Dr. Charles Holland/Code 1133
Office of Naval Research
Ballston Tower No. 1
800 Quincy St.
Arlington, Virginia 22217-5000

Dear Sir:

RE: N00014-83-K-0490

1. Contract Information

This is the Final Technical Report for ONR Contract Number N00014-83-K-0490, entitled "Consistency Management Mechanisms: Analysis and Performance." The principal investigators are Dr. J. C. Browne and Dr. A. Silberschatz.

2. Summary and Research Significance

In the research performed under this grant we evaluate the applicability and performance impacts of mechanisms for consistency management. We analyze and evaluate the applicability and performance properties of procedures which have been previously proposed, and develop formulations and mechanisms for consistency and integrity management which are performance effective as well as being functionally correct over a spectrum of environments. The foundation for the analysis is the establishment of a framework for classifying and constructing appropriate concurrency control mechanisms. The workload descriptions are based upon analysis and measurement of existing systems. Our approach combines theoretical analysis with systematic experimentation and modeling. The modeling framework extends from analytically based searches of parameter space to very detailed trace driven models which have accuracy approaching that of measurement of the executing systems.

The results obtained have led to the development of a family of protocols which improve concurrency and preserve consistency in distributed databases. The protocol family is the first in which segments of the database may have multi-versioned or uni-versioned entities, independent of other segments. Correctness with respect to consistency and absence of deadlock is established in that the protocols require no global sequencing mechanism and do not abort partially completed transactions.

Simulation studies which evaluate the performance of this family of protocols show that at heavy workloads, the proposed protocol qualitatively outperforms existing protocols, including the two-phase locking protocol. The primary contribution then, is the extension of the affordability domain of consistency protocols to higher workloads.
3. Publications


6. Program Participants
   The following students participated in the research as graduate research assistants:
   Yeturu Aahlad
   Mohan Ahuja
   Lewis Barnett
   Munir Cochinwala
   Gad Dafni
   Raghu Ramakrishnan
   Donald Stuart

Mohan Ahuja completed the Ph.D. degree during the period of this grant.

Sincerely,

A. Silberschatz
Professor

J. C. Browne
Professor and Chairman