



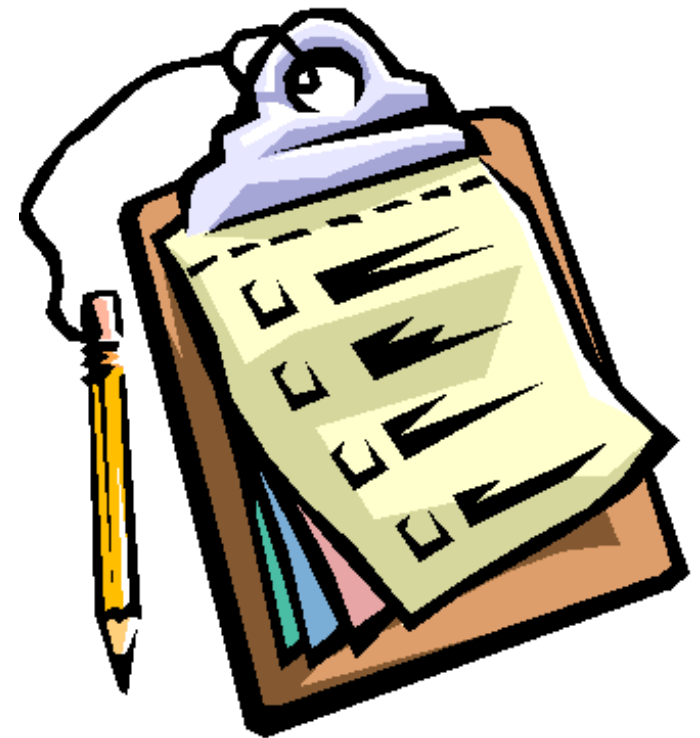
Telenor's view on traffic management

21.02.12

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Agenda

1	Telenor's view on NetNeutrality
2	Traffic development
3	Video: the dominant traffic type
4	Infrastructure investments
5	The desired Internet?
6	The need to differentiate
7	Transparent mechanisms



Telenor supports an open and sustainable Internet

- Retail: Consumers have access to information and services of their choice
- Wholesale: Providers of access and services want their end-users to have access to their service
- Sound business models yet to be developed
- Competition & customer choice



Telenor has supported the pragmatic Nordic approaches to Net neutrality

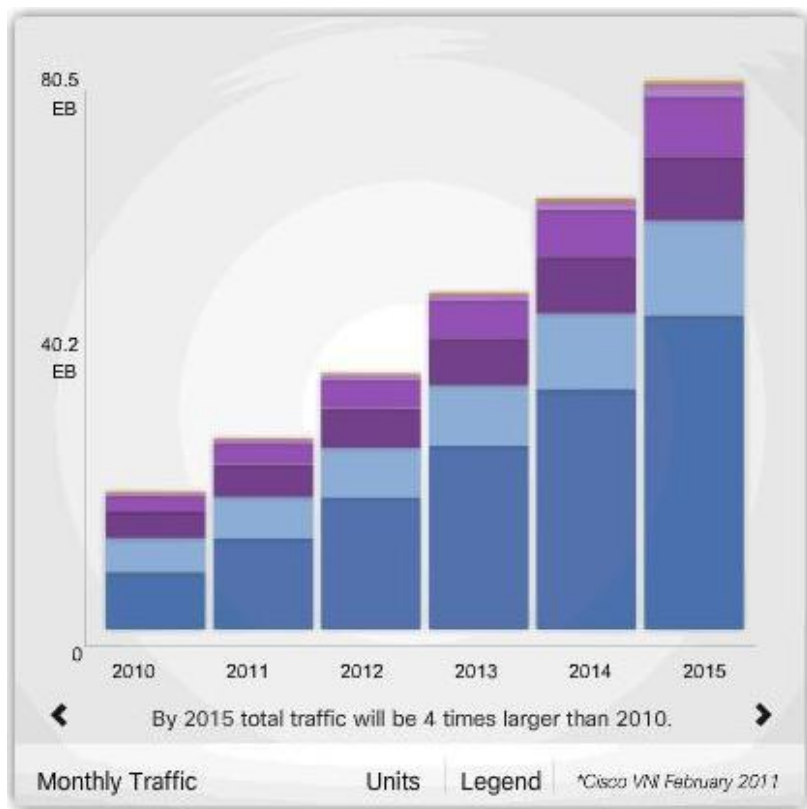
Norwegian guidelines

- ✓ Internet users are entitled to an Internet connection with a predefined capacity and quality
- ✓ Internet users are entitled to an Internet connection that enables them to
 - send and receive content of their choice
 - use services and run applications of their choice
 - connect hardware and use software of their choice that do not harm the network
- ✓ Internet users are entitled to an Internet connection that is free of discrimination with regard to type of application, service or content or based on sender or receiver address

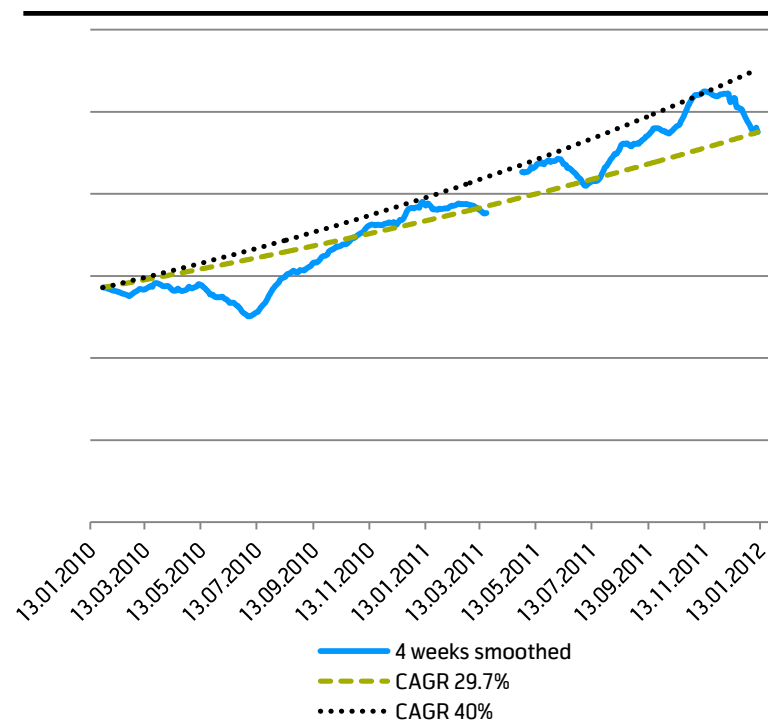
- Basis for common understanding
- Focus on customers rights
- Positive side effects for all stakeholders

Internet traffic growth – CAGR fixed 40%; mobile 100%

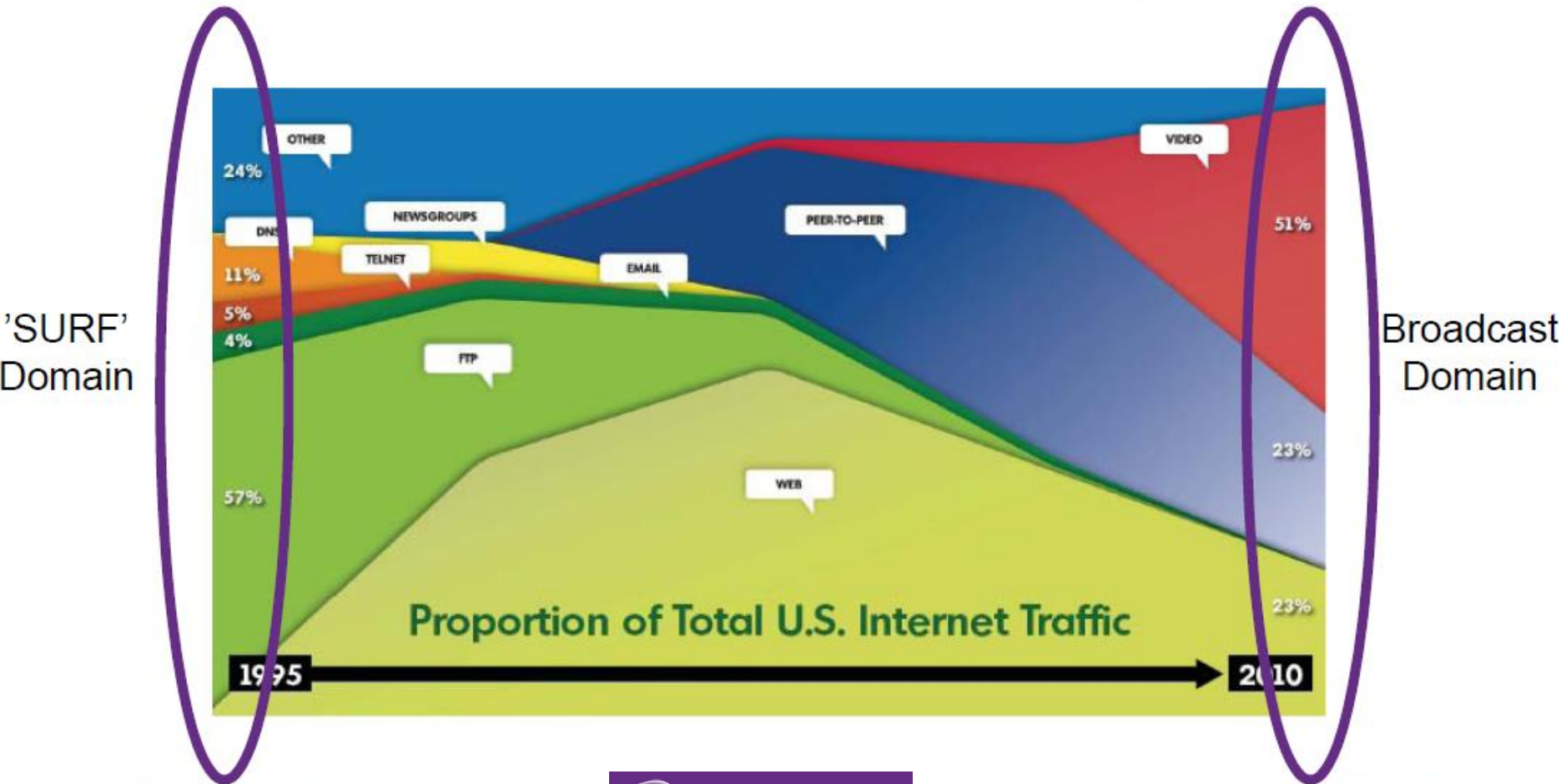
Telenor experiences growth in line with Cisco projections



Traffic development Telenor IP network Scandinavia



Video is taking over as the predominant traffic type on the Internet – content providers are targeting eyeballs



Eyeballs need Content
(Eyeballs have the \$\$\$)

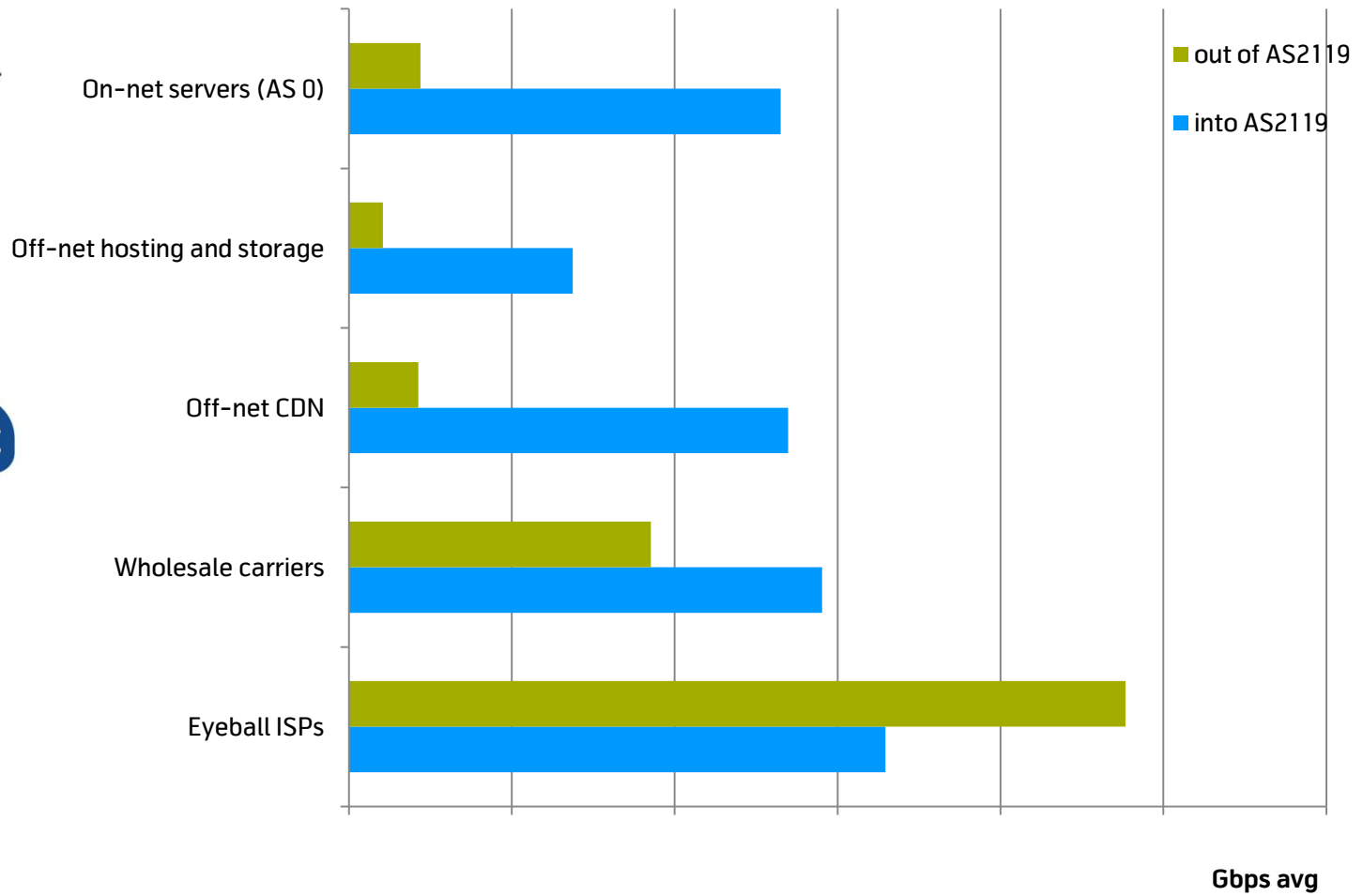


Content needs Eyeballs
(Content has the \$\$\$)



Video is taking over, and cloud services are increasing rapidly

Most of the traffic in Telenor IP network comes from CDNs and cloud-players



Gbps avg



All international TV broadcasters have an extensive web-TV offering, including Nordic players



- Leading web-TV player in the Nordic region > 3 Petabyte/month
- Uses Qbrick as CDN today. Is currently running RFI/FRQ for content delivery



- Leading web-TV player in Norway > 1,3 Petabyte/month (archive OTT only)
- Uses Akamai CDN for broadcast over internet, Telenor CDN for archive TV



- Almost 2 billion streams in 2011
- 7 million programme requests through connected TVs, >1000%/year-on-year

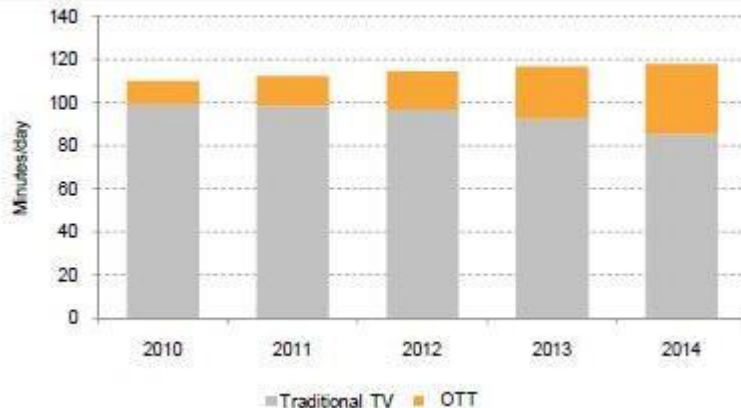


- Already accounts for >30% of peak data traffic in the US
- US Netflix users consume an average of 8 hours of video per week (20Million in the US)
- Has just launched in the UK and Ireland



- World's largest "TV" company?
- Uses own CDN in the Nordic region

Consumed TV for age group 15-25



Question : as more and more TV-traffic is distributed via the internet – are current internet business models sustainable?



2nd screen, HW-players and media players drive a huge growth in video distribution over the Internet

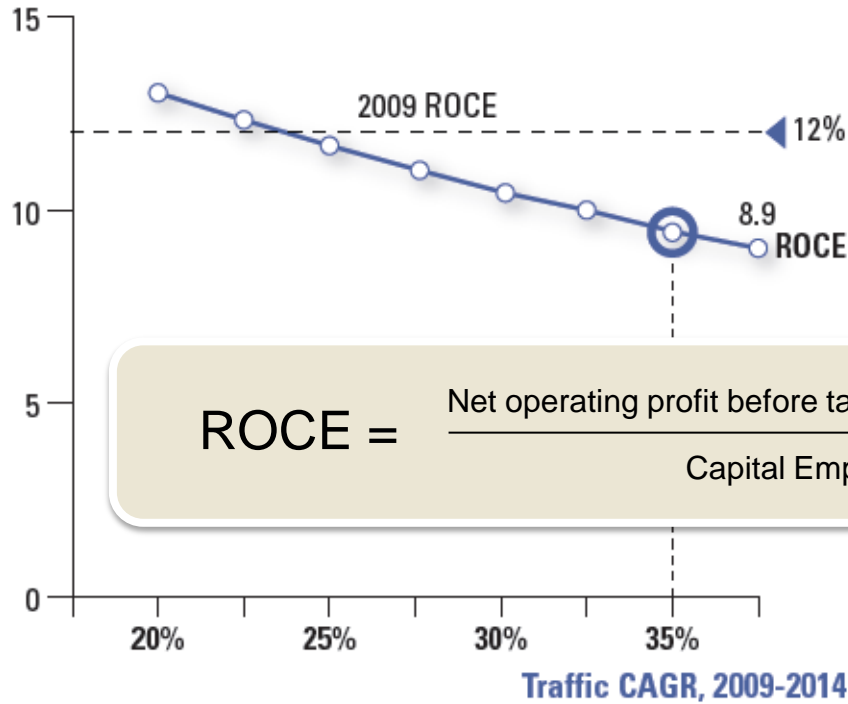


Nu kan du se
EXPRESSEN TV
live - i din
iPad

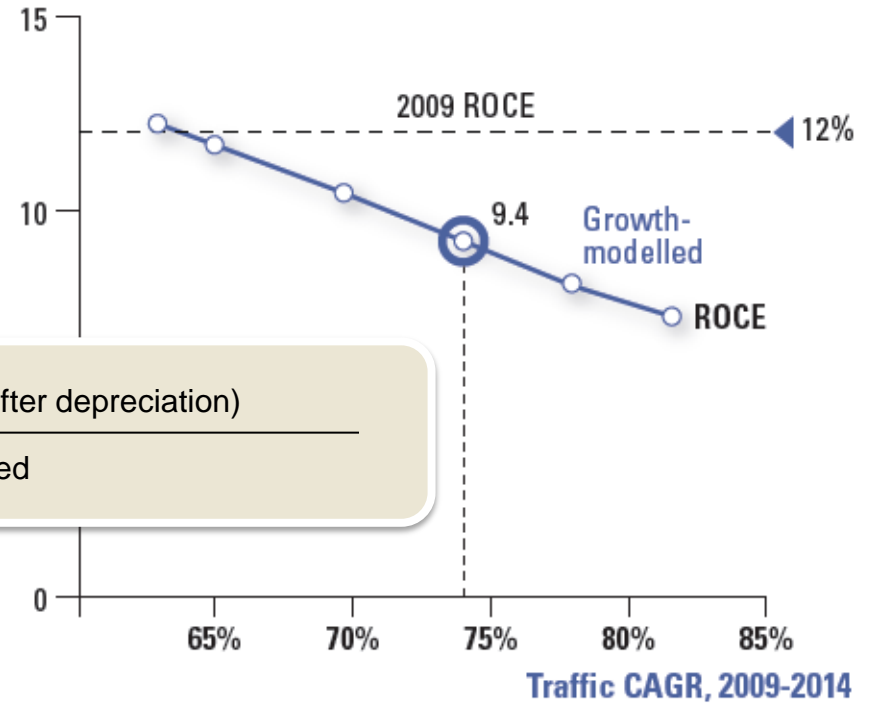


Network investments become less profitable the more traffic grows

Fixed
ROCE 2014, %



Mobile-hybrid 3G-LTE option
ROCE 2014, %



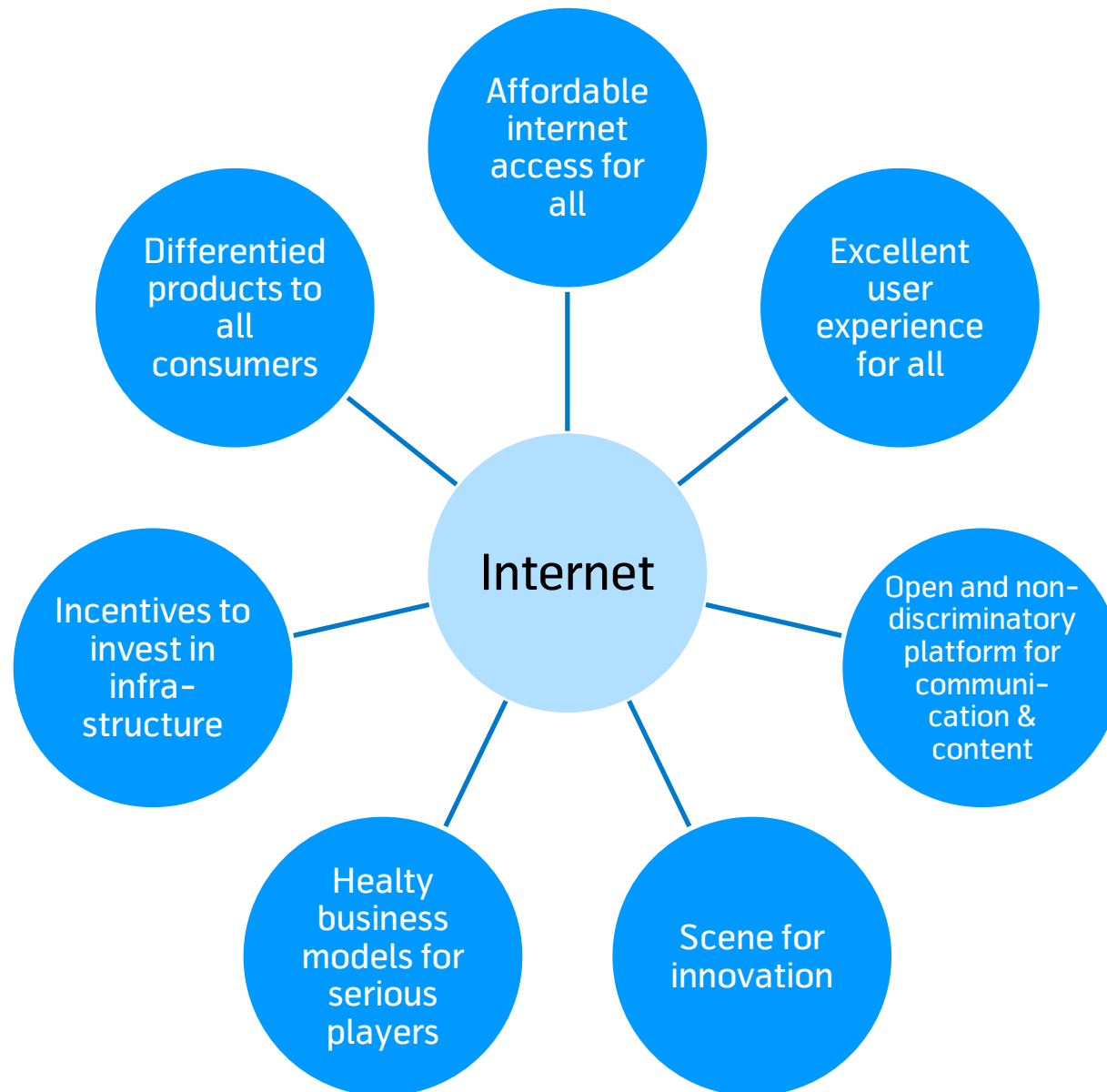
$$\text{ROCE} = \frac{\text{Net operating profit before tax (after depreciation)}}{\text{Capital Employed}}$$

Note: Assuming a 34% CAPEX/revenues for Fixed and 25% for mobile

Sources: Cisco VNI, A.T. Kearney Global Cost Benchmark; A.T. Kearney analysis



What kind of internet do we want?



Norwegian authorities suggest priority mechanisms in the mobile network after this year's experience with a major storm

7.1.8

PT foreslår å innføre prioritet i mobilnettene. Mange samfunnsfunksjoner er i dag avhengige av mobilkommunikasjon. Dette gjelder også de som har funksjoner som er av "kritisk karakter" for samfunnet. I en **krisesituasjon** vil trafikken øke, og ved noen typer hendelser kan **kapasiteten i nettene bli redusert eller brukt opp**. Ved knapphet på kapasitet i nettene i en krise- eller beredskapssituasjon, er det viktig med ordninger som klart prioriterer de som innehar svært viktige funksjoner, sett fra samfunnets side. Sannsynligheten for lokal overbelastning i nettet er langt større i et nett med mobile brukere enn i fastnettet, og det gjør at behovet for prioritetsordning er størst for mobilnettene. Ekomloven § 2-10 første ledd krever at prioritet gis ved behov. PT anser det som **hensiktsmessig med en egen regulering av trafikkprioritet i egen forskrift**, da dette skjer ut fra samfunnets behov. Kostnader med eventuell forhåndsprioritering i mobilnettet vil trolig omfattes av ekomloven § 2-10 annet ledd jf fjerde ledd.



Post- og teletilsynet



Internet providers are totally dependant on traffic management in order to make the Internet work



Congestion



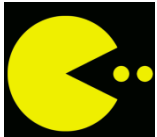
Fault handling



Security



Demand is "infinite"



Applications have different requirements



The willingness to pay varies greatly



Optimize network investements

ISP perspective: without traffic management we might get highly undesirable effects and an unwanted Internet

The business market need specialised service level agreements (SLA)



Seperate physical networks for business traffic?

Some applications are highly latency sensitive – eg. voice



The continued rise of 3rd party CDNs, ADNs and web-acceleration services?

ISPs need to secure return on infrastructure investements



Throttling & quotas only mechanisms in line with NN?

ISPs must secure a good customer experience for all customers



End of all-you-can-eat internet?

RECOMMANDÉ

Internet
Comfort

Le confort de l'internet ultra rapide.

Vitesse download max : **15 Mbps¹**

Vitesse upload max : **2,5 Mbps¹**

Volume inclus : **100 GB**

€ 7,5/mois (option)

PROMO +

€ 34,05 /mois

REDUCTION EN LIGNE

Commander

Plus d'infos

Choose a **Broadband** package

Speed Monthly usage limit

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- Basic security
- BT Home Hub
- FREE Wi-Fi minutes
- See more features
- Save up to 50% on BT Telephones
- 18 month contract

Up to **20Mbps** download speed

10GB usage

BT Winter Deal

Note: these are speculations, but not far fetched if today's internet market is observed

Traffic management is in the interest of most internet players, and Telenor is in the favour of transparent use

- Transparency, transparency, transparency
 - Subscribers should be fully informed of mechanisms in use
- Mechanisms should be traffic agnostic
 - Per subscriber
 - For basic service (best effort)
- "Positive discrimination"
 - Maintain basic service
 - No blocking or throttling
 - Upgrades rather than down-grades
- Special cases: eg. child pornography – blocking not monitored by Telenor/ISP but by police



"There, didn't I tell you that if I kicked up enough fuss, they'd move us to business class."

Traffic management schemes are still in the making, and ISPs have yet to establish which are to be utilised and which are not

Concluding remarks;

Traffic management is here to stay, and in the interest of consumers

- Telenor supports an open and sustainable Internet
- Internet traffic is still increasing with a yearly growth rate around 40%
- Video is taking over as the dominant traffic type
- A fundamentalist approach to network neutrality will limit network investments
- Traffic management is necessary in order to make the Internet as we know it continue to work
- Not all bits are created equal
- Curbing traffic management might have unintended consequences
- Transparency is vital

