

# Benchmark Problems Report

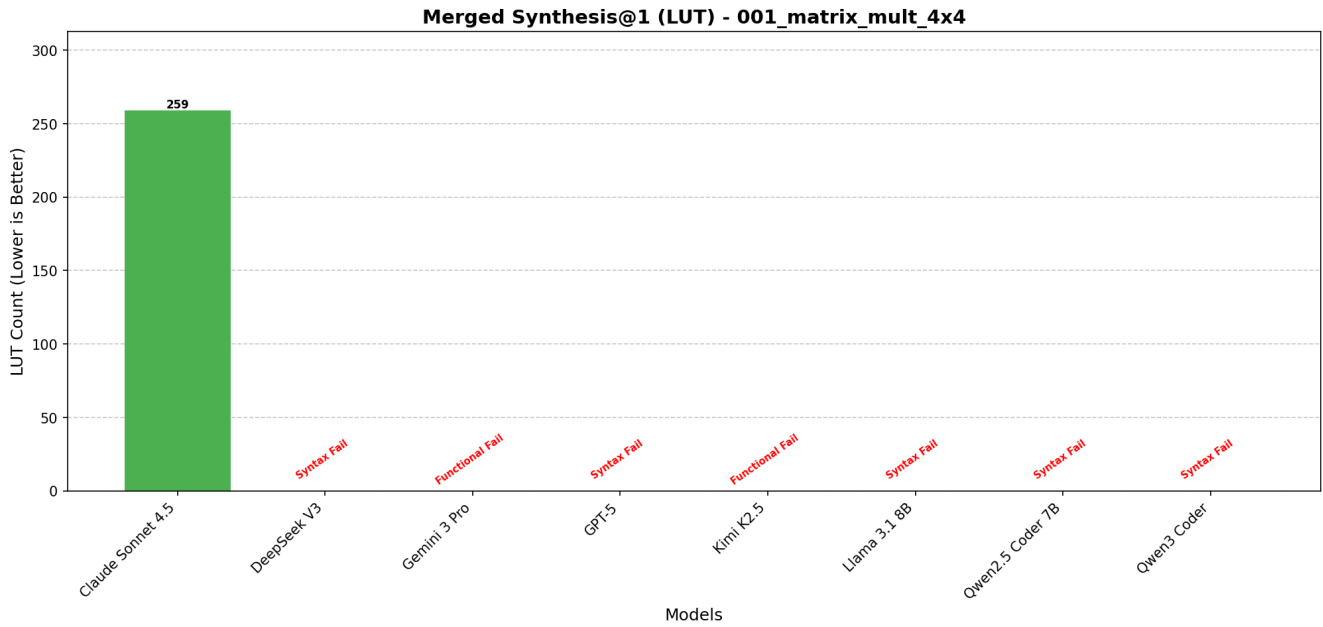
Automatically generated on April 07, 2026 at 12:52

## Summary of Problems

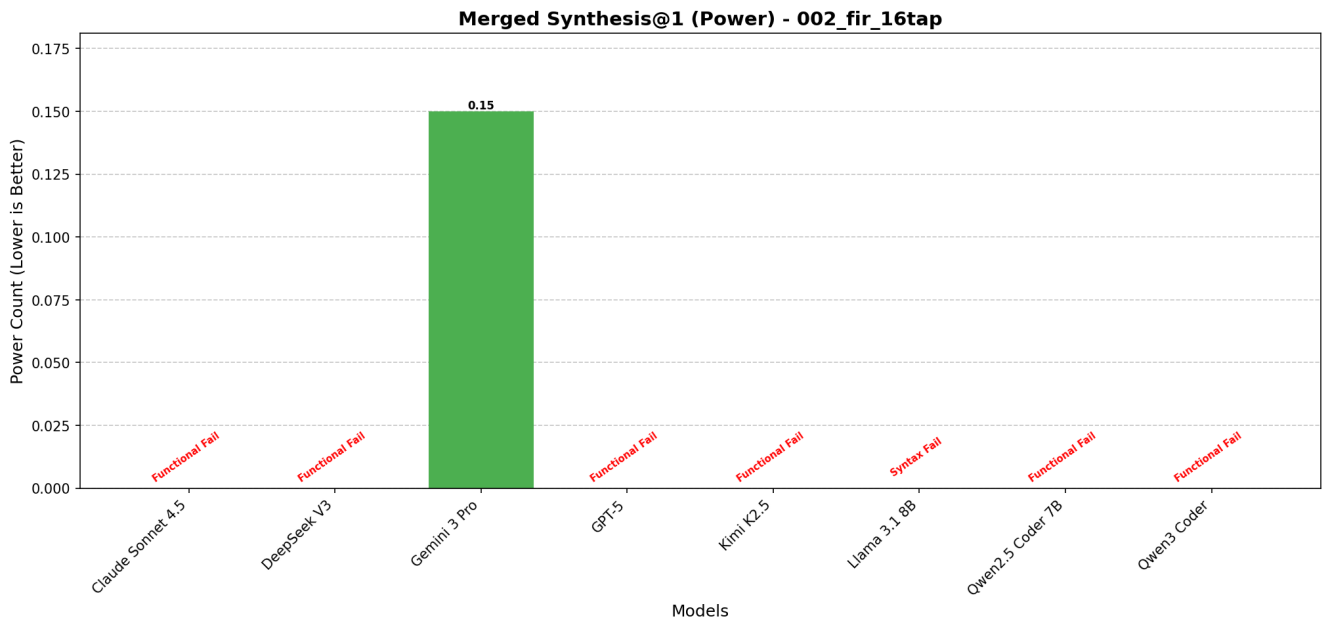
#	Problem	Objective	Models
1	4x4 Matrix Multiplier	↓ LUT	✓
2	16-Tap Symmetric FIR Filter	↓ Power	✓
3	Pipelined 8-Tap FIR Filter	↑ Fmax	✓
4	Streaming 3x3 CNN Convolution Layer	↑ Fmax	✓
5	Sobel Edge Detection Accelerator	↑ Fmax	✓
6	AES-128 Encryption Engine	↓ LUT	✓
7	Streaming Pipelined AES-128 Encryption	↑ Frequency	✓
8	G-Share Branch Predictor	↓ LUTs	✓
9	Dual-Port Register File	↓ LUT	✓
10	8-Bit Single-Cycle ALU with Flags	↑ Fmax	✓
11	Direct-Mapped Write-Through Cache	↓ LUT	✓
12	Fixed-Point Softmax Approximation Layer	↓ LUT	✓
13	Hardmax One-Hot Classifier	↓ LUT	✓
14	IPv4 Header Sniffer	↓ LUT	✓
15	Longest Prefix Match Router	↓ LUT	✓
16	Priority-Based Packet Filter	↓ LUT	✓
17	Key-Value Database with Round-Robin Replacement	↓ LUT	✓
18	CRC-32 Generator	↓ LUT	✓
19	Iterative CORDIC Sin/Cos	↓ LUT	✓
20	Pipelined CORDIC Sin/Cos	↑ Fmax	✓
21	Fixed-Point PID Robot Position Controller	↓ LUT	✓
22	Fixed-Weight Perceptron	↓ LUT	✓
23	Streaming FIX Message Decoder	↑ Fmax	✓
24	Keypad Access Control FSM	↓ LUT	✓
25	64-bit Popcount with Threshold Flag	↑ Fmax	✓
26	Complementary PWM Generator with Dead-Time	↓ LUT	✓
27	Streaming Run-Length Encoder	↑ Fmax	✓
28	Sliding-Window Heart-Rate Estimator	↓ LUT	✓
29	4-Point Complex FFT	↓ LUT	✓
30	AXI4-Stream 8-to-32 Upsizer	↓ LUT	✓
31	Hamming SECDED Decoder	↓ LUT	✓
32	Priority Interrupt Controller	↓ LUT	✓
33	Asynchronous Dual-Clock FIFO	↓ LUT	✓
34	8-Port Round-Robin Arbiter	↓ LUT	✓
35	SPI Mode-0 Master	↓ LUT	✓
36	Oversampled 8N1 UART Receiver	↓ LUT	✓
37	ECG R-Peak Detector	↓ LUT	✓
38	7-Sample Median Denoising Filter	↓ LUT	✓
39	Single-Cycle RV32I Micro Core	↓ LUT	✓
40	Triple-Hash Bloom Filter Engine	↓ LUT	✓
41	64-Bin Streaming Histogram Engine	↑ Fmax	✓
42	Fixed-Ladder Top-of-Book Builder	↑ Fmax	✓

#	Problem	Objective	Models
43	Parallel Bitonic Sort and Rank Engine	↑ Fmax	✓
44	16x8 Binarized Dense Layer	↓ LUT	✓
45	Parallel Prefix Sum Unit	↑ Fmax	✓
46	Token Bucket Rate Limiter	↓ LUT	✓
47	8-Entry TCAM Lookup	↓ LUT	✓
48	2x2 Streaming MAC Tile	↑ Fmax	✓
49	Variable-Width Timestamp Delta Encoder	↓ LUT	✓
50	Streaming Dot Product Accumulator	↑ Fmax	✓
51	Runtime-Reconfigurable 8-Tap FIR	↓ LUT	✓
52	Streaming 5-Point Stencil Engine	↓ LUT	✓

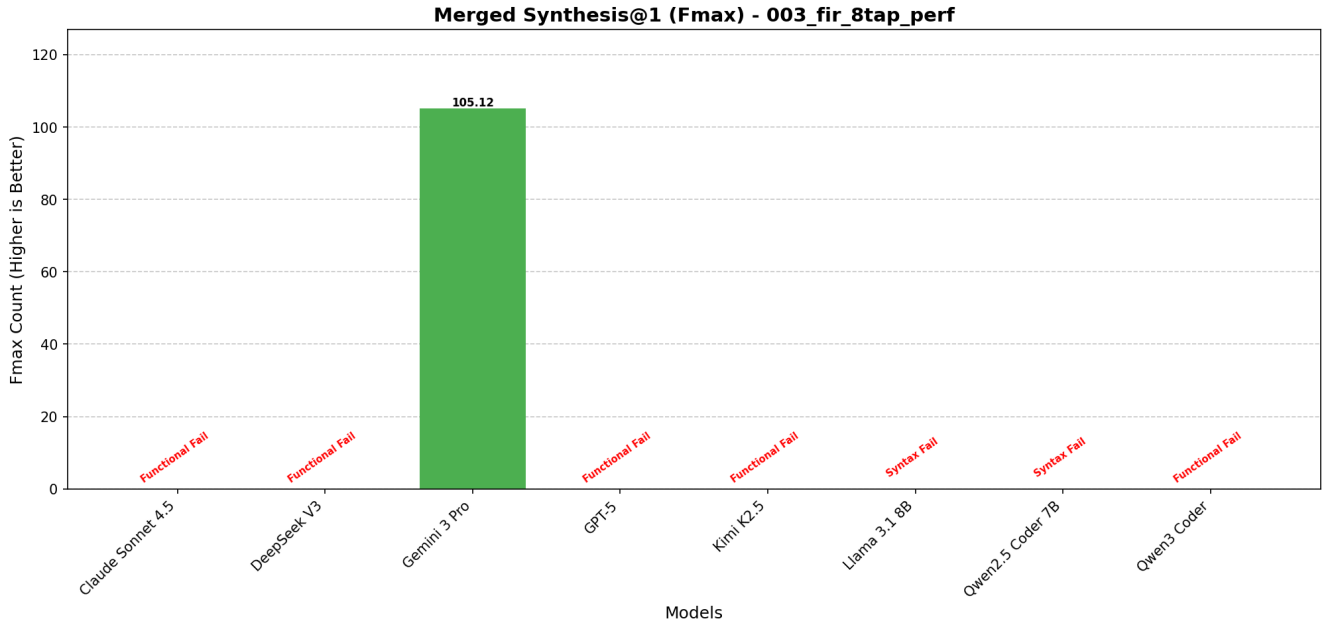
# 1. 4x4 Matrix Multiplier



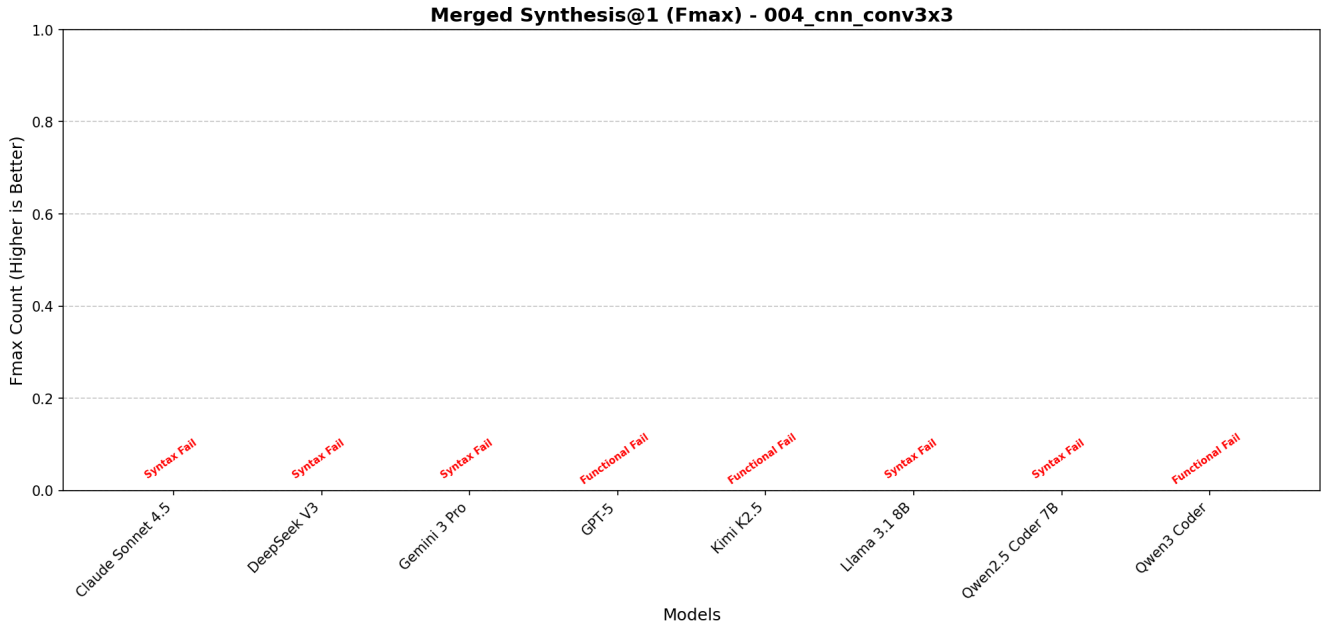
# 2. 16-Tap Symmetric FIR Filter



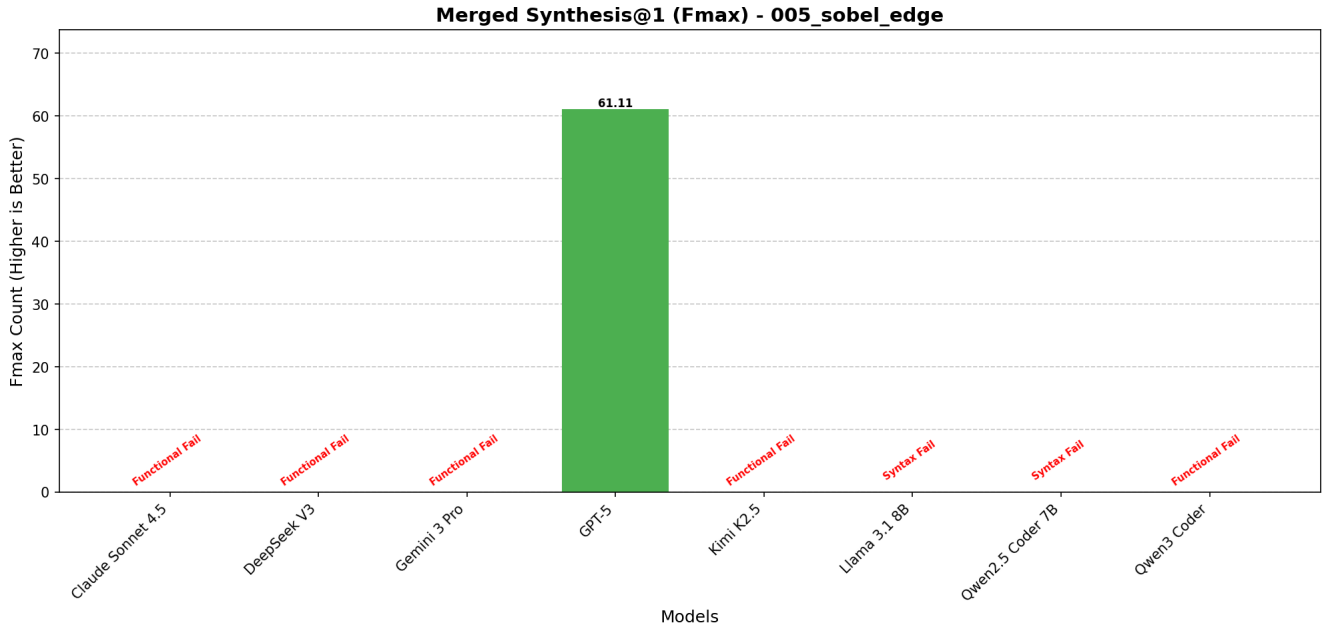
### 3. Pipelined 8-Tap FIR Filter



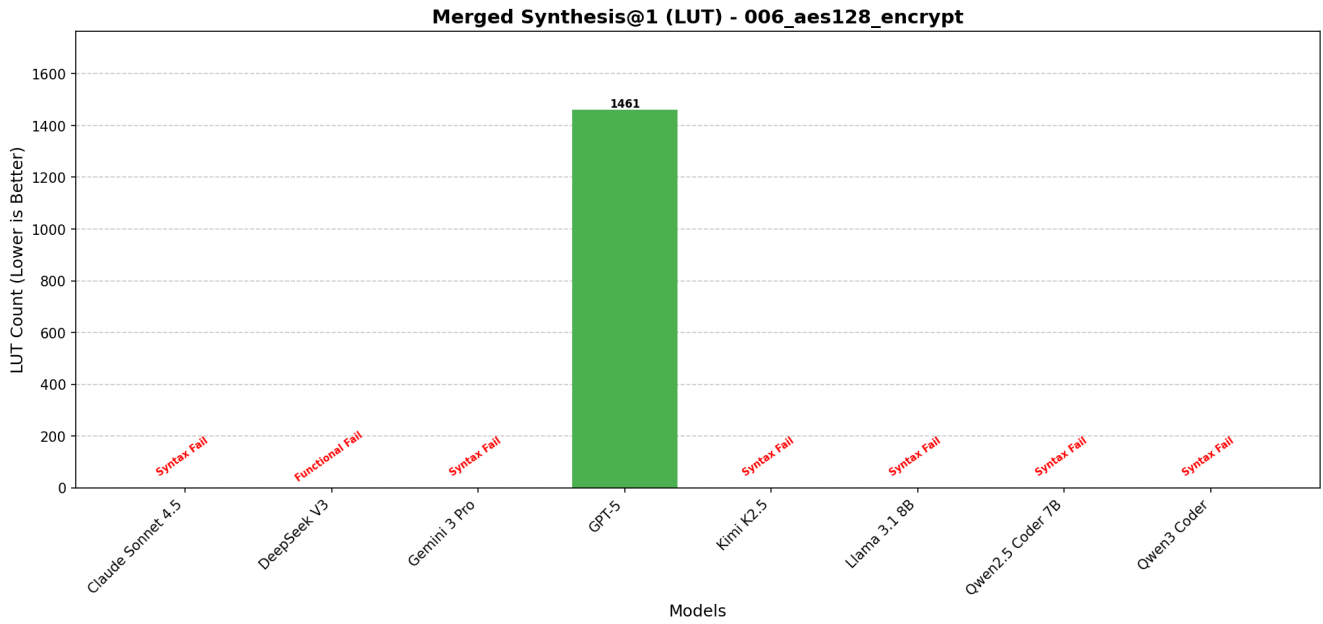
### 4. Streaming 3x3 CNN Convolution Layer



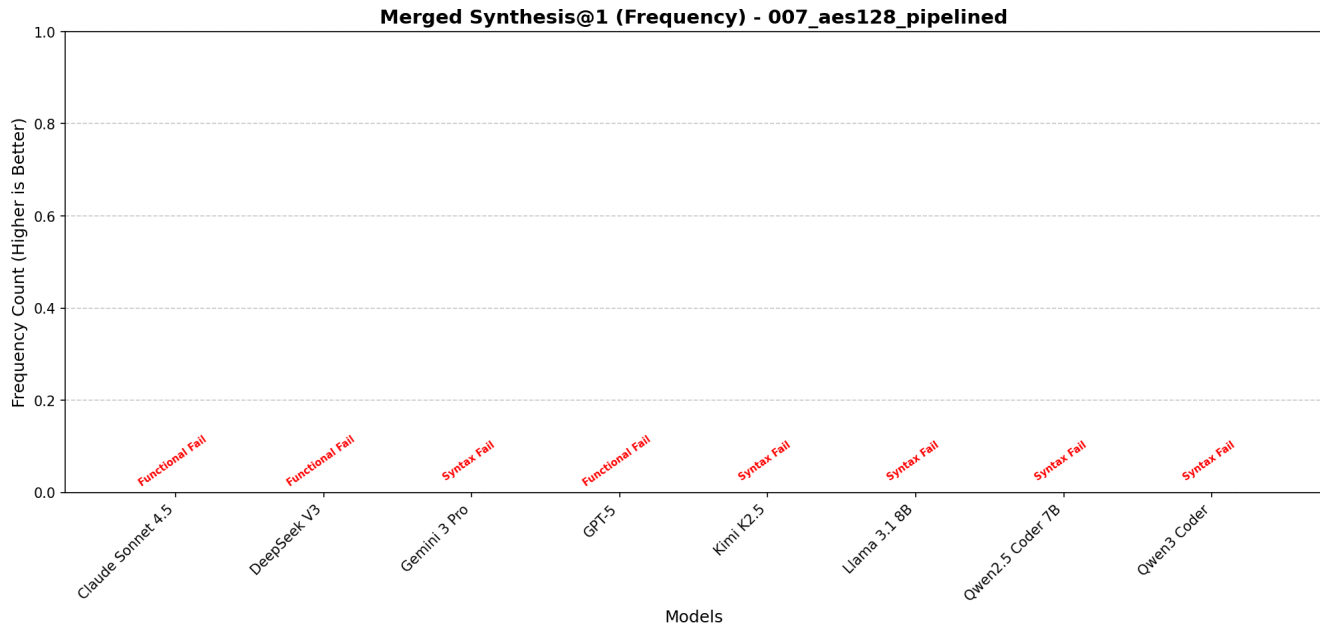
## 5. Sobel Edge Detection Accelerator



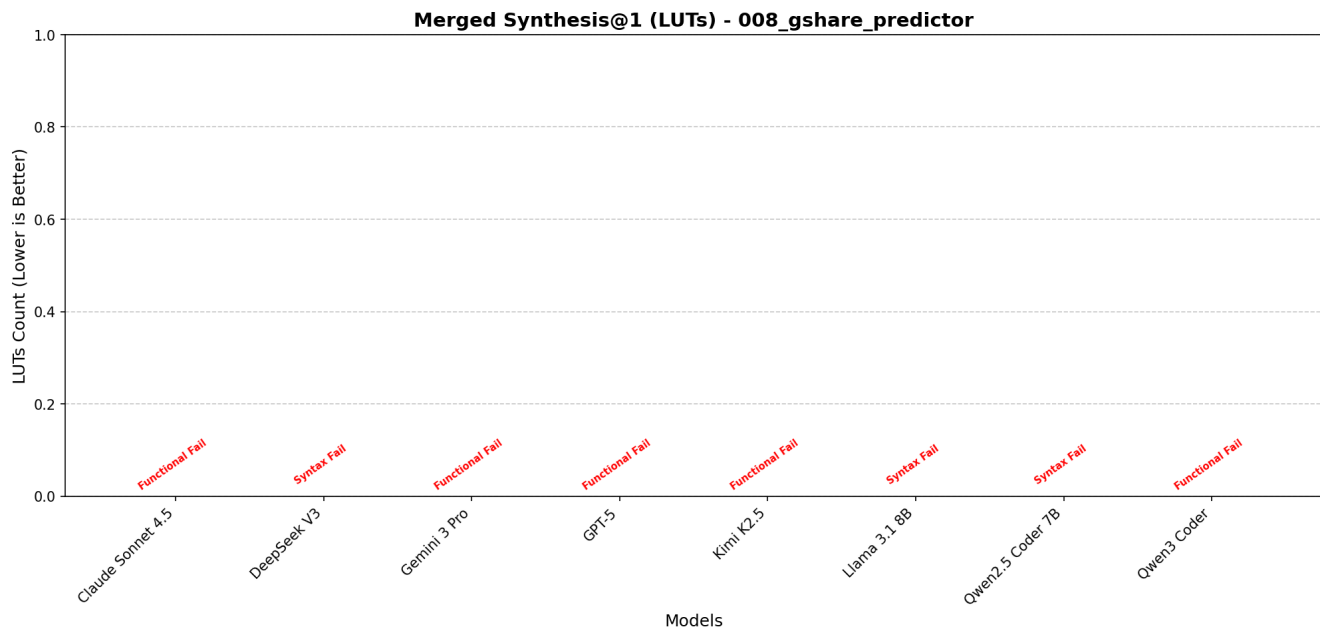
## 6. AES-128 Encryption Engine



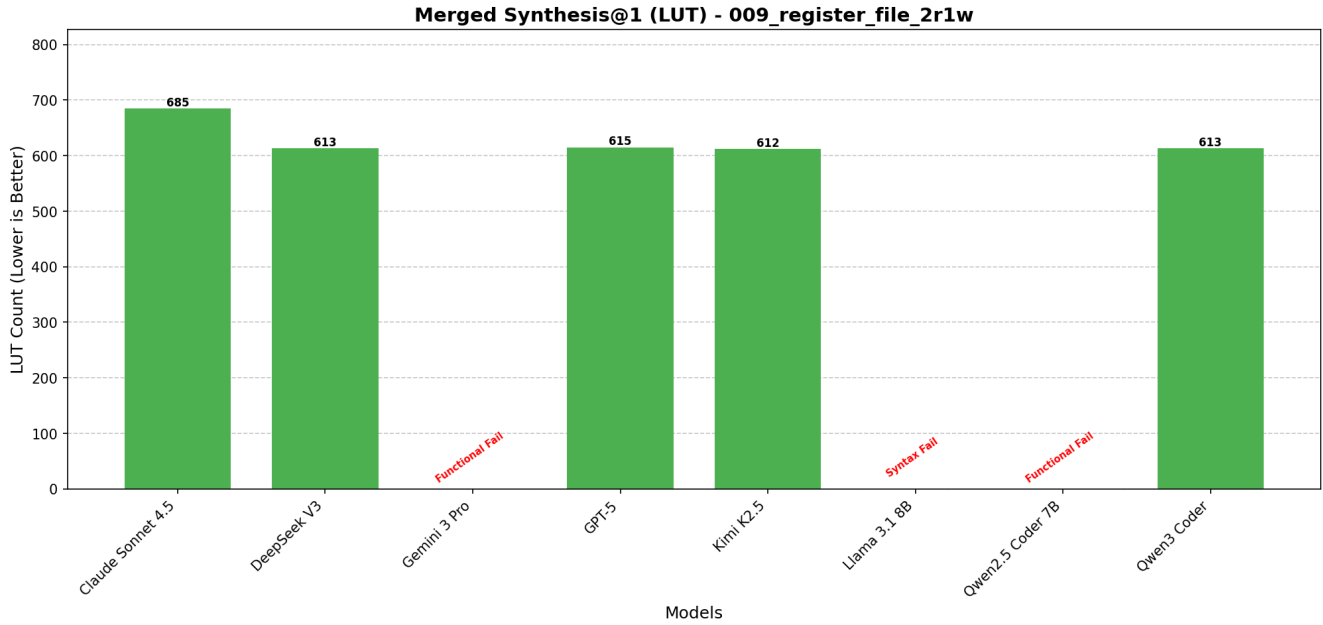
## 7. Streaming Pipelined AES-128 Encryption



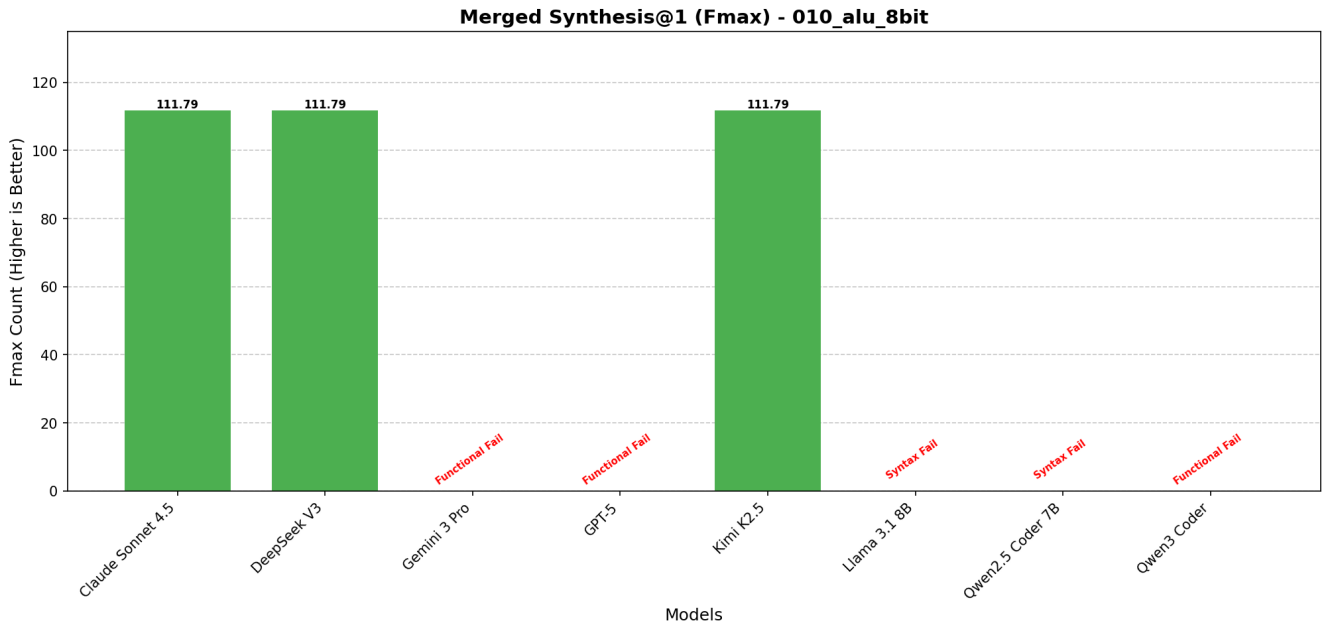
## 8. G-Share Branch Predictor



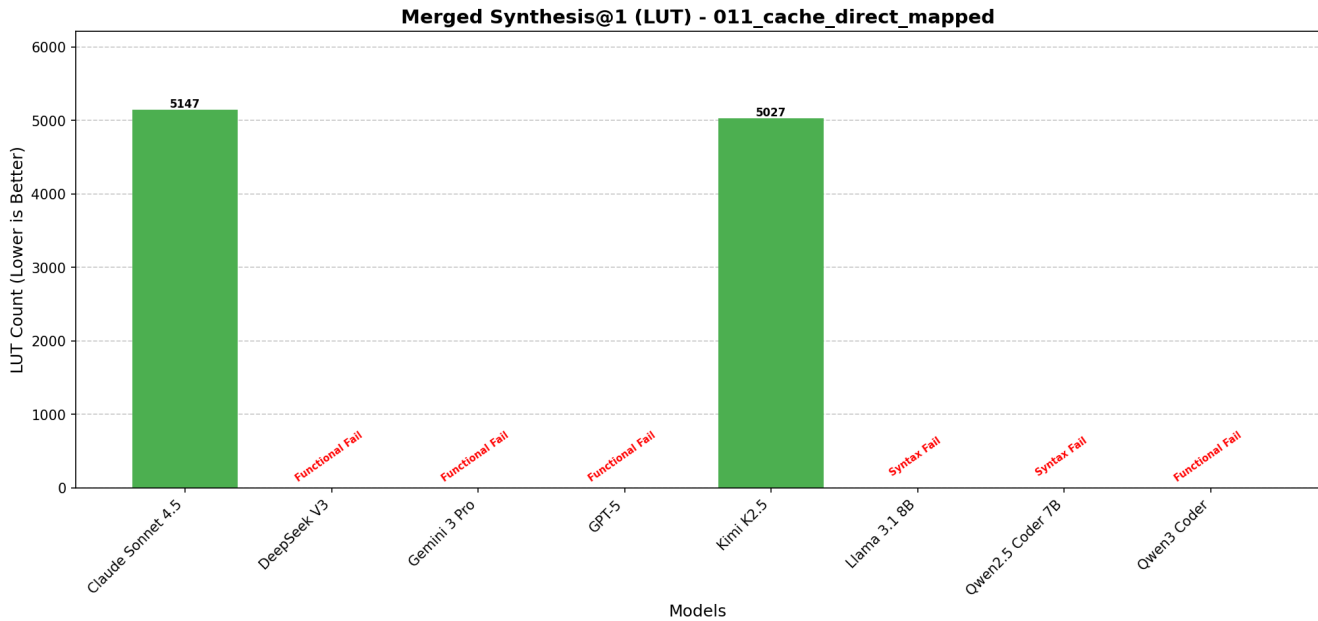
## 9. Dual-Port Register File



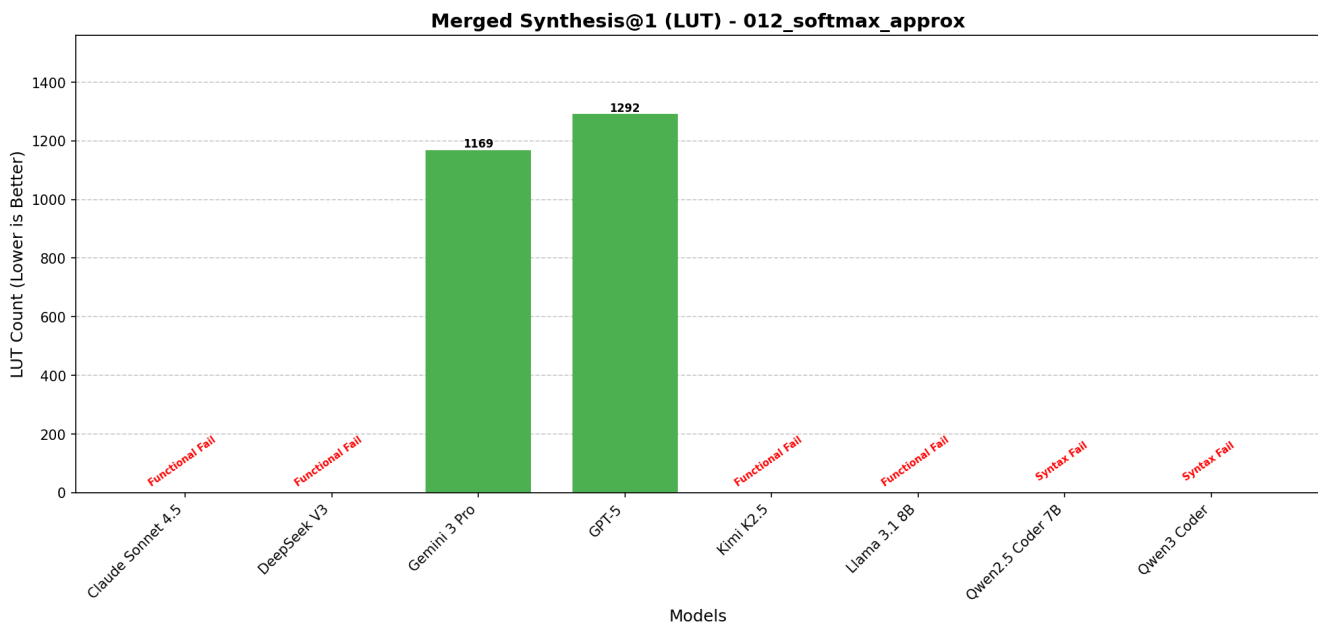
## 10. 8-Bit Single-Cycle ALU with Flags



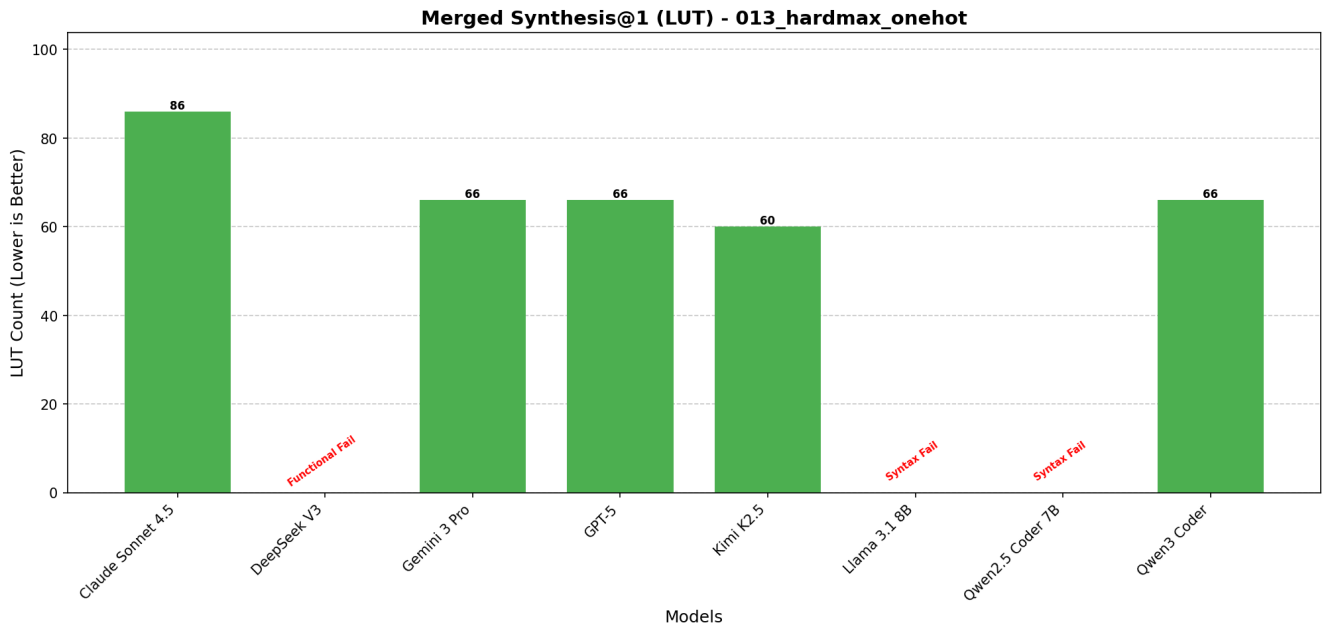
## 11. Direct-Mapped Write-Through Cache



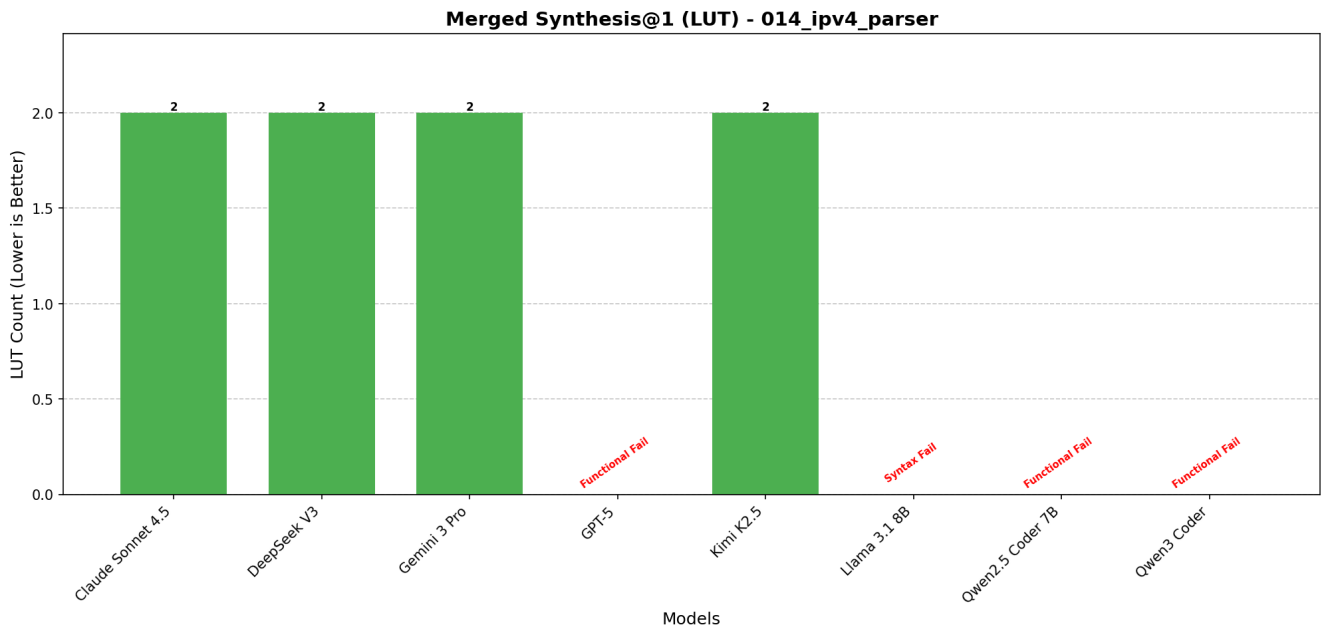
## 12. Fixed-Point Softmax Approximation Layer



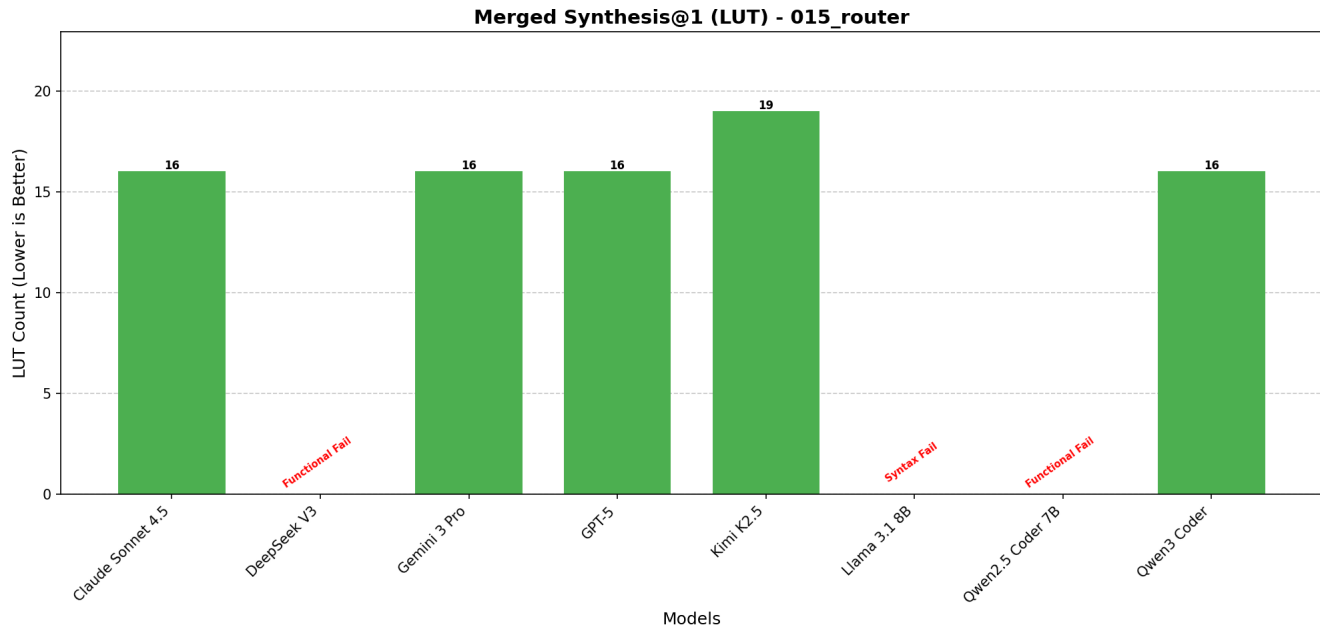
### 13. Hardmax One-Hot Classifier



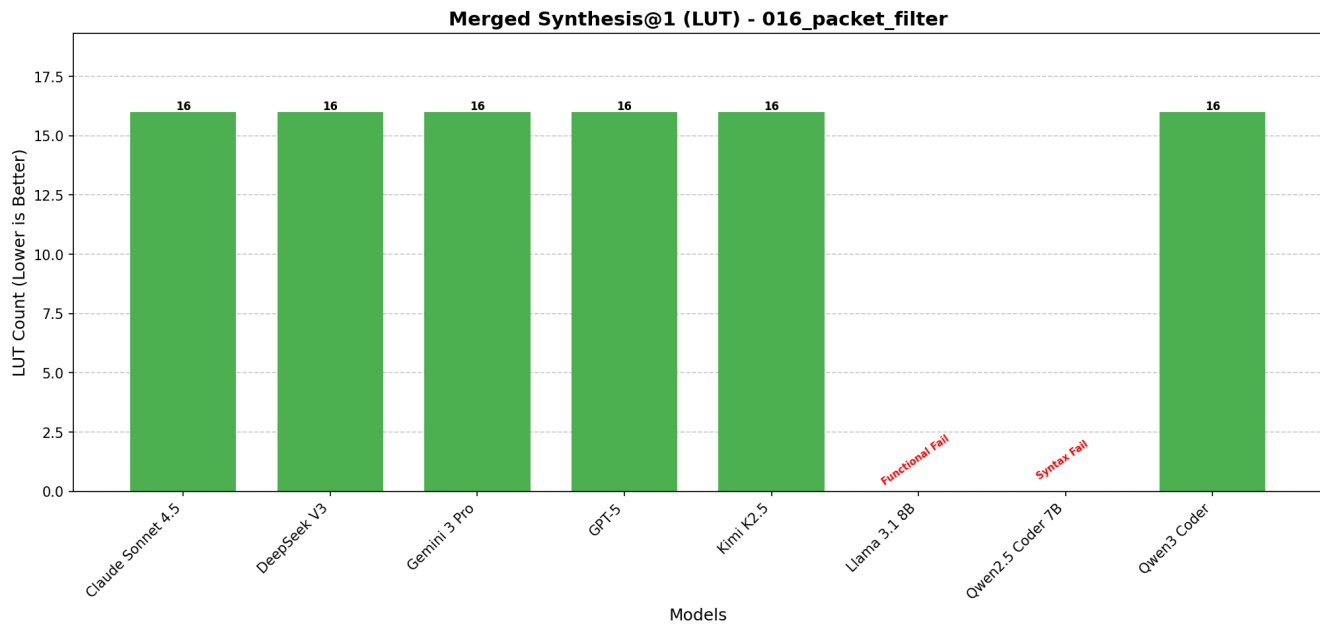
### 14. IPv4 Header Sniffer



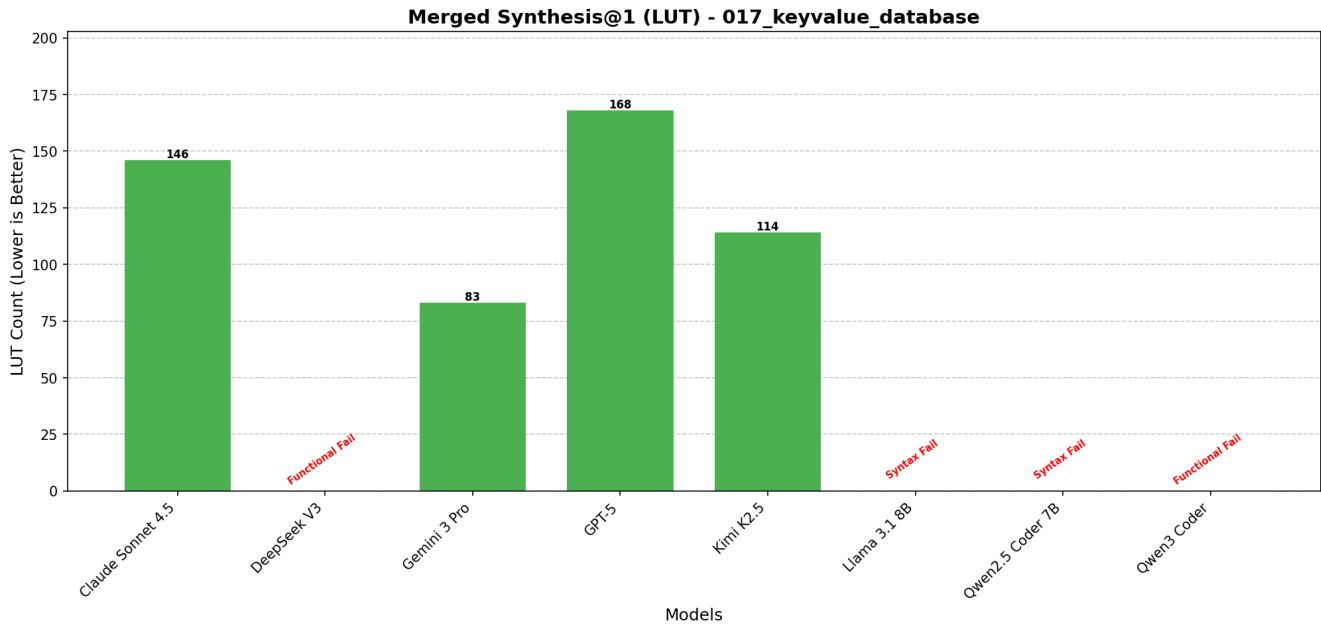
## 15. Longest Prefix Match Router



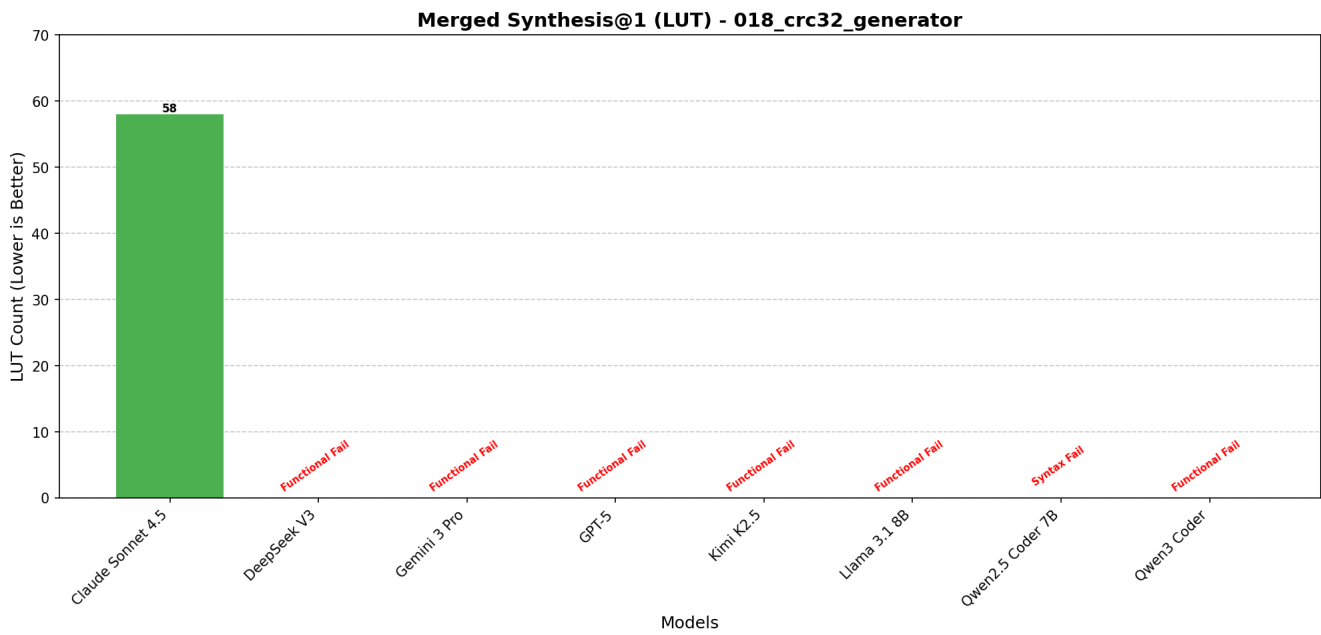
## 16. Priority-Based Packet Filter



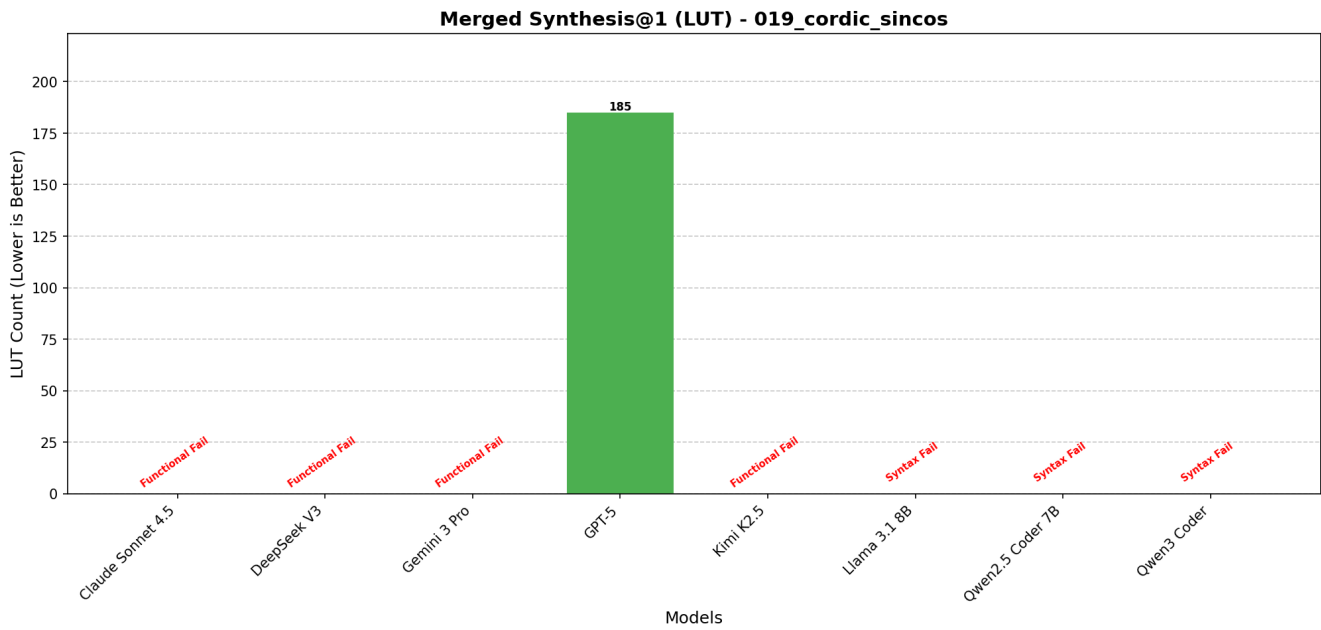
## 17. Key-Value Database with Round-Robin Replacement



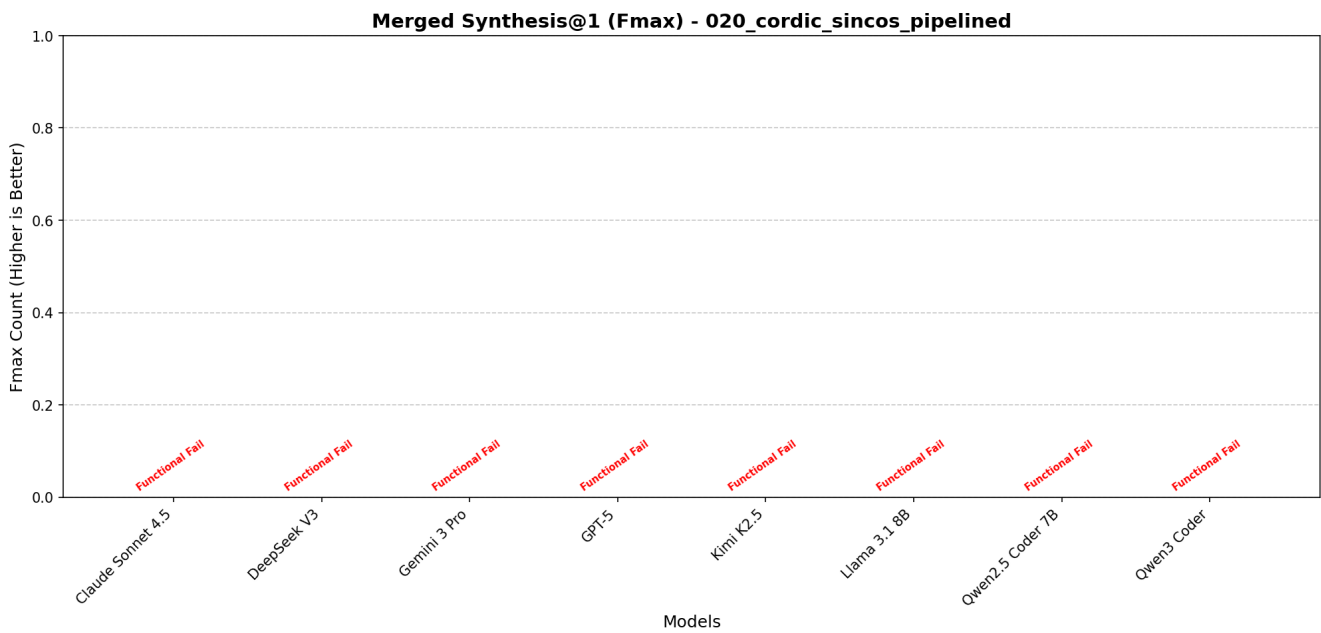
## 18. CRC-32 Generator



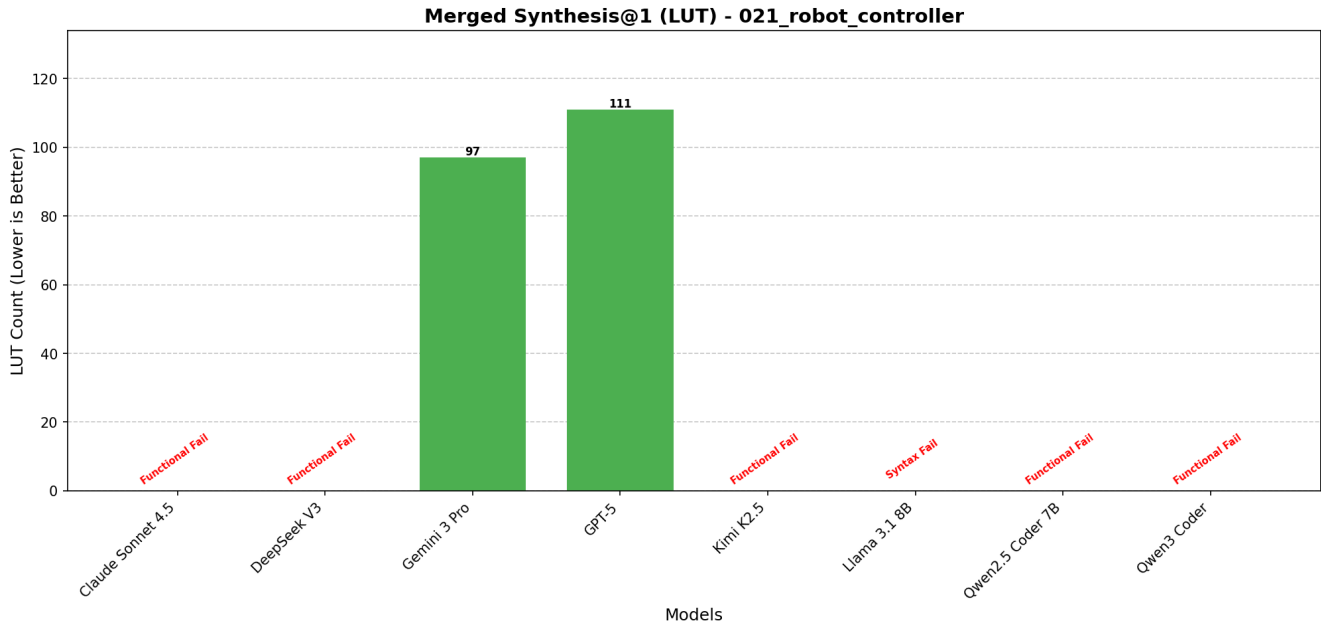
## 19. Iterative CORDIC Sin/Cos



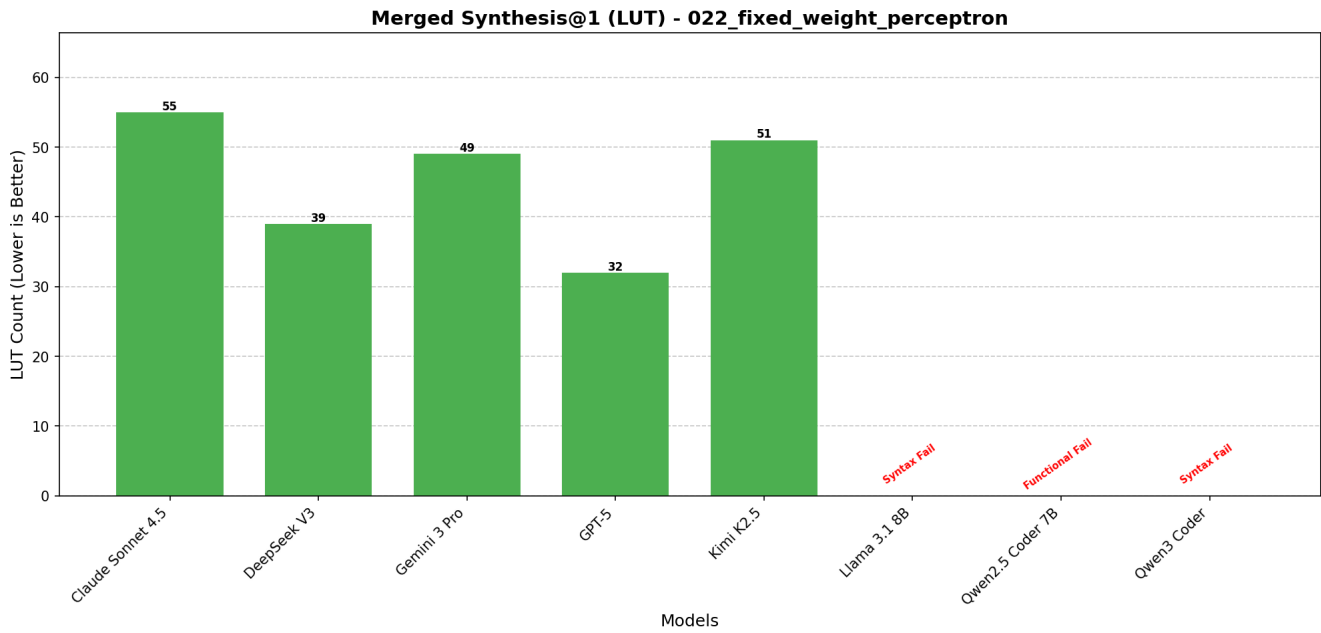
## 20. Pipelined CORDIC Sin/Cos



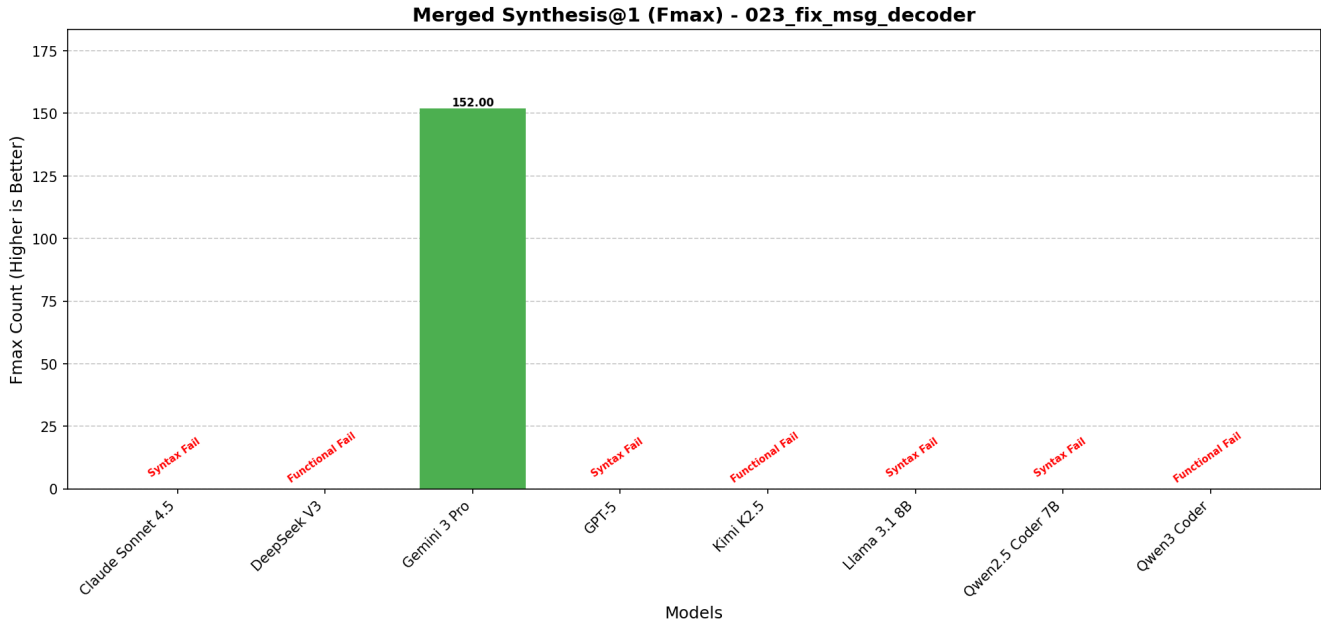
## 21. Fixed-Point PID Robot Position Controller



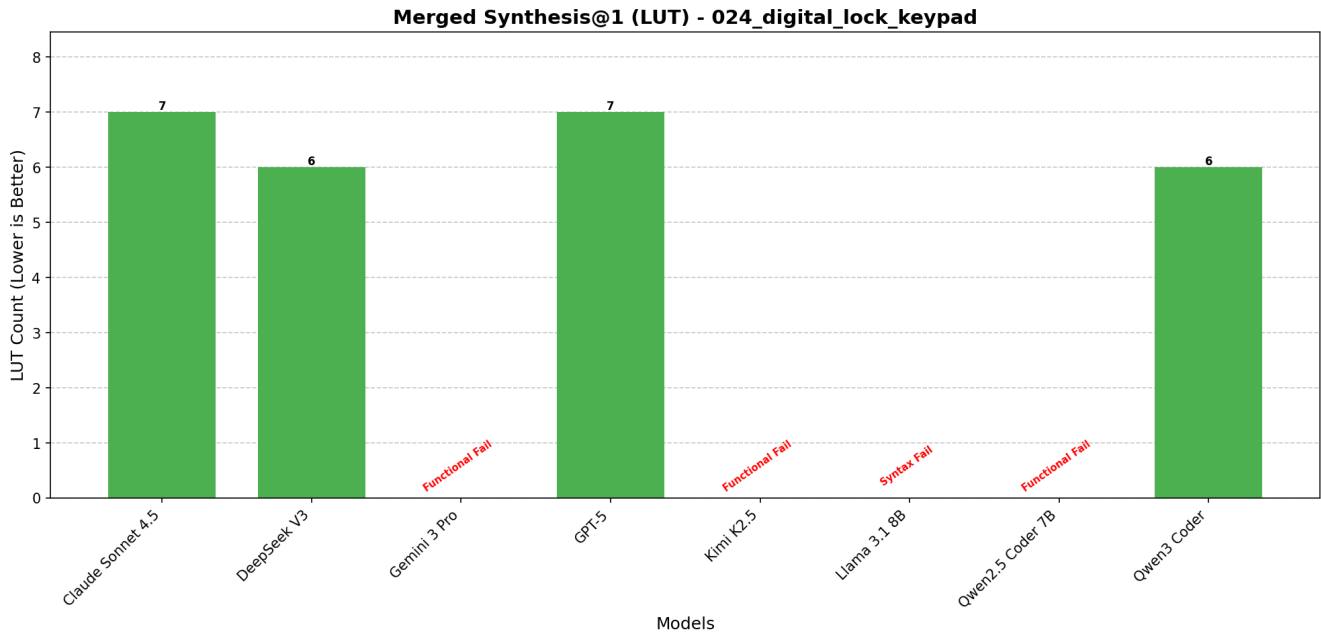
## 22. Fixed-Weight Perceptron



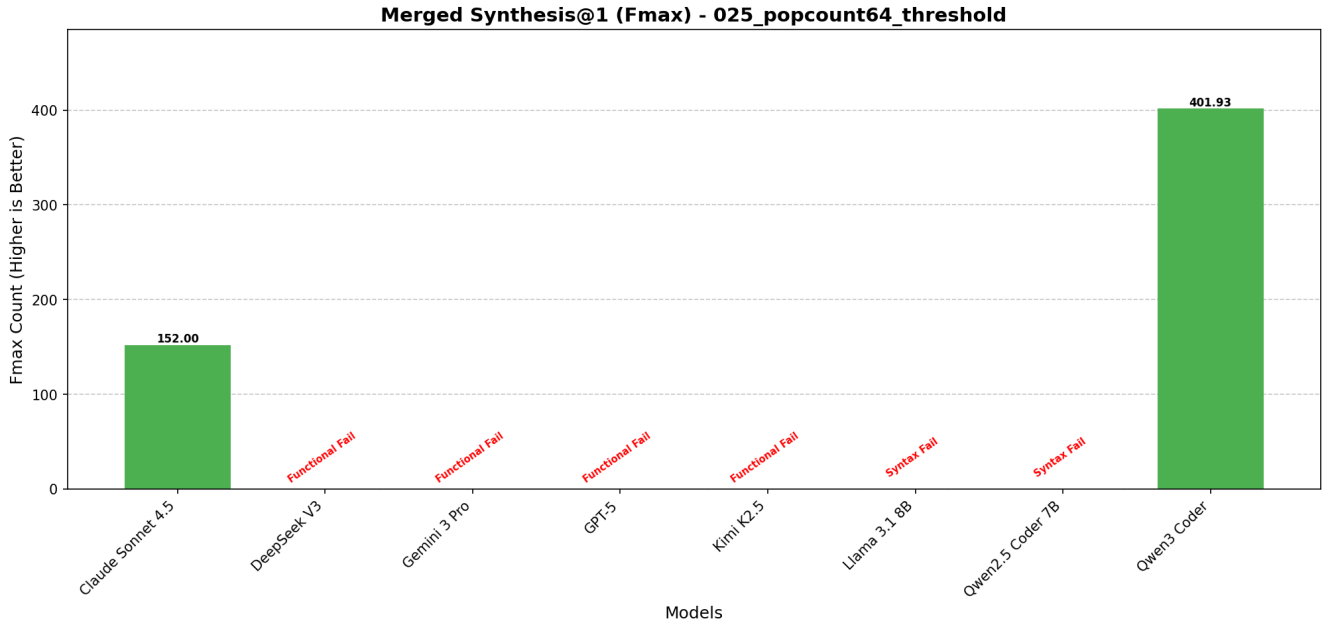
## 23. Streaming FIX Message Decoder



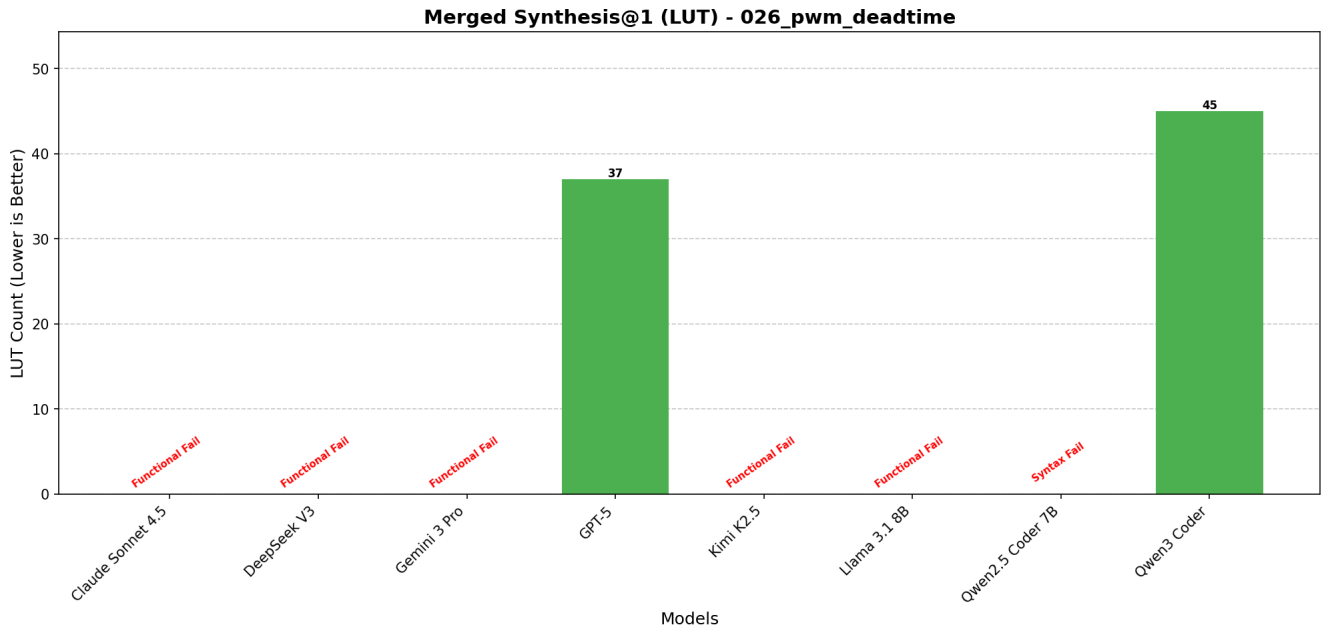
## 24. Keypad Access Control FSM



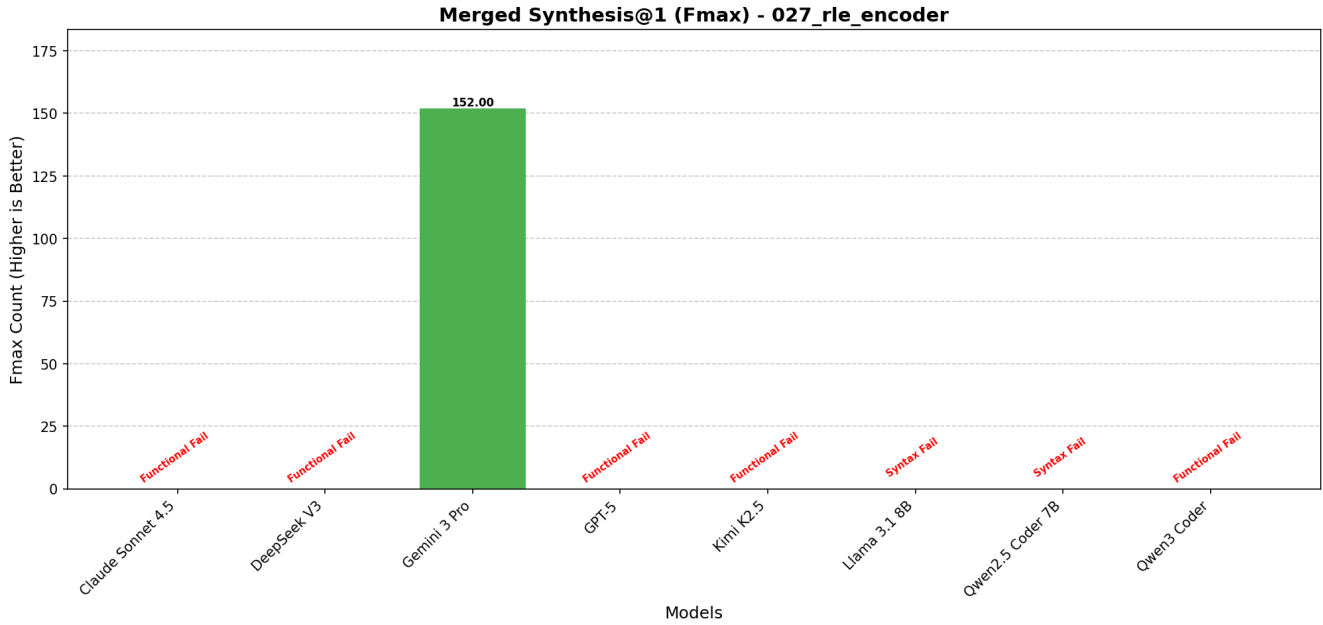
## 25. 64-bit Popcount with Threshold Flag



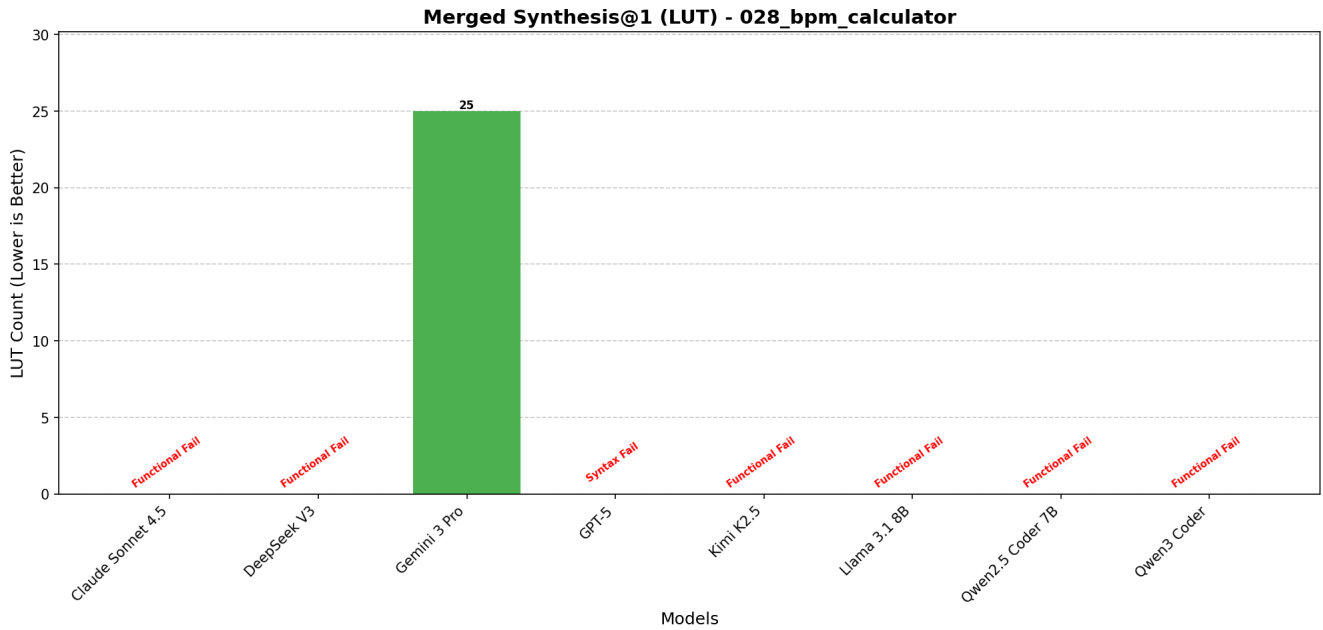
## 26. Complementary PWM Generator with Dead-Time



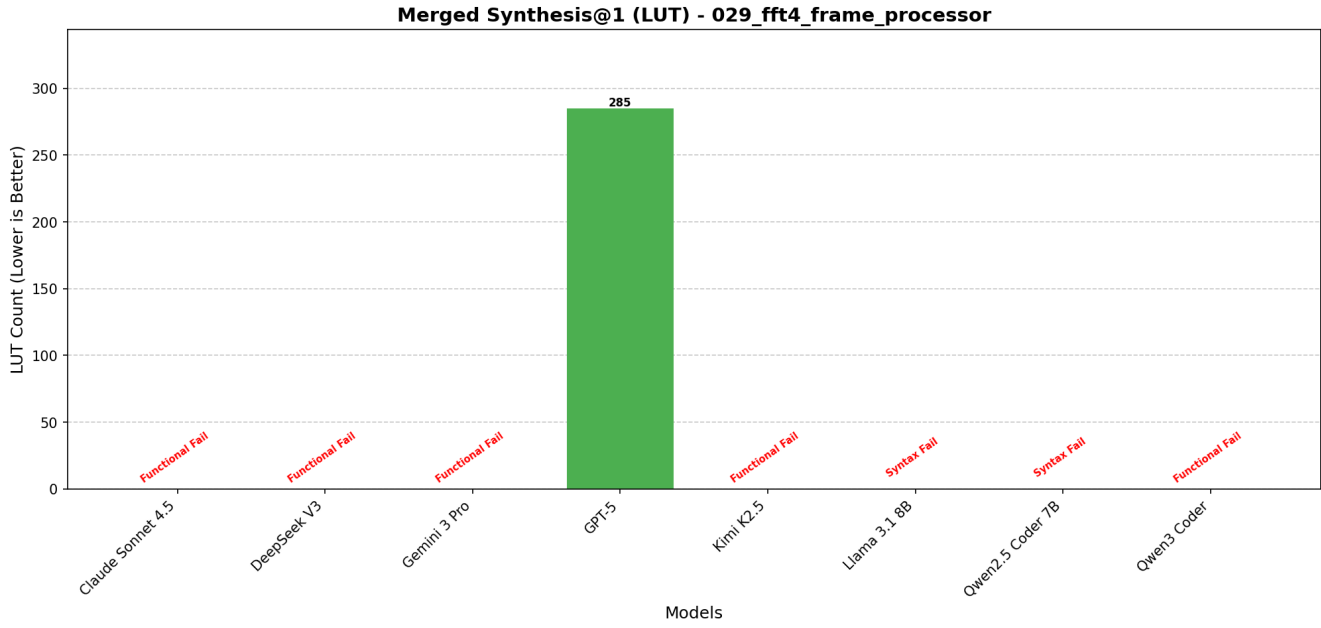
## 27. Streaming Run-Length Encoder



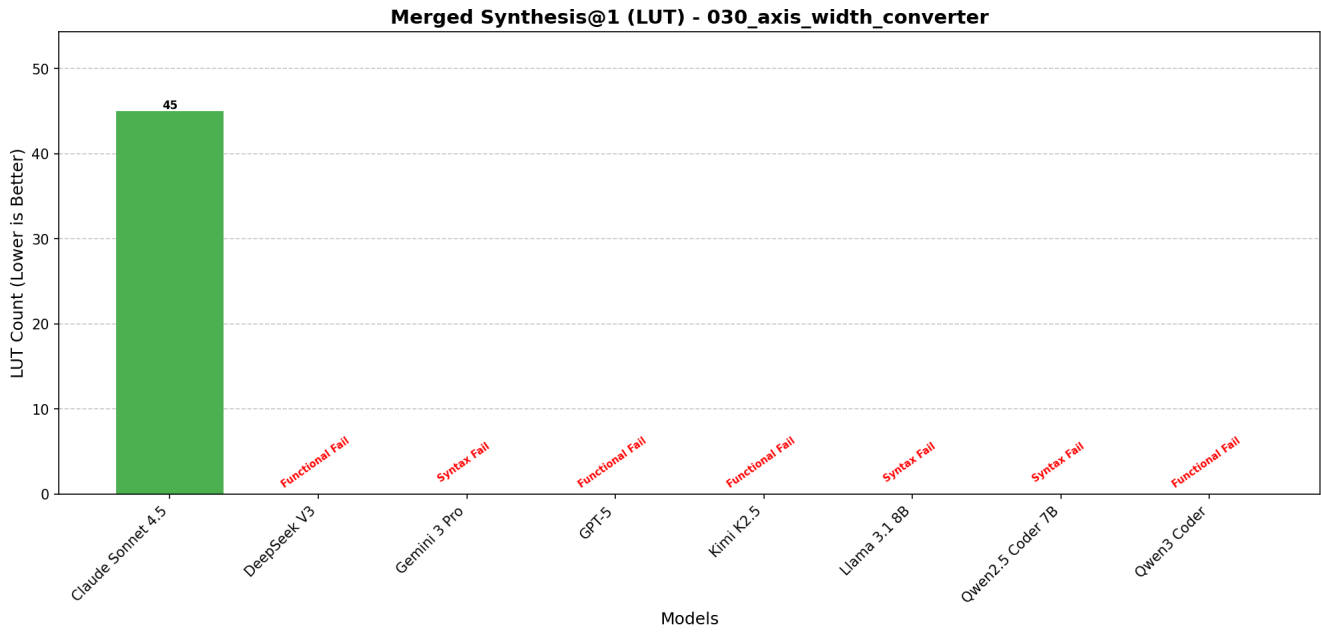
## 28. Sliding-Window Heart-Rate Estimator



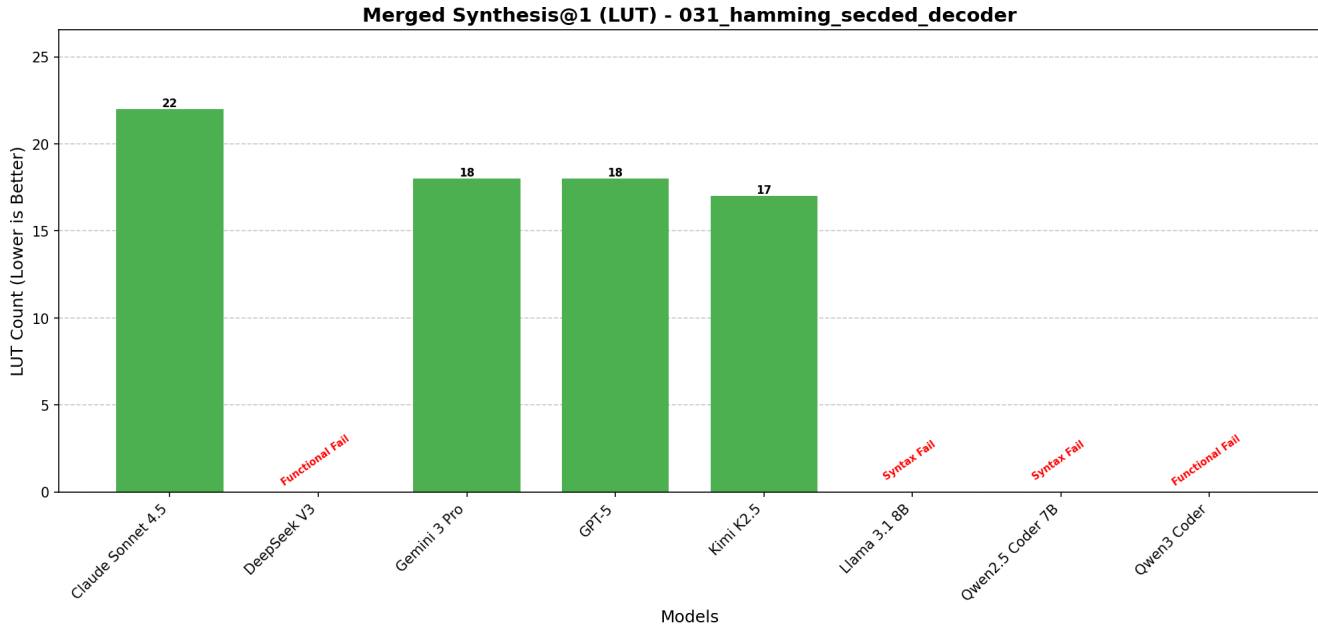
## 29. 4-Point Complex FFT



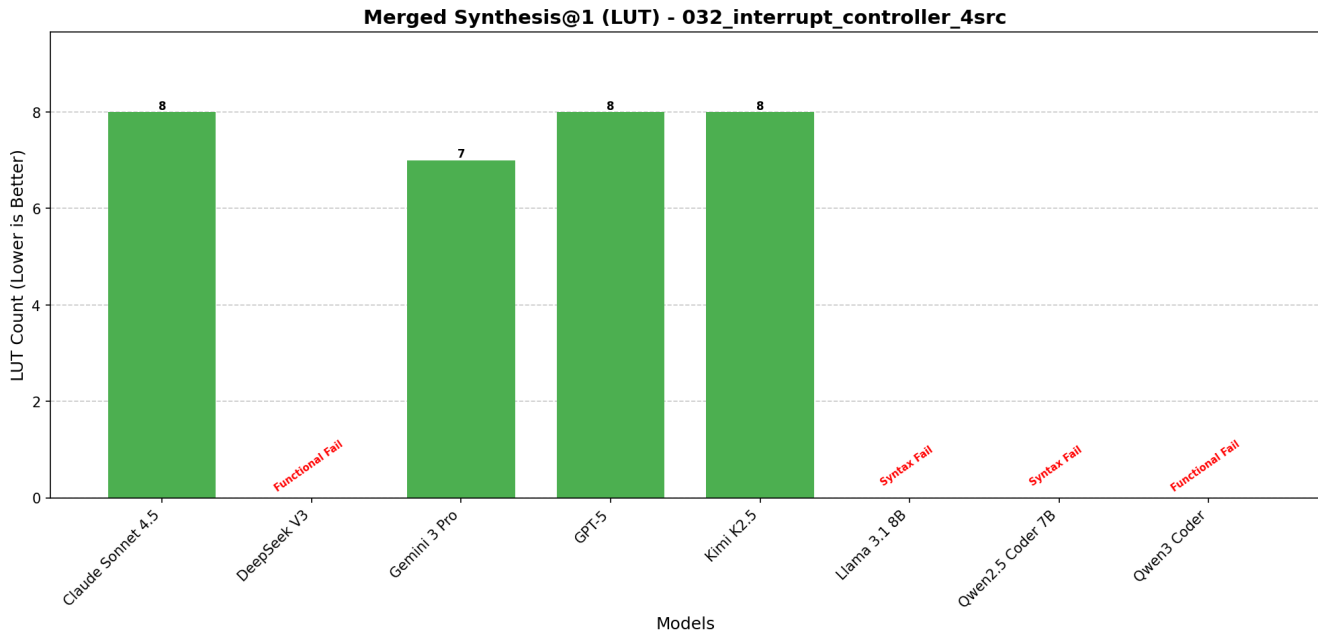
## 30. AXI4-Stream 8-to-32 Upsizer



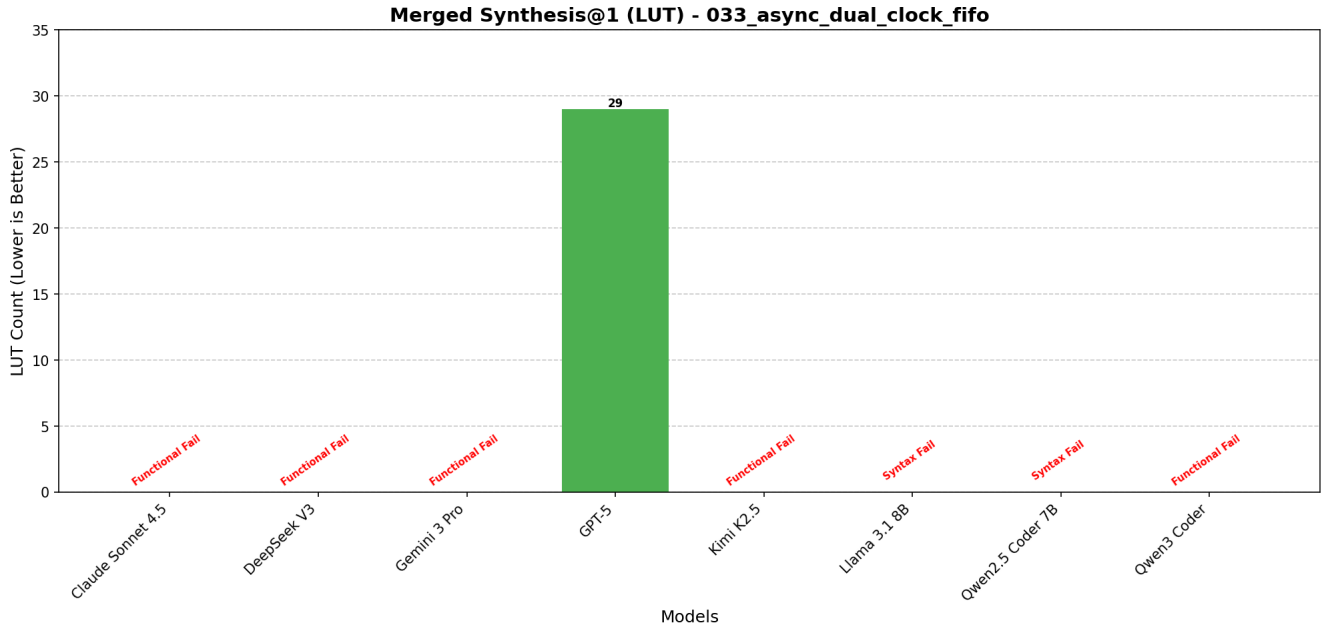
### 31. Hamming SECDED Decoder



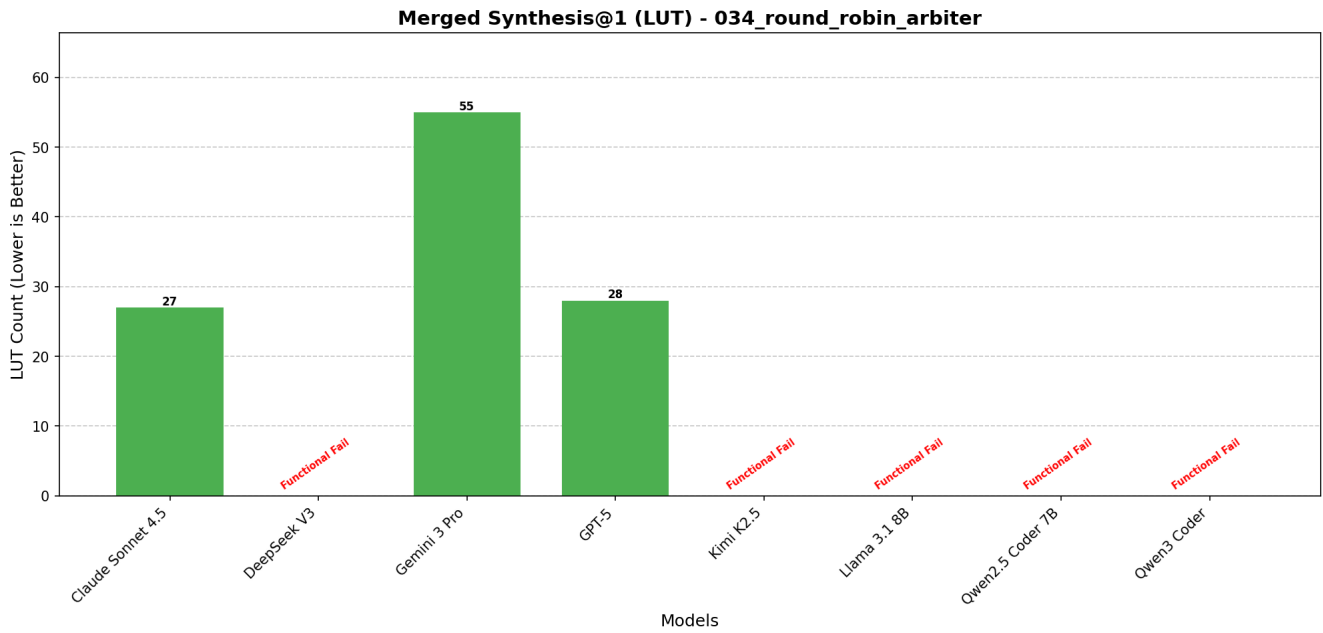
### 32. Priority Interrupt Controller



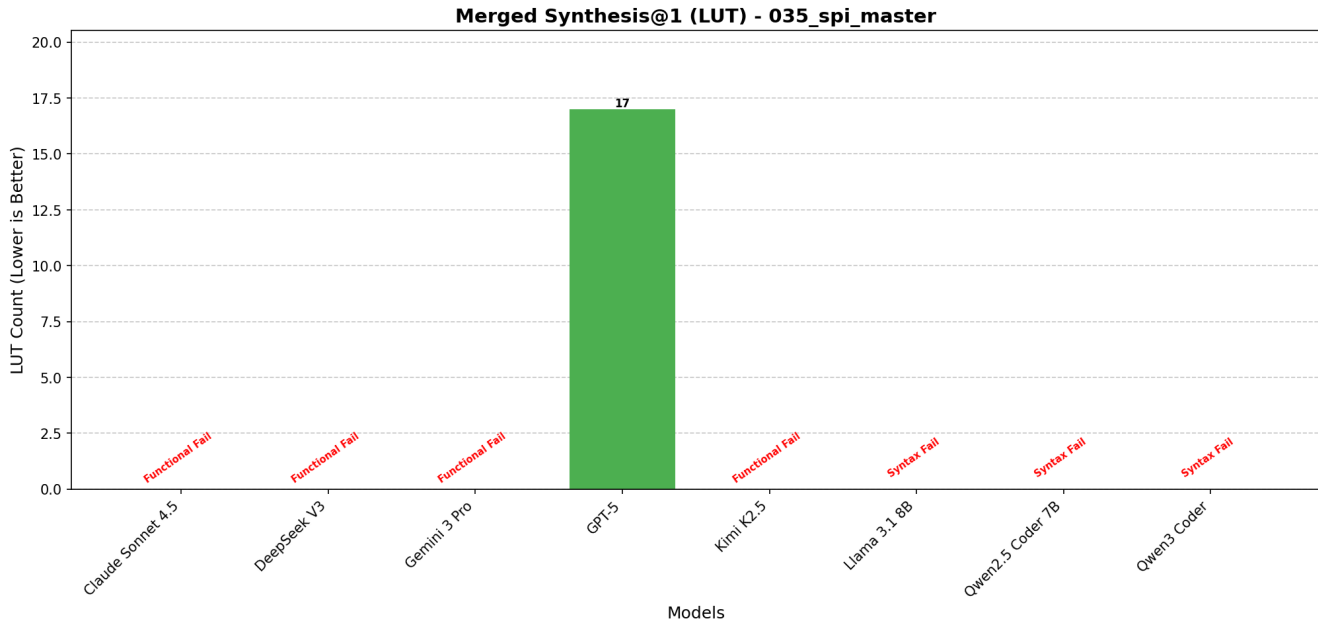
### 33. Asynchronous Dual-Clock FIFO



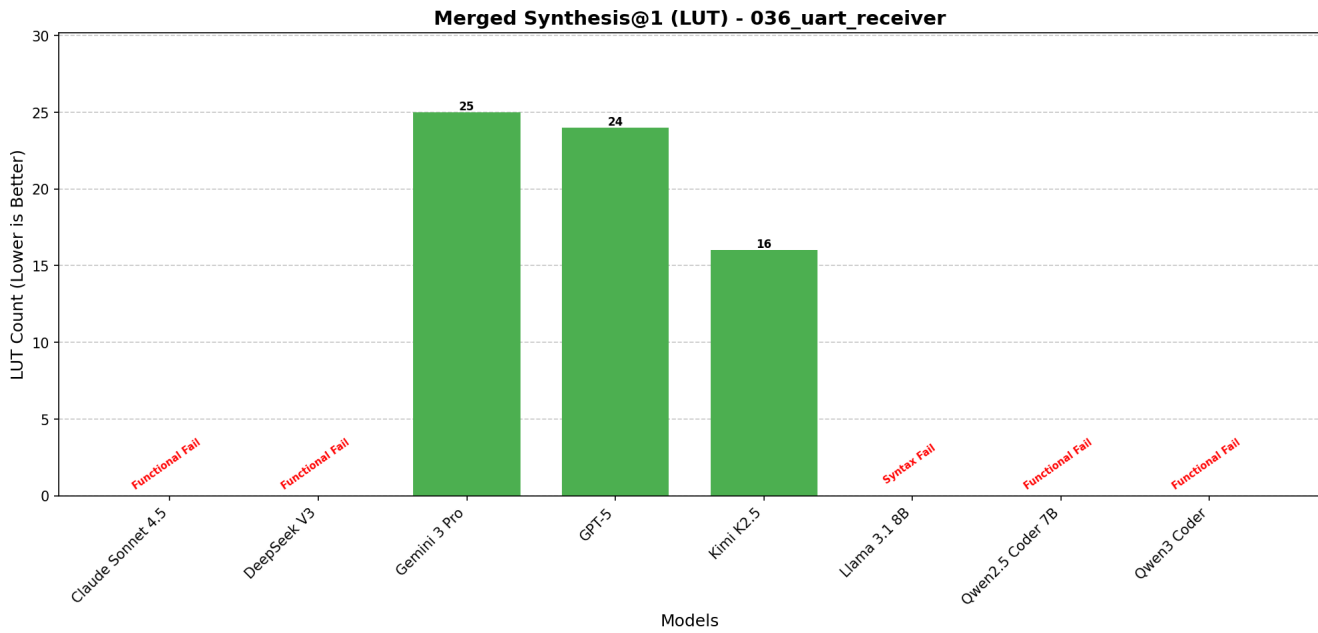
### 34. 8-Port Round-Robin Arbiter



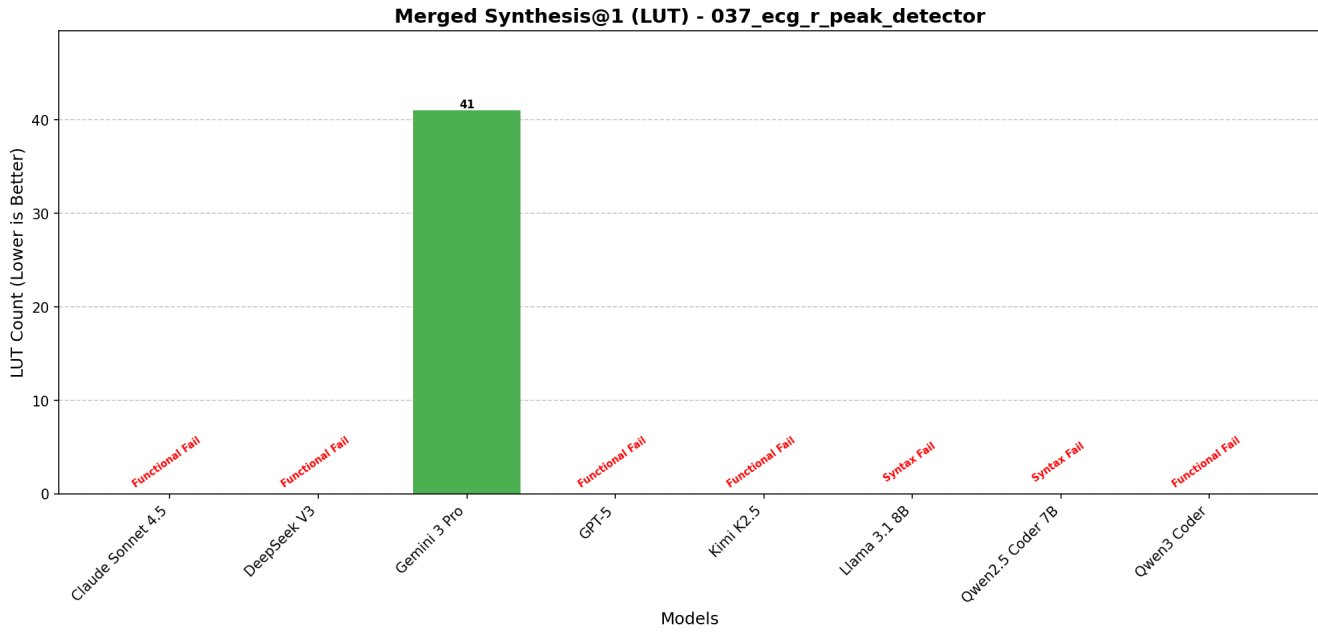
### 35. SPI Mode-0 Master



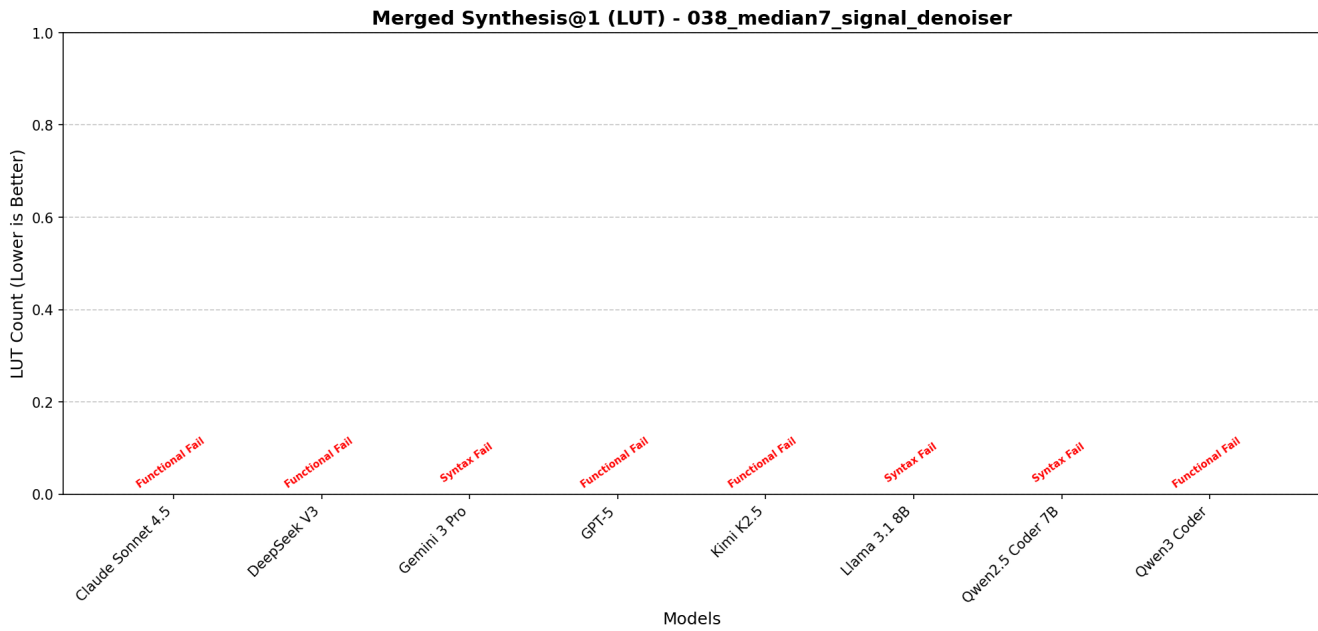
### 36. Oversampled 8N1 UART Receiver



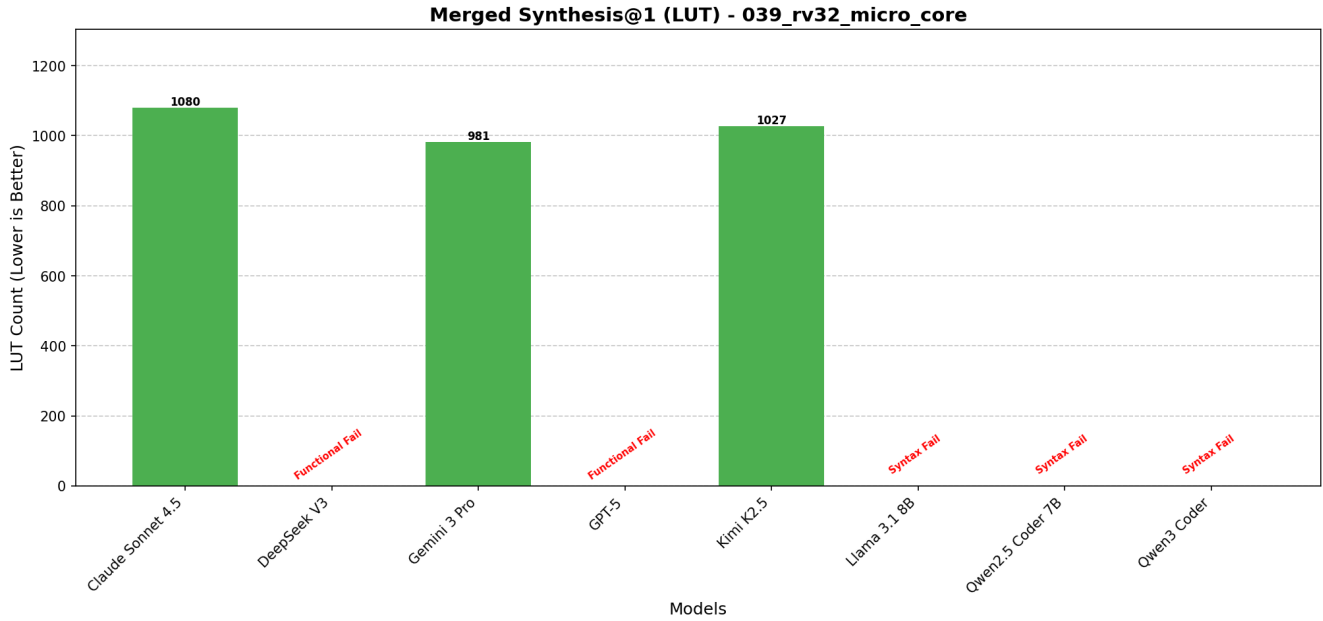
### 37. ECG R-Peak Detector



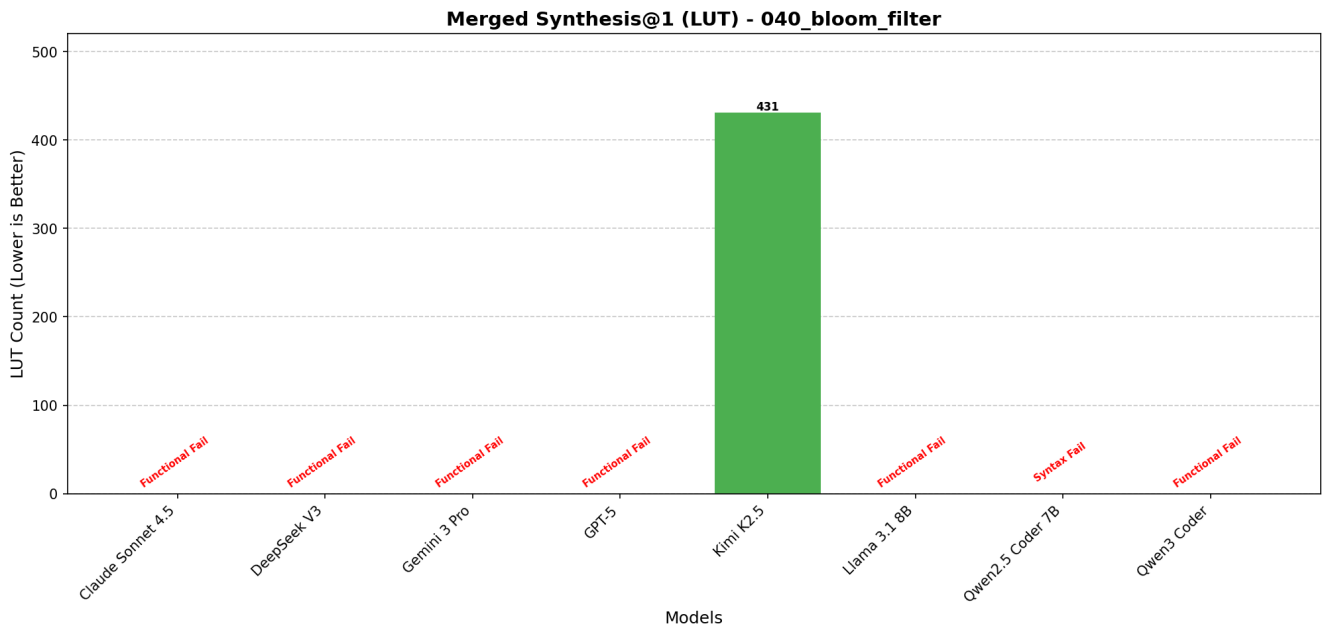
### 38. 7-Sample Median Denoising Filter



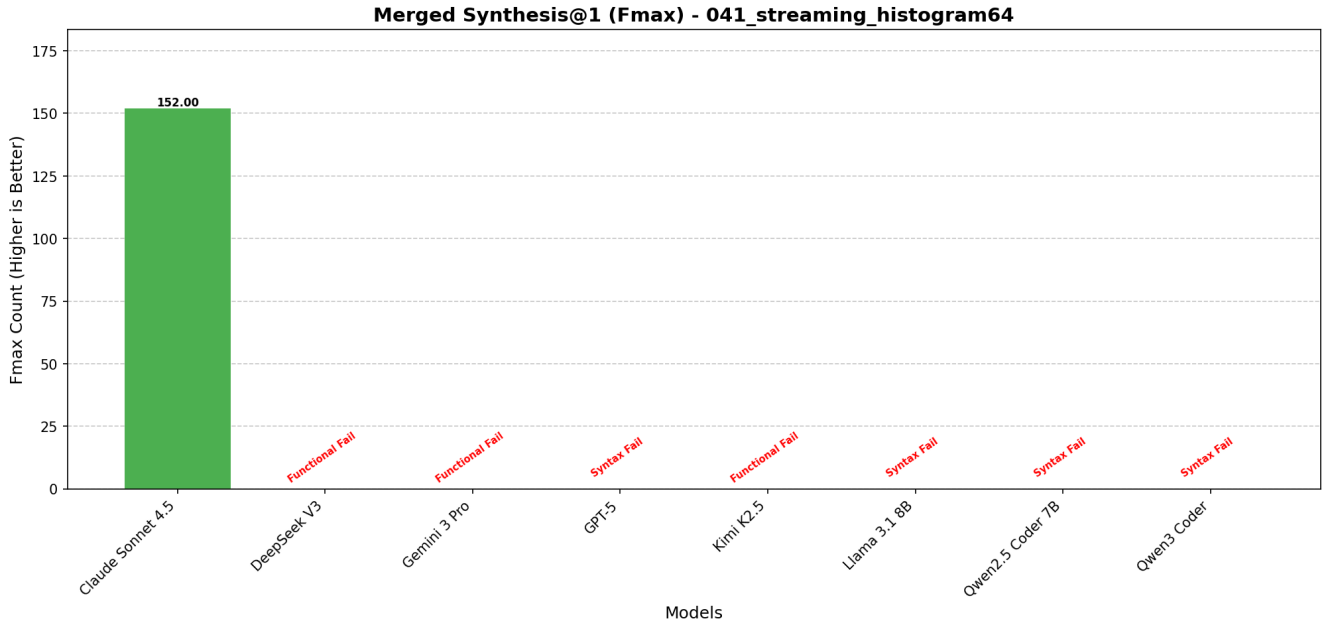
### 39. Single-Cycle RV32I Micro Core



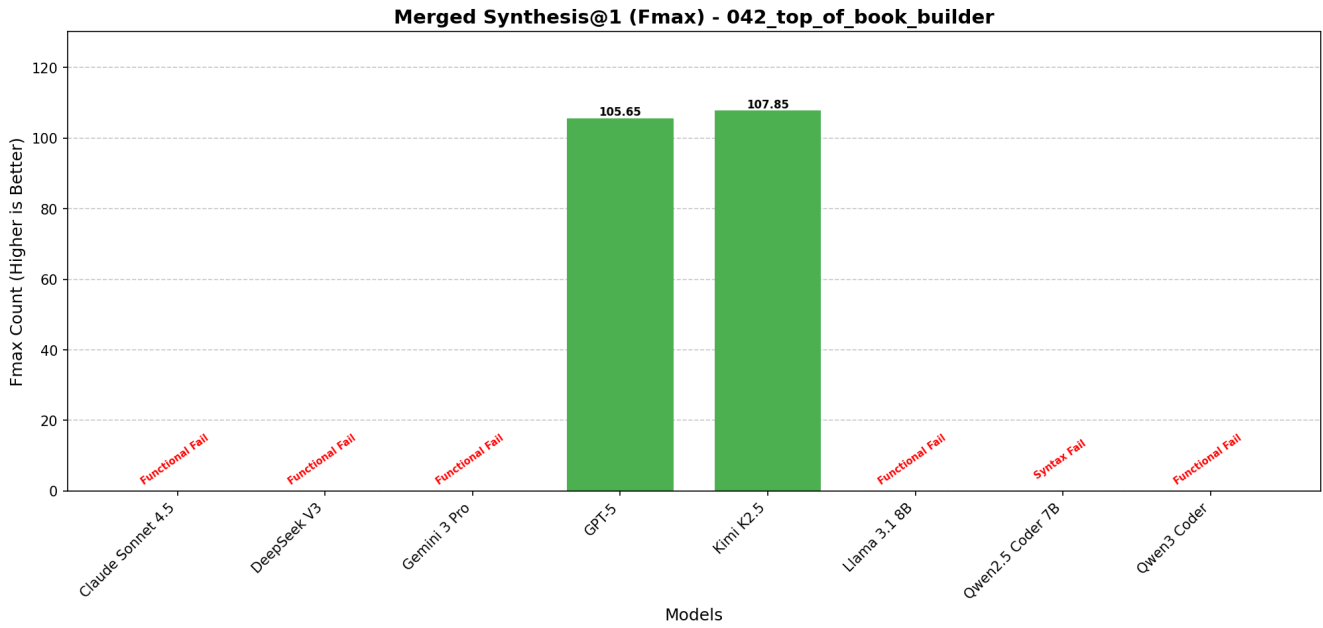
### 40. Triple-Hash Bloom Filter Engine



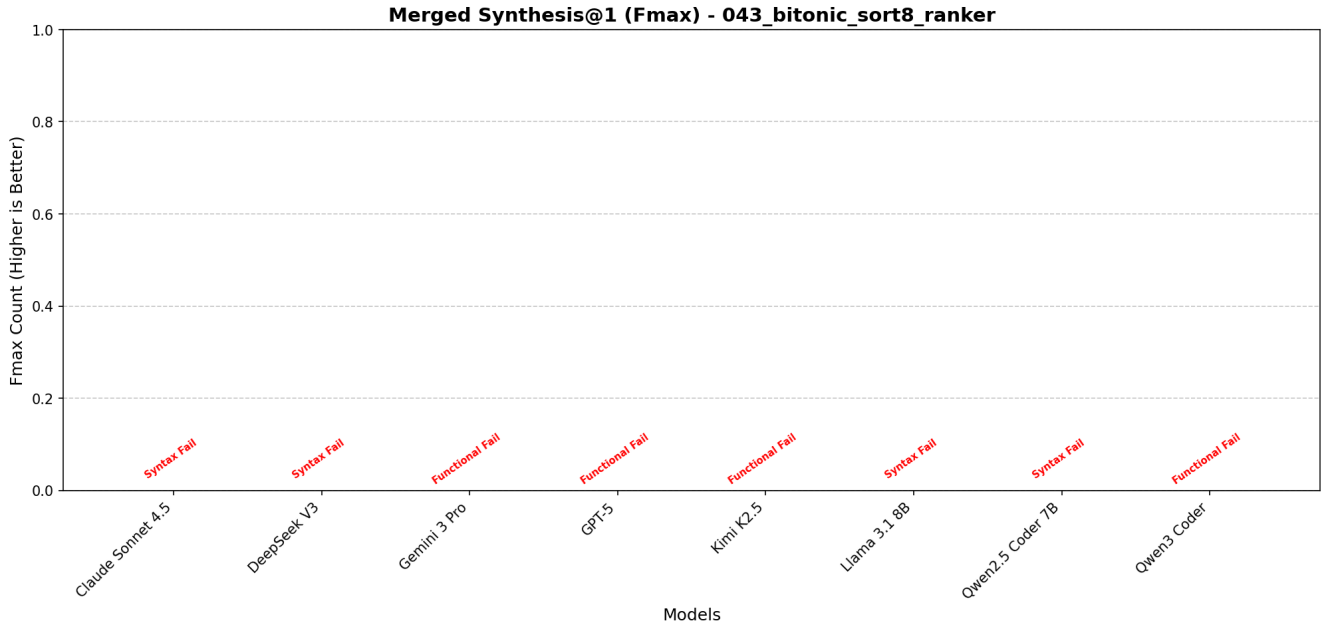
## 41. 64-Bin Streaming Histogram Engine



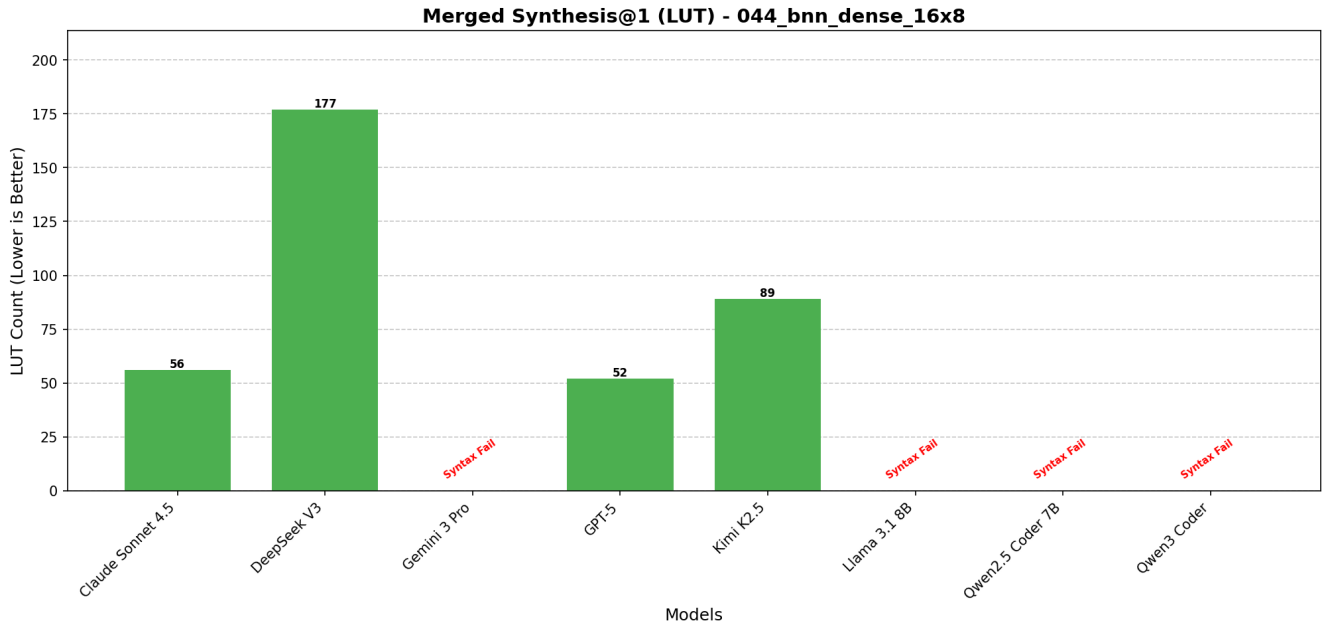
## 42. Fixed-Ladder Top-of-Book Builder



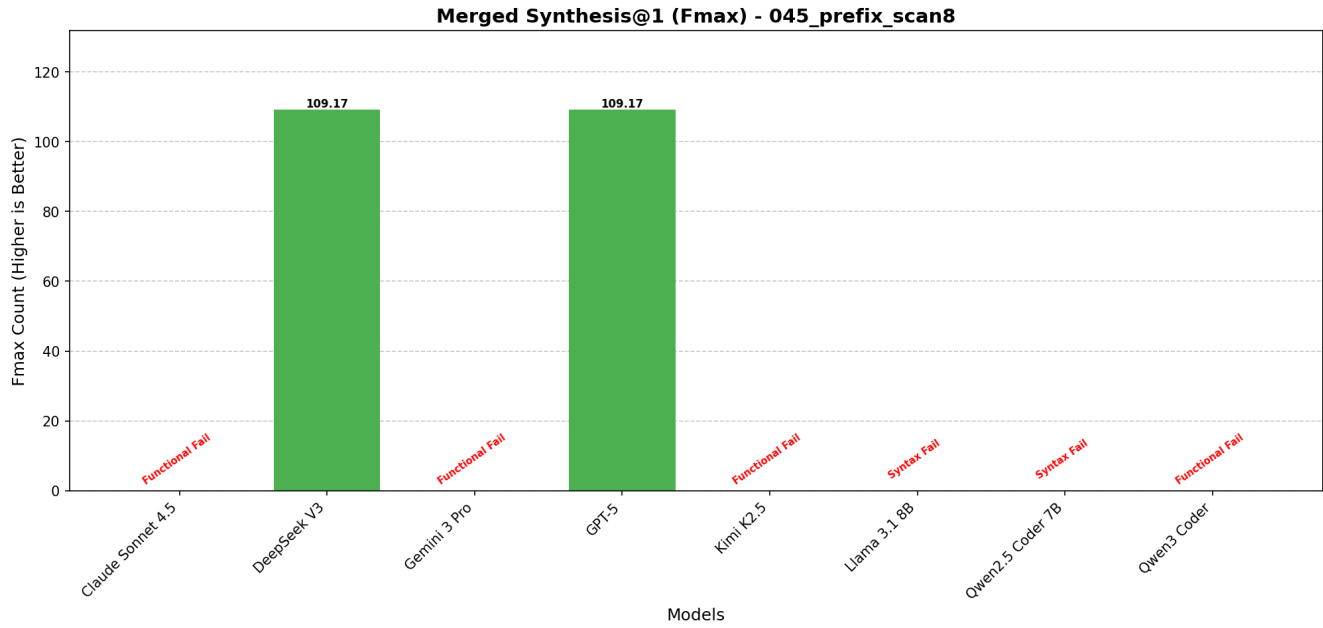
### 43. Parallel Bitonic Sort and Rank Engine



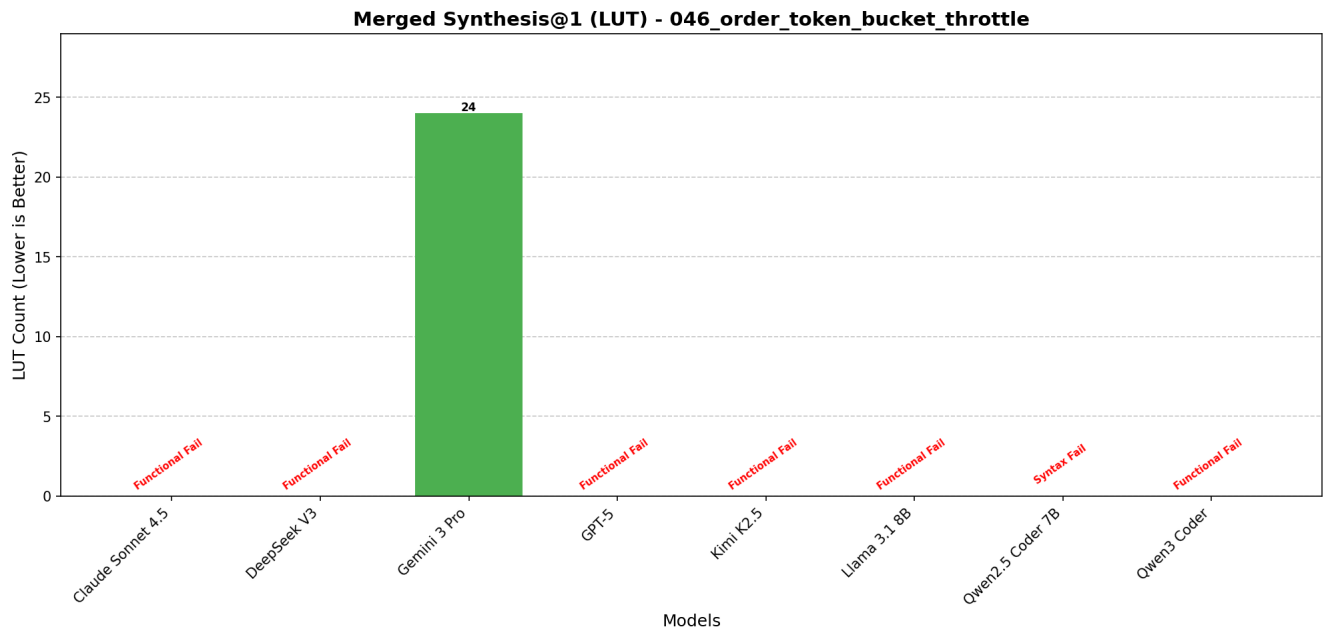
### 44. 16x8 Binarized Dense Layer



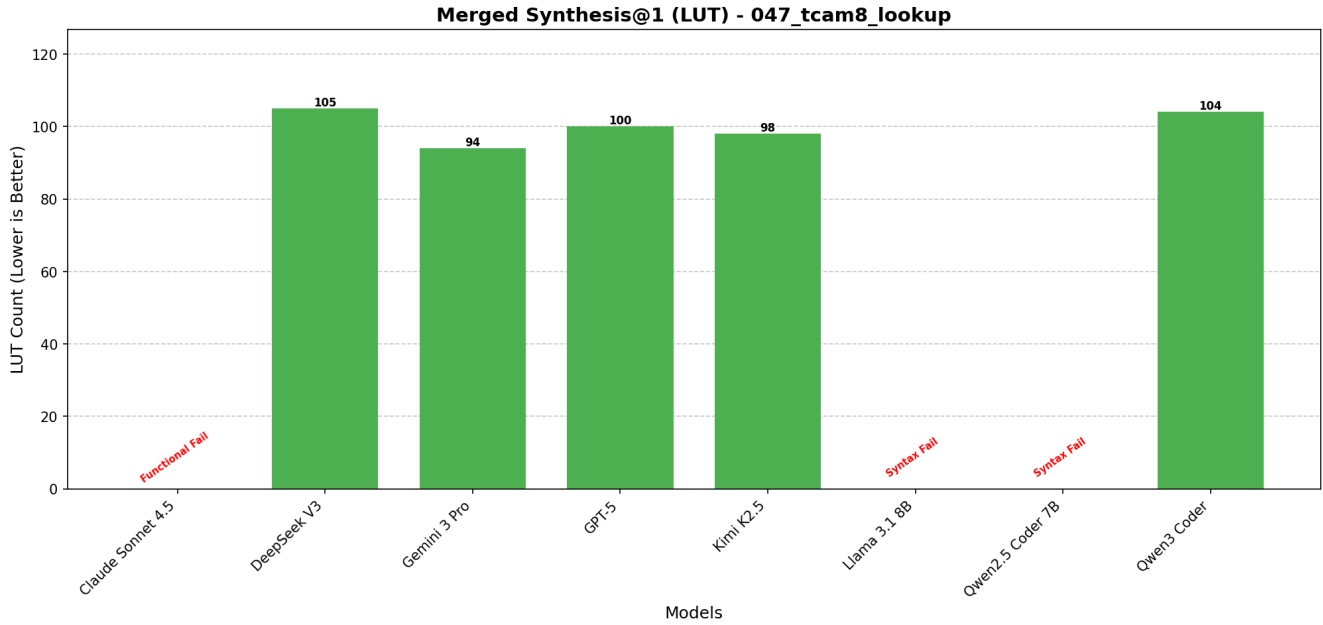
## 45. Parallel Prefix Sum Unit



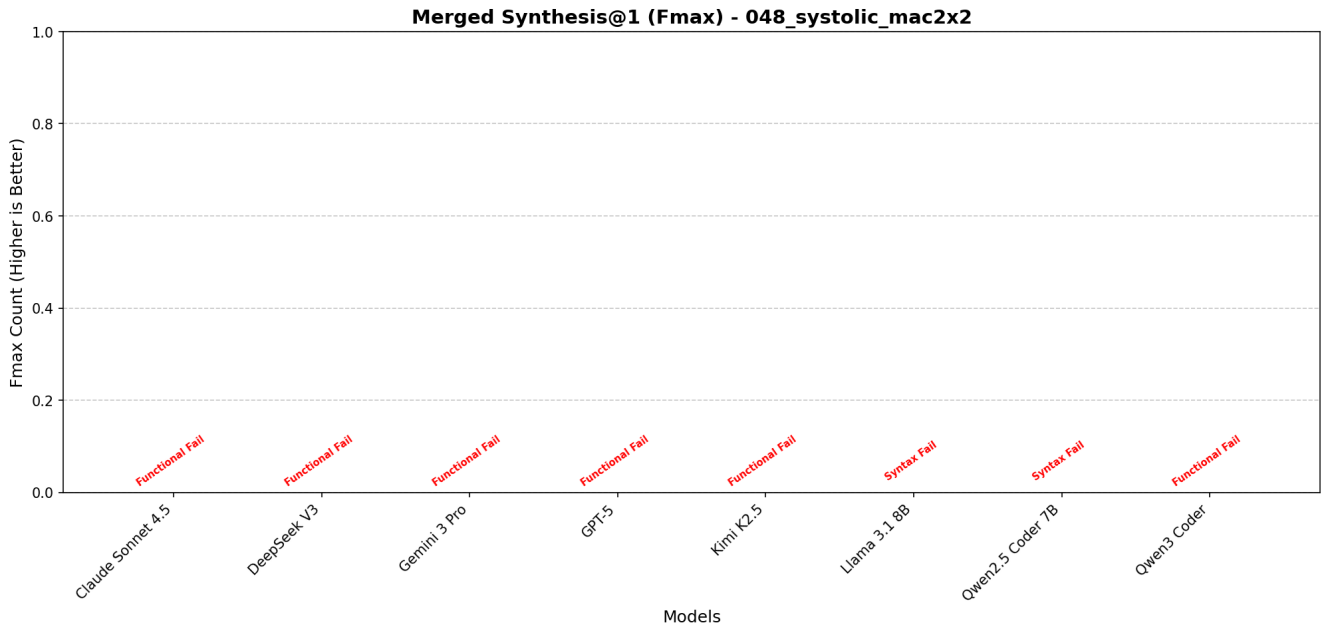
## 46. Token Bucket Rate Limiter



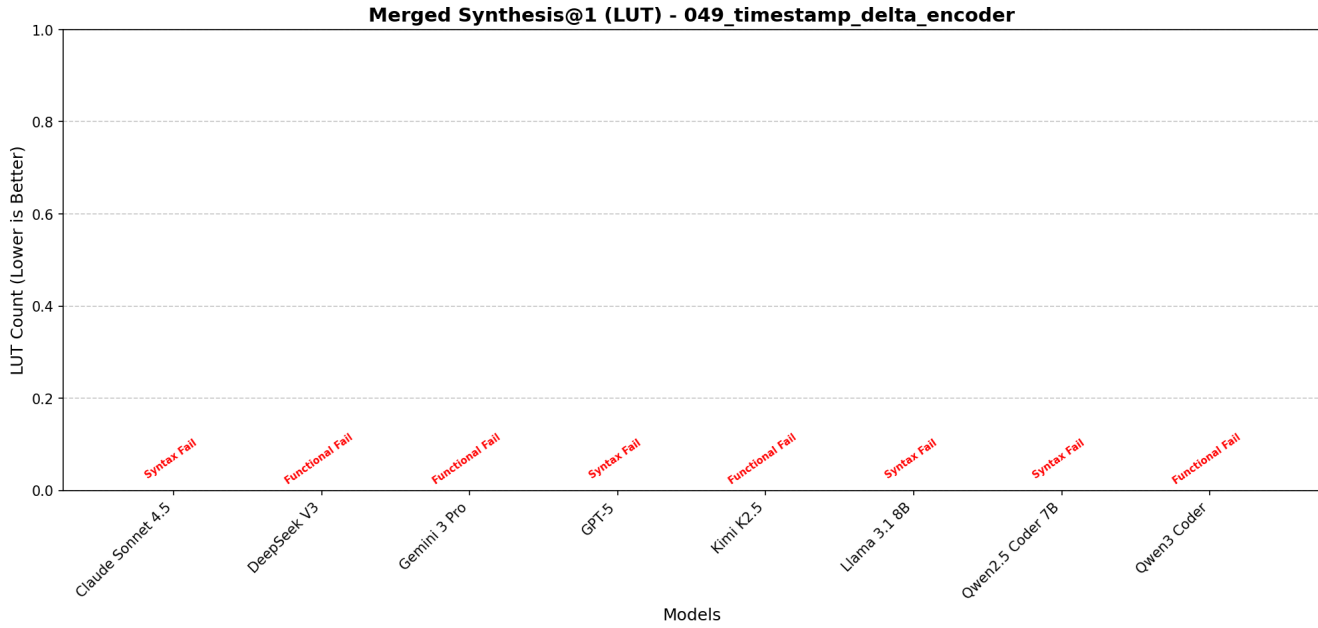
## 47. 8-Entry TCAM Lookup



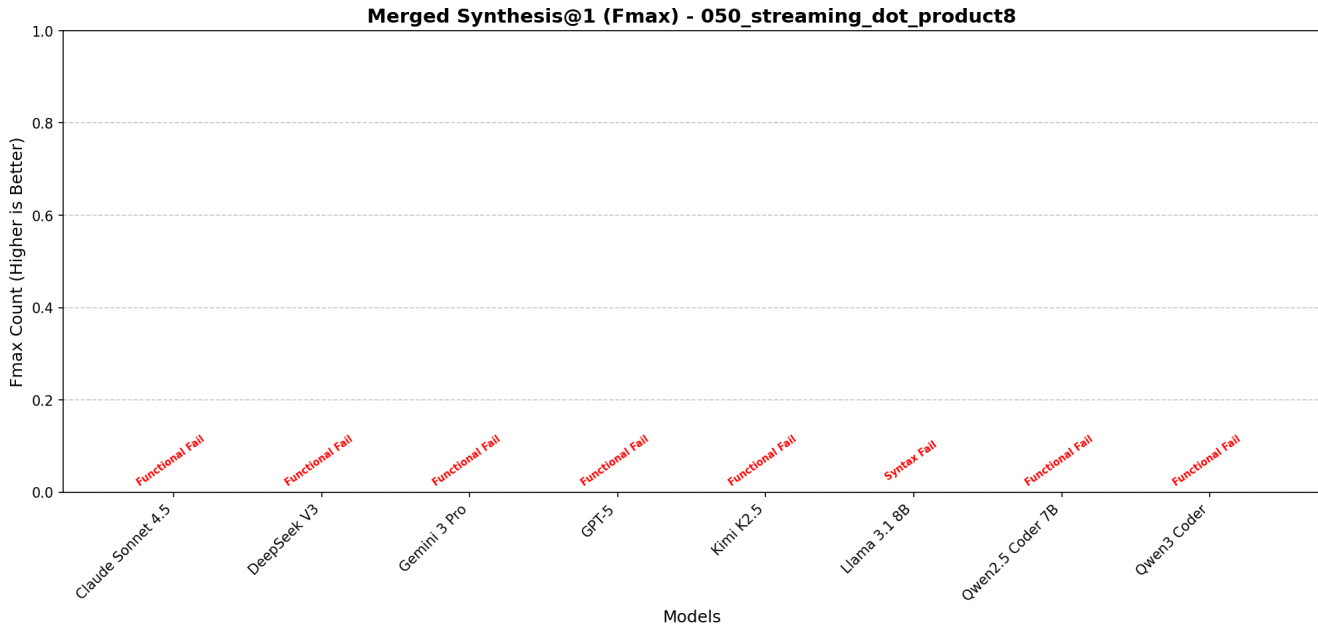
## 48. 2x2 Streaming MAC Tile



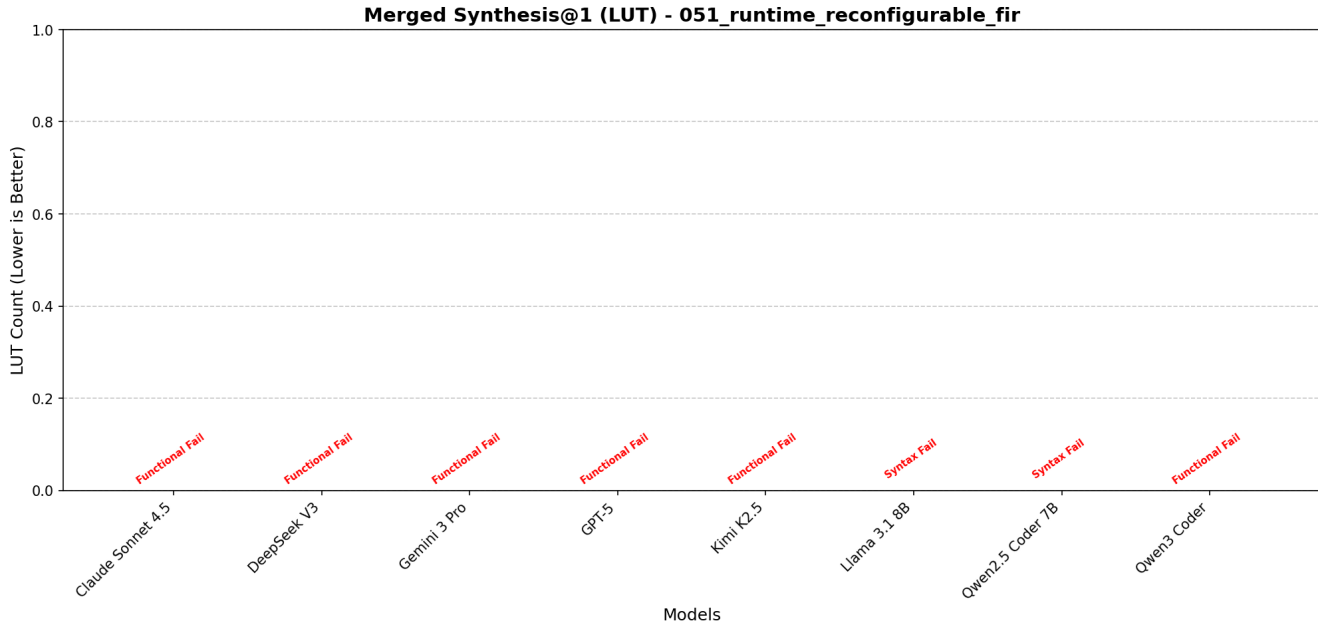
## 49. Variable-Width Timestamp Delta Encoder



## 50. Streaming Dot Product Accumulator



## 51. Runtime-Reconfigurable 8-Tap FIR



## 52. Streaming 5-Point Stencil Engine

