RADIOWORLD

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NewBay Media

Let's Build an OpenSUSE Storage Server

Now, the Fun Begins!

BY STEPHEN M. POOLE

OpenSUSE (*www.opensuse.org*) is my personal favorite of all the Linux distributions. It's easy enough for the beginner, but can nonetheless be

RADIO IT MANAGEMENT

used to build an enterprise-class Web server, router or firewall. The online support in their forums (*forums.opensuse.org*) is excellent. The configuration tool (YaST, or "Yet Another Setup Tool") is superb. Best of all, it's free of charge. The only cost to you is the download time and a blank CD or DVD!

In this article, I'll use OpenSUSE to set up a simple, easy-to-use, but very secure file-sharing server. If you don't have something like this, I'll bet that your sales staff and their clients are sending huge files via e-mail. This not only puts a heavy load on your mail server, it's inefficient. I'll show you a much better way to do the job, using free software.

Step One: A Little Planning

In previous articles, we've discussed obtaining a separate DSL (or equivalent) service with a static IP for server use. Now we start doing useful things with that access. You could register a domain name for the IP for this first exercise (e.g., "files.myradiostation.com"), but that's not really necessary. For this file-sharing server our clients can simply connect with the "raw" IP address.

Fig. 1: Opening the SSH service port in the firewall.

You'll need a reasonably late-model spare or discarded PC that will boot from a CD/DVD. I recommend at least 512 MB of RAM and 100 GB of hard-drive space — the more, the merrier. If Windows or some other OS is already on there, make sure you back it up first. (Tip: Given that hard drives are dirt cheap nowadays, just buy a new hard drive for the server. Remove the old one and store it in a safe place as your backup.)

Step Two: Download the ISO, Burn to CD

On any Internet-connected machine with a CD/DVD burner, go to *www.opensuse.org* and click the "Get It" button. You could download the full 4.7 GB DVD, but I'm using the Live GNOME CD ISO (a little further down on the page) for this example. It's a "try before install" version that is much smaller, and it fits on a single CD. Also, select "direct link"; you don't want to set up a BitTorrent

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A Man Who Can Help You With Your Plan

Howard Price on 'Business Continuity' And the Importance of Disaster Planning

BY MICHAEL LECLAIR

Radio engineers have always been concerned about the reliability of their transmission systems. News stations in particular have a special responsibility to provide reliable and up-to-date information in emergency situations. In

NEWSMAKER

recent years, catastrophes like Hurricane Katrina have demonstrated the need for radio stations to maintain their operations when many, if not all, the other public systems such as cell phones and utility electricity have failed. The portable nature of radio makes it an ideal emergency medium.

In this issue's interview we spoke via e-mail with Howard B. Price, whose full-time responsibility is to plan and prepare for emergency operations. Price is the director of business continuity and crisis management at ABC News. He is charged with making sure that all

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The Inside Debate: Is Radio Dead?

Contributors Banter About Buggy Whips and Steel

BY MICHAEL LECLAIR

You may not have guessed, but those of us who write about our industry are a passionate lot, sometimes intensely so, and we care a great deal about the radio business. In this column, I share a recent three-way exchange inspired by a blog from John R. Quain at Fox News titled "Radio Is Dead, Is Apple iTunes Next?"

It isn't hard to summarize the gist of the blog: The author's point was that Apple's music distribution model, where consumers "own" the music they listen to, is now being challenged by subscription or ad-supported "cloud" services. You can hear anything you want, but you don't have to actually take care of it or *maintain* it. With mobile interconnectivity becoming more widespread, music can be accessed anywhere from the web.

Of course his dig about radio being "dead" got our eyebrows up. Taking part in our internal discussion were Brett Moss, gear & technology editor at Radio World; a group chief who has written in RW and asked to remain anonymous here; and myself.

OPENING ROUND

Brett took the role of cynic, giving voice to concerns that many people in radio may harbor but not voice openly.

"It would seem to me that music stations are facing a dark future," he wrote. "Any station relying on material that is recorded and played time and again, never changing, doesn't have an advantage over the Pandoras, stuffed iPods, et al., but it has many disadvantages.

"However, stations where the content changes every day such as talk radio, sports radio, news/traffic/weather, some religious stations, NPR-types, etc. look to have more defensible positions. That stuff can't be replicated by a Pandora, though Internet streaming could devour much of that market eventually.

"If or when Rush Limbaugh and ESPN decide to become streaming-only, radio broadcast stocks could look like OTC penny stocks, and a majority of (surviving) operating radio stations may be nonprofits," Brett continued, emphasizing that this is pure speculation.

"All those #14 music stations in 20-station markets, or #5 in eight-station markets, are the ones that are going to get ripped to pieces in the future. They don't generate much income. The owner may be too strapped, or even too cheap, to do a decent job of migrating to the Net, and its playlist is 'meh' (which would partially explain the lackluster ratings). Maybe they should sell now while the market is high. Or they'll be walking away from them later."

Brett worries that owning a station these days may be akin to owning a livery stable around 1920. "You've made money in the past, you can still make money but the horse-powered economy is about to go seriously sideways in a few years."

He also thinks the Fox blogger "underestimates Apple's ability to keep the Applebots enthralled and enslaved to the Apple family of products. Most assuredly Jobs & Co. have already put the Next Step into motion and will be able to move the moment they sense iTunes losing momentum."

Three people offer three contrasting views of the industry's health and outlook

RIGHT BACK ATCHA

Brett's musings are personal contemplation, not any kind of official prediction from Radio World. But they are dark, and they produced this reaction from our engineering colleague:

"With a comment like that, I have a hunch Brett hasn't listened to a 'real' radio station in sometime … having been completely sucked into the online streaming and iPod/iTunes music vortex.

"Suggesting that music radio stations are all the same and merely play tunes over and over, as Pandora and iPods do, completely ignores what happens between the songs on well-programmed total entertainment-driven radio stations," he wrote.

"Such 'entertainment,' done properly, includes companionship with a one-to-one human connection, local news, weather and traffic info, human interest stories, trivia, contests, etc. And nowadays, direct interactive contact and side conversation with the live human talent via Twitter, HipCricket and other online services used in most live music station control rooms.

"I find it a little bit amusing to read and hear netheads like Fox News' Jeremy Kaplan who have been declaring for some time that 'radio is dead.' They're totally and utterly ignoring the reality that 85 percent of the population still uses radio every day. And it isn't just via AM and FM. More of radio's brands and products continue to be discovered on the Internet and mobile devices every day."

He continued: "Content will always be king, and radio has been aggressively extending its presence in the burgeoning digital space. In fact, traditional radio continues to dominate the growing online sector serving as an additional tool to reach listeners when they are not in their car, but also when they are at work in their office, or at home on their PC, or out and about with their smartphone.

"Undoubtedly Brett is right about the smaller radio players that continue to do music radio on the cheap being an endangered species. Unless they can find other supportable business models with other formats to keep their stations alive, they will fail and be sold or auctioned to niche operators like ethnic and brokered-time broadcasters. But as long as traditional radio remains free and ridiculously easy to use via the billion radios in circulation in this country, along with the Internet, we'll have a very large audience for many years to come."

As for John Quain's suggestion that iPods are next to die: "This fellow really should get out a little more and see how the average human is really using the various electronic media devices and platforms available. Yes, radio TSL has fallen off a bit in recent years as more choices have become available, but to declare it completely dead and Apple iTunes is twisting in the wind?"

DARE I WEIGH IN?

The last time I questioned Brett's visions of the future, I had to quickly eat

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THIS ISSUE

APRIL 13, 2011

PRICE

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the ABC News platforms (radio, TV and Internet) are up and running, no matter the circumstances.

Price grew up in Poughkeepsie, N.Y., and began his career in broadcasting in an era when local radio in most places included local news.

Tell us a little about your experiences and how you began your career in broadcasting.

My professional broadcast career dates back nearly 36 years, and my first gig was as a high school intern with WKIP(AM) in Poughkeepsie, where I spent most of childhood. I served primarily in the news department, eventually parlaying the internship into a paying summer job as a reporter and anchor.

From there, it was on to the Medill School of Journalism at Northwestern University (1976–80), and during my studies there, I worked part-time at WIND(AM), Chicago, then owned by Westinghouse Broadcasting, and newly reformatted as a news/talk station. I served as a talk show producer and a newswriter/producer.

After graduation (1980), my newly-minted BS in journalism in hand, it was off to my birthplace, Baltimore, Md., and a newswriter's job at WJZ(TV), then also owned by Westinghouse. I also served there as a newscast producer and assignment editor.

I joined WABC(TV) in late 1981 as a newswriter, and would go on to serve as producer, suburban news bureau chief and assignment editor. I earned an MBA in management and marketing from New York University's Stern School of Business in 1993 before leaving WABC in 2008 for the newly-created position of director, business continuity and crisis management at ABC News.

While at WABC, I was the recipient of two local news Emmys and shared in the Peabody Award given to ABC News for its coverage of the 9/11 attacks.

In the wake of 9/11, I also took on ad-hoc responsibilities for developing contingency plans for WABC that became models for plans at other ABC-owned stations. And I earned formal certification as a business continuity professional.

Are there certain real-world events that you lived through that ignited your interest in emergency preparedness?

Each of these chapters of my life is highlighted with some great anecdotes that surely shaped the course of my career, and which no doubt influenced what I do now.

As a five-year-old, I marveled at the power of television to unite a nation with its coverage of the JFK assassination — an event that fueled my passion for broadcasting. Two years later, radio was the great comforter and informer when the Great Blackout of 1965 plunged much of the Eastern Seaboard into darkness, and many TV stations were knocked off the air.

I was privileged to cut my teeth professionally in radio when many local radio stations, even those in small towns, still had well-staffed news departments.

In Chicago, I experienced again the importance of radio as a source of information, and a tool for holding public officials accountable, when Chicago's city services proved no match for the Blizzard of '78.

And in New York, I learned just how vital TV and radio are in times of crisis — to their audiences and to each other — as the 9/11 attacks exploited the vulnerabilities in transmissions systems at a time when listeners and viewers looked to the media for information they could get nowhere else.

Howard Price in ABC's TV-2 Control Room, the current origination point for ABC News programming in New York.

What do you do for ABC News today?

Basically, my job involves working with all ABC News business units — those on the air, and those which support our broadcast operations — to assess risks and threats, and help draft plans to prevent, mitigate, respond to and recover from disasters large and small.

I've held this job for about two-and-a-half years, and I believe it's the only such job in existence in the broadcast network news business today.

What exactly is business continuity?

The field has existed for many years, but really, only in the post-9/11 era has broadcasting embraced it institutionally. To be sure, forward-thinking station operators had emergency plans and resources to back them up, but in many cases these were ad-hoc plans. BC planners now try to bring a more systematic approach to emergency response, and work to assure the continued viability of broadcast operations beyond the immediate recovery from a disaster.

BC traditionally has found its greatest support in industries like financial services, where regulatory requirements stipulate that firms maintain contingency plans as stewards of other peoples' money. After 9/11, and the tragic loss of much of New York's radio and TV transmission facilities — not to mention the lives of six heroic broadcast engineers who manned their transmitter rooms even as the World Trade Center collapsed — the FCC assembled a task force to examine the vulnerabilities and preparedness of America's telecommunications infrastructure. And business continuity became a top-of-mind concern of the nation's broadcasters.

And that's exactly as it should be. On 9/11, cellular and Internet systems were overwhelmed; for many, traditional radio and TV were the most accessible and most reliable sources of information. Radio and TV have to be at the best when things are at their worst. Our listeners and viewers expect nothing less. Good BC planning makes sure stations and networks have the human and capital resources — and the plans they need — to stay on the air in times of crisis.

How does your background in news fit in with your interest in business continuity?

I talk a lot about 9/11, because it frames my experience as a business continuity planner. But in truth, my previous life as a news assignment editor prepared me well for all kinds of events that demanded an

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DEBATE

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my words. I had argued against him that it was unlikely any governmental force would try to pry valuable spectrum out of the hands of broadcasters, since it would effectively result in a taking of their business property. About four weeks later, the FCC announced that it was looking to take back 300 MHz of spectrum from television broadcasters so it could be auctioned to wireless broadband carriers. Ouch. Score one for Brett.

So this time I'm going to agree with him, although I won't take quite as extreme a position.

I agree that the future for music stations is under a lot of pressure. They currently enjoy a very large presence, and they are maintaining that presence via web-enabled streaming. But what they offer faces considerable competition. The Internet has humbled the record companies (to the degree that the quantity of new music being produced by the majors is more limited than before) and it will humble radio over time. It all depends on how long your perspective is. Is radio selling buggy whips or steel? If it's the former, it will die out. If it's the latter, competition will erode its importance, but never really eliminate the industry entirely. I think it's more like the latter.

As far as the other entertainments mentioned, radio seems much stronger when we talk about live sports or news. Consider the highly produced shows that serve as hallmarks of the NPR world, such as "Car Talk," "Prairie Home Companion" or the news shows like "All Things Considered." The competition in this arena is largely from television, an industry facing its own pressures, not music distribution companies.

Radio as a distribution technology offers economies of scale that packet-based systems don't. This remains radio's best strength. And it's hard to compare the simplicity of operation of a radio to the Internet version, the Wi-Fi radio.

As far as the "radio stars" and their ability to determine the future: I think we've seen how this works already, and it just isn't as simple as losing two or three big names and radio will end.

Stars like Limbaugh, who have built their careers and fortunes on radio, conceivably could do great harm to radio if they chose to exit the industry. But they don't have the ability to invent a new medium on their own. Howard Stern tried it and the result was a nice speculative payout to Howard; but this was more than offset by the bankruptcy of the believers in his ability to define an entire industry. I see Limbaugh et al. as holding the power to destroy but not to rebuild on another medium.

I suppose that makes a good case for a streaming provider, like Verizon, to spend a part of its billions on convincing Limbaugh to retire. That's kind of like Microsoft wanting to acquire Netscape so they could ultimately bury the product.

Is radio technology nearly dead as the blogosphere likes to state? Drop us a line at *rwee@nbmedia.com*.

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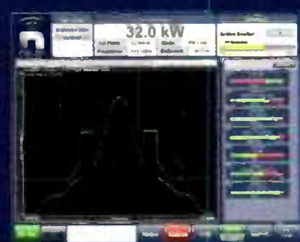

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PRICE

(continued from page 4)

instant "Plan B." Well before 9/11, there was the bombing of Pan Am 103, the crash of TWA Flight 800, the Northridge and Loma Prieta earthquakes in California and other events that happened when stations were least prepared to deal with them: after 5 p.m., late into the night, the early hours of the morning or a weekend.

So how do you muster command and control, mobilize resources, maintain a constant stream of information to your audience, fact check and establish rumor control — all at the worst possible time? These are skills every good assignment editor knows, and they are skills essential to every good business continuity and crisis management professional.

Is there one particular news emergency that you recall that made a special impression on you?

An event shortly after 9/11 brought the criticality of BC into focus for me.

I'll never forget the Great Northeast Blackout of 2003. I was about to give a visitor a tour of the WABC(TV) newsroom, when the place took an unusually large power hit. Our electrical system stabilized, but the phones began ringing off the hook, and my then-boss came running out of his office, yelling that he'd just spoken with a friend who told him Cleveland was blacked out. We ran to the windows and saw traffic lights around the station were out — and realized we ourselves were running on generators. But cellular service, the lifeblood of our ability to coordinate live news coverage, was fading fast. Our two-way radio systems likewise were without power. And our newly relocated microwave and satellite control room hadn't yet been wired into the station's emergency power systems.

As engineers worked feverishly to run extension cords from outlets on e-power to racks that needed it, I dashed downstairs to a spare live truck, equipped with a full-power two-way radio. And there I remained, for the next eight hours, the truck radio in one hand, and my handie-talkie in the other — the only link between our live trucks, helicopter, control rooms and newsroom. In the end, we supplied outstanding coverage to our viewers. But the effort to do so was Herculean. The '03 Blackout revealed just how important backup plans and systems — and regular exercises to test them — were to our ability to perform in real-world emergencies.

You have established a nonprofit "idea exchange" called MediaDisasterPrep.com. Can you tell us more about that?

With so much of the world in chaos these days, it's a wake-up call to broadcasters that bad things large and small can impact their operations in unpredictable ways. I believe disasters are those things for which we do not plan, and while planning won't completely protect you, a good plan, well-rehearsed, can mitigate most any impact.

MediaDisasterPrep.com was born of my desire to give something back to the industry I love — an industry that simply "has to be there" when all else fails. It is a non-commercial venture — I make no money from it, and provide it purely as an idea exchange to make our industry's emergency readiness the best that it can be.

Featured on the site are tips to jump-start any station's contingency planning process, along with an extensive video and audio archive to illustrate the wide variety of things than can and do go wrong, and the profound impacts those events can have on any broadcaster's operations.

The site has a companion blog, MediaDisasterPrep.wordpress.com, where I write about business continuity themes of the moment. And I maintain a Facebook (search for the MediaDisasterPrep.com page) and Twitter presence (@mediadisaster) as well. I've become a national speaker on the subject of business continuity, presenting at a number of industry conferences and even guest lecturing at MIT. It's a gratifying validation of how essential continuity planning has become in our business.

In the aftermath of Katrina, radio proved to be an important medium for getting information to storm survivors when most other communications systems were shut down.

How should the radio industry think about its role in disaster planning?

Even with the advent of satellite and Internet broadcasting, radio was, is and I hope will forever be America's most important source of *local* information, especially in times of crisis. There are far more radio than TV stations, and their connection to their listeners is unlike that of any other media.

So to my mind, it's especially important that radio stations, no matter their size or coverage area, always have plans — tested plans — for staying on the air, no matter what.

What to plan for? You name it. Each station's geographic location has its own specific risks. But I counsel stations — and my own network — to think less about specific scenarios (there are just too many to fathom, and many we'd never think of) and think more about impacts.

In any crisis, there are really only six: Infrastructure (something affects your building), Technology (something affects your systems), Personnel (something affects your people), Stakeholders (something affects your vendors, your audience, your sponsors or the regulatory environment), Finance (something affects your cash flow) and Reputation (something affects your credibility among your stakeholders).

So when writing plans, I tell folks not to preoccupy themselves with the *cause* of a problem. Focus instead on how that problem has affected your operations, and what your fallbacks are to deal with those impacts. I also advise people not to think of problems as isolated events, but to prepare for a cascade of issues. It's Murphy's Law — whatever can go wrong, usually does.

What are some high-impact preparations that news radio stations should implement?

Where radio specifically is concerned, I'd say the top three concerns would have to be loss of power, loss of transmission systems and the ability to staff up knowledgeable newsgathering on very short notice and at the worst possible time.

Planning for these contingencies isn't really difficult, but it ain't cheap. And stations embarking on contingency planning for the first time need to make sure there's an executive champion with an open checkbook, committed to the process philosophically — and as a matter of public service.

Loss of power? Install a generator with a large and reliable fuel supply. Want to really cover your bases? Install two at the station, and two at the transmitter site.

Use an STL, or a bunch of them? How will *they* be powered in a grid outage? A bad storm could knock out your relays, so perhaps you want to think about some dark fiber you can light up between your studios and your transmitter. Or perhaps solar-charged batteries at each site.

Towers are the most vulnerable assets at most stations; do you have a backup antenna on someone else's stick? Or maybe a tall building? And if you had to completely transfer operations somewhere else, what's your plan for doing so? And don't forget your web presence. Depending on the crisis, with so many smartphones out there now, it could be a real lifeline to your listeners, allowing you to stream even if you lose your on-air signal.

Can't afford a big news staff? Why not build a relationship with a local TV station, maybe the one affiliated with the same network as your station? Arrange a standing feed so you can piggyback on their coverage of a breaking news event until your own staff can ramp up.

Have cots, shelf-stable food and drink on hand to support the people who might have to live at the station during periods of extreme emergency.

Perhaps most important, do you have a cross-training program in place to make sure your receptionist can run the board, your sales manager can go into the field and gather news, your promotions team can handle rumor control and listener inquiries?

And did you know how the RePO man (or woman) could be your best friend in an emergency? That's RePO as in recovery partnership opportunity, a contingency package your sales force can design to help local businesses join you in preparing your community before disaster strikes, and rebuilding your community after a crisis.

A final word?

There is one other incident that I think speaks volumes about why it is so important for stations to plan for contingencies.

In May 2007, WABC(TV) was knocked off the air when a fire erupted behind its news set in the station's only studio — with less than 15 minutes to the start of our late Sunday night newscast (generally, the most-watched newscast on our schedule).

The building filled with smoke; the news portion of our studio was seriously damaged and out of action for weeks. Fortunately, everyone escaped without injury. But we had to improvise quickly in order to resume normal broadcast operations before the start of our early morning news.

It was the first time our station failed to air a scheduled newscast in its modern history; the fire occurred when the station was thinly-staffed and backup facilities were not readily available.

Operators must remember that it's not just wide-scale catastrophe for which they have to plan; indeed, I'd suggest that day to day, it's the "routine" emergencies — fire, flood, technical failures, etc. — that will trip them up.

Since 9/11, our industry has been preoccupied with "doomsday scenarios." And surely, in this day and age, we must plan for those. But the average station will find itself dealing with more common disruptions that can be just as impactful operationally and financially — and which could strike at the worst possible times.

Moreover, simply "having a plan," even a well-documented one, is insufficient. Plans must be regularly tested to account for changes that occur over time, and to assure that all staffers know who is doing what and when to mitigate injury, damage and operational disruption. A plan, generally, isn't worth the paper it's printed on if it is not tested — rigorously and often.

Interviewer Michael LeClair is technical editor of Radio World Engineering Extra and chief engineer for WBUR, Boston.

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A Brief Primer on the Art of Equalization

BY DAVE MOULTON

The author is an audio engineer and producer, author, composer, educator and acoustician. He operates Moulton Laboratories/Digital Media Services in Groton, Mass. This article is based on a series published in TV Technology magazine.

Part 1: The Audio Spectrum

Before we dive into a discussion of easy tips for excellent equalizing, we need to review briefly the concept of timbre and its relationship to the audio spectrum.

Timbre is an overly broad term used to describe the subjective attributes of a sound other than loudness and pitch. In fact, the definition of timbre is "all the things that allow us to distinguish one sound from another other than loudness and pitch." So, an immense number of things affect timbre, from how the sound starts to what the singer had for breakfast. For all that, one major determinant of timbre is the distribution of energy across the audio spectrum. And it is that physical distribution of energy that the process of equalization affects. As a result, we tend to think of EQ as "timbre control." This is a reasonable viewpoint, so long as we keep in mind that many other things affect timbre. Further, because we have equalizers, it is the determinant of timbre we can most easily control. So we do.

For this column we'll be working on spectrum and equalization as they affect timbre or tone quality. The audio spectrum is the range of frequencies that we humans can hear. It is a comparatively large range: 10 octaves or 1,000:1. Each of those octaves has its own character, and a great deal can be learned about audio and music by a detailed study of these octaves. Fig. 1 describes the 10 octaves in a fair amount of detail. Have fun!

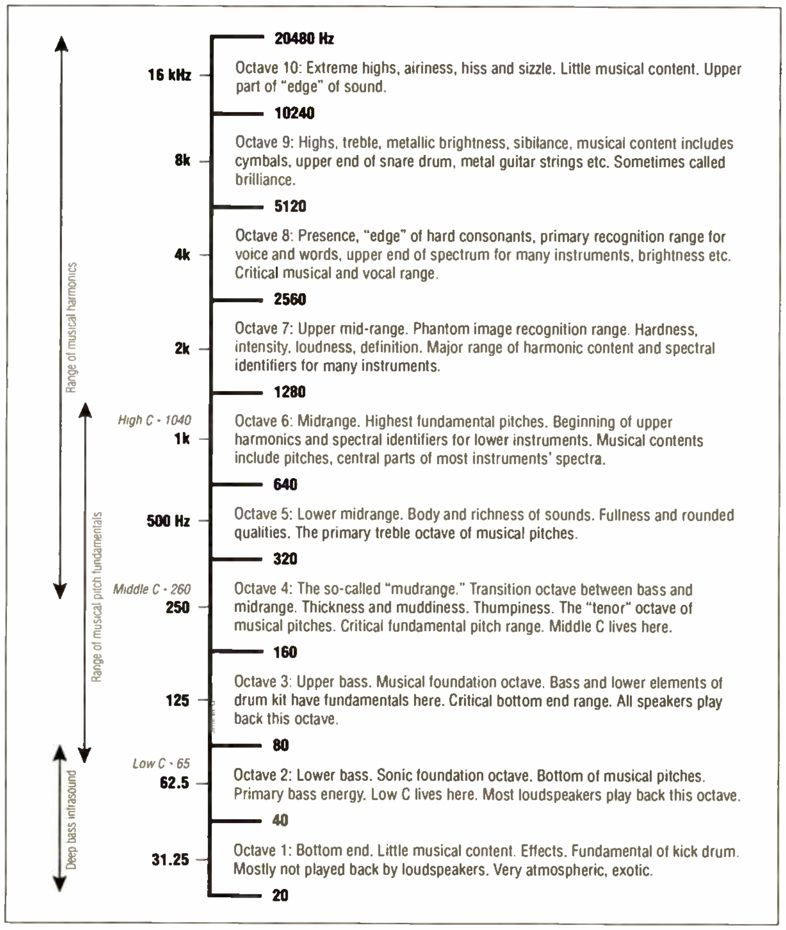

Fig. 1: The 10 octaves of the audio spectrum. Adapted from 'Total Recording,' KIQ Productions

A SIMPLER WAY

For our purposes here, we can start by thinking about the spectrum in a more basic three-part way: bass, midrange and treble. What could be simpler? These three regions all have their own functions, and if we control them well, we can really enhance the quality of our work.

Basically, bass refers to all the energy below about 200 Hz. This bass region provides richness, fullness, energy and body. Due to the physics of room acoustics, loudspeaker variability and the quirky nature of our hearing, bass is also extremely variable, hard to work with and hard to predict. In broadcasting, the bottom octave (20 to 40 Hz) can be dispensed with, and we can set bass by changing the level of the spectrum from approximately 50 Hz to 250 Hz.

Midrange refers to energy in the region from about 200 Hz to 2,000 Hz. The lower end of this range is sometimes referred to as the "mudrange" because of its tendency to add "muddiness" to the sound when injudiciously boosted. More importantly, the midrange covers an ambiguous spectral region in our hearing, wherein it "crosses over" from one mode of neurological detection of sound to another. The specifics of this are beyond the scope of this column, but the perceptual ambiguity is real and it affects everything from perception of pitch to transparency to the perception of overtones.

For our purposes here, this midrange region is generally where we adjust the relationship between fullness and transparency. Boost the midrange to make the sound fuller. Cut the midrange to make it more transparent. Gently now, gently does it!

Treble refers to everything above about 2,000 Hz (maybe a little lower than that — use your ears). Interestingly, this region includes no musical pitch fundamentals (high C is 1,040 Hz), only overtones. Everything here is timbre tweaking … how bright, how brilliant, how edgy, how airy, and, most important for voice, how intelligible. Try gently boosting the region between 3,500 Hz and 4,200 Hz to make voice more intelligible. In broadcast, we won't have much in the range over about 12 kHz, so the top octave isn't all that important.

THAT SUMS IT UP

In a simple sense, that's the audio spectrum. With equalizers, we manipulate the level of each of these regions independently in order to make the sound fuller and more energetic, while also more transparent, with brilliance and intelligibility. The equalizer is one of our most powerful tools, just because of this capability.

However, using it takes skill, practice, patience and some careful, critical listening. One of my very good colleagues worries that many producers and engineers haven't developed the skills or ears yet to do it well, and should leave it alone. It is quite possible to make a given sound much uglier with EQ as well as much more beautiful — in fact it's much easier to do ugly than beautiful.

My take is that you need to practice it, and practice listening to the effect of equalization. It will take a while, but it's worth the time and effort. Once you have it in your ears, you can do a lot, and it will seem like magic to your less skilled colleagues.

Part 2: Overtones and Equalizers

THE IDEA OF OVERTONES

When we perceive a musical pitch, a trumpet playing A above middle C for instance, we perceive an unequivocal and singular construct of a musical entity. We don't hear it as a collection of various frequencies. However, that's just what it is. They are called overtones or harmonics. They are a central conceptual building block of any resonating or vibrating system.

When such a system vibrates, it does so not just at its basic, or fundamental frequency, but at *all* frequencies that it physically can. These are generally related, mathematically, to that fundamental frequency by what are called "whole-number integers." If we call the fundamental frequency "F," then the overtones will tend to occur at 2F, 3F, 4F, 5F and on up, ad infinitum. There can be hundreds of overtones present in a particular note or sound.

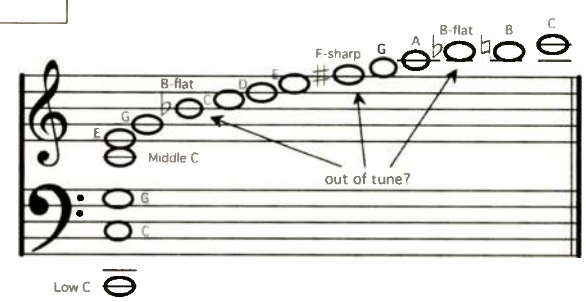

Fig. 2: Grand staff showing first 16 harmonics from low C to high C, with annotations for the ambiguous tuning ones.

THE OVERTONE SERIES

The lower reaches of the overtone series constitute a complex chord that is basically a dominant seventh chord based on the fundamental, spread out over three octaves.

Let's consider low A (110 Hz) for a moment. The fundamental (F) = 110 Hz, 2F = 220 Hz, 3F = 330, 4F = 440, 5F = 550, 6F = 660, 7F = 770 and 8F = 880. It goes on up from there of course. So, 110 Hz is an A, 220 is also A (an octave up), 330 is an E, 440 is another A, 550 is a C, 660 is another E, 770 is a G and 880 is another A. Whew!

We can train ourselves to hear these individual overtones with practice (I once had a conductor, during an audition, tell me that I had the loudest fifth overtone he'd ever heard), but we tend not to hear them that way, due, I suspect, to the fact that they are phase-locked.

Here's the point: the part of timbre we are concerned about in this column is determined by the relative loudness of these various overtones. Each instrument, each

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EQUALIZATION

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note will have a different distribution of loudness of the various overtones. We call that distribution the *timbre* of the note, the instrument.

See Fig. 2, a graphic from my book "Total Recording," showing the first 16 harmonics of a low C (ca. 65 Hz).

IN THE UPPER OCTAVES

If you were really alert, you may have noticed that as we increase the frequency there are twice as many harmonics present in each successive octave. By the time we hit the fifth octave above the fundamental, there 16 overtones present in that octave, while by the eighth octave there are 128 overtones present! Beginning in that fifth octave, there are more overtones than musical pitch frequencies, so we say that the overtones have become microtonal. They begin to be a wash of spectral energy, readily suitable for equalization.

At the same time, that wash of spectral energy responds to the specific resonances of the instrument itself, regardless of the pitch fundamental. At the same time, it also responds to resonances present in the microphone (and there are usually many). Some of those resonances turn out to be undesirable, subjectively speaking. And here's where the art of equalizing begins.

USING A PARAMETRIC EQUALIZER

The first thing we wish to do when equalizing an individual source (say, a voice track) is to get rid of the problems inherent to the track. Those problems will mostly be some of these narrow, closely-spaced resonances.

First, we search for them, and then, after we find them, we attenuate them. The search usually involves reducing the equalizer's input level by about 10 dB and then cranking a high-frequency equalizer band up to its maximum (+18 dB) at a narrow Q (say 12–15, 1/10th of an octave or less). Then, starting at about 10 kHz, slowly sweep down and listen for resonances that sound both pronounced and wrong. This is a subjective activity, and you've got to practice and learn to trust your ears.

When something jumps out at you, zero in on it, narrow the Q as much as you dare, and then change that +18 dB boost to about –3 dB cut. Let your ears rest for a moment, raise the input level back to reference, and audition your effort, switching the EQ in and out. If you've done it well, you will hear hardly any change.

Keep repeating this, continuing to sweep downward to about 1600 Hz, notching out the troubling resonances. There will usually be between two and six such resonances.

Then do the same for low frequencies, between about 110 and 225 Hz. Here we are listening for room modes that may be swamping the low frequencies. Be careful in this range to not take out a resonance that is just a natural part of the speaker's or instrument's sound or a specific musical pitch. It takes gentle care.

When you're done, the track should sound cleaner and smoother, as well as a little more natural. You aren't done yet, and the voice isn't fully equalized, not by a long shot. But this is a good start.

One interesting thing about this is that all these cuts don't change the overall level of the track at all. While boosts will increase track level, cuts don't decrease the level. Interesting, eh?

THE KINDEST CUTS

The management of these very small bands of overtones is a key element in the process of high-quality equalization. It is a great place to start in learning how

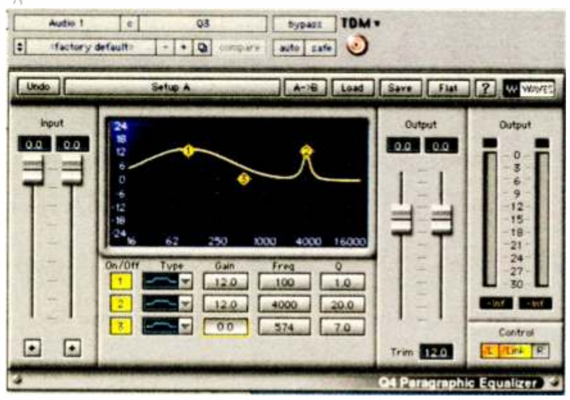

Fig. 3: A digital parametric equalizer showing one band at 100 Hz and a Q of 1 (a little more than an octave and a half) and another band at 4 kHz with a Q of 20 (about 1/12th of an octave). Both are shown with 12 dB of boost for graphical clarity. A third band has no gain and is irrelevant.

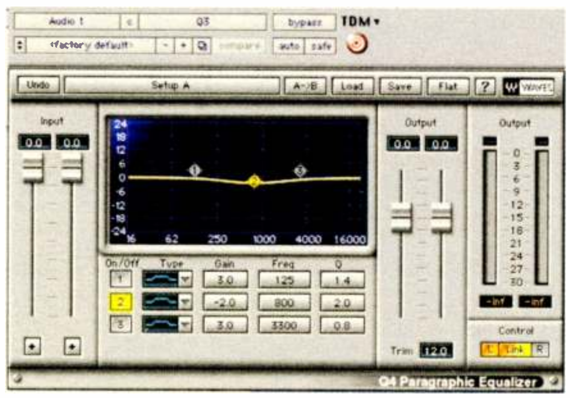

Fig. 5: This chart shows the same equalizer with mids dipped as per the article: –2 dB at 800 Hz with a Q of 2 (approximately 2/3 of an octave).

to equalize well. When you cut very narrow bands by very modest amounts (2–4 dB), it can't do a great deal of damage at worst, and as you get the hang of it, you'll notice that your tracks are getting far more natural-sounding.

Part 3: How to Make Audio Sound Good

Making the audio sound good mainly means making it sound clear, natural and effortlessly intelligible. If we do it right, our listeners don't even hear our work—all they do is *really* like the music, the FX or the announcer's voice. We've enabled that by making the audio go down real easy. To accomplish this we need gentle, broad boosts (low Q) or occasional dips. Remember too, we've already taken out all the bad stuff.

THE MEANING OF Q

Q is another term for bandwidth — I glossed over it earlier. Q is calculated by dividing a filter's center frequency by its width. The wider the bandwidth (as expressed in octaves, or ratios of 2:1), the lower the Q number. A Q of 1.4 has a bandwidth of an octave. A Q of 20 has a bandwidth of a semitone. The actual arithmetic is irrelevant.

What we want here are wide, gentle swaths of spectrum, with Qs generally less than 1.4 (i.e., greater than an octave). Two or three octaves (Qs of 0.67 and 0.4 respectively) are pretty good values to experiment with. For this work, no Q greater than about 2 (around half an octave) usually works very well.

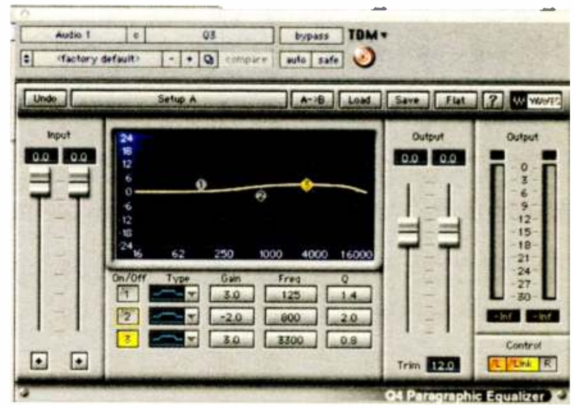

Fig. 4: This chart shows an equalizer with highs boosted approximately as suggested in the article: 3 dB of boost at 3300 Hz with a Q of 0.8 (a little less than two octaves).

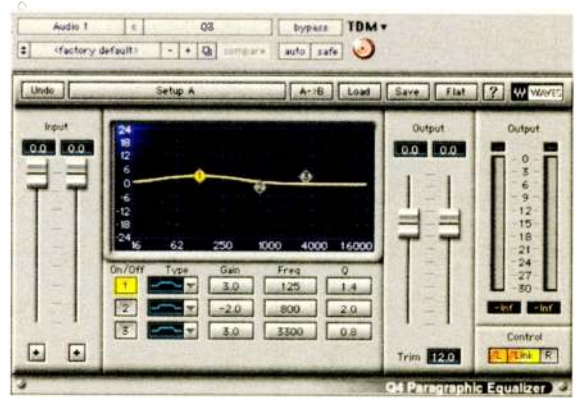

Fig. 6: This chart shows the same equalizer with lows boosted by 3 dB at 125 Hz with a Q of 1.4 (1 octave).

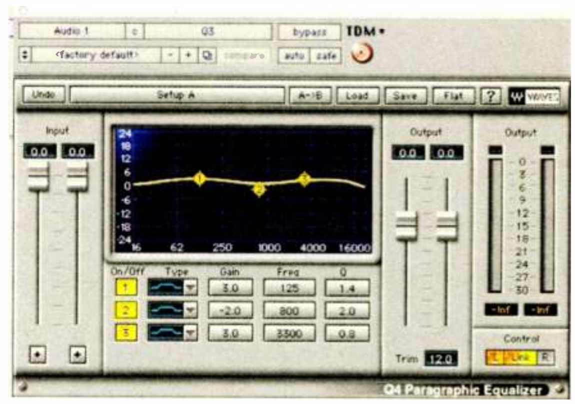

Fig. 7: This chart shows the composite curve of these three settings. You might want to try this and start fooling around with it.

TAKING THE HIGH GROUND

Let's consider the high-frequency portion of the spectrum first. Using a Q between 0.7 and 1 centered at, say, 3200 Hz, we gently boost the signal by a couple of dB, perhaps 3 dB. The net result is a somewhat brighter and clearer sound, perhaps a little more brilliant. Also, if the source is a voice, it'll be a little more intelligible.

Interestingly, this gentle boost seems to work for most sounds, unless they are really screwed up or bizarre. You may want to tweak that center frequency, going up as high as 4 kHz (which will make the sound more brilliant, metallic and edgy) or as low as about 1,500 Hz (which will make the sound kind of full, throaty, honky and/or present).

If you go that low, you may want to make the

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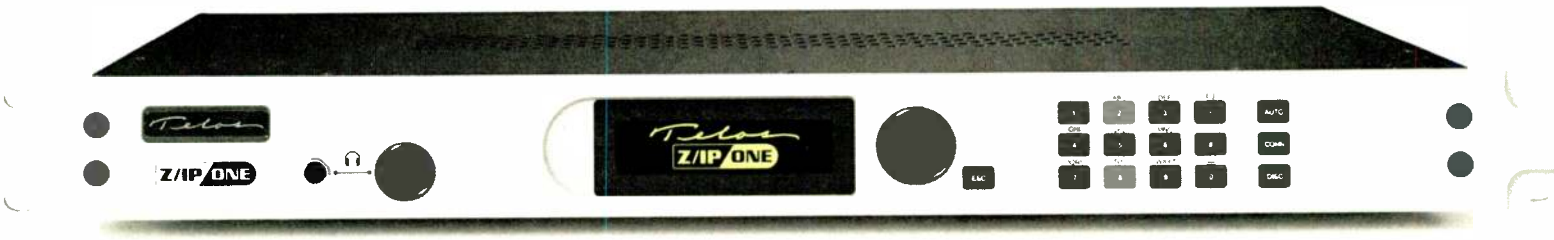
Drops jaws. Not audio.



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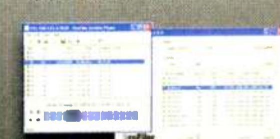

PC Software for archiving and logging all of your stations audio.

EQUALIZATION

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bandwidth even wider, going to a Q of maybe 0.5 (2.5 octaves). You certainly don't want a lot of boost (maybe 1.5–2 dB?). Remember to not just take my word for it. Use your ears.

The reason for the enhanced intelligibility has to do with the fact that our ears are most sensitive to sound in an octave-wide band around 4 kHz, and this is where the spectrum of most hard consonants (t, k, s, etc.) occur. This is fundamental to speech, hearing and language.

DIP THE MIDS

In the first part of this article I mentioned that our hearing has a neurological crossover region (an octave or so wide, surrounding the frequency rate at which the nerve endings on the basilar membrane fire — ca. 700 Hz), which serves to separate our two localization mechanisms. I've found, over the years, that our perception (at least *my* perception) of this part of spectrum is a little ambiguous and confusing. With one important exception, I've found that gently dipping the spectrum in this range seems to really help with clarity and transparency. Try a Q of about 1.5–2 (an octave or slightly less), and dip about 2 dB.

BASIC BASS

Ah, yes, bass. What we're talking about here is the bass body or fullness of the sound source itself on the track, not the bass of the room or acoustic ambience. Again, think of a bandwidth of 1–2 octaves (Q between 1.5 and 0.7). The center frequency will depend on the size of the source and the amount of low-frequency energy it can generate. In any case, that center frequency will probably never be lower than about 80 Hz or higher than about 200 Hz.

We're adjusting the level of this spectral region to give us the "bassiness" or fullness we desire from the sound. This can only be done by ear, and it helps to be working with studio monitors that are known to you and also well understood, in terms of their relationship to the general run of speakers in the real world. It is a highly subjective process, and really touchy. As a general rule, be restrained and conservative in your boost amounts, but at the same time don't just wimp out and make the sound thin.

THE UNIVERSALITY OF IT ALL

What's interesting is that this three-band approach to enhancement seems to generally work well for most tracks and sound sources. After years of studying loudspeakers and our hearing mechanism, I'm fairly sure this universality has to do with the nature of loudspeakers (and particularly their directivity), as well as the nature of our hearing. To a lesser extent I think it also has to do with the very quirky spectrum of stereophonic phantom images. So, think of it as a "loudspeaker thing," not a "sound source thing." I suspect it is also related to the "smiley face" EQ (bass and treble turned all the way up) we find in so many rental cars and boom boxes. There's actually a reason for those crass settings, even if they turn out to be a little (or way!) much.

Part 4: Spectral Management and the Organization of Multitrack EQ

Finally, I'd like to discuss a concept I call spectral management, which refers to a process for allocating parts of the spectrum to different instruments and voices. Unfortunately, you can't just use one cookie-cutter curve for all your tracks — it ain't that universal and if you were to do such an inadvisable, slothful thing, the tracks would mask each other, blurring and obscuring the mix. This process, done well, will have the happy effect of making your mixes clearer, more transparent, a little louder for a given maximum level and generally a little "nicer" sounding (whatever that means).

Octave #	Frequency Range, Hz	Attributes
10	10K - 20K	Airiness
9	5K - 10 K	Brilliance
8	2500 - 5K	Voice intelligibility, hearing sensitivity peak
7	1250 - 2500	Presence
6	640 - 1280	Upper midrange, hearing crossover region
5	320 - 640	Lower midrange
4	160 - 320	"Mudrange"
3	80 - 160	Upper bass
2	40 - 80	Deep bass
1	20 - 40	Infrasound, FX

Fig. 8: The 10 octaves of the audio spectrum, including frequency ranges and a few attributes of each octave

OUR 10 OCTAVES

Fig. 8 shows again the 10 octaves of the audio spectrum. Almost all sounds contain energy in at least six of those octaves. Octaves 7–10 are almost exclusively overtones. Octave 1 has almost no useful information, even though it is quite dramatic and a lot of fun to mess around with. Unfortunately, it is not reproduced well by many loudspeakers. Octaves 2 and 3 provide critical bass energy and need great care, attention and aesthetic nourishment. They are tender and touchy.

Because almost all sounds have energy in almost all octaves, there can be conflicts between sounds, particularly as we begin to boost. Bands of energy from the acoustic guitar track can conflict with bands of energy from the trumpet track, which in turn can conflict with bands of energy from the voice track, which then can conflict with bands of energy from the motorcycle FX track, which, of course, conflicts with the acoustic guitar track, coming full circle.

As you EQ the guitar track and get it sounding pretty good, you begin to notice you can't hear the motorcycle, the trumpet or the voice tracks anymore. So you turn up the trumpet track and the motorcycle, destroying the voice track and rendering the good EQ you had on the acoustic guitar track basically inaudible. What's a body to do?

GETTING OUR PRIORITIES STRAIGHT

This is where spectral management comes in.

First, you prioritize your tracks. For example, you decide that voice is most important, trumpet and acoustic guitar are tied for second and motorcycle is last. Start by EQing the voice track, probably boosting the eighth octave (ca. 4 kHz) for intelligibility and clarity on the voice.

Second, you now declare this octave band more or less off-limits for the other tracks, which is to say, don't boost Octave 8 on the trumpet, acoustic guitar or motorcycle tracks. But you know that you especially like Octave 8 boosted on the acoustic guitar. What to do?

Well, you boost Octave 7 instead — it's adjacent, it has many similar qualities and it doesn't fight with the voice boost you've done on Octave 8. What you'll notice is that you get that acoustic guitarness just fine, and the EQ certainly won't sound bad, while the combination of the two tracks, voice and guitar, sound better than they would if both were boosted in Octave 8. Interesting, eh?

Moving right along, for the trumpet track you try boosting Octave 9, to pull up its metallic, brassy brilliance. It won't be quite as fat as you might have liked, but it'll be brassy and it'll mix better as well.

Finally, the motorcycle. I'm assuming it's a Harley, very broadband. You might add a little of Octave 9 (see below for why), some Octave 10 for the edge of the individual exhaust explosions, and some boost in Octave 3 and Octave 5, to fill in the classic fullness of that wonderful Hog sound. You can evoke it really well, while leaving the bespoke octaves available for their instruments.

TRANSIENTS VS. SUSTAINED SOUNDS

The reason it's okay to have both the motorcycle and the trumpet boost in Octave 9 is the difference in their temporal character. The trumpet is sustained, while the Harley's sound is all impulses, also known as transients. Because of this difference in their time character, neither masks the other.

This also means you can EQ percussion using frequency bands that are shared with other instruments. Kick drum often needs some boost in the 4–8 kHz range, while snare may need both some 2 kHz and also maybe some 250 Hz.

These won't interfere much at all with the more sustained timbres of voice, trumpet and guitar, for example, occupying those ranges as well. Use your ears here. It's an art, not a science.

WHAT DOES IT ALL MEAN?

Checking how your EQ is working needs to be done "in mix context," which means you make your final decisions and tweaks while listening to everything in the mix.

It's okay to start out by EQing while listening to individual tracks. However, you need to satisfy yourself that they sound okay while listening in mix context. Better they should all sound good together than they should all sound absolutely fabulous on their own with little regard to how they sound together in the overall mix.

So, there you have it: a brief little primer on equalization. To do it well you will have to practice — really learn to listen carefully and pull apart the frequency spectrum in your ears. As you get good at that, these processes will help you begin quickly and effectively to get much better sounds and mixes than you ever could before.

CORRECTION

In our Feb. 16 issue, the web links in the reference section of Philipp Schmid's white paper "Putting the IBOC Quality Metric to the Test" were incorrect. The correct links are:

The National Radio Systems Committee, NRSC5-B In-band/on-channel Digital Radio Broadcasting Standard, iBiquity Digital Corporation, **http://www.nrscstandards.org/SG/NRSC-S-B/NRSC-S-B.pdf**, April 2008.

HD Radio Air Interface Design Description-Layer 1 FM, iBiquity Digital Corp., **http://www.nrscstandards.org/SG/NRSC-S-B/1011sF.pdf**, August7, 2007, rev.F.

MINSTRUMENT MATRIX

Sophisticated Minstruments from NTI give you comprehensive test capability... and these flexible audio instruments fit in the palm of your hand

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- VU + PPM level meter for the embedded audio
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DR2 Digirator
Digital Audio Generator

The DR2 Digirator not only generates digital audio in stereo & surround, it is a channel transparency and delay tester as well, all condensed into a handheld package. Delivering performance & functionality challenging any digital audio generator made today, it produces all common audio test signals with sampling frequencies up to 192 kHz and resolution up to 24 bit. The Digirator features a multi-format sync-input allowing the instrument to be synchronized to video and audio signals. In addition to standard two-channel digital audio, the DR2 can source a comprehensive set of surround signals.

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AL1 Acoustilyzer
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The AL1 Acoustilyzer features extensive acoustical measurement capabilities as well as analog audio electrical measurements such as level, frequency and THD+N. With both true RTA and high resolution FFT capability, the AL1 also measures delay and reverberation times. With the optional STI-PA Speech Intelligibility function, rapid and convenient standardized "one-number" intelligibility measurements may be made on all types of sound systems, from venue sound reinforcement to regulated "life and safety" audio systems.

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- Cable tester and signal balance measurement
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Analog Audio Analyzer

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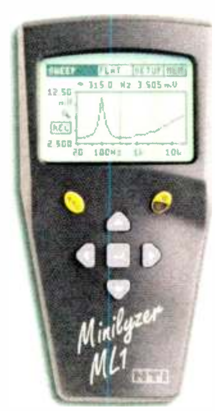
Add the optional MiniLINK USB computer interface and Windows-based software and you may store all tests on the instrument for download to your PC, as well as send commands and display real time results to and from the analyzer.


MiniLINK



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SBE certification is the emblem of professionalism in broadcast engineering. To help you get in the exam-taking frame of mind Radio World Engineering Extra poses a typical question in each Certification Corner. Although similar in style and content to exam questions, these are not from past exams nor will they be on future exams in this exact form.

It's Not the Flux Capacitor, Marti

Question posed in the Feb. 16 issue

(Exam level: CBRE)

Your remote crew tells you that there is something wrong with their 10 watt 160 MHz RPU transmitter. On site you realize that you need to substitute a dummy load to ascertain if the problem is the transmitter or antenna. Your dummy is back on the bench, but in your kit you have the resistors listed below. How can you quickly arrange them to make a workable 50 ohm load?

Quan	Value (ohms)	Power handling (watts)
4	100k	1/2
2	620	1/2
2	150	1/2
4	100	1
1	100	5

a. There is no solution as the 1/2 watts will blow no matter what at 10 watts input.

b. Put all the above resistors in parallel.

c. Put the four 100 ohm 1 watts in parallel and then series these with the 100 ohm 5 watt.

d. Make a series parallel network out of the four 100 ohm 1 watts (two series 100 ohms with these series pairs in parallel) and this network paralleled with the 100 ohm 5 watt.

e. Parallel all the 100 ohm resistors.

The correct answer is d.

When you step back and think about our work in broadcasting, a large portion of our technical effort is conservation of power. At the transmitter, since that plant runs near continuously, we want to get as much radiated as possible for the smallest supporting costs. Every watt that does not come out of the antenna is essentially turned into heat.

In the case of a transmitter dummy load, we need to turn *all* that RF power into heat.

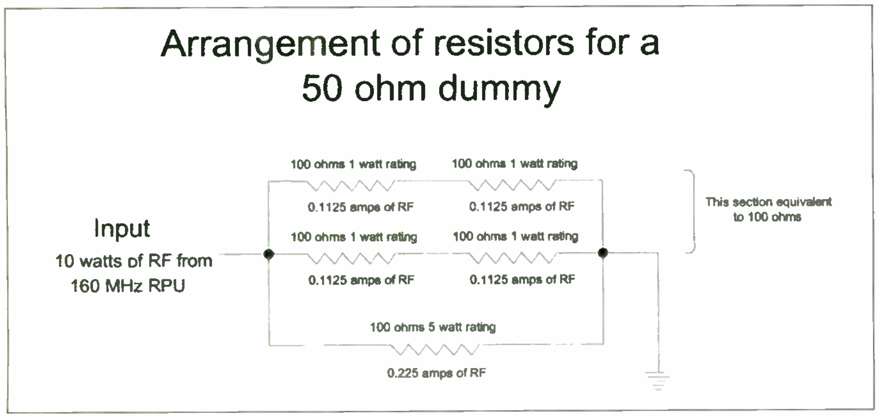
An ideal dummy for a transmitter requires some specific qualities. First and foremost, it needs to mimic the antenna load that the transmitter normally sees. Since this is most often a 50 ohm resistive load, the ordinary station dummy load is 50 ohms.

Second, it has to have sufficient power handling capability such that it does not enter self-destruction mode as soon as you apply power.

This last item about power handling is important. Do I dare repeat a story that has brought me much chagrin already?

While testing modulation at a full 1 kW power on a beautiful MW-1 — which I had completely refurbished in my garage for the distinguished Reverend Marvin Oliva, whose active radio ministry, La Cosecha del Tiempo Final, spans most of Central America — I fried my 500 watt dummy load listening to Kiri Te Kanawa sing the "One Fine Day" aria from Madame Butterfly. Guess I was just carried away by those crystal-clear high notes and didn't put together that the burning smell was overheated oil in the dummy

In the case of this specific question, we have two luxuries. First, we need only a short test; second, we don't have a requirement to be exactly right; we only need to be close enough for a test



Schematic of arrangement based on our limited choices that comes closest to 50 ohms

Left: Air-cooled dummy loads like this 20 kW unit grace medium-powered radio stations throughout the world; no water for cooling is required.

Below: Smaller Air-cooled Dummy Load Shown With Mechanical Patch Bay.

that allows us to eliminate the Marti as the source of the problem.

The section of our dummy load comprised of the four 100 ohm, 1 watt resistors has a combined resistance of 100 ohms. Kirchhoff's Laws tell us then that the current flowing through this 100 ohm path will be identical to that flowing through the single 100 ohm 5 watt resistor. (In 1845, German physicist Gustav Kirchhoff described two laws that became central to electrical engineering. The laws were generalized from the work of Georg Ohm. They can also be derived from Maxwell's equations but were developed prior to Maxwell's work.)

From Ohm's Law, the dissipated Power = Current^2 x Resistance, so if we need to dissipate a nominal 10 watts in 50 ohms then the current flow will be approximately 0.45 amps. Half will flow through each 100 ohm path or 0.225 amps. The power dissipated in the 100 ohm 5 watt resistor will be nearly 5 watts. Similarly, the current flow through each 200 ohm leg (two 100 ohms in series) will be half the total current in this branch, or 0.1125 amps. This works out to 1.25 watts in each of those 100 ohm 1 watt resistors (using Ohm's Law above again).

Power ratings for resistors are generally the handling limit for continuous duty in standard pressure and ambient conditions of still air. Obviously we couldn't let this remote pickup transmitter operate for long, asking these little resistors to handle an additional

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TRANSMITTER

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25 percent of power; but for the few moments that are needed for our quick test, they're up to the stress.

THE FAMOUS CANTENNA

We talked about the need for a dummy load to mimic the antenna in both resistance and reactance. A well-designed antenna matching system will actually present a completely resistive load to the transmitter. To reduce the reactance in the dummy load, big power-handling resistors are usually carbon composite for minimal cumulative reactance. If wire types are necessary, an input correction network is needed to zero the reactance. No matter what, each resistor is carefully selected and tested to make certain that they maintain their rated resistance at operating temperatures.

As mentioned, all of the power is turned into heat and will build up quickly if not transported elsewhere, so just about every dummy over 1 kW has some system of fans or oil flow or heat sink transfer scheme to get rid of the heat before self-destruction.

Every ham has seen or owns one of those classic CanTennas from Heathkit. Rated for a kilowatt of ham radio power, this unit was a 50 ohm carbon composite resistor immersed in a gallon of cod liver oil or distilled water in a paint can. The design allowed about 10 minutes of 1 kW of transmitter on and 20 off. The CanTenna was adequate for 1 kW key down CW for a few minutes and similar low duty cycle SSB testing.

Leo the cat turns his attention to Buc's classic CanTenna.

The CanTenna can be used to test a 1 kW AM broadcast rig with modulation. To handle the extra sideband power, one needs to place the can on a brick in a bucket such that the top of the can is just above the bucket top. A garden hose is then used to let that cool water (tap water is usually about 54 degrees F) flow into the bottom and over the bucket top. This water overflow facilitates a heat exchange where the heat coming off the can is given up to the cooler, flowing water. If one limits transmission to 5 minutes on and 10 off, you can tune and troubleshoot your rig off the antenna with modulation.

Missed some past articles or want to review them in preparation for your next exam? Find Certification Corner articles under the Columns tab at radioworld.com.

Charles S. "Buc" Fitch, W2IPI, is a registered professional consultant engineer, member of the AFCCE, senior member of the SBE, lifetime CPBE with AMD, licensed electrical contractor, former station owner and former director of engineering of WTIC(TV) in Hartford, Conn., and WHSH(TV) in Marlborough, Mass.

Class Distinction

Question for next time

(Exam level: CBRE)

All stations in the commercial part of the FM band are protected to their 1 mV/m contour except for:

a. Class A and full Class C
b. Class B and Class D
c. Class B and Class C2
d. Class B and Class B1
e. Class B1 and C1

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OPENSUSE

(continued from page 1)

unless you want other people downloading the ISO from *you* later.

Burn the ISO image to CD. We're going to test SUSE on the hardware first: temporarily connect the server PC to your office network for normal Internet access. Insert the CD and boot onto it. After a few minutes, you'll be in the GNOME desktop. The equivalent of Windows' Start Menu is the "Computer" button in the lower left corner. Assuming that DHCP on your office network is working properly, you should have Internet access. Click on "Computer" and start the Firefox Web browser.

Step Three: Install It on Your Server PC

Now move the network cable from the server PC over to the dedicated DSL connection. We'll set up the networking in a moment. Click the "Live Installer" icon on the GNOME desktop to do the install. The defaults will work fine, and it'll typically take less than 15 minutes.

One note: During the installation, on the page where you enter your name and password, you'll see a checked box that says, "Use this password for system administration." There are arguments for having a separate root (superuser/administrator) account, but just use a decent password and leave this checked. Make sure you write down the password somewhere.

The machine will reboot once the installation is done; remove the CD and put it away. On the first boot, it will finish the configuration. If a window appears with a question, just select the obvious or the default (in the unlikely event that there is no obvious choice, ask in the Forum online!). Once done, OpenSUSE is now installed, and you should again end up in the GNOME desktop.

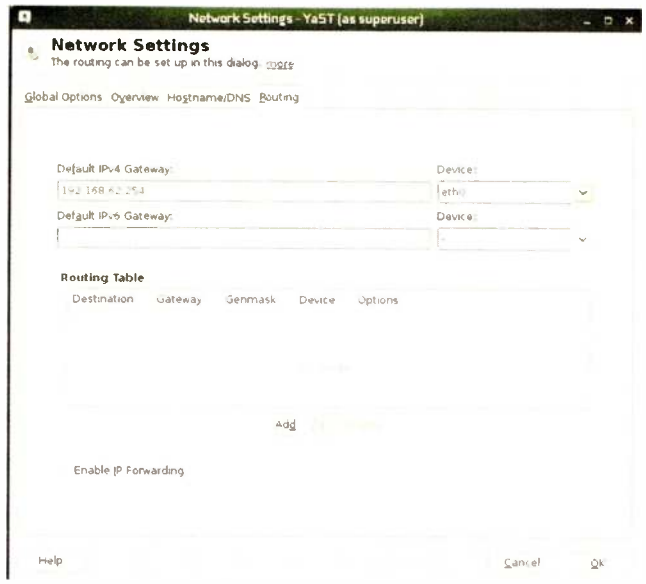

Fig. 2: Adding a new user to the server.

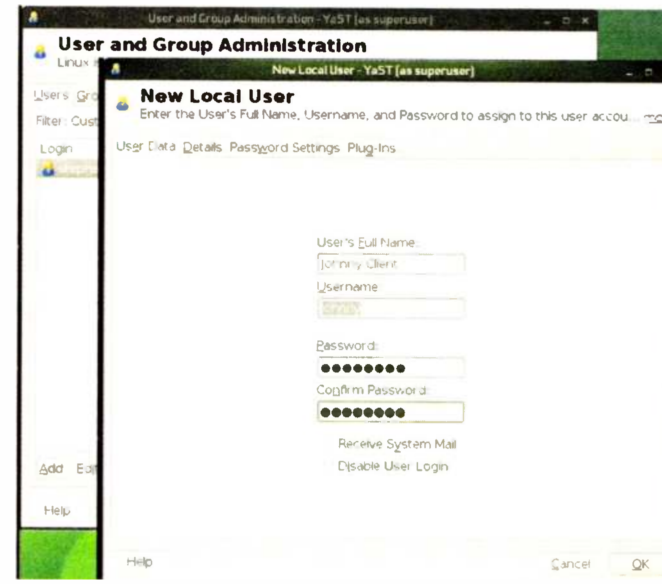

Fig. 3: Setting up the network.

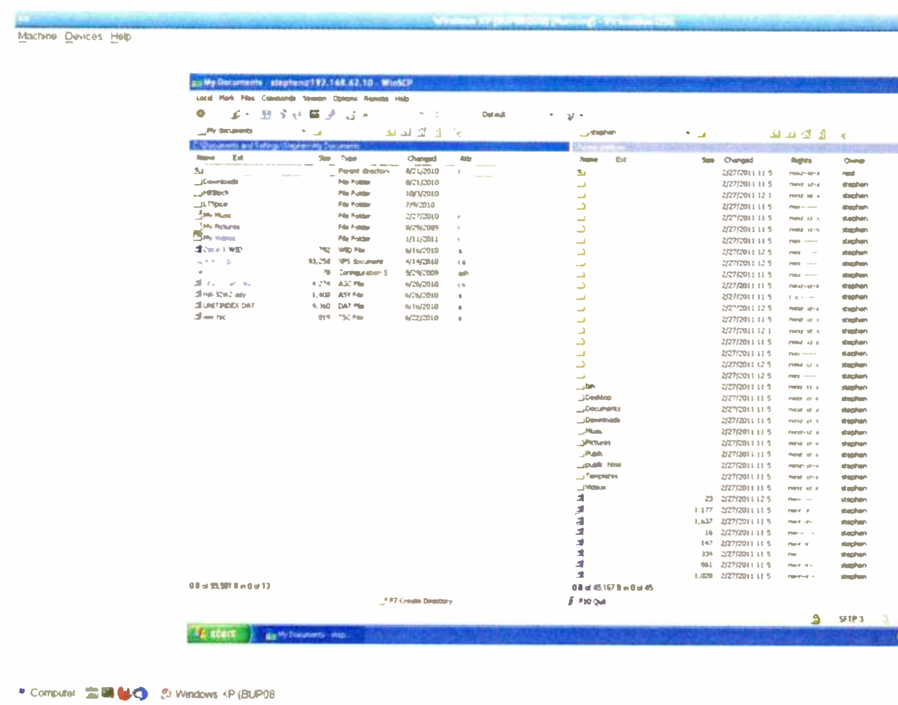

Fig. 4: Drag and drop files with WinSCP.

Step Four: Open the Firewall for Secure Shell (SSH)

Click the "Computer" icon at the lower left of the desktop, then click YaST (in the right column). When the YaST window appears, scroll down to the "Security And Users" section, then click on "Firewall."

In the firewall screen (Fig. 1), select "Allowed Services" in the left column. To the right, click the dropdown box and select "Secure Shell Server." Click the "Add" button, then "Next." On the next screen, click "Finish" and you're done. SSH is now open for business.

Step Five: Add Your Users

Still in the "Security And Users" section of YaST, now click on "User And Group Management." Click the "Add" button in the window that appears (Fig. 2) to create new users. Give each a good password, then click "OK." Repeat this for all users who should have access to this server.

Step Six: Set Up the Networking

As discussed in a previous article ("How to Set Up Your Own Domain," RWEE, Dec. 8, 2010, or *radioworld.com*, keyword "Domain"), you'll need the provisioning sheet from your Internet Service Provider (ISP) for this. In this example, I'm setting up the server on a local network for testing. Replace my values with the ones from the sheet. Contact your ISP if you're missing a needed value.

Open YaST again, scroll down to "Network Devices" and click "Network Settings." The window shown in Fig. 3 will appear. Note that there are four tabs across the top: "Global Options," "Overview," "Hostname/DNS" and "Routing." We'll do these one at a time.

Global Options: The defaults are fine; uncheck the IPV6 box unless your ISP has specifically said that you need it (and they probably haven't, not at this writing).

Hostname/DNS: You can enter your hostname information here, if you've registered a domain. If you've chosen "files.mybroadcast.com," for example, you'd put "files" in the hostname box on the upper left and "mybroadcast.com" in the domain name box to the right. Otherwise, just leave it at the default. At the bottom of this screen is where you enter your ISP's DNS server information. Use the values from your provisioning sheet.

Routing: The main thing you'll do here is set the default IPV4 gateway to the value on your provisioning sheet, and select "eth0" as the device.

Overview: I've saved this one for last. Select your card (again, I assume you only have one, eth0) and click "Edit." Enter your IP address from the provisioning sheet. (As discussed previously, if you have more than one, simply choose an unused one from the sheet.)

Speaking from experience, it's easy to accidentally close the configuration before you've actually finished. Simply click on "Network Settings" again and correct the missing values. Once you're done, click the "OK" button at the bottom right. The configuration will be applied, at which point you can try browsing the Web with Firefox. If you can't access the Web, recheck your network settings. If you continue to have issues, post the contents of your provisioning sheet in the OpenSUSE forum, describe your problem, and the helpful folks there will walk you through a solution.

Step Seven: The Windows Clients

We'll assume that most of your clients will be accessing this file server with Windows. The easiest way is with a free program called WinSCP (which stands for Secure Copy). It's a free download from *winscp.net*. Download the installer, run it, and you'll have a WinSCP entry in your Start menu.

When you start WinSCP, it'll ask for the server information. Enter the IP address of your server, your username and your password. Make sure the protocol is "SFTP" (Secure FTP is a built-in component of the Secure Shell Server). Click log-in and you should get a window like the one shown in Fig. 4. This allows you to drag and drop files directly between your PC and the remote machine. Nice!

Best of all, it's extremely secure. SSH is called "Secure Shell" for a reason: Everything, from log-in to disconnect, is completely encrypted. Assuming you've used a good password, SSH is very difficult to crack too, so you could even place contracts and other sensitive items in there.

Continue to play with this and become comfortable with OpenSUSE. Learn its features; read the help files for ideas. Next time, we'll set up a fairly advanced Web server on this same machine. Until then!

Find past Radio IT Management articles under the Business tab at radioworld.com.

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COCKPIT

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unbeatable. Our species was an evolutionary experiment that proved to be highly successful.

LET THE GROUP WORK TOGETHER

Decades ago, I had my first taste of the effect of changing an engineering culture into what I call a meta-animal.

I was asked to take over a dysfunctional engineering department that had been tasked with developing a critically important product to protect the company's market position. While I recognized that I was now the "captain," my job was to fuse the group into a collective set of brains that could function like the hunting parties of our ancestors.

My first command was as follows: If anyone brings up a problem in the design and presents it publicly, he is no longer responsible for solving the issue. In other words, a public disclosure relieves the engineer of all responsibility. The group would own the problem, and if the collective wisdom could not invent a good solution, I would own the problem.

This was the airplane cockpit in a corporate context. I was dependent on the information that others had but would not make public. To make a long story short, with a cohesive engineering culture, the product made the schedule and was a top performer in the market. And everyone had a stake in making that happen. I was like the conductor in an orchestra, being in charge, but not making the music. I needed their information and wisdom, just as the captain of the cockpit needs the input from the crew.

The same principle has been described in corporate management under the title "management by walking around."

This idea was popularized in the 1980s because it was becoming clear that executives were becoming isolated from what was really happening in other parts of their company. When information has to pass through too many layers, those who need to know are left in the dark. Without this data, an executive would easily become preoccupied with an issue that was not necessarily the most important one.

In 1965, there was a major power outage across the Northeastern section of the country. Most radio stations had emergency power systems to keep them on the air. While these systems had been tested weekly, some stations discovered, to their horror, that all of the testing had drained the fuel tanks. Nobody had bothered to put the refueling issue on the table as part of the testing.

I have no doubt that some lowly janitor had noticed that the tanks were close to empty, but he did not exist in a culture where that information could capture the attention of executives who were preoccupied with more important issues. The same dynamic happens in airplane cockpits, surgical operating theaters and executive suites of major corporations.

If the conclusion that group-think is so valuable, why is that insight seldom recognized and incorporated into organization cultures?

My answer is that hubris among those with high stature and sophisticated education leads to them to the false conclusion that their brain wiring is superior to that of an illiterate peasant. Regardless of our professional success, we are all limited by the evolutionary brain trajectory of our species.

When someone gets a promotion to become a leader with the corresponding increase in authority and responsibility, his brain has not changed. A title does not increase your intelligence and skills. Actually, a promotion often degrades brain functioning because you focus in creating the illusion that the new position changed your brain. It didn't. As I often say, humility is the key to success.

Barry Blesser is director of engineering for 25-Seven Systems. Find past "The Last Word" articles under Columns at radioworld.com.

PRODUCTS & SERVICES SHOWCASE

What Airplane Crashes Can Teach Us

Good Management Requires Group Cooperation

BY BARRY BLESSER

The paradox of the information age is that there is an unbelievable amount of useful information readily available, but these gems are buried in a sea of useless junk.

Perhaps only 1 percent of the available publications, both electronic and paper, have any real value. Dogbert, who continued the tradition that began with Aristotle, once said that given infinite time, a thousand monkeys with typewriters would eventually write the complete works of Shakespeare. But it would take thousands of lifetimes to read all of their gibberish to find Hamlet.

However, when a trusted colleague recommends something of value, he provides me the service of finding something in that sea of junk. Last year, one of my clients introduced me to a set of articles and books on organizational structure that, in my opinion, have important value.

One of these publications, "Change by Design" by Blake, Mouton and McCanse, references the analysis of airplane crashes in the 1970s.

At this point in time, the mechanical systems had been continuously improving until safety reached a lower (but unacceptably high) limit. The missing piece of the puzzle was traced to human factors, which were becoming the dominant source of air disasters. Even though members of the cockpit were highly trained with simulators, human error was still a major issue. In an analysis of crashes in the 1970s, 60 percent of fatal commercial air carrier accidents were attributed to the management of human resources in the cockpit, and when the statisticians included noncommercial airplanes, that rate approached 80 percent.

UM, SIR, WE'RE ABOUT TO ...

To understand the nature of human failure, social scientists studied the dynamics in the cockpit, which had been organized like a corporation with a strong authoritative leader in charge. The buck stops with the captain (or CEO), who is given the mandate to make all decisions. The captain is *the* captain.

iStockphoto/Luis Carlos Torres

A few examples illustrate how human foibles produced fatalities. In 1977, a KLM captain insisted on commencing a takeoff, in heavy fog, without a takeoff clearance. Other members of the cockpit knew they had not received clearance to take off and they tried to convey those concerns to the KLM captain, but he was focused on the fact that any delay would cause the flight crew to run out of legal duty time. The deadliest accident in aviation history followed.

In a similar type of incident, a UAL captain was preoccupied with the failure of an indicator showing that the landing gears were locked correctly. As he was focusing on solving this technical problem, keeping the airplane in a holding pattern while he tried to determine the failure mechanism, he ignored the warning of his crew that the plane was running out of fuel. After an hour elapsed, all four engines simply stopped.

There are many similar stories where the captain was focusing on a real problem, and ignoring a secondary issue that would later prove to be more deadly. The Titanic sank for similar reasons; the chairman of the company, onboard, was worried about the commercial implications of being late to arrive in New York, and therefore ignored the advice of those who knew about the risks of icebergs.

Captains and CEOs are also human beings who can become hyper-focused on one issue while ignoring others. The problem is compounded by the organizational structure where the captain (buried in his distraction) does not listen to those who have no "right" to challenge the authority figure. Some Asian cultures give the captain a god-like authority to make all decisions, which can become a serious problem when handling an unexpected crisis in the cockpit.

LET'S NOT VOTE ON IT

The opposite structure does not work either. Decisions cannot be made by a democratic vote, and interminable debates are not acceptable. There has to be a better way. Could social scientists change the behavioral structure of the cockpit to create a real team without undermining the leader's responsibility?

Over a period of decades, a program called Crew Resource Management has been instituted and refined in all the major airlines, with a dramatic reduction in fatalities. The program emphasizes the cognitive and interpersonal skills required to manage the cockpit under adverse conditions.

In this context, cognitive skills are defined as the mental processes that evaluate *all* possible sources of information in decision-making. The captain is trained to value inputs from everyone, regardless of status and stature. In addition, the flight crew is trained to make their concerns known in a polite but forceful manner. CRM is a culture change that is neither authoritative nor disrespectful. This approach is also being used in the medical industry where the chief surgeon is like the captain or CEO.

The general principles embodied in CRM are neither new nor novel, and they apply to a wide variety of situations, including broadcast stations. Group culture has a very strong influence on individual behavior because it compensates for the evolutionary limitations of the human brain. These limitations are unrelated to intelligence, training or personality.

GROUP MULTITASKING

Let's take a simple look at the conscious attention system in the neocortex.

Beneath this system, a preconscious sorting process evaluates dozens of stimuli, both internal and external, in terms of their importance. The stimulus that is tagged to be most important for survival and well-being is then passed to the attention system, which is not able to do true multitasking.

In the case of the UAL airplane crash, the captain tagged the landing light failure as being most important and ignored the warning that the airplane was running out of fuel. Preoccupation with one stimulus is a failure in tagging. But since tagging is a preconscious activity, the victim cannot do anything about it by himself. He needs a social culture to compensate for a failure to tag the most important stimulus correctly.

We arrive at a similar conclusion when we look at the evolutionary history of our species. Ancient hominids (our ancestors) were not the fastest, strongest or best combatants in fighting with competing species for resources. Why, then, did we come to dominate all other species, becoming mammalian cockroaches?

The answer is that multiple individuals could act like a meta-animal with distributed senses and intelligence. A hunting party of 10 individuals had 10 sets of eyes, ears, noses that fed information to a multiplicity of brains with different skills, abilities and perspectives. As we now observe by the size of the human population, meta-animals proved to be

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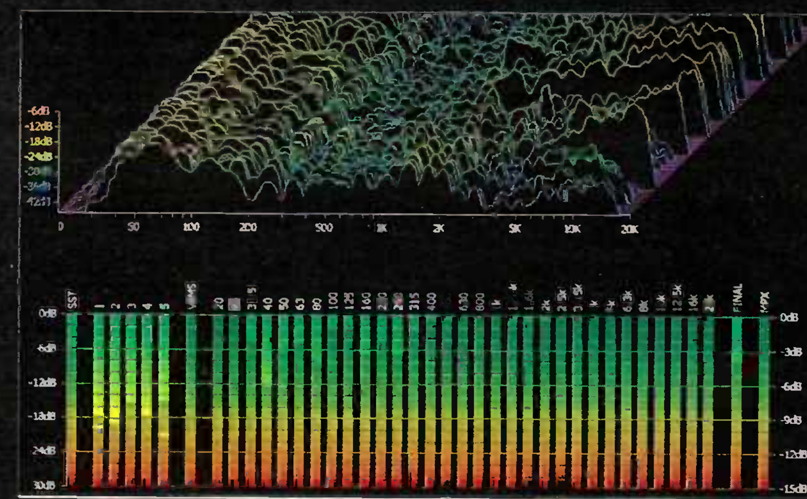
VORSIS AIRAURA DIGITAL SPECTRAL PROCESSOR



Real Comments From Real Users About Vorsis

Just wait until they get their hands on AirAura™

"I am giving the Vorsis development team a BIG thumbs up as this product stands out as a very SUPERIOR audio processor design."

"This processor is amazing!"

"I have the HD output feeding our web stream encoder, and two national program hosts at remote locations in the US have told us 'your audio stream sounds incredible!'"

"I can say that the Vorsis processor does NOT sound like the "O"ther guys! It sounds far better and has a very unique 'signature'. I really, really like how this processor sounds! Every other station in the market sounds like crunched up FM radio while our station is loud now and yet it still has "life" with CD quality dynamics and punch."

"I've listened to the station since the first few days after the format flip (which was a month ago yesterday), and the one thing I notice most is that the new Vorsis processor's audio quality is always terrific, regardless of the source material."

"If the Vorsis that I heard while you were testing processors last night is your final air chain (it was) it might just be the cleanest and best sounding FM I've heard since...well, forever. Great work!"

"Thanks for a great sounding box that makes us sound bigger than the so called big stations!"

"Your Sweet Spot Technology AGC has the most invisible gain correction that I have EVER heard in ANY on air processor. Listeners have been calling to compliment us on the improvement in our on air sound."

"We've used your product close to a year now and it's just out of this world. When we put the Vorsis box online our audience noticed the difference instantly and started calling asking questions like 'What's going on? What did you all do? Your sound is clear, crisp, and bright and the audio sound level is great now!!!'"

"The music sounds great, and this box can be tweaked to anyone's preference. There is a lot to discover in this machine.....but our single biggest achievement has been achieving the clearest, cleanest 'voice' I have ever heard come from an FM processor."

"I am extremely impressed with the unit's capabilities and how well it performs with our NPR talk/Classical format."

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IT'S TIME YOU WON THE RATINGS WAR

"What an amazing difference in sound quality!!! This is a brand new FM station and comparing it to the other new station in town using the Other brand of processor our client is louder, cleaner, and even legal. Wheatstone definitely has a winner here with Vorsis."

"This is a great sound and we are so, so pleased with our new Vorsis on-air processor. You just threw down the gauntlet to the processing industry with this new unit! Nobody can match a sound this loud, this clean, and this unique! Now everybody gets to chase after us for a while. Thanks Vorsis!!"

"Our signal used to virtually disappear in downtown New York when we went on night pattern because of the extremely high level of manmade noise. Now when we're on night pattern our coverage in downtown is actually better than when we are on day pattern, the other brand of audio processor and a 10X higher powered transmitter! We're buying a second one to put on our daytime transmitter!"

"You have to be kidding! I have NEVER heard FM audio sound this good, this detailed, this smooth, this clean, and this loud (how did you do it???). Very nice work!"

"Love the box!!! Overall the sound of the station is vastly improved. It's loud, wide and clear."

"I guess the only word for Vorsis is 'WOW.' It's got some great bottom end, and it's more transparent than any processor I've heard."

"The AGC/Compressor/SST combination is simply amazing. We play classical CDs. Older classical CDs were mastered at a much lower level than current ones. Announcers don't compensate and never will. Your processor is able deal with what amounts to probably 40-45dB (or more) *average* level variations and hold them perfectly in the sweet spot with virtually no squashing, pumping, sucking, or other usually audible artifacts of such wide range level control. In short it does its job perfectly every time."

"This box sounds much better than any other processor I have ever tried. Ever!"

"I love classic rock and it's the program format on the station that I own. No other processor that I've tried (and I think I've tried them all!) sounds as good on this format. We're nice and loud and still cleaner than the other stations in the market. We were surprised to hear the intentional dynamics of songs actually get on the air – other processors just flatten them out or turn them into a sea of mush. For the first time ever we're also hearing subtle nuances in songs that we used to think we knew every single note of. What an amazing air sound! No.... What an amazing processor!!"

"The SST algorithm is the least audible of ANY processor I have ever had experience with. I'm not sure how you did it or exactly how it works but its automatic "leveling" is excellent – no preprocessing whatsoever is necessary with SST."

"The high end of this processor is very open sounding – there is no fake "sparkle" with the HF EQ either. Perfectly clean and natural sound. And did I mention LOUD?"

"Your equalizers are actually useful and unlike other processors do not grunge-up the sound merely by enabling them."

"Finally! A processor that deals effectively and transparently with overly-sibilant announcers and audio levels that usually go all over the place! (I especially love the tweak-able multiband thresholds!)!"

"Why haven't the other audio processor companies been able to make an AM box that sounds this good? I can't think of a positive superlative that is big enough to describe how pleased I am with our AM sound now. Our coverage seems to have increased by quite a bit too!!"

"Our multipath is Gone! GONE! As an engineer I have difficulty believing a processor can make this much difference in apparent coverage area but the listening is the proof. We've had several listeners call and comment that their reception has greatly improved and even I've noticed vast improvements when driving through what were previously horribly multi-path prone areas. I'm not sure why, but it sure does work!!"

"This box has great metering and excellent analytical tools – you get good visual indication of everything that is happening inside."

"The unit's stability has been flawless, not even a tiny glitch. We have it set up to time-sync and it works great. The scheduler-based (and SILENT!!) preset switching is perfect! Unit sounds very accurate sonically and is very easy to set-up."

"We are now VERY unique in our audio. Compared to other stations in the market, we are as loud yet maintain legal modulation (at least 4 stations in our market run with 130%+ modulation). We're not "squashed" sounding at all and if you compare us with the other stations (all formats) we're clearly a dynamic and clean stand-out signal on the dial now."

NOTE: We aren't naming names because everyone who is reaping the rewards of sounding better appreciates their anonymity (with respect to the competition). We won't blow your cover, either.