

Remote Visualization  
Using Low-Level Event Services  
and Cluster Computing

—OR—

ECho, cluster computing,  
and the Access Grid

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<http://www.cc.gatech.edu/projects/ihpcl>



***IHPCL***

**Interactive  
High Performance  
Computing Laboratory**

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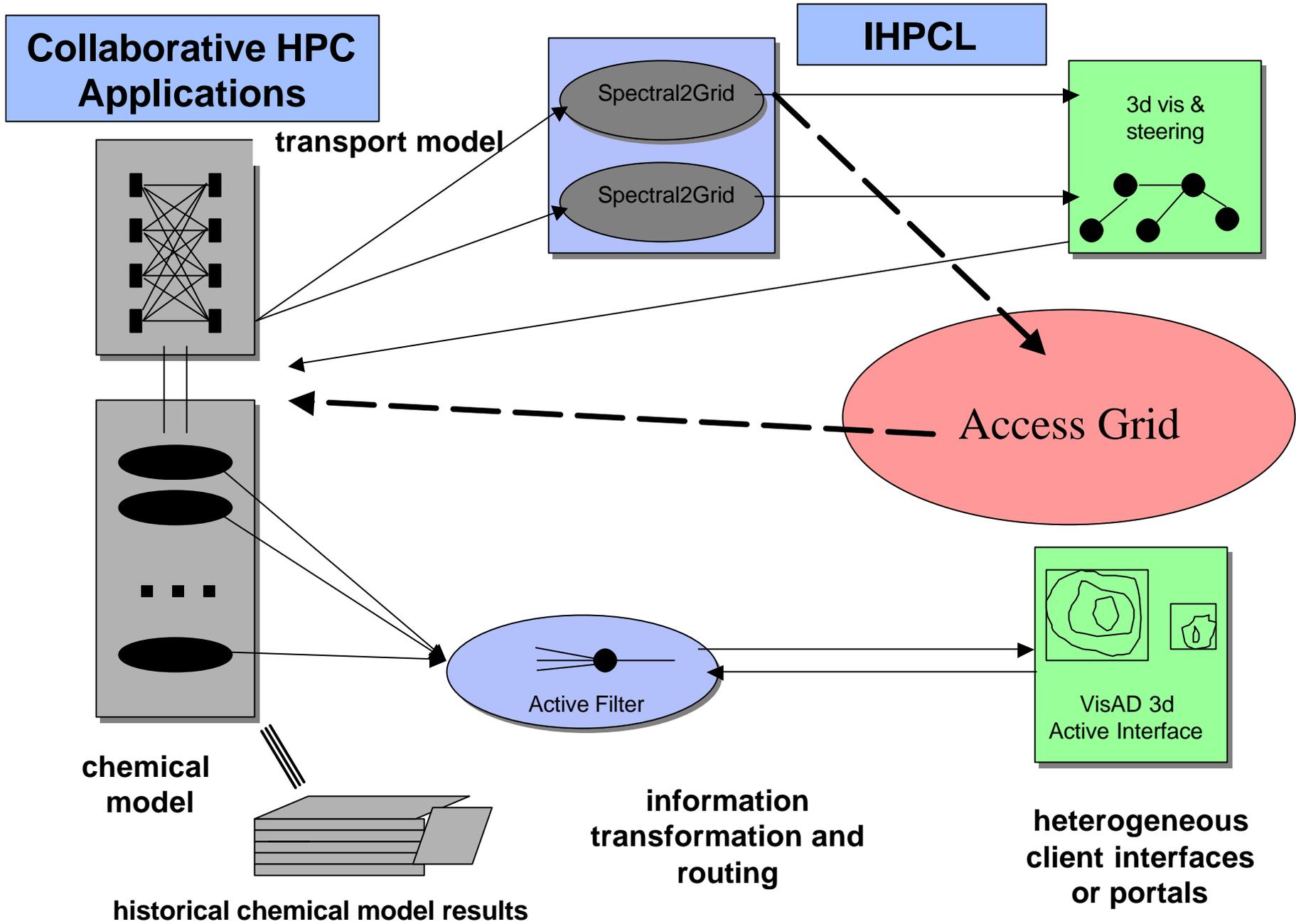
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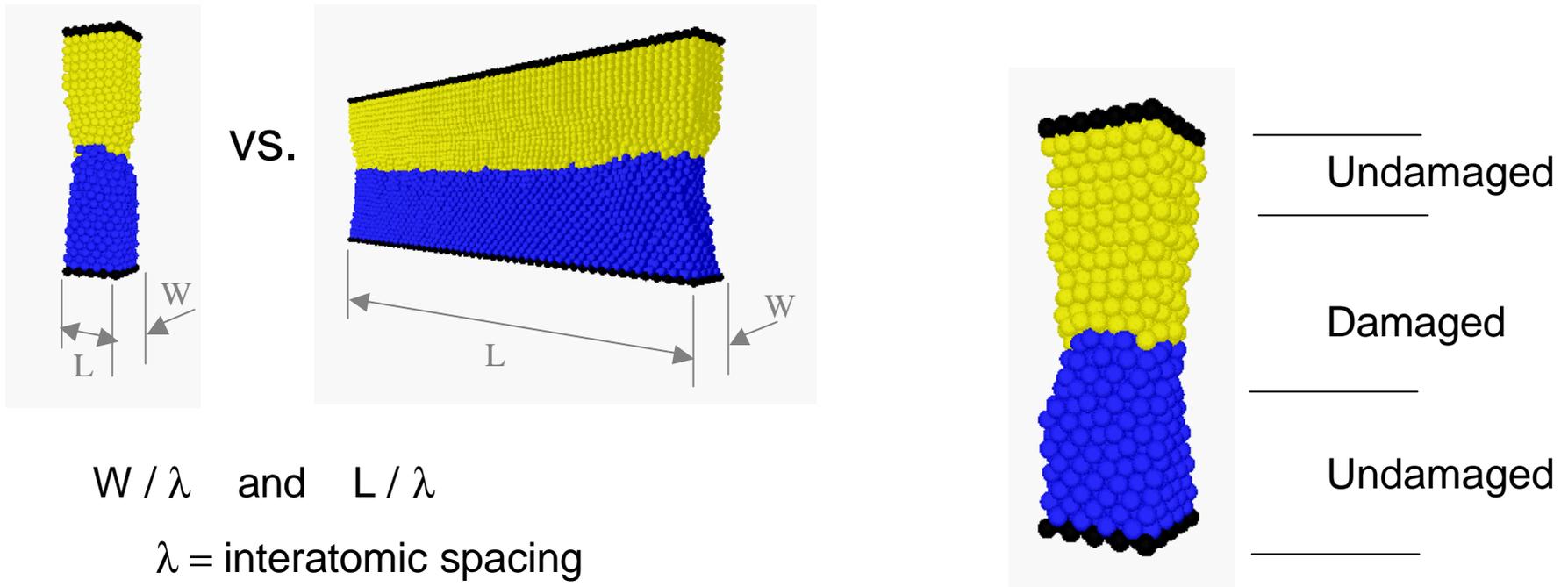
+ Research Scientists and

Graduate Students

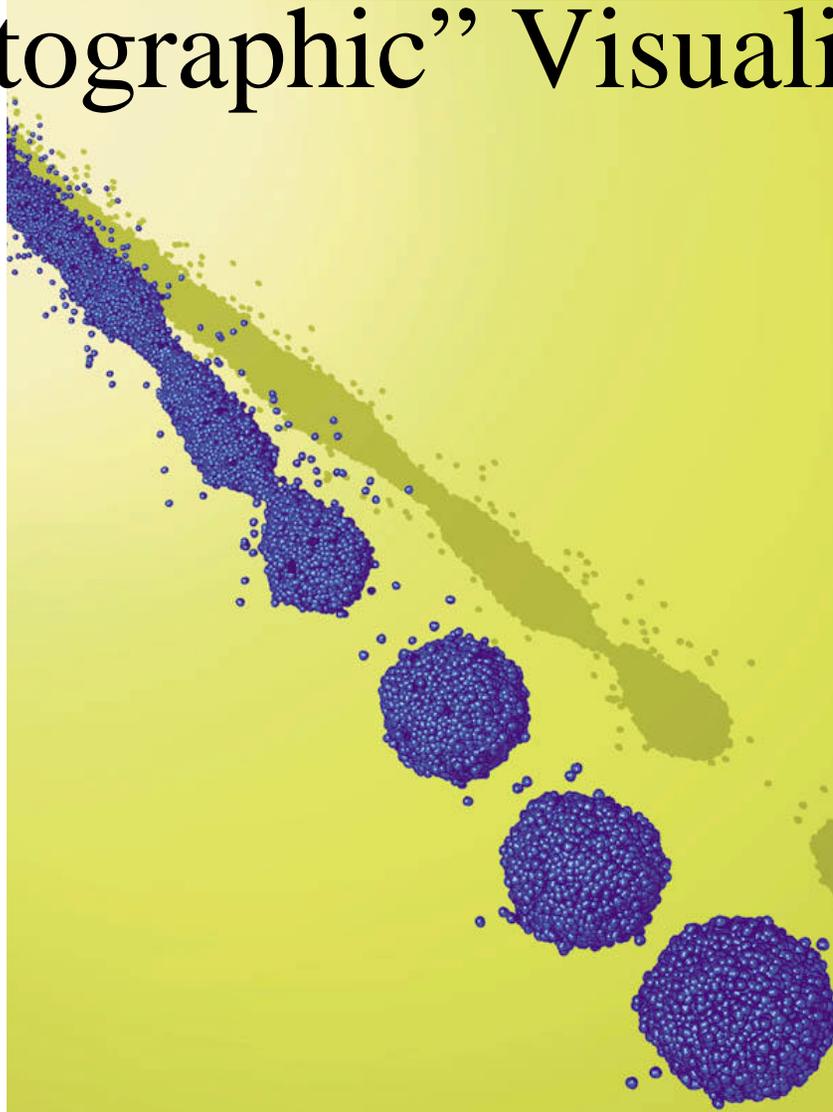


# Research Application: Molecular Dynamics

- Mechanical Engineering
- Chemistry
- Physics
- Aerospace Engineering

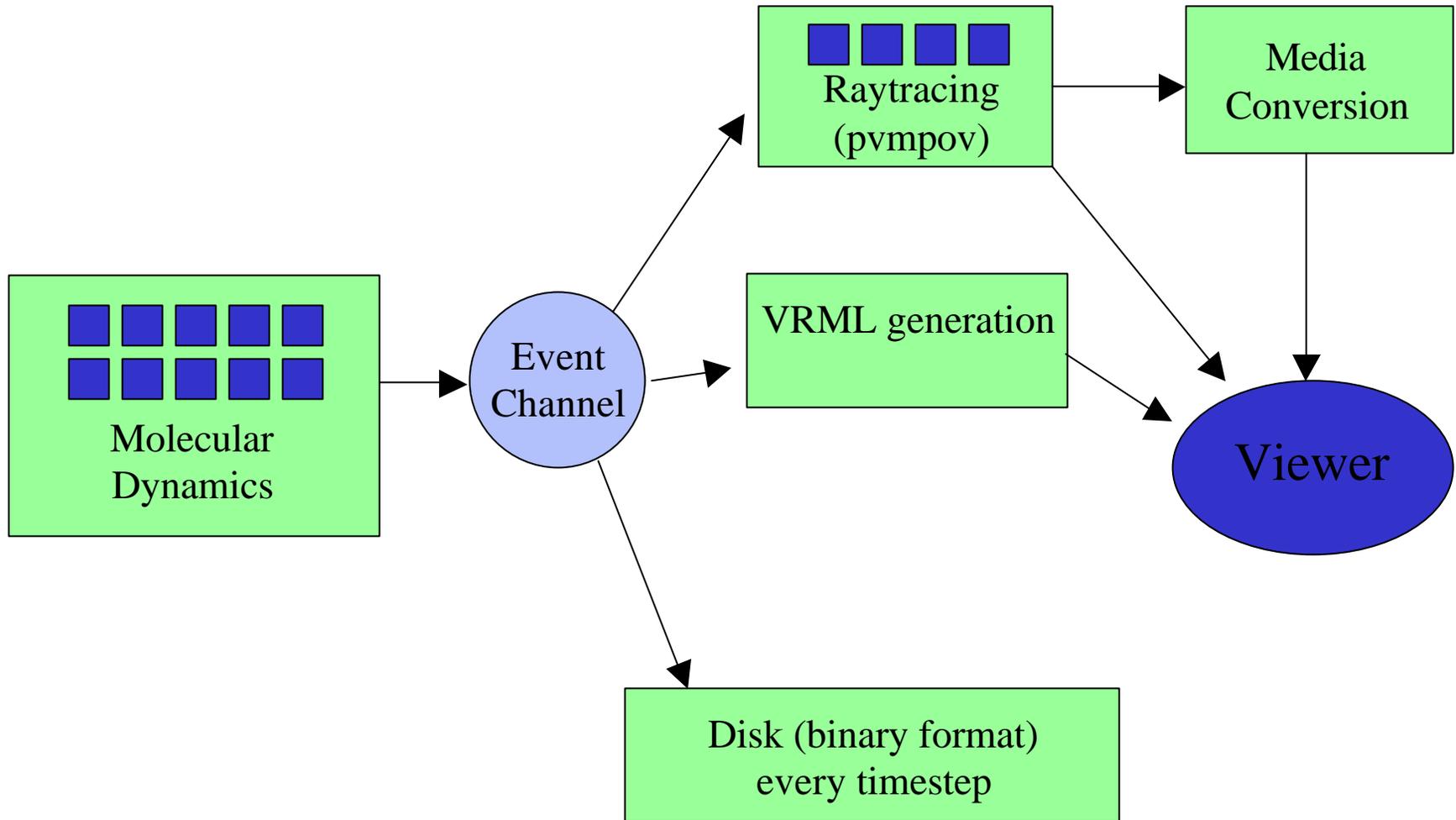


# Real-Time, “Photographic” Visualization

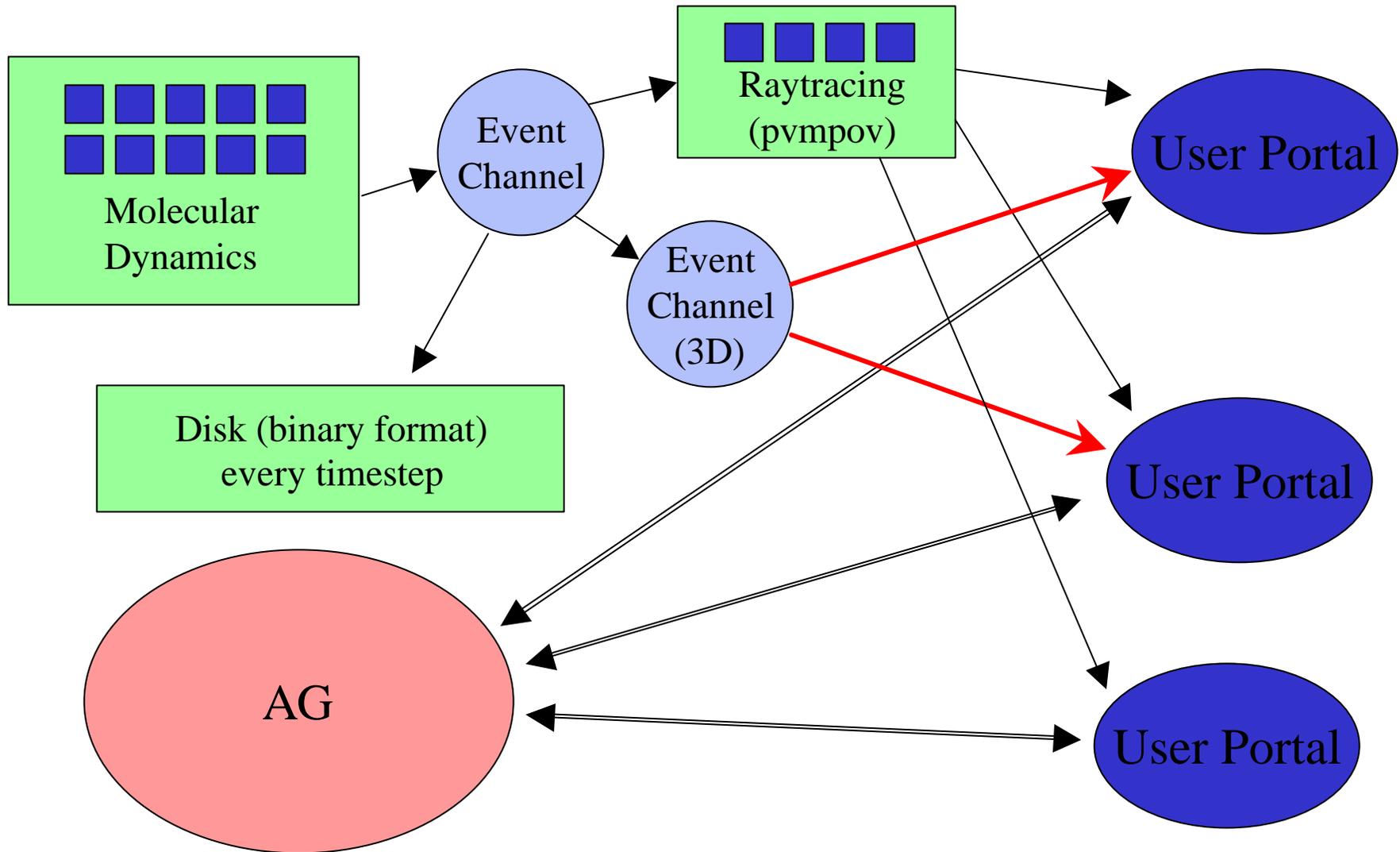


Taken from the same research on the cover of the August 18, 2000 edition of *Science*.

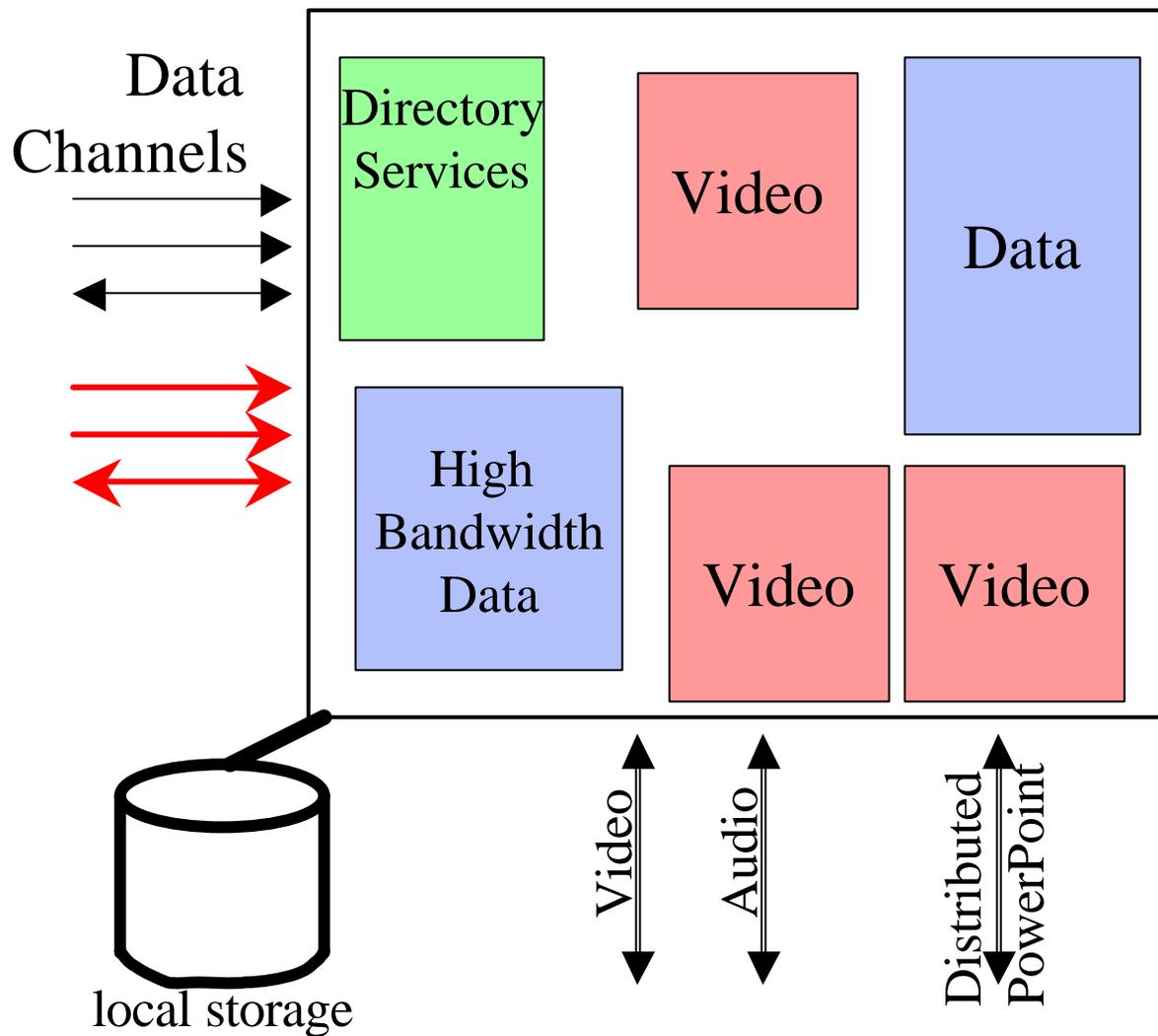
# Current Implementation



# What We Would Like



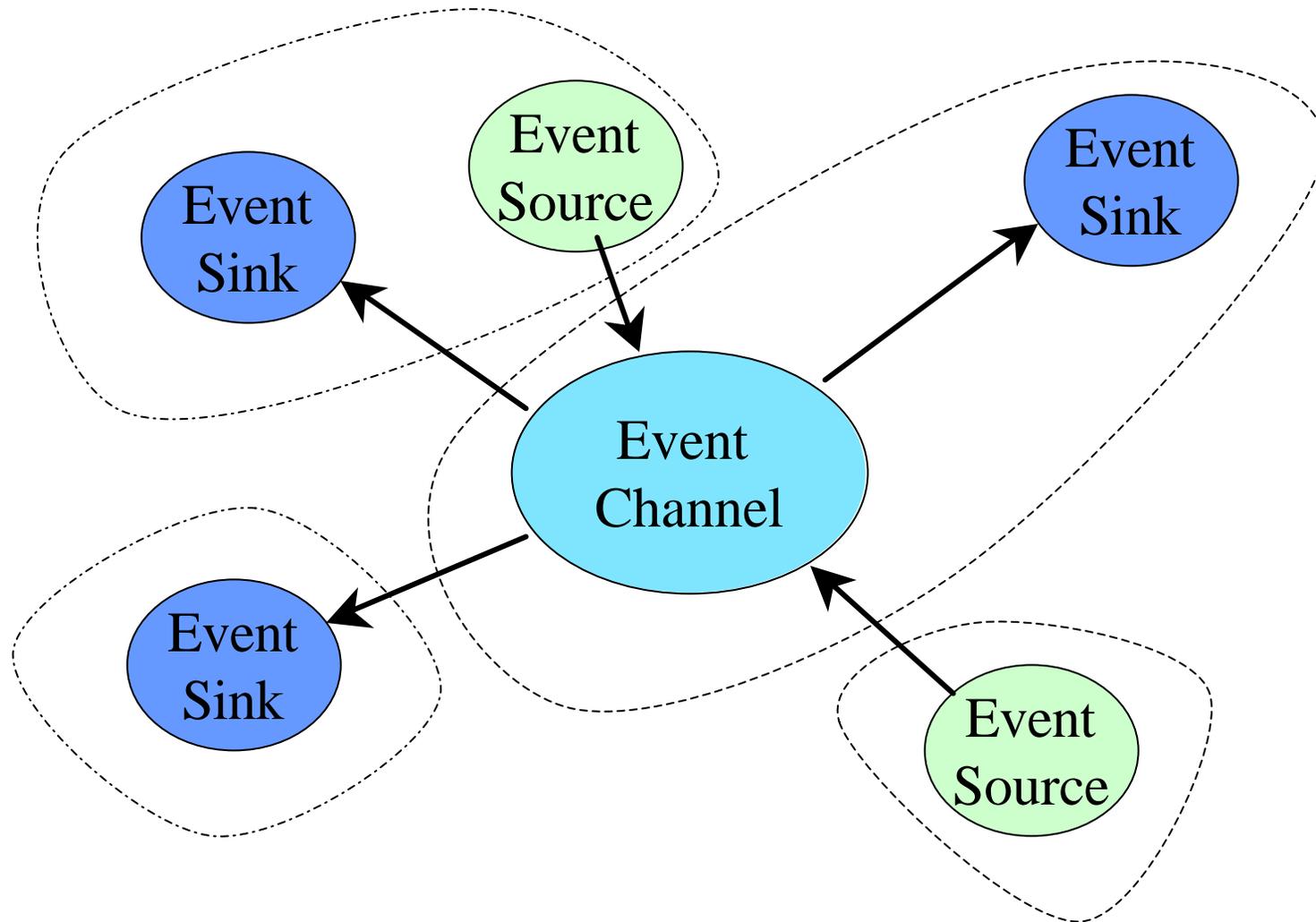
# So What's This Portal?



Data Channels have

- labeling
- synchronization
- replay
- user-defined transformation
- high performance
  - handle “large” data feeds

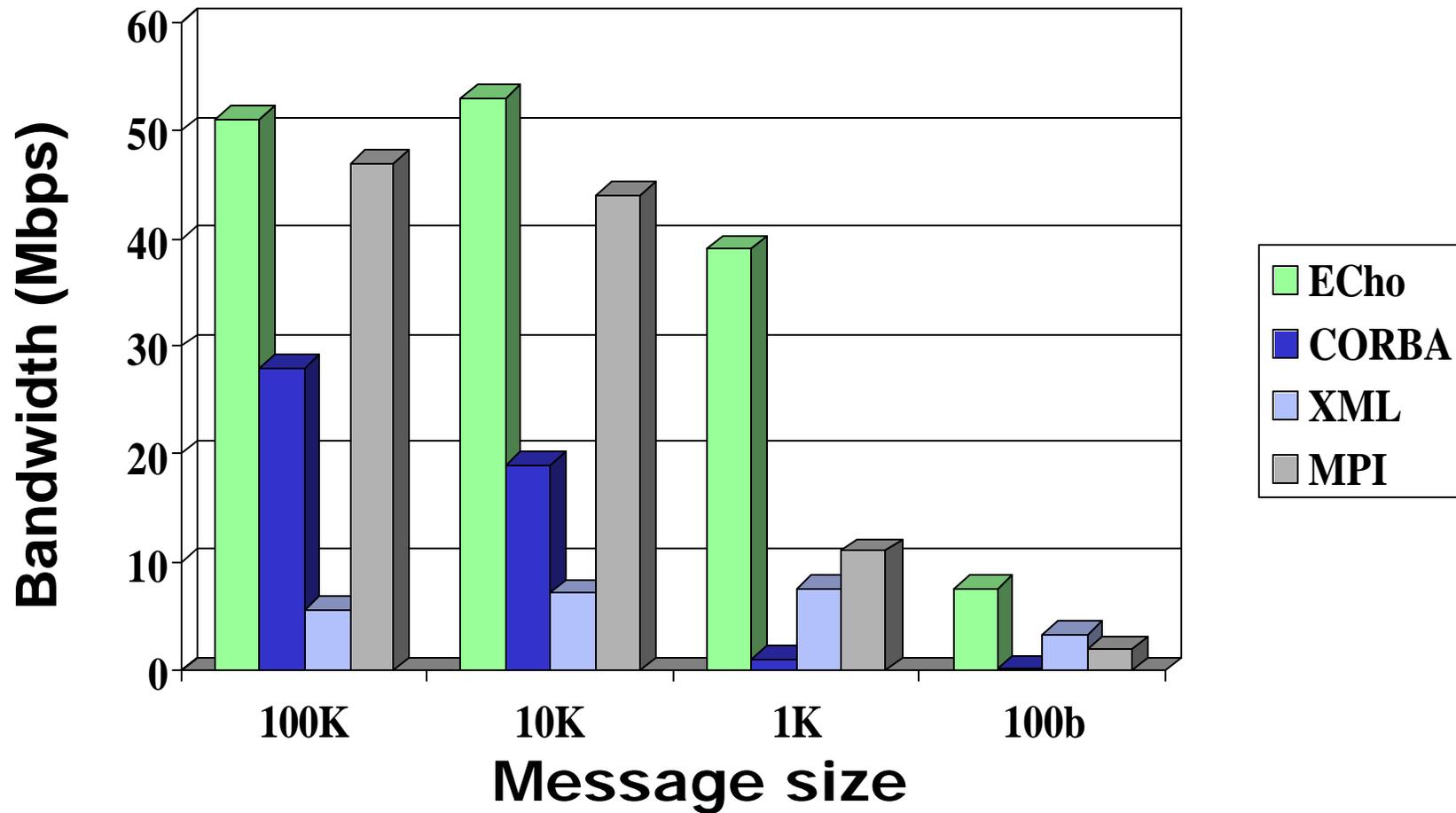
# Network Delivery



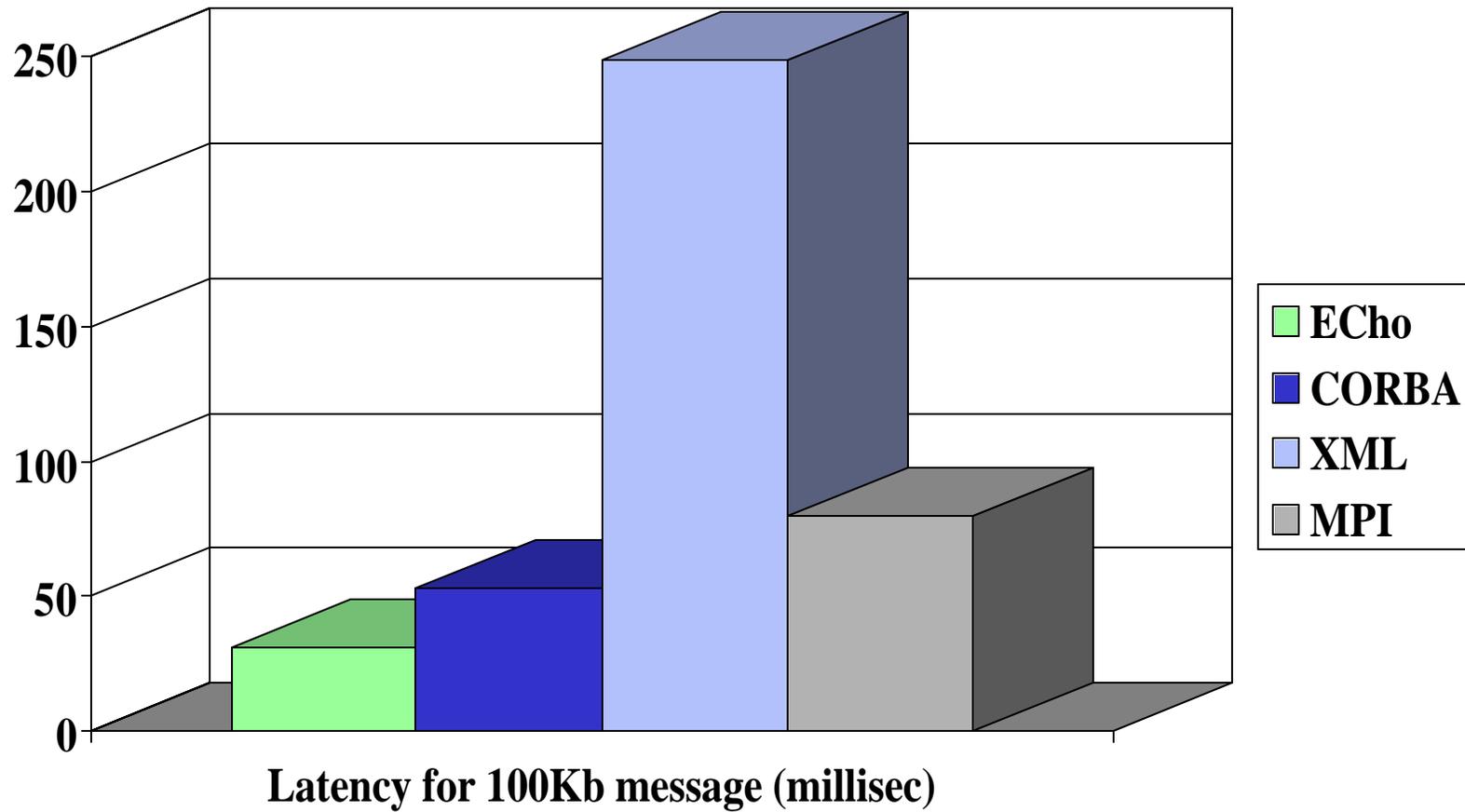
# ECho Infrastructure

- Event Services for data and control structures
- Interoperability
  - Automatic conversion of data types between platforms
  - Bindings for C and Java; Fortran almost completed
- No centralization, channels are represented by distributed data structures
- Local event delivery by subroutine call or queuing
- Remote delivery multiplexed over shared communications links (TCP, UDP, Wireless, multicast)

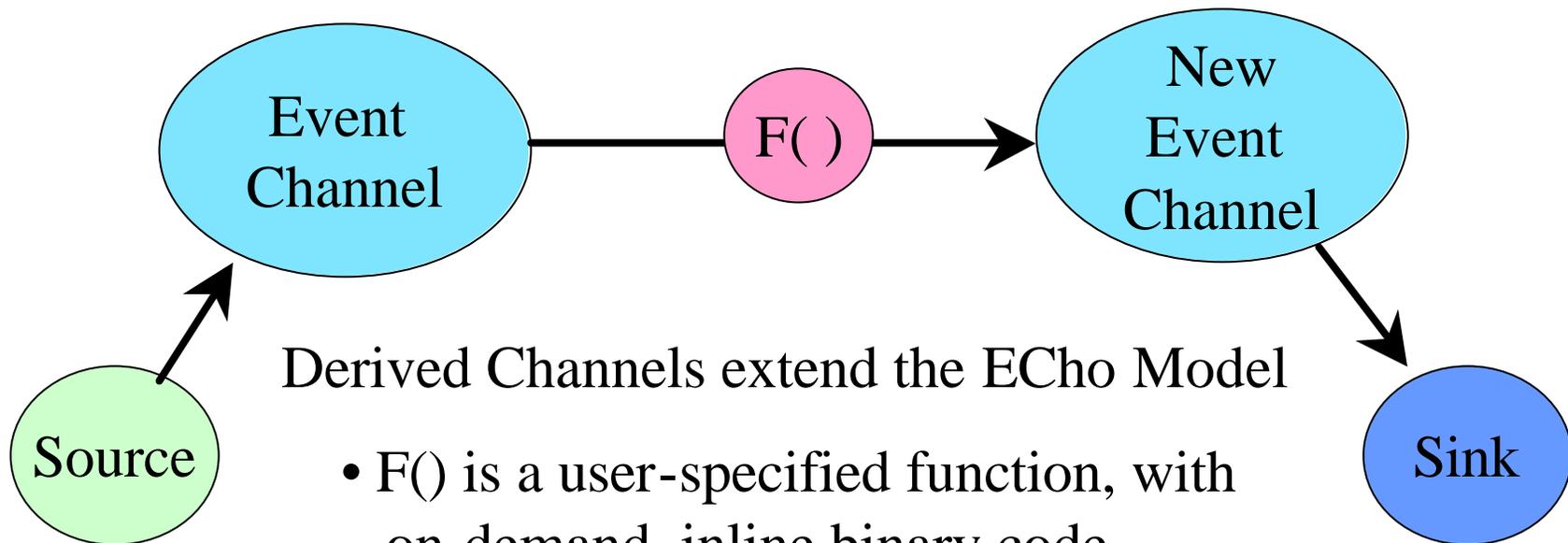
# ECho Performance



# ECho latency



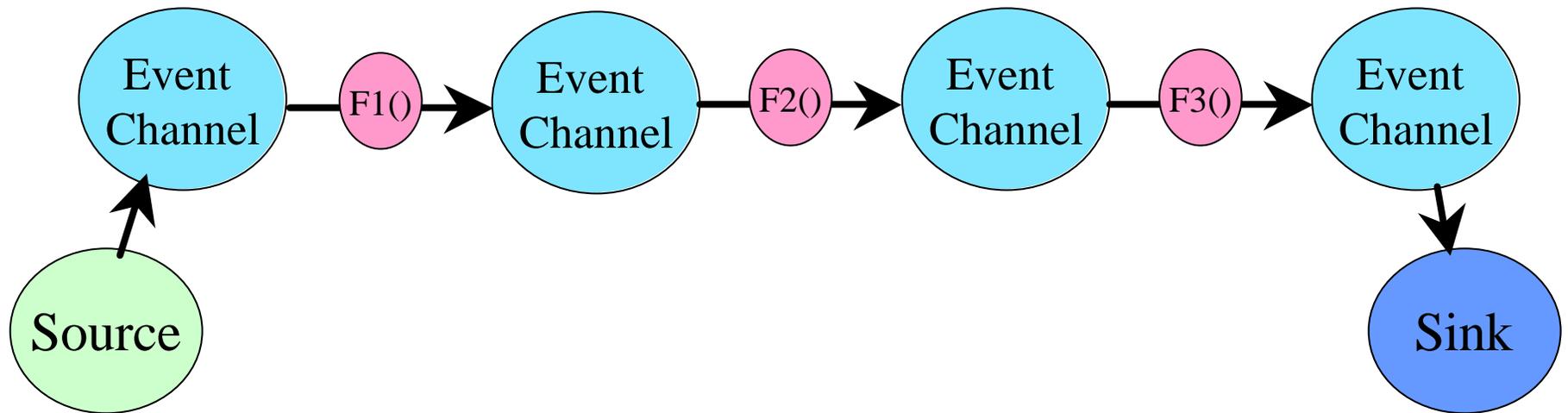
# Derived Event Channels



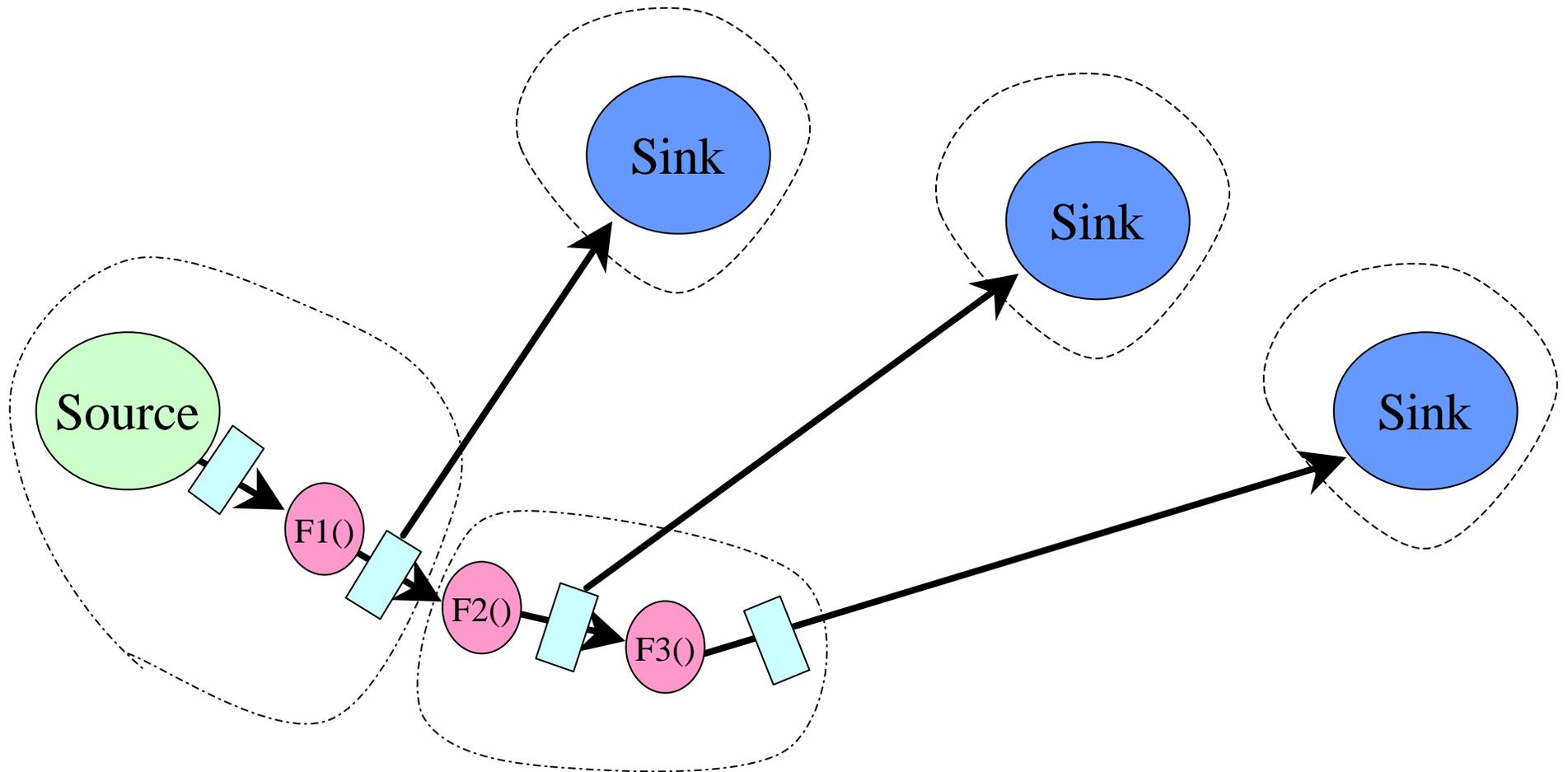
Derived Channels extend the ECho Model

- $F()$  is a user-specified function, with on-demand, inline binary code generation
- $F()$  can be dynamically linked into the source
- Next: Third party evaluation of  $F()$

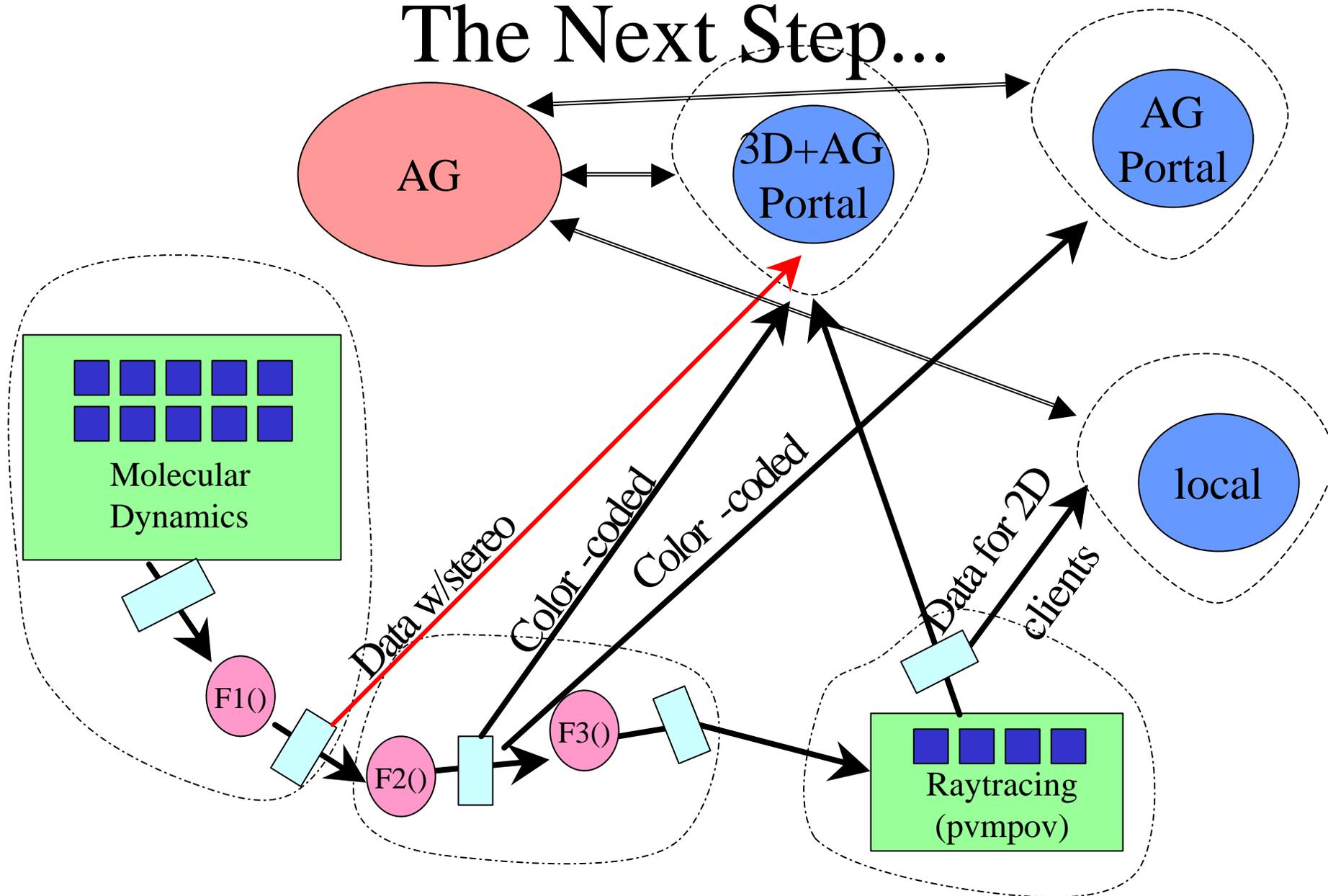
# Chaining Derivations



# Chaining Derivations



# The Next Step...



# ECho References

- **The ECho Event Delivery System**, Greg Eisenhauer
- **A Middleware Toolkit for Client-Initiated Service Specialization**, Greg Eisenhauer, Fabian Bustamente and Karsten Schwan, Proceedings of the PODC Middleware Symposium - July 18-20, 2000
- **Event Services for High Performance Computing**, Greg Eisenhauer, Fabian Bustamente and Karsten Schwan, Proceedings of High Performance Distributed Computing (HPDC-2000)
- **JECho - Supporting Distributed High Performance Applications with Java Event Channels**, Dong Zhou, Karsten Schwan, Greg Eisenhauer and Yuan Chen, To appear at Cluster2000

Downloadable versions available from  
<http://www.cc.gatech.edu/systems/projects/ECho/>