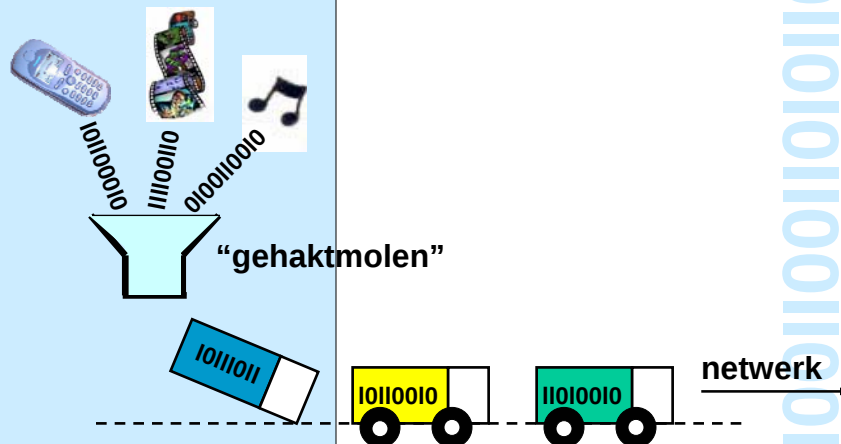


Verkeersproblemen op de digitale snelweg



Rob van der Mei

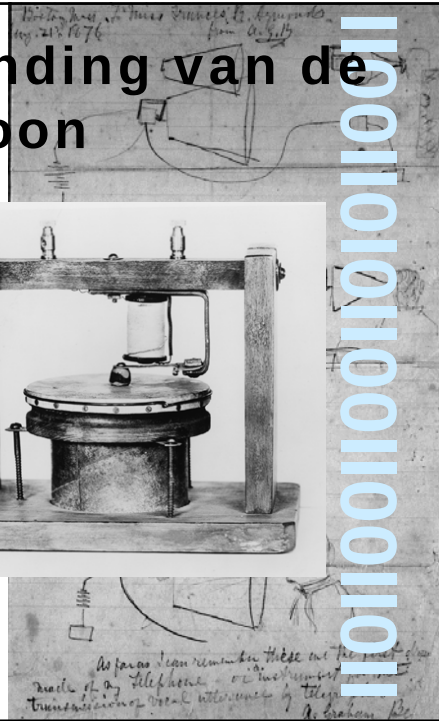
Analogie met weggennet



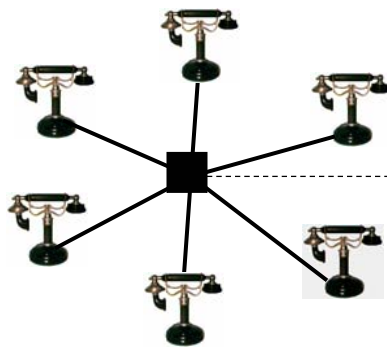
1877: De uitvinding van de telefoon



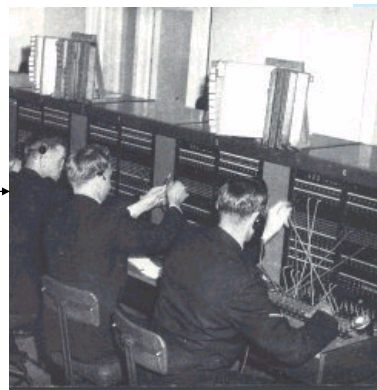
Graham Bell



Bellen wordt gemeengoed...

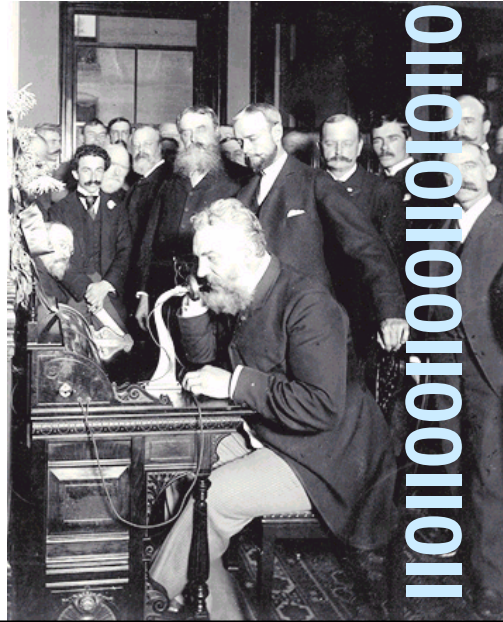
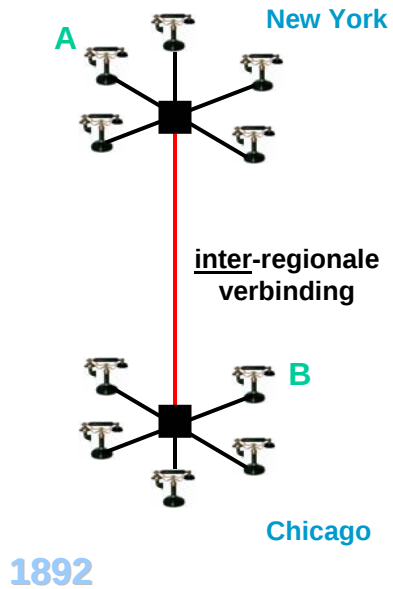


lokaal netwerk

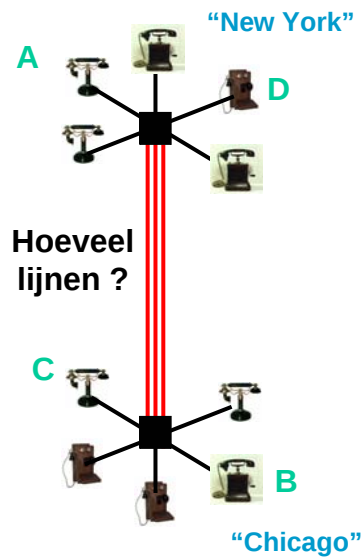


switching center

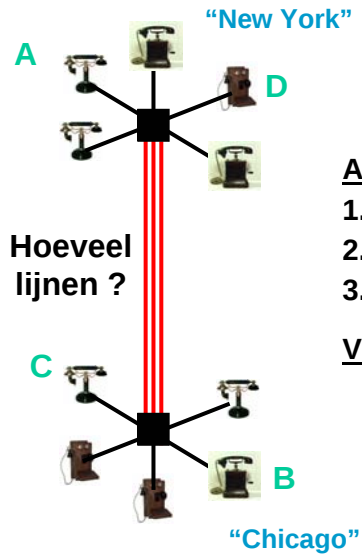
Inter-regionaal bellen...



De eerste verkeersproblemen...



De geboorte van het vakgebied...



Aannamen:

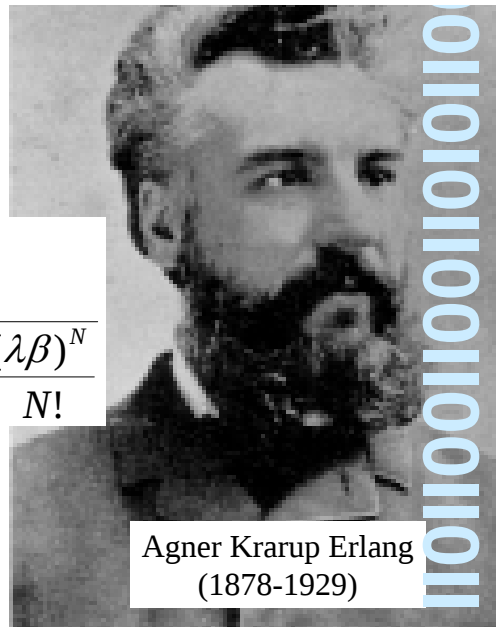
1. aantal "calls" per minuut = λ
2. gemiddelde gespreksduur = β
3. aantal lijnen = N

Vraag: wat is de blokkeringskans ?

De "Erlang blokkeringsformule"

blokkeringskans =

$$\frac{\frac{(\lambda\beta)^N}{N!}}{1 + \frac{(\lambda\beta)^1}{1!} + \frac{(\lambda\beta)^2}{2!} + \dots + \frac{(\lambda\beta)^N}{N!}}$$



Agner Krarup Erlang
(1878-1929)

1917

De technologie schrijdt voort...



radio

1920

1101100110011011011

De technologie schrijdt voort...

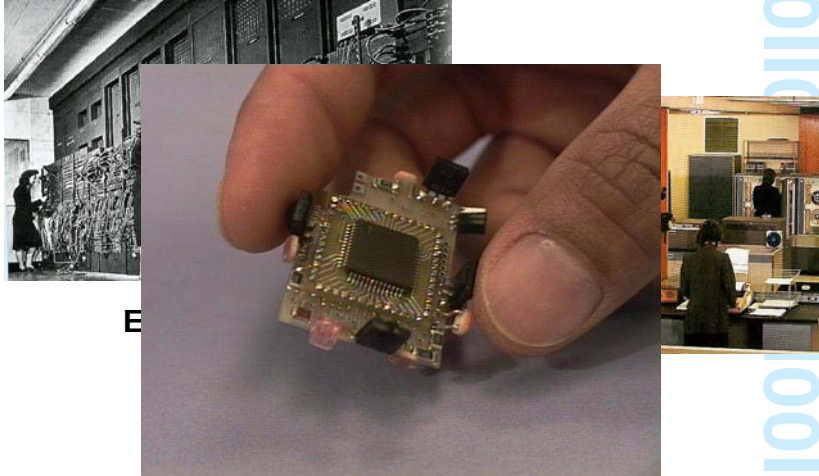


zwart-wit televisie

1950

1101100110011011011

De computer doet zijn intrede



microprocessor

1971

Personal Computer



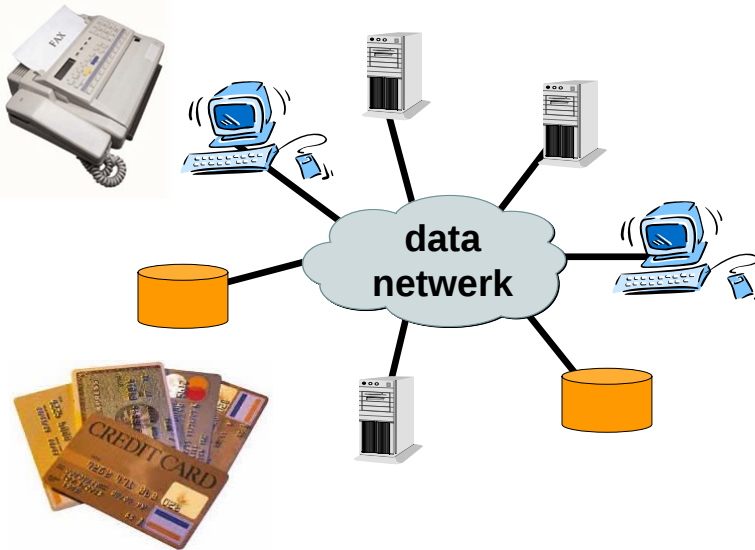
eerste Apple PC



eerste PC van IBM

1981

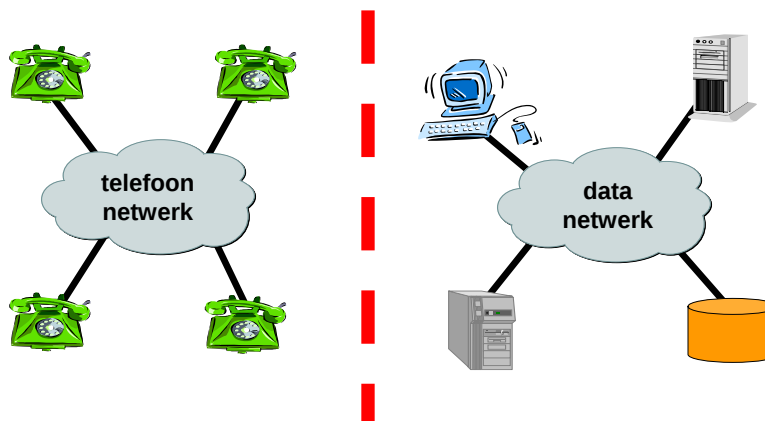
Data-comunicatie



1980

11011010110011011011

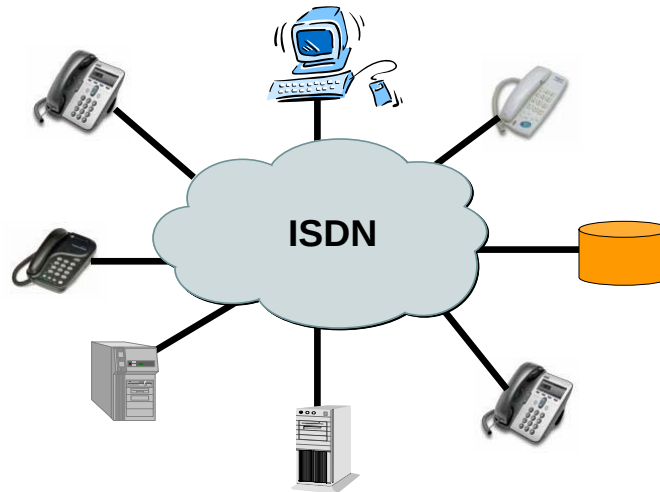
Van gescheiden netwerken...



jaren 80

11011010110011011011

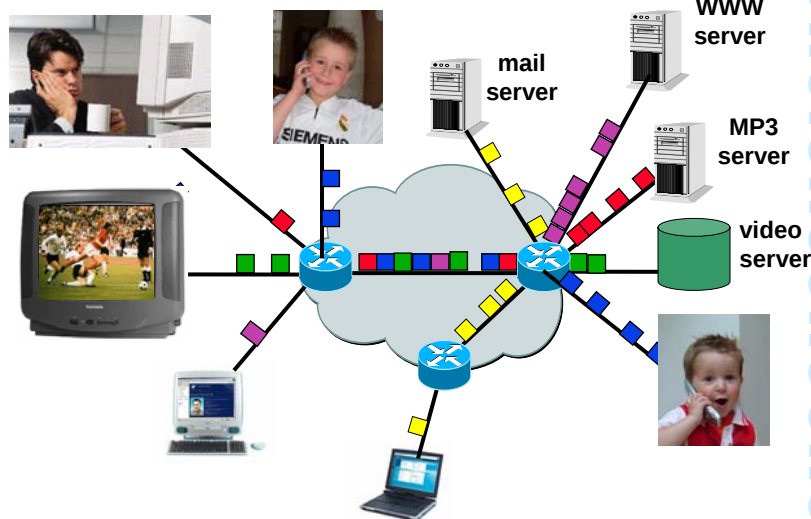
... naar geïntegreerde netwerken



jaren 80

11011010101011011

Internet



jaren 80-90

11011010101011011

Degradatie van kwaliteit



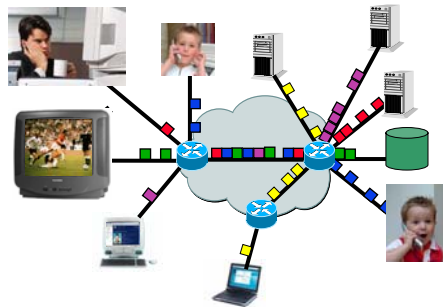
geen pakketverlies



5% pakketverlies

1988

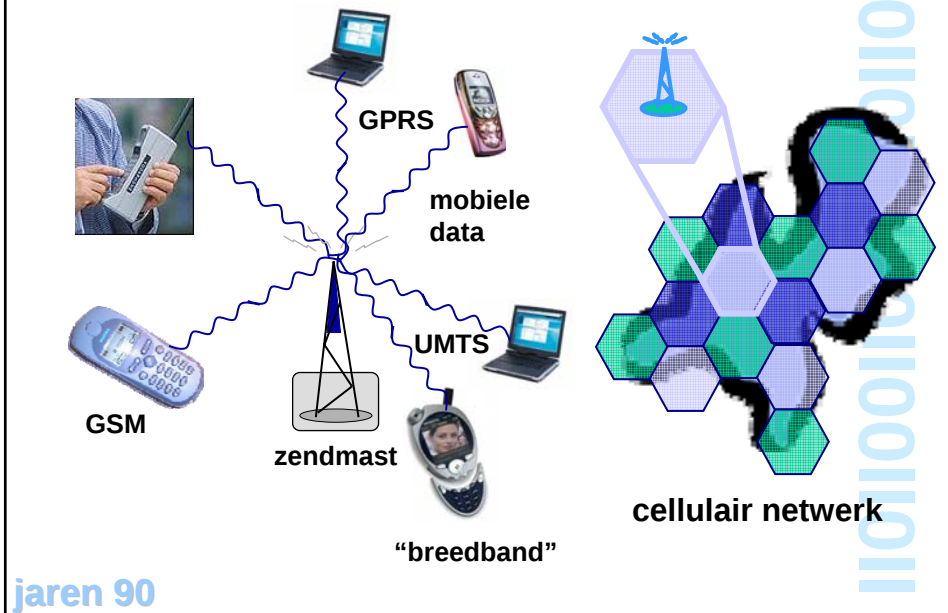
Een interessant spel...



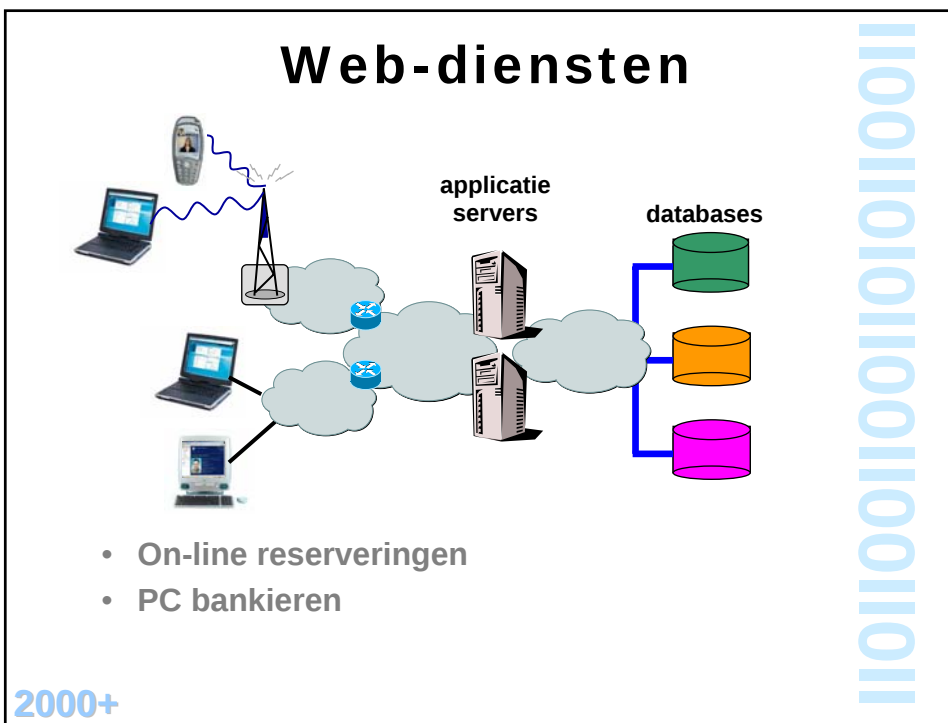
- Kwaliteitseisen per applicatie
- Voorrangsregels, prioriteitsklassen
- Feedback mechanismen
- "Best Effort": geen kwaliteitsgaranties

jaren 90

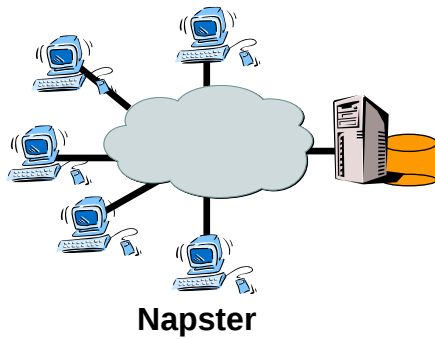
Mobiele netwerken



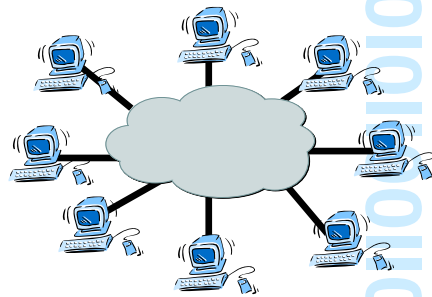
Web-diensten



Peer-to-peer netwerken



Napster

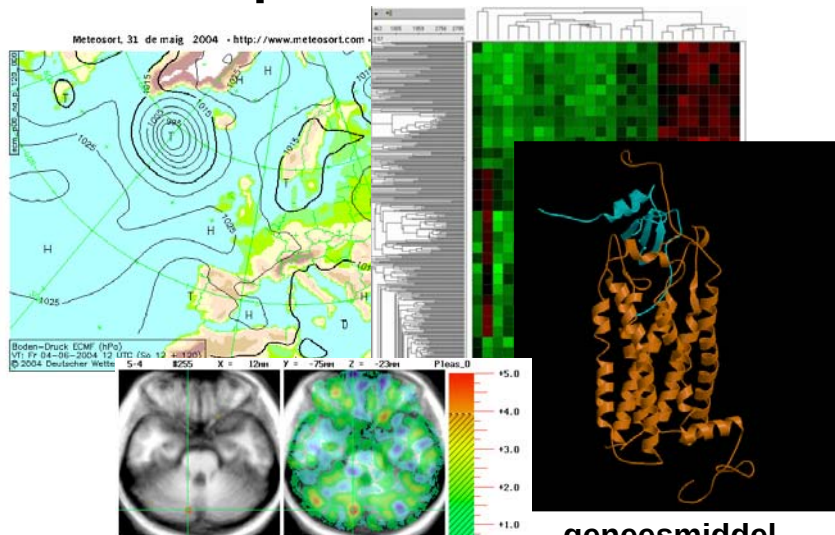


peer-to-peer

2000+

110110011011011011

Computational GRID

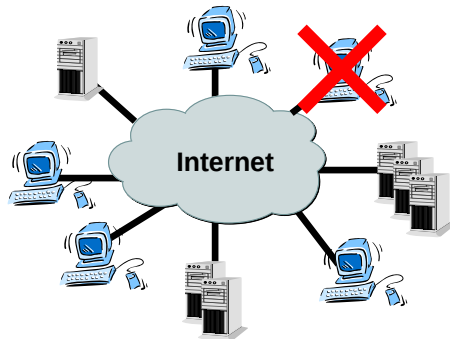


MRI scan

geneesmiddel-
onderzoek

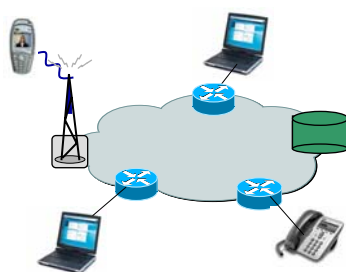
2000+

Computational GRID

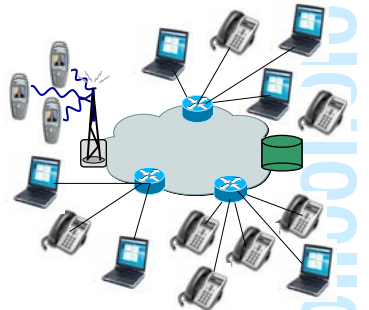


2000+

Essentie van het vakgebied



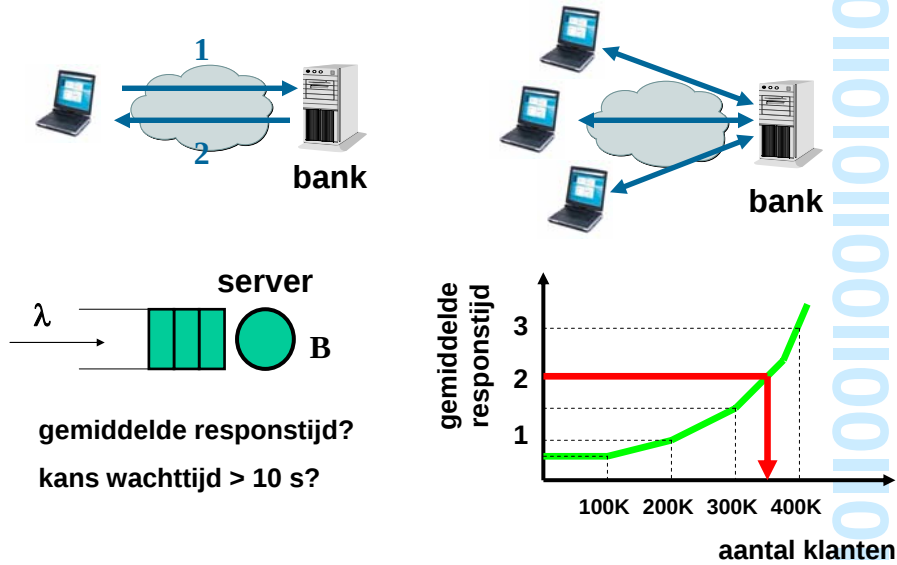
kwaliteit goed



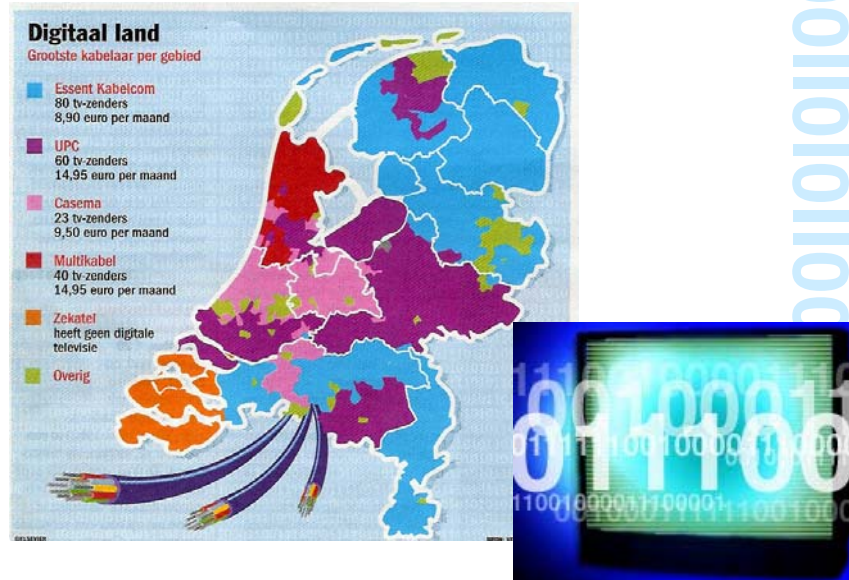
kwaliteit nog steeds goed?

Relatie tussen aantal klanten, kwaliteit en capaciteit

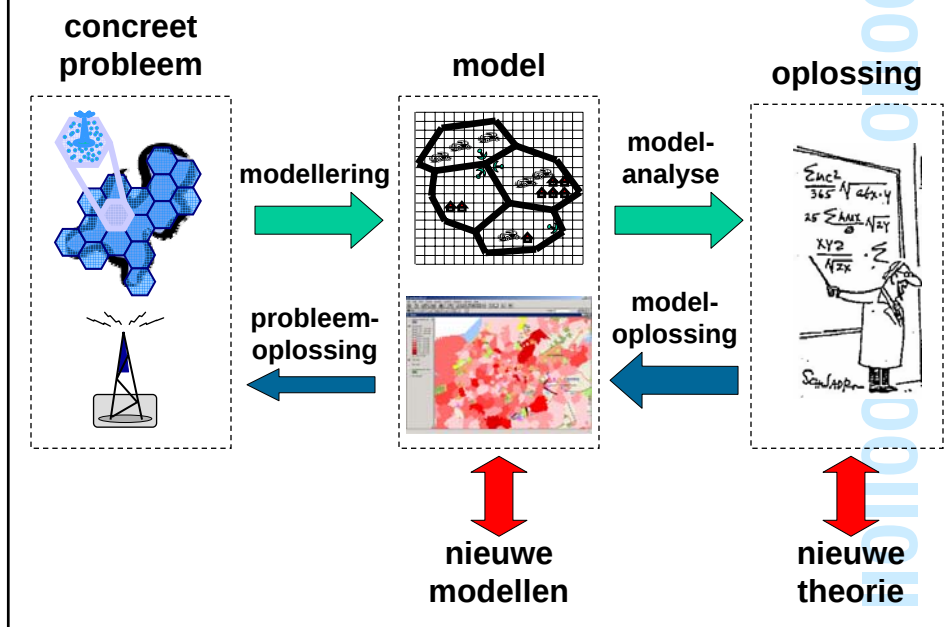
Wachtrijmodellen



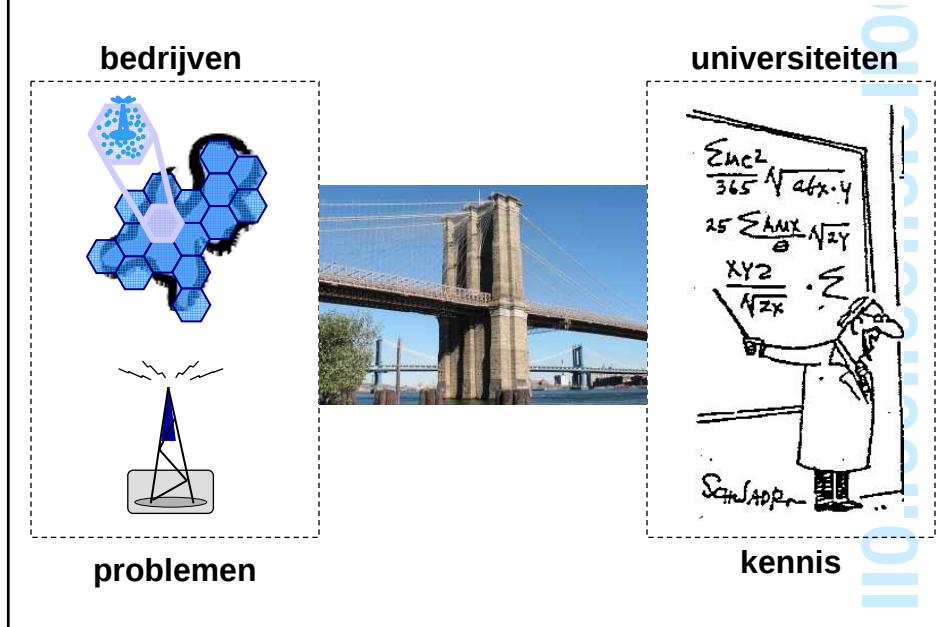
Kabelbedrijven en digitale TV



Wetenschappelijke relevantie



Brug tussen theorie en toepassing

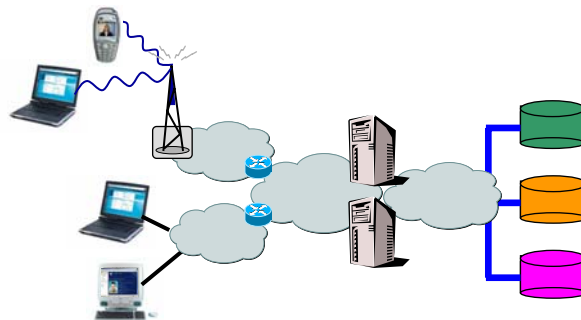


Onderwijs en Popularisering



1101100110011011011

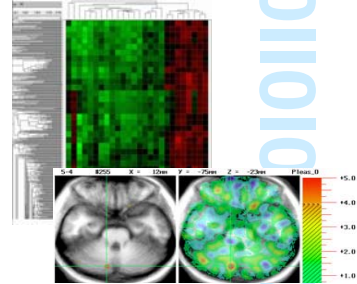
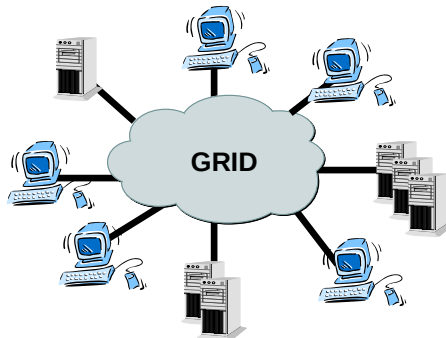
Onderzoek



“End-to-end” kwaliteit op gebruikersnivo
Kwaliteit van grootschalige software-systemen

110110101100110011011

Onderzoek



“End-to-end” kwaliteit op gebruikersnivo
Kwaliteit van grootschalige software-systemen
Robuste applicaties voor computational GRID
En nog veel meer...

Verkeersoplossingen op de digitale snelweg

