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Supporting SCA Applications in a Lightweight CCM Environment

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The Ultimate Performance Machine

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SCA Evolution

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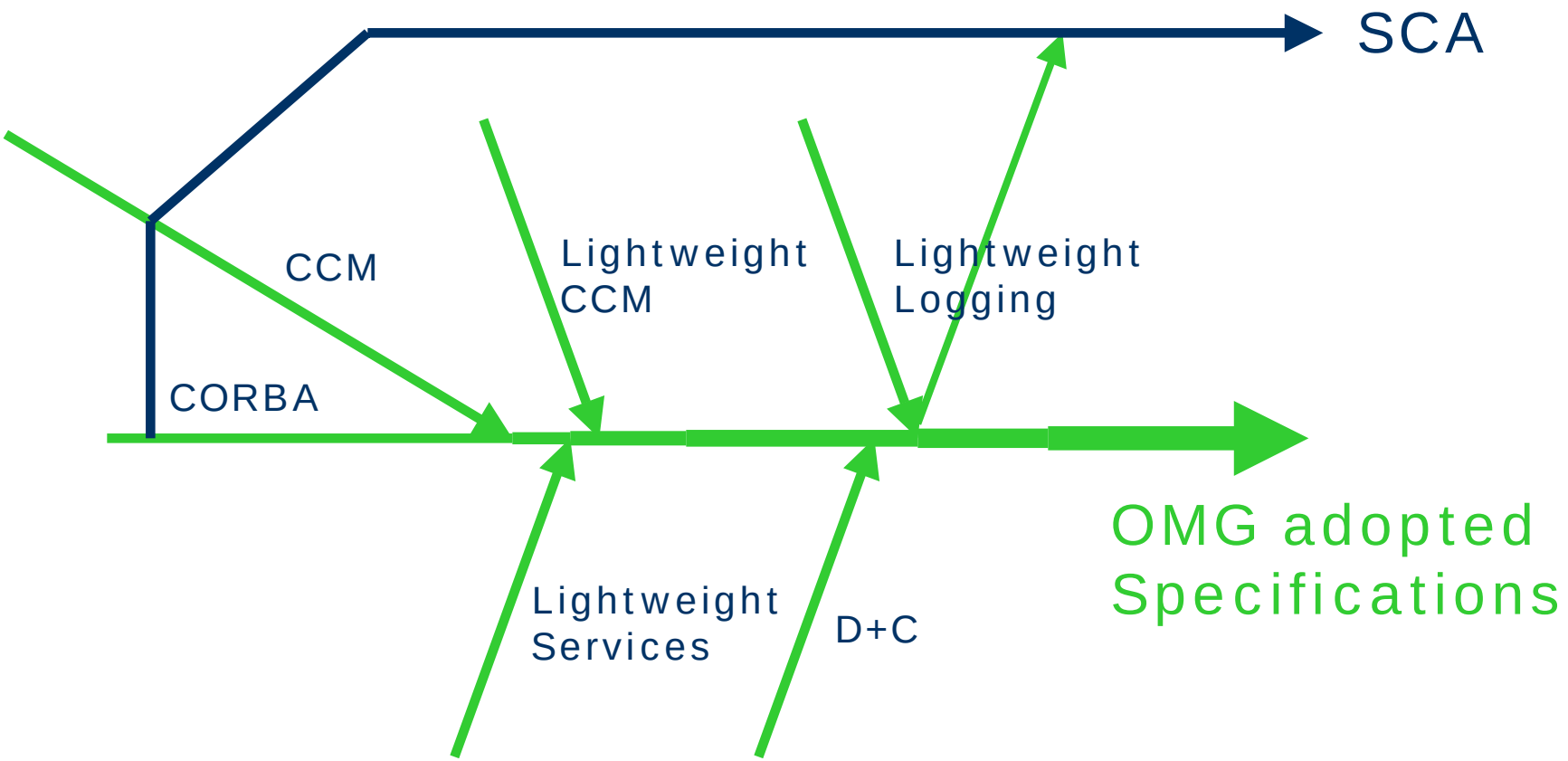
SCA History

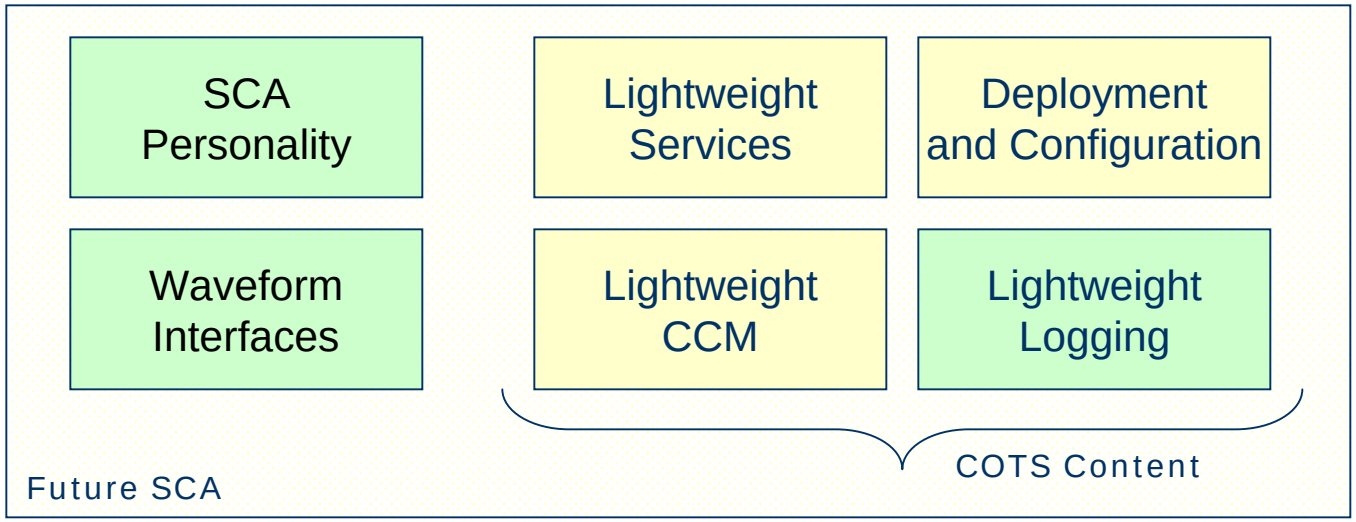
- SCA pioneered component-based development in embedded systems
  - Branched from CCM during finalization
  - Added important concepts of its own
- OMG specifications are catching up, exceeding SCA functionality
  - Lightweight CCM, Streams for CCM, Light-weight Log, Lightweight Services, D+C
- Combine OMG and JTRS efforts in component-based embedded system development

SCA, OMG Timeline

- **Leverage OMG standardization efforts**



COTS SCA



- Leverage existing specifications
- Increase COTS Content in SCA
  - Commercial, not DOD or SDR specific
- Focus on Software Radio domain-specific aspects

SCA Evolution

- **Future SCA Assumptions:**
  - **SCA Resources become CCM Components**
    - **Commercially available Component Model**
    - **Make use of future extensions, e.g., Streams for CCM**
  - **Use of D+C metadata and infrastructure for the deployment of applications**
    - **More powerful assembly and deployment model**
  - **No changes to Core Framework interfaces**
- **Future SCA Impact:**
  - **Container/Component API changes**
  - **Metadata (SCA Domain Profile) changes**

SCA Evolution Study

- Premise
  - SCA Evolution by embracing commercial standards is beneficial for both JTRS and OMG
- Adressing Evolution Issues
  - Mercury project to study and resolve evolution and migration issues
  - Idea: study migration now, so that it will be feasible and not troublesome later
  - Resulted in whitepapers and this presentation

SCA Evolution Issues

- Investments into SCA-based infrastructure must be protected
  - Core Framework implementations
  - Applications (Waveforms)
  - Clients (HCIs)
  - Devices
- Application and HCI investments most critical
  - Limited set of “off the shelf” Core Framework implementations and Devices

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Migrating Waveforms

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Migrating Waveforms

- **Goal:**
  - Run existing SCA waveforms, unmodified, in a (Lightweight) CCM- and D+C-based environment
- **Approach:**
  - Automatic transformation of application metadata, so that application can be deployed by COTS (not SCA or SDR specific) D+C based infrastructure
  - Automatic generation of implementation wrappers, so that resources can be executed as components in a CCM Container

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Application Metadata Transformation

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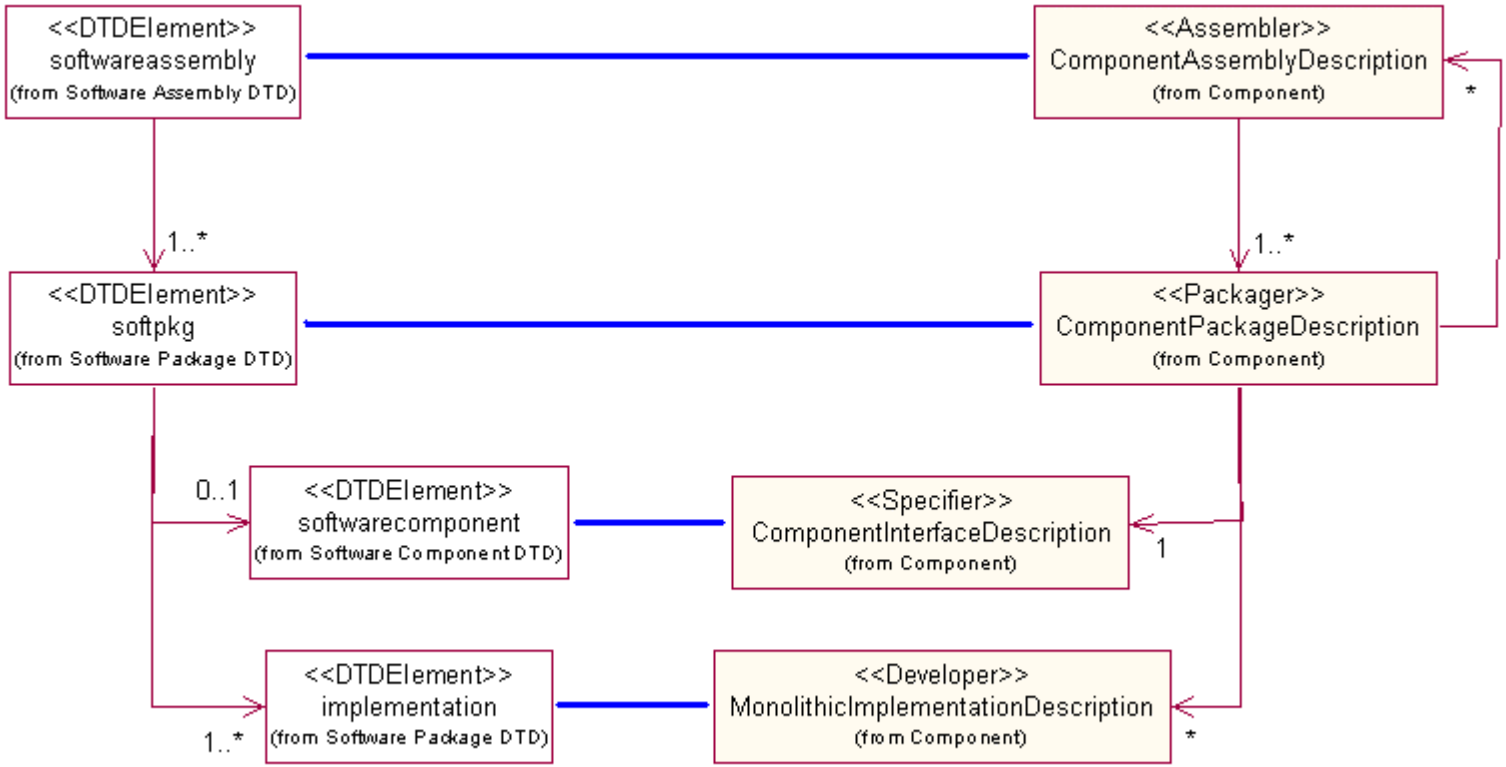
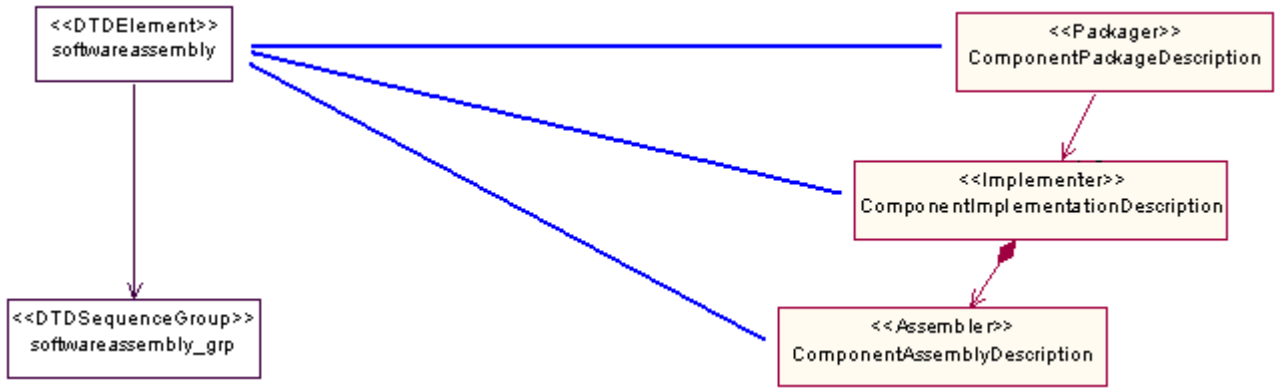
Metadata Transformation



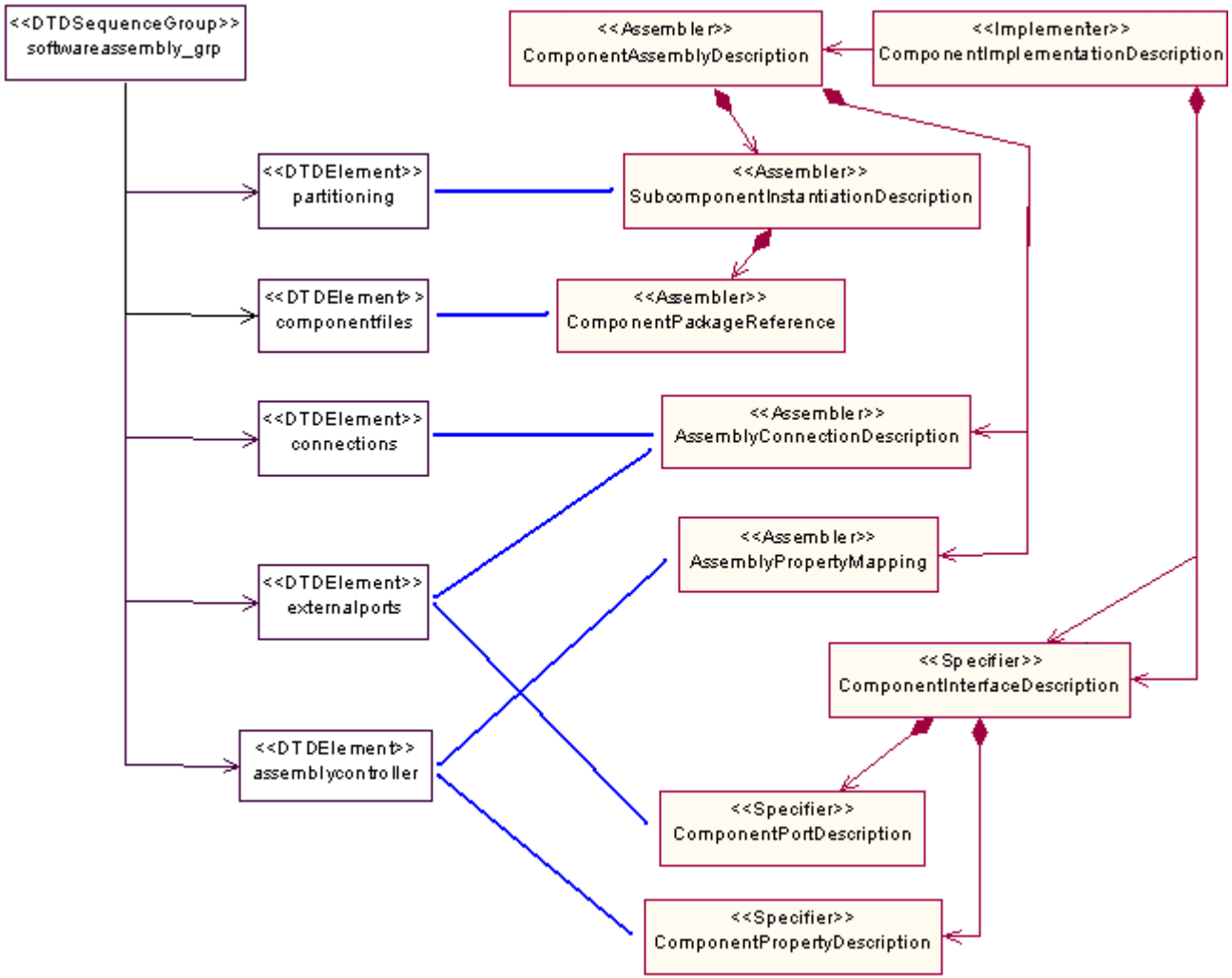
- **Strong correlation between SCA Domain Profile and D+C meta-data**
  - **Transformation is well-defined (by design)**

Assembly Metadata



- SCA Software Assembly Descriptor is transformed to a D+C Component Package, containing a single assembly-based implementation

Assembly Metadata Detail



Metadata Comparison

- Mercury whitepaper compared SCA vs. D+C metadata:
  - D+C metadata is superset of SCA
  - In the process, discovered and resolved a few issues
    - E.g., “devicethatloadedthiscomponentref” resolved via a port delegation mechanism
- All SCA application metadata can be converted to D+C application metadata

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Application Implementation Wrappers

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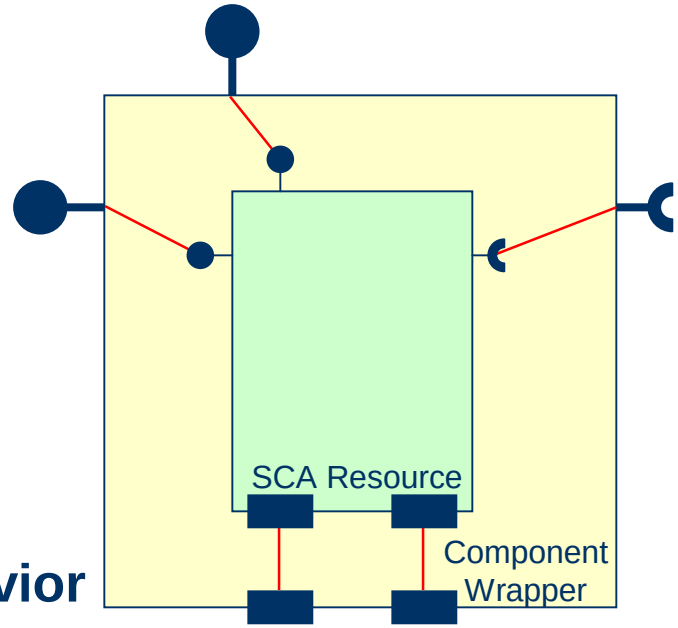
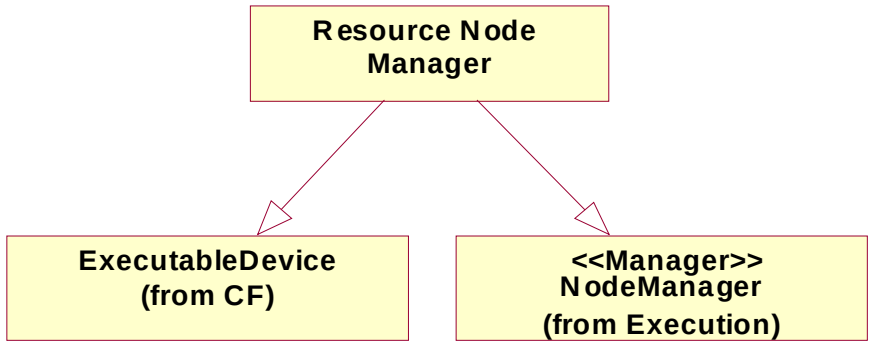
SCA Resource Wrapper

- **Wrap SCA Resources as a CCM Component**
  - So that they can be deployed in a CCM Container
  - Wrapper acts as CCM component, delegating all behavior to Resource implementation



- **No performance impact**
  - Involved in connection setup, not in data transport
- **Can be generated automatically**
  - Using port and property names from Software Component Descriptor (CCD)

“Device” Alternative



- Alternative: “Executable Device” compatible Node Managers
  - SCA Executable Device implementing D+C Node Manager interfaces
  - Capable of running Resources “natively” (in addition to CCM components)
  - Disadvantage: requires modification of many Node Managers, becoming SCA specific

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Summary

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Summary

- Adopting OMG specifications within the SCA has benefits
  - Greater standards base and implementation choice
  - More powerful assembly and deployment model
  - Combined efforts for future evolution of component-based development
  - Make SCA software radio specific -- no need to define a generic infrastructure
- Migration issues can be overcome
  - SCA Applications can be migrated to D+C using a one-time, automated process