IWIN 2009

History of the AlohaNet - ALOHA to the Web

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1

SUMMARY

- The history of ALOHA
- ALOHA applications
- The ALOHA channel
- Current issues in ALOHA

2

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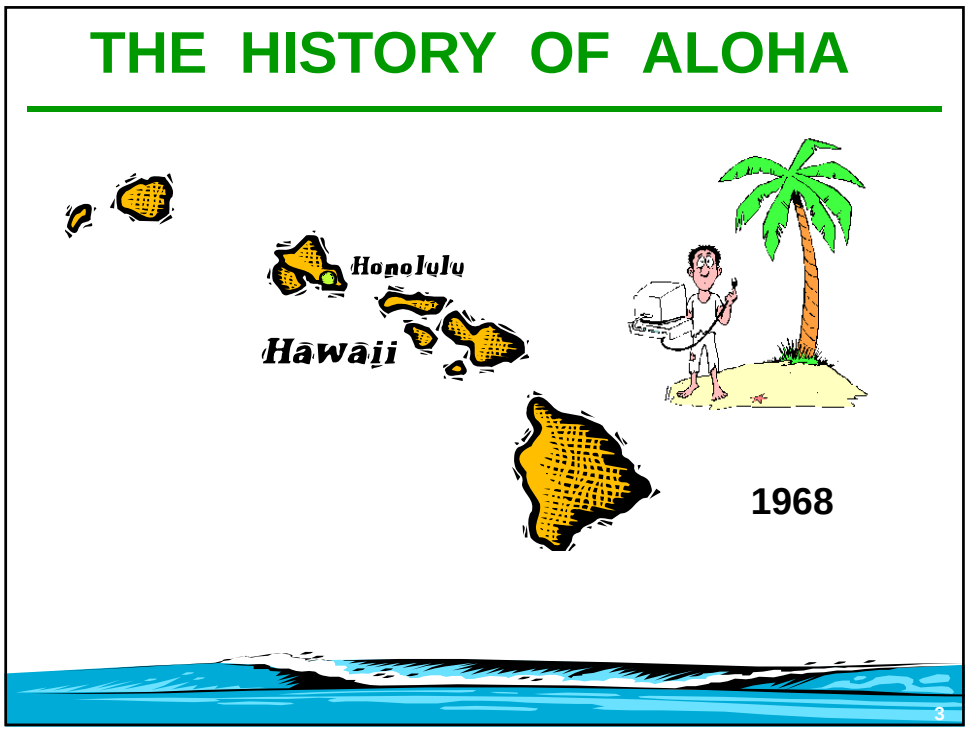
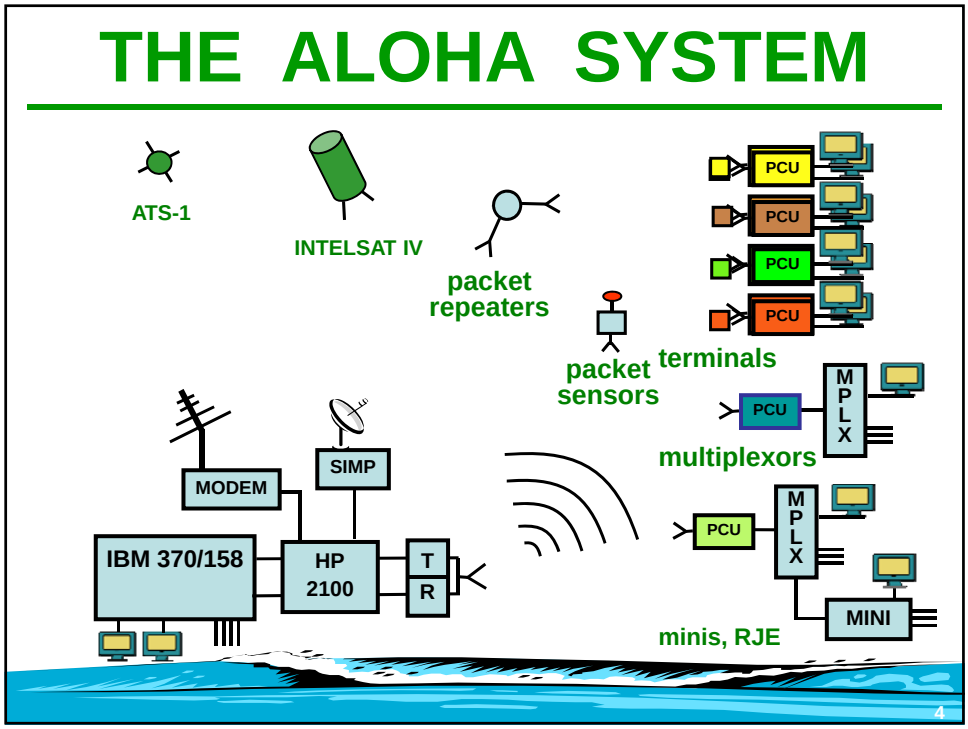
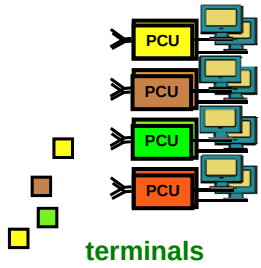
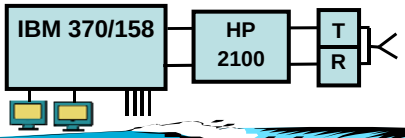

THE HISTORY OF ALOHA
Honolulu
Hawaii
1968
3


THE ALOHA SYSTEM
ATS-1
INTELSAT IV
packet repeaters
packet sensors
terminals
multiplexors
minis, RJE
PCU
PCU
PCU
PCU
PCU
PCU
MPLX
MPLX
MODEM
SIMP
IBM 370/158
HP 2100
T
R
MINI
4

THE ALOHANET



terminals



5

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6

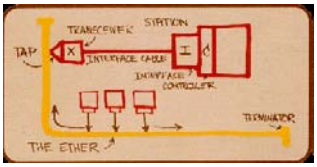
ALOHA APPLICATIONS

1. wired and fixed wireless (LANs)
2. satellite networks
3. wireless mobile networks

7

LANs – ETHERNET

- Alto ALOHA Network – Metcalfe '73
- CSMA/CD – Kleinrock / Tobagi '75
- Standard – IEEE 802.3 '83 .....



1973

2009

8

LANs – WiFi

- unlicensed bands (US) ‘85
- CSMA/CA – Kleinrock / Tobagi ‘75
- standard – IEEE 802.11 ‘97 .....

1995

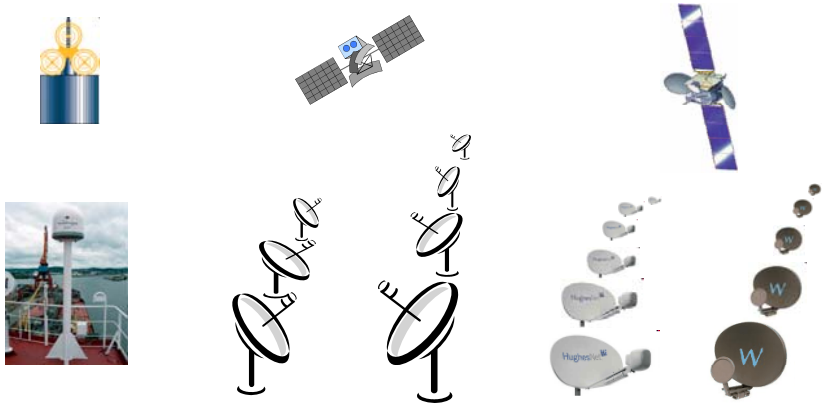
EtherNet or ALOHANet ?

9

LANs – WiFi (Applications)

10

SATELLITE ALOHA



Marisat 1976 | private networks 1980's | Internet access 2000's

11

ALOHA in MOBILE NETWORKS

1980's	1990's	2000's	2010's
1G	2G	3G	4G ...

request control → * SMS → * GPRS → * web

12

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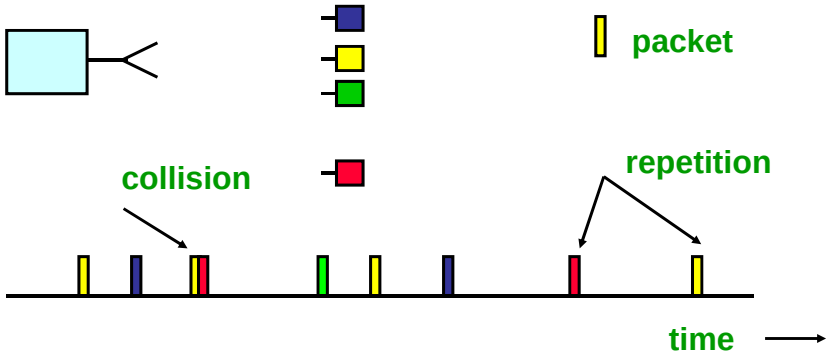
13

THE ALOHA CHANNEL



maximum throughput = $\frac{1}{2e}$ = 0.186

14

ALOHA FLAVORS

- unslotted ALOHA
- slotted ALOHA
- reservation ALOHA
- CSMA
- spread ALOHA

15

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16

CURRENT ISSUES in ALOHA

- to slot or not to slot ?
- spread ALOHA – CDMA w/o CD
- WiFi – EtherNet or ALOHANet ?
- bursty traffic – charging by the byte
- throughput and protocol overhead

17

REFERENCES

- N. Abramson, *The ALOHA System - Another Alternative for Computer Communications,* Proceedings of the 1970 Fall Joint Computer Conference, AFIPS Press, Vol. 37, 1970, pp. 281-285.
- L. G. Roberts, *ALOHA Packet System With and Without Slots and Capture*, Computer Communications. Review, Vol. 5, No. 2, pp. 28-42, Apr. 1975.
- R. M. Metcalfe, *Packet Communication*, Massachusetts Institute of Technology, Cambridge, MA, Report MAC TR-114, July 1973.
- N. Abramson, *The Throughput of Packet Broadcasting Channels*, IEEE Transactions on Communications, Vol. Com-25, No. 1. Jan. 1977, pp 117-128.
- R. Binder, et al., *ALOHA Packet Broadcasting – A Retrospect*, AFIPS Conference Proceedings, 1975 National Computer Conference, AFIPS Press, Montvale, New Jersey, May 19-22, 1975.
- N. Abramson, *VSAT Data Networks*, Proceedings of the IEEE, Special Issue on Satellite Communications, Vol. 78, No. 7, pp. 1267-1274, July, 1990.
- N. Abramson, *The ALOHANet – Surfing for Wireless Data*, IEEE Communications Magazine, to be published 2009.

18

HISTORICAL REFERENCES

- N. Abramson, *The ALOHA System - Another Alternative for Computer Communications,* Proceedings of the 1970 Fall Joint Computer Conference, AFIPS Press, Vol. 37, 1970, pp. 281-285
- R. Metcalfe, *Xerox PARC memo*, from Bob Metcalfe to Alto Aloha Distribution on Ether Acquisition, May 22, 1973.
- N. Abramson, *The ALOHA System Final Technical Report*, Advanced Research Projects Agency, Contract Number NAS2-6700, October 11, 1974
- R. Binder, et al., *ALOHA Packet Broadcasting – A Retrospect*, AFIPSConference Proceedings, 1975 National Computer Conference, AFIPS Press, Montvale, New Jersey, May 19-22, 1975.
- N. Abramson, *The ALOHANet – Surfing for Wireless Data*, IEEE Communications Magazine, to be published 2009.