
Monday 14 September · Session 2 · 16:00
STINT 2026
Poster Lightning Madness
Nine posters · one minute each · your poster is on the screen behind you
15 minutes, hard stop at 16:15
Irish College, Leuven
Session 2 · Protocols & Integration · Chair: Alberto Montilla

How it works

Fifteen minutes at the end of Session 2, then the welcome activity.

Each presenter gets **one minute** at the front. The poster is on the screen behind you: no slides, no laptop swap.

The pitch order follows the wall on the next slide (same order as the website).

Posters go up on **Tuesday morning** and stay on display all day. The PDFs are already online.

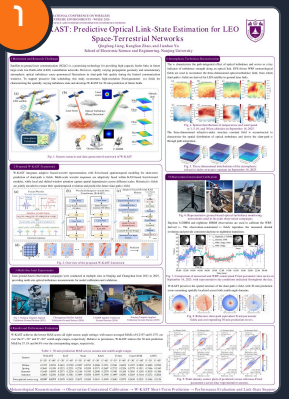
9 POSTERS	60 SECONDS EACH
TUE ON DISPLAY	PDF ON THE WEBSITE

Bring your poster on Tuesday morning!
Boards go up at the registration desk · on display **all day Tuesday**

Nine posters, in pitch order

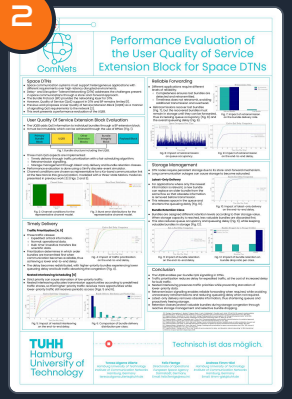
Same order as the Posters section of stintworkshops.org.

1



W-KAST
Jiang · Zhao · Yu

2



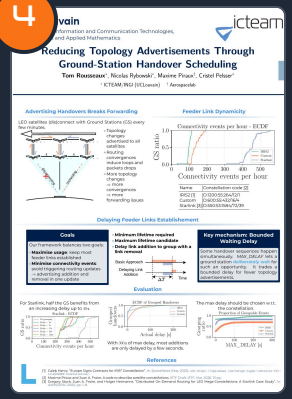
UQEB for space DTNs
Algarra Uliarte et al.

3



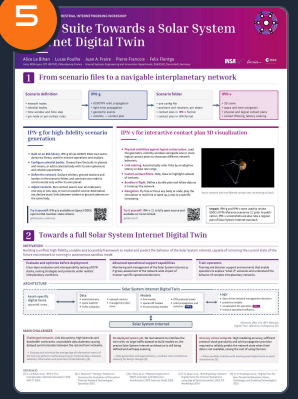
DTN inter-networking
Tchilinguirian et al.

4



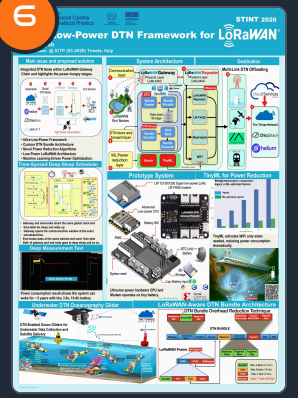
GS handover scheduling
Rousseaux et al.

5



SSI digital twin
Le Bihan et al.

6



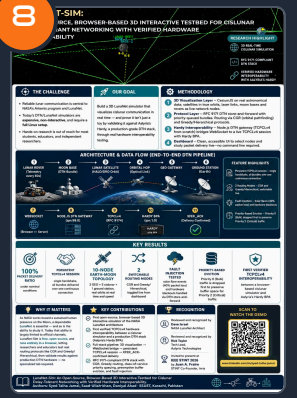
Low-power LoRaWAN
Altayeb

7



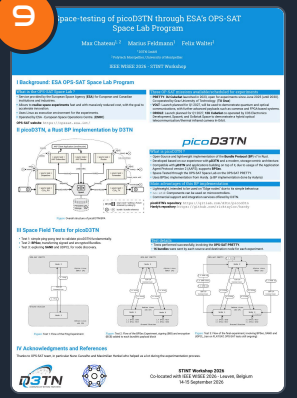
Space-terrestrial IoT
Coeugnet et al.

8

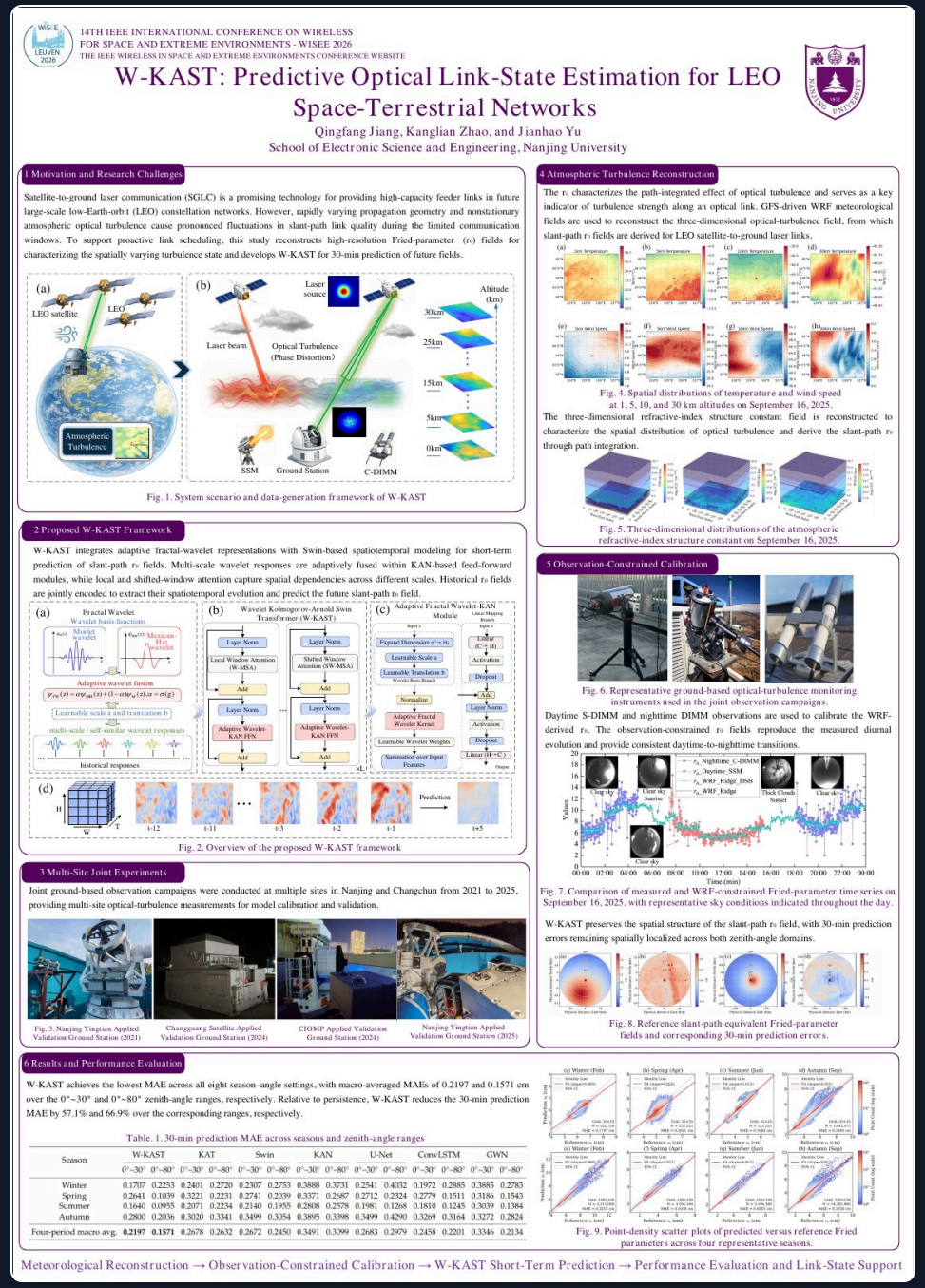


LunaNet-Sim
Jamal et al.

9



picoD3TN in space
Chateau et al.



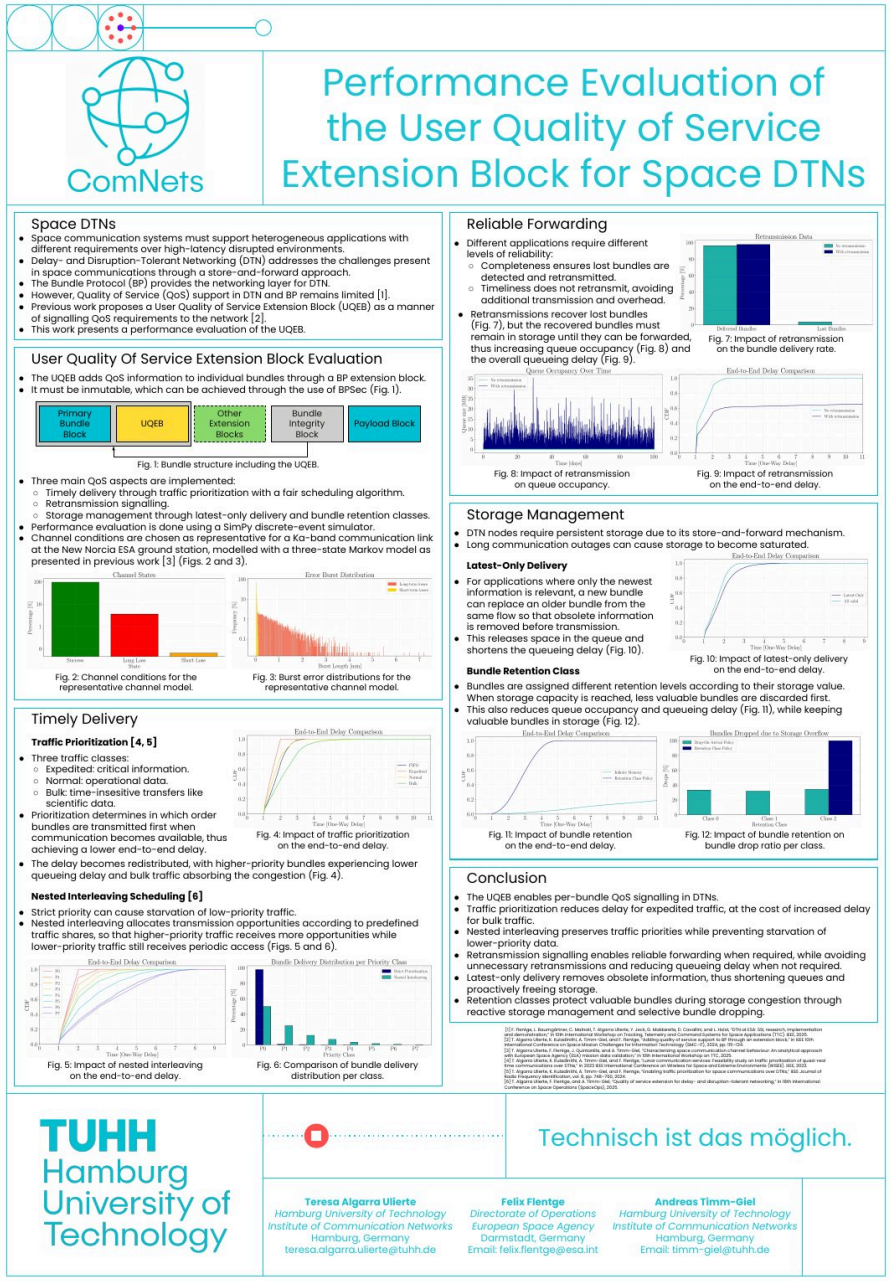
POSTER 1 of 9 #44

W-KAST: Predictive Optical Link-State Estimation for LEO Space-Terrestrial Networks

Qingfang Jiang, **Kanglian Zhao**, Jianhao Yu

School of Electronic Science and Engineering, Nanjing University

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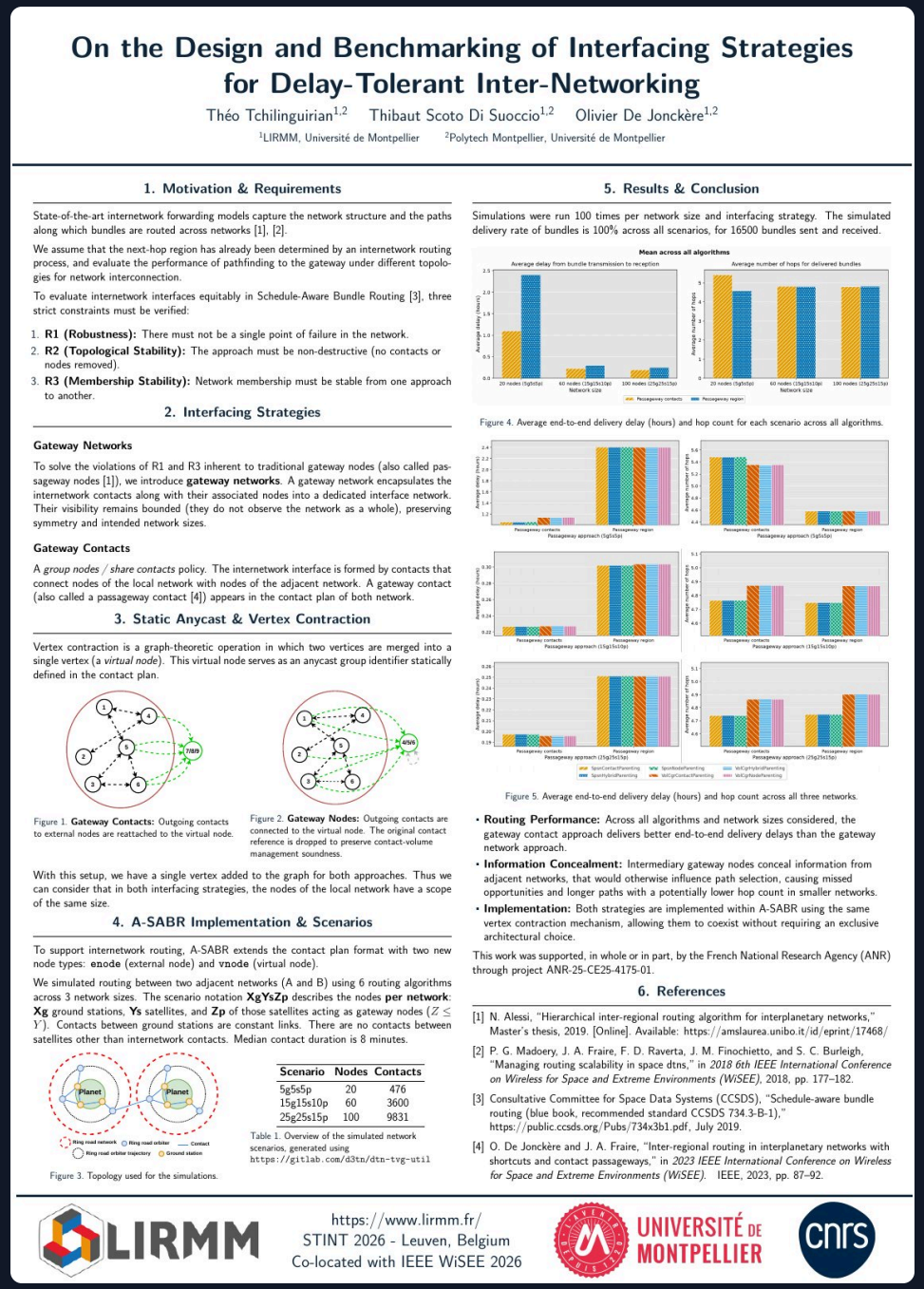
POSTER 2 of 9 #64

Performance Evaluation of the User Quality of Service Extension Block for Space DTNs

Teresa de Jesús Algarra Uliarte, Felix Flentge, Andreas Timm-Giel

Hamburg University of Technology · ESA/ESOC

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On the Design and Benchmarking of Interfacing Strategies for Delay-Tolerant Inter-Networking

Théo Tchilinguirian[1,2] Thibaut Scoto Di Suoccio[1,2] Olivier De Jonckère[1,2]

[1]LIRMM, Université de Montpellier [2]Polytech Montpellier, Université de Montpellier

1. Motivation & Requirements

State-of-the-art internetwork forwarding models capture the network structure and the paths along which bundles are routed across networks [1], [2].

We assume that the next-hop region has already been determined by an internetwork routing process, and evaluate the performance of pathfinding to the gateway under different topologies for network interconnection.

To evaluate internetwork interfaces equitably in Schedule-Aware Bundle Routing [3], three strict constraints must be verified:

1. **R1 (Robustness):** There must not be a single point of failure in the network.
2. **R2 (Topological Stability):** The approach must be non-destructive (no contacts or nodes removed).
3. **R3 (Membership Stability):** Network membership must be stable from one approach to another.

2. Interfacing Strategies

Gateway Networks

To solve the violations of R1 and R3 inherent to traditional gateway nodes (also called passageway nodes [1]), we introduce **gateway networks**. A gateway network encapsulates the internetwork contacts along with their associated nodes into a dedicated interface network. Their visibility remains bounded (they do not observe the network as a whole), preserving symmetry and intended network sizes.

Gateway Contacts

A *group nodes / share contacts* policy. The internetwork interface is formed by contacts that connect nodes of the local network with nodes of the adjacent network. A gateway contact (also called a passageway contact [4]) appears in the contact plan of both network.

3. Static Anycast & Vertex Contraction

Vertex contraction is a graph-theoretic operation in which two vertices are merged into a single vertex (a *virtual node*). This virtual node serves as an anycast group identifier statically defined in the contact plan.

Figure 1. **Gateway Contacts:** Outgoing contacts to external nodes are reattached to the virtual node.

Figure 2. **Gateway Nodes:** Outgoing contacts are connected to the virtual node. The original contact reference is dropped to preserve contact-volume management soundness.

With this setup, we have a single vertex added to the graph for both approaches. Thus we can consider that in both interfacing strategies, the nodes of the local network have a scope of the same size.

4. A-SABR Implementation & Scenarios

To support internetwork routing, A-SABR extends the contact plan format with two new node types: `enode` (external node) and `vnode` (virtual node).

We simulated routing between two adjacent networks (A and B) using 6 routing algorithms across 3 network sizes. The scenario notation **XgYsZp** describes the nodes **per network**: **Xg** ground stations, **Ys** satellites, and **Zp** of those satellites acting as gateway nodes ($Z \leq Y$). Contacts between ground stations are constant links. There are no contacts between satellites other than internetwork contacts. Median contact duration is 8 minutes.

Figure 3. Topology used for the simulations.

Scenario	Nodes	Contacts
5g5s5p	20	476
15g15s10p	60	3600
25g25s15p	100	9831

Table 1. Overview of the simulated network scenarios, generated using `https://gitlab.com/d3tn/dtn-tvg-util`

5. Results & Conclusion

Simulations were run 100 times per network size and interfacing strategy. The simulated delivery rate of bundles is 100% across all scenarios, for 16500 bundles sent and received.

Figure 4. Average end-to-end delivery delay (hours) and hop count for each scenario across all algorithms.

Figure 5. Average end-to-end delivery delay (hours) and hop count across all three networks.

- **Routing Performance:** Across all algorithms and network sizes considered, the gateway contact approach delivers better end-to-end delivery delays than the gateway network approach.
- **Information Concealment:** Intermediary gateway nodes conceal information from adjacent networks, that would otherwise influence path selection, causing missed opportunities and longer paths with a potentially lower hop count in smaller networks.
- **Implementation:** Both strategies are implemented within A-SABR using the same vertex contraction mechanism, allowing them to coexist without requiring an exclusive architectural choice.

This work was supported, in whole or in part, by the French National Research Agency (ANR) through project ANR-25-CE25-4175-01.

6. References

[1] N. Alessi, "Hierarchical inter-regional routing algorithm for interplanetary networks," Master's thesis, 2019. [Online]. Available: https://amslaurea.unibo.it/id/eprint/17468/

[2] P. G. Madoery, J. A. Fraire, F. D. Raverta, J. M. Finochietto, and S. C. Burleigh, "Managing routing scalability in space dtns," in *2018 6th IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE)*, 2018, pp. 177–182.

[3] Consultative Committee for Space Data Systems (CCSDS), "Schedule-aware bundle routing (blue book, recommended standard CCSDS 734.3-B-1)," https://public.ccsds.org/Pubs/734x3b1.pdf, July 2019.

[4] O. De Jonckère and J. A. Fraire, "Inter-regional routing in interplanetary networks with shortcuts and contact passageways," in *2023 IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE)*. IEEE, 2023, pp. 87–92.

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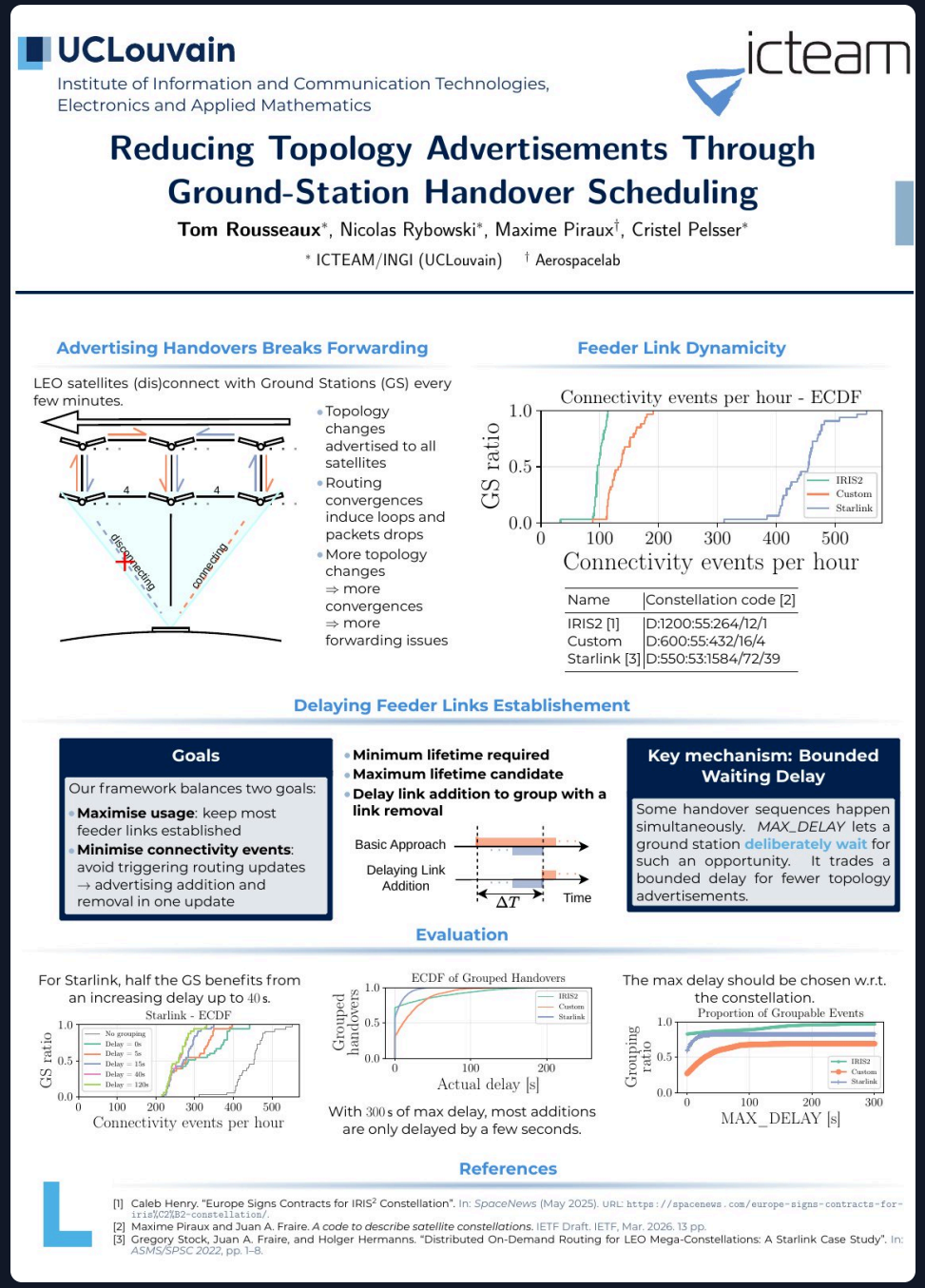
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On the Design and Benchmarking of Interfacing Strategies for Delay-Tolerant Inter-Networking

Théo Tchilinguirian, Thibaut Scoto Di Suoccio, Olivier De Jonckère

LIRMM, Université de Montpellier · Polytech Montpellier

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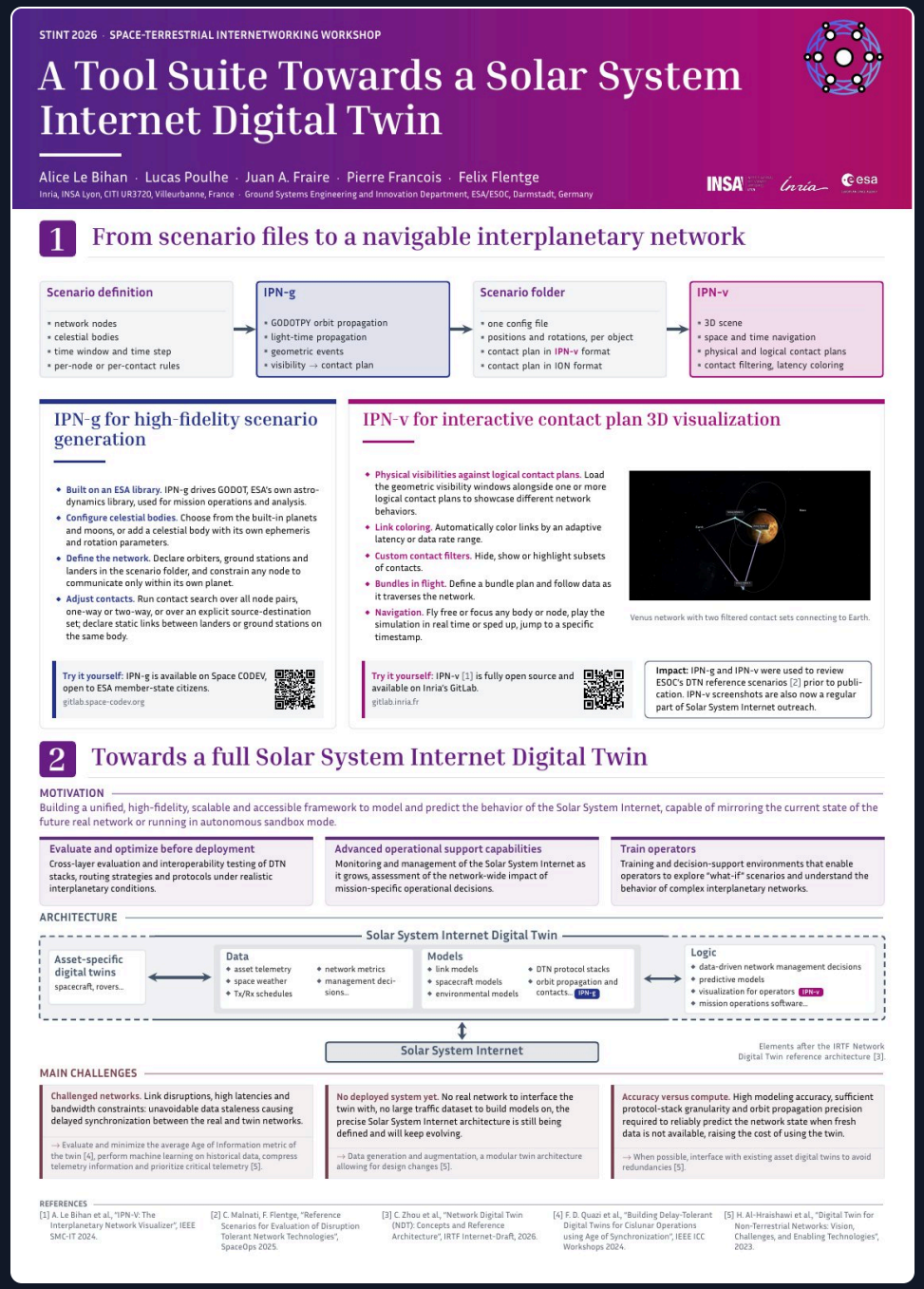
POSTER 4 of 9 #72

Reducing Topology Advertisements Through Ground-Station Handover Scheduling

Tom Rousseaux, Nicolas Rybowski, Maxime Piraux, Cristel Pelsser

UCLouvain, ICTEAM

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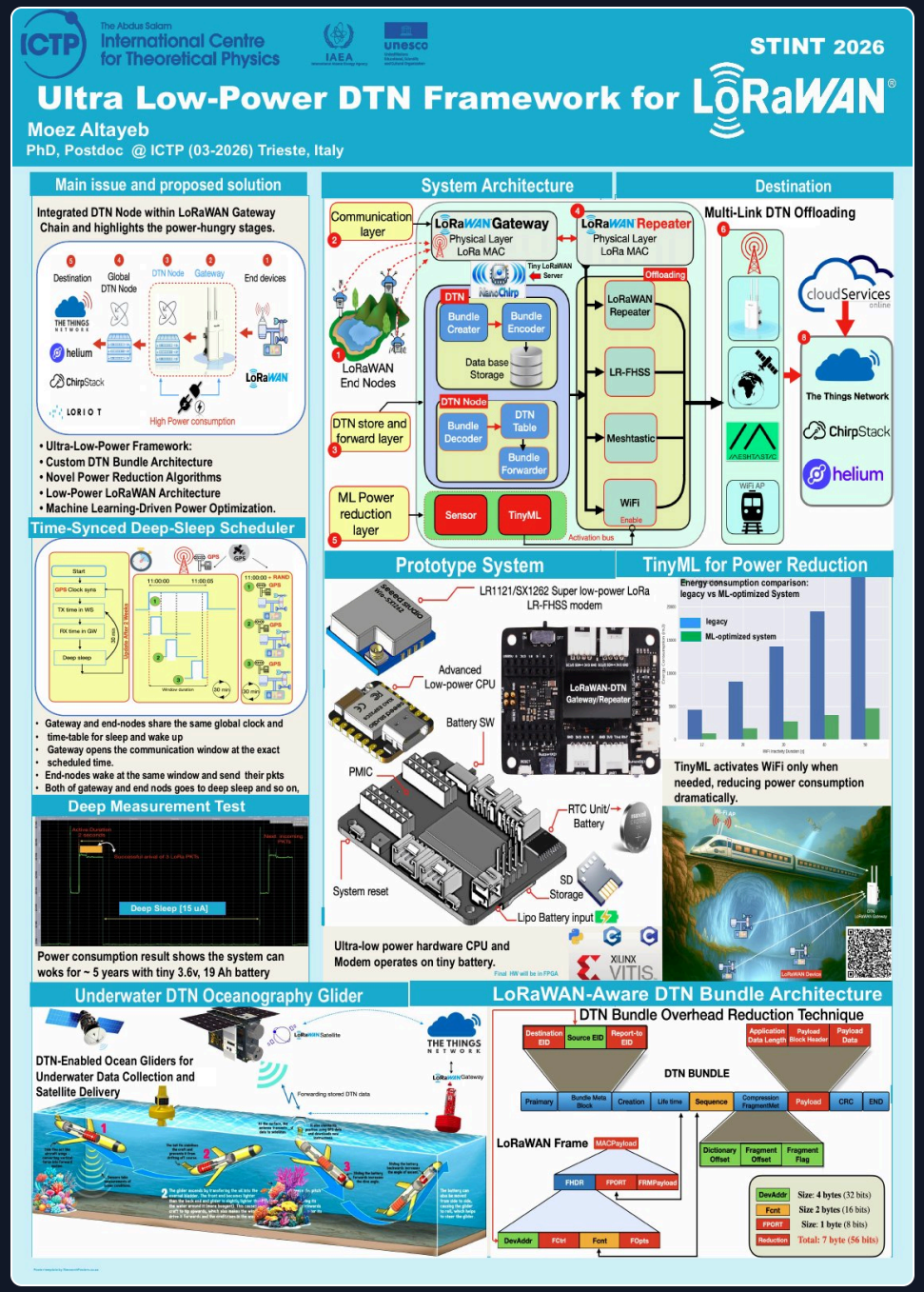
POSTER 5 of 9

A Tool Suite Towards a Solar System Internet Digital Twin

Alice Le Bihan, Lucas Poulhe, Juan A. Fraire, Pierre Francois, Felix Flentge

Inria/INSA Lyon · ESA/ESOC

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POSTER 6 of 9

Ultra Low-Power DTN Framework for LoRaWAN

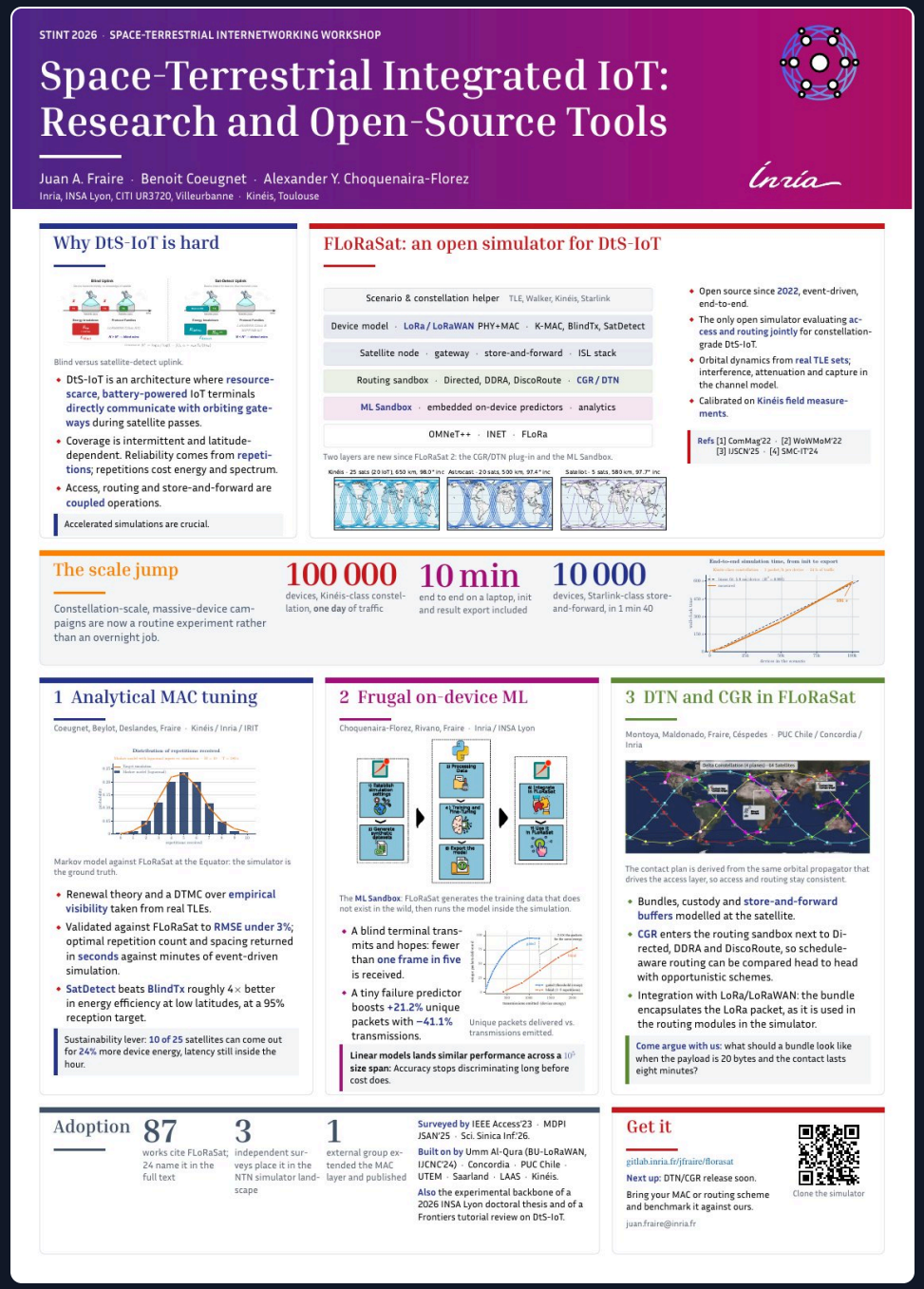
Moez Altayeb

ICTP, The Abdus Salam International Centre for Theoretical Physics, Trieste

The author could not travel to Leuven: no pitch and no board on Tuesday. The poster is online only, on stintworkshops.org.

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POSTER 7 of 9

Space-Terrestrial Integrated IoT: Research and Open-Source Tools

Benoît Coeugnet, Alexander Choquenaira Florez, Juan A. Fraire

Inria Lyon

60 s pitch

Board goes up **Tuesday morning**

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POSTER 8 of 9

LunaNet-Sim: An Open-Source, Browser-Based 3D Interactive Testbed for Cislunar Delay-Tolerant Networking with Verified Hardware Interoperability

Syed Talha Jamal, Saad-Ullah-khan, Daniyal Ahad

Sir Syed University of Engineering and Technology, Karachi

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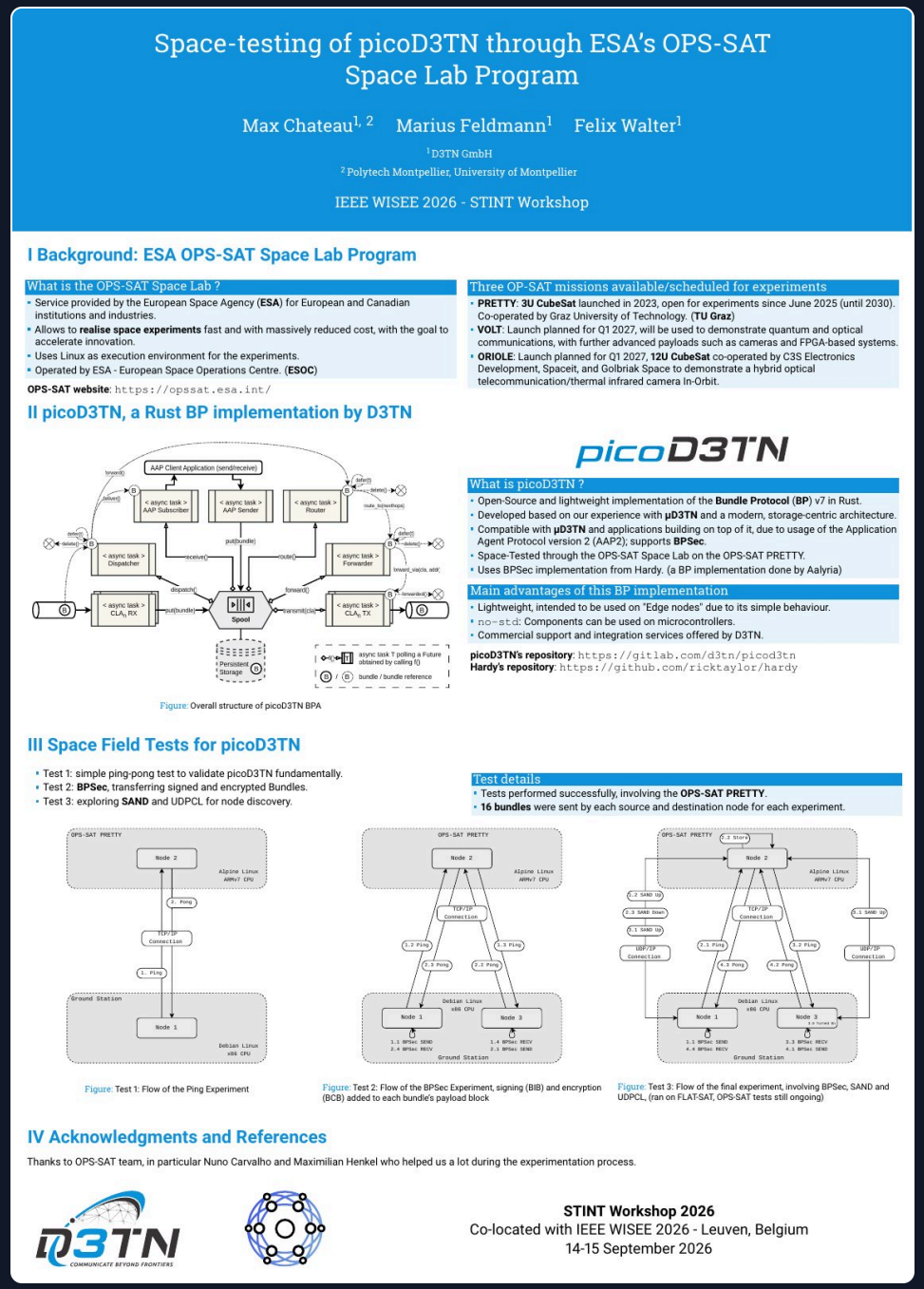
POSTER 9 of 9

Space-Testing of picoD3TN Through ESA's OPS-SAT Space Lab Program

Max Chateau, Marius Feldmann, Felix Walter

D3TN GmbH · Polytech Montpellier

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Space-testing of picoD3TN through ESA's OPS-SAT Space Lab Program

Max Chateau[1, 2] Marius Feldmann[1] Felix Walter[1]

[1] D3TN GmbH

[2] Polytech Montpellier, University of Montpellier

IEEE WISEE 2026 - STINT Workshop

I Background: ESA OPS-SAT Space Lab Program

What is the OPS-SAT Space Lab ?

- Service provided by the European Space Agency (**ESA**) for European and Canadian institutions and industries.
- Allows to **realise space experiments** fast and with massively reduced cost, with the goal to accelerate innovation.
- Uses Linux as execution environment for the experiments.
- Operated by ESA - European Space Operations Centre. (**ESOC**)

OPS-SAT website: `https://opssat.esa.int/`

Three OP-SAT missions available/scheduled for experiments

- **PRETTY**: **3U CubeSat** launched in 2023, open for experiments since June 2025 (until 2030). Co-operated by Graz University of Technology. (**TU Graz**)
- **VOLT**: Launch planned for Q1 2027, will be used to demonstrate quantum and optical communications, with further advanced payloads such as cameras and FPGA-based systems.
- **ORIOLE**: Launch planned for Q1 2027, **12U CubeSat** co-operated by C3S Electronics Development, Spaceit, and Golbriak Space to demonstrate a hybrid optical telecommunication/thermal infrared camera In-Orbit.

II picoD3TN, a Rust BP implementation by D3TN

Figure: Overall structure of picoD3TN BPA

picoD3TN

What is picoD3TN ?

- Open-Source and lightweight implementation of the **Bundle Protocol** (**BP**) v7 in Rust.
- Developed based on our experience with **µD3TN** and a modern, storage-centric architecture.
- Compatible with **µD3TN** and applications building on top of it, due to usage of the Application Agent Protocol version 2 (AAP2); supports **BPSec**.
- Space-Tested through the OPS-SAT Space Lab on the OPS-SAT PRETTY.
- Uses BPSec implementation from Hardy. (a BP implementation done by Aalyria)

Main advantages of this BP implementation

- Lightweight, intended to be used on "Edge nodes" due to its simple behaviour.
- `no-std`: Components can be used on microcontrollers.
- Commercial support and integration services offered by D3TN.

picoD3TN's repository: `https://gitlab.com/d3tn/picod3tn`
Hardy's repository: `https://github.com/ricktaylor/hardy`

III Space Field Tests for picoD3TN

- Test 1: simple ping-pong test to validate picoD3TN fundamentally.
- Test 2: **BPSec**, transferring signed and encrypted Bundles.
- Test 3: exploring **SAND** and UDPCL for node discovery.

Test details

- Tests performed successfully, involving the **OPS-SAT PRETTY**.
- **16 bundles** were sent by each source and destination node for each experiment.

Figure: Test 1: Flow of the Ping Experiment

Figure: Test 2: Flow of the BPSec Experiment, signing (BIB) and encryption (BCB) added to each bundle's payload block

Figure: Test 3: Flow of the final experiment, involving BPSec, SAND and UDPCL, (ran on FLAT-SAT, OPS-SAT tests still ongoing)

IV Acknowledgments and References

Thanks to OPS-SAT team, in particular Nuno Carvalho and Maximilian Henkel who helped us a lot during the experimentation process.

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Up next · Welcome activity, 18:00 · Leuven Botanical Garden