

# SHAPE Application Form

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<b>Project Title</b>	DemocraSIM : DEMOCRatic Air quaility SIMulation
<b>Company Name</b>	AmpliSIM
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<b>Company Website</b>	<a href="http://www.amplisim.com">http://www.amplisim.com</a>
<b>Company Number</b>	
<b>Number of Employees</b>	2
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## Has the company worked with PRACE before?

Not directly with PRACE, but the company has worked on French Tier0, Tier1 and Tier 2 systems (Airain, Curie and Occigen, see details below).

## What does the company do?

AmpliSIM is an on-demand browser-based Numerical Simulation Service for business companies and public authorities, enabling operational urgent-computing.

Our market is impact assessment for Air Quality and management of industrial hazard. We provide private users or public authorities with the capability to perform seamless numerical simulations needed for air quality impact assessment of industrial plants, including the possibility to run urgent-computing simulation in case of emergency.

AmpliSIM brings:

- **Web portal dedicated to air quality simulation: nothing to install or keep up-to-date**
- **Better usability: advanced visualization tools based on natural web geographical interface to configure simulation or explore results using big-data analytics**
- **Scalability using HPC clusters in the Cloud**
- **Enabling operational urgent-computing**
- **Pay as you go**

AmpliSIM founders are:

Olivier OLDRINI:

- **Graduated from Ecole Polytechnique (96) & ENSTA (01), Master degree from Paris VI University (99)**

- 15+ years of experience in Numerical simulation, HPC & Strategy Consulting
- Environment and energy industry

Sylvie PERDRIEL:

- ENSTA, class of 85
- Brings 20+ years of SMB management, and a SMB success story (ARIA Technologies)
- Air pollution modeling, IHM development, User management

AmpliSIM team took part in:

- RC-View project (2015), labeled Grand Défi by GENCI (on Tier1 Occigen): 3D parallel visualization of very large Air Pollution calculations using ParaView
- EMERGENCIES project (2014), labeled Grand Challenge by CEA (on Tier0 Curie): HPC simulation and visualization for accidental air pollution management over a 40x40km domain of Paris Fire Brigade using PMSS/SWIFT/WRF/Code\_SATURNE
- AIRCITY project (2013), funded by FEDER and labeled Advancity (on Tier2 Airain), dedicated to air quality in cities using PMSS/SWIFT/WRF

Follow-up to EMERGENCIES is right now being setup in collaboration with CEA for mid 2016.

### Project Abstract

DemocraSIM aims to bring numerical simulation as a commodity to users concerned about air quality, filling a gap between HPC simulation production and non-academic community of potential users.

DemocraSIM idea popped to our mind when we saw what people did when Fukushima hazard occurred: crowd-sourced data of radioactivity measurements displayed on a single web map (see <http://safecast.org/tilemap/> for the map and <http://blog.safecast.org/history/> for the history). The question that we ask ourselves was: why can people do their own measurement of radioactivity, and share them, while they can not do this for simulations of the event?

DemocraSIM will provide a web service allowing individual people or organization to:

- Perform relevant air quality simulation for impact assessment or in case of hazard,
- Share them using state of the art visualization tools and data analytics,
- Improve and validate them using expertise from the community.

The technology and the data are out there: web maps, mature models, input data (meteorology, topography, ...). And most of them are even available either open source or free.

The DemocraSIM SHAPE project will allow AmpliSIM to tackle technological locks on the use of urgent-computing, advanced visualization and data-analytics with PRACE HPC experts, before being able to launch an industrial solution on a private HPC-cloud (such as Fortissimo

platform). It will also allow PRACE HPC expert to address these issues on “real cases”, with potential reuse on academic cases of urgent-computing.

### Industrial relevance and potential business impact

The impact of project DemocraSIM on AmpliSIM business is twofold:

- **Viral impact:** the project will give AmpliSIM possibly a very large audience and visibility,
- **Big data valorization** on this large amount of simulation data.

#### **Viral impact:**

AmpliSIM, being a Software as a Service (SaaS) company, targets a worldwide market. We do have a partnership with a commercial based in Singapore covering south east Asia, but we are lacking relays in numerous part of the world (north and south America, China, ...).

Stakeholders are more and more aware of air quality impact: events like Fukushima, or last November the methane leakage in California, have shown a general trend to get better information, and for companies to improve their communication in case of emergency. The success of the crowd-sourced web site Safecast is one illustration.

DemocraSIM has the potential to be something similar to the simulation side of Safecast. And, like Safecast or any crowd-sourced data, it gains more value as more people use it.

#### **Big data valorization:**

Data from AmpliSIM customers remain property of customers. On the contrary, data from free user of DemocraSIM will be shared. Statistical treatments can be performed and bring value to the whole community of users:

- **Automatic relevant physical parameterization** of numerical models in specific context,
- **Estimator of duration of simulations,**
- **Wind rose on specific sites,**
- **Pollution levels,**
- **Model ensemble averages,**
- ...

### Proposed high-level Work Plan

<b>Start date:</b>		1/9/2016		
<b>Task</b>	<b>Title</b>	<b>Description</b>	<b>SME effort (PM)</b>	<b>PRACE effort (PM)</b>
1	AmpliSIM access	PRACE experts will provide support to AmpliSIM team to connect its backend on PRACE computers	1,0	1,0
2	Development of community framework	Development of the web tools needed to allow user to share and publish their results, give advice on options taken, comment and rate simulations, exchange their expertise	3,0	1,0
3	Development of the Big Data statistical tools	The Big Data estimators should learn on simulations inputs and results published on DemocraSIM and produce predictions of: <ul style="list-style-type: none"> <li>• Model use: physical algorithms to chose, simulations duration, ...</li> <li>• Physical data simulated: wind data, concentration levels, emissions, ...</li> </ul>	1,0	2,0
4	Deploying and testing of demonstrator	Proof of concept by deploying and testing DemocraSIM on HPC resource through AmpliSIM web site.	1,0	2,0
5	Final report	Produce report on the outcomes of the work	0.5	0.5
<b>Total</b>			<b>6,5</b>	<b>6,5</b>

### **Technical and business requirements**

#### **Compute Resource**

<b>Existing architecture</b>	Linux MPI clusters
<b>Preferred architecture</b>	Linux MPI clusters
<b>Parallelisation strategy</b>	MPI
<b>Storage (Gbyte)</b>	10To
<b>Third party software</b>	WRF / Code Saturne / Scipuff / Calmet / Calpuff / Python / R
<b>Typical run</b>	6-48 hours on 20 -500 cores.
<b>Core hours</b>	150 000: 50 runs * 24 hours * 100 cores + statistical treatment on the data generated
<b>Memory</b>	8 GB / core
	...
<b>Other50</b>	Any further relevant technical details e.g. I/O estimates

**In the framework of DemocraSIM, the CPU will be used to:**

- **Test the urgent framework and produce simulations to be used by the Big Data statistics engine,**
- **Run the Big Data statistics engine and produce estimators.**

**Non-technical resource**

<b>Confidentiality</b>	NDA requirements
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