

System Component Deployment in a Real-time Embedded Software Defined Radio (SDR) Architecture

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Outline

- Software Defined Radio Forum(SDRF) Commercial Industry View
- US Military View - Joint Tactical Radio System(JTRS) Requirements
- The Software Communications Architecture (SCA)
- Component Deployment Architecture
- JTRS Deployment Architecture
 - Compare & Contrast with the CORBA Components Model

Software Defined Radio Forum

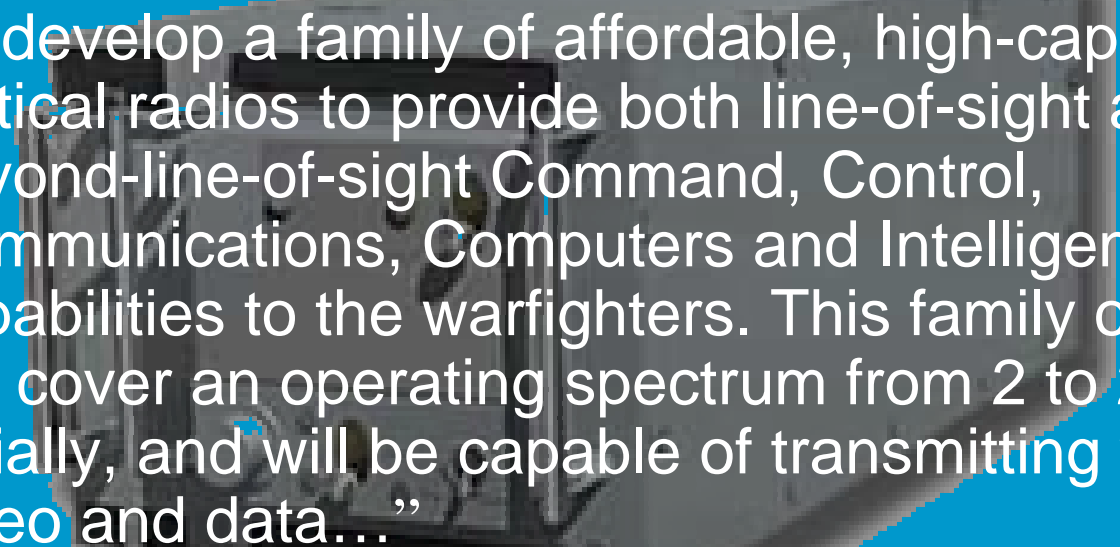
Commercial Industry View

- Large handset volumes attracting new companies
 - Consumer product companies need shorter TTM, higher customer satisfaction and inventory protection
 - Desire new revenue models
- Forecasts move from single-mode to multi-mode
 - Some predict 80% multi-mode sales by 2002
- Internet models in wireless world
 - Downloadable features/capabilities
 - Any node
 - Any system/server
 - Free flow of information
 - Smart people create new value
 - Quicker evolution
- Adaptability to multiple standards
 - The best standard / feature wins based on customer value



<http://www.sdrforum.org>

US Military View: the Joint Tactical Radio System (JTRS)

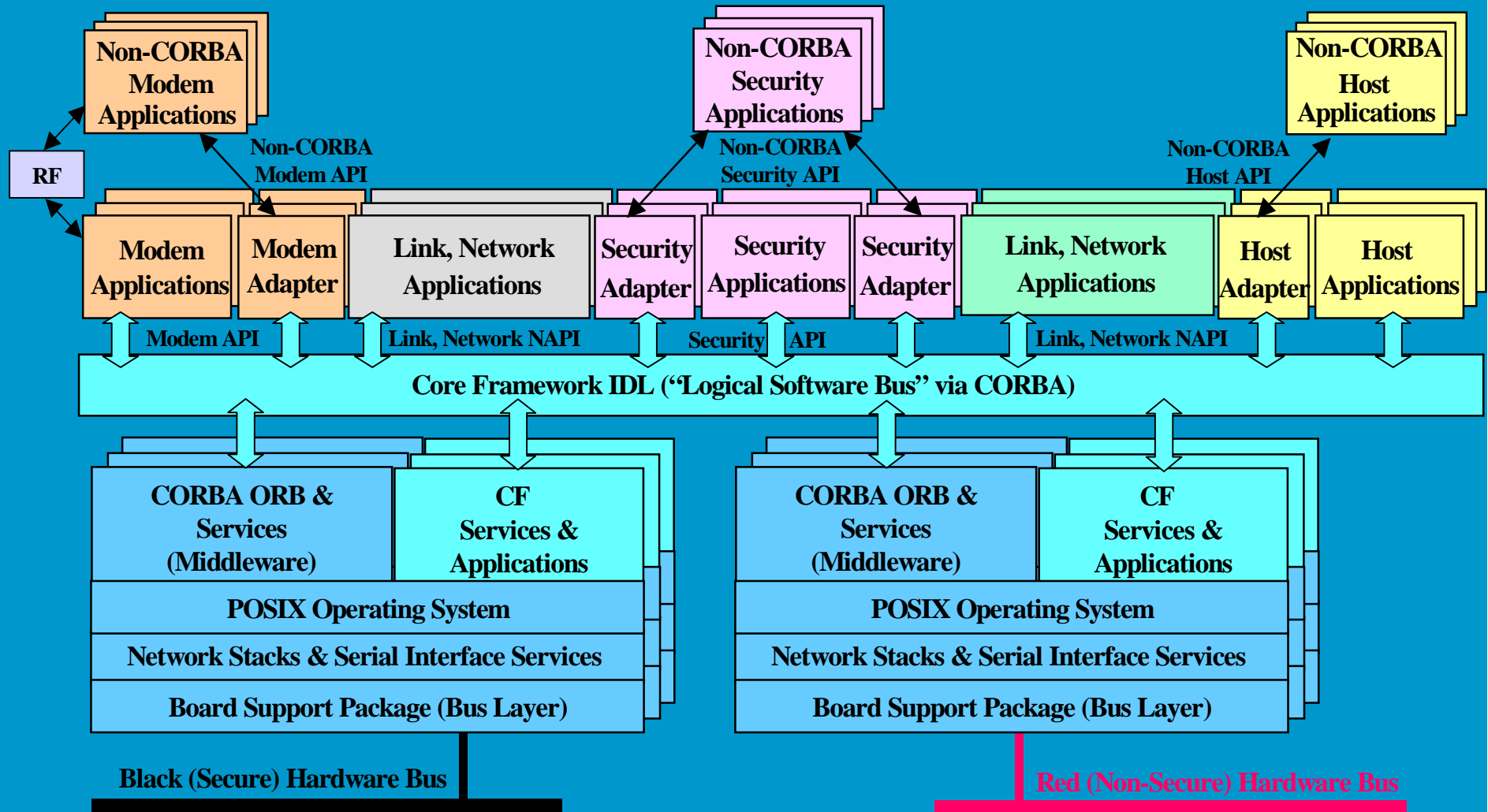
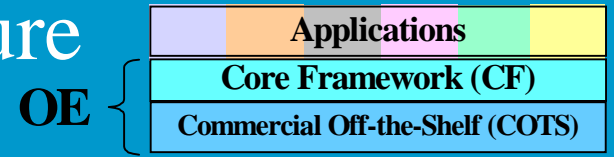


“...to develop a family of affordable, high-capacity tactical radios to provide both line-of-sight and beyond-line-of-sight Command, Control, Communications, Computers and Intelligence (C4I) capabilities to the warfighters. This family of radios will cover an operating spectrum from 2 to 2000 MHz initially, and will be capable of transmitting voice, video and data...”

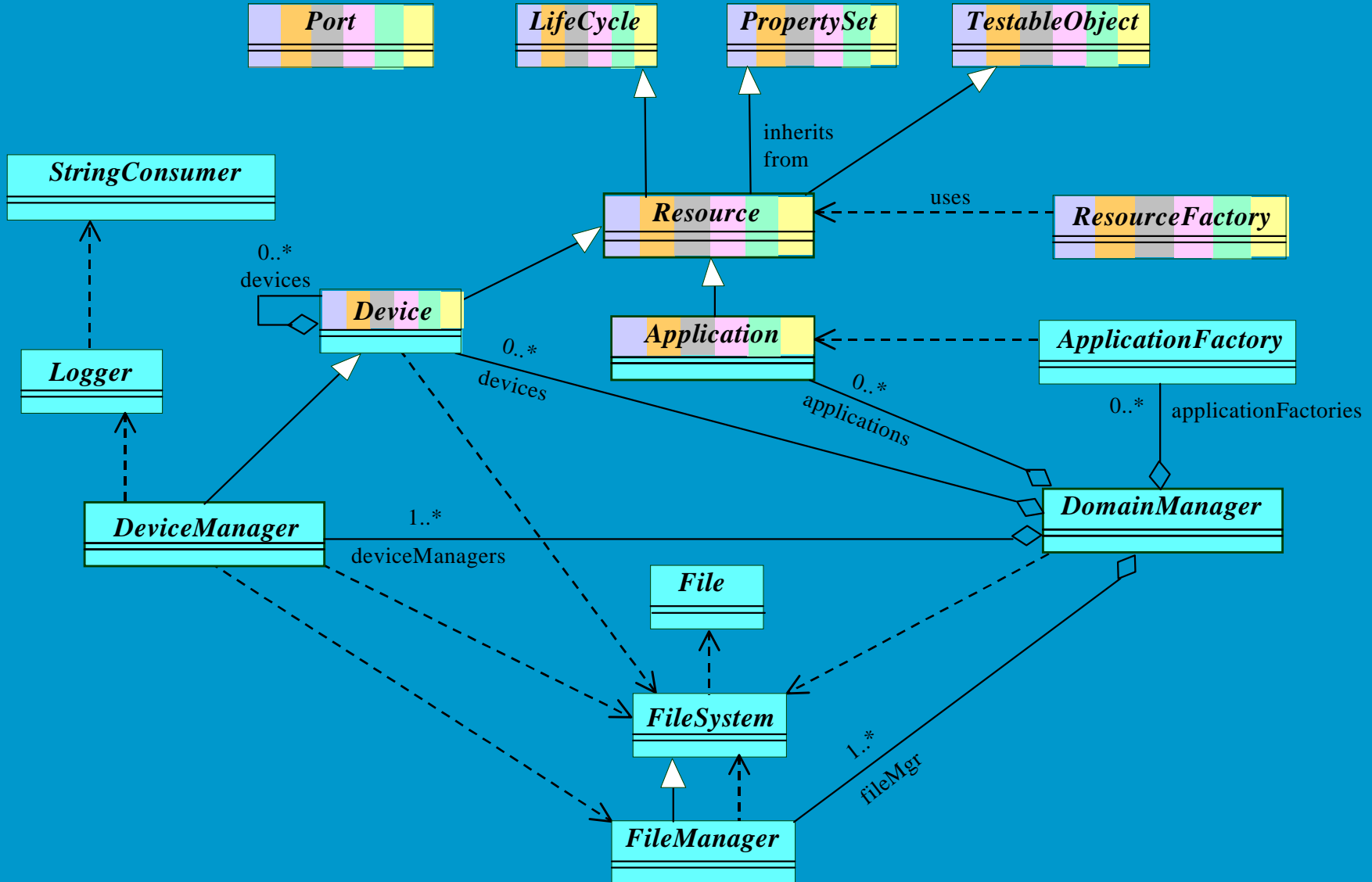
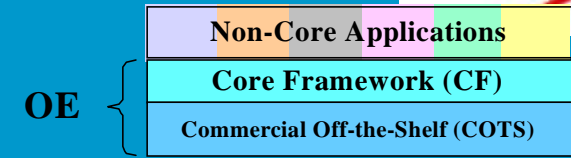
JTRS Program Requirements

- Common Open Architecture
 - Embedded implementations or instantiations
- Multiple Domains
- Multiple Bands, Multiple Modes
- Compatibility with Legacy Systems
 - Real-time performance (deterministic latency) is often required
- Technology Insertion
- Security
- Networking
- Software Re-use / Common Waveform Software

The SDRF/JTRS Software Communications Architecture



A Detailed View of the Core Framework

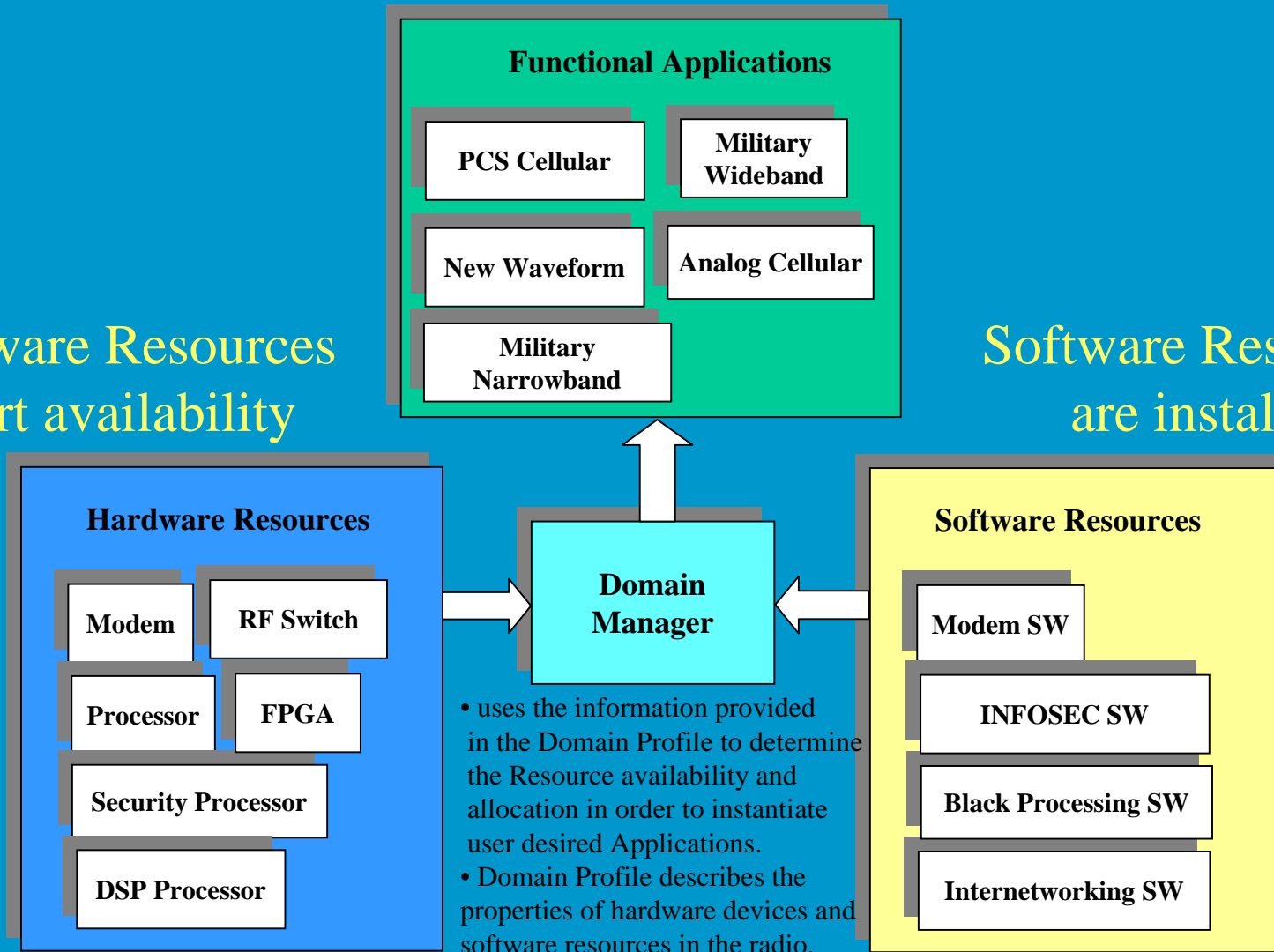


Domain Manager

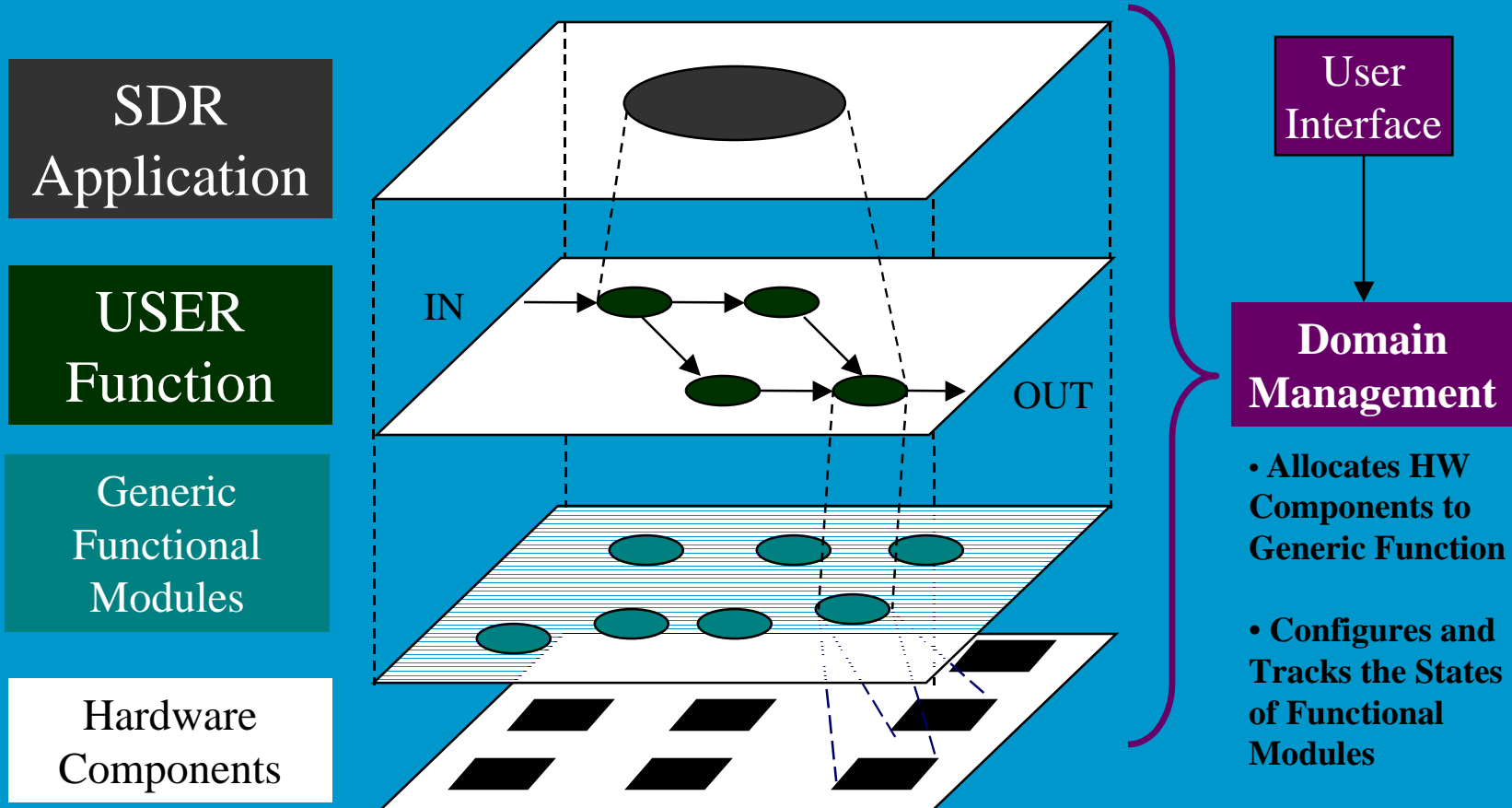
Applications are Created

Hardware Resources
report availability

Software Resources
are installed



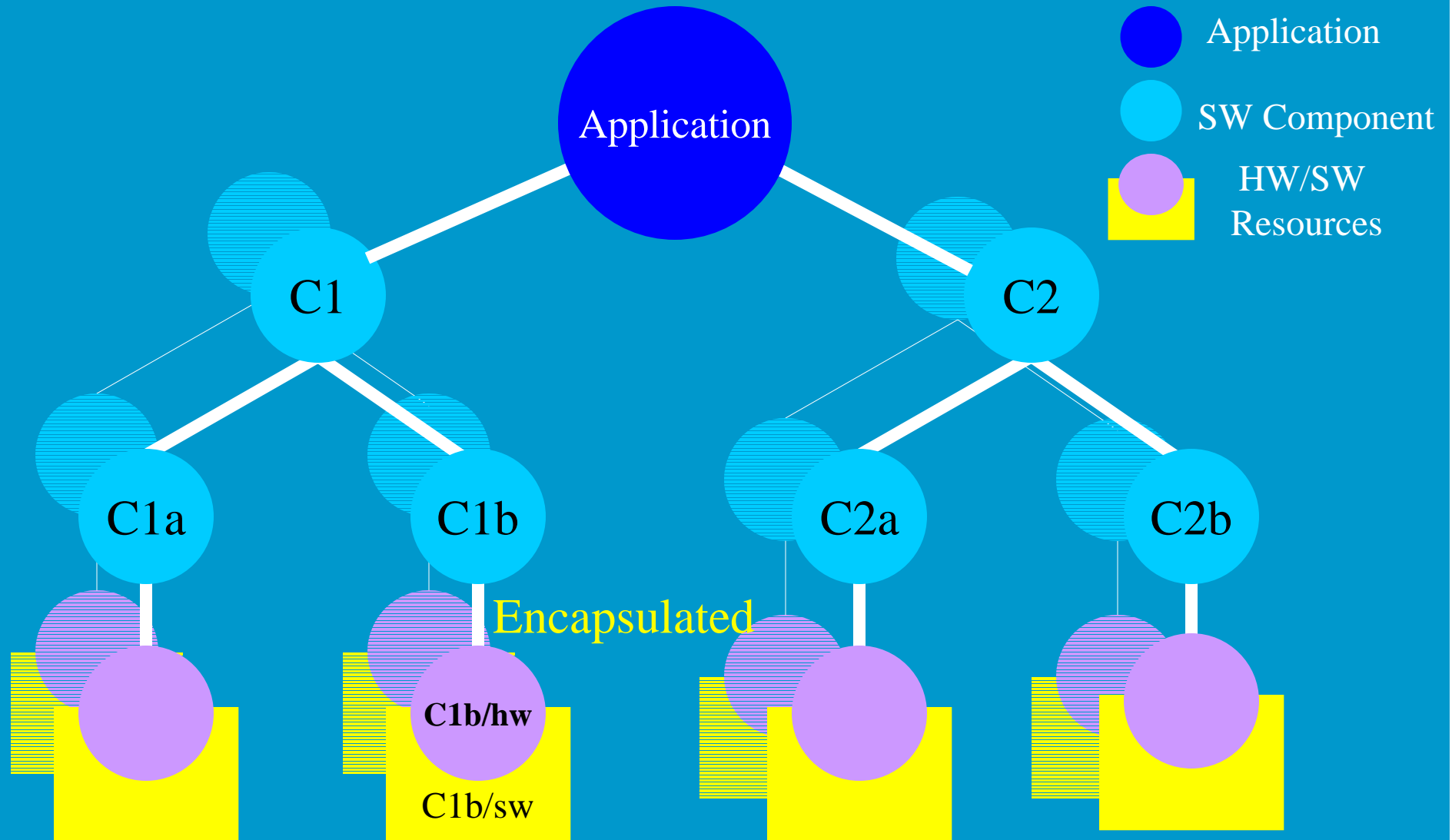
Application Development



Domain Profile

- Sometimes discussed as a *script, repository, knowledge base, configuration file, etc.* the Domain Profile has certain requirements for its contents.
 - Contains information about the Hardware Components in the system, including capabilities, unique qualities, and information regarding their use with applications.
 - Contains information about the Software Components installed in the system, including software version, location, capability provided, and any Resource requirements of the Software
 - Contains information necessary to Startup, Manage, and Control a user Application. The Application definition is the highest level Software Resource in the system.

Domain Profile Representation



Domain Profile

Requirements:

- Industry standard mechanism for documentation of Domain Profile
- Prefer Readability and Clarity
- Supports Object-Oriented Technology and Component based Architecture
- Extendable to support additional migration of capabilities
- Configuration Management Tool

XML meets the basics:

- XML is an industry standard
 - XML 1.0 is documented and supported
 - OMG has endorsed XML as a standard
- Readability & Clarity - a version of HTML.
- Supports OO Technology
 - XML is designed for component technology, structured storage of information
- eXtensible Markup Language (XML 1.0)
 - Designed for extendibility; Flexible Meta-Data, Name-Value Pair capabilities
- Configuration Management
 - Supports a Standard Mechanism for documenting important features of the Architectural Components
 - Supports CM Tasks necessary for definition of SDR Specific Standards

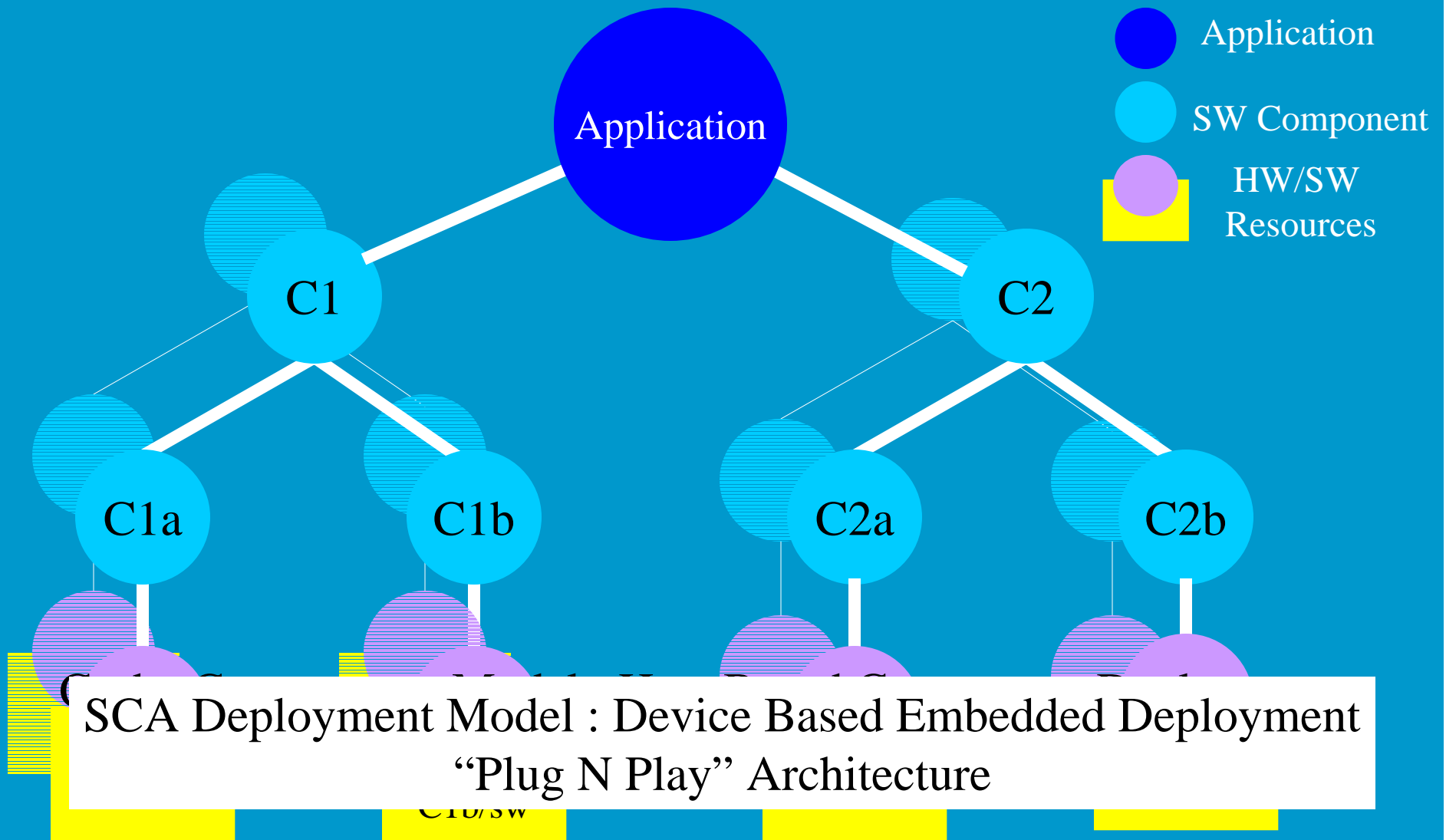
What is the SCA Deployment Architecture

- Based on CORBA Components Specification for Deployment of Components.
- Principals of Software Deployment using XML-based information delivered about modules.

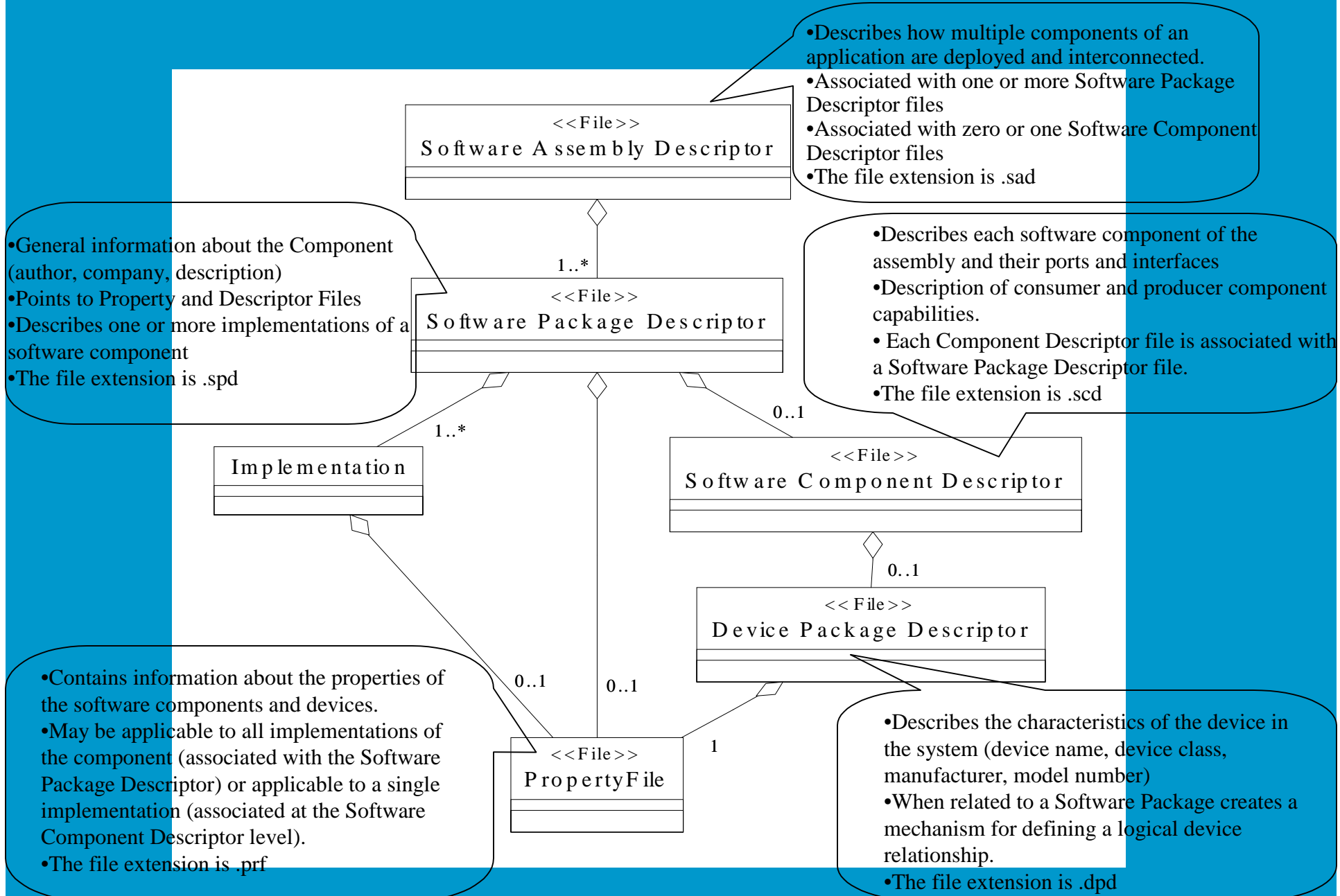
Variations from CORBA Components Model

- Device Deployment
- Dependency Relationship are described between Software and Hardware
- Run-time environment limitations based on real-time CORBA environment.

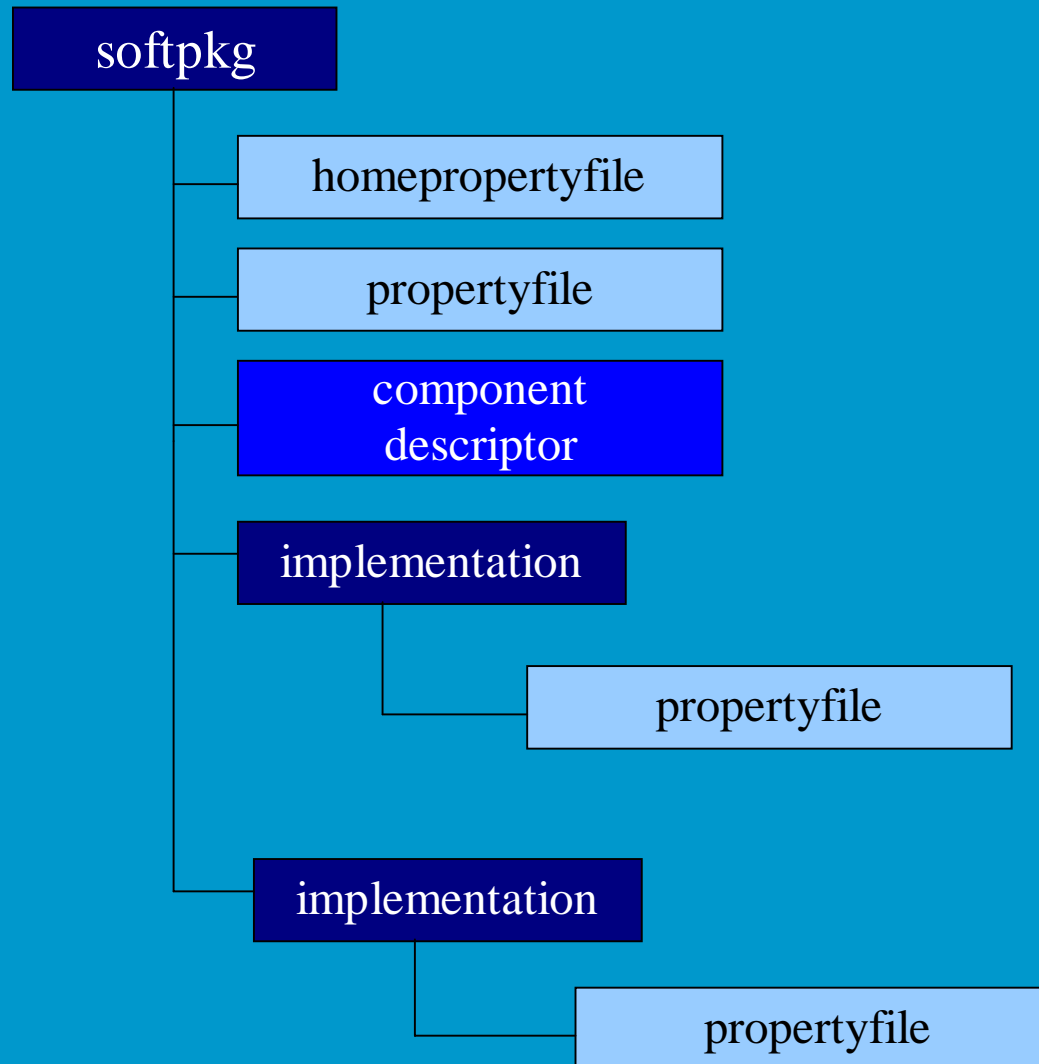
SCA Deployment vs CORBA Components



SCA Deployment Architecture



Software Package Deployment



Backup

Common Open Architecture

- One architecture applicable to all users communications requirements, utilizing open system architecture to the maximum extent possible

Multiple Domains

- Airborne
 - Fixed Wing
 - Rotary
 - Unmanned
- Maritime/Fixed Station
- Ground Forces
 - Handheld
 - Dismounted Soldier
 - Vehicular

Multiple Bands, Multiple Modes

- A single architecture that is able to accommodate multiple frequency bands of operation, multiple waveforms modes of operation.
- Accommodated in a single unit if required. Changes can be made on the fly.

Compatibility with Legacy Systems

- Thus far - all existing legacy waveforms and accommodates those yet defined.

Technology Insertion

- Able to insert the latest in technology developments easily or with minimal change

Security

- Meet security requirements based on waveforms.

Networking

- Provide networking functionality, thus enabling connection of JTRS units in a network or network of networks.

Software Re-use / Common Waveform Software

- Enable applications to be written once and used in numerous instantiations of the architecture.
- Also allow common software modules (say an FEC) to be used in numerous instantiations.

XML Resources

- Web Support for XML
 - <http://www.w3.org> (World Wide Web Consortium)
 - <http://www.omg.org> (see XML Resource Page)
 - XML is specified as part of the CORBA Component Model
 - <http://www.developers.com> (see XML)
 - <http://msdn.microsoft.com> (see XML Library Resources)

Conclusion on DP & XML

- XML Offers an excellent solution to the critical question of how to standardize the information stored in the Core Framework Domain Profile to provide the Domain Management Component the necessary information about the System Hardware, Software, and Applications.
- Suggested Action : Domain Profile Working Group begin specification of detailed requirements for SDR XML (SXML) standard