Environmental Simulation in Support of Engineered Resilient Systems

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Any Environment…Anywhere…Anytime

GROUND VEHICLES

Virtual Prototyping

- ***Virtually prototype many more designs in less time***
- ***Support the T&E community***
- ***Mission test in notional and physical environments***
- ***Employ variable-fidelity depending on accuracy required***

Improve product resilience while reducing unnecessary costs early in acquisition process.

Environmental Simulator Capabilities

- **Rapidly acquire & process environmental data**
- **Build simulations for locations anywhere, anytime**
  - Environmental Simulator has tools to build high fidelity computational models
- **Execute Simulations – predict environmental conditions**
- **Feed high-fidelity tradespace analysis**

Enables preparation of millions of simulated tests

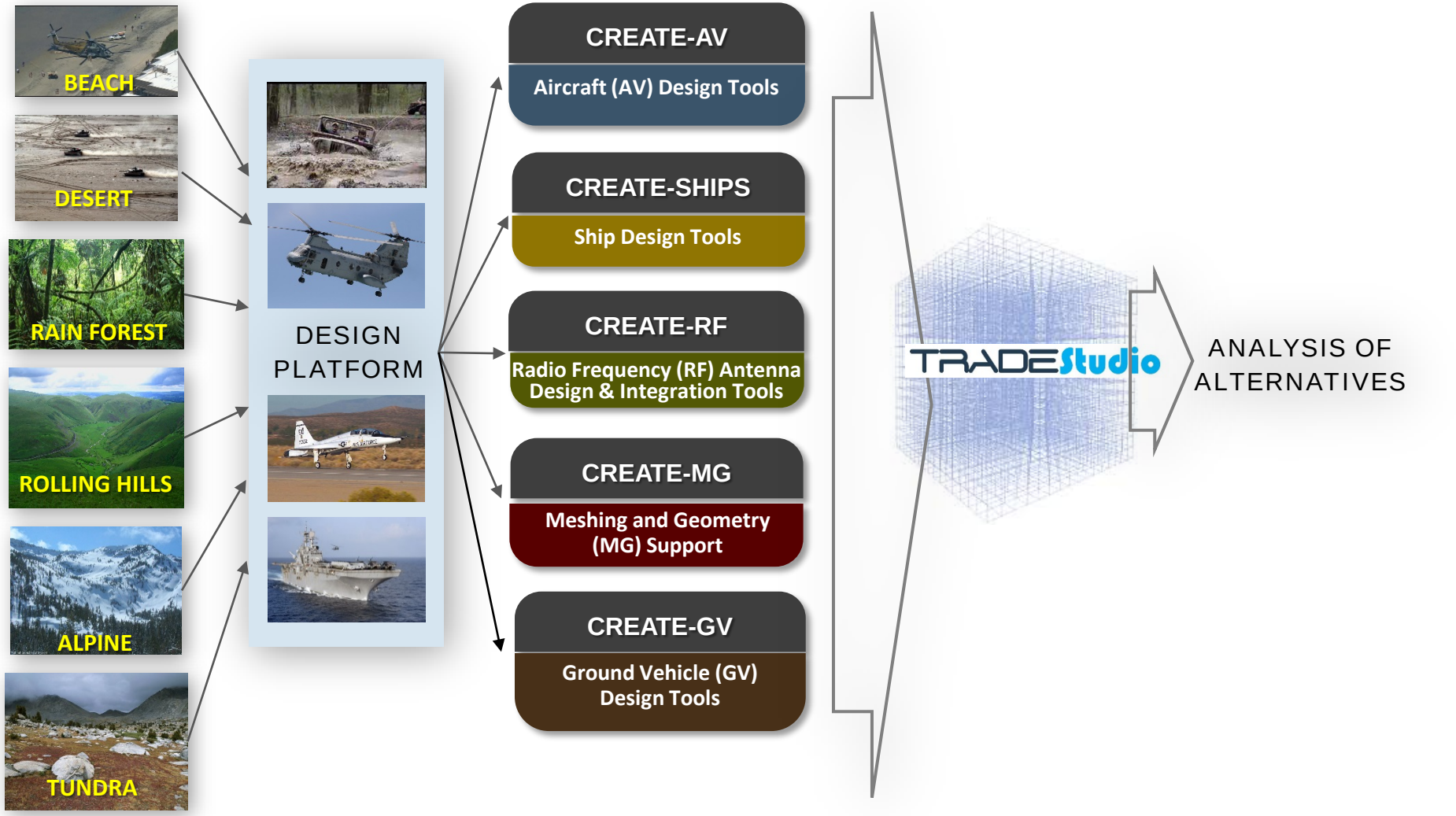
Conceptual Workflow Overview

Data Browser → **Model Development Environment** → **Scenario Builder**

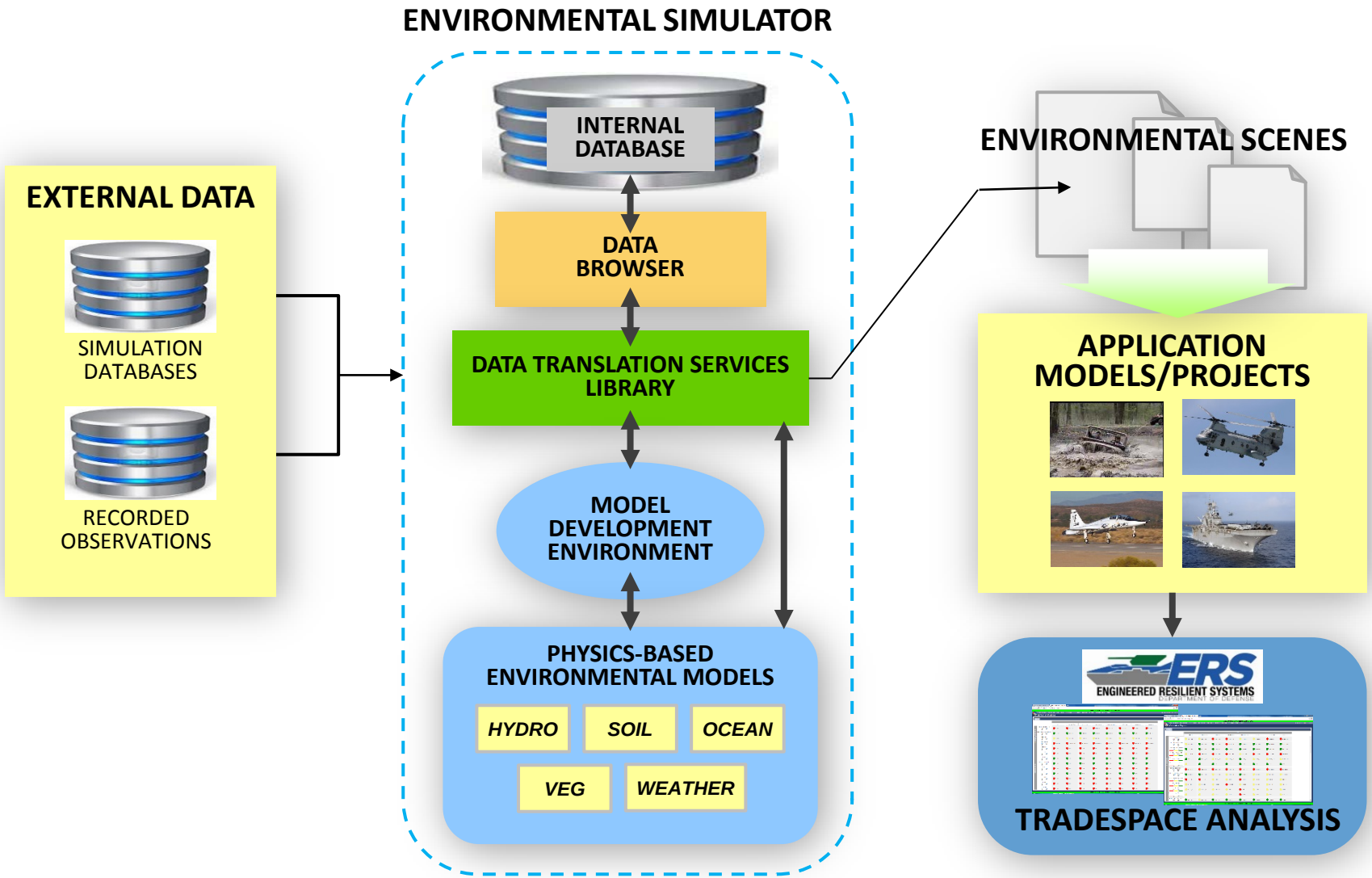
Attributes of interest entered into scenarios

Soil Moisture
Overland Water Flow
Ocean Waves
Currents
Precipitation
Land Cover
Wind
Temperature
…….

Workflow

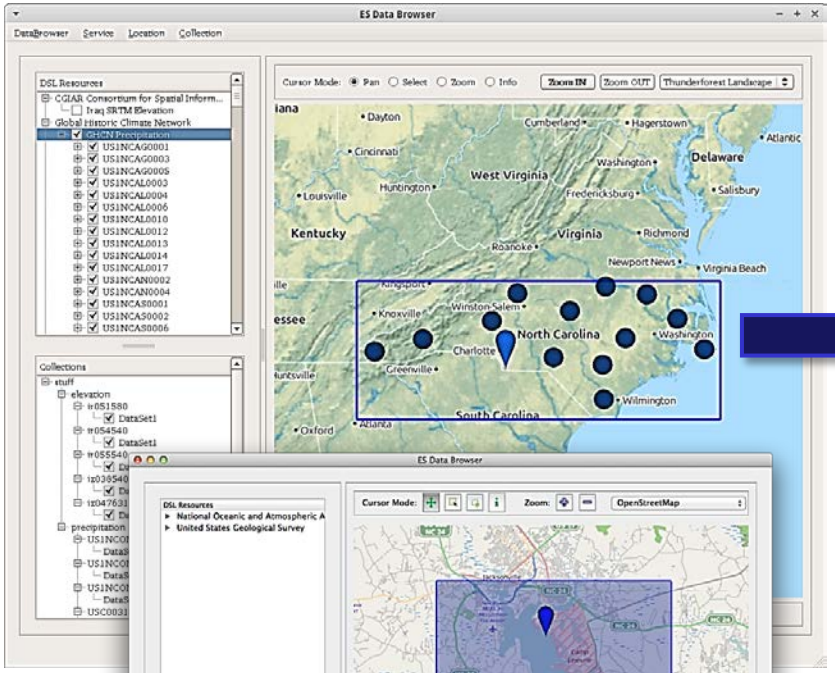

BEACH
DESERT
RAIN FOREST
ROLLING HILLS
ALPINE
TUNDRA
DESIGN PLATFORM
CREATE-AV
Aircraft (AV) Design Tools
CREATE-SHIPS
Ship Design Tools
CREATE-RF
Radio Frequency (RF) Antenna Design & Integration Tools
CREATE-MG
Meshing and Geometry (MG) Support
CREATE-GV
Ground Vehicle (GV) Design Tools
TRADEStudio
ANALYSIS OF ALTERNATIVES

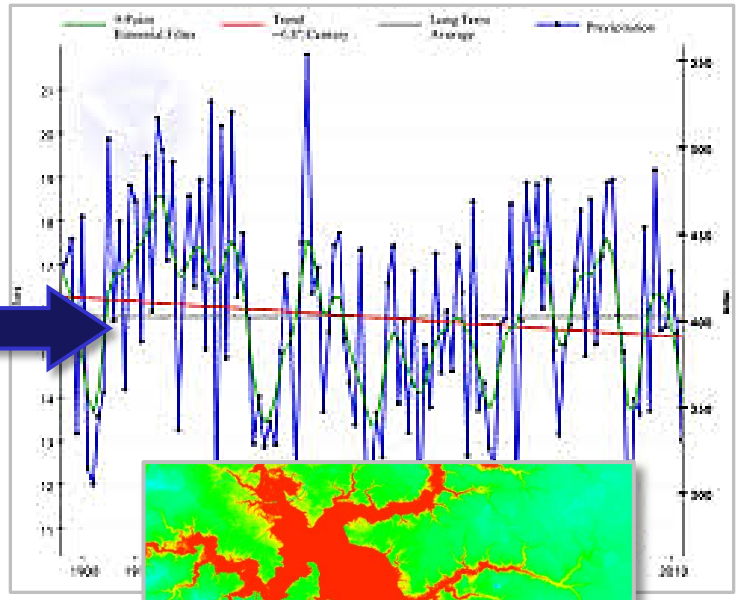
Architecture

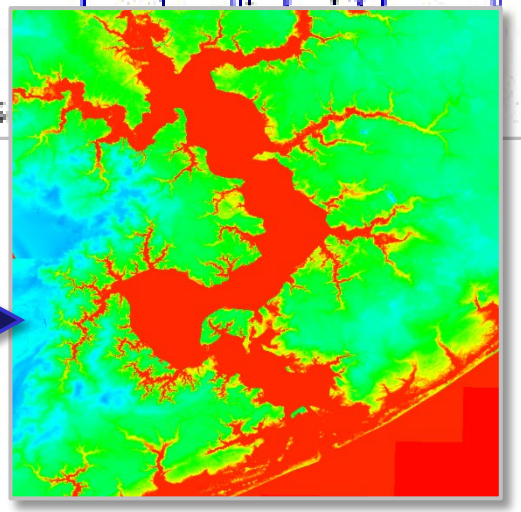


DataBrowser

Interface for Data Translation Services Library

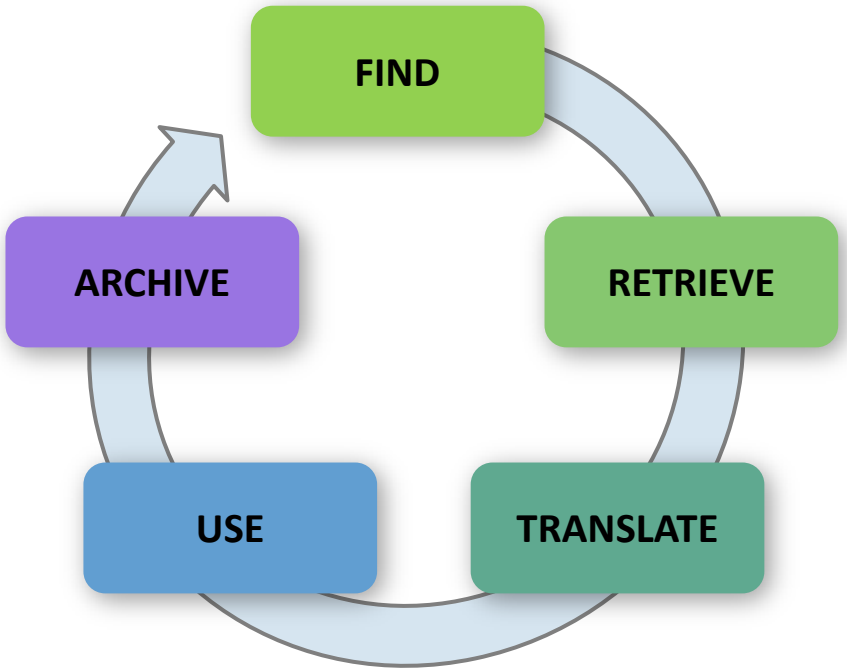






Data Translation Services Library

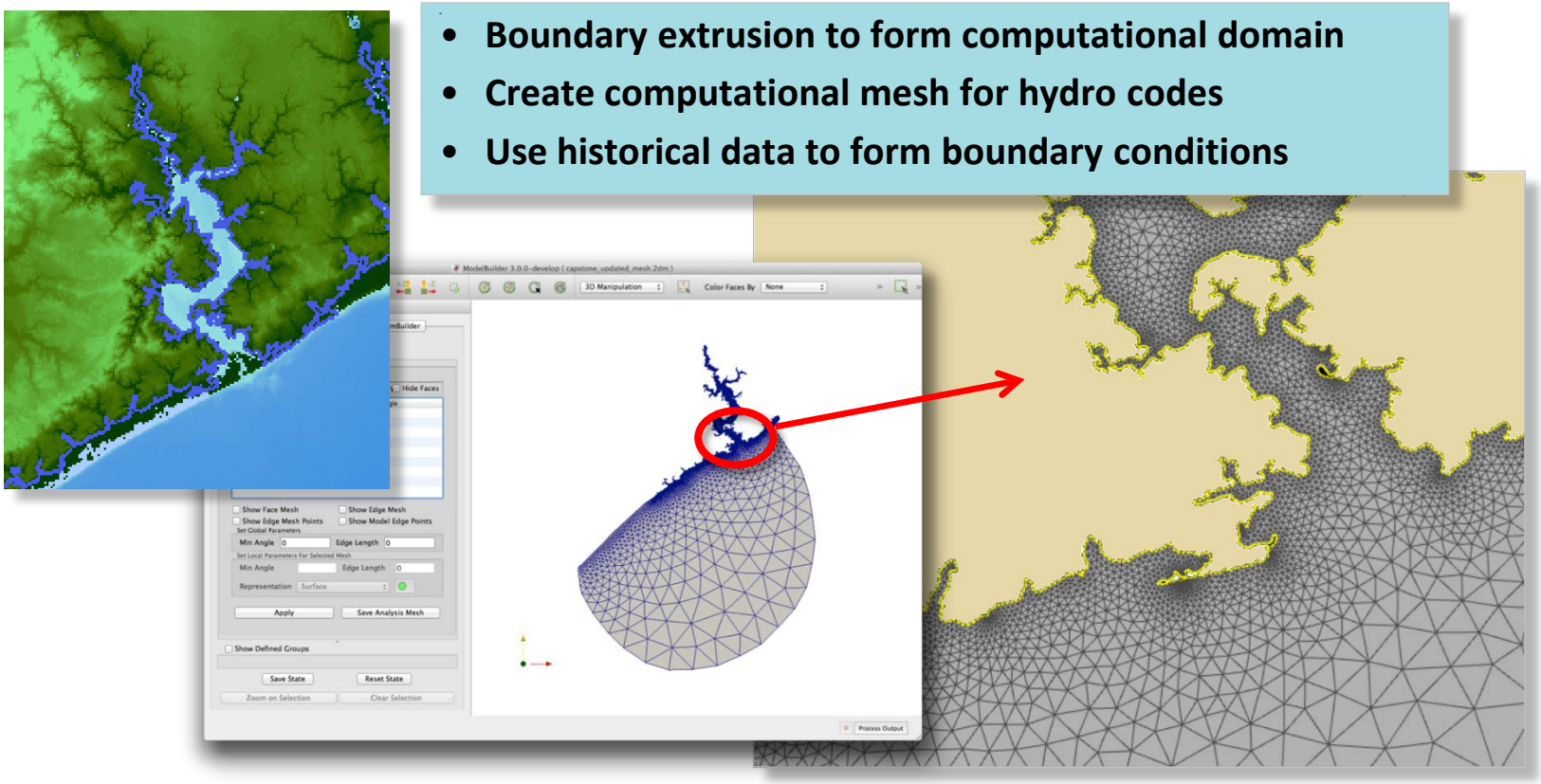
- **Unified geospatial search for data**
- **Data retrieval from local and remote sites**
- **Format translation, spatial and temporal interpolation**
- **Cataloguing and archival of simulation results**



Model Development Environment

Conceptual model development; mesh generation; boundary/initial condition assignment

- Boundary extrusion to form computational domain
- Create computational mesh for hydro codes
- Use historical data to form boundary conditions



Scenario Builder

- **Build environmental scenarios by**
  - Modifying physics-based model inputs
  - Tweaking specific parameters
- **Automatic generation of parameter sensitivity studies**
- **Execute applications on local machines, clusters, HPC resources**
- **Monitor status**
- **Visualize results**

Demonstration: Camp Lejeune

Ground vehicle tested in physics-based, simulated environments

Vegetation Density

Soil Conditions

Seasonal Tidal Conditions

River Flow Velocity & Depth

Urban Ground Conditions

ENGINEERED RESILIENT SYSTEMS
DEPARTMENT OF DEFENSE

Questions & Answers