



UHI mission

To establish for the Highlands and Islands of Scotland a collegiate university which will reach the highest standards and play a pivotal role in our educational, economic, social and cultural development

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UHI will

Widen access to high quality Higher Education

through the 13 UHI academic partners, 2 associated institutions and the 50 learning centres now being developed

Develop and apply new approaches to learning and teaching using information and communication technologies



UHI Academic Partners

- Argyll College
 - Inverness College
 - Lews Castle College
 - Moray College
 - North Highland College
 - Orkney College
 - Perth College
 - Shetland College
 - Sabhal Mor Ostaig
 - Highland Theological College
 - North Atlantic Fisheries College
 - Scottish Association for Marine Science
 - Sea Fish Aquaculture
- Associated Institutions**
 Lochaber College
 Highland Psychiatric Research Foundation

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UHI courses validated through the Open University Validation Services, 1998

| UHI Course | Responsible Partner |
|---------------------------------|------------------------------|
| BA Gaelic & N. Atlantic Studies | Sabhal Mor Ostaig |
| BA Gaelic Language & Culture | Sabhal Mor Ostaig |
| BA Social Sciences | Inverness College |
| BA Theological Studies | Highland Theological College |
| BA Tourism | Perth College |
| BSc Computing | Lews Castle College |
| BSc Rural Health Studies | Lews Castle College |



UHI courses validated through the Open University Validation Services, 1999

| UHI Course | Responsible Partner |
|----------------------------------------------------|----------------------------|
| BA Business Administration | Inverness College |
| BA Fine Art | Moray College |
| BA Music Performance | Perth College |
| BA Rural Development Studies | Lews Castle College |
| BSc Mechanical Engineering | The North Highland College |
| Dip HE Contemporary Textile Design & Related Craft | Shetland College |
| MA Professional Development | Lews Castle College |

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UHI courses validated through the Open University Validation Services, 2000

| UHI Course | Responsible Partner |
|-----------------------------------|----------------------------|
| BSc Electrical Engineering | Inverness College |
| BSc Marine Science | The North Highland College |
| BA Child and Youth Studies | Perth College |
| BA Cultural Studies | Orkney College |
| BA Golf Management | The North Highland College |
| BSc Applied Environmental Science | Inverness College |

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UHI courses validated through the University Validation Services, 2000/1

| UHI Course | Responsible Partner |
|------------------------------------|----------------------------------|
| BSc Environment & Heritage Studies | The North Highland College |
| BSc Forestry and Conservation | Inverness College |
| MSc Applied Fisheries Science | North Atlantic Fisheries College |
| MSc Infection Control | Inverness College |

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The UHI Experience of Integration in Learning and Information Services

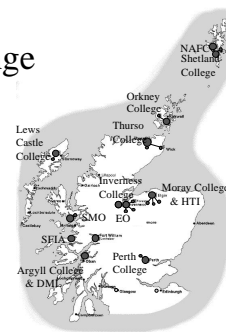
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UHI Millennium Institute

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The Challenge

- Distance
- Geography
- Cost
- Service Provision



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A quick history

- 1993: The University of the Highlands and Islands Project (UHIp) gets serious
- A dozen partners (including 8 FE colleges, a NERC research institute, a statutory body, an industry-funded college, etc)
- All partners have an independent IT history and therefore a dozen different legacies

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Technological integration begins

- 1995: kilostream-based connections between partners
 - JANET connection, WWW server on Unix, and
 - 1st co-ordinated service: FirstClass email
- FirstClass ran on a server at each site, with a dozen part time administrators
 - Relatively few staff & student accounts (<1000)
 - Complex and inefficient administration
 - Lots of administration effort just trying to maintain interworking between all those servers
 - Things never really worked everywhere all at once

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Technological integration cont.

- Summer 1996: New 'integrated' service: ISDN-6 based VC
 - 12 studios, 12-way ISDN MCU, BT lines
 - SOEID funded capital and recurrent costs, so gives desired illusion of being free at the point of use
- September 1996: Millennium Commission announces £33m funding in c. £100m initiative
- February 1997: new offices, new staff, 3yr plan
 - Rationalisation of FirstClass email system: 2 servers (staff & student), 1 administrator, at one central site
 - More and faster kilostream connections (change of the cost trade-off between systems and telecoms)

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Technological advances

- 1998:UHI WAN project
 - High Speed networking – 45Mbit/sec
 - Interim upgrades to 2Mbit/sec
 - Service quality acceptable from off-site servers
 - Enabling technology for most of the subsequent/parallel projects

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Slogans to remember

- 'cheaper AND better'
- 'spend and SAVE'
- 'just trust me ... we're colleagues'
- 'I'm doing this FOR you not TO you'
- 'what's the seven year cost of that?'
- It's easier to fund capital than recurrent

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'Selling' Technological integration ...

- January & June 1998: staff seminars
 - Two days of presentations and discussion on each occasion – establish 'buy-in'
 - Good hotel, food, environment
 - Presentations from suppliers where known (network infrastructure projects)
 - Presentations from potential suppliers (choice of naming services made by all staff)
 - Establish collegiate staff relationships

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Overview of UHI ICT Network Development Projects

Jem Taylor

© UHI 1998

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Why build a WAN?

- Share costs of JANET & Internet access
- Share facilities across UHI
 - One WWW server, many 'web sites'
 - other 'server' facilities - eg. E-mail
 - Videoconferencing across data network
- Reduce other costs
 - eg. telephony costs
- Campus-style collaborative working

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Why update LAN equipment?

- New technologies - e.g. ISDN VideoConf, 100 Mbits/sec LANs, Digital Telephony
- Bulk procurement -> cheaper purchasing
- Technical Compatibility - all sites are 'the same'
- Modern all-purpose cabling system allows all applications and services to be delivered in every room

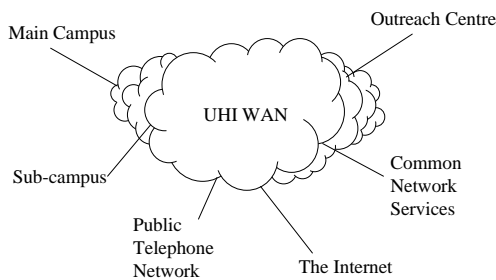
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Why Digital Telephony?

- ISDN-based VideoConferencing
 - £400 per annum line rentals for ISDN-2
 - High call charges of BT Public Switched Telephone Network (PSTN)
- Digital PBX required for
 - ISDN-2 internal extensions
 - private site-site trunk links
- Control spiralling recurrent costs

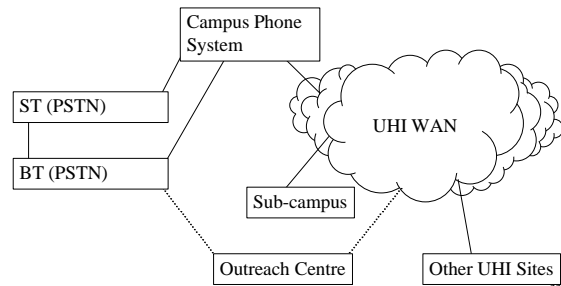
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Multi-Service Data Network



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Private Telephony Network



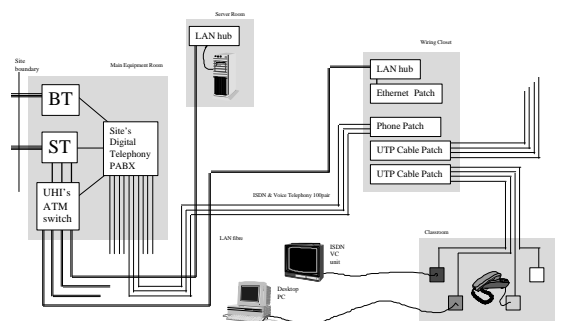
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A typical site has . . .

- Perhaps several buildings
- A single WAN connection
- A Private Automatic Branch Telephone Exchange (PABX)
- An 'Equipment Room' for WAN eqpt
- A 'Server Room' for file servers etc.
- Several 'Wiring Closets' for data cabling

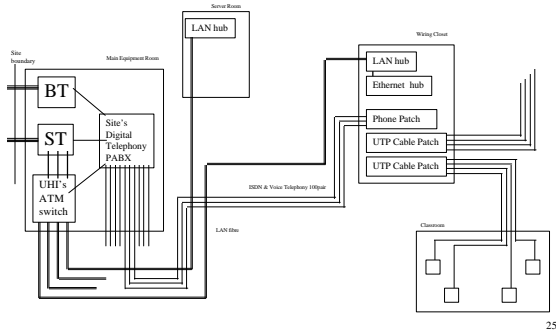
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Generic Site Network



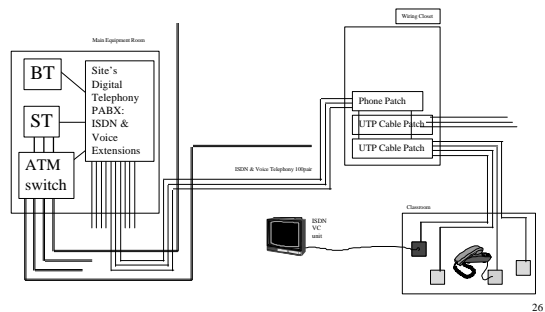
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'passive' Cabling System



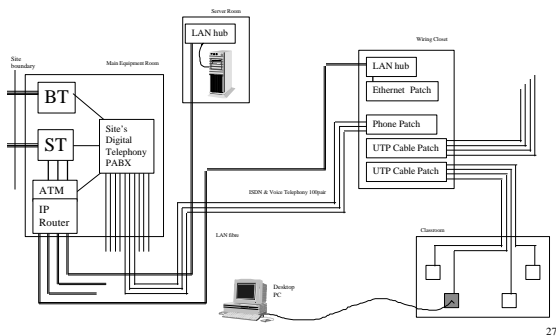
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Digital Telephony



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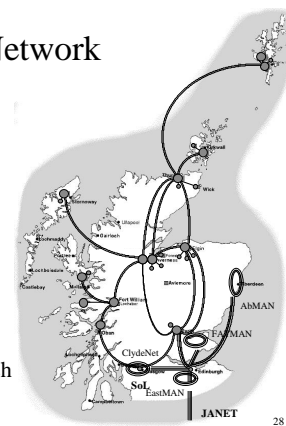
Data networking



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UHI Network

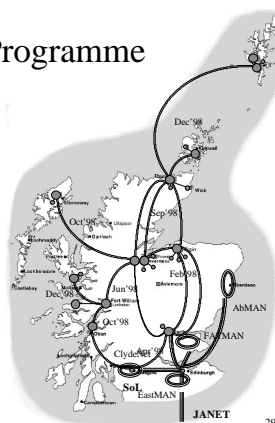
- DS3 delivery
 - 45Mbit/s
- Multi-Service
 - IP data network
 - Internal telephony
 - Video broadcasting
- "The 5th MAN"
 - connection to Scottish MANs Interconnect



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Roll-out Programme

- Phased Delivery
 - Q1 1998
 - Q2 1998
 - Q3 1998
 - Q4 1998
- All paths are 45Mbps
 - Easier sparing
 - High resilience
 - Multiple paths in 'core' of network



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Back to the story...

Technological sprinting begins

- 1999: Applications Infrastructure project takes big decision on core technology platform for 'Applications' to run over network.
 - Desktop computing oriented
 - Common platform for IDENTITY
 - NT ? 4 ? Or 5 ? Active Directory ?
 - Unix based NIS ?
 - Novell NDS on NetWare 5 ?
- Only NDS can support all the others, so for us, NDS **has** to be the one to give the framework.
 - Others can co-exist *within* the NDS.

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UHI_NDS_TREE

- Major procurement, major deployment
 - Over 40 IBM Netfinity 5000/5500 servers at 14 sites
 - NetWare 5 NDS designed and implemented
 - Five 'regions' each covering a group of locations due to NDS container size restrictions (no longer apply).
 - Location-oriented structure partly due to lack of faith in the robustness of telecomms (misplaced).
 - Initial IPX services over wide-area, now IP.
- Might detail differently today, but details not important: key platform for everything else.
 - Target 25,000 user population, over 13,000 so far.
 - Delegated responsibility for name allocation

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Groupwise.uhi.ac.uk

- Summer 1999: E-mail services crisis looming
 - FirstClass v3 not Y2K
 - FirstClass designed for 1,000 users not 10,000 and the design limits already reached: creaking at seams
 - Per-user license cost too high to upgrade to v4/NT
- Rapid replacement with two GroupWise post-offices on one server, in December 1999
 - Sendmail hacks hide incompatibilities and allow changeover with minimal impact
 - WebMail interface introduced

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User@uhi.ac.uk

- GroupWise selected as ubiquitous email
 - Integrated (more or less) with NetWare 5
 - Designed for 1,000 users per post-office
 - Two or more post-offices (staff & student) at each of the 14 UHI Academic Partner sites
 - Integrated addressing, single Internet g/w
 - Distributed administration, one addressbook
 - With co-ordinated naming imposed via NDS
 - Includes scheduling & resource booking

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Telephony

- Alcatel 4400 platform
 - Network PBX with 'central' management
 - Replaces mixed bag of new, old, very old, Y2K and non-Y2K standalone PBXs
 - Common number plan
 - Single common VoiceMail system
 - Full DDI
 - Internal voice and ISDN over ATM network
 - Directory built in to system, Unix-based management platform, but not (yet) integrated into NDS directory
 - Butrooms / desks have phones, not people

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Videoconferencing

- 1996 – 2001: H.320 ISDN-based
 - Uses Network PBX, free at point of use
 - Room-based systems
 - Need network-wide scheduling and implies UHI-wide room timetabling will be needed
- 2001 onwards: H.323 IP-based
 - Uses network directly, free at point of use
 - Room or Person oriented (studio & desktop systems)
 - Need ILS service to find people: ils.uhi.ac.uk
 - Need **secure** ILS tied to NDS login identity otherwise users can masquerade ... not yet solved
 - Still need room & equipment timetabling system to control scarce resources (MCU) and book sessions

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UHI Library Management System

- LMS required for UHI's HE student base
 - UHI students study HE within Academic Partner sites, where we only want one Library
 - Single LMS common to FE & HE therefore required, which implies network Library IDs
 - Single (oracle on Unix) server at DataCentre
 - Records all students and book-stock
 - One core-funded Library Systems officer supports the service
 - Issue desks at every library location
 - Major purchase of new stock now underway

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Student Information System

- SIS required for UHI's HE student base
 - FE students flow into HE (essential part of UHI concept) and may attend several Colleges
 - Single SIS common to FE & HE therefore required
 - Fiendishly complex requirement to maintain inter-college Data Protection regime for FE
 - Enrolls/records all students and many teaching staff
- Since August 2001, provides source for all FE & HE student user identities imported into NDS
 - Import can now be done centrally to save duplication of effort by scarcest resource – the technical staff!

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Student ID cards

- SIS identities used to issue standard cards
 - all FE and HE students
 - Photo-stations at each site
 - ID fed to library system
 - ID cards are now used as library cards
- Distance learning students are a problem for enrollment anyway, but can't photograph them by post ...issue blanks!
 - ? Do you need a signature on a photo-card ?

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Software Licensing

- Need to license standard desktop software
 - Core funding makes software – or indeed anything – 'free at point of use'
 - Might not be able to core fund after the first year ... but a good way to start
 - External capital allows initial core-funding without top-slicing (but note asset question)
 - Then top-slice in later years to reduce cost of internal financial administration ?

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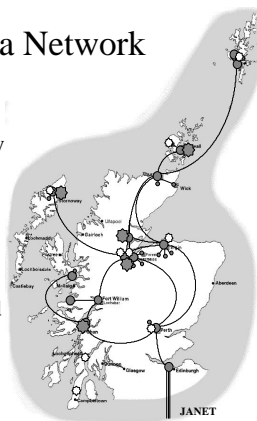
Summary: we have achieved a ubiquitous desktop computing environment ...

- NetWare based
 - Network Login with universal validity
 - Fileserver / network drives
 - GroupWise email integrated with NDS
- UHI-wide identities really work
 - Everyone has ID and services @uhi.ac.uk
 - DHCP everywhere: full 'laptop PC' mobility
- Core funded by UHI
 - Provided for benefit of all users, not just HE

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UHI Area Network

- All UHI partner staff & students are connected by high bandwidth network for internet, email, telephone and video conferencing
- Effectively a regional 'campus LAN' organised by *location* rather than by *department*
 - Virtual Campus concept



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vle.uhi.ac.uk

- Latest common service for HE & FE ...
 - Service provided centrally
 - Single server platform in DataCentre
 - Several VLE software environments
- Identities exported from SIS
 - Passwords managed within each of the VLE environments (not via NDS/LDAP) which cannot scale far enough, so ...
 - Need to move to SIS & NDS integration
 - ? Need to move to MLE ?

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Has UHI solved all the Authentication problems?

- No ...
 - Some colleges *still* use NT to login
 - One college *still* runs (two) distinct NDS
 - Not all NDS identities flow from SIS (yet)
 - Because no common employer, no common staff identity source, so have to allow distributed administration of staff creation/deletion
- Still in process of yielding economy of scale in IT staffing costs, despite common NDS

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What does the future hold?

- FE sector structurally under-funded
- All FE institutions financially challenged
- UHI Partners are quite small, individually, but need to obtain economies of scale to
 - Act as one entity for HE ...
 - Achieve financial viability ...
- While at the same time
 - Developing leading-edge distance learning ...
 - So as to fulfil regional social/economic development goals.

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How can UHI Partners get required economies of scale?

- Common Services provided centrally
- Managed server platforms
- Core technical staff implement common methods (ubiquitous availability)
- UHI-wide staff development (awareness)
- Single MLE software environment (integrated)
- Identities integrated with & between the UHI-provided SIS, Library, Desktop and publishing environments such as WWW.

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Can UHI Partners survive despite economies of scale?

- Common Services provided centrally
 - UHI partners have high cost-barrier to 'rolling their own', but they can *if they need to* have diverse systems for FE specialisms
- UHI-wide environment has to provide a 'harness' for local specialisms
 - Otherwise everyone will (have to) wander off and costs will spiral out of control
 - But without driving up central costs 'too much' and undermining benefits

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