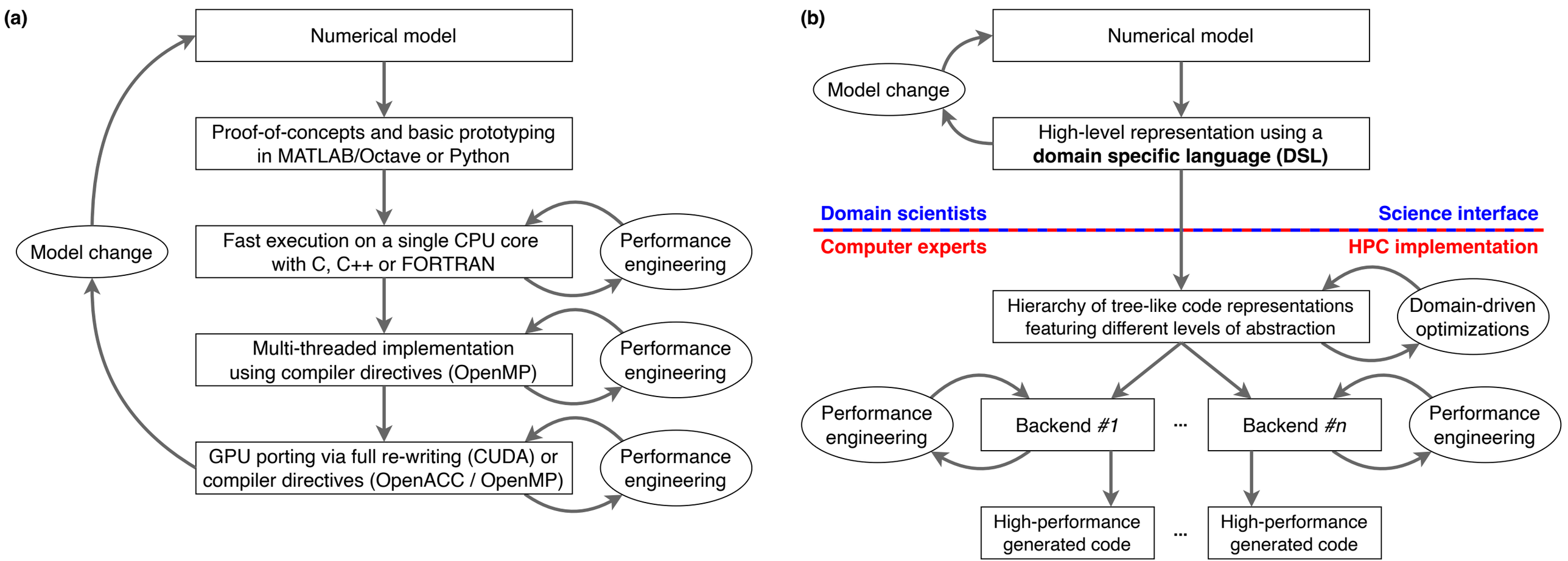
(a)
Numerical model
Proof-of-concepts and basic prototyping in MATLAB/Octave or Python
Fast execution on a single CPU core with C, C++ or FORTRAN
Performance engineering
Multi-threaded implementation using compiler directives (OpenMP)
Performance engineering
GPU porting via full re-writing (CUDA) or compiler directives (OpenACC / OpenMP)
Performance engineering
Model change
(b)
Numerical model
Model change
High-level representation using a domain specific language (DSL)
Domain scientists
Science interface
Computer experts
HPC implementation
Hierarchy of tree-like code representations featuring different levels of abstraction
Domain-driven optimizations
Performance engineering
Backend #1
...
Backend #n
Performance engineering
High-performance generated code
...
High-performance generated code