

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

## CORBA Migration Benefits

1. Allows the architecture to extend into a collective of trusted servers and server clusters.
2. Allows the extension of data spaces to terabytes, petabytes, exabytes, and beyond.
3. Allows multiple simultaneous consumers of served information.
4. Allows cross-language consumer capabilities; a Java GUI may be made to access a C++ server.
5. Allows the services of an application to be provided without the necessity of releasing the proprietary, capital-asset code to those receiving those services; software maintenance reduction.

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## PIA Speed of Data Access

No facility dealing with an exabyte of data is likely to be characterized as being “fast”; however, PIA facilities are expected to allow expeditious access to such volumes of data.

1. PIA’s primary data sorting facility is the balanced, binary tree which provides a reliable, scalable  $\log n$  search cost for items. For example, the expected search for any one particular item in a tree of a billion billion items (an exa-item tree) is only 60 key comparisons.
2. PIA uses a deep,  $n$ -ary tree directory structure to organize the files holding the internal states of deactivated objects. Continuing the exa-item example, the file for any particular object would be identified, on average, after only 128 file-name comparisons.
3. Combining these two technologies is expected to allow PIA to provide reasonably rapid access to very large amounts of data. Again continuing the exa-item example, assuming that the objects of the entire tree were inactive at the time a search was begun, a particular item could be identified and its data made available after a total of only 7,680 (128 times 60) file operations.

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## Impact of Self-Revealing and Semantic Infusion Technology

1. Traditional database technologies require the consumer of information to be built with a fore-knowledge of record content. It is the consuming application's responsibility to span disparate databases that may contain similar, but not identical, sets of information.
2. PIA relies upon the technology of self-revelation rather than fore-knowledge. Different information sources may be seamlessly consumed based upon the kinds of information they have in common without concern that the information each contains outside that focus may be different.
3. PIA also uses the technology of semantic infusion through class derivation to make information, in a sense, self-aware. For example, recorded payments can "know" whether they were made in dollars, yen, or pounds sterling.

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## Areas of Anticipated Improvement

PIA was not initially conceived of as a “database” replacement, but as an integrator of technical applications. As very large database “applications” are contemplated, certain improvements suggest themselves.

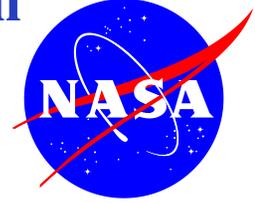
1. The positional iterator technology can be extended into an implicitly-segmenting capability to allow the iteration over dynamic sets approaching a practical infinity. Exhaustive search of near-infinite sets is, of course, to be discouraged; however, when necessary, this adjustment will facilitate such operations
2. Iteration over a portion of a set (for example, key values greater than  $A$  but less than  $B$ ) can be added.
3. Traditional iteration over static sets can certainly be added to PIA information structures. These features were left out of the original implementation only because all “applications” were presumed to be inherently dynamic.

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## Expected Growth in the CORBA-Served Implementation

Conceptual growth has always been expected in the transition from the C++ prototype of PIA to the CORBA-served implementation.

1. It is expected that various kinds of “applications” will be defined in the CORBA-served implementation of PIA.
2. While the exact hierarchy of application kinds has not been settled, it seems reasonable that a “database” (or information resource) kind of application will arise at some point.
3. It is within the PIA philosophy to add functionality appropriate to the kind of thing encapsulated. Thus, a database application kind might well add standard query features such as Structured Query Language (SQL) support.