FIG.6 Hardware Abstraction (CPU/GPU/TPU)

Device Detection

• CPU: Always available
• GPU: CUDA/ROCm
• TPU: JAX/TensorFlow
• Framework detection

1201

DeviceManager

Hardware Abstraction Layer
Automatic device detection & selection
Tensor operation routing

Features

• Auto device selection
• Batch optimization
• Memory management
• Cost tracking

1205
Device Selection Logic
Config-based preference (auto/cpu/gpu/tpu)

1206
Tensor Operation Router
Routes NBMF encode/decode to optimal device

CPU GPU TPU

Device Pathways

1202
CPU Pathway
Standard CPU tensor ops
PyTorch/TensorFlow CPU

1203
GPU Pathway
CUDA/ROCm accelerated
PyTorch/TensorFlow GPU

1204
TPU Pathway
TPU-optimized batch ops
JAX/TensorFlow TPU
Batch factor: 128