
# An Overview of the COSMIC FFP Field Trial Results

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# Agenda

- **Introduction to the COSMIC method**
- **Field Trials**
  - **Aims and participation**
  - **General Findings**
  - **Measurement results**
- **Conclusions**

# Existing methods of measuring the Functional Size of software have reached their limits

- **Albrecht -> IFPUG 4.1**
- **Refinements: Feature Points, MkII FPA, 3-D FP, etc**

✓ **Widely accepted in Business/MIS software domain**

X **Tried and mostly rejected for 'real-time' software (e.g. telecoms, embedded, process control, operating systems)**

X **The attempt to account for technical and quality requirements via a 'Value Adjustment Factor' is clearly no longer valid**

# The COSMIC FFP Project Aims

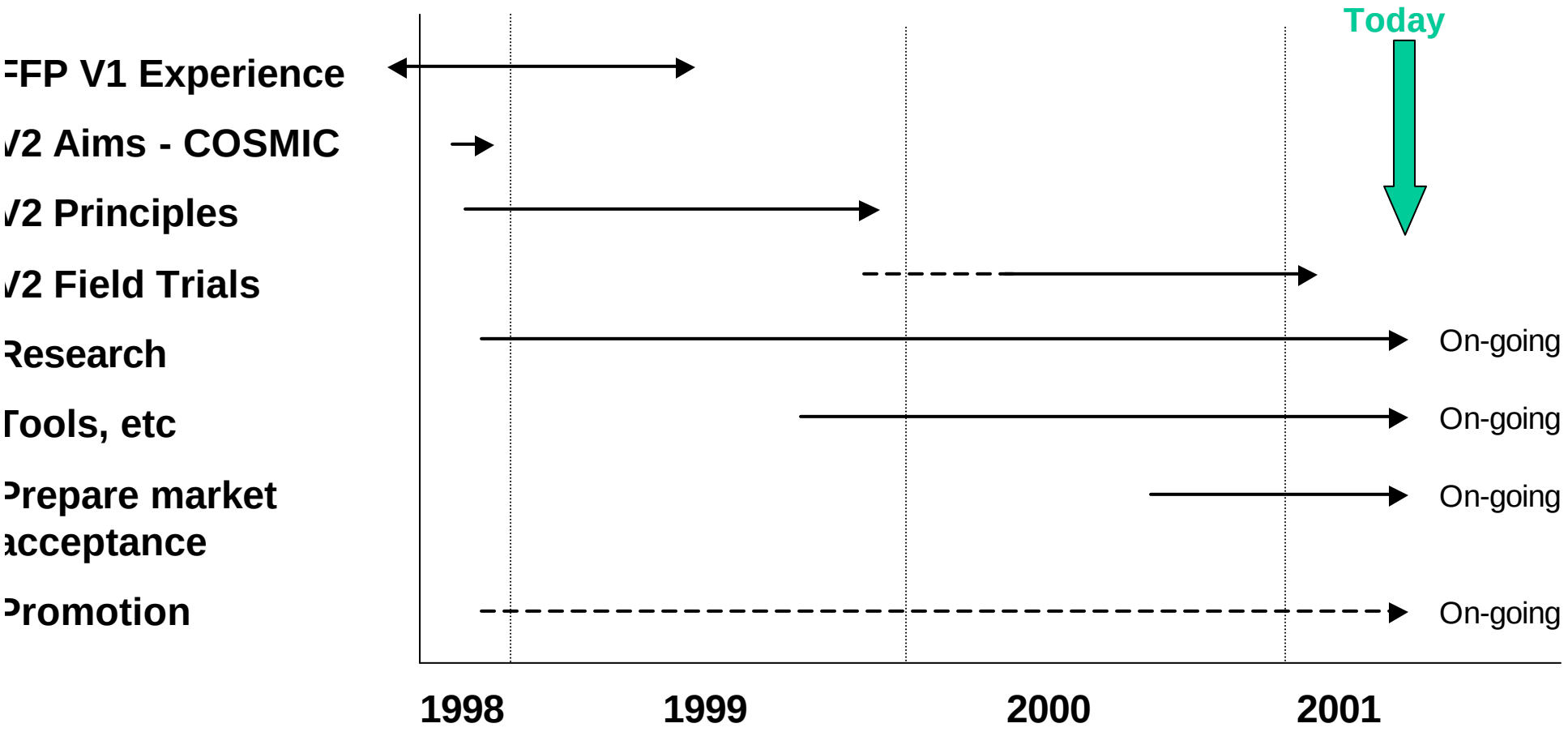
**To develop, test, bring to market and gain acceptance as an industry standard, a new generation of software functional sizing methods which are applicable:**

- **in as wide a range of software 'domains' as possible;**

**priority to be given to business and real-time software (e.g. process control, operating systems, telephony, embedded, etc.)**

- **for performance measurement**
- **as a component of estimating methods from early in a software item's life**

# Evolution of COSMIC FFP



# COSMIC FFP Core Team: a broad range of academic and practitioner experience

| | | |
|---|---|---|
| Alain Abran | Canada | Joint Project Leaders |
| Charles Symons | UK | |
| Moritsugu Araki | Japan | |
| J.-M. Desharnais, Serge Oligny, Denis St Pierre | Canada | |
| Reiner Dumke, Gunter Buehren | Germany | |
| Peter Fagg, Grant Rule | UK | |
| Vinh Ho | Vietnam | |
| Roberto Meli | Italy | |
| Pam Morris | Australia | |
| Jolijn Onvlee | Netherlands | |
| Marie O'Neill | Ireland | |
| Risto Nevalainen | Finland | |

**Experience:**

- Academia
- Industry
- IFPUG, MkII, Laturi, NESMA, etc
- ISO SC7/WG12

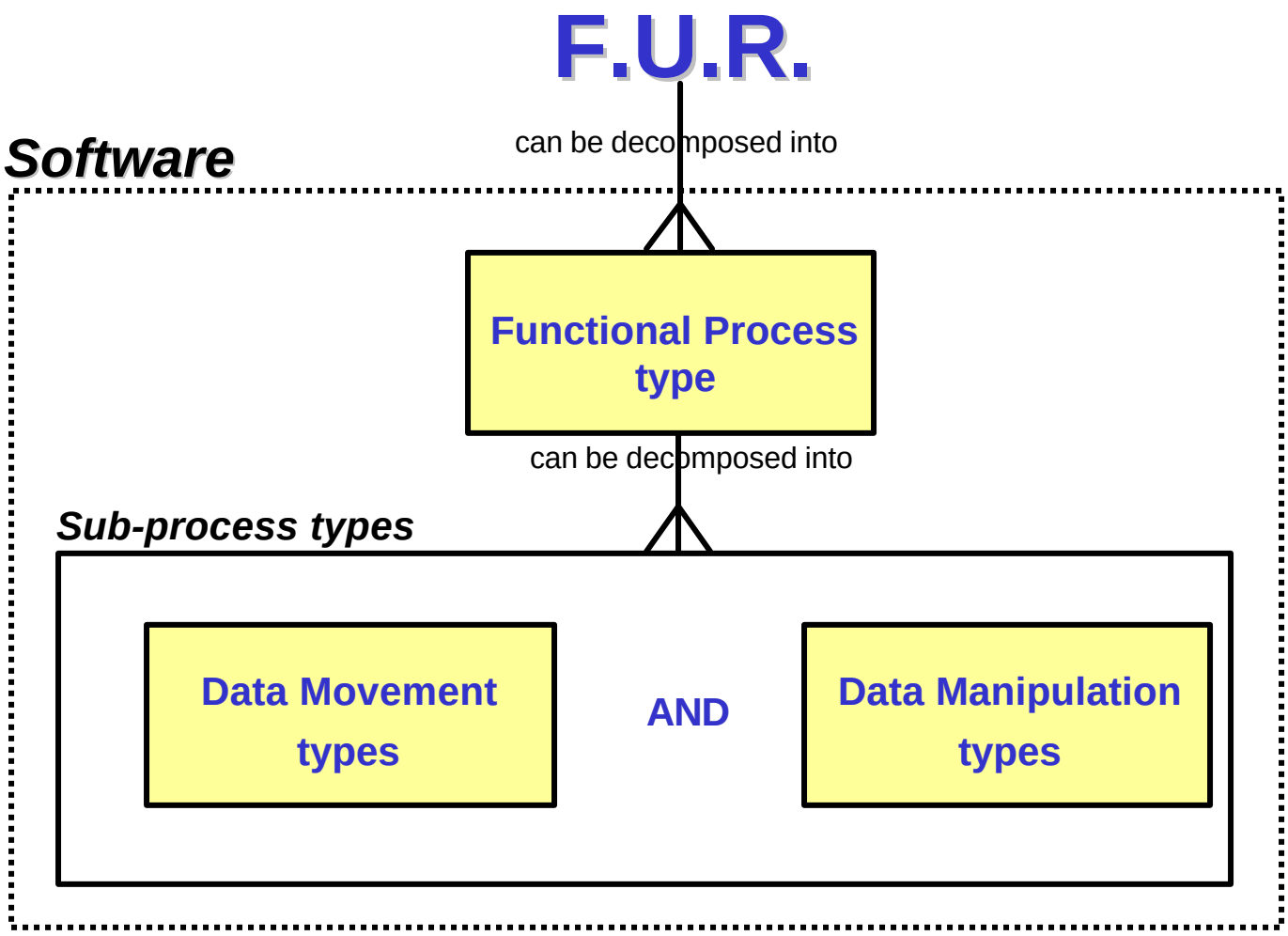
# The ‘Functional Size’ of software

- **ISO/IEC/JTC1/SC7 Standard #14143 definition**:

**“Functional Size: A size of software derived by quantifying the functional user requirements”**

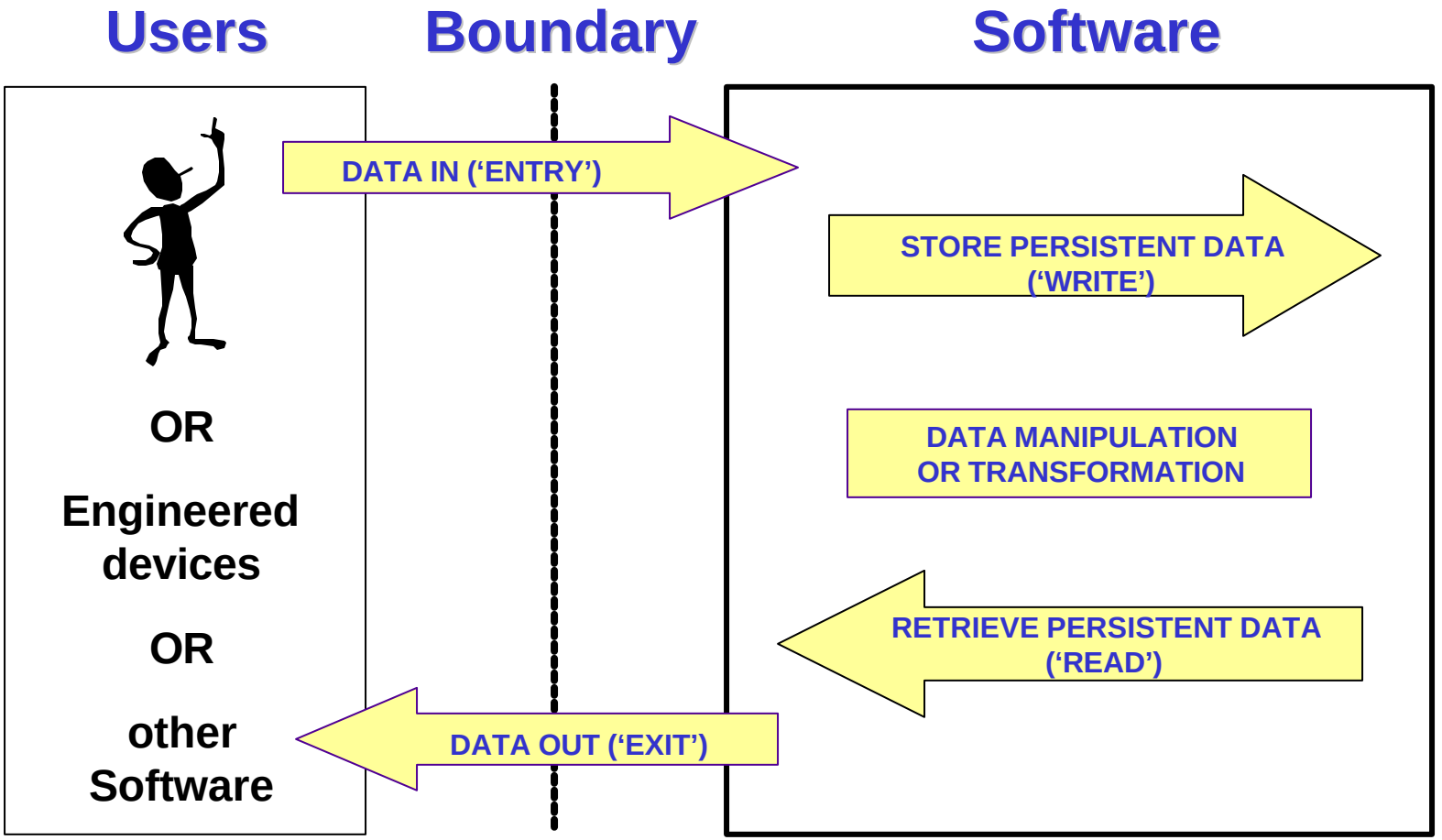
**“User: Any person, physical device, item of software, etc which interacts with the software being measured”**

# A general model of software FURs

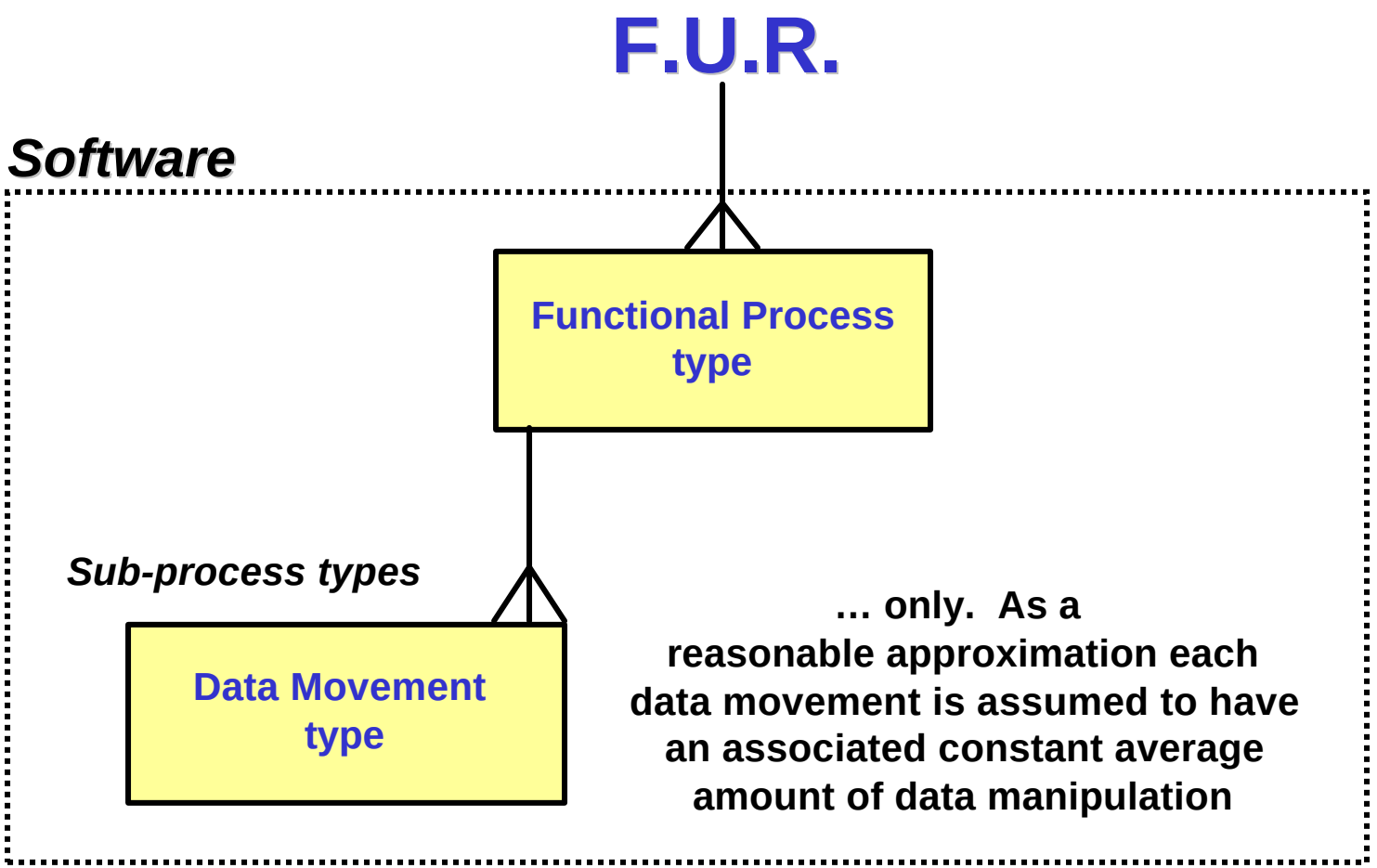



***Functionality = Data movements and Data manipulations***

# The User view of software FUR components



# The COSMIC FFP model of software FURs




***Functionality = Data movements + some processing***

# Definition of a 'Functional Process'

**A functional process is a unique set of data movements (Entry, Exit, Read, Write)**

**It is triggered by a unique event-type and, once performed, must leave the software in a coherent state with respect to the triggering event**

**(Equivalent to MkII "Logical transaction" and similar to a an IFPUG "Elementary process".)**

# Definitions of ‘Data Movement’ and ‘Data Group’

- **A Data Movement moves data belonging to a single Data Group**

- **A Data Group is a set of data attributes where each included data attribute describes a complementary aspect of the same, single Object of interest**

**‘Object’ is a synonym of ‘Entity-type’ – DO NOT confuse with ‘Objects’ of OO methods!**

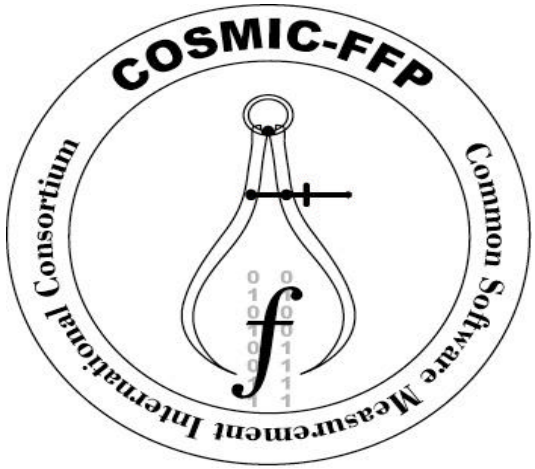
# The Size of a Functional Process

- **Convention for Unit of Measure**

  **1 Data Movement = 1 COSMIC functional size unit (Cfsu)**

- **The size of a Functional Process is the arithmetic sum of the number of Data Movements (Entries, Exits, Writes and Reads)**

- **The size of an item of software is the sum of the sizes of all the Functional Processes**



# Functional Process: simple MIS example

**A Functional Process to 'Create' a new employee**

**Event: the arrival of a new employee in the world of the User**

**1 x Entry (new employee data)**

**1 x Write (make employee data persistent)**

**1 x Exit (error and/or confirmation message)**

**Total Size of the Functional Process: 3 Cfsu's**

# Functional Process: simple Real-time Example

**A Functional Process to control temperature at regular intervals**

**Event: the tick of the real-time clock**

**1 x Entry (clock-tick)**

**1 x Entry (current temperature)**

**1 x Read (target temperature)**

**1 x Exit (on/off command to heater)**

**Total Size of the Functional Process: 4 x Cfsu's**

# Overview of the measurement process

**Define Purpose and Scope**

**Gather artifacts of software to be measured**

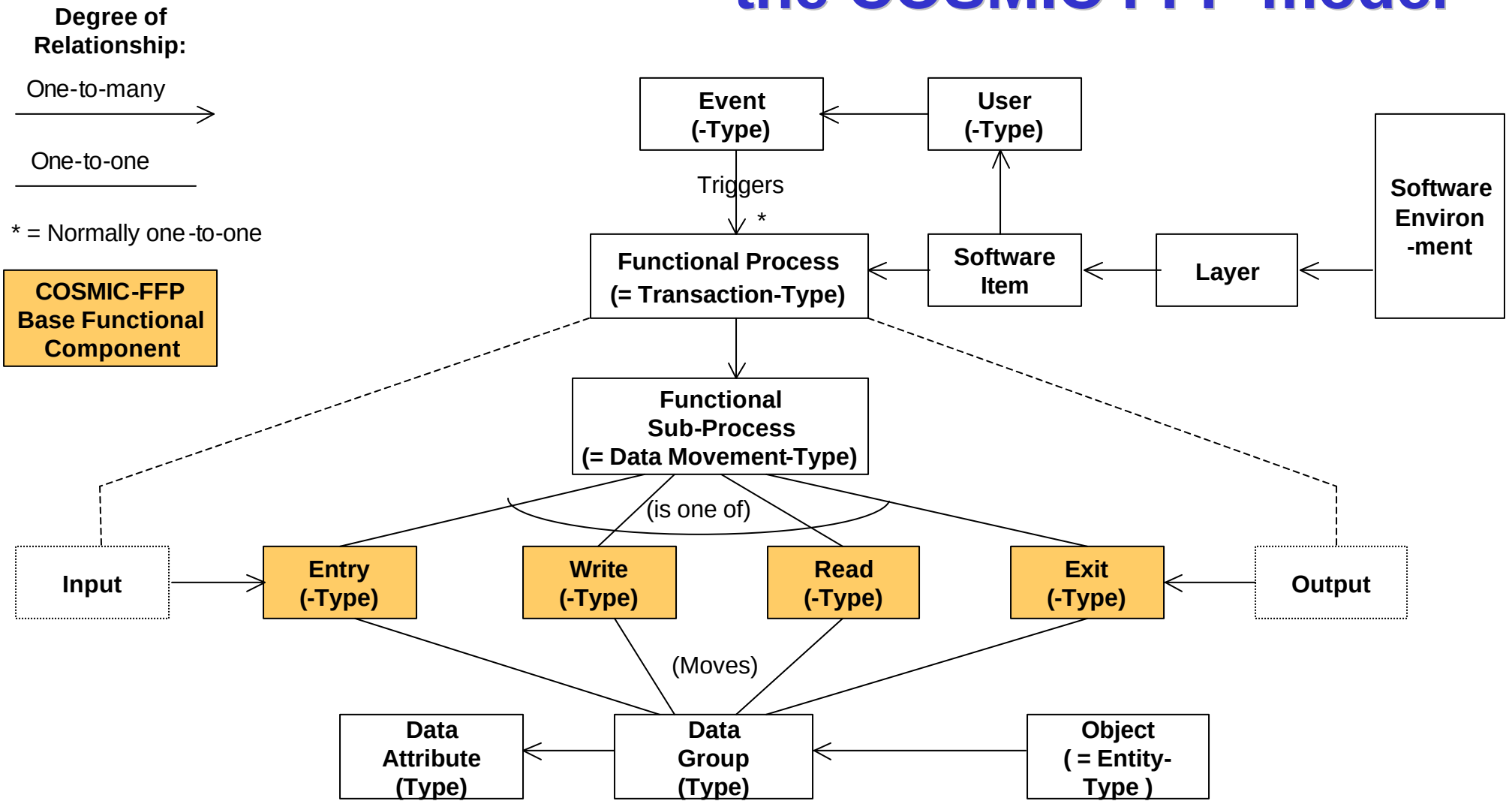
**MAPPING PHASE 1**

**Software FURs in COSMIC model**

**MEASUREMENT PHASE 2**

**Functional size of software FURs**

# Summary: the full set of concepts of the COSMIC FFP model



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# The Field Trial aims:

- **to test for a common, repeatable interpretation of the Measurement Manual (under widely-varying conditions: organisations, domains, development methods, etc).**
- **to establish the detailed procedures, where necessary to ensure repeatable interpretation**
- **to test:**
  - **that the measures properly represent functionality**
  - **and/or correlate with development effort**
- **to enable a full transfer of technology to the trial 'Partners'**

# COSMIC FFP V2 Field Trials Participation

**Data collection completed in a formal context:**

- European aerospace manufacturer
- European Bank (MIS systems)
- Two European telecommunications manufacturers
- Australian defence software contractor

**+ Other data from:**

- Australian defence contractor
- Australian real-time software house
- Australian aerospace manufacturer
- Canadian small software house
- Canadian defence contractor
- Canadian energy transportation organisation

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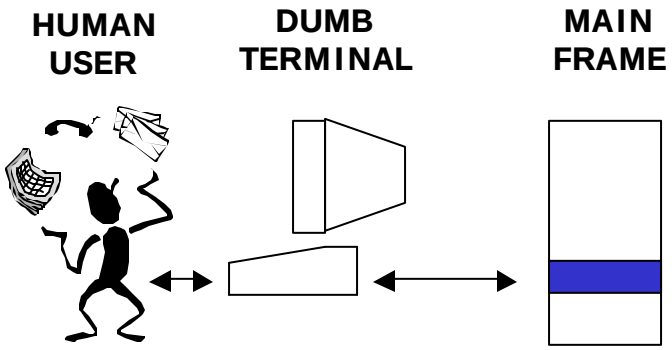
# Some initial conclusions from applying the COSMIC FFP method

| | |
|---|---|
| **Can the method be applied equally to MIS and real-time software?** | **YES It is easy to interpret the model in both domains (Cf IFPUG. Classifying Elementary Processes as Inputs, Outputs or Inquiries is OK for MIS, but not for real-time software)** |
| **Are the four DM Types all of equal weight?** | **On very limited evidence - YES** |
| **Are the DMs on average the same size in MIS and real-time software?** | **We do not know yet.**<br><br>**Therefore, productivity comparisons across MIS and real-time software using COSMIC FFP must still be treated with caution** |

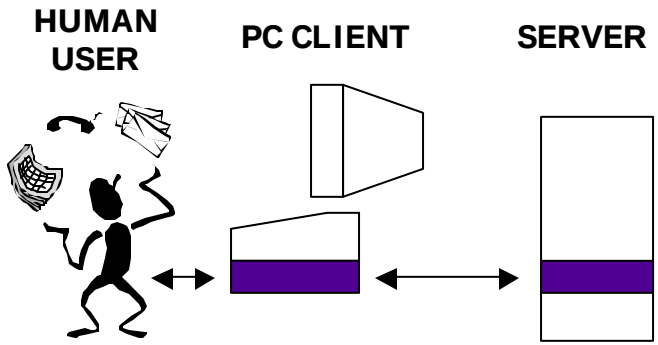
# Tests showed good Repeatability in the right circumstances

- **Test 1: avionics software documented to a high standard; engineers familiar with the domain -> near-perfect repeatability**
- **Test 2: process control software; senior engineers with domain experience -> good repeatability; junior engineers with limited experience of the domain and of functional sizing -> poor repeatability**
- **Conclusion: conditions for good repeatability**
  - **Experience of the domain and of the COSMIC FFP method**
  - **Local rules for unambiguous interpretation of local documentation standards using the COSMIC FFP method**

# Conventional FPA was designed to size the human view of business application software

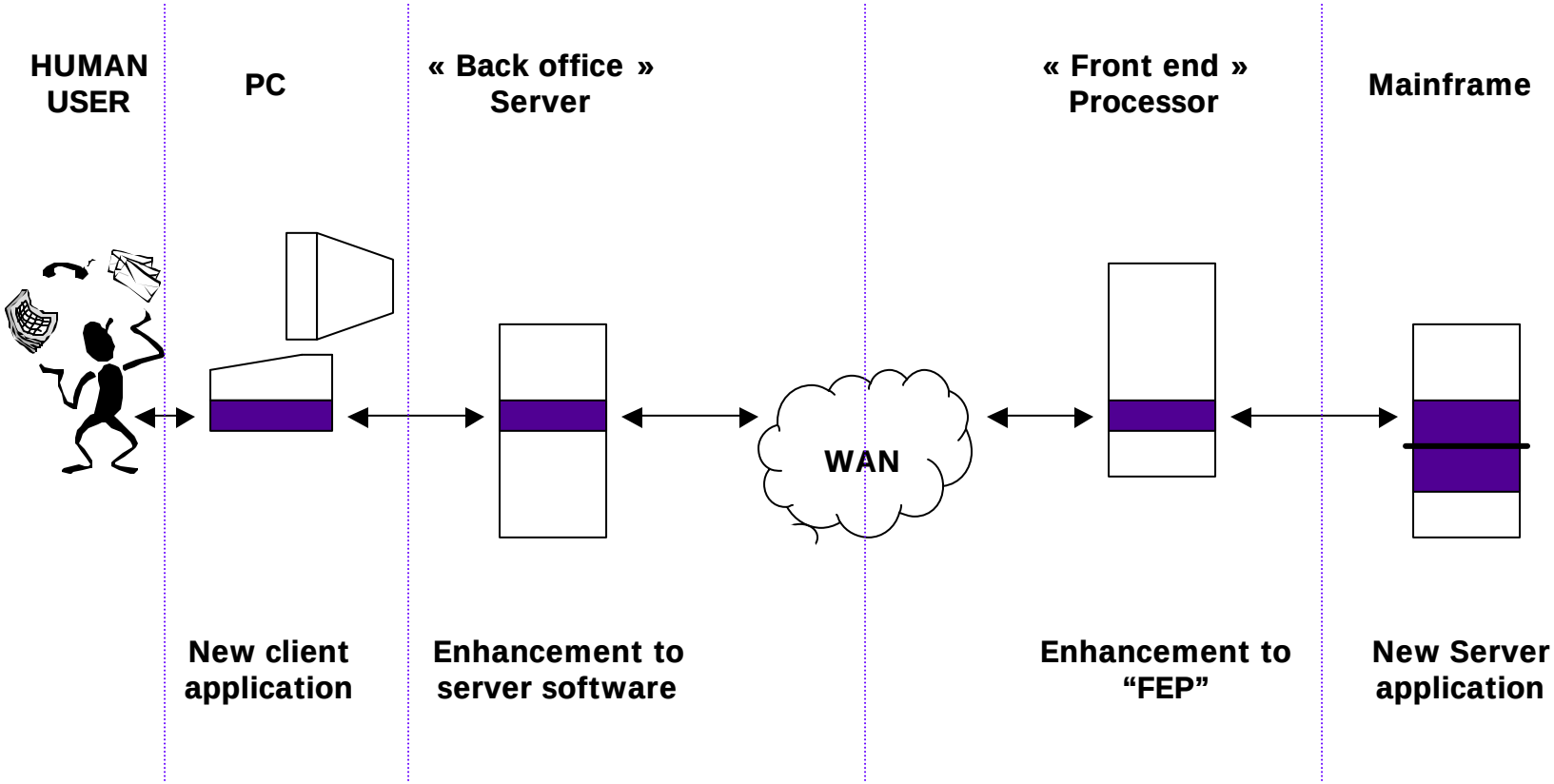



Conventional IFPUG and MkII FPA: the human view of functional size is identical to the developer's view




With two-tier Client-Server software, conventional FPA can measure the human view of size and can be stretched to measure the separate sizes of the client and server components

# The COSMIC method is much more flexible in the sizes it can measure than conventional FP methods




**The COSMIC method can be used to size the human view and also the size of the components of multi-tier, multi-layer software which the developer must build**

# The general feedback is very positive

- **‘Project Teams were able to grasp the elements of the method easily and were enthusiastic about the method’**
- **‘Documentation and effort needed is similar to that for applying the IFPUG method, though there is an extra step to identify layers’**
- **‘The Z-unit has now also continued COSMIC FFP measurements with new projects and decided to implement this measurement technique as a standard procedure in their development process ’ (European participant).**

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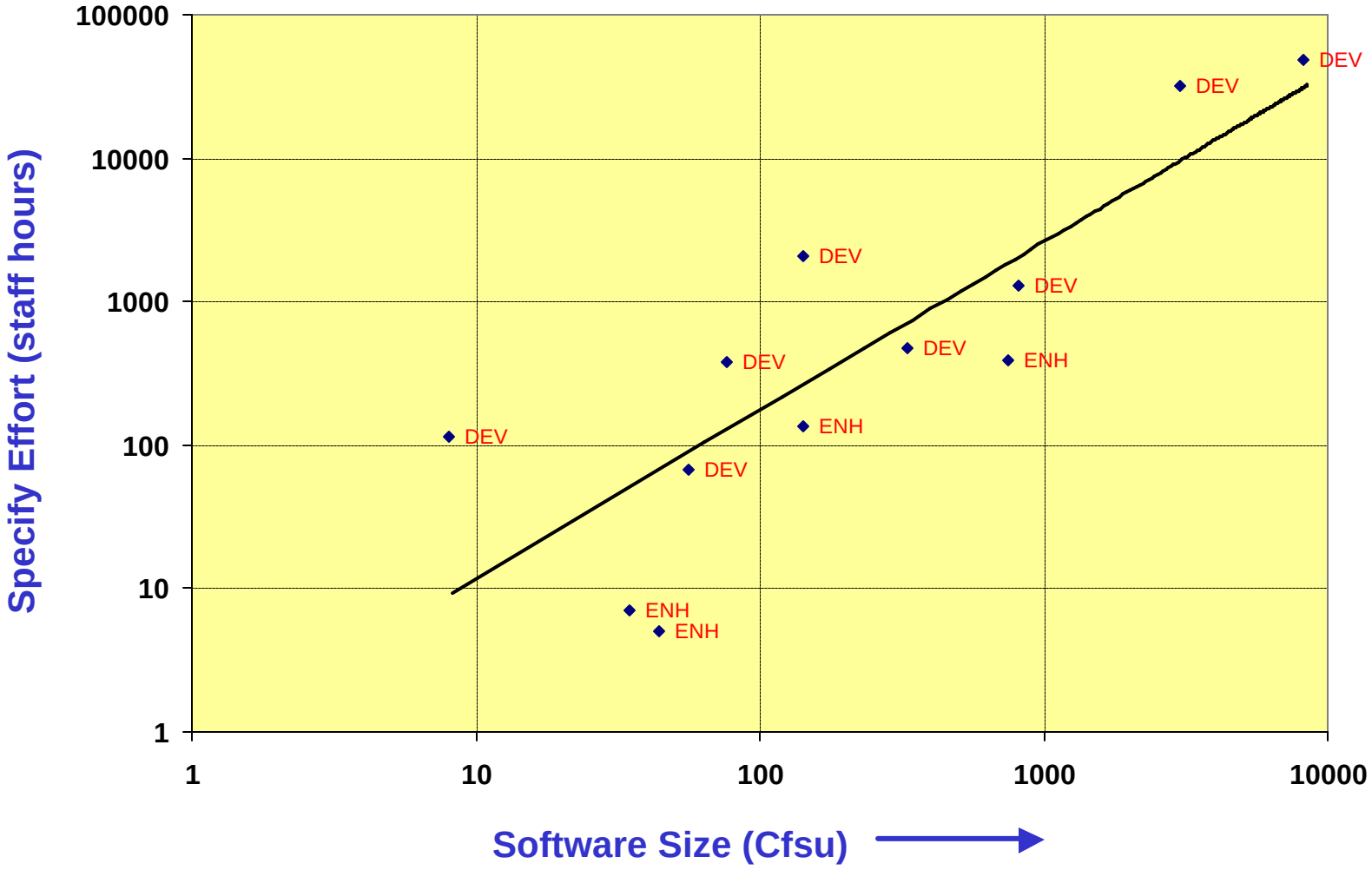
# Field Trial projects used a variety of technologies

## Set A of Development projects :

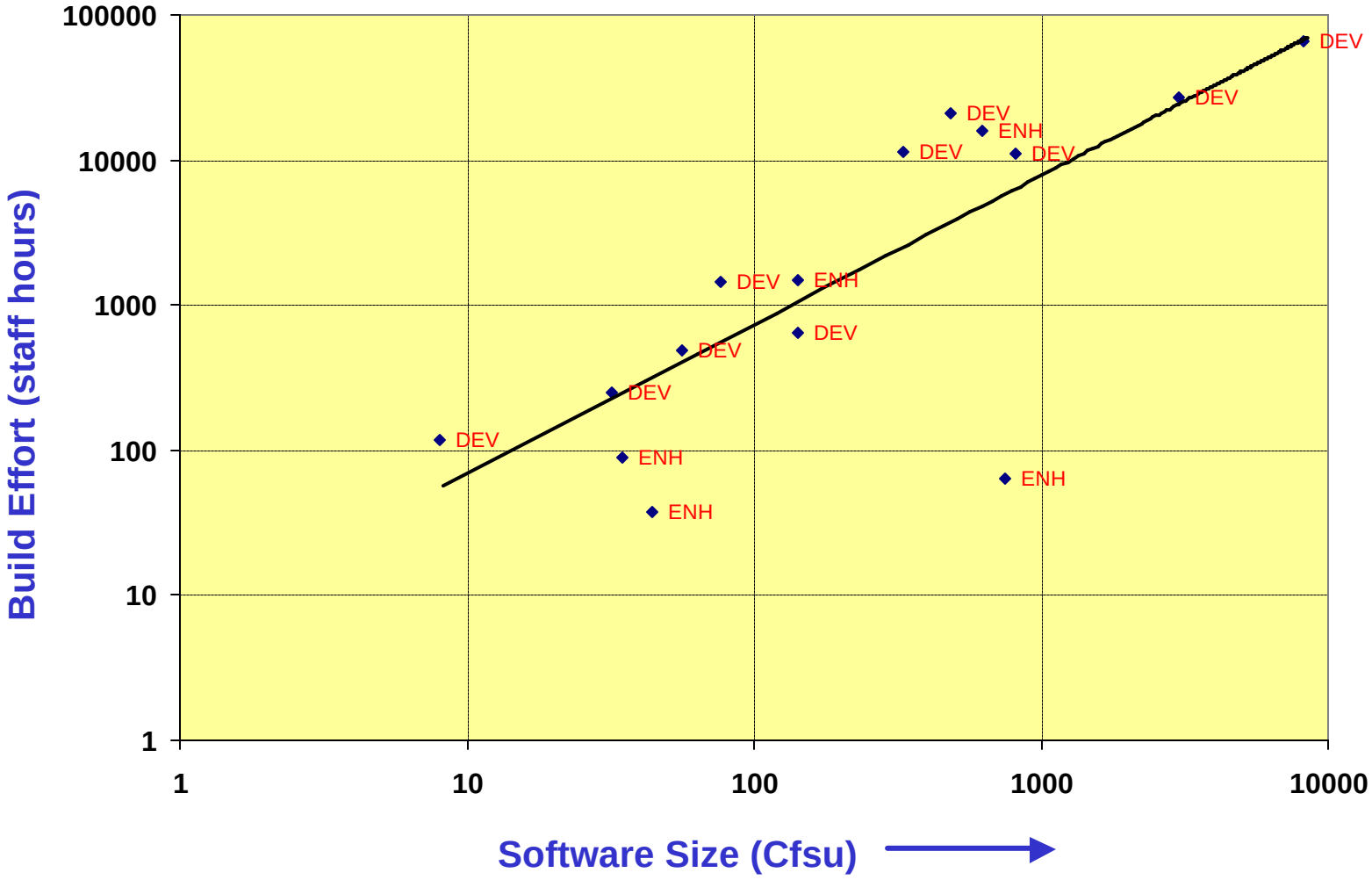
**18 projects from 5 organisations:**

- **16 New Developments & 2 Enhancements**
- **Platforms: 7 PC, 4 DEC, 2 HP, 2 IBM mf and 1 Compaq**
- **Completed between March 1999 and May 2000**
- **Duration: from 5 to 75 months**

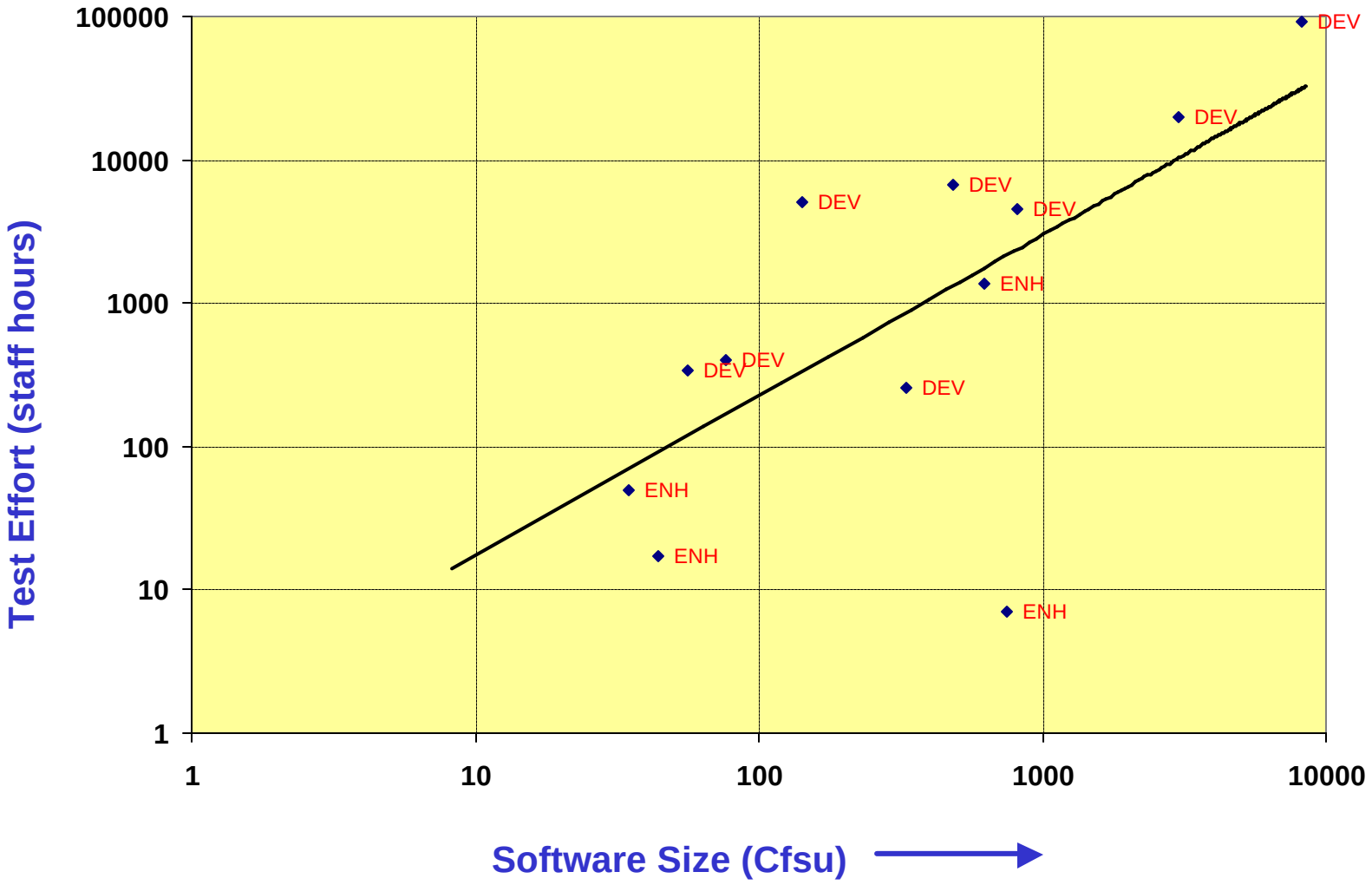
# Specify effort per unit size is quite variable; Enhancements need less effort



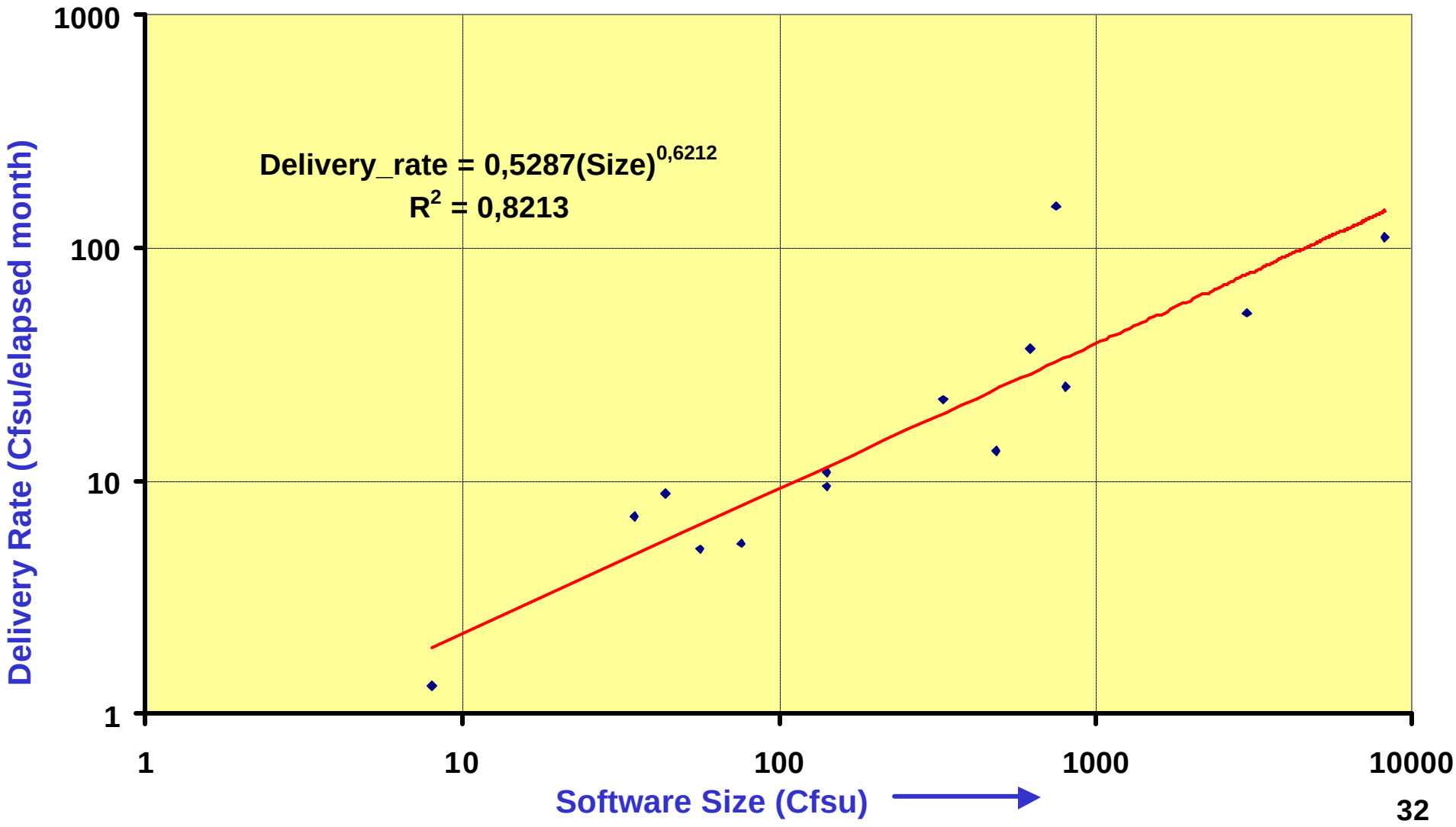
# Build effort per unit size is generally much more consistent



# Test effort/unit size is also quite variable



# Speed of Delivery is also quite consistent



# The performance measurement results give confidence in the measurement methods

**Considering the variety of application types (telecoms, avionics, defence, MIS), technologies, organisations, there is a high degree of consistency of the performance measurements**

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# The COSMIC FFP method is a big advance over existing Functional Sizing methods

| | IFPUG FPA | MkII FPA | COSMIC FFP |
|---|---|---|---|
| Usable for MIS applications? | Yes | Yes | Yes |
| Usable for real-time applications & infrastructure software? | No | Not easily | Yes |
| Accuracy for MIS | Questionable | OK | OK |
| Ease of use | Complicated | Slightly complex | Simple |
| Compatible with modern requirements analysis methods? | No | Yes | Yes |
| Benchmark data? | Yes | Yes | Starting |
| International acceptance? | Yes | Growing from UK base | Growing from International base |

# The COSMIC FFP method is much more valuable than just for sizing

**We need requirements which are**

- **Understandable**
- **Traceable**
- **Testable**
- **Measurable**

**The COSMIC FFP method is a basic requirements analysis method – size measurement is almost a spin-off**

# COSMIC FFP method has achieved a number of 'firsts'

**The first Functional Sizing method to:**

- **be designed by an international group of experts on a sound theoretical basis**
- **draw on the practical experience of all the main existing FP methods**
- **be designed to conform to ISO 14143 Part 1**
- **be designed to work across MIS and real-time domains, for software in any layer or peer item**
- **be widely tested in field trials before being finalised**

# Available resources

- **Complete documentation on the Web**
  - ✓ Concepts and definitions,
  - ✓ Measurement Manual,
  - ✓ Publications,
  - ✓ http://www.lrgl.uqam.ca/ffp.html
  - ✓ http://www.cosmicon.com
- **Training and consultancy support available in Europe, N America and Asia/Pacific**