OpenSceneGraph

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Programming of Graphics Shaders,

WS 2020/2021

Agenda

1. What is OpenSceneGraph?
2. Use of OpenSceneGraph
3. Demo
4. Features
5. Conclusion

What is OpenSceneGraph?

- 3D graphics toolkit
- Uses OpenGL for rendering
- Open source
- Written in Standard C++
- Rendering middleware
- Based on scene graph theory
- Retained rendering system

[1]

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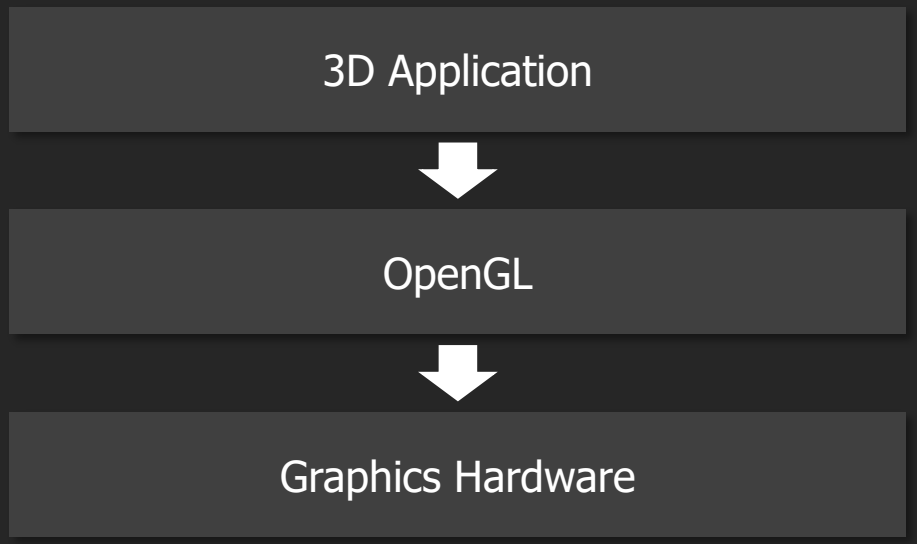

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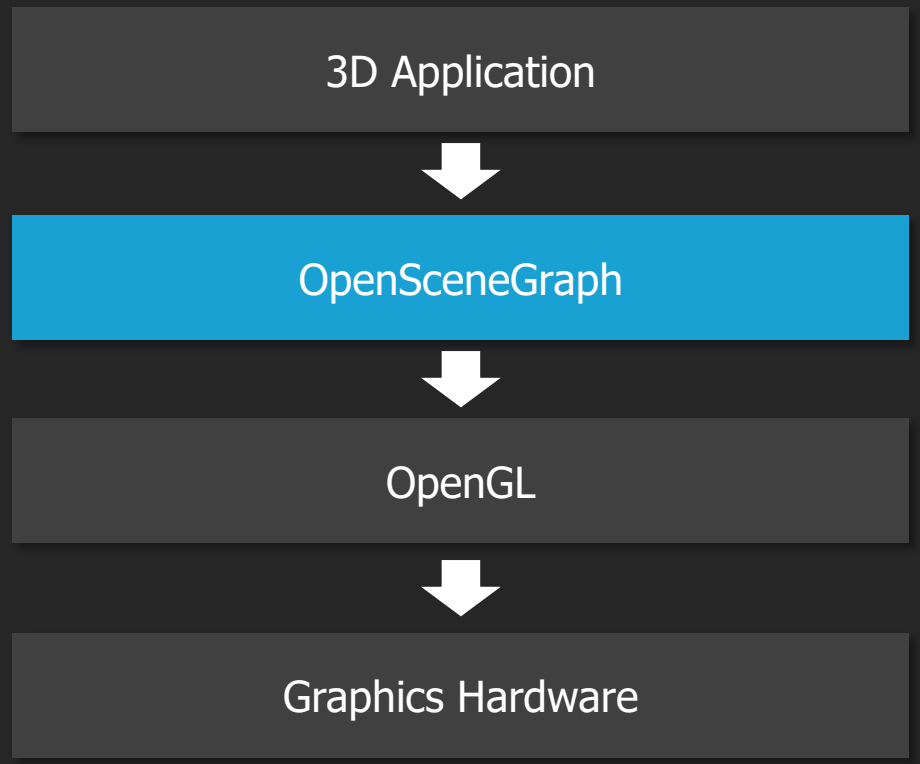
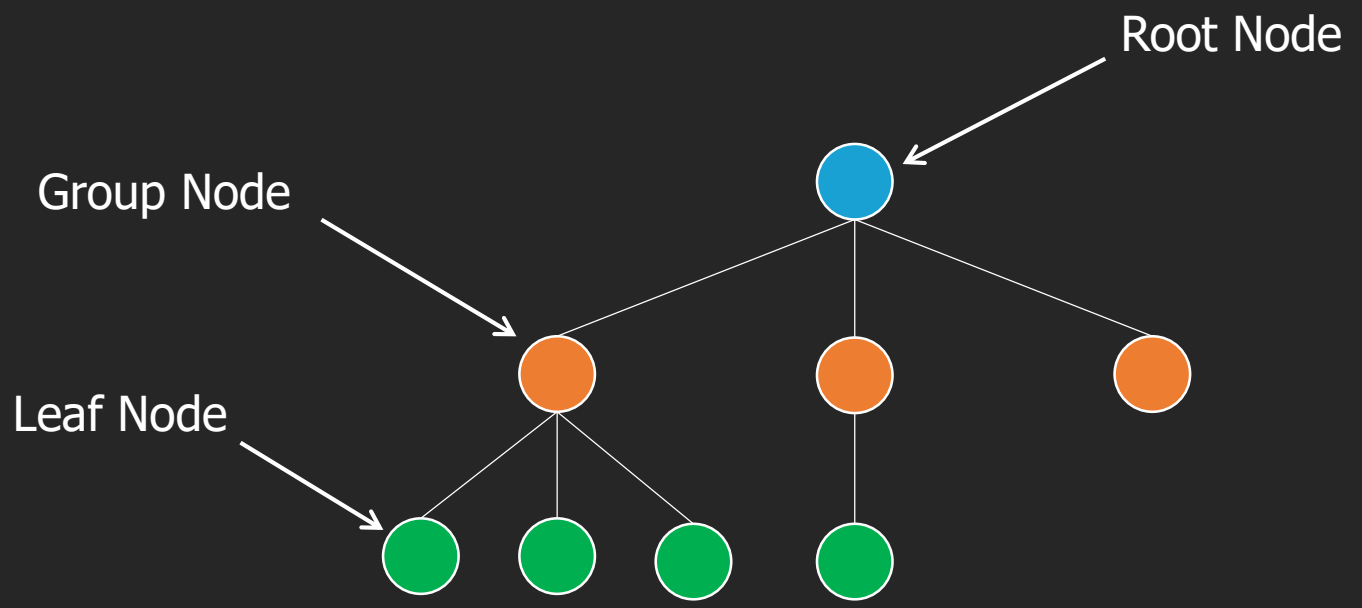


Scene Graph



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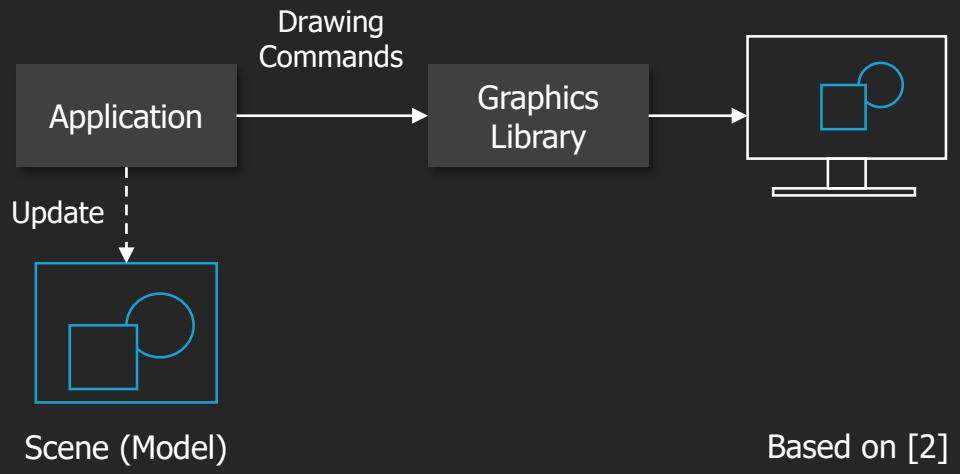
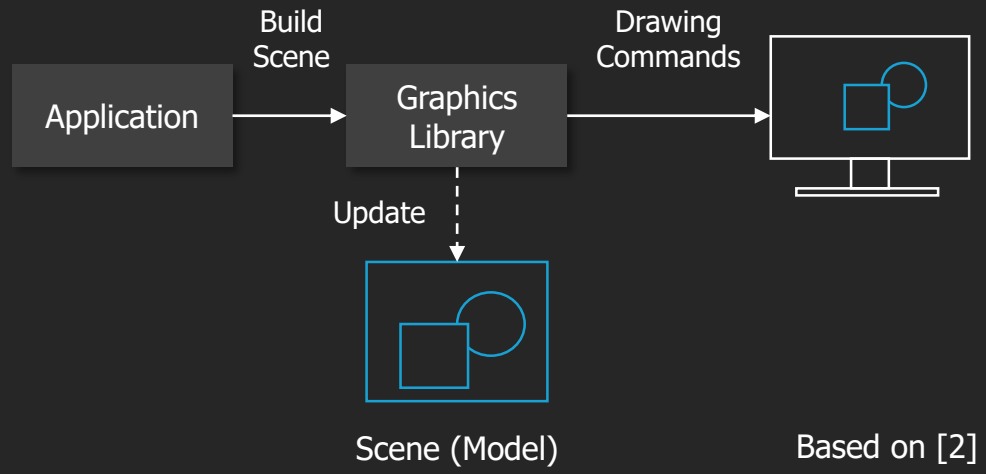
Immediate and Retained Mode

Immediate Mode



+ More flexibility

Retained Mode



+ Simpler to use
  (Library does initialization, state maintenance, cleanup)

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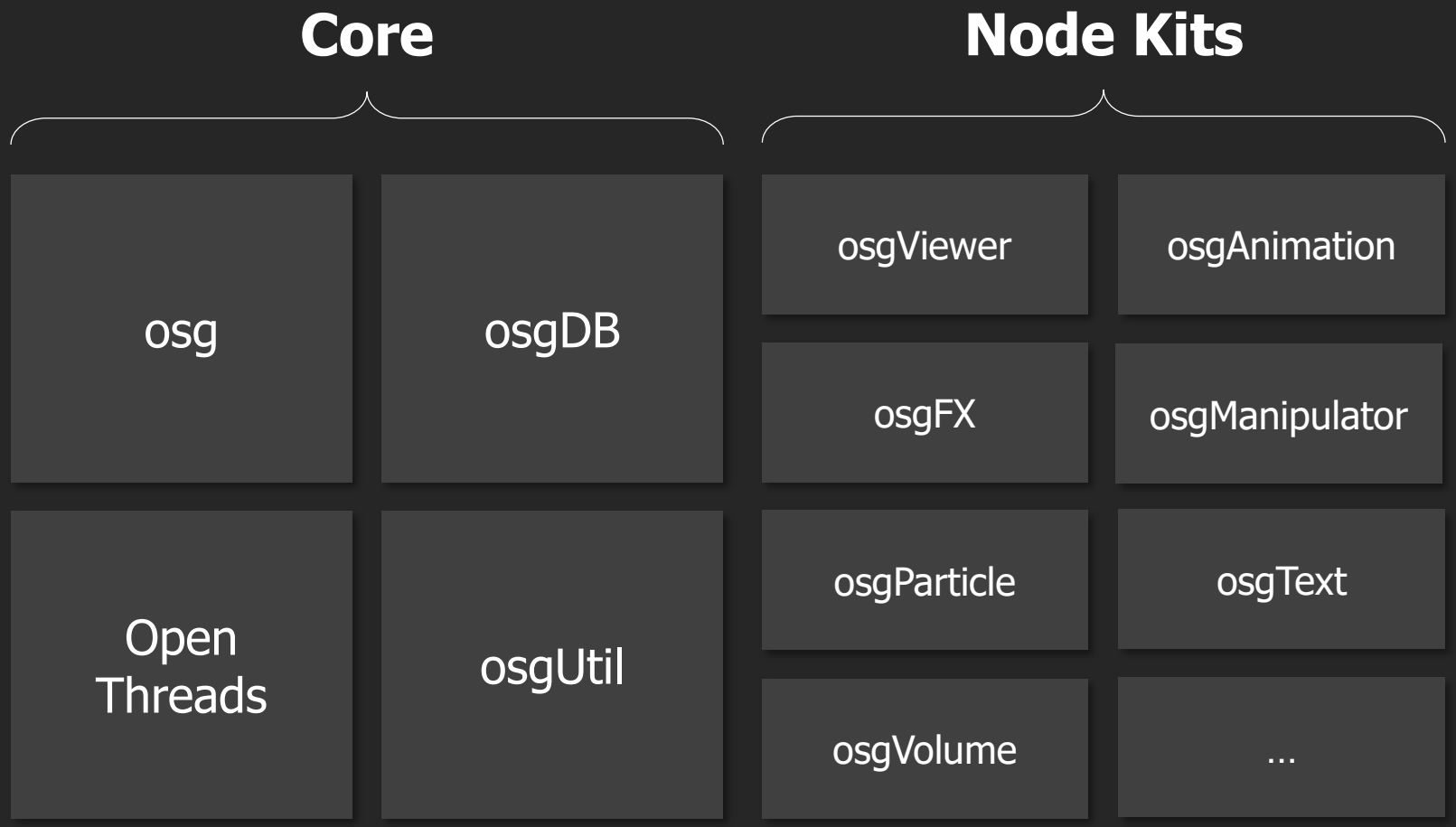
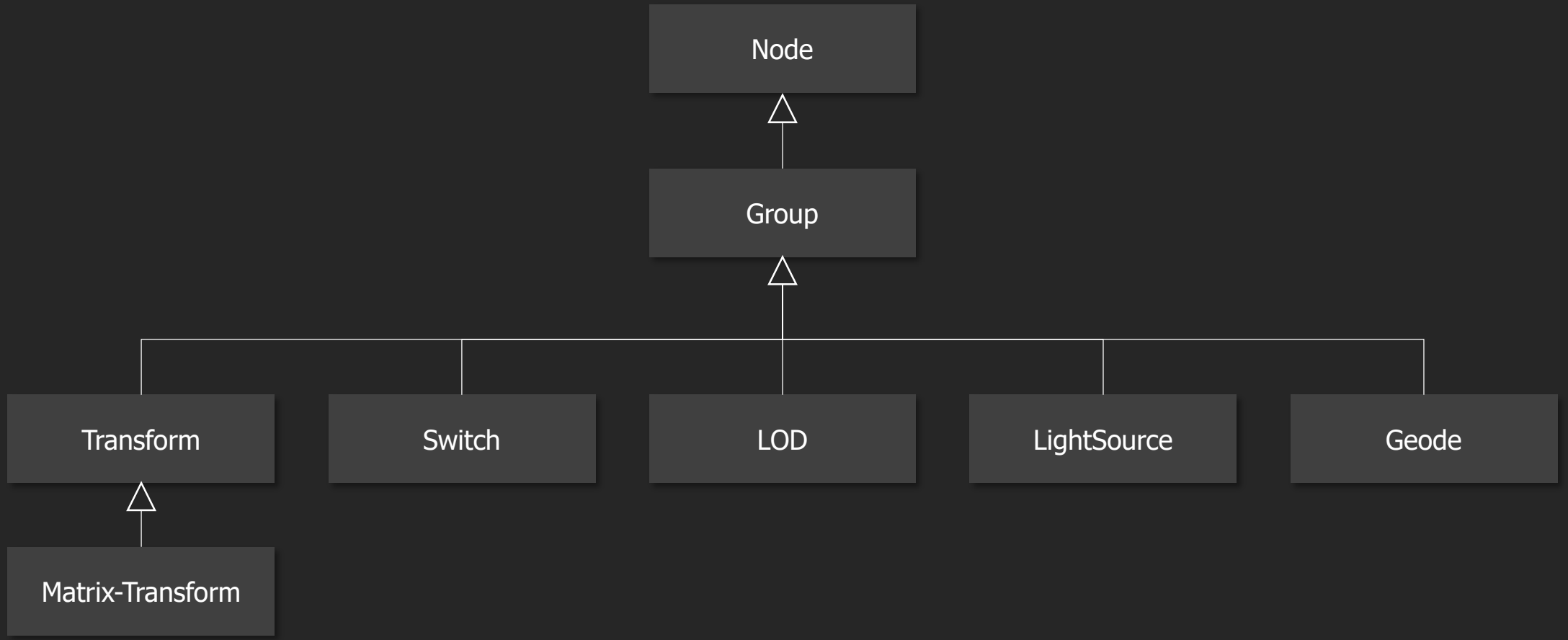
OpenSceneGraph Libraries



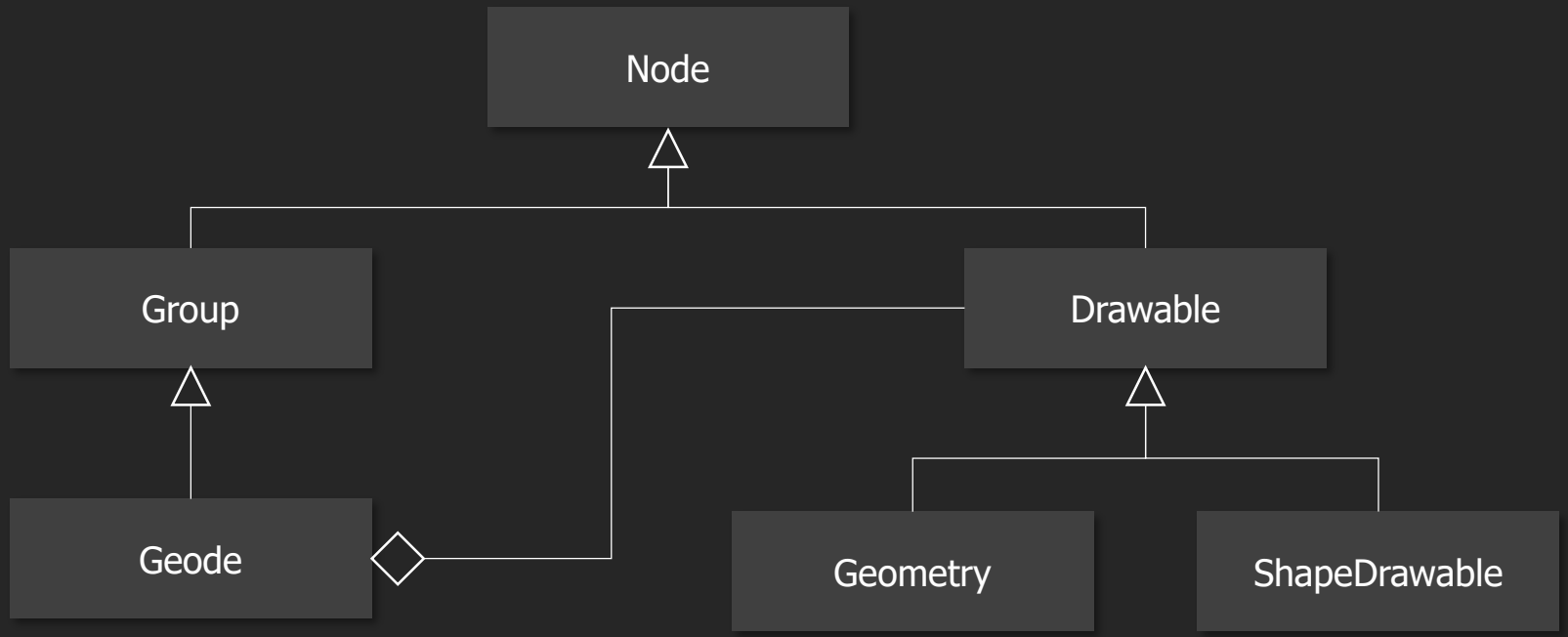
„Hello World“

„Hello World“ Demo

OSG Node Types

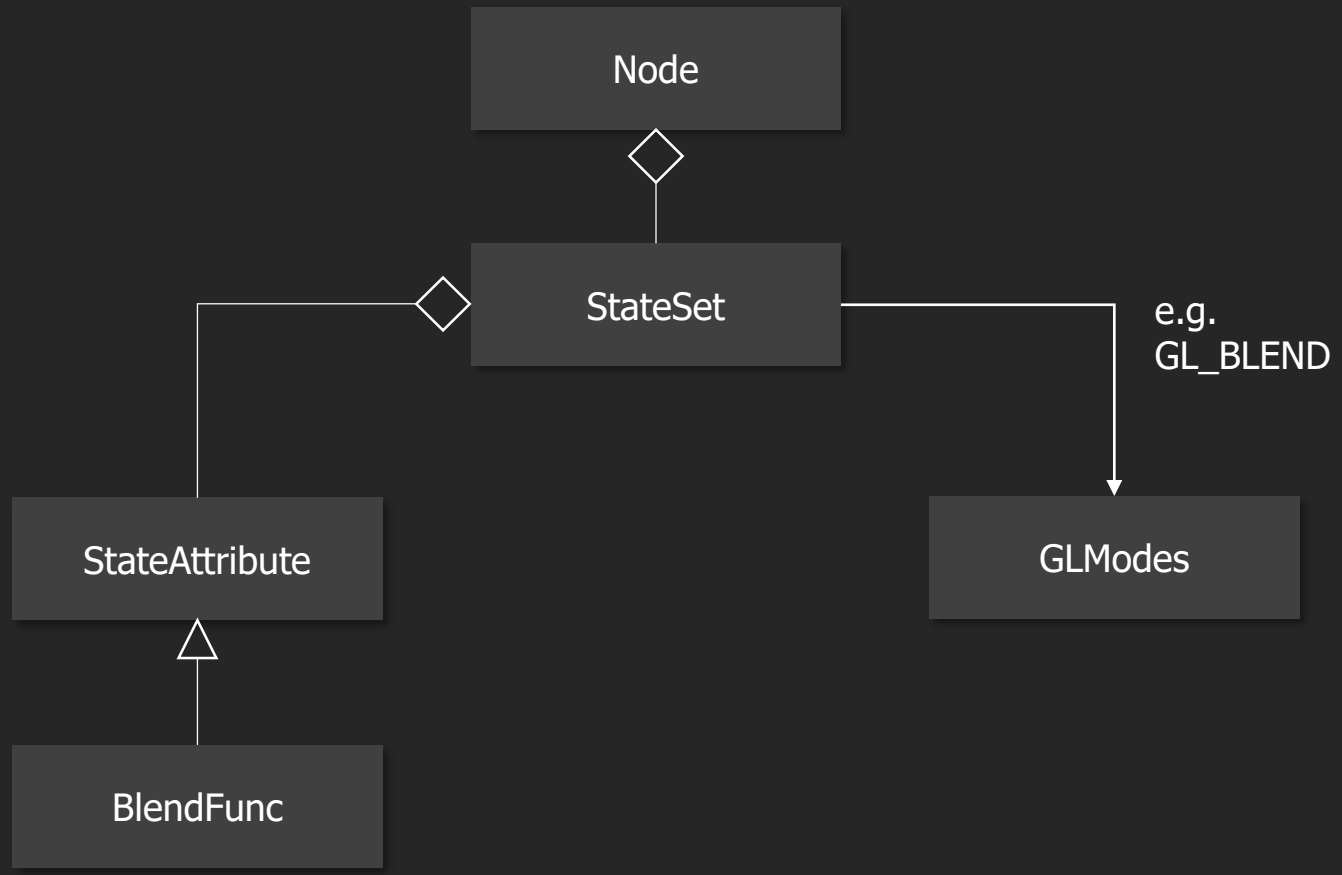


OSG Node Types

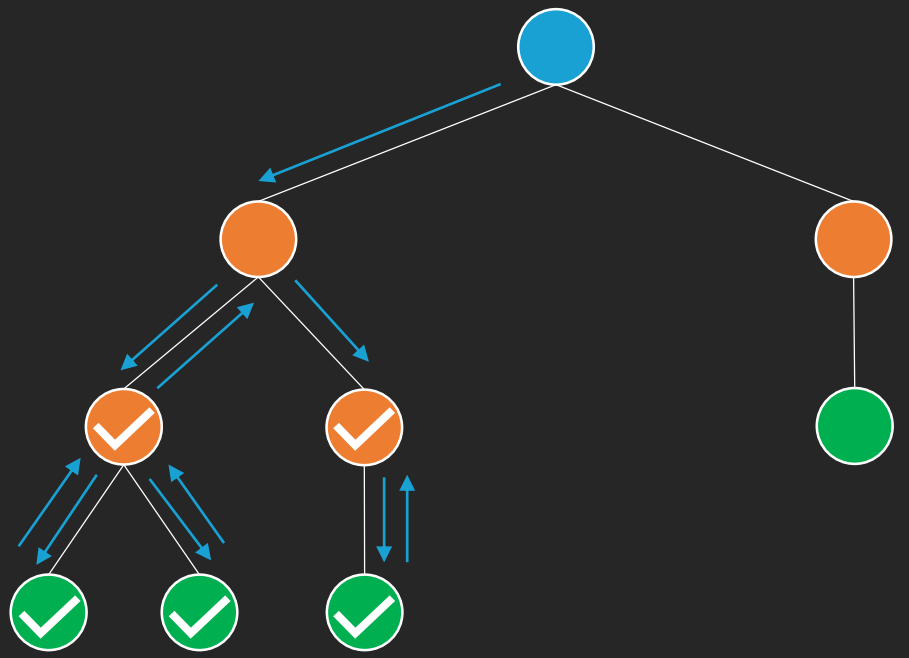


StateSet

OVERRIDE
PROTECTED
INHERITAT



Traversing a Scene Graph



Types of Traversals

1. Event traversal (process mouse and keyboard events)
2. Update/Application traversal (modify scene graph)
3. Cull traversal (test whether node is within viewport)
4. Draw/Rendering traversal (issues low-level OpenGL API calls)

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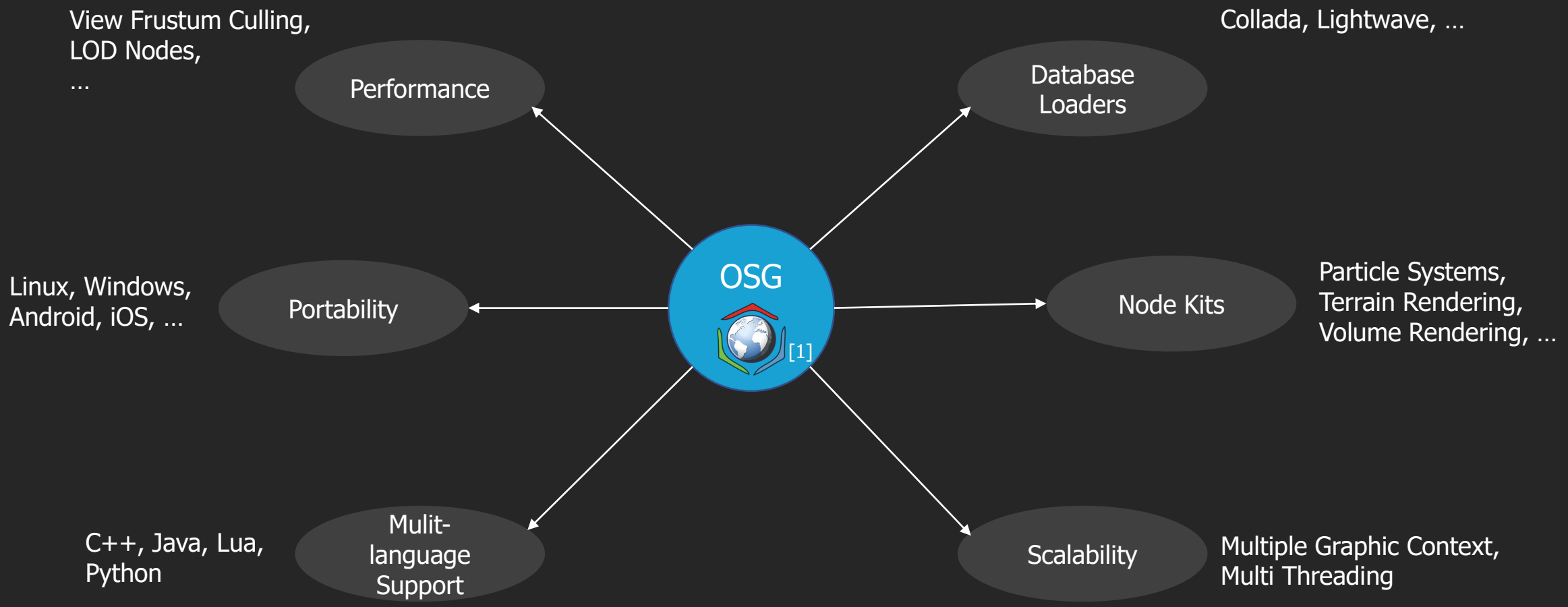
Features


View Frustum Culling,
LOD Nodes,
…
Performance
Collada, Lightwave, …
Database
Loaders
Linux, Windows,
Android, iOS, …
Portability
OSG
[1]
Node Kits
Particle Systems,
Terrain Rendering,
Volume Rendering, …
C++, Java, Lua,
Python
Mulit-
language
Support
Scalability
Multiple Graphic Context,
Multi Threading

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Conclusion

[3]

[4]

Conclusion

- Difficult to represent very large and complex scenes in a single scene graph

- It is often necessary to map different types of relationships between objects (spatial, semantic or rendering order)

    -> Not possible (or only via hacks) to do in a scene graph

    -> Multiple structures are used for that

Conclusion

+ Flat learning curve
+ Object oriented concept
+ Use of smart pointers
+ Amount of available functionallity

- Documentation seems quite old

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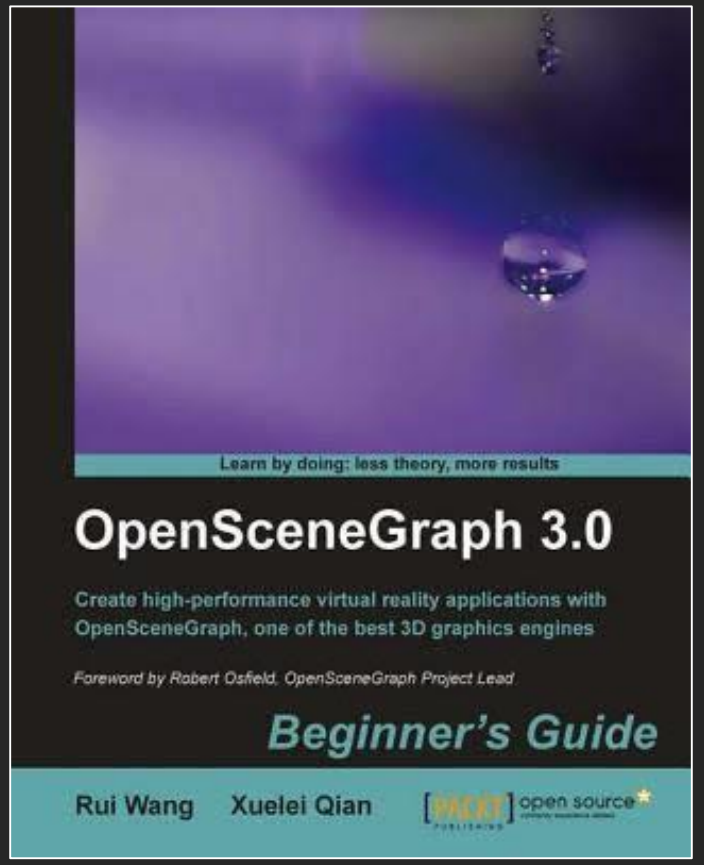
Learn by doing: less theory, more results
OpenSceneGraph 3.0
Create high-performance virtual reality applications with OpenSceneGraph, one of the best 3D graphics engines
Foreword by Robert Osfield, OpenSceneGraph Project Lead
Beginner's Guide
Rui Wang
Xuelei Qian
open source

Sources

[1] OpenSceneGraph, *The OpenSceneGraph Project Website.* [Online]. Available: http://www.openscenegraph.org (accessed: Jan. 22 2021).

[2] Quinn Radich and Michael Satran, *Retained Mode Versus Immediate Mode.* [Online]. Available: https://docs.microsoft.com/en-us/windows/win32/learnwin32/retained- mode-versus- immediate-mode (accessed: Jan. 09 2021).

[3] FlightGear, *Introduction to FlightGear.* [Online]. Available: https://www.flightgear.org/about/ (accessed: Jan. 09 2021).

[4] OpenSceneGraph, *DIOSoft Pirates.* [Online]. Available: http://www.openscenegraph.org/index.php/gallery/use-cases/77-diosoft-pirates (accessed: Jan. 09 2021).

[5] Tom Forsyth, Scene Graphs - just say no. [Online]. Available: http://tomforsyth1000.github.io/blog.wiki.html#%5B%5BScene%20Graphs%20-%20just%20say%20no%5D%5D (accessed: Jan. 09 2021)