

Zynq RFSoc DFE (Digital Front-End) Product Announcement



Xilinx Unveils Zynq RFSoc DFE for 5G NR Mass Deployment

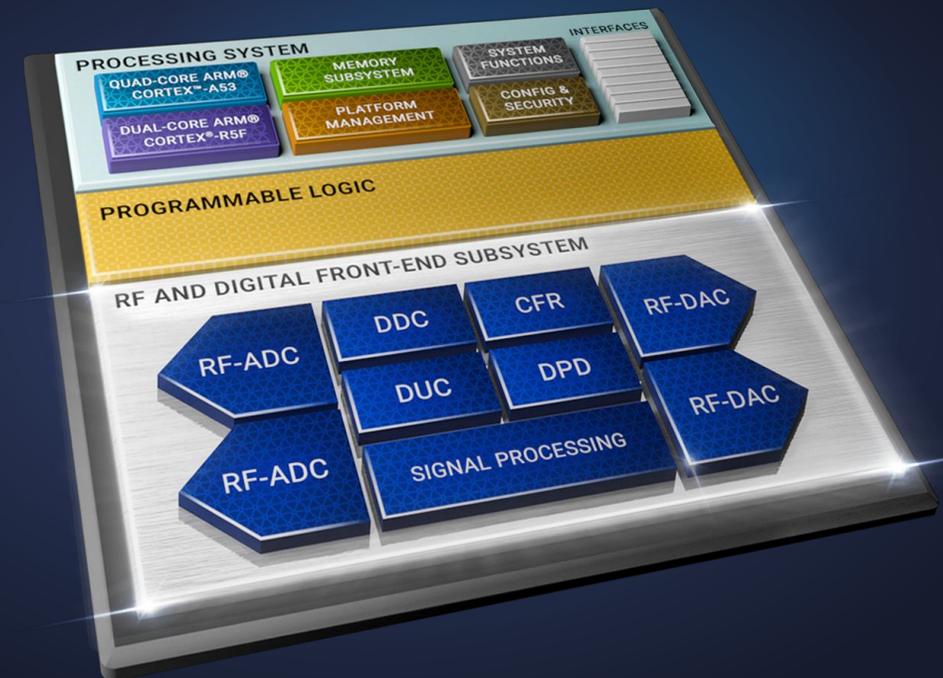
Breakthrough Integration of Hardened IP

ZYNQ[®]
RFSoc DFE

Meets 2nd wave 5G NR requirements with 2X performance/watt*

A 5G NR radio solution that balances flexibility and cost

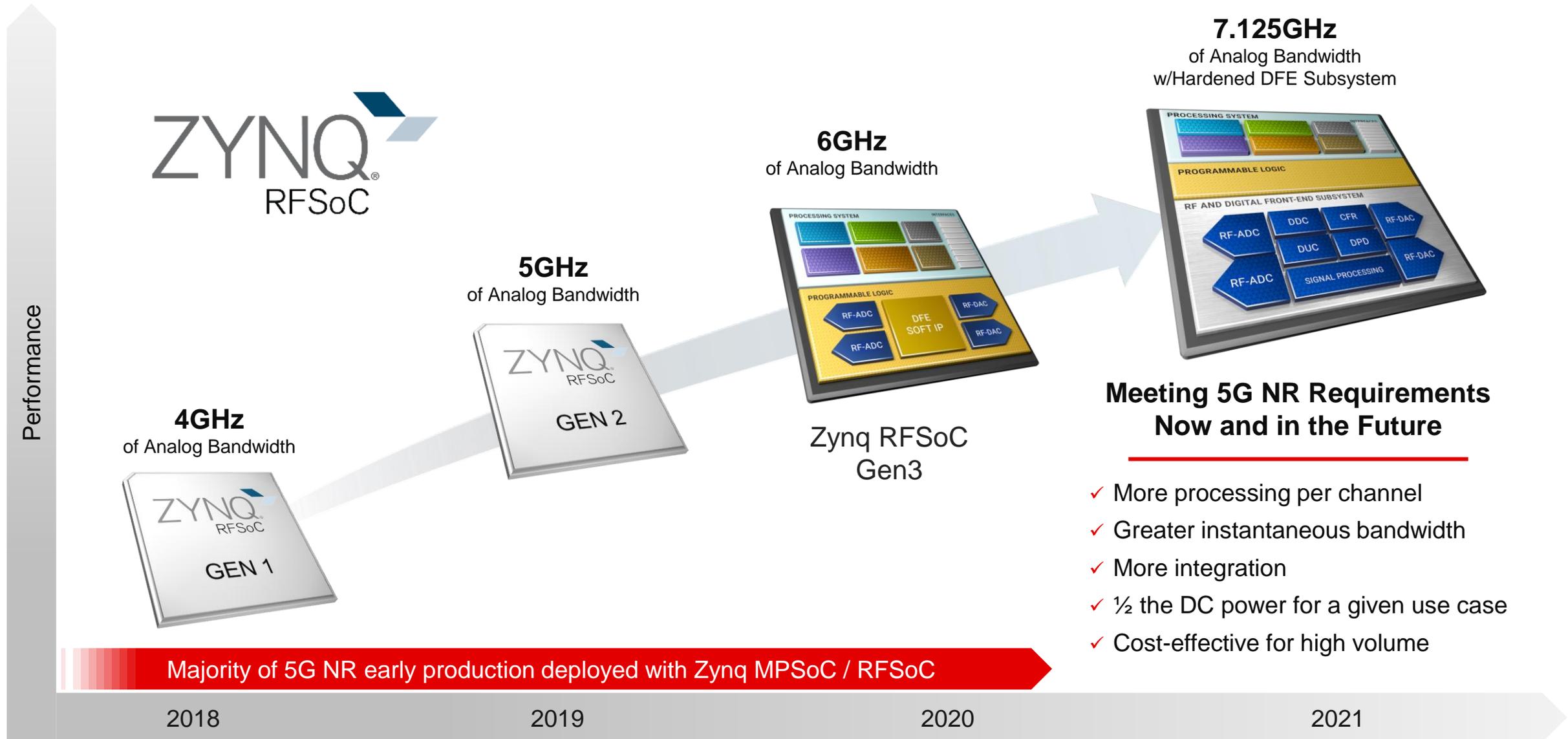
Hardware adaptable to keep pace with the evolution of 5G



New Class of Devices Integrates More Hardened IP than Soft Logic

*Power and Performance vs. Zynq RFSoc Gen3

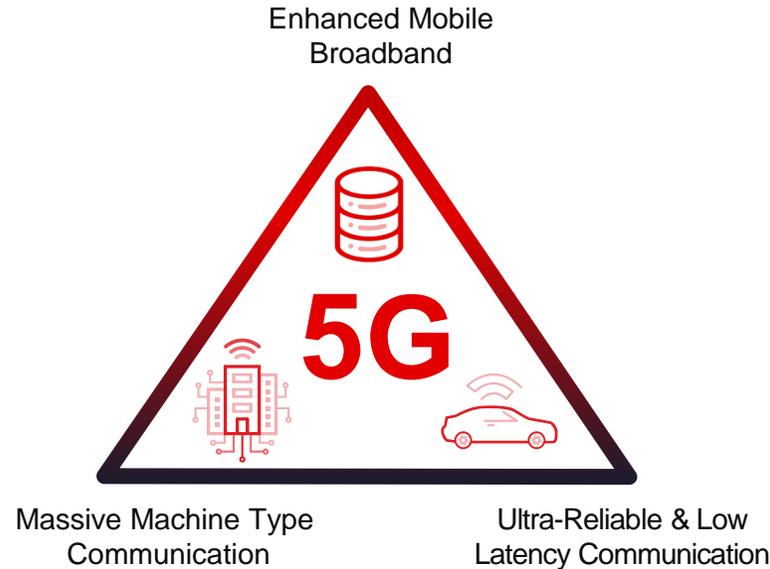
Portfolio for Current and Future Market Needs



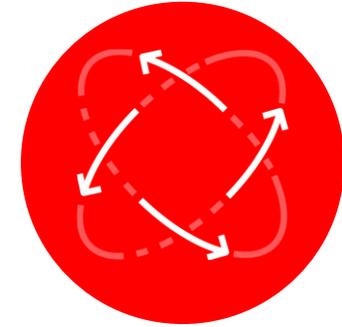
Challenges for 5G NR Rollout in 2nd Wave of Deployment



Increasing Bandwidth
& Compute Requirements
at Lower Power and Cost



Diverse 5G NR Use Cases
and Evolving Standards

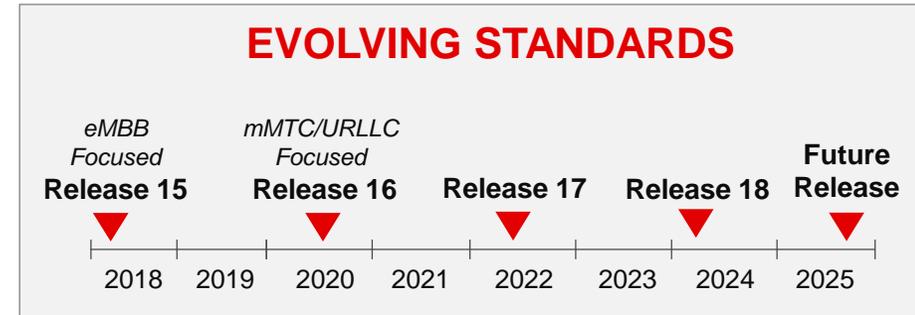


Market Disruption (e.g., ORAN)
Creates Opportunities & Solutions

5G Will Be More Complex than 4G with Multiple Uses Cases and Emerging Requirements

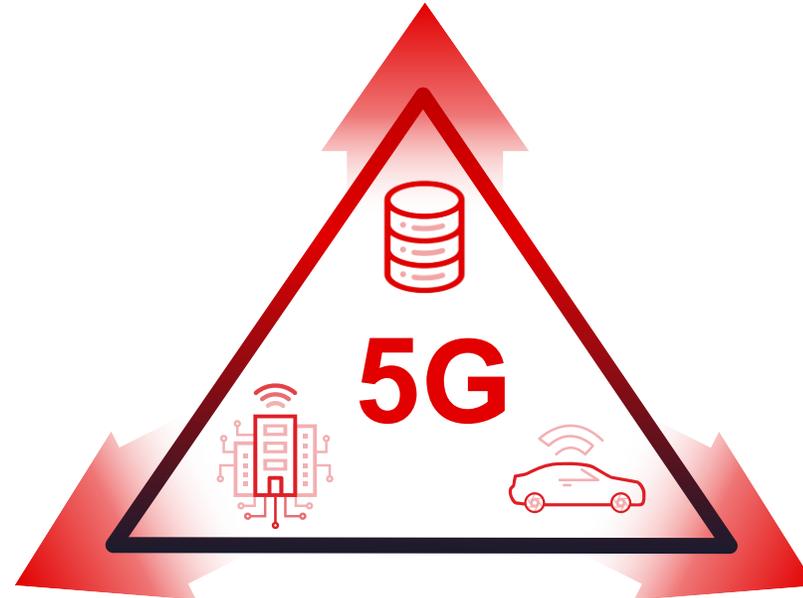
Enhanced Mobile Broadband

- ▶ Spectral Efficiency
- ▶ New Spectral Bands



Massive Machine Type Communication

- ▶ Low transmit power
- ▶ 100x-connected devices



Ultra-Reliable & Low Latency Communication

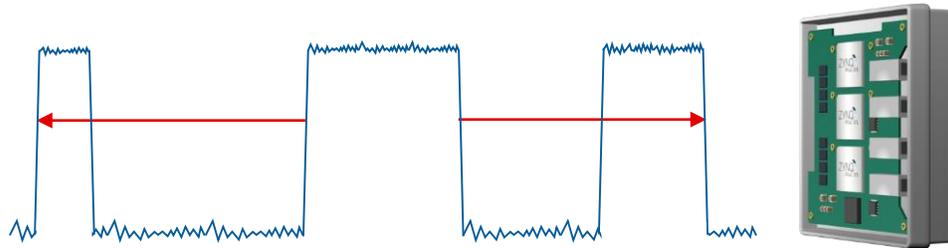
- ▶ Deterministic latency
- ▶ Low error rates



An Adaptable Platform Needed to Support Diverse Use Cases As They Evolve

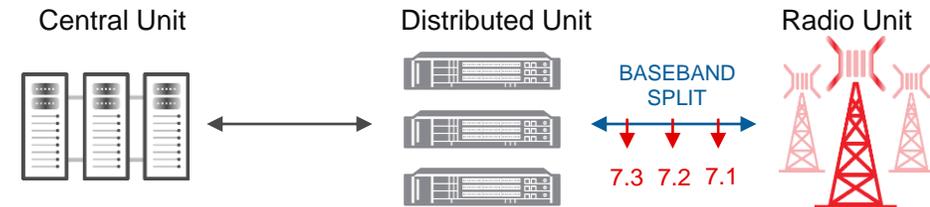
5G's Diverse Requirements and Increasing Complexity

INCREASING BANDWIDTH & PERFORMANCE/WATT REQUIREMENTS



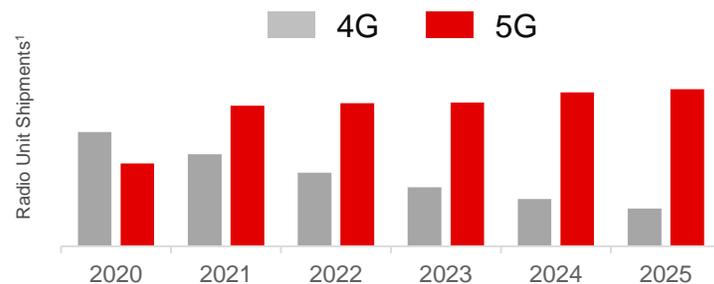
Zynq RFSoc DFE Hardens Radio Cores for Performance and Power that Rivals ASICs

DISAGGREGATED RAN with O-RAN



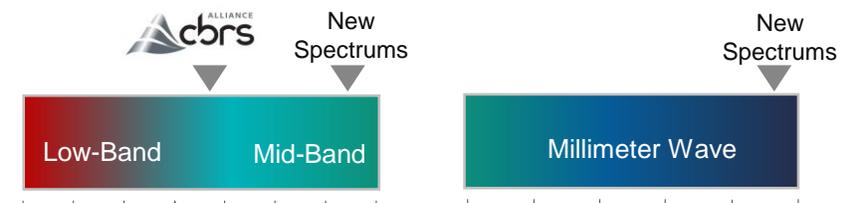
Zynq RFSoc DFE allows for flexibility to split baseband processing between radio unit & distributed unit

NEED FOR 4G & 5G IN PARALLEL



Zynq RFSoc DFE enables multi-mode (LTE and 5G) and RAN sharing support on a single radio

SPECTRUMS ARE IN FLUX



Zynq RFSoc DFE delivers Direct RF multi-band (tri-band) in FR1 and optimized mmWave interface

1: Mobile Experts, August 2020

5G Market Disruption Enables New Operators and Providers

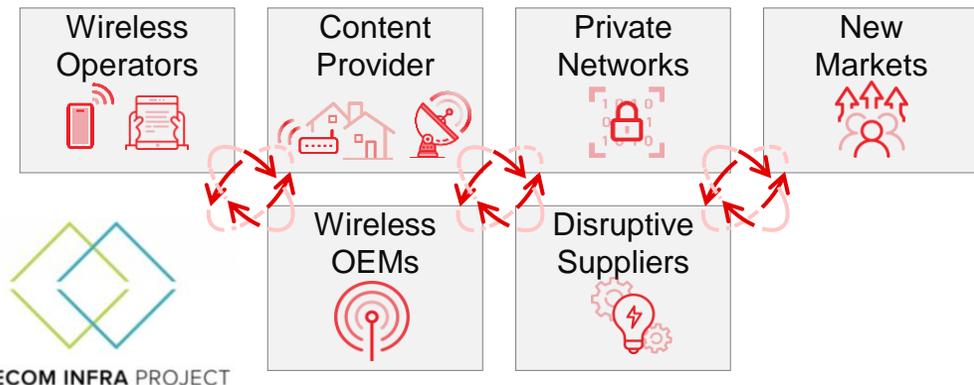
4G Market was Rigid

- ▶ 4G Market was one use case: Mobile Data
- ▶ Operators selling data to consumers
- ▶ Operators building network with traditional hardware OEMs



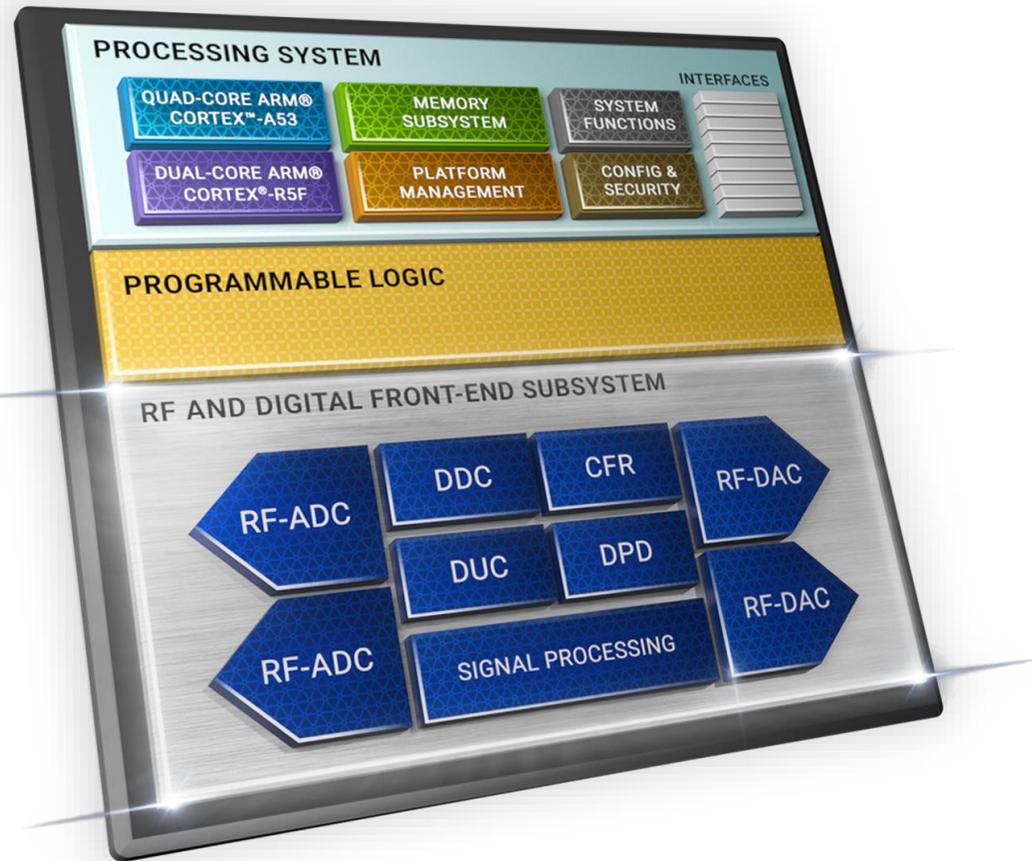
5G Will Enable New Business Models & Competition

- ▶ O-RAN and TIP are disrupting established business models enabling smaller more diverse supplier base
- ▶ Disruptive operators, MVNO, Cable and Satellite are acquiring spectrum and becoming mobile operators
- ▶ Private networks will harness advantages of 5G for enterprise customers creating unique solutions



Zynq RFSoc DFE Offers an ASIC Alternative to Both Traditional OEMs and New Providers

Zynq RFSoc DFE: Adaptive SoC with a Hardened Radio Subsystem



Adaptive SoC

Arm Processing System • UltraScale+ Programmable Logic • 32G SerDes

Hardened Radio Subsystem Single-Chip 8T8R FDD/TDD



Direct-RF DACs/ADCs
7.125GHz Direct-RF Bandwidth



Digital Pre-Distortion (DPD)
Supports traditional & ultrawide band (400MHz) GaN PAs



Crest Factor Reduction (CFR)
Up to 400MHz of Instantaneous Bandwidth



DUC / DDC¹
Multi-carrier, multiband support

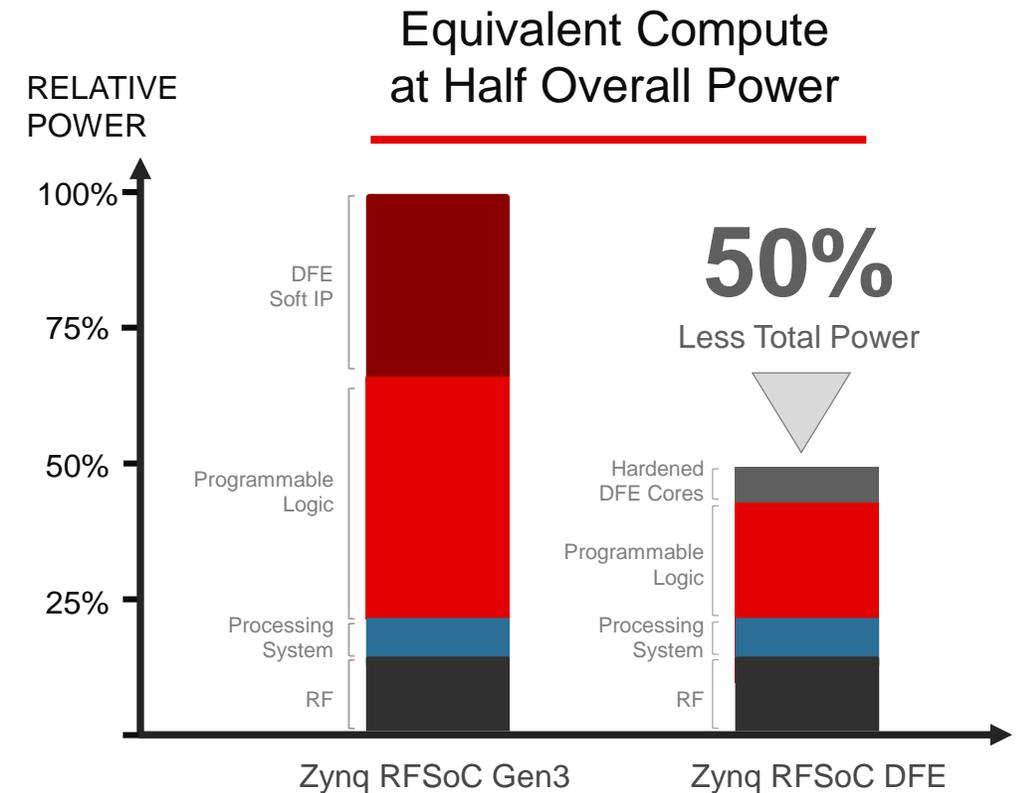
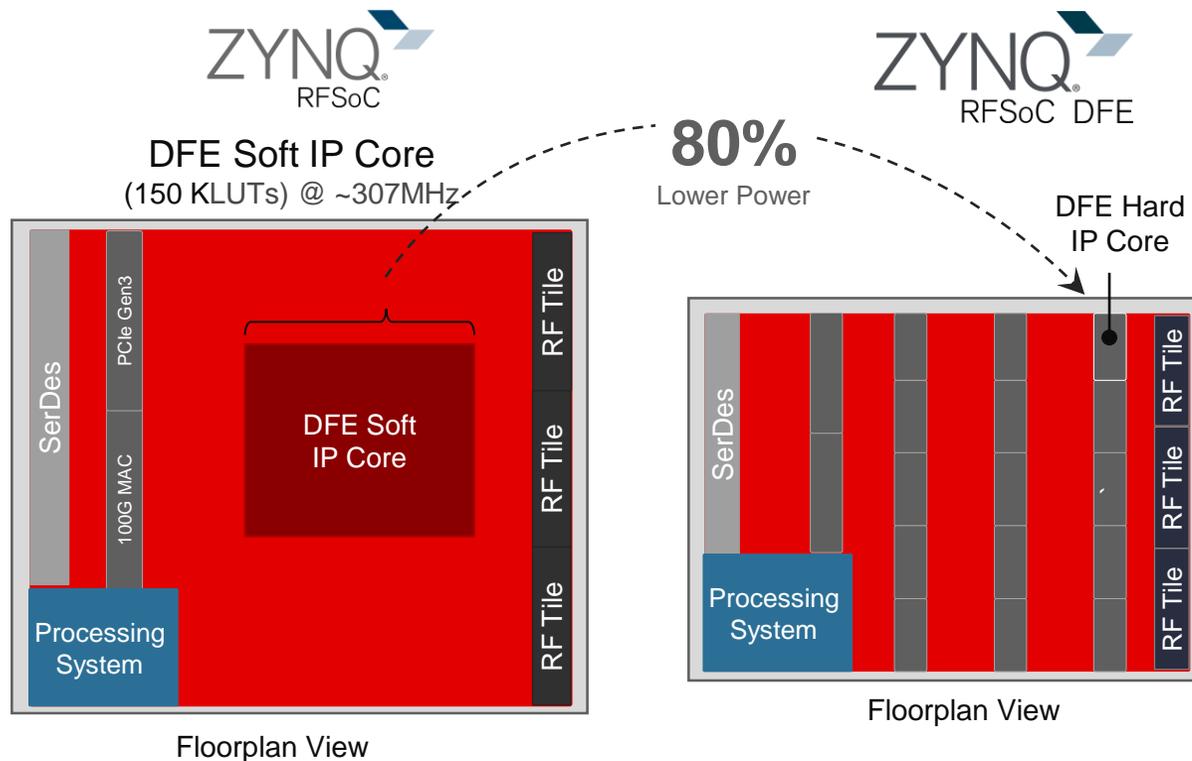


Signal Processing IP
Re-Sampling, Equalizer

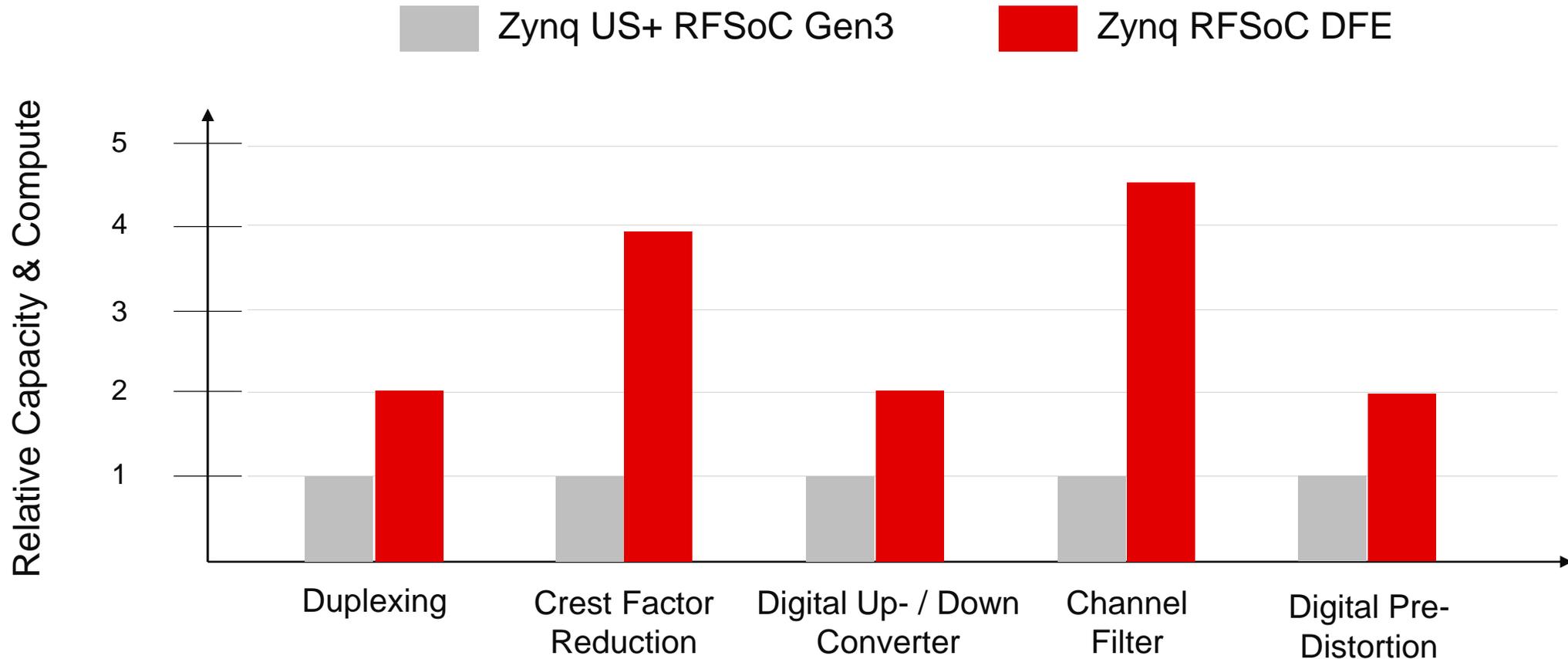
1: Digital Up-Conversion, Digital Down Conversion

Hard IP: Power and Area Reduction for the Same Compute

- ▶ Hard IP (@500MHz) enables ~80% lower power vs. equivalent soft IP implementation
- ▶ 50% lower total power for an equivalent use case chip-to-chip
- ▶ Balanced logic density for adaptability with improved cost effectiveness



Delivering 2X the Compute

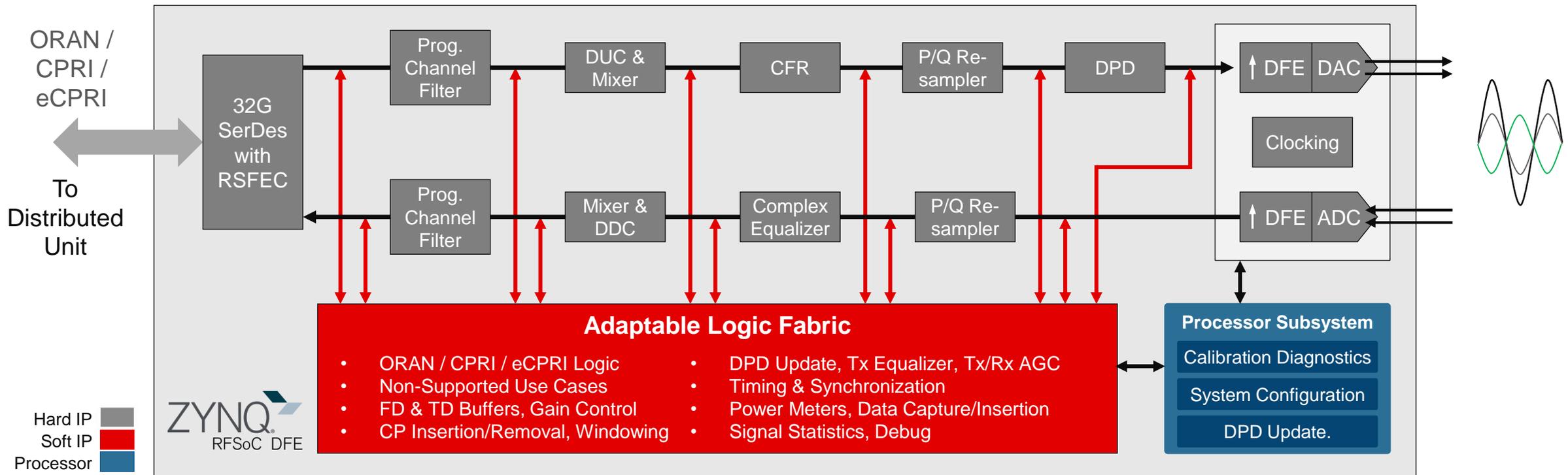
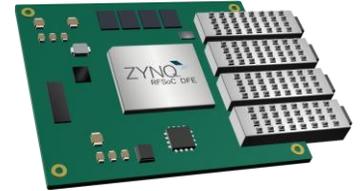


More Processing per Channel to Meet 2nd Wave 5G New Radio Requirements

Efficiency of Hard IP with Adaptive Programmable Logic

- ▶ Common compute intensive and power-hungry blocks are hardened ($>500\text{MHz } F_{\text{MAX}}$)
- ▶ Each hard block can be bypassed and/or appended for maximum flexibility and customization
- ▶ Programmable logic for differentiation and adaptability to future 5G market requirements

Single-Chip Adaptable Radio Platform



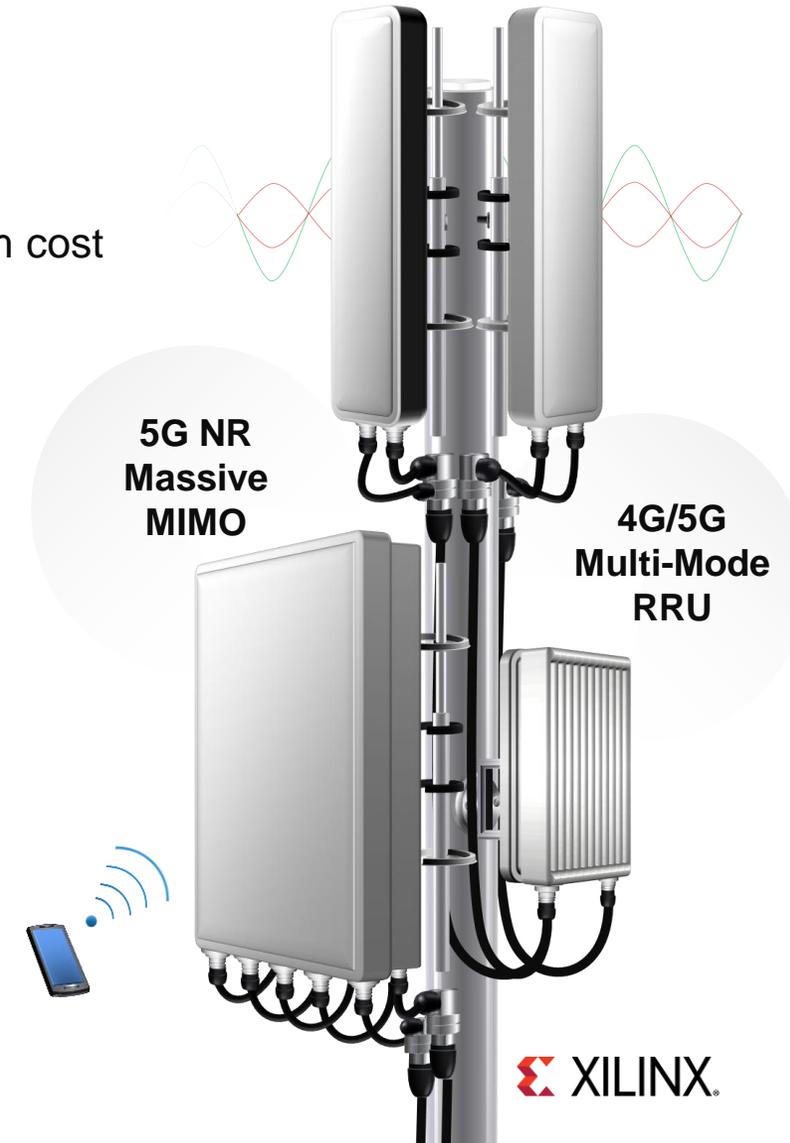
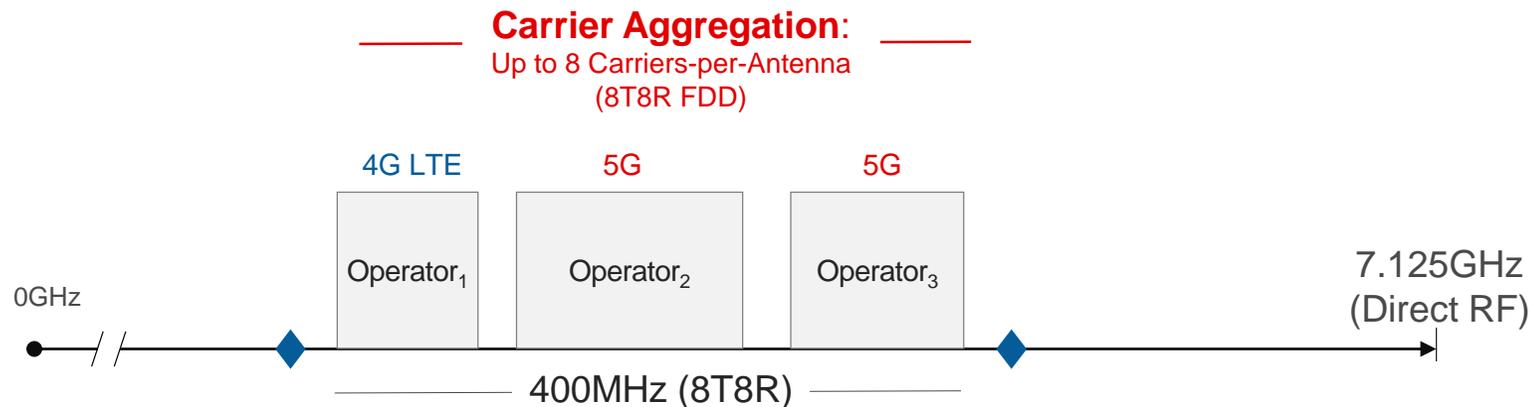
System Capabilities for Diverse Carrier Needs

Industry's Only 400MHz Instantaneous Bandwidth (iBW) Radio Platform (2X the Industry)

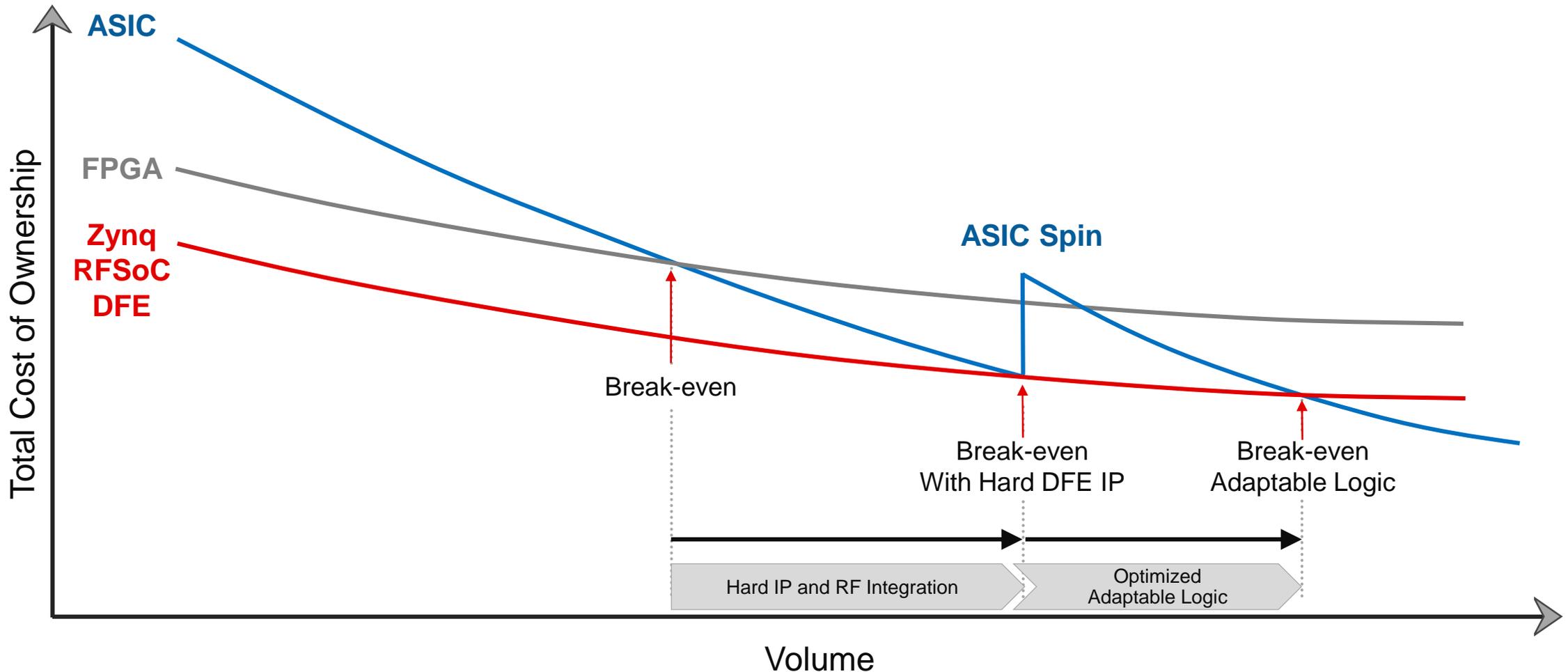
- ▶ Supports 400MHz (8T8R) up to 7.125GHz Direct-RF (FR1)
- ▶ Up to 1600 MHz iBW mmWave IF transceiver (FR2)
- ▶ Delivers greater compute per antenna or more antennas per radio
- ▶ More bandwidth per radio → fewer units → fewer power amplifiers → lower system cost

Multi-Band with Carrier Aggregation of Up to 8 Carriers-per-Antenna

- ▶ 4G LTE & 5G on the Same Radio (Multi-Band, Multi-Mode)
- ▶ More data pipes through same radio lowers system cost
- ▶ Enables RAN sharing (multiple operators sharing the same radio unit)



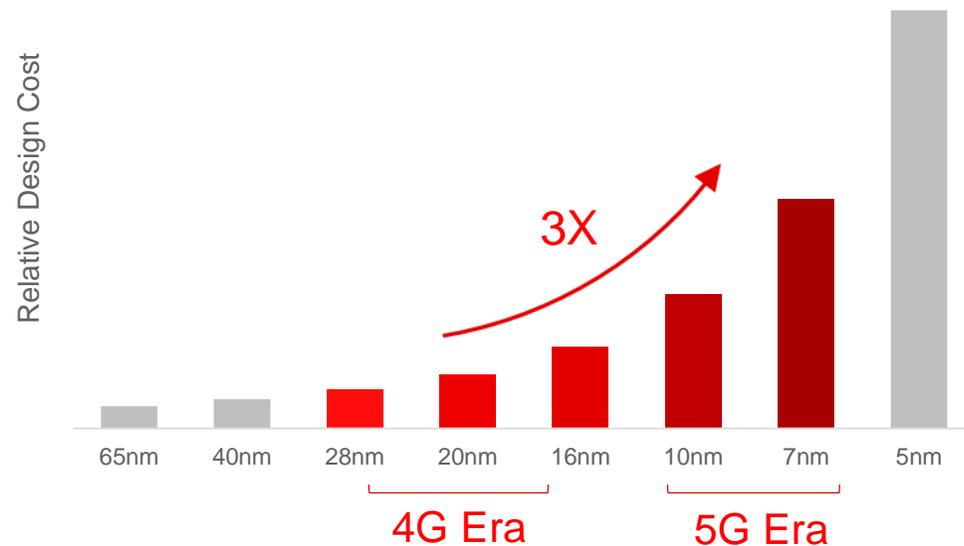
RFSoc DFE Hard IP Integration Requires higher ASIC Volume for ASIC TCO break-even



5G Evolution and Diverse Use Cases Blur ASIC Strategy

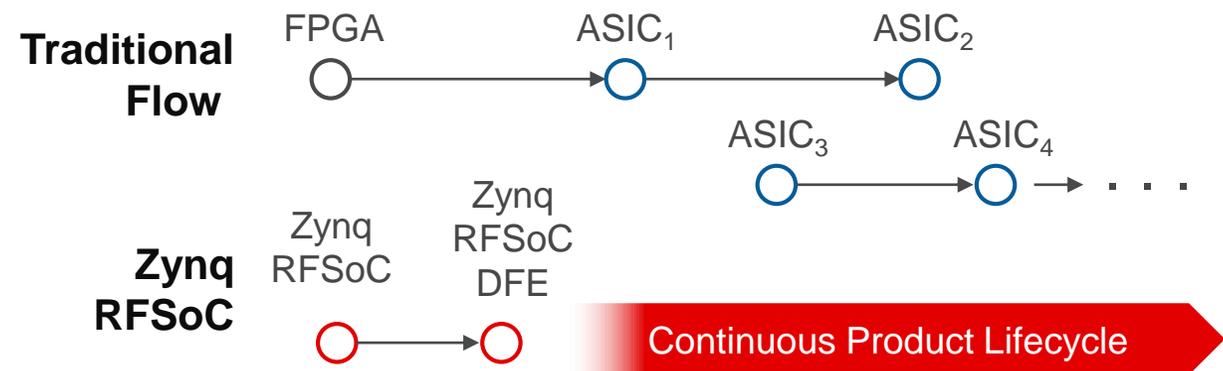
ASIC Economics Not Always Viable

- ▶ ASIC NRE cost in 5G era is 3x higher vs. 4G era
- ▶ Niche markets and use cases will not justify an ASIC
- ▶ 2+ year ASIC cycle time is too long



Expect a Decade of 5G Upgrades

- ▶ Not clear how 5G NR requirements will change
- ▶ ASICs will launch in parallel for multiple radio variants
- ▶ Zynq RFSoc DFE is an alternative for mass deployment



Scalable From Massive-MIMO Macrocell to Small Cell



MASSIVE MIMO MACROCELL

Full Sub-7GHz
Direct RF

MULTI-MODE MACROCELL

Support for
5G and 4G LTE

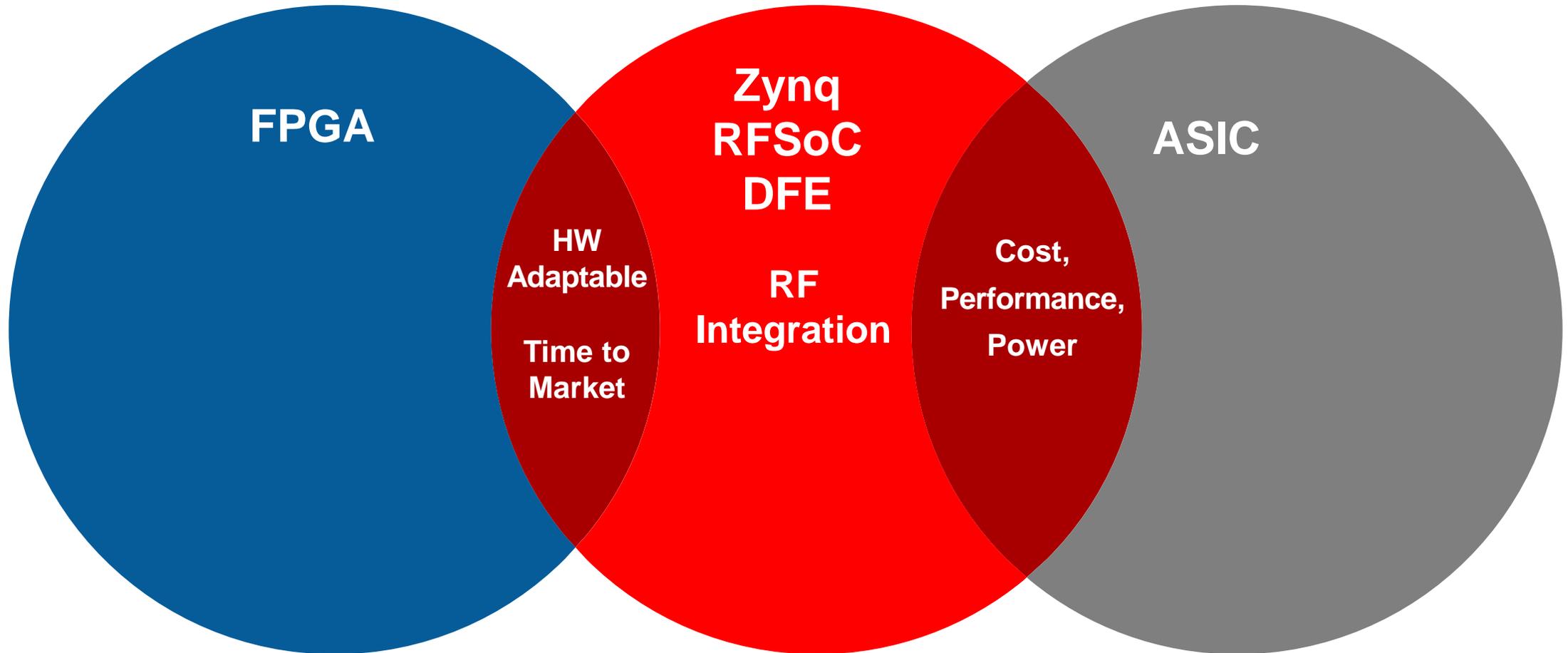
FIXED WIRELESS ACCESS

IF Digital Transceiver
mmWave Spectrums

SMALL CELL NODES

Power & Cost-Efficient
Single-Chip Radio

Zynq RFSoc DFE : The Best Balance of Both Worlds



Optimized to Capture Important Application Attributes

Zynq RFSoc DFE: for 5G NR Mass Deployment

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Meets 2nd wave 5G NR requirements with 2X performance/watt*

A 5G NR radio solution that balances flexibility and cost

Hardware adaptable to keep pace with the evolution of 5G



Silicon Shipping
1st Half 2021

New Class of Devices Integrates More Hardened IP than Soft Logic

*Power and Performance vs. Zynq RFSoc Gen3



Thank You

