

# MULTI-THREADED EVENT RECONSTRUCTION

WITH

## JANA

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### WHAT IS JANA?

JANA IS A **MULTI-THREADED, C++** FRAMEWORK FOR RECONSTRUCTION OF EVENT-BASED, HIGH-VOLUME DATA IN HIGH ENERGY AND NUCLEAR PHYSICS EXPERIMENTS

### DOCUMENTATION

JANA CAN BE FOUND AT:

[HTTP://WWW.JLAB.ORG/JANA](http://www.jlab.org/jana)

THERE YOU WILL FIND:

- JANA SOURCE CODE (WITH EXAMPLES)
- PDF MANUAL
- CODE DOCUMENTATION (DOXYGEN)



### WHY MULTI-THREADING ?

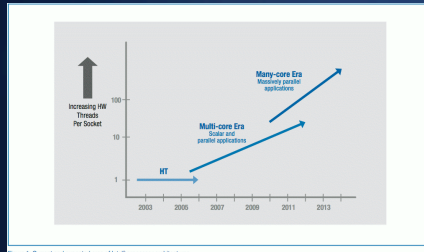


Figure 1. Current and expected era of Intel processor architectures

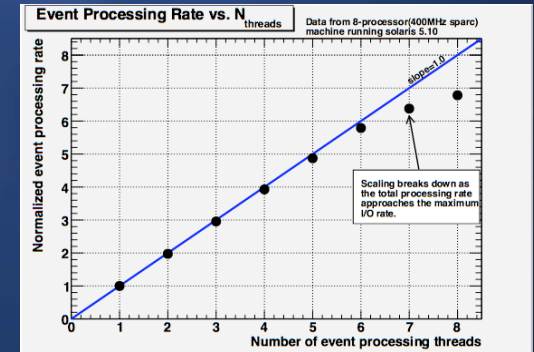
FROM THE 2005 INTEL WHITE PAPER: "PLATFORM 2015: INTEL PROCESSOR AND PLATFORM EVOLUTION FOR THE NEXT DECADE"

- CPU CLOCK SPEED IS PHYSICALLY LIMITED
- MULTI-CORE CPUs ARE THE PRESENT AND FUTURE
- 20-100 CORES WILL BE STANDARD
- MULTIPLE THREADS ARE NEEDED TO UTILIZE MULTIPLE CORES

### UTILIZE YOUR PROCESSING POWER

THE PLOT BELOW SHOWS THE TOTAL **EVENT PROCESSING RATE** VS. THE NUMBER OF PROCESSING THREADS FOR A JANA APPLICATION. THE TEST WAS DONE ON AN 8 CORE ULTRASPARC COMPUTER RUNNING SOLARIS 10. THE RATES ARE NORMALIZED TO THE SINGLE THREAD RATE. THE BLUE LINE INDICATES THE LIMIT OF PERFECT SCALING.

THE JANA SOFTWARE MAXIMIZES USE OF THE AVAILABLE CPU POWER ON MULTI-CORE MACHINES.

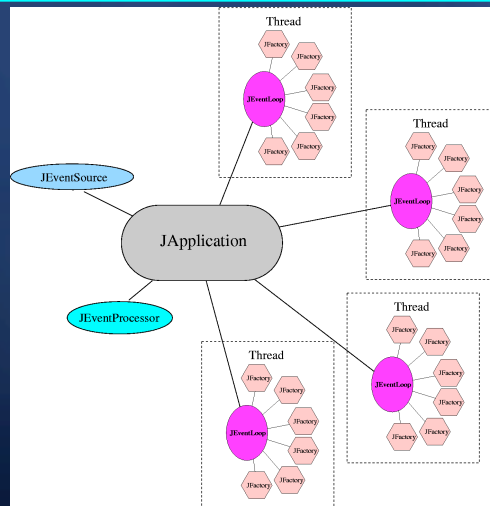


### HOW JANA WORKS

A JANA APPLICATION CONSISTS OF A SINGLE *JApplication* OBJECT AND MULTIPLE *JEventLoop* OBJECTS. EACH *JEventLoop* HAS ITS OWN COMPLETE SET OF "FACTORIES" THAT TOGETHER CAN COMPLETELY PROCESS AN EVENT.

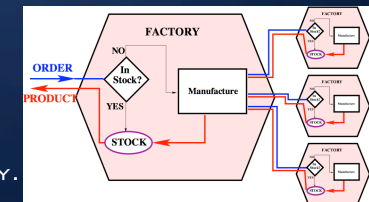
### DATA ON DEMAND

JANA'S MODIFIED FACTORY MODEL PRODUCES DATA ONLY "ON DEMAND". THIS AVOIDS WASTING CPU CYCLES ON RECONSTRUCTION THAT IS NOT NEEDED FOR THAT PARTICULAR EVENT.



### JANA'S FACTORY MODEL

RECONSTRUCTION CODE IS BUILT INTO FACTORIES AS CALLBACK METHODS. INPUTS COME FROM OTHER FACTORIES. IN JANA'S MODEL, OWNERSHIP OF THE OBJECTS STAY WITH THE FACTORY. ONLY CONST POINTERS ARE RETURNED



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