P41 AUTOMATED STORM-BASED SCHEDULING ON THE NATIONAL WEATHER RADAR TESTBED PHASED ARRAY RADAR

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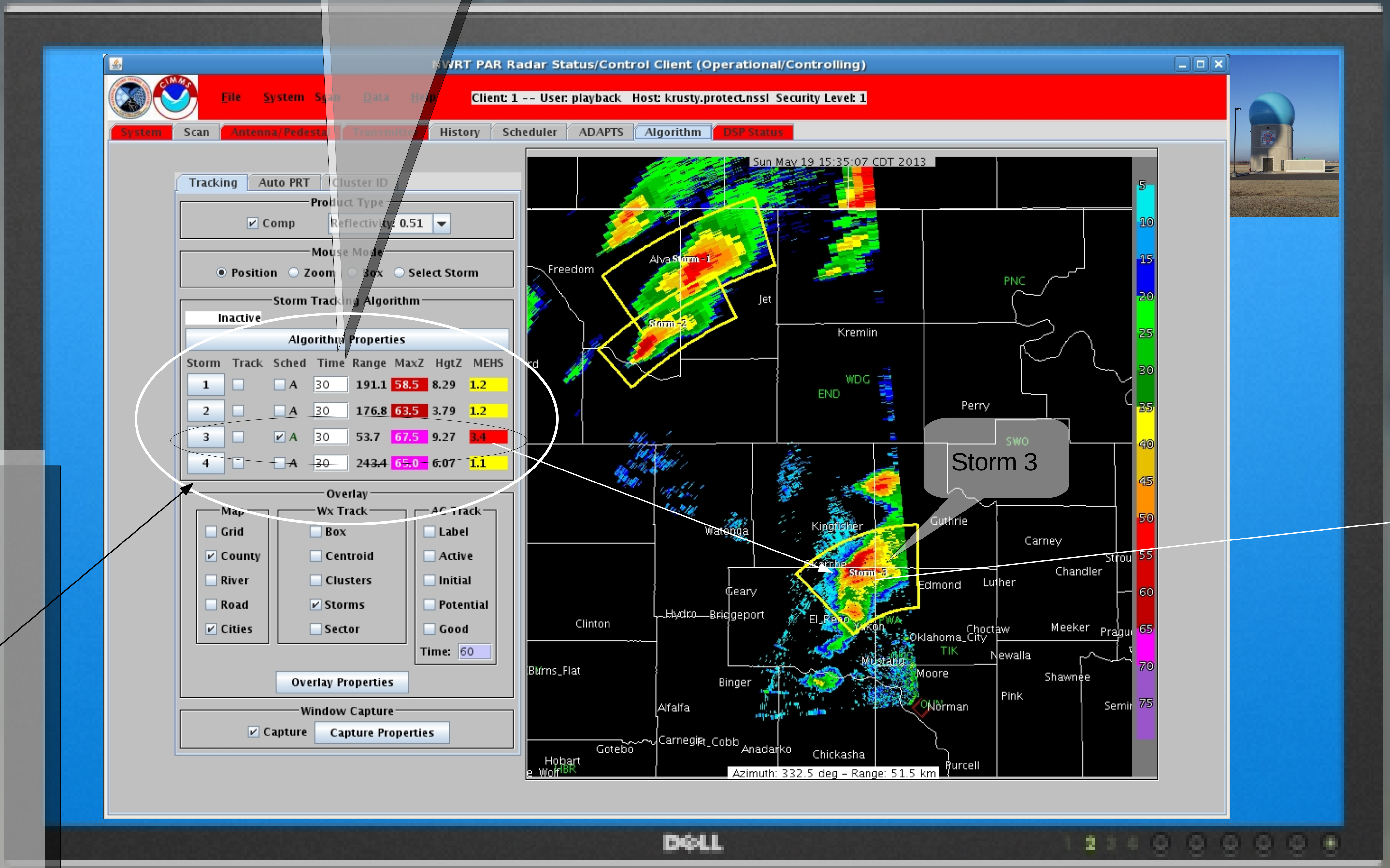
The National Weather Radar Testbed (NWRT) Phased Array Radar (PAR) provides a platform to develop and demonstrate adaptive scanning techniques unique to electronically steered antennas. Free from the mechanical limitations of conventional rotating dish antenna radars, techniques have been developed to focus scanning on regions containing severe weather. Using a cluster identification algorithm, candidate storm clusters are identified from reflectivity data, at either a constant elevation angle or height. The azimuth sector defining their lateral boundaries are used to define the scan sector and the range of the cluster gate with the highest reflectivity is used by a range-based volume coverage pattern (VCP) algorithm to define the scan properties.

Until recently, storm selection has been performed by a human operator. Work is currently underway to automate the process by replacing the human operator with an algorithm that utilizes selected storm cluster properties to identify candidate storms and schedule them for focused scanning. This paper provides more details about the storm scheduling process and how selected cluster properties can be used to identify candidate storms clusters.

In this study, maximum expected hail size (MEHS) is used by the storm selection software to identify candidate storms. When an upper MEHS threshold is reached, the storm scheduling algorithm creates a range-based VCP, focused on the storm sector. The VCP is sent to the Real Time Controller (RTC) where it is added to a scan table. The scan table consists of a single weather surveillance and up to 9 storm sector VCPs. During scan execution, the weather surveillance VCP is executed first followed by any storm sector VCPs. The storm sector VCPs are executed in a round-robin fashion and repeated until an operator controlled time interval elapses. At this time the full sequence is repeated.

Storm List

Clusters which meet a minimum storm threshold get added to a storm list which is displayed here. Any storm which meets the upper threshold will be targeted for focused scanning. In this example, the two thresholds are maximum expected hail size (MEHS) = 1 inch and MEHS = 2 inch. The MEHS for storm 3 is 3.4 inches which exceeds the upper threshold so its sector would be targeted for focused scanning.



Client: 1 -- User: playback Host: krusty.protect.nssl Security Level: 1

Product Type: ☑ Comp Reflectivity: 0.51

Mouse Mode: ● Position ○ Zoom ○ Box ○ Select Storm

Storm Tracking Algorithm: Inactive

Algorithm Properties

Storm	Track	Sched	Time	Range	MaxZ	HgtZ	MEHS
1	☐	☐ A	30	191.1	58.5	8.29	1.2
2	☐	☐ A	30	176.8	63.5	3.79	1.2
3	☐	☑ A	30	53.7	67.5	9.27	3.4
4	☐	☐ A	30	243.4	65.0	6.07	1.1

Overlay

Map: ☐ Grid ☑ County ☐ River ☐ Road ☑ Cities

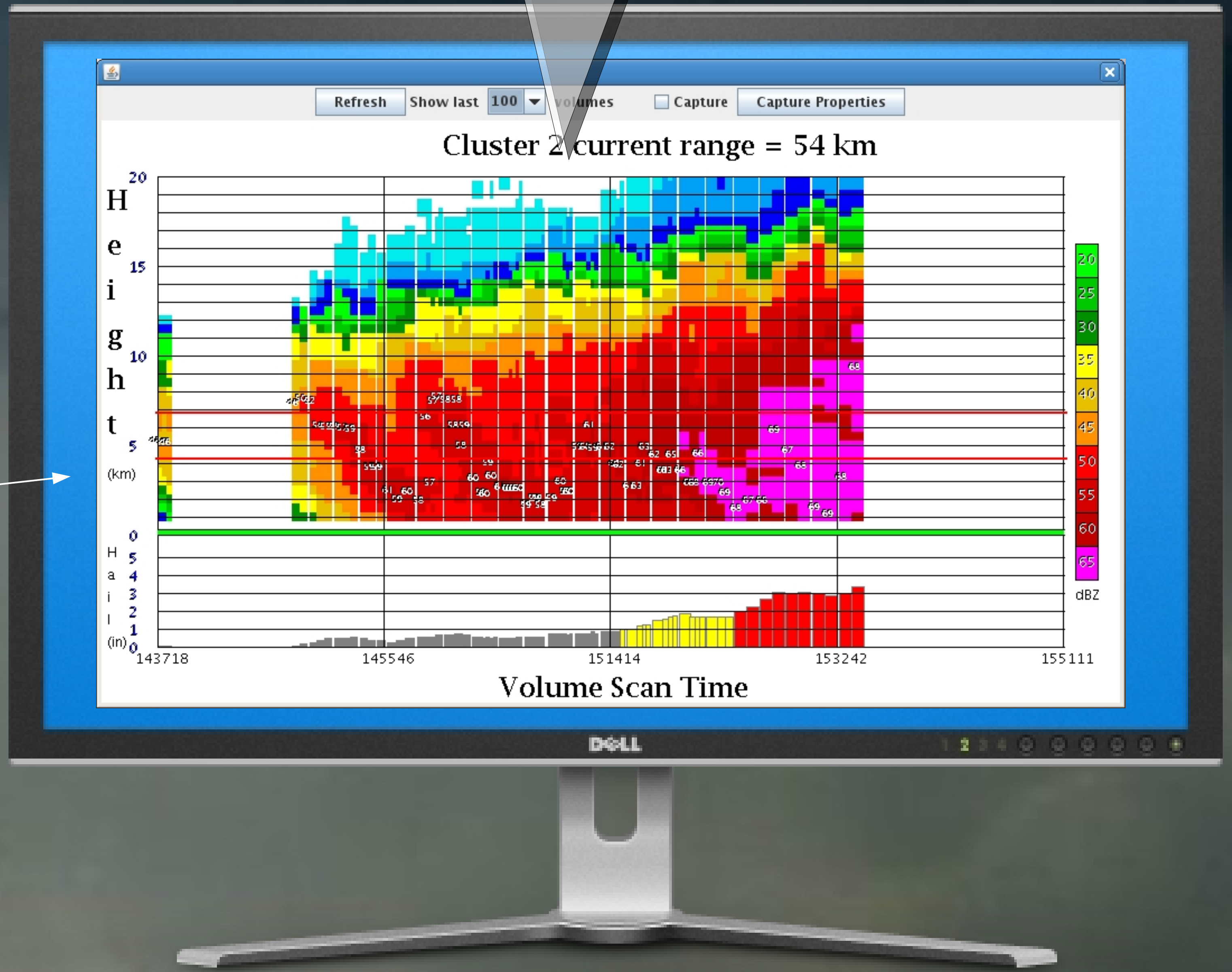
Wx Track: ☐ Box ☐ Centroid ☐ Clusters ☑ Storms ☐ Sector

AC Track: ☐ Label ☐ Active ☐ Initial ☐ Potential ☐ Good Time: 60

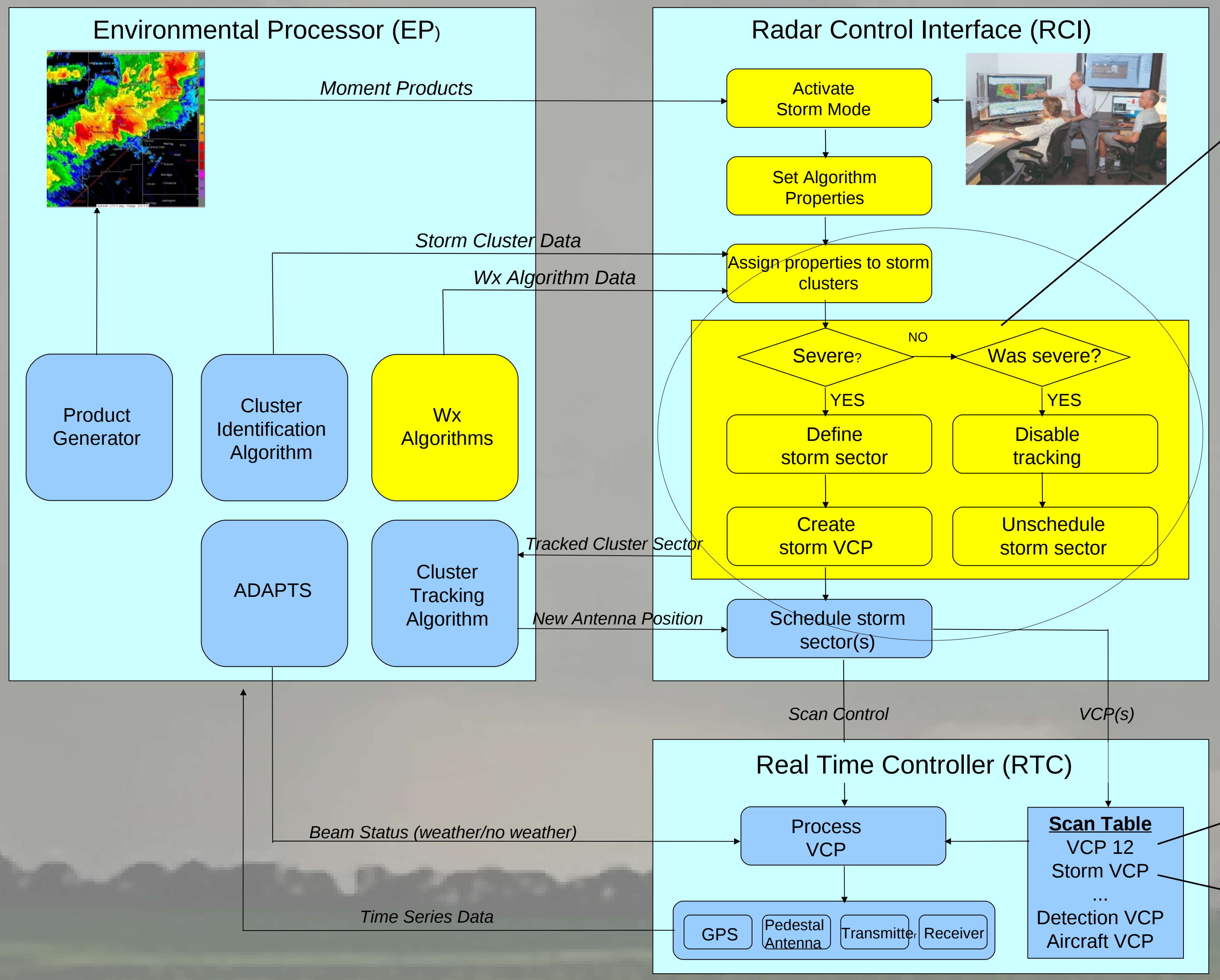
Window Capture: ☑ Capture

Storm 3

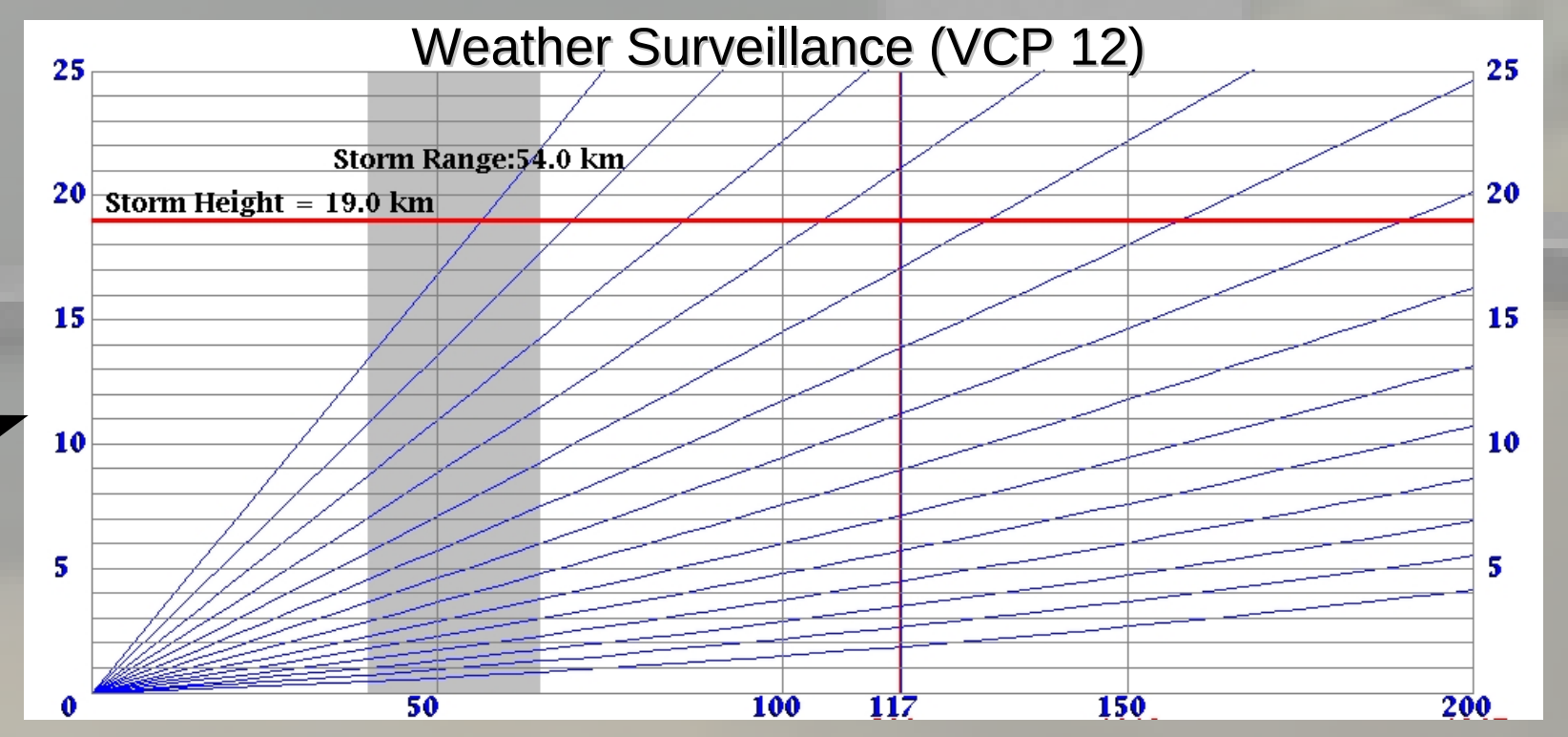
Cluster history profiles can be displayed by selecting a storm in the display window. A profile of maximum reflectivity in ½ km height intervals is maintained for each cluster as well as other volumetric properties. In this example, maximum expected hail size (MEHS) is displayed along the bottom. Gray, yellow, and red are used to denote MEHS below threshold, between the lower and upper thresholds, and above the upper threshold, respectively.

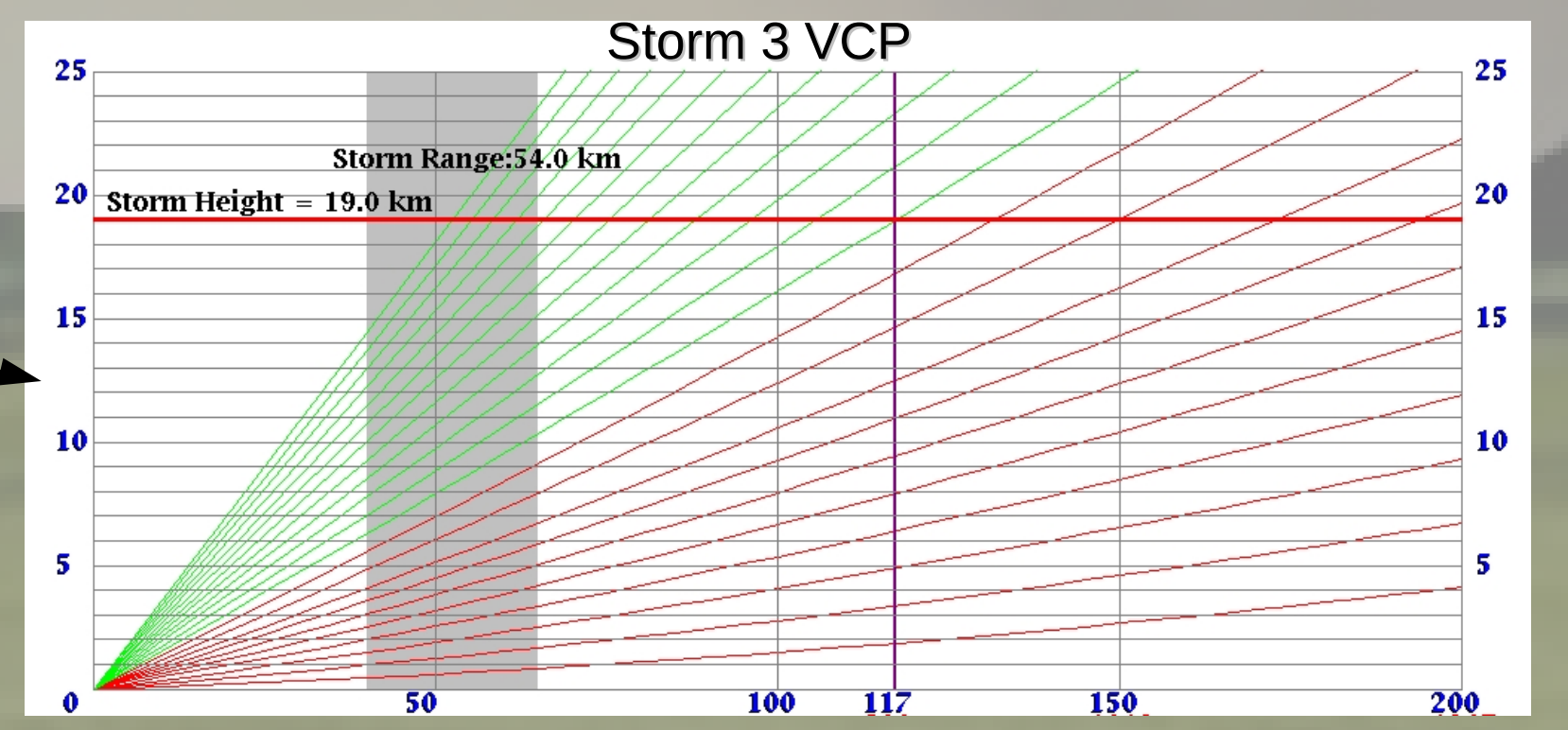


NWRT Adaptive Scanning Functional Diagram



Scan Table VCPs





Standard VCP to scan everywhere within the antenna field of view. This VCP leaves gaps at higher elevation angles when storms are closer to the radar. Also, it may not scan to storm top when storms are inside 50 km range.

Focused storm sector scanning uses a range-based VCP which provides 0.5-1.0 km coverage from 0.5° elevation up to storm top, leaving no gaps in vertical coverage..

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