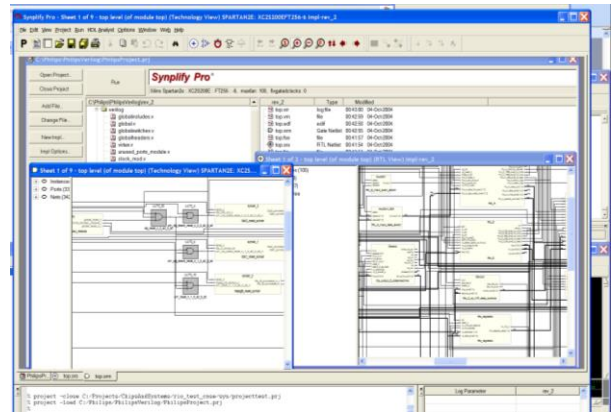


# Tentmaker Systems Consulting

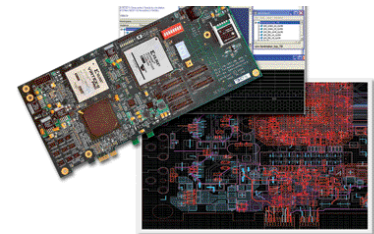
**Who we are:** A Silicon Valley Team of Experienced Engineers, each with over 35 years of successful experience. In addition to our local engineers, Tentmaker has Software/Firmware and Hardware Teams in India to allow you to leverage the same savings enjoyed by companies with an offshore presence - without all that hassle. References include Xilinx and NXP.

## What we do:

- On or off-site Engineer Contractor placement
- ASIC & FPGA & System Architecture
- ASIC Physical Design
- FPGA Design & Debug
- Board Design, Layout, Fab, Parts Procurement, Assembly & Bring-up with 1-2 day board turns
- ASIC Verification in FPGAs (also includes Board Architecture, Design & Debug)
- ASIC Verification
- Software Design
- Embedded Systems and Firmware Design, BSPs packages
- Driver Coding
- Network Management Software
- System Specification, Architecture & Design
- Contract FAE support
- Last minute Board Debug Assistance
- Evaluation Board/Design Kit: Design, Sales & Support
- Fixed bid contract option



Connect to us on LinkedIn  
Search for our Chief Technologist  
"Neil Mammen" and mention this brochure.



**35 years of Experience in the Valley working with Startup Companies, Venture Capitalists, Large Corporations and everything in between.**

**Tentmaker has especially extensive experience with Packet Processing, Networking. Video and PCIeexpress**



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## FPGA Development



The Tentmaker Systems FPGA development team, most with over 35 years of FPGA and PLD and RTL experience will deliver fully validated ready to deploy FPGA solutions based on *your* set of requirements. If you are too busy, give us a Marketing Requirements Document and we will write the Product Spec for your approval then Architect and Design it for you and provide all needed documentation. Our expertise ranges from design of companion FPGAs with a few hundred thousand gates to SoC (System on Chip) designs with multi-million gate FPGAs. We can work on site with your engineers or off site.

### Solutions

- Intellectual Property (IP) development: Custom design solutions
- System-on-Chip designs and implementation of standards
- Proof-of-concept: ASIC verification in FPGA
- Conversion of ASIC to FPGA
- Performance accelerators
- Companion FPGAs for ASSP components
- Processor interface designs: Bus translators and converters
- Control and monitoring sub-systems

### Expertise

- Architecture design
- HDL coding
- Test bench with test scripts
- Functional verification
- Timing Verification
- Device fitting: Pin out and place & route
- Design and Validation on hardware platforms

### The Tentmaker Systems Advantage

- Alliances and Long Term relationships with major vendors and Distributors
- Experience in low, medium and high complexity designs
- Expertise in hardware & software work partitioning for optimum performance and cost
- Expertise in building test benches and test automation scripts for FPGA verification
- In house board and software development teams for building validation boards and test software

Well established and proven design methodologies & review processes  
Domain expertise in datacom, telecom, industrial and consumer electronics  
Long term support contract for product maintenance and enhancements



## Product Development

Tentmaker Systems is uniquely placed to offer services in products/ total solutions development - from requirements capture to architecture, design, prototyping, design validation and support during deployment.

Since our team consists of experts in board design, FPGA design, embedded software, application software, mechanical design and product styling, Tentmaker Systems is uniquely placed to offer services in products/ total solutions development - from requirements capture to architecture, design, prototyping, design validation and support during deployment. Design experience and domain knowledge garnered over the years in the valley, help our product design teams deliver quality, cost effective solutions in the shortest time frame. This expertise coupled with our long-term relationships with manufacturing houses for prototyping and volume production and accredited laboratories for agency and compliance certification help us offer end to end design services under one roof that benefit our customers immensely. The design service is backed with excellent support during deployment and product sustenance through enhancements and feature additions.

## Solutions

- ✦ Telecom: Switches and routers Devices. Experience ranges from IP design to FPGA and ASIC implementation.
- ✦ Broadband: Media gateways & ADSL solutions
- ✦ Storage: Storage over WAN solutions, RAID and Fibre Channel adapter cards, SATA, IDE
- ✦ Aerospace/Industrial: SBCs & Host controllers
- ✦ Consumer: Video & Audio playback systems, USB, PCIexpress, HDMI, DisplayPort

## Expertise

- ✦ Market study: Research products features requirement and competition offering
- ✦ End-to-end design services: Requirements capture, architecture, design, prototyping, validation and support during deployment
- ✦ Proof-of-concept: Technical feasibility study & rapid prototyping using simulation platforms or development boards
- ✦ Sub-systems design: Boards, FPGAs and software components
- ✦ System simulation and verification: Performance measurements in simulation environments & design fine tuning
- ✦ Prototyping and design validation
- ✦ Compliance and agency certification
- ✦ Production diagnostics
- ✦ Management and configuration software
- ✦ Mechanical & thermal design
- ✦ Support during deployment

- Product sustenance: Continued support for changes & enhancements throughout the life cycle of the product.

### The Tentmaker Systems Advantage

- Experience in high complexity systems design
- In-house teams for system architecture, board, FPGA, firmware, mechanical and applications software development
- Development tools & experts for electrical & mechanical CAD
- Specialized team for handling components & materials procurement
- Experience in working with accredited labs for environmental (EMC/ESD, vibration, drop, safety etc.) compliance certification testing
- Pilot production for alpha and beta testing and early customer deployments
- Experience in working with major manufacturing houses to meet DFM/DFT requirements & transfer of design to production
- Long term support contract for product maintenance and enhancements
- Domain expertise in telecom, broadband, aerospace/industrial and consumer electronics
- Well-established and proven design & review processes

### Capability Matrix

Features	Expertise
System design	Expertise in telecom, broadband, storage, aerospace/industrial and consumer products design
Board design	OrCAD, Mentor, Size: 5 to 300 sq in Layers: 2 to 28 layers Hi Frequency.
FPGA design	Device family: Altera & Xilinx Frequency: 312 MHz.
Software design	BSPs & boot loaders for processors OS: VxWorks, Linux, NetBSD & WinCE Device drivers for Linux, VxWorks and Windows x.x Protocol stacks (TCP/IP, ATM, Fibre Channel) porting Diagnostics: Prototype testing & production Applications: Management and configuration software
Mechanical design	Board layout, Allegro, PADs etc. Enclosure design: Sheet metal & plastic Tools design Thermal analysis Shipping cartons & packages



Testing	Prototype testing: Functional & timing Design validation Agency certification Support during Alpha and beta testing and deployment
Support	Support teams during deployment Product sustenance: Re-design to counter components EoL & enhancements

## Board Design & Development



Tentmaker Systems team has a successfully delivered high-speed, high-density multi-layer boards and systems. This coupled with a proven design practice helps us deliver complex boards on time.

Tentmaker Systems offers complete board design capability - from requirements to design, layout, prototyping, testing and transfer to production. Our team has real world competitive experience designing high-speed, high-density multi-layer boards and systems. This coupled with our time vetted design processes & methodologies help us meet the challenge of delivering complex boards on time to meet your reduced time-to-market requirements.

### Solutions

- ❖ SBCs & Motherboard design
- ❖ Host controllers & line cards for chassis-based systems
- ❖ Microcontroller based boards and Industrial controllers
- ❖ Peripheral adapters: PCI, PCMCIA and Compact FLASH
- ❖ Silicon validation and reference boards

### Expertise

- ❖ Architecture design
- ❖ Schematics capture
- ❖ Board layout
- ❖ DFM/DFT
- ❖ Signal integrity & Cross talk analysis
- ❖ EMI/EMC analysis
- ❖ Thermal analysis
- ❖ Prototyping
- ❖ Bring-up testing & Design validation
- ❖ Pilot production (low volume)
- ❖ Transfer to production

### The Tentmaker Systems Advantage

- ❖ Experience in medium to high complexity systems design
- ❖ Domain expertise in datacom, telecom, aerospace/industrial and consumer electronics
- ❖ Well established and proven design & review processes
- ❖ Experience in working with major manufacturing houses to meet DFM/DFT requirements
- ❖ Experience in working with accredited labs for environmental (EMC/ESD, vibration,

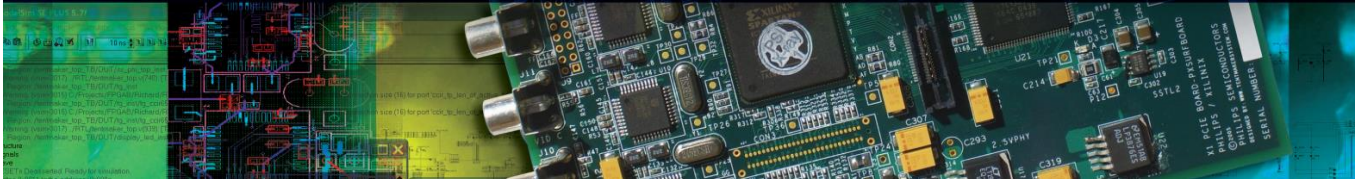
- drop, safety etc.) compliance certification testing
- » Experience in cost reduction and reengineering
- » In-house electrical CAD team & tools
- » In-house mechanical design & product styling team
- » Specialized team for handling components & materials procurement
- » Pilot production for alpha and beta testing and early customer deployments
- » Complete design package for design transfer to volume production
- » Complementary design services: FPGA, firmware, products development, Management and configuration application software.
- » Long term support contract for product maintenance and enhancements

**Capability Matrix**

Features	Expertise
Board Size	20 inches x 16 inches
Layers	28 layers: 16 routing and 12 power planes
Components	8,000 + 32 BGA devices



## Pre & Post Silicon Activities



Tentmaker Systems offers specialized semiconductor design services aimed at supporting design, verification, bring-up and validation of silicon devices to get first-time-right designs in the shortest time frame possible with the lowest cost.

### Solutions

#### Silicon Verification

- Pre-silicon RTL verification
- Behavioral models/components for verification
- Test bench and test scripts generation
- Proof-of-concept & performance tuning on FPGA platforms

#### Diagnostics and bring-up Software

- Bring-up software development on FPGA or emulator platforms
- Bootstrap code
- Device drivers
- Diagnostic test cases
- Download and flashing solutions
- Test automation by scripting
- Silicon failure (RMR analysis) identification by using Linux test suites
- Linux Test Project (LTP) based automation testing
- Operating system porting

#### Bring-up boards and reference designs

- Bring-up boards for silicon wake-up & validation
- Test vector FPGAs for stress testing and measurements
- Companion FPGAs for feature augmentation & standard/custom interfacing
- Reference designs packages: Schematics, layout, BoM, design recommendations & bring-up software
- Compliance testing and agency certification trials
- Thermal & SI analysis and recommendations
- Evaluation boards for software development
- Design services to Tier 1/Tier 2 customers for customization of solutions

## Expertise

RTL: Performance tuning, verification & validation  
Behavioral models: Verilog and C  
Board design: Silicon bring-up and reference boards  
FPGA design: For verification, test vector generation & performance enhancements  
Firmware: Bring-up software, diagnostics, performance measurement and OS porting

## The Tentmaker Systems Advantage

Experience in participating in Silicon verification, bring-up and validation  
Complimentary skills: Design teams for board, FPGA & firmware development  
Full-fledged laboratories with logic analyzers, storage scopes and traffic generators for testing and validation  
Experience in working with accredited labs for environmental (EMC/ESD, vibration, drop, safety etc.) compliance certification testing  
Long term support contract for product maintenance and enhancements  
Domain expertise in telecom, broadband, mobile phone technology, aerospace/industrial and consumer electronics  
Well-established and proven design & review processes  
Long term support contract for product maintenance and enhancements

## Capability Matrix

Tentmaker Systems has expertise in developing drivers and diagnostics that are used in the pre-silicon and post-silicon testing of multimedia/smart phone processors. Pre-silicon testing is done on VIRTIO and ZEBU platforms and later post-silicon testing is done on the silicon plugged in the evaluation platform. Tentmaker Systems team interacts and co-ordinates with the silicon designers and evaluation platform designers at different stages.

Features	Expertise
System design	Expertise in developing silicon bring-up solutions for switches, edge devices, mobile phones, Network Processors and bus interface devices
Board design	Expertise in developing bring-up boards & reference designs Size: 5 to 300 sq in Layers: 2 to 28 layers
FPGA design	Expertise in designing companion and test vector FPGAs Device family: Altera & Xilinx

Device drivers/ Diagnostics	Memory: SDR/DDR, NAND, NOR (Intel Strata and Sibley) UART, USB (Full speed and High speed), IRDA, Bluetooth MMC/SD storage interface SIM card interface, LCD, Camera, I2C, I2S GSM, GPRS, EDGE, 3G WCDMA, WLAN Keypad, Touchscreen, Mouse, Keypad Ethernet, Battery charger programming/monitoring FM radio interface, Audio. Vibrator & TV out, HDMI, DisplayPort
Simulation platforms	VIRTIO (Software model for complete embedded platform), ZEBU (FPGA based hardware emulation platform)
Host software	MFC based application for download, diagnostics and image formatting OpenSSL based image signing solutions and security utilities Custom debuggers
Verification Tools	VERA, E, SystemC, SystemVerilog



## Network Management Software Development

Tentmaker Systems has expertise in building real world network management solutions. Our NMS teams have industry vetted experience in developing network management software ranging from SNMP agents for devices to Element Manager Systems (EMS) on the host side & solution integration with industry standard NMS platforms like HP OpenView and AdventNet.

### Solutions

- SNMP agents for telecom, datacom, storage and broadband equipment
- Management Information Base (MIB) implementations
- Element Manager/Device Manager Applications
- EMS integration with NMS Platforms

### Expertise

- Embedded design: SNMP (V1, V2 & V3) Agents, Proxy Agents and SNMP AgentX
- Application: EMS/DM development using standard and custom tool kits - architecture, implementation and testing

### The Tentmaker Systems Advantage

- Experience in low, medium and high complexity designs
- Complementary design services on offer: Application, system and embedded software design teams
- Well established and proven design methodologies & review processes
- Domain expertise in datacom, telecom, aerospace/industrial and consumer electronics
- Long term support contract for product maintenance and enhancements

### Capability Matrix

Features	Expertise
SNMP	SNMP v1, v2 & v3, SNMP Proxy Agent & SNMP AgentX
Operating System	Agents: VxWorks & Linux EMS: Windows x.x, Linux & Solaris
MIB	Standard, Interface and protocol MIB implementations
Platforms	HP Open View, AdventNet
Tools	AdventNet Web NMS tool kit & HP NNM tool kit Proprietary solutions based on Tcl/Tk, Java for multi-platform & MFC/ASP/.NET for Windows platforms

## Embedded Software



Our software development capability ranges from small assembly routines for micro-controllers to complete firmware solutions for large telecommunication systems. Our software development teams have a vast experience in architecting, designing and implementing firmware solutions that meet the optimization and performance requirements for embedded systems.

### Solutions

- Board support packages (BSPs)
- Device drivers
- Operating systems porting
- Protocol stacks porting
- Applications development
- Prototype and production diagnostics
- Micro-code development for network Processors

### Expertise

- Architecture design
- Design optimization for performance
- Coding
- Testing: On emulators & actual hardware platforms
- Product sustenance: Enhancements, bug fixes and support

### The Tentmaker Systems Advantage

- Experience in medium to high complexity systems design
- Complementary design services on offer: Board, FPGA and embedded software design teams
- Well established and proven design methodologies & review processes
- Domain expertise in datacom, telecom, aerospace/industrial and consumer electronics
- Long term support contract for product maintenance and enhancements

### Capability Matrix

Features	Expertise
Board support packages (BSPs)	Processors: PowerPC IBM405, MPC860, MPC8240, MPC8260, ARM, Pentium. Mseries
Operating systems	Embedded Linux, VxWorks, WinCE, NetBSD and

proprietary kernels

Device drivers	Communication: Ethernet, USB (host and client) SCSI, HDLC, T1/E1, PCI target & host bridge, I2C, IrDA, Switch fabric & Network Processors Storage: Fibre Channel, RAID, IDE, SATA, Compact Flash, EEPROM, NAND & Flash, SD card, MMC & HDQ Display systems: LCD, LED & Graphics Controller (VGA) I/O Devices: CD-ROM, DAC, GPIO, Joystick, Keyboard (USB/PS2), Keypad, Mouse (USB/PS2), Touch Screen Multimedia: MPEG2, JPEG Others: DMA, Interrupt controller, Serial port, UART, Timer, GPS driver, Power Management, DSP link, ATM card
Protocol stacks	Data Link Layer: ARP, PPP Network Layer: ICMP, IP v4&v6, RIP2 & IPv6, RIPng for IP v6 & VRRP Routing Layer: STP, BGP-4, EGP, OSPF & HSRP Session Layer: DNS Application Layer: BOOTP, DHCP, TFTP, POP3, SMTP, SNMP, Telnet, HTTP, FTP, NAT, NFS Network Management Agent: SNMP V1, V2, V3, AgentX, Proxy Agent ATM Stack: Q93.B, Q.SAAL, ILMI, P-NNI, LEC, LES/LECS/BUS Fibre Channel: FC-PI, FC-FS, FC-SW, FC-AL, FCIP, iFCP
Diagnostics	POST, Prototype debugging & production diagnostics
Language	Assembly, Micro-code, C, C++, HTML & XML, Java



## Software Development



Tentmaker Systems application software development team is capable of delivering solutions in a wide variety of domains based on the experience gathered over the years. Our application software team has rich experience in developing products for process automation, network management and configuration, device configuration and management, e-Learning and distributed processing.

## Solutions

- Process automation
- Network management and configuration
- Device management and configuration
- e-Learning
- Distributed computing

## Expertise

- Platforms development
- Applications development
- Graphics and user interface design
- Design optimization
- Product sustenance: Enhancements, bug fixes and support

## The Tentmaker Systems Advantage

- Experience in medium to high complexity systems design
- Complementary design services on offer: Board, FPGA and embedded software design teams
- Well established and proven design methodologies & review processes
- Domain expertise in datacom, telecom, aerospace/industrial and consumer electronics
- Long term support contract for product maintenance and enhancements

## Capability Matrix

Features	Expertise
Operating systems	Windows Linux: Red Hat/Enterprise/Fedora

Technology	Microsoft: .Net, ASP, MFC Sun: Java, JSP, Java-RMI Database: ODBC, JDBC, Native Interface, LDAP GUI: GTK+, SWING, X-Windows W3C XML protocol: SOAP Distributed Application: CORBA
Open Source Library	ACE, TAO, xerces, xalan, libxslt, Curl
Open Source Application	Apache, Tomcat & VNC Server
Database	MySQL, Oracle, MS-SQL, Postgresql
Install package	Installshield & WebStart
Tools	VSS, CVS, METLAB, Simulink, GNU tools (make, gcc, gdb etc.)
Language	C, C++, C#, Java, HTML, XML, Tcl/Tk, PHP, Perl Script, Python, Shell Script, Expect



## Mechanical Design

End to end service offering in mechanical design capability ranging from concept to design, rapid prototyping, validation and fabrication drawings.

Tentmaker Systems offers complete mechanical design capability from conceptual drawings to design, rapid prototyping, validation and fabrication drawings through our India Team. Tentmaker Systems mechanical team also offers services in components and tools design for volume production. This expertise coupled with our collaboration with manufacturing houses for prototyping and volume production enable us to offer complete mechanical solutions.

### Solutions

- ❖ Product styling & conceptual drawings
- ❖ Enclosure design: Plastic & sheet metal
- ❖ PCB layout drawings
- ❖ Shipping carton/packaging designs
- ❖ Components, tools and die design
- ❖ Prototyping and volume production

### Expertise

- ❖ 3-D modeling
- ❖ Rapid prototyping & validation
- ❖ Design & fabrication drawings
- ❖ PCB layout & thermal design
- ❖ Collaboration with fabrication houses for die casting, compression & injection molding
- ❖ Agency certification trials: CE mark, NEBS, vibration and safety

### The Tentmaker Systems Advantage

- ❖ In-house mechanical CAD team & tools
- ❖ Experience in medium to high complexity designs
- ❖ Domain expertise in datacom, telecom, aerospace/industrial and consumer electronics
- ❖ Complete design package for design transfer to volume production
- ❖ Experience in working with fabrication houses for components, tools, dies and prototypes.
- ❖ Well established and proven design & review processes
- ❖ Specialized team for handling components & materials procurement
- ❖ Complementary design services: Board and products development.
- ❖ Long term support contract for product maintenance and enhancements

## Capability Matrix

Features	Expertise
Enclosure design	Chassis with backplane for telecom, broadband and storage equipment ,19" and 23" rack-mount devices with field replaceable modules and hot-swappable power supplies & fan trays
Table-top devices	Plastic molded devices with EMI/EMC coating Aluminum die cast devices with conduction cooling solutions
Tools	Injection and compression molding, aluminum die casting
Design tools	AutoCAD, Pro-E & Solid Works