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AEOLUS

Algorithmic Principles for Building Efficient Overlay Computers

Deliverable D6.2.8

New Components for the Overlay Computing Platform

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Deliverable D2.2.8 consists of all software components produced up to now which correspond to functionalities described in Deliverable D6.1.2 (Overlay Computing Platform: Design report). Most partners that participate in WP6.2 have implemented or are currently implementing functionalities selected from those described in Deliverable D6.1.2 and support environments. In the following, we present a very brief summary of the available implementations.

Functionalities related to SP2: The AEOFORGE demo application uses new functionalities for storing, updating, maintaining, and replicating data. Functionalities for storing and replicating data have also been implemented by UOI and have also been integrated into the AEOLUS testbed. Both implementations are available as JXTA services. Naming and indexing functionalities are based on the reuse of JXTA services. Distributed catalogues and group services have been considered by the Arigatoni software of CNRS. This year, Arrigatoni has been implemented in a framework called Arriwheels. Times and mobility of the peers and the mapping between the logical network and the transport network have been studied. A simulation has been done using Torino's downtown map and city mobile agents (mobile buses, cars and pedestrians), all equipped with WiFi devices. The simulation has shown up that the model scales up to a large number of peers and various services. UDRTV continues its work on improving the distributed hash table implementation of JXTA. They are implementing a different rendezvous service based on a real DHT in order to improve performance of discovery, publication, and query for advertisements. The new rendezvous service (called JXTACH) is based on Chord DHT and substitutes the one used by JXTA which can be thought of as a lightweight DHT. Also, MPII has developed prototype software for the P2R2 method for near-optimal dynamic replication in global overlays. This functionality is described in more detail in Deliverable D6.2.9. Furthermore, publish/subscribe functionalities have been implemented by UOI and are used in the wireless extension of the AEOLUS testbed.

Functionalities related to SP3: A long list of functionalities have been implemented as part of the AEOLUS testbed by UPB. These include functionalities for communication, routing, session management, and node allocation. Functionalities for process/thread migration have been implemented as part of the Web Computing library (UPB). Functionalities for performance monitoring and microbenchmarking (UNIPD) have been extracted by the Microbenchmarking software package (Deliverable D6.2.2) and have now been integrated into the OCP as a submodule called JCACHE. Different functionalities for scheduling and load balancing are used at different levels of the OCP. A new DHHT load balancer is used as part of the Web Computing library (UPB). It features simplicity, fairness, and consistency and thereby guarantees low communication costs among peers, a fair schedule among tasks themselves as well as among processes of each task, and a minimal number of migrations to rebalance the load on changes in the available computation power of participating nodes. CAU's scheduling functionalities (called Mimic) have been

integrated into the OCP. The two completely different theoretical approaches of Mimic and PUB-Web's DHHT scheduler can soon be compared using practical applications. UOP has upgraded scheduling functionalities for OCP applications in order to handle dynamic scenaria where servers/task come and go while they now handle task migration.

Functionalities related to SP4: A functionality for Secure Timestamping has been developed by UNISA as a JXTA service and has been integrated into the testbed. The implementation has been written in a way to easily modify the timestamping protocol in case it is required. The functionality is currently being integrated in the AEFORGE application. Furthermore, in the last year UNISA continued its work in improving the performance of the implementation of Certified Information Access. UNISA has also started the implementation of a prototype for secure function evaluation that allows the possibility to define a JXTA service for each given function to be securely evaluated. A cross-integration of this functionality with the schedulers of UOP is in progress. The development of a Trust-X prototype supporting the X-RNL language in Java and JXTA is in progress by UOI/Insubria. The implementation consists of a JXTA membership service and of the infrastructure needed to actually verify the disclosure policy required by the peer and the group. The initial Trust-X prototype has been re-engineered to be easily extended with further functionalities, like negotiation crash-recovery and support for long-running negotiations. K.U.Leuven continues the implementation of SibylGuard. SybilGuard is a theoretically well studied Sybil protection protocol based on a social network. K.U.Leuven aims on an implementation that shows its practical usability. Furthermore it shall provide a platform to investigate the influence of the network structure on the reliability of SybilGuard. Furthermore, CYB completed the implementation of the prototype for protocol security verification to be used as a utility for programming in global/overlay computers (Deliverable D6.2.7).

Functionalities related to SP5: During the third year, significant effort has been made to integrate the high level functionalities of the wireless extensions to the AEOLUS testbed. CTI has integrated the webdust platform's JXTA services to operate within the AEOLUS testbed. Additionally, CTI and UOI have cooperated to integrate the PrefSiena content distribution system that is based on the publish/subscribe model with the AEOLUS wireless extensions. In terms of low level services, CTI has implemented a long list of functionalities. These include functionalities for delay tolerant communication, routing, localization, and over the air programming. In terms of application development based on the offered services of the AEOLUS OCP, the application of the second year has been extended and an additional application has been developed. Regarding the application for monitoring and controlling buildings, UDRLS has implemented additional functionalities so that it can be used for cultural heritage preservation; the AEOLUS platform has been installed to operate in a historical site of ruins of the Roman era. CTI has implemented additional functionalities to allow control of electric appliances within the

monitored buildings; wireless sensors and actors have been installed in the local server room to control the HVAC system in order to save energy. Finally, CTI has implemented a new application that is based on the AEOLUS platform for playing mobile, locative and collaborative distributed games. The key characteristic of the games developed is that players interact with each other and their surrounding environment by moving, running and gesturing as a mean to perform game related actions, using the AEOLUS wireless extensions.

Detailed information about a selection of the functionalities mentioned above is available at `http://aeolus.ceid.upatras.gr/files/AEOLUS-DEMO-CD.rar` together with related material for all deliverables of SP6. This information includes a short description together with slides, the code together with instructions for installing/running each functionality, and video demos or screenshots. The particular functionalities are JCACHE (UNIPD), JXTACH (UDRTV), schedulers for OCP applications (UOP), secure function evaluation (UNISA), secure timestamping (UNISA), Sybilguard (K.U.Leuven), and pervasive gaming (CTI).