### Logical Devices

**Vulkan: Overall Block Diagram**

- **Application**
- **Instance**
- **Physical Device**
- **Logical Device**

#### Queues
- **Logical Device**
- **Physical Device**
- **Queue**

#### Command Buffer
- **Logical Device**
- **Physical Device**
- **Command Buffer**

### Looking to See What Device Layers are Available

```c
const char * myDeviceLayers[] = {
    // "VK_LAYER_LUNARG_api_dump",
    // "VK_LAYER_LUNARG_core_validation",
    // "VK_LAYER_LUNARG_image",
    "VK_LAYER_LUNARG_object_tracker",
    "VK_LAYER_LUNARG_parameter_validation",
    // "VK_LAYER_NV_optimus"
};

const char * myDeviceExtensions[] = {
    "VK_KHR_surface",
    "VK_KHR_win32_surface",
    "VK_EXT_debug_report",
    // "VK_KHR_swapchains"
};

// see what device layers are available:
uint32_t layerCount;
vkEnumerateDeviceLayerProperties(PhysicalDevice, &layerCount, (VkLayerProperties *)nullptr);
VkLayerProperties * deviceLayers = new VkLayerProperties[layerCount];
result = vkEnumerateDeviceLayerProperties(PhysicalDevice, &layerCount, deviceLayers);
```
Looking to See What Device Extensions are Available

```c
// see what device extensions are available:
uint32_t extensionCount;
vkEnumerateDeviceExtensionProperties(PhysicalDevice, deviceLayers[i].layerName,
&extensionCount, (VkExtensionProperties *)nullptr);
VkExtensionProperties * deviceExtensions = new VkExtensionProperties[extensionCount];
result = vkEnumerateDeviceExtensionProperties(PhysicalDevice, deviceLayers[i].layerName,
&extensionCount, deviceExtensions);
```

What Device Layers and Extensions are Available

```c
4 physical device layers enumerated:
0x004030cd   1  'VK_LAYER_NV_optimus'  'NVIDIA Optimus layer'
160 device extensions enumerated for 'VK_LAYER_NV_optimus':
0x00400033   1  'VK_LAYER_LUNARG_core_validation'  'LunarG Validation Layer'
0 device extensions enumerated for 'VK_LAYER_LUNARG_core_validation':
0x00400033   1  'VK_LAYER_LUNARG_object_tracker'  'LunarG Validation Layer'
160 device extensions enumerated for 'VK_LAYER_LUNARG_object_tracker':
0x00400033   1  'VK_LAYER_LUNARG_parameter_validation'  'LunarG Validation Layer'
```

Vulkan: Creating a Logical Device

```c
float queuePriorities[1] =
{ 1.0f};
VkDeviceQueueCreateInfo vdqci;
vdqci.sType = VK_STRUCTURE_TYPE_DEVICE_QUEUE_CREATE_INFO;
vdqci.pNext = nullptr;
vdqci.flags = 0;
vdqci.queueFamilyIndex = 0;
vdqci.queueCount = 1;
vdqci.pQueueProperties = &queuePriorities;
vdqci.pQueueCreateInfos = IN vdqci;
```

Vulkan: Creating the Logical Device's Queue

```c
// get the queue for this logical device:
vkGetDeviceQueue( LogicalDevice, 0, 0, OUT &Queue );               // 0, 0 = queueFamilyIndex, queueIndex
```

Vulkan: Creating a Logical Device

```c
// see what device extensions are available:
uint32_t extensionCount;
vkEnumerateDeviceExtensionProperties(PhysicalDevice, deviceLayers[i].layerName,
&extensionCount, (VkExtensionProperties *)nullptr);
VkExtensionProperties * deviceExtensions = new VkExtensionProperties[extensionCount];
result = vkEnumerateDeviceExtensionProperties(PhysicalDevice, deviceLayers[i].layerName,
&extensionCount, deviceExtensions);
```

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