**Sector failure calibration against vanilla Poisson arrivals of document failures**

RBLandau 20180403, 20180519

| | | |
|---|---|---|
| sector half-life | 10 | megahours |
| sector half-life in hours | 10,000,000 | hours |
| ln(2) constant | 0.693147181 | |
| sector mean lifetime = half-life / ln(2) | 14,426,950 | hours |
| sector failure rate per hour | 6.93147E-08 | |
| length of simulation | 10 | years (metric years) |
| length of simulation | 100,000 | hours |
| sector failure rate over length of simulation | 0.006931472 | (=mu) |
| size of disk | 1 | TB |
| sector size | 1 | MB |
| number of sectors | 1,000,000 | |
| document size | 50 | MB |
| sectors per document | 50 | |
| documents per sector | 0.02 | |
| documents per disk | 10,000 | assuming disk is half full |

Poisson calcs for sectors:

| | | |
|---|---|---|
| lambda = mu*t | 0.006931472 | per sector over length of simulation |
| exp(-lambda) | 0.993092495 | =Pr{sector with zero sector failures} |
| 1-(exp(-lambda)) | 0.006907505 | =Pr{sector with some failures} |
| times number of docs | 6908 | =Expected number of failed sectors |

Poisson calcs for documents with disk half-full

| | | |
|---|---|---|
| lambda = mu*t | 0.34657359 | per doc over length of simulation |
| exp(-lambda) | 0.70710678 | =Pr{doc with zero sector failures} |
| 1-(exp(-lambda)) | 0.29289322 | =Pr{doc with some failures} |
| times number of docs | 2,929 | =Expected number of failed docs |

**Percent of docs lost, by sector half-life (across) and simulation length (down)**

| 29 | 2 | 3 | 5 | 10 | 20 | 30 | 50 | 100 | 200 | 300 | 500 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 16 | 11 | 7 | 3 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| **2** | 29 | 21 | 13 | 7 | 3 | 2 | 1 | 1 | 0 | 0 | 0 | 0 |
| **3** | 41 | 29 | 19 | 10 | 5 | 3 | 2 | 1 | 1 | 0 | 0 | 0 |
| **5** | 58 | 44 | 29 | 16 | 8 | 6 | 3 | 2 | 1 | 1 | 0 | 0 |
| **10** | 82 | 69 | 50 | 29 | 16 | 11 | 7 | 3 | 2 | 1 | 1 | 0 |
| **20** | 97 | 90 | 75 | 50 | 29 | 21 | 13 | 7 | 3 | 2 | 1 | 1 |
| **30** | 99 | 97 | 88 | 65 | 41 | 29 | 19 | 10 | 5 | 3 | 2 | 1 |

**Percent of sectors lost, by sector half-life (across) and simulation length (down)**

| 0.6908 | 2 | 3 | 5 | 10 | 20 | 30 | 50 | 100 | 200 | 300 | 500 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0.3460 | 0.2308 | 0.1385 | 0.0693 | 0.0347 | 0.0231 | 0.0139 | 0.0069 | 0.0035 | 0.0023 | 0.0014 | 0.0007 |
| **2** | 0.6908 | 0.4610 | 0.2769 | 0.1385 | 0.0693 | 0.0462 | 0.0277 | 0.0139 | 0.0069 | 0.0046 | 0.0028 | 0.0014 |
| **3** | 1.0343 | 0.6908 | 0.4150 | 0.2077 | 0.1039 | 0.0693 | 0.0416 | 0.0208 | 0.0104 | 0.0069 | 0.0042 | 0.0021 |
| **5** | 1.7179 | 1.1486 | 0.6908 | 0.3460 | 0.1731 | 0.1155 | 0.0693 | 0.0347 | 0.0173 | 0.0116 | 0.0069 | 0.0035 |
| **10** | 3.4064 | 2.2840 | 1.3767 | 0.6908 | 0.3460 | 0.2308 | 0.1385 | 0.0693 | 0.0347 | 0.0231 | 0.0139 | 0.0069 |
| **20** | 6.6967 | 4.5158 | 2.7345 | 1.3767 | 0.6908 | 0.4610 | 0.2769 | 0.1385 | 0.0693 | 0.0462 | 0.0277 | 0.0139 |
| **30** | 9.8750 | 6.6967 | 4.0736 | 2.0580 | 1.0343 | 0.6908 | 0.4150 | 0.2077 | 0.1039 | 0.0693 | 0.0416 | 0.0208 |