

# ***X-Stack Front-End***

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# Exascale Challenges

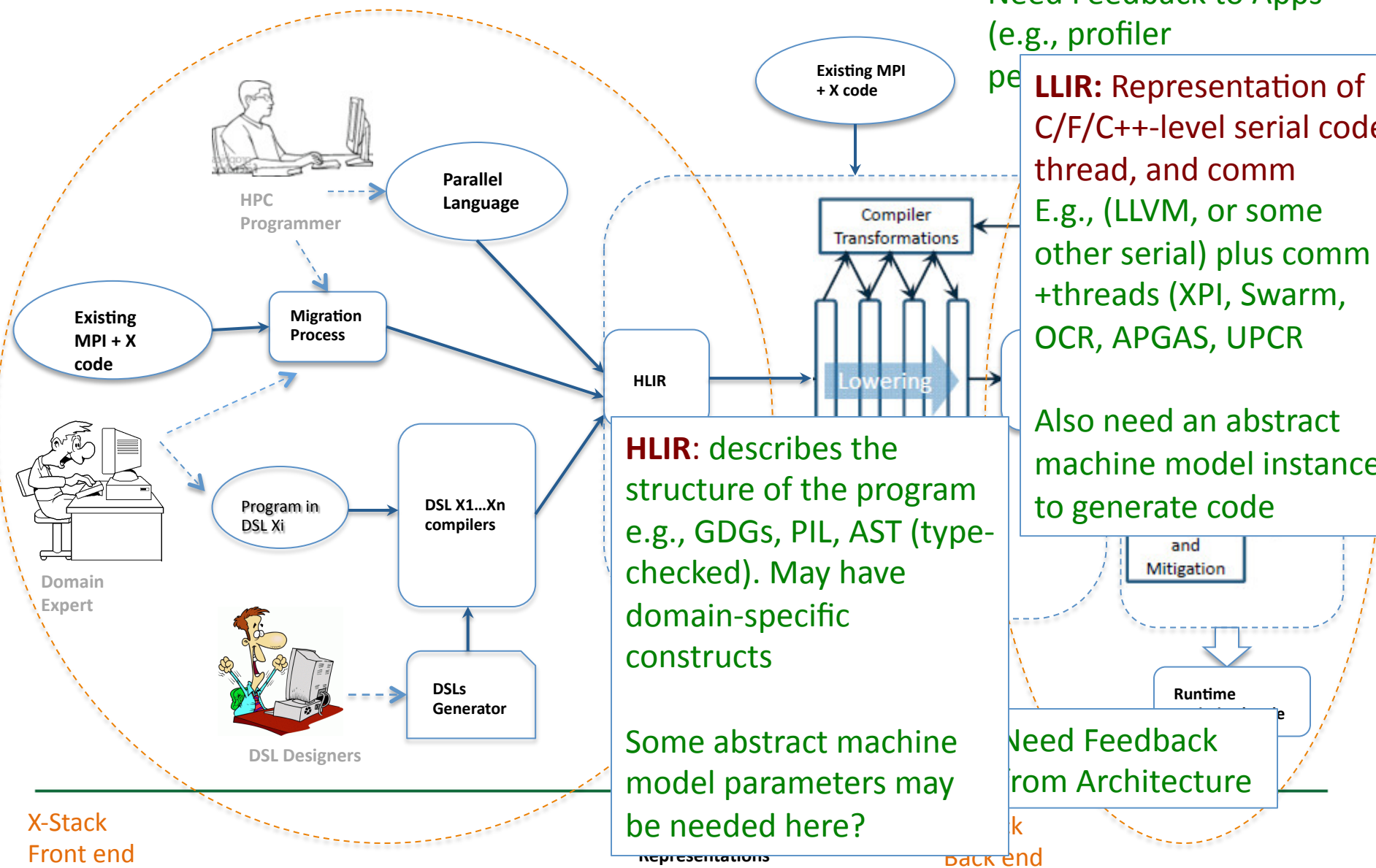
Resilience	Programming model (all), OS/RT approach (DEGAS, GVR), Compiler (D-TEC), Compiler/RT (Traleika)
Undetected errors	Resilience Sensitivity (D-TEC, Corvette, SLEEC,GVR)
Spatial locality	Wide SIMD and how independent/configurable? Scatter/gather (MEMISA)? Language/DSL repr (DAX,DEGAS), Compiler (DAX,X-TUNE,D-TEC), Library interface selection (SLEEC), Library (HTA: Traleika & DAX)
Temporal locality	Scratchpad memories, communication avoidance, Non-Cache-Coherent, Language/DSL repr (DEGAS,D-TEC), Compiler (X-TUNE,D-TEC,Traleika/DAX:R-Stream), Library (Traleika/DAX:HTA)
Large # threads	Lightweight threads, synchronization mechanisms Language/Library (D-TEC,Xpress,DAX:Traleika:codelets,DEGAS), Compiler (X-TUNE,D-TEC)
Dynamic threads	Varying performance, Dynamic launch and migration, latency hiding Library (Traleika,DAX:HTA,R-Stream,DEGAS,XPRESS)
Heterogeneity	Explicit (DEGAS,Traleika,SLEEC,DAX,D-TEC,X-TUNE), Implicit (D-TEC,X-TUNE,Traleika)

# Exascale Challenges

Mapping	Common High-level compiler/runtime IR? Common execution model? Common abstract machine model? [must capture above attributes]
Legacy Apps	
Off-node Communication	Bandwidth tapering or topology, nesting collectives DEGAS, Xpress, D-TEC, Traleika, DAX
Control over performance	
Feedback to user	
Portability	
SIMD vs. Spatial locality	

# Agenda – Second Day

Energy Efficiency, Resilience, Programmability, Scalability, Performance Portability, Interoperability



X-Stack Front end

Back end