

Generic Transformational Scalable Modular Adaptive RF Transceiver (Get SMART)

Perry Hamlyn

781-271-2137 • phamlyn@mitre.org

MITRE Sponsored Research



Problem

DoD and intelligence communities need low-cost, secure systems for wireless data transmission to accomplish missions such as tagging, beacons, and data exfiltration. These systems require performance characteristics beyond those provided by commercially available hardware.

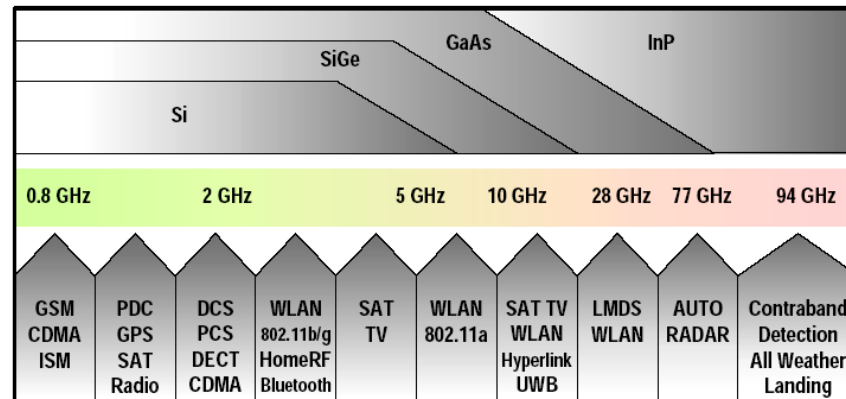
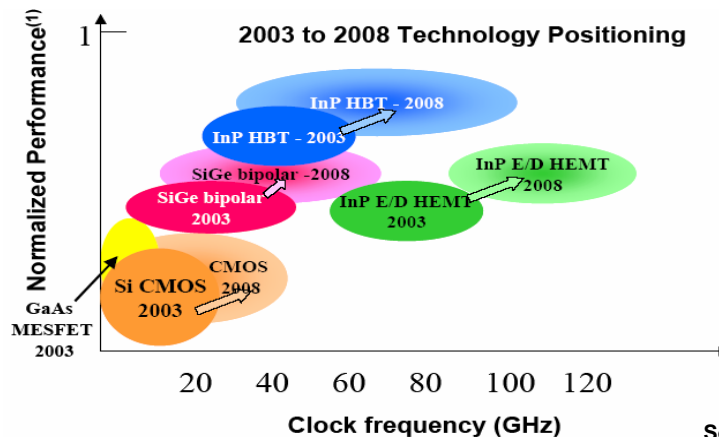
Military and intelligence performance characteristics include:

- Platform Interoperability
 - Configurable waveforms and messaging
- Wide frequency coverage and agility
- Large (>100 MHz) instantaneous bandwidth
- Ability to work independent of commercial infrastructure

Background

- Commercial Industry Not Focused on the Military Market
 - Radio on a Chip Focused on Cellular, 802.XX, Bluetooth Systems, ...
 - High Quantities : 100,000s+
 - Fixed Modulation Characteristics (BPSK, QPSK, FSK, etc)
 - Not: LPI/LPD, Interoperable, Reconfigurable
- “Special” Application Quantities Do Not Attract Commercial Investment

Risky Development + Low Production Quantities = Bad Investment



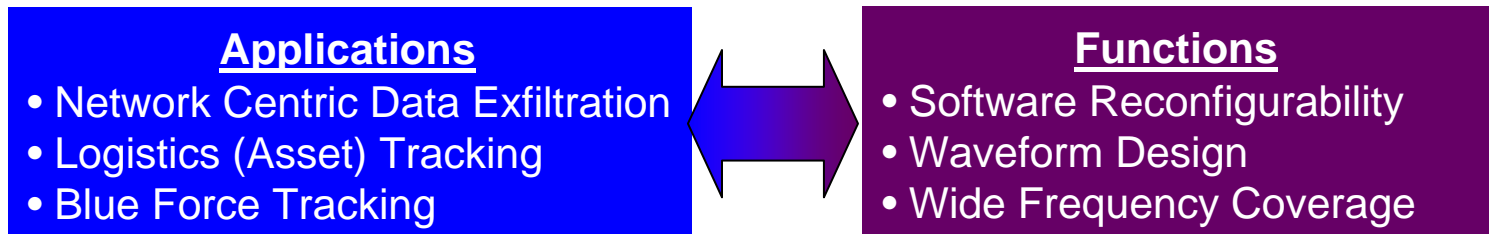
Source: International Technology Roadmap for Semiconductors 2003

Objective

- **Develop and demonstrate a generic, scalable, modular, reconfigurable RF transceiver using system-in-a-package microelectronics technology that will be a foundation for low-cost, adaptive, tag and data exfiltration communication modules**
- **Integrate SiGe into MITRE digital, mixed-signal, and microwave design processes and tools to extend SoC integration capability**

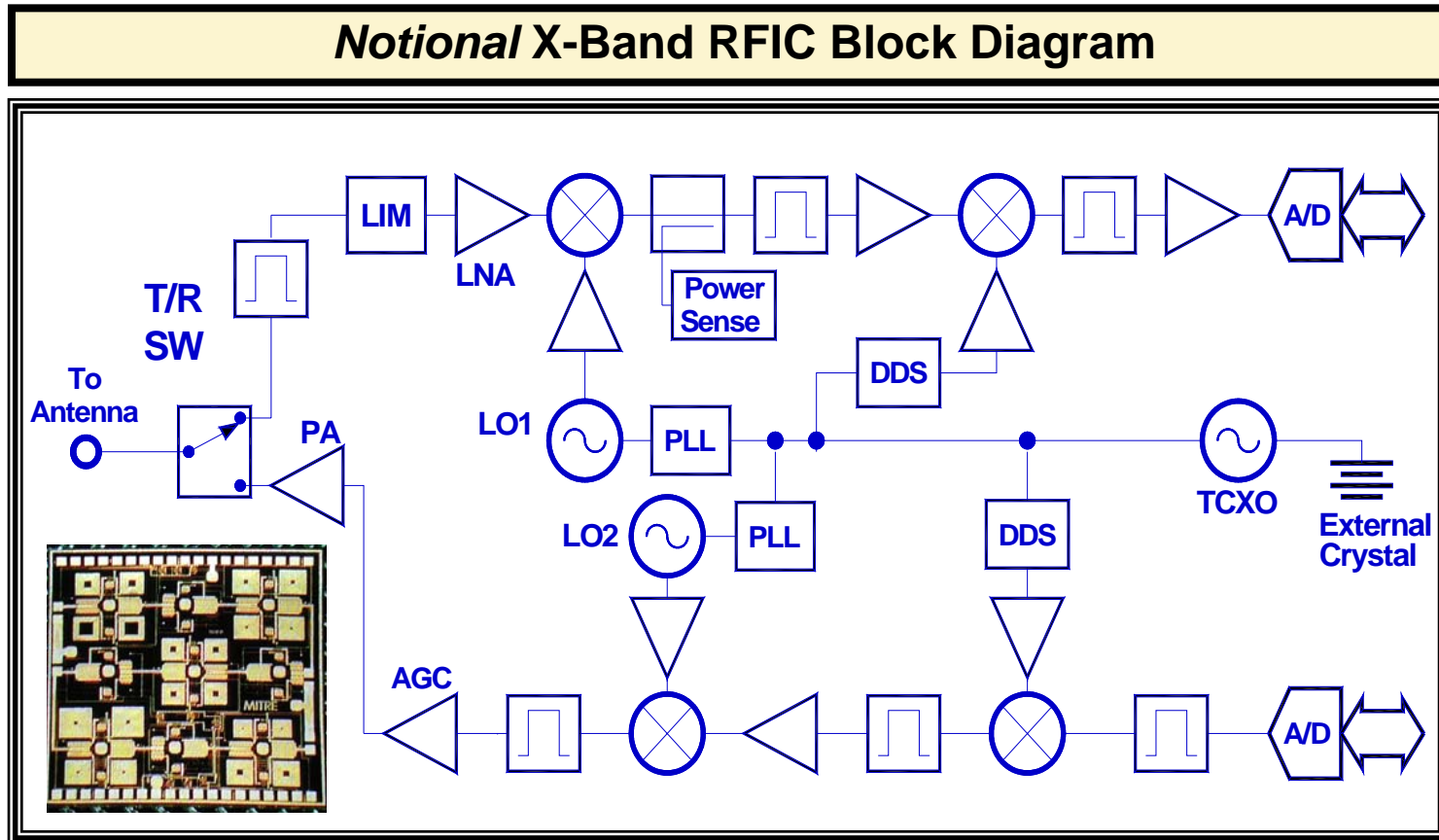
Activities

- **Employ system-level methodology to design, analyze, and implement a generic transceiver**

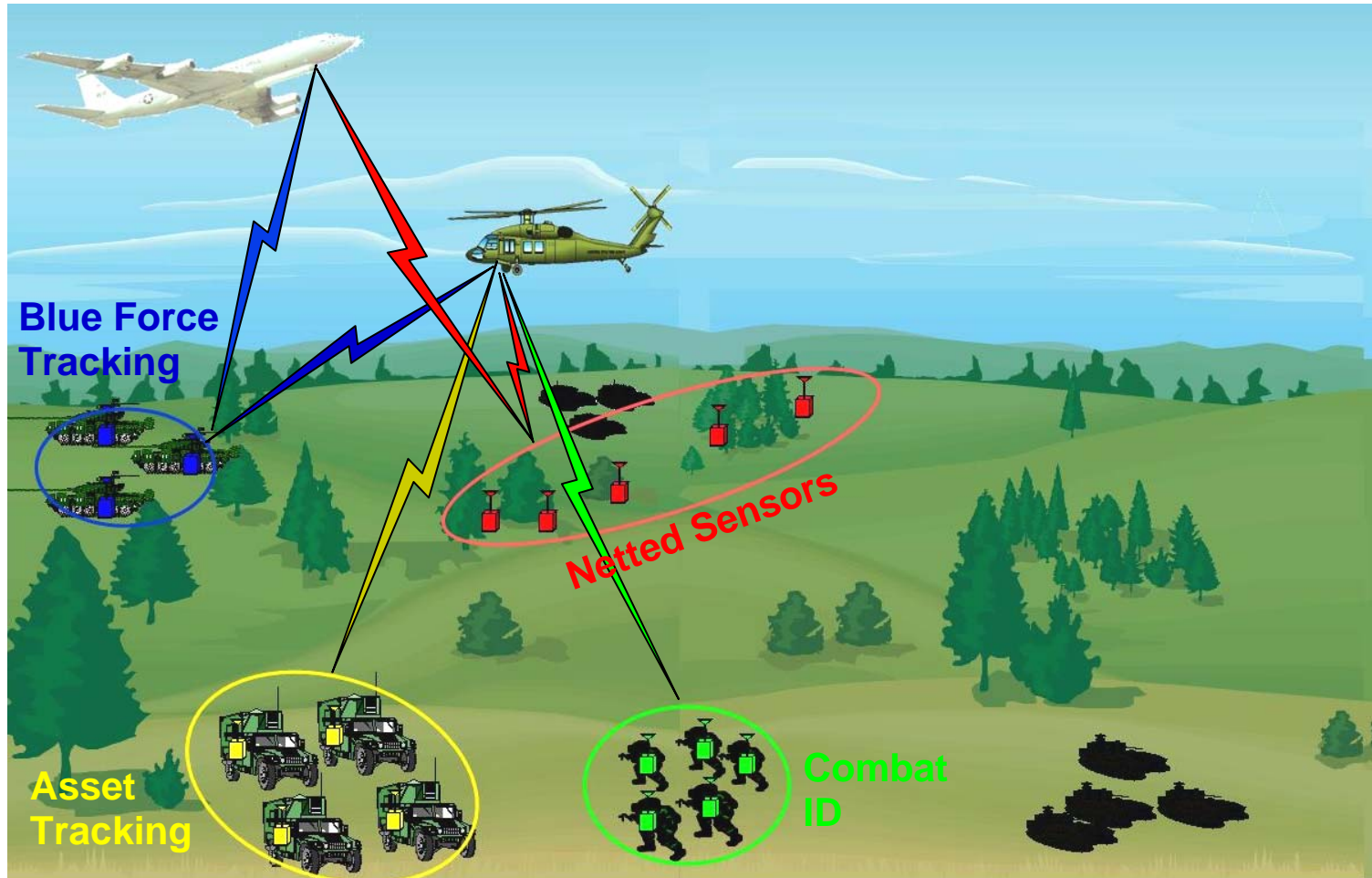


- **State of the Art Circuit Design**
 - Ultra Low Power (System Architecture, Adaptive Sampling, Power Control Circuits)
- **Expand Domain Knowledge in SoC. In particular:**
 - SiGe Layout for Both RF and Digital Integration
 - RFIC Mixed Signal Design
- **Develop System Expertise in Application Areas**

Highlight



Demonstration



Impacts

- Fills the performance/cost void for high performance transceivers
- Surpasses all known commercial SoC transceiver efforts for data bandwidth and reconfigurability
- Reduces industry risk by demonstrating low-cost, portable, wireless data transmission
- Supports the MITRE vision of network centric connectivity, providing real-time, reliable data
- Expands technical capabilities in applications such as blue force tracking and data exfiltration
- Advance the Microelectronic Technology Center strategic goal of system on a chip through RFIC and SiGe technologies

Future Plans

Get SMART Development Plan	FY 2005				FY 2006				FY 2007				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Develop Specification	▼	→	▲										
Model		▼	→	▲									
Chip Layout		▼	→	▲									
Fab Chip				▼	→	▲							
Test Chips					▼	→	▲						
Develop RFIC (Rev. 2)						▼	→	▲					
Fab Chip									▼	→	▲		
Develop Packaging					▼	→	▲						
Test Chips											▼	→	▲



The ultimate goal is to integrate the SiGe RF and digital functionality on to a single chip, providing the maximum advantages of SoC integration.

