Dandin Chronicles 2.1

A Different Kind of World,
A Different Kind of Company

Lunch with the Steves, or
Intro to Satellites

Sunday in Tonga

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CEO Dewayne Hendricks on doing business in an era of rapid change

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I certainly don't know what I'm going to be doing at the end of this year.

I know that I'll have some kind of product ready in the June timeframe and I'll have something else ready at the end-of-the-year timeframe.

But I can't tell you what that is right now, because that's not the way things work anymore.

We're in six-month product cycles now. People haven't really gotten used to all that and what it means—the various infrastructure issues, how you have to put together this web of companies and people that do things for you to allow you to do products in six-month cycles.

Our business model has always been different than a regular start-up. The company is more than just a technology provider. That puts us in a whole different space. Six-month product cycles, as opposed to three- or four-year, mean you have to essentially run your business a lot differently. You don't have time to screw around and do all this planning stuff when you're doing a six-month product cycle.

It's not that you don't plan. You have to do it in a different way than you did before. Plans used to be an event—you sit around and work out the business plan. Now it becomes more of a process, how you respond to changed realities. Obviously each task we undertake will be changing as new dimensions get brought into it.

As I explain to potential investors, I don't know for sure what I'll be shipping and doing in June. I certainly don't know what I'm going to be doing at the end of this year. I know that I'll have some kind of product that I'll have ready in the June timeframe and I'll have something else ready at the end-of-the-year timeframe. But I can't tell you what that is right now because that's not the way things work anymore.

When you're in six-month product cycles, you have a planning horizon of 18 months; you're going to have three things in the pipe in various stages of development. A lot of those are going to be ill-defined as you push them forward, but at some point you have to start ordering real parts. You're working with a number of vendors who are used to quick turnarounds on this stuff, and they have their facilities set up so that they can take and output and realize it in a very quick period.

We're trying to do open standards, to take the radios that we're designing and put the design out as part of this open-hardware idea. When people ask "How are you going to make money that way?", I say, "Well, we're going to do what Sun does, and use their business model and be 'best of breed.' And keep innovating."

Steve Ludvik

Steve Purcell

Lunch With the Steves, or Intro to Satellites

Satellites figure prominently in Dandin's business, and since they're actually a fairly arcane subject to people outside the field, it seemed like a good idea to find out more and put the info in the Chronicles.

With that in mind, Steve Ludvik, Steve Purcell and I sat down in mid-January at the Country Gourmet in Mountain View (a fine establishment) so they could impart the fruits of their experience and recent research.

Mary Eisenhart: So we've been hearing a lot about geosynchronous satellites—what are they? Are all satellites geosynchronous?

Steve Purcell: The lower you fly, the faster you have to circle the earth not to get sucked in. The higher you fly, the slower. And in the middle, there's one level where you fly one revolution per 24 hours.

ME: So you're sort of locked in with the earth.

SP: Right. In fact you fly roughly over the equator.

Steve Ludvik: Geosynchronous was envisaged by the early pioneers of satellite communication; they realized that if you're in this magic orbit over the equator a certain distance from the earth, it's a stationary star overlooking the earth. With three of those satellites, you can cover the whole earth. You can point beams with just three of them.

SP: It's the circle around the poles that you can't see.

ME: So all geosynchronous satellites are travelling around the equator, but others are elsewhere, right?

SL: With the ones that are moving—like the LEOS, the Low Earth Orbiting Satellite, like the Iridium things, the Teledesic, which is Bill Gates' idea of 680 satellites—the idea is you can always see one, but they're all constantly moving. The tricky thing is then, how do you switch—you have to have a very clever receiver and transmitter that can figure out who's doing what.

As you go to higher frequencies, you need a smaller antenna.

A little DirectTV antenna that you buy from Radio Shack, where the dish is only about 18" in diameter, that's Ku-band.

SP: It's a bit like driving down the freeway and going from cell to cell with your cellphone.

SL: It's the same concept of having a base station in the sky, but there has to be a lot of intelligence. So when it was realized that with three satellites you could cover, not the poles, but where people live, then they said, "Well, how many more can we put up there?"

And it turns out that through a combination of engineering and calculations, every two degrees you can have a satellite. It's like a little string of beads around the equator. It becomes like special real estate. Imagine, physically, how close they are—23 thousand miles away, you've got these things dotted around like that, 180 is what you can fit.

So then you say, "Now that the physical space is fixed, can I use different frequencies from the same satellite? So that's where you get C-band, which is 6 gigahertz, in Tonga; Ku-band, which is 14 gigahertz, which is in the US and the rest of the world, in parts of the South Pacific; and the next generation beyond that is called Ka-band, which is 20 gigahertz to 30 gigahertz.

As you go to higher frequencies, you need a smaller antenna. A little DirectTV antenna that you buy from Radio Shack, where the dish is only about 18" in diameter, that's Ku-band.

ME: So a C-band would need a bigger receiver.

SL: You see some in back yards and hotels. The early implementers used C-band, which was cheaper and more available at the time.

SP: 6' was kind of the minimum.

SL: It was typically a ham, or someone in a country area, who committed space to these things. Most people want little dishes, and that's why it has taken off with Ku band.

The advantage of a stationary satellite is you don't have any Doppler, because it's not moving. The Doppler effect in radio transmission is like what you experience when the train comes towards you—the whistle frequency changes. The satellite's whizzing around, the frequency appears to change, so your receiver has to be much more intelligent to follow. It means it's more expensive and complex. So geostationary is simpler on the receiver and has become the bread-and-butter of satellite transmission.

Now the problem is that one of the disadvantages,

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apart from the limited number of orbital positions, is that they're 22-23 thousand miles away, so the delay is like 250 milliseconds to go up and down. With what they call the low-earth orbiting satellites, which are about a thousand miles up or thereabouts, you have less delay, but the satellites are moving.

ME: So you've got to have more sophisticated equipment on the ground.

SL: Exactly. So what happened with Motorola is they said, "Iridium is the answer. The equations say it should work."

ME: Iridium is low-orbit?

SL: Low-earth orbit, and I don't know what happened, but it didn't work so well—business $2 a minute, $3 a minute… Although we did run across an executive at Sun, and he said, "I used this in some remote area out in the middle of nowhere, and it worked just fine." He's got this big radio to carry around....

So when Motorola had 77 satellites and Bill Gates had to have 680, that was one-upping Motorola. And it turns out 77 didn't work, so what do you think will happen with 680? Well, the idea is with 680, you have essentially very, very low-cost satellites. You can just fire them up every week.

ME: A beer can here and a beer can there.

SL: …a beer can there, and they sort of come tumbling down—very untidy, pretty much like Microsoft Windows. So it'll be very untidy, but that was the solution he proposed. Now, who can argue with Mr. Gates' profound logic?

What makes that area interesting is when the first concept of doing communication satellites came up in the US, Congress got involved. It's like the Internet. With the concept and implications of communication satellites, Congress and government necessarily became involved.

It's a high-risk venture. We don't want to have every Tom and Bill sending up his satellite to rain down on us and cause terrible things. So they allowed the formation of a monopoly called COMSAT. They had a monopoly for some period of time; they were a public company so you could invest—like Iridium at the time, but a monopoly.

ME: This was like an industry consortium kind of thing?

SL: Yes, and there was some government act that allowed them

Despite everything I still feel there is a huge opportunity in Tongasat.

If Tonga owned the satellite, if they had some joint venture to send up their own satellite...

to be a monopoly—to offer satellite services. And so in the US, that was the venture that got started; as it got successful and became international, there was the issue of when you encroach in some other people's territory, what are the rules?

ME: Was it at about that point that Tongasat did its thing?

SL: That was a little bit later. Some other pioneers, I think in the US, were studying all these little 180 positions, and saying...

ME: Real estate!

SL: Dewayne has some of the history on that. I just came across it because one of our associates has followed it. When he heard we were working in Tonga he asked if I knew about Tongasat. I had not heard about it, and it was apparently quite well known. Basically a couple of entrepreneurs who'd been in the business for 30-40 years figured out that Tonga has seven slots that could be considered in their territory. Not only that, they're well positioned between the US and Asia.

ME: So, why is it exactly that Tongasat is not useful to us?

SL: My understanding of it is that it's like owning the real estate, but somebody else owns the hotel.

ME: Tongasat doesn't own the satellite, it's just renting out the slots.

SL: They get, I believe, a significant amount of funds, and one of the things that is happening is that they are at risk of losing their license because they have not exercised the terms of their license. They simply chose to lease, to maybe a Chinese group or somebody else.

Once Tonga receives sizable funds, people don't really care a lot more. I don't know the details, but to go to the next level of pain, which is offering service, the incentive is less. I think that they own the license, but somebody else owns the satellite.

For us to get involved in that, we'd have to approach Tongasat and go through the whole long drawn-out process.

Despite everything I still feel there is a huge opportunity in Tongasat. Those guys recognized the strategic value; if Tonga owned the satellite, if they had some joint venture to send up their own satellite…

Fundamentally the issue is that in US territory, if you put up a dish that interferes with a satellite that provides service to the US, there are legal mechanisms to correct any problems.

SP: Which costs about $20 million…

ME: They'd be in a lot more control of their own destiny.

SL: But imagine if I came to you and gave you 10 million dollars to put a tent on your house or in one room of your house. You'd say, really? I think that's kind of the issue. The temptation's too great to just take it for the minimal amount of effort, just take the money.

But back in the early days with national involvement, there was the question of how do you deal if you want to have service? There's protocol for getting that service through INTELSAT.

ME: INTELSAT is the international version of COMSAT?

SL: Right, the consortium. They have all these signatories. It's like the UN. You're a member of this and a member of that. And you agree to do this.

Fundamentally the issue is that in US territory, if you put up a dish that interferes with a satellite that provides service to the US, there are legal mechanisms to correct any problems. Very clear: I've got a license, you don't, you're not allowed to transmit. There are mechanisms in place to handle disagreements, etc.

ME: Just like the FCC swoops down on you if you jam the TV station.

SL: Yes.

Internationally—I don't want to be judgmental here, but say I'm Libya who has the technology to jam, and I choose to do that.

SP: Or a ship on the high seas.

SL: Talking about ships and piracy and so on. That's a big issue if you depend on that as a primary conduit for your information.

ME: And people are, in fact, becoming more and more dependent on this.

SL: Well, fiber is the same. That fiber has to land somewhere. That little precious land, that control point, can choke the communications. In fact, it's much more vulnerable than satellite. With satellite you can distribute it. So someone captures this

So INTELSAT was happily bubbling along, and everyone was making lots of money, and very happy. As we understood the technology and risks better, the question came up—"Why can't we do this privately?

fiber landfall, he can prevent (or charge for) access. If the fiber goes in the ocean, costing millions and millions of dollars…

ME: Sooner or later there's one little controllable bottleneck.

SL: And I believe that one of the reasons there's always renewed interest in satellite is because it doesn't have that same obvious choke-point where it's subject to political whims or revolution. You've got more workarounds.

So INTELSAT was happily bubbling along, and everyone was making lots of money, and very happy. As we understood the technology and risks better, the question came up—"Why can't we do this privately? We can launch our own satellites. We have enough history. This needs to be deregulated." So PanAmSat is just one example. LORAL and other companies set about launching and managing their own satellites.

PanAmSat is based in Greenwich, Connecticut. They're 80% owned by Hughes, as I found out. Essentially one individual pioneer in Greenwich pushed for the idea that privatization would work. He claimed that a commercial service is viable, to offer satellite without the need for all this regulation. So they gave him Hughes, they gave him a satellite. It's not that big a company; it's only 600 people.

SP: Twenty [now 21] geosynchronous satellites scattered everywhere.

SL: And they have TV broadcast and telecom and different specialties.

Now there are issues of the way they polarized the satellites, whether their field goes this way or that way or circular, or the differences in the satellites, but basically that's PanAmSat, an alternative to INTELSAT.

ME: With less bureaucracy.

SL: With less bureaucracy.

With Ku-band, you choose a frequency based on the smallest dish the customer can have. An 18"—I can put that on my roof. It's a winner basically because it fits.

Hughes has always had significant technology prowess They, at one time, were just like Bell Labs; they had good people, and they knew exactly what they were doing and they did it. They thought about the satellite 23,000 miles away.

Until then, maybe ten watts was considered a reliable

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transmitter in a spacecraft. Somebody asked, "Could we increase the power to 200 watts? If so, we could use an 18" (or smaller) dish." And that's essentially what they did. They made it a very reliable 200-watt transmitter that's up in its orbit. And that essentially broke loose those little 18" dishes.

In certain areas of the South Pacific, like over Cook Island, Fiji, there's beams that are Ku-band. Unfortunately, with Tonga, there is not a beam at this time, but there is a C-band beam that actually covers the whole hemisphere. There are also different antennas and different configurations. The bottom line is that the coverage in Tonga looks like C-band is available, for which we need a bigger antenna.

But the logistics of getting it, that's entirely the ongoing saga here. The protocol to set up service right now requires every country to designate what they call a designated access company responsible to INTELSAT. Now, it turns out that in Tonga, that is Cable & Wireless.

ME: Which has no incentive to make our life easy.

SL: We've discussed this a little bit with Dewayne from a business point of view, and if I were very simple-minded, I would go to them and say, I want direct access to the satellite. I expect they would either make it difficult or turn me down. If they did that, we then would have a basis to go to the government and so on and say…

ME: These guys are stonewalling us.

SL: That's what happening. That's a fact. And then what are we going to do? There'd be due process to change that; however, it takes time.

SP: Especially in Tonga.

ME: We're dealing with Tonga, where the true relationships between any two entities are not immediately visible.

SL: They're not obvious. With Dewayne's guidance we thought more seriously about PanAmSat. I contacted them, saying "Do you have coverage over Tonga?" Initially it was "No, the beam is too weak"; the uplink from Tonga to the satellite would not work on their satellite. And so we said, "Okay, we have to go back to the INTELSAT."

It turns out that Henry Goldberg, who is our attorney in Washington, also supports PanAmSat.

Clearly a lot depends on what Cable & Wireless does in July. Our goal is to have something up and running.

If there is some functioning service, C&W might be more inclined to discuss with us, and we would have some sort of transition between the two.

So, he asked what was going on. He put us in touch with Ruth Sweetman (Director PanAmSat Asia Pacific) in Australia. She called last night and agreed to look into space segment availability.

Dewayne found out that during the millennium celebrations there was an uplink from Tonga using the PanAmSat PAS2 satellite. Their response was that this satellite provides only "ad hoc channel" for short term and special-event usage.

Because of this reliability issue of satellites, you can't have every channel dedicated—you need to have extra bandwidth if something comes up.

We have asked them to determine what bandwidth, and how long we could use the channel.

We are assuming there are 5 E1s on the main island…

SP: The in-place satellite capacity now.

ME: What are E1s?

SL: Like a T1. Two E1s on another island, and 1 E1 on the other. Maybe a total of 10 E1s. And to utilize that we need about maybe 20 MHz each way. At this point well, we have 9 MHz that we can have, maybe. Our goal is to get some level of service to establish the basic credibility that we can offer this service. That's really our objective. Then we can grow into a more robust solution.

ME: So, are we going to bump our heads immediately? Or do we have the potential to expand?

SL: Yes. Clearly a lot depends on what Cable & Wireless does in July. Our goal is to have something up and running. If there is some functioning service, C&W might be more inclined to discuss with us, and we would have some sort of transition between the two. That's really the dilemma right now. I certainly didn't think it'd be that complex.

ME: None of the real problems of this project seem to be technology-related. It's all human stuff and business stuff and cultural stuff.

So, if I understand you correctly, the Reader's Digest condensed version is that the capacity that we can get from PanAmSat at this moment is less than we really envisioned needing.

SL: Yes.

It's been quite an education to me. I feel that we're talking with the right people.

ME: But in theory, we might be able to get more later.

SL: Yes.

ME: The burning questions is, Is this a valid theory?

SL: That we'd get more later?

SP: Or, can we keep what we get once? They have bigger customers than us, and when they want more, where do we stand?

SL: Oh, no, you have to sign up for a couple years at so many thousand a month.

SP: But then you have renewal rights?

SL: Yes, there are always first rights of refusal and all that.

ME: So it's a reasonably orthodox business?

SL: Yes, it is, and it has to be, because that's the whole point of the self-regulation.

It's been quite an education to me. I feel that we're talking with the right people, and in fact, when I was talking to the Greenwich group in Connecticut, I essentially said, "This won't work. We have to go back and work with Cable & Wireless, bite the bullet, have them turn us down, and do whatever is necessary." And if it weren't for Henry Goldberg…

ME: That's where you'd be.

So the PanAmSat stuff we're likely to be dealing with is C-band, whereas INTELSAT is Ku-band?

SL: And C-band. There are no Ku-band beams over Tonga at this time. There were some plans; I think several years ago there were some satellites that went up and blew up. You probably heard about those, like from LORAL.

ME: So, how does going with PanAmSat affect what we have to have on the ground in terms of dishes, antennas?

SL: It's a bigger dish.

Before anything, we needed to resolve the question of availability, and something we call link budget. Going up from Tonga is the problem, and that's why you need the bigger dish.

ME: But you only need one on each island, or each significant island?

SL: Yes. Right now it's a 7.3 meter dish, which is big. We had hoped for 4.6. Before anything, we needed to resolve the question of availability, and something we call link budget. Going up from Tonga is the problem, and that's why you need the bigger dish. Now I think Tonga Telecom uses INTELSAT, but it works with Cable & Wireless.

ME: Does this have any bearing on the customer premise cost?

SL: No, that's just like the main plug. It's a very small part of the cost.

SP: Certainly the base station cost—the monthly fees for the satellite, even those are pretty tame because they're sort of proportional to traffic, and the traffic under today's tariffs carries a lot of revenue, so if you need more capacity, you have more revenue, so that part's pretty good.

No, it's more go/no go. So few providers if you can't make the deal with one, then you're over a barrel, because you're stuck with dealing with Cable & Wireless.◆

Sunday in Tonga

"Go up to the king's church," says Papiloa of the Centenary Chapel, where the royal family attends services. "The singing there is fantastic. It's how the Tongans revive their spirits for the next week."

Indeed, as the millennium celebration's 10,000-voice Hallelujah Chorus suggests, Tongan religious music blends passion, harmony and and exultation in hymns of formidable power.

Walk down the main street of Nuku'alofa on a weekday, and it's a bustling scene of busy pedestrians, honking cars, and

lively business. Take the same walk on Sunday, and the place appears all but uninhabited, the silence broken only by the occasional musical outburst as an opening church door lets hymns pour out into the morning air.

Since the days when the Rev. Shirley Baker, a Wesleyan missionary who went on to figure prominently in Tonga's history for good and ill, collaborated with Tupou I to write the Kingdom's constitution, religion has been inextricably woven into the fabric of Tongan life. Most of the population is Wesleyan (Methodist), but there are also many Catholics, and the Mormons and various evangelical religions who have arrived on the scene more recently enjoy healthy conversion rates.

The idea of Sunday as a day of rest and worship is firmly entrenched. Businesses close early on Saturday to allow people to prepare for the next day's round of churchgoing and family gatherings, and when Sunday comes around, regular activity ceases. Stores are closed. Traffic is almost nonexistent. Planes do not take off or land at the airport. (Bakeries open for a couple of hours so people can buy bread, a legal exception created after a typhoon struck the island on a weekend and the people had no place to buy food on Sunday.)

Some years back, Queen Elizabeth of England was in the area, cruising about on a goodwill mission.Tonga, a former British protectorate with a great fondness for the Queen, was a scheduled stop, and the initial plan of the royal party was to have a free day of leisurely travel before their arrival, to allow the Queen to recuperate from her demanding schedule. Anticipation ran high in Nuku'alofa until it was discovered that the Queen's arrival date fell on a Sunday, whereupon consternation seized one and all. The Tongans were saved from the unattractive choice between rudeness and impiety when the Queen herself opted to give up her day of rest and arrive on Saturday instead, which she did amid much rejoicing and hoopla.