

REPORT DOCUMENTATION PAGE *Dist: A*

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

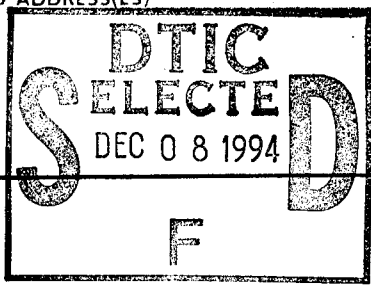
1. AGENCY USE ONLY (Leave blank) 2. REPORT DATE 3. REPORT TYPE AND DATES COVERED
ANNUAL/FINAL/01 DEC 90 TO 30 NOV 93

4. TITLE AND SUBTITLE
USING THE PROCESS TRILLIS TO ORGANIZE LARGE-SCALE PARALLEL REALTIME MONITORS AND EXPERT SYSTEMS (U)
5. FUNDING NUMBERS

6. AUTHOR(S)
Professor David Gelernter
2304/FS
AFOSR-91-0098

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Yale University
Dept of Computer Science
New Haven CT 06520
8. PERFORMING ORGANIZATION REPORT NUMBER
AFOSR-TR- 94 0684

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
AFOSR/NM
110 DUNCAN AVE, SUITE B115
BOLLING AFB DC 20332-0001
10. SPONSORING / MONITORING AGENCY REPORT NUMBER
AFOSR-91-0098



11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED *A*
12b. DISTRIBUTION CODE
UL

13. ABSTRACT (Maximum 200 words)
Accomplishments under this grant were: The researchers defined a new "sensor/actuator" view of process trellis software architecture for data fusion. The trellis architecture was ported to a LAN environment. The researchers tested a new LAN-capable sensor/actuator package by developing a monitor-controller for the Piranha adaptive parallelism environment. A trellis-structured wide area Piranha system is the next goal of the researchers.

19941129 077

DTIC QUALITY INSPECTED 5

14. SUBJECT TERMS 15. NUMBER OF PAGES
16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
UNCLASSIFIED
18. SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED
19. SECURITY CLASSIFICATION OF ABSTRACT
UNCLASSIFIED
20. LIMITATION OF ABSTRACT
SAR (SAME AS REPORT)

ANNUAL + Final Project Report *per DL*
AFOSR-91-0098

“Using the process trellis to organize large-scale parallel realtime monitors and expert systems”

Submitted by:



David Gelernter, Associate Professor
Principal Investigator
Department of Computer Science
Yale University
51 Prospect Street
New Haven, CT 06520
(203) 432-1278
gelernter@cs.yale.edu

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A1	

Final Report on AFOSR-91-0098

Research in connection with this grant accomplished a number of things:

1. We defined a new "sensor/actuator" view of the process trellis software architecture for data fusion. The original architecture served only in the role of passive monitor. The sensor/actuator version can serve not only to monitor but to control realtime processes. The sensor/actuator extension is a natural one in the trellis context, but required extensions to the design and the implementation of the existing software.
2. We ported the trellis architecture to a LAN environment. The original (parallel) program ran only on shared-memory multiprocessors. The code is written in C-Linda, which is portable to essentially any asynchronous parallel environment, including LANs. But the trellis package depends not only on the correct execution of code; it also performs (heuristically) optimized realtime scheduling of trellis modules onto available nodes. The heuristic scheduler is based on an analytic model of the hardware. Porting to the LAN environment required the development of a new (and more complicated) underlying model and heuristic scheduler.
3. We tested the new LAN-capable sensor/actuator package by developing a monitor-controller for the Piranha adaptive parallelism environment. Piranha is a system that allows processes of a parallel application to be created dynamically (for example on newly-idle LAN nodes) and removed dynamically (for example, when an owner resumes work at his node) while the computation as a whole continues without interruption. The Piranha system poses a number of monitoring and control problems: it requires that the current idle/busy and "idleness criteria" status of all nodes be maintained, that predictions be developed with respect to likely future idleness patterns of each node in the pool, that the status of all Piranha applications and their behaviors be maintained and that Piranha jobs be assigned to particular idle nodes, among other issues. The problem was a good test bed for the sensor/actuator LAN trellis because it required actuator and not just sensor capability, it was inherently distributed and required LAN capacity, and it was inherently a significant, interesting problem. The Piranha-trellis we developed

worked sufficiently well to suggest that the entire Piranha system (and not just monitor-control functions) might be structured as a trellis. A trellis-structured wide area Piranha system is our next research goal.

Publications

N. Carriero, E. Freeman, D. Gelernter and D. Kaminsky, "Adaptive Parallelism." *IEEE Computer* (to appear).

N. Carriero, E. Freeman and D. Gelernter, "Adaptive Parallelism on Multiprocessors: Preliminary Experience with Piranha on the CM-5," in 6th Ann. Languages and Compilers for Parallel Computing Workshop Springer-Verlag (Feb. 1994).

D. Gelernter, M. Jourdenais and D. Kaminsky, "Piranha Scheduling Strategies and Implementation." *Int. Journal of Parallel Programming* (to appear).

S. Ahmed and D. Gelernter, "A CASE Environment for Parallel Programming," in *Proc. Fifth Int. Workshop on Computer-Aided Software Engineering*, July 1992.

D. Gelernter and D. Kaminsky, "Supercomputing out of Recycled Garbage: Preliminary Experience with Piranha." in *Proc. 1992 ACM Int. Conf. Supercomputing*, July 1992.

Donna Edwards, Michael Factor, Scott Fertig, David Gelernter and Joseph Harris, "Realtime Data Fusion for Climate Monitoring, via Process Trellis," in *Proc. of the International Space Year Conf. on Earth and Space Science Info. Sys.*, Feb. 1992.