Use of Tornado in KAT-7 and MeerKAT

Charles de Villiers (charles@ska.ac.za), Bulelani Xaia (bxaia@ska.ac.za)
SKA South Africa

KAROO ARRAY TELESCOPE CONTROL PROTOCOL (KATCP) 1,2
- Control and Monitoring (CAM) software for the Karoo Array Telescopes
- Simple text-based protocol for control and monitoring
- Used for KAT7 (prototype) now for MeerKAT
- Provides abstractions for a networked system Message, Server, Client, Sensor
- Original implementation used Python threading for concurrency

TORNADO 3
- Concurrency framework and Web server written in Python
- Highly scalable
- Supports non-blocking I/O
- Provides scheduling on top of coroutines
- Caller must ‘yield’ the Future if it needs the result
- Scheduler can proceed with other non-blocking tasks

ADAPTING CAM AND KATCP TO TORNADO
- KATCP and CAM core classes have been rewritten to take advantage of Tornado coroutines
- But there is much legacy code that expects synchronous responses
- Compatibility layer (using decorators) takes care of the differences
- Clients can select a synchronous or asynchronous interface
- CAM software currently includes both types of client

CAM SOFTWARE LAYERS

SUMMARY
- Tornado is starting to deliver on its promise of efficient multitasking
- The Tornado Web server and testing framework are also proving useful
- Application code simplifications are being achieved by the removal of complex locking logic
- Simpler code means better, more reliable code
- The effort of conversion has been considerable, but we believe it has been worthwhile

REFERENCES
1. KATCP documentation: https://pythonhosted.org/katcp/
2. KATCP GitHub repository: https://github.com/skasa/katcppython
4. Python website: https://www.python.org/