

Dynamical Processes Chaos Relativity to Environment Implement Scope - DYVELOP

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Abstract: The requirements of chaos relativity comprehensibility are bringing new approaches for end-users as dominant clients of communication - cyber-informatics's service providers. Chaos comprehensibility is related to definition/ discrimination/ resolution/ reception/ sensation/ setting/ background/ empathy levels (aspects) – i.e. to the environments & theirs zoom in practice. Suitable 'language' for analysis, modelling, simulation and evaluation apparatus and methodology must bring fundamental solutions of this problem; namely if the end-user is crisis situations manager operating in threats life cycles. Here up-graded apparatus UML, (UP)/DYVELOP is proposed and tested. The specialists from diverse branches and in various environments can easy manage these apparatus and methodology without sophisticated preliminary disposition. They are available to model dynamical temporal extraordinary events on mass serving computers even. Here are introduced three kinds of initially chaotic → consequently comprehensive use cases – 1/ the Mastering of <<DYVELOP[©]>>, 2/ emergency applicable - Baseline CAMouflage Architecture for ADAPTIV project and 3/ the Family in a Crisis. Static system's / dynamic process relationships and logistic flows will be displayed by means of original 'blazons' - maps of roles. They show big potential of this apparatus for among-branches using in various environments. Dynamic blazons are the best to show in live on-line PowerPoint presentation, which will be dramatized at conference finally.

Key-Words: Chaotic Events Modelling; Requirements/Concurrent Engineering; Blazon; UML; DYVELOP; Application Development Life Cycle

1 Introduction to the Problem

The end-users must be perceptible as dominant **clients** of cyber-informatics' service **providers** always! The **Requirements Engineering** (RE) runs as significant collaboration activity in the **projects of applications development**. The RE must bring new international academic, scientific and standardization approaches in common methodology beside. Un-substitutable role of RE is to provide adequate, above-state-of-art technologies, systems and know-how for all **actors** in project cooperation – **clients** (end-users) & cyber-informatics service **providers** (developers) during iterative Life Cycles of Applications Development. Developer must gravitate toward solution side by side with end-users. In application development of information systems and/or technologies (IS/IT) is necessary to use the RE for application **iterations**. Here, it is fundamental to enthroned suitable and simple language's syntax & semantics & methodology for analysis, modelling, simulation, design and evaluation processes of concurrent application developing RE.

In this paper, here RE's capability, competency and responsibility is introduced for extraordinary situation of threat scenarios model development. It enables an implementation of modelling and

simulating new apparatus DYVELOP/UML,(UP) [2, 1, 6]. Quite original instrument is **DYVELOP[©]** – **Dynamic Vector Logistics of Processes apparatus** (J.F.UrbaneK, 1999 [3]) here. It uses iconographic mathematical idioms - the **Blazons[©]**, which are available for the modelling on mass serving computers. Any specialists from diverse branches and in many environments can easy manage this apparatus without sophisticated preliminary disposition. Here, its 'language' is fairly simple and it is able to plot any entities and their relations blazonry even for the purpose of interoperable information and services exchanges, sharing and provisioning in multinational environments. Here, 'semantic' interoperability is thinking, based on common domain ontologies. Professor I. Zandi from the University of Philadelphia said about it ten years ago: "So, this UrbaneK's DYVELOP apparatus is an Esperanto of Process Approach. Everybody can simple and easy understand its".

The DYVELOP[©] has an ambition of standard format for end users, participating at application development, in the actor's role. It is the product of ten year's efficient searching, identification and formulation of frequently antagonistic among-branches knowledge and approaches.

2 A Development of a Project

Now, it is necessary, on the basis of Process Approach [in a sense of ISO 9001: 2000], to connect above 'Esperanto' with RE of initially chaotic → consequently comprehensive Use Cases. Arisen product must be able globally useable by whatever client of informatics service providers. It must be provided for various education, scientific and practitioner levels.

Here methodologically will be introduced DYVELOP/UML, (UP) as opened standard which can manage the **projects** of any application development and advancement. Its advantage will be in the versatileability and applicability for rapid, synoptical and handily comprehensible analysis and **relations** displaying of seeming chaotic process systems - operating with IS/IT (virtual) aid or assistance in project development. Project's Actors act in cyber-informatics practitioners roles. The end-user has client's (consumer's) role, which need quick management of problem solution. But solution runs together with service providers, which have supplier's role. They both must use clear common language. This common language and/or modelling apparatus for project development methodology must be easy intelligible without special preliminary tutorship and experiences of primary ordinary no-well-educated end-users. From IS/IT analyzer's, designer's and provider's aspect, above common language must be 'patchable' with high level of their knowledge, know-how, expressions, standards and procedures. But everything must be simple, synoptically comprehensive and instructive for the end-users and it must be concurrently highly creative & effective executable for the cyber-informatics service-providers.

Immediate / future beneficiary or projecting IS/IT development runs iterative & incrementally in own **workflow** through the analysis, design, implementation and testing. But workflow **iterations** (get out of chaos) with visible positive increments needs effective end-user requirements acquisition, definition, specification & formulation firstly and end-user requirements improvement in further iterations.

The base (transit) aims for individual actors are their better pertinent services for successful development of the project. But principal (terminal) aim for all actors is **conjunctive operational capable IS/IT** arising from Application Development Life Cycle (ADLC)! Methodologically it needs cyclic repeatable **four phase's** process running in the **domains**: real time & _space & environment & actor's team. Each project phase ends

after pertinent milestone definitive obtaining. The milestone is 'visible guide-pointer on a roadmap of producing project'.

Project **Inception** phase set-ups and tends to first milestone - Project Life Cycle Objectives, which consist from 'planning labours of actor's team' mainly. This phase is running fully in RE's taking into account. Controlled by the provider RE's processes importance is strengthen during following phases of ADLC. Then **Concurrent Engineering** character prevails in all actors' team collaboration. It is continuing in further ADLC phases, which subsequently run repeatable having subsidiary aim to product sustainable incremental benefits via workflow iterations.

Second milestone - an **Architecture** - it is collaboration phase result, which is the product of 'material labour of actor's team' mainly.

Third milestone - Initial Operational Capability is construction phase resulting in the form of a **programme** (software) which is the product of 'control labour of actor's team' mainly.

Four milestone - Product Release is transition phase during it's the programme is 'employed to the environment' where it must be **integrated** gradually.

All actors' awareness of each Application Development Life Cycle Project is essential because any project, which get out of chaos, cannot be sustainable successful without continual relationships cultivation of the couple: the client - the provider!

3 DYVELOP Syntax & Semantics

Next modelling & simulation use case studies use methodologically Computer-assistance Model (CaM) [3] created by Microsoft Windows™ common drawing technologies. For model design procedure aiming to applications developing RE serves from the analysis model developing language DYVELOP©, which originate first by 'ideologic hand made' CiM - Computer-independent Model. Dependent on computer platform PdM - Platform-dependent model follows (Windows™ here). Further model processes issue into defined conceptions of software development, which are derivative on basis MDA - Model Driven Architecture [6]. The MDA defines concept model, which finally serves for second milestone architecture production. Because modeled & simulated processes are dynamic, then they need visualization, modelling & simulation of finally created use case by live on-line PowerPoint™ presentation. This is only way of time - space dynamisms expression of primary chaotic and complicated processes, which must be managed!

Our DYVELOP[©] [6] syntax & semantics is enabling to make quick development of any project, R&D project especially, to implementation, realization and testing phases in very short time. By virtue of the DYVELOP[©] method, we can make 'Quick Win' by effective iterations. We must notice here that below blazons aren't enough temporarily sufficiently playing in technical public. But like the idioms of process entities and their relations has great potential in the RE. It is all-important necessity in cyber-informatics modelling of the chaos in near future. It is reason for next short excursion to our DYVELOP[©] gnoseology, model's symbolism, syntax, semantics, expression methodology and pragmatics.

3.1 The Environment – ENV [3] is necessary entity as determination subject of **implement scope**. It is related to definition/ discrimination/ resolution/ reception/ sensation/ setting/ background/ empathy levels in practice. The ENV is playing the role of a meta-model of abstract supra-class in [1]. Here it is in the role of a **domain** on blazonry sight, where it graphically uses broken line icon, which can be bounded by billowy and/or straight interfaces (lines) also (for Boolean NOT complementation formulation with other entity - <<NOToperator>>). ENV's inscribed name is a substantive, or adjective.

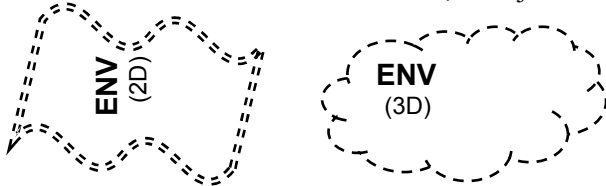


Fig. 3.1, Environment symbols

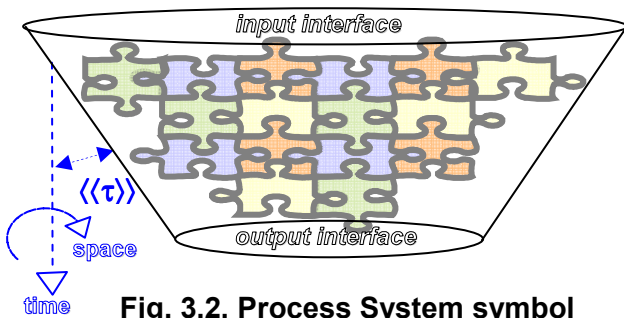


Fig. 3.2, Process System symbol

3.2 The Process System – PrS [2, 6], and/or on occasion just a **Processor** and/or a **System** is a subject having Structural Thing [1] role like model entity. The PrS is comprehended here as dynamical functional system operating in relative process chains working with defined domains (e.g in time sequential or cycling mode; in defined environments relating to distinguish level etc.). Each PrS has input and output interfaces - between them runs process things **transformation** assessed by a<<τ>>.

$$tg\tau = \frac{dVA}{dt} \tag{1}$$

Here the VA is process produced Value Added and the t is real time. The PrS operates always in **relative process networks** - in coherent, simultaneous or turbulent activities, which can seem chaotic, until its 'successful subjugation' to the blazonry model. Blazonry, the PrS uses graphic symbol (an icon) of single lined polygon (a tetragon most frequently) with inscribed name in the grammatical form of the substantive. Operating PrS as model entity applied in over most two-dimensional co-ordinate system (3D) take cuboid or polyhedron form with sharp rims.

3.3. The Function is entity's characteristic attribute manifestation, which gives **incidence** effect from the processes, activities, operations and abilities. It has purposefully bounded influence to entities behaviour. Blazonry expressed function needs defined **domains** (time, space, environment, information, resource, field, nature, enemy etc.) and defined **actors** (operators, process cells, factors, agents, forces, instruments, interfaces, users, etc.). Defined domains and actors are a necessity for DYVELOP[©] operations always! Here blazonry, the domain is puted as operational self-existent field which is independent on operation performance. Formally, the Function has five 'function's syntactic modalities': *Supp, Poss, Subs, Base, Princ* – see Fig. 3.6.1. Blazonry, the Function has two semantic modalities: the **Use Case** and/or the **Operation Function**. 3D modeled Functions have plump shape, rounded rims.

3.3.1 The Use Case [1] is model developing entity, which is operational string of process **event specification** including variable and error strings that are used by the systems, subsystems or things by means of interactions with pragmatic external actors. the UseCases need specific actors (agents, factors, users, interfaces...) from of whose sight they are initiated and composed. Inscribed "camelLetter" alphanumeric legend into lips bounded polygonal icon must be nominative gerund (with a desinence '...ing') expressing an action, event or state and can be completed by a specification expressing structural things always, which operate in defined ENV.

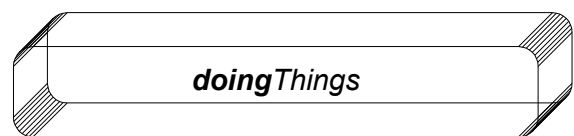


Fig. 3.3.1, Use Case symbol

3.3.2 Operation Function [6] is model developing entity, which is a specification of the behaviour, action, capability or function in their terminal or

transit **incidence**. Real time, space and ENV have been no omitting here as fundamental domains! Inscribed legend into globoid icon must be a *verb* with preposition 'to' and it describes (determines, designs, marks) process attribute in the Class [1] role here.



Fig. 3.3.2, Operation Function symbol

3.4 Process Cell [2] – is as the most **miniature functional process system** having input (material, energy, ideas), output (products, services) and three processing subsystems inside of the cell – material subsystem (giving logistic and production processing of the semi product), information subsystem (giving processing of the plan) and control subsystem (giving processing of the program) – see Fig. 3.4 Process cell is base building block of PrS's chains and networks. Into its structure is showing blazonry terms sense:⟨⟨ semiproduct, plan and program⟩⟩.

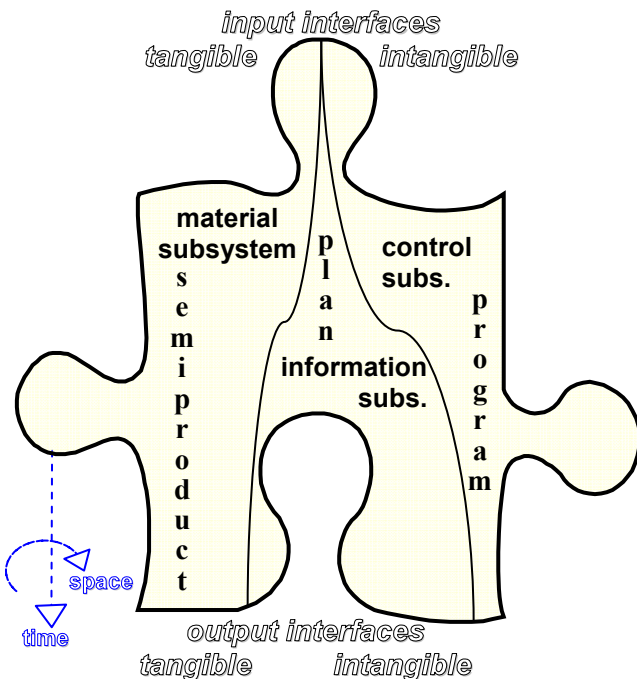
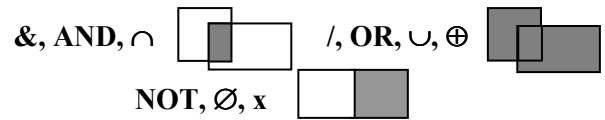


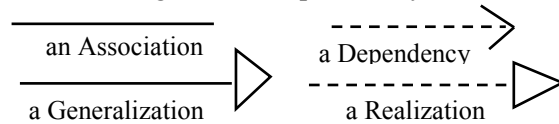
Fig. 3.4, Process Cell – blazonry putting architectonical structure

3.5. Entity's Relationships (Relation & Coupling) is DYVELOP[©] method able to express by means of model development scheme in a form of graphic map of entity's roles – in the **Blazon** [2] (Blazoning Scheme). The Blazon needs competent interpretation by special Blazonry **Entity Diagram** (table, paragraph, item, legend, clue etc.) always! The relationships have mostly inseparable the both the syntactic and semantic senses.

3.5.1 Structural Logic Relations are expressed blazonry by set operations of Venn's diagrams and by three logical operator of Boolean algebra [2]:



3.5.2 Semantic Couplings (interactions e.g.) between Things [1] are expressed by the links:



3.5.3 Logistic Relationships [2] are able to show blazonry processes **Productivity** – (PR). The PR is expressed alphanumerically as a broken number of a Batch. Here numerators are logistic flying things (dependent quantity - e.g. information, mass, power, etc.) and the denominators are logistic actors (independent quantity - e.g. agents, time, space, ENV, etc.) always. PR value is inscribed inside full arrow vector symbol (PrS indeed!), directed from a resource to a target. Arrow icon goes through at least one line of the **interface**. A couple of broken numbers inside productivity icon can signalise a **change** of logistic flow **quality** between source and target – i.e. it signalise inherent process of logistic flow transformation [3]. Relationship's quality can be described also by field's colours. Moreover, colour change into arrow or other blazonry (visualizing) modelled entity can express qualitative transformation also: green / orange / red = favourableness / stress / unfavourableness.

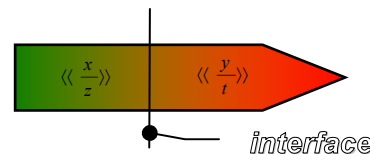


Fig. 3.5.3, Productivity symbol

3.6. An UseCase ⟨⟨**Mastering of DYVELOP[©]**⟩⟩ is shown below as 2D blazonry example of using various relationships of seemingly chaotic entities. This UseCase processes scene is expressed by means of mathematic / graphical apparatus DYVELOP[©] for DYVELOP[©]'s mastering.

3.6.1 The relationships of functional syntactic modalities are blazonry manifested at next Fig. 3.6.1 The Function relating to defined environment where operating (parameterized by time – space domains) in process system of function's modality transformation ⟨⟨PrS fncTransf⟩⟩ with variable value τ . Here, this blazon has five functional syntactic modalities: principal ⟨⟨*princ*⟩⟩, base ⟨⟨*base*⟩⟩,

subsidiary $\langle\langle subs \rangle\rangle$, possible $\langle\langle poss \rangle\rangle$ and supplementary $\langle\langle supp \rangle\rangle$. The functions operating in real time & space domains with modality $\langle\langle base \rangle\rangle$, $\langle\langle subs \rangle\rangle$ and $\langle\langle poss \rangle\rangle$ are **transit** functions. The functions operating with modality $\langle\langle princ \rangle\rangle$ and $\langle\langle supp \rangle\rangle$ are **terminal** functions (to PrS's relation). The body of PrS fncTransf is in the shape of a funnel, which side forms an angle τ - see (1) with time's domained vector direction. This body contains organized **network** of **process cels** in process **chains**. Terminal productivity of $\langle\langle PrS fncTransf \rangle\rangle$ has the incidence, that multiple 'it is making supplementary extraction' from the $\langle\langle ENV ofFunctionalModalities \rangle\rangle$ (yellow PrS arrow above blazon's part framed in $\langle\langle doingSuppMod \rangle\rangle$ useCase) and that terminally 'it is giving principally something' to the $\langle\langle ENV ofFunctionalModalities \rangle\rangle$ (green PrS arrow below framed in $\langle\langle doingPrincMod \rangle\rangle$ useCase). Principal objective is provided by function's achievement $\langle\langle to lern DYVELOP \rangle\rangle$, which is **conjunctive** for neighbouring blazon at Fig. 3.6.2 also!

3.6.2 The relationships of the process of the $\langle\langle Mastering of the \langle\langle DYVELOP \rangle\rangle \rangle$ method is blazonry elaborated with latent (blazonry invisible here) terminal principal objective 'successful project management' - see next blazon at Fig. 3.6.2. Here is expressed that the process of the mastering of DYVELOP[©] method (under $\langle\langle PrS of competent project leader in any project development \rangle\rangle$) can bring **big transformation** as a **rebirth and a growing of the end-users role** (from former actors to inseparable domains $\langle\langle ENV EndUserDOMAIN \rangle\rangle$) in application development life cycle of any project! - if they play as mastering domain. It needs $\langle\langle ENV of actor's cooperation \rangle\rangle$ of all actors (participants) of the project and function's encompassment (capability) partially (in the project) $\langle\langle to lern \rangle\rangle$ and conjunctive $\langle\langle to lern DYVELOP \rangle\rangle$.

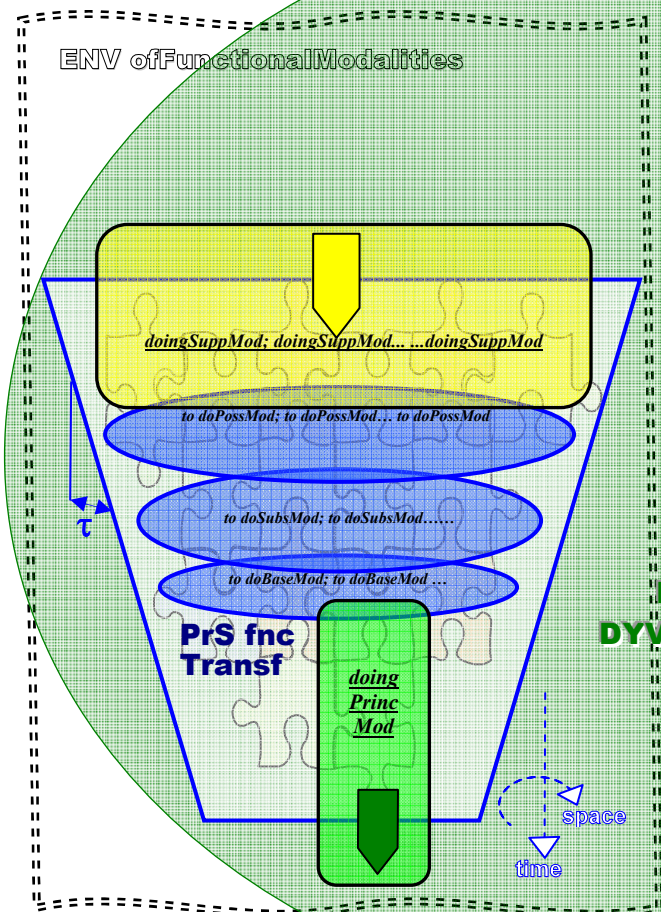


Fig. 3.6.1, Blazonry chain from a sight of function's syntactic modalities with the domains: ENV, time, space.

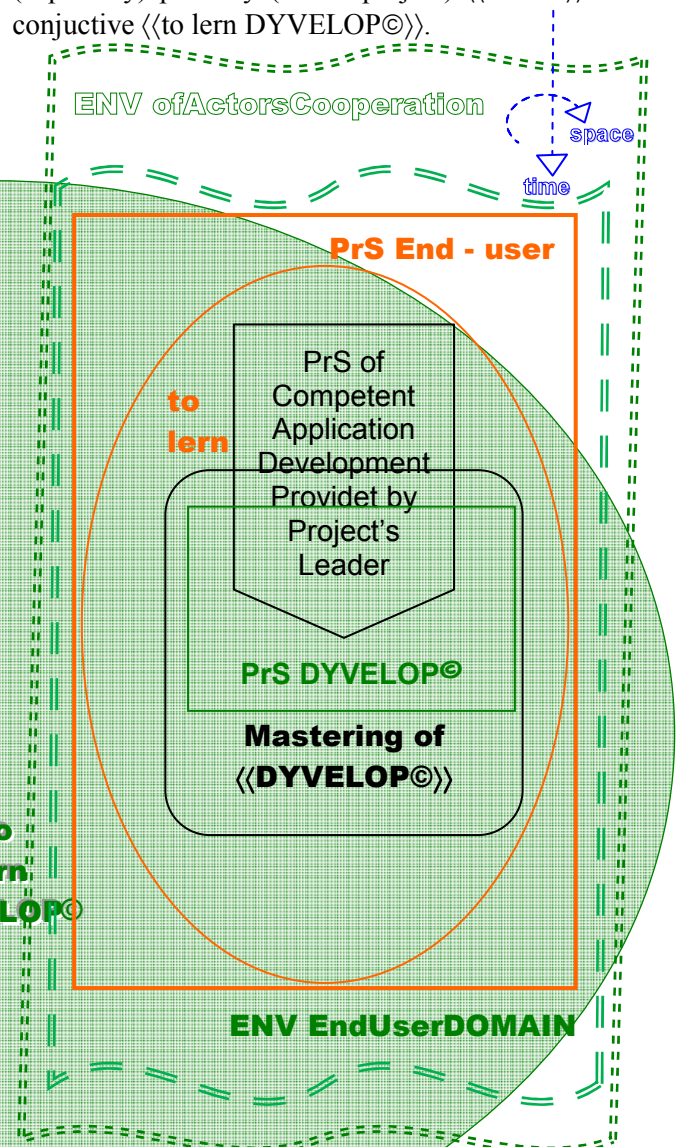


Fig. 3.6.2, Blazonry DYVELOP[©] mastering process from a sight of project's leader & end-user cooperation with the domains: ENV, time, space.

Above blazons are model representations of entity's relations – **Maps of Roles**. Blazon's interfaces represent what the entities performs and implementation how it performs. Any **Interface** defines qualitative agreement guarantying regulation of separate implementation, which quantity can be expressed by a PrS <<Productivity – PR>> above. Each BLAZON needs an interpretation by **Map** (diagram, table) **of the entities**.

It is important that these blazons are suitable for both the entity's relationships analysis as well as for design creation of entity's process systems. So, they are not specialized instrument of software engineering only, but they are suitable for modelling and simulating of all chaotic dynamical processes, of human relations, of project's life cycles development and so on...

4 Project's development ADAPTIV UseCase – from chaos to string

Each management must operate from a chaos to the strings in the catastrophes similary as in project development. Here is expressed above (chapt.3.6) methodology implementation in non-profit University of Defence's author's institutional security / emergency research and development project with real terminal product of ran ADLC <<CYBERSYS™>> [5] - see Fig. 4. The ADLC of this project was successfully finished in 2008 and it creates supplementary baseline for starting new ADLC of Defence Research National Project titled '*ADAPTIV- The Proposal and Use of New Adaptive Technologies for the Simulation and Camouflage in Operational Environment of Armed Forces of Czech Republic and for Infrastructure Protection*'. Its principal objective is a using of the perspectives, research, development, implementation and application of cybernetic computerized aided technologies, intended for a protection of troop's forces and equipments, of the civilians and technological infrastructure and for the simulation and camouflage of military activities and targets.

So, the CYBERSYS™ will be transforming to CAMou^{flage}™ baseline. CAMouflage acronym means: "Computer Aided Mobile Roaming university made NET for last stage mile" [7]. It is cybernetic net's system & technology for wireless high-speed WiMAX and secure data transmission in emergency environment operating in own autonomous net NETou®.

4.1 CYBERSYS™ Entity's Map has an aim 'architecture's blazon mapping'. Baseline things (systems and technologies) are: 'A Workshop of Crisis / Emergency Management's tent' using

WiMAX (Worldwide Interoperable Mobile Access) for high-speed data transmission technology; Pylon INFLATour™ for antennas carrying; autonomous



Fig. 4, Real ADLC project product CYBERSYS™ - emergency management' tent – view from own UAS SATELKITE™ camera.

UASs (Unmanned Aerial Systems) – i.e. baloonette kite SATELKITE™ and/or aviette avaxTou® and NETou® operating at Ultra Mobile Personall Computers (UMPCs) for data mining and processing using technology system named 'Autonomous Interoperable Outdoor Videoconference System Especially for Crisis Management of Civil Protection®' working at EMOFF (Emergency Office) SW. For data interpretation is using esTou® (Expert Service for Cris/EmManagement) and for data roaming from the neighbourhood is using SMARTerminal™.

A modell of architecture's blazon at Fig. 4.1 is possible to read with DYVELOP® know-how knowledge:

In the ENV of Project Development << CAMou^{flage}™>> first blazonry entity is necessary to implement process system named <<Autonomous Interoperable Outdoor Videoconference System Especially for Crisis Management of Civil Protection®>> desirable operating by means <<EMOFF>> SW, which is interoperable & interconnectable operating at Autonomous Wireless Digit Net' that will use implicitly for its operations a system of Autonomous Telecommunication Net Technology named <<NETou®>>.

4.2 Third and four milestones achievement of old CYBERSYS™ ADLC is putting new CAMou^{flage}™ baseline. It is information & communication system using **new** technologies. It will be created iterative & incrementally in own workflow through projecting processes development by means of effective end-user (client) requirements acquisition, definition, specification & formulation firstly. Then a workflow

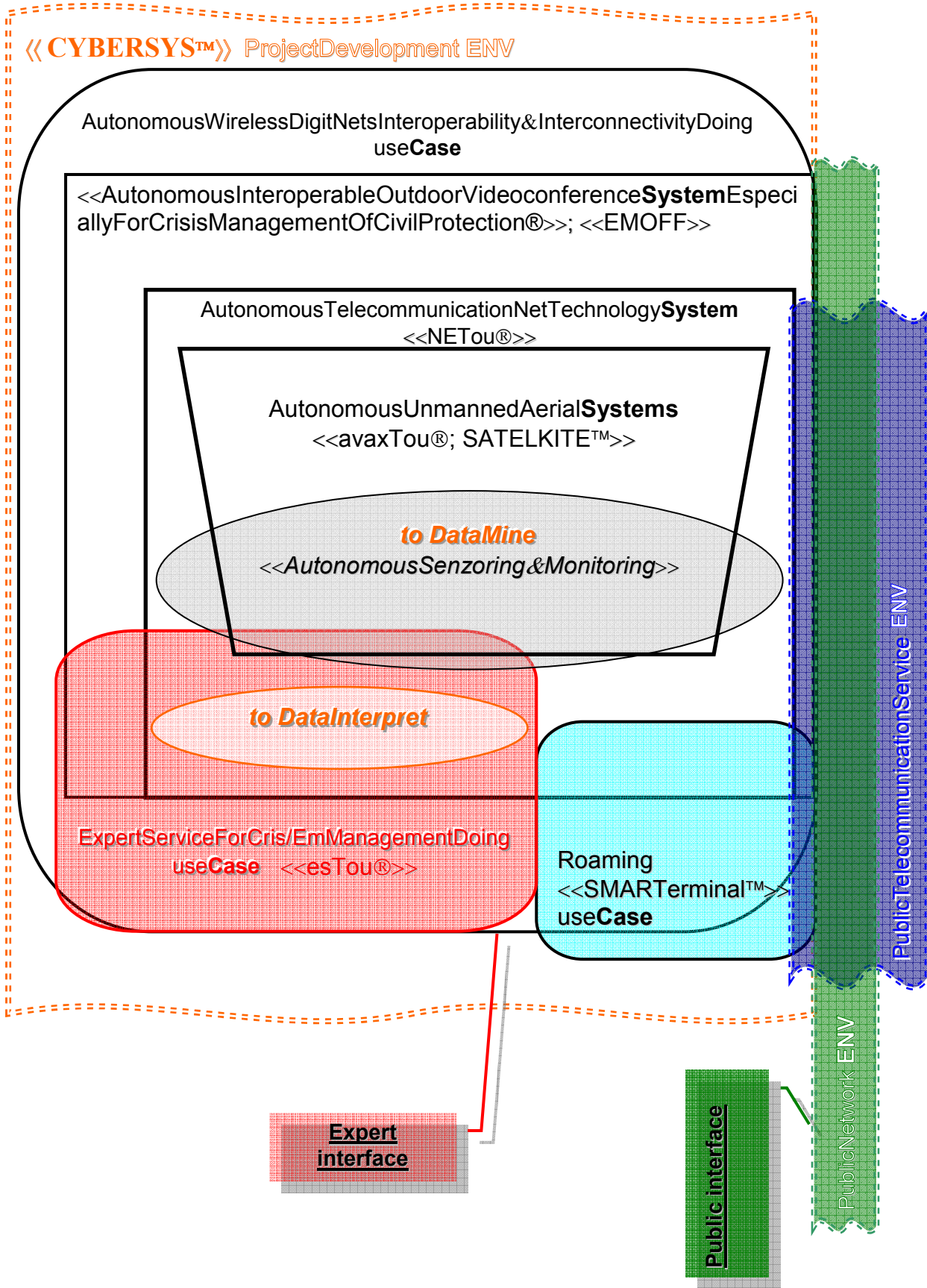
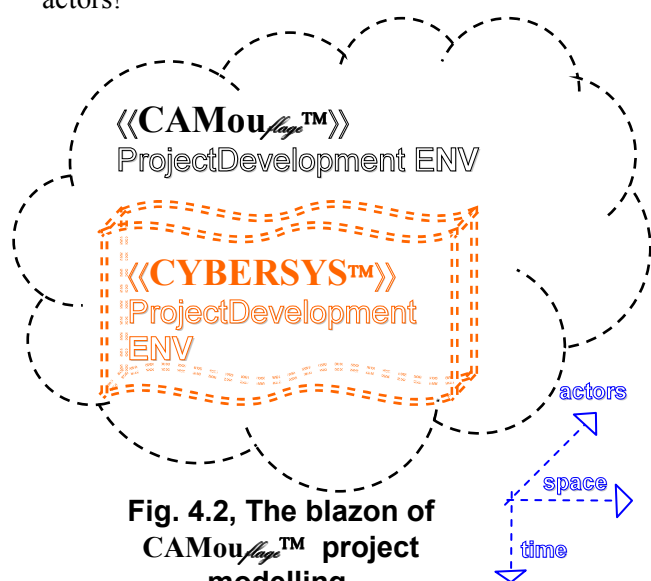


Fig. 4.1, The blazon of CYBERSYS™ architecture modelling.

continues via the analysis, design, implementation and alpha testing in domains - real time & environment & new actor's team including end-users. This project inception phase of new project was ended by an achievement of first milestone a definition of project life cycle objectives of CAMou_{stage}TM project. Next new project phase and concurrent initial operational capability of old project's product CYBERSYSTM prototype was tended to second milestone – CAMou_{stage}TM project development with new third dimension (parameter) – the actors.

The relationships of the both ProjectDevelopment ENVs i.e. <<CYBERSYSTM>> and <<CAMou_{stage}TM>> are new blazoned at Fig. 4.2. in 3D time – space – actors!



5 Nella's relationships Blazon

Next blazon at Fig. 5 is first part of Family in crisis scenarios: "Nella is daughter and here are modeled relevant relationships among she and her family's members, her domains, her friends, her study..." A <<trace>> in dynamic blazon bottom evokes those 'story' dramatization continuation, which will be dramatized via MS Word Power Point at the conference.

6 Conclusions

Above blazons and their relevant relationships of all above expressed entities needs dynamic modelling, displaying, simulating in real time by means of live presentation Power Point^{MS}. So, it is understanding groundwork for an process approach, for UML, (UP) /DYVELOP modelling. Here was shown architecture creation and initial operational

capability of process oriented dynamic analytic, modelling, simulation and design of seeming chaotic systems. They are controlled via use cases and the risks of the changes, which will be iterate verified, simulated and tested in project workflow - *requirements, planning, analysis, design, integration, implementation, testing & installation*. This workflow operates in project life cycle application development in process network environments of crisis/emergency management in a benefit of ascendancy fruition of decision making.

The DYVELOP /UML,(UP) assertion shows as successfully support of efficient implementation on basis of end-user qualified requirements in catastrophic /extraordinary events driven human activities. Its big potential and information intelligibility will be fully understood in dynamic blazonry presentation at the conference.

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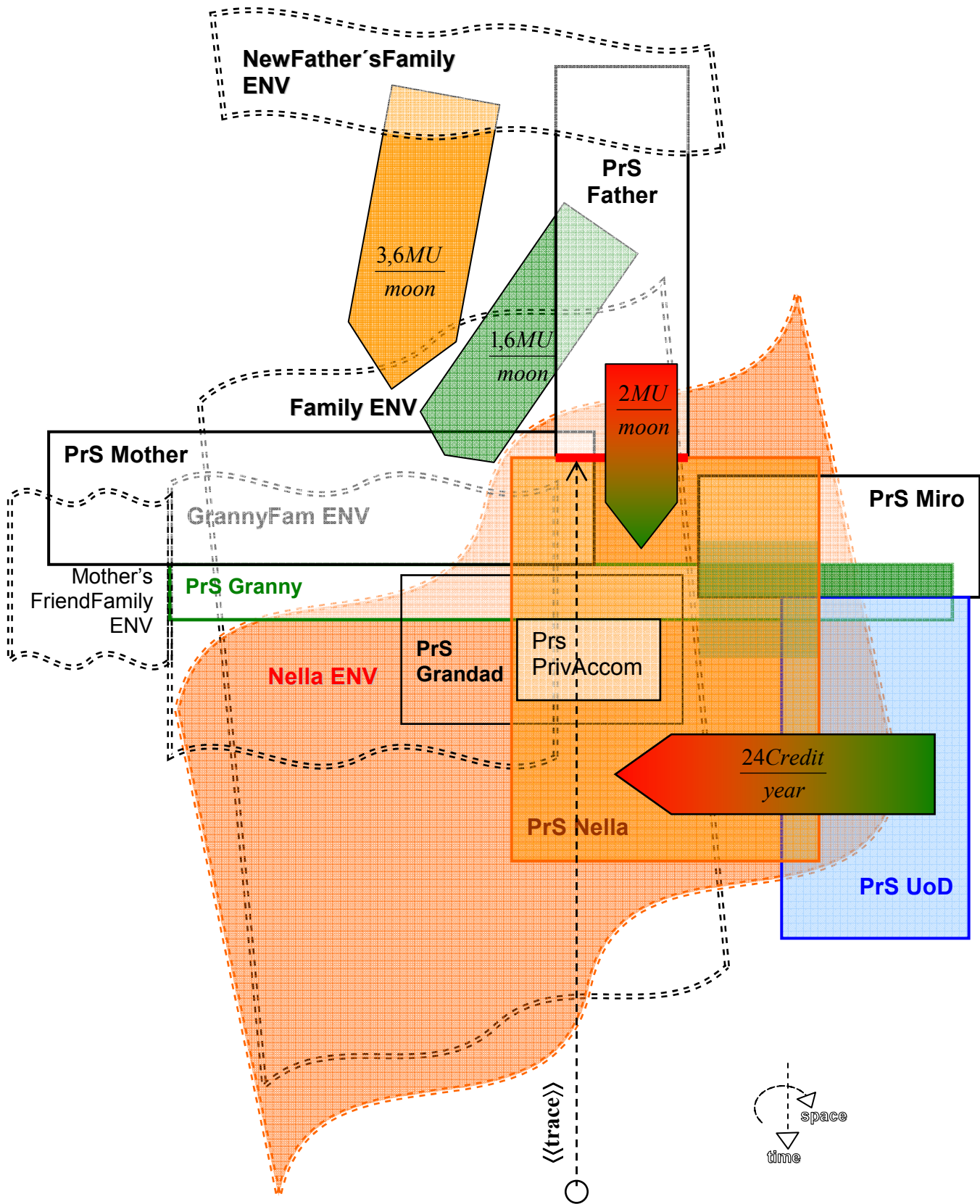


Fig. 5., Blazon of Nella's relationships with the domains: ENV, trace (time), space.