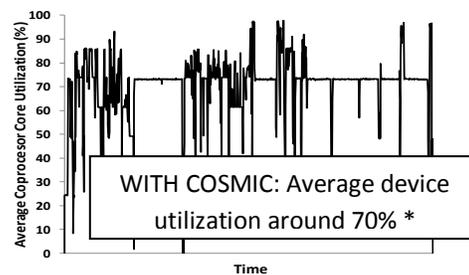
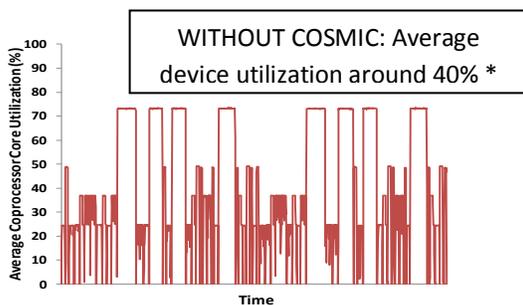
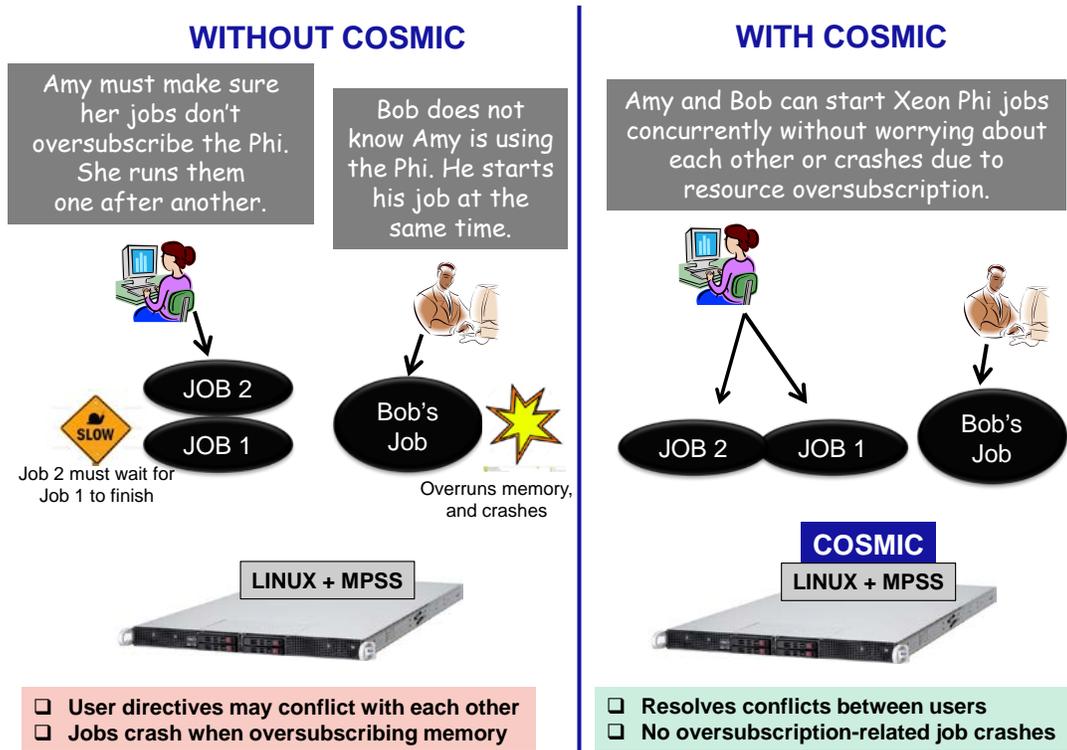


# COSMIC

## System Software for Efficient Xeon Phi Coprocessor Sharing

COSMIC+ is NEC's system software that enables seamless Xeon Phi coprocessor sharing. It is completely transparent to applications and all other system software components. COSMIC is useful in organizations where several users share one or more Xeon Phi-based servers. It can reduce capital cost by efficiently utilizing fewer servers.



+ COSMIC is pre-commercialization and the name is subject to change.

\* Measured using 64 randomly arriving jobs on a server with 1 8GB Xeon Phi. Study reported in HPDC 2013.

## COSMIC: middleware turbo-charges Xeon Phi stack for coprocessor sharing

### Job Management with Xeon Phi Sharing

- Eliminates Xeon Phi out-of-memory crashes by intelligent memory management of multiple tenants
- Shares coprocessors to achieve better overall utilization and minimize waiting
- Load balances devices and cores: resolves conflicts between directives of different users

### CapEX/OpEX Reduction

- Multi-tenancy allows consolidation of coprocessors to reduce system footprint and cost
- Fewer coprocessors and higher utilization per coprocessor reduces power consumption

### Simple Deployment

- Simple add-on to Xeon Phi SW stack
- Supports native or offload processing
- Completely transparent to user applications and Xeon Phi SW stack
- Requires no changes (or recompilation) of user applications

FEATURE	Without COSMIC	With COSMIC
Job scheduling	FCFS	Resource-driven scheduling improves turnaround time and throughput
Thread Oversubscription Control	NA	Pro-active thread management improves performance
Memory Oversubscription Control	NA	Pro-active memory management avoids swaps and crashes
Load balancing of coprocessor devices	User-managed	Automatic load balancing
Load balancing of cores within a device	User-managed	Automatic load balancing of jobs across device cores
Avoid conflicts between user directives	NA	Automatic
Manage interference between apps	NA	Resource-aware scheduling
Manage policies for thread and memory management, and for load balance	NA	Administrator sets and controls policies

**CONTACT: Yoshiaki Hirotsu (y-hirotsu@aj.jp.nec.com)**