EWSN 2016 Dependability Competition

Logistics Information

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Institut für Technische Informatik

10.02.2016

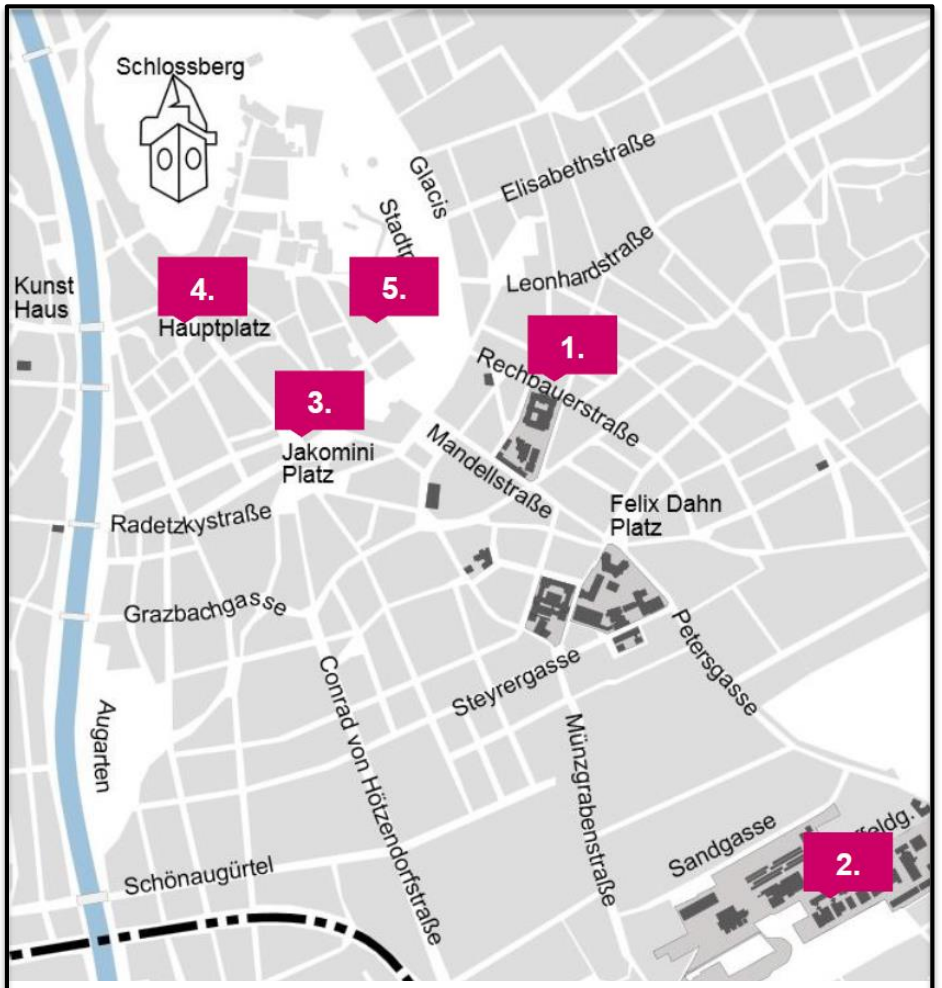
Venue

- Competition and main conference are in different locations!
  - Inffeldgasse 16 (competition preparation & evaluation)

2.

  - Rechbauerstraße 12 (main conference & competition awards)

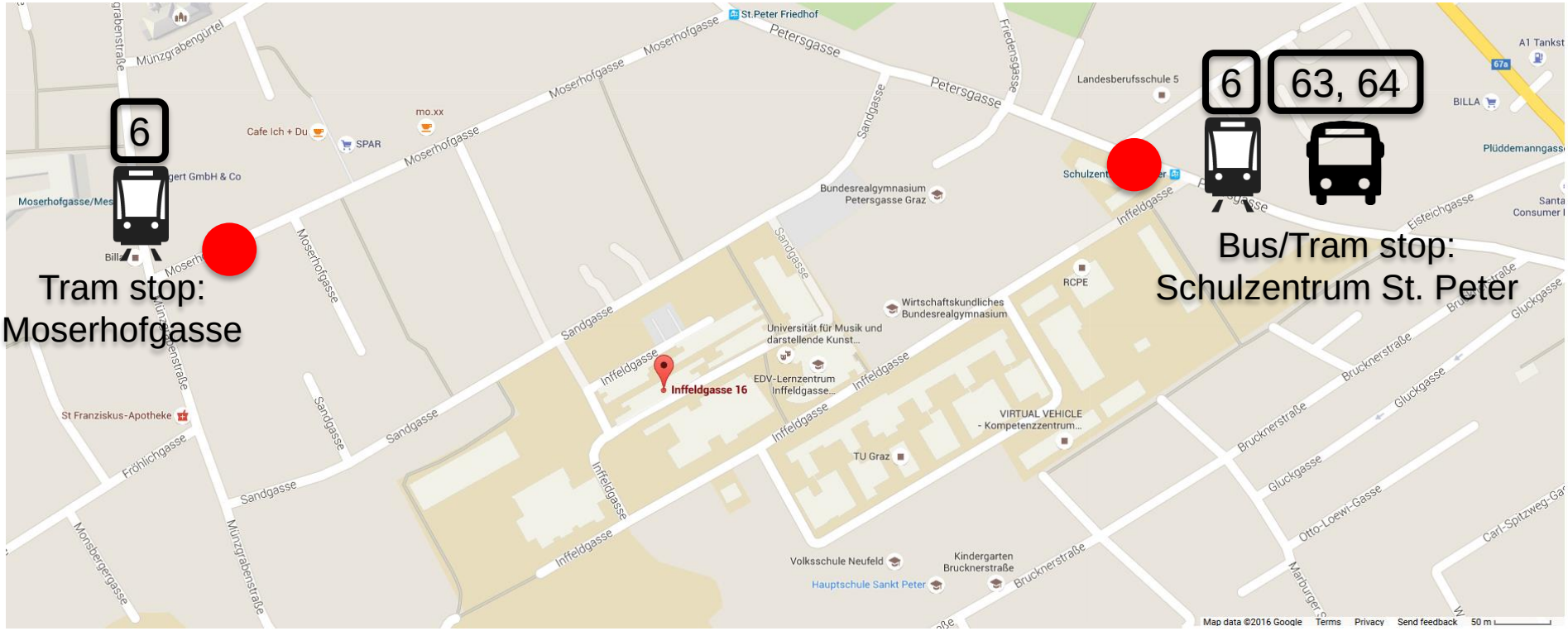
1.



1. Rechbauerstraße 12
2. Inffeldgasse 16
3. Jakominiplatz (central transfer point)
4. Town all and main square (Hauptplatz)
5. Grazer Burg (reception)

Venue

- Inffeldgasse 16 (about 3 km south of the main square)
  - Reachable by tram or bus
  - Public transportation: http://www.verbundlinie.at/lang/en/bbb.php



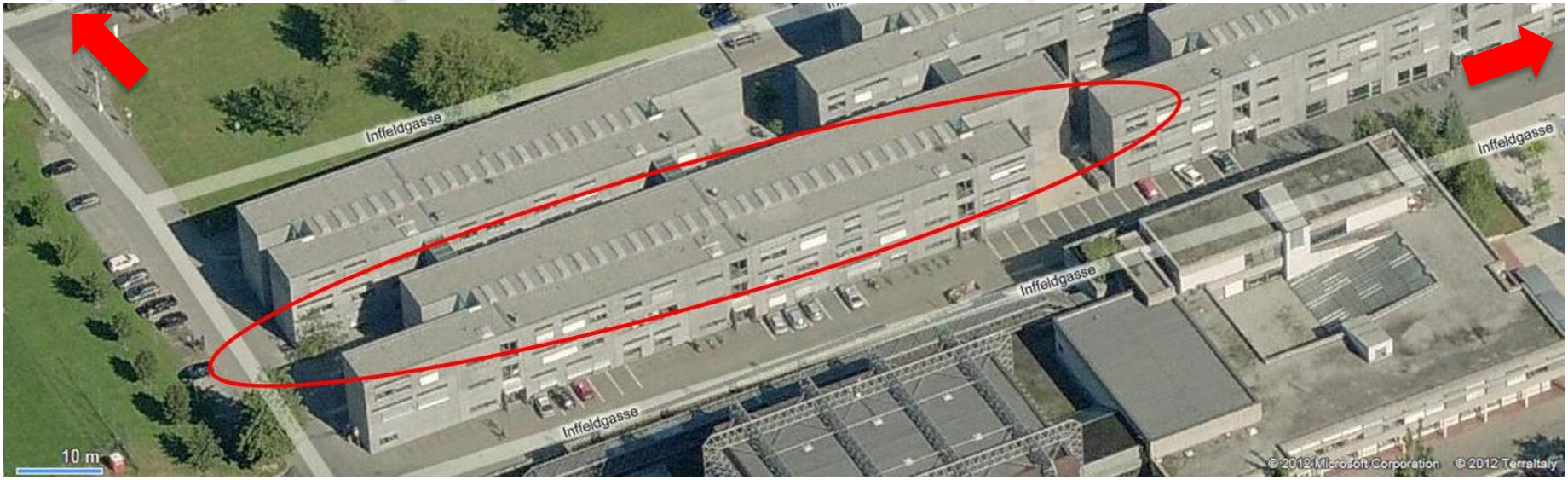
https://www.google.com/maps/place/Inffeldgasse+16,+8010+Graz,+Austria/@47.0583461,15.4559869,17z/data=!3m1!4b1!4m2!3m1!1s0x476e4a91e62c5cd9:0x3cd7381fadd641b9

Venue

- Inffeldgasse 16 (about 3 km south of the main square)
  - 1st floor, in the laboratories of the Institute for Technical Informatics (Institut für Technische Informatik)

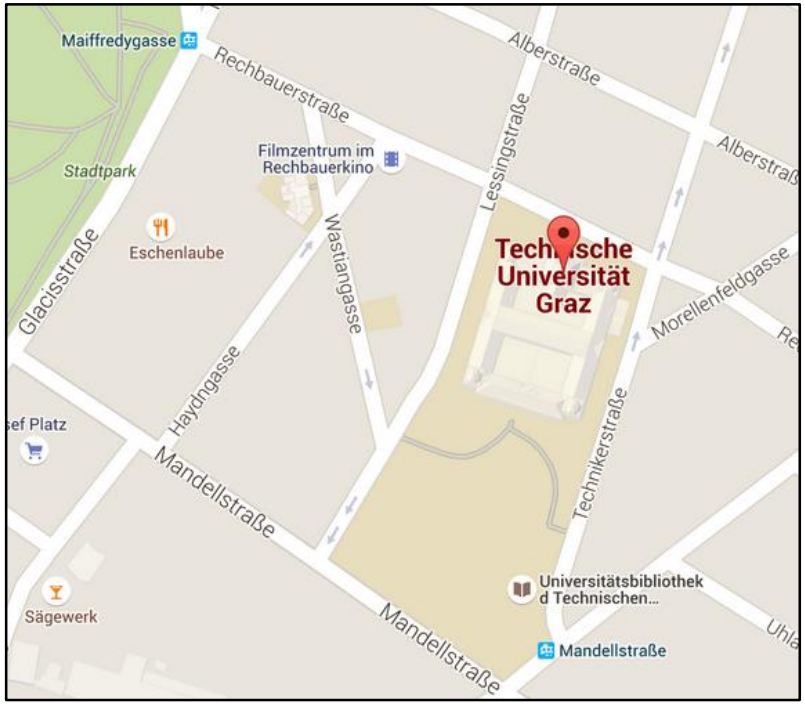
Entrance from Sandgasse
(Tram stop: Moserhofgasse)

Direction Petersgasse
(Bus stop: Schulzentrum St. Peter)



Venue

- Rechbauerstraße 12 (main conference venue)
  - Easily reachable by foot from the city center, as well as by tram (number 1, 7, 13) and by bus



Schedule

- No changes to the schedule as originally announced
  - Saturday, 13.02.2016
    → 14:00 – 19:30: Early preparation day (all)
  - Sunday, 14.02.2016
    → 8:30 – 19:30: Preparation day (all)
  - Monday, 15.02.2016
    → 8:30 – 18:30: Evaluations (pre-defined timeslots)
  - Tuesday, 16.02.2016
    → 8:30 – 10:30: Awards and presentation of winners during the main conference track

Schedule in Detail

Saturday, 13.02.2016	
Afternoon program (14:00 - 19:30)	**Dependability Competition, early preparation (Location: Inffeldgasse 16/1, 8010 Graz)**
13:30	Registration
14:00	Welcome: rules overview and evaluation procedure Chair: Carlo Alberto Boano
14:30	Preparation and testing Coffee, drinks, and cold sandwiches are provided to all contestants.
19:30	End of early preparation (Dinner is not provided)

Sunday, 14.02.2016	
All day program (8:30 - 19:30)	**Dependability Competition, preparation (Location: Inffeldgasse 16/1, 8010 Graz)**
8:00	Registration
8:30	Welcome: rules overview and evaluation procedure Chair: Carlo Alberto Boano
9:00	Preparation and testing Coffee, drinks, and cold sandwiches are provided to all contestants.
19:30	End of preparation (Dinner is not provided)

Schedule in Detail

Monday, 15.02.2016	
Morning program (8:30 - 14:00)	**Dependability Competition, evaluations (Location: Inffeldgasse 16/1, 8010 Graz)**
8:30	Team #1: Channel Exploration/Exploitation Based on a Thompson Sampling Approach in a Radio Cognitive Environment Arash Maskooki (Inria, France), Viktor Toldov (Inria and Université Lille, France), Laurent Clavier (Université Lille and Institut Mines-Télécom, Télécom Lille, France), Valeria Loscri (Inria, France), and Nathalie Mitton (Inria, France)
9:25	Team #3: Towards Low-Latency, Low-Power Wireless Networking under Interference Beshr Al Nahas (Chalmers University of Technology, Sweden) and Olaf Landsiedel (Chalmers University of Technology, Sweden)
10:20	Team #4: RedFixHop Jirka Klaue, Angel Corona, Martin Kubisch (Airbus Group Innovations, Germany), Javier Garcia-Jimenez (Kinexon, Germany), and Antonio Escobar (Infineon, Germany)
11:15	Team #5: An Adaptive Protocol Stack for High-Dependability based on the Population Protocols Paradigm Dimitrios Amaxilatis (University of Patras and CTI, Greece) and Ioannis Chatzigiannakis (Sapienza University of Rome, Italy, and CTI, Greece)
12:10	Team #6: Is Concurrent Transmission Flooding a Good Idea for Random Traffic? Makoto Suzuki (The University of Tokyo, Japan), Chun-Hao Liao (The University of Tokyo, Japan), Yuki Katsumata (The University of Tokyo, Japan), Kyoichi Jinno (The University of Tokyo, Japan), Hiroyuki Morikawa (The University of Tokyo, Japan)
13:05	Team #7: Sparkle: Energy Efficient, Reliable, Ultra-low Latency Communication in Wireless Control Networks Dingwen Yuan (Technische Universität Darmstadt, Germany) and Matthias Hollick (Technische Universität Darmstadt, Germany)

Schedule in Detail

Monday, 15.02.2016	
Afternoon program (14:00 - 18:30)	**Dependability Competition, evaluations (Location: Inffeldgasse 16/1, 8010 Graz)**
14:00	Team #8: Reliability through Time-Slotted Channel Hopping and Flooding-based Routing Pedro Henrique Gomes (University of Southern California, USA), Thomas Watteyne (Inria, France), Pradipta Gosh (University of Southern California, USA), and Bhaskar Krishnamachari (University of Southern California, USA)
14:55	Team #9: Stateless Routing based Cross Layer Approach for Interference-Resilient, Low-Delay Networking Guillermo Sierra Aiello (Universitat Politecnica de Catalunya, Spain), Ilker Demirkol (Universitat Politecnica de Catalunya, Spain), Anna Calveras (Universitat Politecnica de Catalunya, Spain), Carles Gomez (Universitat Politecnica de Catalunya, Spain), Eduard Garcia (Universitat Politecnica de Catalunya, Spain), and August Betzler (i2CAT Foundation, Spain)
15:50	Team #10: ContikiMAC with Differentiating Clear Channel Assessment Alex King (Lancaster University, United Kingdom), James Hadley (Lancaster University, United Kingdom), Utz Roedig (Lancaster University, United Kingdom)
16:45	Team #11: Dependable Network Flooding using Glossy with Channel-Hopping Philipp Sommer (ABB Corporate Research, Switzerland), Yvonne-Anne Pignolet (ABB Corporate Research, Switzerland)
17:40	Team #12: Multimodal Reactive-Routing Protocol to Tolerate Failure Tiong Hoo Lim (Institut Teknologi Brunei, Brunei), Iain Bate (University of York, United Kingdom), Jon Timmis (University of York, United Kingdom)
18:30	End of evaluations
19:00	Evening program (Reception in Graz Town Hall)

Schedule in Detail

Tuesday, 16.02.2016	
Morning program (8:30 - 19:30)	**Dependability Competition, awards and presentation of winners (Location: Rechbauerstrasse 12, 8010 Graz)**
	Registration
8:30	Welcome Chair: Kay Römer Opening Words by the Rector of TU Graz Opening Words by the General Chair Opening Words by the Program Chairs
8:45	Keynote Chenyang Lu, "Dependable Wireless Control through Cyber-Physical Co-Design"
9:45	Dependability competition: awards and presentations of winners Chair: Carlo Alberto Boano
10:30	Coffee break
11:00	Conference main track: session 1 (see main conference program)
…	…

Registration

- All registered participants to the EWSN competition have also access to the complete conference program
- What is included?
  - Workshops, main conference track, posters & demos
  - Welcome reception, conference dinner, and lunch on Monday, Tuesday, and Wednesday
  - During the competition preparation days, cold sandwiches and drinks will be served to all participants (however, please notice that dinner will not be provided on Saturday and Sunday)
- All members of a competing team that want to actively participate to the competition (i.e., attend any of the three days in person), must be registered for EWSN in advance!

Evaluation Area

- 1st floor of Inffeldgasse 16
  - Office building (TU Graz, Institute of Technical Informatics)
  - Two large laboratories and open space (corridors)
  - Covers an area of approximately 150 m^2
  - A lot of concrete and metal around

Hardware

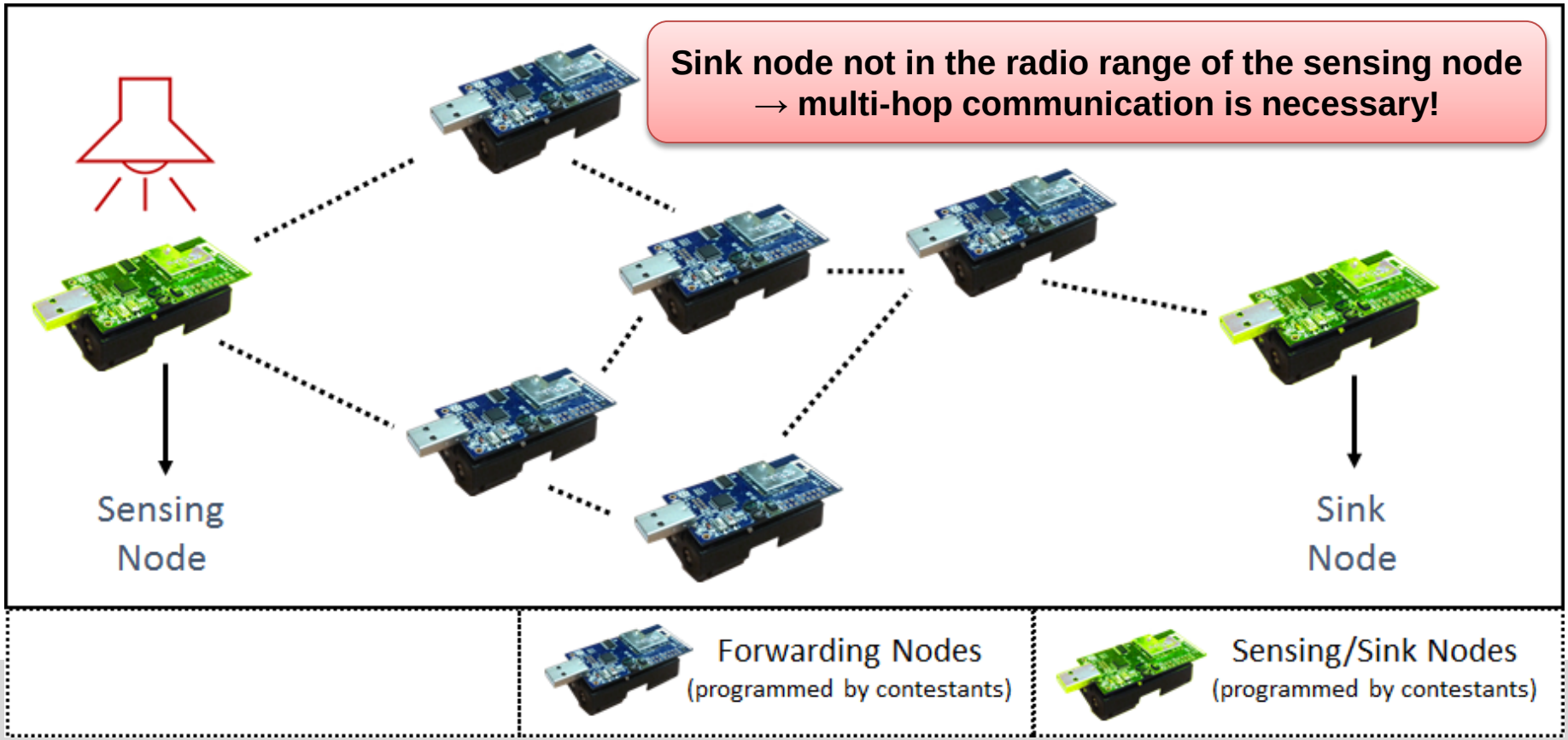
- Maxfor and Advanticsys replicas of TelosB / Tmote Sky wireless sensor nodes
  - Some with SMA antenna
  - Some with PCB antenna
  - Nodes can be attached on ceilings, walls, or can lie on tables
  - All powered via USB and connected to a testbed infrastructure

SMA antenna of motes have no specific orientation

- How many nodes?
  - Up to 15 nodes of the testbed used in the evaluation scenario
  - Their identity / position is not going to be disclosed beforehand
- You cannot use your own nodes
  - You are not allowed to attach your equipment to the testbed!

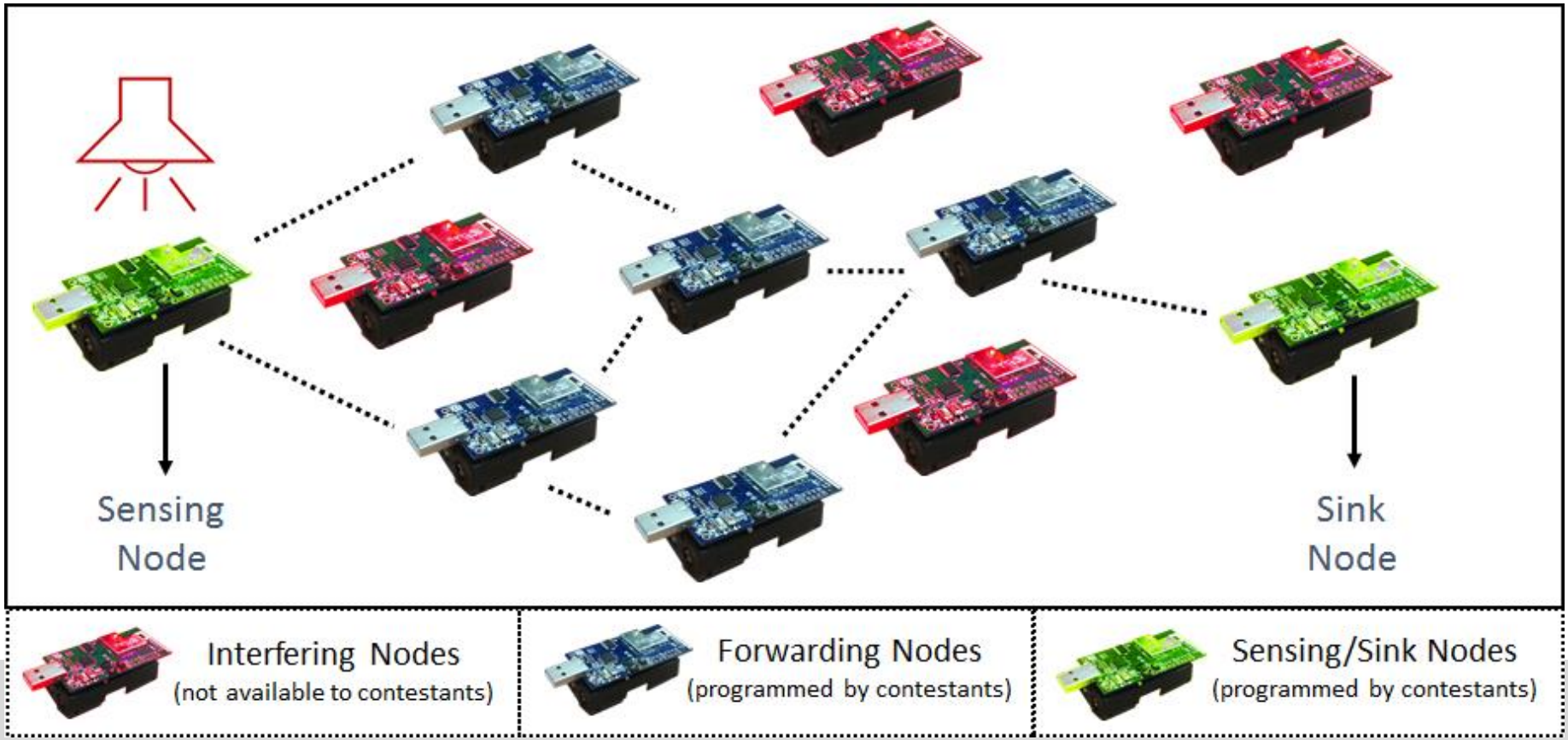
Evaluation Scenario

- Sensing node in proximity of a light source (blinking LED)
  - Continuously monitoring its brightness using light sensors
  - Changes in LED status (on/off) need to be forwarded to a sink



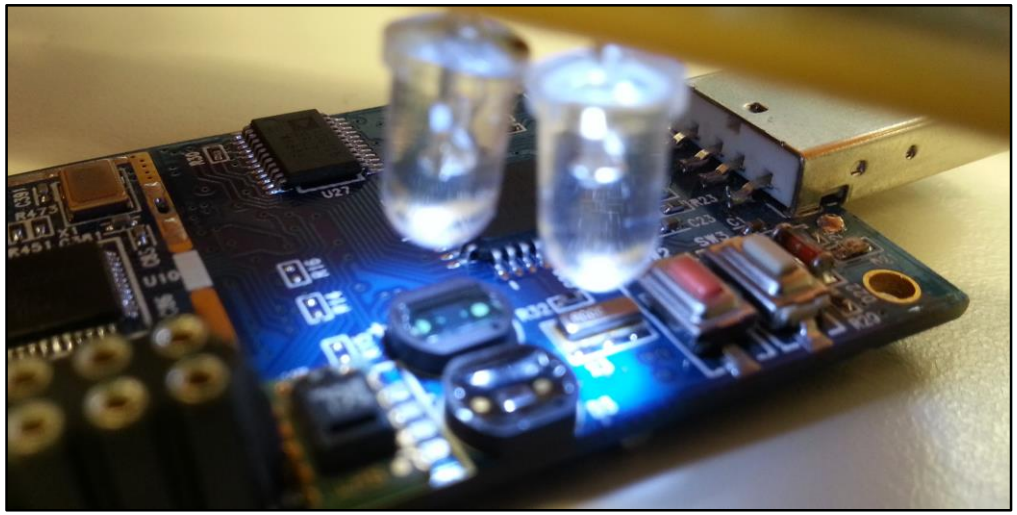
Evaluation Scenario

- RF interference will be generated in the evaluation area
  - Sensor nodes will run JamLab to ensure repeatability across experiments (for more information, refer to this document).



Light Source & Sensing Node

- The light source will be a blinking LED controlled by a TelosB node connected to the testbed infrastructure
  - LED will be turned on and off according to a secret schedule
  - Initial state of the LED: off
  - You will have the chance to select the right threshold for the on/off status detection during the preparation days



Light Source & Sensing Node

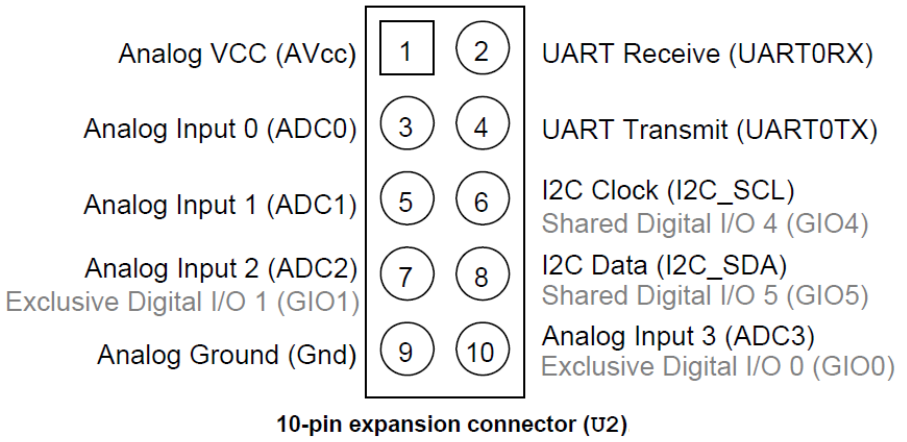
- How often will the LED status changes be scheduled?
  - At least 2 seconds in between each change in LED status
- Can the changes in the lighting condition occur at time 0?
  - No, there will be a slack time of at least 15 seconds to allow for topology discovery (if any)
- How many sensing nodes?
  - Only one sensing node will capture the LED status
  - Its identity (node ID) is known beforehand (see next slides)
  - All other nodes can be used as forwarders to the sink

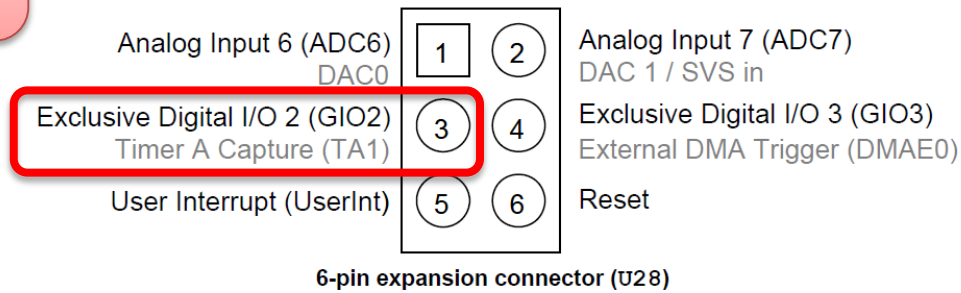
Sampling strategy selected and implemented by each contestant!

Sink Node

- A sink node will receive the information about the LED status (on/off) and trigger one of its I/O pins accordingly
  - We suggest to use the GIO2 pin
  - Light on: GPIO pin high
  - Light off: GPIO pin low

We will measure the latency from the instant in which the LED status has changed to the one in which your GPIO pin has changed!





Node ID and Roles

- Two options to read the node ID
  - On-board 1 MB external flash
    - → The ID is an unsigned short (16 bits) number
    - → Example program in Contiki on how to read it from flash is available here
  - 48-bit unique ID chip (DS2411)
- Identity of sensing and sink nodes known beforehand
  - Sink node: 219 (13:b7:76:fb)
  - Sensing node: 116 (13:b7:6e:1f)
  - Exact IDs will be confirmed during the competition days

Node ID and Roles

- Position / identity of the forwarding nodes not revealed beforehand
  - Nodes may be shuffled between preparation and evaluation days
  - The amount of nodes available may vary during the preparation days and the evaluation day (at most 15)
  - Nodes may be replaced (e.g., a node with SMA antenna can be replaced the following day with a node with PCB antenna)

Firmware Upload

- All sensor nodes are USB powered and connected to a central testbed infrastructure for efficient reprogramming
  - Contestants will be asked to provide a single binary file to be uploaded to all nodes in the network using a common MSP430 Bootstrap Loader
  - The final code to be used for the evaluation should be sent by e-mail to cboano@tugraz.at by Sunday 14.02.2016, 23:59 CET
- FTDI / serial output
  - Contestants can ask for the serial output of the nodes during the preparation phase for debugging purposes
  - During the evaluation, the FTDI interface of the nodes will be disabled to minimize the energy consumption

Energy Measurements

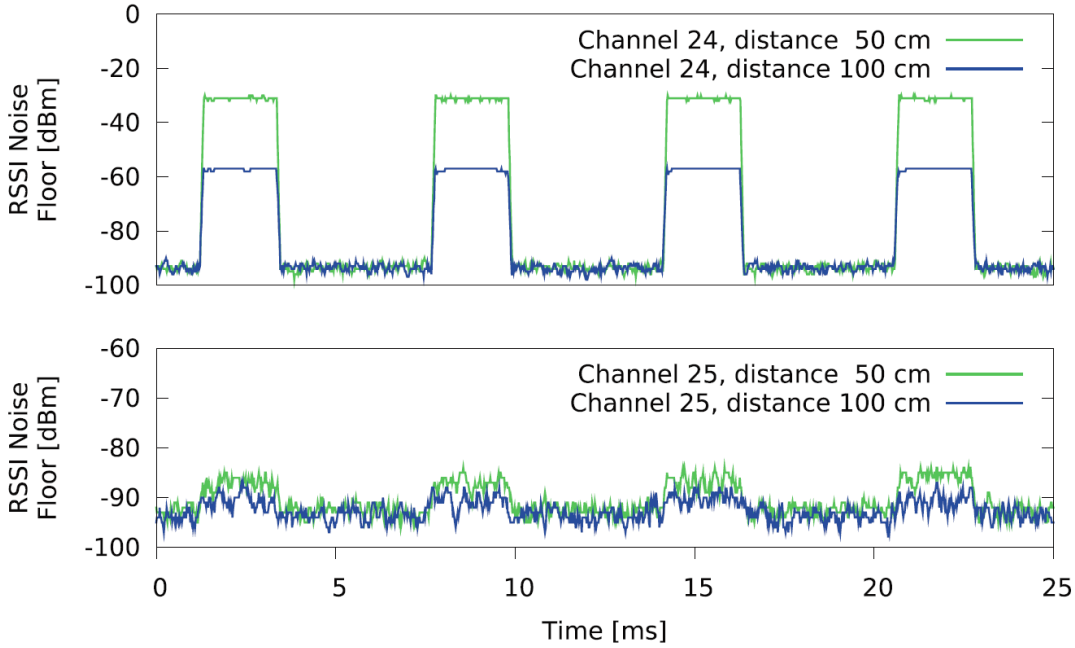
- Custom boards measuring current and voltage of wireless sensor nodes
  - Based on a Raspberry Pi2
  - Energy measurements is synchronized with the reset pin (so, at time zero the measurements starts)
    - → Node and topology discovery (if any) will account for the total power consumption of the sensor nodes.

Interference Generation

- Radio interference generated using JamLab
  - http://soda.swedish-ict.se/4110/1/boano11JamLab.pdf
  - Interference patterns reproducing common appliances (e.g., Wi-Fi devices and microwave ovens)
  - Contestants cannot assume that some IEEE 802.15.4 channels are constantly interference-free
  - JamLab records and emulates interference patterns from real-world devices, but does not back-off and stop interfering in case one of the sensor nodes is transmitting strong messages nearby (as, for example, Wi-Fi access points do [ref])
  - An example of a Contiki application running JamLab emulating a Wi-Fi video streaming can be found here

Interference Generation

- Radio interference generated using JamLab
  - Each jammer will be tuned to a specific 802.15.4 channel, but a limited disturbance may also affect neighboring frequencies
  - Example: jammer active on channel 24
    may also slightly affect channel 25



C.A. Boano and K. Römer. External Radio Interference. In Radio Link Quality Estimation in Low-Power Wireless Networks, Chapter 2, SpringerBriefs in Electrical and Computer Engineering - Cooperating Objects. ISBN 978-3-319-00773-1, Springer. July 2013. http://link.springer.com/chapter/10.1007/978-3-319-00774-8_2

Interference Generation

- Radio interference generated using JamLab
  - Interference is never persistent
    - → We are not going to produce a constant carrier for the whole duration of the tests.
    - → The interference will be turned on and off randomly (resembling the on-off patterns of common devices)
    - → There may be some "silent" periods and the signal power of interference may vary over time
  - JamLab will be active since the beginning of the experiment, i.e., also during node and topology discovery (if any)
    - → Interference varies over time: the one recorded at the beginning of an experiment is not necessarily representative of the one that is generated at a later stage

Interference Generation

- To ensure repeatable experiments, the surrounding Wi-Fi access points will be disabled
  - Wi-Fi will still work, but it will only use the 5 GHz band
  - Operations on the 2.4 GHz band will be disabled from 8:00 to 20:00 on Monday, 15.02.2016
  - During the preparation days, Wi-Fi will still be active in order to allow all contestants to surf the Internet
  - We will monitor the interference levels during the evaluation to make sure there is no suspicious activity

- Any contestant caught generating deliberate radio interference during the evaluation will be immediately disqualified!

Evaluation Metric

- Solutions will be evaluated according to three criteria:
  - Reliability of transmissions
    - → Number of changes in the LED status that were missed (i.e., that were not correctly reported to the sink)
    - → If a status change has not been reported to the sink before the next one occurs it is considered to be lost
  - End-to-end latency
    - → Time necessary to communicate a change in the LED status to the sink node
    - → Measured with microseconds precision using GPS timestamps
  - Energy-efficiency
    - → Overall power consumed by the nodes in the network (measured in hardware)

Evaluation Metric

- For each criterion, a separate ranking of the solutions will be derived
  - Points will be assigned to the contestants based on their rank, i.e., (11 points to the team ranked first, 10 points to the team ranked second, etc.)
  - The final classification will be derived by summing the points obtained in each ranking
  - The team with the highest score wins (i.e., the team with the best rankings across all three metrics)
- The organizers will consider the relative differences in each metric
  - In case of a tie, these will decide which solution is best
  - If there are no significant differences, the most energy-efficient solution will be preferred

Awards

- Top three teams will be awarded
  - First place: 750€
  - Second place: 500€
  - Third place: 250€

- Announcement of the results
  - During the main conference track
  - Tuesday, 16.02.2016 at 9:45
  - The top 3 teams from each category will be given the opportunity to present the details of their work
  - Be ready to give a 10 min talk about your system if you end up in one of the top 3 places!

Agenda

- Saturday: early preparation
  - Contestants can test the right threshold for the light sensor
  - Contestants can test their solution on the testbed infrastructure and make sure communication to the sink node is possible without interference
  - Contestants can get a first hint about the latency and energy-efficiency of their solution (without radio interference)
- Sunday: official preparation
  - Teams have a budget of test runs on the testbed infrastructure with interference (5-minutes each)
  - Teams receive the results (three evaluation metrics) as well as serial output from each node
  - No pre-determined schedule (testbed allocated on-demand, giving priority to teams that already had the least test runs)

Agenda

- Sunday: official preparation
  - Results and current “classification” will be available to other contestants during the preparation
- Monday: evaluation
  - 55 minutes timeslot for each team (see official schedule)
    - → 10 minutes preparation and testbed reprogramming
    - → 35 minutes evaluation run (quick check everything is running smoothly after first 5 minutes)
    - → 10 minutes to gather results
  - Teams should come to the evaluation venue at least 15 minutes earlier and return to the main venue (where the workshops take place) after their timeslot
  - Cold sandwiches will be available for groups being evaluated around lunchtime

Looking Forward to See You in Graz!