AGREEMENT BETWEEN

Meteorological Command and Control Group
AT THE
UNIVERSITY OF MASSACHUSETTS AT AMHERST

AND

TROPINET (Tropical Radar Network) (NSF MRI) Project at
THE DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING AT THE
UNIVERSITY OF PUERTO RICO (MAYAGÜEZ CAMPUS)

Re: FOR **THE METEOROLOGICAL COMMAND and CONTROL UNIT (MC&C)** INSTALLATION and TEST ON TROPINET

I. INTRODUCTION

This Memorandum of Understanding is made by and between the university research groups: Meteorological Command and Control (MC&C) at the University of Massachusetts at Amherst (UMass), henceforth referred as the MC&C team, and TropiNet Radar Network Project at the University of Puerto Rico at Mayagüez (UPRM) and funded by the NSF Major Research Instrumentation (MRI), henceforth referred as the TropiNet team.

II. MOTIVATION

The Meteorological Command and Control (MC&C) developed by UMass researchers manages the real-time scanning control of networks of weather radars. It was developed for the CASA project to ingest data from a network of remote radars, identify meteorological features in the data, and determining each radar's future scan strategy based on detected features and end-user requirements. The MC&C was extensively tested in the CASA IP1 radar network testbed that was deployed in southwestern Oklahoma from 2006-2011.

The MC&C team and the TropiNet team are interested in using the MC&C software to control the operations of the the newly deployed UPRM TropiNet weather radar network. This new radar network was deployed by UPRM with NSF funding through the NSF MRI program. The TropiNet radars are dual-polarized, Doppler, X-band radars that can operate individually or as a network in order to observe the same atmospheric volume from different angles, thus providing additional information such as wind speed vectors and attenuation correction, among others.

This initiative represents a continuation of a long-term history of successful collaboration between faculty and students from the three institutions mentioned above, both in research and education. This collaboration between the MC&C and TropiNet projects will be of mutual benefit, allowing for the testing of the concept of collaborative adaptive sensing under automated MC&C control in the TropiNet platform, in a tropical environment.

III. RESEARCH TEAM PARTICIPATION

Personnel from TropiNet (UPRM)

1) José Colom-Ustáriz, and Sandra Cruz-Pol - PIs of the facility

Personnel from UMass-CASA

1) Michael Zink – MC&C leader
2) David Westbrook
3) Eric Lyons
4) David Pepyne

IV. **FUNDING:**

Each institution will be individually responsible for any expenses (equipment, travel, labor) arising out of this agreement; no monies will be exchanged between institutions.

V. **OTHER TERMS OF THE AGREEMENT**

a. Dedicated, standalone computer(s) will be installed by the MC&C team at UPRM facilities with the necessary capacity and connectivity to run the MC&C software. This computing equipment will be separate and independent from the computers running the signal processing and control for the TropiNet radars.

b. UPRM will fund the electrical power requirements and Internet connectivity of the UMass owned MC&C computer described in (a).

c. To allow the MC&C Engineering team remote access to the MC&C computer described in (a), UPRM shall provide the MC&C computer with a public IP address and the local firewall shall allow ssh/sftp access.

d. The MC&C software running on the MC&C computer in its dedicated, standalone computer(s) will connect to the computers running the signal processing and control for the TropiNet radars through an IP network. Except for the software connections necessary for the MC&C to control the TropiNet radars, the MC&C team shall have no other access to the computers running the signal processing and control for the TropiNet radars, except that which allows the MC&C software connection and with the only purpose of connecting the MC&C software.

e. Data sharing between the computers running the signal processing and control for the TropiNet radars and the MC&C computer shall include, at a minimum, the standard set of base polarimetric weather products Z, V, W, Zdr, rhohv, phidp, and Kdp (with both attenuation corrected and uncorrected terms where applicable) from each of the TropiNet radars, preferably in a standard form such as a NetCDF file. The MC&C shall provide the TropiNet radars with radar beam steering and (if applicable) radar waveform commands. The MC&C team shall be allowed to archive the above-mentioned TropiNet radar data products at UMass for use in its research. The TropiNet team can do likewise with the MC&C steering/waveform commands. Neither team has the right to distribute the products of the other team to parties who are not a part of this agreement without that team's express written permission.

f. The TropiNet team will manage the computers running the signal processing and control for the TropiNet radars and will prepare them for connection to the remote MC&C software. No outside access will be enabled to computers running the signal processing and control for the TropiNet radars except to allow the MC&C software connection. The MC&C team will manage any MC&C software updates via remote Internet access. The TropiNet

team will be provided an interface and instructions for turning the MC&C on and off, but shall have no other access to the MC&C source codes or algorithms.

g. Any proposed technical work that may involve or have an impact on the TropiNet radars and their associated computers (such as preparing the interface to the MC&C software or initial testing of revisions / modifications to the MC&C software) must include the TropiNet Engineering team in the process as the technical point of contact. Likewise, any proposed work that may have impact on the MC&C software and its associated computers (including changes to network access, need to cycle the power or physically move the computer) must include the UMass MC&C Engineering team as the technical point of contact.

h. The MC&C team must include TropiNet's Research Team as co-authors in any publication resulting from any MC&C work that involves the TropiNet's radar network or its data in any form. The TropiNet team will also include the MC&C researchers in publications that make use of the MC&C.

i. Any proposal prepared by the MC&C team that plans to use the TropiNet's facility and/or data, must include the Faculty Team from the TropiNet Facility in the negotiation process. Similarly, any proposal prepared by the TropiNet team that plans to use the MC&C to control the TropiNet radars, must include the faculty from the MC&C team in the negotiation process.

j. This agreement may be terminated at any time. In the event of termination, the standalone MC&C computers and its software shall be returned to UMass (at UMass expense).

VI. LICENSING TERMS

a. UMass hereby grants to UPRM, a non-exclusive, royalty-free research license and right (without the right to sublicense) in the field of meteorological/weather applications to CASA MC&C software Version 1.0 solely for the purpose of collaborating with UMass MC&C team on the TropiNet Radar Network Project during the duration of this agreement. UPRM hereby agrees that it shall not attempt to seek patent protection for the MC&C Software. The license grant herein expressly prohibits commercial exploitation of the MC&C software. UMass hereby informs UPRM that additional licenses may be required from other parties to make full use of the full complement of software that supports the MC&C software.

b. UPRM agrees and acknowledges that the MC&C Software is confidential proprietary information of UMass and must be maintained in strict confidence. Disclosure of the MC&C Software to a third party is prohibited without the written permission of UMass

c. UPRM agrees and acknowledges that the MC&C software is the sole property of UMass and is being provided by UMass on an "as-is" basis, without warranty of any kind, and UMass disclaims any and all warranties, express or implied, and any warranty arising by operation of law or otherwise. UMass does not represent or warrant that MC&C Software is appropriate for the uses intended. UPRM assumes all risks and responsibilities associated with its use of the MC&C software and further releases and holds harmless UMass, its

trustees, officers, directors, faculty, staff and students from any and all liability associated with its use of the MC&C software.

d. UPRM acknowledges that it will use MC&C software in compliance with applicable export control regulations.

DURATION OF AGREEMENT:
This agreement will be in effect a minimum of 5 years beginning from the date it is signed by all parties. At the end of this period this agreement will be reviewed and considered for renewal by all parties.

The undersigned approve this agreement on this 25 day of June 2014.

University of Puerto Rico at Mayagüez:

José Colom-Ustáriz
NSF-MRI TropiNet PI

Revised by Elvia Camayd
Director of IP and Tech Transfer Office and
Assistant Researcher

Lucas Avilés
Acting Chancellor UPRM

University of Massachusetts at Amherst:

Michael Zink
MC&C Team leader

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