

Creating a Difference



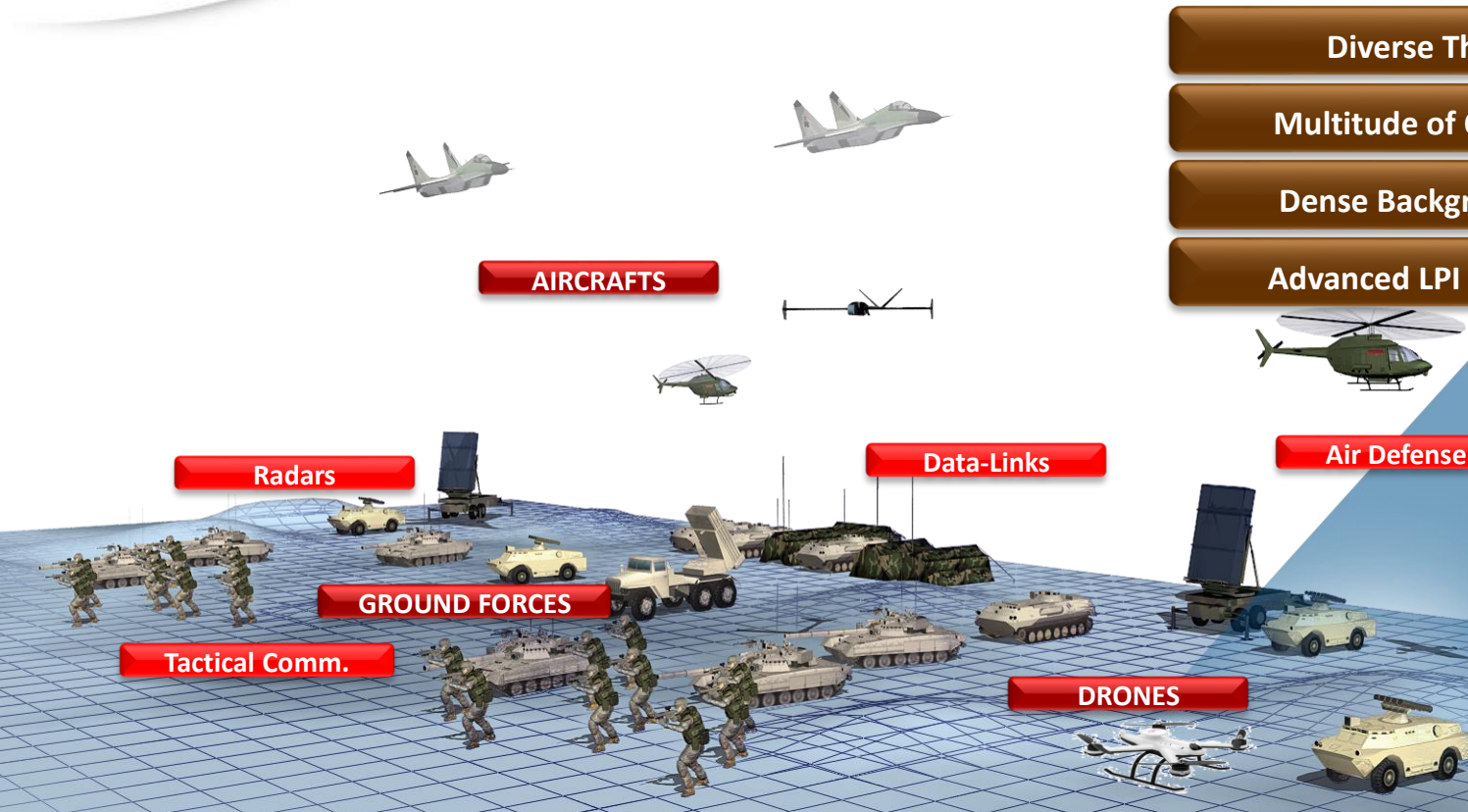
MULTI-FUNCTION AESA FOR EW MISSIONS

Dr. Nitzan BARKAY
Intelligence, EW & Comm. Division

ELTA Systems Ltd.

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The EW Operational Environment



Diverse Threats & Targets

Multitude of Overlapping Signals

Dense Background Environment

Advanced LPI & ECCM Techniques



Air Defense

Data-Links

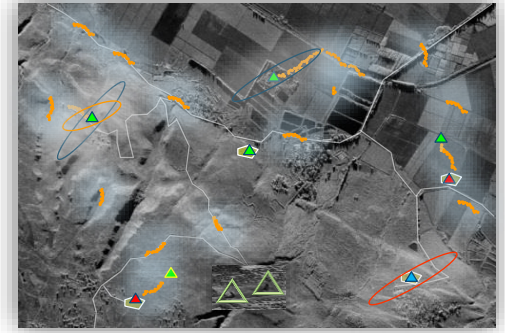
Radars

GROUND FORCES

Tactical Comm.

DRONES

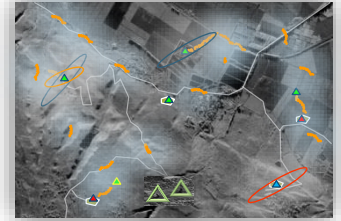
- Complex & dynamic scenario
 - Dense EM environment
 - EM spectrum saturation
 - Background and interference signals
 - Dynamic scenario
 - Large diversity
 - Fast changing
 - Proliferation of modern weapon systems
 - Complex waveforms
 - LPI signals
 - ECCM operation
 - **Software-defined**



Confronting the Modern EW Battlefield

- EW systems should be **OPTIMAL** for **EACH** signal, threat, target and mission within the complex battlefield

- **Wide coverage**
- **Powerful capabilities**
- **Adaptability**





System Requirements

■ Wide coverage

- Spectrum: frequency & bandwidth
- Spatial: platform & mission dependent

■ Powerful capabilities

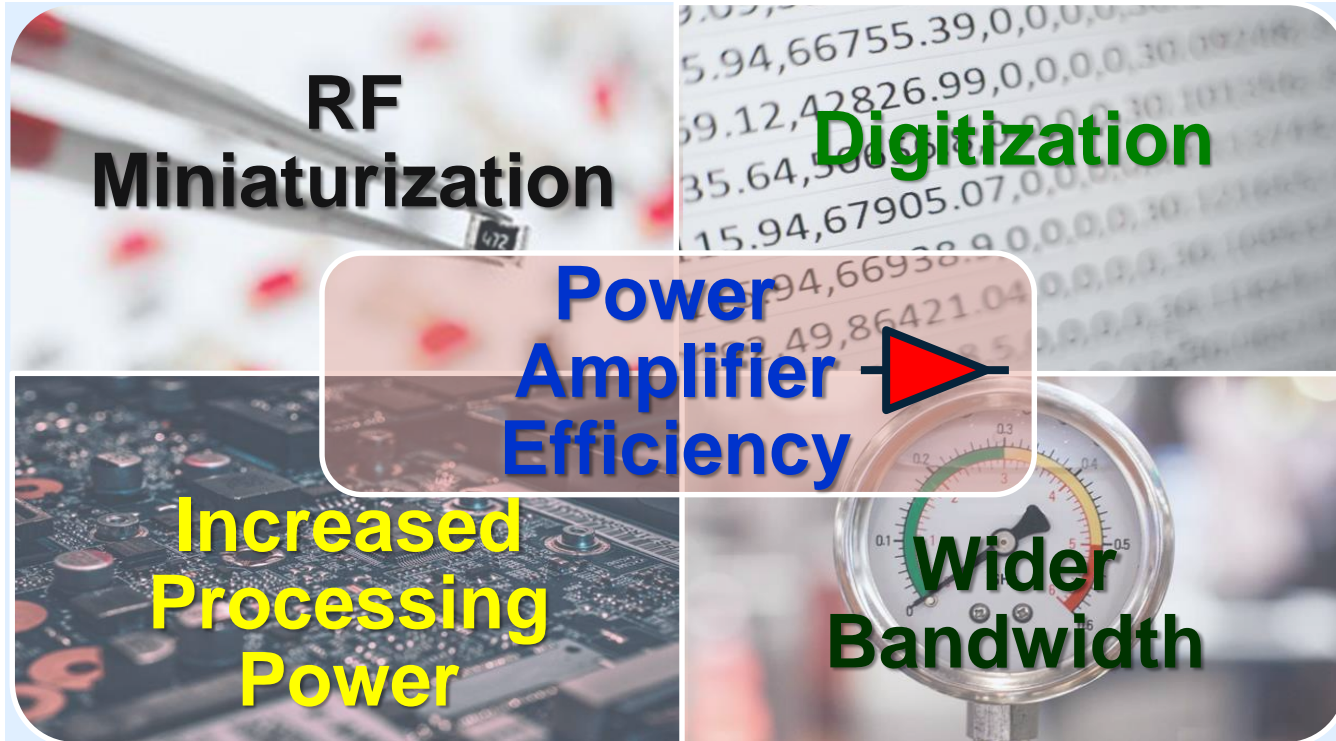
- Interception: high sensitivity for LPI signals
- Transmission: high ERP against modern threats
- Processing: Optimal operation for each signal & threat; All together

- **Wide coverage**
- **Powerful capabilities**
- **Adaptability**

■ Adaptability

- Mission flexibility
- Selectivity
- Control over all aspects of the electromagnetic signal
 - Time, frequency, polarization, direction, amplitude
- **Multi-function**

Trends of Available Technology



Technology trends contribute to future EW solutions

Technology trend – AESA

AESA-based systems
widely used in radars

Enhanced
Wideband
operation

Extensive
Online
processing

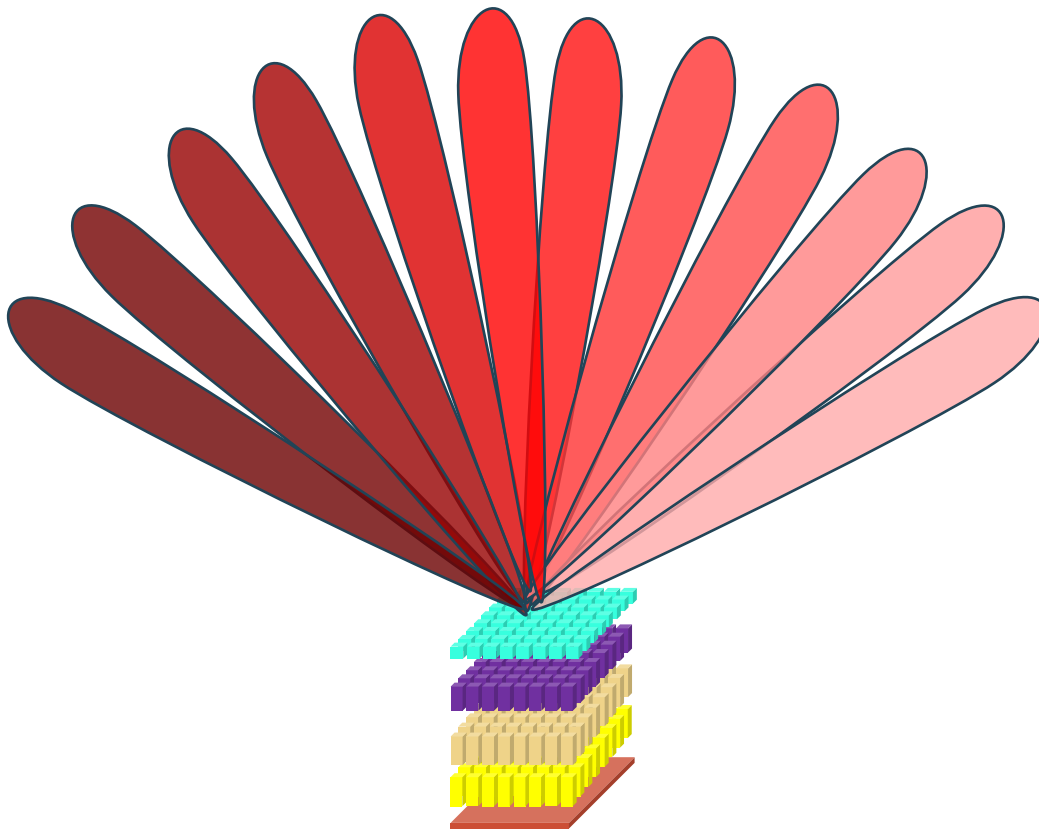
**Core technology for new generation
of active & passive EW systems**

Active
Electronically
Scanned
Array



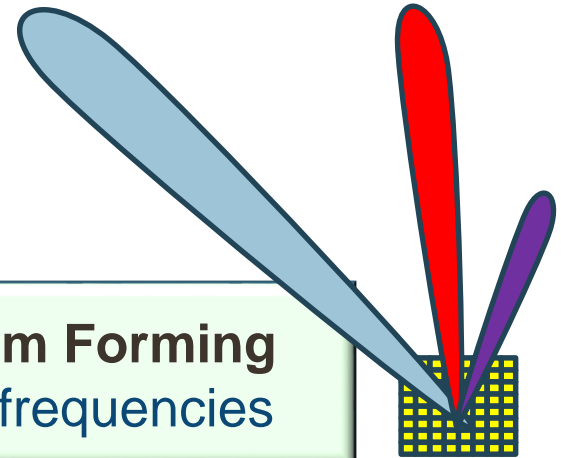


AESA – Directional Receive/Transmit Beams



- Directional operation supports all Rx & Tx tasks
 - Sensitivity of a narrow-beam
 - Selective interception
 - Higher ERP
- Controllable direction, time, frequency, amplitude, polarization
- Multi-beam option

DBF – Digital Beam Forming
for all directions & frequencies



Focusing in all directions

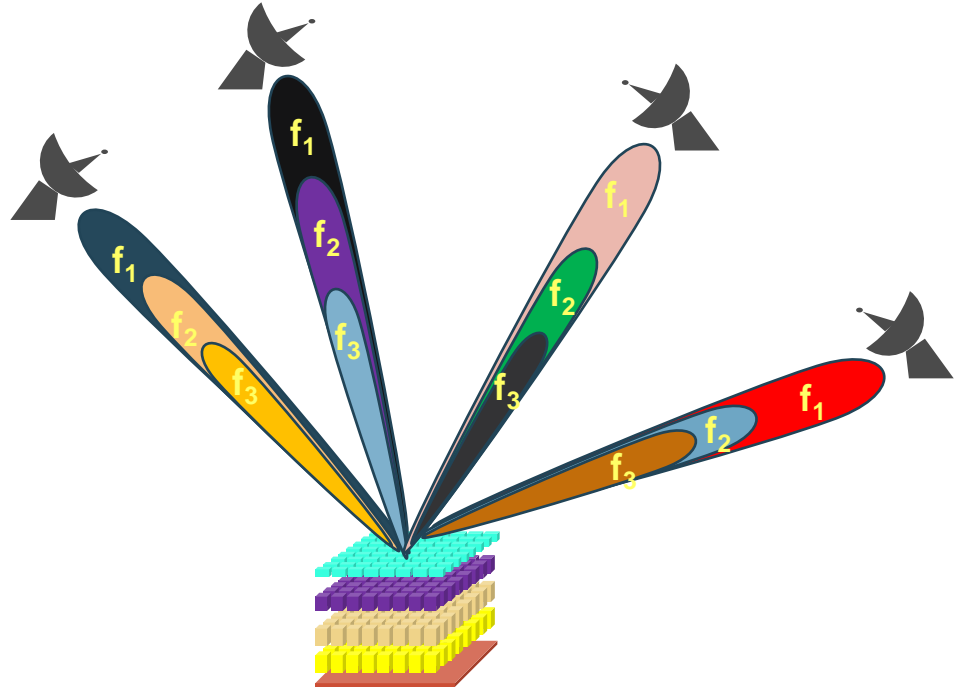
Multi-layered Selectivity in AESA EW

- Selectivity and resolution by

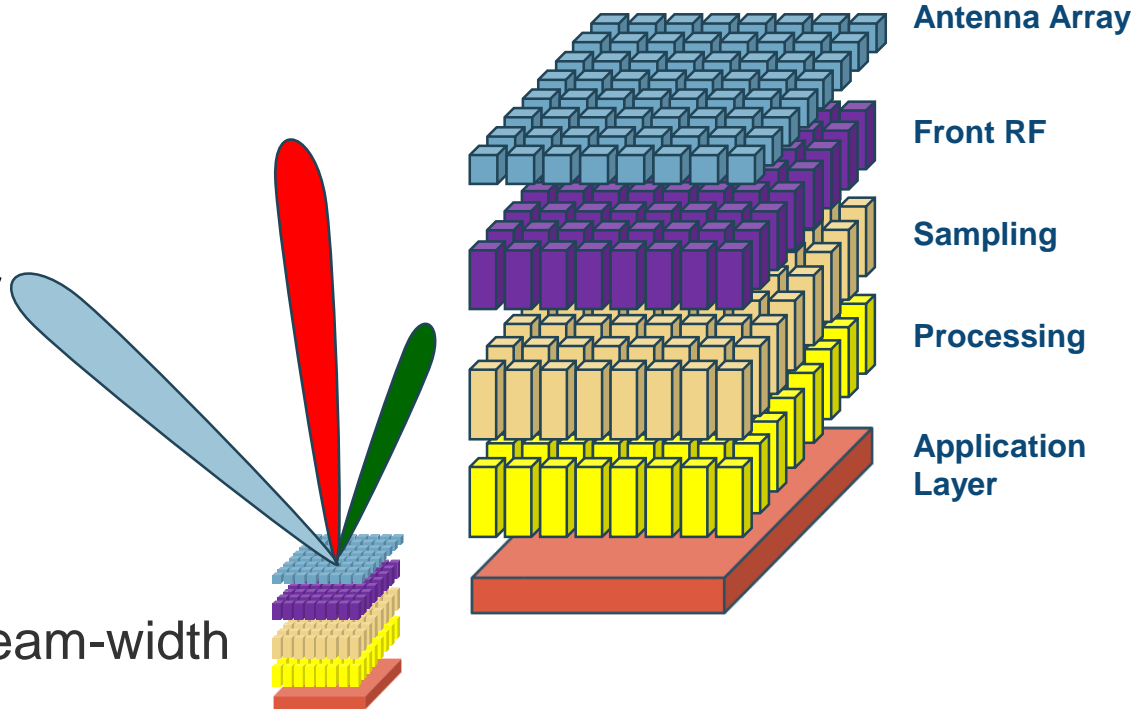
- time,
- frequency,
- polarization,
- direction

- Even for complex threats

- Waveform can be very agile
- Target position (= direction) is relatively stationary



- Digitization of array processing
 - Frequency & Phase
 - Amplitude
 - Timing
- Directional Transmitter
- Staring Receiver
 - Reception in all directions
 - Simultaneous operation
 - Wide coverage, narrow beam-width



EW AESA Implementation Challenges

- Driving challenge is **Bandwidth**

- Phased-array implementation vs. digital beam forming
- Antenna array
- RF elements
- High power transmit elements
- Digital data rate

- Implementation issues

- Bandwidth
- Digitization
- Processing
- Response time
- Size
- Power consumption
- Cooling
- Cost



■ Reception

- Handle multi signals simultaneously
- Wide coverage with narrow-beam sensitivity
- Receives weak signals
- Selectivity - track signals according to direction
- Interference filtering

■ Transmission

- Pinpoint jamming
- Less interference to others
- Multi-Beam jamming
- Controllable power, frequency, direction





EW AESA for Ground System

■ Reception

- Handle a dense signal environment
- Directional resolution & selectivity
- Wide coverage with narrow-beam sensitivity
- Receives sidelobes & weak signals from long range
- Interference filtering

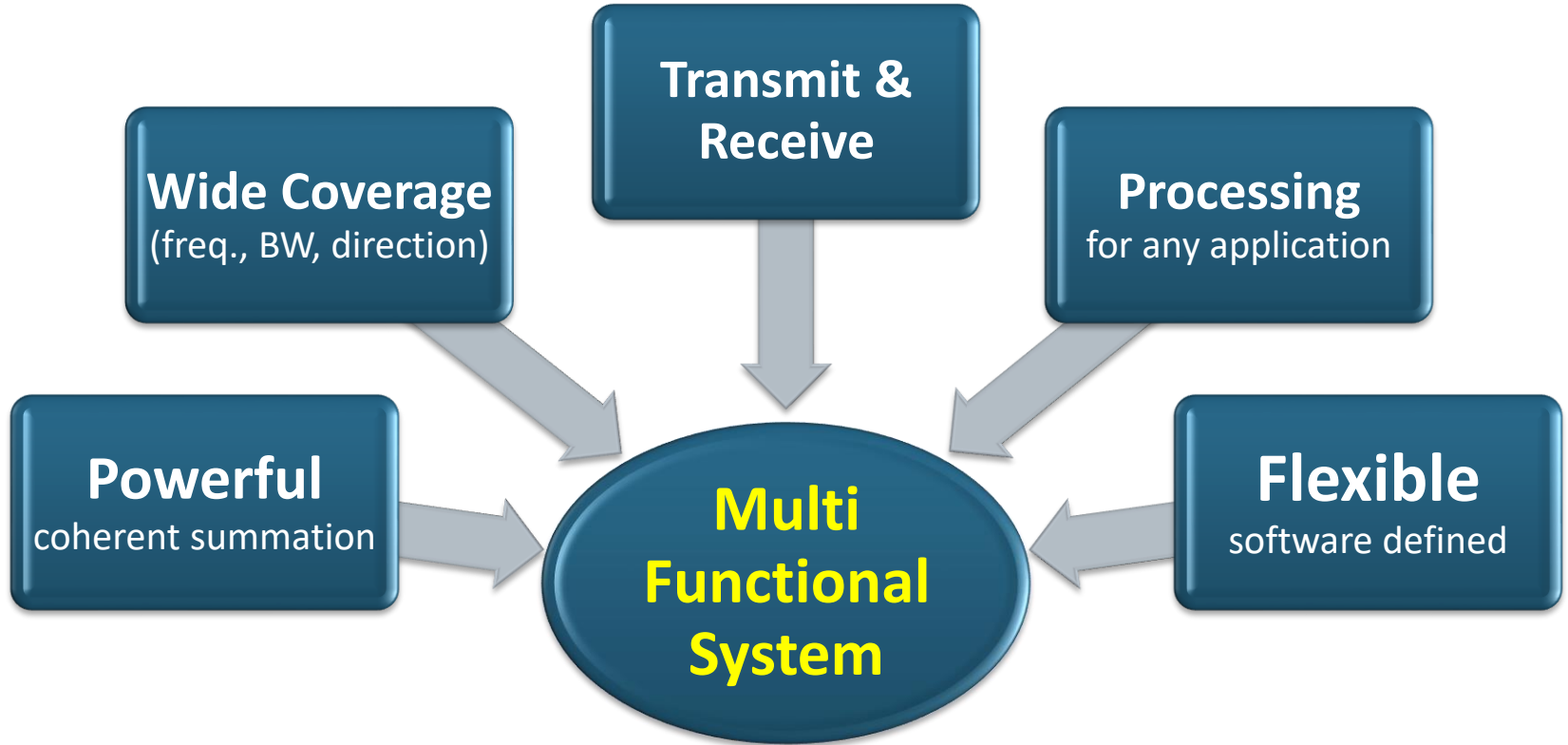
■ Transmission

- Powerful jamming
- Less interference to others
- Multi-Beam jamming
- Controllable power, frequency, direction



(ELL-8256SB)

AESA Multi-Functional System





Multi-Functional System (model 1)

- A unified system for multiple functions

- Specific tool for each function

- Operated one by one
- Total size & weight increases with the number of functions





Multi-Functional System (model 2)

- A unified system for multiple functions

- Common HW for most functions

- Functions may be operated in parallel

- Same size & weight for (almost) all functions

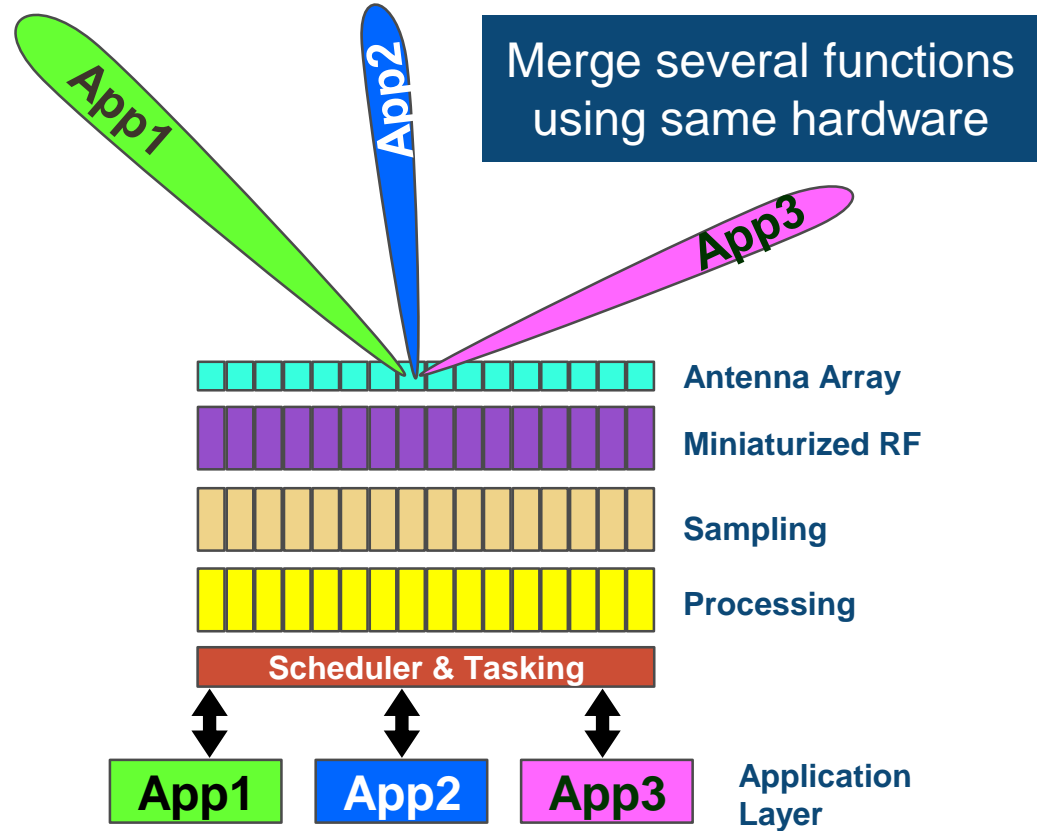
Digital



Analog

Unified AESA Multi-Functional System

- Various Roles
 - Active EW – EP & EA
 - Passive EW – ELINT
 - Communication
 - Radar
- Common aperture
- Software scheduler & tasking
 - Operational priority
 - System limitations



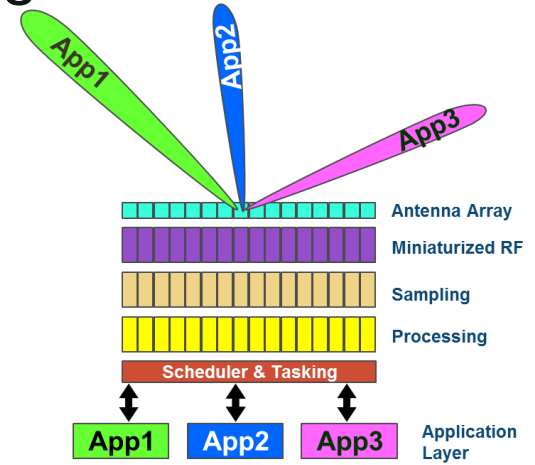
Limitations of Multi Function

- Performance compromise
 - Compared to a specialized tool for each function
 - But better compactness and suitability to small platforms

- Cost
 - More than each function exclusively
 - But more affordable than the total sum



- EW AESA is a basis for all EW applications
- Wide-angle staring with pencil-beam sensitivity
- Multi-layered selectivity
- Directional high ERP beams
- Potential for a multi-functional unified system



Focusing in all directions for all missions