Institute for Software Integrated Systems

Vanderbilt University

Provisioning Resources in DRE Systems with Lightweight CCM

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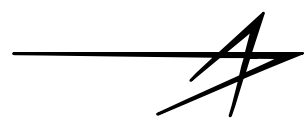
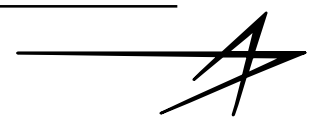


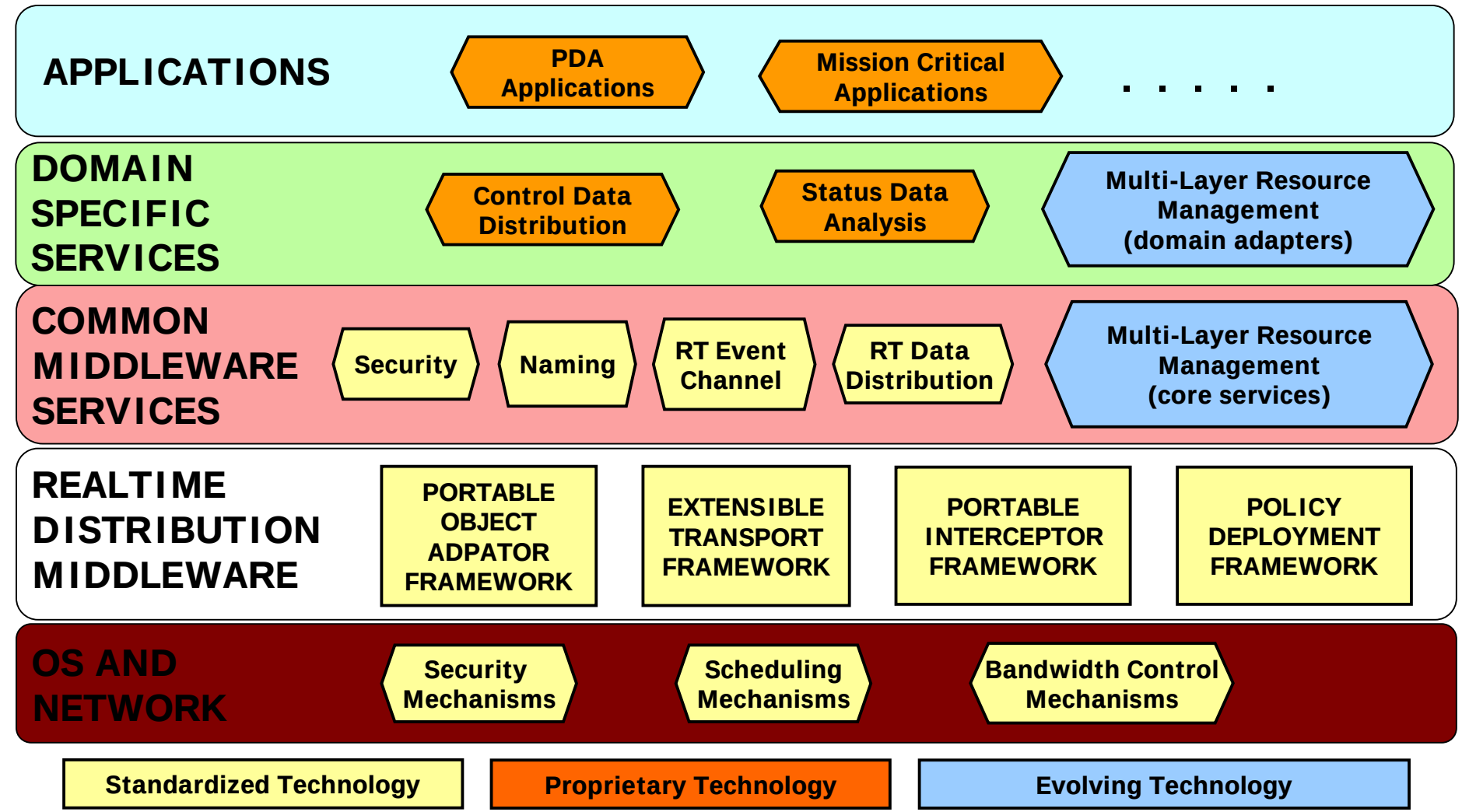
Motivation

Resource Manager with the following desired properties:

- Distributed
- Multi-Layered
- Modular
- Reusable elements
- Tracks latest lightweight CCM (LWCCM) specifications
  - Specs in flux
  - Special Distributed Resource Manager needs
    - Multi-Dimensional QoS requirements
    - Non-component applications
- Short step to full CCM compliance when
  - Full D+C implementation is available
  - DRE-related QoS property management is integrated

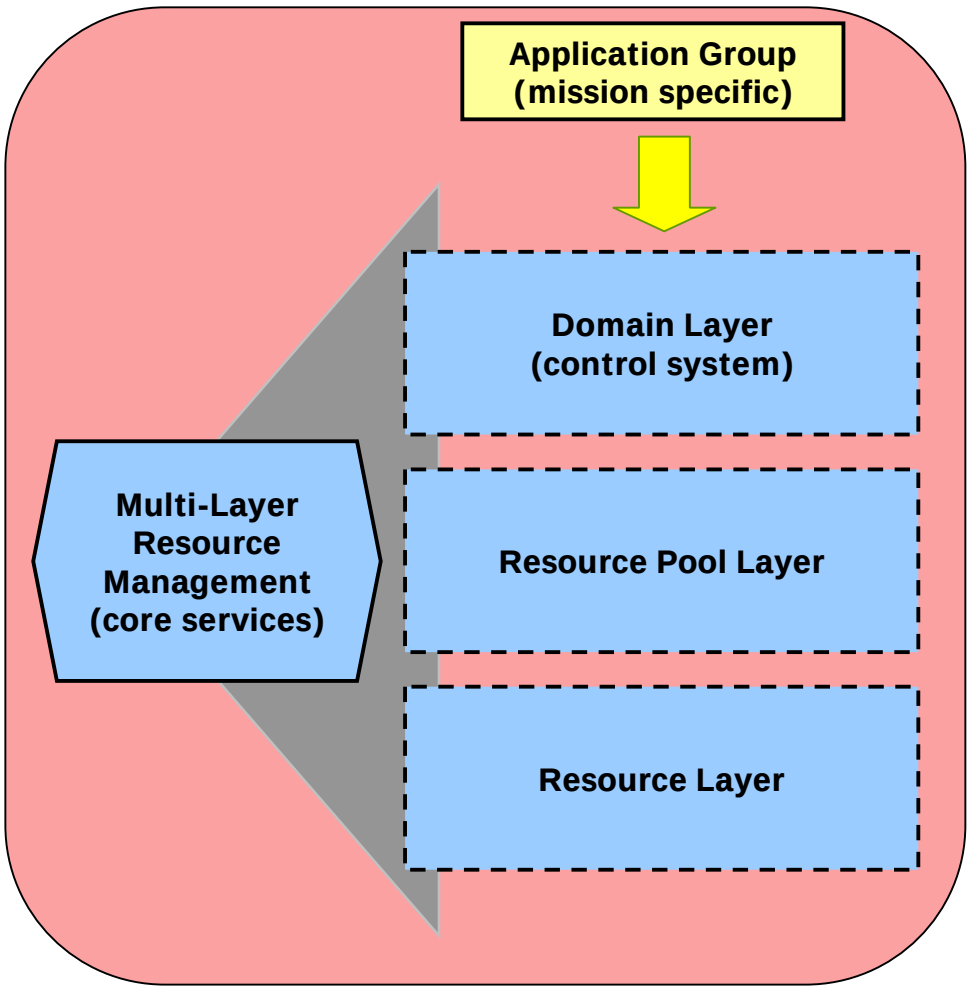


Distributed Resource Manager (DRM) in Context



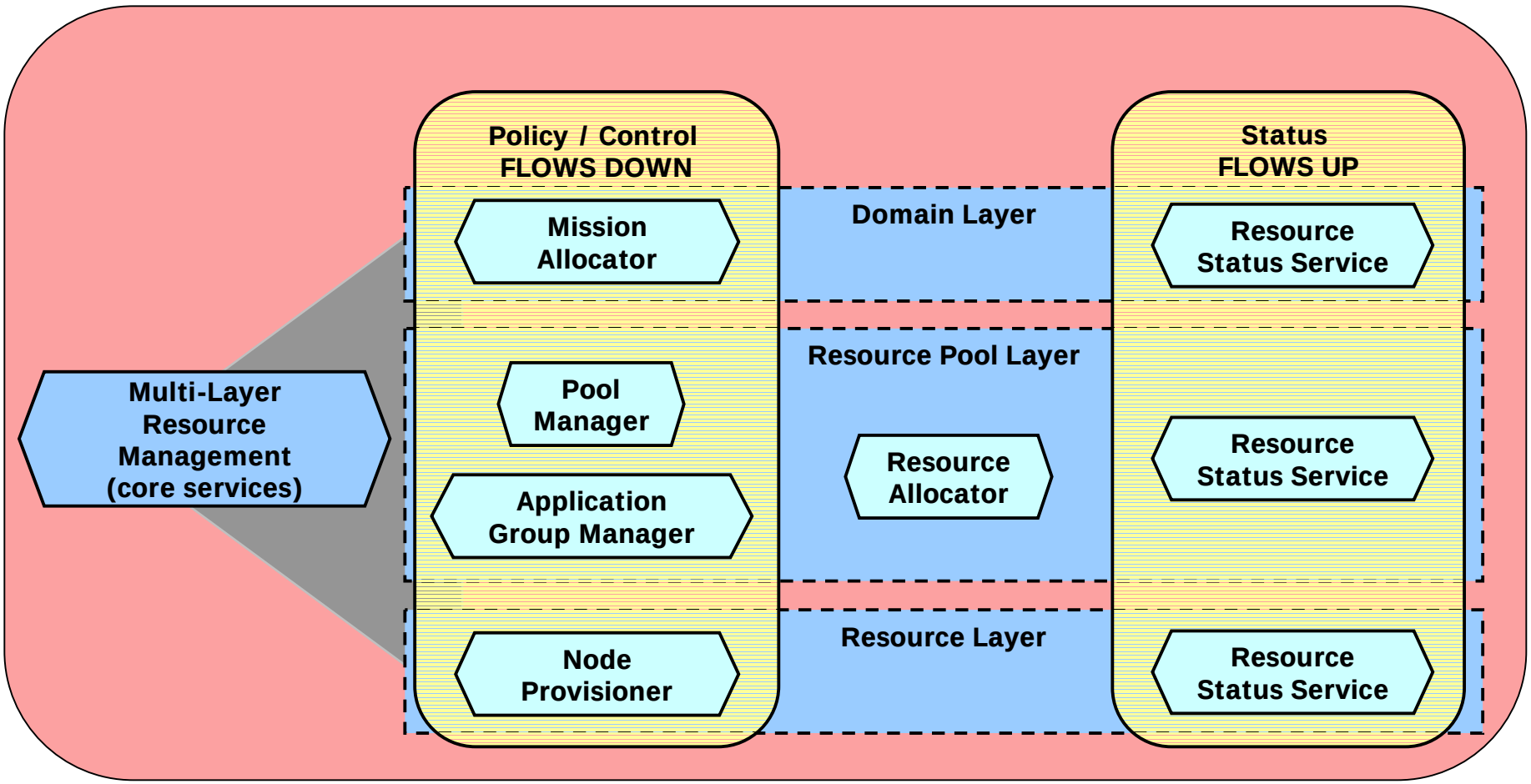
BBN TECHNOLOGIES

Distributed Resource Manager Overview (1 of 2)

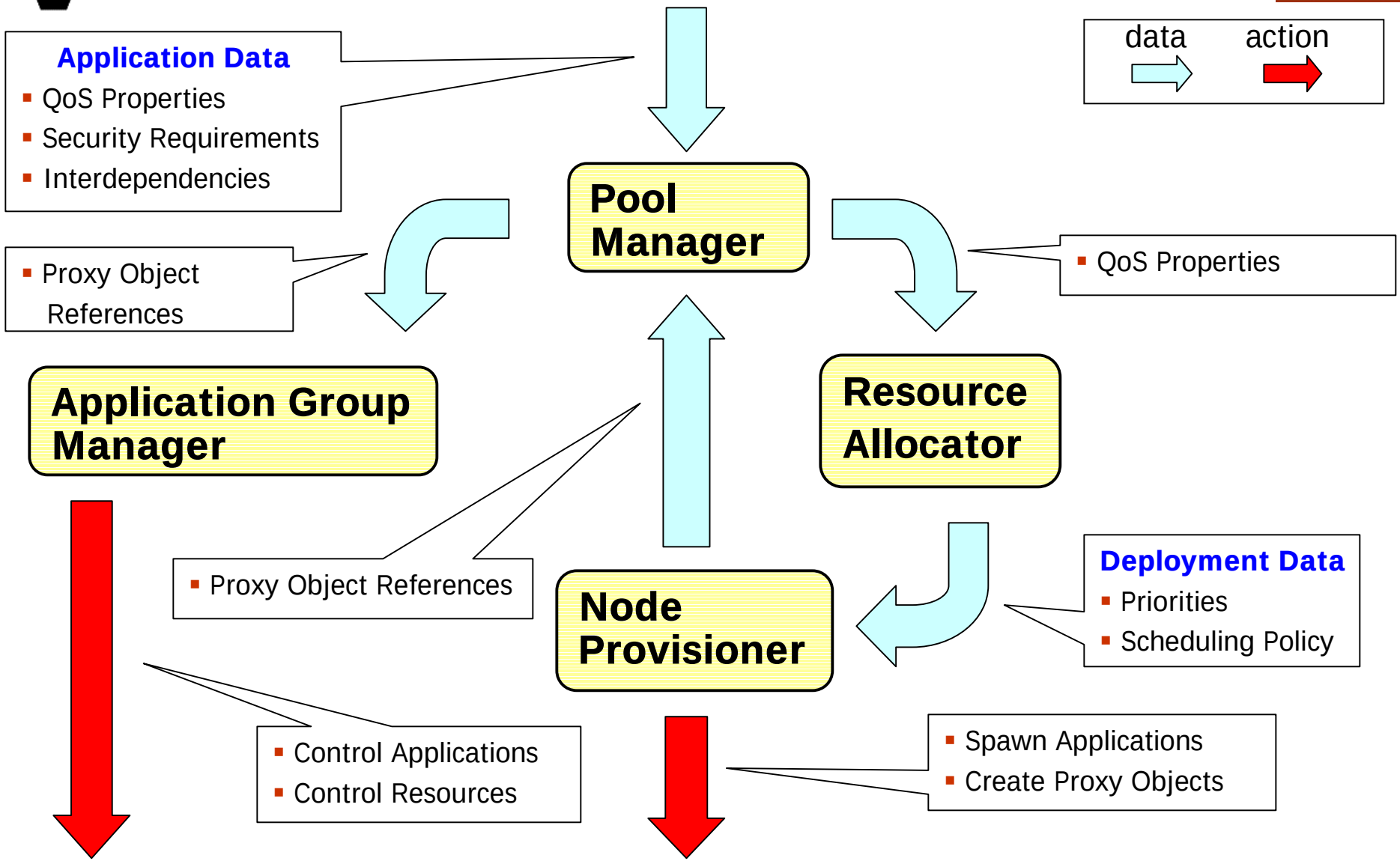


- Domain Layer (Top Level)
  - Control flows down
  - Status info flows up
- Resource Pool Layer – Resources grouped by
  - Physical Location
  - Security Considerations
  - Application Group
- Application Group – Apps grouped by QoS properties
  - End-to-end deadline
  - Publish/Subscribe
  - Task Type
- Resource Layer
  - Node – host/hardware
  - Application - executable

Distributed Resource Manager Overview (2 of 2)



Node Provisioner in Action



Comparisons with LWCCM (1 of 2)

DRM	Semantics	Equiv. LWCCM
Pool Manager	▪ Uses ***Resource Allocator*** to arrive at allocation decisions. ▪ Exposes a transactional type interface to higher layers. ▪ Uses ***Resource Status Service*** to gather dynamic resource utilization.	TargetManager + ExecutionManager
Resource Allocator	▪ Encapsulates different algorithms for allocating applications across various nodes.	TargetManager + ExecutionManager
Resource Status Service	▪ Gathers dynamic resource usage using a data model which is unique. ▪ Node level heart beat mechanism.	TargetManager + ExecutionManager

Comparisons with LWCCM (2 of 2)

DRM	Semantics	Equiv. LWCCM
Application Group Manager	▪ Based on QoS properties and resource availability decides on pools where the application group splits across. ▪ Can control resource usage of applications to add more applications to pools in its control.	No equivalent
Node Provisioner	Spawn Applications	NodeManager + NodeApplication-Manager

Conclusions

- LWCCM provides a number of capabilities for managing component resources.
  - New D+C spec is the focus of improvement.
  - Evolving as implementors relay lessons learned.
- LWCCM abstractions could be extended or refined to deal with
  - Mission-critical QoS properties.
  - Dynamic resource & application management.
- Distributed Resource Manager's abstractions are useful for a wide range of DRE systems.

Updated Slides

http://dre.vanderbilt.edu/~parsons/ppt/DRM_NodeProvisioner.ppt