Space Communications Capacity Modeling: Link Budget Software Integration

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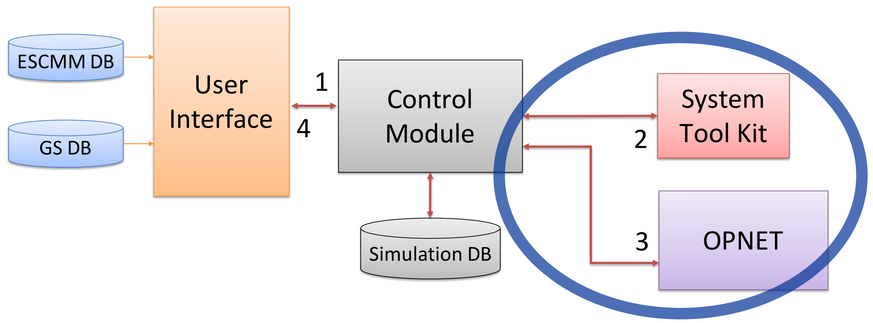
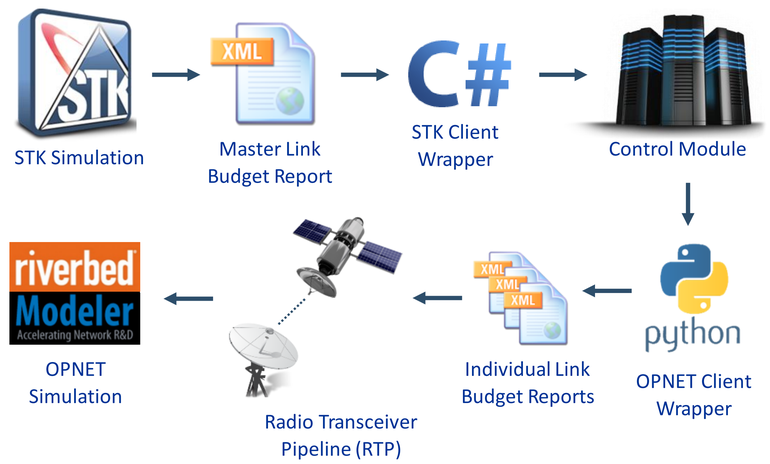
Objective: SCENIC Model Control



- Project Goal: Simulated Capacity Modeler for combined SCaN Networks – Near Earth, Space, and Deep Space
  - Integrate software from MagicDraw, STK, and OPNET through a central control module and shared databases
  - Expandable to future SCaN Network capabilities
- My task: develop software integration between Systems Tool Kit (STK) and OPNET
  - Utilize STK's link budget metrics in OPNET simulation

Link Budget Data Flow



- **Programming Languages:** C, C++, C#, and Python
- **System communication:** Simple Object Access Protocol (SOAP), Web Service Definition Language (WSDL)
- **Simulation:** OPNET Radio Transceiver Pipeline, STK Link Budget

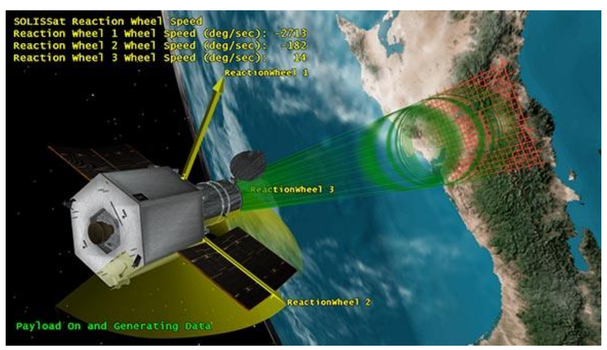
Terms & Acronyms

- **SCaN** = Space Communications and Navigation
- **SCENIC** = Strategic Center for Education, Networking, Integration, and Communication
- **STK** = Systems Tool Kit (by AGI, Inc.)
  - Simulates physical transmission parameters
- **OPNET** = Operational Network Engineering Tools (aka Riverbed Modeler)
  - Simulates communication protocols and packet transmissions
  - Performs discrete event simulations (DES)

Future Work

- Customize OPNET network model (layers 2-4) to use CCSDS protocols
  - Space Link Extension (SLE)
  - IP over CCSDS (IPoC)
- Incorporate additional metrics from STK link budget calculations
  - Signal-to-noise ratio, receiver power, etc.

STK Link Budget Calculation



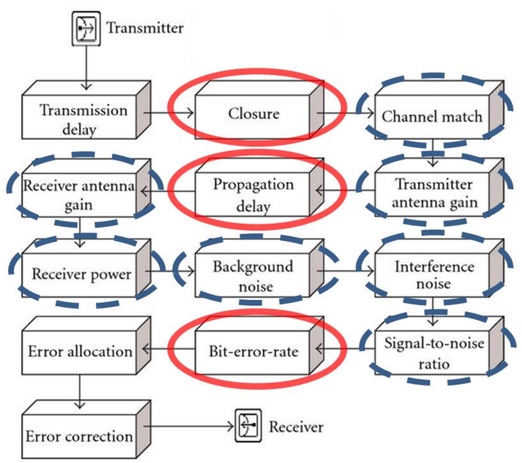
AGI's Systems Tool Kit (STK) simulates:

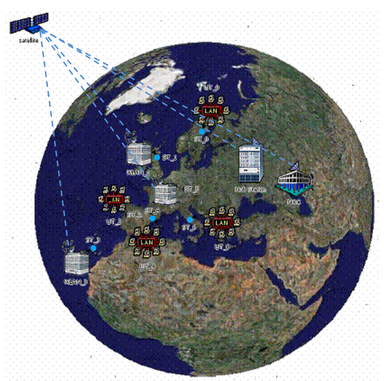
Orbital Dynamics | Link Access | Propagation Delay

Bit Error Rate | Noise Interference

*** Generates reports to send to OPNET ***

OPNET Radio Transceiver Pipeline





*** Generates reports to send back to the user ***

Acknowledgements

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