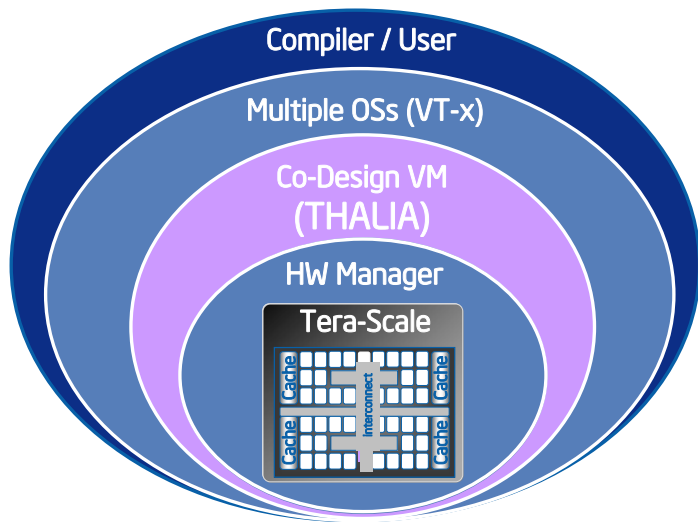# A Co-Designed Virtual Machine For Dynamic Optimizations

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GOAL: Dynamically adapt/tune the running software to the underlying hardware, to efficiently exploit its capabilities.

Compiler / User

Multiple OSs (VT-x)

Co-Design VM (THALIA)

HW Manager

Tera-Scale

Thalia: A muse of poetry in Greek Mythology

Main Characteristics

SW layer tightly designed with the HW underneath
- Code analysis/optimizations done in SW
- Works at the micro-op level

Native execution of cold code

Additional Features

Backward and forward compatibility

Prototyping features

Removing / simplifying the micro-sequencer

Management of heterogeneous resources

❶ Hot region detected

PROFILING HARDWARE

branch inst   request

❷ Thalia gets control

CORE

the app thread was running

the thread execs THALIA

❸ Thalia builds a region

A

B   C

D   E

F   G

A
C
D
G

❹ Thalia opts the region

Original SB → Optimized SB

Current optimizations
- Classical opts.
- Code reordering
- Register allocation
- Aggressive mem opts

❺ Thalia stores the region

MEMORY

concealed

visible to OS and apps

Optimized SB

❻ Thalia updates jTLB

jTLB

source IP | target IP

indexed by IP reg

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