

## 5.12 TOSSIM

- TOSSIM (TinyOS Mote Simulator) is an open-source operating system specially developed for the wireless embedded sensor networks. There are few hardware platforms available for TinyOS, some commercial and some non-commercial.
- TinyOS release includes a simulator called TOSSIM. It is built especially for Berkeley Mica Mote platform. TOSSIM is an emulator rather than a simulator, as it runs actual application code. Simulated application code can be transferred directly to the platform, but it might not run in a mote as it runs in a simulation due to the simplifying assumptions in TOSSIM.
- Figure 5.6 shows the working flow of TOSSIM. The TOSSIM architecture is consisted of five segments: Frames, Components, Models, Services and Events.
- TOSSIM is a very simple but powerful emulator for WSN. Each node can be evaluated under perfect transmission conditions, and using this emulator can capture the hidden terminal problems.
- As a specific network emulator, TOSSIM can support thousands of nodes simulation. This is a very good feature, because it can more accurately simulate the real world situation. Besides network, TOSSIM can emulate radio models and code executions. This emulator may be provided more precise simulation result at component levels because of compiling directly to native codes.

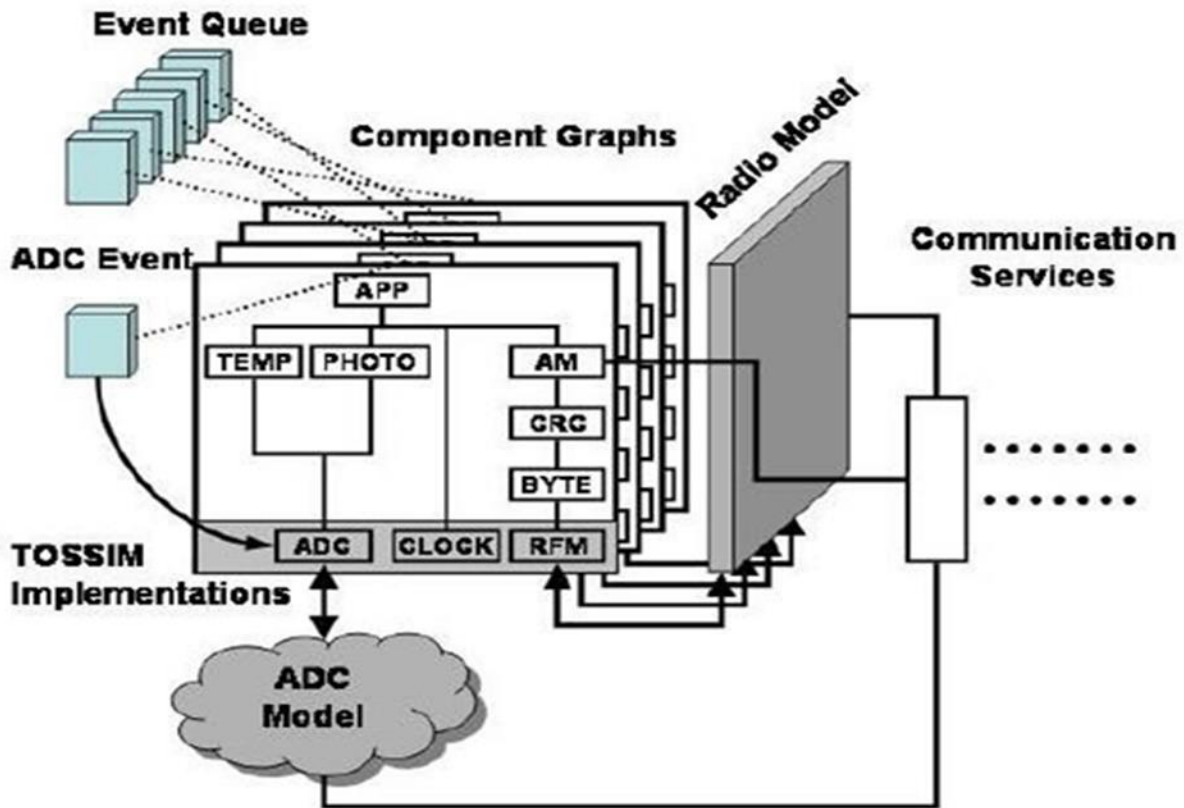


Figure 5.6 TOSSIM Architecture

Source : Protocol and Architecture for Wireless Sensor Networks by Holger Karl , Andreas willig

TOSSIM is a bit-level discrete event network emulator built in Python, a high-level programming language emphasizing code readability, and C++. It can run TOSSIM on Linux Operating Systems or on Cygwin on Windows.

- TOSSIM also provides open sources and online documents. Developers had set four requirements for TOSSIM: scalability, completeness, fidelity and bridging.
- To be scalable, a simulator should manage networks of thousands of nodes in a wide variety of configurations. To achieve this, each node in TOSSIM is connected in a directed graph where each edge has a probabilistic bit error.
- For completeness, a simulator must capture behavior and interactions of a system at a wide variety of levels. And for fidelity, a simulator must capture

behavior of a network with a subtle timing of interactions on a mote and between motes. Requirement for bridging is met as the simulated code runs directly in a real mote.

□ The goal of TOSSIM is to study the behavior of TinyOS and its applications rather than performance metrics of some new protocol. Hence, it has some limitations, for instance, it does not capture energy consumption. Another drawback of this framework is that every node must run the same code. Therefore, TOSSIM cannot be used to evaluate some types of heterogeneous applications.

