

Polymorphous Computing Architectures

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DARPA/DARPA



Problem

- **Current computational architectures in high performance applications require unique digital signal processing and stream processing hardware designs. Development costs, maintenance and system production are driven by the uniqueness of the components and the programming effort to create the system application.**

Background

- **Current DOD embedded information computing systems can be characterized as fixed in nature, relying on hardware driven heterogeneous point-solutions that represent fixed architectures and software optimizations.**
- **A unique processing design for each specific mission's sensor configuration can not be afforded due to the cost that such an approach requires in the multiplicity of platforms and the inability to accurately define and predict mission variations prior to deployment.**

Objective

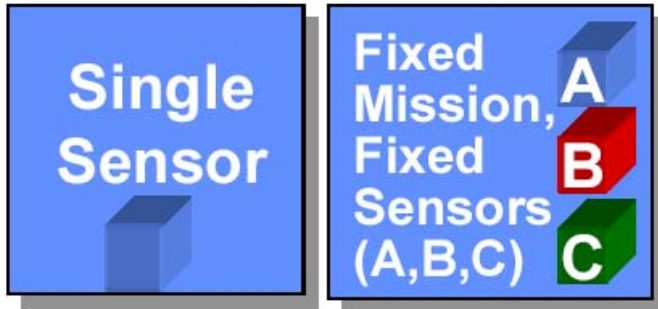
- **Span a broad dynamic application space by implementing a transparent reactive layer between the application program and the malleable micro-architecture elements.**
- **A polymorphic layer will enable software and hardware to be developed in a cooperative constraint sensitive environment instead of in a failure prone hardware first and software last paradigm.**
- **The resulting embedded computing systems will enable optimization across a broad range of applications and possess the ability to react to dynamic mission requirements.**

Activities

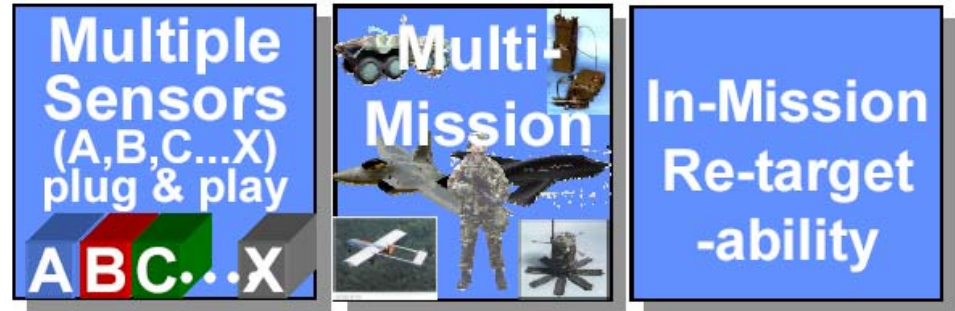
- Provide identification of opportunities to exploit PCA capabilities in the C4ISR domain.
- Expose PCA system requirements to the research community.
- Explore hardware and software resource management issue using Quality of Service (QoS) metrics.
- Develop a SAR application description and software demonstration.
- Collaborate with the Morphware forum to facilitate future software libraries in support of PCA.

Highlight

Have

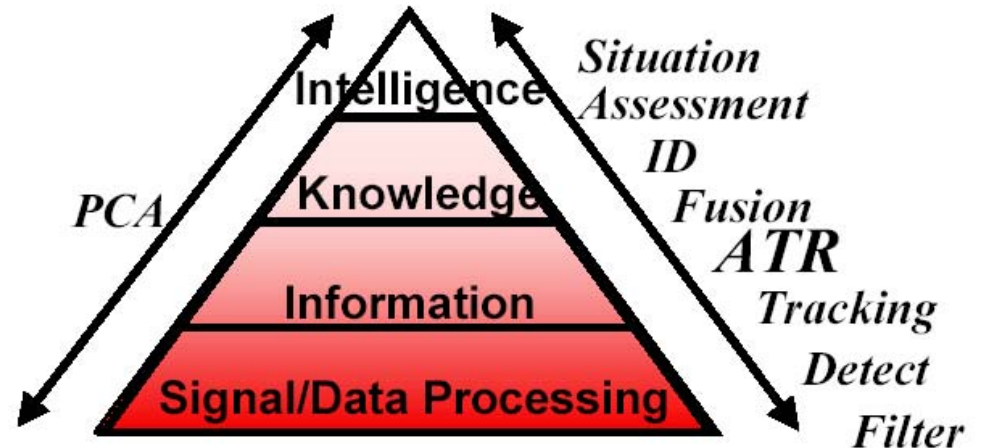
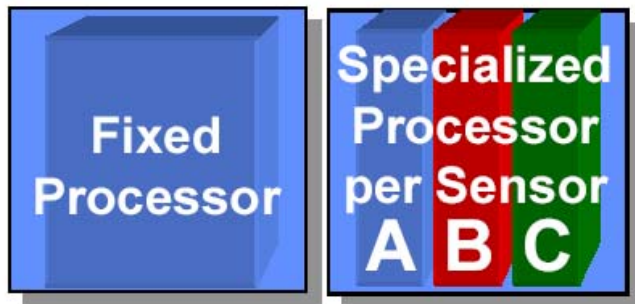


Could Have

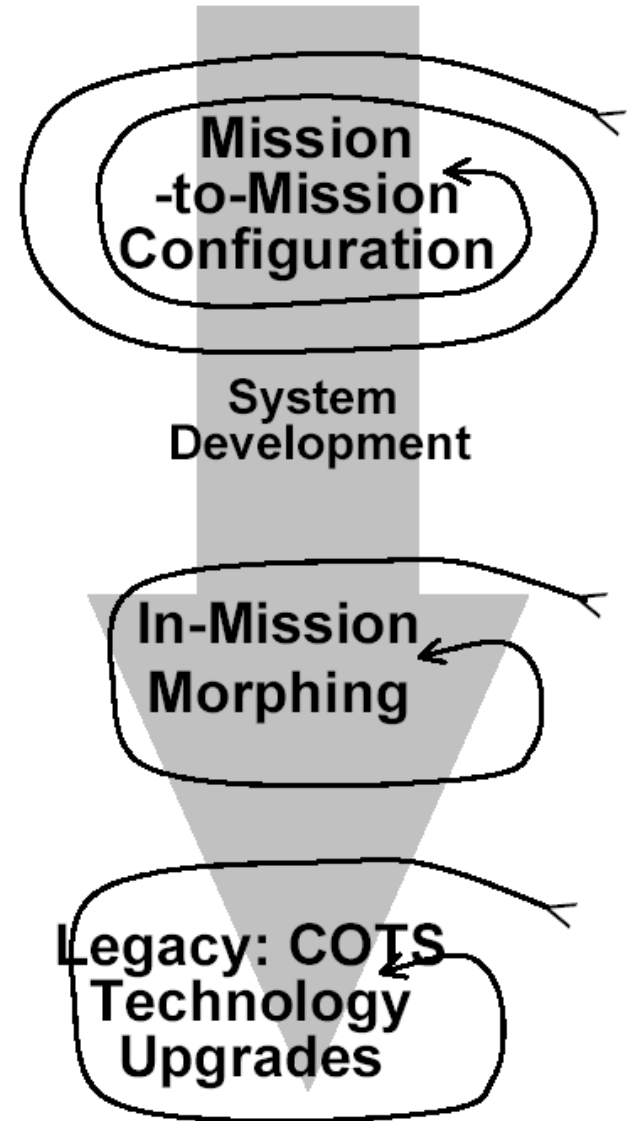
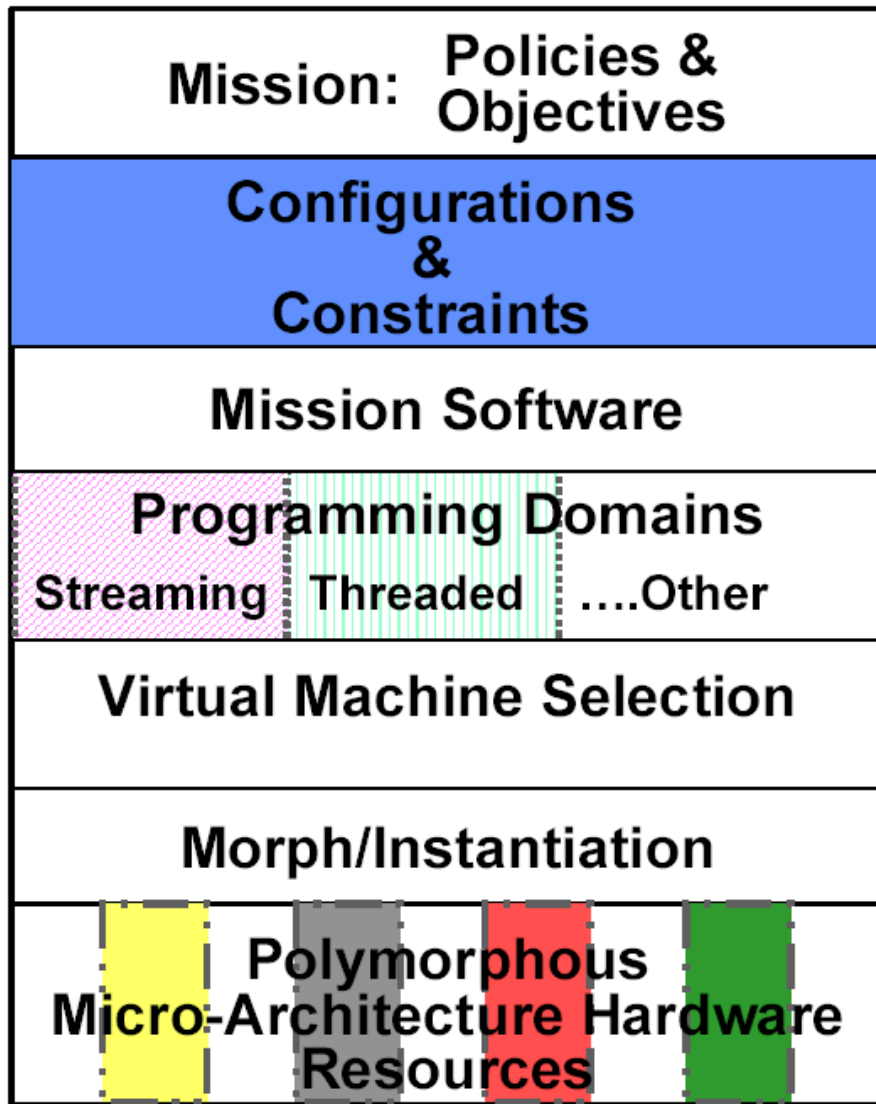


BOUNDED MISSION CAPABILITY

DYNAMIC MISSION CAPABILITY



Highlight/Demonstration



Impacts

- **Improved understanding of PCA systems architecture as it relates to defense applications.**
- **PCA community feedback of prototype applications lessons learned to evolve the requirements in software and hardware architecture.**
- **Identify opportunities for future research through improvement in system performance, software development, and architecture issues as they relate to C4ISR target applications.**

Future Plans

- **Prototype PCA based applications.**
- **Demonstration of size, weight, energy, performance and time advantages of PCA designs.**
- **Facilitate defense application technology transition.**
- **PCA application software development**
 - **Portability of existing code**
 - **Resource management**
 - **Development cost and risk**