



RIVIERA

A Programmable RISC V Edge Architecture
for NFC Signal Processing

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Agenda

Introduction to NFC and NFC Controllers

NXP-AT Engagement with TRISTAN Project

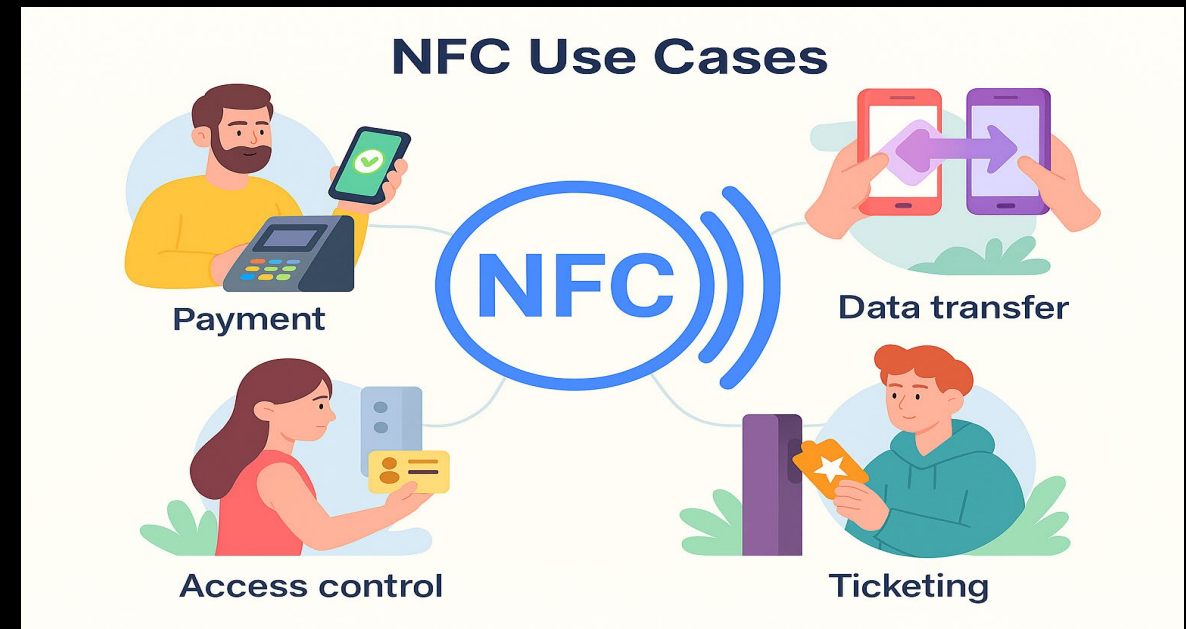
RIVIERA Program



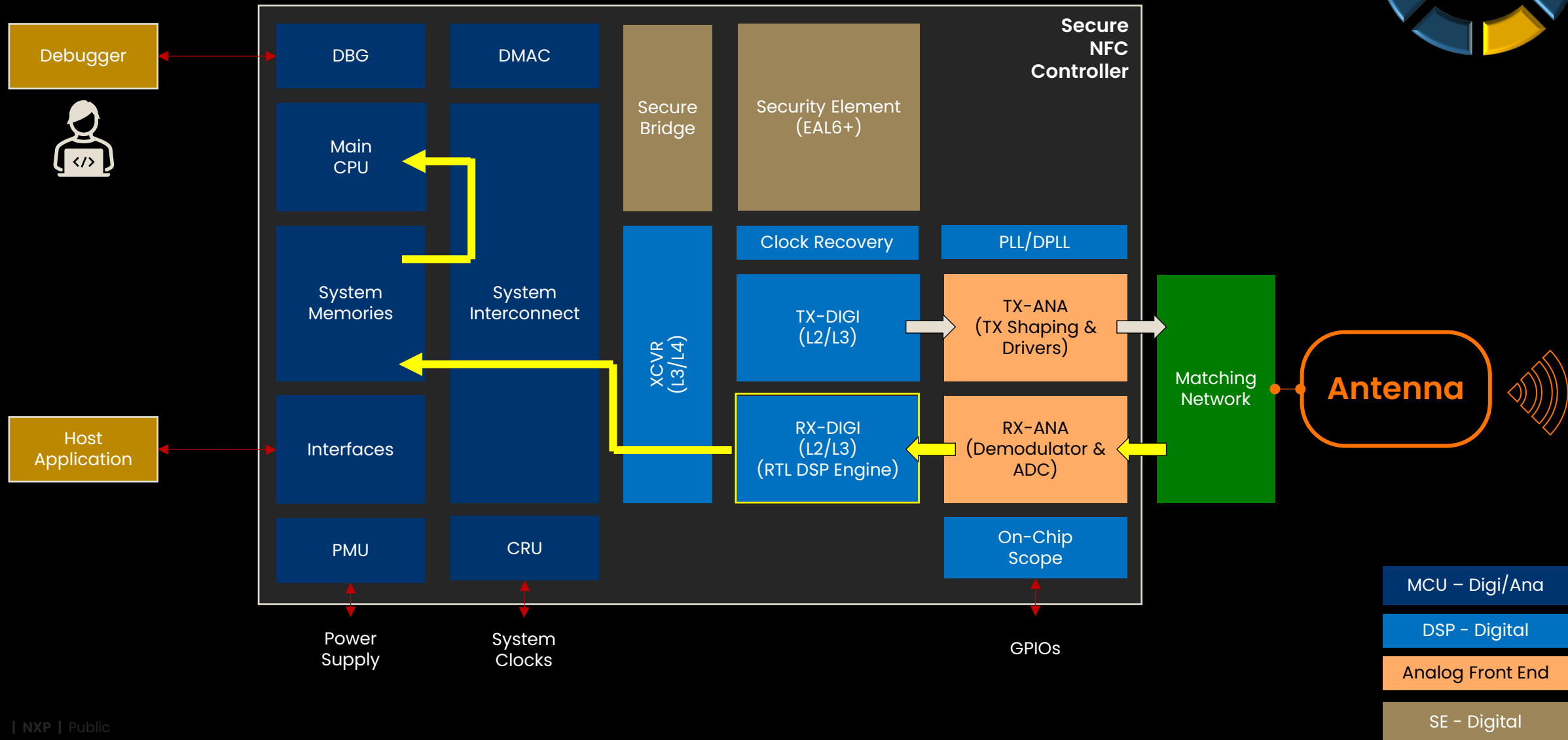
NFC in a nutshell



- Radio Frequency Identification (RFID) technology, operating at 13.56MHz
- Set of protocols to enable close-proximity communication between two devices
- Currently deployed in billions of IoT devices worldwide



Typical Secure NFC Controller Elements



Pros and Cons of a Full HW DSP Design



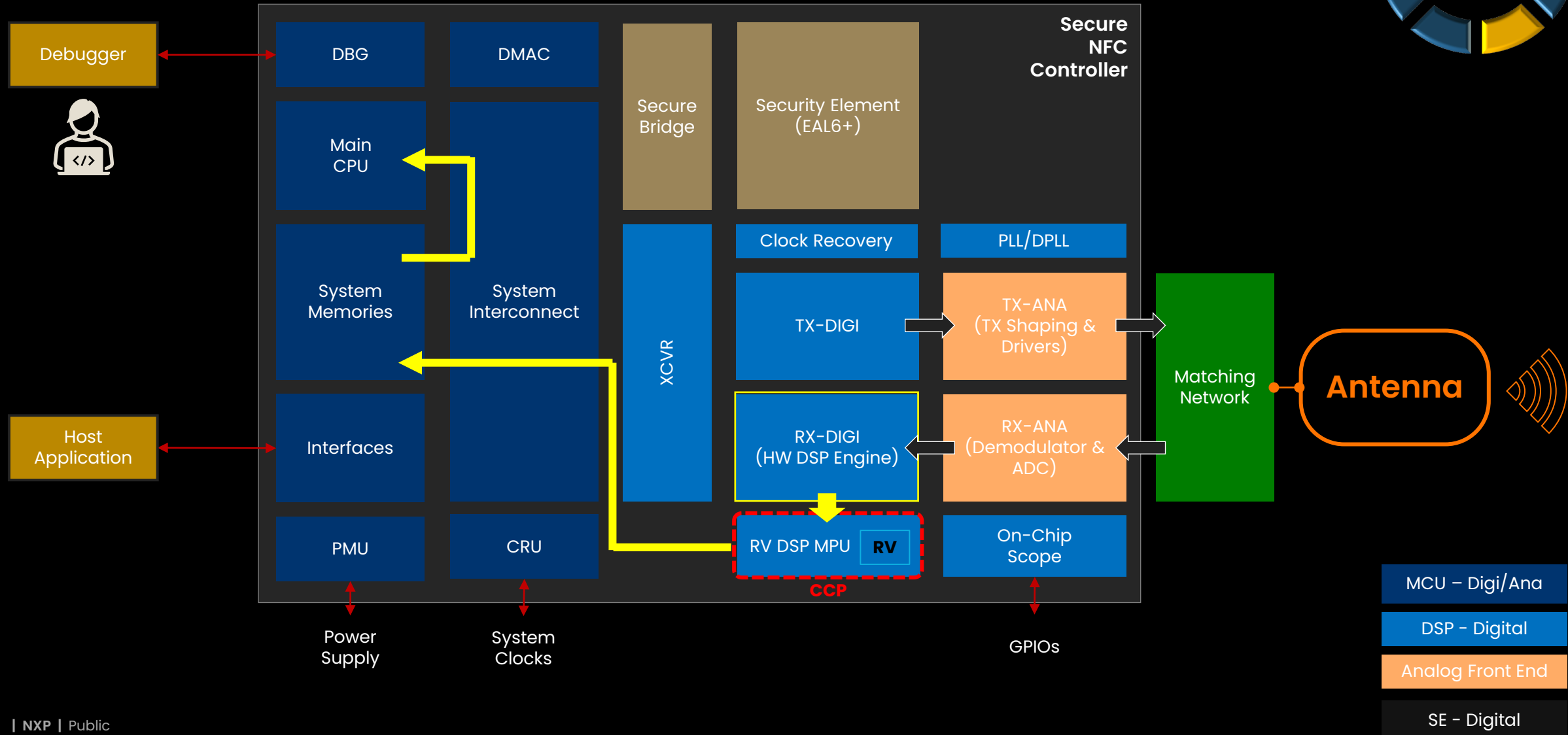
NFC MODEM STATE OF THE ART

- Involves a significant amount of analogue and digital signal processing
- Enables high-performance and robust communication across diverse operating conditions
- Supports multiple communication standards

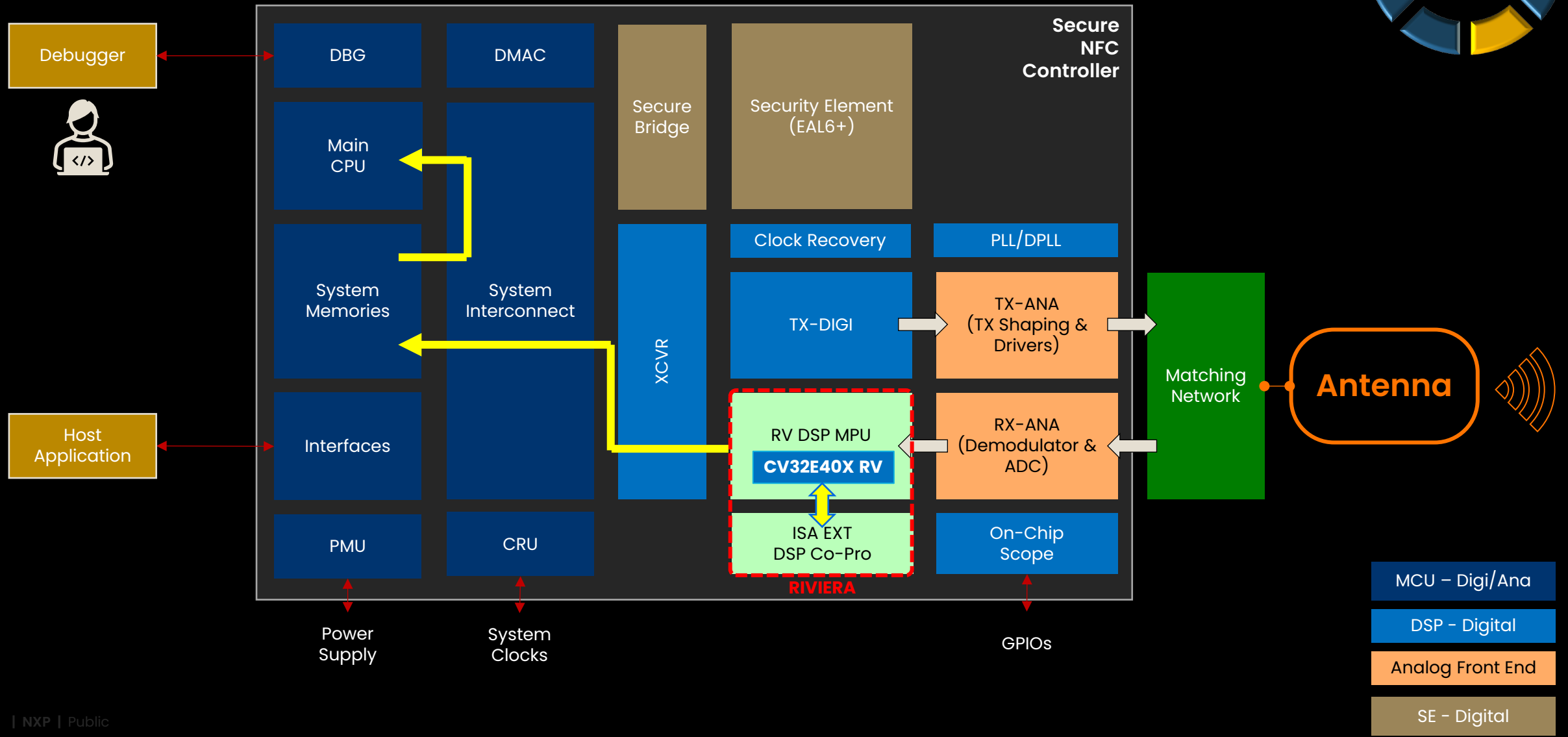
CHALLENGES

- Limited functional flexibility once implemented in silicon
- Limited capability to mitigate bugs post-silicon
- High pre-silicon design and verification effort required

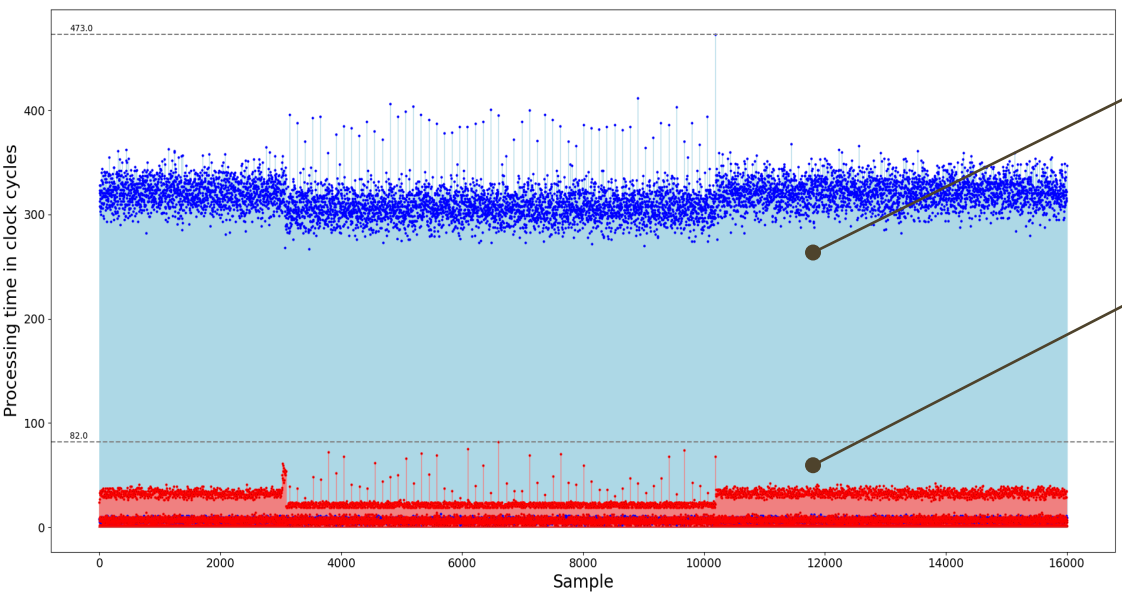
RISC-V as Downlink/RX DSP support



SW Defined Radio concept with RIVIERA Core



RIVIERA HW/SW Improvement Loops



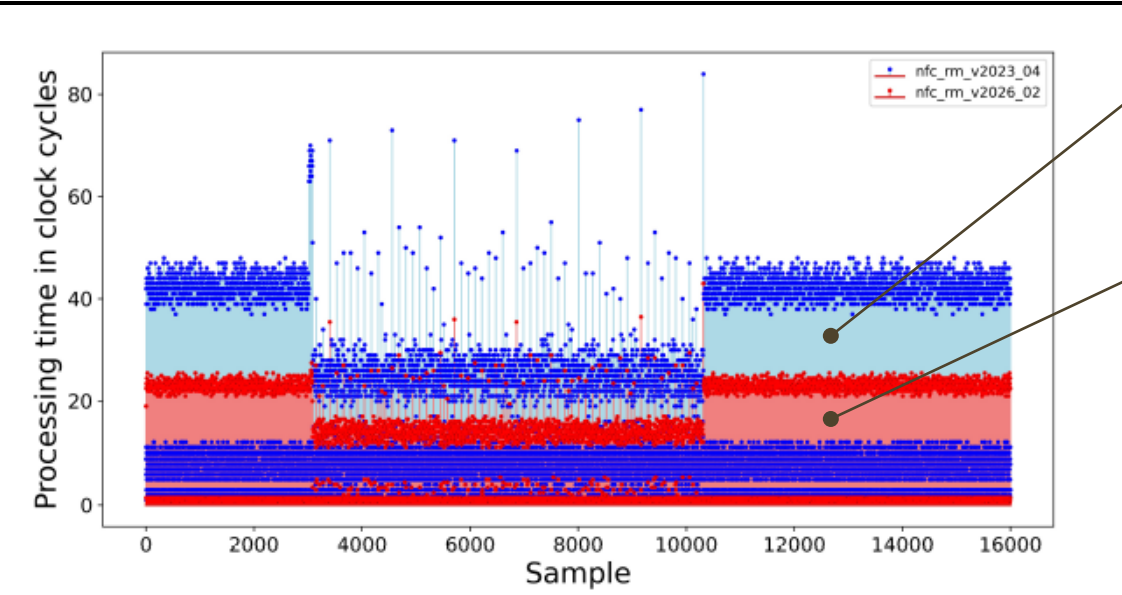
Initial ver performance

max: 473; min: 2
mean: ~161

Intermediate ver performance

max: 82; min: 1
mean: ~11

per algorithm run	Initial ver	Interm ver	speedup
number of instructions	705946	37253	18,95x
number of clock cycles	2578982	177373	14,54x



Intermediate ver performance

max: 82; min: 1
mean: ~11

Final ver performance

max: 42; min: 1
mean: ~8

per algorithm run	Interm ver	Final ver	speed up
number of instructions	41471	23275	1,78x
number of clock cycles	219421	163174	1,34x

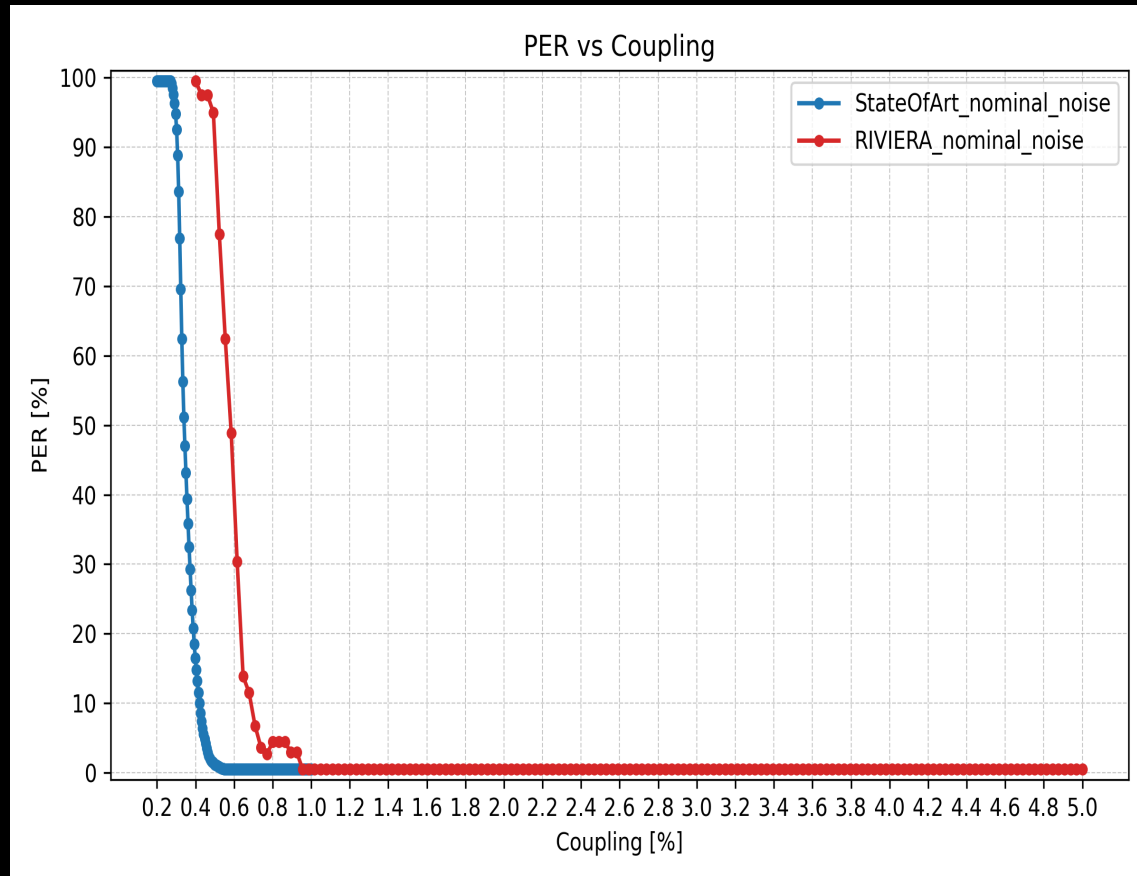
TRISTAN
RISC-V



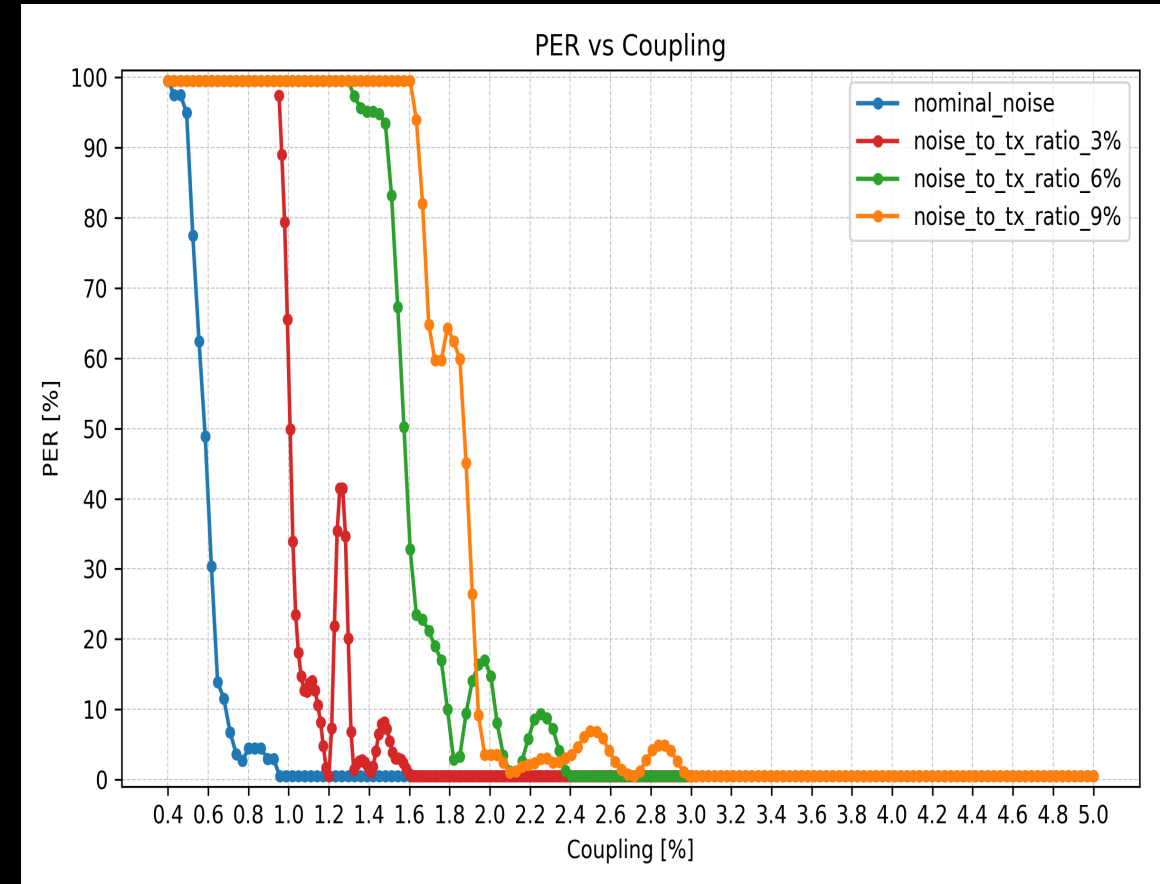
RIVIERA Validation Performance Tests



RIVIERA vs State of the Art



RIVIERA robustness testing





Let's stay connected

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