

GSAW 2000

**Agent-based Support Environment for
Flexible Architectural Analysis of Embedded
Component-based Systems**

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Outline

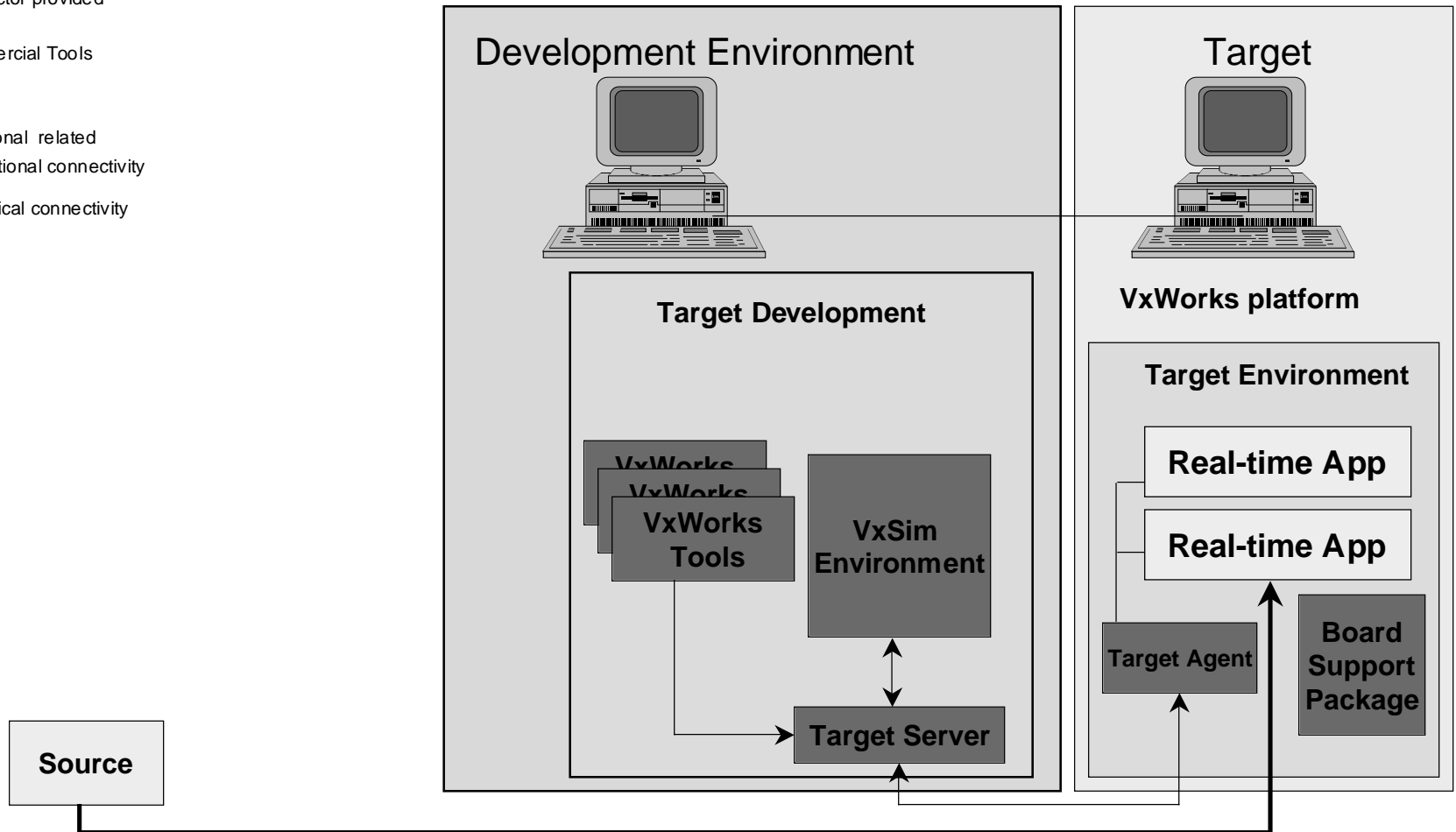
- **Some Trends in Software Architectural Assessment**
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Some Trends in Architectural Assessment Tools

- **Evolving UML-based tools**
 - Highly competitive market (betas every 2-3 months)
 - More complete UML representations
 - Integration with simulation/modeling support
 - Forward engineering support for component-based development environments
 - Embedded, real-time architectural support
- **More sophisticated Reverse engineering**
 - Class and sequence diagram support
 - Performance improvements
- **Improved event analysis**
 - Context events for architectural context
 - Transition events for improved granularity
 - Measured events for system state

Classic Embedded Development

- Contractor provided
- Commercial Tools
- Functional related
- ➔ Functional connectivity
- Physical connectivity



Challenges for Embedded Component-based Systems

- **Ability to easily configure embedded application environment**
 - Often tedious and error-prone
 - Environment often configurable but proprietary and constrained.
 - Custom solutions can be expensive
 - Multiple, disparate analysis tools
- **Ability to dynamically assess execution context information to identify architectural shortfalls early is needed.**
 - How best to study the composability of software components under different reconfigurable scenarios
 - Ability to "on-the-fly" evaluate and manage context-dependent information
- **Trend toward component-based architectures is promising for flexibility but better understanding of how best to dynamically configure them for analysis is needed.**

An Idea!

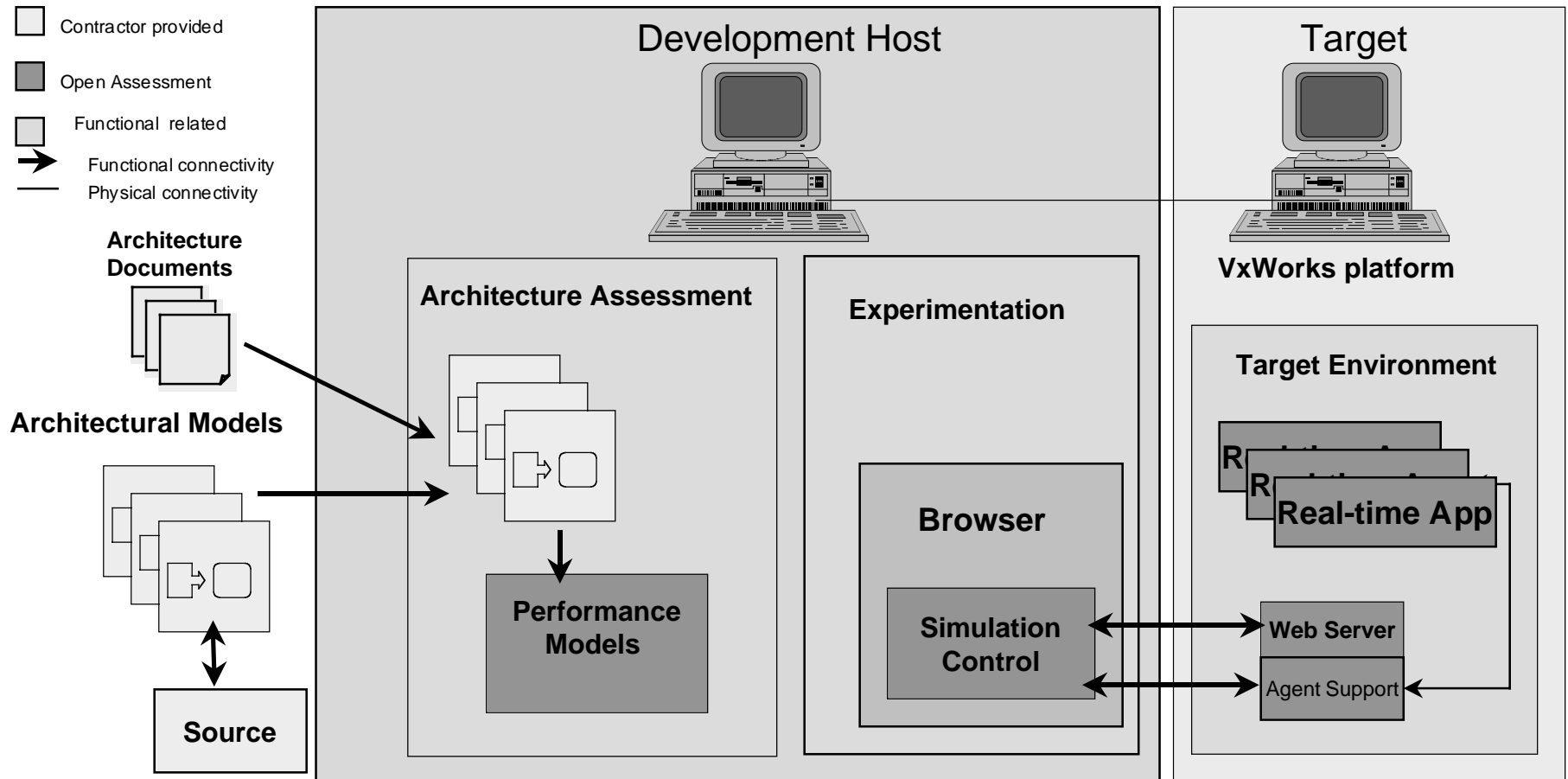
- **Leverage rapid evolution of architectural representation information with performance evaluation**
 - Enabling assessment independent of development methodology
- **Exploit internet technologies to simplify implementation**
 - Application servers of dynamic content
 - Java VM environment (No Java support for direct memory access)
 - Resource description XML metalanguage
 - Active Java activities in embedded environments

Support an architectural assessment environment!

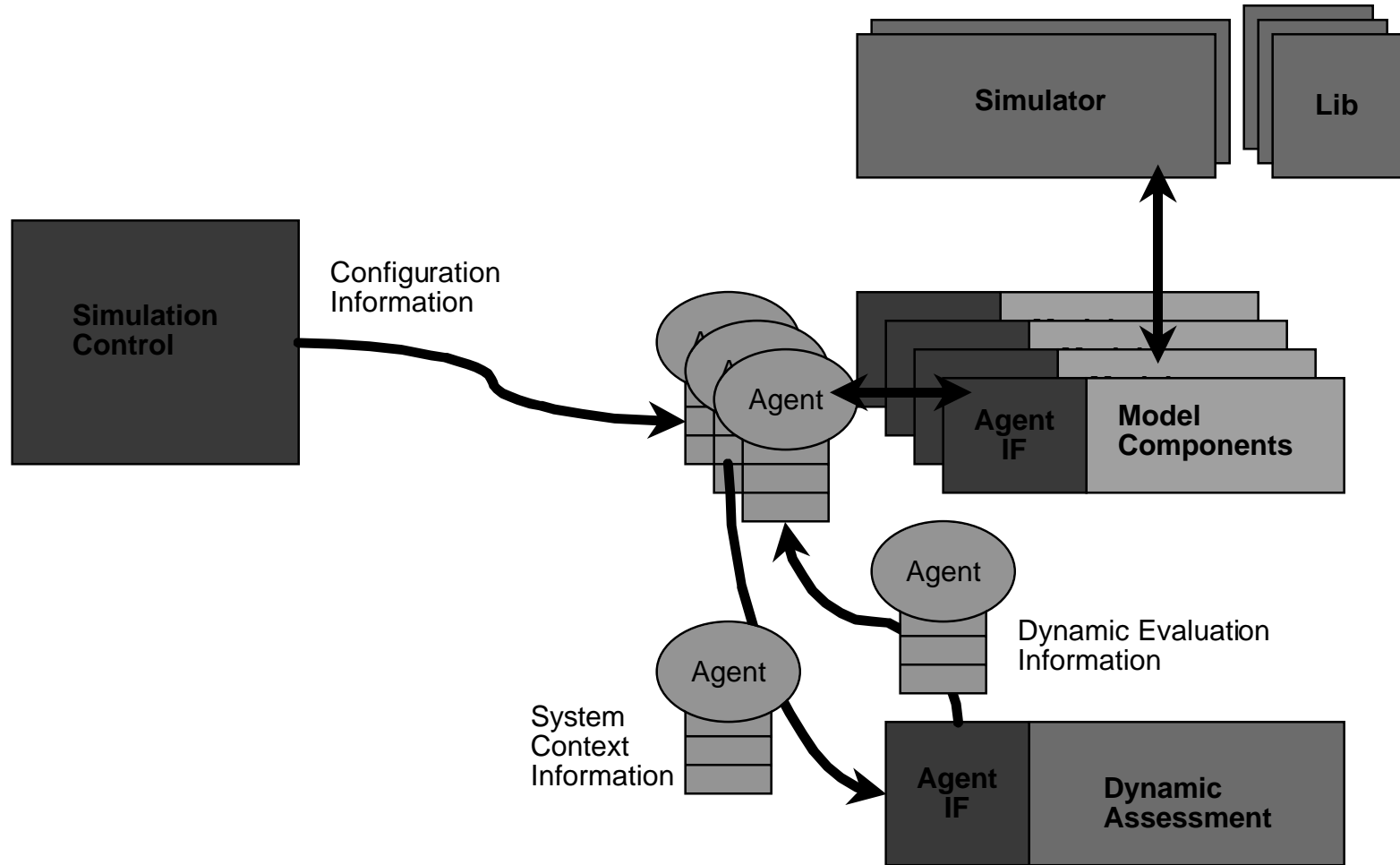
Approach

- **Adopt an embedded web server approach:**
 - Simplified webserver for memory and file constrained environments
 - Java integration with JNI required.
- **Use mobile agents to control, monitor context and configuration**
 - Support environment is developed in Java to exploit powerful language capabilities (Object-serialization, etc.)
- **Advantages:**
 - Standard protocol choices for data exchange:
 - Dynamic HTML, XML for device management,
 - Can leverage recent trend of using JVMs on embedded microprocessors as well as direct-execution Java technology

Architectural Analysis Environment



Agent-based Support Environment for Architectural Assessment



Implications for Future Architecture Design and Development

- **Support for mobile agent integration not difficult in Java**
- **Analysis rides on Java technologies**
 - Object-serialization
 - JNI
 - Interest in RT Java will help experimentation as well
- **Application dependent reconfiguration control interfaces**
 - Something that just works is not good enough

Future Plans

- **Configurable Rule-based context semantics**
- **Integrate the semantic information with dynamic assessment**