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# Prosody X – telephony cards for voice, fax signalling and messaging

For IP and converged telephony solutions, Aculab's Prosody X product range provides feature rich, hardware-based media processing, call control signalling and PSTN connectivity. The portfolio has been specifically designed to enhance a range of communications platforms and solutions.



Reliable, deployment proven technology, the family of media processing products offers a comprehensive set of functionality used to create a wide range of enterprise and telco level service applications, including voicemail, interactive voice response (IVR), conferencing, prepaid platforms, voice portals, unified messaging, fax bureaux, VoIP gateways and media servers.

The product range enables delivery of feature-rich solutions that address the demands of the IP communications era. To ensure maximum deployment flexibility and 'fit for purpose' cost-effectiveness, a wide choice of hardware variants with different media processing capacity, optional E1/T1 trunks, operating system support, and a selection of industry standard form factors, is offered. The latest variant is a 1U chassis option – please refer to the supplementary datasheet for full details. The Prosody X family of enabling technology products is ideal for IP and converging VoIP and TDM applications, providing the ultimate ROI for a wide range of solutions.

The product range leverages Aculab's core expertise in combining complex technologies into a powerful and flexible proposition that assures developers a simple, clear migration path. Those looking to develop multimodal voice and data communications solutions will benefit from the 'future-ready' architecture of the product line, which is already capable of handling multimedia call sessions.

## Target applications

- Announcement servers
- Conference servers
- Contact and call centres
- Fax bureaux
- IMS compliant MRF and MGCF/MGW functions
- IP media servers with transcoding capabilities
- IVR servers and voice portals
- Media and signalling gateways
- Online gaming platforms
- Quality monitoring and test equipment
- Session border controllers
- Unified communications platforms

## 'Best in class' with outstanding value

Aculab's Prosody X range offers a complete portfolio of call control signalling and media processing functions, including SIP, H.323, SS7 and MRCP protocol stacks, VoiceXML and CCXML scripting language interpreters, high density TDM/IP gateway, voice recording/playback, DTMF handling, echo cancellation, N-way matrix conferencing, transcoding with a wide choice of voice codecs, Group 3 and T.38 fax, Asterisk channel driver, and many other advanced functions. With the software development kit (SDK) available under a cost free licence, a range of technical support options and competitive pricing – outstanding value for money is guaranteed!



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## Product features

- The widest variety of media processing resources for a complete range of communication solutions including: IVR, call centres, fax broadcast, conferencing and military applications
- Up to 720 media processing channels per board
- Telco grade functionality, including hot swap and automatic failover
- On-board IP architecture
- Distributed architecture – possibility for multi-board systems; boards can be controlled remotely via Ethernet
- Dual redundant 10/100 BASE-T or 1Gb Ethernet ports
- The broadest range of codecs including: G.711; G.723.1; G.726; G.728; G.729 AB; G.729i; iLBC; GSM-FR; AMR-NB; EVRC; SPEEX
- Wideband (HD Voice) codecs include: G.722, ITU-T G.722.1, licensed from Polycom®, AMR-WB (G.722.2)
- SIP, H.323, MRCP, and an extensive selection of SS7, ISDN and CAS protocols
- SIP authentication, SIP over TLS (SIPS), Secure RTP and symmetric signalling
- Unrestricted number of SIP Bridge channels for third party call control
- Optional TDM interfaces – 1, 2, 4 or 8 software selectable E1/T1 trunks

## Product benefits

- Best fit from SME/SMB up to telco grade applications
- Provides 99.999% availability, system reliability and resilience – enabling service continuity
- Allows implementation of N+1 or 1+1 protection schemes with redundancy management
- Widest range of media processing functions – enables creation of highly functional solutions and reduces product variants needed
- Unrivalled benchmarks in density and price – improves margins and reduces board count
- Aculab software is available under a cost free licence – improves margins and ROI1
- Foreseeable longevity – reduces long term OPEX
- Distributable amongst different chassis – cost-effective use of resources
- Ease of use through a single coherent and consistent API – faster time to market
- ‘Future-ready’ architecture for IMS and mobility solutions
- A wide range of codecs enables connection to many endpoint device types
- Applications can be expanded or scaled to suit end-user channel count requirements
- Deployable in a choice of servers – use the platform best suited to the business need
- Reliable, deployment proven technology means systems can be confidently specified for all application purposes
- Outstanding value for money is guaranteed through readily available software, a range of support options and competitive pricing

**Note:**

1. Excludes SIGTRAN M3UA which is licensed separately.



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## Prosody X boards

Prosody X boards are based on a unique IP-centric architecture, which means they are designed for media processing in IP-based networks. This common, product family architecture enables the creation of flexible, resilient and scalable solutions, which can be distributed amongst different chassis.

Prosody X offers the capabilities needed to implement reliable, high availability platforms and solutions with unrivalled benchmarks in density and price. The highly configurable boards provide developers, integrators and telecommunications equipment manufacturers with a durable competitive advantage for fourth generation IP communications, based on the leadership of Aculab's technology.

The boards offer low and medium to very high density IP media processing options, with a range of 'mix and match' software modules to scale a wide range of applications. They are suitable for implementation in communication solutions spanning SME/SMB to large enterprise and telco grade densities.

The variants combine support for rich media processing resources, VoIP telephony and, recognising there is still a need, optional E1/T1 PSTN connectivity. This means a single board type can perform media processing operations in either IP or TDM environments, or simultaneously, such as for gateway applications. All of which helps to future proof solutions as they move to IP.

## Unrivalled density and feature set

Aculab's Prosody X range offers a comprehensive selection of software modules or firmware algorithms that can run independently on the board-based DSPs.

Up to 4 DSPs can be selected to run the algorithms and with each DSP capable of supporting up to 180 channels, a total of 720 channels per board is achievable. On Prosody X boards, whether transported by IP or TDM, all media is handled by the same DSPs, thus giving a truly flexible platform. Because Prosody X can perform all available functions on a single board, stock holding and the maintenance cost of spares is greatly reduced.

### Telephony resources

Assuming the appropriate hardware and software configuration, key media processing resources include IP-to-TDM 'gatewaying', record and playback with a range of compressions, DTMF tone handling, echo cancellation, and data transmission protocols. Each algorithm can be used separately or in combination to develop more sophisticated solutions, making Prosody X the clear choice for advanced speech processing development.

In addition to standard media processing functions the Prosody X family of products also supports a broader set of higher-level technologies, including transcoding between various speech codecs, N-way (both wideband and narrowband) conferencing, Group 3 and T.38 fax processing, call progress analysis, live speaker detection and packet forking.

Being the enabling technology for a wide range of applications, from IMS, through convergence of IP with mobile or cable networks, to mobile messaging, the products are capable of accommodating the comprehensive feature set required for creation of many sophisticated solutions.



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**Signalling protocols**
The product range also offers a broad choice of signalling protocols used for call control in VoIP, PSTN, IMS and mobile networks. Aculab offers a complete implementation of SIP and H.323 and integration with 3rd party speech engines is enabled through the MRCP protocol. In addition, developers are given an option of using 3rd party signalling stacks to facilitate multi-vendor solutions integration.

**Application programming interfaces**
All functionality is accessed via a consistent set of APIs, which are designed to maintain backward compatibility as far as possible in order to protect investments in existing application code. Although very different types of enabling technology, all variants share some essential qualities – API, media processing and call control functionality, as well as the same development team. Consequently, an application developed using Aculab's API can be easily ported to any of the products in the Prosody portfolio.

## Scalability

Scalability is essential for every telecom service application, to support future growth of usage capacity with minimal added costs. Prosody X, supporting IP media and signalling, features linear scalability, therefore, allowing seamless growth from tens to thousands of channels in a solution. In addition, a unique capability of these products allows creating solutions with distributed physical architecture, making the solutions scale cost-effectively beyond a single node.

## IP-based architecture

At the heart of Prosody X is an Ethernet switch, which is complemented by the TDM matrix used by previous generations of Prosody. This change acknowledges and accommodates the relentless shift toward an IP-based communications transport infrastructure and the benefits this can bring. The on-board IP architecture enables Prosody X to be distributed amongst different chassis platforms offering resilience and scalability as well as helping future proof solutions as they move to IP. A dual redundant 10/100 BASE-T or 1Gb Ethernet interface provides the external IP connection, while the host's PCI bus will view Prosody X as if it were a NIC.

## Impressive TDM options

It is widely recorded that the circuit switched network will continue to be a great workhorse for many years to come, with the transition to IP-based transport happening over a period of years. To complement the comprehensive VoIP support, Prosody X provides the option of E1/T1 trunk interfaces, via daughter board modules or point of sale base board options, to ensure traditional TDM connectivity using Aculab's renowned worldwide protocol suite. The use of CAS/SS7 protocols is enabled through PMXC modules or base board options.

Protocols include ISDN, CAS and SS7 – Aculab's SS7 protocol stack coverage provides signalling messages for MTP, ISUP, SCCP and TCAP procedures. Taking advantage of the latest telephony software features, each trunk's configuration may be made individually, allowing for different protocols on different trunks, which may be E1 or T1 set with different terminating impedances. This flexibility is unmatched and includes reconfigurations without the need to restart a system, bringing great value to solution providers. Options from 1 to 8 E1/T1 trunks per board are available, providing up to 248 usable TDM channels.



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## Telco grade functionality

Prosody X meets the particular functionality demands of ISPs and voice carriers by providing the reliability, resilience and scalability necessary for these customers. The basic requirement for the creation of resilient solutions is eliminating single points of failure by introducing redundant functional components. DSP boards provide hot swap and board protection mechanisms, and sophisticated redundancy management is supported to allow the creation of applications with 'five 9s' availability (99.999%), independent of the final solution scale or channel count.

### Distributed architecture

All variants of the Prosody X family allow the flexible allocation of media processing resources, which can be shared between several high level control applications, where one of them could be on the local host and others on remote machines, connected to the enterprise LAN. In case of failure of the main high level application, application control can be switched to a remote standby alternative, providing service continuity by implementation of either N+1 or 1+1 protection schemes. Additionally, Prosody X boards can be distributed between several physical hosts and load balancing software may be implemented to minimise the impact of a failover event. Automatic failover mechanisms are also supported by the Prosody X family, making the solution failure tolerant, from the low level telephony hardware level up to the application part.

Keeping high service continuity as the paramount objective, Prosody X utilises the inherent strengths of the distributed IP architecture to provide, as applicable, effective board, link and application protection mechanisms.

## Prosody X variants

| Prosody family of media processing platforms | | | | | |
|---|---|---|---|---|---|
| **Product line**[1] | **Physical type** | **Media and signalling support** | **Maximum channel count** | **Digital network access** | **Platform or form factor** |
| **Prosody X PCI** | DSP-based boards | IP and TDM | 600 channels | Optional, up to 8 E1/T1 trunks | PCI |
| **Prosody X PCIe** | DSP-based boards | IP and TDM | 300 channels | Optional, up to 4 E1/T1 trunks | PCIe |
| **Prosody X PCIe (revision 3)** | DSP-based boards | IP and TDM | 720 channels | 1,2,4 or 8 E1/T1 trunks | PCIe |
| **Prosody X 1U**[2] | DSP-based 1U chassis | IP and TDM | 1440 channels | Up to 16 E1/T1 trunks[1] | 1U, 19-inch rack-mount chassis |

**Notes:**

1. Due to the architecture, applications can be designed to be portable from one Prosody X platform to another with minimal modification. Systems will clearly need appropriately matching device drivers, but on a per channel basis the API is identical.
2. Refer to supplementary datasheet, APB0319, for full details of the Prosody X 1U chassis.



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## Technical summary

| | | Product variant | |
|---|---|---|---|
| **VoIP and telephony functionality** | | **Prosody X PCI** | **Prosody X PCIe** |
| Audio/voice channel capacity | | Up to 600 per board | Up to 720 per board |
| VoIP protocols | Signalling and control | SIP, SIPS, SDP, H.323[5], MRCP, VoiceXML, CCXML – see website for further details | |
| | Media | RTP, Secure RTP, RTCP, RTCP XR[1]; with variable frame size | |
| Telephony protocols and approvals | | We have a wide range of host independent approvals and global TDM protocol coverage – see website for further details | |
| Voice compression[4] | | G.711 Annex I & II, G.723.1A, G.726, G.728, G.729A, G.729AB, G.729D, G.729E, G.729i, OKI and IMA ADPCM, GSM-FR, GSM-EFR, MS-GSM, AMR-NB, EVRC, iLBC, Speex, TETRA[1], iSAC[1], MELPe[1], G.722, G.722.1, licensed from Polycom®, G.722.2/AMR-WB Additional codecs supported – please contact Aculab for further information | |
| Data modems and interfaces | | V.8, V.17, V.18, V.21, V.23, V.27ter, V.29, V.32, V.34HD, V.110, V.110 RLP or HDLC, V.150.1 (gateway), Bell 103, Bell 202, configurable FSK modem | |
| Jitter buffer | | Adaptive, with configurable upper limit | |
| Lawful intercept support (LI/CALEA) | | Yes, via RTP forking and packet replication | |
| Tone signalling (CAS) | | Via PMXC module | Via CAS/SS7 DSP module; built-in on revision 3 boards |
| SS7 | | Integrated MTP, ISUP, SCCP, TCAP, redundant MTP3, distributed ISUP, flexible ISUP, SS7 monitoring, distributed TCAP, SIGTRAN M3UA Support for high level applications – please contact Aculab for further information | |
| Interoperability with Asterisk™ | | Supported via an open source channel driver | |
| Additional functionality | | User-configurable DSCP (ToS byte); DHCP; Transparent data over RTP (IETF RFC 4040) | |
| **Media processing functionality** | | **Prosody X PCI** | **Prosody X PCIe** |
| IP-to-TDM gateway | | Independent, simultaneous voice, fax and data channels | |
| Conferencing | | N-way matrix conferencing; narrowband and wideband modes; mixing loudest/active speakers; independent volume and gain control for each participant; personalised mix for each participant (e.g., for call centre coaching, network gaming, voice chat, etc.); active speaker detection; active speaker notification via CSRC; DTMF events suppression; HD Voice | |
| Predictive dialling / call progress analysis | | Robust and accurate live speaker detection (e.g., differentiating between a human response and that from an answering machine); simultaneous signal categorisations on a per channel basis; DTMF, tone and call progress (ringing, busy/engaged, fax, SIT etc.) detection; speech energy detection; complete cause code functionality | |
| Audio recording and playback | | Recording and playback to local and remote hosts; multiple file formats; fast/slow pitch invariant replay | |
| Audio gain control | | Automatic (AGC) or programmable for each channel | |
| Transcoding | | Any-to-any voice codec[2]; full-duplex channels; rate matching; narrowband/wideband conversion (up/down sampling) | |
| Fax handling | | T.30 and T.38 fax termination at up to V.34 speeds, pass-through, relay and gateway; fax over G.711; automatic fax detection and notification; interoperability with HylaFAX systems using open source plug-in | |
| Echo cancellation | | G.168 compliant with configurable tail of 40, 72, 104, 136, 168, 200ms[2] | |
| DTMF handling | | DTMF detection and generation; inband; pass-through; DTMF relay and user indications (RFC 2833; RFC 4733[1]); DTMF out-of-band (SIP INFO, RFC 2976) | |
| Speech - ASR, TTS SVI | | Integration with 3rd party voice engines via MRCP v1 and v2; Interoperability tested with Loquendo, Lumenvox, Nuance, Telisma and Verbio | |
| Stream connection | | CALEA / lawful intercept support for RTP streams; packet forking, switching and media replication (fan out) | |



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| | | | |
|---|---|---|---|
| Additional functionality | Tone generation; universal tone detection; call progress tone detection; pulse/rotary dial detection; grunt detection; voice activity detection (VAD); comfort noise generation (CNG); packet loss concealment (PLC); silence suppression; live speaker detection; voice morphing/pitch change | | |
| G.711 A-law and μ-law encoding conversion | Via PMX or PMXC module | Via CAS/SS7 DSP module; built-in on revision 3 boards | |
| **Physical and environmental** | **Prosody X PCI** | **Prosody X PCIe** | **Prosody X PCIe (revision 3)** |
| Operating systems supported | Operating system support for Linux and Windows; see http://www.aculab.com/downloads for more details | | |
| Board format | Full size, single slot PCI board | Full size, single slot PCIe board | |
| Bus type | PCI 32 Universal (3V3/5V); 32 bit; 66MHz | PCISIG 1.1; electrical/mechanical x4 | |
| Ethernet interfaces | Dual redundant 10/100 BASE-T via RJ45 connector | Dual redundant 10/100 BASE-T via RJ45 connector | Dual redundant 10/100 BASE-T or single Gigabit Ethernet via RJ45 connector |
| TDM network line interfaces | 0, 1, 2, 4 or 8 E1/T1 trunks via PMX or PMXC modules[3] | 0, 1, 2, 4 E1/T1 trunks on board, CAS/SS7 via DSP module[3] | 1,2,4 or 8 E1/T1 trunks, CAS/SS7 integrated with main board |
| TDM network terminations | E1/T1 (75R, 100R or 120R) – all software selectable | | |
| CT board interconnections | H.100 CT bus | | |
| Base board rich media DSP resources | 1, 2 or 4 DSPs | 1 or 2 DSPs | 1, 2 or 4 DSPs |
| Board control | Host-based via PCI/PCIe bus or remote via Ethernet | | |
| Remote board management | Aculab ACT and remote control toolset | | |
| Power consumption (maximum) | 25W | 14W | 20W |
| Operating environment | Operating temperature: 0 to +50°C; storage temperature: -20 to +70°C; humidity: 10 to 95% RH non-condensing; altitude: 0 to 2500m | | |
| EMC standards | Meets all mandatory international standards | | |
| Safety standards | Meets all international certification schemes e.g., CB, UL, CUL | | |
| RoHS compliance | Fully compliant | | |
| **Other functionality** | **Prosody X PCI** | **Prosody X PCIe** | **Prosody X PCIe (revision 3)** |
| Software licensing | SIGTRAN M3UA is licensed on a per host basis; options range from 100 to 12800 transmit messages per second | | |

**Notes:**

1. Planned release – contact your Account Manager for details.
2. Could affect channel density.
3. Most combinations of DSPs and trunks are available – contact your Account Manager for details. Revision 3 PCIe boards have CAS/SS7 built onto the motherboard, no need for separate modules.
4. Aculab does not grant the right to practice the following standards: G.722.1, licensed from Polycom®, G.722.2 (AMR-WB), G.726, AMR-NB, EVRC, iLBC, GSM-FR, GSM-EFR and MS-GSM. To seek the right to practice the standards please contact the appropriate intellectual property rights (IPR) holders. The iLBC codec available under an open source (3-clause BSD) license as a part of the open source WebRTC project. For IPR related to the G.722.2, AMR-NB and EVRC codecs, please contact the VoiceAge Corporation (licensing@voiceage.com). For IPR related to the G.723.1A and G.729AB codecs, please contact Sipro Lab Telecom (www.sipro.com) or the DSP Group (www.dspg.com). For IPR related to the ITU-T G.722.1 codec, licensed from Polycom®, please contact Polycom (www.polycom.com); if you or your customer is a conference service provider, you must display Polycom's Licensed Trademark in your product.
5. H.323 provided upon request



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## Channel counts summary – Prosody X

| Features | Feature detail | | Max resources per DSP[1] | Max resources per PCI or PCIe board[1] |
|---|---|---|---|---|
| MOH playback | With DTMF detection; G.711, TDM | | 150 | 600 |
| | With DTMF detection; G.711, RTP | | 180 | 720/448[3] |
| Play and record (simultaneous) | Full duplex channels; G.711, TDM | | 150 | 600/544[3] |
| | Full duplex channels; G.711, RTP | | 170 | 680/320[3] |
| Media gateway | VoIP/TDM, DTMF handling (IETF RFC 2833); 40ms echo cancellation | G.711 | 126 | 504 |
| | | G.723.1A | 86 | 344 |
| | | G.726 | 60 | 240 |
| | | G.729AB | 96 | 384 |
| | | GSM-FR | 126 | 504 |
| | | GSM-EFR | 48 | 192 |
| | | EVRC | 32 | 128 |
| | | iLBC | 32 | 128 |
| | | G.722 | 48 | 192/160[3] |
| | | G.722.1 | 48 | 192/160[3] |
| | | G.722.2 (AMR-WB)[4] | 18 | 72/72[3] |
| DTMF detection | Can be used in parallel with play or record | | 150 | 600 |
| Matrix conferencing | G.711; DTMF handling; 40ms echo cancellation | | 128 | 512 |
| Group 3 fax transmit | T.30 | V.27ter; V.29; V.17 | 120 | 480 |
| | | V.34 | 40 | 160 |
| Group 3 fax receive | T.30 | V.27ter | 90 | 360 |
| | | V.29 | 64 | 256 |
| | | V.17 | 35 | 140 |
| | | V.34 | 20 | 80 |
| Fax over IP | T.38 termination | | 100 | 400 |
| Echo cancellation | Figures are for use in parallel with record, playback and DTMF detection e.g., to enable barge-in with ASR; echo tail 40ms | | 128 | 512 |
| Live speaker detection | Identify human or answering machine speech | | 170 | 680 |
| Data communications | V.110, V.110 RLP or HDLC, configurable FSK modem | | 150 | 600 |
| Modem over IP (MoIP) gateway | V.150.1 (V.32)[2] | | 20 | 80 |
| | V.150.1 (V.34)[2] | | 18 | 76 |
| Analogue display services interface (ADSI) | Library using above FSK modem allows support for GR-1273-CORE | | 150 | 600 |

**Note:**

1. These are maximum channel counts provided for illustration; actual channel counts will depend upon the simultaneous combination of functions used
2. These figures are provisional
3. First value is for the revision 3 8-trunk, 4-DSP Prosody X PCIe board connected with Gigabit Ethernet, second value is for other variants connected using Fast Ethernet
4. Varies according to bit rate, figure shown is worst case with bit rate set to 23.85kbit/s

For more information, please contact your Account Manager or view our website

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