Evaluating and Calculating "Five Nines"

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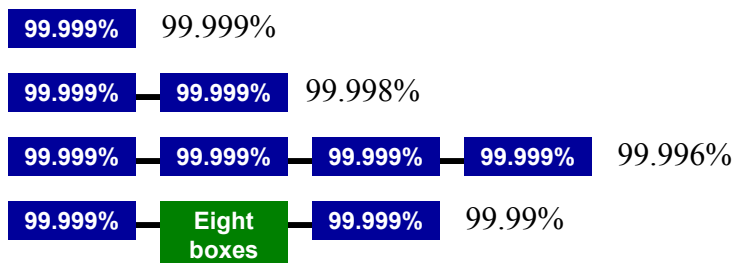# Copyright and Notices

What does "Five Nines" mean?

- Up time is at least 99.999%
- How good is 99.999%?
  - Measurement interval is one key
    - If measured yearly, less than 5.5 minutes of downtime in the year
    - If measured monthly, less than half a minute per month
    - 99.99 (four nines) measured monthly is about 4.5 minutes per month
  - Is five nines yearly or four nines monthly "better"?
  - Are there any excluded outages?
    - Usually refers to equipment failure
    - What about "busy signals
    - Check out the Frame Relay Forum's FRF.13 Implementation Agreement

How do you calculate the availability / reliability

- Components or network elements in series reduce reliability
  - Any single failure causes a system failure
  - Calculated by multiplying the reliability of each element

99.999%	99.999%

99.999%

99.999%	99.999%

99.998%

| 99.999% | 99.999% | 99.999% | 99.999% |

99.996%

| 99.999% | Eight boxes | 99.999% |

99.99%

How do you calculate the availability / reliability

- Components or network elements in parallel increase reliability
  - Any single failure is protected
  - Calculated by multiplying the probability of failure for each element
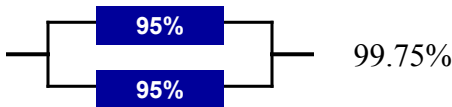
| 95% | 95% |

| 95% |
| 95% | 99.75%

How do you calculate the availability / reliability

- Components or network elements in parallel increase reliability
  - Any single failure is protected
  - Calculated by multiplying the probability of failure for each element

| 95% | 95% |

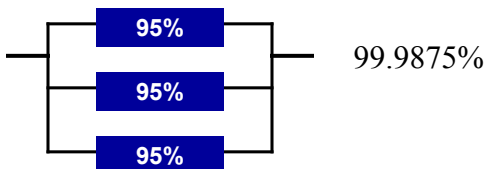| 95% |
| 95% |
| 95% | 99.9875%

How do you calculate the availability / reliability

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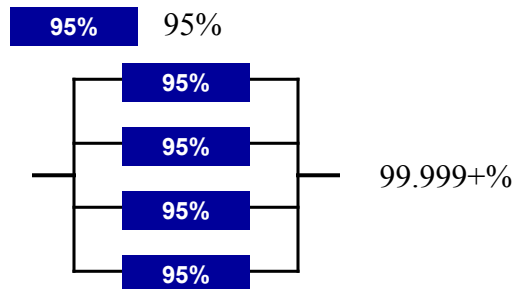
| 95% | 95% |

95%
95%
95%   99.999+%
95%
95%

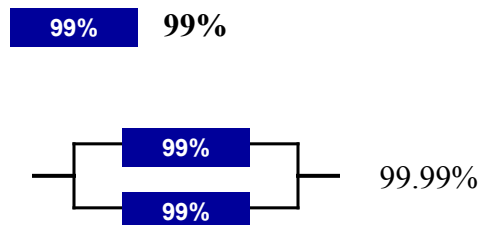# How do you calculate the availability / reliability

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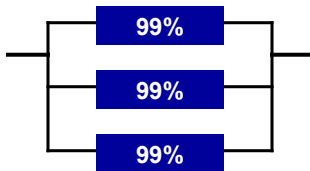
| 99% | **99%** |

99%
99%   99.99%

How do you calculate the availability / reliability

- Components or network elements in parallel increase reliability
    - Any single failure is protected
    - Calculated by multiplying the probability of failure for each element

99%   99%

99.9999% - "Six nines"

The bottom line on five nines

- Make sure you do the arithmetic
- Look for parallel elements in
    - The LAN?
    - Station equipment?
    - Local switching equipment
    - Network access
    - The WAN network
- Traditional telephony tends to be based on circuit switching
    - A failure means you redial
- Most packet switching architectures do automatic rerouting in the event of failure