Vulkan Application

- As a kind of computer graphic API, like OpenGL, Vulkan is widely used in 3D animation, 3D game, and 3D movie field.
- Indeed, Vulkan has updated many of OpenGL's capabilities.
- Furthermore, compared to OpenGL, Vulkan has greater advantages in HMI (Human-Machine Interface) applications.

3D HMI System

- HMI means Human-Machine Interface
- A branch of computer graphic
- Monitor and control the machine actions
- Continuous collection of signal values

HMI System Configuration in Plant

- HMI system is the "face" of an industrial production line.
- Deal with a lot of input and output signals at the same time.
- A developed HMI system can be the communication center station among Main PLC, L2 Computer, and Signal Machine PLCs.

Platform of 3D HMI

- Vulkan API can be used between GPU and 3D HMI application software.
- Compared to OpenGL API:
  1. Vulkan is designed for multithreading.
  2. Vulkan uses Graphics Pipeline for "State" preset.
  3. Vulkan needs much less user hand holding.
  4. Vulkan never "LOCK".
- Vulkan API is ideal for application software which has heavy load of signals input and output.

gl_Vetex gotten from Real World

- gl_Vetex is used for display the machine sizes and positions accurately on HMI screen.
- Tracing the welding point position.
- Detail values of machine size and position can get from process designers.
Shader Task 1

- Display the position change
- Mechanical actions are simple movements
- Forward/Backward
- Open/Close
- Up/Down
- Rotation

Shader Task 2

- Display the solution concentration distribution
- Analog signals need to be traced and recorded
- The changing analog signals will be shown to operators in real-time

Shader Task 3

- Display the temperature distribution
- Temperature distribution in the 3D space inside the furnace will influence the shape of steel strip which is passing inside the furnace

Shader Task 4

- Display temporary test calculation
- Sometimes, temporary calculations need to be programmed on HMI platform and only show the results on HMI screens
- And, these test calculations must work independently without bothering the normal PLC signal communication

Shader Task 5

- Display trending curves
- What happened in the specific timing?
- That is why we use Vulkan API to communicate with GPU

Thank you!