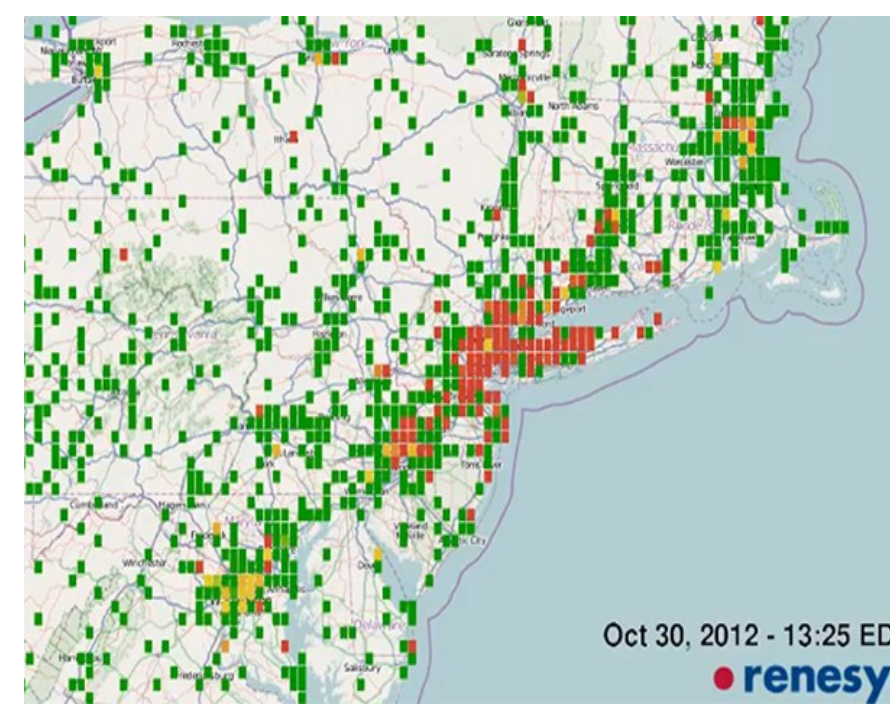
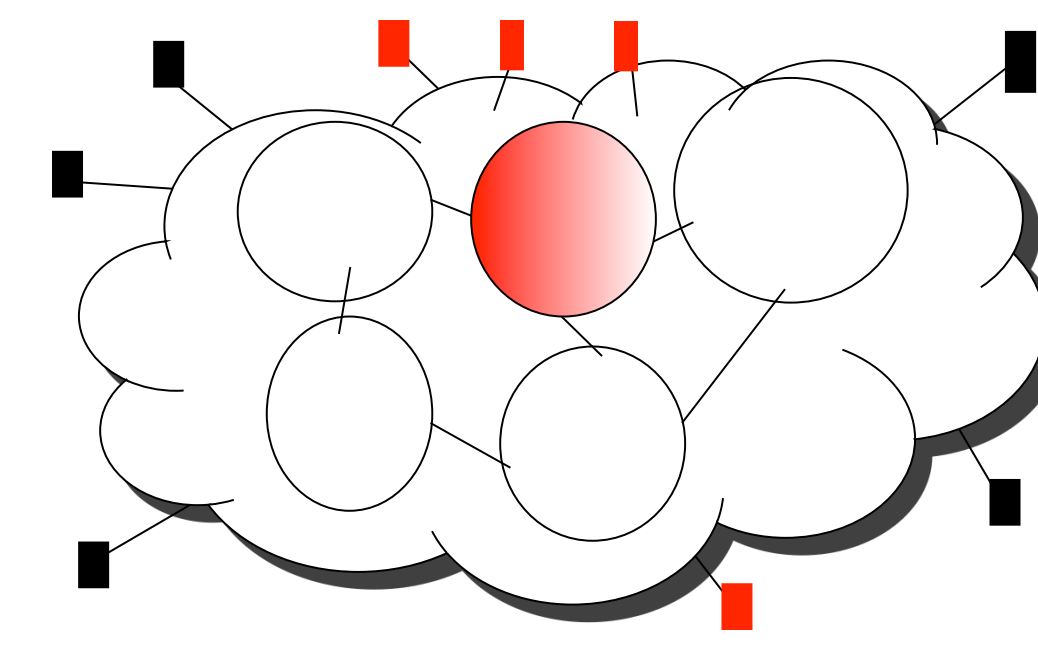


Srikar Tati (Penn State), Bong Jun Ko (IBM), Ananthram Swami (ARL, MD) and Thomas La Porta (Penn State)

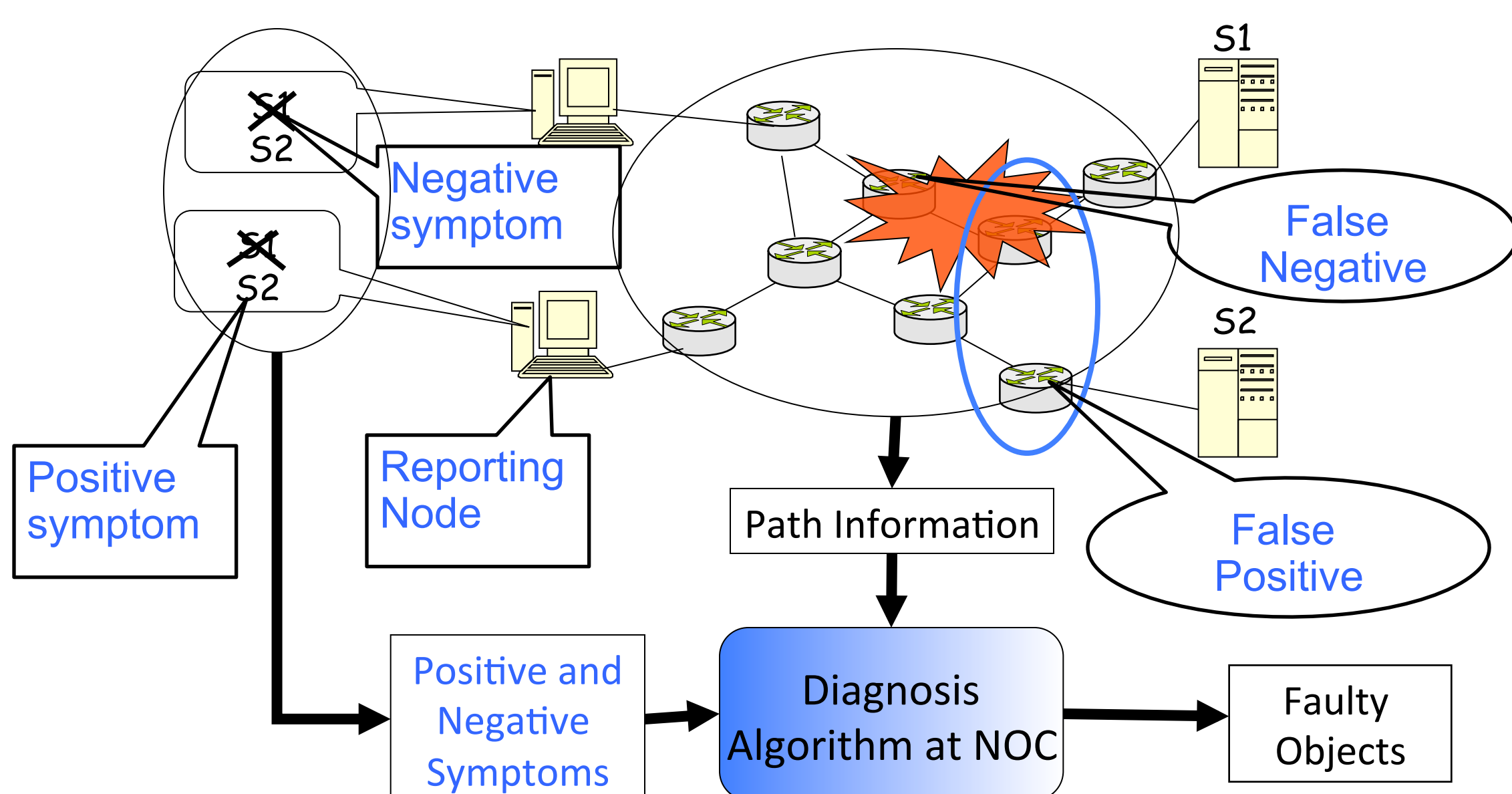
In this work, we propose algorithms to efficiently diagnose large-scale clustered failures (*intentional attacks, natural disasters etc.*). We address the practical challenge of determining faults with limited number of symptoms. **Cluster-MAX-COVERAGE (CMC)**, is based on greedy and combinatorial approaches by makes novel use of both positive and negative symptoms. In our simulations, CMC requires only reports from about half as many nodes as other existing algorithms to determine failures with 100% accuracy. In addition, we empirically conclude that at a reporting node, few negative symptoms are enough and more positive symptoms are useful. Furthermore, we propose an adaptive algorithm called **Adaptive-MAX-COVERAGE (AMC)** that performs efficiently during both independent and clustered failures, using a Bayes classifier.



Internet Disconnectivity after HURRICAN SANDY

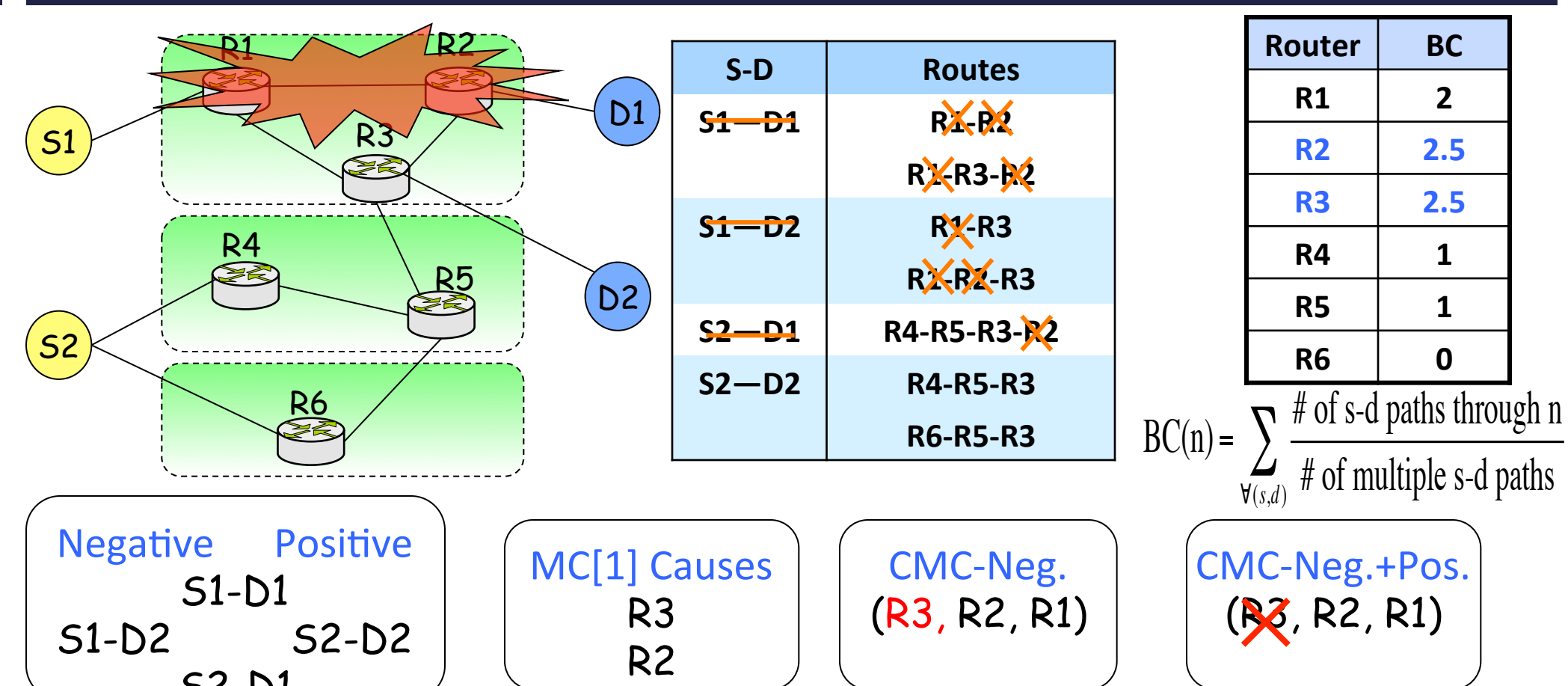


Problem and Terminology

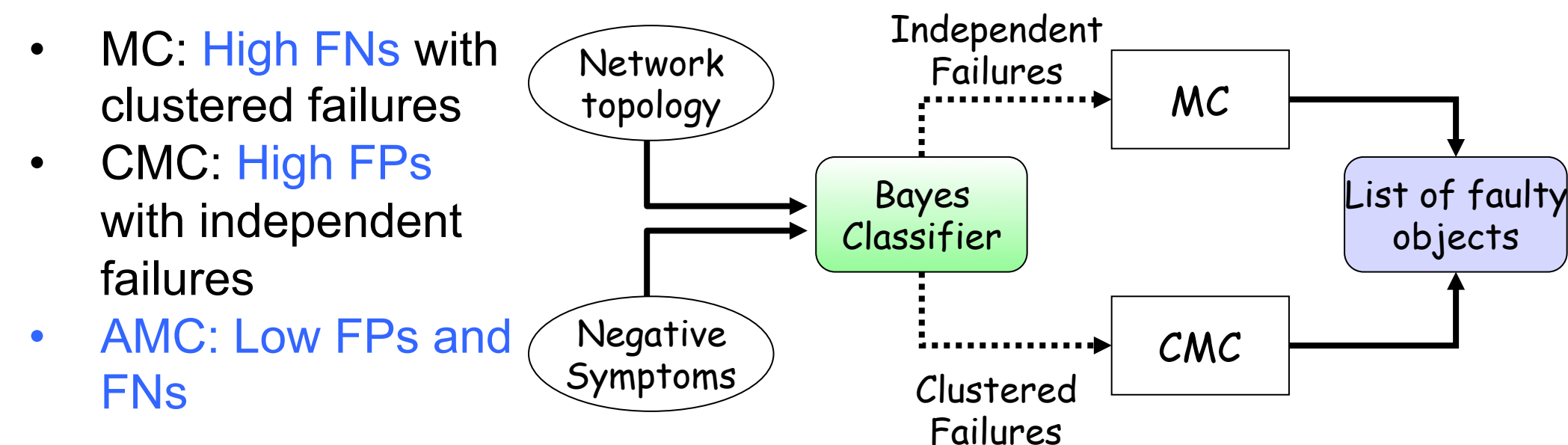


- Current algorithms (Max-Coverage (MC) [1]) for independent failures require high connectivity info (symptoms)
- **Problem:** Given limited connectivity information, we want to diagnose large-scale failures effectively with **high accuracy and reasonable run-time**
- **netCSI** [Srikar et al. 2] (combinatorial) has **high accuracy, but high run time**

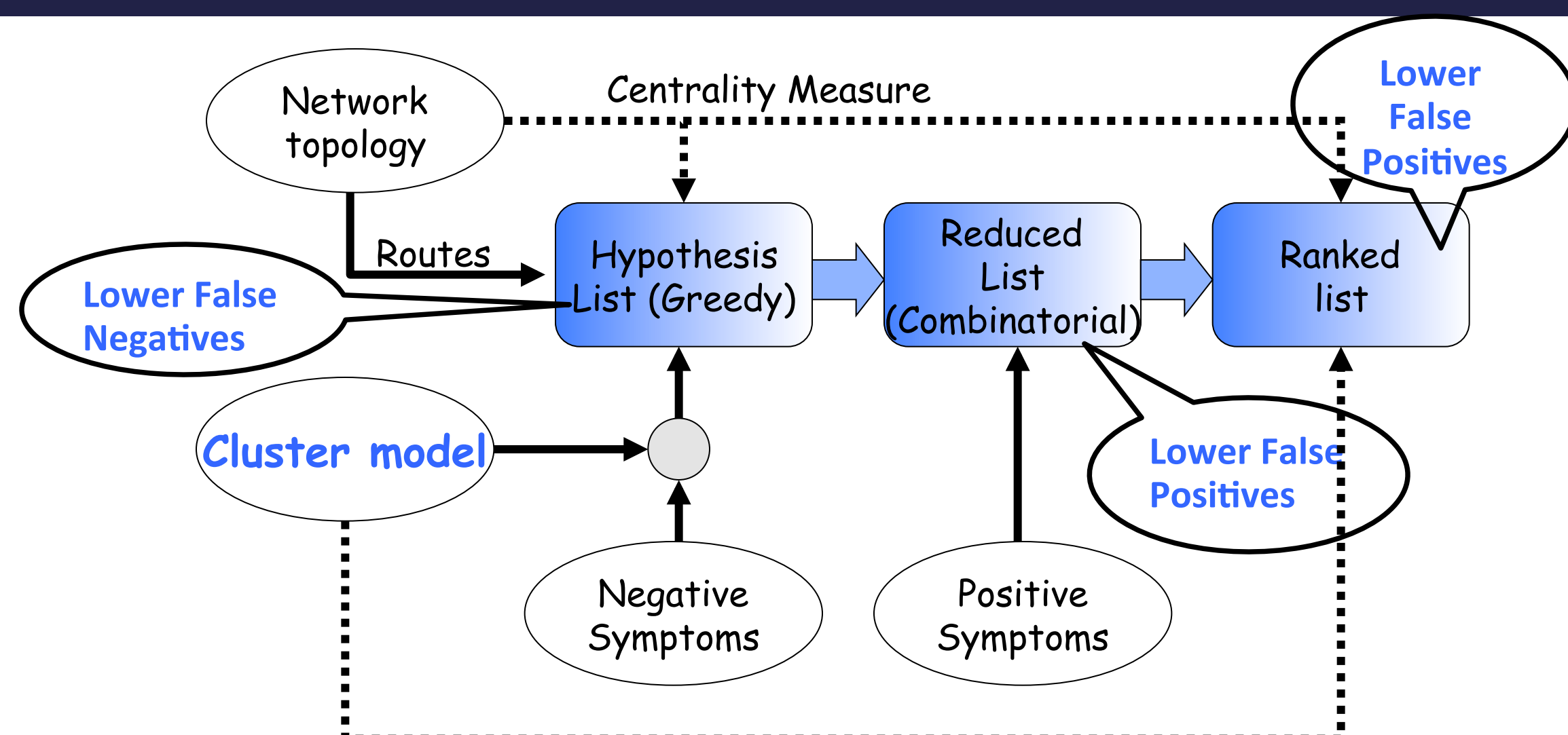
Illustrative Example



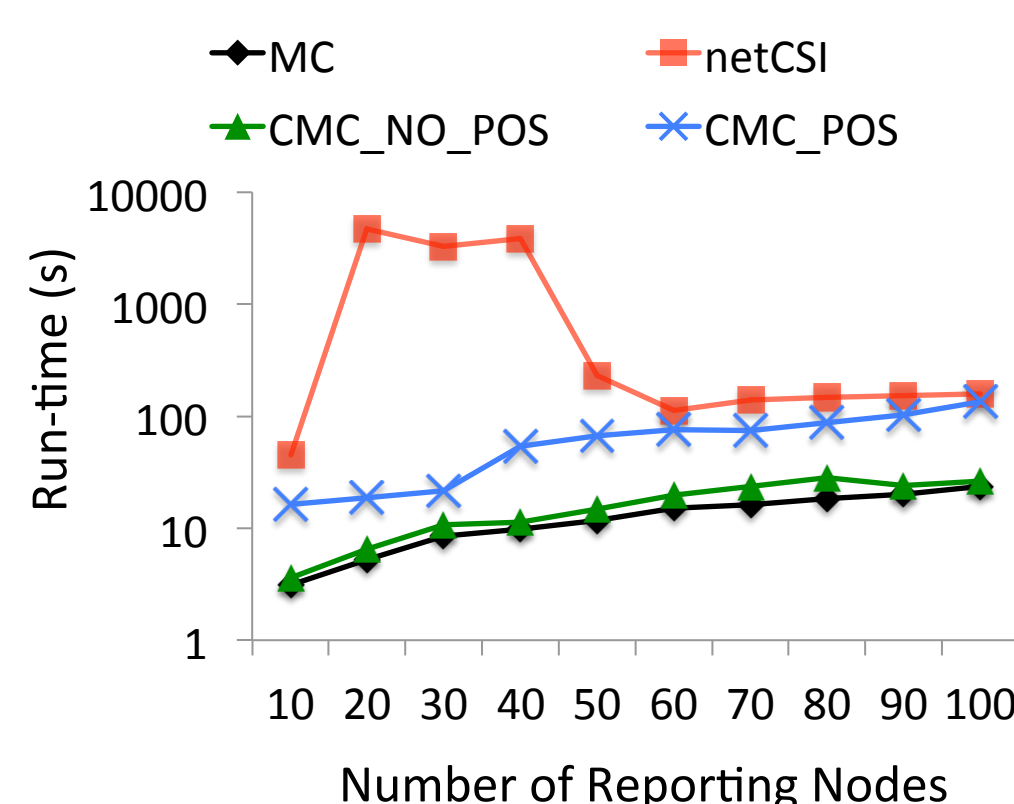
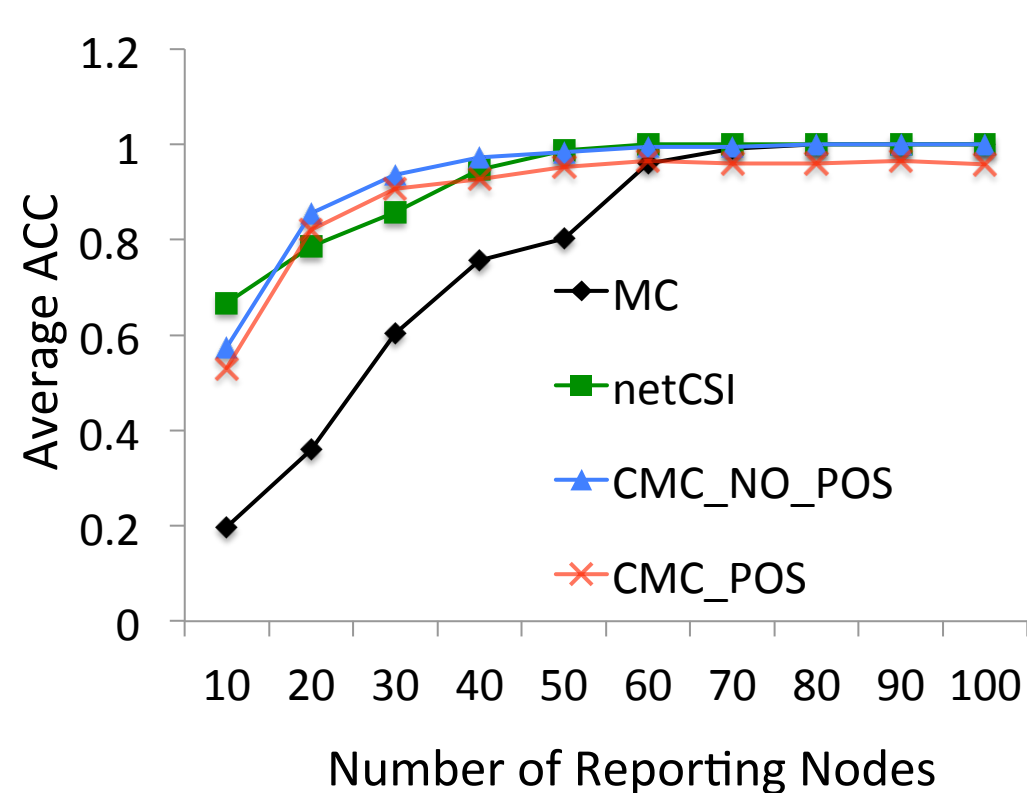
Adaptive Max-Coverage(AMC)



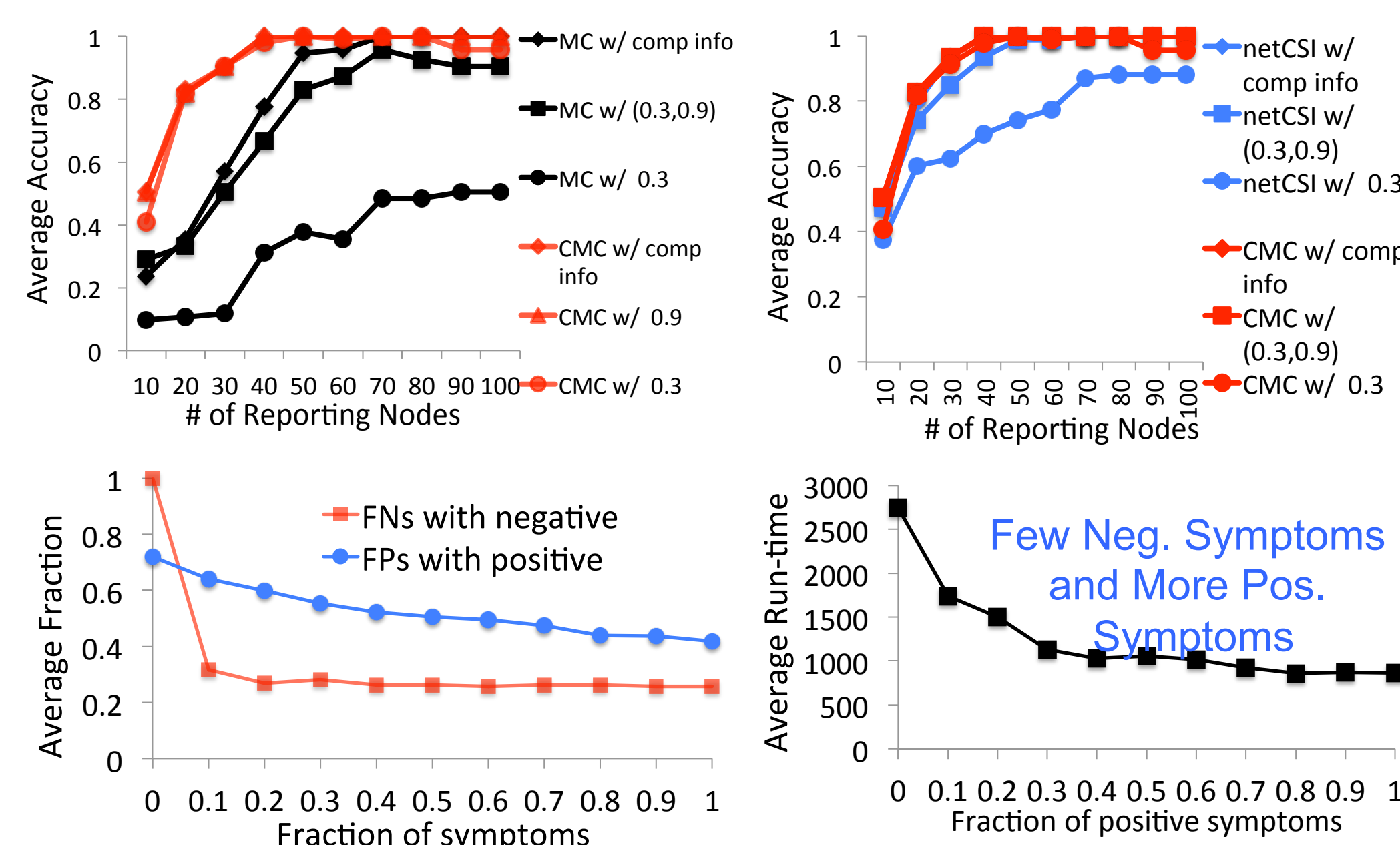
Cluster Max-Coverage (CMC)



- CMC [3] is a hybrid algorithm of **greedy and combinatorial** approaches
- We observed **high accuracy and low run-time** in our simulations



Incomplete Symptoms



References

- [1] R. R. Kompella, J. Yates, A. Greenberg, A. C. Snoeren, "Detection and Localization of Network Blackholes", IEEE INFOCOM, 2007.
- [2] S. Tati, S. Rager, B. Ko, G. Cao, A. Swami, T. F. La Porta, "netCSI: A Generic Fault Diagnosis Algorithm for Large-Scale Failures in Computer Networks", IEEE SRDS, 2011.
- [3] S. Tati, B. Ko, G. Cao, A. Swami, T. F. La Porta, "Adaptive Algorithms for Diagnosing Large-Scale Failures in Computer Networks", IEEE DSN, 2012 and IEEE TPDS, 2014.