INTERNATIONAL VIRTUAL OBSERVATORY ALLIANCE
US National Virtual Observatory OPTICON AUI AURA NSF

Applications Framework

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Applications Framework

- Topics
  - What is it
  - Who is involved
  - Applications framework concept
  - Near term plans

What is the Applications Framework?

- A framework
  - A common desktop environment and computational framework
  - Python, Java are baselined for top level applications, but the architecture is not limited to these
  - Computational components may be in any language
  - Provides scalable computation

- A set of open system standards
  - Specifications for key elements of the framework
  - Reference implementations for the framework elements
  - May be used individually or as an integrated framework

What Is It Not?

- A complete end-user system
  - Framework, app packages, tools are separate products
  - They come together to form a complete system
  - Many system configurations are possible
- A class library for implementing applications
  - O/IR, radio, X-ray, etc. require (and already have) their own specific class libraries and algorithms
  - Legacy software already has its own class libraries built-in
  - We need class libraries to build applications but they are a separate (but potentially integrated) product

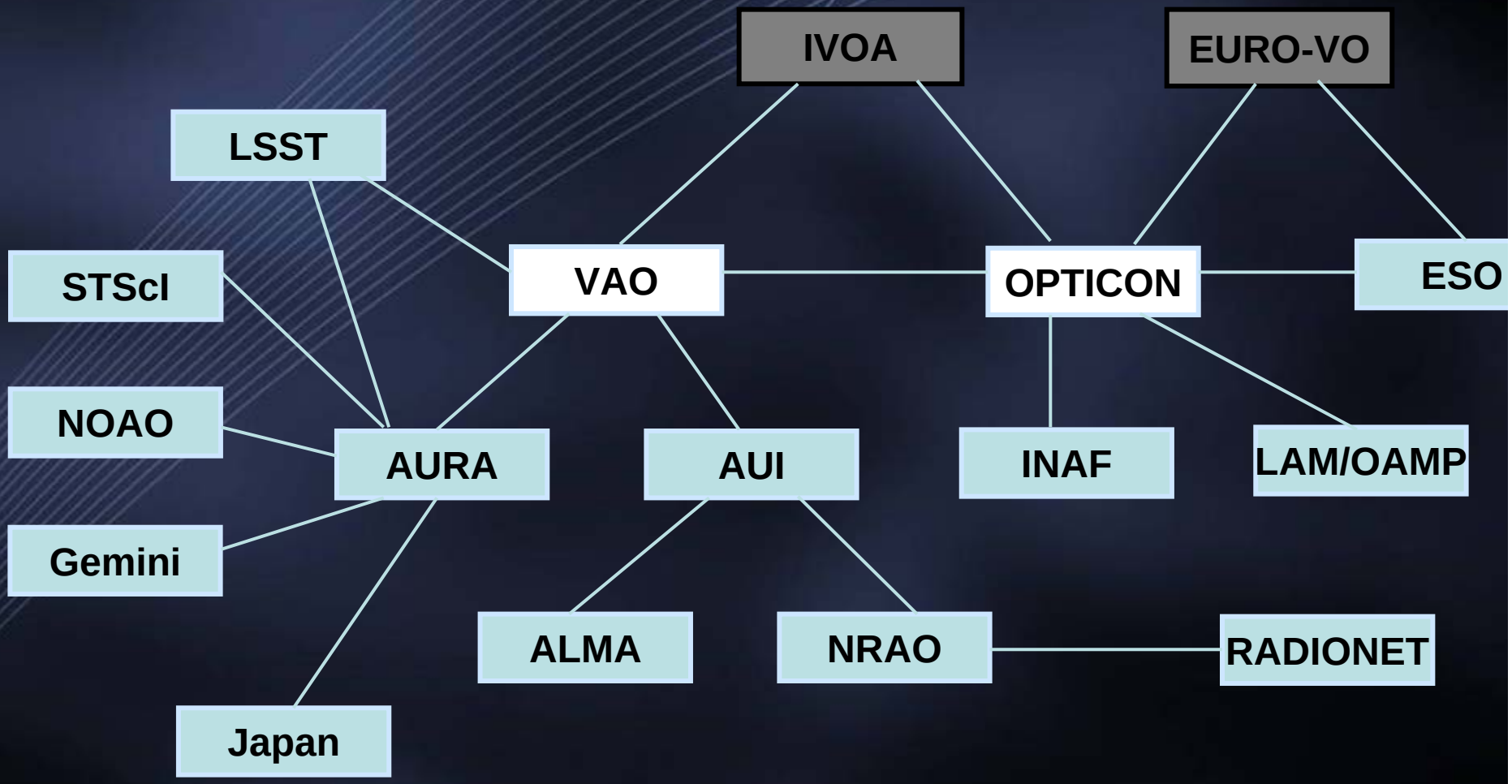
Applications Framework

- Some Goals
  - Integrate software from multiple observatories and projects
    - app packages from many sources install into common environment
  - Integrate observatory software with the VO and with VO technology
    - use VO standards (Grid, data access, DM, etc.) in observatory s/w
    - use observatory software to build VO services and applications
  - Migrate legacy software to a modern new environment
    - AIPS, CASA, GIPSY, IRAF/PyRAF, MIDAS, Starlink, etc.
  - Provide a framework for constructing and deploying new applications
  - Provide common user experience and promote software sharing/reuse
  - Address harder problems
    - open system, scalability, standards development

Typical Use Cases

- Desktop data processing and analysis
  - Python UI/CLI/scripting environment and tools
  - Framework plus applications packages
  - Client integration with VO (VOClient, data access, etc.)
- Pipeline processing
  - Instrumental data processing pipelines
  - Both facility mode and user-reprocessing modes
  - Scalable, remote/distributed execution
- Data processing for VO services
  - Virtual data generation for data services (DAL)
  - Analysis services with Grid front end (CEA etc.)

Who Is Involved?

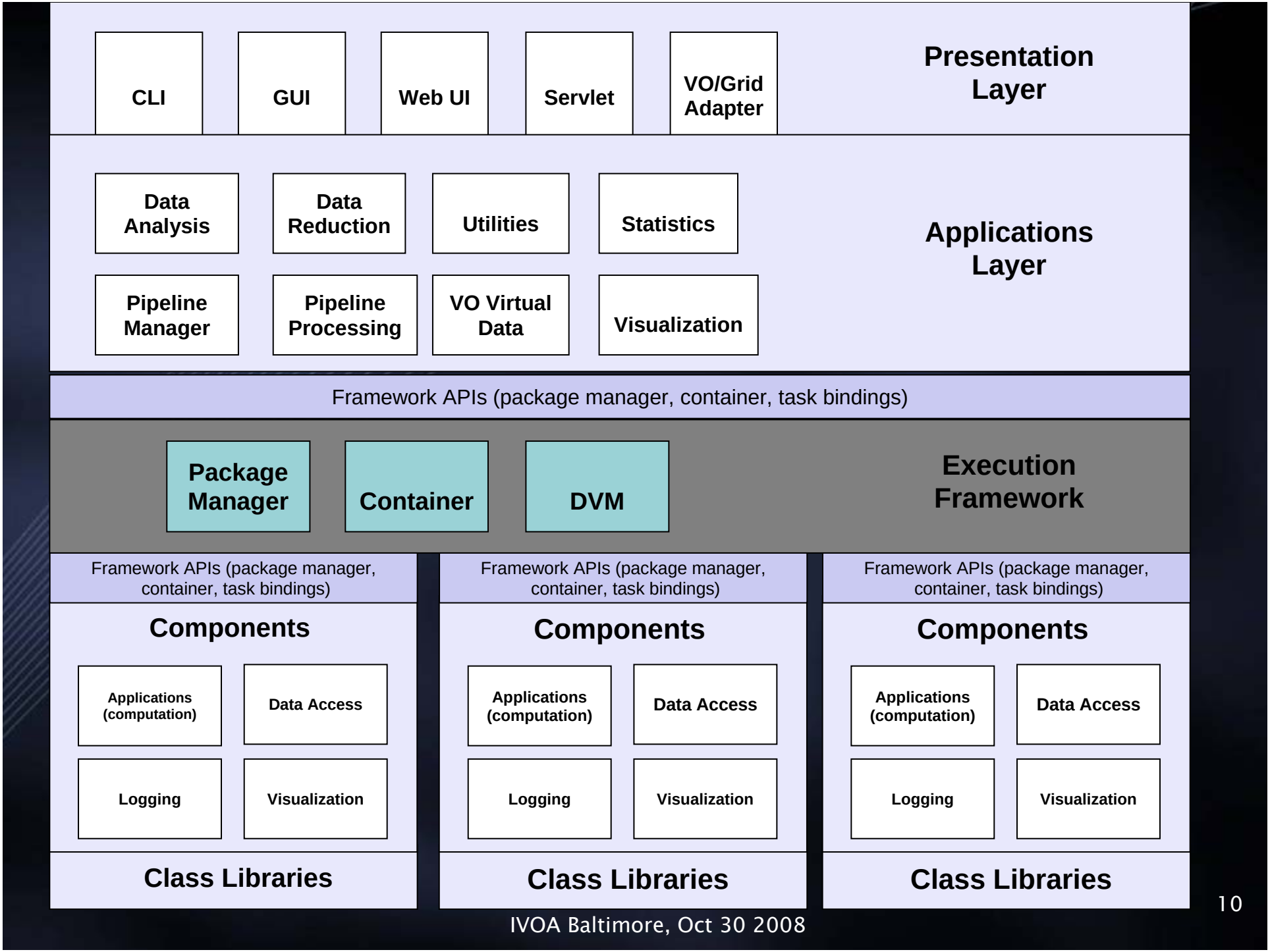


Current Status

- OPTICON/NVO Collaboration
  - Phase I wraps up this year
    - Requirements document
    - Architecture whitepaper
    - Applications framework conceptual design (*new*)
  - Phase II (implementation) funded, begins next year
    - More on this at the end of talk

Current Status

- AURA Software Initiative
  - AURA observatories (NOAO, STScI, Gemini)
  - Also LSST, NVO/VAO, Japan
  - Hilo workshop held June 2008
  - Joint strategic whitepaper in progress
- AUI Software
  - CASA project (also AIPS, ParselTongue/OBIT with RADIONET)
  - AUI and AURA will jointly manage VAO


CLI
GUI
Web UI
Servlet
VO/Grid Adapter
Presentation Layer
Data Analysis
Data Reduction
Utilities
Statistics
Pipeline Manager
Pipeline Processing
VO Virtual Data
Visualization
Applications Layer
Framework APIs (package manager, container, task bindings)
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DVM
Execution Framework
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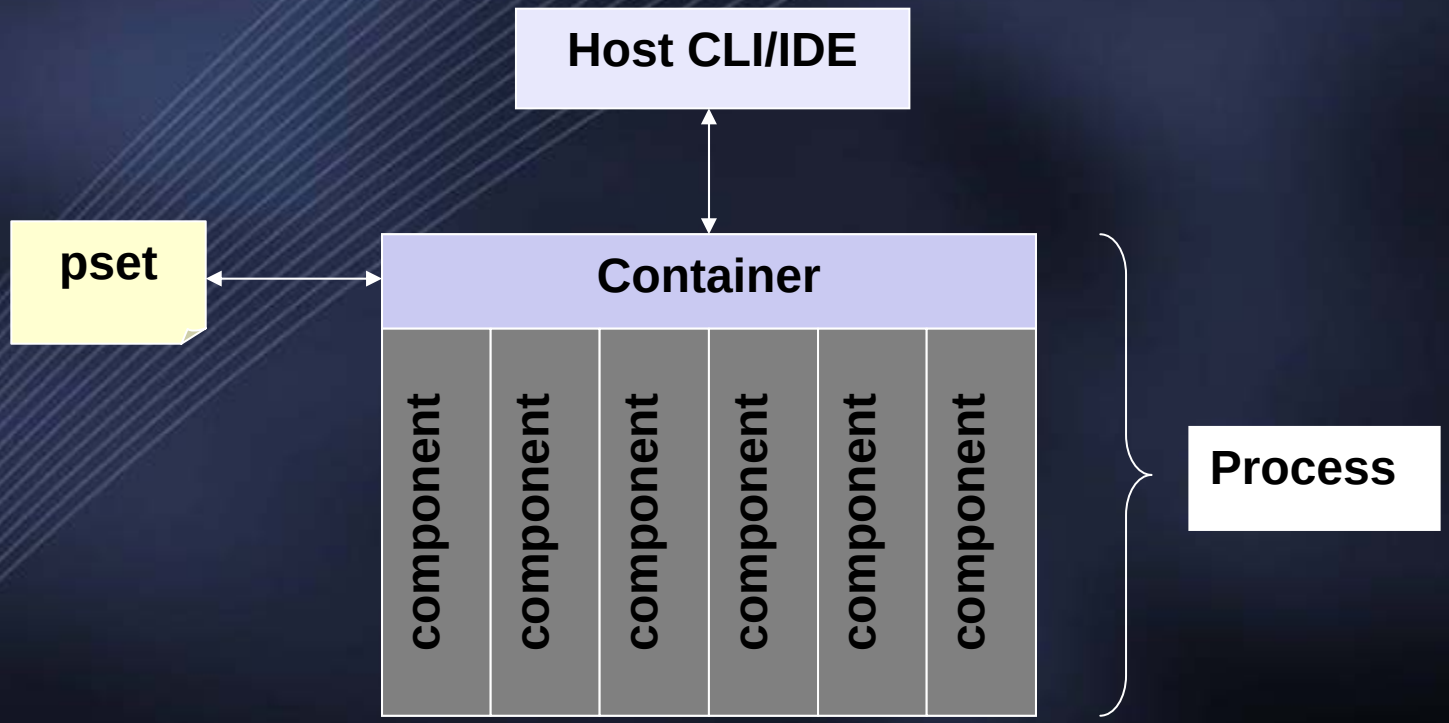
Framework Elements

- Packaging
  - Applications package containing applications, components, parameter sets, package documentation, package metadata, etc.
  - Entire package in one Zip file (like a servlet War file)
  - Legacy software is repackaged in this form
- Component Container
  - Components are "tasks" (one method) and "tools" (DO, stateful)
  - Components have a standard interface, run within the container
- Parameter Mechanism
  - Tasks and tool methods have a parameter set interface
  - Parameter sets used for both input and output, also data entities

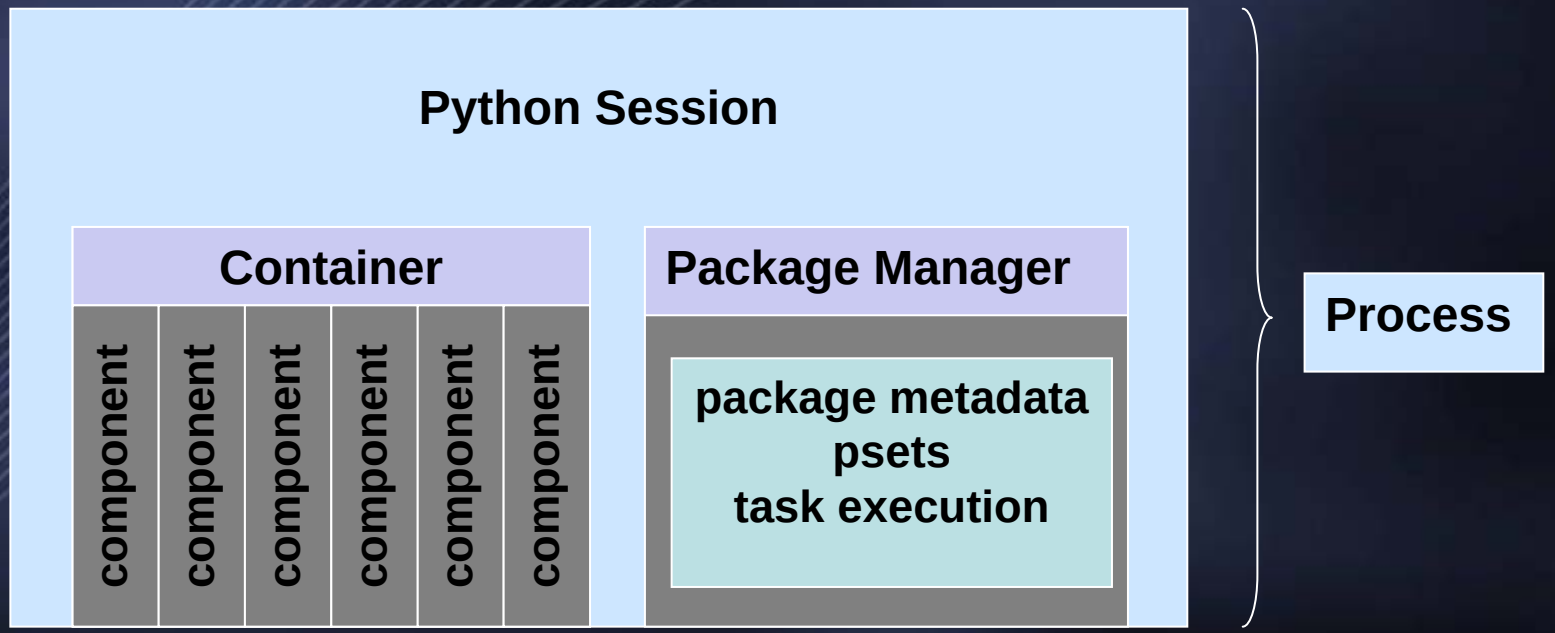
Framework Elements

- Messaging
  - Applications and components can communicate via messaging
  - SAMP (2.0 probably) is part of this but not all there is to messaging
- Package Manager
  - Runtime management of packages, tasks, parameter sets, etc.
  - Manages metadata, instances, pset storage, task execution, etc.
- Distributed Virtual Machine (DVM)
  - Provides basic functionality for distributed, scalable execution
  - MPI integration (e.g. OpenMPI), SPMD parallelization capabilities
  - Low level messaging and process control
- Framework Services
  - Logging, concurrent data access (locking, data integrity)

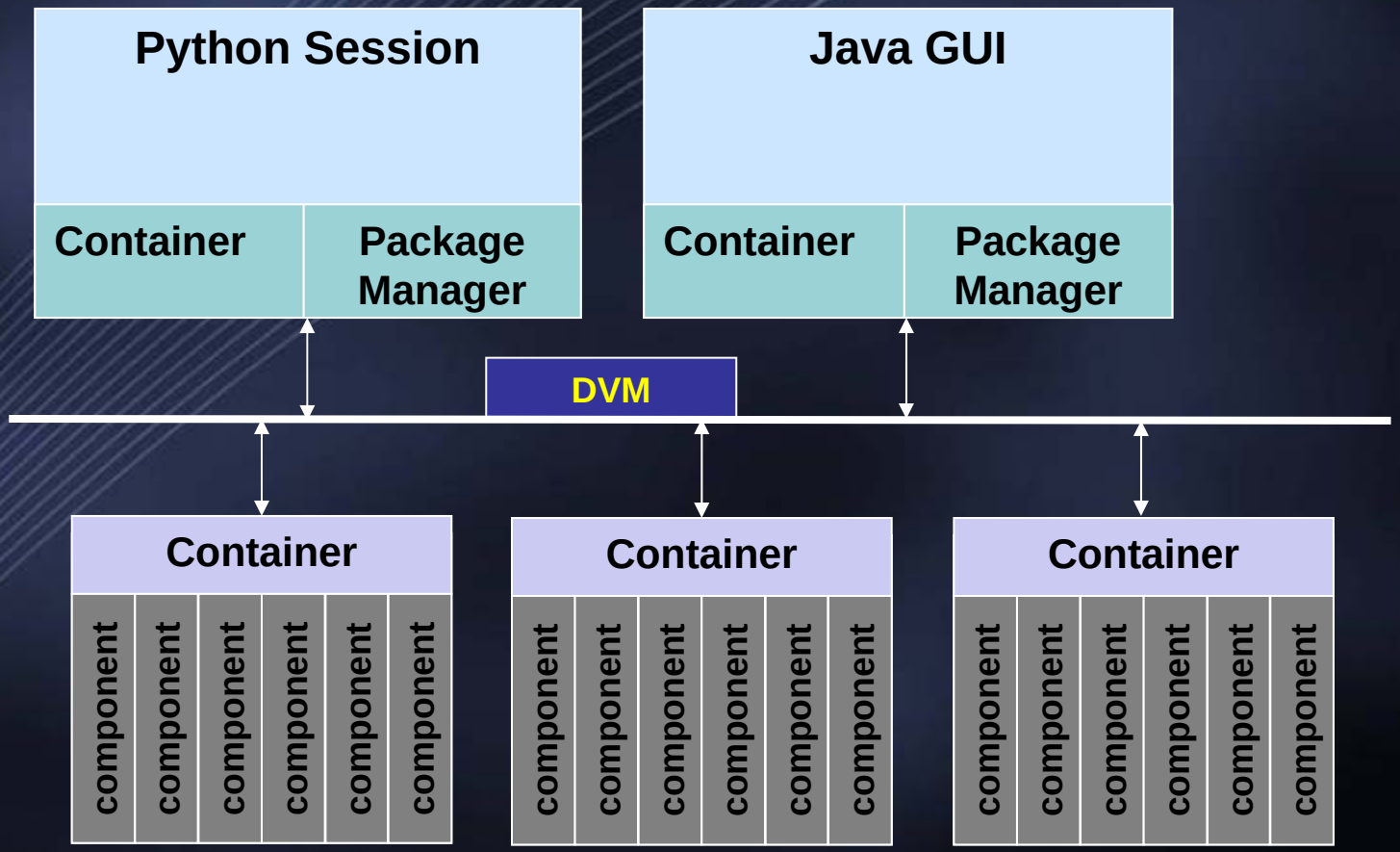
Container (Host Execution)



Container (In-Process)

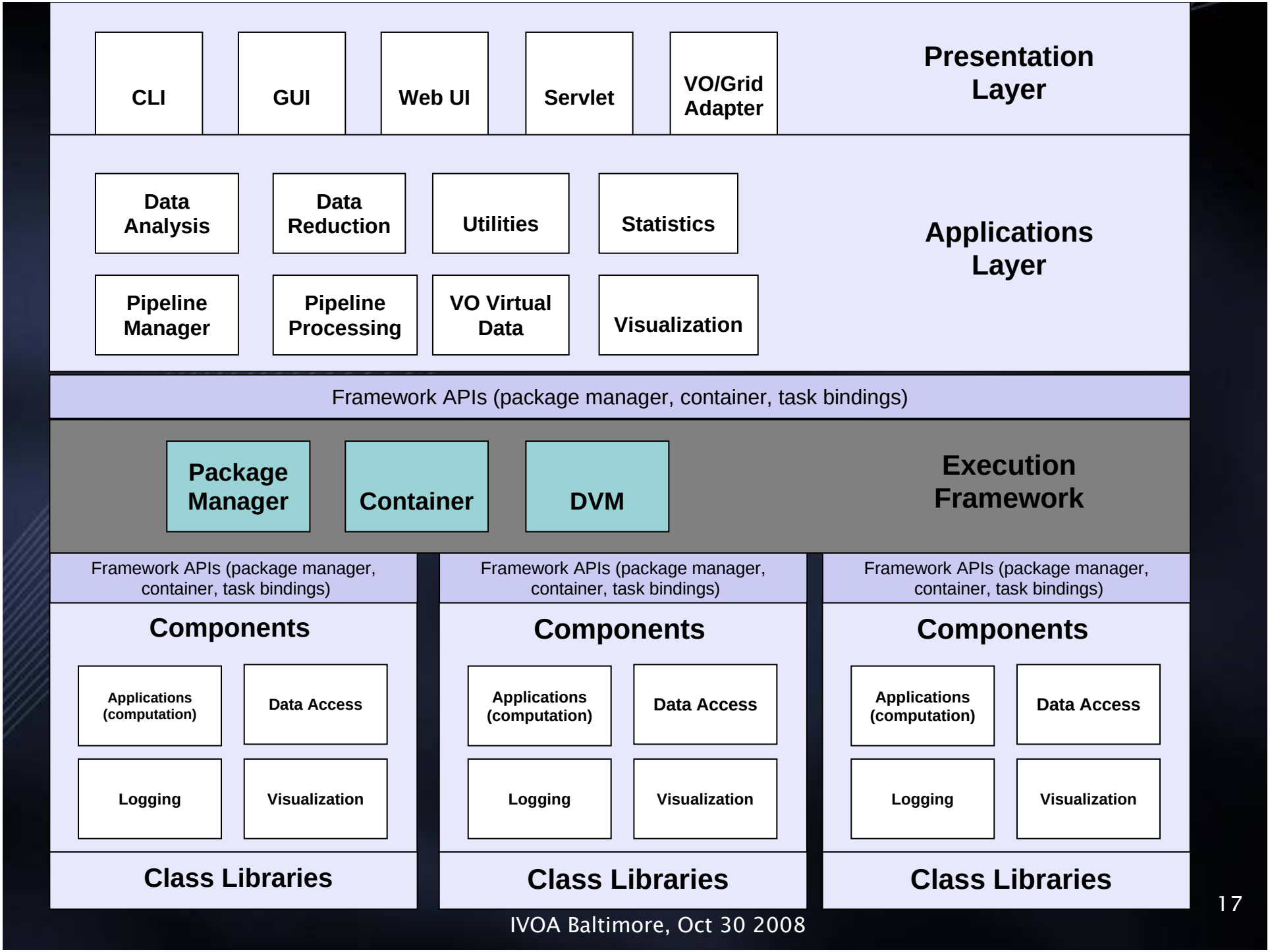


Distributed Execution



Near Term Plans

- VAO/OPTICON effort
  - Runs for 2-3 years
  - Yearly specify/build/test cycle
  - Specify, reference implementations, end-to-end testing
  - Year 1 TBD, e.g., component/container, parameters, Python integration
- Broader Effort
  - Plans still under discussion
  - All projects have short term plans specific to project
  - Longer term planning coordinated with common framework effort
  - Projects do use-case implementations based upon framework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