PRIORITY 2

INFORMATION SOCIETY TECHNOLOGIES (IST)

REVIEW REPORT

51136 HYCON

Project full title: **HYbrid CONtrol: Taming Heterogeneity and Complexity of Networked Embedded Systems**

Review no. 3 covering project month 12 to 18

Contract start date: 15th of September 2004

Contract end date: 15th of September 2008

Review dates: 27th of March 2006

Review location: 33, avenue de Beaulieu, Brussels

Project Officer:	Rolf Riemenschneider	
Reviewers:	Holger Karl	holger.karl@uni-paderborn.de
	Gabriel Leen	gabriel.leen@ul.ie
	Véronique Pevtschin	v.pevtschin@alum.mit.edu

Report classification:	Confidential
Report version:	1.1 final

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY **3**

2 ORGANISATION AND LOGISTICS **4**

3 PROJECT MANAGEMENT **4**

4 DELIVERABLES **6**

Deliverables 6

Progress report 7

5 WORKPLAN AND RESOURCES **7**

5.1. Workpackages not under review at this meeting 7

5.2. Workpackage 1: Creation of the European Institute for Hybrid Systems EIHS 9

5.3. Workpackage 4: General Remarks 9

Workpackage 4d: Networked Control 9

5.4. Workpackage 5: 11

5.5. Workpackage 6: 12

6 USE AND DISSEMINATION **13**

7 FUTURE WORK **13**

8 ASSESSMENT OF OBJECTIVES **13**

9 RECOMMENDATIONS **14**

10 REVIEW CONCLUSION **15**

11 NEXT REVIEW MEETING **15**

12 APPENDICES **16**

1 EXECUTIVE SUMMARY

The HYCON project is a Network of Excellence (NoE), funded for a duration of four years starting on 15th of September 2004. The total EC contribution is 4.6 M€, with the first 18 months period accounting for 2.1 M€.

The third review is a mid-term review, addressing specific topics that were highlighted as requiring more attention following the 2nd review.

These topics are:

- Finalisation of the description of work starting at Month 18
- Progress achieved in the activities related to
  - The establishment of the EIHS (WP1)
  - Hybrid control methodologies for networked control systems (WP4.d)
  - Knowledge management for hybrid control(WP5)
  - Industrial involvement in Hycon (WP6)

The period under review covers months 13 to 18.

The overall objective of HYCON is to integrate European research in "hybrid" control (i.e., systems & models with discrete and continuous aspects). This objective is structured into scientific and technological **integration** (coordinating fragmented European research & developing a research infrastructure), achievement of a **durable integration** mechanism through the establishment of a sustainable European Institute of Hybrid Systems, and overall spreading of excellence.

Major achievements of this period are:

- Decision taken on the EIHS (Re-branded the European Embedded Control Institute EECI)
- The increase of work in the area of WP4.d
- The creation of a hybrid control taxonomy (WP5)
- The increase and interest of industries in the IAB (WP6)
- Dissemination activities are running extremely well. Nonetheless, the consortium might want to consider whether to undertake dissemination activities outside of the hybrid control communities as well. For example, the HYCON activities are little known in the networking communities.

Areas for monitoring have been identified as:

- Even if a decision has been taken regarding the EIHS, implementation of the EIHS is an important step. Two specific aspects require on-going monitoring:
  a) ensuring that the EIHS is effectively implemented across the two selected locations (Paris and l'Aquila). This requires, among other issues, the clarification through a letter of intent or other means by the CNRS about the practical operation of the EIHS (hiring of a manager, replacement of the manager in case he / she decides to leave etc, continuation beyond Hycon) and from SupElec about the EIHS premises (temporarily within their existing buildings).

b) building up the EIHS as one of the hybrid control references.

- There seems to be a gap between the *level of integration* expected by the reviewers and the one foreseen by the project partners. The project partners should detail what is their expectation and why, to avoid this gap creating a misunderstanding between the reviewing team and the project. Provision of the matrix (tools / problems) requested at previous review is one of the elements that should help clarify some of the concerns of the reviewers linked to the integration issues. It also appeared during the review that the level of integration within one area differs from the one expected (or intended) in another area. This difference could perhaps partially depend on the maturity level of the tools in that area (for instance, expected integration level within the automotive area, within the networked control area etc); however, it could also depend on different working styles intended by the different partners of the consortium addressing different areas, even more reasons are conceivable – in either case this difference is quite apparent and should be explained if initial or remedied if unintentional. Therefore, prior to the next review, the reviewers strongly recommend that the consortium defines the expected level of integration:

  a) within one sector

  b) across sectors

  As a suggestion, to help clarify this point, the consortium is encouraged to produce a structured organisational chart for the next review, which illustrates the (technical, not organizational) linkages within and across workpackages.

The overall conclusion of the review meeting is that:

- The project is progressing well at both a technical and integration level.
- The next review covering Month 13 to Month 24 shall constitute a major milestone in monitoring effective implementation of the EIHS and agreeing on the expected level of integration, within vertical domains and horizontally across domains. Industry-related deliverables and milestones in WP6 will also constitute key elements.
- The reviewers support the continuation of HYCON, assuming that the finalisation of the Description of Work is achieved within 10 working days after the review and in line with the agreement at the review.

2 ORGANISATION AND LOGISTICS

The review was held in Brussels, at Commission premises. All partners required for this second review meeting were present.

The presentations were of good quality. Nevertheless, the reviewers feel that despite the technical presentations being very interesting, in this specific mid-term review, the key issue being focused on was how well *integration work* was progressing. None of the presentations, deliverables and answers given on the day provided a clear and precise view of this issue. This point is further discussed below.

3 PROJECT MANAGEMENT

As in previous review, project management is of demonstrably good quality.

The issues to mention are that

- responsibility for the final delivery of the updated Description of Work lies with the project manager, and this issue has to be tackled urgently.
- deliverables should, when possible, remain short and concise, and include the summary page which was proposed at last review. (From previous review report: *Moreover, a succinct "executive summary", putting each deliverable quickly into focus, summarizing the problem at hand at the contribution to this problem, for each deliverable would be highly appreciated (the level of abstraction provided by the current deliverable abstracts is not very useful*). To assist the consortium, the reviewers suggest that the summary page include the following general headings and a concise description:

    a) Executive Summary

    A description of the key results and overall comments on the WP's **technical** and **integration** progress, management, and exploitation (5 lines)

    b) Objectives and intentions

    A summary of that outlined in the DoW (5 lines)

    c) Obstacles and challenges

    An overview of unforeseen challenges and remedial action taken. This section would highlight deviations from the original plan (5 lines)

    d) Technical results achieved

    Preferably in bullet point format (1 to 2 lines per point)

    e) Integration results achieved

    Preferably in bullet point format (1 to 2 lines per point)

    f) Future plans

    A brief discussion of future intentions (5 lines)

- As a general remark: the time interval between public calls (e.g. submission of draft papers, case studies, etc.) and the deadline for submissions appears to be rather short. The consortium are encouraged to plan for longer intervals between calls and submission deadlines, which may stimulate more responses. In addition the level, degree and breath of such calls could be improved.

From previous review 2, the following list highlights the status of the recommendations.

- **Review 2 - Recommendation 1 – status ok and on-going:** this is a general recommendation that has been taken into account (focusing of deliverables on hybrid control aspects). Specifically, the hybrid nature of each research question which HYCON addresses needs to be clearly stated to be a justified topic of work within HYCON.
- **Review 2 - Recommendation 2 – status on-going**: the EIHS-related decisions have been taken, implementation will be reviewed at the next review.
- **Review 2 - Recommendation 3 – status ok:** resubmitted deliverables are accepted.
- **Review 2 - Recommendation 4 – status ok:** IAB has been restructured into 4 sections and one IAB council.

- **Review 2 Recommendation 5 – status pending:** the matrix of tools has not been provided => this recommendation remains open, also pending the clarification on "level of integration" topic.
- **Review 2 - Recommendation 6 – status ok and on-going:** the progress report listed industrial interest and the documentation of the upcoming Application Workshops in June will be reviewed.
- **Review 2 - Recommendation 7 – status pending:** Milestones should not only be listed as "milestone achieved", but a brief documentation detailing the decision taken at a given milestone should be provided. This constitutes necessary information to assess the progress of the project. At the time of the 3rd review, the list of milestones and associated documentation could not be located on the Web site by the reviewers.
- **Review 2 - Recommendation 8 – status ok and on-going:** the clarification of the problem under review for WP4.d. was provided at the mid-term review. The updated status will be reviewed at the M24 review.
- **Review 2 - Recommendation 9 – status ok and on-going:** Hycon has implemented links to other projects and dissemination activities linked to external events. This is a continuous activity monitored at each review.
- **Review 2 - Recommendation 10 – status ok and on-going:** the Website and visibility are improving.
- **Review 2 - Recommendation 11:** The scientific council seems to be biased towards the US (9 out of 13, 2 Europeans, 1 Canadian and no Asian representative) – the reviewers encourage the consortium to reconsider this aspect. *This recommendation is still open and will be assessed at review 4.*
- **Review 2 - Recommendation 12 – status pending review M24:** the level of integration and integration issue will be reviewed extensively at the review M24, in parallel with deliverable 8.2.2.
- **Review 2 - Recommendation 13 – status pending / urgent:** the workplan was due to be finalized and submitted by 10/2005.

4 DELIVERABLES

As this was a mid-term review, only deliverables for which resubmission was requested are accepted at this review. All other (newly submitted) deliverables will be formally evaluated at the 24 months review.

DELIVERABLES

The resubmitted and accepted deliverables are:

D3.5.1. Accepted after having revised the summary.

D4c.4.1. Accepted. Nevertheless, it should be noted that considerably less digested and refined documentation of industrial feedback would be anticipated from forthcoming deliverables of this nature. Of particular interest, where possible, will be the industrialists' experience regarding the application of hybrid techniques; perceived opportunities for their application; technique evaluations and comparison with other techniques (hard facts are always good); suggestions for their adoption; and so forth. In addition, testimonials pertaining to the successful application of hybrid control techniques will be valuable for the consortium.

D5.4.4. Accepted after re-submission.

PROGRESS REPORT

The progress report is well structured and concise and its sections are clearly written. The progress report clearly highlights also an improvement in "human" integration of Hycon. However, some mistakes are confusing and should, when possible, be avoided. This is the case for D 1.6.1. whose status is set as "S" in the first table and "P" in second table.

Also, the progress report could be improved by further detailing upcoming activities on topics of concern. For instance, the selection process of the EIHS, which is well documented, leads to additional work needed to establish the relationship with CNRS for the establishment of the office and the selection of the office manager. This is just mentioned as a single sentence, while it is clear that this step is key and urgent.

5 WORKPLAN AND RESOURCES

Overall, the workplan has been followed. Resource allocation during the period under review has not been assessed. This section:

- briefly describes the highlights of the work packages not under review at this meeting
- details the main work packages under review, namely WP1, WP4.d, WP5 and WP6.

5.1. WORKPACKAGES NOT UNDER REVIEW AT THIS MEETING

While these work packages were not under review, the consortium presented a summary of highlights and evolutions of the following work packages:

- WP2
  - The call for benchmarks has generated more interest in topic "Solar Plant' than topic "Idle Speed Control"
  - 9 Solar Plant benchmark proposals received, with only a few days expected for each benchmark.
  - Lessons learned: the call procedure foresaw a delay that ought to be extended.
  - Open issue – will the consortium implement a new call to increase the number of Idle Speed Control benchmarks? When is this to be decided, when are the proposals going to be due if yes?
- WP3
  - The tool repository Web site is online.
  - Open issue – is there a tracking process implemented to monitor whether the tools are actually used? To enhance the value of this tracking process it would be beneficial to know: a) who used the tools; b) for what was it used; c) any feedback on the success/failure and general comments.
- WP4a
  - From the presentation, it appears that a common working platform has been set up, including the definition of benchmarks and the availability of a set of tools, for the three targeted areas. However, from deliverable D4a.31, the common aspect is not obvious -> the consortium shall further demonstrate the level of integration at review 4 (see topic of integration detailed later in this report). With respect to the deliverables, it appears that the interesting work is lost amide lots of less important details.
- WP4.b

- A new case study has been added with the highlight that, while this was a real industrial case study, the size of the problem is manageable which is not always the case in real industrial cases. The industrial partner interested is Danfoss. This new case study will be presented at an industrial user workshop at PSE/ESCAPE 2006 (in July 2006). This WP is well on track and seems to run very smoothly.

- WP4.c
  - The recommendation to focus has been taken into account.
  - Three case studies within the area of automotive hybrid control have been identified:
    Task 4c.1 Hybrid models for automotive control
    Task 4c.2 Hybrid control in automotive applications
    Task 4c.3 Design methodologies for embedded automotive control systems
    This strategy will help to facilitate: a balanced allocation of resources; reduce management overhead; encourage collaboration, synergy and integration.
  - The degree of industrial interest and association - 10 companies is significant, commendable and viewed very positively. The project management are encouraged to maintain their focus and monitor closely resource allocation.
  - The Special issue of the International Journal of Control on Advanced Design Methodologies in Automotive Control is an excellent initiative and will help to publicist hybrid systems and the work of the HYCON consortium.
  - Links with the Artemis (the European Technology Platform dedicated to Embedded Systems) are encouraged.
  - The participants in this workpackage are encouraged to monitor developments in the Autosar initative (http://www.autosar.org), which is developing a standard core solution for automotive embedded systems. This initiative will have present opportunities and challenges for future hybrid control development and application.
  - The horizontal collaboration between WP5 and WP4c, which has lead to an initiative to create a special taxonomy and annotated bibliography for the application of hybrid systems in automotive applications is commendable.
  - The special HYCON & CEMaCS (Complex Embedded Automotive control Systems) workshop on automotive systems and control, is a recognised positively as a noteworthy effort to disseminate the activities of Hycon to a relevant audience and leverage off existing Framework 6 activities.
    The reviewers look forward to the industrial feedback and event analysis.
  - The idea of choosing a case study and promoting 'super test cases' to industrial players in WP6 has been well received. In that sense, the link across WPs will be strengthened and visibility of the project will be increased. The reviewers are confident that access to the different case studies for industrial players will be facilitated by significant training support.

For all of these work packages, the comments from previous review report are still valid and should be used to prepare the fourth review (24 months review).

5.2. WORKPACKAGE 1: CREATION OF THE EUROPEAN INSTITUTE FOR HYBRID SYSTEMS EIHS

The EIHS is delayed, but the following decisions have been taken and are expected to be implemented in the coming months:

- the location of the EIHS has been selected, with the main location in Paris and a secondary location at L'Aquila.
- the manager of the EIHS will be hired by the CNRS

The reviewers highlight the importance of defining a clear letter of intent or other means between the CNRS and the partners,

- to clarify the CNRS's expectations and commitment in proposing a CNRS manager for the EIHS
- to clarify the CNRS's vision on the continuation issue of the EIHS beyond Hycon (as detailed in deliverable 8.2.2. which will be analysed at the next review). This clarification may lead to an update of deliverable 8.2.2. (this deliverable has been provided to reviewers but not officially reviewed until next M24 review).

The reviewers want to clarify that the issue is not the fact that this letter of intent is highly binding or legal, but that the main purpose is to define, beforehand, what each institute expects to commit and to reach as outcome (CNRS and Hycon partners). The format of this letter of intent can be any form acceptable to the consortium partners, and is expected to be provided prior to the next review in the context of the setting up of the EIHS. This request should not, in any way, delay the implementation plans.

The Paris based location imposes certain legal aspects, the reviewers want to ensure that the L'Aquila secondary location will be compatible with the legal structure of the institute.

In addition, the delay in setting up the EIHS versus the initial plans requires that the "creation of visibility of the EIHS" activities should start in parallel to the setting up phase of the EIHS. Also, the added value of the second location at L'Aquila should be clearly stated, as should the way of operation between these two locations be organized such that an efficient operation is possible despite the disparate locations.

5.3. WORKPACKAGE 4:

Workpackage 4d: Networked Control

The work in this workpackage has improved compared to the last meeting, and a number of technically interesting problems have been defined. The consortium confirmed 2 selected scenarios (hybrid control of multi-robot systems & distributed and hybrid control over resource-constrained wireless networks) being an important and vibrant area whilst having defined numerous sub classes that will be linked to a variety of small test beds. The reviewers does appreciate the level of enthusiasm and energy in this workpackage as well as the difficult problem context this workpackage works in.

Nevertheless, the reviewers express growing concern regarding the degree of focus and the apparent level of cohesion and integration which appears in this workpackage. Despite the consortium intending to apply a unifying, platform-based design approach to several of the research projects in

WP4d, the reviewers are concerned that this may do little in reality to actuality address the issues highlighted in review 2 and unify the work program.

Actually, the consortium may risk spreading their resources too thinly over too many research facets related to one of the 2 case studies. This danger is clearly evident from WP4d's deliverable: Many different facets of the two main problem classes are described, each one a description contributed by a *single* partner only. It remains fully unclear from the deliverable what the exact relationship of these sub-problems to each other is, why they are considered in the context of this workpackage, and how, for example, any experiences made by one partner can provide any benefit for the solution of other small problems. For this list of individual sub-problems, there is no clear perspective apparent why the HYCON approach, ideas, methods, tools/toolsets could or should be applied to these problems and how any *synergies* from solving these problems could be achieved. Why would it not be more efficient to let each partner solve these problems in isolation without talking to each other? The example of rate adaptation over a wireless channel might indeed proof to be a good testcase as there is a large body of knowledge available on this topic; however, to the reviewers' knowledge, hybrid control techniques have so far not in their pure form been applied to this problem area – a provably optimal adaptation protocol (under non-trivial channel assumptions) would certainly be interesting and could focus attention and work. The evident downside of this example is that it does not fit into the two identified problem areas (it is certainly not a multi-robot system and it is also not the control *over* a resource-constrained wireless channel but rather the control *of* the resources of a wireless channel, in this sense re-opening a discussion about project direction that has been on-going since the first review meeting, apparently without the reached decisions being particularly firm). But the reviewers point out that they are *not* prescribing this particular example – this is entirely for the consortium to decide; we only (but strongly) warn against overextension.

Hence, a clear, single, ***unified*** problem description for each of the two problem areas (hybrid control of multi-robot systems & distributed and hybrid control over resource-constrained wireless networks) to serve as a case study for theory development, tool application, and tool integration is still missing. After having introduced a so-called unified view it was not clear which control methods will be applied and in which way this could be integrated across the different initial experimental problems. The idea of looking into a new design approach might be useful; however, the reviewers are somewhat concerned that this will open yet another front for the project to work on and it was not clear to the reviewers how this approach would integrate with the work described in the previous and current deliverables (in particular, since this topic only came up during the review presentations but had not been introduced in the deliverables so far). While it might be a wise choice to concentrate on such design flow issues, the reviewers strongly urge the project to carefully deliberate how this will fit in with the work previous described – there is a clear danger of overextension and of dropping previous, incipient, unfinished work. In case the focus shifts to this topic, the man power allocations as well as how to salvage already invested work should be carefully discussed within the project.

In contrast to WP4b, there are currently no active industrial drivers. As promoting industrial success stories is considered essential for the WP, the industrial commitment mentioned during the review needs to be confirmed ASAP. The factory floor example mentioned during the review is interesting and might represent a stepping stone or door opener for HYCON, but should be acted upon carefully and diligently.

Overall, activities in the WP appear to need more focus by isolating simple but concise problems – the reviewers here reemphasize and strengthen the recommendations from last review. So far, progress in formulating the actual hybrid control problem at experimental and theoretical level has

been very little. The experts urge the consortium to further demonstrate an improved level of integration for review 4 and to concentrate on the formulation of a limited number of simplified control problems by to restricting the definition of 2 case studies – from this background, it was somewhat surprising to the reviewers to see the project start the design aspect discussions at the review meeting. However, for review 4, the mere *formulation* of two hybrid control problems would be rather a limited success. In addition, it would be desirable to also see the application of hybrid control techniques to these problems, showing that this approach can lead to new insights or better problem solutions than existing techniques. This would demonstrate a closer tie to other workpackages within HYCON, which is currently completely missing.

On a practical note, the reviewers are concerned about the vast number of different simulation and experimental environments currently in use by the partners in WP4d. It is rather hard to imagine how from such a set of environments, any fruitful cooperative work could result (also with respect to the European institute's lab to be opened in L'Aquila). While this is not a hinderance to theoretical work, it would be a shame for the consortium to only stay at a theoretical level and not exploit the HYCON NoE to jointly undertake actual experiments. The reviewers would like to understand which strategy the consortium intends to undertake to make such joint experiments possible with acceptable overhead.

Similar to other workpackage recommendations, it would be interesting here as well to obtain a few more details about dissemination activities, like the MSTN session, at future reviews.

In summary, the main recommendations and expectations to WP4d are:

- The focus in this workpackage still has to be improved. The current long list of individual research problems, collected under the two main research direction headings (hybrid control of multi-robot systems & distributed and hybrid control over resource-constrained wireless networks) does not yet seem to achieve this and does not seem to allow the project to integrate efficiently. The reviewers would appreciate a clearly visible integration of research activities at the next meeting, clear-cut problem definitions, and new insights being derived from the application of hybrid control methods.
- Improve co-operation and integration with other HYCON workpackages.
- Clearly state whether the new idea of looking into design issues is going to be embraced by the project and how this will impact work distribution and previous, unfinished work in the workpackage.
- Improve industrial participation in this workpackage.
- Develop a strategy how to efficiently integrate simulation and experimental environments, especially with the perspective of the European institute.
- Improve reporting on dissemination activities.

5.4. WORKPACKAGE 5:

The two recommendations made during the second review in relation to this workpackage have been adopted. Resources been have reallocated to focus on the lightweight publication of a handbook instead of an online library, which would require a 'heavy' infrastructure. In addition, resources have been diverted from WP5 to reinforce the core tool integration activities of WP3. The consortium appears to be in agreement with this reorientation of work and embraces it.

The taxonomy framework has been instantiated; this represents a significant step forward. Progress in this respect is good. Many of the entries are still incomplete; however, this work is scheduled. The broadening and horizontal linkage of this workpackage to include a special taxonomy for literature concerning automotive applications of hybrid systems theory is laudable. The consortium might want to consider whether such an extension should or could also be undertaken for other application areas, but such an extension should not consume a noticeable amount of resources. Also, it might be an incentive for contributors to actively work with this framework if they receive recognition or credit for entries contributed (e.g. the authors initials (or name), and that of subsequent contributors, could appear at the end of the entry).

The HYCON web site search engine only appears to search one of the HYCON partner web sites – http://300gp.ovh.net, this should be rectified.

The consortium is encouraged to facilitate the contribution of entries to the taxonomy, from both consortium members and the broader hybrid control community. If entries to the taxonomy are allowed from third parties, the consortium should consider its stance on quality control of this resource (where no explicit quality control would be one acceptable decision as long as it is consciously taken).

Concerning the new DoW, timing of task, deliverables and milestones should be revised in a way that progress of work could be assessed during the next review.

5.5. WORKPACKAGE 6:

This work package has progressed well:

- The IAB has been restructured to map to the different activities classified under WP4a, b, c, and d. There are four IAB subsections and one IAB council with one representative per area.
- The addition of the light association concept, which enables enlargement through lighter procedure and participation to Hycon meetings. In total, there are 4 different levels of association to Hycon, with 16 Member Companies and 1 Connected Company. Of these 17, 5 joined Hycon during the period under review and 5 additional ones were contacted.
    - ♦ Connected Company: receiving information on HYCON activities;
    - ♦ Associate Member Company: attendance to HYCON events;
    - ♦ Full Member Company: contribution to HYCON research;
    - ♦ Premium Member Company: resources and financial support to HYCON research, joining the IAB. Hycon currently includes 6 Premium Member companies: ABB, Fiat, Drivetrain Innovations, Ford, Scania AB, Swedish Defence Research Agency.
- On-going investigation of “super test cases”, i.e. hard industrial applications from industries available to provide feedback. Current status: Magneti Marelli available with an injection engine control problem.
- Research and training activities: Hycon is currently looking into the process of forming a coherent set of workshops and courses.

6 USE AND DISSEMINATION

Exploitable knowledge and its use

No information on this topic for the period under review.

Dissemination of knowledge

The dissemination activities have implemented links to existing events (such as MobiHoc 2006) and to other running research activities and projects such as WiseNets, eSense, Cruise, NewCom.

7 FUTURE WORK

At the previous review, this section mentioned that "*The critical issue at the moment is the further planning of the workplan for the coming months M13-M30. The current proposal made by the consortium at the review meeting makes sense overall; however, the number of proposed deliverables and milestones seems very large though they have for the most part been well justified. Similarly, the nature of milestones and deliverables should be fine-tuned; some deliverables might actually be milestones and vice versa. The new workplan therefore is accepted subject to the requirement of some minor modifications.*"

On the date of the current review, the new Description of Work had not yet been signed, and the budget proposed was re-discussed during the review. The conclusion was that the consortium will submit the DoW within 10 working days of the review with a revised budget planning to ensure that sufficient budget is available, in particular for core partners of each WP, for the period extending beyond M30 in order to be able to achieve its objectives.

8 ASSESSMENT OF OBJECTIVES

The objectives of the NoE HYCON are relevant. Both the actual research work objectives – in principle, assessing tools for hybrid control systems in different application areas – as well as the integration work –ensuring that different tools are compared against each other and that, in general, the state of awareness of hybrid systems is raised in a wider audience are relevant to the field and to industrial practice.

With the evolution of Hycon, the second objective "integration" should be clearly explained through either the deliverables or the progress reports. This is further detailed in the recommendations.

9 RECOMMENDATIONS

While detailed recommendations made in the previous sections, the overview of recommendations is listed below.

- **Recommendation 1:** The consortium is asked to clarify their "integration" objective. This clarification builds on previous review reports and the request for a tool/ problem / maturity level matrix is reinforced. Recommendation is also detailed in the executive summary of the review report. In summary, the *level of integration* targeted by the consortium should be clarified, both within vertical domains (i.e. within automotive, within network control etc) and across domains (i.e. can automotive tools impact / be useful in another domain etc).

- **Recommendation 2:** Concerning the creation of the EIHS, the consortium has taken important decisions. The effective implementation of these decisions should be the focus of the coming months. Recommendation has been detailed under the WP1 section, with

    - clarification of the CNRS / SupElec / Hycon / EIHS relationship
    - EIHS implementation in Paris and at L'Aquila (including the legal structure issue)
    - visibility building activities linked to the existence of the EIHS

- **Recommendation 3:** A brief documentation is requested for each Milestone when achieved.

- **Recommendation 4:** A tracking process should be implemented in Wp3 to monitor whether the tools are actually used within one application area.

- **Recommendation 5:** With respect to Workpackage 4d ,it should better focus, work within it should be better integrated between partners and the cohesion between them should be improved – this pertains both to problem definition as well as to experimental equipment. While the work has been formulated into two overall scenarios, they are still fragmented; this fragmentation should be overcome. Also, the work should be better integrated with the other HYCON workpackages, studying and applying e.g. the application of hybrid tools to derive new solutions for the focused problems. Industry participation & involvement should be increased. In summary, the level of integration in this WP is not satisfactory and a clear strategy of integration targets is missing. The WP4d should not continue like this and the work plan needs major restructuring in terms of focus, links to other WPs (e.g. WP3) and dissemination.

- **Recommendation 6:** Budget planning should be revised to ensure that sufficient budget is available, in particular for core partners of each WP, for the period extending beyond M30 in order to be able to achieve its objectives.

- **Recommendation 7:** Pending the submission of the revised DoW within 10 working days after the review, the project should not be suspended.

- **Recommendation 8:** the next M24 review will monitor all the pending recommendations from review 2, and the status of the review 2 recommendations is provided in this report to

help prepare the next review. Also, all comments from the previous review report on individual work packages are to be taken into account. Industrial links of Hycon will be formally reviewed at the next review based on upcoming deliverables and milestones of WP6.

10 REVIEW CONCLUSION

Outcome of the review:

	Continue	Modify	Stop
Technical Progress:	**X**		
Management and Consortium	**X**		
Dissemination + Exploitation:	**X**		
Future Plans:	**X**		
Overall Status of Project	**X**		

The outcome of the review is

- the project has progressed well, even if two areas remain critical: EIHS and integration. These issues will be extensively reviewed at the next M24 review.
- the finalisation of the updated DoW is of utmost urgency, as without this finalisation the consortium could end up operating in the absence of a legal framework.

11 NEXT REVIEW MEETING

The next review, which will formally review the period from M13 to M24, will take place on the 26th – 27th of September 2006 (2 DAYS).

Reviewers' signatures:

Holger Karl Véronique Pevtschin Gabriel Leen

12 APPENDICES

12.1 List of participants

Name	Organisation	Email
Rolf Riemenschneider	European Commission	Rolf. Riemenschneider @cec.eu.int
Peter Caines	McGill University	peterc@cim.mcgill.ca
Gabriel Leen	University of Limerick	Gabriel.Leen@ul.ie
Holger Karl	University Paderborn	holger.karl@uni-paderborn.de
Véronique Pevtschin	Tecsin	v.pevtschin@alum.mit.edu
Françoise Lamnabhi-Lagarrigue	CNRS	lamnabhi@lss.supelec.fr
Elisabeth Kohler	CNRS	Elisabeth.Kohler@dr4.cnrs.fr
Fortunato Santucci	University of L'Aquila	**santucci@**ing.univaq.it
Alberto Sangiovanni-Vincentelli	Parades	alberto@eecs.berkeley.edu
Maria Domenica Di Benedetto	University of L'Aquila	**dibenedetto@**ing.univaq.it

12.3 Agenda

IST-2003-511368
Third Review Meeting
Agenda
Date: 27 March, 2006

Venue: European Commission
Beaulieu 33
1160 Brussels, Belgium

From	To	Topic	Speaker
09:45	10:15	Reviewers closed session	
10:15	10:45	Project overview including the implementation of the previous review recommendations and WP1 & WP5 achievements and milestones M13-M18	F. Lamnabhi-Lagarrigue
10:45	11:00	Coffee Break	
11:00	11:30	WP1 & WP5 achievements and milestones M13-M18	F. Lamnabhi-Lagarrigue
11:30	12:00	Unified view of WP4d and industrial applications	A. Sangiovanni-Vincentelli
12:00	12:20	Role of hybrid systems in the unified view	M.D. Di Benedetto
12:20	13:45	Lunch	
13:45	14:15	Description of case studies	F. Santucci
14:15	14:30	Integration, dissemination activities and future perspectives	F. Santucci
14:30	14:45	WP6 achievements and milestones M13-M18	A. Sangiovanni-Vincentelli
14:45	15:00	Final verification of Updated Work Plan	F. Lamnabhi-Lagarrigue
15:00	15:45	Reviewers closed session	
15:45	16:00	Closing	R. Riemenschneider