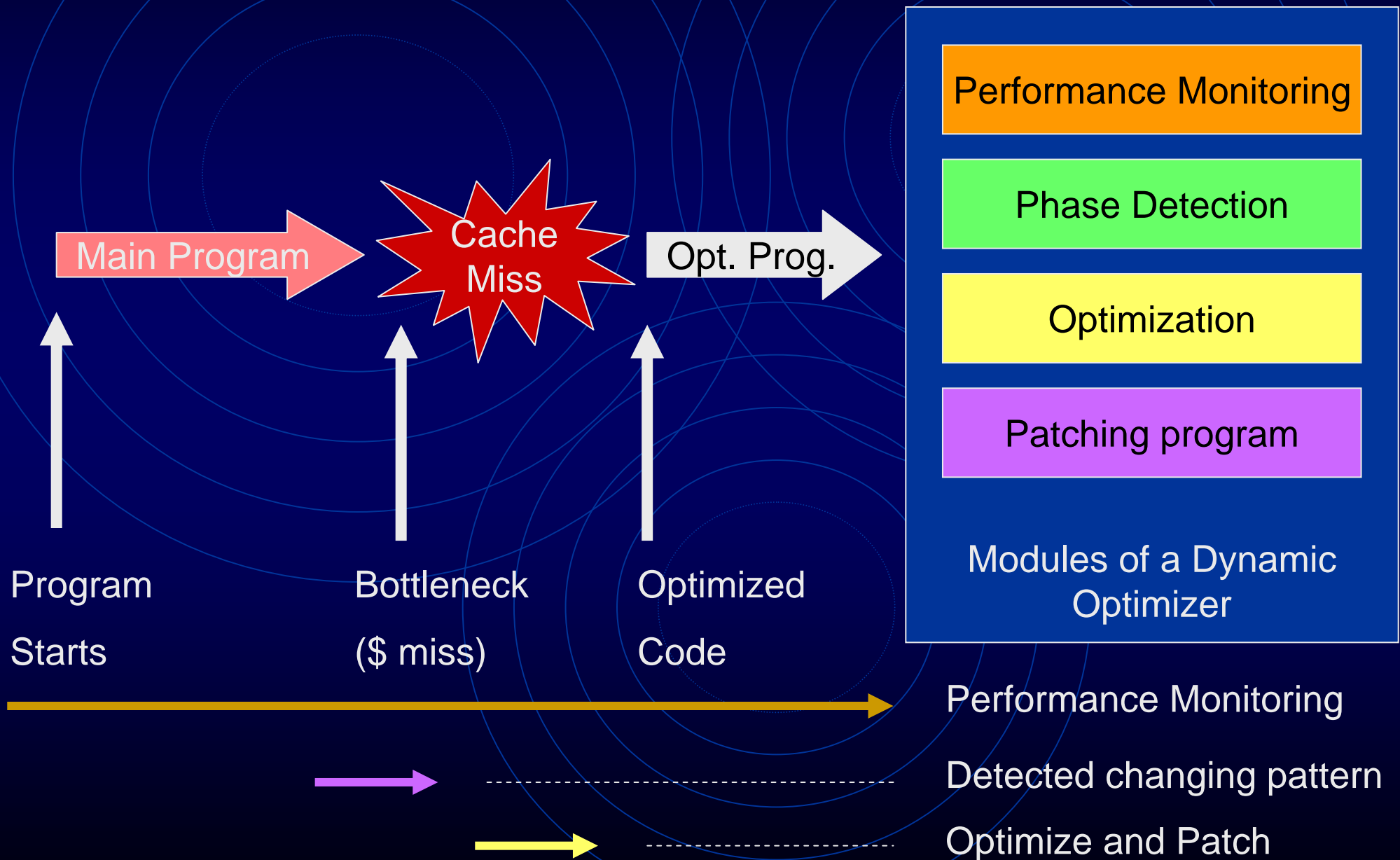


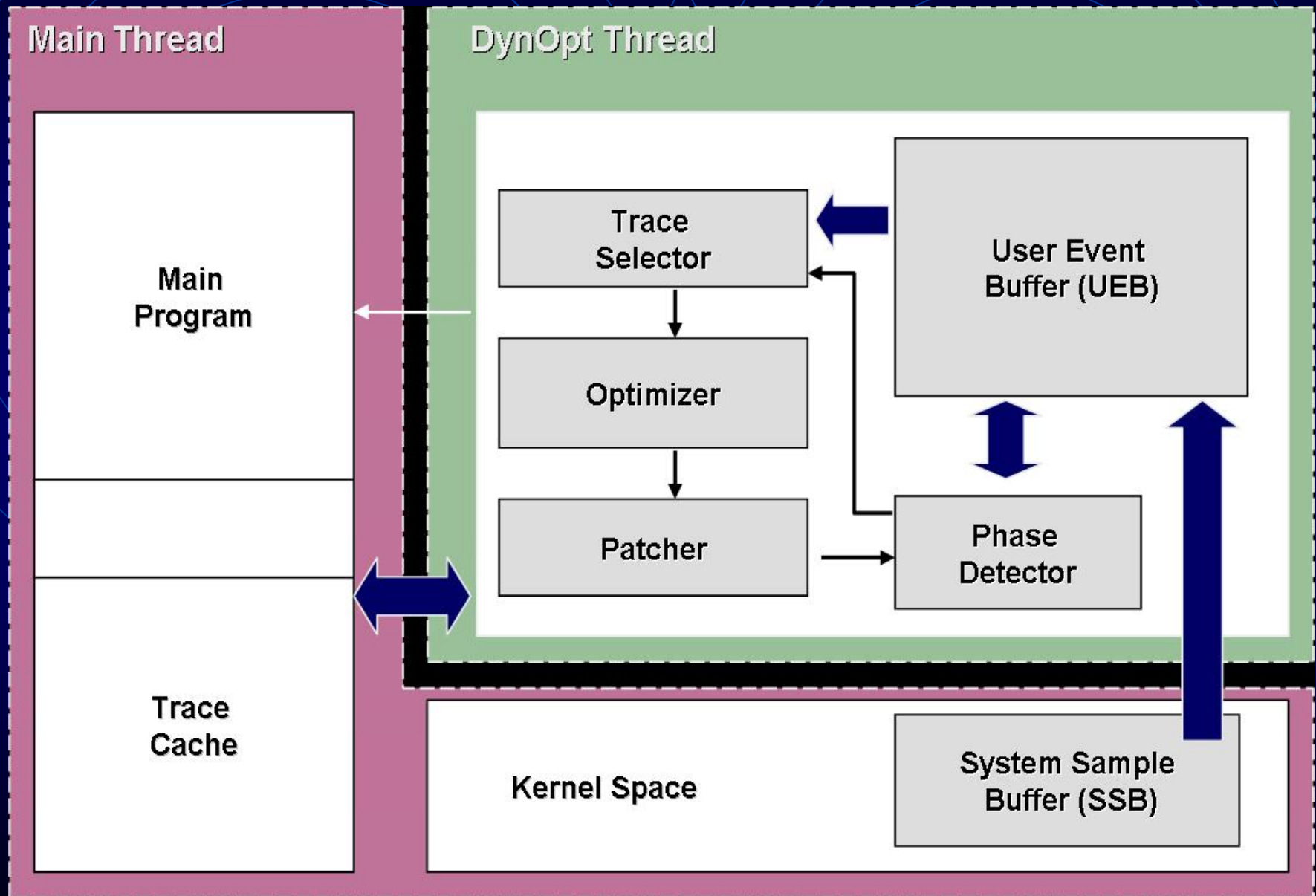
IPF Related Projects at UofM

- **ADORE**: **AD**aptive **O**bject code **RE**-optimization system
 - Using Itanium HPM sampled information at runtime to guide dynamic cache optimizations.
- **AGASSIZ**: A compiler framework for aggressive speculative optimizations.
 - Using advanced analysis and alias/data-dependence profile feedback to guide aggressive speculative optimizations.
 - Based on the ORC (Open Source Compiler) infrastructure.
 - Exploit speculative thread parallelism for multi-core processors.

How ADORE works?



Structure of Components



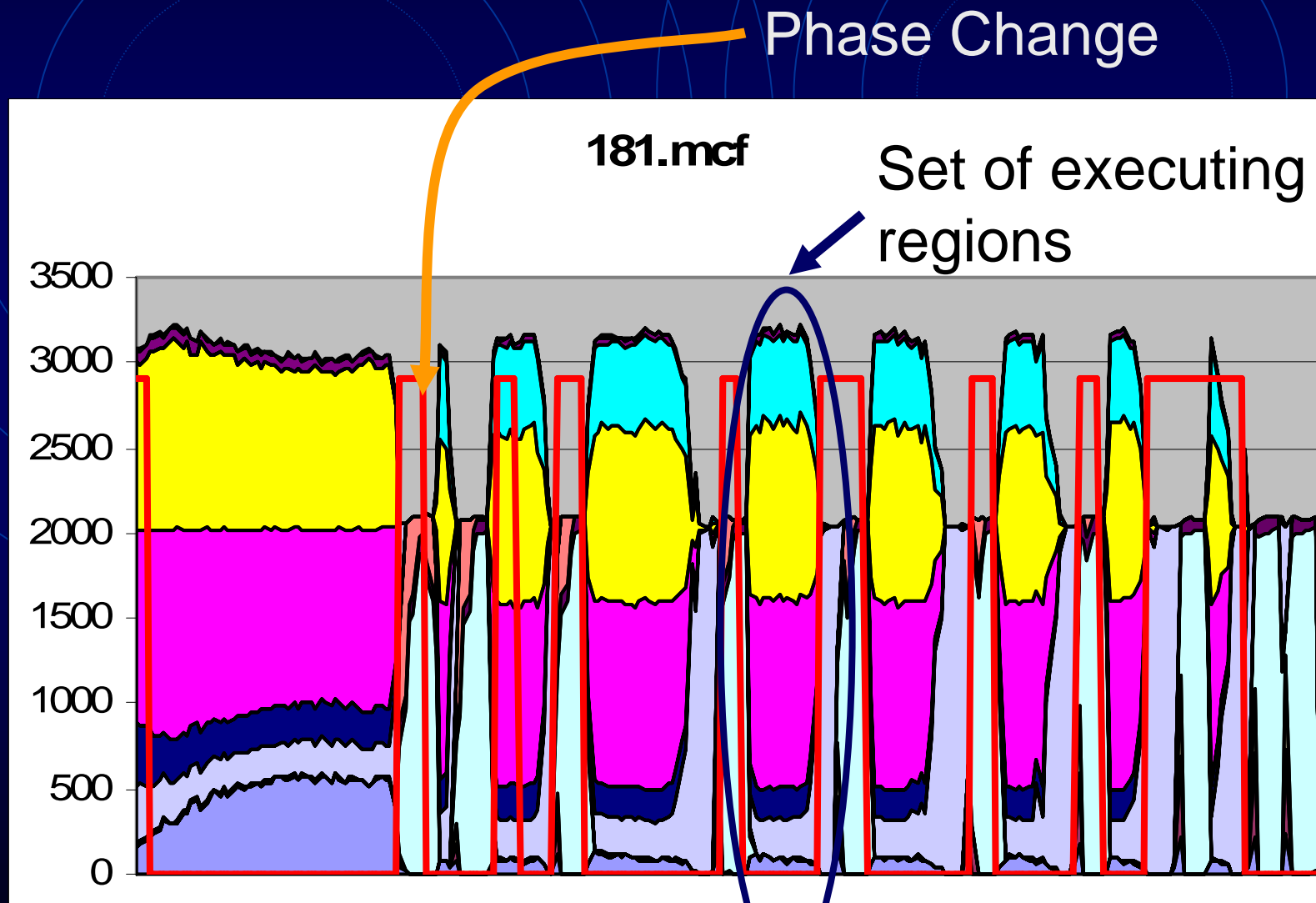
Profiling

- Low overhead
 - Periodically sample HPM (Hardware Performance Monitor) counters
 - Sampling on cycles/instructions selects “hot” traces or code regions.
- Itanium processors have extensive support for configurable performance counters and event address registers.
- Branch trace buffer enables efficient hot trace selection on-the-fly.

Phase Detection

- **Phase:** Stable working set of instructions, basic blocks, traces, procedures, with similar performance metric.
- Optimization is needed only on phase change
 - Reduces overhead of dynamic optimization
- Lightweight change detection scheme
 - **Global phase change:** compute mean of program counter samples to estimate change in working set
 - **Local phase change:** based on code regions and performance monitoring of regions.

Phase Detection in 181.mcf

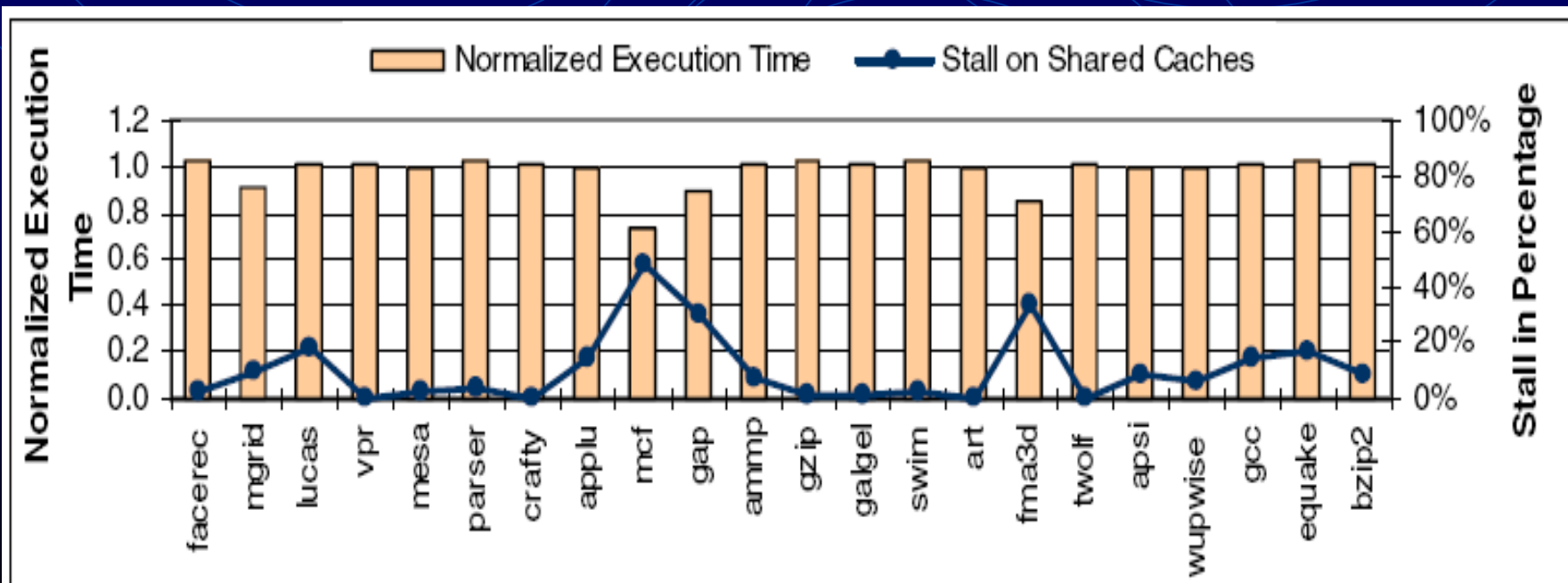
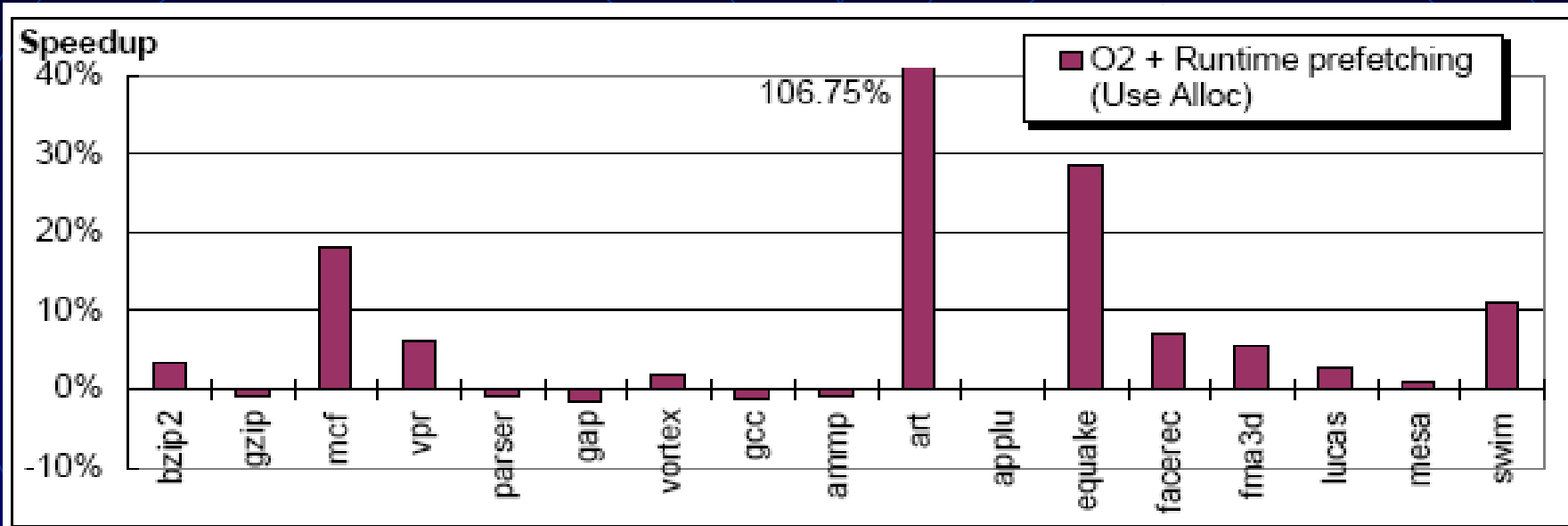


Code Patching

Deploying Optimizations

- **Redirect execution to optimized code**
 - Atomically modify a single instruction to a branch to modified code
 - Called In-Thread optimizations
- **Software Scouting**
 - Start another thread for optimized code
 - Used for pre-fetching data into shared cache
 - Implemented on dual core UltraSPARC IV+
 - Investigating vertical thread scouting on Montecito.

Performance Results



Future Directions

- Hardware and Software support for dynamic optimization
 - Compiler annotations (software)
 - Cache miss history buffer (hardware)
- New Optimizations
 - Dynamic Inlining
 - Useless prefetch removal
- Dynamic optimization for multi-threaded applications such as OLDP, OpenMP, ... etc.