Operating Systems II 2017/1 Projects

Void Detour for TSTP's Geographic Routing

- **Summary**: implement TSTP recovery routing mode; TSTP uses greedy, reactive geographic routing by default, but there are cases in which irregular topologies or node failures cause geographic voids, preventing that scheme from working properly; therefore, the design of TSTP also makes room for an exception routing mode (a bit in the header); solutions are described in A and B;

Multi-party Diffie-Hellman Key Exchange

- **Group**: Nícolas Pfeifer, Evandro Sasse, and André Alex Araújo Santos Camargo Pereira
- **Summary**: implement the multi-party Diffie-Hellman key exchange and a network cycle estimator to be used by the IoT Gateway while deciding when a group key exchange can take place; while device-gateway exchanges are mandatory and must take place at device activation time, group key exchanges are initiated (demanded) by the gateway only if it knows it won't overload the network.

Multicarrier Wi-Fi Access Point for Vehicles

- **Group**: Luis Gustavo Lorgus Decker, Cesar Smaniotto Junior, and Gilney Nathanael Mathias
- **Summary**: implement a multicarrier Wi-Fi access point for vehicles using a Linux-based IoT Gateway; Linux supports bonding multiple network interfaces behind a virtual interface that is subsequently used by higher-level protocols (e.g. IP); this feature can be used to accommodate multiple 4G connections under a unique virtual interface, thus promoting link stability if multiple carriers are used.

TSTP IoT Fog Interest Message Admission Control

- **Group**: Nathan Junior Molinari, Alisson Granemann Abreu, and Willian Santos de Souza
- **Summary**: design and implement a mechanism to estimate the burden imposed on an TSTP IoT Fog by taking a new **Interest** message; the SmartData construct used with TSTP to declare interest on data coming from a given region of space for a given interval of time can define a Time-Triggered mode of operation, for which the number of **Response** messages produced by IoT devices can be determined; therefore, ignoring transient failures that might cause retransmissions, an IoT Fog operating in that mode can have worst-case guarantees determined beforehand to judge the impact of admitting new Interest messages or new IoT devices into the network.

Predictors for Trickling in WSN

- **Group**: Douglas Marcelino Beppler Martins, Lucas May Petry and Maike de Paula Santos
- **Summary**: evaluate and implement SmartData predictors to be used jointly by IoT devices and gateways to do trickle (talk less, yet don't lose information); if devices can run the same predictor ran on gateways to deduce the next data point on a series, then they can avoid transmitting that data point whenever the prediction made by the gateway is correct; different physical phenomena require different predictors; a linear regression with gradient descent predictor and another one using Elman Neural Networks will be implemented.

Embedded Artificial Neural Networks

- **Group**: Giovanni Antonio Tomaso Ferreira Rotta, Wagner Fernando Gascho, and Guilherme Reinaldo Corrêa
- **Summary**: evaluate and implement or port **Artificial Neural Network** libraries to be used in deeply embedded systems (i.e., few resources, including processing power, memory, and energy; low-jitter or even deterministic).

AI for Embedded ANN Selection and Configuration

- **Group**: Leonardo Vailatti Eichstaedt, Arthur Machado Branco, and Juan Alejandro Terenzi Cuttle
- **Summary**: evaluate AI techniques to exploit large time-series of IoT data in order to select the best embedded Artificial Neural Network implementations from a set of existing ones along with their optimized configurations; implement one of the considered strategies and demonstrate the system's ability to select an adequate ANN to be used as an embedded trickle predictor.

Voice Recognition Offloading for the IoT

- **Group**: Ile Caian Gums
- **Summary**: implement a voice recognition engine to run on TSTP IoT Gateways and also a multimedia transfer protocol for TSTP; IoT nodes often don't have the resources needed to perform complex operations that are becoming common sense, such as voice recognition; offloading such tasks to the gateway is a convenient alternative; IoT devices can easily feature a microphone and capture commands, which are sent to the gateway for recognition; a standard TSTP command is the result of such processing; to save energy, TSTP usually operates on a very small duty cycle, leaving the channel free for most of the time; ordinary TSTP packets can be used to negotiate the use of the spare time on the channel to transmit multimedia.

Vehicle Seat Booking App for Android

- **Group**: Rodrigo Pedro Marques, Ricardo Ademar Bezerra de Almeida, and Gabriel Rosa Goulart
- **Summary**: develop an android app to reserve seats on shared vehicles in the realm of Smart UFSC; users must be authenticated using Id UFSC and seats can be booked in a row for some users (e.g. every Mondays and Wednesdays until August at 7:30 departing from UFSC); transactions must be validated using a TSTP timestamp obtained from a gateway on the unicity principle.

Android Vehicle Tracker - A

- **Group**: Renan Luiz Arceno and André Henrique Gomes
- **Summary**: develop an android app to track vehicles in the realm of Smart UFSC using an EPOSMoteIII with the GPS+GPRS shield embedded in the vehicle as the data source; data is transmitted to UFSC's IoT gateway for storage and subsequent processing (out of scope for this project); a small daemon must be developed to run on the IoT gateway to filter tracking data coming from vehicles and generating the tracking events needed by the app and by the web tracker, which currently uses Tiki's *openlayers* and *trackers*.

Android Vehicle Tracker

- **Group**: Anna Victoria Cabrera Rondon Oikawa, Pedro Henrique Lenzi Soares, and João Guilherme Fritsche Colombo
- **Summary**: develop an android app to track vehicles in the realm of Smart UFSC using an EPOSMoteIII with the GPS+GPRS shield embedded in the vehicle as the data source; data is transmitted to UFSC's IoT gateway for storage and subsequent processing (out of scope for this project); a small daemon must be developed to run on the IoT gateway to filter tracking data coming from vehicles and generating the tracking events needed by the app and by the web tracker, which currently uses Tiki's *openlayers* and *trackers*.

Project Template

Title

Authors

Motivation

Objectively describe the **target problem** and why it is important to solve it. Use references to the literature.

Goals

Objectively describe the **envisioned solution** and any evidence you have that this is a solution for the proposed problem. Use references to the literature.

Methodology

Objectively describe the **strategy that you will use to tackle** the problem and reach the envisioned solution.

Tasks

List and detail the tasks that must be executed in order to reach the aimed solution to the target problem using the specified strategy. Each task must have a **deliverable**, i.e., something that can be used to assess its successful execution.

Deliverables

Briefly recap the deliverables resulting from the execution of each task to make sure you know what has to be done until what date.

Schedule

Summarize tasks and deliverables on a weekly time table.

Task	W1	W2	W3	W4	W5	W6	W7	W8
Task1	x	x	D1					
Task2			x	x	D2			
Task3					x	x	D3	
Task4							x	D4

Bibliography

1. List all pieces of literature used in the project here and reference it in the text above. Also include software, tools, web pages and any resource used in the project.