

DAMA in NS-2

DVB-RCS DAMA on free NS-2 platform

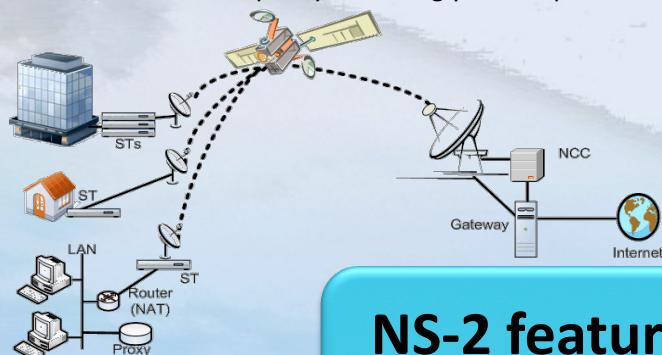
DAMA schemes are adopted in **DVB-RCS standard** to achieve efficient resource management in the return link. NCC collects all the requests from STs and allocates capacity accordingly on a superframe basis. The allocation process takes a time dependent on the DAMA scheme (CRA; RBDC, VBDC, hybrid CRA/VBDC, etc.), which is added to the propagation delay. The bandwidth assigned to each ST may vary strongly and abruptly.

Upper layer protocols performance are drastically affected by **DAMA control loop** and need accurate analysis under large set of configuration (DAMA profiles, traffic source types, number of STs, etc.).

Simulation and particularly event-driven simulation represent a powerful tool to carry out quick and cost-effective experimentation.

The *Satellite Multimedia Group of the University of Rome "Tor Vergata"* developed a **DAMA module for NS-2** which extends the satellite functionalities introducing a realistic DVB-RCS MAC layer.

TCL scripting language of NS2 permits to define any testing setup, including multiple TCP and UDP flows on both forward and return directions, and gathers all the necessary information from different layers: physical, MAC, transport and application.



Exhaustive configuration of DAMA profiles

DAMA physical parameters:

- Mac/Sat/Dama set frame_per_superframe
- Mac/Sat/Dama set slot_per_frame
- Mac/Sat/Dama set superframe_duration

DAMA profile:

- set STprofile [new DamaTerminalProfile]
 - \$STprofile set terminal_id_ #ST DAMA identifier
 - \$STprofile set cra_ #Slot assigned in CRA
 - \$STprofile set rbdc_ #Maximum number of slots allowed in RBDC
 - \$STprofile set vbdc_ #Maximum number of slots allowed in VBDC

NCC DAMA algorithms:

- Proportional
- Round Robin

NS-2 features

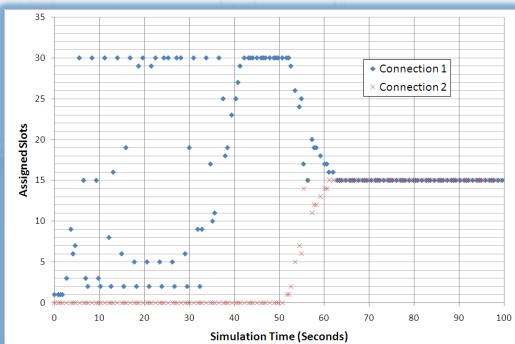
- ✓ GPL license, open-source code
- ✓ Continuous community development
- ✓ Extremely flexible: built-in core functionalities in C++, test scripting language in TCL
- ✓ Generates outputs for graphical plotting tools (e.g. gnuplot)
- ✓ Widely accepted as academic network simulation tool in scientific literature

DAMA patch available at <http://www.tlcslsat.uniroma2.it/DAMA>

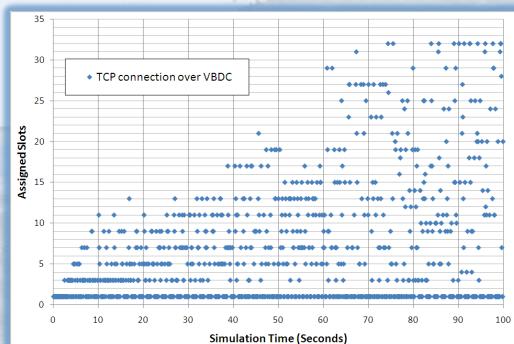
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DAMA statistics

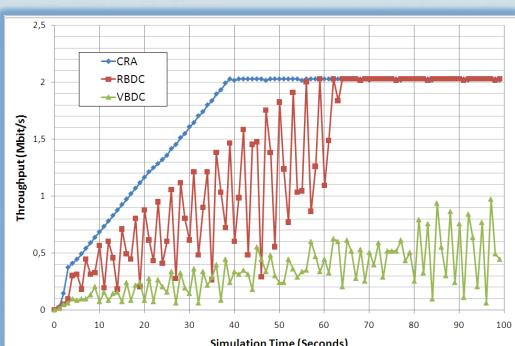


2 TCP connections from 2 different STs starting with an offset of 50 s – DAMA scheme: RBDC (max 30 slots)

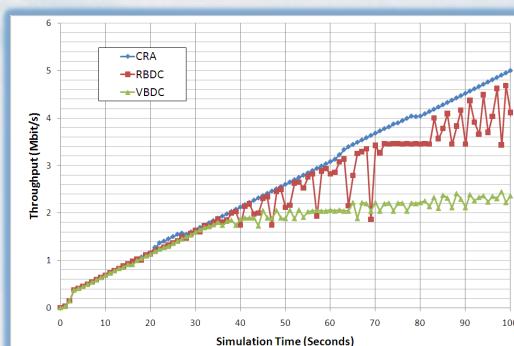


1 TCP connection running over VBDC (max 32 slots)

Throughput

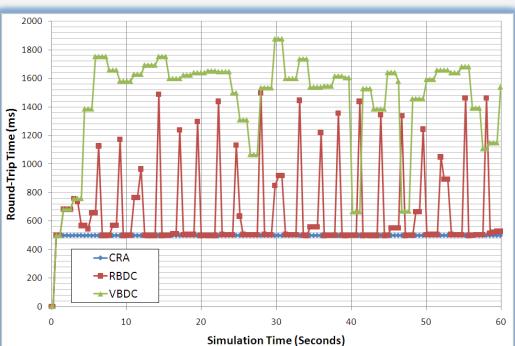


Throughput over return link (capacity=2048 kbit/s). 1 TCP connection. CRA, RBDC and VBDC

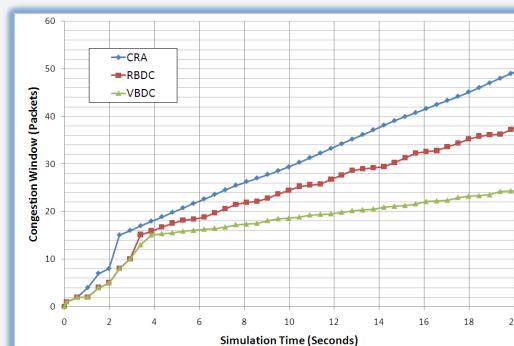


Throughput over forward link (capacity=10 Mbit/s). 1 TCP connection. CRA, RBDC and VBDC

TCP statistics



RTT experienced by TCP running over return link (capacity=2048 kbit/s). CRA, RBDC and VBDC



Congestion Window of TCP running over return link (capacity=2048 kbit/s). CRA, RBDC and VBDC