12th Gen Intel® Core™: performance hybrid architecture

Alder Lake harnesses performance and efficiency on Intel’s biggest architectural shift in a decade. **Performance-cores** and **Efficient-cores** work together with help from the Intel® Thread Director in a flexible system that adapts to complex workflows that blend foreground and background tasks.

**Performance-cores**
Built for raw speed and lower latency to push single-threaded performance to the limit.

- Take on high-priority tasks like gaming, content creation, and applications that involve AI.
- **+19%** Higher performance than the last generation at the same frequency.

**Efficient-cores**
Designed to enable wide dynamic range by using power and die area more efficiently.

- Scale in groups of four to increase multi-threaded performance and take on background tasks like software updates, cloud syncing, and refreshing mail.
- **+80%** More throughput than Skylake in quad-thread configurations.

**Intel® Thread Director**
Uses real-time feedback from the hardware to help the OS scheduler assign the right task to the right core at the right time.

- **High-priority tasks** like gaming are assigned to available P-cores.
- **Background tasks** like email and cloud syncing run on the E-cores.
- When a new high-priority task starts, like an app that requires AI, the Thread Director suggests which existing tasks to reconverge to the E-cores to make room for the new task on the P-cores.

**Optimized for Windows 11**
The Intel® Thread Director team worked closely with Microsoft to enable a seamless experience in Windows 11.

- Monitoring the state of each core, the instruction mix, and other telemetry tasks the OS scheduler allocate work more intelligently.

**Wider** larger instruction cache can decode instruction length on demand to accelerate modern workflows.

**Deeper** branch prediction minimizes wasted work and improves the flow through the pipeline.

**Smarter** better prefetch and branch prediction put the right data within reach and improve the flow of operations.