

Design Technology

"Constraint-Driven Routing Closure for High-Frequency Mixed-Signal Designs"

Conventional congestion-driven routers are ill-suited for high-frequency mixed-signal designs. They introduce jogs, staircase segments, and acute angles that disrupt impedance continuity, lack propagation delay matching across timing-critical net groups, and provide no explicit shielding control. Bus nets are routed individually, leaving parallel signals vulnerable to cross-coupling. The result is DRC-non-compliant routing that demands slow, error-prone manual correction.

This paper presents a scripted, constraint-driven methodology built on the Cadence HFR router. Straight-line geometries are enforced across all metal layers. Scripted length-matching routines absorb excess wire through accordion, coil, or trombone topologies to minimize delay skew. Bus groups are routed cohesively to preserve net ordering and uniform pitch. Shielding placement is scripted for precise parasitic control and analog-to-digital isolation.

Results demonstrate a 98% reduction in intra-group skew, 76% decrease in DRC errors, 99% reduction in coupled noise, and 95% reduction in manual routing effort

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