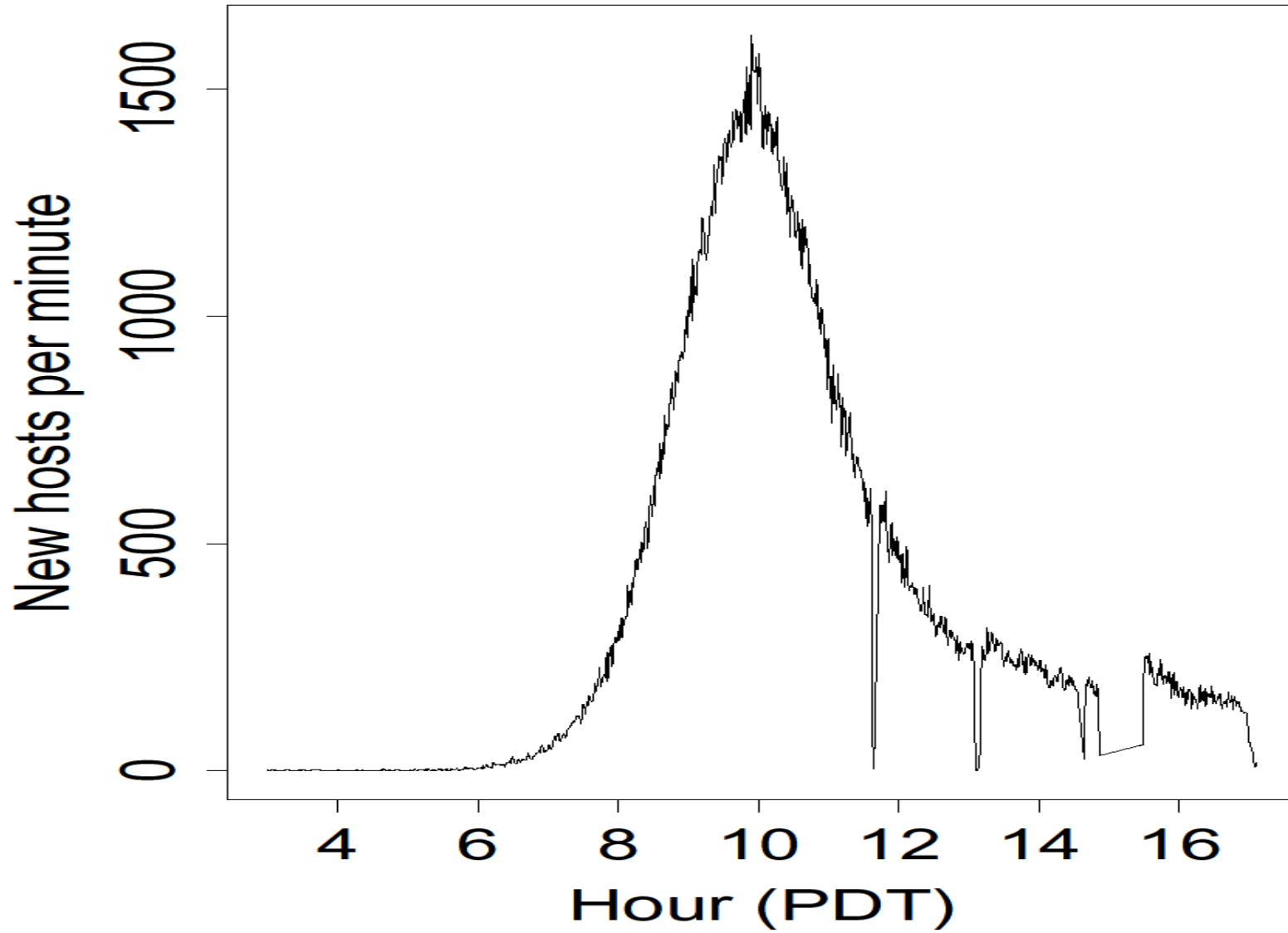
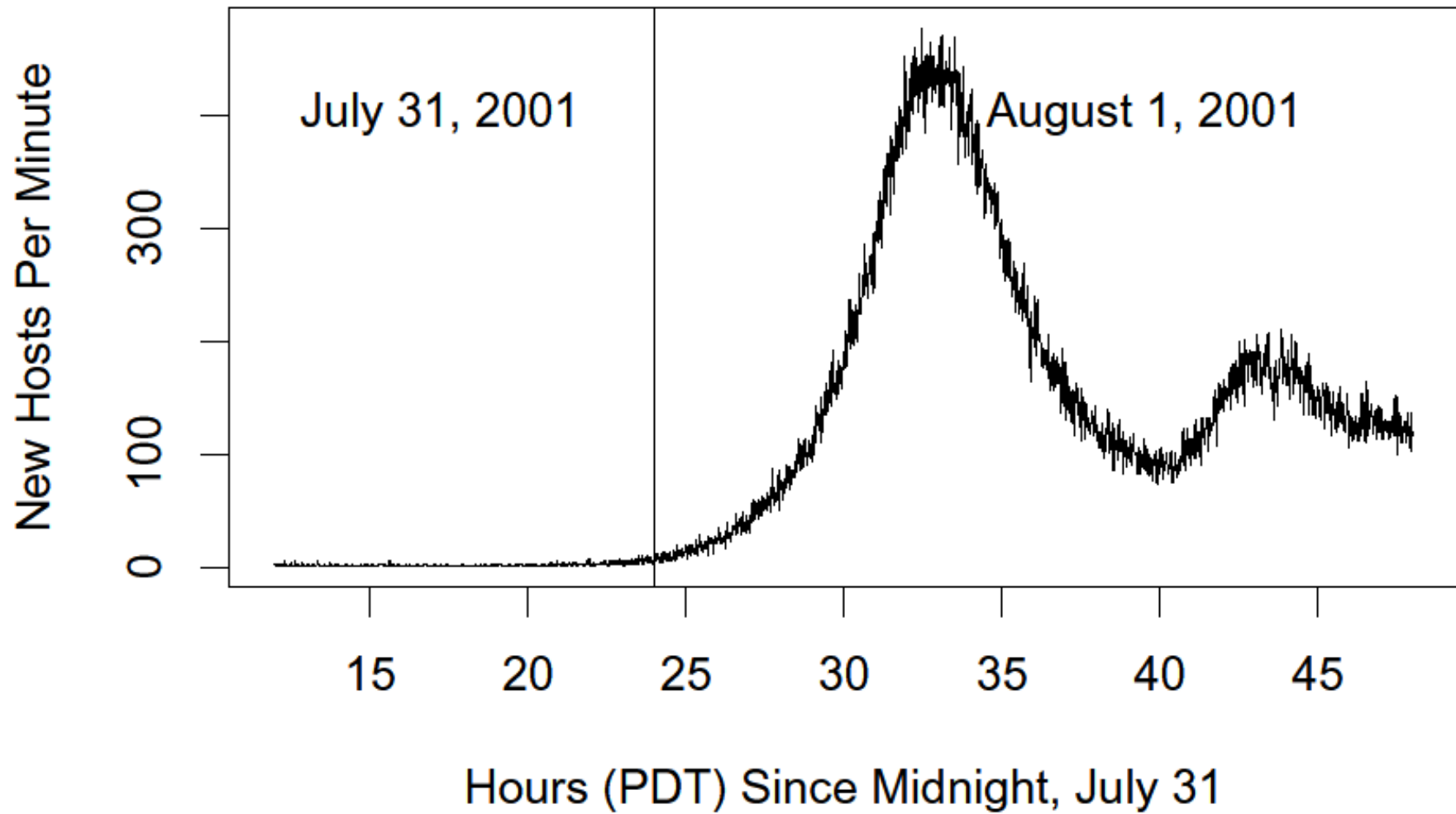


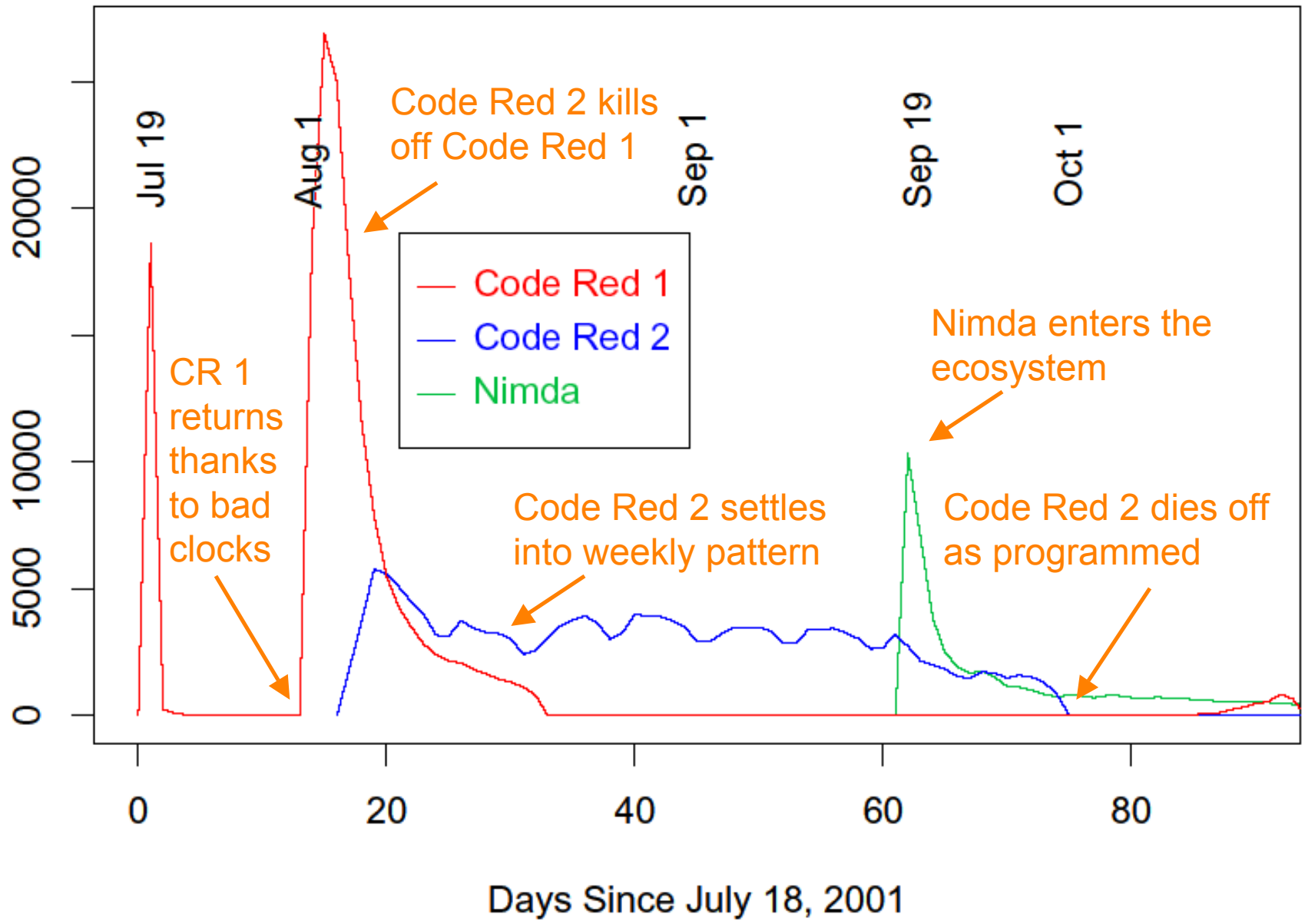
Growth of Code Red Worm



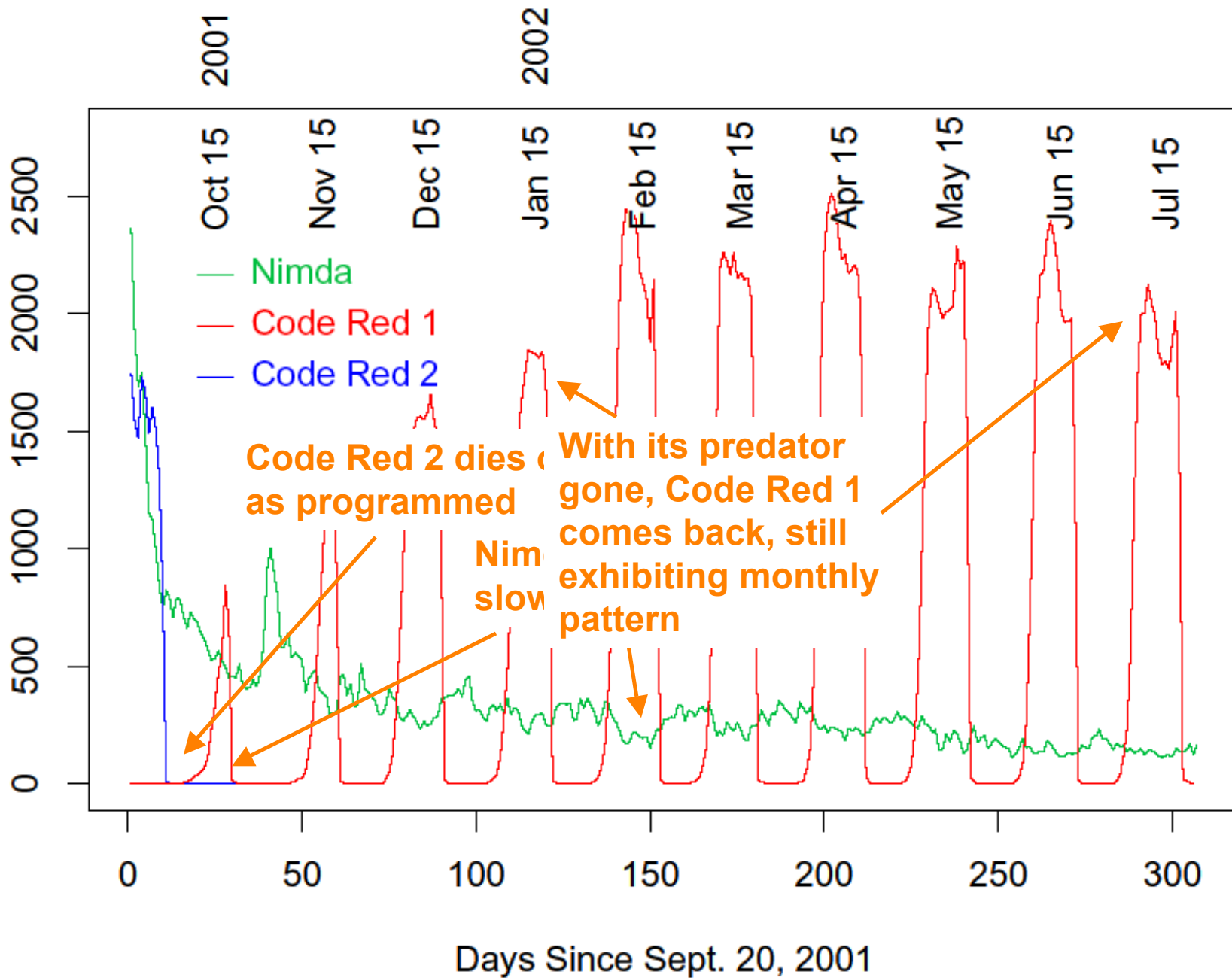
Return of Code Red Worm



Distinct Remote Hosts Attacking LBNL



Distinct Remote Hosts Attacking LBNL



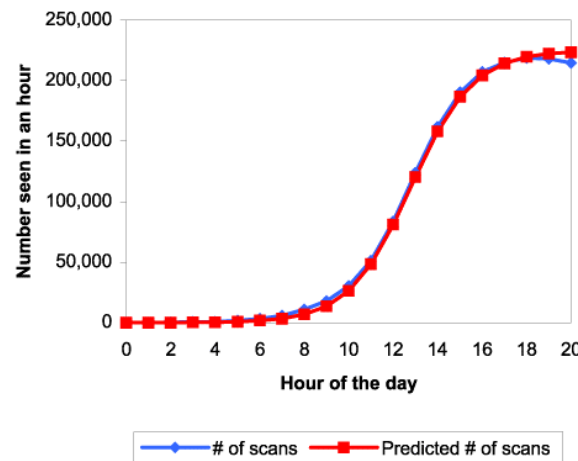
Modeling Worm Spread

- Often well described as *infectious epidemics*
 - Simplest model: homogeneous random contacts
- Classic SI model

- N: population size
- S(t): susceptible hosts at time t
- I(t): infected hosts at time t
- β : contact rate
- i(t): I(t)/N, s(t): S(t)/N

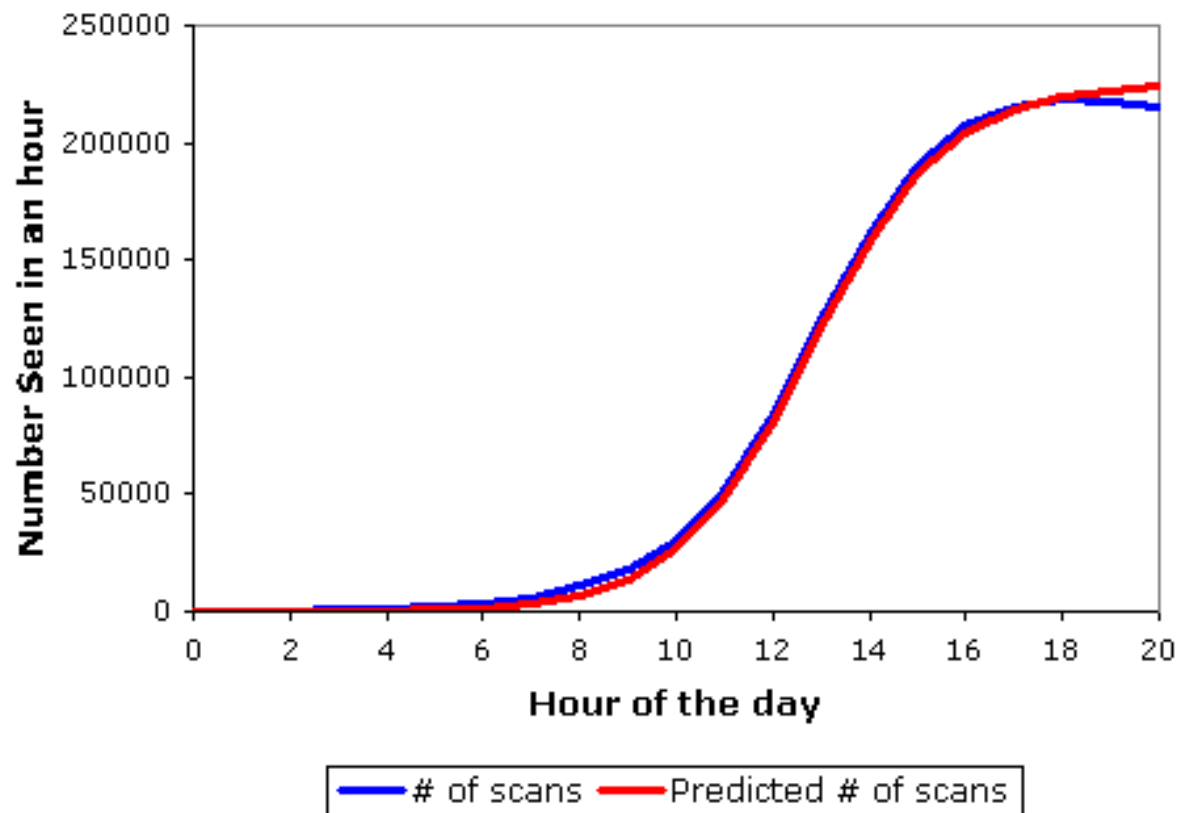
$$\begin{aligned} \frac{dI}{dt} &= \beta \frac{IS}{N} \\ \frac{dS}{dt} &= -\beta \frac{IS}{N} \end{aligned} \rightarrow \frac{di}{dt} = \beta i(1-i)$$

$$i(t) = \frac{e^{\beta(t-T)}}{1 + e^{\beta(t-T)}}$$



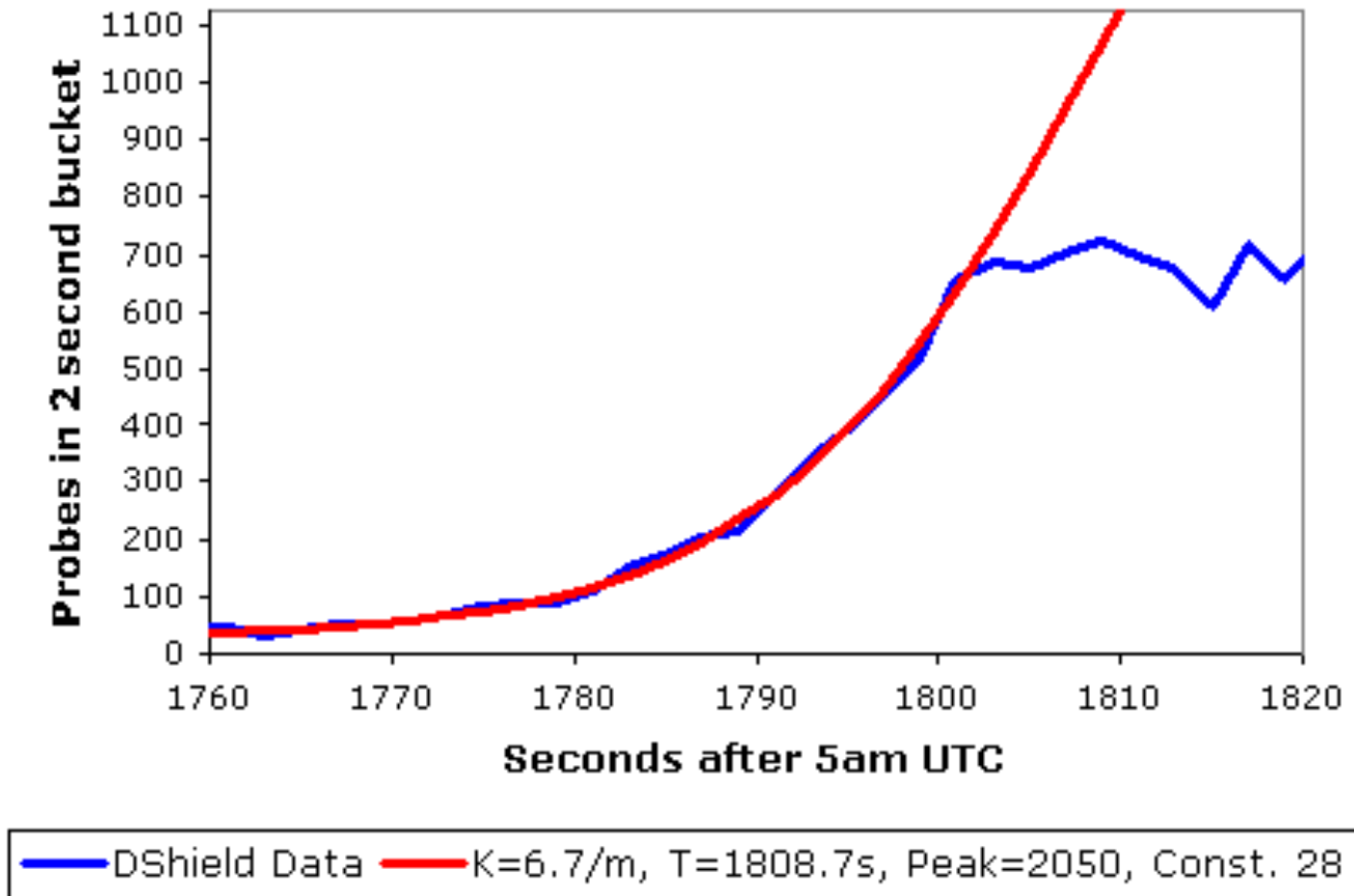
The Usual Logistic Growth

Probes Recorded During Code Red's Reoutbreak



Slammer's *Bandwidth-Limited* Growth

DShield Probe Data



Distinct Remote Hosts Attacking LBNL

