



Product update: on the road to Ada05

Sigada 2003

San Diego 12-10-03

Recent Developments in GNAT technology

- ▶ New targets
- ▶ New configurations
- ▶ New tools
- ▶ New language!

New Targets

- ▶ GNAT for the Rockwell AARM chip
 - Completed
 - Does not use GCC back-end

- ▶ GNAT for Itanium / Gnu-linux
 - Ready for test drive

- ▶ Gnat for Itanium / VMS
 - In progress
 - Indispensable to complete VMS port

New Configurations

- ▶ Ravenscar
 - Profile and light-weight library

- ▶ AE653

- ▶ Configurable run-time
 - From bare board to full Ada

- ▶ All new releases based on GCC 3

New Tools

- ▶ The projects facility
- ▶ Mixed language compilation
- ▶ GPS
- ▶ Interfacing to Eclipse

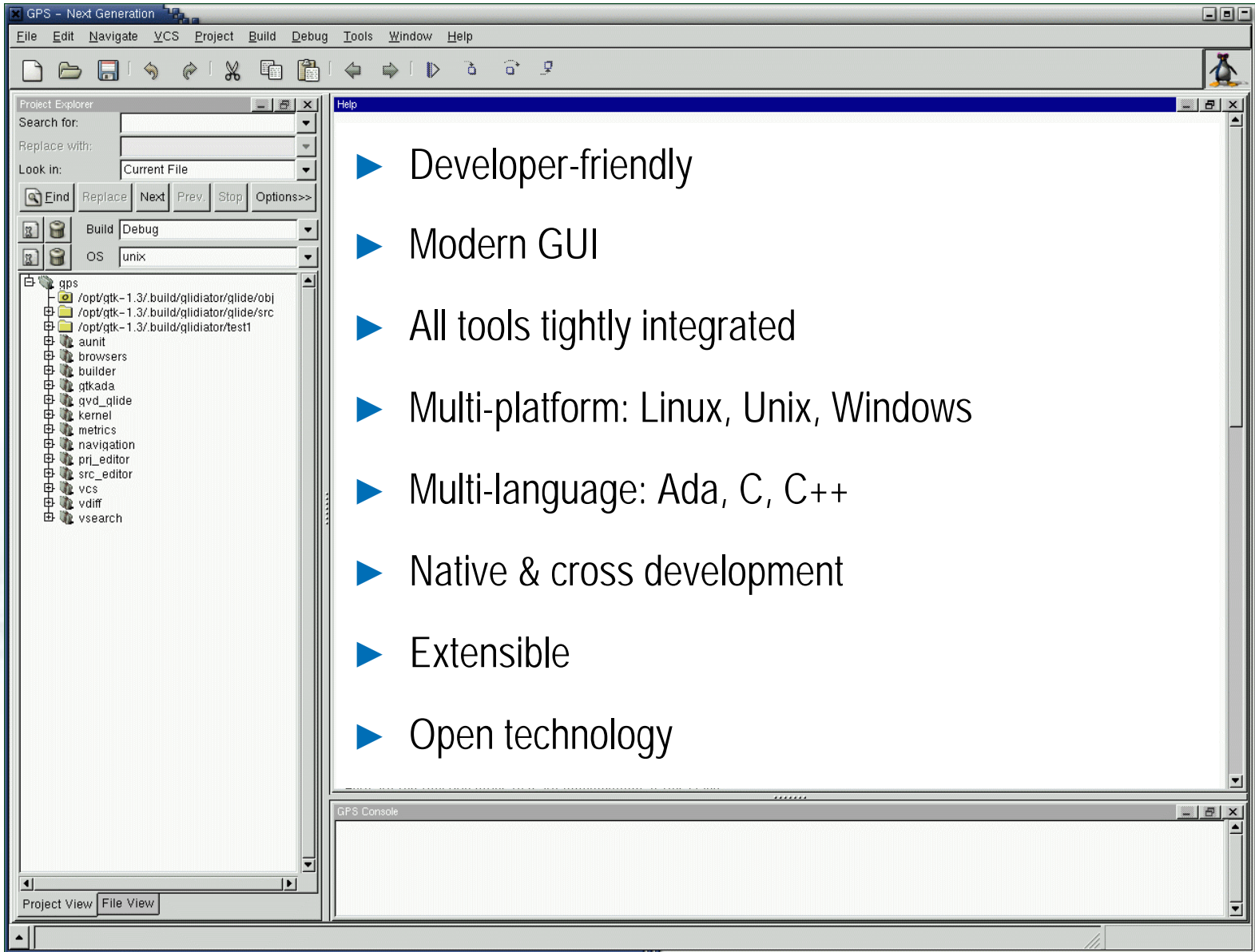
GNAT Project Facility

- ▶ Plain ASCII Text Control Files
- ▶ Integrated with gnatmake, gnatfind, gnatpp & gps
- ▶ Controls entire compiler tool chain
- ▶ Supports Mixed-Language Applications
- ▶ Supports Modular Hierarchical Designs
 - Uses an Ada-like Package Model – “withs” bring in other projects
 - Subsystems in APEX, Subprojects in MULTI
- ▶ Supports Project Extensions and Project Inheritance
- ▶ Supports Alternate Views & Builds
 - Configuration variables control various kinds of builds
- ▶ Supports Alternate Naming Conventions
- ▶ Supports building objects, libraries and executables

Compiling Languages other than Ada

- ▶ Gpr2make is a tool which converts gnat project files into makefiles:
 - Proj.gpr -> Makefile.proj
 - This makefile
 - Makes use of Makefile.prolog & Makefile.generic
 - Will call gnatmake to compile all ada units
 - Will use make rules to invoke compilers and other tools on units using other languages
 - Uses special features of GNU make
 - Guarantees exactly correct dependencies (using information generated by G++ compiler).

GPS: The GNAT Programming System



- ▶ Developer-friendly
- ▶ Modern GUI
- ▶ All tools tightly integrated
- ▶ Multi-platform: Linux, Unix, Windows
- ▶ Multi-language: Ada, C, C++
- ▶ Native & cross development
- ▶ Extensible
- ▶ Open technology

GPS: The Programmers' Companion

- ▶ Developer-friendly
 - Intuitive interface
 - Easy to learn and use
 - Allows to develop, build, maintain large complex systems
- ▶ Modern GUI
 - Same look'n'feel for all tools and on all platforms
 - Can plug your favorite look'n'feel (e.g. Windows)
- ▶ All software-engineering tools are tightly integrated
 - Tools interact in a coordinated fashion
 - Launch all tools from the same interface
 - User's extensions tightly integrated

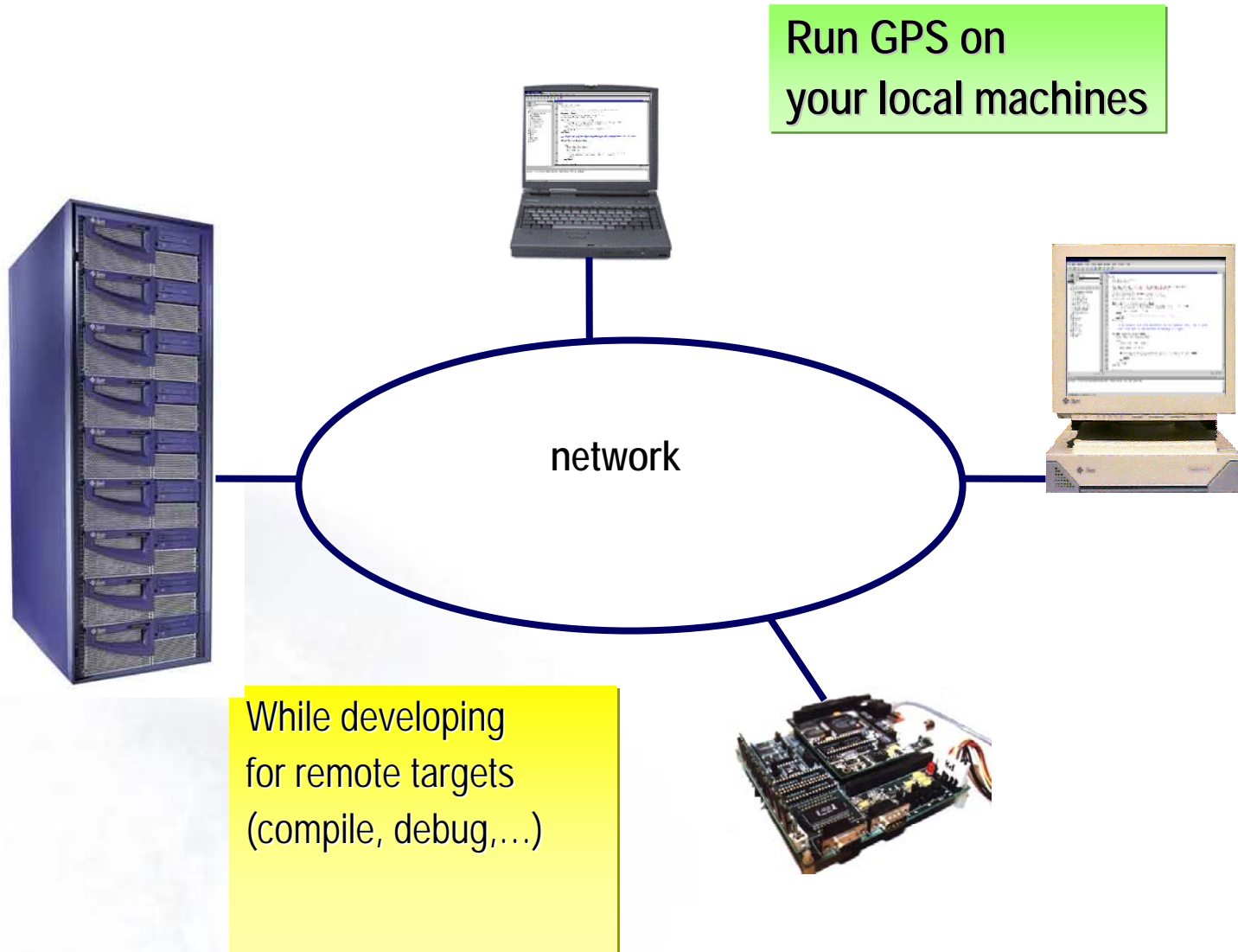
GPS Tools

- ▶ Language sensitive editor
- ▶ Source code navigation
- ▶ Source-level debugger
- ▶ Project, dependency & call graphs
- ▶ Version control (RCS, CVS, ClearCase, ...)
- ▶ Project & configuration manager

- ▶ Class, type & instantiation graphs
- ▶ Unit testing
- ▶ Reformatting tool
- ▶ Documentation generator
- ▶ Metrics
- ▶ Refactoring tool

- ▶ GUI builder
- ▶ Real-time event monitoring

GPS & Heterogeneous Environments



GPS is an Open Environment

- ▶ All tools also available from the command line
 - You can use them in text-only mode (e.g. for use in scripts)
 - Call them from your own tools
- ▶ All formats use plain text
 - E.g. the project file
- ▶ Ability to plug in your own tools

GPS is Customizable & Extensible

- ▶ You can change key bindings, shortcuts, font colors, etc
- ▶ You can add a menu or a button to invoke a new tool
- ▶ You can extend the editor to understand a new language
- ▶ Easy to plug-in 3rd party tools
- ▶ The ultimate extensibility: You can plug your modules in GPS

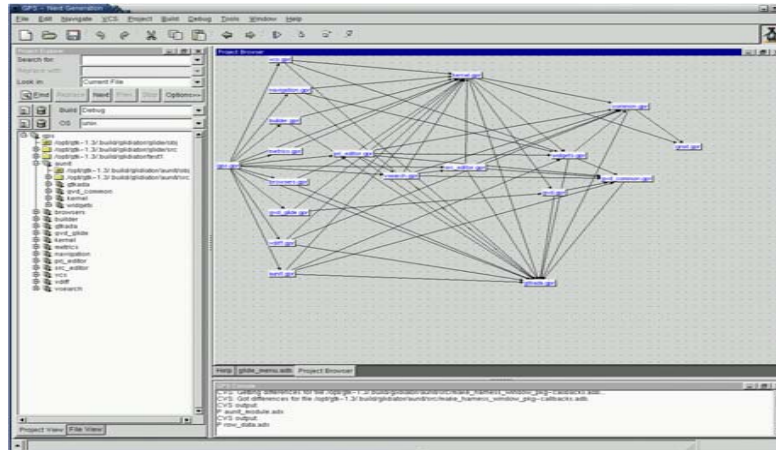
GPS Architecture

LOC

- 200,000 Ada
 - 90,000 GNSA
 - 50,000 GVD
 - 60,000 GPS

100,000 Ada

400,000 C



GtkAda
Thick Ada binding

Gtk
toolkit for creating graphical user interfaces

X11 or Win32
graphic libraries

Linux, Unix, Windows

Integration of GPS into Eclipse

- ▶ Simple invocation of GPS executing independently
- ▶ Invokes GPS on selected file from within Eclipse
- ▶ Uses built-in Eclipse support for “external tools”
 - Dedicated button indicates GPS
- ▶ Full GPS project support as long as:
 - GPS project file name is same as the Eclipse project name
 - GPS project file is located in Eclipse project directory

Dedicated buttons

Resource - cognicenti.adb - Eclipse Platform

File Edit Navigate Search Project GNAT Pro Run Window Help

Invoke GPS

Navigator

- .project
- activities.adb
- activities.ads
- chopsticks.adb
- chopsticks.ads
- cognicenti.adb
- cognicenti.ads
- dining_philosophers.adb
- identities.ads
- simpleadaproject.gpr
- user.adb
- user.ads

Outline

An outline is not available.

```

with Ada.Text_IO;
with Chopsticks;
with Activities;

package body Cognicenti is

  protected Terminator is
    procedure Start_Shutdown;
    entry Stop_Me;
  private
    Done : Boolean := False;
  end Terminator;

  task body Philosopher is
    My_Id : Identifier;
  
```

Tasks (0 items)

✓	!	Description	Resource	In Folder	Location

2 items selected

Writable Insert 1 : 1

GPS Pro - GNAT Programming System (project: simpleadaproject) - cognicenti.ads

File Edit Navigate VCS Project Build Debug Tools Window Help

Project Explorer - x

- simpleadaproject
 - .
 - activities.adb
 - activities.ads
 - chopsticks.adb
 - chopsticks.ads
 - cognicenti.adb
 - cognicenti.ads
 - dining_philosophers
 - identities.ads
 - user.adb
 - user.ads
 - .

c:\eclipse\workspace\simpleadaproject\cognicenti.ads

```

1 with Identities;
2 use Identities;
3
4 package Cognicenti is
5
6     task type Philosopher is
7         entry Identify( Me : in Identifier );
8     end Philosopher;
9
10    Philosophers : array( Identifier ) of Philosopher;
11
12    procedure Shut_Down;
13
14 end Cognicenti;
15
  
```

Insert Writable Unmodified 4:22

Messages

Welcome to GPS Pro 1.4.0w (20031015) hosted on pentium-mingw32msv
 the GNAT Programming System
 (c) 2001-2003 ACT-Europe

Schedules/Capabilities (GPS)

▶ GPS 1.4.0

- Full support for Ada, C and C++ editing
- Full support for version control management
 - CVS
 - Clearcase (static views)
- Full support for Ada intelligent browsing
- Extensive support for C and C++ browsing
 - Some limitations for templates, name spaces, macros
- Full build capabilities for Ada, C, C++ builds
- Full support for Ada and C debugging
- Extensive support for C++ debugging
 - Some limitations for templates, name spaces, macros

Schedules/Capabilities (GPS)

- ▶ GPS 1.4.0
- ▶ Released November, 2003
 - Windows NT
 - Windows 2000
 - Windows XP
 - Solaris
 - GNU/Linux x86
 - Redhat Enterprise edition
 - Novell/SUSE
 - Other targets to follow
 - HPUX
 - True 64 (DEC Unix)
 - Other targets as needed

Schedules/Capabilities (GCC)

- ▶ GNAT 5.01a available now for nearly all targets
 - Supports Ada and C fully, can interface to C++
- ▶ GNAT 5.02a scheduled for early Q1` 2004
 - C++ compilers added for
 - Solaris
 - GNU/Linux x86
 - Windows 2000, NT, XP
- ▶ GNAT 5.02a1 scheduled for Q2 2004
 - Full support for C++ offered on selected targets
 - C++ capability added on additional targets

Towards Ada05

- ▶ Implementation of major Ada05 enhancements is in progress

- ▶ Driven by:
 - Customer demand
 - Resource planning
 - Implementor's itch

Object-Oriented facilities

- ▶ Cyclic type structures
 - Fully implemented (`limited_with` clauses)
 - Years of design, days of implementation effort
 - Supercedes `with_type` clauses
- ▶ Interfaces
 - Under study, proposal still fluid, implementation effort probably non-trivial
- ▶ Prefix notation
 - No implementation difficulties, no enthusiasm
- ▶ Accidental overriding
 - Early implementation discarded, new one underway
- ▶ Extensions of protected / task types
 - Unlikely (for now)

Access types

- ▶ Anonymous access types
 - In progress
- ▶ Downward closures and anonymous access to subprograms
 - Preliminary design

General purpose capabilities

- ▶ Aggregates for limited types
 - Fully implemented
 - Constructors????
- ▶ Pragma Unsuppress
 - Early GNAT pragma
 - Implementation may need adjusting
- ▶ Private with_clauses
 - Not yet

Real time facilities

- ▶ Ravenscar
 - Fully supported
- ▶ Dynamic ceiling priorities
 - Implemented, re-implemented
- ▶ Execution-time clocks
 - No time budget yet

Interfacing

- ▶ Unchecked-union
 - Minimalist implementation available for years
 - Maximal version needs work
- ▶ Directory operations
 - gnat-directory_operations available
- ▶ Vector and Matrix operations
- ▶ Container libraries
 - **Implementors welcome!**