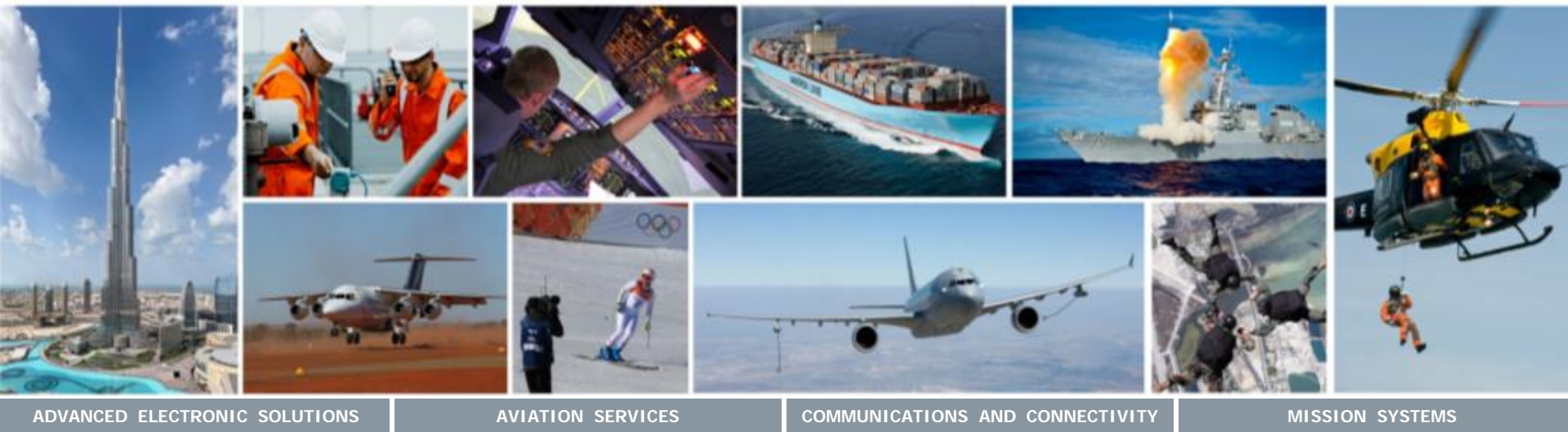


The most important thing we build is trust



Business and Technical Aspects of Adopting the SCA

Marv Rozner

VP Strategic Development
Cobham AvComm
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marv.rozner@cobham.com

- A leader in commercial and military radio, and avionics test solutions and services
- Decades of experience teaming with top radio manufacturers and end users worldwide
- Products support development, conformance, production, depot and field test & diagnostics
- Acquired in Sept. 2014, and part of the Cobham Communications and Connectivity Sector

Leader in Automated Test

- 7200 (radio ATE-in-a-box)
- IFF7300s (avionics ATE-in-a-box)
- Radar Modules
- Satellite Payloads



Leader in Avionics Ramp Test

- IFR4000 (Communications)
- IFR6000 (TCAS/TCAN)
- 424(v)5 (IFF)
- GPS/GLONAS
- Radio Altimeter



Leader in LMR Test

- 3920B Digital Radio Test Set
- 35XX Portable Radio Test Sets
- 8800 Portable Radio Test Set



Leader in Military Test

- Frequency Agile Test Set
- 45TS (IFF)



- We developed the world's first "software-defined" automated all-in-one radio test set more than 35 years ago!
 - Synthetic instrument cores change functionality via software—same as SDR
 - More than 50,000 radio test systems sold worldwide!
 - Supporting the world's top radio manufacturers and end-users through multiple radio lifecycles and evolutions of waveforms, protocols, and form factors
 - Several OEM's sell our systems alongside their radios!

Tactical Radio Test Set Evolution

AN/GRM-114A



TS-4317



AN/GRM-122
GRM AV Kit



3920



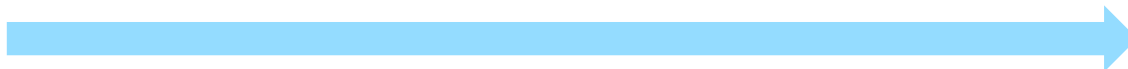
7200/GRMATS



SCA Platform
Next Gen RTS



1979



2016+

But you are a test and measurement company, why the heck would you use the SCA if not forced?



Good question...

We Wanted to Create the Next Generation of...

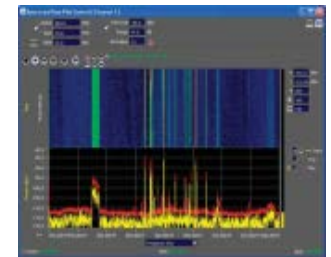
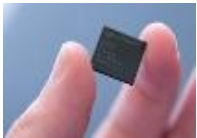
COBHAM



...using “one” common architecture and development approach!

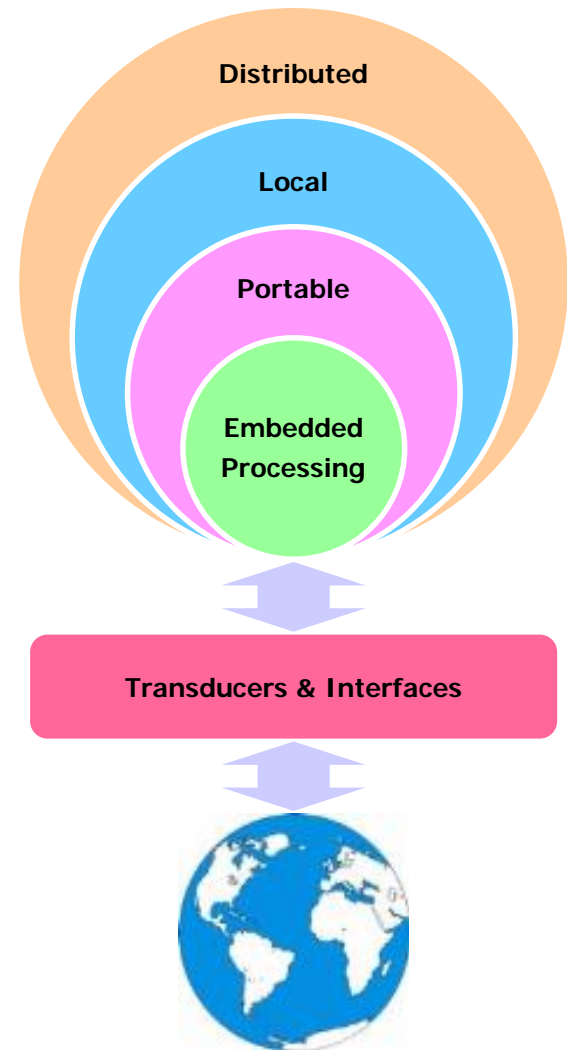
To Do it We Wanted to Leverage

- Our expertise and intellectual property in measurement science, signal processing, automation and control, and real time systems
- Modern development tools and techniques
- Modern hardware and software standards
- Modern user interface and user experience concepts
- Access to the Internet/Intranet almost anywhere
- Advances in computing



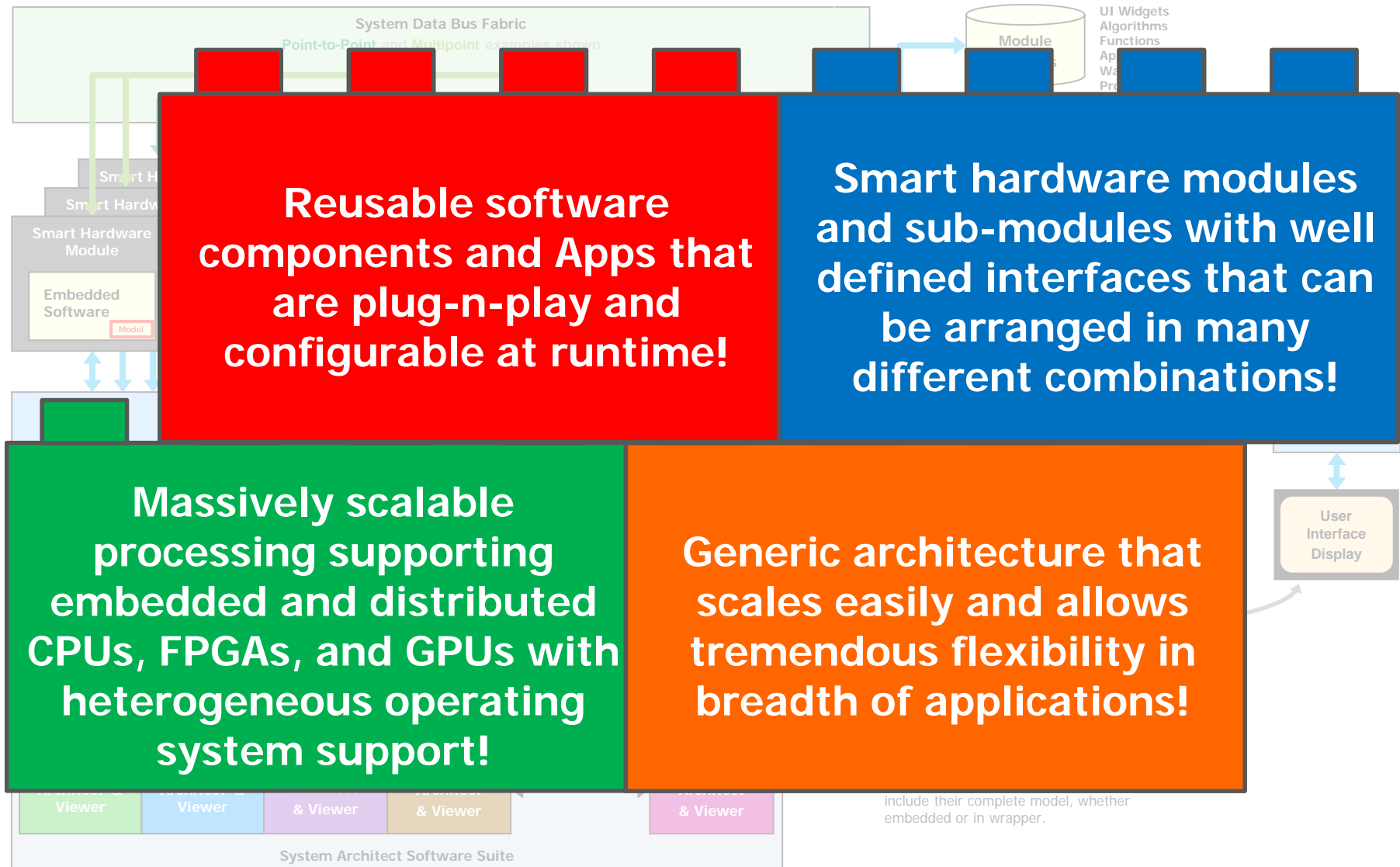
Essentially, we started with a blank sheet of paper!

- A highly scalable and modular real time computing, signal processing, monitoring, and automation framework with accompanying development tools
- With these key attributes
 - Product and market agnostic
 - Supporting many different interfaces
 - Of course including RF/ μ W
 - Configured “without programming”
 - Integrated real time control and automation
 - Based on industry standards
 - Embedded documentation and training



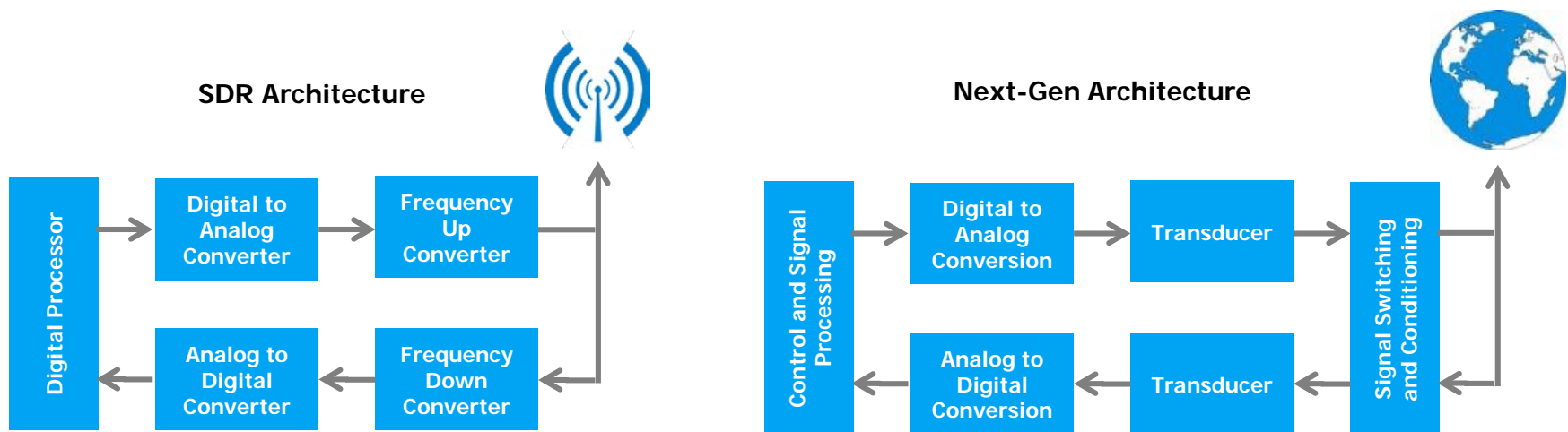
What do we and our customers need today? Let's build it!

We Desired a “LEGO®-like” Architecture



LEGO® is a trademark of the LEGO Group of companies which does not sponsor, authorize or endorse this presentation!

- We already treated our legacy products like Software Defined Radios (SDR)
 - Just more granular so we can scale to a greater extent and provide many different combinations of hardware modules and software components
 - We also require **4-10X the performance of what we are testing or emulating**
 - With more generically designed interfaces to support many different types of transducers beyond just radio front ends
- Just happens to be the same architecture as many of the things we will test!



We Desired Extreme Scalability



*Production
Test Systems*



*Bench Instruments
and MicroATE Systems*



Portable Test Sets



*R&D Simulation,
Development, Emulation and
Certification Test Systems*



*Hand-held and Field
Monitoring, Emulation,
Test and Diagnostics*

To prove scalability from portable embedded devices to ultra-high performance distributed systems we developed both ends of the spectrum!

We Desired Innovation with Standards

- We searched for widely adopted and predicted high-longevity open industry standards and select de facto standards
 - Reduces development costs and time to market
 - Only **develop where we must**, and **where we add value!**
 - Helps manage product roadmaps and obsolescence
 - Customer and Cobham team both benefit!
 - Best-in-class standards innovatively leveraged from diverse industries such as T&M, IT, communications, industrial control and others – leave no stone unturned



OpenCL

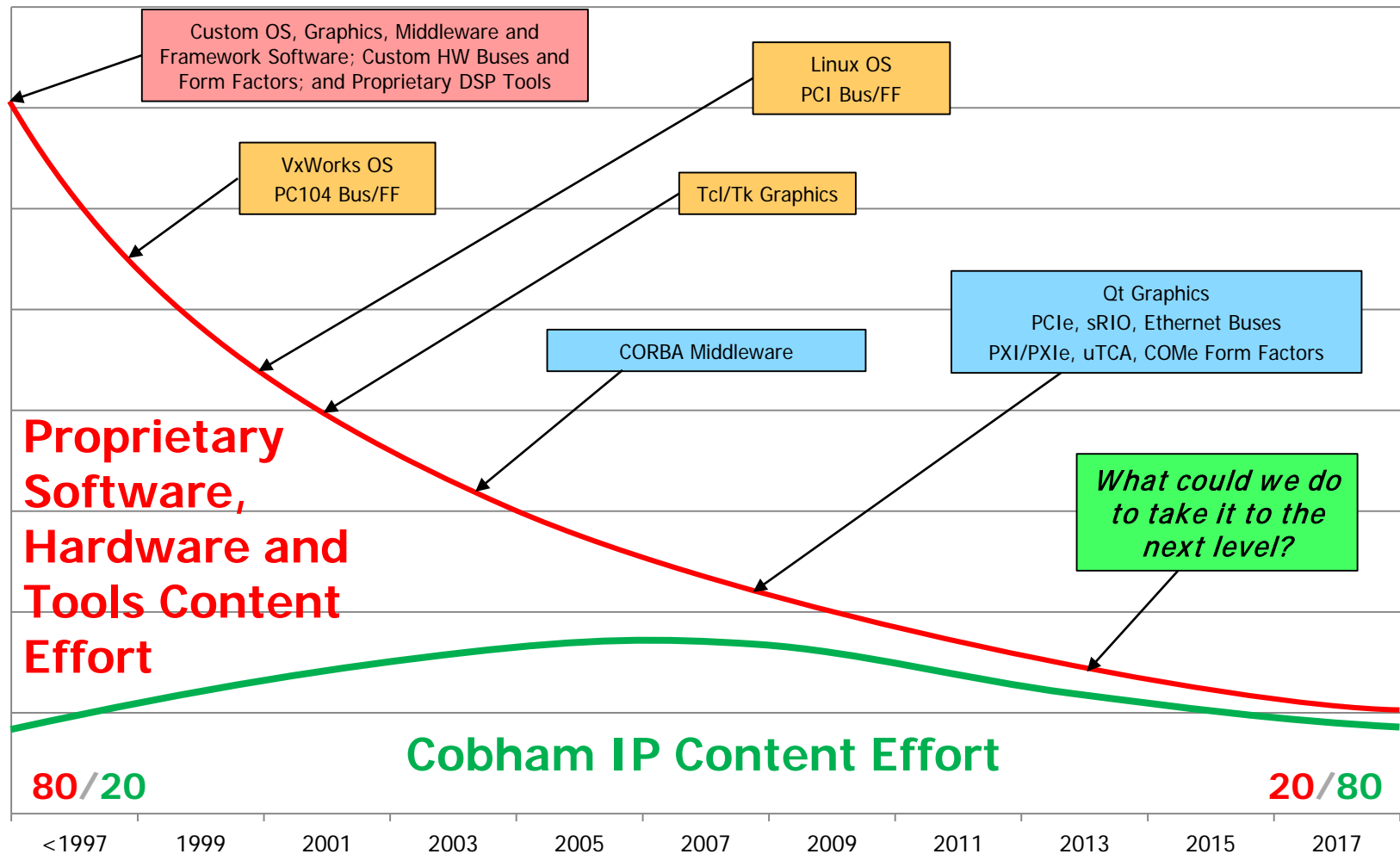


StarPU



SCA 2.2.2/4.1

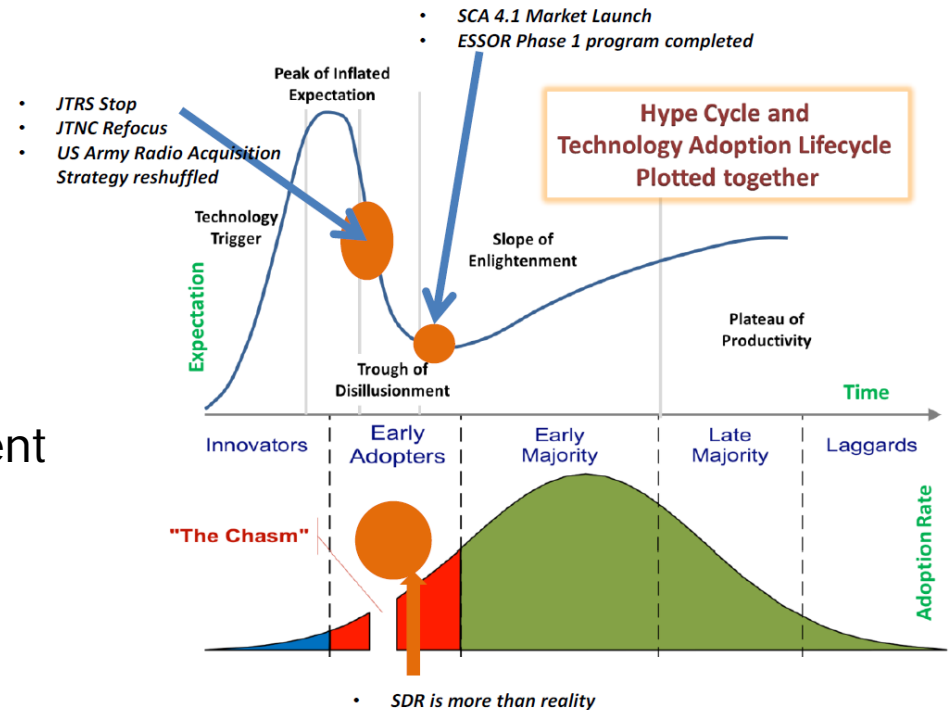
While Reducing Development Time and Cost



Let's focus on doing the things where we add value for our customers!

The SCA Checked Many of the Boxes!

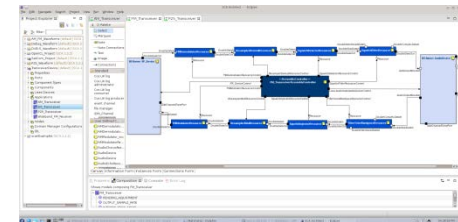
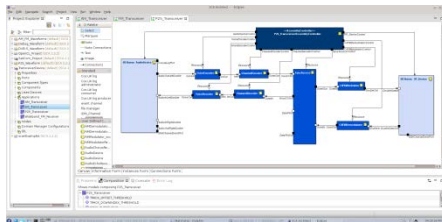
- ✓ Software component framework supporting LEGO-like infrastructure
- ✓ High potential for software application reuse across different form factors
- ✓ Proven support for the SDR paradigm
- ✓ Supports embedded and distributed heterogeneous implementations
- ✓ Robust, comprehensive, mature and well supported international open standard
 - Product and market agnostic
 - “if you squint a bit”
- ✓ And it is Commercially Available
 - Battle proven Core Framework
 - Complete development environment
 - Introspection tools



The fact that many customers used the SCA was actually a bonus—not the main reason!

Source: From Business Models Report by WinnF, October 2015

- NordiaSoft launched in October 2013 as a commercial spinoff from CRC
- Their core team has a long list of industry firsts in SCA/SDR technologies
 - Leading experts on SCA, and have trained hundreds of government and radio OEM personnel worldwide on the SCA and SDR
 - Developed “the” SCA Reference Implementation (SCARI)
 - JTEL compliant SCA Core Framework, and used to improve the JTRS test application (JTAP) used in compliance certification
 - Commercial SCA software tool suite and core framework
 - Deployed and battle-proven in 1000’s of fielded radios worldwide



We used a commercial standards based component framework instead of creating our own again!

- Modern Object-Oriented, Model Driven and Component Based
- Leverages our team's unique intellectual property
 - Advanced signal synthesis and analysis based on real time signal processing
 - Built-in real time automation, monitoring and control system
 - Automated code-generation
 - Debugging and monitoring introspection
- Common development tools, processes and libraries for OOP, SDR/SCA, OpenCL/DSP, QML/UI and more
- Same components and Apps run on embedded and distributed platforms!
- SCA v2.2.2 compliant
 - SCA standard interfaces and JTRS public devices
 - 4.1 compliance in development



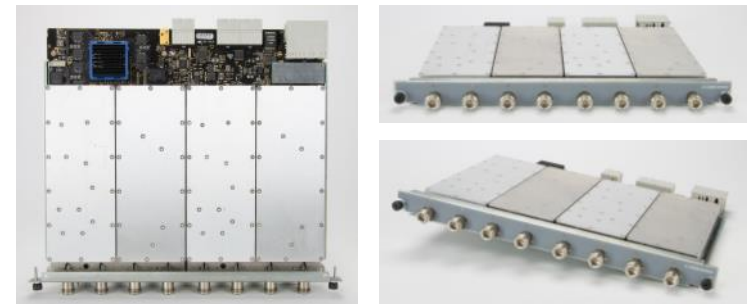
Chassis

- Co-creator of the AXIe standard
- Industry's highest bandwidth
 - Implemented all optional features
 - 32 GB/s per slot, 1.5 Tb/s aggregate!
- Exclusive Switch Fabric overlay
 - Heterogeneous multi-host capability
 - Including virtual domains!
 - Still standard compliant!
- 2 and 5 slot versions, 200 W per slot
 - Enclosed configurations available



Modules (at launch)

- Processing
 - 2 CPU modules + $\frac{3}{4}$ PCIe card
 - CPU, GPU, FPGA, DSP, memory, and storage
 - Future: 4 CPU, 1 PCIe, and more
- Receivers, Generators and Transceivers
 - 1 MHz – 6 GHz, 200 MHz BW, fully calibrated instrument grade
 - Gen, Rcv and high and low power duplex ports
 - Industry's highest density RF
 - Future: 26.5/50 GHz, 500+ MHz BW, and more



#1 Modular Instrument Story of 2015



Home > Community > Blogs > Outside the Box

Cobham leaps into AXIe

Larry Desjardin -October 05, 2015

2 Comments



The modular instrument industry just became a bit more interesting. Cobham will be introducing a suite of modular products based on AXIe. Expect the introduction in early 2016.

For those of you without a scorecard, Cobham purchased Aeroflex in 2014. Aeroflex has been a major player in modular instrumentation for many years, focused on **mil/aero** and **wireless test** applications. In 2003, Aeroflex brought their first RF instruments to PXI.

Cobham is **the first AXIe chassis vendor to offer Wide PCIe capability...Cobham's introduction of x16 Wide PCIe will change AXIe.**

This positions the Cobham transceiver module as **the highest density modular RF instrument available.**

Don't see the PCIe, LAN, and trigger ports? That's because they are on the back, where many system integrators prefer.



First, **Cobham** brings the same open system flavor to AXIe that Keysight has recently brought to PXI...**adds significant credibility to AXIe** and competitive choices to the customers.

Second, ...**compelling architectural features...10 vector transceivers in a 4U rack height...double the density available in PXI...record density...first vendor to adopt Wide PCIe and PCIe Gen3...eight fold increase in speed**

Top 5 modular instrument news stories of 2015

Larry Desjardin -December 07, 2015



#1. Cobham leaps into AXIe

This October, in a Test Cafe exclusive story, Cobham **announced their entry into AXIe**. For those of you without a scorecard, Cobham is the new name of Aeroflex, recently purchased by Cobham. Cobham's entry into AXIe is important for two reasons.

And they didn't even know about our SCA compliance, switch fabric, etc...

Source: <http://www.edn.com/electronics-blogs/test-cafe/4440452/Cobham-leaps-into-AXIe> and <http://www.edn.com/electronics-blogs/test-cafe/4440981/6/Top-5-modular-instrument-news-stories-of-2015>

- At the completion of a four day SCA training session, one of “our” engineers
 - Installed the SCARI suite on a legacy 7200 radio test set, compiled and installed the SCA core framework, extracted audio business logic from 7200 code, wrapped it as SCA components, executed and transmitted audio to another radio test set
 - All in less than two hours!
- From the time of our first functional low level transceiver driver to operating the system as an SCA radio with AM, FM and P25 — less than one week!
- Acting as the radio RF front end for an Android phone running the SCA framework and AM, FM and P25 — less than one day!

And we are just getting started!

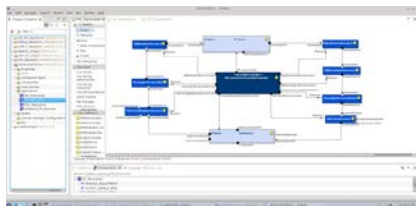
We Now Have a Total Lifecycle Support Platform

Simulate...

Model and execute a complete SCA system even before adding the business logic!

Demonstrate system prototypes early in the business development phase

Add prototype business logic for key conceptual components



Complete SCA Modeling, Code Generation, Validation, and Runtime Environment

Instrument grade calibrated SCA platform to prototype waveforms, applications, and algorithms

Perform customer demonstrations for feedback and requirements validation

Unlimited experimentation before committing to formal design



Ultra-Wideband Chassis with 32GB/s Per Slot, Full Switch Fabric, Virtual Domains, and Supporting Heterogeneous Processors and Multiple OS's Simultaneously

Design...



Dual COMe and PCIe Processing Carrier supports CPU's, GPU's, FPGA's, Memory and More (shown with Dual i7's and ATI GPU)

Characterize hardware required to run software components on calibrated SCA compliant platform

Execute Software early and provide feedback to hardware team

Add COTS or prototype hardware as selected and rerun for continuous validation and feedback between hardware and software teams



Graphical Representation of *Every* Concept in the SCA Specification

Write and test SCA software components (with business logic) on a fully SCA compliant platform many months before target or prototype hardware is available

Test performance on various CPU's, GPU's and FPGA's

Only optimize code where necessary

Emulate...

Connect any SCA device to a fully instrumented SCA Platform for final integration and design verification testing, where the SCA Platform acts as an Emulator *and* Test Instrument

Multi-channel systems support complete network emulation and test

Future small form factor MIL-Class I XCVR will even support field test!



Up to 8 High Performance Transceivers Per Chassis Plus Highly Scalable Processing

Complete runtime monitoring, control and configuration of the SCA system

Fully integrated with the SCARI Software Suite



Instrumentation Carrier shown with Dual DC-6GHz, 200MHz BW Transceivers

Test!



Ethernet, WiFi, USB3, PCIe, Clock I/O, Trigger I/O and Even Backplane I/O for Multi-Chassis Configurations



Complete SCA Compliance and Conformance Testing Available

Ultimate test traceability and reuse by running tailored versions of the simulation, design and emulation software on fully SCA compliant test and diagnostics configurations

Production, depot and field platform configurations, and all are SCA based!



Even run on SCA based portable and handheld field test and diagnostics test sets



We Realized Along the Way...that others could use a platform like this too!



Proudly launched at WinnComm 2016 - *Home of the SCA*

Video

**THANK YOU
QUESTIONS?**