In the Beginning

Early networks in the UK
and how the Internet became

The First Day

- On the First Day
  - Computers were big and lonely
  - There were no networks
  - Ethernet had not been invented
  - Computers sat and pined in the darkness, running COBOL and doing company accounts
  - Remote teletypes connected via modem at 110 baud

The Second Day

- Computers were still big
- But not lonely
- IBM invented bi-sync (1960s)
- Bi-sync was used to communicate between RJE terminals and mainframes (1970s)
- Half duplex, byte orientated, EBCDIC
- Speed climbed from 120/75 to 300/300 to a scorching 1200 baud

The Third Day

- IBM invents SNA
  - Built on SDLC
  - Which was a modified form of HDLC
- SNA is still in use, mainly by banks
- Unified structure
- Proprietory (license fee payable to IBM)
- IBM will phase it out in May 2007

(aside) HDLC

- FLAG (01111110)
- Bit stuffing
- CRC

The Fourth Day

- Ethernet is invented at Xerox PARC (1976)
- Robert Metcalfe leaves Xerox to found 3Com (1979)
- Ethernet standard published by DEC, Intel and Xerox (1980)
- Jerry Saltzer writes influential paper condemning ethernet
- Major manufacturers do not fit ethernet as standard
- 3Com cleans up, by fitting ethernet adapters
- “Ethernet works better in practice than in theory”

(Aside) Ethernet

- Original spec
  - Thickwire (huge coaxial cable)
  - 3M transmission (later upgraded to 10M)
  - Enormous “vampire taps” and transceivers
  - 500m range (10base5)

Ethernet


CentreCOM 470
IEEE 802.3 TRANSCEIVER (MAU)
Allied Telesis
COLLISION
RECEIVE
TRANSMIT
PORT 3 POWER
PORT 4 POWER

(Aside) Ethernet

- “Thinwire”
  - Thin coax cables, BNC connectors
  - 10M
  - Much more compact transceivers
  - 200m range (10base2)

Ethernet 2

- “Twisted pair”
  - No longer a shared medium (hubs)
  - Twisted pair cables
  - Flood wiring
  - 100m range
- Speed upgraded to 100M and then 1000M and now 40000M

The Fifth Day

- Still no cheap WAN
- Unix to Unix CoPy
  - Ran over cheap modems and ordinary telephone lines
  - Free with UNIX
  - Provided remote command execution
  - Computers no longer lonely
  - Email was born

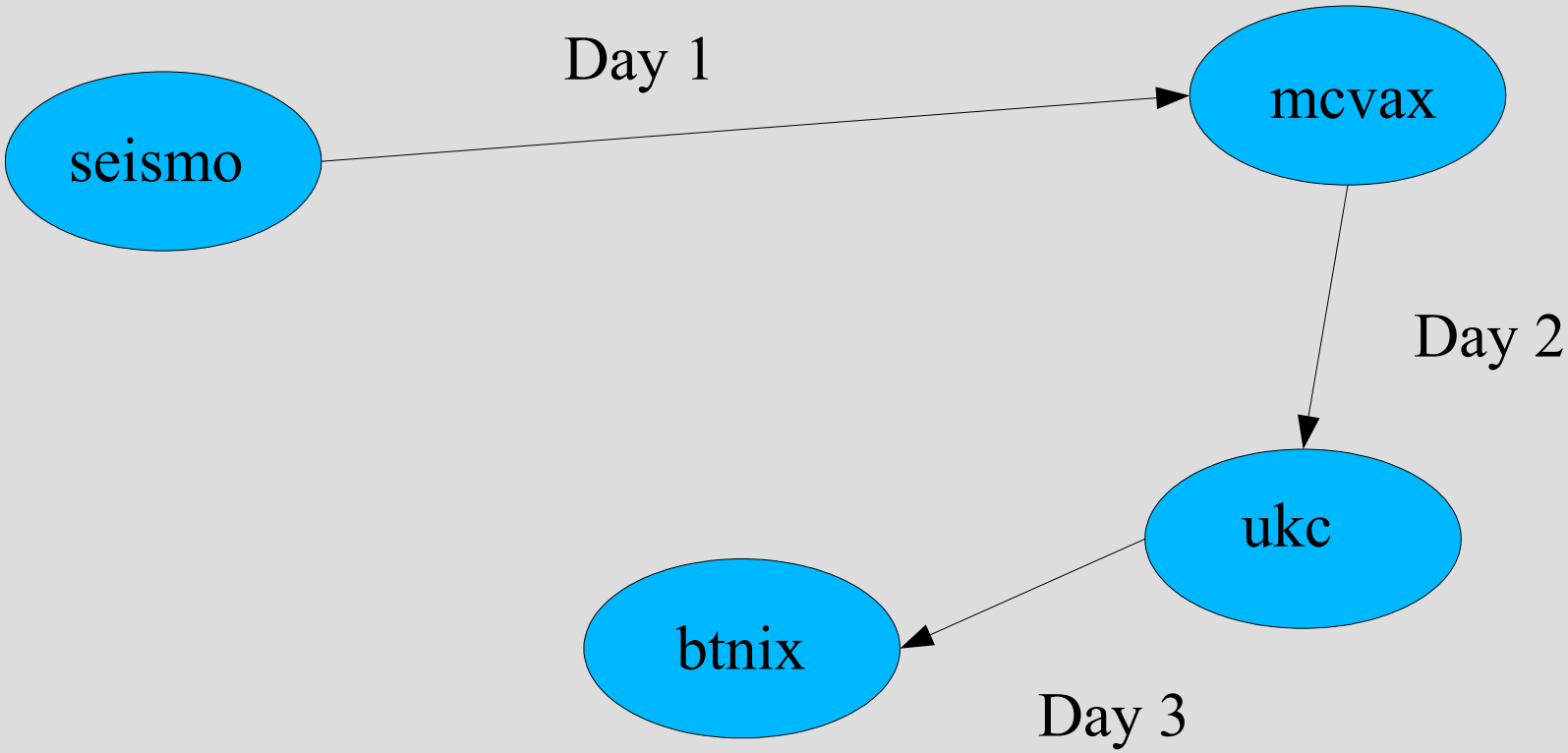
(aside) UUCP

- Run from cron
- uucp, rmail, rnews queued remote jobs
- uucico at transmitting system
  - Checked spool queues
  - Connected to remote site using dialer script
  - Transferred command, data
- uucico at receiving system
  - Received and executed jobs
  - Turned around connection and transmitted jobs back

UUCP (2)

- Dialling during cheap rate
- “Midnight lines”
- Hop by hop routing (bang paths) for email
  - {seismo,ihnp4}!mcvax!ukc!btnix!ntitley
  - Long transit times
- Usenet news
- Trailblazer modems

UK connectivity



UK UUCP (2)

- UKC (University of Kent at Canterbury)
  - Main entry point
  - Charged for onward feeds (BT paid by loaning a trailblazer)
- BT was major node
  - Eventually 40 onward feeds
  - Security concerns
  - Enormous phone bill
  - 6 dedicated trailblazers

The Sixth Day

- The Age of OSI (the way of the future)
  - The answer to Life, the Universe and Everything
  - Designed by ITU and ISO
  - 4 year standards cycle
  - Enormous gravy train
  - Embraced by management everywhere

(aside) OSI

- Seven layer model
  - Physical
  - Data link
  - Network
  - Transport
  - Session
  - Presentation
  - Application
- What it means
  - Copper wires
  - It's a telephone
  - Using touch tone
  - and telephone numbers
  - She's answered the phone
  - She's speaking swedish
  - Can I have a date?

OSI (2)

- Physical
- Data link
- Network
- Transport
- Session
- Presentation
- Application

- Physical
- HDLC
- X25
- Mostly empty
- Mostly empty
- Mostly empty
- X40, X500, FTAM, etc

OSI (3)

- Telcos launched data services based on OSI
  - X25
  - X400
- Charged per packet
- Expensive
- No choice because markets still regulated

JANET

- Joint Academic NETwork
- First body to be granted a license to operate a telecommunications network in the UK
- Initially 9.6K backbone
- “Coloured book” protocols over X25
- By 1990 Fastest data network in the world (8M backbone, 2M access links)
- Intended to “upgrade” to OSI but overtaken by events

The Seventh Day

- God, the ISO and the ITU rested
- The geeks got up early on Sunday morning and built the Internet
- By early 1990s TCP/IP had taken over
  - Pragmatic
  - Fast standards development
  - Built by engineers, not standards people
  - US government funded

UK Internet

- IP was banned at first on JANET
- UKC spawned Uknet which launched the first semi-commercial internet service in the UK
  - Based on 9.6K PSS lines
  - 64K internet feed back to mcvax in Amsterdam, later upgraded to 128K
- JANET gave in to the inevitable and launched JIPS service (IP over X25)

UK Internet 2

- Pipex was first truly commercial ISP in UK
  - Grew from Unipalm
  - Formed in 1991
  - 64K line to UUNET in the US
  - Initially would not sell to ISPs
- BT finally reluctantly launched ISP in 1994
  - 8M SMDS backbone
  - 2M line to UUnet (largest in the UK at the time)

To Be Continued

For the next exciting episode
Come to UKNOF 3