CROSS-STANDARDS INTELLIGENCE · AI INFRASTRUCTURE, WIRELESS, TRUST AND MEDIA · EVIDENCE CALENDAR 2026–2029

Twelve standards communities, one evidence ladder

How separate decisions about chips, networks, media and trust become one experience for the people who use them.

Apex Standards Research · San Francisco, Taipei, and Zürich · Research cutoff 6 November 2026 · Public records only

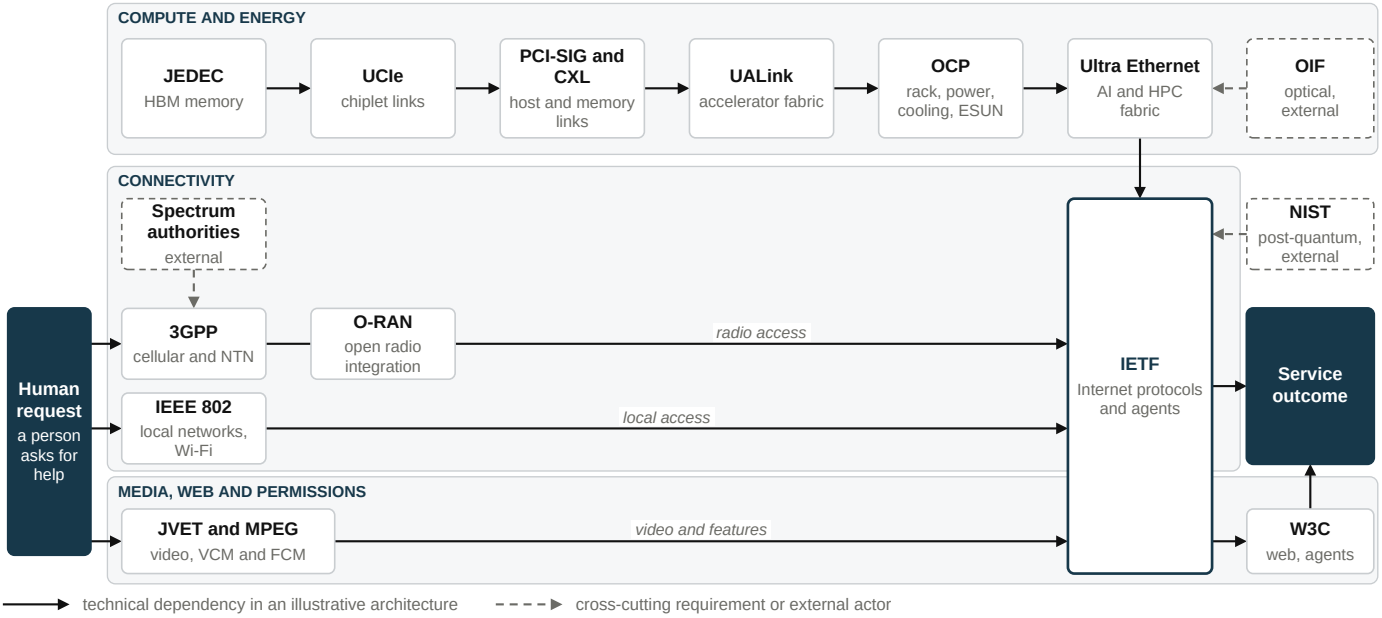
A message reaches a phone in an unfamiliar place. The person receiving it does not need to know which satellite carried the signal, which radio protocol kept it intelligible, or which company made the chips. The message either arrives in time or it does not.

In 1906, an international convention adopted SOS as a distress signal. Six years later, during the Titanic disaster, the common signal still depended on operators recognizing it, listening on compatible channels and acting. Publishing a rule had not completed the work of making it useful [9, 10, 11].

That distance remains visible in a different technology landscape. A memory specification can be published before independent chiplets work together. A radio ballot can pass while thousands of comments await resolution. An AI system can be given an instruction to stop before an interoperable way to carry, obey and audit that instruction is established.

This report follows the twelve standards communities in Figure 1 through public records dated to 6 November 2026. It asks what has been agreed, what has been tested, where technologies depend on one another, and which decisions in 2027–2029 may alter everyday services. The answers begin with one distinction: a rule on paper and a service that people can rely on are different achievements.

Figure 1. Twelve standards communities



The twelve standards communities this report covers, in the order an AI-assisted request meets them. Dashed boxes mark outside actors that the report cites where they touch a covered community. Different organizations cover each area, and no single consolidated standard covers them all.

Scope. Illustrative architecture. The arrows are editorial and are no claim that a request passes through every body or that OCP stands downstream of UALink. JVET and MPEG are separate processes that share some work.

SPECIAL EDITION · TOWARD THE END OF 2026

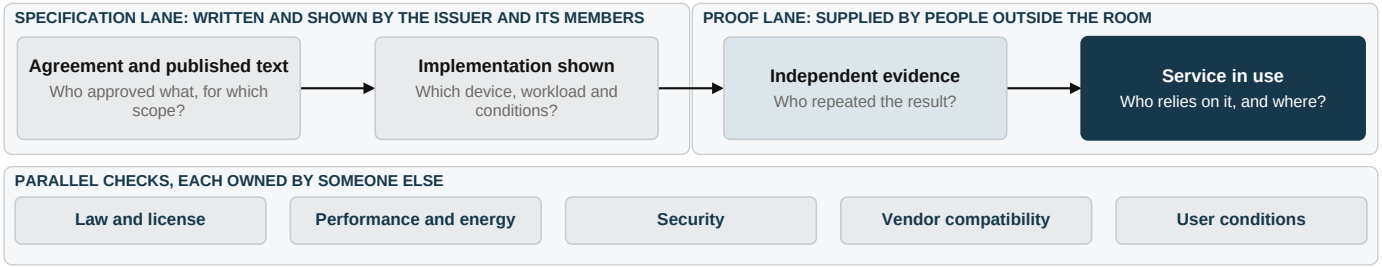
Premium intelligence on every standard we follow

Toward the end of 2026, Apex Standards will publish a Special Edition covering every standard we follow for our clients: decision-grade intelligence for strategic planning. Every finding is supported by a verifiable record, traced to the issuer's own public source, and built to withstand scrutiny. Trust is earned in drops and lost in buckets, and clients plan years ahead with Apex Standards because each line can be checked.

Published → **Shown** → **Relied on**

A body has approved a text and issued it. Someone has run it on named equipment, with the conditions stated. People outside the room use it, and a record shows who and where.

Figure 2. A rule becomes dependable through more than publication



The path from a shared rule to dependable use has different owners, because different issuers control different decisions. A published specification, a demonstration and independent operational evidence answer different questions. The figure is an illustration for readers and is no approval procedure used by standards bodies.

Scope. An editorial reading aid created for this report. The arrows show questions for a reader and carry no automatic promotion from one box to the next.

Table 1. Nine readers, a place to begin and a question to carry

Each row gives a starting point, a place to return to for depth and the decision question the records help with.

Reader	Begin with	Return for depth	Decision question
General reader	Page 1 and Section 1	Section 7 and Section 12	What changes in daily use?
CTO or system architect	Section 2 and Section 4	Section 5 and Section 6	Which layer is our bottleneck?
Semiconductor, memory and packaging teams	Section 4	Section 13, record ledger	Which component interfaces are published, and which have been tested across vendors?
Wireless and telecom delegates	Section 5	Section 9	Which choices are studies, ballots or deployed operations?
Satellite and spectrum policy teams	Section 5	Section 9	Which authorization and technical obligations must align?
Media and AI developers	Section 6 and Section 7	Section 4 and Section 5	Should the task transmit video, features or a result?
Security and agent designers	Section 6	Section 9	Can an instruction be executed and leave an audit record?
CEO, board or investor	Section 2 and Section 8	Section 11	Which milestones affect deployment risk and timing?
Student	Page 1 and Section 1	Section 7 and the glossary in Section 13	How do separate standards connect?

1 A PUBLISHED RULE, A WORKING SERVICE

The Berlin radiotelegraph convention of 1906 made SOS the international distress signal and required wireless stations to give distress calls priority [9]. On 15 April 1912 the Titanic's operators were still sending the older CQD of the Marconi company, and added SOS only later. ITU's own account notes that rivalry between equipment makers led operators at times to ignore each other's signals [10]. In response to the sinking, the London conference of 1912 agreed a common frequency for ships' distress signals and rules for operators to keep watch for them [11]. The signal had been published for six years. The common frequency and the habit of listening, which made it work, arrived afterward.

The distance between a standard published and a standard in use is the subject of this report. Across 2025 and 2026, and most densely between 1 October and 6 November 2026, twelve standards communities chartered, balloted, released, approved or called for proposals, each in its own verb, and each record reached a reader as news. The verb in a record tells us what happened. It does not tell us what will work. A procurement lead, a spectrum lawyer or a codec engineer who reads those verbs as equals can mistake text for practice.

This report reads every record with four questions, drawn in Figure 2. What did the issuer agree, and for which scope? Which implementation was shown, on what workload and under which conditions? Who repeated the result? Who relies on the service, and where? Six stages sit behind the four boxes: a question is open, work on it is agreed, a specification is published, an implementation is shown, a second party repeats the result under stated conditions, and the service runs in daily use. The lens is an editorial reading aid written for this report. No standards body uses it as a procedure, none has approved it, and a record can advance on one question without answering the others.

Three qualifications keep the lens honest. An independent repeat needs named independent parties, their test inputs and conditions, a reproducible method and evidence that others can inspect; two companies that take part in one controlled demonstration have not yet supplied one. In service is a deployment fact for a named generation, and a live 5G standalone network says nothing about 6G. Legal authority, standards status, implementation and adoption are separate questions. Figure 4 groups them into three parallel lanes, and this report scores no record on a single scale, because an indicator that becomes a target stops measuring well (Goodhart's law).

Table 2. Fifteen dated records: what each establishes and what it leaves open

The same five weeks hold a counted ballot, a published specification, a charter, a discussion and a plan, and each record leaves a different test open.

Record	Issued action	What it establishes	What remains open	Source
CR-01 3GPP, 6G radio study	Approved TR 38.914 v1.0.0, the first 6G RAN study, at RAN#112, with a Release 21 timeline for the first 6G specifications dated 10 June 2026	A study basis and a sequence for later work, ahead of any commercial 6G	Working groups in Calgary from 16 November; plenaries in Boston from 7 December; no finalized 6G radio	[42, 30]
CR-02 IETF, agent protocols	Chartered AGENTPROTO and DAWN in October; AUDIT is a BoF	Scope for interoperable agent communication and discovery	IETF 127 sessions on 16, 17 and 19 November; specifications and tests lie ahead	[19]
CR-03 IEEE 802.11bn, Wi-Fi 8	Draft 2.0 passed Working Group Letter Ballot 296, 3 August to 2 September: 417 approve, 128 disapprove, 15 abstain; 76.5 percent of 545 against a 75 percent criterion	One draft advanced through one formal stage	8,016 comments to resolve; D3.0 ballot planned for January 2027; ratification still ahead	[18, 43]
CR-04 OCP, AI racks	Held its Summit on 12 to 15 October; ESUN 1.0 published; NVIDIA contributed Vera Rubin rack designs and AMD announced its Helion blueprint	Open design materials exist, as one specification and separate contributions	Interoperability, power and cooling depend on implementations; AMD partner configurations planned for November	[1, 4]
CR-05 W3C, web agents	Held TPAC breakout sessions on agents and on-device AI, 26 to 30 October	Problems and options under discussion	No chartered group or draft dated on the pages read	[36]
CR-06 O-RAN ALLIANCE, open radio	Released 66 new or updated documents since July; 162 unique titles	The size and activity of the document corpus	A count shows publication activity and says nothing about cross-vendor deployment or field reliability; next meeting 15 to 19 February 2027	[25, 26]
CR-07 JVET, beyond-VVC video	Issued a call for proposals on 28 July; met as JVET 44 in Hangzhou on 17 to 23 October	New compression proposals can be submitted and compared	Evaluation at JVET 45 in January 2027; no codec selected; a new standard is the goal for 2029	[20, 38]
CR-08 MPEG, video and features for machines	MPEG 156 listed common test conditions for Video Coding for Machines and Feature Coding for Machines	Comparable experiments under stated setups	Task accuracy, decoder support and interoperable bitstreams are not shown by a test-condition document	[39, 83]
CR-09 PCI-SIG, PCIe, and CXL Consortium, CXL	Released PCIe 7.0 to members in June 2025; announced CXL 4.0 on 18 November 2025; reported PCIe 8.0 at Draft 0.5 on 6 May 2026	Published link and memory-connectivity bases; PCIe 8.0 is a target	PCIe 8.0 full release on track for 2028; cross-system CXL behavior is still to be measured	[44, 45, 46, 53]
CR-10 JEDEC, HBM4, SPHBM4, photonics	Published HBM4 on 16 April 2025; announced the publication of SPHBM4, as JESD330-4, on 13 July 2026 and announced JESD264 on 1 October 2026	Interface and qualification baselines	Yield, cost and reliability across suppliers are not shown by a release; no dated next gate on the pages read	[55, 47, 2]
CR-11 UCIe, chiplets	Released UCIe 3.0 on 5 August 2025; Intel and Cadence ran a live UCIe-S interoperability demonstration at Chiplet Summit 2026	A defined die-to-die interface and one demonstration	The parties who built it cannot supply an independent repeat; SC26, 15 to 20 November, brings a booth and no ballot	[48, 49, 23]
CR-12 UALink, accelerator fabric	Released four specifications on 7 April 2026, among them Common 2.0 and 200G DL/PL 2.0	A common interconnect with manageability designs	Vendor compatibility and power and latency on real workloads are still to be shown; 93 percent (UALink 1.0) is a design claim	[50, 17]
CR-13 Ultra Ethernet Consortium, AI cluster Ethernet	Released Specification 1.1 on 12 October 2026	Packet and collective mechanisms, with an example of up to 2x	The 2x compares 1 GB sent per endpoint with 2 GB, an example with no measured job behind it; CSIG with IEEE and the next ESUN with OCP are undated	[3]
CR-14 NIST and IETF, post-quantum cryptography (external authority)	NIST made IR 8547 final on 27 October 2026, after FIPS 203, 204 and 205 of 13 August 2024; the IETF published RFC 9954 in July and RFC 10024 in August	Algorithms, a TLS key-exchange practice and a transition plan	Moving deployed systems is a separate task for each system owner	[8, 76, 79, 80]
CR-15 FCC, satellite direct-to-device (external authority)	Approved SpaceX's system for direct-to-device service on 6 October (DA 26-1078) and three AWS-3 licenses for Starlink on 21 October (DA 26-1129)	A decision with legal effect on the parties it names	Authorization is not service: handsets, coverage and commercial operation are separate; the EchoStar transfer to SpaceX is expected to close on or about 30 November 2027	[6, 32, 65]

The IETF wrote a form of the independent repeat into its own procedure. RFC 2026 of October 1996 asked a specification to show at least two independent, interoperable implementations from different code bases, with successful operational experience, before it could reach Draft Standard [15]. RFC 6410 of October 2011 cut the standards track from three maturity levels to two and kept the demand: at least two independent, interoperating implementations, with widespread deployment and successful operational experience, for an Internet Standard [16]. These are the IETF's requirements for its own track, and JEDEC, 3GPP, IEEE and the regulators follow their own procedures. The motto the Royal Society adopted with its First Charter of 1662 carries the same instinct. The Society glosses it as “take nobody's word for it” [14].

Table 1 gives a shorter path to any reader who wants one. The sections that follow keep one order: a human question first, the systems that must cooperate second, and then the organizations, the records they issued and the tests that remain open. Dates run from the past toward the future, and a date later than 6 November 2026 is scheduled or targeted, never a completed outcome. A bracketed number points to the reference list at the end, which gives each record's issuer, title, date and link.

2 THE OCTOBER RECORD: WHAT WAS AGREED, SHOWN AND LEFT OPEN

What happened in the weeks before 6 November 2026 can be told as three jobs that one service has to do. It has to compute an answer: memory, chiplets, links, racks and Ethernet. It has to connect the person: Wi-Fi, cellular radio, open radio networks and satellites. And it has to be trusted to act: protocols, permissions, video for people and for machines, and the cryptography beneath them. The records fall into the same three groups, and Figure 3 sets them on one calendar, in the order they arrived, with the dates ahead to mid-December.

The window opens on 1 October, when JEDEC announced JESD264, which it calls the first industry-wide reliability standard for silicon photonics [2]. On 6 October the FCC approved SpaceX's non-geostationary mobile satellite system for direct-to-device service [6]. On 8 October SpaceX announced an agreement for up to 14 MHz of paired 800 MHz spectrum, subject to final FCC approval, and the Commission published a fact sheet on proposed rules for licensed spectrum used for direct-to-device service [41, 31]. On 12 October the Ultra Ethernet Consortium released Specification 1.1, and the OCP Summit in San Jose, from 12 to 15 October, drew 15,000 attendees, with ESUN 1.0 already published [3, 4, 1]. The codec community met in Hangzhou from 17 to 23 October and the O-RAN ALLIANCE in Hanoi from 19 to 23 October [38, 26]. ITU-T approved Y.3839 on 19 October [35], the FCC approved the transfer of three AWS-3 licenses to Starlink on 21 October [32], W3C held its TPAC breakouts from 26 to 30 October [36] and NIST made IR 8547 final on 27 October [8]. NGMN put its request to vendors on 29 October [27], MediaTek and Ericsson reported a pre-6G field trial with T-Mobile US on 2 November [7] and TRAI released its recommendations on 5 November [34]. The IEEE 802 plenary opens in Bangkok on 8 November [28].

Three patterns show in the calendar. Publications cluster early: the first half of October carries a JEDEC standard and an Ultra Ethernet release, and consortia time releases to a summit. Deliberation clusters late, and ballots, charters and plenaries fill November. The venues, from 12 October to the Boston plenaries of 7 December, spread over ten cities: five in North America, four in Asia and one in Europe [1, 22, 37, 26, 36, 28, 19, 24, 29, 30]. The AI-infrastructure and Internet meetings sit in San Jose and San Francisco, and the codec, Open RAN and Wi-Fi meetings sit in Hangzhou, Hanoi and Bangkok. Hangzhou alone hosted three meetings within eleven days: a focus group on embodied AI, JVET 44 and MPEG 156 [37, 38, 39]. A shared week, a shared city or a shared member company is no evidence that two bodies coordinated. Section 3 marks the handoffs that rest on a documented reference or a stated partnership, and calls every other relationship parallel work.

Table 2 turns the calendar into a ledger. Each row is one dated record about one technology, so a joint team that runs two processes appears twice, and a row that names two bodies, PCI-SIG and the CXL Consortium, says which is which. The first thirteen rows keep the twelve communities in view, and the last two rows add authorities outside the twelve whose records the others depend on. The Source column gives the reference numbers of this report, and Section 13 gives the full ledger with the instrument, the evidence and the check status of every row.

Read for what each row establishes, the ledger gives one answer: among the selected emerging records, none has been independently repeated under published conditions in the materials read. The nearest approach is the live UCIe-S interoperability demonstration by Intel and Cadence at Chiplet Summit 2026 [49], and a demonstration by the parties that built it becomes an independent repeat only when a third party reproduces the result. Live services belong to older work: 95 operators had launched 5G standalone service by 20 April [51], and that fact is about 5G and says nothing about 6G. Four communities, W3C, JEDEC, UALink and Ultra Ethernet, give no dated next gate on the pages read. For them the calendar of Section 9 rests on process, and the distance between a published text and an independent test is where the work of the next two years sits.

No single score would fit these rows, and Figure 4 shows why. A record can advance in three separate ways: through agreement among the people who write the rule, through proof that devices and networks do what it says, and through the licenses, handsets and operators that make a service available. A passed ballot is progress in the first lane and says nothing about the second or the third. Consensus is not unanimity: a ballot may pass while objections remain, and the calendar beside it still has to say who tested which implementation.

Across the fifteen records, six patterns recur and seven decisions pull in two directions, and Table 3 and Table 4 set them out. Three mechanisms matter most. A specification arrives before a service: the SOS rule, the UALink and Ultra Ethernet texts, the 3GPP 6G study and the W3C breakouts all precede a field result. An advance moves the bottleneck, so a faster interface makes the next transfer the new delay. And consensus and technical evidence are different things: a ballot with 8,016 comments and a demonstration by its authors each settle one question and leave the other open. The records yield no ranking of organizations. The repeated question is which promise another organization, operator or device maker has to keep.

A regulator's binding order, a working-group discussion, a company's design release and a forecast deserve different labels, and the tensions in Table 4 are tensions of engineering and of institutional choice. The table attributes no unrecorded vote to any participant. Trade-offs need explicit assumptions, and where a side is argued by a named body, the source is given.

3 A REQUEST TRAVELS THROUGH MANY SYSTEMS

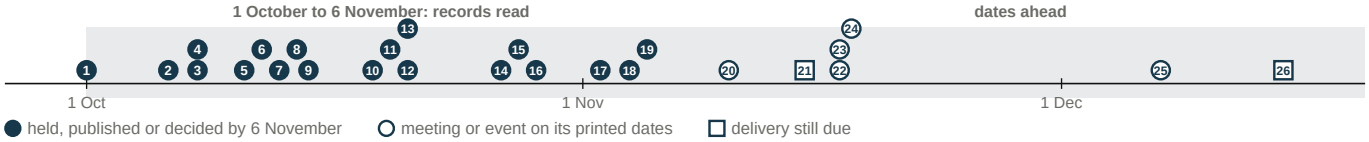
Take one illustrative scenario and follow it. A traveler in an unfamiliar town points a pair of smart glasses at a street sign and asks for help, and the answer has to come back in a few seconds. The scenario is a device for reading the records, and it is no claim about any product: no vendor is known to combine every technology below, and nothing here says that a given service worked this way.

The request leaves the glasses as a short result or as video, over a Wi-Fi link or a cellular radio, or through a satellite where towers do not reach. An operator carries it to a data center, where a model running on accelerators with stacked memory produces the answer, and a software agent may act on it with the traveler's permission. Each step is governed by different people in different rooms. Figure 1, on page 1, names the twelve communities beside the step each one touches, and keeps three outside actors, NIST, the spectrum authorities and the OIF, apart from the twelve.

Read the system as a whole. The questions the scenario raises are the questions of the sections that follow: where memory and accelerator chips wait for one another and who bears the energy cost (Section 4); what capacity and reliability a radio link needs when a device uploads video, a far heavier load than a short result, and what happens when towers disappear (Section 5); who defines what an assistant may do, how it is stopped and how its action is audited (Section 6); and what good compression means when the camera data goes to an algorithm (Section 7).

Table 5 lists eight places where the work of two bodies meets. Conway's law gives the reason to look at these seams: the architecture of a system tends to mirror the communication structure of the

Figure 3. One calendar, 1 October to 20 December 2026: what each record is and where it stands



1. 1 Oct. JEDEC announced JESD264, a reliability standard for silicon photonics. [2]
2. 6 Oct. FCC approved SpaceX's direct-to-device system (order DA 26-1078). [6]
3. 8 Oct. FCC issued a fact sheet on proposed direct-to-device spectrum rules; a final rule is still ahead. [31]
4. 8 Oct. SpaceX announced a spectrum agreement for up to 14 MHz, subject to final FCC approval. [41]
5. 11 Oct. O-RAN ALLIANCE reported 66 new or updated documents released since July. [25]
6. 12 Oct. Ultra Ethernet Consortium released Specification 1.1. [3]
7. 12 to 15 Oct. OCP held its Global Summit in San Jose; ESUN 1.0 was already published. [1, 4]
8. 13 to 16 Oct. ITU-T focus group on embodied AI met in Hangzhou. [37]
9. 15 Oct. JEDEC held its industry forum on AI memory in Seoul. [22]
10. 19 Oct. ITU-T approved Recommendation Y.3839 on quantum key distribution networks. [35]
11. 17 to 23 Oct. JVET 44 met in Hangzhou; MPEG 156 met there from 19 to 23 Oct. [38, 39]
12. 19 to 23 Oct. O-RAN ALLIANCE met in Hanoi. [26]
13. 21 Oct. FCC approved the transfer of three AWS-3 licenses to Starlink (DA 26-1129). [32]
14. 27 Oct. NIST made IR 8547, on the transition to post-quantum cryptography, final. [8]
15. 26 to 30 Oct. W3C held TPAC breakout sessions on agents. [36]
16. 29 Oct. NGMN asked vendors to confirm multi-RAT spectrum sharing on existing hardware. [27]
17. 2 Nov. MediaTek, Ericsson and T-Mobile US reported a pre-6G field trial; rates stated as potential. [7]
18. 4 Nov. Replies closed on Canada's consultation SMSE-010-26 on space spectrum. [33]
19. 5 Nov. TRAI released recommendations on satellite network authorization. [34]
20. 8 to 13 Nov. IEEE 802 plenary in Bangkok. [28]
21. Nov. AMD's Helion partner configurations planned (month only). [1]
22. 14 to 20 Nov. IETF 127 in San Francisco: AGENTPROTO 16 Nov, AUDIT BoF 17 Nov, DAWN 19 Nov. [19]
23. 15 to 20 Nov. SC26 in Chicago, with UCIe at booth 1020. [23, 24]
24. 16 to 20 Nov. 3GPP working groups meet in Calgary. [29, 30]
25. From 7 Dec. 3GPP plenaries (TSG #114) in Boston. [30]
26. Mid-Dec. MPEG's second package of beyond-VVC submissions due (month only). [40]

Each marker sits at the date the issuing body gives its record, and its shape says what kind of record it is: a decision already taken, a meeting or event, a ballot or deadline still due. The key beneath lists every marker with its date, issuer, action and source.

Scope. Records read at 6 November 2026. A range sits at its middle and a month at mid-month; both are conventions of the drawing and imply no day. Numbers follow the markers from left to right. Markers close in time show a shared date and no shared decision.

Figure 4. Progress has more than one dimension

Standards process Consensus and documents	Working-group agreement · letter ballot · approved report · RFC · published specification	**Question** What did the issuer formally decide?
Engineering proof Tests and demonstrations	Demonstration · disclosed test conditions · independent interoperability · field reliability	**Question** Who tested which implementation, under what conditions?
Operating conditions Commercial and regulatory	License · supported devices · operator deployment · maintenance · usable service	**Question** Can people rely on it in the situation being described?

Consensus, proof and operating conditions are independent questions about a named technology and version. A single record may advance one lane without establishing the other two, and no arithmetic average of the three is meaningful.

Scope. Illustrative scope: one named technology version. The lanes are an editorial grouping and no standards body uses them.

organizations that build it. A formal liaison, a normative cross-reference, a joint test or a stated partnership is evidence of coordination, and two products that sit side by side are not. The last column says what to check before the word coordination is used. Where the records read name a partnership, the source is given, and where they do not, the row says so.

4 FROM MEMORY TO THE NEXT DATA CENTER

When the traveler's answer arrives late, the delay can sit in many places: an accelerator waiting for memory, a chiplet waiting for its neighbor, a link between servers waiting for the traffic ahead of it. Each wait has its own standards community and its own calendar, and a bottleneck can move after an upgrade, so the useful reading covers the whole stack. Figure 5 shows six layers, from the memory stack beside the accelerator to the optical line between sites.

Memory moves on its own schedule. JEDEC published HBM4, JESD270-4, on 16 April 2025 with a 2,048-bit interface at rates up to 8 Gb/s, which gives up to 2 TB/s across 32 channels. The release carries statements from NVIDIA, AMD, Cadence, Google, Meta, Micron, Samsung, SK hynix and Synopsys [55]. On 13 July 2026 JEDEC announced the publication of SPHBM4 as JESD330-4, which serializes four signals onto one, so that its interface needs 512 data signals where HBM4 needs 2,048, and which keeps the same DRAM dies on organic substrates [47]. JEDEC announced JESD264 on 1 October, calls it the first industry-wide reliability standard for silicon photonics, and convened a forum on AI memory in Seoul on 15 October [2, 22].

The chiplet layer keeps the strictest schedule. The UCIe Consortium published 1.1 on 8 August 2023, 2.0 on 6 August 2024 and 3.0 on 5 August 2025 [48]. Version 3.0 doubles the 32 GT/s of 2.0 with rates of 48 and 64 GT/s, extends the sideband channel to 100 mm, and adds runtime recalibration together with fast throttle and emergency shutdown mechanisms that give immediate system-wide notifications [54]. At Chiplet Summit 2026 Intel and Cadence ran what the consortium calls the industry's first live UCIe-S interoperability demonstration, on the Cameron Creek test chip [49]. At SC26 in Chicago, which runs from 15 to 20 November, UCIe holds booth 1020 in the Open Standards Pavilion [23, 24].

Table 3. Six patterns that recur across the records

Each pattern ends in a question that a reader can put to the next record.

Pattern	Where the records show it	In human terms	Question it leaves
A specification arrives before a service	The SOS rule of 1906; the UALink and Ultra Ethernet texts; the 3GPP 6G study; the W3C breakouts	Writing a common recipe does not ensure that every kitchen can cook it under pressure	Who ran the independent trial, and under what conditions?
An advance moves the bottleneck	HBM, UCIe, PCIe and CXL, UALink, Ultra Ethernet and optical links	A faster stretch of a journey can make the next transfer point the new delay	Which layer limits the energy per completed AI task?
Consensus and technical evidence are different	The 802.11bn ballot and its 8,016 comments; the UCIe-S demonstration	A meeting can agree which rule to write, and a test shows what devices do with it	Are dissent, issue closure and conformance recorded separately?
Separate calendars must eventually meet	3GPP, WRC-27, FCC and EU satellite dates; the stages of the Wi-Fi ballots	A journey needs the timetable and a station that is ready	Which dependent milestone comes last?
Future use changes what performance means	Ericsson uplink, VCM and FCM, AI agents, post-quantum cryptography	A camera asked to recognize a sign need not send what a video call sends	Is the target a bit rate, a completed task, latency, privacy or energy?
Governance is a path of several steps	The EU AI Act stop capability; W3C semantics; IETF agent and audit work	A stop sign works only if the message reaches the actor and someone can check it was obeyed	Can distinct implementations carry, execute and record the stop?

Table 4. Seven decisions that pull in two directions

In each row both sides are real, and the evidence that would settle the question is a test or a record that does not yet exist.

Decision	One side	The other side	Evidence needed	What it asks of standard-setting
6G capability against reuse of installed hardware	New architectures can expand capability	NGMN asks vendors whether Multi-RAT Spectrum Sharing works on existing hardware and bands [27]	An operator request and vendor compatibility results	Weigh novelty, backward migration and capital cost
Wi-Fi reliability against draft closure	802.11bn objectives aim at better 95th-percentile latency, throughput and loss [43]	Passing at 76.5 percent did not resolve 8,016 comments [18]	Ballot tally, comment resolution and an independent test	The open design choices matter more than a headline that Wi-Fi 8 is approved
More bandwidth against total energy and capital	Faster PCIe, HBM4 and optical capacity may help workloads	System power, cooling, queues, memory supply and interoperability may dominate	A published specification plus a workload-level measurement	Validate end to end on the stated workload
Device inference against edge or cloud inference	A local result can avoid sustained raw-video upload and depend less on coverage	Some tasks need server-class models, and moving computation changes uplink, power, privacy and owner	An application test: accuracy, bytes sent, 95th-percentile latency, watts, failure mode	Examine MPEG VCM and FCM, 3GPP traffic and edge integration together
Terrestrial efficiency against satellite reach	Non-terrestrial networks extend coverage where towers are uneconomic	Spectrum-sharing conditions, handset links and interference management constrain deployments	A regulator's record plus a field test of the satellite link	Separate authorization from commercial availability
Agent autonomy against accountable human control	Tool-using agents can finish multi-step work	Permissions, safe stop, audit trails and key management remain distinct	A W3C or IETF draft, an independent exercise and a governance requirement	Define interoperability around authority and verification as well as the ability to call tools
Human-viewed video against machine-consumed features	Perceptual compression optimizes reconstruction for viewing	Machine tasks may value other signals and intermediate tensors	A JVET call, MPEG common test conditions and workload measurements	Future codecs may need several objectives and comparable test suites

A demonstration is not deployment. The UCIe-S demonstration was run by the two companies that took part in it, so it shows that an interface can work in one controlled setup. An independent repeat would be a third party reproducing the result under stated conditions, and none of the records read supplies one.

The host interface sets the rhythm of the stack. PCIe 6.0 reached 64 GT/s per lane in January 2022 and PCIe 7.0 reached 128 GT/s in June 2025, forty-one months later [52, 44]. PCI-SIG's blog of 6 May 2026 reports PCIe 8.0 at Draft 0.5, with an objective of 256.0 GT/s per lane and up to 1.0 TB/s in both directions on an x16 link, and places the full release on track for 2028 [46]. Figure 6 shows the three steps.

CXL borrows the wire. CXL 3.0 rests on PCIe 6.0, and CXL 4.0 rests on the PCIe 7.0 physical layer at 128 GT/s [53]. The consortium announced 4.0 on 18 November 2025, five months after PCIe 7.0 [45]. A buyer who plans memory pooling over CXL therefore inherits PCI-SIG's calendar.

Scale-up networks came in two releases a year apart, all but a day. UALink 1.0 arrived on 8 April 2025 with 200G per lane and up to 1,024 accelerators per pod, and with a design claim of 93 percent effective peak bandwidth [17]. UALink 2.0 arrived on 7 April 2026 as four specifications, Common 2.0, 200G DL/PL 2.0, Manageability 1.0 and Chiplet 1.0, with computation inside the network and manageability through gNMI, YANG, SAI and Redfish [50]. OCP's workstream for Ethernet scale-up networking, ESUN, had published its specification 1.0 by the time of the October summit [4, 1].

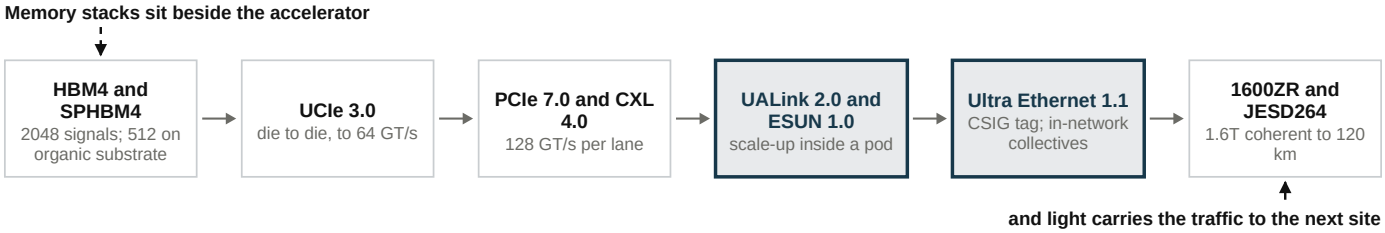
Ultra Ethernet 1.1, released on 12 October, adds a congestion signaling tag, CSIG, of four or eight bytes at layer 2, optimizations for scale-up networking, a reduced inter-packet gap that saves as many as 11 bytes and a Unified Forwarding Header that saves 20 bytes against a traditional IP packet [3]. Its in-network collectives carry the headline figure, a communication speedup of up to 2x. The release shows where the 2 comes from: a traditional all-reduce has each endpoint send 2 GB to obtain a 1 GB result, and the in-network version sends 1 GB [3]. The consortium says it is partnering with IEEE to standardize CSIG and working with OCP to bring the 1.1 scale-up technologies into the next ESUN specification [3].

Table 5. Eight handoffs: what passes between bodies and what to check before calling it coordination

Only a few of the eight rest on a partnership or reference that the records read name, and a published interface says nothing yet about measured outcomes.

Handoff or coexistence	Responsibility on each side	What passes across the boundary	Check before making a coordination claim
JEDEC, UCIe, and PCI-SIG with CXL	Memory interface; die-to-die link; host and memory links	Signal and interface assumptions, packaging constraints and performance requirements	CXL 4.0 runs on the PCIe 7.0 physical layer [53]; the records read show architectural adjacency between JEDEC and UCIe and no normative reference; the UALink chiplet specification, by contrast, states full compliance with UCIe 3.0 [50]
UALink, OCP ESUN and Ultra Ethernet	Accelerator interconnect; rack and network integration; AI Ethernet	Fabric behavior, forwarding and congestion, and management	The Ultra Ethernet Consortium says it is working with OCP to bring its 1.1 scale-up technologies into the next ESUN specification, undated [3, 4]
Ultra Ethernet, IEEE and the OIF	AI packet network; protocols and physical interfaces; optical transport	Packet formats, interface rates and network operations	The consortium says it is partnering with IEEE to standardize CSIG [3]; the OIF, writer of 1600ZR [56], is external to the twelve communities
3GPP and O-RAN	Cellular architecture; open RAN integration	Network configuration and RAN interface specifications	A published O-RAN document leaves interoperability testing as a separate step [25]
3GPP, regulators and ITU-R	Radio specifications; spectrum permissions and the IMT process	Radio assumptions, bands, coexistence and licensing conditions	3GPP aligned its Release 21 timeline with M.2160 [42]; a regulatory approval is a separate decision from a 3GPP consensus vote
IEEE 802 and IETF	Link layer; Internet services	Interoperable networking behavior	The records read document no liaison, and a shared subject area establishes no reference between the bodies
W3C, IETF and NIST	Web semantics and permissions; protocols; cryptographic standards	Tool authority, agent discovery, secure channels and audit evidence	A W3C breakout, an IETF charter and a final standard are different procedural states [36, 19, 76]
JVET and MPEG with 3GPP, IEEE and IETF	Media representation; radio, local transport and IP	Bitstreams, latency, uplink demand and compatible applications	Machine-oriented codec work is a call and a set of test conditions that no deployed device carries yet [20, 39]

Figure 5. Six layers of the AI stack and the bodies that write them

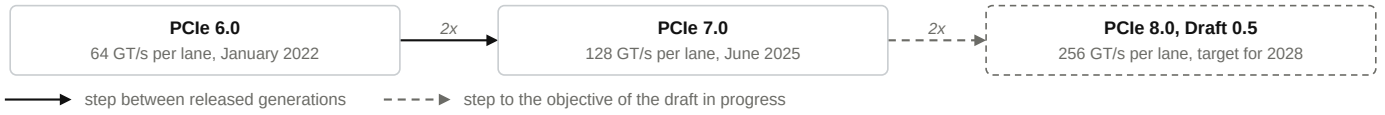


Six layers are written by eight bodies. Seven are among the twelve communities, with PCI-SIG and the CXL Consortium sharing one heading: JEDEC, the UCIe Consortium, PCI-SIG, the CXL Consortium, the UALink Consortium, OCP and the Ultra Ethernet Consortium. The eighth, the OIF, writes the optical line and is external.

The path runs from the memory stack beside the accelerator to the optical line between sites. Two layers added computation inside the network in 2026: UALink 2.0 in April and Ultra Ethernet 1.1 in October.

Scope. Layers named as the issuing bodies name them. Shading marks the two layers that added in-network computation.

Figure 6. PCIe doubles the rate per lane with each generation



Solid boxes are released generations and the dashed box is the objective of the draft in progress. Each arrow marks a doubling of the printed rate.

Scope. Rates in GT/s per lane as PCI-SIG prints them [52, 44, 46]. The 2028 date is a year only.

Both figures come from the suppliers of the specifications. The 93 percent is a design claim, and the 2x is an example of data sent, with no measured job behind it. A published interface carries no measured outcome, and a standard can define interoperability without ensuring performance: transfer rates in gigatransfers per second per lane are design rates of a link, and a benchmark means something only with a defined workload. Independent figures for real jobs, with the hardware and software named, are the evidence still missing.

The same names recur across these rooms. Eight companies appear in more than one of the records read. NVIDIA appears in three: the chair of JEDEC's HBM subcommittee gave its statement in the HBM4 release, the CXL Consortium's president, Derek Rohde, is with it, and it contributed Vera Rubin rack and compute-tray designs to OCP, while it is absent from the UALink board list [55, 45, 1, 50]. AMD appears on that board, in the HBM4 release and at OCP with its Helion rack. Microsoft, Meta, Google, Intel and Synopsys each appear in two records, Cadence in two, and Micron, Samsung and SK hynix stand behind one memory text. The twelve board members are Alibaba, AMD, Apple, Astera Labs, AWS, Cisco, Google, HPE, Intel, Meta, Microsoft and Synopsys [50]. A company may contribute to several consortia. Its role in each record must be checked separately.

Table 6. Ten releases of the AI stack, in date order

Each headline figure is a design figure printed by the body that wrote the specification, and none carries a repeat by a second party.

Date	Release	Headline figure as the issuer prints it	What sets the figure in context	Kind of figure
8 Apr 2025	UALink 1.0	200G per lane; up to 1,024 accelerators per pod	The 93 percent effective peak bandwidth is a design claim [17]	Specification parameters; design claim
16 Apr 2025	HBM4, JESD270-4	2,048-bit interface; up to 2 TB/s; 32 channels	Nine company statements, three from memory makers [55]	Specification parameters
5 Aug 2025	UCIe 3.0	48 and 64 GT/s	Double the 32 GT/s of UCIe 2.0 [54]	Specification parameters
18 Nov 2025	CXL 4.0	128 GT/s	Runs on the PCIe 7.0 physical layer, five months after PCIe 7.0 [45, 53]	Specification parameters
7 Apr 2026	UALink 2.0	Four specifications; in-network compute	Manageability through gNMI, YANG, SAI and Redfish [50]	Specification parameters
13 Jul 2026	SPHBM4, JESD330-4	512 data signals	Four-to-one serialization on organic substrates, against 2,048 signals for HBM4 [47]	Specification parameters
9 Sep 2026	1600ZR, OIF (external)	1.6T coherent, up to 120 km	Twice the capacity per wavelength of 800ZR [56]	Specification parameters
1 Oct 2026	JESD264	Qualification and reliability baseline for silicon photonics	JEDEC calls it the first industry-wide standard of its kind [2]	Announced standard
By 12 Oct 2026	ESUN 1.0	Specification 1.0 published	An OCP workstream for Ethernet scale-up networking [4, 3]	Published specification
12 Oct 2026	Ultra Ethernet 1.1	4- or 8-byte CSIG tag; in-network collectives up to 2x	The 2x compares 1 GB sent per endpoint with 2 GB [3]	Design example

No record read reports the energy used per completed task. A faster link or a denser memory stack may help a workload, but cooling, power delivery and queues can set the limit, and a more efficient chip can raise total demand. The measure that settles it is an end-to-end test on a stated workload, with the hardware named: answers served, energy used and the 95th-percentile delay. An efficiency claim should also say what it counted as power: the chip, the rack or the whole facility.

Four observations follow from the dates. The release calendar is regular enough to plan against: UCIe has published in the first ten days of August for three years, UALink in the first ten days of April for two, and CXL followed PCIe by five months. UALink 2.0 in April and Ultra Ethernet 1.1 in October each add computation inside the network, about six months apart, and each prints a design figure; evidence from a real job would be a second party measuring one, and none of the records read supplies it. The statements of scale come from the companies: Microsoft describes its Multipath Reliable Connection as designed for networks of more than 100,000 GPUs on two network tiers, which is a design objective [1]. The optical layer shows the widest gap between a headline and a body: the Nokia, T3 Broadband and Aureon announcement of 18 June prints up to 100 Tb/s in its summary and a design that scales to 400 Tb/s in its body, for a route from North Dakota to Chicago [57].

A buyer can turn the calendar into a purchasing question. A request for proposals that names UALink 2.0, Ultra Ethernet 1.1 or CXL 4.0 should name the version, the conformance test and the party that ran it, and should ask of every quoted number whether it is published, shown, independently repeated or in service. Vendors should optimize for the workload people run, and the request can ask for results on that workload, with the hardware, the software versions and the number of runs named. The next dated gates are few: SC26 opens on 15 November, AMD plans Helion partner configurations for November [1], and PCIe 8.0 is on track for 2028. Section 9 places the rest on one calendar.

5 FROM THE AIR TO THE HANDSET

The request now has to leave the glasses, and three radio communities have records in the window. A cellular network and a Wi-Fi network answer to different bodies, and a satellite link adds a regulator. Their records differ in kind, and Table 7 sorts the main ones into three lanes: what is deployed today, what is a study or a draft, and what is a trial. A live 5G standalone network is no evidence about 6G, and a ballot is no evidence about a field result.

The 6G study calendar and the 5G upgrade calendar answer different questions. The study calendar belongs to the ITU and 3GPP. Recommendation M.2160 of November 2023 gives 50, 100 and 200 Gbit/s as examples for IMT-2030, with completion no later than 2030 [58]. 3GPP approved TR 38.914 v1.0.0, its first 6G RAN study, at RAN#112, with a timeline for the first 6G specifications in Release 21 dated 10 June 2026 and aligned with M.2160 so that the study can feed the ITU-R process [42]. The working groups meet in Calgary from 16 November, the plenaries open in Boston on 7 December, and ITU-R is expected in December to approve 20 IMT-2030 technical performance requirements, seven of them new [30, 59].

The service calendar belongs to 5G. By 20 April 2026 operators had launched 5G standalone service at 95 networks, and 29 percent of 5G services were standalone against 71 percent non-standalone [51]. Ericsson's Mobility Report of 16 June counts 3.1 billion 5G subscriptions and forecasts 6.4 billion by the end of 2031. It finds uplink growth above downlink growth at 43 of 55 service providers, and above 1.5 times downlink growth at 17 [60]. Its scenario model puts uplink traffic in 2031 at three times the 2025 level in the Medium case, which assumes that 43 percent of subscribers use an AI assistant on smartphones, and at five times in the High case [61]. A scenario is a model's output under stated assumptions, with no measurement behind it, and Table 14 sorts it as a kind of claim of its own.

The IEEE record runs on ballots. Wi-Fi 8, the work of the 802.11bn task group, sets objectives against EHT, the amendment behind Wi-Fi 7: for at least one mode of operation, 25 percent more throughput, 25 percent less latency at the 95th percentile and 25 percent less MPDU loss [43]. Letter ballot 296 ran from 3 August to 2 September

Table 7. Wireless records in three lanes: deployed, study or draft, and trial

Each lane holds a different kind of evidence, and a record in one lane says nothing about the others.

Lane	Record	What the record shows	What it does not show
Deployed today	5G standalone, GSA, 20 April 2026 [51]	95 operators had launched standalone service; 29 percent of 5G services were standalone	Anything about 6G, or the coverage and speed a user gets
Study or draft	6G radio, 3GPP, June 2026 [42]	A study report and a timeline for the first 6G specifications	A finalized radio or a commercial 6G service
Study or draft	Wi-Fi 8, IEEE 802.11bn, September 2026 [18]	A draft that passed a ballot, with 8,016 comments to resolve	A ratified standard or a measured improvement
Study or draft	Open RAN, O-RAN ALLIANCE, October 2026 [25]	66 new or updated documents since July	Cross-vendor deployment or field reliability
Trial	Pre-6G trial, MediaTek, Ericsson and T-Mobile US, September 2026 [7]	Peak rates above 5 Gbps down and 2 Gbps up, stated as potential; latency as low as 4 ms, stated as achieved	An independent repeat, or a service
Trial	Starlink V3 satellites, SpaceX, 28 September 2026 [69]	26 satellites deployed, with contact to every one; checkouts to follow before service	Service to any handset

2026. Of a pool of 705, 560 returned ballots: 417 approve, 128 disapprove and 15 abstain. Approval counts as 417 of 545, or 76.5 percent against a 75 percent criterion, and the ballot passed with 8,016 comments [18]. Comment resolutions were used to generate draft 2.1 in September [43]. Twelve more disapprove votes would have taken the share below 75 percent. The task group lists a D3.0 working group letter ballot for January 2027, an initial Standards Association ballot on D4.0 for May 2027, final working group approval for March 2028 and RevCom and SASB approval for May 2028 [43]. The sessions that carry those dates are Irvine in January 2027, Singapore in March, Gothenburg in July, Hawaii in November and Bangkok in March 2028 [62].

A passed letter ballot is one formal stage. It does not resolve the 8,016 comments, and it is no approved IEEE standard: the task group's own schedule runs through a D3.0 ballot, a Standards Association ballot and RevCom approval in May 2028. A ballot may pass while objections remain, and the unresolved comments, more than the headline, hold the open design choices.

The 802 plenary opens in Bangkok on 8 November. Two study groups have records under way there: the 802 review of AI Offload is expected in November, and Wireless Intelligent Networking expects its PAR and CSD in January 2027 [28, 63]. The O-RAN ALLIANCE released 66 new or updated documents since July, which brings its list to 162 unique titles [25]. It met in Hanoi from 19 to 23 October and meets next in Germany from 15 to 19 February 2027 and in Asia from 18 to 22 October 2027 [26].

A document count measures publication activity. It does not show conformance, cross-vendor deployment or field reliability, and each of those is a separate test.

The records contain one field trial near 6G. MediaTek reported on 2 November that it and Ericsson ran a multi-vendor pre-6G trial with T-Mobile US at the 6G Innovation Hub in Bellevue in September, over a 400 MHz contiguous block. The release states peak rates of more than 5 Gbps down and more than 2 Gbps up as potential, and states latency as low as 4 ms as achieved [7]. The request that matters most for the December plenary came from the operators. On 29 October NGMN asked vendors to confirm whether Multi-RAT Spectrum Sharing works on existing RAN hardware and in existing frequency bands, and to report any adverse performance impact. NGMN will use the answers to update its guidance to 3GPP ahead of the December plenary, and its operator members want 6G migration options held to an absolute minimum [27].

The wireless records split by generation, and the generations are not interchangeable. 5G is in service, with 95 standalone launches. Wi-Fi 8 is a draft that passed a ballot, and its objectives are design targets. 6G is a study with a timeline, and one company-reported trial lies near it. The NGMN request is the only record here that asks a vendor to confirm a result on installed equipment, and operators have a reason: hardware in the field is capital already spent, and a 6G path that reuses it commits less new capital before revenue. The market and the standards body keep different time, and trade-offs need explicit assumptions, because capability, backward migration and capital cost pull against each other. The answers will shape NGMN's guidance to the December plenary, and the calendar to watch is short: Bangkok on 8 November, Calgary from 16 November, and the Boston plenaries from 7 December.

Orbit and spectrum: when coverage needs a license

Suppose the town has no signal. Coverage then depends on four things with four owners: a satellite, a radio standard in the handset, a license for the spectrum and a commercial service. Table 9 keeps them in separate rows, because an authorization answers only one of the four.

In orbit and spectrum the records of 2026 are orders, consultations and proposals from regulators. Ofcom's statement of 19 March 2026 opened up to 10 GHz of Q/V band for satellite gateways in low-density areas, which cover 94 percent of the UK landmass, and a consultation on up to 8 GHz for high-density areas closed on 28 May [64]. On 12 May the FCC approved the sale of EchoStar spectrum in two deals: about 65 MHz to SpaceX, made up of 15 MHz of unpaired AWS-3, 40 MHz of AWS-4 and 10 MHz of H-Block, and about 50 MHz to AT&T, made up of 30 MHz at 3.45 GHz and 20 MHz at 600 MHz. The Commission puts the combined value above 40 billion dollars, and EchoStar funds a 2.4 billion dollar escrow [5]. The order, DA 26-471, moves the licenses in two steps, includes a terrestrial construction waiver tied to direct-to-device buildout conditions, and sets final closing on or about 30 November 2027 [65].

Other regulators followed through the spring and summer. Canada's ISED opened SMSE-008-26 on 13 May, on L-band, Big LEO and 2 GHz spectrum, and SMSE-010-26 on 24 July, on space operations, launch vehicles and variable-trajectory spacecraft [66, 33]. On 27 May the European Commission proposed a Regulation for one EU-level selection procedure in the 2 GHz mobile satellite band, whose current licenses expire in 2027 [67]. Ofcom's direct-to-device page records a VodafoneThree variation in 900 MHz and amending regulations that commenced on 10 July [68].

Table 8. Nine wireless records, in date order

Four of the nine are counts, three are plans, one is a company-reported trial and one is an operator request, and the request is the only one that asks a vendor to confirm a result on installed equipment.

Date	Record	What the issuer prints	Kind of record
Nov 2023	ITU-R M.2160	Peak rate examples of 50, 100 and 200 Gbit/s for IMT-2030; completion by 2030 [58]	Planned
20 Apr 2026	GSA, 5G standalone	95 operators launched; 29 percent of 5G services standalone [51]	Counted
10 Jun 2026	3GPP RAN#112	TR 38.914 v1.0.0 approved; Release 21 timeline for the first 6G specifications [42]	Planned
16 Jun 2026	Ericsson Mobility Report	3.1 billion 5G subscriptions; uplink growth above downlink at 43 of 55 providers [60]	Counted
3 Aug to 2 Sep 2026	IEEE 802.11bn, LB296	417 approve, 128 disapprove, 15 abstain; 76.5 percent; 8,016 comments [18]	Counted
Sep 2026	MediaTek, Ericsson, T-Mobile US	Potential peaks above 5 Gbps down and 2 Gbps up; latency as low as 4 ms [7]	Company-reported
11 Oct 2026	O-RAN ALLIANCE	66 new or updated documents since July; 162 unique titles [25]	Counted
29 Oct 2026	NGMN	Operators ask vendors to confirm Multi-RAT Spectrum Sharing on existing hardware and bands [27]	Request
Dec 2026	ITU-R study group	20 IMT-2030 requirements, seven new; approval expected [59]	Planned

The satellite side reported in numbers of its own. SpaceX's Starship Flight 14 on 28 September deployed 26 Starlink V3 satellites, with contact to every one and checkouts to follow before service [69]. Starlink describes V3 with 2,048 beams each way and 1.2 Tbps of RF backhaul, and about 20 times the capacity per Starship launch compared with a Falcon 9 launch of V2 satellites [70]. Every figure is company-reported, and the V3 figures are design figures. A satellite that is deployed and in contact is not yet a service: service begins after the checkouts. GSMA counted 151 operators on 3 September with satellite services live, in testing or planned, across about six billion connections [71], and a count that mixes live, testing and planned services is one number for three different states.

October brought the decisions that put the pieces together. On 6 October the FCC approved SpaceX's non-geostationary mobile satellite system for direct-to-device service in DA 26-1078 [6], and SpaceX's own update states that the FCC approved its Gen2 application for 15,000 satellites optimized for 2 GHz [41]. On 8 October SpaceX announced an agreement for up to 14 MHz of paired 800 MHz spectrum, subject to final FCC approval, and the Commission published a fact sheet on proposed rules for licensed spectrum used for direct-to-device service [41, 31]. On 21 October the FCC approved the transfer of three unpaired AWS-3 licenses from Tristar to Starlink, with satellite service obligations attached [32]. Replies on Canada's SMSE-010-26 closed on 4 November, and on 5 November India's TRAI released its recommendations on authorization of satellite communication network providers and the assignment of spectrum to them [33, 34].

Proposed, recommended, approved, effective and deployed are different words. A proposal, such as the European Commission's of 27 May, awaits a decision. A recommendation, such as TRAI's of 5 November, is advice to a government. An order, such as the FCC's of 6 October, is a decision with legal effect on the parties it names. None of them is a signal on a handset: a satellite license authorizes specified activity, and it does not promise a signal on every handset.

2027 is where the calendars meet. The EU licenses in the 2 GHz band expire in 2027 [67]. 3GPP's work item on GNSS-resilient NR-NTN operation, in Release 20, started on 6 June 2026 and plans to end on 9 September 2027 [72]. WRC-27 meets in Shanghai from 18 October to 12 November 2027, and its agenda item 1.13 covers direct connection between mobile satellite service and IMT handsets in the bands between 694/698 MHz and 2.7 GHz [73]. The applicants expect the EchoStar transfer to SpaceX to close on or about 30 November 2027 [65]. A regulator decides by order and docket and a standards body decides by ballot and meeting, and the two calendars meet in one year. The orders of 2026 set terms, and the work item and the conference that carry the handset side end in the same year as the licenses and the closing.

6 WHEN SOFTWARE ASKS PERMISSION TO ACT

Suppose the traveler's assistant is asked to do more than answer: to book a taxi, message a contact or pay for a ticket. That raises questions of authority. Who defined what the assistant may do, how is it stopped, and how is its action checked afterward? Figure 7 sets three kinds of answer side by side, a law, a protocol and a test.

The Internet's engineers have taken positions on what their protocols should and should not make easy. RFC 2804 of May 2000 records the IETF's policy on wiretapping, and RFC 7258 of May 2014 is titled *Pervasive Monitoring Is an Attack* [74, 75]. Both are decisions about a protocol's purpose. The records of 2026 ask a comparable question about software that acts on its own.

Three pieces of cryptographic work share a headline and answer different questions. NIST published FIPS 203, 204 and 205 on 13 August 2024, the standards for ML-KEM, ML-DSA and SLH-DSA [76, 77, 78]. In 2026 the IETF turned them into TLS practice: RFC 9954 of July gives a construction for hybrid key exchange in TLS 1.3 as an Informational document, and RFC 10024 of August, on the Standards Track, marks X25519MLKEM768 as Recommended in the IANA registry and SecP256r1MLKEM768 and SecP384r1MLKEM1024 as not recommended [79, 80]. On 27 October NIST made IR 8547 final. The report describes NIST's approach to the transition from quantum-vulnerable algorithms and states that it supports Executive Order 14412 and OMB Memorandum M-26-15, which direct federal agencies to prioritize migrating their most sensitive systems [8]. The first piece is a set of algorithms, the second is the handshake that carries them and the third is a plan for moving systems onto both. Quantum key distribution is a separate approach: ITU-T approved Y.3839, a framework of cryptographic application registration for quantum key distribution networks, on 19 October [35].

The agent record is younger than the cipher record. W3C's TPAC breakouts, held from 26 to 30 October in Dublin, covered action semantics for agents on 26 October, the agentic web on 27 October, and AI-friendly pages and agent security on 28 October [36]. A

Table 9. Five questions that a satellite authorization does not answer by itself

Each field has its own record, and no record read joins all five for one service.

Field	What the records read show	What they do not show
Legal authorization	FCC DA 26-1078 approved SpaceX's system for direct-to-device service on 6 October, and DA 26-1129 three AWS-3 licenses for Starlink on 21 October; Ofcom's amending regulations commenced on 10 July [6, 32, 68]	That the authorized service exists
Launched hardware	Starship Flight 14 deployed 26 Starlink V3 satellites on 28 September, with contact to every one and checkouts to follow before service [69]	That the satellites provide service
Supported handset	3GPP's work item on GNSS-resilient NR-NTN runs from 6 June 2026 to a planned end on 9 September 2027, and WRC-27 agenda item 1.13 covers direct connection to IMT handsets [72, 73]	A handset model that supports the service
Coverage	Starlink describes V3 with 2,048 beams each way and 1.2 Tbps of RF backhaul [70]	Measured coverage or capacity; the figures are company-reported design figures
Commercial operation	GSMA counted 151 operators on 3 September with satellite services live, in testing or planned [71]	Which of them are live

Table 10. Ten regulator records on satellite spectrum, in date order

Five of the ten records are decisions, two are consultations, two are proposals and one is a recommendation.

Date	Body	What it printed	Kind of record
19 Mar 2026	Ofcom	Statement: up to 10 GHz of Q/V band for gateways in low-density areas, 94 percent of UK landmass [64]	Decision
12 May 2026	FCC	EchoStar spectrum to SpaceX (about 65 MHz) and AT&T (about 50 MHz); the SpaceX transfer in two steps, closing about 30 Nov 2027 [5, 65]	Decision
13 May 2026	ISED Canada	SMSE-008-26 on L-band, Big LEO and 2 GHz spectrum; comments closed 13 Jul [66]	Consultation
27 May 2026	European Commission	Proposed Regulation for EU-level selection in the 2 GHz band; current licenses expire in 2027 [67]	Proposal
10 Jul 2026	Ofcom	Amending regulations for direct-to-device commenced [68]	Decision
24 Jul 2026	ISED Canada	SMSE-010-26 on space operations and launch vehicles; replies closed 4 Nov [33]	Consultation
6 Oct 2026	FCC	DA 26-1078: SpaceX system approved for direct-to-device service [6]	Decision
8 Oct 2026	FCC	Fact sheet on proposed rules for licensed spectrum used for direct-to-device service [31]	Proposal
21 Oct 2026	FCC	DA 26-1129: three AWS-3 licenses from Tristar to Starlink, with satellite service obligations [32]	Decision
5 Nov 2026	TRAI	Recommendations on authorization of satellite network providers and spectrum assignment [34]	Recommendation

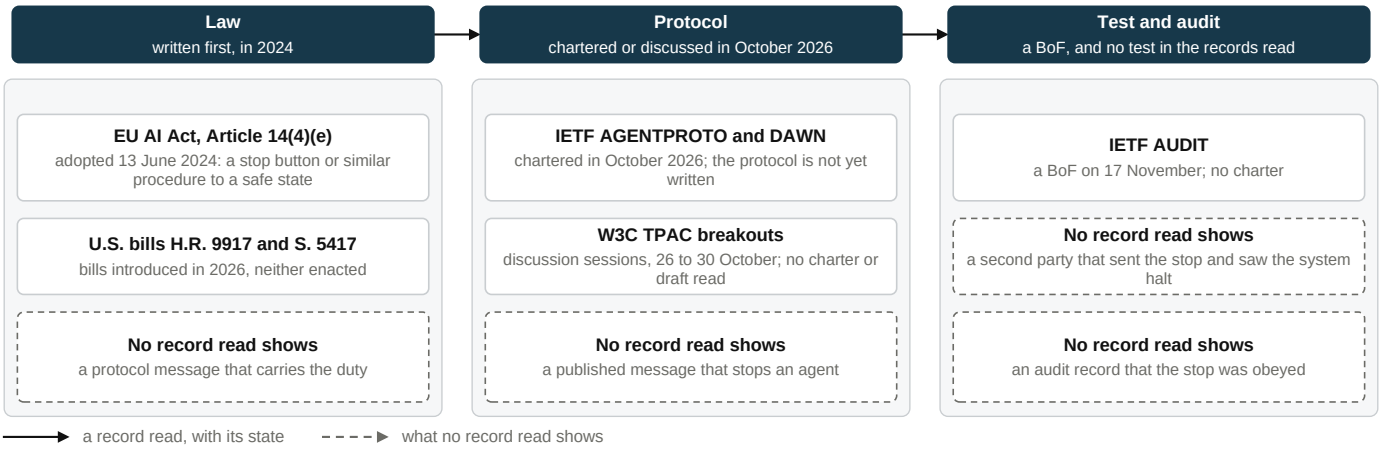
breakout is a discussion session, with no chartered group and no draft, and none is dated on the pages read. In October the IETF chartered AGENTPROTO, after a BoF at IETF 126, to define protocol building blocks for AI agents to communicate reliably with tools and with other agents, and chartered DAWN, on how a client discovers agents in an interoperable way. A charter states a scope, and the protocol it promises is not yet written. A third effort, AUDIT, is a BoF on interoperable mechanisms and data models for recording, exchanging and verifying audit information [19]. At IETF 127 in San Francisco, AGENTPROTO meets first on Monday 16 November, AUDIT on Tuesday 17 November and DAWN on Thursday 19 November [19].

Permission is where an assistant's ability meets a person's consent. The W3C breakouts on action semantics and agent security, and the IETF work on how agents talk to tools and discover one another, are where that question is being worked on. Disclosure is not consent, and the boundary an agent may cross is also a security boundary. Interoperability here should be defined around authority and verification as well as the ability to call tools. Agency can be delegated; accountability cannot. Trust depends on accountable action: who acted, under whose permission, and whether the record can be checked.

A stop command crosses three layers, and the three stand at different stages. The law is first in time. Article 14(4)(e) of the EU's AI Act, adopted on 13 June 2024, asks that people overseeing high-risk systems be able to interrupt them through a stop button or a similar procedure that brings the system to a halt in a safe state [81]. The protocol layer is chartered and young: the working groups that will define how agents talk to tools and to each other were chartered in October 2026, 28 months after the Act's text. The audit layer is a BoF. In the U.S. Congress, H.R. 9917, the AI Kill Switch Act, was introduced on 23 July 2026 by Representatives Lieu and Moran and amends the Homeland Security Act of 2002, and S. 5417, the AI Emergency Button Act, introduced by Senator Kennedy on 16 September, would require DHS regulations within 90 days of enactment [21, 82]. Both are bills that have been introduced, and neither is enacted law.

Table 11 sets the records in order, and the practical question for any product that claims to be controllable follows from it: which layer carries the stop? A duty in law with no protocol message to carry it, or a message with no audit record to show it was obeyed, leaves a gap that only a test closes. An assistant's stop command must be carried, obeyed and recorded, and the test that counts is a second party sending the stop and showing that the system halted. No record read here

Figure 7. From authority to audit: three lanes for one stop command



A stop command crosses a law, a protocol and a test. The records read put the law first in time, the protocol work at charter or discussion, and the test nowhere. Solid boxes show records and their state, and dashed boxes show what no record read shows.

Scope. Records as of 6 November 2026. A bill that is introduced awaits enactment, and a charter or a breakout comes before a finished protocol.

Table 11. Eleven records on stopping, keying and auditing machines, in date order

The law records come first in time, the protocol and audit records follow, and three cryptographic tracks run on their own.

Date	Body	What it printed	Kind of record
13 Jun 2024	European Union	AI Act, Article 14(4)(e): a stop button or similar procedure to a safe state [81]	Law, adopted
13 Aug 2024	NIST	FIPS 203, 204 and 205: ML-KEM, ML-DSA and SLH-DSA [76, 77, 78]	Post-quantum standards
Jul 2026	IETF	RFC 9954: hybrid key exchange in TLS 1.3, Informational [79]	TLS design
23 Jul 2026	U.S. House	H.R. 9917, AI Kill Switch Act, introduced [21]	Law, bill introduced
Aug 2026	IETF	RFC 10024: X25519MLKEM768 marked Recommended [80]	TLS design
16 Sep 2026	U.S. Senate	S. 5417, AI Emergency Button Act, introduced [82]	Law, bill introduced
Oct 2026	IETF	AGENTPROTO and DAWN chartered [19]	Protocol, chartered
19 Oct 2026	ITU-T	Y.3839 approved: a framework of cryptographic application registration for quantum key distribution networks [35]	QKD network standard
26 to 30 Oct 2026	W3C	TPAC breakouts on agents, action semantics and agent security [36]	Discussion
27 Oct 2026	NIST	IR 8547 final, the transition report [8]	Post-quantum transition plan
17 Nov 2026	IETF 127	AUDIT BoF on recording and verifying audit information [19]	Audit, BoF

supplies one. For product teams the cipher track has a concrete first step, the group the registry marks Recommended.

7 WHEN THE VIEWER IS A MACHINE

The glasses' camera sees the sign. Whether the sign is then read by the wearer, by a model in the glasses or by a model in a data center decides what the camera data has to carry. Coding video for human eyes optimizes perceptual fidelity, so it has to look right. Coding it for a machine optimizes task features, so it has to support a task. That difference is why a video-coding community has called for a standard beyond VVC, and why MPEG is writing test conditions for coding video and features for machines.

The codec community keeps the most explicit calendar in this paper. On 28 July 2026 JVET, the joint team of ITU-T Study Group 21 and ISO/IEC JTC 1/SC 29, issued a call for proposals for a video coding standard beyond VVC. Registration ran from 1 August to 1 September, evaluation takes place at the 45th JVET meeting in January 2027, and the stated goal is a new standard by 2029. The use cases include machine vision, and evaluation covers subjective and objective measures [20].

The meetings that followed the call ran in one city. Hangzhou hosted the third meeting of the ITU-T Focus Group on Embodied AI for Multimedia Technologies from 13 to 16 October, JVET 44 from 17 to 23 October and MPEG 156 from 19 to 23 October [37, 38, 39]. MPEG 156 lists common test conditions for Video Coding for Machines, Part 2 of MPEG-AI, and for Feature Coding for Machines, Part 4, together with explorations on systems support, Gaussian splats and beyond-VVC coding [39]. Feature coding compresses the intermediate feature tensors of a machine-vision network [83]. MPEG 155's timetable for beyond-VVC submissions asks for processed materials by the end of October and a second package in mid-December [40]. Machine consumers of video appear in the call's use cases and in MPEG's test conditions alongside human viewers.

Five terms need to stay apart, and Table 12 sets them out. Test conditions are an experimental method that lets proposals be compared on one footing, and MPEG 156's list is no finished codec. A codec is a system decision, because it touches the chip, the device and the cloud, and improving compression can increase the computation it costs. Human-visible frames and feature representations are different things to code, and machine-oriented coding is judged by task metrics as well as by rate and reconstruction quality.

Table 12. Five terms for coding video, each judged differently

Only the beyond-VVC call and two sets of test conditions are dated in the records read, and none of the five is a finished universal codec for handsets.

Term	What is coded or sent	Judged by	Status in the records read
VVC	Pictures, mainly for viewing	Perceived quality at a given rate	The codec that the beyond-VVC call is written against [20]
Beyond-VVC	Pictures; the use cases include machine vision	Subjective and objective measures [20]	Call for proposals of 28 July 2026; evaluation in January 2027; a new standard is the goal for 2029
VCM, Video Coding for Machines	Video	Task metrics as well as rate and reconstruction quality	Common test conditions listed at MPEG 156, Part 2 of MPEG-AI [39]
FCM, Feature Coding for Machines	The intermediate feature tensors of a machine-vision network [83]	Task accuracy at a given rate	Common test conditions listed at MPEG 156, Part 4 of MPEG-AI; status ongoing [39, 83]
Split inference	A model cut at a chosen layer, so that features cross the link	Latency, bytes sent, energy and task accuracy	An architecture with no codec of its own; no standard for it appears in the records read

The same camera and the same task can be placed in four ways, and Figure 8 follows the data in each. The drawing is qualitative: it claims no saving in bits per second, delay or energy. Where computation runs changes who bears the burden. On-device inference trades dependence on the cloud for local limits of power and heat, cloud inference trades device limits for dependence on the network, and moving computation changes the latency budget.

On-device inference is not automatically safer or cheaper, a cloud model is not automatically more accurate, satellite direct-to-device links do not give uniform capacity, and a bitstream optimized for viewing is not necessarily optimal for a machine task. Every claim needs its task assumptions: the model, the workload, the network and the failure mode. The uplink numbers of Section 5 belong in this picture, and they need care. Ericsson counts uplink growth above downlink growth at 43 of 55 service providers, and its scenario puts uplink traffic in 2031 at three times the 2025 level in the Medium case [60, 61]. The first is a count and the second is a scenario under stated assumptions. Neither measures the traffic that an AI assistant's requests generate, and neither says which of the four placements will carry the load.

8 WHAT THE NUMBERS CAN SUPPORT

Every section above met numbers, and the numbers come in kinds. Figure 9 asks of any figure what is being claimed and what would have to be shown next, and Table 14 sorts fifteen figures from this report by the answer. A ballot count, a document count and an operator count are counts. A satellite launch and a field trial are reported by the companies that ran them. The 2x of Ultra Ethernet, the 93 percent of UALink and the 25 percent of Wi-Fi 8 are design targets or design examples. Ericsson's 3x and 5x are scenarios. The 2028 of PCIe 8.0 and the 2029 of the next codec are plans. These kinds are not ranked, since a counted number can be small and a design target can prove conservative once a second party tests it. What the kind settles is how far a number may travel into a plan: a plan can rest on a count, can use a design target as a starting value with a test attached, and should treat a scenario as an input to vary.

Five numbers that look alike are not alike. 76.5 percent is the share of approve votes among approve and disapprove votes in one ballot. 25 percent is a design objective for at least one mode of Wi-Fi 8. 3x is a scenario for the uplink traffic of 2031. 2x is a design example of data sent in one collective operation. 95 is a count of 5G standalone networks, and it is no count of 6G. They cannot stand on one scale. A percentage needs its denominator, and a result is only as strong as its evidence: the claim should go as far as the evidence goes and no further, and a reader can ask what evidence would change the conclusion.

9 WHICH DECISIONS WILL MATTER NEXT

A gate is a date on which a record can change what it establishes. The gates of the next three years are of three kinds: meetings where text changes, ballots and deadlines that fix text, and decisions that bind. Figure 10 sets them on one calendar from late 2026 to mid-2029 and gives each kind its own symbol, because a date already fixed by an order, a ballot only planned and a year given as a target make three different promises.

2027 is the decision year. The Wi-Fi 8 task group plans a D3.0 working group letter ballot in January and an initial Standards Association ballot on D4.0 in May [43], and JVET evaluates the beyond-VVC proposals at its 45th meeting in January [20]. The 3GPP work item on GNSS-resilient NR-NTN ends in September, WRC-27 meets in Shanghai from 18 October to 12 November, and the EchoStar transfer to SpaceX closes on or about 30 November [72, 73, 65]. The EU's 2 GHz licenses end in the same year [67]. 2028 is the year of specifications: PCIe 8.0 is on track for its full release [46], and Wi-Fi 8 is due for working group approval in March and for RevCom and SASB approval in May [43]. 2029 is the year the beyond-VVC goal falls due [20].

The gates that bind, licenses and closings, have dates fixed by orders and statutes. The gates that confirm, ballots and releases, run later and depend on consensus among volunteers. A plan that needs both should schedule against the gates, and the nearest fall in the next six weeks.

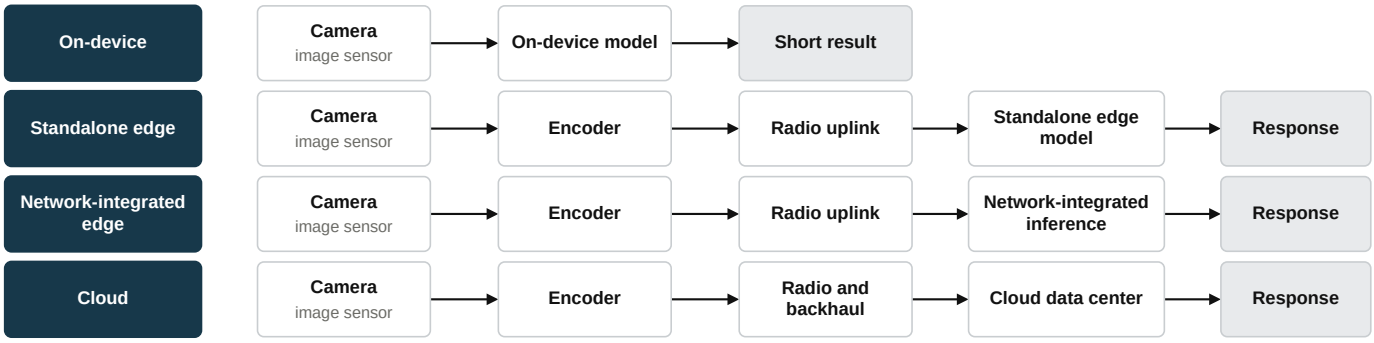
A meeting can open a question or agree work. A straw poll takes the temperature of the room and binds no one, so it shows momentum and leaves adoption to a later decision. A ballot or a release publishes text. A demonstration shows an implementation. An independent repeat and a service in daily use need a second party and an operator, and a date on a calendar can only mark the occasion for either. A gate that passes may confirm a plan, delay it or change it, so a reader plans in scenarios and asks what remains true across them, and a forecast names the signals that would change it. The list below runs in date order and names the body that owns each gate.

Watch list: now to January 2027

8 to 13 November: IEEE 802 plenary in Bangkok, with the 802 review of the AI Offload study group expected in November [28, 63].

14 to 20 November: IETF 127 in San Francisco. AGENTPROTO meets on 16 November, the AUDIT BoF on 17 November and DAWN on 19 November [19].

Figure 8. Four placements of the same machine-vision task



Moving inference changes the data that crosses each link. Local inference may upload a result, and remote inference may need video or intermediate features. Which option works depends on model capability, network conditions, privacy, power and task accuracy.

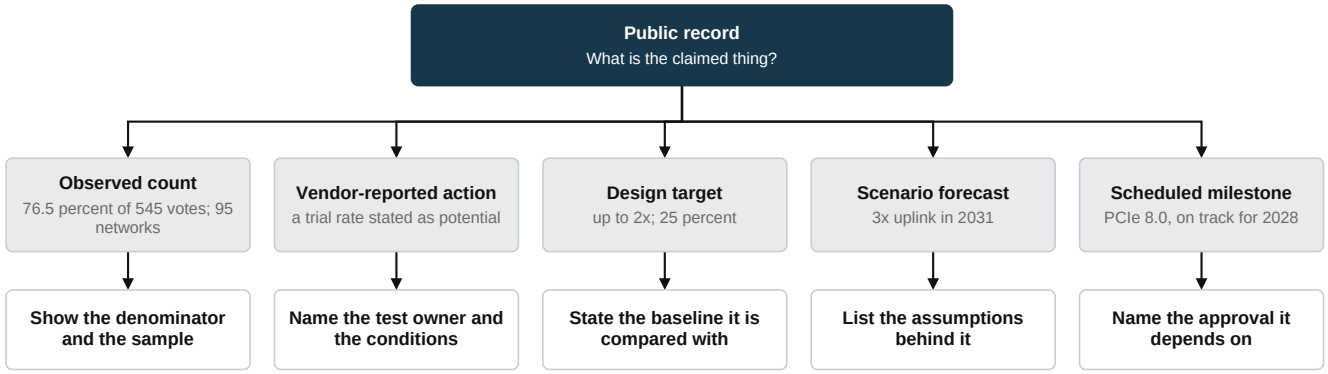
Scope. Qualitative architecture. The four lanes compare placements and announce no product, and the drawing claims no saving in bit rate, latency or energy.

Table 13. What to test in each of the four placements

The placement decides which standards topics bear on the task, and each placement fails in a different way.

Placement	What likely crosses the uplink	What must be tested	Standards topics that become relevant	Human example
On-device	A small label, coordinates or an alert; raw video is optional	Task accuracy and device energy under thermal limits	JEDEC memory classes, device compute, media preprocessing, local privacy	Smart glasses reading a street sign
Standalone edge	Encoded video, selected frames or features, depending on the split	Coverage, sustained uplink, model and task latency, handling of failure	3GPP uplink, IEEE 802, edge integration, JVET and MPEG	A factory safety camera near a local edge server
Network-integrated edge	Similar media or features, with an execution boundary managed by the network	Slice and quality of service, security, orchestration, handoff and interoperability	3GPP and O-RAN, IETF, codecs, security	Augmented-reality assistance with network-managed compute
Cloud	Media or features, plus return traffic across radio and backhaul	End-to-end 95th-percentile latency, network cost, privacy, reliability and cloud energy	3GPP and IEEE, IETF, Ultra Ethernet, OCP, UALink and JEDEC, JVET and MPEG	A multimodal AI interpreting a long scene

Figure 9. What the claim is, and what to show next



Each kind of claim asks for a different follow-up before it can be used in a plan. The five kinds are listed in no order of quality, and a figure belongs to one kind, whatever its size.

Scope. An editorial reading aid created for this report. It classifies the claim and passes no judgment on the claimant.

15 to 20 November: SC26 in Chicago, where UCIe holds booth 1020 in the Open Standards Pavilion [23, 24].

16 to 20 November: 3GPP working groups in Calgary, then NGMN's updated guidance, which depends on vendor answers on Multi-RAT Spectrum Sharing [29, 27].

November: AMD's planned Helion partner configurations [1].

7 to 10 December: 3GPP plenaries in Boston, and the ITU-R study group's expected approval of 20 IMT-2030 requirements, seven of them new [30, 59].

Mid-December: MPEG's second package for beyond-VVC submissions [40].

January 2027: the 802.11 session in Irvine, JVET 45 and the PAR and CSD of Wireless Intelligent Networking [62, 20, 63].

10 HOW WE GOT HERE: WHAT OLDER RULES NEEDED

The records of 2026 echo older decisions, and the histories below run in the order of the older dates. A precedent informs a reading: each history shows what an earlier rule needed in order to work, and none predicts what a record of 2026 will do. Chesterton's fence applies as well: do not remove an old rule until you understand why it was created.

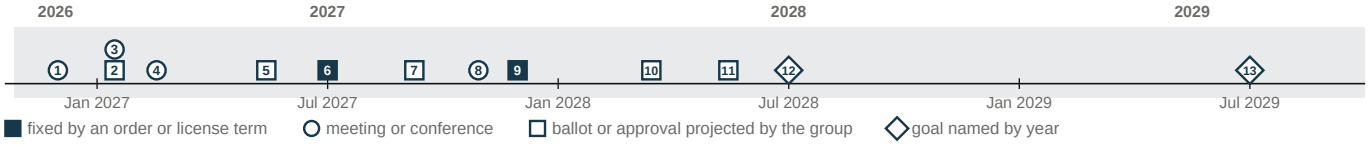
Independent repetition is the oldest of these tests. The Royal Society asked for it in 1662, and the IETF wrote it into its procedure in 1996 and 2011, as Section 1 describes [14, 15, 16]. None of the selected

Table 14. Fifteen figures from this report, sorted by the kind of claim

The kind of claim decides what must be shown next, and it says nothing about the quality of the figure.

Figure as printed	Kind of claim	Record	What would have to be shown next
417 approve, 128 disapprove, 15 abstain; 76.5 percent against a 75 percent criterion	Observed count	IEEE 802.11bn D2.0, letter ballot 296 [18]	Resolution of 8,016 comments and the later ballots
66 new or updated documents; 162 unique titles	Observed count	O-RAN ALLIANCE document count [25]	Conformance and cross-vendor field results
95 networks; 29 percent of 5G services standalone	Observed count	GSA, 20 April 2026 [51]	Nothing about 6G; coverage and speed need measures of their own
43 of 55 service providers with uplink growth above downlink growth	Observed count	Ericsson Mobility Report, 16 June 2026 [60]	Which applications drive it; it is no measure of AI traffic
26 Starlink V3 satellites deployed, with contact to every one	Vendor-reported action	SpaceX, Starship Flight 14 [69]	Checkouts, and service to handsets
Peaks above 5 Gbps down and 2 Gbps up as potential; latency of 4 ms as achieved	Vendor-reported action	MediaTek and Ericsson with T-Mobile US [7]	A repeat by a second party under stated conditions
Up to 100 Tb/s in the summary; a design scaling to 400 Tb/s in the body	Vendor-reported action	Nokia, T3 Broadband and Aureon route [57]	A measured route, with its conditions
Up to 2x communication speedup	Design example	Ultra Ethernet 1.1, in-network collectives [3]	A measured collective on a real job, by a second party
93 percent effective peak bandwidth; up to 1,024 accelerators per pod	Design target	UALink 1.0 [17]	Third-party bandwidth on real workloads
In at least one mode, 25 percent more throughput, 25 percent less latency at the 95th percentile and 25 percent less MPDU loss, against EHT	Design target	IEEE 802.11bn task group objectives [43]	Measured results from products, by a second party
256.0 GT/s per lane; up to 1.0 TB/s bidirectional on x16	Design target	PCIe 8.0 Draft 0.5 [46]	The full release, planned for 2028
3x (Medium) and 5x (High) the 2025 uplink traffic in 2031	Scenario forecast	Ericsson scenario model [61]	Observed traffic in later years, and the assumptions of each case
Working group approval in March 2028; RevCom in May 2028	Scheduled milestone	IEEE 802.11bn task group schedule [43]	Each ballot and approval taking place
A new video coding standard by 2029; evaluation of proposals in January 2027	Scheduled milestone	Beyond-VVC call for proposals [20]	Proposals evaluated and a codec selected
WRC-27, Shanghai, 18 October to 12 November 2027, agenda item 1.13	Scheduled milestone	ITU conference calendar [73]	A conference date forecasts no outcome for any technical proposal

Figure 10. The calendar of decisions: status by type, November 2026 to mid-2029



1. Nov to Dec 2026. The meetings of the watch list: IEEE 802, IETF 127, SC26, 3GPP in Calgary and Boston (months only). [28, 19, 30]
2. Jan 2027. IEEE 802.11bn plans the D3.0 working group letter ballot (month only). [43]
3. Jan 2027. JVET 45 evaluates the beyond-VVC proposals (month only). [20]
4. 15 to 19 Feb 2027. O-RAN ALLIANCE meets in Germany. [26]
5. May 2027. IEEE 802.11bn plans the initial Standards Association ballot on D4.0 (month only). [43]
6. 2027. The current EU 2 GHz licenses end; the Commission proposes an EU-level procedure for what follows (year only). [67]
7. 9 Sep 2027. 3GPP's work item on GNSS-resilient NR-NTN is planned to end. [72]
8. 18 Oct to 12 Nov 2027. WRC-27 meets in Shanghai. [73]
9. About 30 Nov 2027. The EchoStar license transfers to SpaceX close, under the FCC's order. [65]
10. Mar 2028. Working group approval of 802.11bn projected (month only). [43]
11. May 2028. RevCom and SASB approval of 802.11bn projected (month only). [43]
12. 2028. PCIe 8.0 full release, on track in PCI-SIG's words (year only). [46]
13. 2029. Goal of a new video coding standard after the beyond-VVC call (year only). [20]

Fixed dates, scheduled meetings, planned ballots and year-only targets carry different symbols, and the key lists each marker with its issuer, action, date precision, status at 6 November 2026 and source.

Scope. Dates as the issuing bodies print them. A month sits at mid-month and a year-only date at mid-year; both are conventions of the drawing and imply no day. Numbers follow the markers from left to right. The WRC-27 dates are those of a conference and forecast no outcome for any proposal.

emerging records of 2026 reaches it. The nearest independent view in these records is a ballot, in which 560 members of a pool of 705 judged one draft of Wi-Fi 8 [18], and a ballot judges text. The repeat of a measured number still waits for a second laboratory.

A standard that names the thing can be tested by a stranger. By the early 1860s a telegram could fall under several conventions in turn, among them the Stuttgart Convention of 1857 and the Brussels and Berne Conventions of 1858, and their provisions did not fully agree [12]. Representatives of twenty, mostly European, countries answered with one convention, signed in Paris on 17 May 1865, whose regulations required the adoption of Morse code and its instruments, which the ITU's own history calls a rare instance of the Union

specifying particular equipment [13]. RFC 10024 names three key-agreement groups and marks one Recommended, and the UALink 2.0 manageability specification names gNMI, YANG, SAI and Redfish [80, 50]. A design target with no named item to test has no stranger who can repeat it.

The stop command of 2026 stands where SOS stood in 1906. SOS was published in that year and waited until 1912 for a common frequency and a habit of listening [9, 11]. The duty to stop a high-risk AI system was written into the EU's AI Act in June 2024, the working groups that will define the messages agents exchange were chartered in October 2026, and the audit layer is a BoF, so the frequency and the habit of listening are still to be built. A shared emergency signal needs a text, a channel and a practice of listening, and the text comes first in time.

The IETF took positions on purpose in 2000 and in 2014, on wiretapping and on pervasive monitoring, and Section 6 sets the two bills of 2026 that ask the law for a shutdown capability beside the protocols that would carry a stop. A statute states a duty and a protocol specifies a message, and the two are written in separate rooms.

A cipher transition needs a text, a protocol profile and a plan, and each arrives on its own calendar. NIST published the three post-quantum standards in August 2024, the IETF published its hybrid key exchange documents in July and August 2026, and NIST made its transition report final in October 2026, 26 months after the standards [76, 79, 80, 8]. Between the first and the last, the buyer carries the risk.

What the histories share is a question to put to each new record: what does the text name, who can test it, and who is still to build the channel and the habit of using it?

11 TAKEAWAYS BY READER

The records matter differently to different readers, and Table 15 names the eight for whom a specific takeaway is useful. Each row gives what the records mean and one first step.

12 AN AGREEMENT BECOMES USEFUL WHEN OTHERS CAN RELY ON IT

A person waiting for an urgent message has little reason to distinguish a committee's approved text from a manufacturer's demonstration. That distinction matters to the people building the systems on which the message depends. A memory interface must work with a package, a package with a server, a network with a device, and a rule about authority with software that obeys it. Each handoff creates another question that the previous specification cannot answer alone.

The next years will bring ballots, proposals, spectrum decisions and specifications. The useful question is what each one permits somebody else to do, and whether that somebody can demonstrate it. A standard reaches beyond the room in which it was written when people who never attended the meeting can rely on its result.

The outlook is a calendar, and long-term planning begins with acknowledging unknowns. This report cannot say which record will prove dependable: its sources stop on 6 November 2026, and a date after that day is a plan. Wi-Fi 8 approval, the PCIe 8.0 release, the end of the EU's 2 GHz licenses, the spectrum agenda of WRC-27 and the goal for the next video codec all fall due between 2027 and 2029, and each is an occasion on which a record can show more than it shows today. Amara's law is a fair caution for such a calendar: people overestimate a technology's immediate impact and underestimate its long-term transformation. The next step a reader can observe is small. When the next ballot, release or order arrives, ask what the issuer agreed and for which scope, who tested which implementation and under what conditions, and who relies on the service and where.

Standards written in different rooms become a common infrastructure when their interfaces work for people outside those rooms.

13 EVIDENCE REGISTER AND EDITORIAL METHODS

This report is a reading of public records. It places each record by what it establishes, scores no organization, and rests every figure on a record that prints it. The unit of analysis is one dated, attributable record about one technology or issue, and the differences between records are kept in separate fields: the body that issued it, the verb the issuer used, the date as the source prints it, the instrument, the origin of the evidence, what the record establishes, what remains open, the figure with its units and conditions, the kind of claim, the next gate and the source. Table 17 and Table 18 give those fields for the fifteen records of Table 2.

Five kinds of statement have five kinds of acceptable source, and Table 16 sets them out. Where the report states a fact about a standard, a regulation or a figure, the source is the issuer's own page or document, and a press release is a pointer to it. An echo adds no corroboration: a statement repeated in ten reports still counts as one source. Where two records differ, both appear. The last column of Table 18 states, for each record, whether the issuer's own pages were re-read on 7 November or did not open and were confirmed only in other reports. Of the 83 cited sources, 33 were re-read on 7 November 2026, the FCC order DA 26-471 in part. Twelve gave no readable page and rest on issuer snippets, company statements quoted in reports or a title, and the reading of the other 38 was not logged page by page.

Table 17 gives the instrument, the origin of the evidence, the figure with its conditions and the kind of claim for each record, and Table 18 gives what each record depends on, its next gate, how a person might notice it and its check status. Both are keyed by the record numbers of Table 2. An external authority is marked as such and is no member of the twelve communities.

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Table 15. What the records mean for eight kinds of reader

Each first step turns a kind of claim into an action with a date or a named document.

Reader	What the records mean	First step
CEOs and boards	Plans can rest on published text with a dated gate. A figure that no second party has repeated is unproven.	Ask each program owner what kind of claim each plan input is and the date of its next gate.
CTOs and architects	The AI stack publishes on a cadence, and its numbers are design figures.	Write version, conformance test and testing party into every purchase order, and ask which layer carries the stop command.
Investors	Counted and company-reported figures are different kinds of evidence, and the gates of 2027 to 2029 date the tests.	Sort a company's quoted numbers by kind of claim and calendar the gate that tests each.
Innovators and patent inventors	Text still moves in the charters and calls of this window: AGENTPROTO, DAWN, AUDIT, the 802 study groups and the beyond-VVC evaluation.	Map each claim to a published version, and plan contributions for the meetings on the watch list.
Standardization delegates	The next changes of text sit in Bangkok, San Francisco, Calgary and Boston, and a single Wi-Fi 8 ballot drew 8,016 comments.	State in each contribution whether the text sets a design target, a test or a deployment fact.
General counsel and legal practice	A stop command spans law, protocol and audit, and spectrum orders carry dockets and conditions with 2027 closings.	Cite specification versions, order numbers and dates in contracts, and map Article 14(4)(e) and the two U.S. bills to the layer that carries the stop.
Product and communications teams	Issuers print their own qualifiers, such as potential rates and design scale.	Quote rates as the issuer states them, and start TLS key agreement from the group the registry marks Recommended.
Policymakers and legislators	A duty written in 2024 meets protocols chartered in 2026, and bills carry 90-day rulemaking clocks.	Name who tests a stop capability and against which published specification, and align deadlines with WRC-27 and the 2027 license dates.

Table 16. What counts as a source for each kind of statement

The label a statement carries follows from its source, and no label is stronger than the record behind it.

Kind of statement	Acceptable source	How the report labels it
A formal standards process	Minutes, ballots, published specifications, contribution records or official charters; a press release is a secondary pointer to these	With the verb the issuer used, never a stronger one
A regulatory permission	A docket, an order, a published consultation or an effective regulation	Proposed, recommended, approved, effective and deployed are kept separate
A measurement	The original test disclosure, with hardware, versions, workload, run count and the definition of the 95th percentile	Vendor-reported until a second party tests it
A forecast	The publisher, with its scenario assumptions, horizon and range	As a scenario, never as an observation
A historical claim	ITU and archival original texts, and the RFCs themselves	For the event cited, with no broad conclusion drawn from one example

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Table 17. The ledger, part 1: instrument, evidence, figure and kind of claim

A formal act records a decision and measures nothing, and only the counted records carry a denominator.

ID	Instrument	Origin of the evidence	Figure and its conditions	Kind of claim
CR-01	Approved study report; agreed timeline	Standards body record	TR 38.914 v1.0.0; Release 21 timeline dated 10 June 2026; no performance figure	Formal act; planned milestone
CR-02	Two charters; one BoF	Standards body record	None; sessions on 16, 17 and 19 November	Formal act
CR-03	Working Group Letter Ballot 296	Ballot tally	417 of 545 approve and disapprove votes, 76.5 percent against a 75 percent criterion; 15 abstain; pool of 705, 560 returned; 8,016 comments	Counted
CR-04	Specification release; company contributions	Consortium release and company releases	ESUN 1.0 published, no performance figure; Microsoft's MRC is described as designed for networks of more than 100,000 GPUs on two tiers	Formal act; design objective
CR-05	Breakout sessions	Event record	None	Discussion
CR-06	Document releases	Alliance release	66 new or updated documents since July; 162 unique titles	Counted
CR-07	Call for proposals	Standards body call	Registration 1 August to 1 September; evaluation in January 2027; goal of a standard by 2029	Formal act; planned milestone
CR-08	Common test conditions	Standards body meeting record	None; conditions for Video Coding for Machines and Feature Coding for Machines	Formal act, an experimental method
CR-09	Released specifications; draft objective	Consortium releases and a blog	PCIe 7.0 and CXL 4.0 at 128 GT/s; PCIe 8.0 objective of 256.0 GT/s and up to 1.0 TB/s in both directions on x16	Formal act; design target
CR-10	Published standards	Standards body releases	HBM4 up to 2 TB/s; SPHBM4 with 512 data signals; JESD264 as a qualification baseline	Formal act; specification parameters
CR-11	Released specification; company-run demonstration	Consortium release and demonstration	UCIe 3.0 at 48 and 64 GT/s; one live UCIe-S demonstration	Formal act; company-reported
CR-12	Released specifications	Consortium release	Four specifications, two at version 2.0; UALink 1.0 at 200G per lane and 93 percent effective peak bandwidth	Formal act; design claim
CR-13	Released specification	Consortium release	CSIG tag of 4 or 8 bytes; up to 2x in one collective example, 1 GB against 2 GB sent	Formal act; design example
CR-14 (external)	Final report; published standards; RFCs	Government and standards body records	None; FIPS 203, 204 and 205; RFC 9954 Informational; RFC 10024 Standards Track	Formal act
CR-15 (external)	Two orders	Regulator decisions	Three AWS-3 licenses; the EchoStar transfer to SpaceX expected to close on or about 30 November 2027	Formal act

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Table 18. The ledger, part 2: dependencies, next gate, effect on a person and check status

The effect on a person is stated as something that may happen if the product delivers, and none is claimed as a present result.

ID	Depends on	Next gate	How a person might notice	Check status
CR-01	The ITU-R IMT-2030 process and 3GPP Release 21 work	Calgary working groups from 16 November; Boston plenaries from 7 December	Future coverage, battery life and migration cost, all still to be delivered	Pages re-read 7 Nov
CR-02	Interoperable messaging, discovery and audit data models	IETF 127, 14 to 20 November	Whether an AI assistant can ask another service to act safely	Page re-read 7 Nov
CR-03	A compatible physical layer and implementations; Standards Association ballots	D3.0 letter ballot in January 2027; D4.0 Standards Association ballot in May 2027	Reliability in crowded homes and venues, if products deliver the objectives	Ballot message and task-group page re-read 7 Nov
CR-04	Implementations of ESUN and of the contributed rack designs	AMD partner configurations in November 2026	Whether AI services stay affordable and responsive	Pages re-read 7 Nov
CR-05	A chartered group or a draft, none dated	None dated on the pages read	Which web tools an AI may use with a person's consent	Page re-read 7 Nov
CR-06	Interoperability testing by implementers	Meeting in Germany, 15 to 19 February 2027	Whether a network can combine equipment from several suppliers	Alliance pages re-read 7 Nov
CR-07	Proposals from several companies and a test suite	Second package of submissions, mid-December; JVET 45, January 2027	Video calls, accessibility and the efficiency of machine vision	Pages re-read 7 Nov
CR-08	Decoder support and task-accuracy results	None dated on the pages read	Whether a wearable sends images or compact task-relevant features	Pages re-read 7 Nov
CR-09	The PCIe 7.0 physical layer, for CXL 4.0; implementations	PCIe 8.0 release, on track for 2028	When AI devices are replaced and when infrastructure is bought	CXL pages re-read 7 Nov; PCI-SIG pages not opened
CR-10	Supplier yield and qualification	None dated on the pages read	Why an AI response may depend on memory supply, price and energy	JEDEC pages not opened; confirmed in secondary reports
CR-11	Packaging and independent interoperability tests	SC26, 15 to 20 November, a booth	Whether chips from different makers can sit in one package	Pages re-read 7 Nov
CR-12	Vendor implementations and compatibility	None dated on the pages read	Whether several AI processors coordinate without delay	Press releases re-read 7 Nov
CR-13	Implementations; IEEE work on CSIG; the next ESUN	Undated	Whether a busy AI service stays responsive	Page re-read 7 Nov
CR-14	Migration of each system; TLS implementations	None dated; federal agencies are directed to prioritize their most sensitive systems	Whether the secure connections behind a service are moved off quantum-vulnerable algorithms	Pages re-read 7 Nov
CR-15	Handsets, satellites in service and commercial agreements	EchoStar transfer to SpaceX, on or about 30 November 2027; WRC-27, 18 October to 12 November 2027	Whether a phone gets a signal where towers do not reach	Two orders not opened; DA 26-471 re-read

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Table 19. Glossary of the terms used in this report

Each term is defined as this report uses it.

Term	Meaning	Term	Meaning
BoF	A birds-of-a-feather session, an IETF meeting held to test interest before a working group is chartered	NTN	A non-terrestrial network: radio access through satellites or other platforms above the ground
Call for proposals	A formal request for technical proposals, to be evaluated against stated criteria	PAR and CSD	The Project Authorization Request and Criteria for Standards Development that open an IEEE 802 project
Charter	A working group's statement of its scope and work items	PQC	Post-quantum cryptography: algorithms designed to resist attack by quantum computers
Chiplet	A small die combined with others in one package to make a larger processor	QKD	Quantum key distribution: sharing cryptographic keys through quantum states
CSIG	The congestion signaling tag of Ultra Ethernet 1.1	RAN	Radio access network: the base stations and radio links of a cellular network
CXL	Compute Express Link, for memory and devices, carried on the PCIe physical layer	RevCom and SASB	The review committee and the board of the IEEE Standards Association that approve a standard
D2D	Direct-to-device: satellite service delivered directly to handsets	SA	Standalone 5G: a 5G network that uses its own 5G core
EHT	The amendment behind Wi-Fi 7, against which 802.11bn sets its objectives	TLS	Transport Layer Security, the protocol of secure web connections
ESUN	An OCP workstream for Ethernet scale-up networking	VCM and FCM	Video Coding for Machines and Feature Coding for Machines, parts of MPEG-AI
GT/s	Gigatransfers per second per lane: the signaling rate of a link; application throughput is a separate measure	VVC	Versatile Video Coding, the codec against which the beyond-VVC call is written
HBM	High-bandwidth memory: DRAM dies stacked beside a processor	Working group letter ballot	An IEEE 802.11 ballot of the working group on a draft, with comments that must be resolved
IMT-2030	The ITU framework for 6G	WRC	The World Radiocommunication Conference of the ITU

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