

# Module Coupling

## Module Coupling

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## Module Interactions

Module Coupling

## Coupling and Cohesion

- **Module Coupling**
  - Measure of the interactions between different modules
  - *Smaller* is better
- **Module Cohesion**
  - Measure of the interactions within one module
  - *Larger* is better

Module Coupling

## Types of Coupling

Best

- None
- Data
- Stamp
- Control
- External = Common = Global
- Content

Worst

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## Data Coupling

Simple Data = Scalar or Array of Scalar  
 Scalar = integer, real, char, etc.

Ex: Proc B(x : real; y : array [1..10] of char);

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## Stamp Coupling

Complex Data = Not Simple Data  
 Ex: record, linked list, etc.

Ex: type T = record . . . end;  
 Proc B(x : T);

B has access to all fields of x but needs access to just some fields.  
**Future error!**

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# Module Coupling

## Control Coupling

Control Data = 1) Sender *must* know receiver *internal* structure to send correct values, or 2) controls the processing of other data.

Ex: Proc GetNext( var x : real; noNext : bool );

**Problem:** change one module, *must* change the other.

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## External/Common Coupling

External Data = Any data defined outside of A and B.

**Problem:** *other* modules *also* have access to the data

Ex: IBM OS/360. ~1000 bugs per release!

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## Content Coupling

Content Coupling = One module directly accesses the content of another module.

**Problem:** change one, must change the other.

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## Examples

1. PrintLabel\_1( Name, Address, City, State, Zip );
2. PrintLabel\_2( Customer\_Mailing\_Address );
3. PrintLabel\_3( Cust\_Purchase\_Order\_Rec );
4. PrintLabel\_4( NameZip, AddressState, City );

where NameZip = Name + Zip,  
and AddressState = Address + State.

5. PrintLabel\_5();

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## Answers

1. PrintLabel\_1( Name, Address, City, State, Zip );

Name, Address, City, State =  $n(\text{char})_m$  = *Simple Data*  
 Zip = either  $n(\text{char})_m$  or int = *Simple Data*

*Thus, This is Data Coupling*

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2. PrintLabel\_2( Customer\_Mailing\_Address );

Customer\_Mailing\_Address  
 = Name + Address + City + State + Zip = *Complex Data*

*Thus, This is Technically Stamp Coupling*  
 but *Effectively Data Coupling* (all fields used)

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## Answers

3. PrintLabel\_3( Cust\_Purchase\_Order\_Rec );

Cust\_Purchase\_Order\_Rec  
 = Customer\_Mailing\_Address + Other\_Stuff

*Thus, This is Stamp Coupling* (some fields unused)

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4. PrintLabel\_4( NameZip, AddressState, City );

where NameZip = Name + Zip,  
and AddressState = Address + State.

*Thus, This is Stamp Coupling* (with *weird* bundling)

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# Module Coupling

**Answers**

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5. `PrintLabel_50;`

Must *assume* that  
Customer\_Mailing\_Address  
= Name + Address + City + State + Zip  
is *global* or in *another module*

*Thus*, This is either *External Coupling*  
or *Content Coupling*

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The End

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