Babel 0.8.4 Release

Tammy Dahlgren, Tom Epperly, and Gary Kumfert

Center for Applied Scientific Computing

Common Component Architecture Working Group

April 10, 2003

This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

UCRL-PRES-152685

What's new in 0.8.2 (26 March 2003)

- Completed Fortran 90 phase II
  - A major improvement in look-and-feel
- Improved documentation
- Changed FORTRAN 77 cast function
- `--comment-local-only` option

Wait there's more in 0.8.4 (7 April 2003)

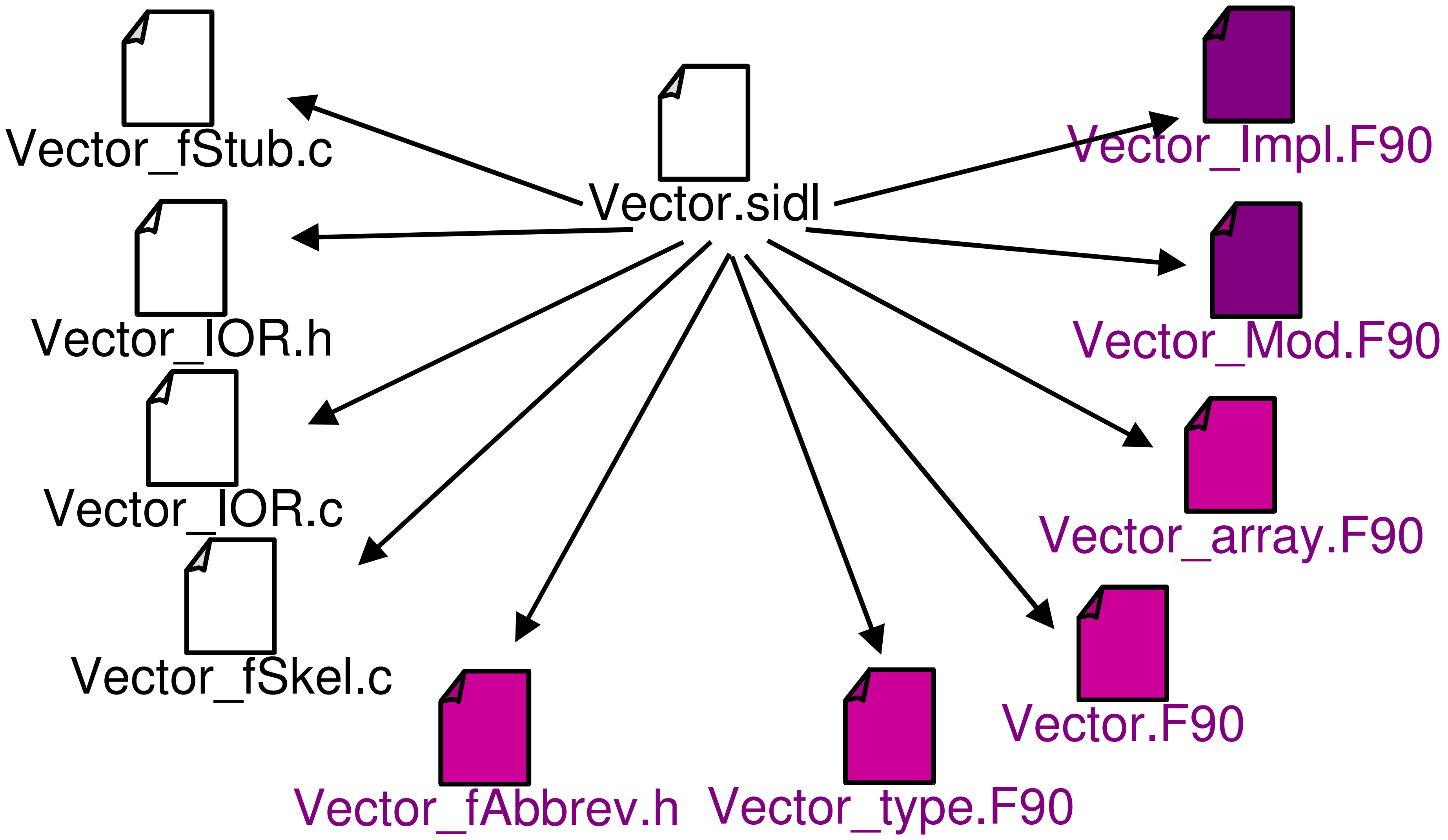
- Fixed F90 name mangling bug in 0.8.2
- Configuration improvements
- Doc comments for enumerated types
- C++ array binding changes
- More regression tests

Fortran 90 Phase II

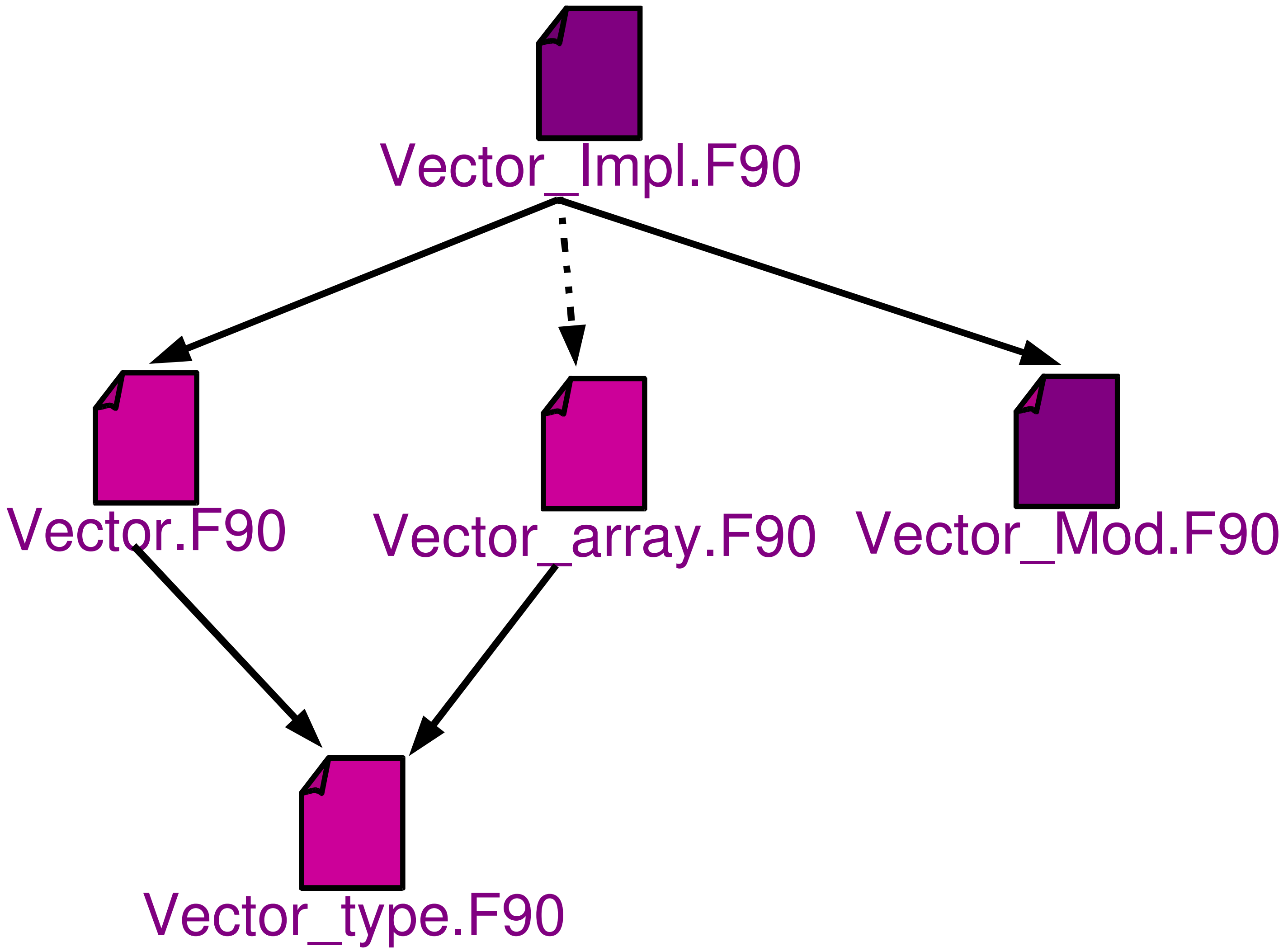
- Before 0.8.2, object & array references were `integer*8`'s
- Now object & array references are F90 derived types
- Examples

```
use gov_cca_Port
use SIDL_BaseException
use gov_cca_Port_array
type(gov_cca_Port_t) :: port
type(SIDL_BaseException_t) :: excpt
type(gov_cca_Port_a) :: portArray
```

Generated F90 files



Dependencies among F90 files



F90 files & modules

File	Module	Description	Edited
Vector_Impl.F90	None	Developer writes functions here	✓
Vector_Mod.F90	Vector_impl	Private data defined here	✓
Vector_array.F90	Vector_array	Array methods	
Vector.F90	Vector	Object/interface methods	
Vector_type.F90	Vector_type	Object & array derived types	

Impact of derived types on coding

- Distinct derived type for each class/interface enables
  - Fortran 90 overloading
    - Short method names distinguished by type

      ```
      call deleteRef(obj)
      call new(obj)
      ```
  - Simple cast methods
    - Every allowable cast operation can be done in one call

      ```
      call cast(port, intPort)
      ```
- Similar benefits for arrays
- Everything looks like a native F90 module

Private data pointer is a derived type

- F90 private data is a pointer to a derived type
  - Adding state data is relatively natural
  - Wrapper derived type holds pointer

```
type tutorial_Driver_private
  sequence
  ! DO-NOT-DELETE splicer.begin(tutorial.Driver.private_data)
  type(gov_cca_Services_t) :: d_services
  ! DO-NOT-DELETE splicer.end(tutorial.Driver.private_data)
end type tutorial_Driver_private

type tutorial_Driver_wrap
  sequence
  type(tutorial_Driver_private), pointer :: d_private_data
end type tutorial_Driver_wrap
```

What's left to do with Fortran 90?

- Incorporate feedback from CCA & Babel users
- Use native F90 array descriptors for simple numeric types (int, long, float, double, fcomplex, dcomplex)
- Resolve name collisions with intrinsic functions
  - Example:
    size the SIDL method
    size the Fortran 90 intrinsic
  - Sun's F90 treats collisions between module functions and intrinsic functions as errors

Fortran 77 cast change

- **Old**

```
x_y_z__cast_f(obj, newtype, newobj)
integer*8 obj, newobj
character*(*) newtype
```

  obj was of type x.y.z, and it would cast it to newtype.

- **New**

```
x_y_z__cast_f(obj, newobj)
integer*8 obj, newobj
```

  obj is any object/interface. It will be cast into type x.y.z (if possible). The result is returned in newobj.

```
x_y_z__cast2_f(obj, newtype, newobj)
```

  does what old _cast did.

- **Similar to C and Python bindings**

Miscellaneous improvements

- Reorganized and enhanced user documentation
- `--comment-local-only` for Doxygen
- Configuration improvements
  - No need for `jar -u` anymore
  - Support kaffe VM `-addclasspath`
  - Jar files stored in architecture-independent dir
  - `babel-config` script reveals configure info
- Now available in Debian unstable

Doc comments for enumerated types

- Doc comments for type and values preserved
- Added to XML representation
- Stub documentation

SIDL

```
// user defined values
enum car {
  /**
   * A sports car.
   */
  porsche = 911,
  /**
   * A family car.
   */
  ford = 150,
  /**
   * A luxury car.
   */
  mercedes = 550
};
```

C Stub

```
enum enums_car__enum {
  /**
   * A sports car.
   */
  enums_car_porsche  = 911,

  /**
   * A family car.
   */
  enums_car_ford     = 150,

  /**
   * A luxury car.
   */
  enums_car_mercedes = 550

};
```

C++ array binding change

SIDL type	C++ binding ≤ 0.8.2	C++ binding ≥ 0.8.4
array<int>	SIDL::array<int>	SIDL::array<int32_t>
array<long>	SIDL::array<long>	SIDL::array<int64_t>

- **Similarity between array and value type was judged more important than similarity to SIDL type**

Testing changes

- Added SIDL & XML backend testing
- Add F90 driver for CCA example
- Total tests: 9981

What to expect in the future

- Assertion checking in SIDL
- Fortran 90 Phase III (or incremental improvements)
- RMI/Integration