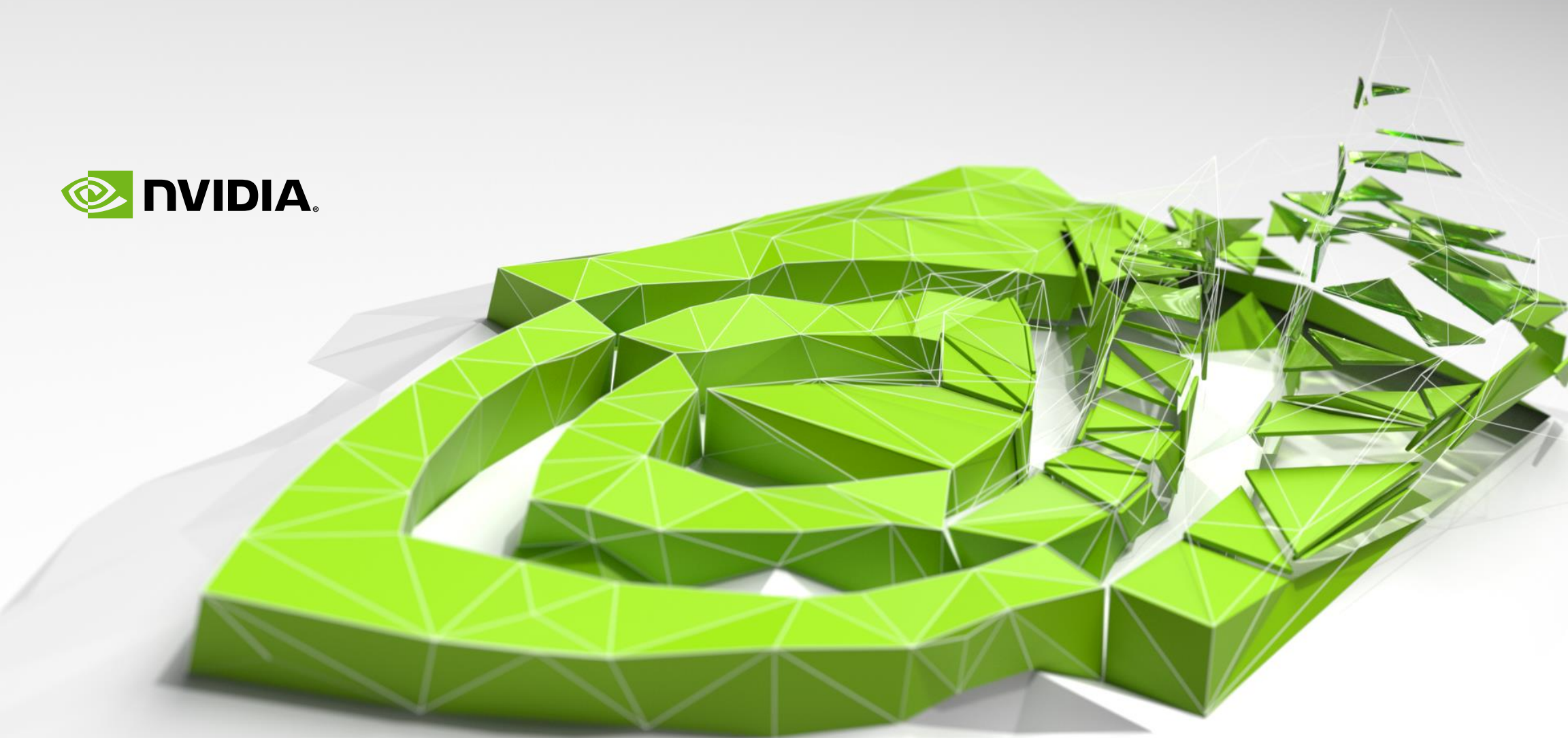
NOTE: The CUDA Samples are not meant for performance measurements. Results may vary when GPU Boost is enabled.
[Matrix Multiply CUBLAS] - Starting...
GPU Device 0: "GRID K520" with compute capability 3.0

MatrixA(320,640), MatrixB(320,640), MatrixC(320,640)
Computing result using CUBLAS...done.
Performance= 880.97 GFlop/s, Time= 0.149 msec, Size= 131072000 Ops
Computing result using host CPU...done.
Comparing CUBLAS Matrix Multiply with CPU results: PASS

NOTE: The CUDA Samples are not meant for performance measurements. Results may vary when GPU Boost is enabled.
ubuntu@ip-10-97-186-7:~/gpu-edu-workshops$
```

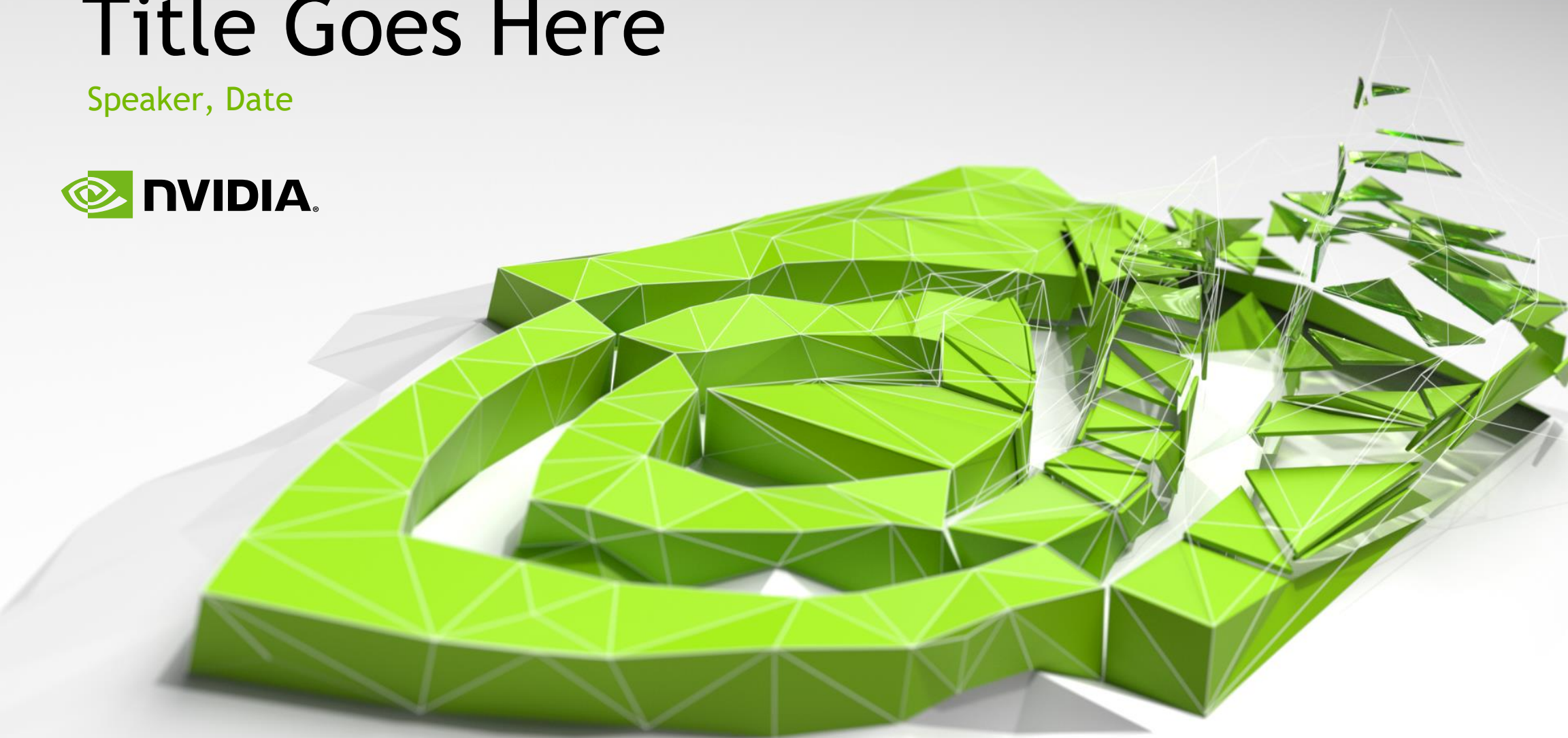

Recap

- Driver
 - `nvidia-smi` to query GPU hardware and state
- CUDA Toolkit
 - Development tools for GPU software development
- CUDA Samples
 - Sample code and diagnostic tests



Title Goes Here

Speaker, Date



CUDA Samples (bundled with Toolkit)

- `~/NVIDIA_CUDA-7.0_Samples/bin/x86_64/linux/release`
- Sample programs to illustrate GPU programming constructs and algorithms
- Useful diagnostic tests to query GPU and its performance
- `cd gpu-edu-workshops`

Content slide: 36 pt black, trebuchet font, up to 2 lines maximum, capitalize only first word

Subtitle: 24 pt, one line maximum

Body/bullet text no longer has a bullet icon

Use 20 pt font

No sub-bullets allowed

No more than five bullets; one idea per bullet

Example of **highlighted** text

Same as previous slide

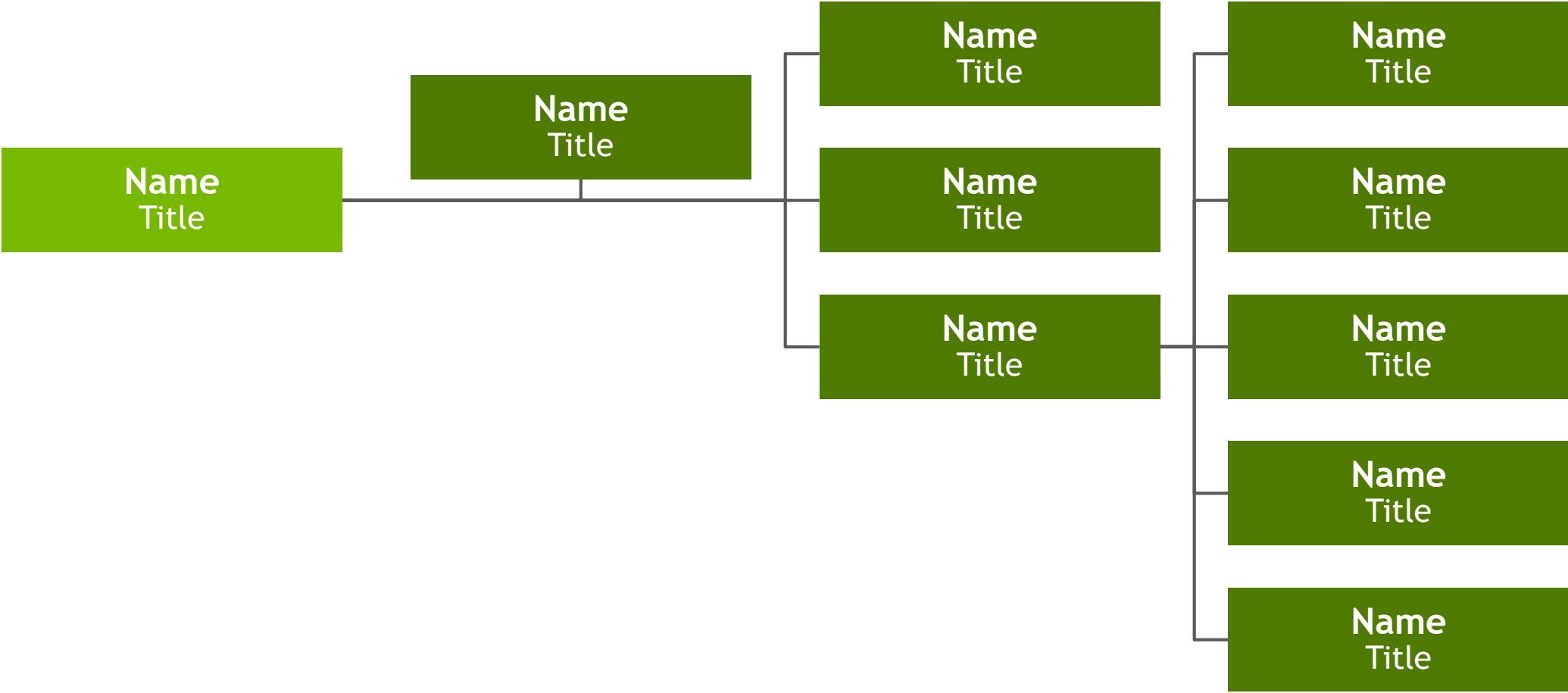
But includes logo and page number in lower right corner

NVIDIA confidential

Use this for slides that include “confidential” information/data

Title only slide

Org chart example



Agenda

Action item number one

Action item number two

Action item number three

Action item number four

Action item number five

Agenda

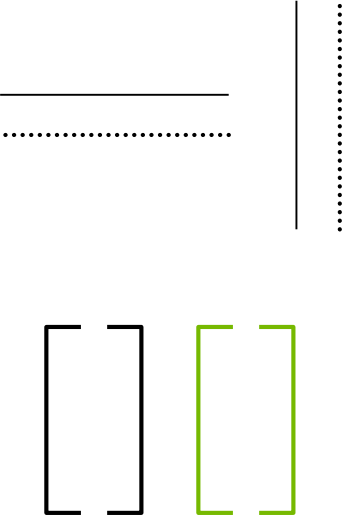
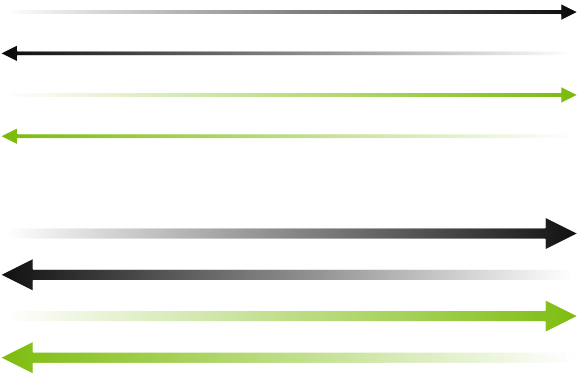
9:00 am	–	9:30 am	Welcome	Presenter Name
9:30 am	–	10:30 am	Keynote	Presenter Name
10:30 am	–	11:30 am	GPU/gaming	Presenter Name
11:30 am	–	12:30 pm	Break	All
12:30 pm	–	1:30 pm	Automotive	Presenter Name
1:30 pm	–	2:30 pm	Enterprise	Presenter Name
2:30 pm	–	3:30 pm	Financials	Presenter Name
3:30 pm	–	5:00 pm	Q&A	All

Section divider or transition slide

Graphic styles

Green Box Style

Gray Box Style



Color palette

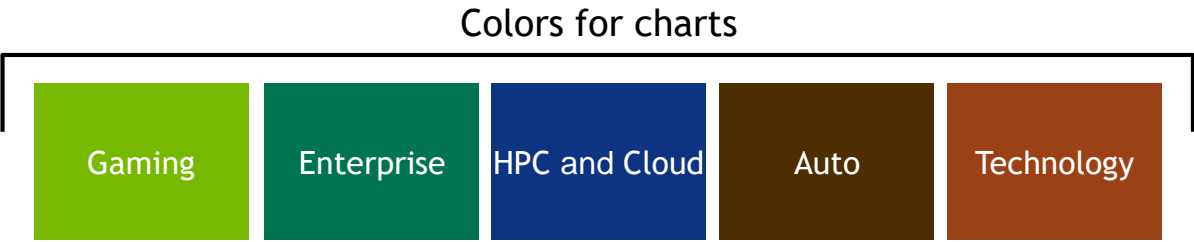
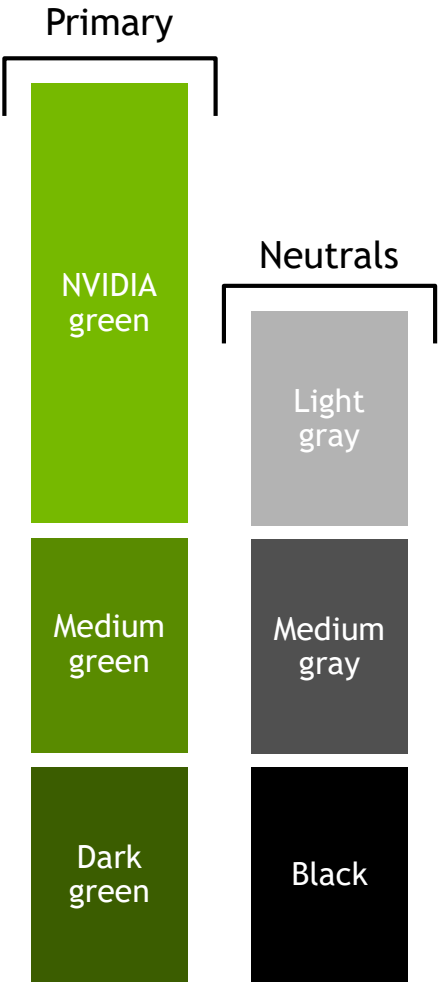
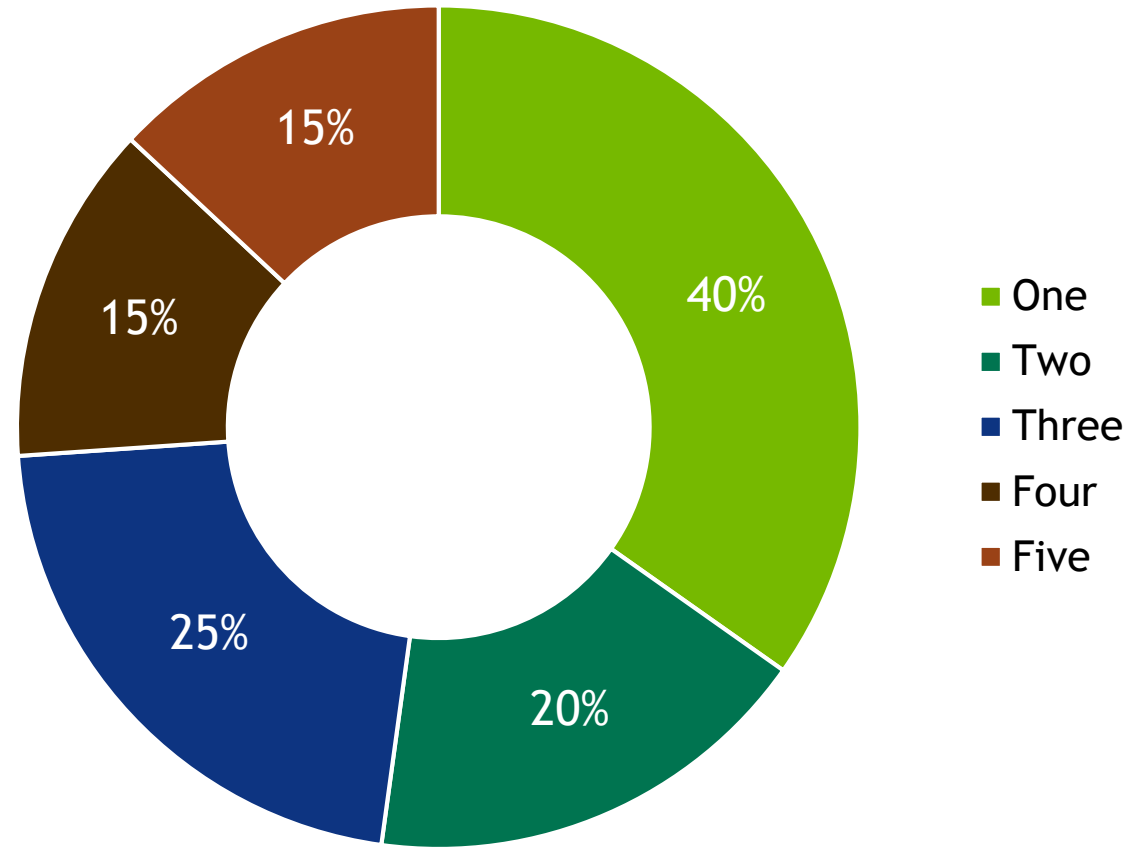


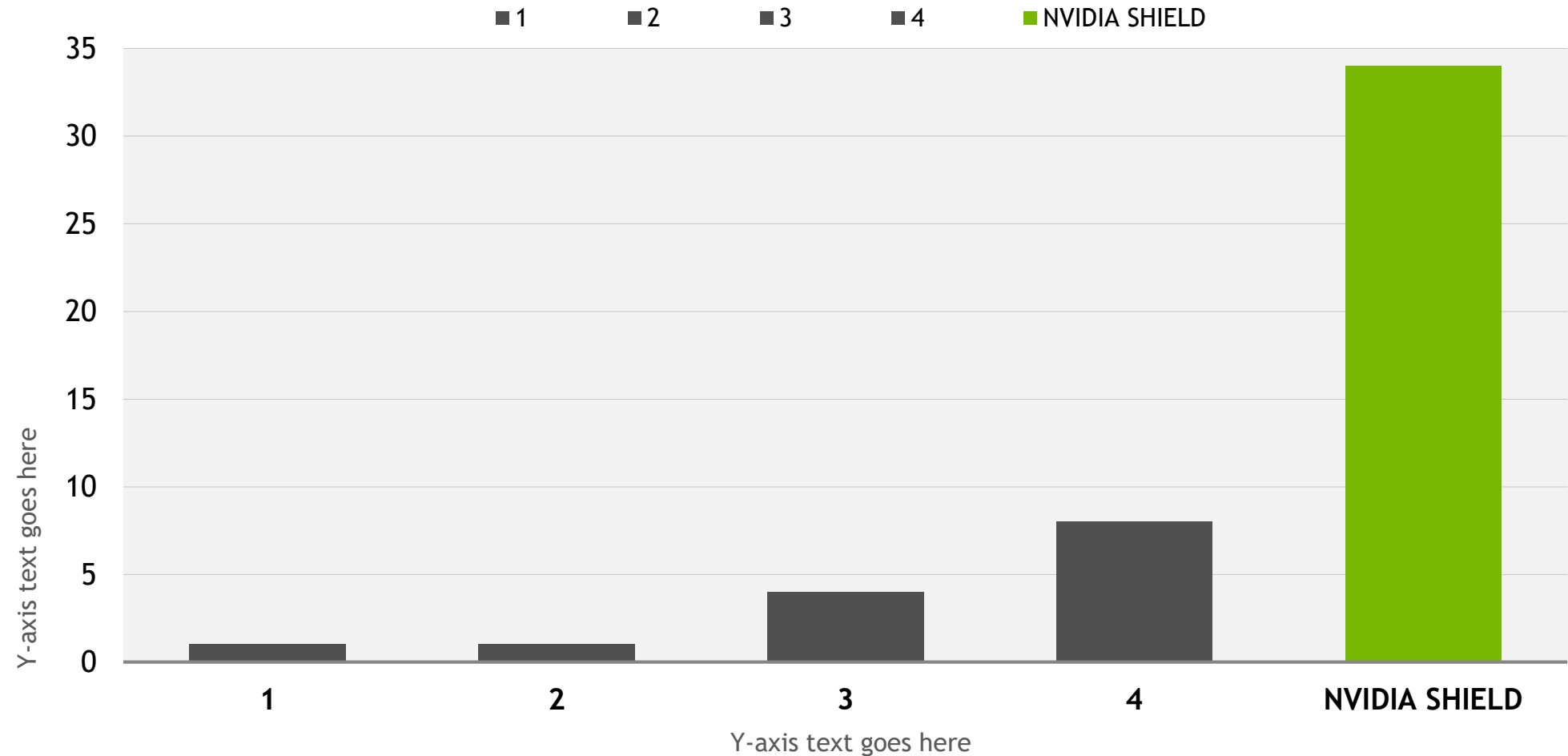
Table sample

	CATEGORY ONE	CATEGORY TWO	CATEGORY THREE
Trebuchet bold, 18 pt	Trebuchet, 16 pt	Text	Text
Row one	Text	Text	Text
Row two	Text	Text	Text
Row three	Text	Text	Text

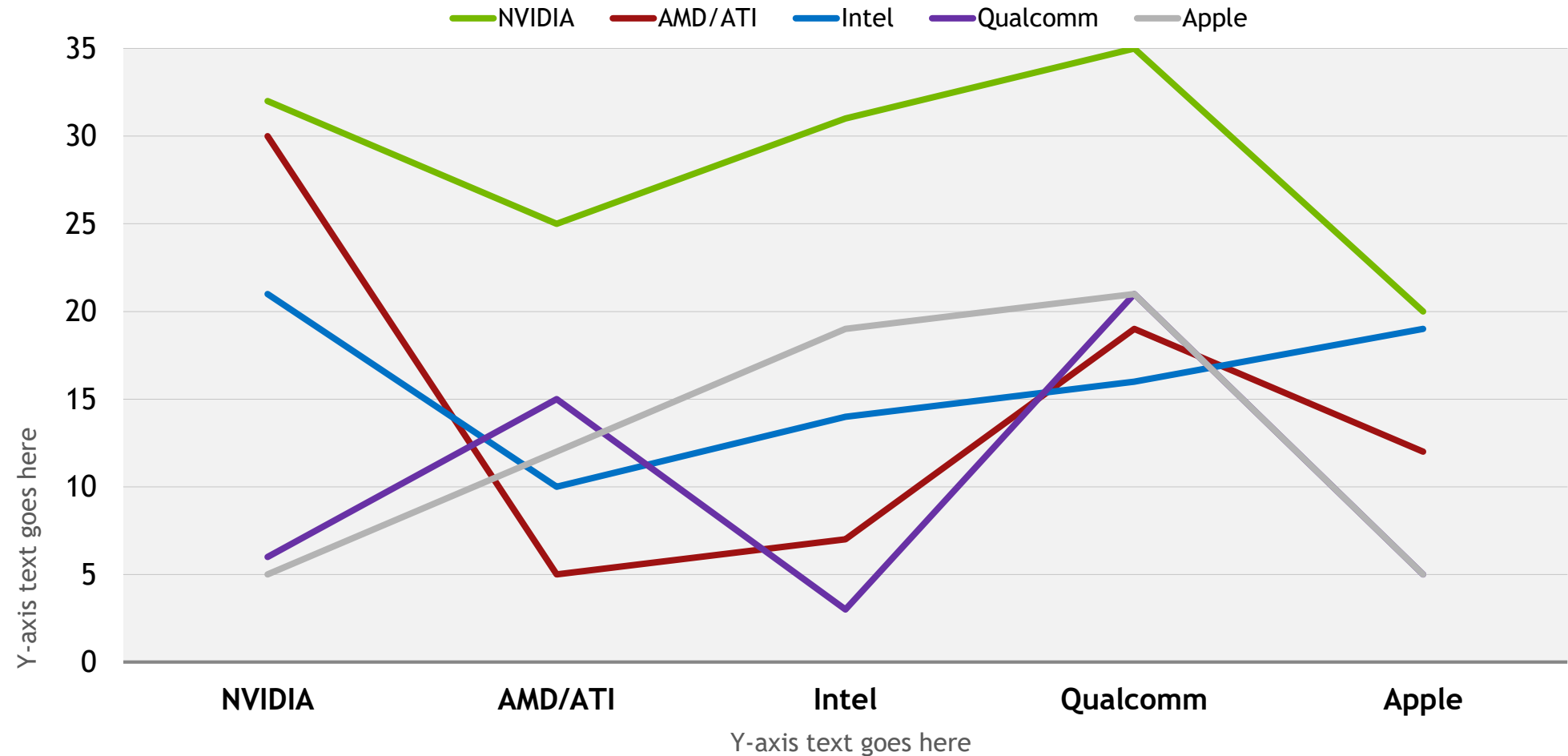
Pie chart sample



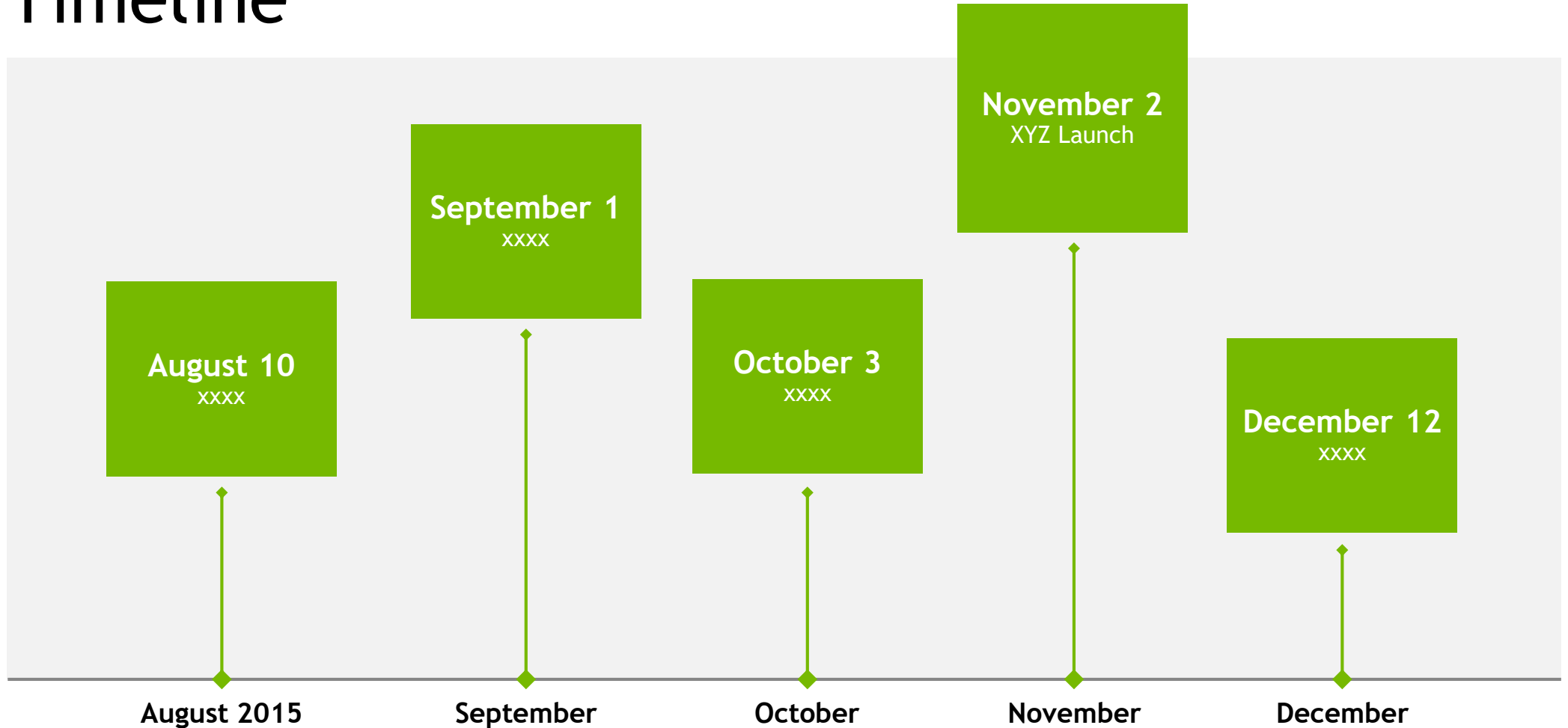
Bar chart sample



Line chart sample



Timeline



Inserting video: Insert/Video/Video from File.
Insert video by browsing your directory and selecting OK.

File type that works best in PowerPoint is: .wmv



Video file

DEMO: Placeholder *(insert picture behind gray bar)*

Compare or contrast sample

Column one

Sample text placed here

Best to keep information
no more than 5 bullet
points long

Should be used to
distinguish buckets of
information across
multiple columns

Column two

Sample text placed here

Best to keep information
no more than 5 bullet
points long

Should be used to
distinguish buckets of
information across
multiple columns

Column three

Sample text placed here

Best to keep information
no more than 5 bullet
points long

Should be used to
distinguish buckets of
information across
multiple columns

Box diagram

Text only descriptors

Title here

Supporting text here

Title here

Supporting text here

Title here

Supporting text here

Title here

Supporting text here

Box diagram

Title with images

Title here



Title here



Title here



Title here



Product slide



Stat example

A solid green rectangular box with a white percentage value inside. The box has a small white upward-pointing triangle at the bottom center.

65%

Supporting text goes here

[Use green for POSITIVE]

A solid red rectangular box with a white percentage value inside. The box has a small white upward-pointing triangle at the bottom center.

25%

Text goes here

[Use red for NEGATIVE]

A solid gray rectangular box with a white percentage value inside. The box has a small white upward-pointing triangle at the bottom center.

10%

Text goes here

[Use gray for NUETRAL]



Photo caption

Text slide with photograph

Optional subtitle

Text goes here

Text goes here



Text slide with photographs

Multiple images

Allow a consistent “gutter” space between images

Use a gray outline (R: 90, G: 90, B: 90) at 0.5 pt



“Quoted text example goes here.
Trebuchet, 42 pt. Use with
shorter (headline type) quotes.”

Quote Source, Trebuchet 20 pt

“Quoted text example goes here.
Trebuchet, 42 pt. Use with
shorter (headline type) quotes.”

“Multi-quote slide sample.”

— Source: Either a name or publication text here, OR, a company logo to the right



“Multi-quote slide sample.”

— Source: Either a name or publication text here, OR, a company logo to the right



“Multi-quote slide sample.”

— Source: Either a name or publication text here, OR, a company logo to the right



Customer success story

Optional subtitle



Challenge

Ei eos viris putant, veritus
deserunt et qui.

Ea his diam labore prodesset,
ei justo atomorum per.

Ei ullum utinam recteque cum.
Quem tota dici

Solution

Ei eos viris putant, veritus
deserunt et qui.

Ea his diam labore prodesset,
ei justo atomorum per.

Ei ullum utinam recteque cum.
Quem tota dici

Impact

Ei eos viris putant, veritus
deserunt et qui.

Ea his diam labore prodesset,
ei justo atomorum per.

Ei ullum utinam recteque cum.
Quem tota dici



