Peter Campbell Burns Access Summary

00:00:00 - Introduction to the Interview

Gavin Clark, representing the National Museum of Computing and Reading Museum, introduces the interview. He explains that it is being conducted to celebrate the 60th anniversary of Digital Equipment Corporation (DEC) opening its first UK office. He states that the interview features Peter Campbell Burns and takes place on 7 December 2023 at Bletchley Park, within the National Museum of Computing.

00:00:30 - Basic Information

After he is asked for his basic information, Peter states his full name and shares that he was born in 1960 in Harrogate, Yorkshire.

00:00:44 - Family Background

After he is prompted to share details about his family's history, Peter reflects on the contrasting backgrounds of his parents. He briefly mentions his mother's involvement in retail but provides a more detailed account of his father's distinguished career. Peter explains that his father was an officer in the Australian Air Force at the time of his birth and worked as a scientist specialising in aerodynamics—a legacy Peter credits with inspiring his own interest in science. He highlights his father's significant role as a spokesperson for the Air Force on space exploration during the 1950s. Peter also mentions that he has documented this role, along with his father's other achievements, through a collection of press cuttings, which he presents as evidence of the strong scientific influence within his family.

00:01:35 - Educational Background

Peter details his educational journey, starting with his A-level studies in Worthing, West Sussex, where he chose chemistry, physics, and mathematics—subjects that laid the foundation for his scientific interests and future studies. He then pursued a degree in computer science at Manchester University, graduating in 1982. Noticing Peter's brief answers, interviewer Gavin encourages him to elaborate on his university experience, noting

Manchester's status as a major computing centre at the time and highlighting it as the place where Peter first encountered DEC computers.

00:02:12 - Manchester University's Computing Curriculum

As requested, Peter expands on Manchester University's curriculum during his time there, describing it as particularly interesting due to its evolution from electronics engineering to the development of early computers. He explains that the course focused heavily on hardware engineering, with substantial work on arithmetic, logic design, computer design, and parallel computers. He highlights the Williamson Display as an example of early storage technology that was part of the learning environment.

Peter notes that the program also included a strong mathematical component and, in the first year, involved using a PDP-11 computer for coding and assembly language learning. He specifically mentions learning the Macro-11 assembly language, which was used for the PDP-11, to explore operating system fundamentals, such as building simple file systems and the associated coding.

00:03:46 - Early Career Path and Transition to Programming

Peter enthusiastically recounts the story of his early career, reflecting on his uncertainty after graduation and admitting that he hadn't initially realised how his experience with DEC at Manchester University would shape his career. After graduating, he first pursued a career in accountancy, applying his computer skills to a business context. However, after just a few months, he realised this wasn't the right fit and resigned. On his way home, he spotted an advert in a magazine for a programmer analyst position at University College. He applied, got an interview the following morning, and by five o'clock that same evening, he received a hand-delivered job offer, entirely due to his PDP-11 experience from university.

He notes the coincidence that his boss-to-be lived just around the corner from where he had lived in Archway, London.

00:04:40 - Reflections on Initial Foray into Accountancy

When asked why he initially chose accountancy, Peter explains that although he had substantial knowledge of computing, he was unsure how to apply it effectively. He felt that his career direction was unlikely to involve hardware, despite his hardware-focused degree. He viewed accountancy as a way to gain valuable business skills that would complement his computing expertise, seeing it as an opportunity to broaden his professional scope. While Peter appreciated the academic aspects of accountancy, he found the nine-to-five routine of audits unfulfilling. He ultimately realised that this path was not for him, but he acknowledges learning important lessons about himself through this misdirection.

00:05:20 - Insights into University College Application

Regarding the quick application process, Peter speculates that he was likely the first candidate University College interviewed who had both experience with and a solid understanding of PDP-11s. He also credits his enthusiasm and passion for science as key factors in his successful application.

00:05:41 - The Importance of PDP-11s at University College

Peter explains that the department at University College relied heavily on PDP-11s, particularly for their capabilities in data acquisition. The Department of Physics and Astronomy was engaged in high-profile experiments in collaboration with the European Organisation for Nuclear Research (CERN). Peter recalls that these experiments aimed to explore the fundamentals of matter and elementary particles, noting that the scale of the experiments was simply breathtaking.

00:06:26 - An Early, Major Project in Digitising Particle Tracks

Peter enthusiastically describes one of the first projects he was involved in: the digitisation of bubble chamber photographs. He explains that a bubble chamber, which he likens to a "dustbin full of liquid hydrogen," is used to track particle interactions. The process involved firing a high-energy particle beam into the chamber, where some particles would collide with protons in the liquid hydrogen. At the exact moment the beam was fired, the hydrogen was decompressed, causing it to boil along the tracks of the particles. Four photographs were then taken from different angles, scanned, and digitised to calculate properties such as energy levels, momentum, and electric charges.

Peter emphasises the crucial role of PDP-11s in this process. The four images were projected onto a tabletop, where Peter would first label the tracks. Following this, a "puck" (a handheld pointing device similar to a stylus, used for precise measurement) was used to measure the particle tracks. These measurements were taken across four measuring tables, each connected to one of the PDP-11s. Peter also recalls using another device, the "Sweep-Nik," a laser-driven instrument that automatically followed and digitised the tracks using advanced optics, requiring only minimal manual guidance to begin. This device was also controlled by another PDP-11.

00:07:55 - A Second Early, Major Project: Using a Holographic Bubble Chamber

Peter describes another significant early project, which involved the use of a holographic bubble chamber. Unlike the previous process, which required taking four separate photographs, measuring the tracks independently, and then merging the data for 3D coordinate reconstruction, the holographic bubble chamber allowed for direct 3D manipulation of the image. The 3D photograph could be moved left, right, forward, and backward, providing a comprehensive view of the particle tracks. Peter recalls writing data acquisition software specifically designed to digitise these holographic photographs.

00:08:26 - A Chance Encounter and the 68,000 Microprocessor

Peter recounts a chance encounter with a professor during his time at University College. The professor noticed a book about 68,000 microprocessors on Peter's desk, which he had recently purchased from a nearby bookshop. Intrigued, the professor mentioned that they needed someone with an interest and skills in microprocessors. During this conversation, the professor discovered that Peter was actively involved in integrating prototype detectors into experimental beams at CERN. Peter frequently visited CERN to run data acquisition processes on these prototypes, with the collected data later brought back to University College for processing on PDP-11s.

00:09:07 - The Transition to DEC VAX and VAX/VMS

Shortly after starting his work with PDP-11s and data acquisition at CERN, the University department invested in a DEC VAX-11/750, an upgrade from the PDP-11s due to its enhanced processing power and advanced capabilities. This new system prompted Peter to expand his knowledge by learning VAX/VMS (Virtual Memory System), a move he credits with steering his career in a new direction.

00:09:27 - Career After University College as a Defence Contractor

After leaving University College, Peter transitioned into a role as a defence contractor, where he worked on a VAX-11/780. He was involved in developing a military command and control system, using the VAX-11/780 to run databases and model the operational system's data structure. Peter highlights this project as an early application of metadata to describe data, emphasising its innovative nature.

Peter remained in this role for several years, finding the work environment engaging, particularly due to the versatility of the VAX-11/780 systems. While the VAX-11/780s were primarily used for database management, they also interfaced with a Lexidata Intelligent Database Machine (IDM)—a specialised processor dedicated to running single databases, which offered enhanced performance for complex data processing tasks.

00:10:32 - Transition to a Consultancy Role

Peter moves on to discuss his transition to a consultancy company, which had an in-house VAX-11/780. Drawing on his past experiences, he quickly became the system manager of the VAX, a position he held for several years. Later, the consultancy invested in MicroVAX and VAXstations, leading to the retirement of the VAX-11/780.

00:11:14 - Why PDP-11 Systems Were Preferred in Laboratory Settings

In response to Gavin's question on why PDP-11 systems were preferred over other computers, Peter notes that while PDP-11s were more commonly used at University College, other systems, such as the GC 4085, were also employed during his time there. He adds that throughout his career, he gained experience with various other computers, including Prime systems.

However, he explains that PDP-11s were particularly favoured because they were relatively easy to interface with external devices and were widely understood in laboratory settings. The PDP-11's Unibus architecture provided a wide range of equipment options, which simplified the interfacing process.

00:12:07 - The Concept of Interfacing and Its Application with the PDP-11

When asked to elaborate on the term "interfacing," Peter explains that it refers to connecting an external device to the computer, allowing it to either read data or control the device. He recalls that the university used an electronics crate with a Unibus interface module within the CAMAC (Computer Automated Measurement and Control) system to establish this connection. Additional modules could then be added to enable data readout from various devices.

Peter reflects on a previous example involving the measuring tables, where the PDP-11 provided two-way control to manage tasks such as lighting, moving film rolls, and reading the puck position. These inputs were processed by the PDP-11 through the CAMAC system. Peter concludes by emphasising that the simplicity of interfacing was the main reason PDP-11s were so widely used in these environments.

00:13:20 - Exploring DEC's Legacy and the Success of the PDP-11

Gavin asks why other computers were less efficient at interfacing and whether DEC's approach was particularly exceptional, or if peripheral makers simply adapted to DEC standards. Peter responds by exploring DEC's history, noting that the company initially avoided the term "computer," which was seen negatively at the time. Instead, DEC focused on developing laboratory modules, readout systems, and control systems. Peter believes this focus on practical interfacing needs and control systems played a key role in DEC's success, particularly with the PDP-11.

He goes on to explain that one of the reasons for the PDP-11's widespread success was its affordability. It was significantly cheaper than many of its competitors, making it accessible for control applications in a range of industries. Gavin then asks Peter to elaborate on why he described the PDP-11 as "ideal." Peter clarifies that the system's compatibility with "off-the-shelf" components, like CAMAC modules, allowed users to easily integrate the PDP-11 into existing setups without the need for custom development. This flexibility, combined with the vast array of available software and hardware, eliminated many technical barriers, making the PDP-11 a practical choice for many users.

00:14:25 - Reflections on CERN's System Choices and DEC Integration

Candidly, Peter admits he has limited insight into what specifically drove CERN's decisions regarding computer systems. However, he notes that CERN's substantial investment in supporting software within the DEC environment made it much easier for institutions like University College to integrate these systems and operate them effectively.

00:14:49 - From PDP-11 to Raspberry Pi: The Challenges of Early Computing

Peter agrees with Gavin as he reflects on the vast differences between the computers he worked with, such as the PDP-11, and modern systems. He notes that he now owns around 25 Raspberry Pi devices, each with no less than 64 gigabytes of memory. In contrast, when programming on the PDP-11, Peter had to work with only 64K of memory and address space, which required careful management of performance and resources. He recalls the constraints of that time, referencing the earlier discussion about the measuring tables and explaining that fitting such programs into the limited 64K instruction space was impossible.

00:15:39 - Memory Management Solutions: DEC's Task Builder and Overlay Trees

To overcome the memory limitations of the PDP-11, DEC provided a task builder, which allowed users to create an overlay tree. This system enabled subroutines to load into memory only when needed and swap out when not in use. It ensured that only essential parts of a program were occupying memory at any given time, rather than the entire program.

Peter concludes by emphasising the stark contrast with modern systems, such as Windows 11, which have vastly larger disk space and resources.

00:16:30 - The Shift from Mainframes to Minicomputers: A Hands-On Evolution

Peter reflects on the late 1960s and 1970s as an exciting transitional period in computing. He describes this era as a time when large mainframes were still dominant, but smaller minicomputers were beginning to emerge. He highlights the growth of companies like Prime, which produced smaller and more affordable computers, making computing more accessible.

Peter recalls his early experiences with mainframes, which were housed in large rooms and managed by dedicated staff, including tape librarians. Interaction with these mainframes was limited to using a terminal, with no direct access to the hardware. However, with the advent of minicomputers, users gained more hands-on control. Peter recounts how, if he needed to store or retrieve data on tape, he could walk into the room himself, take the tape from the cupboard, and handle it directly.

He explains that the tactile, hands-on nature of working with minicomputers was a stark contrast to the detached experience of mainframes. This shift allowed users to directly interact with the technology, giving them the ability to "play" with it in ways that were previously impossible.

00:17:39 - Lamenting the Loss of Connection in Modern Computing Power

Peter reflects on how today's generation often takes the accessibility of technology for granted, remarking—for sake of hyperbole—that even children now hold more computing power in their hands than the early machines like the PDP-11s and VAX systems he once worked with. He expresses concern that this ease of access to modern technology has led to a diminished understanding of, and connection with, the technology itself.

00:18:34 - Reflections on Constraints and Creativity with PDP-11s

When asked whether working with the PDP-11s and their limited memory made his job more complicated and frustrating, and whether DEC's improvements eased this, Peter responds with a perspective of relativity. He humorously observes that while he now has a Raspberry Pi with a 128-gigabyte card, in ten years, even that may seem inadequate, with people wondering how AI could function on such limited space.

Addressing the question directly, Peter explains that at the time, the PDP-11 systems didn't feel like constraints. In reflection, these tight limitations rather fostered problem-solving and creativity, pushing them to think differently about how to achieve their objectives.

Peter contrasts this with today's standards, where modern computers' vast capabilities allow much more to be done in memory. In the PDP-11 era, many tasks had to be written to disk, which slowed operations. Despite these challenges, Peter insists that the PDP-11 was trailblazing for its time, pushing the boundaries of what was possible with the technology available.

00:19:56 - The Scale of Achievements with PDP-11s

Reflecting on the scale of projects handled by the PDP-11s at University College, Peter reminds Gavin that their primary role was data acquisition. As such, the data volumes they managed were not particularly high in terms of computing space or storage demands. Once data was digitised, it was sent to IBM mainframes at the Rutherford Laboratory or CERN, where the more intensive data processing and complex calculations took place.

Peter then shifts focus to the volume of images digitised, emphasising that this was substantial. He recalls that the measuring tables, often operated by students earning extra money, ran seven days a week, with four tables frequently operating through the night. As a result, the amount of digitised particle interactions was immense. However, Peter clarifies that despite the high overall throughput, the data processed at any individual point in time was relatively small.

00:20:53 - Project Bates and Managing Performance Challenges

Peter continues by reflecting on his involvement with Project Bates, where he used a VAX-780 primarily as a database engine and later for code development within a repository known as the "code coral." A significant challenge arose due to performance constraints, as multiple users were multitasking simultaneously—compiling code, running SQL queries, and more—which caused severe system overloads. As a result, performance dropped sharply, prompting the company to adopt a four-day workweek to better manage resources. Employees worked staggered shifts, including four-day weeks, ten-day weeks, and alternating long weekends, as part of a strategy to reduce the performance bottlenecks and distribute the system load more effectively.

00:22:08 - Reflections on Discoveries from CERN Collaborations

When asked to reflect on the breakthroughs or significant achievements at CERN using technologies like the bubble chamber, Peter acknowledges that many discoveries resulted from this work. However, he clarifies that these findings cannot be solely attributed to University College. Instead, University College would predict certain behaviours, such as expecting to observe a million particle interactions, and if a statistically significant number of targeted events fitting their hypothesis were observed, it would help validate their predictions.

Peter elaborates that the films captured from the bubble chambers were distributed among various collaborators—some films went to France, others stayed in Switzerland, and others were sent to Germany. This collaborative approach meant that discoveries could be made by any of the participating institutions. Ultimately, the true breakthroughs emerged when the collective data and findings were combined.

As an example, Peter mentions the discovery of the W Boson, a breakthrough from the bubble chamber work, but with a grin and reluctance to tackle complex physics, he quickly quips, "please don't make me explain it."

00:23:16 - Recalling the Immense Scale of the Bubble Chambers

Peter reflects on the sheer size of the bubble chambers, revisiting his earlier description of them as "a dustbin full of liquid hydrogen." He confirms that this comparison is accurate in terms of scale, but adds that when considering the magnets and other components surrounding it, the size becomes even more impressive.

He recalls standing atop the massive European Bubble Chamber, playfully remarking that it was larger than a three-story house. He describes it as huge, emphasising how incredible and exciting it was to work in such an awe-inspiring environment.

00:23:51 - The Scale and Complexity of Scanning Bubble Chamber Images

Peter reflects on the process of scanning images from the bubble chamber experiments. He explains that the individual negatives, measuring about two and a half inches square, were projected onto a measuring table, where they expanded to roughly one and a half to two metres square. Although Peter doesn't recall the exact data size of these images, he emphasises their complexity and notes that the scanning process was highly selective, focusing only on areas of scientific interest.

He details how each scan captured between 50 to 100 points per line, with the number of lines varying based on the complexity of the interaction—some images contained just a few lines, while others had between 20 and 50. While the data from each image wasn't particularly large, the real challenge lay in identifying what to scan and how to do it effectively, ensuring that only the most essential details were captured.

00:25:05 - The Shift from Analog to Digital Detection at CERN

After Gavin prompts Peter about his earlier comments on converting analog data to digital using PDP systems, Peter recalls the period when prototype detectors were gaining prominence at CERN. This era coincided with the construction of the Large Electron-Positron Collider, a 27-kilometre tunnel that would later be repurposed for the Large Hadron Collider. Peter explains how, during this time, the transition from analog to fully digital detectors became widespread.

He highlights the modern digital detectors now used in colliders, including scintillation counters, which detect particles by generating flashes of light captured by photomultipliers. Peter also describes the function of drift chambers, which measure ionised atoms drifting toward sense wires when particles pass through, and calorimeters, which determine particle energy by measuring the intensity of the light flash. This shift to fully digital systems represented a major advancement in particle detection technology.

00:26:22 - Managing Immense Data Volumes at the Large Hadron Collider

Peter reflects on the immense volume of data generated by the advanced digital detectors at the Large Hadron Collider. He explains that the majority of recorded particle interactions and collisions are ultimately discarded. Incoming data passes through multiple stages in a processing tree, where it is evaluated for significance. If the data is deemed uninteresting, it is discarded to free up space for the next event in the continuous, vast stream of data flowing through the system.

00:27:05 - Transition from PDP to VAX: A New Computing Landscape

In response to Gavin's question about his transition from PDP systems to VAX systems, Peter describes it as a completely different environment. He reflects on the significant shift from the hands-on experience of handling disc packs and occasionally using magnetic tape for data import and export to a more advanced, less tactile setting. With the VAX systems, gone was the intimate connection that PDP users, like Peter, cherished—gone were the flashing lights and switches on the front panel that fostered a sense of direct engagement with the machine.

Peter also explains that moving to VAX systems required learning a new operating system. He transitioned from using RSX-11M Plus on PDP systems to VMS on VAX systems. While VMS was new to him, it shared enough familiar elements to make the learning process relatively easy. He further reflects on how the VAX systems broke through the limitations of the PDP's 64K program space, as VAX—standing for Virtual Address eXtension—pioneered the use of virtual memory, allowing for vastly expanded memory capabilities.

00:28:13 - Expanded Memory Capabilities and the Transformation from PDP to VAX

Peter elaborates on VAX's increased memory capabilities by explaining how virtual memory functions. He clarifies that a system has active memory (RAM) and secondary memory (disk storage), which together create a larger address space by dividing memory into pages. If a page wasn't actively being used, it would be swapped out to the disk. When the system needed access to a swapped-out page, it would be brought back into active memory. This method allowed for a much larger address space, enabling more complex and faster-running programs.

Peter emphasises that this advancement fundamentally changed the way users approached coding. Instead of focusing on fitting code into limited memory, programmers could now concentrate on solving the actual problem at hand. He concludes by noting that the transition from PDP to VAX represented a remarkable transformation in computing.

00:29:20 - Reflections on DEC's Transition from PDP to VAX

In response to Gavin's question about DEC's transition from PDP to VAX systems, particularly the shift from hands-on control to terminal-based interaction, Peter explains that such changes were part of the natural evolution of computing. He reflects on earlier IBM computers, which were operated through arrays of lights and switches, and notes that even the later PDP-11 systems began replacing physical controls with smaller computers, allowing users to manage the main system via a console terminal instead of direct manipulation.

Peter acknowledges that while DEC navigated this transition well, it signalled the beginning of the loss of tactile interaction with machines. He fondly recalls working with PDP-11s, where the physical engagement—flicking switches, observing lights, and hearing the noise of line printers—created a fully immersive experience. As computing evolved, however, he felt a sense of loss; despite the advances in software and hardware capabilities, the excitement of direct, hands-on interaction faded. He humorously laments that his current office, where he now works as a data engineer for an automobile company, is completely paperless—a stark contrast to the noisy, hands-on days of early computing.

00:31:25 - Consistency Across DEC Platforms

When asked to elaborate on his survey response regarding "consistency across platforms," Peter explains that even during the transition from PDP-11s to VAX systems—from the VAX-780 and VAX-750 to the MicroVAX—there was never a dramatic shift. Users experienced a reliable sense of familiarity across the range, even as output and capabilities improved. This consistency also extended to programming languages, making transitions smoother for users.

Peter contrasts this with his experience using the GC 4085 system with the OS 4000 operating system at University College, which required a completely different approach due to variations in commands and vendor-specific features in the compilers.

In contrast, DEC platforms always felt cohesive and cutting-edge, offering a more unified experience.

00:32:35 - An Innovation: DECnet, Part 1

Peter recalls one of the most exciting advancements during his time at University College: the introduction of DECnet, DEC's proprietary networking protocol. Describing DEC as cutting-edge, he explains that DECnet enabled computers to connect and exchange data at high speeds, revolutionising how information was shared. Unlike today's Ethernet cables, the thick Ethernet cables used at the time required specific transceiver points to tap into the network, creating a more structured system—but no less groundbreaking.

For the first time, this technology reduced the need for physical data transfers, such as running around with paper tapes, marking a significant leap in efficiency and workflow. DECnet allowed users to connect machines in ways never before possible, facilitating faster data exchange and collaboration.

00:33:25 - An Innovation: DECnet, Part 2

Before the introduction of DECnet, Peter recalls using a file transfer protocol to connect a GC 45 and PDP-11 over a 9,600-baud computer terminal line. The process was somewhat primitive: one computer would "think" it was printing to a terminal, while the other acted as if it were reading from a keyboard. By comparison, DECnet introduced high-speed file transfers, marking a significant leap forward.

Peter reflects that this advancement signalled the start of an exciting new era. DECnet laid the groundwork for clustering computers, a concept that would eventually evolve into modern cloud computing. In reflecting on this, Peter emphasises that DEC was ahead of its time, and being part of that innovation was incredibly exciting.

00:34:16 - A Strong Community and the Role of DEC Support

Unprompted, Peter goes on to praise DEC, emphasising the strong sense of community that developed around their products. He highlights how users felt well-supported, noting that there was always ample help available.

Although he wasn't personally a member, Peter mentions the DECUS (Digital Equipment Computer Users Society), DEC's official user group. He also commends DEC management for staying current with communications, ensuring the quality of their products, and providing well-documented materials that users could consistently rely on.

00:34:42 - Official Training and Unofficial Learning

Peter describes the privilege of attending several official training courses provided by DEC. Initially held in a small office in Reading, these courses later moved to Shire Hall. Among the courses he attended were VAX fundamentals and system management training, which he found invaluable.

He reflects that every interaction with DEC was an opportunity for learning. For example, hardware failures—such as malfunctioning chips—were not uncommon at the time. When this happened, a DEC service engineer would be called in. Peter admits he always looked forward to these visits, as the engineers were not only highly knowledgeable but also engaging conversationalists. These interactions often provided valuable insights that weren't always covered in the manuals.

00:35:42 - An Anecdote of a DEC Service Engineer

Peter shares an anecdote to highlight the value of his interactions with DEC service engineers. He recalls calling DEC after encountering an error, with the diagnostic pointing to a specific failure—though he can’t remember the exact details. Initially, it seemed unlikely that the issue could be related to any other component based on the error message. However, the DEC engineer responded swiftly and suggested Peter ignore the reported error. The engineer explained that the error actually indicated a failure in a different board. Following the engineer’s guidance, they replaced the other board, and the system worked perfectly. Peter reflects on how the DEC engineers’ expertise often surpassed what the diagnostics alone suggested.

00:36:33 - Reflections on DEC's Philosophy from a User's Perspective

When Gavin asks Peter if he sensed a guiding philosophy at DEC from a user’s perspective—such as a commitment to doing right by the customer—Peter admits that he didn’t really think about such things at the time. However, looking back, he reflects that DEC was always there when needed, providing consistent support. He recalls that software and documentation updates were both regular and reliable, reinforcing the company’s dependability.

00:37:06 - The Importance of Dependability in Mission-Critical Roles

After acknowledging DEC’s dependability, particularly in mission-critical roles, Gavin asks Peter how essential this reliability was. Peter responds that it was absolutely vital. He gives the example of digitising bubble chamber images, where keeping up with progress was crucial. The sheer volume of scanning required was immense, and any delays would have meant passing the film rolls to other universities, which could have risked reputational damage and lost trust within the scientific community. Maintaining progress was essential to ensure that the scientific needs were met in time.

00:37:40 - Dependability in Project Bates

To further illustrate the importance of dependability, Peter describes Project Bates, which involved around 150 people. If the VAX-780 system went down, a significant number of people would be unable to work, making continuity of service essential to the project's success. Any system downtime would halt productivity for many, emphasising the critical need for reliable systems.

00:38:06 - DEC's Service and Responsive Support

Peter revisits the topic of DEC's service, explaining that the level of support you received often depended on the service-level agreement in place. In his experience, he was consistently impressed by DEC's responsiveness. He recalls never having to wait long when system failures occurred. As mentioned earlier, the timely arrival of an engineer was invaluable, allowing operations to quickly resume without significant delays.

00:38:32 - Feeling Like Part of the DEC Family

When asked whether he felt like part of the DEC family, Peter responds enthusiastically, saying that he did. While he didn't have close ties to departments like procurement due to limited interactions, he felt a strong connection from an engineering perspective. As mentioned earlier in the interview, he always welcomed visits from DEC engineers—not just for the invaluable technical knowledge they shared, but also for the everyday interactions that made him feel more personally connected to the company.

00:39:24 - Reflections on DEC's Proprietary Nature

In response to Gavin's comment about DEC not being an open systems company, Peter addresses whether he was aware of its proprietary nature. He asserts that his work was closely tied to DEC, as it was widely used in the environments where he operated. He recalls using the GC 4085 system and completing offline processing with IBM 360s at Rutherford Laboratories.

Peter concedes that Gavin's observation holds some truth, acknowledging that he worked within a "bubble" of DEC technology, but it was a comfortable and highly effective space to be in. However, as his career progressed, Peter found himself moving away from DEC—not by choice, but due to the natural progression of his career. Transitioning to working with Sun Microsystems in Unix and Microsoft Windows, Peter reflects on how the technological landscape seemed to shrink, with fewer diverse systems in use.

00:40:24 - The Changing Relationship with Technology

Peter discusses how the relationship with technology has shifted dramatically, particularly with the rise of systems like Windows. He observes that today's users are much more removed from the suppliers of the technology they use—a stark contrast to the tactile, hands-on relationship he had with larger systems like mini-computers in the past. Now, people are more reliant on companies like Microsoft, with far less personal engagement with the machines themselves.

00:41:03 - The Changing Support Relationship with Technology Companies

In response to Gavin's question about whether the support relationships with technology companies have changed compared to those with DEC, Peter agrees that the differences are significant. He explains that the biggest change is the complexity of modern systems. In the days of PDP-11s and VAX systems, users relied mainly on the operating system and perhaps one or two compilers. There wasn't much else layered on top, as the nature of the work was simpler.

Peter contrasts this with today's environment, explaining that modern desktops, like those running Windows, are packed with various tools such as Microsoft Teams, Zoom, antivirus software, and VPNs. Referring to his current workplace, he notes how both SaaS (Software as a Service) and Oracle play central roles in operations. He also highlights how browsers are now essential for accessing many services, creating a vastly more complex environment compared to the limited number of products available in earlier computing systems.

00:44:22 - The Enduring Legacy of DEC Software

Peter highlights an interesting point about DEC's software, noting that many platforms once familiar to workers—such as Prime, Data General, and Harris—have disappeared, along with their operating systems. He reflects on how these systems are no longer in use, whereas DEC's legacy continues. While Digital Equipment Corporation itself no longer exists, Peter emphasises that OpenVMS, which evolved from VMS, is still widely used. He even mentions that he successfully got it running on a Raspberry Pi, underscoring its continued relevance and longevity in the modern era.

00:43:17 - The Benefits of Clustering, Part 1

When asked to reflect on the use of clustering, Peter explains that their main challenge with data acquisition systems was transferring data from multiple sources. They had the measuring tables connected to one PDP-11, the holographic bubble chamber connected to another, and Sweet Nick connected to yet another PDP-11. The difficulty lay in transferring this data to its final destination—Rutherford Appleton Laboratory via the GC 4085. The process involved manually loading magnetic tapes onto each machine, writing the data, and then physically taking the tapes downstairs to load onto the GC one at a time.

With clustering, this process became far more efficient. Peter recalls how a single command could now transfer data seamlessly between systems, eliminating the need for manual tape transfers. He highlights this as the biggest advantage of clustering, laying the foundation for what cloud technology offers today in terms of resilience and ease of data transfer.

00:44:47 - The Benefits of Clustering, Part 2

Clustering didn't just revolutionise data transfer; it also greatly improved the backup process. Peter explains that with standalone machines, backups were laborious. Each machine required its own backup copy on magnetic tape, and the tapes had to be managed individually. Clustering simplified this by allowing backups from multiple machines to be stored on one larger central machine, reducing the process to backing up just that machine.

Peter recalls how painful the backup process was for one of his old PDP-11s, which had only a single system disc. Creating a backup meant frequently swapping discs in and out. He admits to once accidentally overwriting a new disc with an old backup, illustrating how challenging the process was before clustering streamlined it.

00:45:58 - The Impact of DECnet

After Gavin remarks that DECnet was one of Peter's most memorable projects, Peter agrees, reflecting on its significant impact. He describes it as a major shift in the way they worked. At the time, Peter was managing three PDP-11s, a VAX-750, and a GC 4085. Today, switching between machines is as simple as using a single terminal, but back then, moving from the VAX to a PDP-11 required him to physically get up, walk across the room, unplug a patch cord, and reconnect his terminal to another machine.

With DECnet, all of that changed. Suddenly, everything could be done from one desktop, eliminating the need for constant movement and manual reconnections. Peter concludes by remarking that this breakthrough made him feel like something truly exciting had occurred.

00:46:55 - Overcoming Challenges During the DECnet Rollout

Peter humbly admits that the rollout of DECnet wasn't something he handled alone. While the head of computing took on much of the work, Peter played a crucial role, contributing wherever he could. He reflects on the collaborative nature of the project, recognising that, although his role was supportive, it was integral to overcoming the numerous challenges they faced throughout the process.

One of the main challenges, Peter explains, was the old building they worked in, which made installing the network infrastructure particularly difficult. Running the wires through the roof spaces and ducting was tricky, especially since the machines weren't all located on the same floor, making the process of tapping the wires a nerve-wracking experience.

Additionally, configuring the system posed its own difficulties, particularly with SYSGEN (System Generation), the process of tailoring the operating system to specific hardware. Despite these challenges, Peter fondly recalls the "WOW" moment when one machine successfully connected to another, making all the effort feel worthwhile.

00:47:50 - The Extent to Which DECnet Was a Form of Ethernet

Peter firmly dismisses the idea that DECnet was only partially a form of Ethernet, asserting that it definitely was. While DECnet used a proprietary protocol, he explains, it still operated on Ethernet principles. Although it wasn't TCP/IP, the standard used today, it functioned similarly to Ethernet. The machines would attempt to access the same line, use collision detection if another computer was already transmitting, and try again later—just like Ethernet. The key distinction was DEC's choice to use a proprietary solution.

Peter admits that he's unsure what eventually happened with DECnet, but speculates that DEC either developed bridges to allow interoperability with other systems or eventually transitioned to supporting TCP/IP as the industry standard.

00:48:55 - Favourite Workload: The Holographic Bubble Chamber, Part 1

When asked to choose his favourite workload or application, Peter selects the holographic bubble chamber, which he has referenced multiple times throughout the interview. He elaborates on his role, explaining that one of his key responsibilities was to build a processing system that allowed for the review and editing of measurements. This system needed to read in data and accurately position the stages for each measurement.

Peter recalls the challenge of working with the “tree” structure, where measurements branched out to represent the possible paths of a particle collision. At the time, the machines didn’t support advanced graphical displays, so the visual representation rarely reflected reality. During editing, it was crucial to know exactly where in the tree structure the measurements were located.

By carefully assessing one branch of the tree and applying his knowledge of mathematical expressions, Peter realised he could reverse the process. Using brackets and arithmetic signs to represent the structure, he successfully displayed the data on the screen. This approach proved highly effective and even earned him a mention in someone’s PhD thesis—an achievement Peter admits was immensely rewarding.

00:50:40 - Favourite Workload: The Holographic Bubble Chamber, Part 2

Peter continues by explaining that his enjoyment stemmed not only from working with the computer but also from the physical interaction—sitting next to the machine, watching as it responded to the buttons he pressed. The system’s use of lasers and other advanced technologies made it incredibly engaging from a technological perspective. Quite simply, he states, it was just so much fun.

This is another example of Peter’s appreciation for the tactile nature of his past work, highlighting the hands-on experience that systems like these provided.

00:51:12 - Text-Based Interaction with the Holographic Bubble Chamber

When Gavin describes the process of interacting with the holographic bubble chamber system—assuming it involved a GUI, a screen, a mouse, and a command line—Peter quickly corrects him. He explains that the system used only a purely text-based terminal. Surprised, Gavin interjects, asking if Peter was really interacting with a text terminal even when working with graphic images. Peter clarifies that there was no way to view the graphics directly at the time.

00:51:31 - Building the Data Structure for the Holographic Bubble Chamber

Peter explains that the measurements and digitisation process for the holographic bubble chamber revolved around building a data structure. He acknowledges that, given the limitations of the tools available at the time, the approach was quite ingenious. While modern programming languages like Pascal and C support dynamic data structures, Peter was working with Fortran IV, which offered almost no support for such flexibility.

00:52:03 - The Hydra Package: Simulating Dynamic Data Structures

To overcome the limitations described in the previous section, some innovative individuals at CERN had developed a package called Hydra, which allowed for more advanced operations behind the scenes. By utilising common data constructs, Hydra effectively simulated the creation of dynamic data structures. This enabled Peter to build the tree-like structures necessary for recording the holographic bubble chamber measurements.

Peter goes on to describe the process: each particle interaction was added as a new node, and when an interaction split into two paths, one node would branch out into two new nodes representing those paths. This simple principle formed the basis of the data structure, which could then be exported for further analysis.

00:52:49 - Transition to Digital Viewing with the Large Electron-Positron Collider

Peter reminds Gavin that during the time of the holographic bubble chamber, there was no way to digitally view the images it produced. He shifts the conversation to when this capability became possible, recalling that it began with the Large Electron-Positron Collider. He notes that the Department of Physics and Astronomy at University College invested in a MegaTech graphic display terminal, allowing them to view images digitally for the first time.

Peter contextualises this advancement, explaining that it coincided with the era of the Large Electron-Positron Collider and subsequent physics experiments, where everything transitioned to solid-state technology, replacing bubble chambers and similar methods. This shift eliminated the need for intermediate photographic stages, marking a significant change in how data was captured and processed.

00:53:36 - The Importance of Good Quality Documentation

Peter stresses the importance of high-quality documentation, sharing an example from one of his early jobs.

He was tasked with interfacing the measuring tables and PDP-11 computers, a system he had discussed earlier in the interview, using CAMAC—a modular system of electronic components housed in a rack. The PDP-11's device driver was initially designed to handle only one CAMAC crate, but Peter needed to chain multiple CAMAC crates together and modify the device driver to support this configuration.

Without thorough documentation on how to write a device driver for the PDP-11 under RSX-11, Peter admits he wouldn't have been able to complete the task. His university experience hadn't exposed him to these specific elements of the PDP-11, so he relied heavily on teaching himself through the detailed documentation available at the time.

He recalls spending considerable time removing old pages and inserting new ones into the large lever-arch files that housed the system's documentation, reflecting on how essential this process was to his ability to successfully update the system.

00:55:11 - How Did Documentation Arrive?

When Gavin asks how the documentation arrived, Peter bluntly responds that it came as a shelf-load of fat binders, spread across many volumes. He adds that when the VAX-750 arrived, there was even more documentation than with the PDP-11. All of this material was stored in large, heavy lever-arch files. Whenever they received a software update or patch, they had to manually locate the relevant sections in the manual, remove the old pages, and insert the new ones. Peter contrasts this with today's ease, noting that now one would simply receive a new PDF.

After a prompt from Gavin, Peter elaborates on the scale of the documentation, explaining that it took up about two full bookcases in the office. When Gavin asks if the documentation arrived with the software, Peter confirms that it did. When buying the software, such as the operating system on magnetic tape, the box also included a stack of manuals—not just for the operating system but also for additional components like the Fortran or Macro-11 assembly manuals. With every update, new pages automatically arrived to replace the old ones.

Peter concludes by praising DEC's organisation of the process, noting that it was all very well managed.

00:56:37 - Third-Party Software and Exchange

After Gavin mentions the DECUS environment, he asks if Peter used software built by others for his projects. Peter replies that he did so occasionally. He explains that there was a lot of exchange between universities and within CERN, where people frequently shared software and solutions. He revisits his earlier mention of file transfers using terminal lines, noting that these were eventually replaced by Kermit, a file transfer protocol. However, Peter admits he's unsure of Kermit's origins, speculating whether it was third-party, open-source, or proprietary.

Peter adds that back then, there was a robust exchange of software, and concerns like viruses weren't much of an issue. Gavin interjects to remind Peter that intellectual property wasn't a major worry either, as open-source licences helped protect intellectual assets.

00:57:27 - Expanding on Third-Party Software Terms and Conditions

Expanding on the mention of terms and conditions for using third-party software, Peter acknowledges that he was fully aware of the restrictions applied to the software he used. He explains that DEC software was proprietary, unlike today, where one might easily share software or games with a neighbour. Peter rhetorically asks, "Who would you even share DEC software with back then?" He clarifies that everything was licensed, often with licence keys, so sharing DEC software wasn't common. However, he notes that within the academic community, it was quite common to openly share useful pieces of FORTRAN code.

00:58:16 - The Last Hands-On Experience with DEC

When asked to recall his last hands-on experience with a DEC system, Peter explains that after moving on in his career, he worked for a consultancy firm where he was responsible for their

VAX systems. He initially looked after their VAX-780, followed by their MicroVAX, which included DECnet and some VAXstations. Peter left the company in 2000, and since then, he admits he has not worked with a DEC system. He adds that he misses working with them.

00:58:43 - Exploring Retro Computing and Astronomy as Hobbies

Peter discusses the thriving retro computing community, where enthusiasts build simulators for vintage systems. He mentions that he owns two PDP-11 simulators, one of which includes a replica front panel with functioning switches and lights. He jokes that he holds a hobbyist licence for OpenVMS and enjoys spending time experimenting with these simulators.

Peter also shares that one of his hobbies is astronomy, specifically his involvement in a network of meteor cameras. One of his projects involves reconstructing the trajectory of "dark flight"—the period after a meteor stops glowing and becomes invisible as an ionised trail. If the meteor is falling to Earth, the goal is to predict its landing site. Peter reveals that he has been working on a dark flight simulation and is in the process of porting it to one of his PDP-11 simulators.

00:59:45 - Reflecting on the Pace of Old vs. Modern Technology

Building on the previous discussion about his PDP-11 simulators, Peter reflects on the stark differences between old and modern technology. He explains that his simulation software, which relies heavily on arrays and memory storage, runs almost instantly on modern systems like Windows. However, on the PDP-11 simulator, the process is much slower. Despite the significant time difference—several minutes on the PDP-11 versus split seconds on modern systems—Peter finds great satisfaction in watching the lights on the PDP-11 simulator flash as it slowly crunches through the numbers.

01:00:36 - The Appeal of Returning to PDP Emulators and OpenVMS

The continued pursuit of PDP emulators and OpenVMS is driven by both nostalgia and intellectual satisfaction. It serves as a reminder of a long-standing love for computers and the joy found in working with technology over the years.

Now in the sixties, there's a humorous confession: while some might have a midlife crisis and buy a Ferrari, the preference is to indulge in retro technology instead.

Peter explains that his continued pursuit of PDP emulators and OpenVMS is driven by both nostalgia and intellectual satisfaction. It reminds him of his long-standing love for computers and the joy he's found in working with technology over the years.

Now in his sixties, Peter humorously confesses that while some people may have a midlife crisis and buy a Ferrari, he prefers to spend his time playing with retro technology.

01:01:15 - The Decline of DEC

Prompted by Gavin to reflect on DEC's decline, Peter admits that by the time DEC was bought out—first by Compaq and later by HP—he was no longer as hands-on with DEC systems as he had been earlier in his career. He recalls feeling great sadness when the company faded, as he had loved being part of DEC's world.

Peter speculates that DEC's decline was partly due to the rise of desktop computers, which marked the end of the minicomputer era. He notes that the entire computing landscape was changing, much like the current shift toward cloud computing. Peter believes DEC's disappearance was somewhat overshadowed by the dominance of desktop computers, which had become the most visible and widespread form of computing at the time.

01:02:29 - Reflecting on DEC's Legacy

Reflecting on DEC's legacy, it's believed that the company made many significant contributions—perhaps the most impactful being the concept of computer clusters. Clustering fundamentally changed how people think and work, revolutionising the field of computing.

One example is the Leo project, where many of the practices used today in data management, business analysis, and systems analysis can be traced back to early pioneering work. Many aspects of how people think and work today were originally pioneered by DEC.

Moving forward, it's noted that DEC played a key role in making computers more accessible, marking a shift from massive mainframes to smaller systems that could fit in an office. This enabled users to operate computers without needing dedicated computer operators or night shifts. DEC's influence is considered profound, and there's still a thriving community of enthusiasts engaging with DEC systems today, including through PDP-11 simulators.

01:03:56 - The Continuing Enthusiasm for DEC Simulators

Returning to the topic of simulators, it's noted that a DEC System 10 simulator is soon to be launched, which is quite exciting. Despite the large control panel that will take up considerable space in the study, there's determination to get one as soon as it becomes available.

It's also mentioned that many people still use OpenVMS, both as a hobby and in business settings. Despite DEC being long gone, there remains a strong community of enthusiasts who hold the company in high regard, demonstrating its lasting impact on the computing world.

01:04:32 - The Legacy of Clustering

Prompted to expand on DEC's legacy in clustering, Peter explains that the key aspect of clustering is resilience. Reflecting on his own role, he admits he has "one foot in the legacy camp," where servers are still physically located in offices, storing data on machines. In contrast, modern systems are built for the cloud, distributed across regions, allowing another region to take over if one goes down—an entirely different world from the one he used to work in. Even the way costs are accounted for has shifted, moving from capital expenditure to more flexible models.

When Gavin asks whether clustering's legacy is exclusively DEC's, Peter dismisses this notion, acknowledging that other companies, like Sun Microsystems, also contributed to networking innovations. However, DEC was one of the first to bring clustering to the market, and the concepts embedded in their early systems had a significant influence. While not solely DEC's legacy, Peter admits that DEC played a pioneering role, particularly with its proprietary systems.

01:06:00 - The Lasting Impact of DEC on a Career in Computing

In reflecting on how DEC shaped his career, Peter begins by expressing his love for everything he's done in computing. However, after moving away from hands-on coding into management consultancy roles, he experienced a long period of dissatisfaction. It wasn't until a redundancy opportunity arose that he had the chance to reflect and decide to return to his roots in computing. This voluntary decision was driven by the realisation that coding and working directly with technology were what he loved most.

Peter further explains that during the middle period of his career, each promotion or career step took him further away from the hands-on technology that had sparked his passion. This distance made his return to more technical roles a deeply fulfilling choice.

01:06:41 - Career Reflections and Leaving Academia

Peter reflects on how fortunate he has been to return to doing what he loves after years of moving away from hands-on technology roles. He fondly recalls his time at University College, calling it one of the best jobs anyone with a passion for science could have asked for, and admits that he still wishes he were in that role today. However, he acknowledges the practical realities he faced at the time—particularly the high cost of living in London, which made it difficult to remain in academia. Although he made the decision to leave for a better lifestyle, he regrets not staying longer.

01:07:44 - The Lasting Legacy of DEC and Personal Reflections

When Gavin prompts him about whether he wished he had stayed specifically with DEC, it's admitted that while working with DEC would have been wonderful, the company didn't survive. He also notes the rise of other systems capable of performing similar tasks in electronic data acquisition, which contributed to his career shift. Despite this, the experience is remembered fondly, and the opportunity is considered a huge privilege.

This sense of privilege extends to the broader influence DEC had, as the passion for DEC's technology has remained strong over the years. There is also recognition that this feeling is shared by many, as an active community of enthusiasts still engages with DEC systems, simulators, and networking. This ongoing interest is seen as a testament to the lasting impact DEC had on those who worked with its technology.

01:08:52 - The Maker Mindset and Preservation of DEC Technologies

When asked if the revival of DEC technologies stems from a maker mindset among younger generations, Peter reflects on this, considering the possibility. He believes that the resurgence in retro computing is mostly driven by people of his own generation. While retro computing often focuses on playing eight-bit video games on systems like Ataris, the interest in PDP simulators and similar technologies is largely driven by those who worked with them firsthand.

Peter admits to having collected a few items from his time working with DEC but acknowledges that, at some point, he will need to part with them. He expresses a desire to pass these pieces on to institutions like the National Museum of Computing or perhaps to schools, as a way to share the knowledge and preserve the legacy of early computing systems.

01:09:45 - A Personal Ethos

Peter believes it is essential for anyone working with today's computing technology to understand the journey that led to the present. He emphasises that there are valuable lessons from past technologies that can still inform modern coding practices.

01:10:00 - Conclusion of the Interview

Gavin concludes the interview, and with a warm smile, Peter gives his thanks.

END OF SUMMARY