AARON SCHULMAN *NEIL SPRING*

PINGIN' IN THE RAIN

University of Maryland

Measuring weather-related failures

Identify residential IPs that will be subject to weather

Ping before, during, and after a weather event

Analyze the pings to find weather-related failures

Aiming pings at weather

Monitor the alert feed from the U.S. National Weather Service

<title>Severe Weather Statement issued May 12 at 4:46PM CDT expiring May 12 at 5:15PM CDT by NWS GreenBay http://www.crh.noaa.gov/grb/</title>

<summary>...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT FOR CENTRAL WAUPACA AND NORTHWESTERN OUTAGAMIE COUNTIES UNTIL 515 PM CDT...AT 443 PM CDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A SEVERE THUNDERSTORM CAPABLE OF PRODUCING QUARTER SIZE HAIL...AND DAMAGING WINDS IN EXCESS OF 60 MPH. THIS STORM WAS LOCATED 7 MILES NORTH OF NEW LONDON...OR 20 MILES NORTHEAST OF WAUPACA...MOVING</summary>

<cap:effective>2011-05-12T16:46:00-05:00</cap:effective>

<cap:expires>2011-05-12T17:15:00-05:00</cap:expires>

<cap:urgency>Immediate</cap:urgency>

<cap:severity>Severe</cap:severity>

<cap:certainty>Observed</cap:certainty>

<cap:geocode><valueName>FIPS6</valueName>
<value>055087 055135</value></cap:geocode>

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Pinging to observe failures

One vantage point is not enough

Ten PlanetLab-based vantage points

Ping infrequently

From each vantage point, ping once every 11 minutes

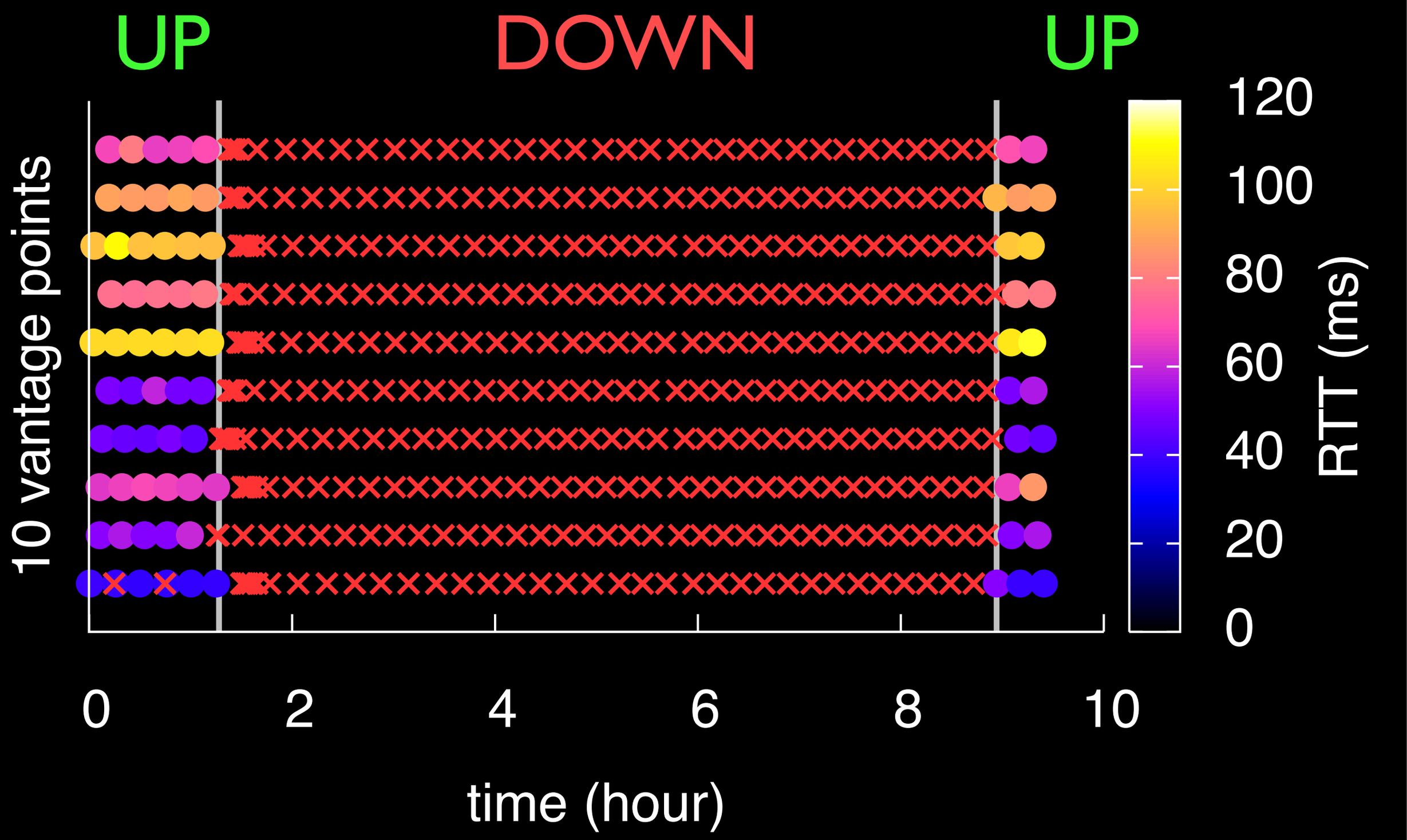
Omit needless pings

Only ping IPs that reply before the weather

One ping is not enough

Retry immediately when a ping indicates failure

Reducing pings to responsiveness



U.S. airport weather stations monitor conditions

photo credit: Austin Cross

U.S. airport weather stations monitor conditions

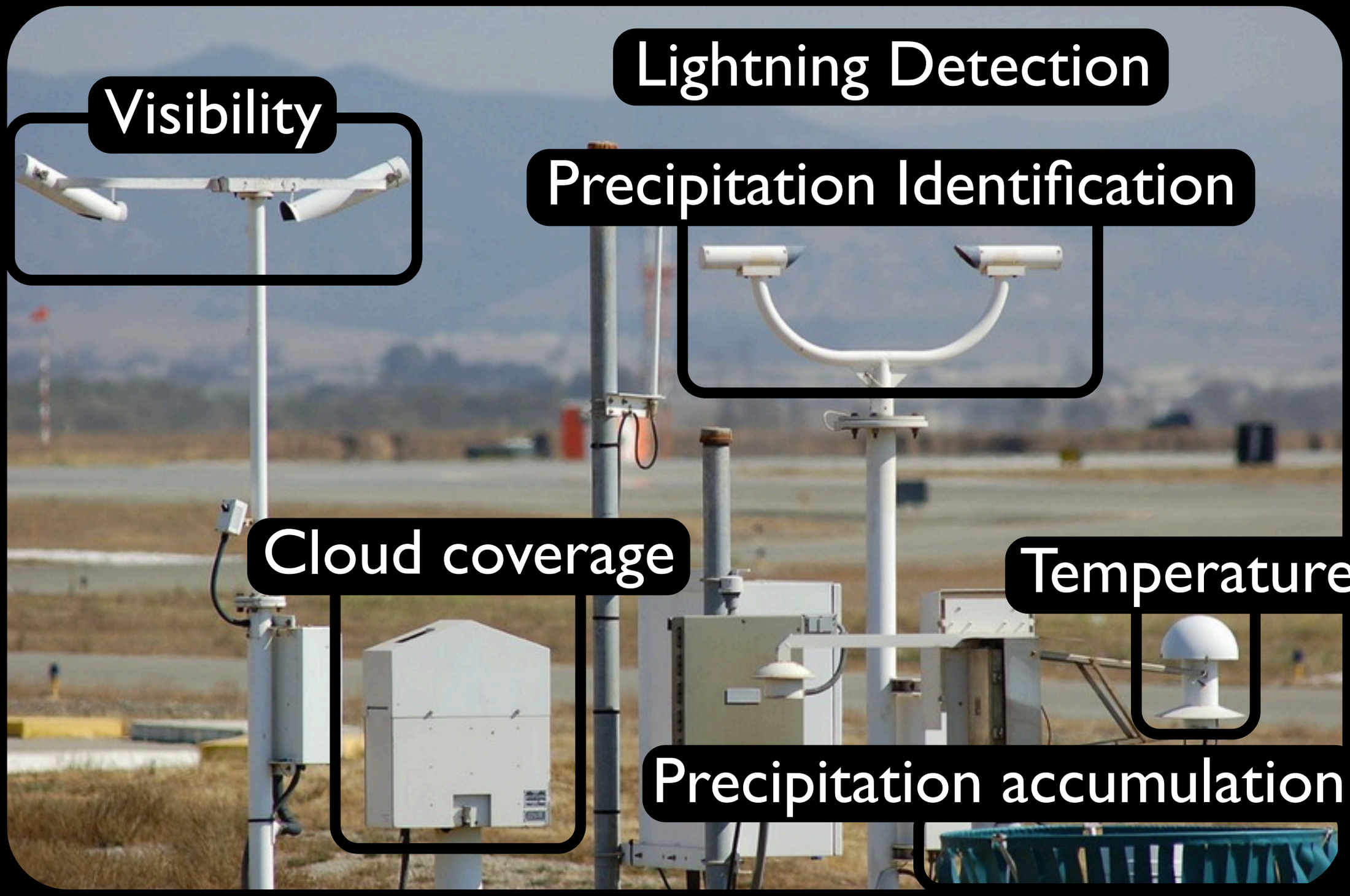


photo credit: Austin Cross

METAR weather history

12:57 PM,80.1,48.0,32,29.95,10.0,Variable,3.5,-,N/A,,Clear,METAR KFLG 051957Z VRB03KT 10SM CLR 27/09 A3029 RMK AO2 SLP141 T02670089,0,2011-07-05 19:57:00

1:57 PM,81.0,45.0,28,29.92,10.0,SSW,8.1,-,N/A,,Clear,METAR KFLG 052057Z 20007KT 170V240 10SM CLR 27/07 A3026 RMK AO2 SLP131 T02720072 58013,200,2011-07-05 20:57:00

2:57 PM,75.9,48.0,37,29.92,10.0,WNW,6.9,-,0.00,,Scattered Clouds,METAR KFLG 052157Z 29006KT 10SM SCT090 24/09 A3025 RMK AO2 RAB46E56 SLP130 P0000 T02440089,290,2011-07-05 21:57:00

3:57 PM,75.0,45.0,34,29.93,6.0,Variable,3.5,-,N/A,,Haze,METAR KFLG 052257Z VRB03KT 6SM HZ BKN075 24/07 A3026 RMK AO2 SLP134 T02390072,0,2011-07-05 22:57:00

4:16 PM,64.4,55.4,73,30.27,5.0,North,13.8,17.3,0.07,Rain-Thunderstorm,Thunderstorms and Rain,SPECI KFLG 052316Z 01012G15KT 5SM TSRA BKN041 BKN050 OVC075 18/13 A3027 RMK AO2 TSB10RAB2258 TS OVHD P0007,10,2011-07-05 23:16:00

4:57 PM,64.9,55.9,73,29.95,10.0,West,8.1,-,0.13,Rain-Thunderstorm,Light Thunderstorms and Rain,METAR KFLG 052357Z 27007KT 10SM -TSRA FEW031 BKN095 18/13 A3024 RMK AO2 TSB10RAB2258 SLP140 TS OVHD P0013 60013 T01830133 10294 20167 58007,270,2011-07-05 23:57:00

5:13 PM,64.4,55.4,73,30.26,1.8,WSW,10.4,17.3,0.03,Rain-Thunderstorm,Heavy Thunderstorms and Rain,SPECI KFLG 060013Z 24009G15KT 210V280 1 3/4SM +TSRA SCT027 BKN085 18/13 A3026 RMK AO2 P0003,240,2011-07-06 00:13:00

Pingin' during hurricane Irene

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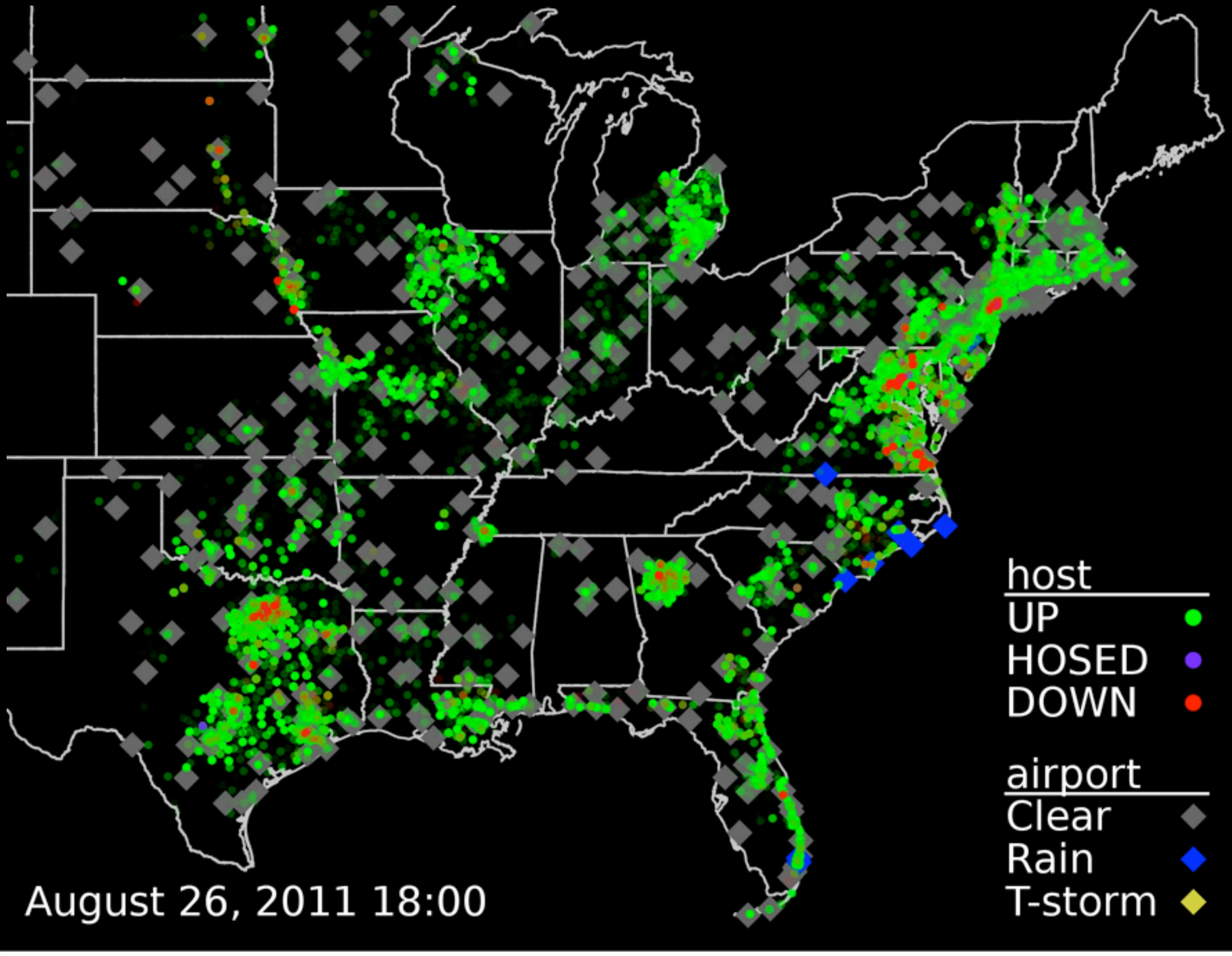
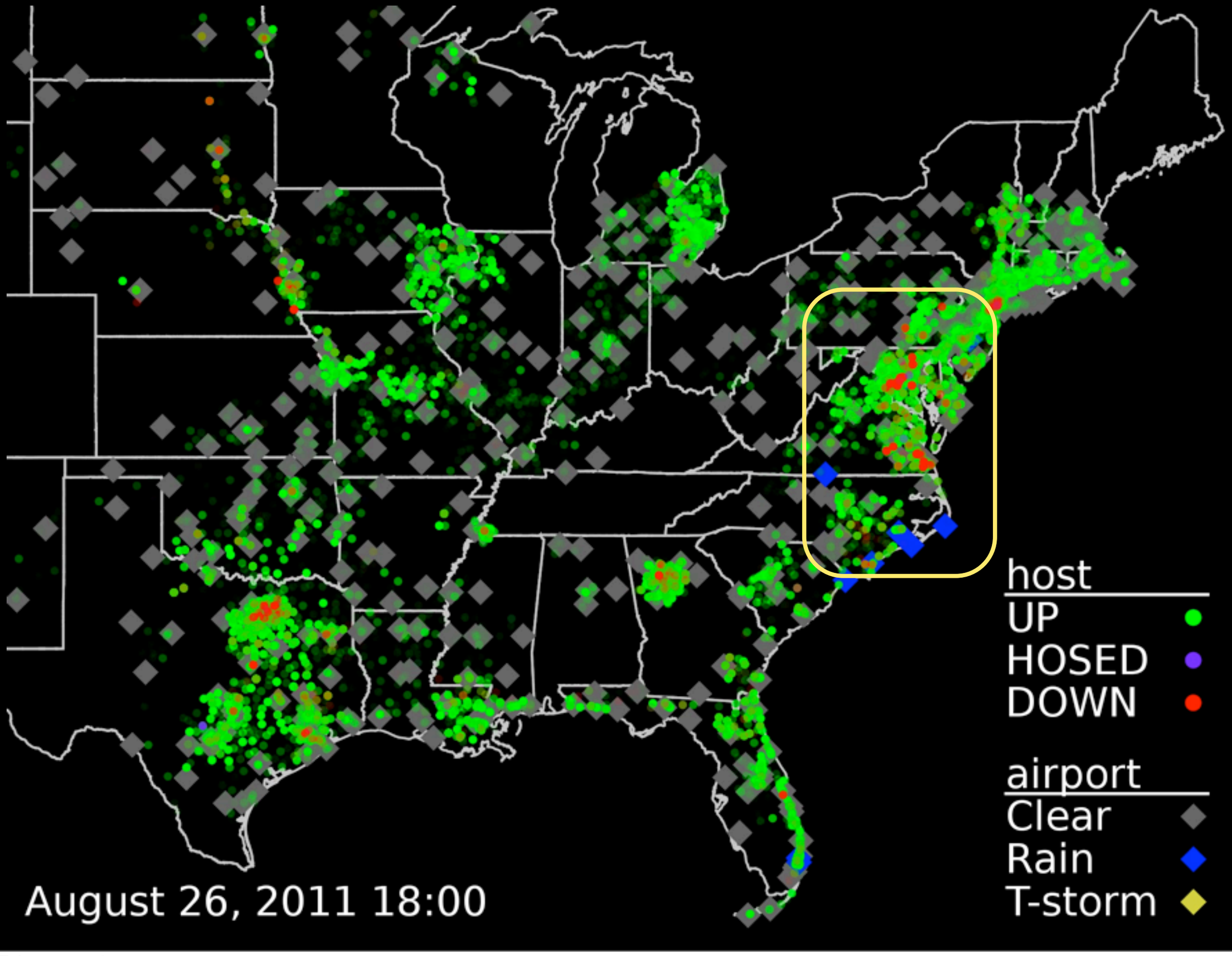


Pingin' during hurricane Irene



Preliminary results

Collected data

Pinged during 66 days (Spring - Summer 2011)

Focused on large providers with known link types

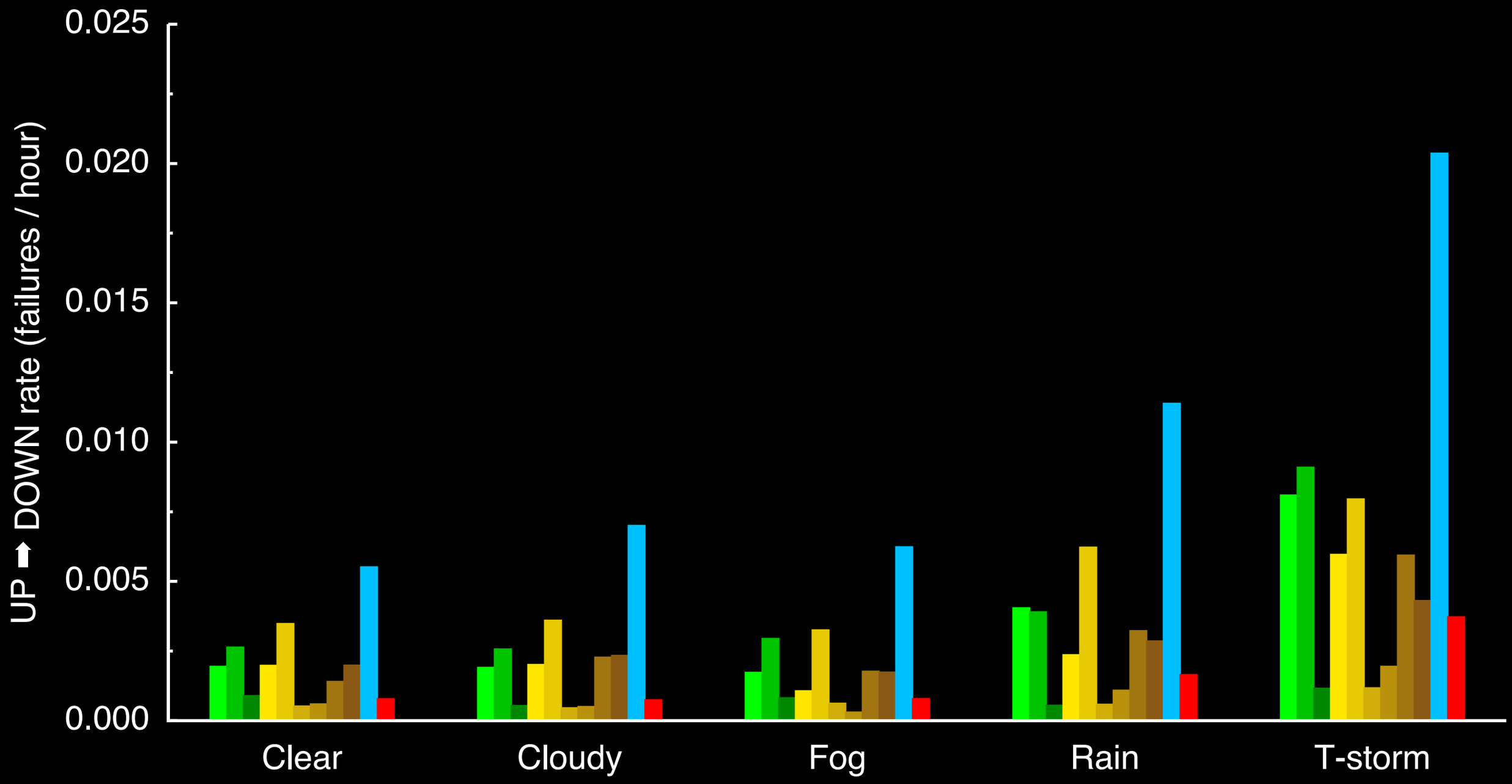
3 Cable, 6 DSL, 1 Satellite and 1 Fiber

Computed failure (UP ➡ DOWN) rate for each provider

$$\frac{\sum \#\ \text{failures}_{IP}}{\sum \text{time observed}_{IP}}$$

UP ➡ DOWN failures

Charter
Comcast
Cox
Ameritech
CenturyLink
MegaPath
Speakeasy
Windstream
Verizon DSL
WildBlue
Verizon FiOS



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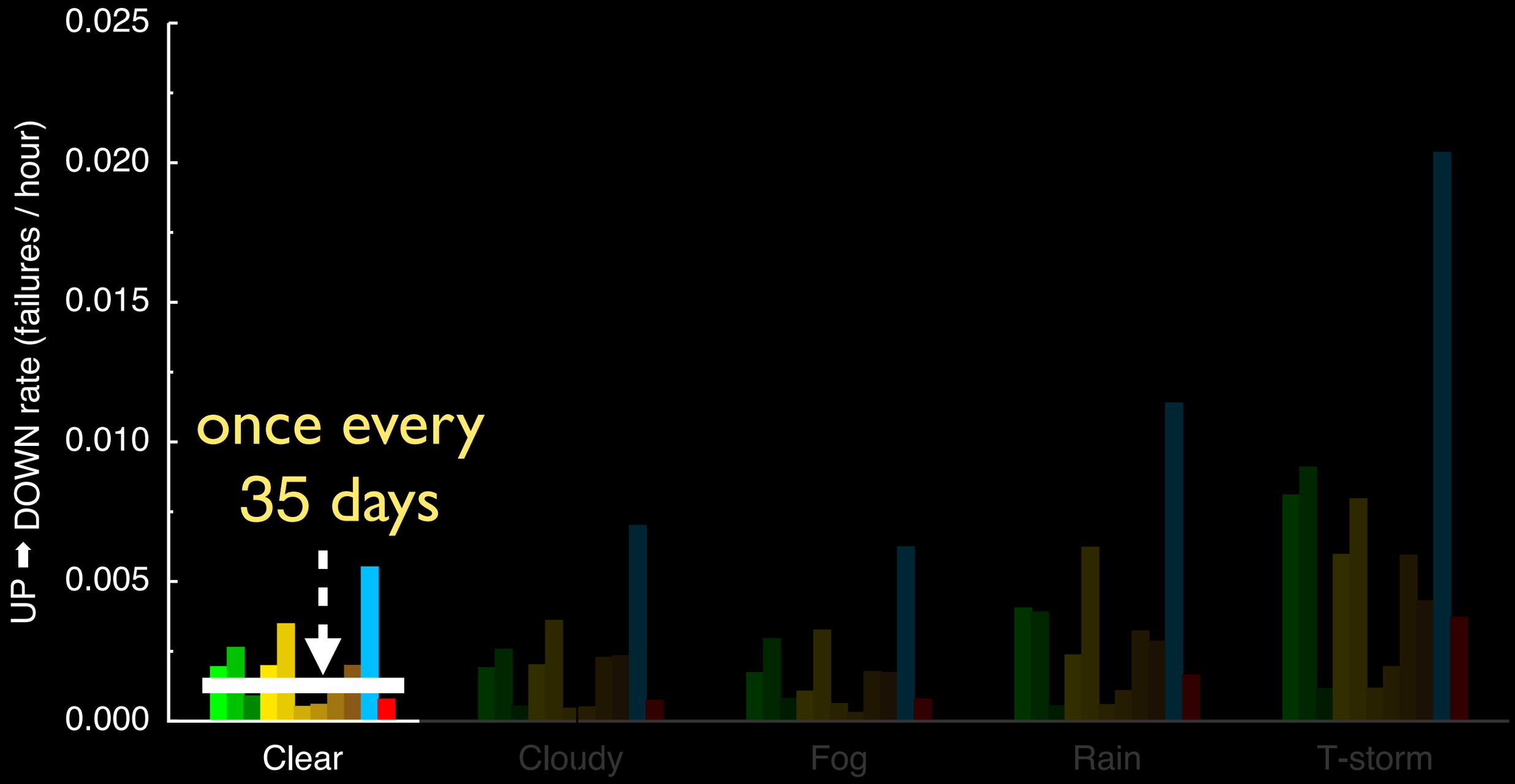

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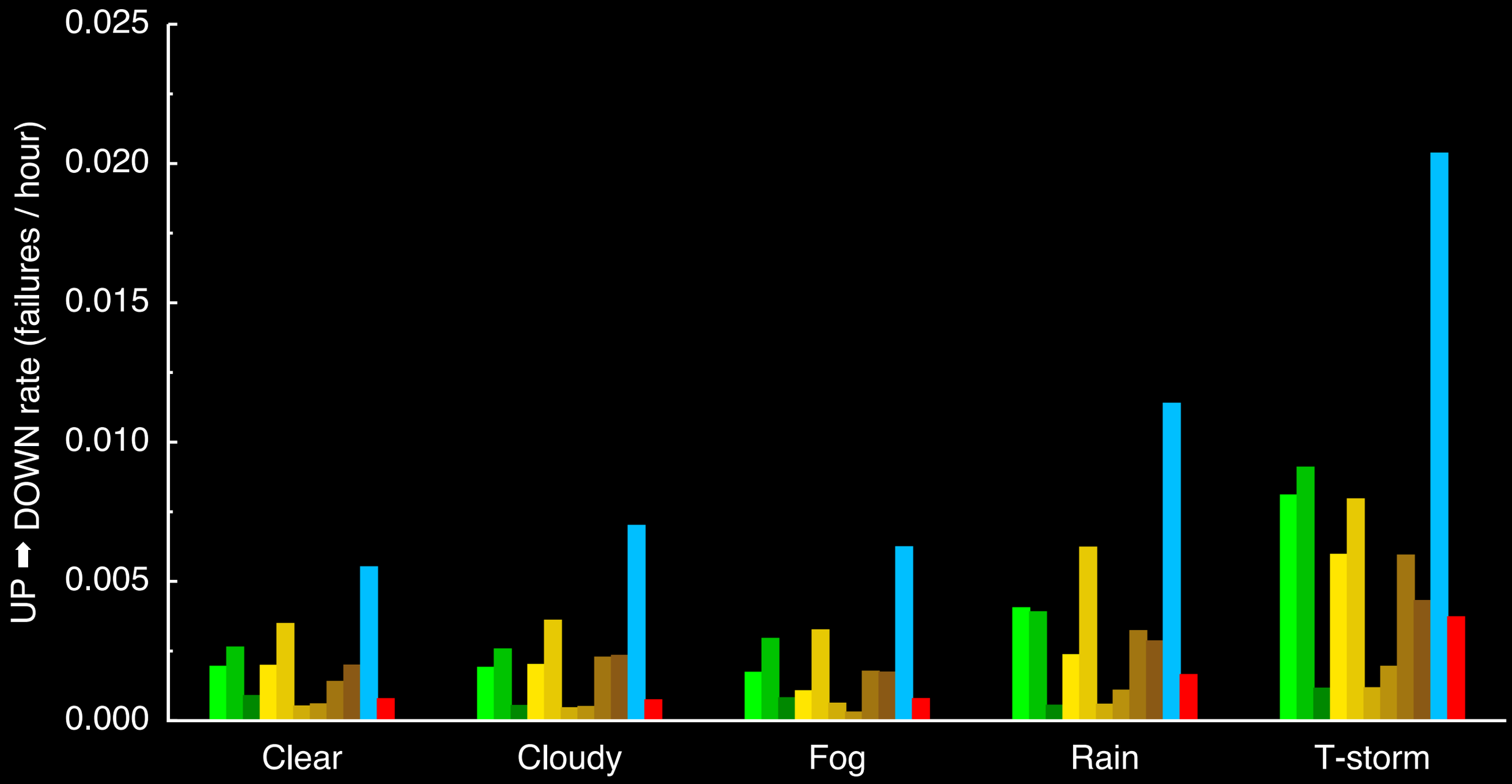

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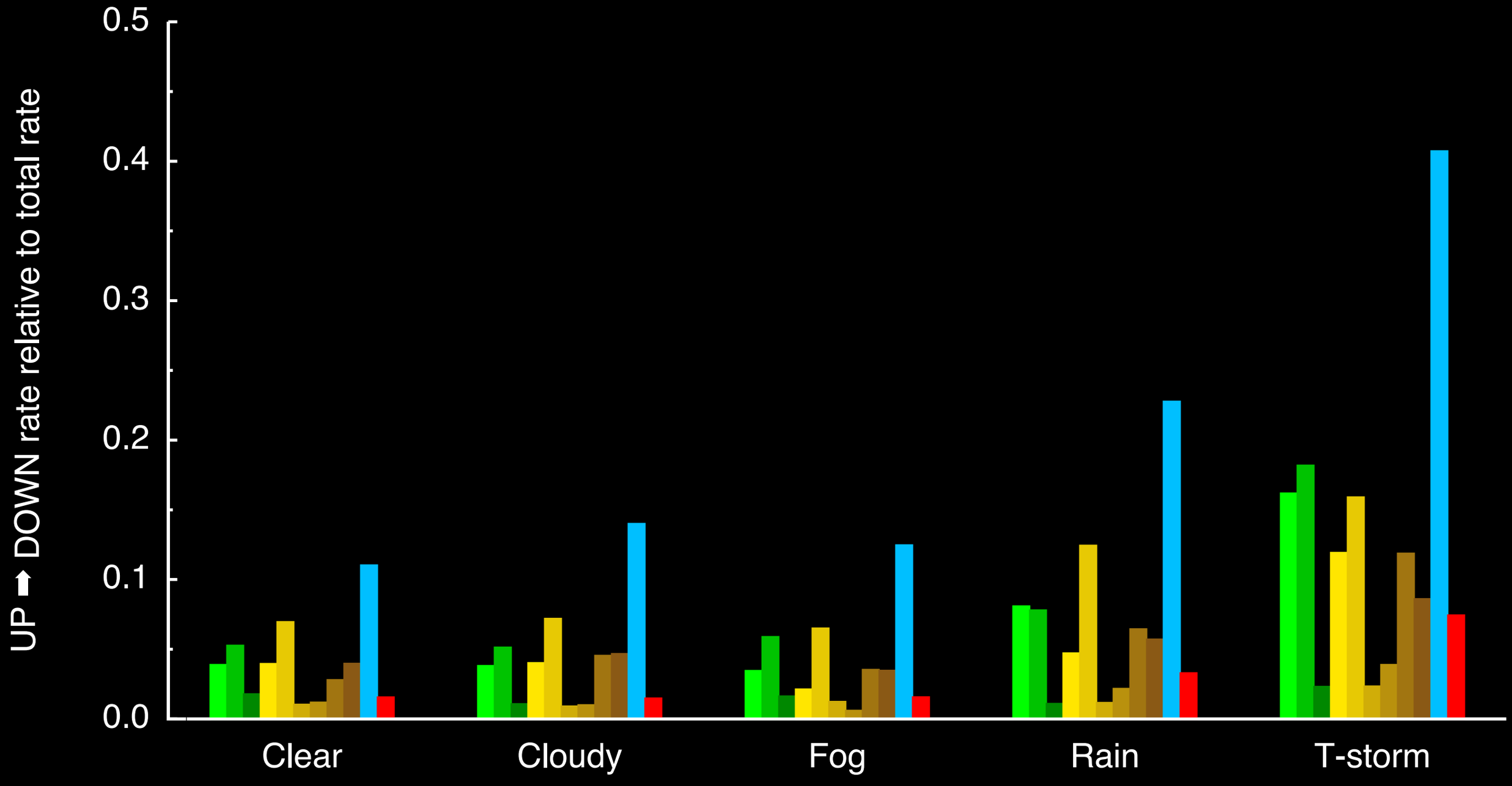

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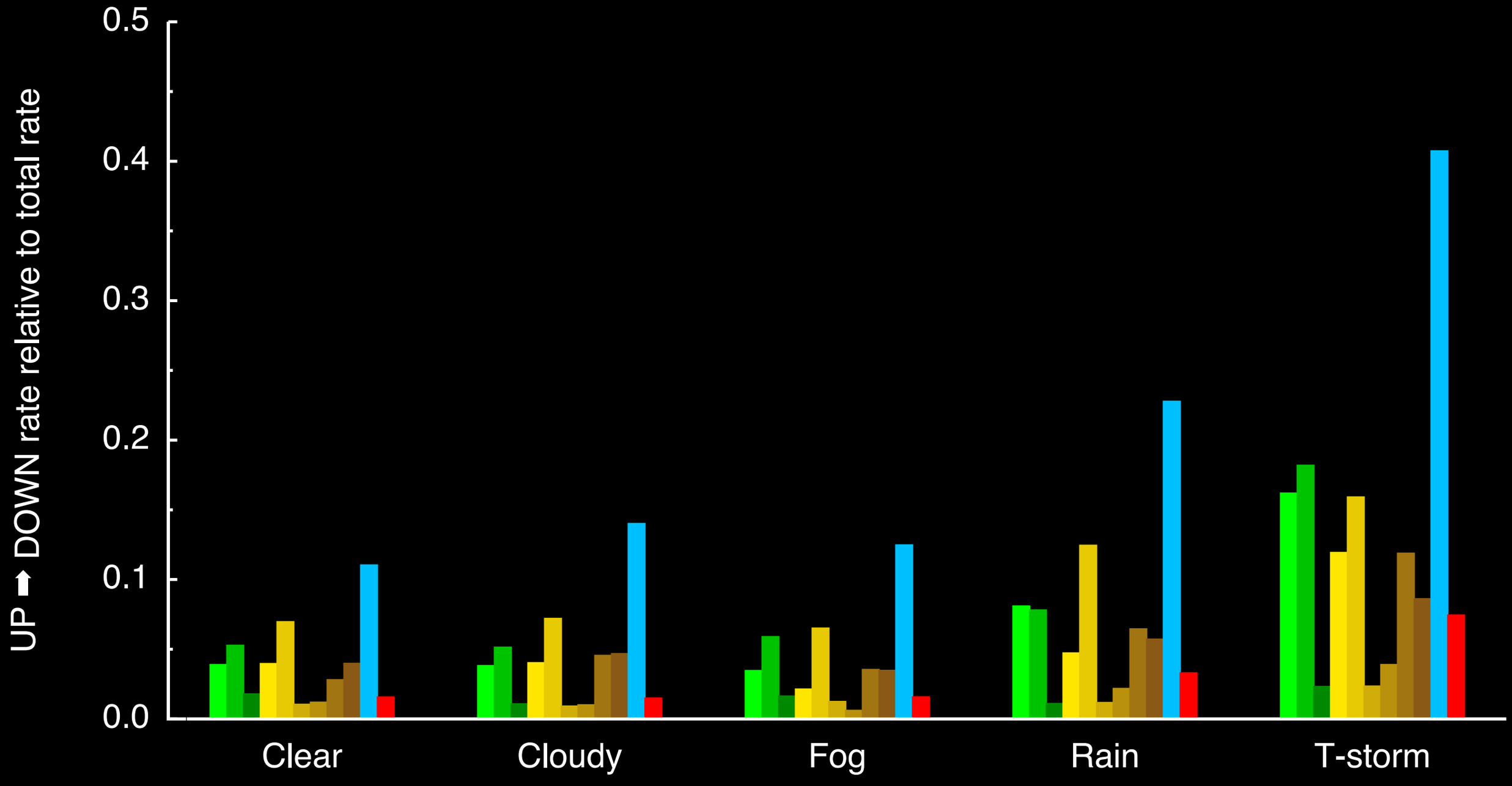

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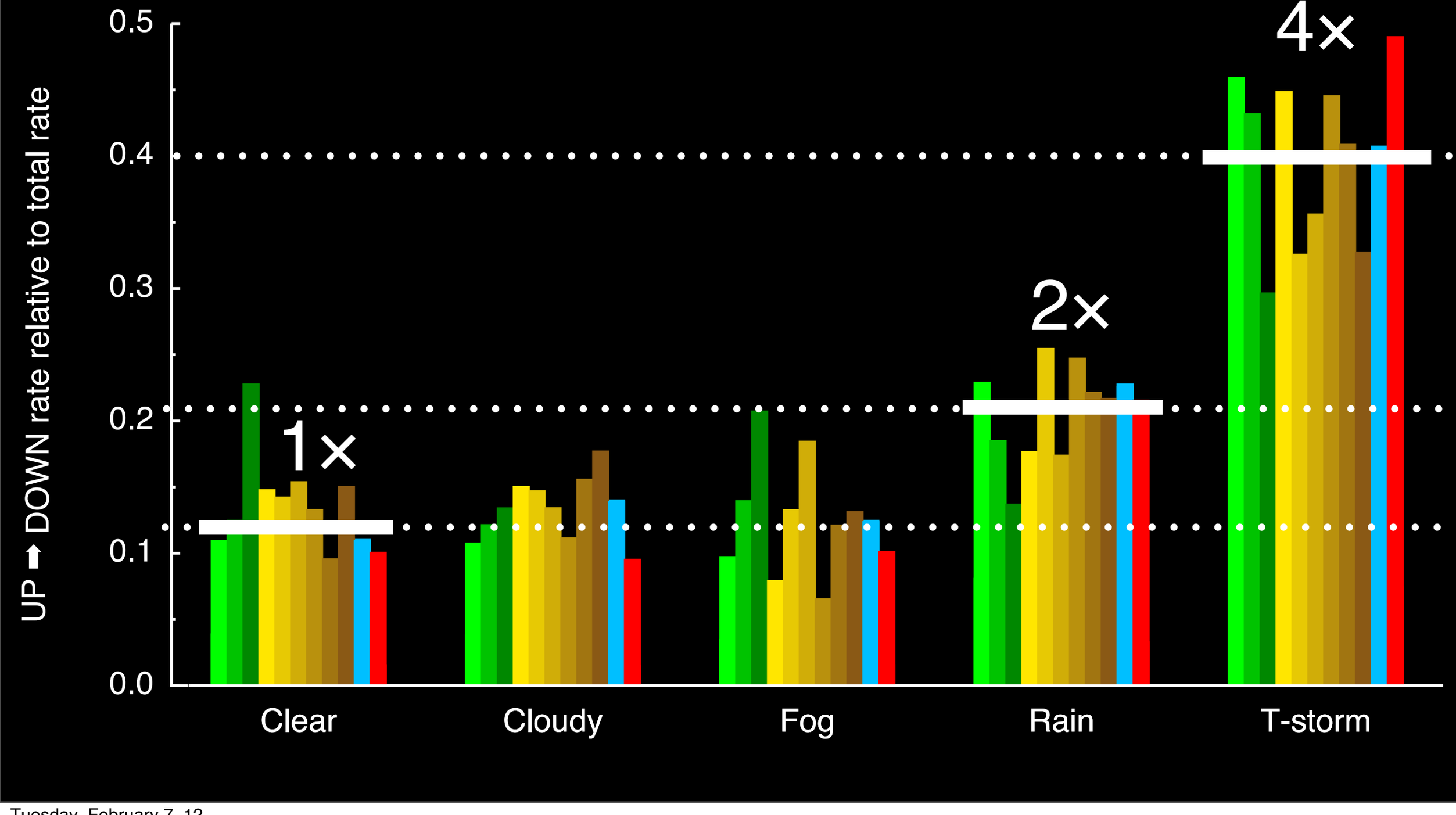

Questions for you

How can we tell the difference between a power failure and a network failure?

How does routine weather affect your network?

How are you monitoring weather related failures?

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