Programme jeunes chercheuses
et jeunes chercheurs 2007

Les personnes impliquées dans plusieurs AAP soumis à l'ANR devront le mentionner dans le tableau « demandes de contrats en cours d'évaluation » (Section D du document).

II - Description du projet et de la composition de l'équipe

Durée du projet : ☐ 24 mois ☐ 36 mois ☑ 48 mois

A - Participants au projet

A -1 – Porteur du projet

* champ obligatoire

Civilité *	Nom *	Prénom *	
Mme	Perronnin	Florence	
Emploi actuel*	MCF	**Date de nomination dans cet emploi**	01/09/2006
Employeur *	**Université Joseph Fourier**		
Mail *	**Florence.Perronnin@imag.fr**		
Tél *	**0476612011**	**Fax 0476612099**	

Laboratoire *(nom complet)* *	
Projet Mescal Laboratoire d'Informatique de Grenoble (LIG) Unité de Recherche INRIA Rhône Alpes	
N° Unité *(s'il existe)*	UMR 5217
Adresse complète du laboratoire *	
Laboratoire LIG ENSIMAG Antenne de Montbonnot 51 av Jean Kuntzmann	
Code postal * 38330	**Ville** * **Montbonnot Saint Martin**
Etablissements de tutelle *(indiquer le ou les établissements ou organismes de rattachement, souligner l'établissement susceptible d'assurer la gestion du projet)* **:** **CNRS,<u>INRIA</u>,UJF,UPMF,INPG**	

Principales publications :

Liste des principales publications ou brevets (max. 5) du porteur de projet au cours des cinq dernières années, relevant du domaine de recherche couvert par la présente demande dans l'ordre suivant : Auteurs (en soulignant les auteurs faisant effectivement partie de la demande), Année, Titre, Revue, N°Vol, Pages. N'indiquez pas les publications soumises.

Florence Perronnin, Philippe Nain, Keith Ross, 2005. **Stochastic Fluid Models for Cache Clusters**. *Performance Evaluation*, 59(1):1-18.

Bruno Gaujal and Florence Perronnin, 2007. **Coupling from the past in hybrid models for file sharing peer to peer systems**. In *Proceedings of the 10th International Conference on HYBRID SYSTEMS: COMPUTATION AND CONTROL (HSCC'07)*, Pisa, Italy, April 2007. Note: To appear.

Florence Clévenot-Perronnin and Philippe Nain, 2005. **Stochastic Fluid Model for P2P Caching Evaluation**. In *Proc. WCW 2005*, Sophia Antipolis, France, pp 104-111, September 2005.

Florence Clévenot-Perronnin, Philippe Nain, and Keith W. Ross, 2005. **Multiclass P2P Networks: Static Resource Allocation for Service Differentiation and Bandwidth Diversity**. In *Proc. PERFORMANCE 2005*, Juan-les-Pins, France, pp 32-49, October 2005.

Florence Clévenot and Philippe Nain. **A Simple Model for the Analysis of the Squirrel Peer-to-peer Caching System**. In *Proc. INFOCOM 2004*, Hong Kong, March 2004.

Ce projet fait-il partie des projets labellisés[1] (ou en cours de labellisation) par un pôle de compétitivité (ou par plusieurs, en cas de projet interpôle) ? **NON**
Si oui, nom du pôle ou des pôles :

[1] Le porteur du projet devra transmettre à l'ANR, pour chaque pôle de compétitivité concerné, un formulaire d'attestation de labellisation dûment rempli et signé par un représentant de la structure de gouvernance du pôle, dans un **délai de deux mois maximum après la date limite d'envoi des projets sous forme électronique**. La procédure à suivre est décrite dans le texte de l'Appel à projets Jeunes chercheuses et jeunes chercheurs.

Programme jeunes chercheuses et jeunes chercheurs 2007

Acronyme ou titre court du projet : DOCCA

A-2 – Participants au projet

L'équipe proposée devra être composée majoritairement de jeunes chercheuses et de jeunes chercheurs titulaires d'un emploi permanent, nommément identifiés (au minimum 150% de temps de recherche consacré au projet) pour lesquels l'implication dans le projet devra représenter une partie importante de leur activité de recherche ; cette implication devra être majeure, voire exclusive, en ce qui concerne le ou la responsable du projet (au minimum 80% de son temps de recherche consacré au projet). Pour les enseignants-chercheurs, il s'agit du pourcentage de leur temps de recherche consacré au projet.
Indiquez en premier le nom du responsable du projet.

Nom	Prénom	Laboratoire ou équipe de rattachement	Emploi actuel	Date de nomination dans le poste	Age au 1/1/07	% du temps de recherche consacré au projet	Rôle/Responsabilité dans le projet 4 lignes max
Perronnin	Florence	LIG - Mescal	MCF	01/09/2006	28	80	Porteur du projet Encadrement de R. Czekster
Touati	Corinne	LIG - Mescal	CR2 INRIA	01/09/2006	30	80	Encadrement du doctorant demandé
Legrand	Arnaud	LIG - Mescal	CR2 CNRS	01/10/2004	30	50	Encadrement P. Velho
Czekster	Ricardo	LIG - Mescal	Doctorant	03/2006	29	100	
Pascual	Fanny	LIG - Moais	Post-doc	2006	25	50	
Nussbaum	Lucas	LIG - Mescal	Doctorant	01/10/2005	25	50	
Richard	Olivier	LIG - Mescal	MCF	01/09/2000	35	10	Encadrement de L. Nussbaum
Velho	Pedro	LIG-Mescal	Doctorant	01/10/2006	24	50	

Florence Perronnin
28 ans
Maître de Conférences UJF

Cursus:

Depuis 09/2006	Maître de Conférences, Université Joseph Fourier (UJF), Grenoble / Projet MESCAL, INRIA Rhône Alpes 2
005-2005	ATER, UJF / Projet MESCAL, INRIA Rhône Alpes
2002-2005	Thèse de doctorat, projet MAESTRO, INRIA Sophia Antipolis. Directeur Philippe NAIN.
	Sujet: Modèles fluides pour l'analyse de performance des systèmes de distribution de contenu.
2002	DEA de Réseaux et Systèmes Distribués à l'Université de Nice-Sophia Antipolis.
2000-2001	Ingénieur d'études pour la société ASTEK (missions pour CS Telecom et Nortel Networks)
2000	Ingénieur diplômée de l'ENST Paris

Thèmes de recherche:

- outils analytiques de modélisation
- techniques de simulation passant à l'échelle
- études de performances de systèmes réels

Publications majeures

- Florence Clévenot, Philippe Nain, and Keith W. Ross. Stochastic Fluid Models for Cache Clusters. Performance Evaluation, 59(1):1-18, January 2005.
- Bruno Gaujal and Florence Perronnin. Coupling from the past in hybrid models for file sharing peer to peer systems. In Proc. 10th International Conference on HYBRID SYSTEMS: COMPUTATION AND CONTROL (HSCC'07), Pisa, Italy, April 2007.
- Florence Clévenot-Perronnin and Philippe Nain. Stochastic Fluid Model for P2P Caching Evaluation. In Proc. WCW 2005, Sophia Antipolis, France, pages 104-111, September 2005.
- Florence Clévenot-Perronnin, Philippe Nain, and Keith W. Ross. Multiclass P2P Networks: Static Resource Allocation for Service Differentiation and Bandwidth Diversity. In Proc. PERFORMANCE 2005, Juan-les-Pins, France, pages 32-49, October 2005.
- Florence Clévenot and Philippe Nain. A Simple Model for the Analysis of the Squirrel Peer-to-peer Caching System. In Proc. INFOCOM 2004, Hong Kong, March 2004.

Corinne Touati

30 ans

CR2 INRIA

<u>Cursus :</u>

Depuis 2006	Chargée de recherche (CR2) INRIA, projet MESCAL
2000 - 2003	Thèse de doctorat, projets MISTRAL et MASCOTTE, INRIA Sophia-Antipolis. Directeurs : Eitan Altman et Jérôme Galtier
	Sujet : les principes d'équité dans les réseaux de télécommunications
2000	DEA RSD (Réseau et Systèmes Distribués) à l'Université de Nice Sophia-Antipolis.
2000	Ingénieur de Telecom INT

<u>Publications majeures :</u>

[1] J.M. Kelif, C. Touati, J. Galtier, E. Altman, et B. Fourestié. Procédés et équipements d'allocations de débit de données pour terminaux mobiles de télécommunications . Brevet 04 291 785.6, 13/7/2004.

[2] C. Touati, E. Altman, et J. Galtier. Generalized Nash Bargaining Solution for bandwidth allocation . Computer Networks (Elsevier), Vol 50, Issue 17, pp 3242 – 3263, Dec 2006.

[3] S. Alouf, E. Altman, J. Galtier, J-F Lalande, et C. Touati. Quasi-optimal bandwidth allocation for multi- spot MFTDMA satellites . Dans IEEE Infocom (Miami, mars 2005), pp. 560571.

[4] A. Inoie, H. Kameda, et C. Touati. A paradox in Optimal Flow Control of M/M/n Queues . Computers & Operations Research 33, numéro 2 (2006), 356368.

[5] A. Legrand et C. Touati, Non-Cooperative Scheduling of Multiple Bag-of-Task Appplications. In Proceedings of the 25th Conference on Computer Communications (INFOCOM'07)/, 2007.

Arnaud Legrand

30 ans

CR CNRS

<u>Cursus</u>

Depuis 2004	CR2 CNRS
2003	Doctorat, École normale supérieure de Lyon

<u>Thèmes de recherche</u>

Conception d'algorithmes parallèles pour plateformes hétérogènes

Techniques d'ordonnancement

Publications majeures :

- A. Legrand, A. Su and F. Vivien. Minimizing the Stretch When Scheduling Flows of Biological Requests. *Symposium on Parallelism in Algorithms and Architectures SPAA'2006, 2006.*
- O. Beaumont, L. Carter, J. Ferrante, A. Legrand, L. Marchal and Y. Robert. Centralized Versus Distributed Schedulers Multiple Bag-of-Task Applications. International Parallel and Distributed Processing Symposium IPDPS'2006, 2006.
- C. Banino, O. Beaumont, L. Carter, J. Ferrante, A. Legrand, and Y. Robert. Scheduling strategies for master-slave tasking on heterogeneous processor platforms. *IEEE Trans. Parallel Distributed Systems*, 15(4):319–330, 2004.
- O. Beaumont, A. Legrand, L. Marchal, and Y. Robert. Scheduling strategies for mixed data and task parallelism on heterogeneous clusters. *Parallel Processing Letters*, 2003.
- H. Casanova, A. Legrand, L. Marchal. Scheduling Distributed Applications: the SimGrid Simulation Framework. *Proceedings of the third IEEE International Symposium on Cluster Computing and the Grid (CCGrid'03)* .

Lucas Nussbaum

25 ans

Doctorant

Cursus

depuis le 01/10/2005	Doctorant BDI CNRS, Projet MESCAL. Directeur de thèse: Olivier Richard.
2005	Ingénieur ENSIMAG

Thème de recherche

Étude des systèmes pair-à-pair à l'aide d'émulation et de virtualisation

Publications majeures :

- Lucas Nussbaum. Une Plate-forme d'Émulation Légère pour Étudier les Systèmes Pair-à-Pair. *Rencontres francophones du Parallélisme (RenPar'17)*, Perpignan, France, October 2006.
- Lucas Nussbaum, Olivier Richard. Lightweight emulation to study peer-to-peer systems. *Third International Workshop on Hot Topics in Peer-to-Peer Systems (Hot-P2P'06)*, Rhodes Island, Greece, April 2006.

Ricardo Czekster
29 ans
Doctorant

Cursus

Depuis 03/2005 Doctorant (soutenance prevue en Décembre/2009). Directeurs de thèse: P. Fernandes, F. Perronnin, B. Gaujal.

03/2004 - 12/2005 Master's degree in CS, Université Pontificale Catholique du Rio Grande do Sul (PUC-RS), Brésil

Thèmes de recherche

Évaluation de performances systèmes pair-à-pair modèles markoviens méthodes numériques réseaux d'automates stochastiques

Publications majeures :

CZEKSTER, R. M. ; SOUZA, O. N. ; SimVIZ - A desktop virtual environment for visualization and analysis of protein multiple simulation trajectories. International Conference on Computer Science and its Applications (ICCSA 2006), Glasgow, UK. 2006. LNCS 2006. v. 3980. p. 202-211.

CZEKSTER, R. M. ; SOUZA, O. N. ; VIZ - A Graphical Open-Source Architecture for Use in Structural Bioinformatics. In: Brazilian Symposium of Bioinformatics, 2005, São Leopoldo. Lecture Notes in Bioinformatics, 2005. v. 3594. p. 226-229.

CZEKSTER, R. M. ; FERNANDES, P. ; WEBBER, T. The Hybrid Algorithm to Vector-Descriptor Product. Rapport de recherche n° 52., PUCRS, Brésil. 2006.

IGLEZIAS, L. M. ; CZEKSTER, R. M. ; MANSSOUR, Isabel Harb. Uma Ferramenta Interativa para Visualização e Exploração de Imagens Médicas. In: XXXI Conferencia Latinoamericana de Informática - CLEI2005, 2005, Cali, Colômbia. Uma Ferramenta Interativa para Visualização e Exploração de Imagens Médicas, 2005.

CARVALHO, Matheus Machado de ; CZEKSTER, R. M. ; MANSSOUR, Isabel Harb. Uma Ferramenta Interativa para Visualização e Extração de Medidas em Imagens Médicas. In: XXIII Congresso da Sociedade Brasileira de Computação - XXII Concurso de Trabalhos de Iniciação Científica, 2003, Campinas. Anais do XXIII Congresso da Sociedade Brasileira de Computação, 2003. v. III. p. 169-179.

Pedro Velho
24 ans
Doctorant

Cursus:

Depuis 10/2006 Doctorant, Projet MESCAL, INRIA/LIG. Directeurs de thèse: Arnaud Legrand et Jean-François Méhaut
Sujet: Simulation de Grilles de Calcul Distribué.

01/2004-07/2004 Séjour de recherche, PUCRS.

2005 - 2006 MsC. en INFORMATIQUE, PUCRS, Brésil.

2000 - 2004 BsC. en INFORMATIQUE , PUCRS, Brésil.

Publications majeures :

Fernandes, L. G. ; Bezerra, E. ; Oliveira, F. ; Raeder, M. ; Velho, P. ; Amaral, L. . Probe Effect Mitigation in the Software Testing of Parallel Systems. In: LATW - Latin-American Test Workshop, 2006, Buenos Aires, p. 153-158.

Kolberg, M. ; Baldo, L. ; Velho, P. ; Fernandes, L. G. ; Cláudio, D. M. . Optimizing a Parallel Self-verified Method for Solving Linear Systems. In: PARA - Workshop on State-of-the-Art in Scientific and Parallel Computing, 2006, Umea.

Baldo, L. ; Cláudio, D. M. ; Fernandes, L. G. ; Fernandes, P. ; Kolberg, M. ; Velho, P. ; Webber, T. . Parallel Selfverified Method for Solving Linear Systems. In: 7th International Meeting of High Performance Computing for Computational Science, 2006, Rio de Janeiro. VECPAR, p. 1-12.

Velho, P. ; Fernandes, L. G. ; Raeder, M. ; Castro,M. ; Baldo, L. . A Parallel Version for the Propagation Algorithm. In: PaCT - International Conference on Parallel Computing Technologies, 2005, Kranoyarsk. Proc. 8th PaCT (LNCS 3606), 2005. v3606, p. 403-412.

Velho, P. ; Fernandes, L. G. ; Roisenberg, P. ; Webber, T. ; Baldo, L.. Parallel PEPS Tool Performance Analysis Using Stochastic Automata Networks. In: Euro-Par 2004, 2004, Pisa. v3149, p. 214-219.

Fanny Pascual
25 ans
Post-doctorante INRIA

Cursus :

2006 – 2007	Post-doctorante INRIA au laboratoire d'informatique de Grenoble.
2003 – 2006	Doctorante monitrice en informatique, à l'Université d'Evry Val d'Essonne. Directeurs: Evripidis Bampis et Eric Angel. Sujet : « optimisation dans les réseaux : de l'optimisation combinatoire à la théorie des jeux ».
03/2006–07/2006	Séjour au laboratoire d'Informatique de l'Université d'Athènes, accueillie par V. Zissimopoulos et E. Koutsoupias.
2002 – 2003	DEA d'informatique, Université d'Evry.

Thèmes de recherche :
algorithmique
recherche opérationnelle
théorie des jeux.

Publications:

Eric Angel, Evripidis Bampis, Fanny Pascual. Truthful algorithms for scheduling selfish tasks on parallel machines. Theoretical Computer Science (TCS), Vol. 369, pages 157-168, décembre 2006.

Eric Angel, Evripidis Bampis, Fanny Pascual. How faire are SPT schedules for fair optimality criteria. Annals of Operation research (AOR), à paraître.

Maria Liazi, Ioannis Milis, Fanny Pascual, Vassilis Zissimopoulos. The k-densest Subgraph Problem in Pairwise Overlapping Cliques. Journal of Combinatorial Optimization, à paraître.

Eric Angel, Evripidis Bampis, Fanny Pascual. The price of approximate stability for scheduling tasks on two links. Euro-Par 2006, LNCS 4128, août 2006.
Eric Angel, Evripidis Bampis, Fanny Pascual. Traffic grooming in a passive star WDM network. SIROCCO 2004, LNCS 3104, juin 2004.

Richard Olivier
35 ans
Enseignant/chercheur en délégation INRIA

Cursus:

Depuis 09/2000	Enseignant/chercheur à l'Institut des sciences et techniques de Grenoble.
Avril-Aout 2000	Ingénieur de recherche au sein de la société ARTABEL.
1998-1999	ATER à l'université Paris XI (Orsay).
1996-1999	Doctorat, Université Paris XI. Sujet : Contribution à l'étude des grappes de serveurs multiprocesseurs
1995:	DEA Architectures Parallèles de l'université Paris XI.

Publications:

Lucas Nussbaum and Olivier Richard. Lightweight emulation to study peer-to-peer systems. Concurrency and Computation: Practice and Experience - Special Issue on HotP2P 06, 2007.

Raphaël Bolze, Franck Cappello, Eddy Caron, Michel Daydé , Frederic Desprez, Emmanuel Jeannot, Yvon Jégou, Stéphane Lanteri, Julien Leduc, Noredine Melab, Guillaume Mornet, Raymond Namyst, Pascale Primet, Benjamin Quetier, Olivier Richard, El-Ghazali Talbi, and Touché Irena. Grid'5000: a large scale and highly reconfigurable experimental grid testbed. International Journal of High Performance Computing Applications, 20(4):481-494, November 2006.

Nicolas Capit, Georges Da Costa, Yiannis Georgiou, Guillaume Huard, Cyrille Martin, Grégory Mounié, Pierre Neyron, and Olivier Richard. A batch scheduler with high level components. In Cluster computing and Grid 2005 (CCGrid05), 2005.

Maurício Pillon, Olivier Richard, and Georges Da-Costa. Drac: Adaptive control system with hardware performance counters. In Euro-Par 2004, Lecture Notes in Computer Science. Springer, 2004.

G. Da-Costa and O. Richard. Impact of realistic workload in peer-to-peer systems a case study : Freenet. PDCP, Parallel and Distributed Computing Practice, 2003.

Programme jeunes chercheuses et jeunes chercheurs 2007

B – Description du projet

La partie (B) sera rédigée de préférence en anglais à l'exception des projets de recherche pour lesquels le français s'impose.
Cette possibilité concerne en particulier les projets en SHS pour lesquels le français peut être utilisé dans le cadre d'une évaluation internationale.

Acronyme ou titre court du projet : DOCCA

B-1 – Equipe : *(1 page maximum en Arial 11, simple interligne)*

Founding members:
A. Legrand, C. Touati and F. Perronnnin are recent members of the MESCAL INRIA project team in the LIG laboratory (UMR 5217).
While having different expertise from very different research areas, they soon found a common interest for P2P systems and algorithmic problems thereof. A. Legrand is an expert in scheduling and parallel computing, C. Touati is a game theory specialist for distributed systems and F. Perronnin's research background is the performance analysis of P2P systems. They soon found out that some interesting problems such as service disciplines for a server are treated very differently in their respective communities. This was a first call for a collaboration aiming at comparing existing approaches with their respective theoretical tools.

History:
F. Perronnin and C. Touati started to work on a P2P incentive problem in the context of file-sharing since the ressource allocation problem studied by F. Perronnin also needed to be addressed from an game-theoretic point of view. When discussing this problem with A. Legrand, his interest in collaborative computing progressively gave birth to the idea of a P2P collaborative computing system, which still doesn't exist and for which very little analytical research has been conducted yet.
The immense potential of this project called for more workforce. The problems considered needed not only a theoretical modeling but also a simulation phase to validate the algorithms, to which end were contacted R. Czekster (PhD student) and B. Gaujal (Project leader) who have an expertise in perfect simulation, and finally an experimentation phase for which L. Nussbaum (PhD student) along with O. Richard (Associate Professor) have the necessary experience in the context of file-sharing systems. These members are part of the MESCAL project team. In addition, the expertise of F. Pascual (Post-Doc from MOAIS project team) on incentives and truthfulness in grid computing was found to be a necessary competence for the incentive mechanism research axis.

Positioning:
The scientific context of our host team MESCAL is the design of middleware solutions for intensive scientific computation.
In practice, the target system of MESCAL research is the Grid, with a user profile requiring large amounts of computation on dedicated systems with a high-performance infrastructure.
Our theme, inspired from P2P networking, aims at using existing ressources (desktop machines) for everyday computation. While the large-scale component is common challenge with MESCAL research, we target a novel system in a totally different environment: high churn rates, selfish behaviour, lower quality network, no centralized control and task preemption (each user still controls its own machine).

We first intend to take advantage of the scientific expertise and working conditions of the MESCAL and MOAIS teams of the LIG laboratory. In the long term we envision the creation of an autonomous research team.

Our team will also interact with MOAIS team for algorithmic problems concerning the possible client applications of our P2P collaborative computing system.

B-2 – Description du projet et résultats attendus : *(8 pages maximum en Arial 11, simple interligne)*

1 General Context

The recent evolutions in computer networks technology, as well as their diversification, yield a tremendous change in the use of these networks: applications and systems can now be designed at a much larger scale than before. This scaling evolution is dealing with the amount of data, the number of computers, the number of users, and the geographical diversity of these users.

This race towards *large scale* is such that most distributed systems deployed nowadays are characterized by highly dynamic entities (participants can join and leave at will), a potential instability of the large scale networks (on which concurrent applications are running), the increasing probability of failure, and the fairness issues in resource sharing when the number of users increases. Therefore, as the system size increases, an automatic adaptation is needed to face the changes of its components, requiring a self-organization of the system when facing of the arrival and departure of participants, data, or resources. Self-organization generally goes with the absence of centralization point.

This race towards *large scale* also offers new opportunities to applications, in particular as far as scientific computing, databases, and file sharing are concerned. Recently many advances have been done in the area of large-scale file-sharing systems, building upon the peer-to-peer paradigm that somehow seamlessly responds to the dynamicity and resilience issues. However, achieving a fair resource sharing amongst a large number of users in a distributed way is clearly still an open and active research field. For all previous issues there is a clear gap between

1. widely deployed systems as peer-to-peer file-sharing systems (KaZaA, Gnutella, EDonkey) that are generally not very efficient and do not propose generic solutions that can be extended to other kind of usage;
2. academic work with generally smart solutions (probabilistic routing in random graphs, set of node-disjoint trees, lagrangian optimization) that sometimes lack a real application.

Up until now, main achievements based on the peer-to-peer paradigm mainly concern file-sharing issues. We believe that a large class of scientific computations could also take advantage of this kind of organization. That is why in this section we precise our motivations for the design of a peer-to-peer computing infrastructure with a particular emphasis on the fairness issues.

1.1 Targeted Platforms

The platforms we target in this project are typically constituted of a large number of remote resources (PCs, workstations, servers) connected to Internet, behind a cable modem and/or a pool of resources (PCs, workstations, servers) inside a LAN. Our work is inspired from classical volunteer computing platforms but with more symmetric objectives as *any* contributer may also consume resources.

1.2 Targeted Applications

Only very loosely-coupled applications may benefit of a platform as unstable as a peer-to-peer system. That is why we identify two classes of applications that are likely to cope with this dynamic and restrict the scope of our research to them.

1.2.1 Bag-of-Tasks Applications

We define Bag-of-Tasks applications as consisting of many independent tasks (without inter-task communication) using files for input and output. Such applications arise in many scientific and engineering domains. Common examples include all kinds of Monte-Carlo simulations and parameter-space searches. Parameter Sweep applications are likely to make efficient use of large-scale loosely coupled distributed platforms. Bag of Tasks applications are also interesting on a scheduling point of view when they exhibit data-sharing patterns (e.g., some tasks sharing input files). It then becomes critical to strategically co-locate data and tasks.

1.2.2 Divisible Applications

Many applications in scientific and engineering domains are structured as large numbers of independent tasks with low granularity (Kalman filtering, image processing, video and multimedia broadcasting or encoding, or the processing of large distributed files). These applications are thus amenable to straightforward parallelization, typically in master-worker fashion, provided that efficient scheduling strategies are available. Such applications have been called *divisible loads* because a scheduler may *divide* the computation among worker processes arbitrarily, both in terms of number of tasks and of task sizes. Divisible load scheduling has been an active area of research for the last two decades. However this application model has mainly been used for master-slave infrastructures. Due to their loosely-coupled nature and their flexibility they are ideal candidates for a peer-to-peer computing platform.

1.3 Targeted Usage

The rationale behind the collaboration of users to form a peer-to-peer system is the diversity of their needs. People generally do not use their computers (or all of their computers' resources) all the time. By giving unused computational resources one should in exchange be allowed to access others' spare resources when needed. Furthermore, one can think two main types of users. On the one hand some users typically submit a very large number of tasks and do not explicitly wait for the end of the computations of all of them. They are more interested in having the work done but do not have a particularly tight deadline. On the other hand some users make generally little use of the system but have a bursty need for a large number of machines (to finish some computations before a deadline). We call these two type of users "permanent users" and "deadline users". The coexistence of both user types enables to even resource usage.

1.4 Related Work

In this section, we briefly present a few projects whose objectives are related to our but whose architectures differs. Most of them rely on a very centralized architecture with asymmetric roles between resource providers and resource consumers.

APST

APST is a user-centric tool that schedules and deploys Bag of Tasks applications on a Computational Grid. This software design by the APPLeS project (UCSD) is designed for a single user willing to use an heterogeneous set of computing resources (a few clusters, a dozen of workstations,). It relies on a master-slave architecture and thus does not scale very well and is not designed at all to handle the situation where multiple users share resources.

SETI/BOINC

BOINC (Berkeley) is a follow-up of the well-known SETI@home project. Just like SETI, it uses client-server technology, but is however designed to handle many applications/projects simultaneously. BOINC uses a Credit System that is mainly designed to reward users and avoid cheating by validating results before granting credit. Volunteering is mainly motivated by the fame gained by contributing to well-known project. BOINC uses a weighted round-robin scheduling that is somehow analogous to fair-shared scheduling in time-sharing systems.

Condor

Condor is a cycle-hunting project from (UWM). The condor project is somehow similar to a classical batch-scheduling system relying typically on idle workstations of a University. Users submit their serial or parallel jobs to Condor and express requirements (e.g. memory, architecture). Condor places them into a queue, chooses when and where to run the jobs based upon a policy, carefully monitors their progress, and ultimately informs the user upon completion.

XtremWeb

The XtremWeb (LRI) software platform allows to setup and run Distributed System projects. XtremWeb can for example be used to build a Global Computing System with centralized control, job scheduling and result collection (in the spirit of BOINC). XtremWeb can also be used to build centralized Peer-to-Peer Systems such as some well known projects related to audio file exchange. This project is for the moment much more concerned with system and security issues than with fairness and analytical modeling issues.

Cigri/OAR

The CIMENT project (Intensive Computing, Numerical Modeling and Technical Experiments) gathers a wide scientific community involved in numerical modeling and computing (from numerical physics and chemistry to astrophysics, mechanics, biomodeling and imaging) and the distributed computer science teams from Grenoble. Among these various application domains, there is a huge demand to manage executions of Bag of Task applications. Providing a middleware able to steer such an amount of jobs is a challenge that has been addressed in the CiGri middleware project. The CiGri server software is based on a database and offers a user interface for launching grid computations (scripts and web tools). It interacts with the computing clusters through a batch scheduler software. CiGri is compatible with classical batch systems like PBS but an efficient batch software (OAR) has been developed by MESCAL and MOAIS Project and experimentations of scheduling tools.

Ourgrid

OurGrid is a free-to-join peer-to-peer grid that has been in production in Brazil since December 2004. Anyone can freely and easily join it to gain access to large amounts of computational power and run parallel applications. This computational power is provided by the idle resources of all participants, and is shared in a way that makes those that contribute more get more when they need. Currently, the platform can be used to run any Bag of Task application and recent works are planning on providing support for divisible applications. OurGrid is thus closely related to our goals. However we do not aim at building a full-fledge peer-to-peer computing platform but more to understand and design effective algorithms to obtain an efficient and fair usage of resources among users.

1.5 Additionnal constraints

We will restrict the scope of our target applications to those that have a low memory usage. This restriction enables to remove the potential need for resource selection mechanism such as the ones that can be found in Condor or OAR. Moreover low memory usage allows preemption and checkpointing applications (which is mandatory in such a volatile context where peers may want to get their machines/resources back at any time). Such constraints call for a non-structured peer-to-peer overlay.

1.6 Summary: a peer-to-peer architecture for collaborative computing

Peer-to-peer technologies are easy to set up, require little administration, make use of existing machines and seamlessly adapt to churn and load variations. Bag of Task and divisible Applications are generally considered as less interesting on a research point of view than more complex applications. They are however clearly very useful and challenging to schedule in a peer-to-peer context. Using classical grid platforms for such applications is unnecessary and we feel that there is a need beyond desktop grids for a system where volunteers would also benefit from this collaboration.

However, the few existing systems that follow this direction have not studied yet sharing issues on a theoretical point of view and rather try to use tricks that have been successful in other context whereas many fundamental differences can be hilighted. That is why we propose to first analytically study the various techniques that have been proposed in the past and come up with new ones for this particular new context.

The strength of our collaboration comes from the fact it gathers several people with different and complementary expertise, ranging from algorithm design and scheduling techniques to networking and peer-to-peer analysis, and to game theory and simulation. There is no similar project in the LIG and, to the best of our knowledge, no other team in France has these competences and interest in this specific subject.

2 Scientific Objectives

We address the need for scientific methodology and optimal algorithms in P2P computing, and tackle the lack of practical P2P solutions for collaborative computing using unused desktop ressources within a large (possibly worldwide) private network.

2.1 Main goals

Our objectives are:

1. Leverage the pluridisciplinarity of the team to combine theoretical tools and metrics from the parallel computing community and from the network community, and to explore algorithmic and analytical solutions to the specific resource management problems of such systems.

2. Design a P2P architecture based on the algorithms designed in the second step and to create a novel P2P collaborative computing system.

The expected results are

1. Provide user synthetic models to the scientific community that can be used as an input in modeling, simulation and experimentation of P2P collaborative computing systems.
2. Provide optimal strategies and resource management algorithms in P2P collaborative computing.
3. Design a decentralized protocol that implements the optimal strategies for the target user models.
4. Implement a prototype and validate the approach on an experimental platform.

2.1.1 Scope

Our project focuses on the fundamental problems of P2P collaborative computing. While such highly dynamic systems exhibit inherent difficult technical problems such as the forwarding and resuming of a job after it was preempted by the machine’s owner, we are convinced that the organization and feasibility of such overlays need to be researched upstream. Therefore, our project focuses on algorithmic aspects, game theoretic analysis, resource management strategies, stochastic modeling and functional evaluation of analytical solutions. Our ultimate target is the elaboration of a novel pure P2P collaborative computation protocol with the implementation of a functional prototype. However, in the long term we envision the creation of a real and complete technical solution based on the results of our research with the help of research teams that have the experience of the final technical problems mentioned above.

2.1.2 Differences with previous work

The vision of a P2P collaborative computing system was greatly inspired by the profuseness of research on incentives in P2P content sharing systems. The P2P overlays have been shown to be highly scalable and numerous, often very performant solutions have been designed to make such systems resilient to selfish behavior. While part of our research effort will include identifying P2P algorithmic solutions that can be applicable to our system, there are several fundamental differences that call for designing specific strategies:

- P2P content sharing networks rely on the efficient diffusion of file *fragments*. To avoid missing fragments, selection strategies have been widely studied. In a computing context, there is no equivalent problem. All "fragments" are identical since they consist in tasks that can be achieved on any machine. As a result a P2P computing system does not require a specific peer search mechanism.
- P2P file-sharing systems are often used for downloading copyrighted content. For this reason, keeping track of the amount of service offered by individual peers is not desirable (from a user perspective) since it may lead to subsequent prosecution. In P2P computing, client and server anonymity is not a requirement. On the contrary, records of offered services is probably wanted by cooperating peers.
- Performance metrics and constraints in P2P networking are 1-dimensional and mainly regard throughput and bandwidth. However, distributed computation is 2-dimensional by nature since a parallel task needs *both* CPU and bandwidth resources.

2.1.3 Originality

The focus on a pure P2P collaborative architecture and the corresponding theoretical resource allocation problems are novel research directions and are not (to our knowledge) studied elsewhere. This project strongly detach from the MESCAL project research theme which focuses on modeling, middleware design and distributed systems targeting intensive scientific computation in a dedicated environment (clusters and grids). The parallel computation context is also novel to the project leader research interests.

2.2 Specific Target Problems

2.2.1 Metrics combination

Heterogeneous Metrics

One of the core targets of this project is to ensure that resources are both efficiently exploited and shared fairly between peers, such that "poor" peers (who have little to offer or experience low network connectivity) get some share and are not systematically denied access. However this notion of equity heavily depends on the satisfaction metric, which in turn depends on the type of application running. For bag-of-task applications, where outputs may be used on the fly, the natural satisfaction metric is the instantaneous throughput (number of tasks per unit time). For divisible applications, where the output is only available when all tasks have been executed, a more significant metric is the stretch (total sojourn time to effective computation time ratio). These metrics are not comparable and cannot be both optimized easily. One of our first goals will be to investigate possible metrics combinations techniques that will account for all targeted applications.

Worst case and average analysis

In addition, metrics and optimality concepts slightly differ between online scheduling, game theory and stochastic modeling research communities. For instance, the processor sharing service discipline (PS) is considered as inefficient from a static scheduling point of view since two concurrent tasks will both suffer from a long delay while the shortest one could be achieved with a lower delay without penalizing the longer one. SRPT (Shortest Remaining Processing Time) is considered optimal. The corresponding metric is thus implicitly the average stretch. However, in the stochastic scheduling community the PS discipline receives more attention for several reasons. First, in a dynamic environment the remaining processing time is typically unknown. Also, dynamic (stochastic) job arrivals imply different strategies. And finally, *fairness* is an important criterion in the network community. We intend to compare the viewpoints of each community to provide transversal guidelines.

2.2.2 Taking both communications and computations into account.

Previous global computing like SETI@home target only computing-intensive applications. Existing file-sharing systems do not consider computations. The communication to computation ratio of the applications we consider is neither zero nor infinite, which makes the resource allocation much more difficult. Indeed a given peer may have a poor connection to the system and good CPU performances and thus would be more suited to applications with a low communication to computation ratio. Conversely peers with a good connection and poor CPU performances are more suited to applications with a high communication to computation ratio. Both characteristics have to be taken into account to ensure a good resource usage. Such problems are known to be generally already hard in a centralized context. However, our application models are much simpler than the ones commonly used in scheduling problems, and is thus probably more tractable.

2.2.3 Resource management

Incentives in peer-to-peer networks generally aims at providing a set of resources to be shared by the considered community. In our context however, incentives are needed to achieve two major goals:

- Optimality: In order to achieve a better usage of the resources, users need to be encouraged to use the shared system preferably at times when the global demand is low.
- Fairness: When resource is scarce in comparison to the demand, some fair share of the resource has to be achieved in between the individuals. Indeed, no contributing user should be left apart and yet, the share given to each individual should take into account their degree of participation in the system.

Towards this end, a major research activity need to be focused on a fine analysis and comparison of different incentive methods.

3 Methodology

3.1 Defining user profiles

A first step in analyzing incentive strategies in P2P systems is to characterize user behavior. Since research on P2P collaborative systems is still in its infancy, no real workloads are available for statistical analysis. However, measurements of related systems can be used for some factors:

- Machine availability: user intrinsic generosity can be estimated from desktop grid measurements. In such systems user contribute computing power without making use of the system. A stochastic model of user generosity can thus be proposed as a baseline for incentiveless systems. However, special care needs to be given to hidden incentives such as generosity records (social acknowledgment). This baseline will later be of interest when studying the impact of incentive strategies on user behavior.
- Connectivity and computing power: corporate or university users are typically heterogeneous in terms of (i) connectivity depending on their physical location (ADSL for home access, and LAN or WAN for on-site and mobile users) and (ii) CPU power depending on the machine age, the user employment position for instance. These factors typically take discrete values: users can thus be *classified* into several connectivity and CPU classes (with possible correlations). These structural characteristics are not specific to P2P computation and existing measurement studies can be used to classify users, possibly with clustering algorithms, and to determine the probability distribution of each class.
- Job submission process: again, no real trace is available to characterize the job submission process and job profiles in a p2p environment. However, a first baseline can be established with the job profiles in existing grids: a stochastic model of job inter-arrivals and size (power+bandwidth) distribution for each application type (bag of task and divisible) will be established based on real workload measurements. However we strongly expect this job profile to be very sensitive to the p2p architecture and the strategies we intend to develop. As a result, this job process characterization will be an ongoing effort to benefit from subsequent advances of p2p computing research.
- Job locality: for tasks with data-sharing patterns, job submission process will exhibit both space and time locality. However, this locality is extremely coupled with the task diffusion algorithm. A correlation study will first be conducted on existing workload for decentralized systems.
- Extrapolation : since this locality is expected to be mainly driven by file transfer costs, the results of this analysis will subsequently be matched to the job profile and connectivity user models for a first validation.

3.2 Applications model

One of our first step is to come up with applications models that are simple enough to enable to derive theoretical results and realistic enough to get relevant and applicable scheduling policies. For example in the divisible load framework, a one-port model is commonly assumed (i.e. the master can communicate with at most one slave at a time). This assumption strongly complicates many aspects of the scheduling problems and is somehow artificial as threads can be used to enable multiple connections at the same time. Some models like the bounded multi-port model of Hong and Prasanna are probably more suited to our framework. Also, divisible load problems are generally difficult due to the explicit computation of optimal pipeline strategies for load distribution. In our context where performances may quickly vary over time, such models and optimizations are unrealistic. A model where pipeline is part of the application model is probably the solution. Anyway, coming up with new application and communication model is one of the key of the success of the design of our algorithms.

3.3 Users perception of Quality-of-Service

Metrics heterogeneity

As mentioned in Section 2.2.1, a first challenge in achieving a good QoS lies into properly defining it. The selected metric is highly dependant upon the type of application used. Yet, the choice of one metric over another is critical in determining appropriate incentive strategies. Hence, what kind of equilibria would each metric infers, and what would be the consequences of having a fraction of users of each type co-existing in a system, will be addressed using performance evaluation and game theory tools.

Fair share

At times when the system's load is high, all users' needs cannot be simultaneously satisfied. Hence, a fair share of the system's resource has to be implemented. This means that a mechanism that favors users that had participated to the project needs to be set up. Yet, it is known that maximizing the (weighted) sum of the users utility leads to great unfairness, as some users would get a null utility. As a result, we will seek at implementing fairness criteria, such as the Generalized Nash Bargaining Solution.

Worst case and average analysis

Service disciplines have also widely been researched both from the scheduling and from the networking community. Fair sharing as well as user individual satisfaction will also be considered with regard to various service disciplines using techniques from the parallel computing community (online scheduling, adversaries) for worst case analysis and statistical models from the network community (queuing network models) for average analysis. These two complementary approaches will enable a deeper understanding of system performance.

3.4 Tasks diffusion and collaboration's incentives

In order to advertise collaboration, users should enjoy benefits from it. This benefit would be measured in priority of accessing resources when availability is scarce. Toward this end, we will consider the introduction of pricing mechanisms. Two types of pricing schemes will be explored.

Local prices

In such scheme, prices are established only between two peers. Each time a peer performs a task for his neighbor, some price is established and exchanged between them. At each epoch, every node in the system has hence memory of all his peers it has debt / credits from. This mechanism is more suited to environments where anonymity is needed (since information is not passed through the whole system) and to enforce protection against malicious users that could enter the system and claim having some money. Also, in this scheme, only local information about the nodes is needed to establish prices.

Universal prices

Another option is the establishment of a fictional currency, that could be under the responsibility of a fictional bank (this bank could itself be distributed over the nodes). Then, the revenues and costs charged for forwarding a task would need to be set up so as to take into account the load of the global system at that instant.

The main challenge in the universal price scheme is the establishment of sensible prices, at each instant, for each resource and for each demanding peer. Indeed, the prices should not only take into account the global load of the system but also the network congestion: as the system's load increases, the bandwidth is a scarce and shared resources and hence the tasks of a peer should be performed in priority on nodes with high networking connection to it.

On the contrary, the main issue in the local price scheme is the determination of task diffusion. Indeed, when neighbors of a given node are in debts but can't fulfill the requested service, they need to forward the jobs to other nodes indebted to them. Yet, as prices are not regulated by a central authority, mechanisms to ensure that tasks would be forwarded in an efficient way into the system will be investigated.

An interesting research direction is to develop systems in which users would not have selfish interests in deceiving other (for instance by advertising false loads). Mechanism ensuring truthfulness have been studied in other contexts in game theory and mechanism design. Without this property, false declarations from users could lead to equilibria with lower global performances.

Finally, our pricing mechanism will seek to prevent oscillatory behavior, where users could gain credits by coming in and out of the system without performing full tasks.

3.5 Decentralized protocol

Our target system is fully decentralized and implements both incentives and resource management algorithms in a transparent way for the final user. While incentive mechanisms are decentralized by nature, self-organized overlay construction needs careful attention. While this construction *is not* a primary research objective, it is mandatory prior to the design of a simple functional P2P computation protocol. Since no search feature is necessary, and since locality seems a desirable property, a limited-scope flooding technique *à la* Gnutella is envisioned. Two problems need to be addressed at this point:

- the relevance of this overlay construction in the collaborative computing context
- the need for overlay structure modeling for job forwarding strategies design and performance analysis

3.6 Performance Evaluation

3.6.1 Mathematical Modeling

When diffusion and incentive mechanisms are finalized, a performance analysis of resource allocation strategies will be conducted using macroscopic models of user behaviour, platforms, and communication links. To this end we intend to use fluid models such as those used in our previous work on BitTorrent resource allocation to obtain closed-form expressions.

3.6.2 Experimental validation

An important research effort will be devoted to experimental validation of the proposed models and algorithms.

Simulation

Simulation will be an important part of the research effort and will be extensively used to validate theoretical results step by step.

Classic trace-driven simulation tools such as SimGrid still exhibit scalability and network model validity issues to be applicable to our framework, since it is designed for long connexions and we consider mixed short and long connexions. Peer-to-peer simulation systems such as PeerSim, SimP2P, P2PSim have interesting features but lack the fundamental computation aspects with all associated QoS problems. Discrete event simulation is also needed for job and user process model validation, as well as for steady-state evaluation of analytical allocation strategies. We will focus on two specific research directions:

- stochastic discrete-event simulation techniques for analytical models with special emphasis on perfect simulation for exact steady-state results.
- trace- and execution driven simulation tool development for a more exensive evaluation.

This simulation research theme will particularly benefit from the convergence of stochastic, discrete-even and trace-/ execution-driven simulation competences.

Emulation

Finally, an important research effort will be targeted at an end-to-end validation with a detailed emulation of the system. Most existing emulation tools do not match the basic features of a P2P collaborative computing system : Xen, User Mode Linux for instance do not take communications into account, while DummyNet or ModelNet do not model computations, and mixed tools (Microgrid) do not target P2P systems (hence serious scalability issues). The emulation task is substantial and will be stretched over the 4 years. An infrastructure will first be built in which a prototype can be implemented. Then algorithms will be progressively included in a client.

4 Expected Schedule

4.1 Tasks

Following the different steps identified in the previous section, we briefly summarize the tasks we will address and detail the participants for each of them.

- Application Models: A. Legrand, O. Richard, L. Nussbaum.
- Platform Models: A. Legrand, F. Perronnin, L. Nussbaum.
- User Behavior: F. Perronnin, C. Touati, R. Czekster, PhD Student.
- Defining Fair Metrics: A. Legrand, C. Touati, F. Perronnin, F. Pascual, PhD Student.
- Survey of existing techniques in pricing, bargaining, epidemic routing, ...: C. Touati, F. Perronnin, F. Pascual, A. Legrand R. Czekster, PhD Student.
- Design of pricing and task diffusion mechanisms: C. Touati, F. Perronnin, A. Legrand, F. Pascual, P. Velho, R. Czekster, PhD Student.
- Analytical evaluation: F. Perronnin, R. Czekster, PhD Student.
- Experimental validation through simulation: A. Legrand, F. Perronnin, P. Velho, L. Nussbaum, R. Czekster, O. Richard, PhD Student, Intern 1, Intern 2.

4.2 Calendar

The expected schedule for the different tasks is the following:

	0-12 months	12-24 months	24-36 months	36-48 months
Application Models	X	X	X	
Platform Models	X	X	X	
User Behavior	X	X	X	
Metrics and Fairness	X	X	X	
Related Work	X	X	X	X
Mechanism Design		X	X	X
Analytical Evaluation		X	X	X
Experimental Evaluation	X(setup)	X	X	X

5 Collaborations

5.1 Local collaborations:

We will receive support from Bruno Gaujal, head of the MESCAL project and who is an expert in stochastic modeling and simulation. We will also receive support from Denis Trystram from the MOAIS projet, who is an expert in scheduling and has started using game theory principles for scheduling in a grid context.

5.2 External collaborations:

We intend to use Derrick Kondo’s (US postdoc in Grand Large, formerly in UCSD) expertise on desktop grids study. We also intend to use Martin Quinson (ALGORILLE) knowledge of distributed applications prototyping. Last, but not least, we will consult with Arnaud Legout for questions related to incentive methods in peer-to-peer networks.

B-3 – Justification scientifique des moyens demandés pour chaque participant de l’équipe impliqué dans le projet

Small equipement

Objet	Quantité	Affectation	coût unitaire	coût total
PC portable	2	R. Czekster (doctorant) PhD Student.	3K	6K
PC	1	Experimental Evaluation	3K	3K

Total: 9 K Euros.

Missions

Given the nature of the research project, a significant part of our budget will go into missions. We do not request the funding of the totality of our expected mission expenses, since our project will be partly supported by the INRIA MESCAL project team. However, given the provisioned workforce (3 heavily involved permanents, 4 PhD students and one postdoc) and given the targeted level of autonomy of the team, we consider that 2 or 3 international conferences per year are a strict minimum for the requested funding. This expense is evaluated to 4 K euros per year.

Total: 16 K Euros.

Human Resources

A. Legrand’s and F. Perronnin’s respective PhD students (P. Velho and R. Czekster) are heavily involved in many essential tasks of the project. C. Touati will dedicate 80and will work jointly with F. Pascual on game theoretic aspects. We are convinced that these fundamental aspects regarding the design of incentive mechanisms lie at the core of our project and require an additional PhD student. This PhD student will be supervised by C. Touati and will work on User Behavior, Metrics, Pricing and Evaluation tasks.

The experimental validation task includes a large amount of software development for simulation framework and prototype implementation. These aspects clearly require at least two 6-months Masters level internships scheduled year 2 and 3.

B-4 – Pièces à joindre

1) Organigramme du laboratoire du responsable du projet

2) Lettre du directeur du laboratoire ou de l’unité de recherche, à laquelle appartient le porteur de projet, précisant la position du projet par rapport à la politique du laboratoire, son originalité et ses chances d’aboutir, ainsi que les moyens éventuels mis à la disposition du responsable du projet

3) Devis pour l'équipement (coût unitaire ≥ 4 000 €) demandé

4) Profil des postes à pourvoir pour les personnels à recruter (1/2 page maximum par type de poste)

PhD student:
Title: Collaborating in future communication networks: the consumer/provider dilemna.

Advisors: Corinne Touati and Bruno Gaujal

Research team: Mescal

Keywords: game theory, peer-to-peer networks, mobile ad-hoc networks, performance evaluation

It is well-known that multiple users with conflicting interests are prone to act selfishly. The resulting equilibrium (known as the Nash Equilibrium) is often inefficient. This is why collaboration should take place in systems shared by a large number of users. In network systems, such as the Internet, this collaboration takes the form of congestion control mechanisms (such as TCP). Their goal is to ensure a good utilization of the network.

In recent systems, the system resources actually belong to the users, which raise new challenges for prompting collaboration between them. Indeed, in cases like peer-to-peer computing systems each user is both consumer and provider. Hence, he / she should not only willingly agree to limit his / her consumption, but also to give away part of his / her individual resources to others. How much ressources should each individual keep for his/her personal use and how much should he / she share with others? To which users should an individual preferably give his resources? These are questions that need to be addressed by developing new algorithms and protocols. Yet, while designing them, the highly dynamic and variable nature of such systems (as users join or leave the system or change the amount or nature of the offered resource) should be kept in mind.

Interns:
Help with the software development required for the experimental validation of our prototypes.

B-5 - Propositions d'experts

Possibilité de fournir une liste de 3 à 5 noms d'experts français ou étrangers (avec coordonnées complètes : adresse postale et adresse électronique) susceptibles d'évaluer le projet avec lesquels les équipes participant au projet n'ont ni conflit d'intérêt, ni collaborations en cours.
La saisie doit être faite sur le site de soumission Jalios à la rubrique Experts

Walfredo Cirne : walfredo@dsc.ufcg.edu.br, UFCG, Brésil.
Bruno Tuffin: btuffin@irisa.fr, IRISA/INRIA Campus de Beaulieu 35042 RENNES Cedex.
Keith Ross: ross@poly.edu. Polytechnic University, New York.

Programme jeunes chercheuses et jeunes chercheurs 2007

C – Fiche de demande d'aide – Laboratoire public / Fondation

Acronyme ou titre court du projet : DOCCA

Porteur du projet (nom, prénom) : Florence Perronnin

Calcul de l'aide demandée à l'ANR et estimation du coût complet du projet pour le laboratoire du responsable :

Avant de remplir ce tableau il vous faut décider quel sera votre établissement gestionnaire.

	Nbre Hommemois	*Coût Homme. mois (salaire chargé et taxé))*	*Nombre de personnes impliquées*	Euros HT	Taux spécifiques à chaque établissement	
Total des dépenses en ÉQUIPEMENT (coût unitaire ≥ 4 000 €) détail § B-3				0	Taux TVA non réc. (4)	P = (P1) * (1 + Taux TVA non réc)
FONCTIONNEMENT						
Dépenses de personnel (1) Chercheur postdoc doctorant	86,4 24 60	3908,51 3410,00 2792,50	4 1 3	337695,26 81840,00 167550,00	2,11	712537,01 172,682,40 353530,50
Dépenses de personnel non permanent à financer par l'ANR (2) doctorant stagiaire etc.	36 12	2792,50 1441,73	1 2	100530,00 17300,76	2,11	212118,30 36504,60
Frais de missions si montant >5% de la somme demandée, justification § B-3						16 000
Petits matériels, consommables, fonctionnement, etc.				9000	15,87	10464,30
Prestations de service externes, sous-contractant (3)				0	Taux TVA non réc. (4)	0
Total des dépenses de fonctionnement						**10464,30**
Frais généraux (assistance, encadrement, coût de structure) (max 4 % du coût total des dépenses)						**5771,80**
Coûts éligibles à l'aide ANR						**275087,2**
Aide demandée ≥ 15 000 € ≤ Z (4)						**150066,86**

Coût complet du projet (5)		**1519608,91**

(1) Il s'agit du personnel qui serait affecté au projet mais qui est présent dans le laboratoire indépendamment de la réussite de l'appel de l'agence. Salaire mensuel chargé (charges salariales et patronales) et taxé.

Pour les enseignants-chercheurs ne compter que la part salariale correspondant à la part recherche (50% du salaire pour 100% de temps consacré à la recherche).
5 grandes catégories (CDD ou CDI) : Ingénieur, chercheur, enseignant chercheur, technicien, autres. Lorsque dans une même catégorie, plusieurs personnes de salaire différent sont mentionnées indiquer la valeur moyenne.

(2) Personnel non statutaire à recruter pour le projet exprimé en hommes mois. Les dépenses éligibles se limitent aux salaires chargés et taxés. 4 catégories : post-doc, ingénieur, technicien, autre.

(3) Propriété intellectuelle, location de matériel, service, etc.
Le total des dépenses de prestations de service pour le projet doit être inférieur ou égal à 50% du montant de l'aide demandée.

(4) L'aide demandée doit correspondre au montant HT augmenté éventuellement de la TVA non récupérable. La TVA non récupérable est actuellement, par exemple, de 88% pour le CNRS. En conséquence pour une demande qui sera gérée par le CNRS, le taux de TVA non récupérable est 0,88 x 0,196 = 0,1725, ce qui conduit à inscrire dans la colonne de droite pour une demande HT de 10 000euros, 10 000 x (1 + 0,1725) soit 11 725 euros soit une demande d'aide de 11 725 euros si le porteur veut disposer de 10 000 euros pour la réalisation de son projet.
En cas d'aide accordée par un autre financeur sur les mêmes dépenses que celles listées dans le tableau, il peut y avoir une diminution de l'aide accordée par l'ANR pour rester conforme à la réglementation.

(5) Pour le calcul en coût complet, il faut augmenter le salaire chargé d'un taux d'environnement, qui tient compte des conditions d'environnement des personnels (infrastructure, par exemple).
<u>EXEMPLE :</u> Le porteur de projet est géré par une délégation régionale du CNRS, le taux d'environnement de cet établissement est de 80% (soit 0.8).
On veut calculer le coût environné d'un ingénieur de recherche 2ème classe (salaire chargé et taxé = 4 626 €) pour 3 mois de travail à 100% sur le projet.
Le calcul se fera ainsi :
4 626 * 3 = 13 878 €.
Coût environné : 13 878 * (1+0.8) = 24 980,4 €

Programme jeunes chercheuses et jeunes chercheurs 2007

D - Récapitulatif global de la demande financière pour le projet

Acronyme ou titre court du projet : DOCCA

a- Estimations du coût complet et de l'aide demandée pour ce projet (en €)

*(reporter les valeurs « **CC** » **et** « **Aide demandée** » de la fiche de demande d'aide)*

	Coût complet	Aide demandée
Total Les totaux obtenus doivent être identiques à ceux calculés par le logiciel de soumission.	**1519608,91**	**150066,86**

b- Détail de l'aide demandée (en €)

*(reporter les valeurs « **Aide demandée** » de la fiche de demande d'aide)*

	ÉQUIPEMENT	FONCTIONNEMENT					TOTAL
		Personnel	Missions	Prestations de service	Autres dépenses	Frais généraux	
Total Les totaux obtenus doivent être identiques à ceux calculés par le logiciel de soumission.		**117830**	**16000**		**10464**	**5771**	**150066**

c- Effort en personnel demandé à financer par l'ANR

(reporter les valeurs de la fiche du porteur)

	en homme. mois	Coût (salaires chargés et taxés) en (€)
Total Les totaux obtenus doivent être identiques à ceux calculés par le logiciel de soumission.	**48**	**248622**

RAPPEL sur les modalités de versement de l'aide (cf. Règlement relatif aux modalités d'attribution des aides de l'Agence Nationale de la Recherche).

- **Organismes publics et fondations de recherche : les versements sont effectués sous forme d'avances (jusqu'à 90% de l'aide), par tranches annuelles de montant égal réparties sur la durée de l'opération, sauf exception motivée par les caractéristiques d'un projet. Lorsque l'opération est menée en collaboration, les tranches correspondant aux diverses avances sont calculées à l'échelle de l'ensemble des financements accordés aux différents bénéficiaires participant au projet. Le règlement du solde (généralement 10% de l'aide) est effectué après expertise favorable du compte rendu scientifique de fin d'opération.**

- **Autres bénéficiaires : L'avance éventuelle est versée dès la notification de l'acte attributif et peut être déduite à tout moment des sommes à payer. Les acomptes sont versés une fois par an au fur**

et à mesure de l'avancement de l'opération, sur présentation de relevés des dépenses réalisées (cf. § 5.2), dans la limite d'un montant annuel fixé par l'échéancier et sous réserve, le cas échéant, de la production par le bénéficiaire des rapports scientifiques intermédiaires prévus. Le règlement du solde est effectué après expertise favorable du compte rendu scientifique de fin d'opération visé au § 6.2, au vu du relevé déclaratif de dépenses (cf. § 5.2) produit et certifié par le bénéficiaire, signé par son représentant légal et visé par le commissaire aux comptes ou, à défaut, l'expert comptable et des documents justificatifs de dépenses prévus à l'article 5.2. Le montant du solde est ajusté pour tenir compte de la dépense réelle, dans la limite du montant de l'aide.

Contrats publics et privés sur les trois dernières années (effectués et en cours)

Nom du membre participant à cette demande	% d'impli-cation	Intitulé de l'appel à projets Source de financement Montant attribué	Titre du projet	Nom du coordinateur	Date début - Date fin
Arnaud Legrand	20	ANR blanc 113400	MEG	Herve AUBERT	2007-2009
Arnaud Legrand	80	ANR "Masse de données: Modélisation, Simulation, Applications" 100500	ALPAGE	Olivier Beaumont	2005-2007
Olivier Richard	20	ANR-Jeunes-Chercheur 100000	DSL LAB	Olivier Richard	2005-2008
Olivier Richard	15	RNTL 288000	IGGI	Jean-Francois Méhaut	2003-2007
Olivier Richard	25	ACI-MD	Grid eXplorer	Franck Cappello	2002-2005

Secteurs disciplinaires

- CSD 1 : Sciences et technologies de l'information et de la communication (STIC),