Using ASIS for Software Product Assessment

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Problem Context

- What's happening in the software industry?
  - Growing complexity of software
  - Increased importance of software in critical applications
  - Systems of complex systems
- Increased importance of building in quality while maintaining:
  - Performance constraints
  - Continuous service
  - Critical/safety requirements
  - High reliability
  - Low maintenance costs

During development, how can we determine whether quality is being built into the product?

Characteristics of our Assessments

- Large-Scale Software Systems
- Analyses performed throughout the product lifecycle
- Often unique, non-standard analyses

- Limited Access to Developers
- Inconsistent/Incomplete Documentation

- Wide client base; with a variety of compilation platforms
- Development and analysis platforms often are different

Software Product Assessment

- **Approach - Analyze the evolving product to determine software quality information**
- **We have developed analysis applications in three categories:**

Determine adherence to project or industry standards

(e.g., conformance to an exception handling policy)

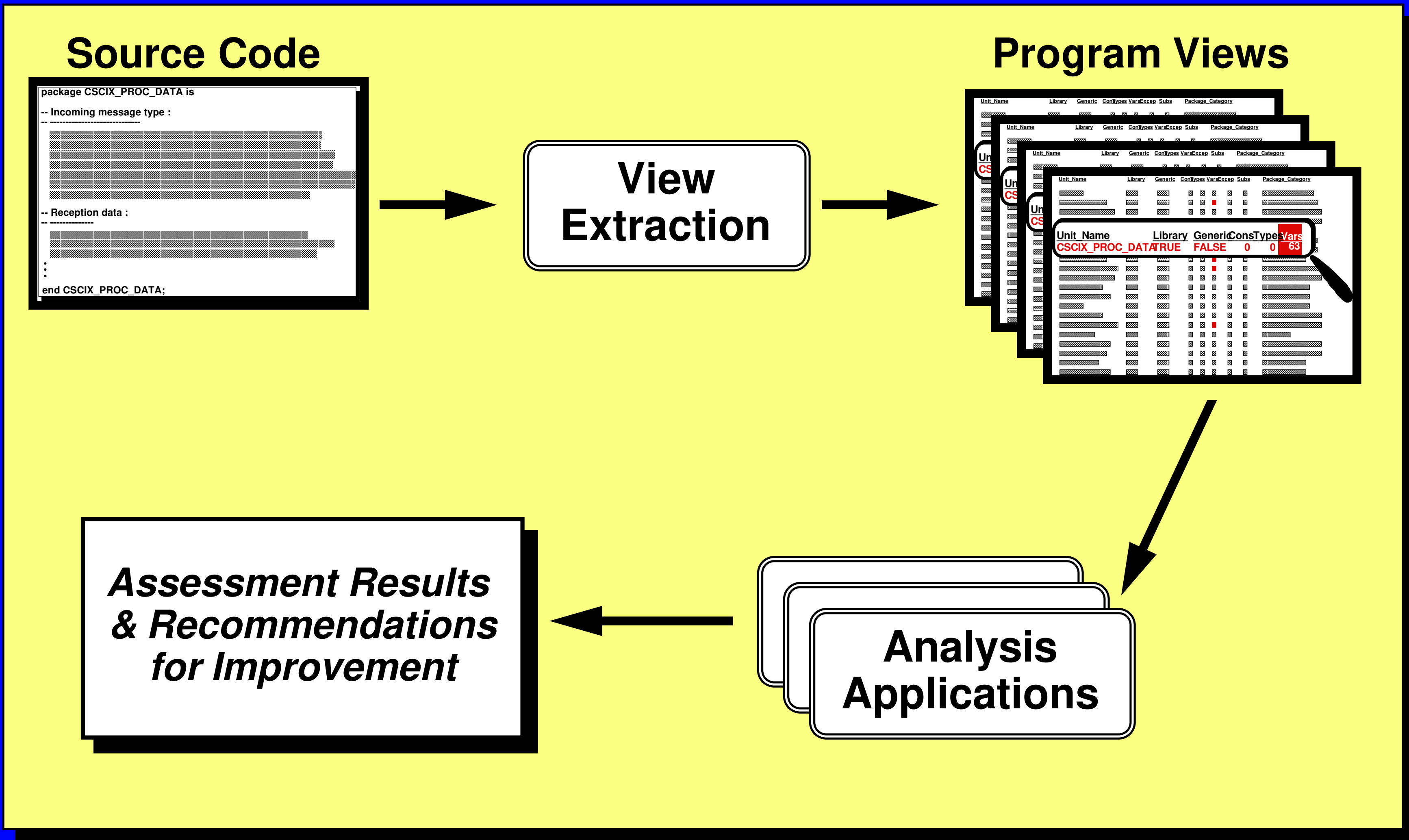
Find evidence of the application of sound software engineering principles

(e.g., modularity and information hiding)

Provide quantitative predictions of downstream qualities

(e.g., defect density, effort to repair errors)

General Approach for Product Assessment



Approaches to Extract Custom Program Views

	Aflex/Ayacc Filters	Diana-based Programs	ASIS-based Programs
Scope of Analysis	Syntax only	Syntax & Semantics	Syntax & Semantics
Development effort	Low	High	Medium
Maintenance effort	Low	High	Low
Application effort	Low	High	Medium

ASIS can provide the required semantic information, and reduce development and maintenance effort

Analysis Applications

- ***Exception Propagation Analysis Tool*** **- used to identify certain errors/weaknesses in the handling of exceptional conditions, and conformance with the stated exception handling policy**
  - **Originally developed with VADS Diana, currently being migrated to ASIS**
- ***Assessor's Workbench*** **- used to support an analysis of the application of sound software engineering principles**
  - **Originally developed with VADS Diana, recently moved to ASIS**
- ***Software Quality Prediction Tool*** **- used to provide empirically based predictions of downstream quality factors (e.g., reliability, maintainability)**
  - **Originally developed using metrics extracted from a parser based tool; moved to ASIS last year**

Our Experience in using ASIS

- **Development of new metric calculation routines using ASIS required roughly half the development effort of similar products developed using DIANA**
- **Migration of VADS-Diana based tool for the analysis of exception handling from SunAda 1.1 to SunAda 2.0**
  - **Required several modifications to the packages that access the DIANA**
- **Migration of an ASIS-based metric calculation tool from APEX 1.6.1 to APEX 2.0 should only require recompilation**
- **Development of cyclomatic complexity analysis tool**
  - **used ASIS and GRC's ASIS/PVL**
  - **minimal development effort**
  - **required only minor changes to count cyclomatic complexity according to different rules**

Future Directions of Product Assessment

- Product assessment approaches are still emerging
  - We don't fully understand software quality in the context of traditional development paradigms
  - We need to further develop capabilities for analysis of new development methods (e.g., object-oriented methods)
- ASIS provides strong support for the development of such new analyses
- ASIS can enhance the use of Ada in developing techniques to measure and assess object-oriented software