

COSMIC-FFP

Some results from the field trials

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Agenda...

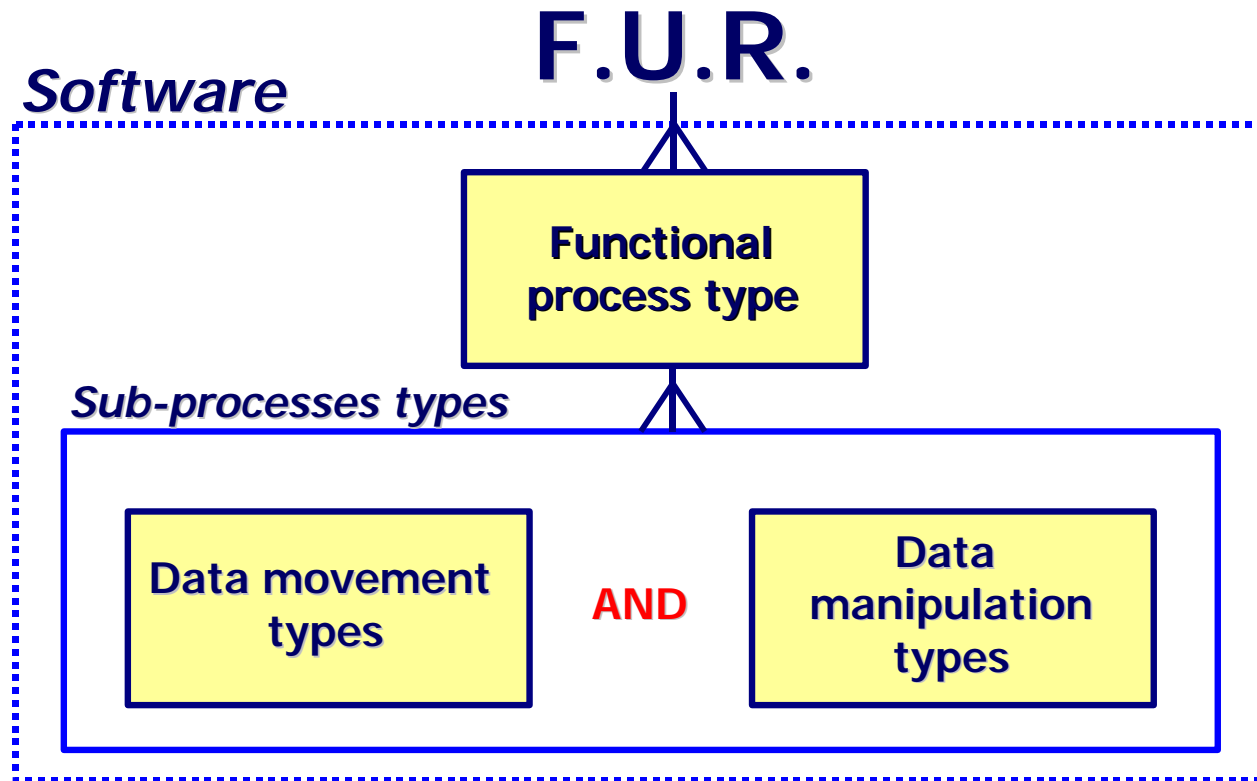
- ⊙ **Context**
- ⊙ **COSMIC-FFP – Brief review of key points**
- ⊙ **Field trials results – first analysis**
- ⊙ **Field trials results – second analysis**
- ⊙ **Conclusion**

Context...

- ⊙ A new functional size measurement method, COSMIC-FFP, was put in the public domain a year ago,
- ⊙ Field trials were conducted essentially until the end of summer 2000,
- ⊙ The first experimental results of the field trials are presented here.

COSMIC-FFP – Key points...

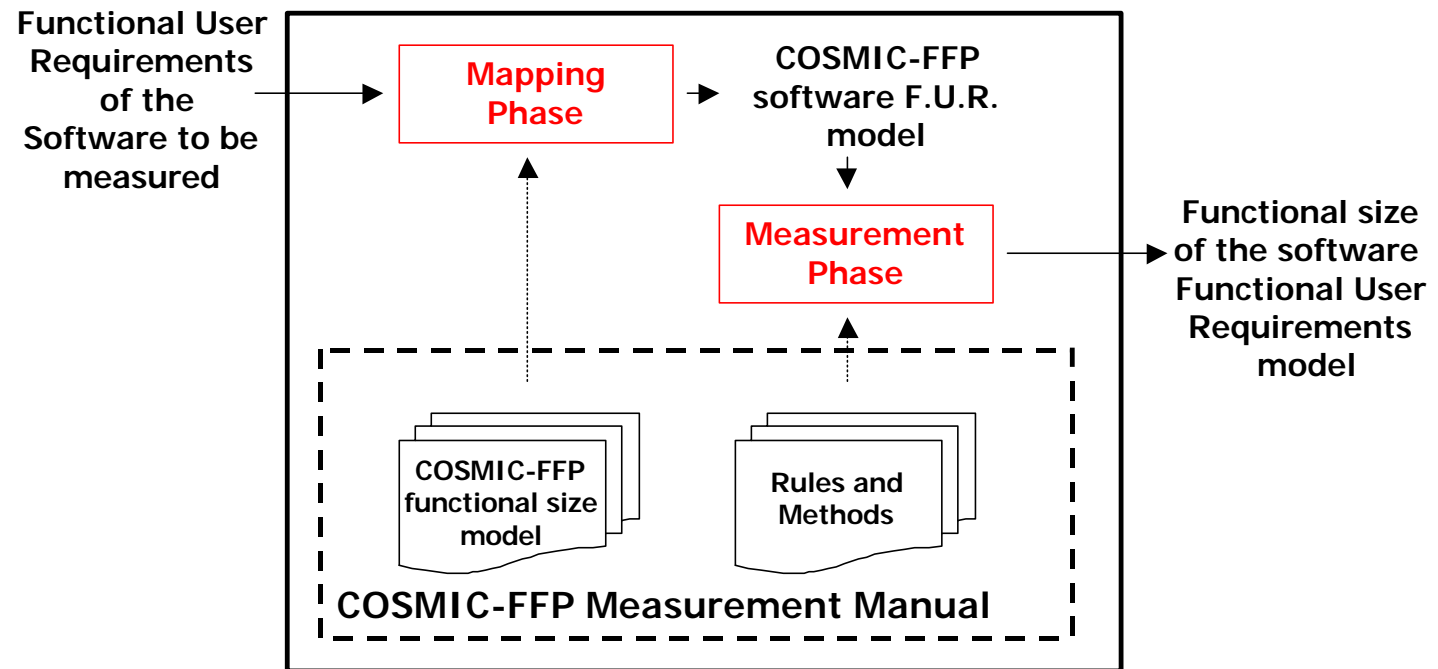
Software model



Functionality = Data movements and Data manipulations

COSMIC-FFP – Key points...

Measurement process



COSMIC-FFP Measurement Manual, p. 12

COSMIC-FFP – Key points...

Measurement system

- Unit of measure: COSMIC Functional Size Unit (**Cfsu**).
- Yardstick (by convention): **1 Cfsu = 1 elementary data movement**,
- Base Functional Components (BFC): entry (**E**), exit (**X**), read (**R**) and write (**W**)
- Therefore **each BFC** receives **1 Cfsu**.
- FFP results can be aggregated at the desired level of detail by **arithmetically adding** the size units assigned to sub-processes.

Field trials results

1st analysis: Study the range of functional process size.

2nd analysis: Study the role of the number of data attributes per data movement

Field trials results – data sample

- ⊙ **One organization, a world class manufacturer of real-time systems,**
- ⊙ **Sample of 93 functional process taken from 6 software delivered in 1999 or 2000,**
- ⊙ **Sample of 456 individual data movements from the same 6 software.**

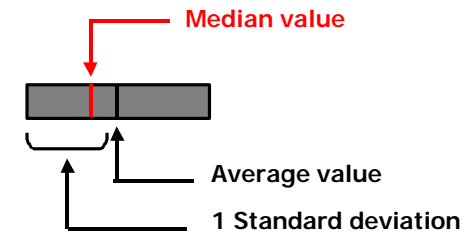
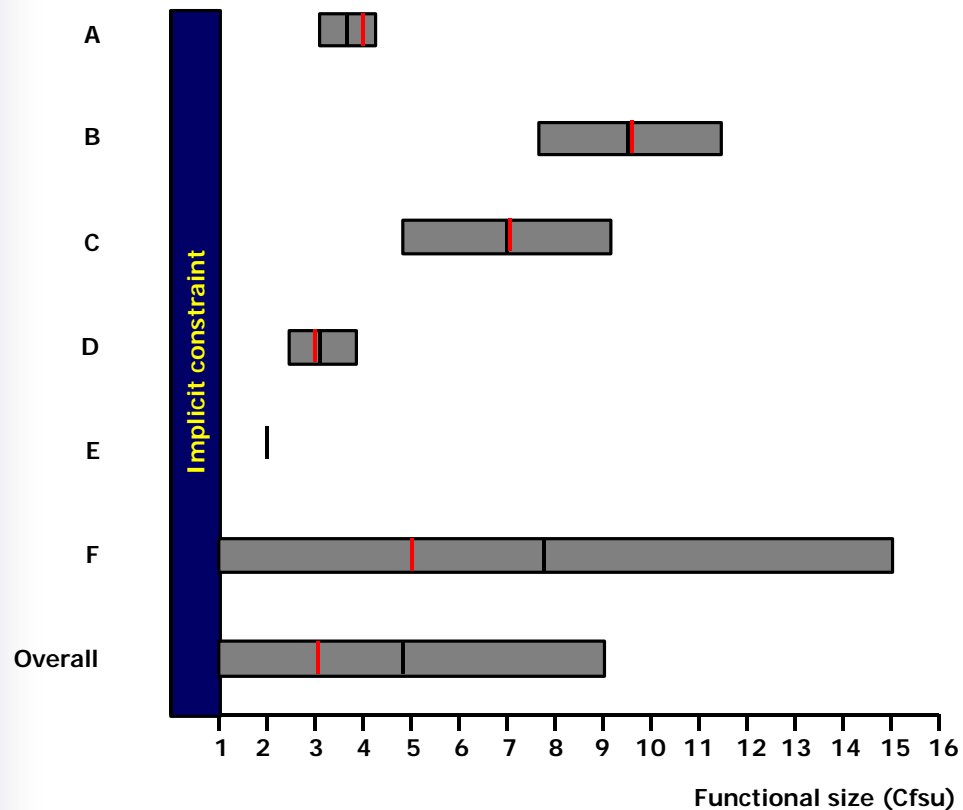
Field trials results – data sample

Software ID	No. of functional processes	Software size (Cfsu)
A	9	32
B	8	76
C	8	56
D	46	142
E	4	8
F	18	142
Overall	93	

Field trials results – 1st analysis

Software ID	No. of func. processes	Software size (Cfsu)	Average size (Cfsu)	Standard deviation
A	9	32	3,6	0,5
B	8	76	9,5	1,9
C	8	56	7,0	2,1
D	46	142	3,1	0,7
E	4	8	2,0	0,0
F	18	142	7,9	7,1
Overall	93	456	4,9	4,1

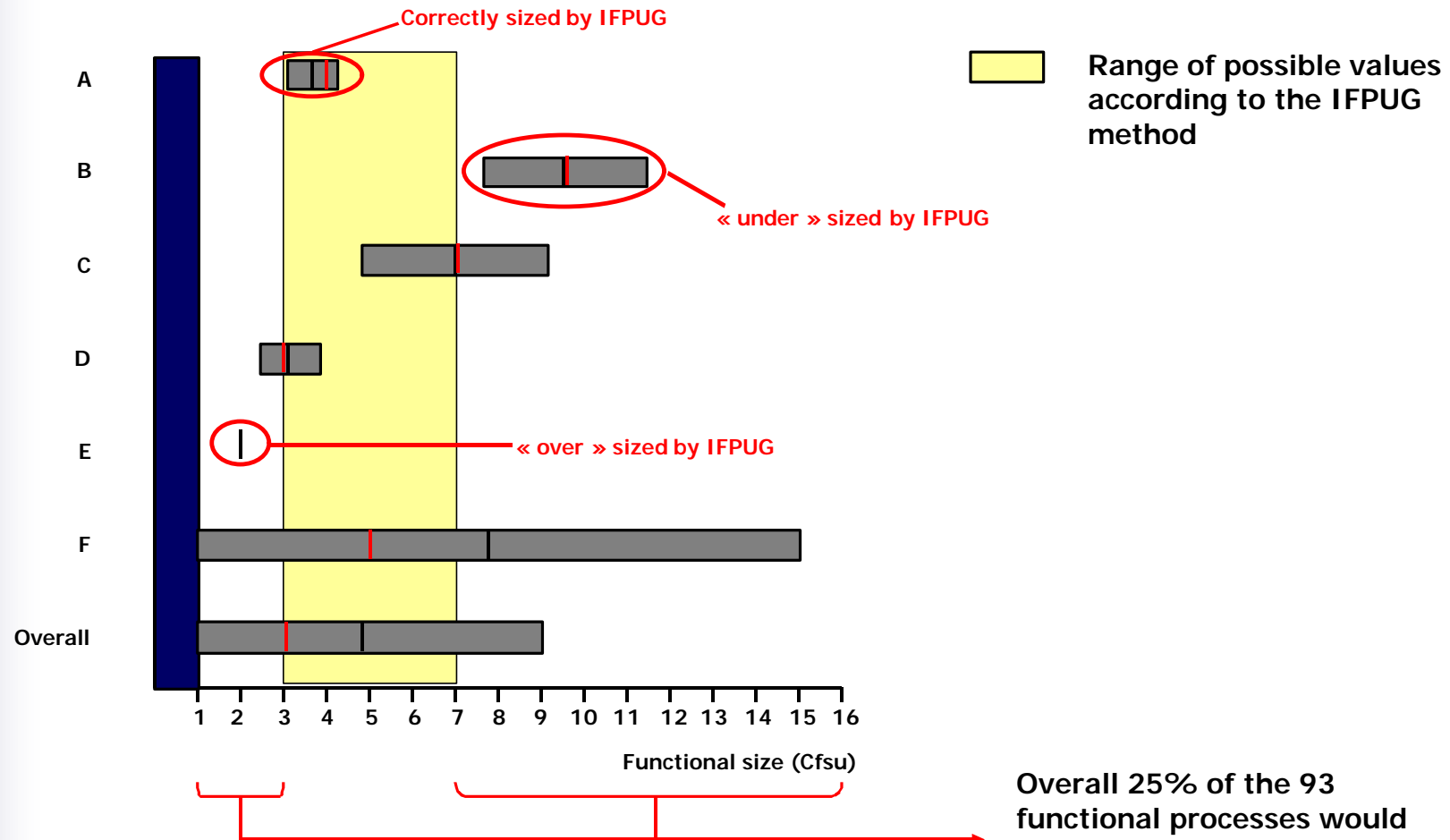
Field trials results – 1st analysis



Hypothese:

Establish an equivalence between COSMIC-FFP functional process and IFPUG elementary process...

Field trials results – 1st analysis



Overall 25% of the 93 functional processes would have been mis-sized by the IFPUG method.

Field trials results – 1st analysis

- ⊙ **COSMIC-FFP was designed to better capture the amount of functionality within functional process**
- ⊙ **We have corroborative evidence that the design of the method meets its goal**
- ⊙ **The granularity of COSMIC-FFP allow to better capture the variations in functional size, as it is often observed in real-time software.**

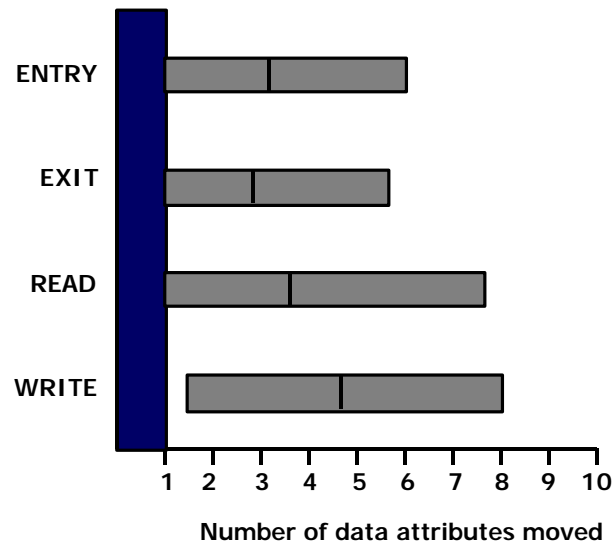
Field trials results – 2nd analysis

- ⊙ **Number of data attributes counted for 344 of the 456 individual data movements,**
- ⊙ **Is there a significant difference in the number of data attributes moved by each type of data movement ?**
- ⊙ **Would it justify different “weights” for each type of data movement ?**

Field trials results – 2nd analysis

Data movement types	Average no. of data attribute	Standard deviation	Number of observations
ENTRY	3,1	2,9	96
EXIT	2,9	2,7	121
READ	3,5	4,1	63
WRITE	4,7	3,3	64

Field trials results – 2nd analysis



Null hypotheses: there is no significant Difference between the number of data Attributes moved by each type of data movement.

$P(H_0) = 0.0025$, thus null hypotheses is rejected at the 0.05 level.

Pre-requisite: variance are equals (H_0) then verify with Levene's test.

Then, which data movement type differs from which others ? ... conduct paired t-test...

Result: 0.1882, thus H_0 is confirmed at the 0.05 level and paired t-test can be applied.

Field trials results – 2nd analysis

H_0 : both type (i,j) move on average the same number of data attributes.

$P(H_0)$ below:

	ENTRY	EXIT	READ	WRITE
ENTRY		0.6098	0.5188	0.0022
EXIT			0.2620	0.0003
READ				0.0271
WRITE				

H_0 rejected at the 0.05 level

Field trials results – 2nd analysis

- ⊙ **Analysis indicate a difference between WRITE and the other three data movement type (as a group),**
- ⊙ **Magnitude of the difference is small though,**
- ⊙ **Unless there would be experimental data supporting a difference of a larger magnitude, each type of data movement will be considered of equal “weight”.**

Conclusion...

- ⊙ **From the 1st analysis:**
 - **The granularity of COSMIC-FFP allows to better capture the variations in functional size, as it is often observed in real-time software for instance.**
- ⊙ **From the 2nd analysis:**
 - **Unless there would be experimental data supporting a difference of a larger magnitude, each type of data movement will be considered of equal “weight”.**

Conclusion...

- ⊙ These two analysis are the first field trial results to be published,
- ⊙ There is much more to come in the following months,
- ⊙ Disclosure of field trial results can be monitored at:

<http://www.lrgl.uqam.ca/ffp.html>

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