

## **Charonite Research and Development Summary Profile**

Charonite is an innovative company with a successful track record of delivering reliable solutions directly to various businesses and Government clients, with expertise in search engine technology, image processing, analytics and intelligent transport systems. Our mission is to provide precise, intelligent and reliable solutions in a consistent manner while relentlessly focusing on meeting customer needs. Our solutions range from intelligent transport systems, including next generation billing platform solutions, sophisticated search engine technology, document analysis, and mobile based applications. Charonite has been operational since 2006 and to date the company's software is in daily use in over 600,000 user accounts in the European Union.

### **TECHNOLOGY SUMMARY INFORMATION**

Our research and development efforts have been concentrated in the creation of the Obulus Platform, which enables us to create applications and perform R&D with less effort by providing an ever improving framework for our development activities. The Obulus Platform is an extensible platform that forms the basis for a number of large-scale solutions in various industries including:

- Intelligent Transportation Systems
- Congestion Charging
- Security and GPS Tracking Systems
- Online Billing and Invoicing
- Large Scale Image Processing
- Office Management Systems
- Call Center and Customer Support Applications
- Price Optimisation

Obulus can support millions of transactions and thousands of simultaneous users, being easily scalable by design. The Obulus platform has been deployed in live operations since 2006 and has handled billions of transactions world-wide while handling millions of Euros in payments. The Obulus Platform is enjoying a rapidly growing market share in Malta, Ireland, the UK and also outside of the EU in the UAE (Abu Dhabi and Dubai), Australia and the USA.

The Obulus Platform forms the basis of a next generation vehicular access control system and congestion charge platform system, including the Controlled Vehicular Access (CVA) system in Valletta.

### **R&D VISION AND RESOURCES**

Our medium to long term R&D strategy aims to build upon our existing knowledge and resources in order to acquire more advanced skills that go beyond what is currently possible. Our team of IT and Engineering graduates is led by key people who have world-class academic and business backgrounds, enabling technically sound R&D to be performed in a commercially advantageous manner. Charonite is geared up for R&D from the ground-up with the vision of becoming Malta's top private research and technology development company utilising the most advanced practices in the ICT fields.

The R&D team is based in Malta, where it enjoys the advantages of a highly skilled and educated workforce at slightly cheaper prices than mainland Europe while having the support of local tax benefit

programmes instituted by Malta Enterprise and the support of the Maltese Government. Our position in Malta also attracts the best talent from the ever growing pool of human resources, which provides us with additional advantages in maintaining focus on our goals. Charonite has also been successful in attracting ERDF funds for R&D projects via Malta Enterprise.

Charonite employs IT, Engineering and Science graduates with a minimum of one undergraduate degree, all the way up to Ph.D.'s in Computer Science.

## KEY RESEARCH PEOPLE PROFILES



**Angelo Dalli**

CEO and Founder

- **Founded Charonite in 2006.**
- **Search Technology and Artificial Intelligence expert since 2000.**
- More than 10 years of experience in IT consultancy and application development. Over 22 publications in the EU and US since 2001.
- Obtained R&D funding in excess of €600K and over €20 million on various EU projects (participated in FP5/FP6/FP7 projects).
- Obtained R&F funding from the UK JRC in conjunction with the UK Ministry of Defence / Defence Science and Technology Lab (DSTL)
- Sits on boards of various entertainment companies and regulated industries.
- Strong on both business and academic skills: has 4 degrees including Ph.D. on Search Engine technology.



**Prof. Yorick Wilks**

Chief Scientific Advisor

- **World-class renowned scientist with over 40 years of experience and extensive network of contacts.**
- **British Computing Society Lovelace Medal (2009).**
- ACL Lifetime Achievement Award (2008).
- Antonio Zampolli Prize (2008).
- Loebner Prize (1997).
- Senior Research Fellow at the University of Oxford.
- Various DARPA / EU projects and 300+ publications.
- Invented one of the first practical Machine Translation systems at Stanford University.
- Member of the UK Computing Research Council and fellow of the UK EPSRC and the ACM

## CHARONITE'S SOFTWARE DESIGN PHILOSOPHY

Our software design philosophy at Charonite is based on six simple attributes that we believe are the hallmarks of quality solutions:

- **Intelligence.** Solve the user's needs with an intelligent, never mediocre, solution. Intelligent design requires more effort and attention to detail, but keeps the end user satisfied.
- **Precision.** Provide precise results that can be relied upon and trusted. Results need to be precise on a large scale to enable business decisions and other major decisions to be based on our software's output.
- **Reliability.** Software has to run non-stop without problems. We take pride in our 24x7 installations that do not require rebooting for months on end without any downtime.
- **Simplicity.** Focus on the user's needs and behavior first – and the interface simple. Users do not want to be forced to learn to work with complicated and confusing screen layouts. A simple interface that presents relevant data quickly and easily requires thought and attention to the user's needs.
- **Performance.** Software has to be fast and responsive, even when dealing with massive amounts of information and complex computing issues. The backend of our systems needs to be capable of handling large amounts of data without failure, in a timely manner. Millions of data items need to be processed without placing any restrictions on users who need to process such data sets.
- **Scaleability.** Interesting applications emerge when there are huge amounts of information and users being processed simultaneously. Software needs to be designed in a way that it can scale up to handle huge installations. When more capacity is needed, it should be a simple matter of adding more hardware resources or additional virtual machines.

## SUMMARY OF RESEARCH AND DEVELOPMENT STRATEGY AT CHARONITE

The following is a summary of the strategic directions research and development activities being carried out at Charonite. Our main areas of expertise are in search engine technology, image processing, analytics and intelligent transport systems.

### Image Processing Algorithms

- Low power image processing algorithms and techniques
- Intelligent Digital Traffic Enforcement (IDITES)
- Aerial image processing techniques including 3D processing using low-cost aerial platforms

### GPU Based Computation

- Innovative GPU and CUDA based computation techniques
- Massively parallel computation speedups
- Integrating parallel processing methods within more traditional programming paradigms
- Creation of new algorithms that take advantage of CUDA and GPU architectures
- Creation of new algorithms that reduce power needs for computing hardware

### **Position-Based and Situational Awareness Algorithms**

- Situational awareness for vehicles (both road and track based)
- Situational awareness for UAVs
- Situational awareness for officers
- Unmanned Aerial Vehicle (UAV) algorithm research

### **Intelligent Transportation Systems**

- Variable rate congestion charge systems and advanced traffic billing rule engines
- GNSS Tracking (GPS, Glonass, etc.) and Dead Reckoning applications
- CO2 Reduction Measures
- Contextual processing and AI-based interpretation of real time traffic imagery

### **Search Engine Algorithms**

- Enhanced ranking algorithms
- Innovative content processing techniques
- Processing of geospatial and temporal contexts of information
- Social network search algorithms
- Semantic analysis of large scale datasets

### **Software as a Service / Cloud Computing**

- Smart SaaS research on creating online applications that continue working in offline mode
- Distributed transaction queues with online/offline processing
- Integrating mobile devices in cloud computing
- Long delay store and transfer networks
- Intelligent ad-hoc networks

### **Distributed Transaction Processing Algorithms**

- Distributed processing of large datasets (in the Terabyte range)
- Distributed storage and retrieval of large datasets
- Resilient computing

## Data Visualisation

- Web-based visualisation of large datasets
- Innovative visualisation from semantic analysis of textual data
- Integration of Natural Language Processing algorithms with Computer Vision Processing techniques



**Intelligence. Precision. Reliability.**

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