An Interview with

NAJAH NAFFAH

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Najah Naffah Interview

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Abstract

In this interview, Najah Naffah describes his experience working under Louis Pouzin on the Cyclades project in France in the 1970s. His work on terminal applications with Cyclades led to subsequent projects in the private sector with Bull, Sabre Technology, and EDS. Naffah led teams that developed distributed office systems and multimedia projects, and shares his perspective from a career of innovation and business in computing and information technology.

This set of nine interviews conducted with Tilly Bayard-Richard, Najah Naffah, Louis Pouzin, Marc E. Levilion, Michel Gien, Jean-Louis Grangé, Gérard Le Lann, Rémi Després, and André Danthine was funded by the ACM History Committee with a fellowship on "European Contributions to Computer Networks: An Oral History Project."

Russell: I'm with Najah Naffah, and we're here to talk about your career and your history with computing. Can you tell me about your education and how you first encountered computers?

Naffah: I started my education with a civil engineering degree from Lebanon. And then I said, "Well, I need to specialize more," and I came to France, and I prepared a degree in telecommunication engineering, what's called the ENST at that time. Now it's known as *Institut Télécom*. Then I faced computers in a special defense system, where I discovered the existence of the IBM 360 and the only group where people would have learned about computing and its 360 principles of operation. And it was exciting. And I said, "Well, I need to specialize in computers," and decided to prepare a PhD, or a doctorate degree that we call in France a *doctorat d'ingénieur*. So I looked for a subject which could be of interest. And a friend of mine said, "Well, why don't you work on connecting computers together?" And I said, "Wow, that's interesting. Who is doing that?" He said, "Well, there is a research institute where there is a pilot project called Cyclades. I know the leader of the project. His name is Louis Pouzin. I'll get you to know him, and we'll take it from there." So I came to Louis and said, "Hi. Do you have a project on connecting computers?" He said, "Yes, of course. We are in the middle of connecting computers. There is the ARPANET. There is Cyclades, we have just started." I think it was in '74. So I started there. So I moved from civil engineering to telecom engineering to computers. And I ended up preparing a PhD in computer networks, so I'll tell you more about that. And then, since then, I worked for 10 years in research at the IRIA – at that time, it used to be called IRIA without the INRIA – and after that, I went to Bull to work on office system for Bull. I stayed about 10 years there. And after Bull I went to Sabre, which is Sabre Technology, the subsidiary of Sabre group, which was the subsidiary of American Airlines. And I worked for five years on reservation system and operation research application for yield management, capacity management. So I led the business unit of Sabre in Europe. And then I went to EDS to do outsourcing. I stayed for seven years at EDS, then HP because HP acquired EDS in doing business process outsourcing. Now I'm an independent consultant, having my own company, and I give consultancy on various strategic aspects of computing without any differentiation, mostly in the cloud

environment, but with the foundations that I have learned through all my careers, whether it's application side or computer side or networking side or architecture or whatever process you want to put on top of all this. So here I am <laughter> ready to tell you more about something I have lived something like 35 years ago.

Russell: To start back at the beginning – you joined Cyclades as a graduate student?

Naffah: Yes, as a graduate student, but I had my engineering degree… <simultaneous talking>

Russell: And you came with an interest in connecting computers. Who was on the team already first?

Naffah: There was Louis. Then there was Hubert, Hubert Zimmerman who became my PhD advisor. And then there was Gerard Le Lann, Jean Le Bihan, and Jean-Louis Grangé, and Michel Gien. So those are the guys, the core team. They used to call us the Daltons… That's silly. There is a *bande dessinée* or… in which are Dalton and Lucky Luke. The Daltons there are supposed to be the bad guys. A humoristic thing. And the bad guys, there is the tallest one, the shortest one,… <laughter> So I dedicated myself, starting by connecting heterogeneous systems. And then my area, which was not yet tackled by the team, was connecting terminals. And at that time, we were only talking about dumb terminals, you know, TTYs. And the idea is the terminal should be more intelligent than a TTY. So there was at that time, the terminal 3270, the data entry terminal, which used to work in block mode rather than in character mode. And they said, "Why don't you take this concept – this metaphor – and make it a packet terminal connected to the network?" These were subjects that had not been approached in the ARPANET, and I started it, and at the end, I was able to create a packet mode terminal that is interacting with the datagram packet-switch network of Cyclades, as like it was a host. So, I brought the proof that a simple terminal with little memory, you can get, put all the protocols needed to interact with other hosts, whether it be link-level protocol, transport-level protocol, and differential terminal protocol. And I illustrated through this

multiple concept, the fact that the terminal can be connected, send packets, receive packets, exercise the flow control, the error control, and all the layers of the network, plus which was the most, let's say vertical subject, was that I made the virtual terminal read. It was able to talk in multiple mode with different applications. It was able to talk in TTY mode. It was able to talk in block mode and in color and all kind of, you know, bells and whistles that you could imagine an advanced application would use to interact with advanced technology from the terminal side. So that was the topic that I have tackled and the implementation that I have done. And it has served a lot. In fact, it has served for testing, for instance every time we had a new host to connect to the network, the first terminal, which was in front of this host, to check the packet, that they are well received within this new host, well transmitted, that was my terminal. And on the screen I used to display the sent packet and the received packet in different color, so it became like a monitoring system every time. So when it passed the test that connected my terminal would say, "This host could be put on the network with no risk." And of course it has been extended because since you have been bringing the proof that not only TTY or block mode terminal could be connected to the Internet, it has moved to a project that I have led later on after Cyclades, which was called the Kayak project. With Kayak, I developed a complete distributed office system, connected to the packet-switch network whether connected to the [X] 25 or in packet mode a la Cyclades through a local area network which we designed as a team. I was a leader of the team, an office work station that its origin was this packet terminal. We created a work station like the outdoor computer developed by [Xerox] PARC, and we've put all the applications in this personal computer. It was called the *bureau viseur*. It was like a complete Ethernet system with multiple workstations, print server, message server, filing server, and the workstation had all kind of applications – editor, graphic editor, text. All that you see now as PowerPoint, Word, it has been developed by the team alongside with good advanced hardware with a mouse, the first mouse in Europe, you know, it was mine. And the story is that, you know, we made the mouse in conjunction with a professor called Jean-Daniel Nicoud from Switzerland who developed the first mice for us. And then those mice, in fact, have been taken, I think, I'm not sure 100%, by the two young entrepreneurs, brothers who went to the United States and founded Logitech. So that's, that's a good story. So that's,

that's the whole aspect. Now from a standardization point, if you want, ISO model, I was involved with the team on developing the OSI model and particularly I was in charge of the layer six, which was the virtual terminal layer.

Russell: Did you get involved with OSI from the very start?

Naffah: Yes. I have, in fact, a very good picture that I can show you where there were like a team of French, I think, Michel Gien, myself, and Hubert. And with a guy called DesJardins from NASA. And a few Japanese who were like 10 people. I just discovered recently the picture, and it illustrates the fact that the OSI team '78 were from various parts of the world. Japanese were very active. And from NEC in particular. And America, Europe, Germany, Switzerland. Yeah, and we had good, good contributions.

Russell: Were you a part of INWG before OSI?

Naffah: No, personally, I didn't participate. I only participated in ISO/ OSI project. I was very involved in implementation and development. So I just participated… probably I'd been solicited for small missions, but there is nothing in my mind or memory that reminds me of a long period where I'd been fighting for all the stuff in different contexts like Louis or Hubert.

Russell: Right. And then, then, in the Cyclades work – before moving back to OSI – one of the things I'm trying to get a handle on is what you thought you were doing at the time. It sounds to me like you were doing research like a student would do, and not really thinking of it in a business context or a competitive context. Is that right?

Naffah: Well, not 100% right, not 100% right. Because I'm a very business-oriented person. At that time, I was not like a stamped business person, but from my education and the fact that a lot of my friends who prepared the degrees with me in civil engineering in particular, they became, like when I was in '78 doing this, they became big rich people because they'd been building bridges, highways, and all kinds of

engineering stuff. I used to be remarked from the family, "Hey, what are you doing here? Like doing research?" And I'm like, "No, no. Sometime it's going to make money." So we tried to in fact… There was a trend to connect to the network more intelligent terminals than dumb terminals. Because dumb terminals take, honestly, just one character per packet or two characters if you type hard or you put some kind of programming – two characters in 128 bytes that only one or two character of data, and then the echo would come back, and you'd put the packet… [So I said] "Hey, Louis, you should do something else. So let's build all the page or the block in the terminal, and we hit the button, and then it goes in the packet and you fill the packet, and then you have at least 40 characters or 60. So where are we? Can we get this?" I think at that time we had some solicitation from Canada. I don't remember exactly who talked to Louis, and Louis said, "Well, why don't you build a proposal – a commercial proposal – and send the guy what you are doing?" Well, it ended up creating some interest, but the problem was that the hardware I had, it's very heavyweight hardware. There was no processor at the time – 8 bits, 16 bits, 32 bits. There was not anything like this [today]. It was one board, you know. You need to program some kind of programmable logic board. *Voila*. And I had a software development system for this board, which was heavyweight. I had to write in assembly language for everything. I had only 156 bytes of memory. 8,000 instructions only that can be put. So you know, I optimized every single bit in the memory for RAM and then every single two byte instruction, not exceeding 8,000 instructions. And then, it's really heavyweight. It was comparable to the 3270 hardware, but it was not something that you would put in the hands of researchers at that time who used to prefer the teletype, you know. So we had a gap in the hardware manufacturing side to make the product acceptable by the market. But, true, the spirit was… If it sold, it's nice to have as a sellable product. It was not like survival, like "Hey, you need to do this and sell it."

Russell: Louis spoke about Cyclades losing funding, and he described some of the politics behind that. I take it that, as a junior member of the team, you weren't too involved in the heavy political aspects?

Naffah: Not much.

Russell: Did you have an eye on the political aspects, or…?

Naffah: No. Not much. Yeah, I think all the politics, I think, if you want to call it politics… All the lobbying, if you want, was done by Louis. And Louis was in the center of all this. Louis has a special character. In France as a society, and particularly the category of people we were facing, they're all engineers. So at that time when you go to school, you wouldn't have courses in management or courses in publication. So very, very engineering-minded people. "Oh, okay. My theory. Your theory. Who can win?" There is not something like, "Hey, let's put all those theories together, and let's win together something." Here I'm telling you this after experience. Now I can do lobbying and do business, whatever you want. But at that time having a post-era judgment, I think Louis was not… He had a lot of confidence from few people, but he had also a lot of enemies, if you want, who didn't like the way he approached the networking game and the fact that network is under the umbrella of the authority called the PTT. They define everything from A to Z. And this idea of having free datagram going from A to B in any route they want, it's not something acceptable. So he was excluded from some of the circles. But he still kept pushing, pushing, pushing, and he created momentum by other people who supported him. And I think this is how he went further and developed other projects in Cyclades. One of them is my project called Kayak, but there was satellite project done by Jean-Louis Grangé. An operating system project, the Chorus project with Michel Gien and Hubert. And Sirius project on database with Jean Le Bihan. And then some other projects in real time and security with Gérard Le Lann. So Cyclades gave birth to multiple pilot projects which had success and momentum at the later stage, despite the fact that Louis had some contenders. <laughter>

Russell: In records from the 1970s that I have seen, Louis is by far the most outspoken about the PTT, and just in the way that you said. But I wonder, even though eventually the team members became successful, how were things immediately after Cyclades's funding was cut? A few people went to CNET, were you the only one to stay at INRIA? <simultaneous talking>

Naffah: No, no. We were all at INRIA. We were all at INRIA. And then there was a funding problem or reorganization problem where some people went to an agency called *Agence de l'informatique* and then others went to the Telecommunications, but I think all of us… I think there was one step where we all went to *Agence de l'informatique*. *Agence de l'informatique*, it's a public agency that has been created by the, by the Minister of Industry with a main focus on helping the society in general, on small enterprise, medium enterprise, large accounts, to be more IT-oriented or to leverage the IT selectivity for the optimization of the workers that they have. And so it's what we call in France the *informatisation*, the digitalization of society. And the projects this organization created, they're called pilot projects versus research projects, which are conducted at INRIA. INRIA had two major labs – one is the *Laboria*, it was the research project based on mathematics, things like that, modeling, simulation, analysis, and they were under Jacques Louis-Lions who were heading *Laboria*. And the others were under Louis called pilot projects, and by the name pilot projects, it means it's applicable to a business case. So the pilot projects have moved completely to the *Agence de l'informatique*, so the budget has moved to the *Agence de l'informatique*, and then from the *Agence de l'informatique*… I stayed two years, paid by the *Agence de l'informatique*, two or three years before the end of the project Kayak, and then I went to Bull. But I don't remember exactly if there were some budget cuts. I think Louis can talk more about that. Personally, I had all the funding that I needed on the Kayak project in the office system. And everything was perfect, and I got a team of 40 people at one point in time, developing a complete office system. That has a lot of attraction. And a good attraction, to a point where a number of the Board of the *Agence de l'informatique* and INRIA said, "I want all this team to come to my company." And this was Jacques Stern, the CEO of CESA, of Bull at that time with Francis Lorentz, they said, "Okay, we'll hire all the guys." So with 40 people, I think, I went to Bull with 20, 25 people, so there was like massive hiring, and we started developing the office system at Bull.

Russell: So the demise of Cyclades for you was just the beginning?

Naffah: Yeah, it was just the beginning.

Russell: What year did you go to Bull?

Naffah: In '84, end of '83. The Kayak project was from '79 to '83. Yeah. I joined in '74. I've done my research for PhD in '74, '75. And then between '76 and '78, I was developing protocols and Open System Interconnection and various system bodies and things like that. And then in '79, I'd been asked to conduct the Kayak project, and it went from 1978 or early '79 to the end of '83. At that time, it was considered as normal time to develop something. In two years time, we had the hardware done, the software done, local area network done, and unfortunately, you know, we were unable to get the market It's a catch 22 game when you have advanced products. If the market is not there, you cannot push the product into the market. You need some kind of receptivity to catch the attention of the mindset. People were there, but the market was not very mature.

Russell: So then you continued this project at Bull?

Naffah: Yes, yes. We changed game at Bull because Bull had already some kind of office system that they had bought already from an American company called Conversion Technologies. And I was supposed to prepare Bull for a more advanced or more competitive system than Conversion Technologies. So I started a project where we segmented the projects and multiple products. We segmented, for instance, software application, editing, publishing solutions. We created an optical disk archiving system. Those were products that were put in the catalog of Bull, and they were sold. A complete digitization system, capturing paper, building forms, doing OCR on the forms, pushing them into an optical disk archival system, searching for them, and then printing them or broadcasting them on a network. All this complete image capture and document management and work flow were completely developed by my team, and it became a very big product in Europe, very well known in Europe. It has been sold in multiple companies up to the point where Wang was interested in it, he said to Bull "I want to buy it," so they bought the whole team and the whole pack.

Russell: Wow.

Naffah: Yeah. So Wang bought the product. It was like competing against Filenet. So, it was a continuation of the work I had been doing in INRIA. And the other thing that we had done – unfortunately, it didn't go up – we created a multi-authoring system with hyperlinks. But we made it not on the Internet. We created a multi-authoring system, you know, the concept of HTTP, HTML, all of these were completely embedded in the language.

Russell: This is at Bull still?

Naffah: Yes, at Bull. We made it before Tim Berners made the World Wide Web. We didn't put it on the Net. And there are papers that show these have been done, and we made the demos and everything. Unfortunately, we were not on the Internet. If we were on the Internet, we… Because the concept of hyperlink existed long, long time before, long time before the CERN had developed the World Wide Web.

Russell: Right. Where did you hear about the Web?

Naffah: Yeah, there was a paper from Nelson. And I looked at this paper, and I thought, "That's interesting," and I said, "Let's do it." A good engineer scientist in my team, Louis (**Soltaire? ~28:02**), and other guys, but he was the leader, we created the multi-authoring system with hypermedia. So, it has propagated, created a lot of things. And then people were startup company from my team who focused on overflow. They made an object-oriented overflow. They created their own company. It's called W4. World Wide Web Workflow. And other people tried to do portable system like the tablet, like the iPad at that time. And this one guy who was involved in the creation of the *bureau viseur*. He was attracted by the venture capitalists, and they together tried to do a small portable company, a portable PDA. I personally stayed in Bull doing advance multimedia projects with NEC because NEC wanted to invest in Bull, and one of the attractions were

to create projects with them on multimedia. They liked at that time multimedia a lot. They had some kiosk approach to multimedia, you know, public places. There was no big view of the Internet, in fact, as the big coming wave as we know it now at that time. So I got involved with projects between France Telecom who had a lab and ran multimedia, NEC and my team, we created a lot of stuff on multimedia storage and standards, mpeg, all kinds of… So it was good. It was a solid ground. Cyclades, it was a bouquet of know-how developed by individuals, five, six people that you're going to meet. And everyone took one element or one constituent of it and developed it, expanded it… I went into the interactivity channel, like creating the best ergonomical workstation, the best application running in the workstation on the server but available to the workstation. And so this was my whole career.

Russell: Your move to Sabre sounds like…

Naffah: It's a big switch.

Russell: Yes, that's what I thought. You have been talking about small, research-intensive, entrepreneurial new projects, and Sabre is famous for being this big, hulking system, right?

Naffah: Yes, right. In '96, I moved to Sabre, because, you know, I made my time in Bull. I should have moved before because when we made the deal with Wang, I had an offer from Wang to go to the U.S. And for family reasons and some pressure from Bull, I didn't go. I think I made a mistake not going to the U.S. in '94, '95. I had an offer from Joe **(? ~31:55)**. Now he was heading EMC. He bought it, and he said, "I want you." And after 15 minutes discussion, he knew that I was behind all the creation of the workflow document management. And we demonstrated the system many times in Chicago, Anaheim, and so on… Our sales guys in the United States were pushing it. We had the best product compared to other products at that time. And he said, "Well, come on." So I came back, and I said, "No." Moving to Sabre I thought, "Okay, I've had enough from a French company. Let me go to see what an American company is." So I moved to Sabre,

and this is where I discovered first a whole new world in terms of business travel and transportation. Wow, I mean, you use it because you take a plane, you use it because you take a train, or because you stay in a hotel, but when you are inside, it's a completely new world. They have their own challenges. The world was moving, the Internet was there. And we had at that time at Sabre, we started doing Travelocity. It was the first big e-commerce system that I was in charge of also was the reservation system for the SNCF. This reservation system had been established for the SNCF by Sabre as a clone of Sabre, which is the reservation system of American Airlines. At that time Bob Crandall, the head of American, accepted to sell it to Sabre at the SNCF. He said, "Well, they won't compete with me anytime because I fly, they ride on the ground, so… Okay, so let's sell the license to SNCF." So Sabre was sold to SNCF but with a complete re-write, and then I had the SNCF account, and then I started productizing the software that had been installed, especially yield management, to sell it to other great companies, so we sold it to Virgin Train, we sold it to Amtrak in the United States. So I became a development and business center, selling worldwide application for rail system, application for hotels. We sold to Club Med an optimization system, a yield management system. It was big fun. And I moved from a French company to an American company until EDS bought us. So in 2001, EDS bought this division of Sabre, and I found myself in EDS. And immediately with the background I had – document management, workflow, Sabre – they said, "We give you BPO responsibility in Europe." So I become Vice President for BPO in Europe within Sabre. BPO is business processes outsourcing. And that's another… <laughter> So we changed completely subject now…

Russell: That's fine, that's fine. It's interesting to see how you moved from field to field. That's a move I assume you're happy with…

Naffah: I was very happy to move.

Russell: Moving away from the technical side?

Naffah: I still had technology, but different technology. I still, you know, within Sabre, I had created a team. We had like 100 people. And half of them were doing maintenance of the system, installed within SNCF, Air France, and Club Med. And the other half were doing R&D, you know, developing products, writing code for yield management with new concepts, big prices, and stuff like that. Concepts had been developed within the research center of Sabre in Dallas, but we had been taken as a base and then adapted, adjusted for non-flying objects, you know, hotels and rail. So I had always my technology team but different areas.

Russell: So this is how you launched new products from Sabre? Since you can't turn the system off, Sabre has very different characteristics than other types of networked systems.

Naffah: Oh, yeah. There was reservation system. It qualified as mission critical. And having a disaster recovery system in those, those solutions were fundamental. When there is one error that makes the system stop, you have like 10 million passengers taking the train free of charge. The company could lose a lot of money if you stay half an hour, an hour, two hours without reservation. I tell you, it's a catastrophe. I mean, nothing works. You have also some security system because scheduling is basic capacity management, sending trains, adding trains, because there is a peak season and things like that. All of that is done by our system, so the top mission critical system is reservation, and there are other less critical but still critical is the capacity, management optimization, yield management, and scheduling. They need to run all the time. So that's interesting. We had some challenges there. So that's my career, and it was big fun. Now the last period, the last one year and a half, where I acted as a consultant, the business process outsourcing period was a big, big challenge, big fun. In addition to technology, still I had very important team doing technology – not development when you do BPO, but you know, acquiring products, putting them together, integrating them, and making them work – in addition to the technology pillar in BPO, you have the process pillar that you need to re-engineer. And you have the labor pillar where people need to work on the technology to provide services. And the people component is something that I didn't realize that as an

offer. You offer the people along with the technology and the process being re-engineered. And when you say the people, I mean people that you need to optimize also. You need the best tool you can, and also some labor arbitrage to provide some of them from an offshore country, which creates some social problems, you know, within the society that you want to sell your BPO services. So this people component was a big, big finding for me. And you know, we had to deal with it in different contexts, you know, whether you're serving an English company or a French company or someone, you just have to take care of those social roots.

Russell: Fascinating. <laughter>

Naffah: For you, it's the complete story.

Russell: What other parts of the story have we not discussed?

Naffah: I think honestly something that we need to remember here is that our training in France has changed, because when I go to the school where I got my degree and they ask me to give courses, I see completely different approach to teaching. Today teaching in my school, which is called *Institut Télécom*, is management. Preparing the guys, the young students, or who would become young engineers, preparing them to manage people, to be confronted to reality, to be able to do business worldwide. In a global company, to understand what's going on in the world – China, Brazil, Russia, Eastern countries. So there are a lot of courses, and I've been asked to talk a lot about my career, how I've been talking with you, just talk freely with the guys, just telling them what I've done, from where I've started, where I ended, and all the challenges I face everyday I go to work, and what I do. At that time, it was impossible to think that that was the course that you would be getting. You started a course saying, "Okay, the equation is blah blah blah." So you start by solving equations, solving equations, solving equations, and when you do work, you just look at the best way of programming this, integrating that, without thinking that there is a client somewhere who has to buy it. If you have some common sense, of course, you do things which are sellable between coasts, but there are a lot of

other criteria to take before you jump into the market with a good product which is really sellable.

Russell: How can you prepare students to understand that?

Naffah: Well, having been in a situation where I gave some courses on yield management at the INSEAD, a famous management school at Fontainebleau, the students need to be with the mindset where they can absorb some concepts, and normally, they do some kind of work where they can have a refreshed degree, but you can always prepare them. All the guys now, all those students are on Facebook. They're all on Twitter. So they understand what's the meaning of technology and the meaning of becoming like Zuckerburg, a one-billion subscribers company. Or Twitter or whatever. So they have some kind of business sense – they hear about it with the radio and so they're not that naïve. So having said this, I think you should always give it a try. You let the student know that there is something else than solving an equation. There is confrontation, negotiation, there is reality, there is, you know, switching, accepting that the others can be right that you are wrong and you're still friends without fighting.

Russell: One of the big buzzwords in policy and education circles in America, and it might be the same here in France, I don't know, is innovation. It's almost an obsession. And it sounds like you learned that by doing, by just being thrust into the right environment. But how do you repeat that? Can you generalize from your experience?

Naffah: Well, I think there are two kinds of people. There is one kind of people who are very execution-oriented. They need to be put into a context where you say, "Guys, look, we have a project. Those are the inputs. This is where we need to go, and this is the project plan, and this is for you, this is for you. Do it, and I will come every week to check about execution." And these guys go and execute. So you need to identify the execution guys. And then you have the innovators, the crazy guys. And here you have to do a lot of filtering about the really crazy guys, who you have to eliminate, and you have the crazy guys who are able to innovate, you know, just think outside of the box. Putting

them together and say, "Okay, the glasses are here. Let's do a house with the glass." They come up with always with an idea, doing a house with the glass. I think you have to identify them, put them together, and then yeah, there are some complementary people, people who can work together and people who cannot work together. So there's the management of the team doing innovation. It's a challenge, you know, who can manage a multidisciplinary team. So all in all, it's really about identifying who is the innovator in terms of character and how you put him in a context to create and to identify the time where this creation needs to be materialized by a product. I think this is… There is no course on this. I think it is really a matter of your ability to, as a manager, to create a team like this. Identify the creators and push them at the right time in the right place. True innovation is always something.

Russell: Thinking back to Cyclades, this sounds like what Louis was able to do. I don't know if you knew he was doing it or not. I didn't really talk about this with him. But judging from the success of his project, how he picked people, and then how you all went on to do other things…

Naffah: You're right. He has a sense for identifying in his team the various roles that need to be filled by x, y, and z with the right profiles – those who execute, those who think out of the box, those who can supervise and manage. It's really an art. I mean, it's something that he acquired by himself by doing. And I think there is also another matter, and this is what I apply personally. I don't think I learned it exactly from Louis; I think we still don't follow exactly the same idea, but… There is nothing called "you invent everything from scratch." Technology-wise, it's always trying to be on the top of the shoulders of someone who has developed something by adding something to it. And really the right thing is not to completely break it and start everything from scratch. My judgment, maybe others think that they have done everything from scratch, but my judgment is that we've started with something called the ARPANET, and there is a good basis, a good foundation, good ideas. And the ideas that we brought are complementary ideas. They're not substitutes. Maybe some would tell you it is a substitute, but hey, come on. You cannot tell me it's a substitute because if you haven't studied what I have

done, you wouldn't have invented your substitute. So the minimum is that you have got the idea, you reshape it, and to a certain degree either you improve it by 10% or you substitute it with 90%, but still, you should recognize that 10% comes from me. So from everything I've read, you know… When I prepared my thesis, I really read tons of papers. Every single guy has developed on what the others have done. So you know, the story of packet radio, Ethernet, and so on, it all came from the initial thought. So I don't know who should be recognized as really the pioneer of the ARPANET and the Cyclades net, but it's a continuum, for me, no one has invented it all. You grew an idea. Like, you know, like the story of the token ring. I made a token ring network. There was a guy who said, "This is how it should run." And I said, "Well, that's a good idea. Let's build it." And suddenly we found that someone else has done the token ring in Sweden. Well, those are two ideas. Who invented before? Probably it could happen that two people invent something in parallel. But in our world now, it's rare. I think it's a continuum… Take Twitter. I don't know how it started. Definitely it's something that came from messaging, SMS, small chat that became Twitter. Now Europe gets salesforce.com – their offices are just down the road – they've done Chatter. Chatter is just a version of Twitter. It's Twitter for companies. And it's a big hit. All the companies, it's been transformed for social enterprise. From a CRM company, they became social enterprise. YouTube. Chatter. Social networks. Twitter is a text-oriented thing. Now Pinterest is a graphic Twitter. It's a Twitter with images rather than 140 characters. No one is inventing. Everyone is building on top of the other. And I think Cyclades network… We've done a lot, but the problem is that we haven't had enough visibility worldwide. This is why we feel like we are frustrated because we believe, at that time, when the ARPANET was there and was growing to become the Internet, we had our own development that had not been recognized. And we were being considered as pioneers of the Internet being associated with ARPANET. But publically, few people admit that. So that's my story. You had some points that you wanted to know about, in the interaction with industrial and private sector. Well, it's funny. Let me tell you a few stories about when I developed the local area network, called Danube.

Russell: When was this?

Naffah: It was after Cyclades. It was in '79. I've been inspired by the Ethernet of course. So we made the transceiver, it was a cable we made to connect our workstation and it was a great concept, 3 megabytes per second network and transceiver working, and it was not like the star kind of network that we do today that was all provided by Cisco. That was all one cable. But the thing is that Xerox at the same time had to sell Ethernet. They had to sell the star and Ethernet, which was a copier company selling those systems. And they had problems here especially in France to tell the story about the value proposition of those products to their clients. So they were waiting for me… When I do public shows or public talks, they were bringing all their clients to listen to the way I explain Ethernet, the interest of Ethernet, to get their clients educated because, you know, their sales team were not at all trained to give training to Ethernet. At that time it was CSMACV already, big problem, multiple access with collision detection. And then at one point in time I had the steering committee of my project, they made the decision, "Hey, stop Kayak." "Why, why stop Kayak?" "Because we're creating attention, momentum around all those technologies, and now the clients if they want to buy, we don't know how to deliver because it's not an industrial product. They'll go buy from American companies. So we're doing research and promoting concepts that lead to the client going to buy from someone else who has already off-the-shelf products." And it was like, "Hey, no, don't do it." Nevertheless, the industrial contacts that we had at that time were absolutely great. It was big visionary whose name was Jacques Stern, head of Bull. He was, you know, he noticed, "Hey, those guys are doing great things. They've done local network. They've done office workstation. They've done applications." Everything that Xerox built was 250 researchers. We were like less than 25, the basic team. He said, "I want them so they'll do an industrial version for me within my big group," who at that time was a 48,000 people group company. And we moved. We were very welcomed in the team. However, selling the solution as is was big challenge, so we, as I told you in the beginning, we took the distributive office system that we had. We segmented it into constituents, and we started sending the constituents to the market. It was a success, not as much as if you were able to do the Cisco of this world because we were able to do the Cisco and the Macintosh, you know. But you cannot do it all at that time. But we had all

the components that Apple had and that Cisco had and that Microsoft with Word and PowerPoint and Postscript had. We made a language. We had an interpreter a la Postscript, you know, like the two guys who went and found Postscript and we had the same language. It was the property of Xerox. So what was the name? I don't remember the names of the two founders of Adobe. So we had all this. I still have the output, the display, the slides, the everything. We couldn't, you know… So we made fragmented selling of few products.

Russell: Was it because you couldn't move fast enough?

Naffah: No, no. At that time, honestly, in '85, '86, the best formula was to go – and Bull was thinking of it very seriously, but it didn't materialize – go to the research center at Silicon Valley, Palo Alto… I mean, they were thinking about me being the head of the research center there and do the product there. It would have been a big move. It was the same time as Star went out, the first version of the Macintosh, the PC at that time was not really graphic. The PC had the elementary, rudimentary kind of text editor and graphic editor. We had it all. We did it all. We didn't go. It was not the top success that ultimately could have been reached, but it was fun. <laughter>

Russell: Did you make contacts with people working on the ARPANET? Did you maintain contacts with them?

Naffah: Yes. Well…

Russell: With John Day, obviously…

Naffah: Yes, we had a connection with Bob Metcalfe that I had seen later on when I was with Bull. He founded the 3Com company, and he was acting as Chief Financial Officer, so I went to see him two, three times with some strategies from Bull to do some kind of industrial alliance. Carl Sunshine… Gary Grossman also was very close to John Day. We had some exchange. He came to France. Yeah, that's all. Then we met in conferences

with the team. Bob Metcalfe, [Alex] McKenzie, I had an exchange with him by mail. But I really disconnected from them, besides Bob Metcalfe who was in the same industrial environment than me. I didn't have the personal exchange with him. I had a connection with Terry Winograd who was a… Fernando Flores who made some wonderful work, like Conversation for Action. Alan Kay, I was a very, very close friend for a number of years with Alan Kay. In '81, after François Mitterand had been elected, there was a project… A problem is that those things have to be noted because – not really directly connected to the Internet but connected to the technologies that have been foundational to Internet. There was this politician who died. His name was… His name is Jean-Jacques Servan-Schreiber. He convinced François Mitterand, president of France, newly elected French socialist, to create a world center – *Centre mondial* – to informaticize society, which aimed to give a PC to every single student in the world or every single citizen in the world. Associated to those, to this center was big stars like Nicholas Negroponte from MIT, like Seymour Papert who created the Logo language, and Raj Reddy from robotics at Carnegie Mellon, and Alan Kay, who was good friend of mine. To start my Kayak project, I went with Louis for a tour. This was the first time I went to university and research centers in the U.S. So we did a 15 days tour. I came back and built a plan for a Kayak project after those visits. I visited MIT, Stanford, and Xerox PARC. And I built the plan. So at that time, I met with Alan Kay, and Alan Kay came many times later for looking at my research. So I kept Alan Kay in my close friend loop, and when the *Centre mondial* had started, Alan Kay came as one of the big scientists to help in the *Centre mondial*. So it was a big venture. It cost France a lot of money. There was a big clash between the way Americans wanted to drive the *Centre mondial* and the way politics in France wanted to create publicity around the *Centre mondial* for political purposes. Plus all the administrative stuff. The *Centre mondial* collapsed, so yeah, it was big fun also. So Alan Kay was one of my best of friends that I met with many times regularly. But I don't think Allen was part of the pioneers of Internet. He invented the Smalltalk language with other guys in Xerox PARC, he was big influencer of the whole technology we are living in.

Russell: One of the problems with calling these things the "history of the Internet" is that it narrows the focus onto just the network and the network protocols. Your experience suggests that the story is bigger than that.

Naffah: Yeah, much, much bigger. For instance, we developed protocols for messaging. I was involved a lot, in addition to ISO and the IFIP world, I've been involved and co-authored in some of the messaging protocols with X.400 and then X.500 with Jim White and someone from Bell Northern research, Jim White from Xerox PARC. And the other one, Cunningham, I don't recall the first name. We designed together the X.400 model. It was very widely accepted. So that was IFIP and ISO, the kind of transition work that I have done between Cyclades and Kayak.

Russell: And this was at layer six?

Naffah: No, messaging was layer seven. Messaging protocol was layer seven, application protocol.

Russell: You mentioned layer six before?

Naffah: Layer six is the virtual terminal. It's called the presentation layer. This is where an application would send messages that follow or comply with the format that is interpreted by a virtual terminal. You can communicate with any terminal around the world, and when it arrives to the terminal parts, there is a translator between the virtual terminal concept and the terminals behind. The application would be written for one unique virtual terminal, and we had to define multiple categories of terminal, like TTY class of terminal, the page terminal, and the more sophisticated with the graphics 3D and terminal. And then there are the files which come to the terminal. If it's a character, it's displayed. If it's a block, it is displayed. If it's an interpreted file that should show a picture, it is displayed. So this virtual terminal is virtualized at our presentation of the data being sent by an application. Now applications themselves – like distributed messaging, send, receive, distribute, create list, destroy list, update, all those elements –

would be at layer seven for protocol for messaging. There is a protocol for directory. We developed X.500 also when I was part of it. And that's it from a standardization point of view – X.400 and X.500 at the level of application.

Russell: Was there much in the way of the politics in that effort? Or did it work harmoniously?

Naffah: No, no, it was perfect. It was absolutely perfect. There was no… Everyone was receptive to that. At that time, there were maybe 1000 people who would exchange messages, or 2000 maybe. There were students, professors, teachers, few hackers, you know? Yeah, I mean, if you take ACM and the IEEE subscribers, I think they, they were the ones who were on the messaging system because their universities were on the messaging system. I think I remember the first time I'd done a messaging system in the Kayak project, immediately the French PTT said, "Wow, that's interesting. Let's do a version of it" in what we called the Minitel. The Minitel is a terminal that sits at home and with a small keyboard and very small display, and messaging needed to be put on the Minitel. So they asked the company to develop the specification. And this company, I think, was Telesysteme. The first areas selected for piloting was Versailles, Vélizy, some in the western suburbs of Paris. There were a few thousand of homes selected. They came and made a copy of my messaging system – the guys got the specification from the specification of my system. And it has been developed and then it has been spread over all the country. But it was, you know, simple messaging, and most of the messages were to do some kind of funny games or funny sights.

Russell: Right. <laughter>

Naffah: Everything related to the application. There was complete harmony between what we were doing and the public establishment whether, you know, the telecom industry or the finance. The Ministry of Finance, at one point, they wanted to put together a complete IT system that takes the latest technology, to make all the financial Minister employees productive. They came, and they made Kayak copy and the specification of

everything I've done, you know, like putting local area network everywhere, putting servers where shared services are, putting advanced workstations where people can work in much easy way. The PCs were dumb at that time. You know, there was MSDOS. So they made what they called the screen project, and it became the specification for which a lot of suppliers tried to respond. So we gave a prototype to copy for the administration, to implement a good advanced solution. This was Kayak also. No fight. Everybody was happy. A lot of congratulations. The only thing, we didn't become millionaires. We didn't do any patents, by the way. We could have patented a lot.

Russell: Why not?

Naffah: We were not encouraged. In fact, the packet terminal… If I patented it – and I don't know if it was patentable, by the way – the fact that the terminal could exchange packets on the network, I would have taken one cent on every PC connected to the Internet today. Because there was no PC connected, no such a thing called PC, or no terminal device connected in packet mode on the network. It was the first time it had been done. You do packet exchange, you implement HDLC, or you implement transport, which was equivalent to TCP/IP... I don't know if it was patentable, but this was an idea. There are many other things. No, we were not encouraged to patent. There was no such a thing called intellectual property protection or leveraging at INRIA. No one. There was only the industry relationship. The idea was to put some industry representative in the steering committee of the project. So they watch what you're doing, and eventually, if they like it, they ask you to come and help their engineers write some product specification.

Russell: Then would they make it? Or patent and would license it.

Naffah: Yeah, they would only make it. If I take the story of Kayak because they are on the Internet, I think there is a lot of… I had tons of stories.

Russell: Well, I see that we're out of time. Thank you very much.