CUSTOM COURSE CAPABILITIES

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INTRODUCTION

SatProf, Inc. specializes in online technical training for the satellite communications industry. We have managed the GVF's global training program since 2006, with over 16,000 students engaged. Today, SatProf's online training is the accepted global standard for satellite communications education.

Many of the courses in the GVF curriculum were designed and implemented by SatProf to meet the needs of the industry at large, but curriculum also includes many specialized and custom courses that teach the skills and knowledge for specific services and equipment models.

We are proud to have developed custom courses in coordination with organizations such as iDirect, Hughes, Gilat, Cobham SeaTel, Speedcast, Intellian, CPI (ASC), Avanti, Intelsat, SES/O3b, DIRECTV, Integrasys, Rohde and Schwarz, and Avcom. Furthermore, SatProf has crafted complete training programs for GVF, IRG/RFI-EUI, and SBCA.

By teaching and assessing critical skills with realistic simulators, training organizations can dramatically reduce the cost and time needed to effectively train geographically-dispersed staff.

SatProf is always open to ideas for new specialized training courses. In this booklet, we will summarize our capabilities, experience, resources, and standard practices for developing and delivering new custom courses.

For more detail about the standard and custom courses in the GVF curriculum, please visit **gvf.org/training**. If you would like to talk with us about working together to solve your training challenges, please contact **Mr. Greg Selzer** at **+1(214) 507-7059** or email **greg@satprof.com**.

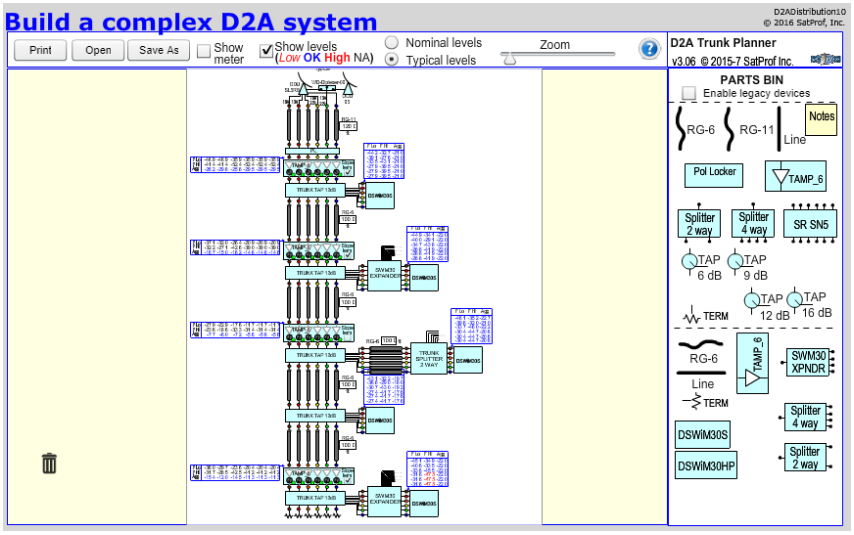
GVF Training

SATPROF

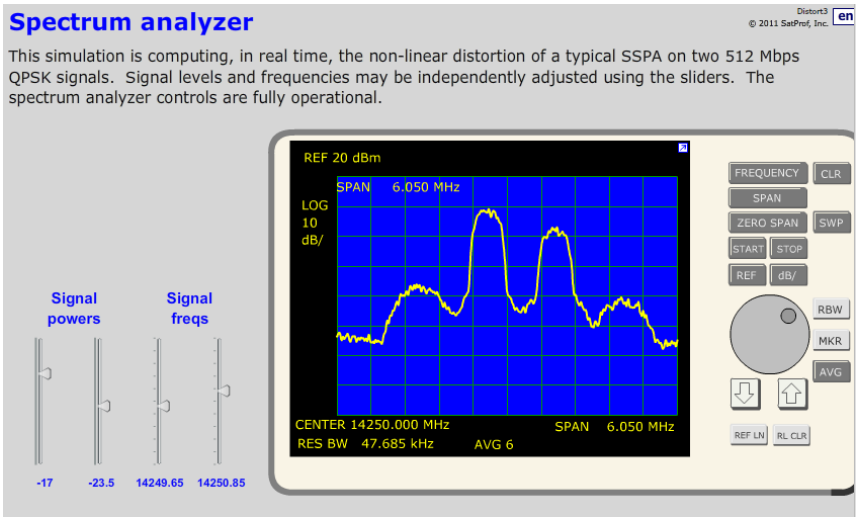
CONTENTS

RF ENGINEERING

SatProf is fundamentally an RF (Radio Frequency) and microwave systems engineering house, with expertise in coding and instructional design, and a training delivery and administration infrastructure. We have over 60 years' experience in earth station systems design, including uplink and downlink chains, antenna applications, link budgets, pointing and look angle analysis, satellite network planning, transponder loading, orbital dynamics, and simulation in MATLAB, Excel VBA, and AS3.



Interactive RF level planner for DIRECTV's D2 Advantage system for distribution of IF signals throughout a multi-dwelling building. The user can build a complete trunk/tap system, view all RF levels, and check for compliance.

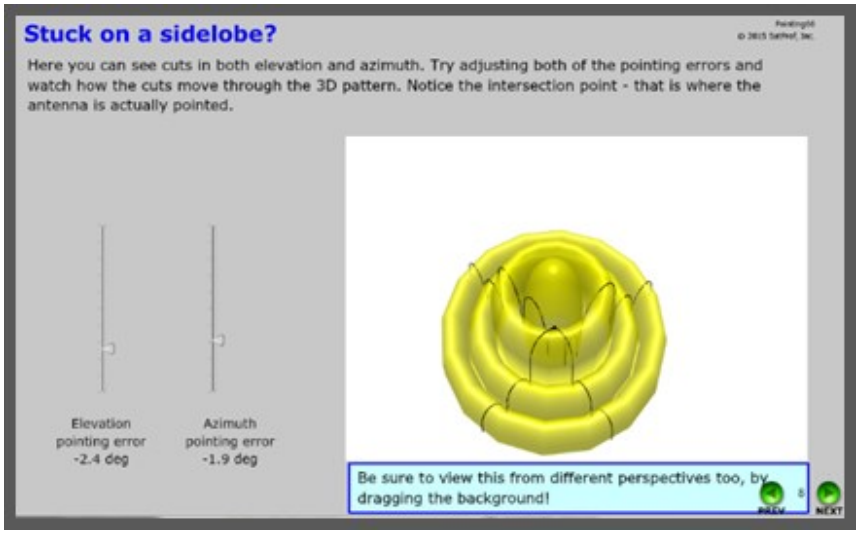


Fully-functional spectrum analyzer connected to a real-time non-linear distortion simulator, fed by two user-adjustable QPSK signals. This simulation allows the student to explore the effects of amplifier distortion as a function of signal levels and frequencies.

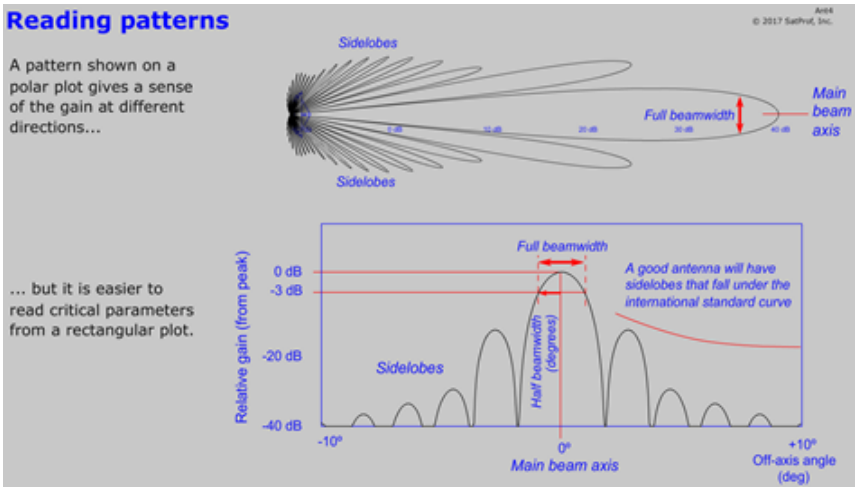
ANTENNA SIMULATION

The SatProf code library includes parametric models for generating simulated antenna patterns (co- and cross-pol) in 2D and 3D, including main beam shape and near and far sidelobes. These models can represent the behavior of symmetric, offset, parabolic, and array antennas from 20cm to 20m.

Pointing accuracy simulation is a SatProf specialty, with models that account for base tilt, hysteresis (backlash), lockdown shift, CP squint, and other impairments.



Interactive 3-D antenna pattern simulator



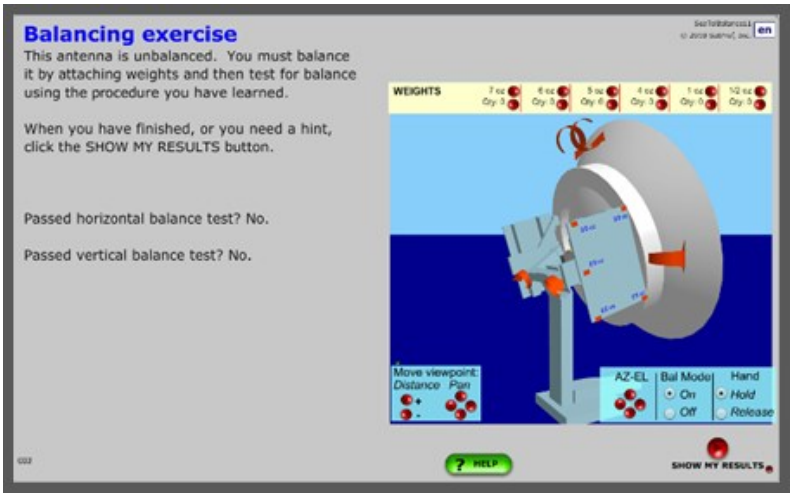
Antenna tutorial with synthesized 2-D patterns

MECHANICAL SIMULATION

We have developed functions that represent El-over-Az and other antenna mount geometries using coordinate transformations. These are used in conjunction with real-time pattern simulation, link budget computation, and 3-D graphics user interfaces to present realistic interactive experiences to students coupled to correct behavior of meters, modems, and RF spectrum conditions. For stabilized marine antennas, we add 3-D inertial modeling coupled to the 3-D graphics, to enable simulation of dynamic balance effects for skills teaching and assessments.

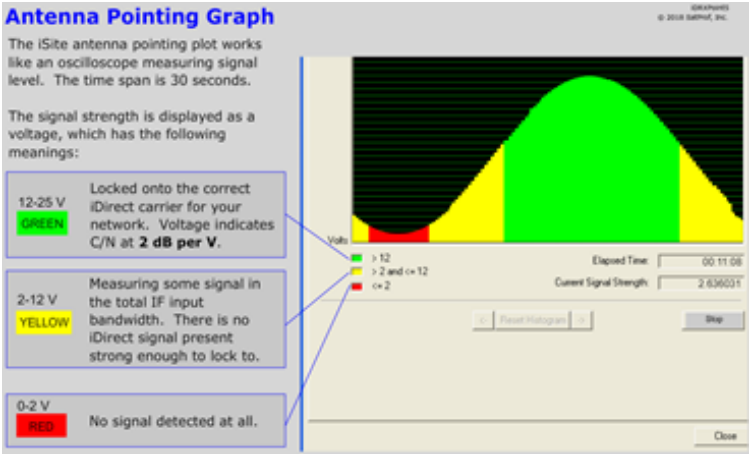
Interactive 3-D gimbal-based stabilized antenna with user-adjustable counterweights.

When released, real-time inertial analysis drives the 3-D graphics to animate motion due to any unbalance. The student then adds or removes counterweights until neutral balance is achieved.



MODEM SIMULATION

When developing specialty courses for installation of specific modems, we work with the manufacturer under NDA to define algorithms that describe the modem's lock and status indicators and CNR (or equivalent) as a function of current and past signal and noise powers. Each algorithm is coupled to the antenna, link budget, and mechanical simulators to form a complete terminal system that can be used for tutorials, practice, and assessments of skills such as finding the satellite, accurate pointing, and cross-pol alignment.

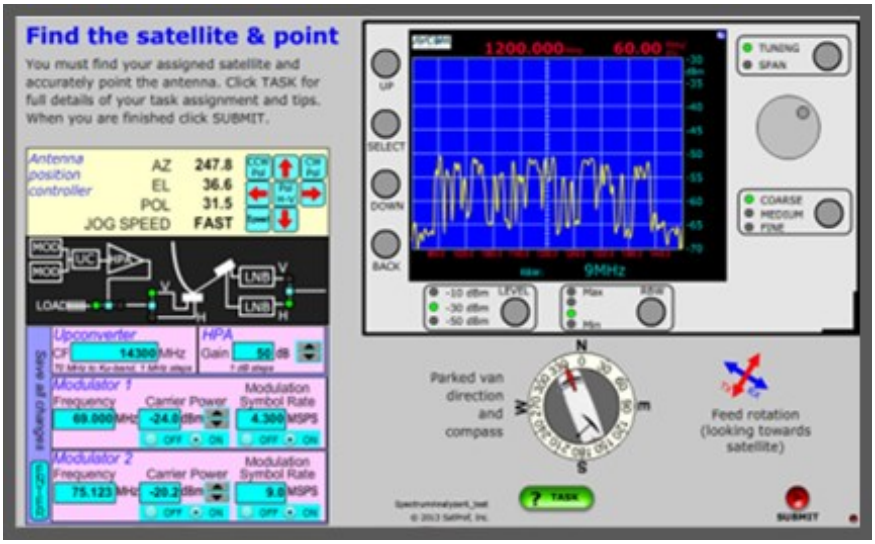


Tutorial explaining a modem's user interface app with C/N simulation.

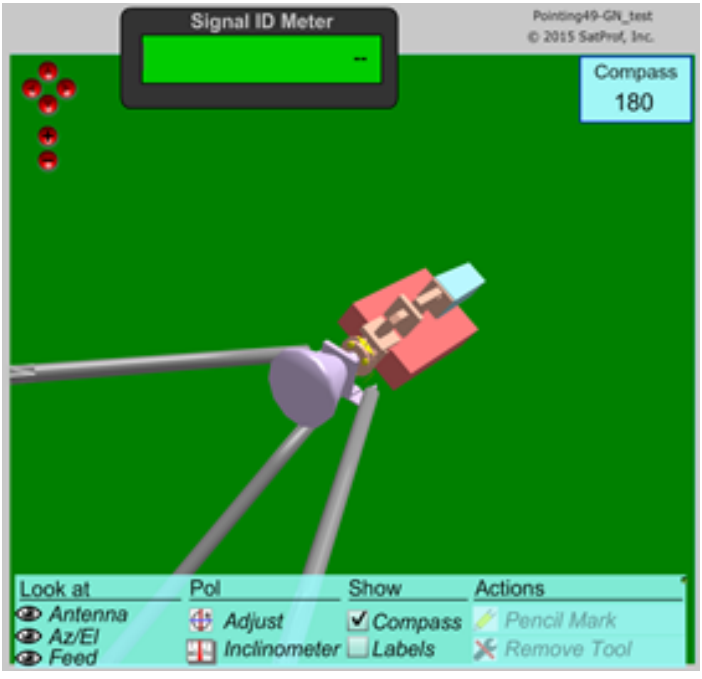
SPECTRUM ANALYSIS

An FFT (Fast Fourier Transform) engine drives the abstracted spectrum analyzer core in our code library. This can be used for simple spectrum displays in engineering tutorials, or with fully-function instrument simulator user interfaces, which can themselves be connected to the antenna and link budget simulators. Realistic spectrum analyzers with real-world signals allow students to learn, practice, and demonstrate specific operating skills.

Example: SNG emulator in course GVF 532, in which the student monitors a typical Avcom analyzer while operating a motorized antenna controller, in an environment of 2-degree spaced satellites, each with a full complement of varied signals across the entire downlink spectrum on both polarizations.



3D GRAPHICS AND INTERACTIVITY



Interactive feed pol adjustment on a VSAT antenna

As part of the code library, we have developed scripted 3-D models of a wide range of shapes, from cylinders and boxes to complete antenna mounts, parabolic reflectors, and feeds, rendered in the Graphics Processor Unit for responsiveness.

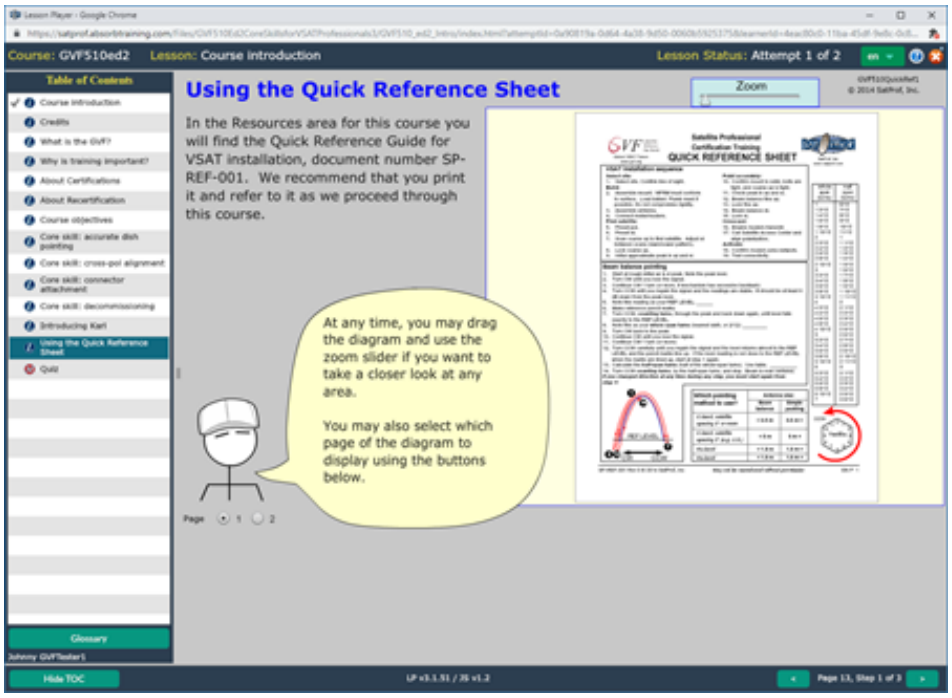
The student moves around and manipulates mechanical systems such as az/el antenna mounts and rotatable feeds.

SATPROF

RESOURCE MATERIAL PREPARATION

SatProf's instructional philosophy is that the online learning conveys concepts and understanding but retention relies on the student being provided with counterpart resource documents, such as quick reference sheets.

In most cases, as part of course development, SatProf will generate these materials, and in the process, spur a collaboration with the equipment manufacturer on preferred processes, approved components, and installation rules.



Tutorial explaining the Quick Reference Sheet that is included with course GVF 510 for VSAT installers.

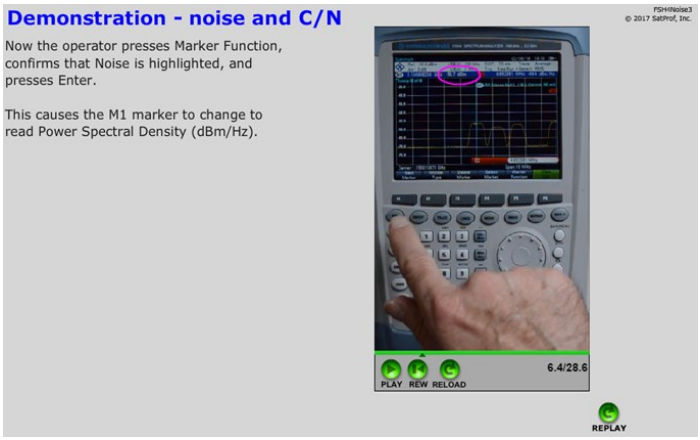
USER INTERFACE SIMULATION

In cases where a browser or an app is used to configure or operate the equipment that the course covers, SatProf will typically write a user interface emulator that imitates the key features. The emulator is then connected to the other simulators as appropriate.

For example, to activate a CW (unmodulated) test carrier for cross-pol alignment, the user may need to open an internal web page in the modem and user controls on that page, such as carrier on/off, level, and frequency. SatProf would emulate that page and the relevant controls.

Fully-function simulation of the user screens on the ASC NGC antenna controller

VIDEO INTEGRATION



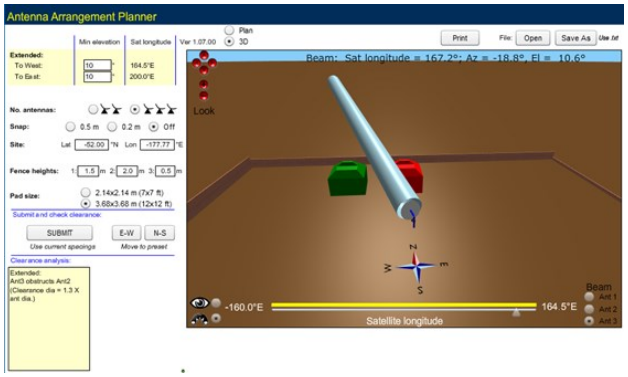
When the instrument or computer screen is very complex, it may be preferable to record a video of each operation to be taught. This video is streamed to the student, but it can be paused and resumed at any number of points as the tutorial explains the action being performed.

Stepped video demonstration of operation of the Rohde and Schwarz FSH4 spectrum analyzer.

COMPANION APPS

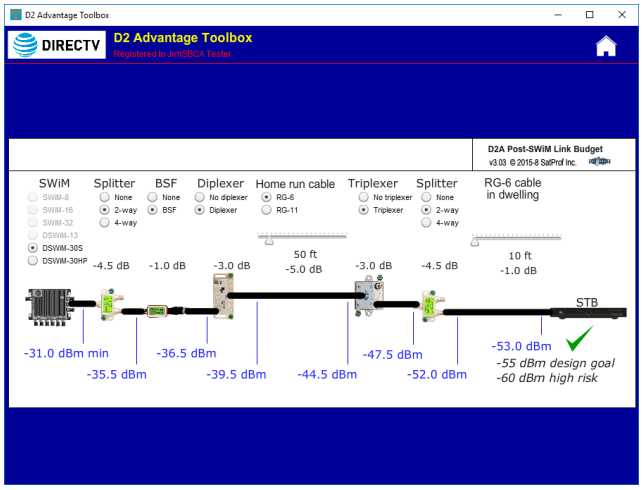
SatProf has developed techniques for reusing the same scripts and graphics not only in Web-delivered pages, but in offline apps for iOS, Android, Windows, and Mac OS. That means the same simulator engine can be used:

- As part of training tutorials,
- As a practice exercise,
- In a certification skills assessment, and
- In a standalone app for field techs to use on the job.



In this example, SatProf built a 3-D interactive app to help site surveyors determine the least amount of area needed for a multi-antenna NGSO gateway site. The app allows the user to move the antennas around and analyzes obstructions in real time. When done, the user can save a report to be emailed to colleagues. The exact same engine is used in the web-based tutorial that teaches how to use the app.

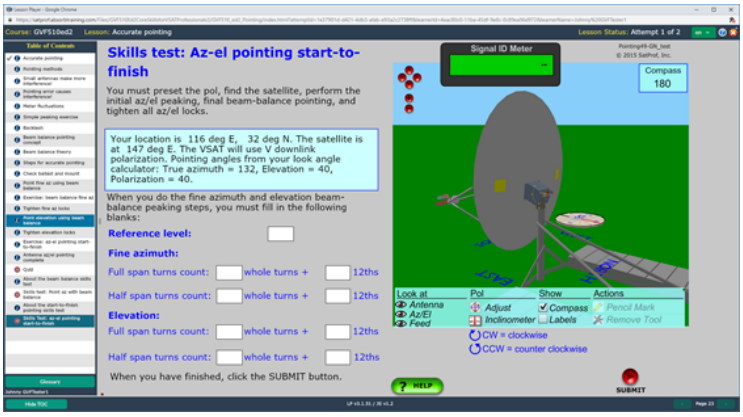
Here we see one of the screens in the field app developed as a companion to the training courses for DIRECTV's D2 Advantage satellite TV distribution system. The user can quickly determine what combination of component choices and cable lengths allow the signal level specifications to be met. The simulator is used in tutorials, skills tests, and in the standalone app.



SKILLS ASSESSMENT WITH SIMULATORS

SatProf's unique delivery infrastructure enables complex, scripted simulators not only to compute the student's skill based on objective training standards, but to transfer the results to the Learning Management System using standard SCORM protocol.

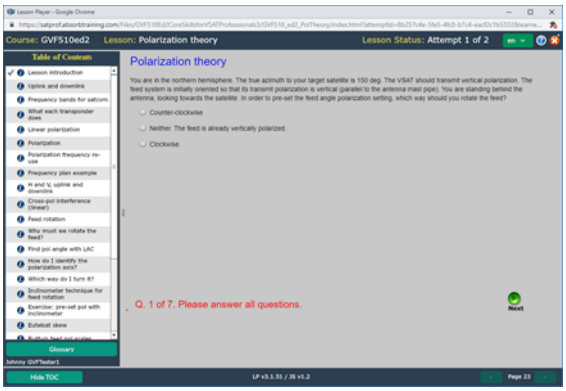
For example, in the pointing accuracy skills test page, the student uses the 3D antenna az/el/pol controls and observes the signal meter. When the student clicks *Submit*, the page script computes the boresight pointing error, compares it with the maximum acceptable value, and returns the student score to the lesson player, which then registers it with the LMS.



This capability is the key to empowering students at remote sites to receive thorough, interactive training and certifications at dramatically lower cost and higher effectiveness than classroom and other online alternatives.

In addition, in all such skills tests, we randomize the initial conditions at the beginning of every attempt, which forces the student to truly understand and demonstrate the skill.

QUIZZES



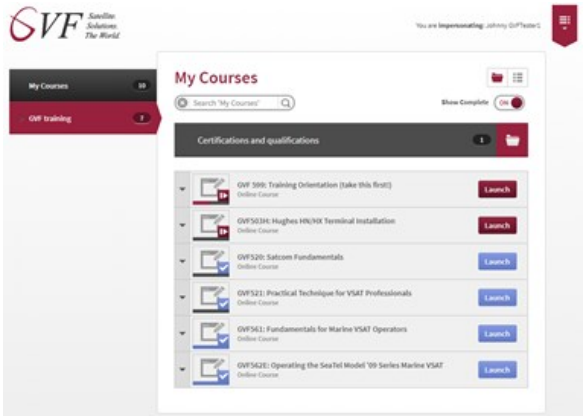
Quizzes are integrated into lessons along with learning pages and skills tests.

In any lesson, one or more pages may be configured to run as quizzes containing true/false, multiple choice, and multiple selection questions drawn at random from a pool.

DELIVERY

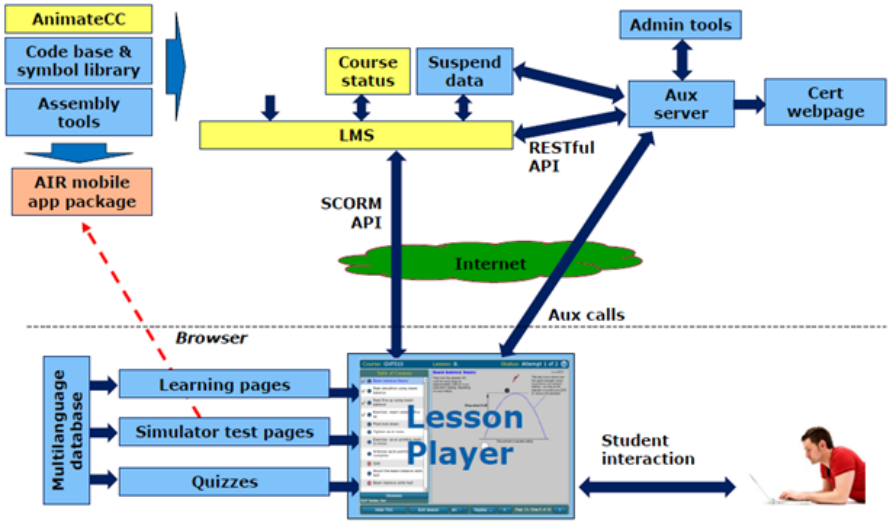
All SatProf courses are delivered through our Learning Management System (LMS). Every student has their own account and can log in at any time to work on any enrolled course. The LMS together with the SatProf lesson player and our auxiliary server tracks detailed progress, so after logging out the student will resume at exactly the same point when they return to the course. The student's computer needs only to have a current browser with the Flash player installed and enabled. An Internet connection must be maintained while studying but a high-speed link is not necessary.

Screen seen by students after login (GVF standard branding).



Opening a course. The LMS shows status in each course and lesson.

The lesson player as presented to a student.



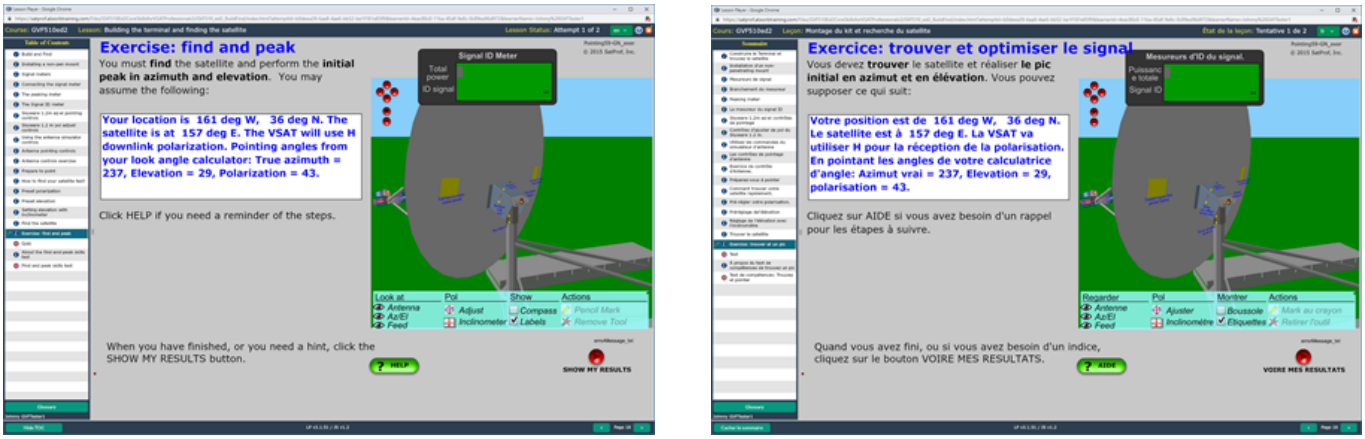
How the lesson player loads information and communicates with the LMS and auxiliary server

LOCAL VS SERVER EXECUTION

Every tutorial page loads as a discrete unit into the user's browser, including all scripts. Once loaded, the tutorial requires no further internet bandwidth. Embedded video, where used, streams while the user works through the tutorial steps. Together, these techniques greatly reduce the need for a high-speed internet connection.

LANGUAGE SWITCHING

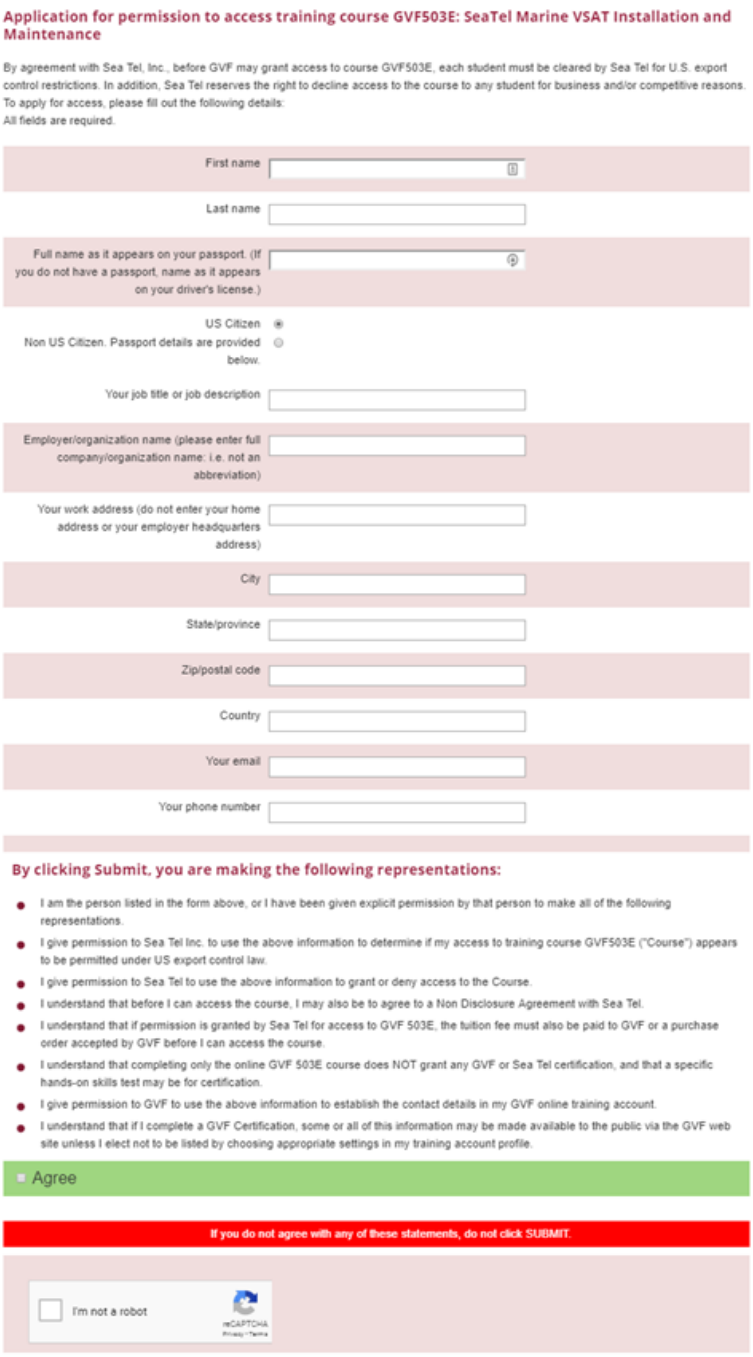
Learning, quiz, and skills test pages can be built to pull all of their text from a phrase translation database. The student can then switch between languages at any time and the page will instantly switch, including within graphics, 3-D objects, and quizzes. SatProf has developed a process for translators to independently submit phrases to a cloud-based database which is subsequently imported into the course learning pages.



A page from the GVF 510 course before and after the student switched from English to French.

STUDENT CLEARANCE

In cases where the partner organization wishes to restrict access to a course (such as to employees or customers), or wishes to pre-approve students taking the course, SatProf can implement a clearance process. In this case, students complete an online clearance application form which is delivered automatically by email to the partner organization. That person then forwards an approval message to SatProf student support admin, who clears the student to access the course.



Application for permission to access training course GVF503E: SeaTel Marine VSAT Installation and Maintenance

By agreement with Sea Tel, Inc., before GVF may grant access to course GVF503E, each student must be cleared by Sea Tel for U.S. export control restrictions. In addition, Sea Tel reserves the right to decline access to the course to any student for business and/or competitive reasons. To apply for access, please fill out the following details:
All fields are required.

First name
Last name
Full name as it appears on your passport. (If you do not have a passport, name as it appears on your driver's license.)
US Citizen
Non US Citizen. Passport details are provided below.
Your job title or job description
Employer/organization name (please enter full company/organization name: i.e. not an abbreviation)
Your work address (do not enter your home address or your employer headquarters address)
City
State/province
Zip/postal code
Country
Your email
Your phone number

By clicking Submit, you are making the following representations:

- I am the person listed in the form above, or I have been given explicit permission by that person to make all of the following representations.
- I give permission to Sea Tel Inc. to use the above information to determine if my access to training course GVF503E ("Course") appears to be permitted under US export control law.
- I give permission to Sea Tel to use the above information to grant or deny access to the Course.
- I understand that before I can access the course, I may also be to agree to a Non Disclosure Agreement with Sea Tel.
- I understand that if permission is granted by Sea Tel for access to GVF 503E, the tuition fee must also be paid to GVF or a purchase order accepted by GVF before I can access the course.
- I understand that completing only the online GVF 503E course does NOT grant any GVF or Sea Tel certification, and that a specific hands-on skills test may be for certification.
- I give permission to GVF to use the above information to establish the contact details in my GVF online training account.
- I understand that if I complete a GVF Certification, some or all of this information may be made available to the public via the GVF web site unless I elect not to be listed by choosing appropriate settings in my training account profile.

Agree

If you do not agree with any of these statements, do not click SUBMIT.

I'm not a robot

Example clearance application form

INTEGRATION WITH GVF PROGRAM

All SatProf courses are delivered on a common Learning Management System (LMS). If desired, new custom courses can be included in the GVF Course Catalog and in the GVF Annual Subscription Plan.

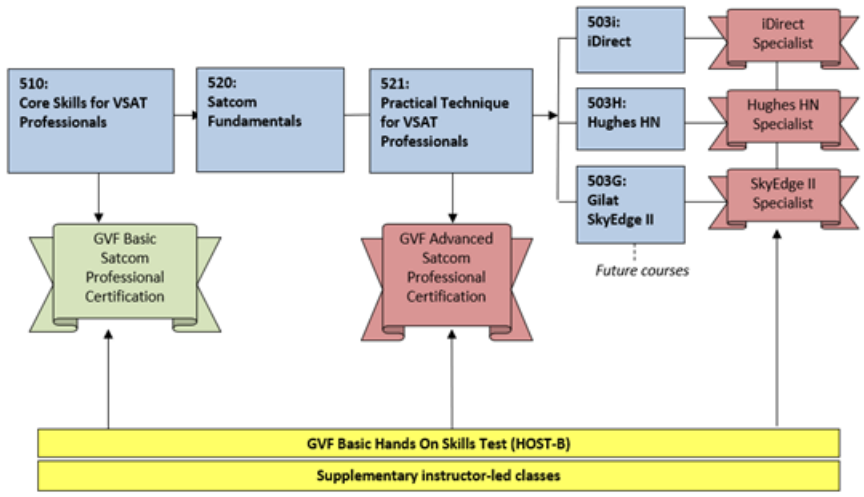
Alternatively, new courses can be restricted to a defined student group, although students in any group can also access standard GVF open courses.

Excerpt of the GVF course catalog as shown on the web site. Shows if the course is included in Annual Subscription plan, and its tuition fee if ordered a la carte. Full details including outlines are presented when the user clicks on the course name.

CUSTOM CERTIFICATION AND LEARNING PATHS

Our LMS can be programmed to award a certification when specific combinations of courses are completed. We use this feature to manage the standard GVF certifications, such as the Advanced Satcom Professional, which requires three separate online courses and a hands-on skills test (which the LMS tracks as an instructor-led class).

New certifications can be readily created from any combination of both standard and custom courses. For example, if we create a specialty course on a specific satellite modem, we can define a new certification comprised of that course plus specified general fundamentals courses.



Paths for the GVF Satcom Professional certification series. Other certifications have different paths.

INSTRUCTIONAL DESIGN

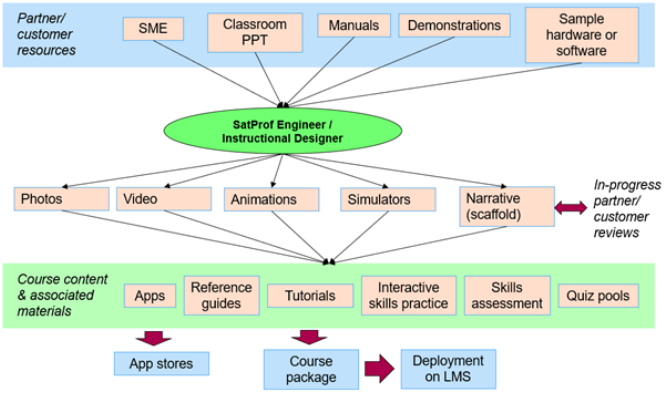
Good online training is all about storytelling. When developing a course, SatProf will start with the source information (manuals, classroom presentations, procedures, etc.) and meet with the subject matter expert to gather a comprehensive engineering understanding of the topic. Often, we propose a series of courses to more flexibly suit a variety of learner profiles, and an overall training program plan.

For each course, we analyze all the source material, and extract a set of cognitive units, and sequence them to tell the student a linear story, always taking care to avoid presenting information before explaining topics it depends on. Along the way, we provide interactivity that is relevant and technically faithful to the real behavior of the equipment or system being taught.

THE DEVELOPMENT PROCESS

Development of a potential custom course covering a specific product, technology, or service will normally begin with a Non-Disclosure Agreement, followed by transfer of relevant source documents and extensive discussions with the partner organization's subject matter experts. SatProf then proposes a course structure and tuition pricing scheme. Once an agreement with the partner organization is signed, SatProf builds an online "narrative" document containing the raw text and graphics in the course sequence and makes it available for review and comment by the partner.

After the narrative is finalized, SatProf then builds the actual course pages, writes any integral simulators, and loads the new course onto the LMS. After review and comment by the partner organization and any required updates, the course is made available to the public through the GVF catalog and/or through restricted access.



The process for developing custom courses.

SOFTWARE LIBRARY

SatProf has been building online technical courses in satellite communications since our inception. We now offer 32 full-length courses with 16 available certification exams. Our library now includes over 11,000 tutorials, supported by almost 500,000 lines of simulator and utility code in over 350 multi-function object classes, and hundreds of reusable graphics symbols. This library allows us to quickly assemble engaging and interactive tutorials and simulators in almost every topic related to satellite communications.

SERVER-SIDE CAPABILITIES

SatProf operates its own server sites running custom PHP and SQL to act as "glue" between the Learning Management System (LMS), the GVF web site, and the student. Examples include:

- Authorization of apps based on enrollment in companion learning courses in the LMS.
- Listing of certification holders on the GVF web site using automatic extraction of student status from the LMS.
- Test timers and detailed status logging that supplement the LMS's native capabilities.

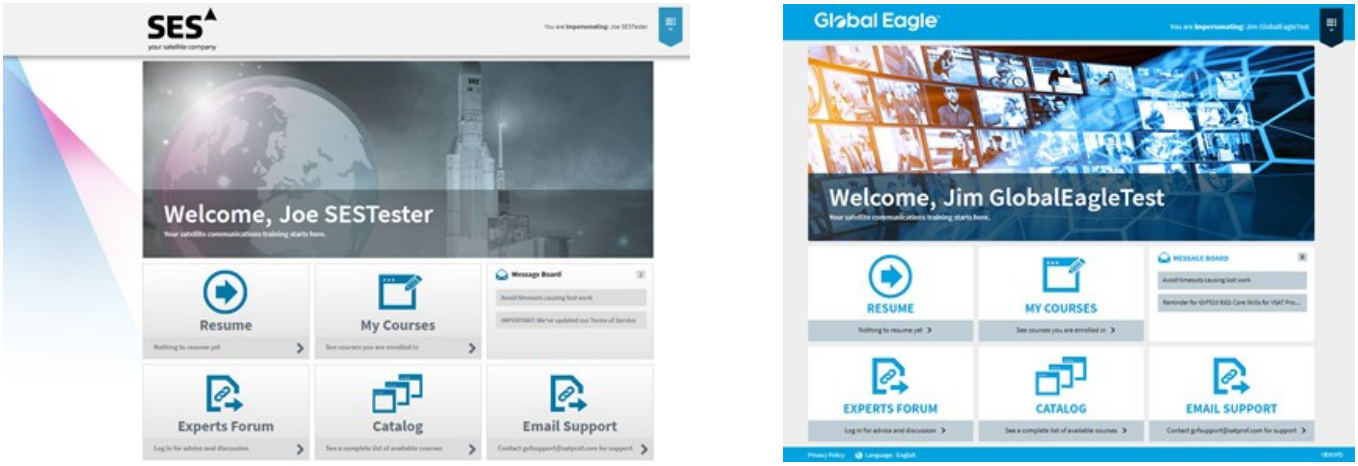
LMS INTEGRATION

Many partner organizations operate their own LMSs for general and internal training delivery. Using server-side custom coding, SatProf can implement integrations such as:

- Single Sign On (student logs in once to access their own system and the SatProf LMS).
- Automated registration, enrollment, and account creation via tailored file transfers.
- Automated status reporting via file transfer in the format needed by the partner's LMS.

BRANDING

SatProf can customize the appearance of the pre-login environment as well as the screens seen by the student after login. In this way the learning experience can be branded according to the student's enrollment group, and thus project our partner organization's identity while retaining all the resources and account details of the full LMS.



Post-login screens for two different organizations, as seen by the student.

PRICING

In general, SatProf does not charge course development fees; instead, we recover our development costs from tuition and subscription fees. During preliminary discussions, SatProf and our partner will estimate the expected uptake for the new course(s), determine a reasonable per-student tuition fee, and decide if the course should be included in the subscription plan. If student enrollments will come primarily or exclusively through the partner organization, SatProf may request that the partner underwrite a minimum number of training seats. Once SatProf and the partner organization agree that the course will be financially viable, an agreement is signed and development work begins.

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