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Software

Enabling Technologies for the 3D Clouds

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What is a 3D Cloud?

- "**Cloud computing** is a model for enabling convenient, **on-demand network access to a shared pool of configurable computing resources** (e.g., networks, servers, storage, **applications**, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." (NIST)

- 3D Clouds will enable **on-demand network access to interactive 3D applications** (like visualization applications for scientific data, CAD applications, etc.)

Why Remote Visualization?

Remote rendering enables effective geographically disperse, multi-disciplinary collaborations

- Remote visualization
  - improves efficiency
  - enables remote collaboration around complex objects

- Look at the same data at the same time

- Interact with data and others can see the effect in real-time

- Even people on low-bandwidth networks and thin clients can interact with the rendered information

- Data remains with data-owner

Target Industries

- **Oil & Gas** - Investigate seismic models in collaborative environments

- **Automotive & Aerospace** – Connect Tiered suppliers remotely with digital mockups (DMUs)

- **Manufacturing** - View models in real time; deliver content-specific 3D images

- **Scientific Research & Analysis** - Simulate climate changes and view remotely

- **Life Sciences** - Experiment with molecular interactions running on large number of severs

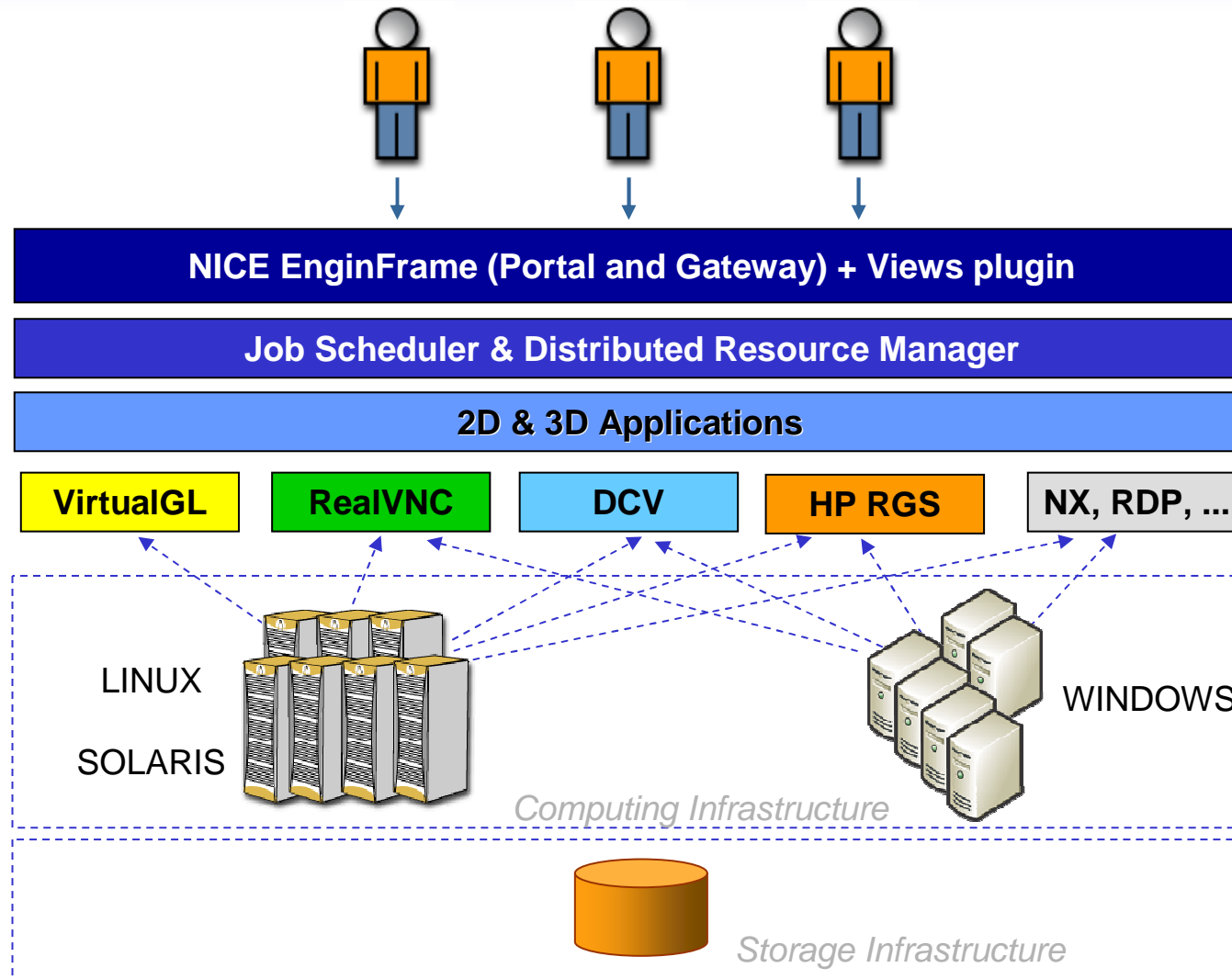- **Defense** - Simulate and investigate operational alternatives

Enabling Technologies for the 3D Clouds

- Technologies providing secure remote network access to interactive 3D applications leveraging server-side graphic hardware acceleration (GPUs)

- A software stack that allows the end-user to easily launch and access remote interactive applications and takes care of managing and load balancing applications and desktop sessions running within a **Visualization Farm**
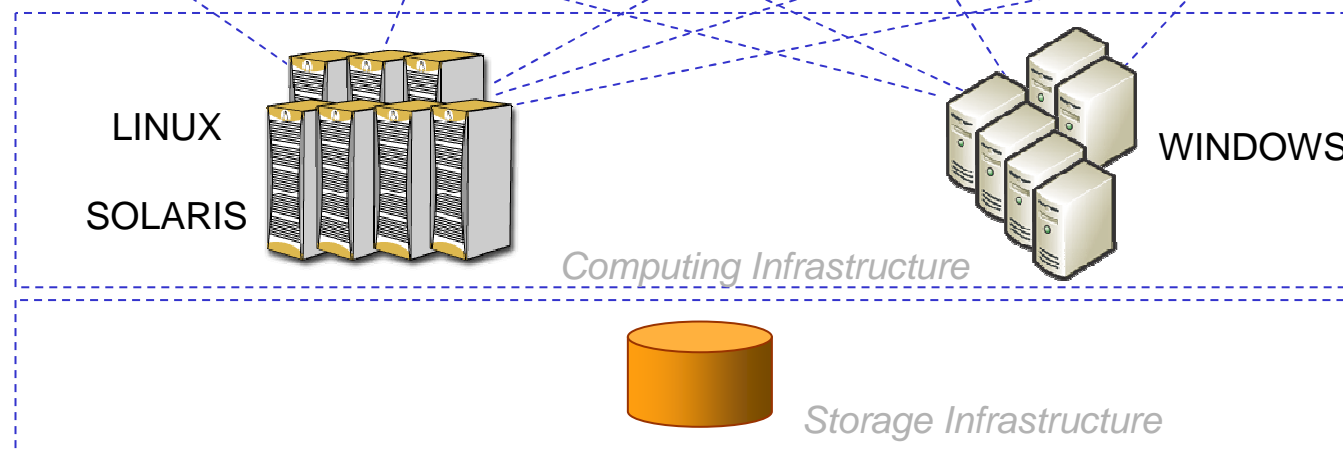
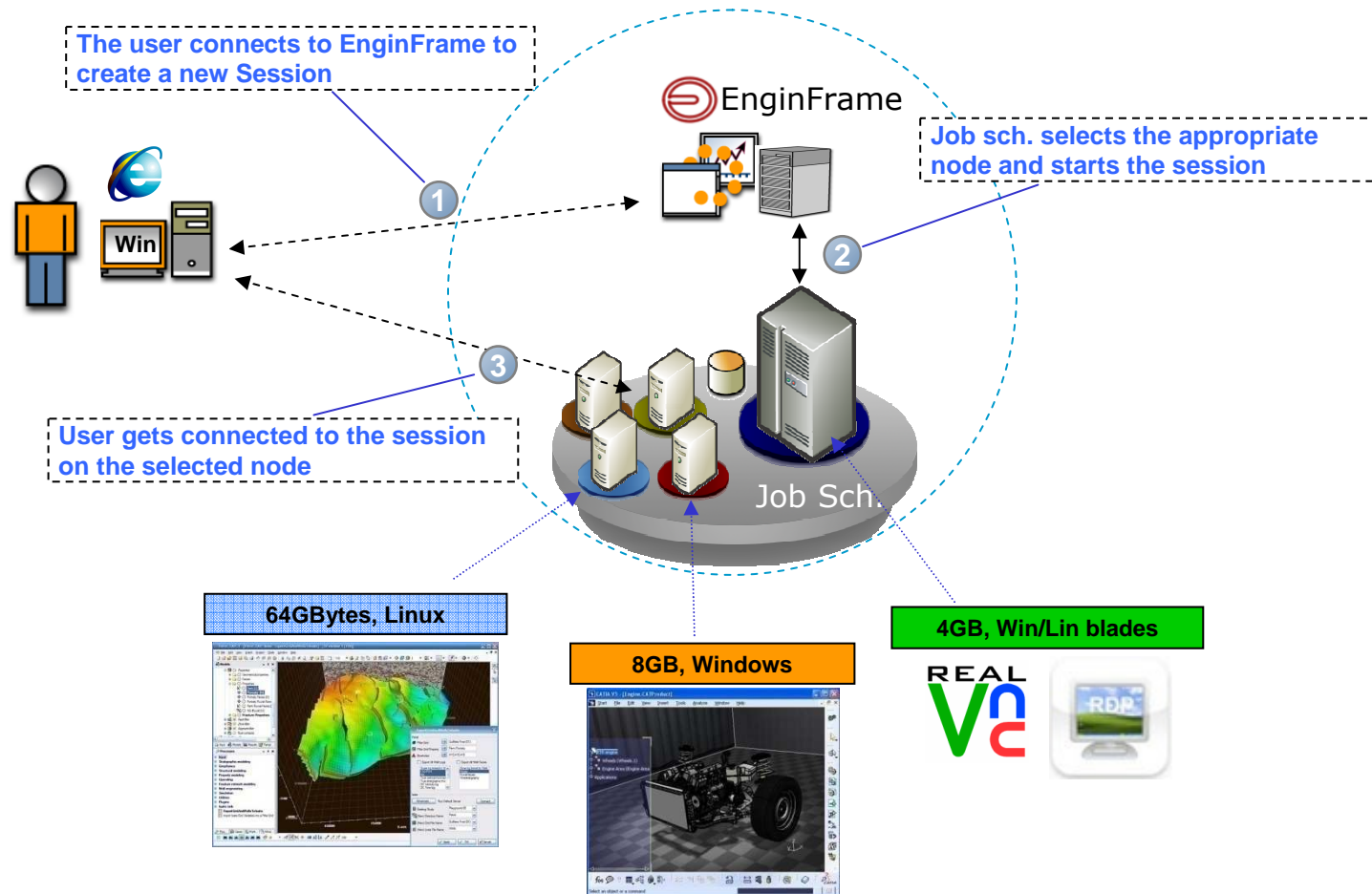# EnginFrame Views - Software Stack for 2D/3D Applications

NICE EnginFrame (Portal and Gateway) + Views plugin

Job Scheduler & Distributed Resource Manager

2D & 3D Applications

VirtualGL | **RealVNC** | **DCV** | **HP RGS** | **NX, RDP, ...**

LINUX

SOLARIS

WINDOWS

Computing Infrastructure

Storage Infrastructure

EnginFrame Views - Software Stack for 2D/3D Applications

EnginFrame Views is solution based on an open framework, leveraging etherogeneous resources and remote visualization technologies

LINUX

SOLARIS

WINDOWS

Computing Infrastructure

Storage Infrastructure

EnginFrame Views - How Does It Work?

The user connects to EnginFrame to create a new Session

EnginFrame

Job sch. selects the appropriate node and starts the session

User gets connected to the session on the selected node

Win

Job Sch.

64GBytes, Linux

8GB, Windows

4GB, Win/Lin blades

Heterogeneous infrastructure: HW, OS, middle-wares

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Benefits for the End Users

- **Access to Applications as a Service**
  - Hide infrastructure details (site, platform, etc…)
  - Session allocation can be influenced by memory requirements, data location affinity and other customer-specific parameters
  - Intelligent load balancing of sessions, based on the Job Scheduler
    - Memory-aware, Memory reservation, Application license-aware
  - Fewer or better optimized data transfers
- **Collaboration, session sharing**
  - The session owner can generate a "URL" that can be sent by email / instant message to invite a collegue to join a given session, without disclosing the user's password
- **Easy management of active session**
  - Create new sessions with user-specific preferences (resolution, etc...)
  - **List**, **reconnect** and **kill** existing sessions
- **Seamless Access to the sessions and Single Sign-On**
  - Automation of session-level password create/destroy
    - E.g. login via NTLM / ActiveDirectory credentials and map to Linux user

Benefits for the Administrators

- **Increased level of service provided to users**
  - Sessions are load balanced by the Job Scheduler to match user needs
  - Memory reservation and Data locality scheduling
  - Reduce help desk calls
  - Exposed services can be personalized per user/group/project
- **Accounting**
  - Sessions are jobs, so the resource usage accounting by *user*, *group*, *project* can be collected through any Analytics tool
- **Monitoring**
  - The load and usage of the login farm is monitored via EnginFrame
  - Node loading conditions, active sessions
  - Administrators can control and manage users' idle or stuck sessions
- **Support**
  - Administrators can connect to user's sessions to provide support
- **Security**
  - Easy integration into identity services, SSO, Enterprise portals

NICE DCV (Desktop Cloud Visualization)

- DCV originated in IBM Research in 2004, acquired by NICE in summer 2010

- DCV is a WAN based technology

- A central (graphics-enabled) server is accessed by remote users

- Users only need low-end machines with network connectivity to the server in order to view and interact with remote application

- One or more users (collaborators) can simultaneously access the server

- DCV is the key technology for delivery of real-time 3D graphics but relies on other software to provide the collaborative environment (RealVNC Visualization Edition)

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The OpenGL Driver Model – DCV Approach

OpenGL App

DCV

OpenGL library
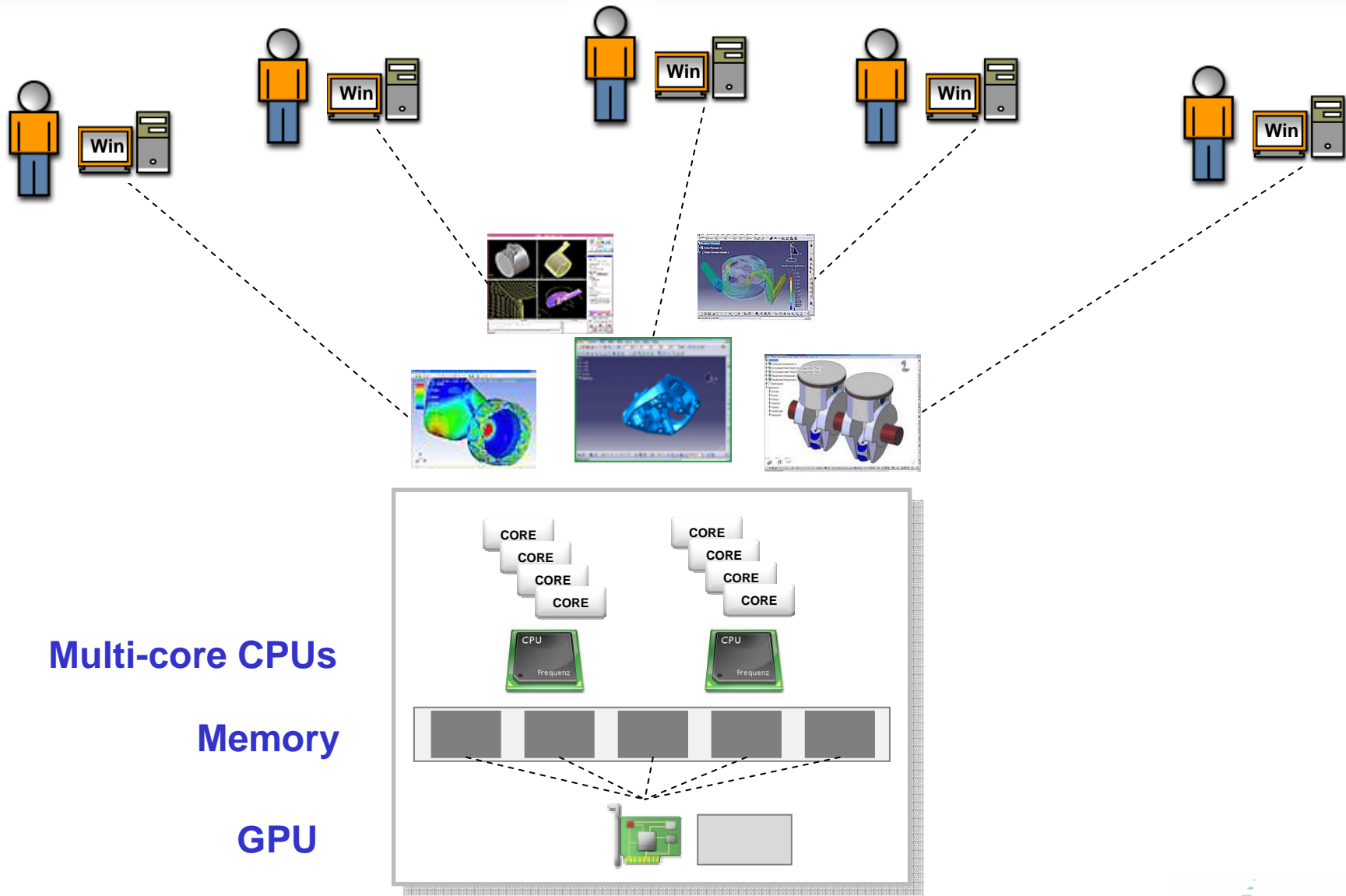
User Mode

Kernel Mode

Graphics Hardware
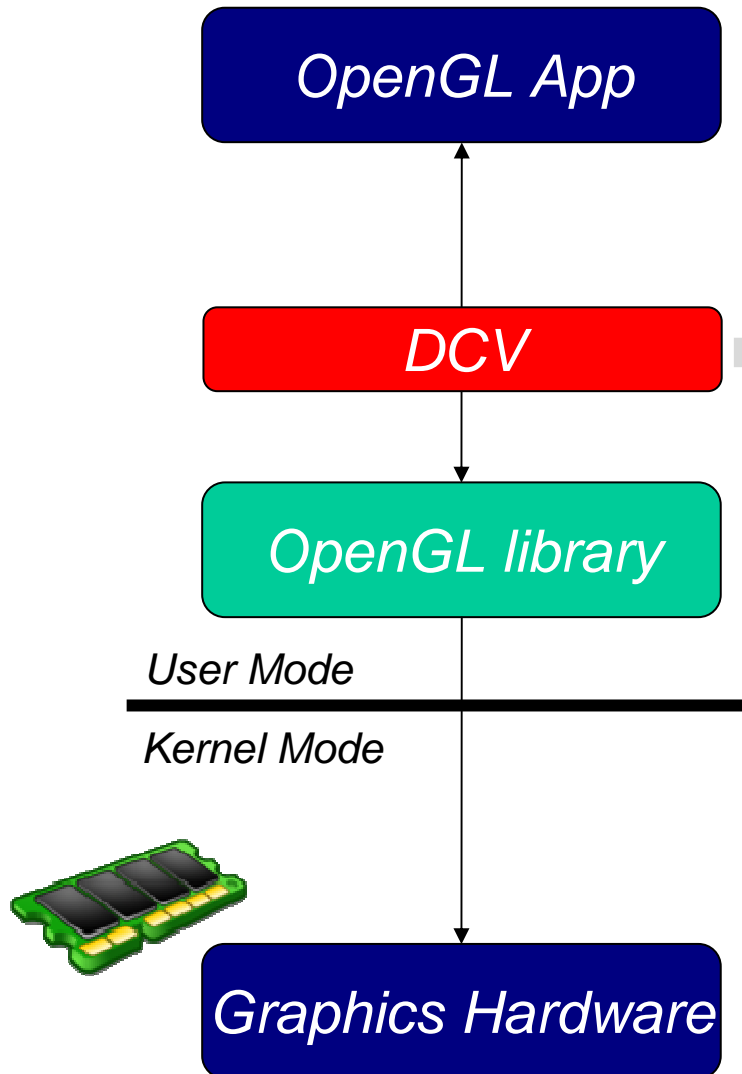
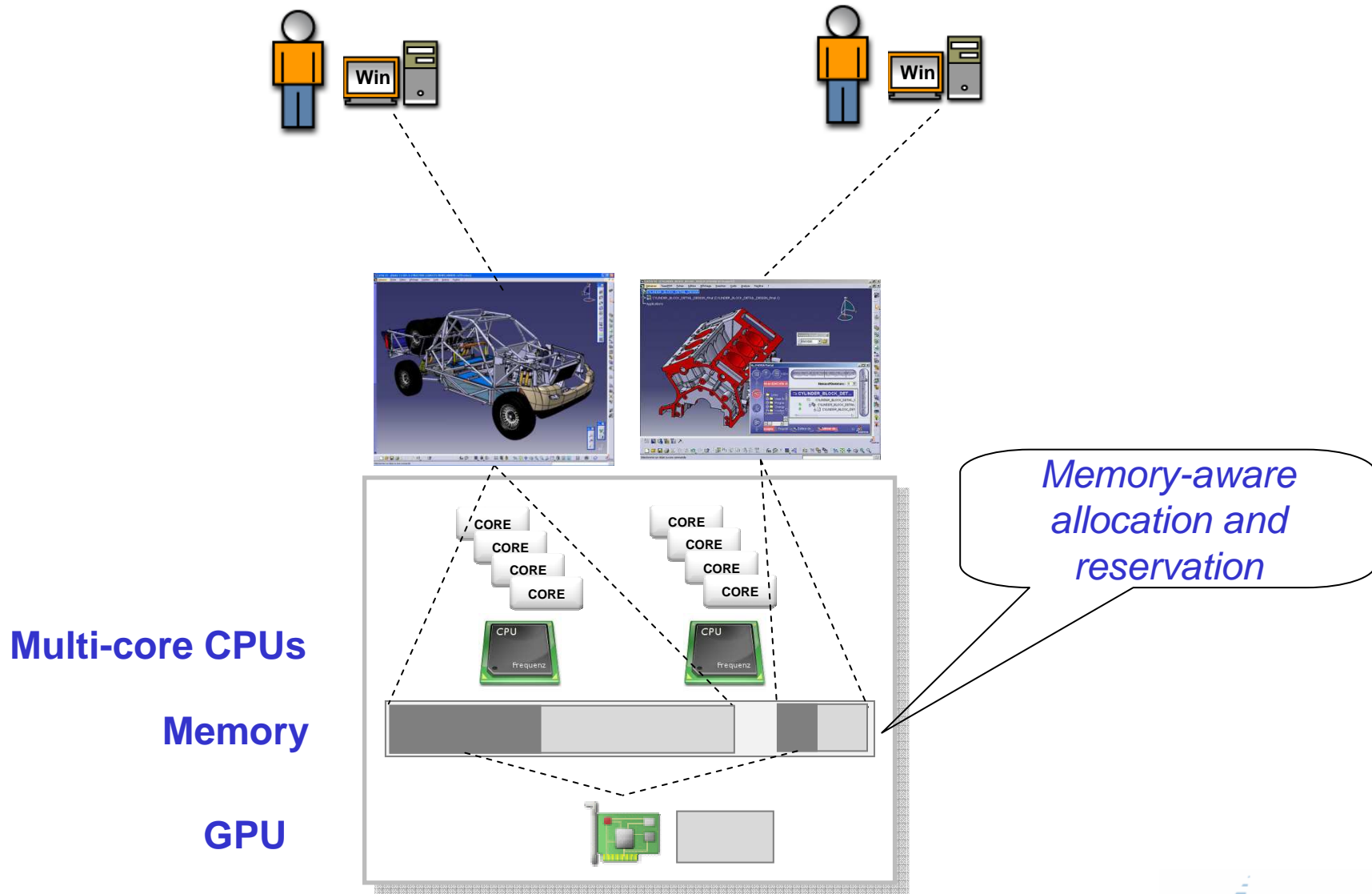OpenGL provides interface to underlying hardware capabilities

Man-in-the-middle approach

- DCV 'pretends' to be the system-wide OpenGL library
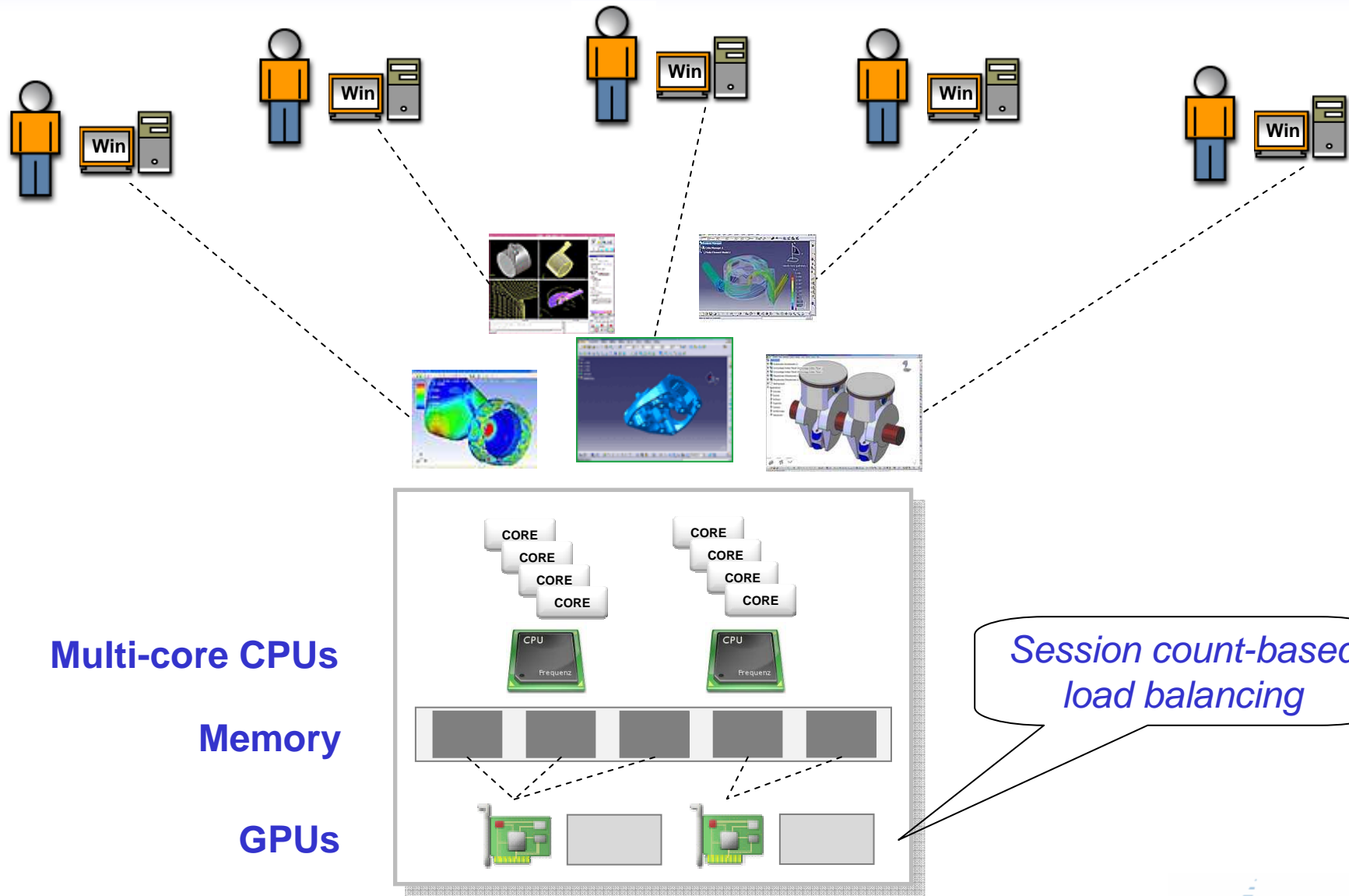- DCV 'injects' itself between application and the real OpenGL library

Multiple sessions on the same node

Multi-core CPUs

Memory

GPU

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Memory reservation

Win

Win

Memory-aware allocation and reservation

Multi-core CPUs

CORE
CORE
CORE
CORE

CORE
CORE
CORE
CORE

CPU
Frequenz

CPU
Frequenz

Memory

GPU

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Multiple sessions, with GPU load balancing

Multi-core CPUs

Memory

GPUs

Session count-based load balancing

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Thank you!