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Solving 5G Massive MIMO Radio Challenges

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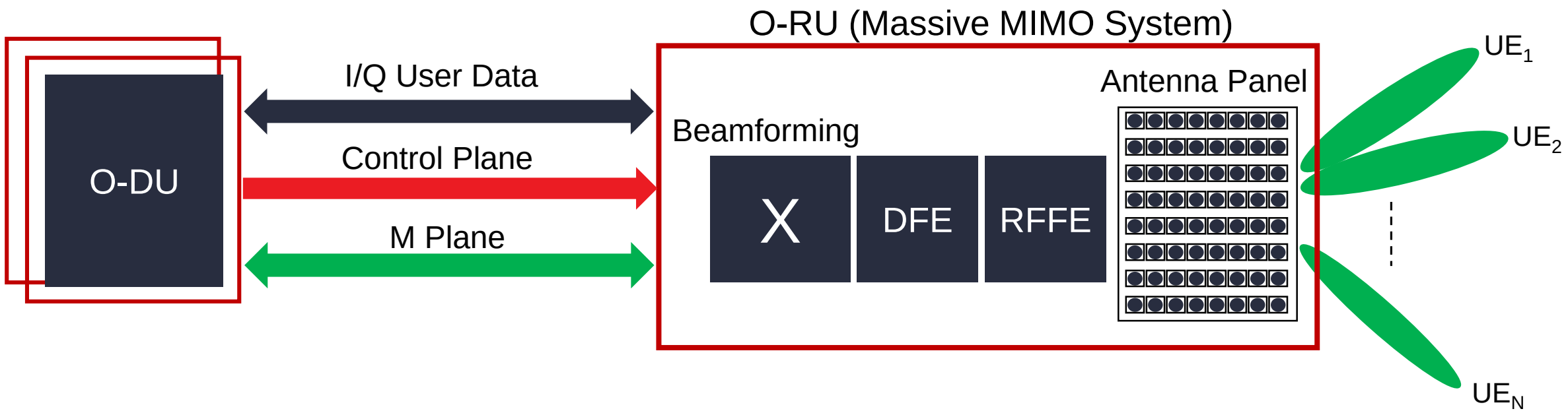
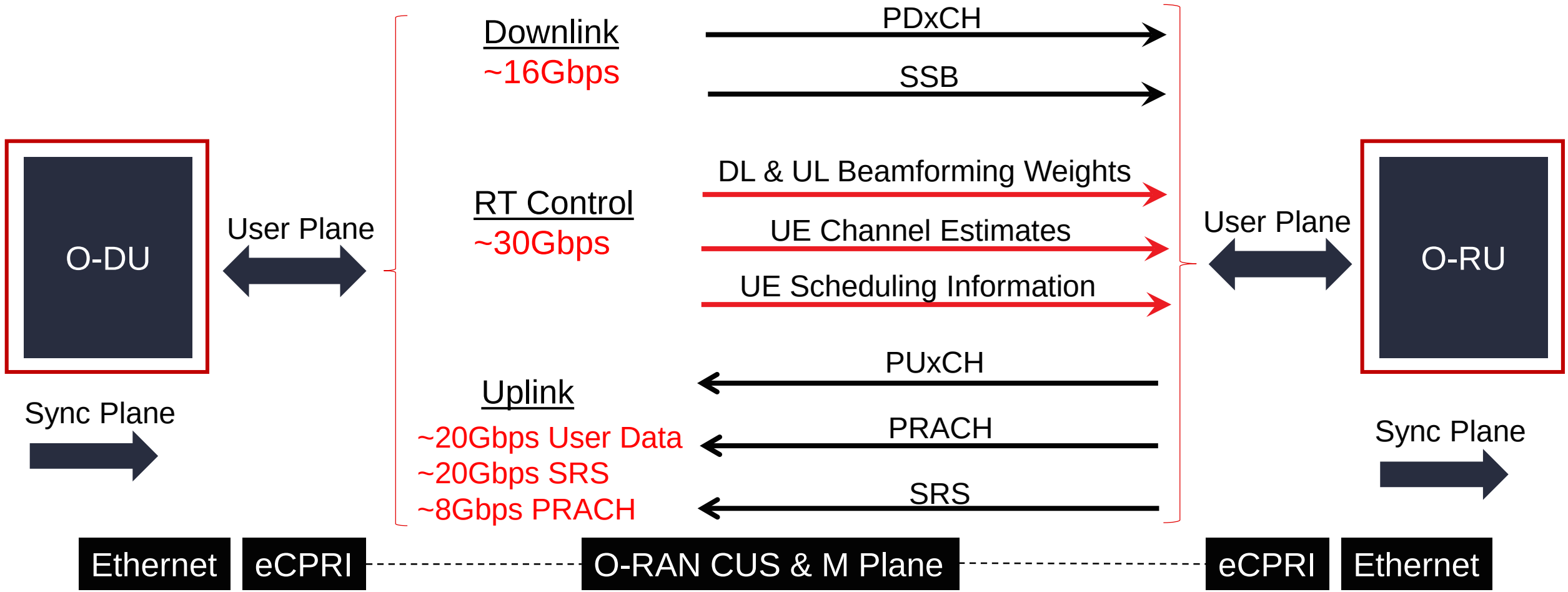
5G NR Massive MIMO Radio – Key Challenges



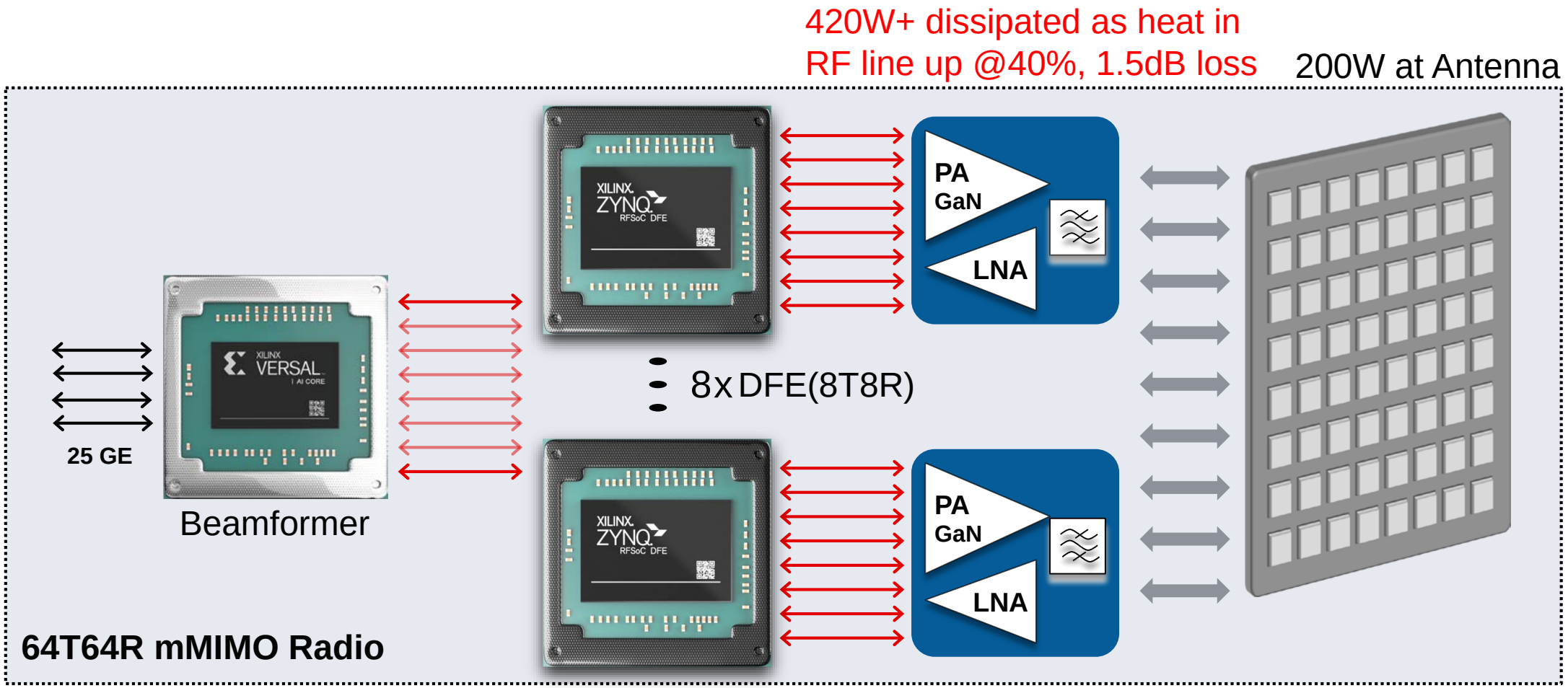
- Optimizing Fronthaul bandwidth
- Power dissipation in Radio
- Maximizing utilization of available capacity DU-RU, particularly for massive MIMO systems

Fronthaul Bandwidth Constraints

64TRX 100MHz 16 Layers DL/ 8 Layers UL Radio
7.2b split (Peak Bandwidth Requirements)

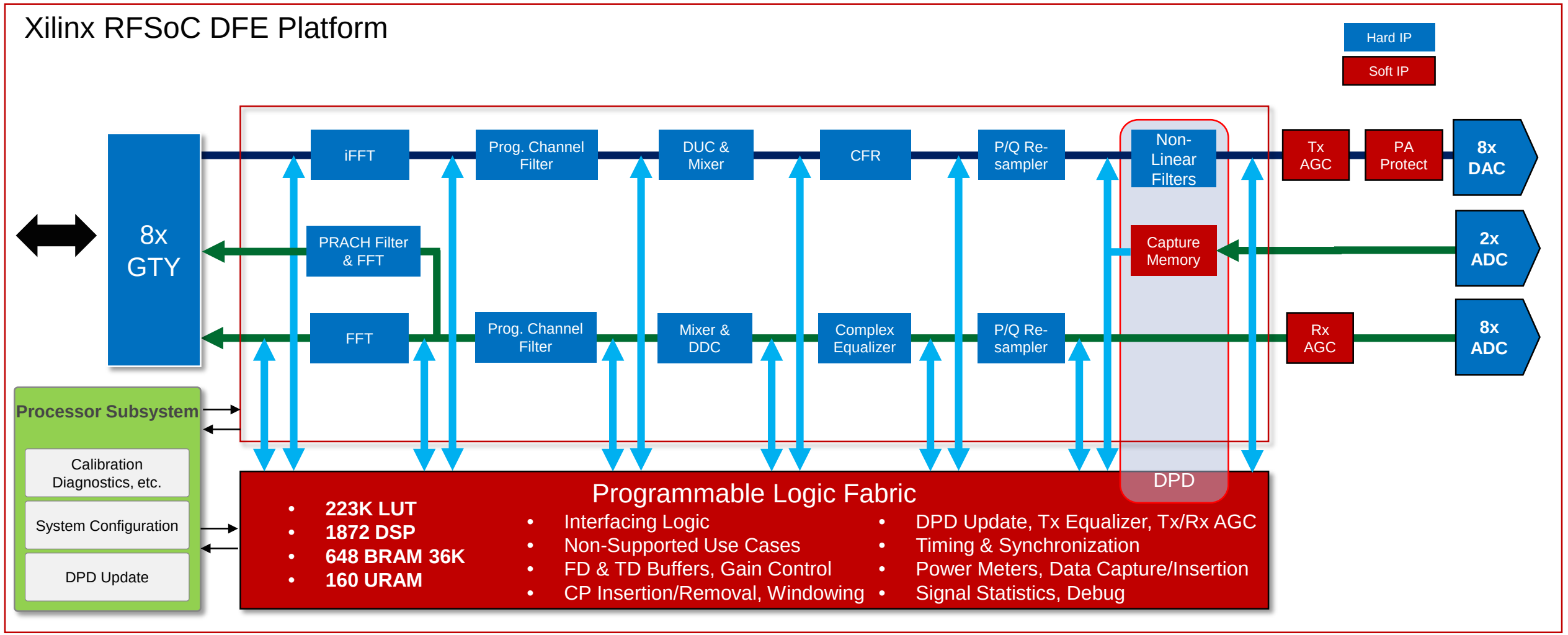


Reducing Dissipated Power in Radio



- PA linearization or Digital Predistortion (DPD) implementation is critical for PA efficiency
- PA technology is evolving at a much faster pace, need lockstep DPD algorithm innovations
- Opening DPD innovation to broader ecosystem

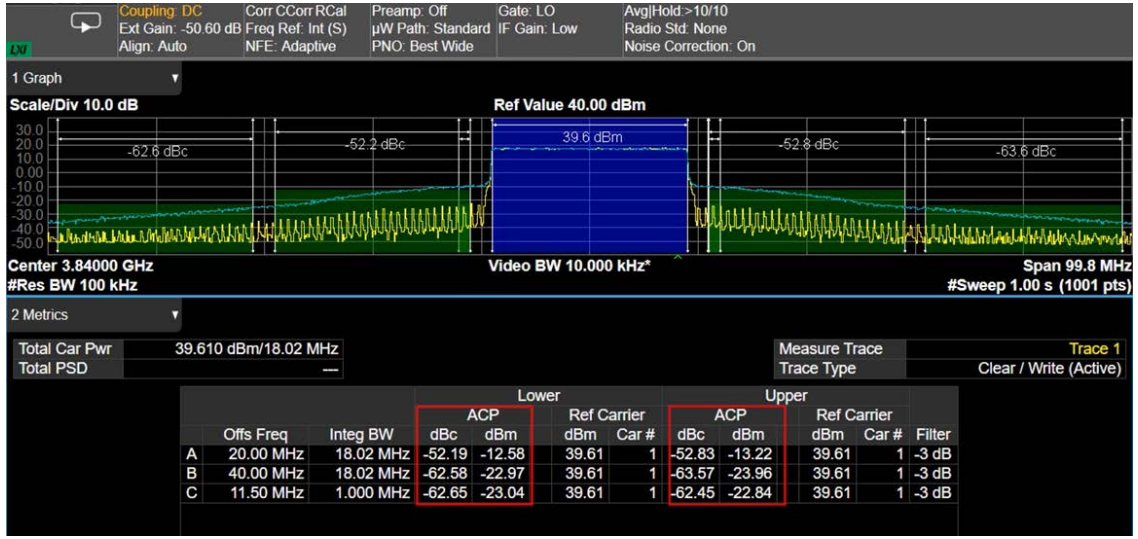
Efficiency of Hard IP with Adaptive Programmable Logic



Long Term Memory Effects of GaN PAs – Simple Use Case

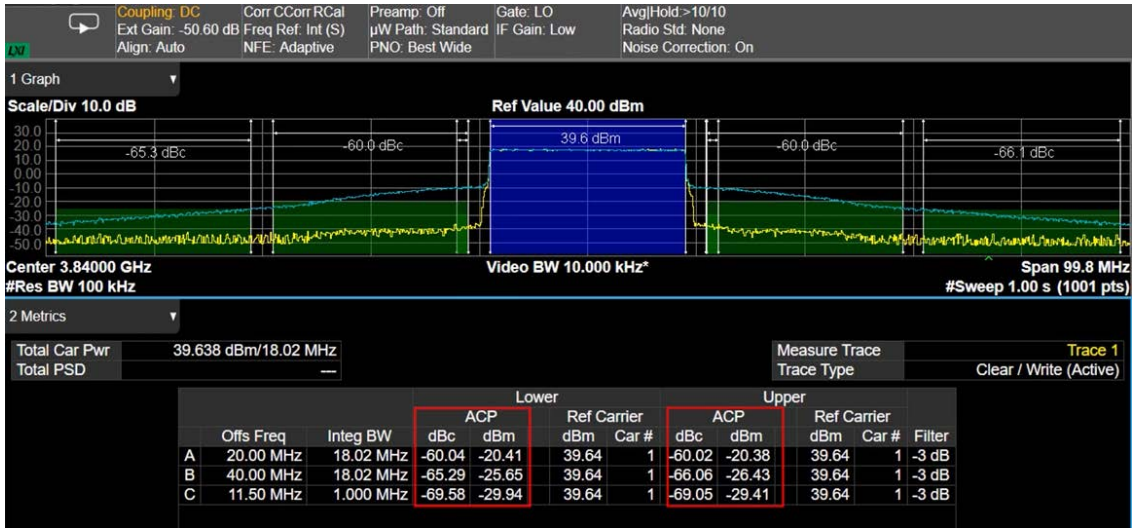
Full Payload - TM3.1A LTE20 TDD ACLR after DPD

No LTM Management DPD



			Lower				Upper				
			ACP		Ref Carrier		ACP		Ref Carrier		
	Offs Freq	Integ BW	dBc	dBm	dBm	Car #	dBc	dBm	dBm	Car #	Filter
A	20.00 MHz	18.02 MHz	-52.19	-12.58	39.61	1	-52.83	-13.22	39.61	1	-3 dB
B	40.00 MHz	18.02 MHz	-62.58	-22.97	39.61	1	-63.57	-23.96	39.61	1	-3 dB
C	11.50 MHz	1.000 MHz	-62.65	-23.04	39.61	1	-62.45	-22.84	39.61	1	-3 dB

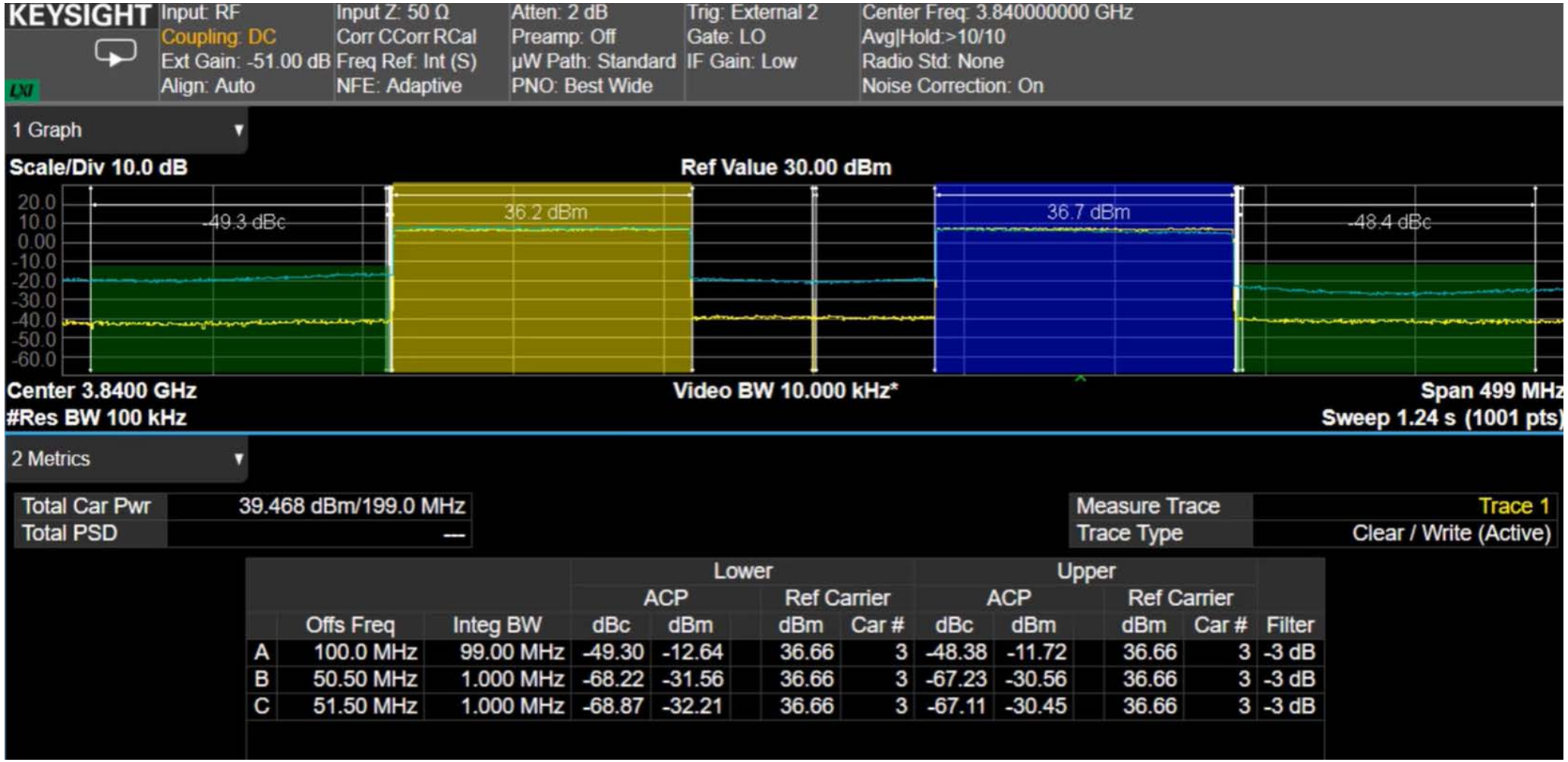
With LTM Management
(Xilinx v11 DPD)



			Lower				Upper				
			ACP		Ref Carrier		ACP		Ref Carrier		
	Offs Freq	Integ BW	dBc	dBm	dBm	Car #	dBc	dBm	dBm	Car #	Filter
A	20.00 MHz	18.02 MHz	-60.04	-20.41	39.64	1	-60.02	-20.38	39.64	1	-3 dB
B	40.00 MHz	18.02 MHz	-65.29	-25.65	39.64	1	-66.06	-26.43	39.64	1	-3 dB
C	11.50 MHz	1.000 MHz	-69.58	-29.94	39.64	1	-69.05	-29.41	39.64	1	-3 dB

See: https://www.xilinx.com/video/events/xilinx-dpd-v11-optimized-for-gan-power-amplifiers.html

GaN PA Linearization, 280MHz iBW, 200MHz oBW



			Lower				Upper				
			ACP		Ref Carrier		ACP		Ref Carrier		
	Offs Freq	Integ BW	dBc	dBm	dBm	Car #	dBc	dBm	dBm	Car #	Filter
A	100.0 MHz	99.00 MHz	-49.30	-12.64	36.66	3	-48.38	-11.72	36.66	3	-3 dB
B	50.50 MHz	1.000 MHz	-68.22	-31.56	36.66	3	-67.23	-30.56	36.66	3	-3 dB
C	51.50 MHz	1.000 MHz	-68.87	-32.21	36.66	3	-67.11	-30.45	36.66	3	-3 dB

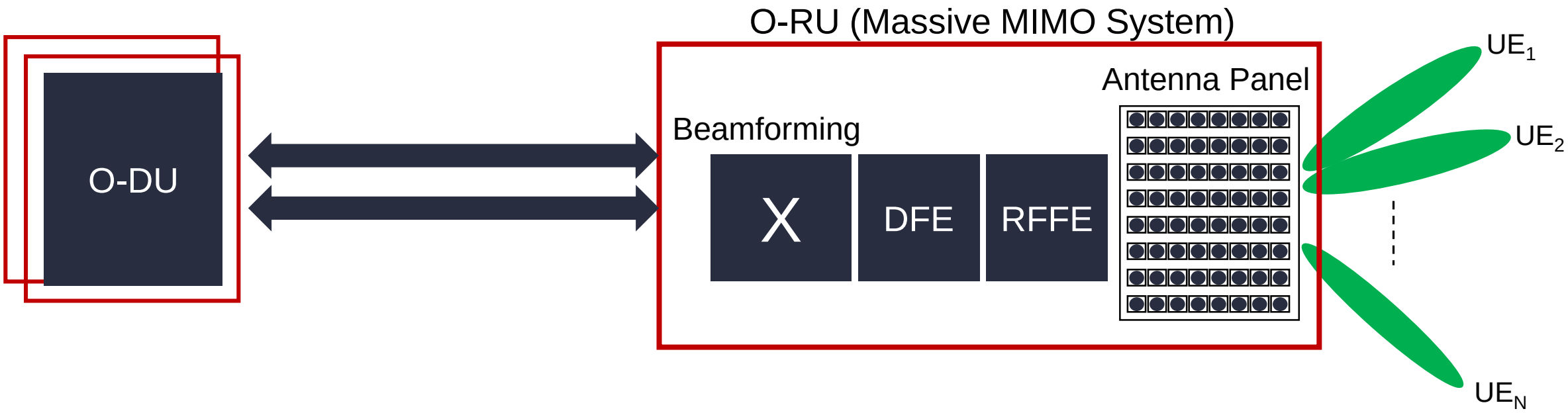
See: https://www.xilinx.com/video/events/xilinx-dpd-v11-optimized-for-gan-power-amplifiers.html

Untapped Capacity in Massive MIMO Radio

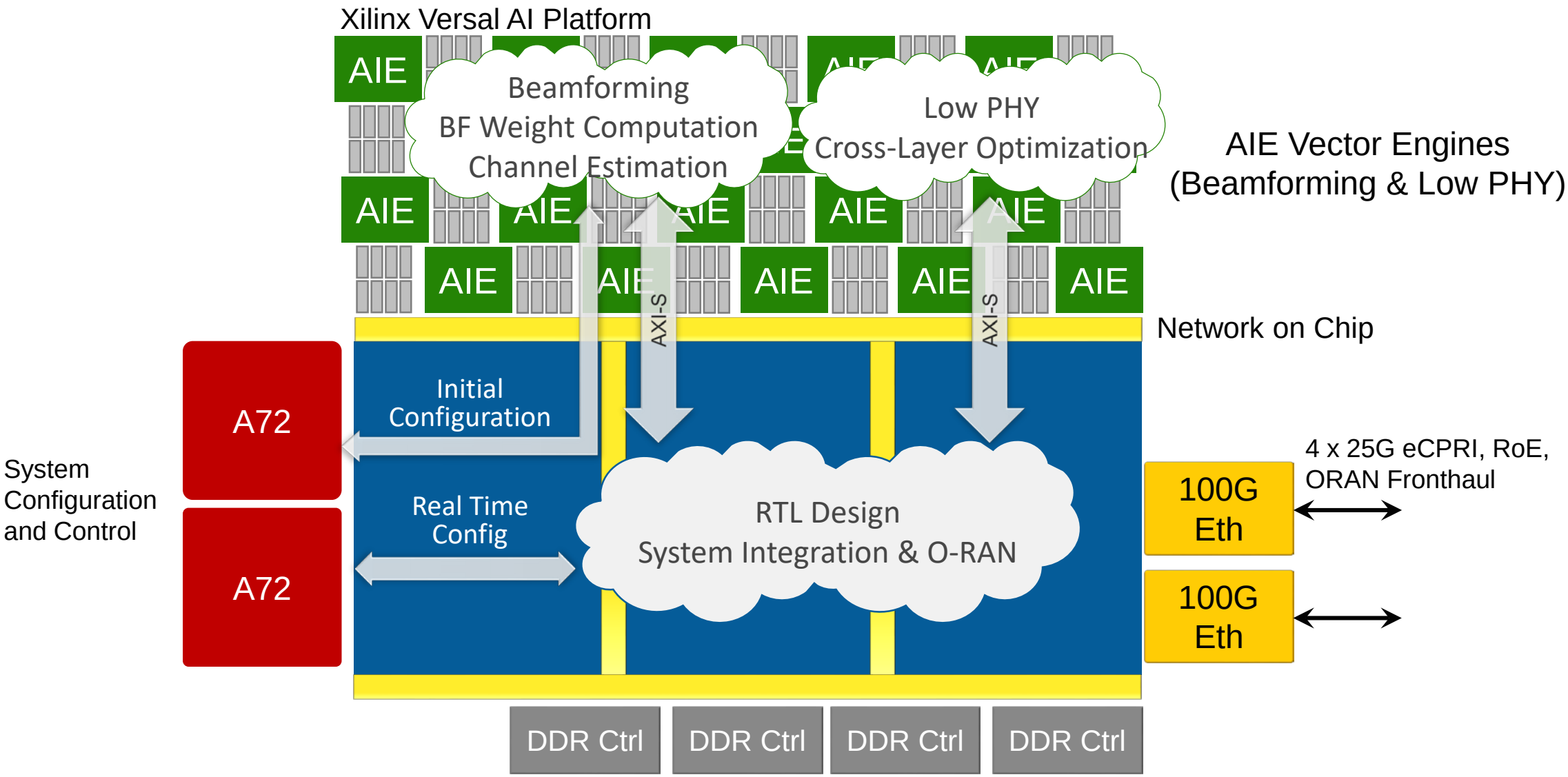
Typical specification:

- 16 Downlink Spatial Streams or Layers
- 8 Uplink Spatial Steams or Layers

Less than 5-6 Layers (DL) are getting used in the field



System Design Approach to Improve Capacity Utilization



Thank You