

Sec. 2.4

Old formula : capacity = $\frac{A_{total}}{A_{cell}} \times \frac{S}{N}$

Annotations:
 - $\frac{S}{N}$ is circled in orange with an arrow pointing to "channels per cell."
 - $\frac{S}{N}$ is also circled in orange with an arrow pointing to "usually S".
 - $\frac{A_{total}}{A_{cell}}$ is circled in orange with an arrow pointing to "cells in the system".

New formula : $\frac{A_{total}}{A_{cell}} \times n \times \Delta$

Annotations:
 - $n \times \Delta$ is circled in purple with an arrow pointing to "users that a cell can support".
 - n is circled in orange with an arrow pointing to "Users that a sector can support".
 - A green arrow points from "get this from the Erlang B formula" to the purple circle.

Sectoring	No Sectoring	120°	60°
K	6	2	1
Δ	1	3	6
$\left\lfloor \frac{S}{N\Delta} \right\rfloor = m$	$\left\lfloor \frac{S}{N} \right\rfloor$	$\left\lfloor \frac{S}{N3} \right\rfloor$	$\left\lfloor \frac{S}{N6} \right\rfloor$

Erlang B formula

$$n = \frac{A}{A_u} = \frac{A}{\lambda_u \times \frac{1}{\mu}}$$

call blocking probability

$$P_b = \frac{\frac{A^m}{m!}}{\sum_{k=0}^m \frac{A^k}{k!}}$$

$A = \lambda \times \frac{1}{\mu}$

Annotations:
 - λ is labeled "call request rate (Poisson process)".
 - $\frac{1}{\mu}$ is circled in orange and labeled "average call duration".
 - An arrow labeled "x n" points from $\frac{1}{\mu}$ to $A_u = \lambda_u \times \frac{1}{\mu}$.

$X = \text{call duration}$
 $X \sim \mathcal{E}(\mu)$
 $f_x(x) = \begin{cases} \mu e^{-\mu x}, & x > 0 \\ 0, & \text{otherwise} \end{cases}$

$$f_x(x) = \begin{cases} \mu e^{-\mu x} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

$$EX = \int_{-\infty}^{\infty} x f_x(x) dx = \frac{1}{\mu} \equiv H$$

$\mu = \text{service "rate"}$