画像情報特論 (1)
Advanced Image Information (1)

はじめに
Class Overview

情報理工・情報通信専攻　甲藤二郎
Dept. of Computer Science and Engineering, Jiro Katto
E-Mail: katto@waseda.jp

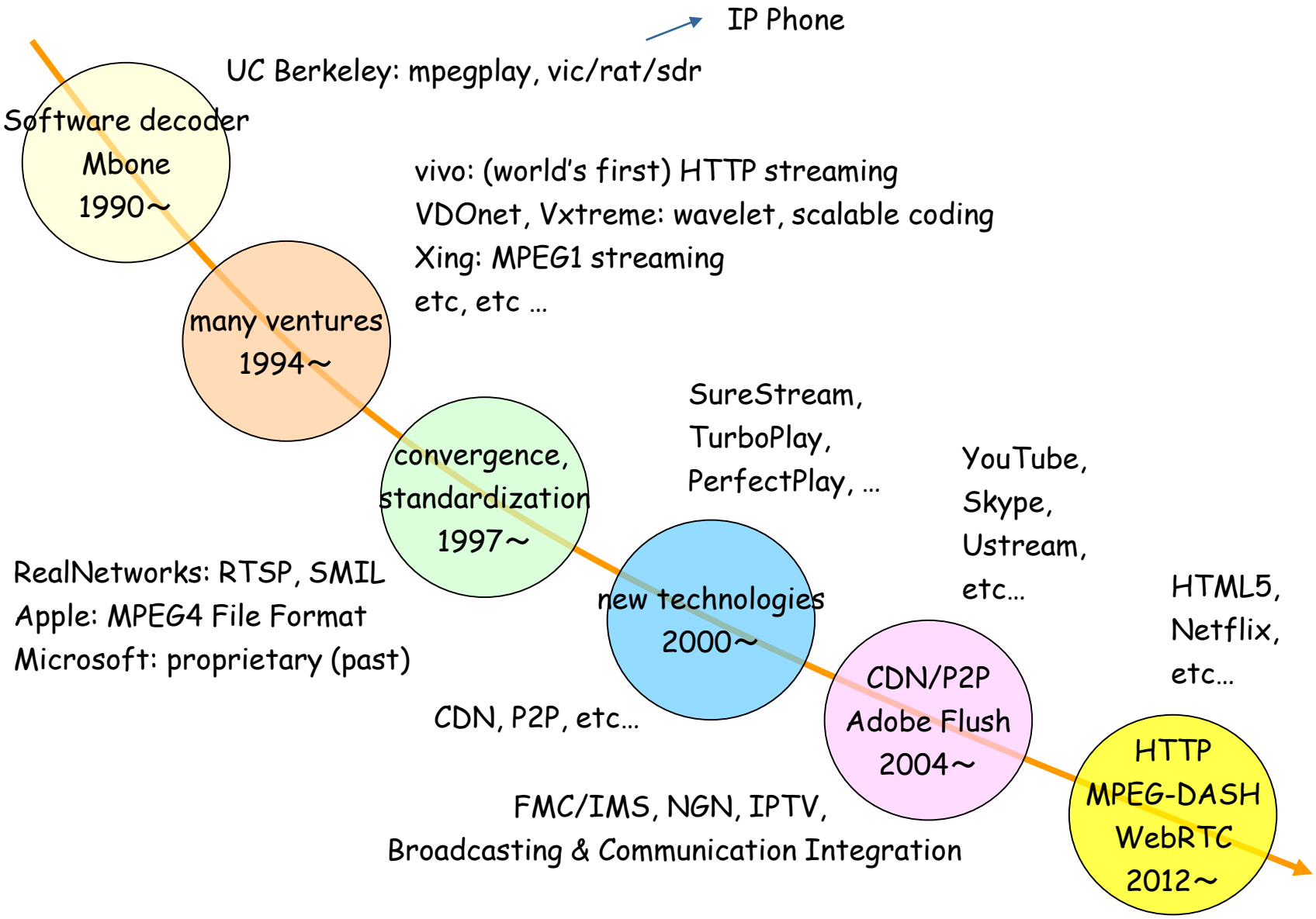
This Year's Schedule

(tentative)

4/06	Class overview
4/13	Video Streaming (1)
4/20	Self study (1)
4/27	Video Streaming (2)
5/11	Video Streaming (3)
5/18	Video Streaming (4)
5/25	Video Streaming (5)
6/01	Video Compression (1)
6/08	Video Compression (2)
6/15	Video Compression (3)
6/22	Video Compression (4)
6/29	Image Processing (1)
7/06	Image Processing (2)
7/13	Image Processing (3)
7/20	Final report

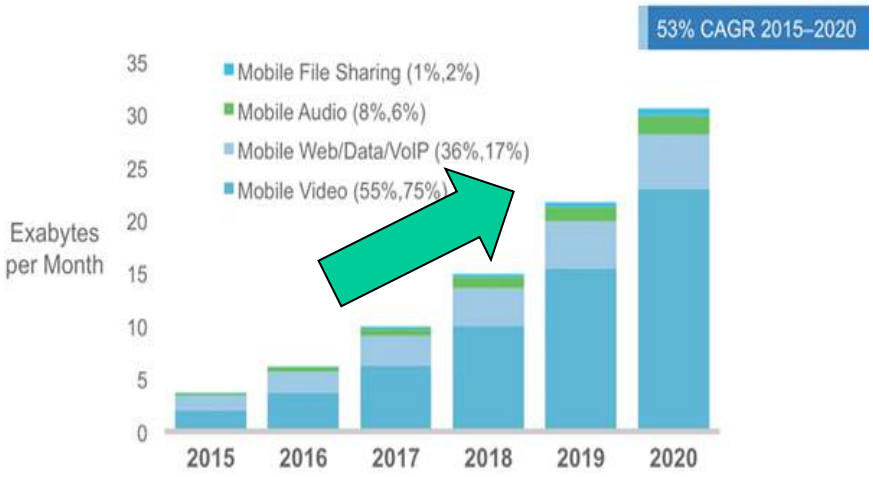
And, additional self studies on CourseN@vi, once or twice

History of Video Streaming



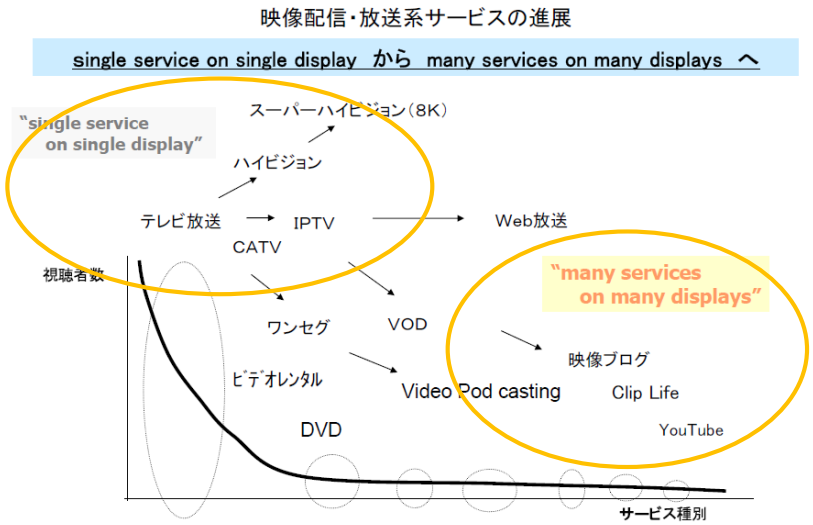
Recent Trends

- Drastic Increase of Video Traffic
  - more than 70%
  - x10 until 2020



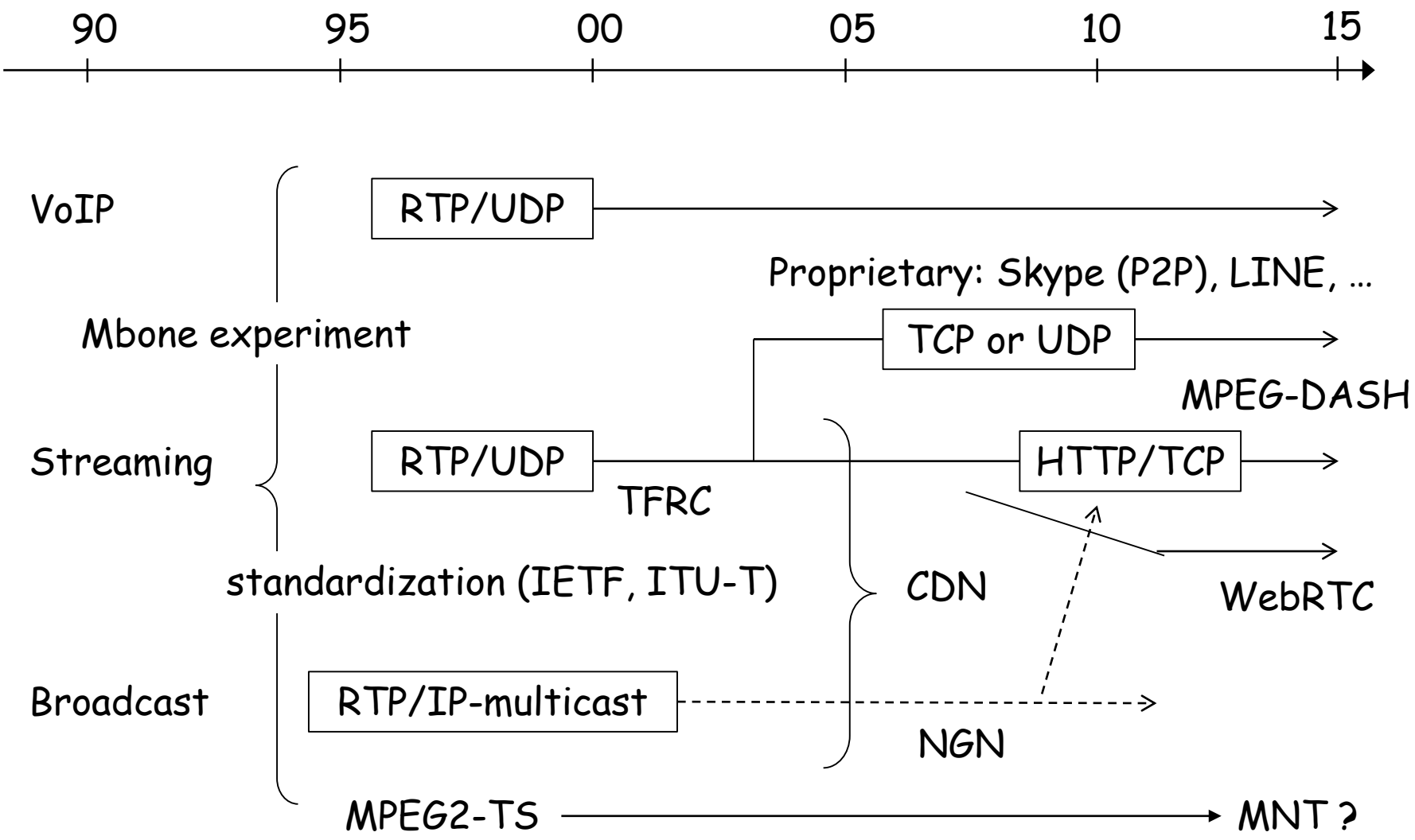
(Cisco VNI, 2016)

- Evolution of Various Video Services
  - higher resolution and personalization



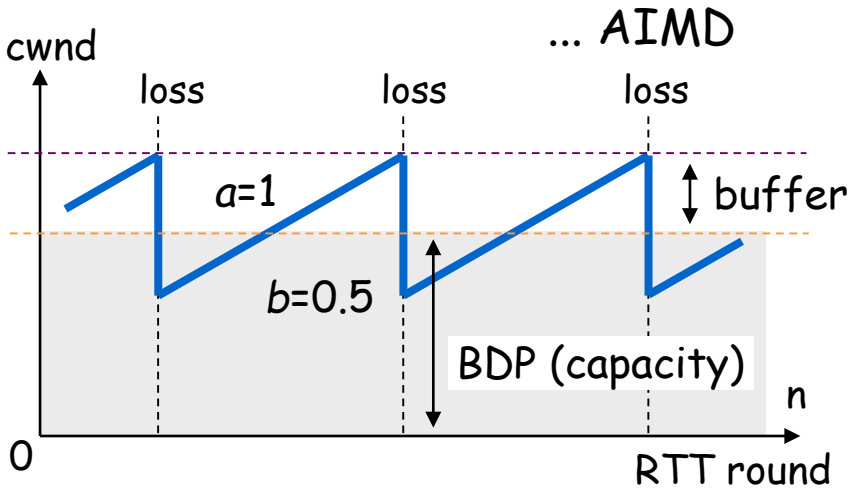
(MIC Report, 2008)

Protocol Transition



Video streaming (1) TCP/IP

- Loss-driven

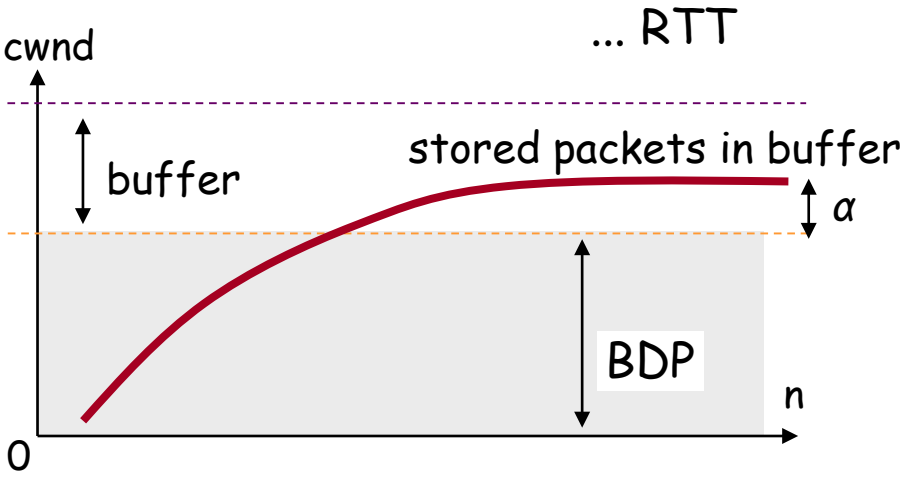


TCP-Reno, High-Speed TCP,
TCP-Westwood, CUBIC-TCP, ...

BDP/Buffer relationship

small buffer → × efficiency
large buffer → × delay

- Delay-driven



TCP-Vegas, FAST-TCP

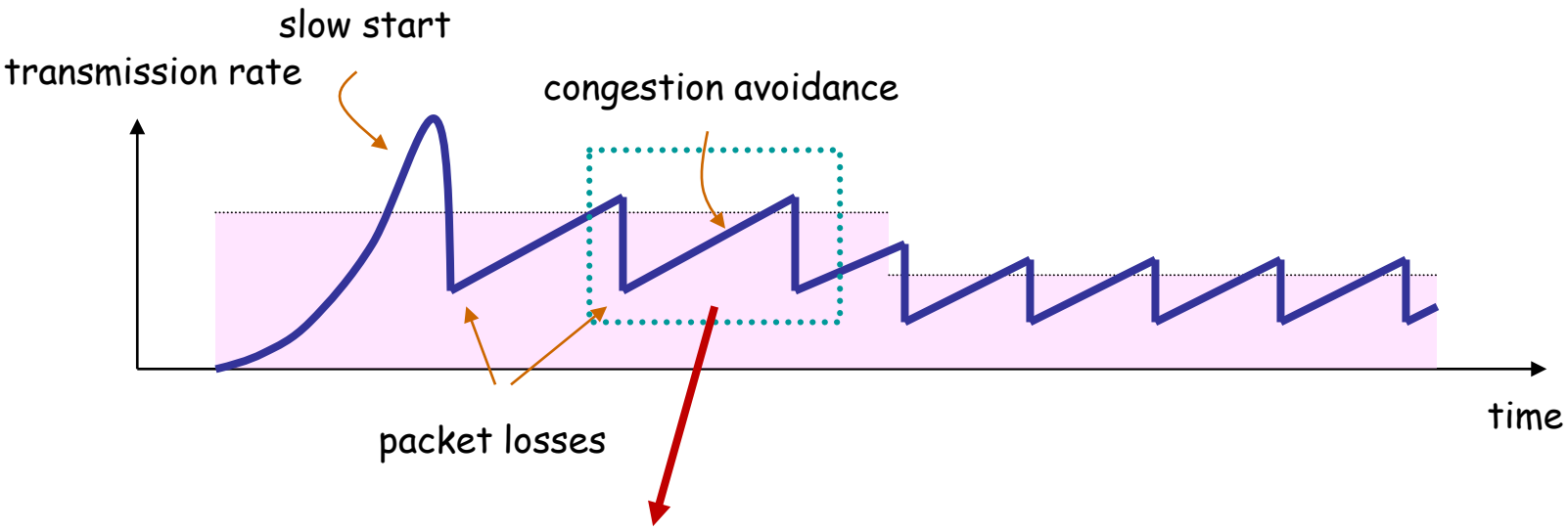
Unfairness by loss-driven TCP

× friendliness

BDP: Bandwidth-Delay Product

Video streaming (2) TFRC

- TFRC



Modeling of steady-state TCP behaviors

$$R = \frac{1}{RTT}\sqrt{\frac{3}{2p}}$$

p: packet loss rate

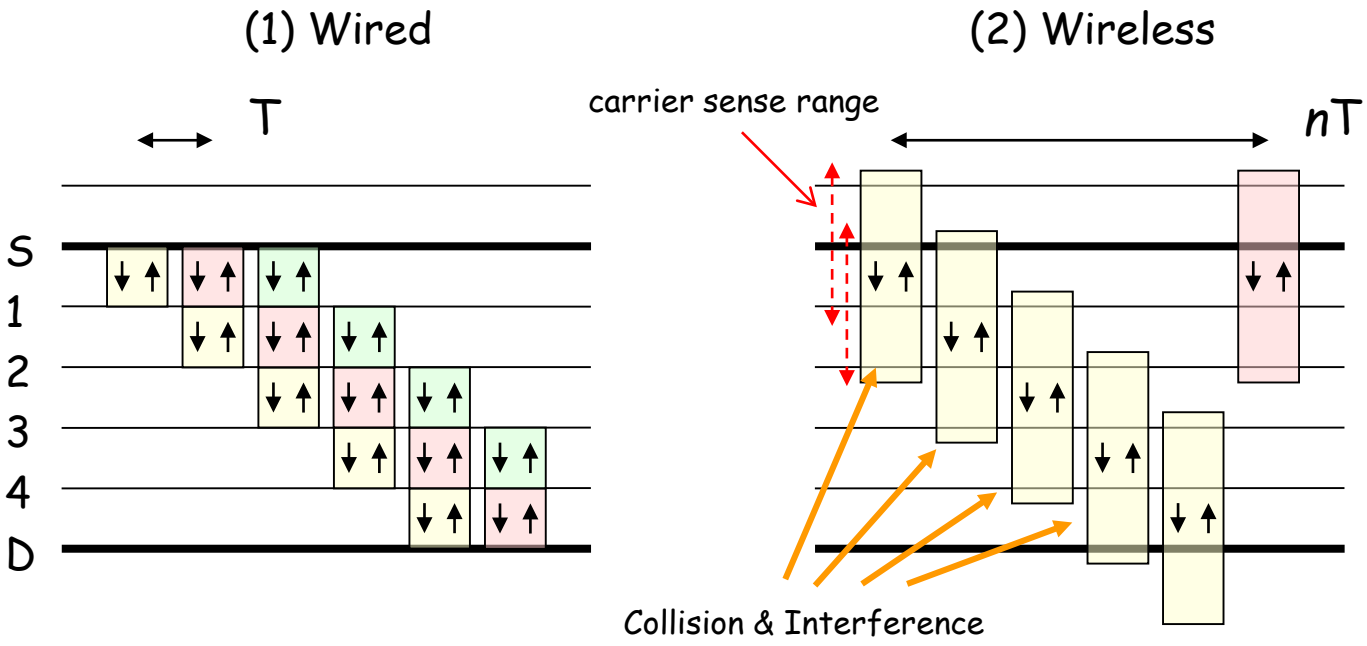
BDP/Buffer relationship

small buffer → ×efficiency
large buffer → ×delay

TFRC: TCP Friendly Rate Control

Video streaming (3) Wireless

- Single-Channel Multi-hop Network



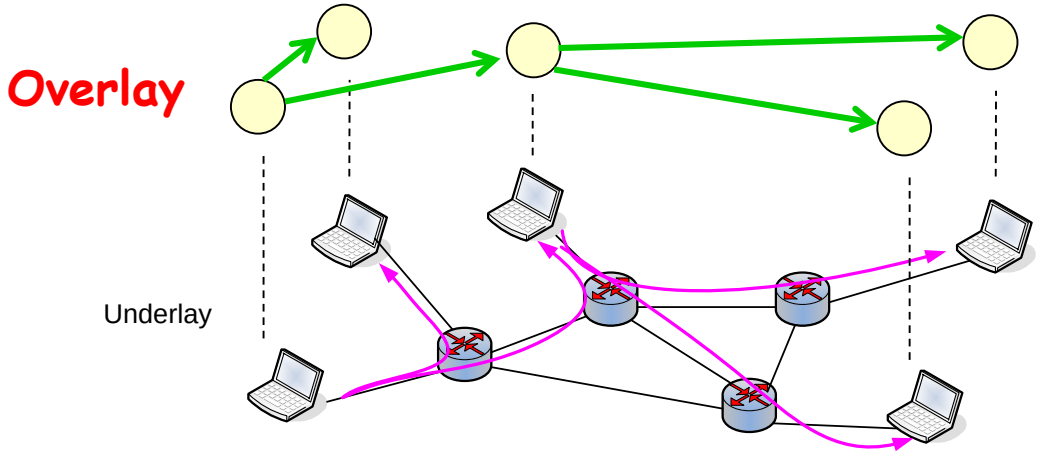
Channel Efficiency = 1

Channel Efficiency = 1/*n*

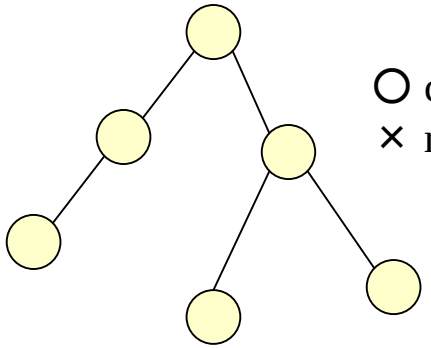
(*n* : # of multi-hops)

Video streaming (4) CDN, P2P & Cloud

- Overlay networks

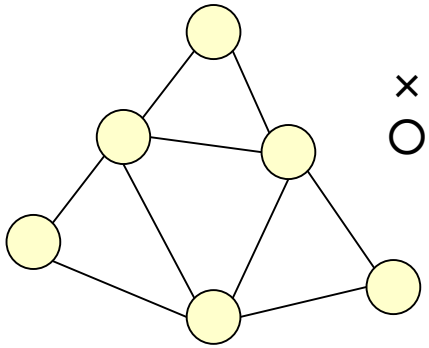


- tree



○ complexity
× robustness

- mesh

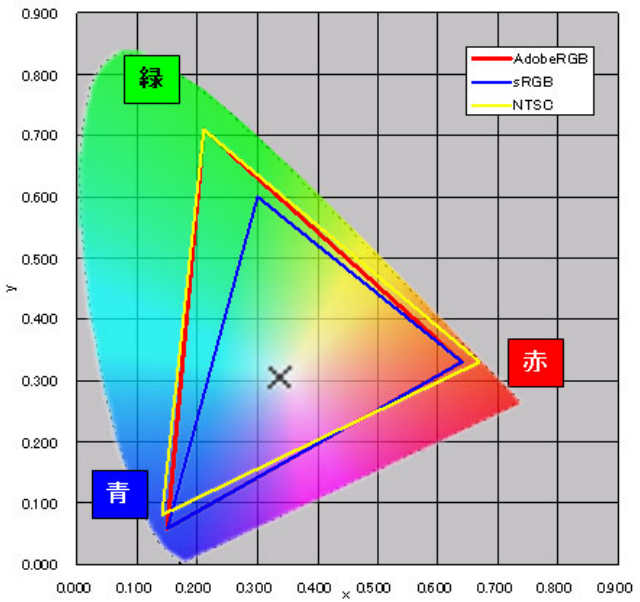


× complexity
○ robustness

Video Compression: H.265 & Beyond

- H.265/HEVC
  - HEVC: High Efficiency Video Coding
  - FVC: Future Video Coding (H.266/FVC)
- Other topics
  - Higher resolution
    - spatial: U-HDTV
    - temporal: 10,000 frames
  - Gamut expansion
  - High dynamic range
  - 3D / freeviewpoint

color diagram

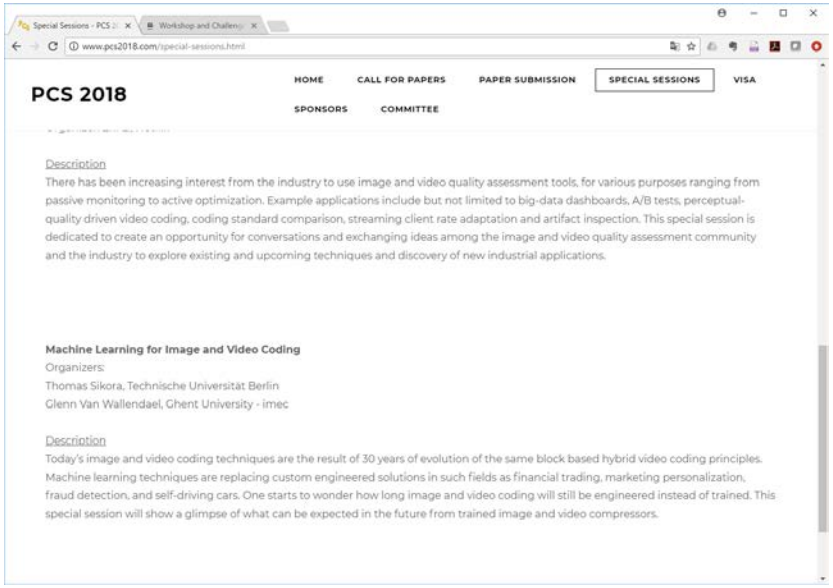


http://plusd.itmedia.co.jp/pcuser/articles/0805/23/news001.html

Machine Learning in Image/Video Compression

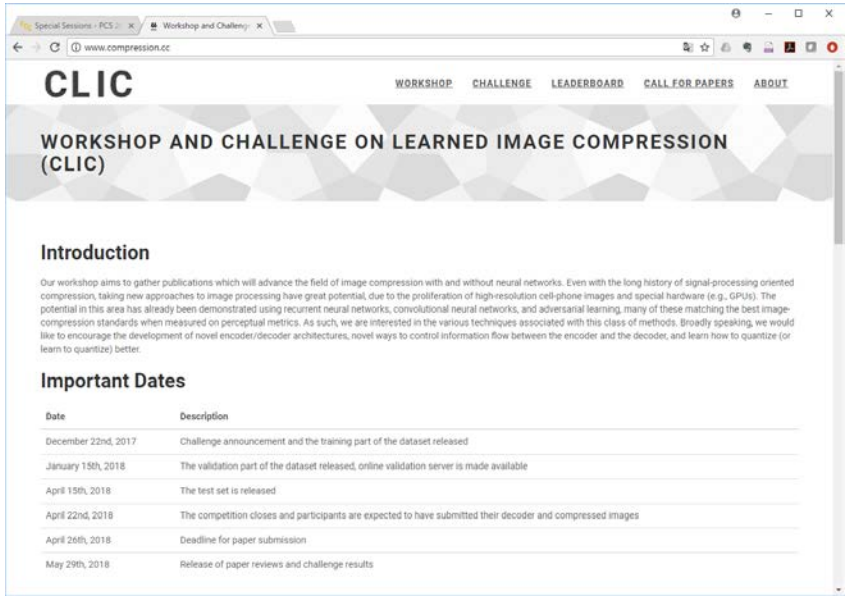
- On-going in these one or two years

PCS 2018 in June



http://www.pcs2018.com/

CLIC in CVPR 2018 in June



http://www.compression.cc/

Handouts

- Check handouts on CourseN@vi.
- (in April) check class web page
  - http://www.katto.comm.waseda.ac.jp/~katto/Class/