Development of web based Radar Control Software for future generation Active Phased Array Radars

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Abstract:

With the significant growth in field of electronics, the development of highly complex hardware systems fetched an improvement in research of Boundary Layer, Middle and upper Atmosphere, Ionosphere. Active phased Array radar is one such atmosphere probing instrument with a dedicated TR Module feeding each antenna providing more beam agility, electronically beam steering capability. Active phased Array radars are mainly useful for deriving wind products, electron density in ionosphere, etc. A web browser based Radar Control software has been designed, developed and validated with complex network of 1024 element AAMSTR, Gadanki.

The major subsystems of the Radar are Radar control software- which is usually termed as brain of the overall system, TR modules, RF subsystems like exciter, distribution units, etc. The dedicated TR Module for each antenna has a FPGA based TSG digital card, which generates necessary control signals for the proper operation of the radar, health status of the field located TR modules. The TR Modules are assigned with an independent IP Address to communicate with Radar Controller PC through different hierarchical levels of Layer2 optical Ethernet switches forming a Tree topological network.

Radar Controller software has been realized in-house at NARL to acquaint better control over complex network of 1024 TR modules distributed over an array size of 130m x130m. Parameters like network throughput, different operational commands, delay required between two requests to maintain a good network stability, ping request timeouts, connection timeouts etc. are properly realized and implemented with 1024 modules.

A web-browser based Radar Controller application has been designed and developed with a rich user interface using Web Technologies like HTML, JavaScript and pure Python. Server communicates with the user interface running in browser using Hyper Text Transfer Protocol (HTTP). Server uses two different protocols for communicating with field located TR modules, viz., Internet Control Message Protocol (ICMP), TCP/IP for data transfer.

Radar Controller software facilitates the user scientists to set the experimental operational parameters as well as allows to operate different modes of scientific experiments such as DBS, SA, VAD.

The detailed implementation methodologies, validation procedures, flexibility in operation and data archival of the monitoring parameters will be discussed in this paper.