The Heterogeneous Integration Framework Initiative (HiFi)

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Motivation

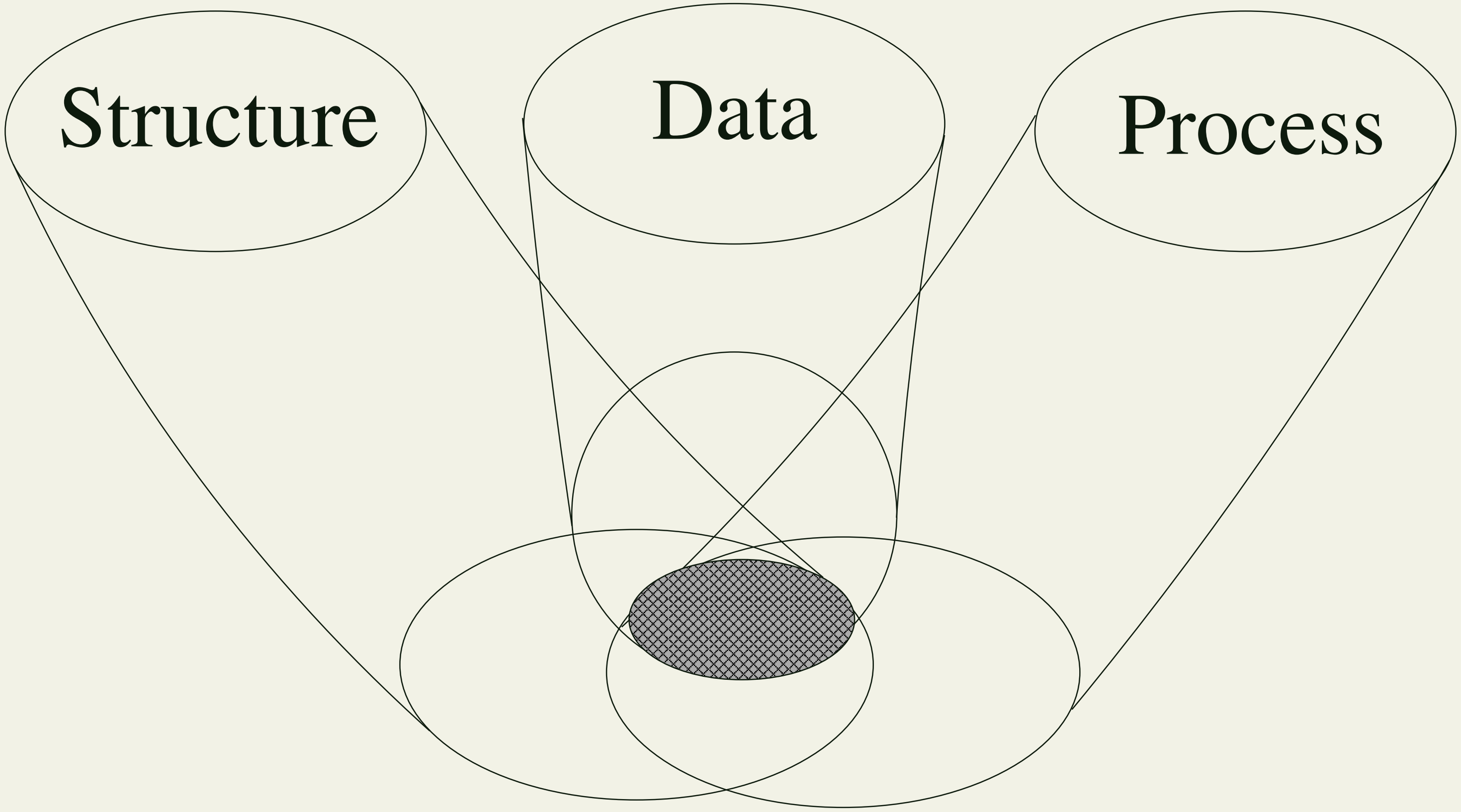
“There is a population explosion among the logical systems used in computer science.” (Joseph Goguen)

“It is a fact of life that no single perspective, no single formalization of level of abstraction suffices to represent a system and reason about its behaviour.” (José Meseguer)

“As can be seen, a plethora of formalisms for the verification of programs, and, in particular, for the verification of concurrent programs has been proposed. Their relationship is almost clear and for many different formalisms we already know if translations between them exist.” (Klaus Schneider)

Motivation

multiple viewpoints are used when specifying complex software intensive systems



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- changes in the formalisms may be needed in the course of software development
- even for one and the same mathematical formalism, there are many slightly varying input languages
- the occasional use of a more complex formalism should not destroy the benefits of mainly using a simpler formalism

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⇒ How can we integrate formalisms and tools?

State of the art: the informal/semi-formal world

- the heterogeneous languages UML deliberately has no formal semantics
- languages for mathematical knowlegde management like OpenMath and OMDoc are deliberately only semi-formal
- service integration approaches like MathWeb, Modelware, JETI are either informal, or based on a fixed formalism

State of the art: the formal world

- bi- or trilateral combinations of different formalisms (e.g., integrated formal methods conference series)
- ad-hoc integrations of decision procedures and model checkers into theorem provers
- meta-frameworks like institutions provide good foundations, but have not been systematically used for integration yet.

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⇒ Need for a both flexible and formal integration.

Formalisms to be integrated

- logics
- process algebras
- semi-formal notations such as the UML (with different morphisms to semantics-based formalisms giving different formal semantics)
- architectural description languages
- programming languages
- . . .

Aims of HiFi

- Clarify the foundations needed for integration
- Integrate existing formalism and tools, together with translations ⇒ case-studies showing usefulness
- Service-oriented architecture of tool integration (proving, model checking, testing, . . .) ⇒ publishing and binding of services in a logical context
- Open, collaborative effort
- based on free software

HiFi may build on existing work

- lots of existing formalisms and bi-, trilateral integrations of these
- institutions, general logics, specification frames, coordinated categories (cf. FLIRTS)
- Common Framework Initiative, CASL and extensions, institution-independent specification-in-the-large
- heterogeneous CASL, heterogeneous tool set Hets
- tools for parsing, translating, rewriting (ASF, Maude)
- services like KUMO, MathWeb, MathServ, Monet

How to start?

- mailing list, web page
- Wiki of formalisms
- meetings, in connection with IFIP WG 1.3
- try to get funding (nationally and EU)
  ⇒ fruitful interaction of funded and voluntary activities
- common repository of tools and integration tools