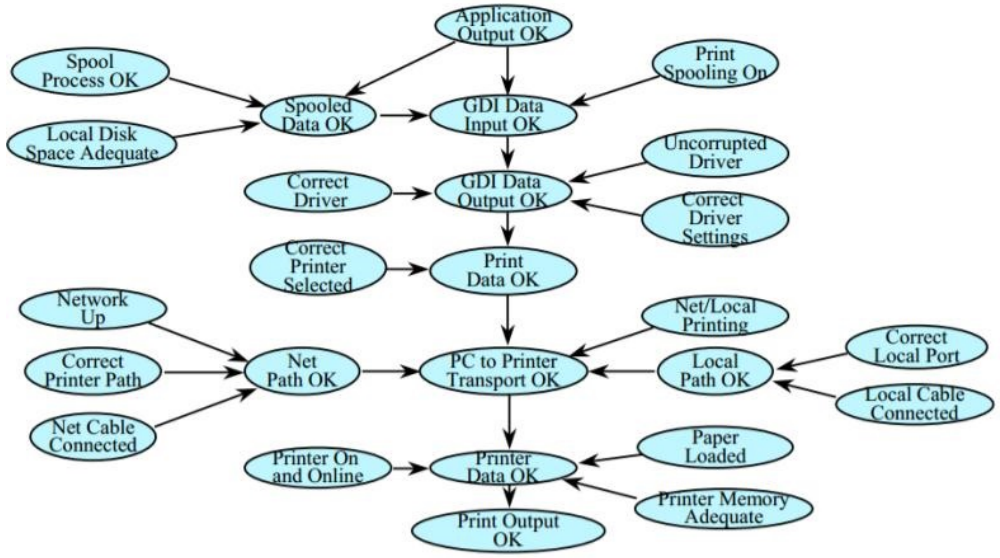
Task 2

March 22, 2018

We need to estimate, how many states need to be specified, consider the following decomposition:



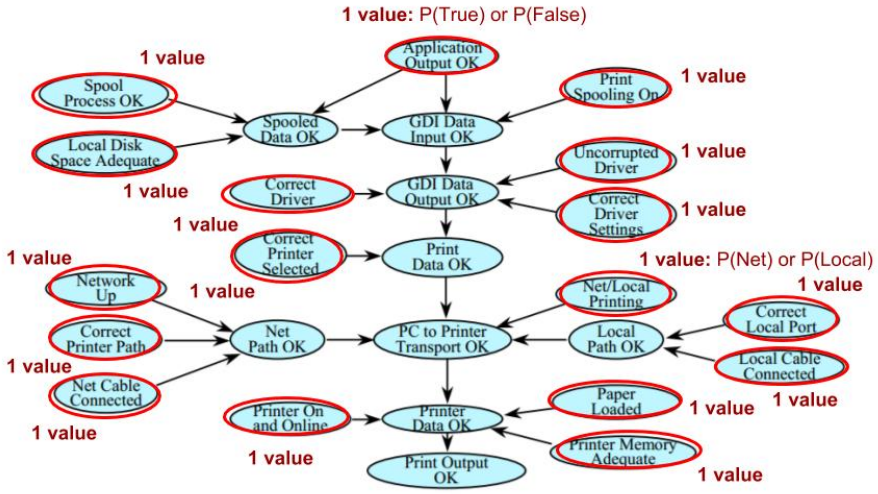
To calculate the number of values to specify we will need the following **formulas**:

- Conditional probability: $P(x_1, x_2, ..., x_n) = P(x_1|x_2, ..., x_n) \cdot P(x_2, ..., x_n)$
- Joint probability for independent events:$P(x, y) = P(x) \cdot P(y)$

Assumptions:
All state's probability have binary outcome.
Step 1: At first we need to calculate probability of states with incoming degree equal to 1:

1. Spool Process OK
2. Local Disk Space Adequate
3. Network Up
4. Correct Printer Path
5. Net Cable Connected
6. Application Output OK
7. Print Spooling On

8. Oncorrupted Driver
9. Connect Driver Settings
10. Correct Local Port
11. Local Caple Connected
12. Paper Loaded
13. Printer Memory Adequate
14. Printer On and Online
15. Net/Local Printing
16. Correct Driver
17. Correct Printer Selected



Totally, 17 values

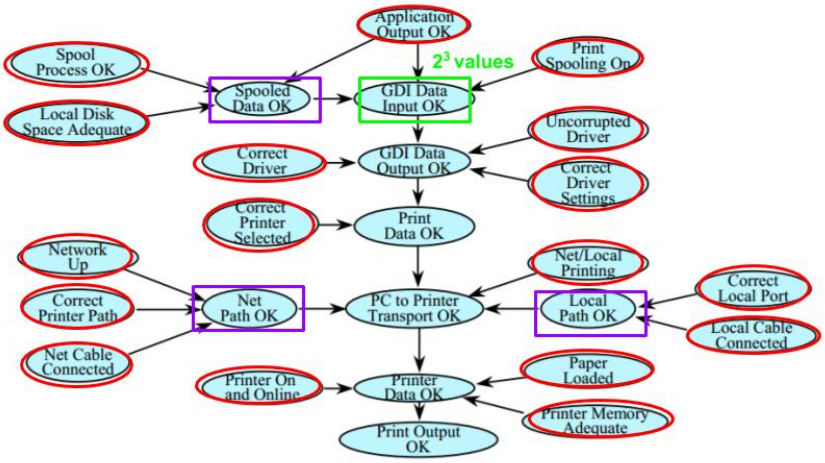
Step 2. Let's calculate required values of conditional probabilities for vertex for which all incoming probabilities had been already calculated:

1. $P(SpooledDataOk|LocalDiskAdequate, SpoolProcessOk, ApplicationOutput)$ — $2^3 values$ (each parameter can be in two state).
2. $P(NetPathOk|NetworkUp, CorrectPrinterPath, NetCableConnection) - 2^3 values$
3. $P(LocalPathOK|CorectLocalPort, CorrectConnection) - 2^2 values$

Totally, $2 \cdot 2^3 + 2^2 = 20$ values

Step 3.

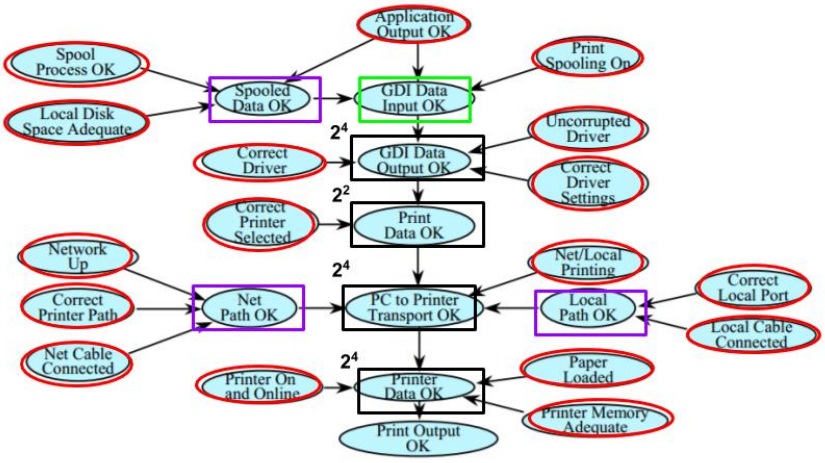
GDT Data OK - 2^3 values



Totally, 8 values

Step 4-7. Further we will calculate sequentially:

1. GDT Data Output - 2^4 values
2. Print DAta OK - 2^2 values
3. PC to Print Transport OK - 2^4 values
4. Printer Data OK - 2^4 values



Totally, $16 + 4 + 16 + 16 = 52$ values

Step 8. $P(PrintOutputOK|...) = P(PrintOutputOK|PrinterDataOK) \cdot P(PrinterDataOK)$ So, $Values\_number(PrintOutputOK|...) = Values\_number(PrintOutputOK|PrinterDataOK) + Values\_number(PrinterDataOK) = Values\_number(PrintOutputOK|PrinterDataOK) + 2 = ... = 17 + 20 + 8 + 52 + 2 = 99$.

Answer: 99 values need to be calculated.