An Interface to the Ada 95 Compilation Environment

ASIS Workshop
Organizing for an ASIS for Ada 05
10 December 2003
SIGAda 2003

ASIS Home Page => *http://www.acm.org/sigada/WG/asiswg*

An Interface to the Ada 95 Compilation Environment

Agenda

- **Some ASIS News**
- **Recent ASIS Activities at Conferences**
- **Overview of ASIS**
- **How to get ASIS Artifacts**
- **ASIS Working Group Charter**
- **SIGAda Category C Liaison with WG9**
- **ASIS Rapporteur Group Charter**
- **ASIS RG New Work Item**
- **ASIS RG Procedures**
- **Officer Discussion**
- **Process Discussion**

Some ASIS News

- ## DCS Tool called AdaSTAT
  - Supports analysis of Ada code for support of Ravenscar
  - Useful for updating legacy code to Ravenscar

- ## ASIS Maillist has been complaining about training
  - Joyce Tokar is currently negotiating with the University of Wichita in Kansas to provide a course on ASIS. This is to support the Boeing facility there.
  - Joyce Tokar has agreed to provide a tutorial at SIGAda 2004 in Atlanta.

Recent ASIS Activities at Conferences

Look at for Possible Design Changes

Ada-Europe 2000

- **ASIS-for-GNAT: A Report of Practical Experiences**
  by Sergey Rybin, Alfred Strohmeier, Vasily Fofanov, Alexei Kuchumov

SIGAda 2000

- **Generation of Documentation using ASIS Tools**
  by Steve Hovater (Rational)
- **ASIS Presentation: Ada Code Analysis Technology, Experience, and Issues**
  by Dan Cooper (Boeing)

Ada-Europe 2001

- **OASIS - An ASIS Secondary Library for Analyzing Object-Oriented Ada Code**
  by Alexei Kuchumov, Sergey Rybin, and Alfred Strohmeier

SIGAda 2001

- **Beyond ASIS: Program Data Bases and Tool-Oriented Queries**
  by Janusz Laski (SofTools, Inc)
- **Vetronics Technology Testbed: Experience Report**
  by William W. Pritchett & Brian Wood (DCS)
- **An Object-Oriented Metrics Suite of Ada 95**
  by William W. Pritchett & Larisa Wells (DCS)
- **Organizing for an ASIS for Ada-95 Workshop**
  Revised ASISWG Charter –Approved at SIGAda EEC that Monday

Recent ASIS Activities at Conferences 2

Ada-Europe 2002

- **About the Difficulties of Building a Pretty Printer for Ada**
  by Sergey Rybin, Alfred Strohmeier

SIGAda 2002

- **Organizing for an ASIS for Ada-95 Workshop**
  Revised ASISRG Charter – Approved at WG9 Meeting that Friday

Ada-Europe 2003

- **Quasar: A New Tool for Concurrent Ada Programs Analysis** by Sami
  Evangelista, Claude Kaiser, Jean-François Pradat-Peyre, and Pierre Rousseau
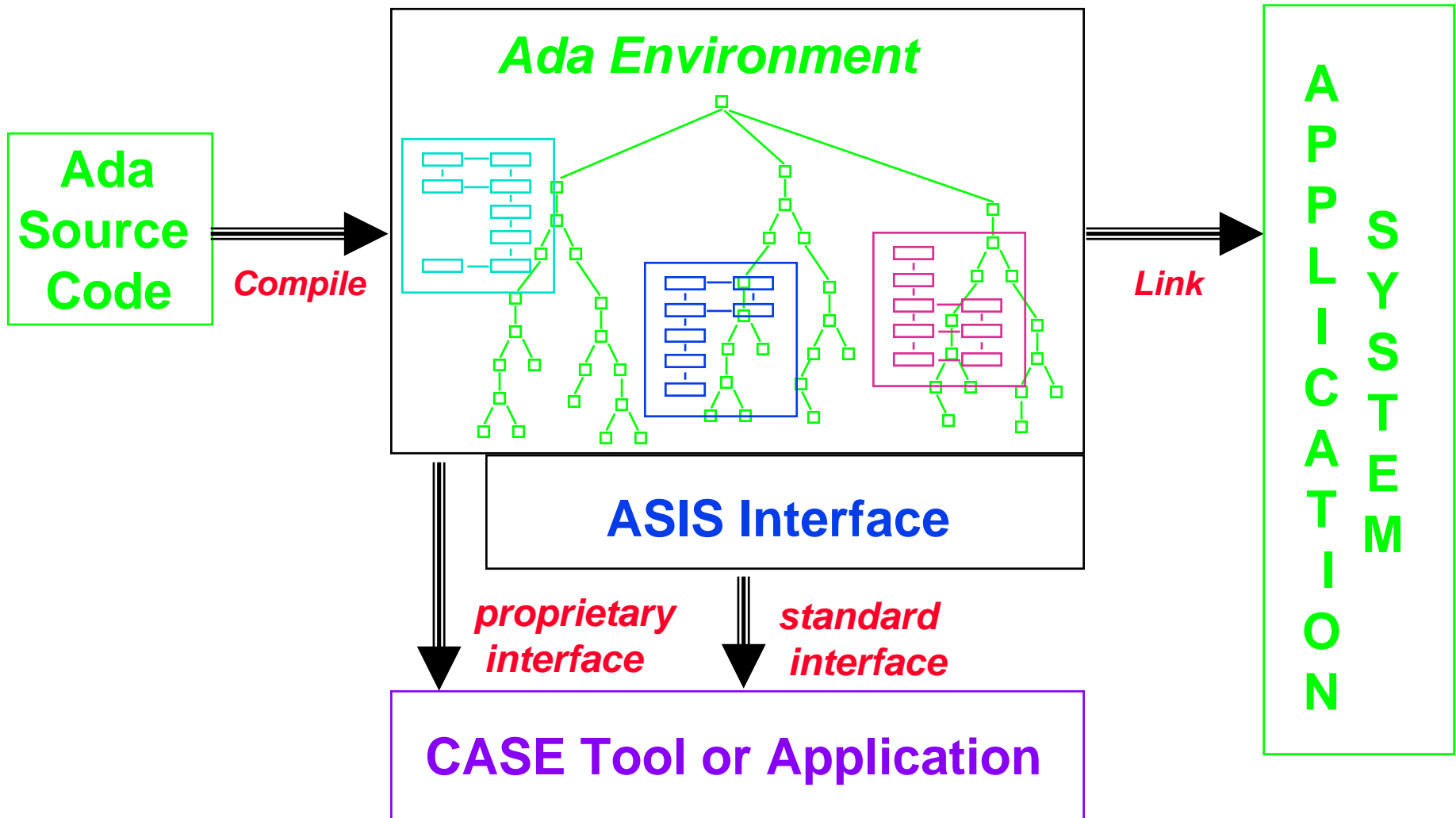
SIGAda 2003

- **Verifying Linear Time Temporal Logic Properties of Concurrent Ada
  Programs with Quasar** by Sami Evangelista, Claude Kaiser, Jean-François Pradat-
  Peyre, and Pierre Rousseau
- **AdaSlicer: An Ada Program Slicer**
  by Ricky Sward, A.T. Chamillard

Ada-Europe 2004

- **"I'm sure you will be glad to hear that we submit a paper to the Ada-Europe
  conference that speaks about streaming of recursive data structures
  implemented with the help of ASIS." -** Alfred Strohmeier

What is ASIS?

Ada Source Code → *Compile* → **Ada Environment** → *Link* → **APPLICATION SYSTEM**

ASIS Interface

proprietary interface | *standard interface*

CASE Tool or Application

Provides Syntactic and Semantic Information from Ada Environment using a standard interface

Syntactic Information

Ada syntax is summarized in Ada 95 RM, Annex P as variant of Backus-Naur Form

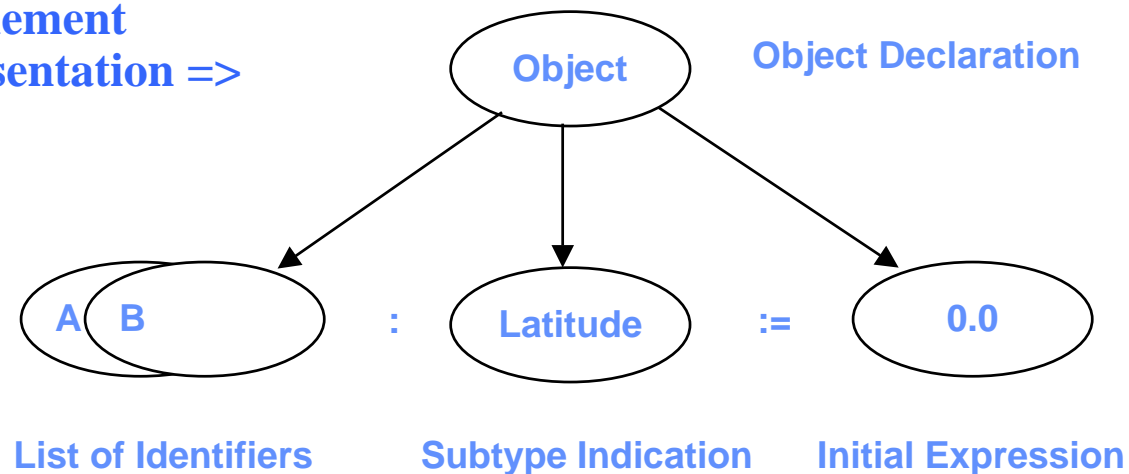**For example:**
object_declaration ::==
defining_identifier_list : [**aliased**] [**constant**] subtype_indication [:= expression]; | ...

For the Ada object declaration =>   A,B: Latitude := 0.0;

**Syntactic Element
Tree Representation =>**

Object   Object Declaration

A B   :   Latitude   :=   0.0

List of Identifiers   Subtype Indication   Initial Expression
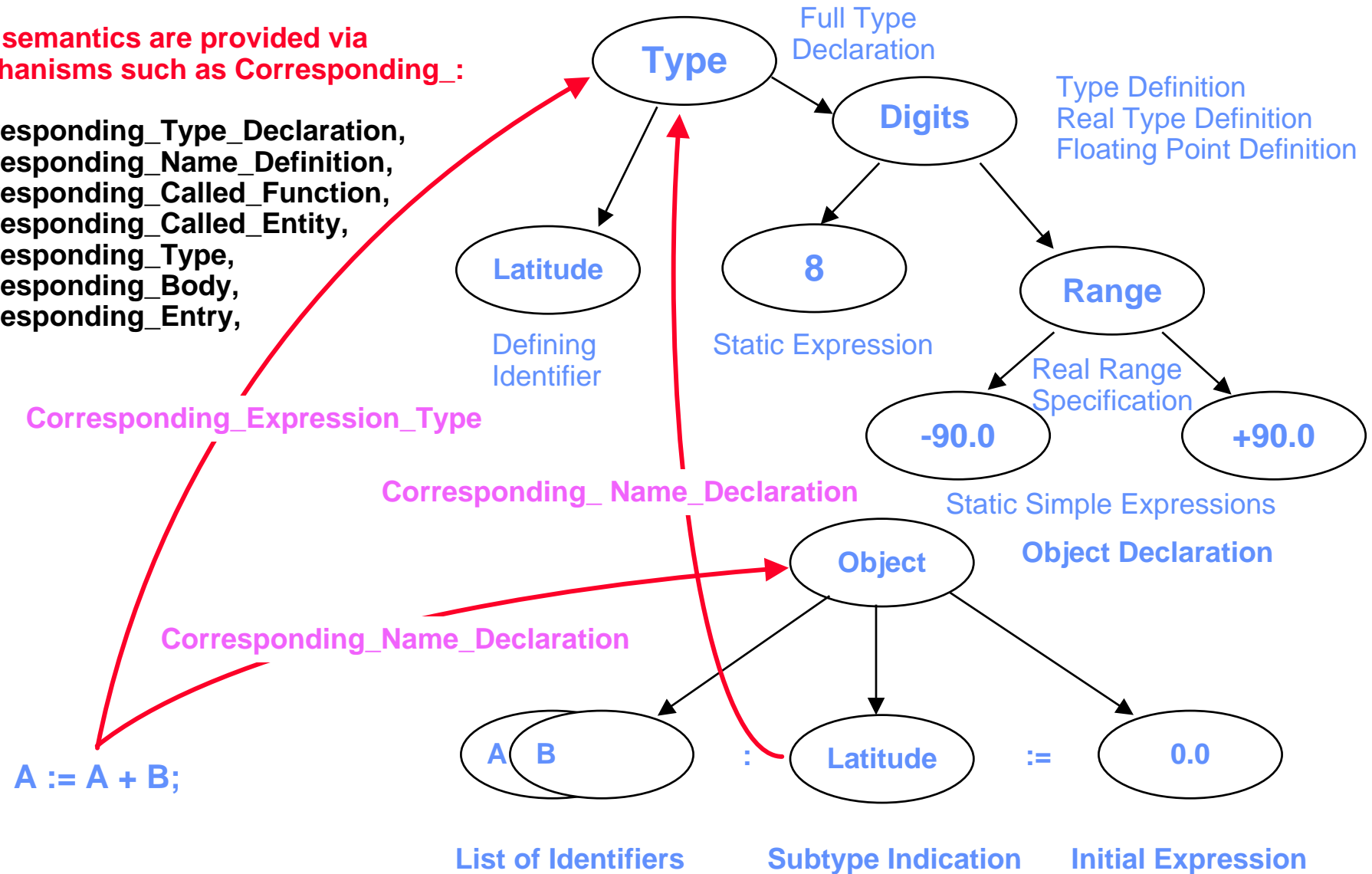
*ASIS can extract desired syntactic information for every syntactic category
Of the 367 ASIS Queries, most support syntactic tree analysis*

Semantic Information

Ada semantics are provided via mechanisms such as Corresponding_:

Corresponding_Type_Declaration,
Corresponding_Name_Definition,
Corresponding_Called_Function,
Corresponding_Called_Entity,
Corresponding_Type,
Corresponding_Body,
Corresponding_Entry,
etc.

Type — Full Type Declaration

Digits

Type Definition
Real Type Definition
Floating Point Definition

Latitude — Defining Identifier

8 — Static Expression

Range

Real Range Specification

-90.0   **+90.0**

Static Simple Expressions

Object Declaration

Object

Corresponding_Expression_Type

Corresponding_ Name_Declaration

Corresponding_Name_Declaration

A := A + B;

A   B   **:**   **Latitude**   **:=**   **0.0**

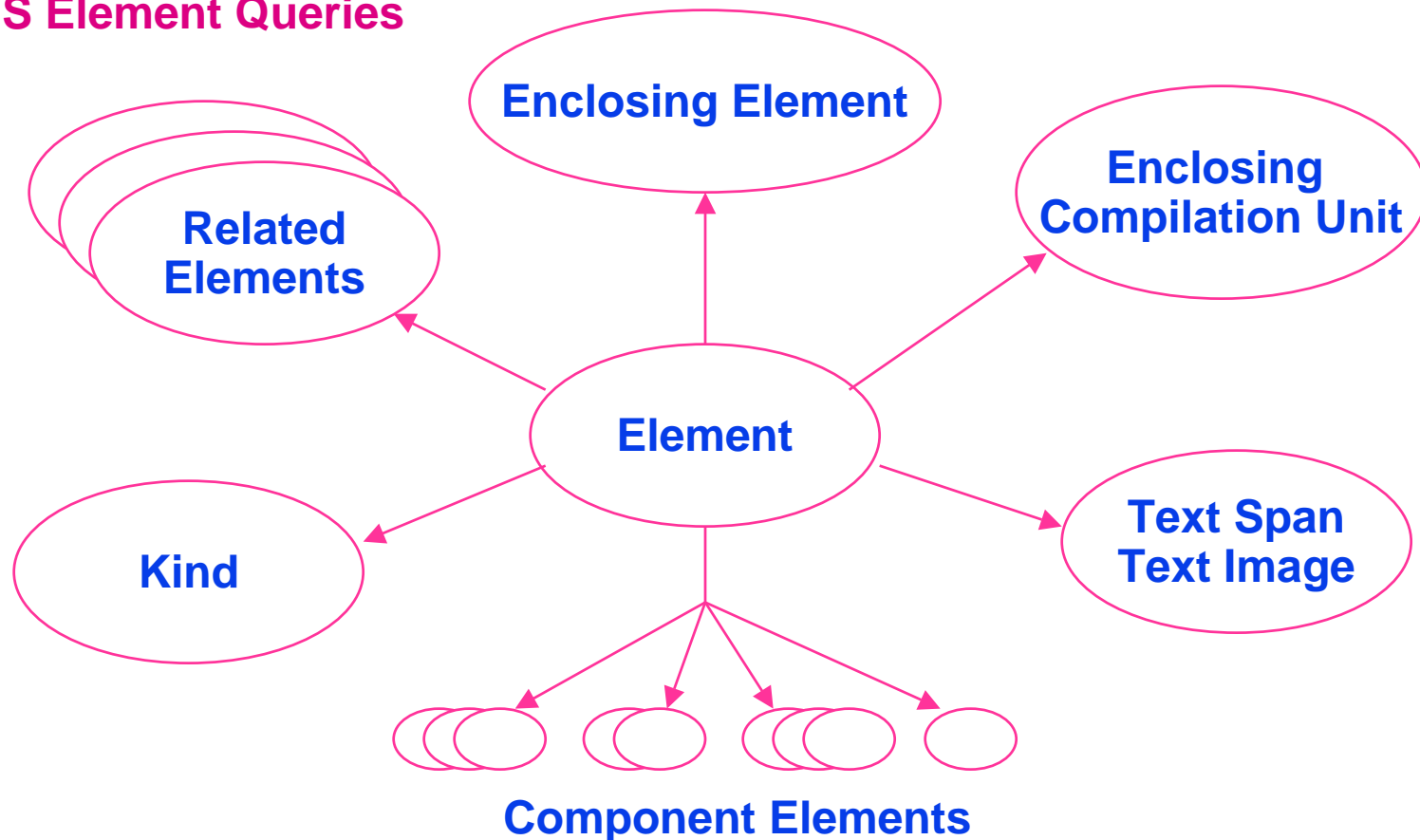**List of Identifiers**   **Subtype Indication**   **Initial Expression**

These mechanisms allow ASIS to traverse the syntactic tree like Hypertext allows one to traverse a document
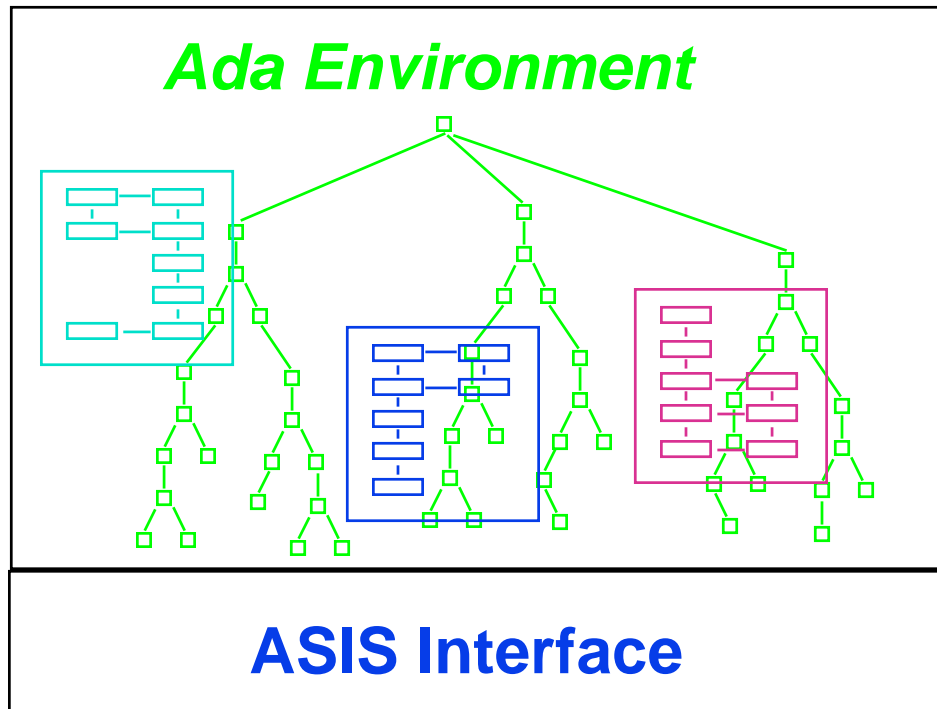
Operations on Elements

Element. A common abstraction used by ASIS to denote the syntax components (both explicit and implicit) of ASIS compilation units.

ASIS Element Queries

Enclosing Element

Enclosing Compilation Unit

Related Elements

Element

Kind

Text Span Text Image

Component Elements

Examples of Tools Built on ASIS

Ada Environment

ASIS Interface

Tools portable to Ada environments supporting ASIS Interface

Code Restructuring Tools
Code Browsing and Navigation Tools
**Coding Style and Standards
    Compliance Tools**
Cross Reference Tools
Data Flow Analysis Tools
Dependency Tree Analysis Tools
Design Tools
Document Generation Tools
Invocation (Call) Tree Analysis Tools
Language-sensitive Editing and
    Prettyprinting Tools
Language Translation Tools
Quality Assessment Tools
Reverse Engineering Tools
Re-Engineering Tools
Safety & Security Compliance Tools
Static Correctness Verifiers
Tasking Analysis Tools
Test-case Generation &
    Coverage Analysis Tools
Usage, Quality, & Complexity Metrics Tools

How to Get ASIS Artifacts

ASIS tutorials, papers, examples, bibliography:

ASIS Home Page =>

http://www.acm.org/sigada/wg/asiswg

The ASIS Specification:

ISO/IEC 15291:1999
Information technology -- Programming languages --
Ada Semantic Interface Specification (ASIS)

Via the ISO Catalogue =>

http://www.iso.ch/infoe/catinfo.html

ASISWG & ASISRG

The primary focus of the Ada Semantic Interface Specification (ASIS) Working Group and ASIS Rapporteur Group has been to evolve ASIS as an interface to the Ada 95 compilation environment.

ASIS now provides a powerful mechanism to perform code analysis for mission-critical and safety-critical applications.

A variety of highly effective tools have been built using ASIS.

ASIS Working Group is Chartered under ACM SIGAda

ASIS Rapporteur Group is established by ISO/IEC JTC1/SC22 WG9 to achieve a task via an approved New Work Item (NWI)

ASIS SIGAda Charter needed updating – Done SIGAda 2001
ASISRG Charter now required – Done SIGAda 2002; Approved WG9
ASISRG Procedures now required – Draft To be Discussed
ASISRG NWI for ASIS for Ada 95 needed – Sample for ARG

ACM's SIGAda's
ASIS Working Group Charter

The purpose of this working group is to evolve an implementation-independent application programming interface to retrieve information from an Ada environment.

The Ada Semantic Interface Specification (ASIS) is an interface between an Ada environment (as defined by ISO/IEC 8652) and any tool requiring information from it. An Ada environment includes valuable semantic and syntactic information. ASIS is an open and published callable interface that gives CASE tool and application developers access to this information. ASIS has been designed to be independent of underlying Ada environment implementations, thus supporting portability of software engineering tools while relieving tool developers from needing to understand the complexities of an Ada environment's proprietary internal representation.

The working group cooperated with the ISO/IEC JTC1/SC22 WG9 ASIS Rapporteur Group (ASISRG) in adopting ASIS as an international standard. The ASISWG is now focused on evolving this interface to satisfy better the needs of the ASIS community and to encourage the development of ASIS-based tools.

Membership in the working group is open to any interested party. Members are responsible for their own expenses. Current members include representatives of Ada compiler implementors, CASE tool developers, application developers, and other interested users.

Original February 8, 1993, Updated June 28, 1994,
Updated November 7, 1995, Updated October 1, 2001

SIGAda Category C Liaison With WG9 - 1

- **Category C Liaison**
- **ISO/IEC JTC1 Letter of Approval**

Benefits to SIGAda are identified in Liaison Request.

In addition, this will also provide extra value to a SIGAda membership, in that:

- SIGAda members will be allowed to see the draft WG9 documentation for the next Ada Standard in its early stages. [This documentation has not been made available to us before.]

- SIGAda members will be allowed (collectively) to comment on the draft WG9 documentation, thus potentially impacting the standard; and

- SIGAda members (collectively) can play a more active role in the evolution of the Ada standard should they choose to do so.

SIGAda Category C Liaison With WG9 - 2

Impact to ASISRG:

- **ASISWG may no longer be needed**

- **Does it make sense to simply become ASISRG?**
  - Membership Lists need to be clearly defined

- **Membership lists need to clearly state who is a member of:**
  - SIGAda
  - WG9

- **Other ???**

ASIS Organizational Requirements

- ***ASIS SIGAda Charter needed updating***
  - – *Done SIGAda 2001*
- ***ASISRG Charter now required***
  - – *Done SIGAda 2002; Approved WG9*
- ***ASISRG Procedures now required***
  - – *Draft To be Discussed*
- ***ASISRG NWI for ASIS for Ada 95 needed***
  - – *Sample for ARG*

ASISRG-1

ISO/IEC JTC1/SC22 WG9 *voted unanimously to create ASISRG on 28 April 1995*

Scope

Standardize the interface between an Ada 95 compilation environment and tools/applications requiring information from this environment.

Purpose and Justification

The Ada Semantic Interface Specification (ASIS) is an interface between an Ada environment as defined by ISO/IEC 8652 and any tool requiring information from this environment. An Ada environment includes valuable semantic and syntactic information. ASIS is an open and published callable interface which gives CASE tool and application developers access to this information. ASIS has been designed to be independent of underlying Ada environment implementations, thus supporting portability of software engineering tools while relieving tool developers from having to understand the complexities of an Ada environment's proprietary internal representation.

ASISRG-2

Purpose and Justification (Continued)

As an international standard, ASIS will benefit the Information Technology community by facilitating the development of powerful CASE tools portable amongst the various environments provided by Ada vendors. This portability can only be achieved through the standardization of ASIS at the international level. A standardized ASIS will promote the development of powerful tools for the software engineering environment by providing access to important semantic information otherwise available only through proprietary interfaces. Further, ASIS will benefit the Information Technology community as a valuable resource for application development (e.g., decoupling system to system interfaces). The international standardization of ASIS will facilitate the use of this important capability in the development of system software applications.

ISO/IEC JTC1 assigned ASIS project number 15291 in May 1996
Successful Final Draft International Standard Ballot in Dec 1998

Schedule to Achieve ASIS Standardization

Dec 93   AJPO recommends ASIS V1.1.0 (ASIS83) be used as
interface to Ada 83 Program Library

Mar 94   Design Goals for ASIS95 identified

Jun 94   ASISWG finalizes ASIS 83 as V1.1.1 with test suite

Jun 94   Evaluate design approaches for ASIS 95

Nov 94   Finalize approach for ASIS 95

Mar 95   Skeleton ASIS 95

28 Apr 95   ASISRG created unanimously by ISO/IEC JTC1/SC22 WG9

Jun 95   Skeleton ASIS 95; new library/environment model

Nov 95   Public Review of ASIS 95 initiated (Version 2.0.E)

2 Feb 96   ISO/IEC JTC1/SC22 approved NWI

Feb 96   ASIS available for GNAT Ada 95 Compiler

Mar 96   ASISRG vote to submit ASIS 95 as ISO Working Draft

Jun 96   ISO/IEC JTC1 approval of NWI - ASIS assigned ISO number 15291

Dec 96   WG9 ballot on ASIS 95 Working Draft commenced

1 Mar 97   WG9 ballot on ASIS completed (6 Affirmatives; 1 Abstain; 0 Negatives)

1 May 97   Disposition of Comments delivered to WG9

2 Jun 97   Disposition of Comments, ASIS to SC22 for Balloting approved

Aug 97   ASIS to SC22 for Registration as ISO CD& CD Final Ballot

9 Mar 98   ASIS approved by SC22 for CD Registration & CD Final

31 Jul 98   ASIS to SC22 and in turn JTC1 for FDIS Ballot

8 Dec 98   **ASIS approved by ISO as ISO Standard**

1999   **ASIS Available as ISO/IEC 15291:1999**

ASISWG/ASISRG Officers

Chair ASISWG/ASISRG: **Currie Colket (MITRE)**

Vice-chair ASISWG: **Steve Blake (former)**

Recorder ASISWG: **Clyde Roby (IDA)**

Vice-recorder ASISWG: **Dan Cooper (Boeing)**

Publicity/Meetings ASISWG: **Bill Thomas (MITRE)**

ASISRG Co-Project Editors: **Steve Blake (former)**
                                       Clyde Roby (IDA)

Final Notes on ASIS

ASIS - Interface for obtaining information from Ada environments

- **Provides both syntactic and semantic information**

- **Supports building powerful and highly portable CASE tools**

- **Supports many safety-critical & mission-critical requirements for code analysis**

- **Used in approximately 10 countries**

- **ASIS mature with implementations from major Ada complier vendors today**

Ada
Semantic
Interface
Specification
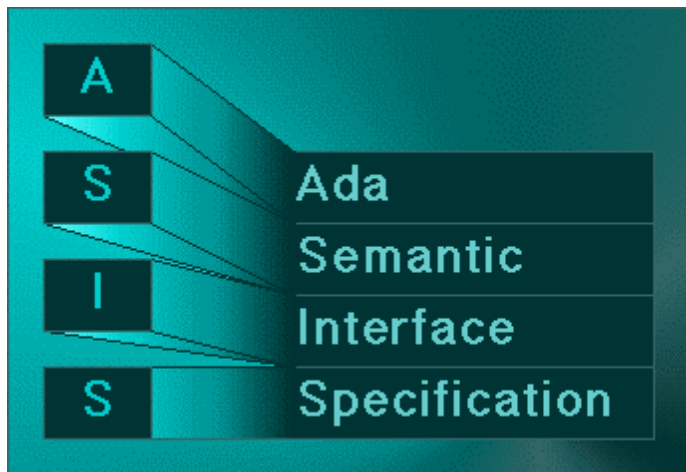
To get involved with ASISWG and/or ASISRG, send email to:

    sigada-asis-request@acm.org

        to join sigada-asis@acm.org

    sigada-asis-tech-request@acm.org

        to join sigada-asis-tech@acm.org

or call Currie Colket @ +1 (703) 242-4561

or Clyde Roby @ +1 (703) 845-6666

ASIS Home page => *http://www.acm.org/sigada/wg/asiswg*