Weatherford®

OneTrip StarBurst™ TAML Level 4 Multilateral System

The Art of Intervention

Reduce the duration, associated cost and risk of complex multilateral installations with the world's first one-trip, TAML Level 4 multilateral system.


Drilling


Evaluation


Completion


Production


Intervention

Multilaterals

- MillThru™
- OneTrip StarBurst™
- Selective re-entry system
- StarBurst™

Maximizing efficiency of TAML Level 4 installations

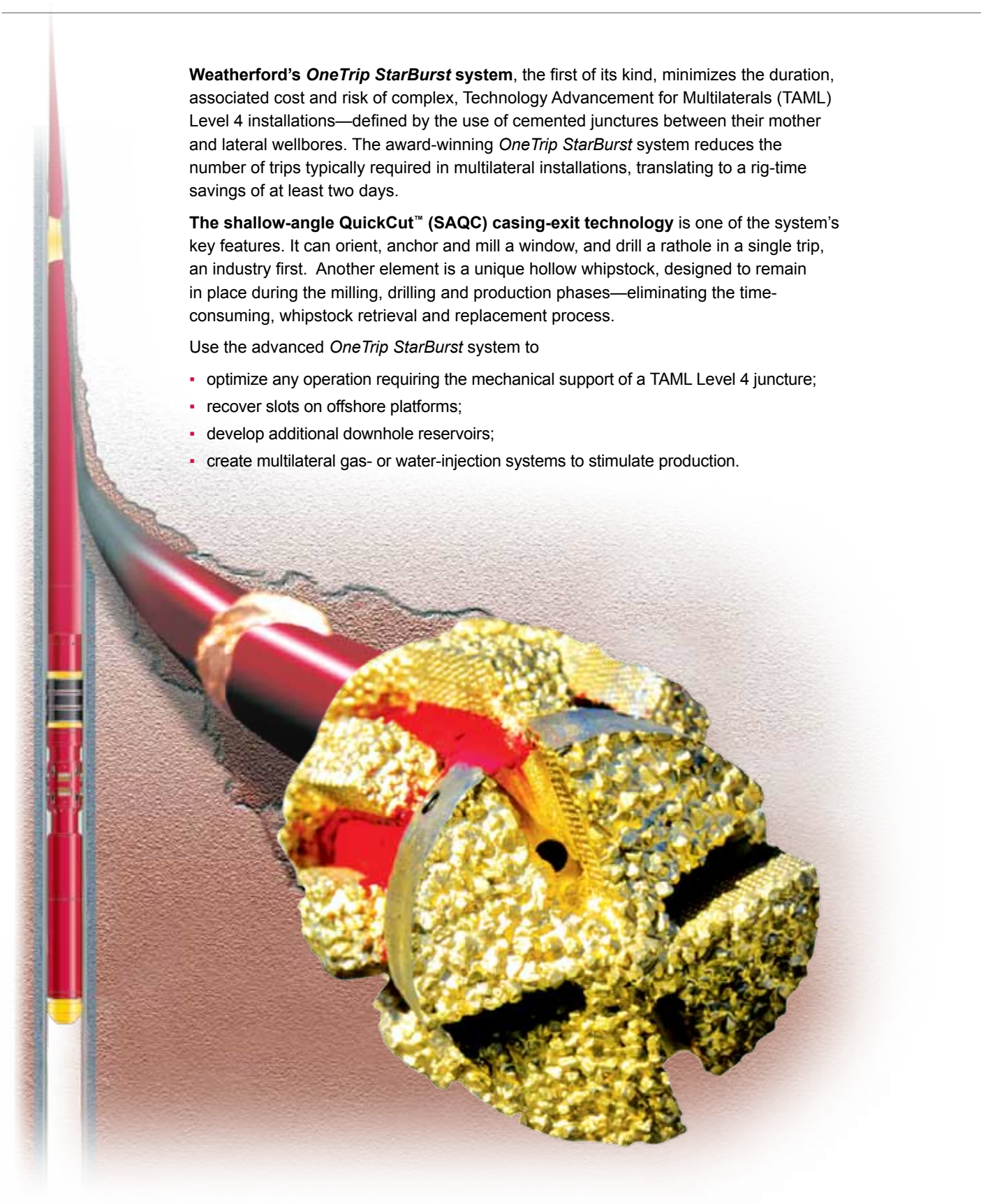
We employ the innovative design features of the OneTrip StarBurst™ system to save you rig time.

Weatherford's *OneTrip StarBurst* system, the first of its kind, minimizes the duration, associated cost and risk of complex, Technology Advancement for Multilaterals (TAML) Level 4 installations—defined by the use of cemented junctures between their mother and lateral wellbores. The award-winning *OneTrip StarBurst* system reduces the number of trips typically required in multilateral installations, translating to a rig-time savings of at least two days.

The shallow-angle QuickCut™ (SAQC) casing-exit technology is one of the system's key features. It can orient, anchor and mill a window, and drill a rathole in a single trip, an industry first. Another element is a unique hollow whipstock, designed to remain in place during the milling, drilling and production phases—eliminating the time-consuming, whipstock retrieval and replacement process.

Use the advanced *OneTrip StarBurst* system to

- optimize any operation requiring the mechanical support of a TAML Level 4 juncture;
- recover slots on offshore platforms;
- develop additional downhole reservoirs;
- create multilateral gas- or water-injection systems to stimulate production.



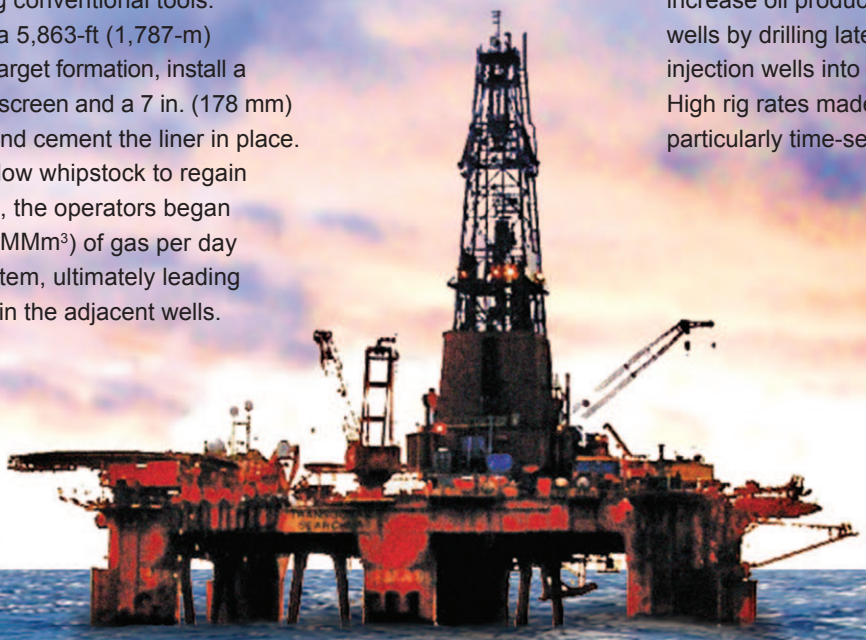
Producing real results

The OneTrip StarBurst™ system reduces well costs on complex drilling operation.

Åsgard field, North Sea, Norway

Operational detail. Using our *OneTrip StarBurst* system, the operators created a cemented junction at 13,314 ft (4,058 m). They milled a 19.7-ft (6-m) window in Super 13 Cr casing and a 19.7-ft (6-m) rathole in Garn 4 hard impermeable sandstone in just 5.5 hours—a procedure that would have taken much longer using conventional tools. They proceeded to drill a 5,863-ft (1,787-m) lateral wellbore into the target formation, install a 5-1/2 in. (140 mm) sand screen and a 7 in. (178 mm) liner in the lateral well, and cement the liner in place. After perforating the hollow whipstock to regain access to the main bore, the operators began injecting 194 MMcf (5.5 MMm^3) of gas per day into the injector well system, ultimately leading to increased production in the adjacent wells.

Background. In its debut operation, Weatherford's *OneTrip StarBurst* multilateral system helped StatoilHydro reduce rig time during a complex multilateral drilling operation. The client's primary objective was to increase oil production from adjacent wells by drilling lateral subsea gas injection wells into two formations. High rig rates made the operation particularly time-sensitive.



Results. The *OneTrip StarBurst* system saved a minimum of two days in rig time. The operation marked the world's first one-trip installation of a TAML Level 4 multilateral and substantiated the viability of using a multilateral well system for gas injection. Its success is a testament to the planning skills and expertise of the joint operating team and the operational and installation simplicity of the *OneTrip StarBurst* multilateral system.

For more *OneTrip StarBurst* system Real Results, please visit **weatherford.com/realresults.**

Complementing innovative technology with expertise

Our extensive experience and tailored training can add substantial expertise to your multilateral installations.

Well intervention experience. Backed by a global team of fishing and milling specialists, we have completed more than 10,000 casing exits (Levels 1 through 4) and 400 multilateral systems worldwide.

Training. Leveraging our global network of training facilities, we provide our well intervention specialists with highly specialized classroom training before deploying them on live operations. Their training continues in the field, where they are paired with experienced well intervention specialists to develop further their skills and ensure the highest caliber of safety and performance in all aspects of multilateral planning and installation.

Providing a more cost-effective alternative

Our OneTrip StarBurst™ system offers numerous benefits compared to conventional multilateral systems:

Cost effective

The *OneTrip StarBurst* system saves costs because it saves rig time and eliminates junction hardware.

Efficient

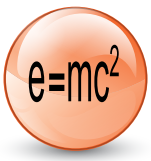
With its one-trip, low-risk TAML Level 4 capability, the system expands the range of depleted wells suited for slot-recovery operations on offshore platforms—an advantage to regions with costly rig rates.

Established

The *OneTrip StarBurst* system features Weatherford's shallow-angle QuickCut™ (SAQC) milling system, which enables it to be run, set, and the window and rathole milled in one trip.

Low risk

The system installs easily and eliminates potential orientation and re-entry difficulties by keeping the original whipstock in the wellbore.



Proven

The system increases production from the main bore and begins production from both laterals.

Time savings

With the SAQC, the system saves two days of rig time. Another day is saved by removing the need to retrieve and replace the whipstock—**reducing cost and accelerating production.**

Combining innovative technologies

Our OneTrip StarBurst™ TAML Level 4 multilateral system incorporates several advanced technologies, including Weatherford's SAQC single-trip, milling system and a unique, single-trip hollow whipstock.

Our shallow-angle QuickCut™ (SAQC) casing-exit system is built for maximum speed and durability.

Designed for quick and safe makeup on the rig floor, it can orient, anchor and mill a long window and deep rathole in a single-trip, permitting the cost-effective use of rotary-steerable assemblies to drill extensive, step-out laterals. Its lead-mill geometry significantly improves penetration rates. The system's robust chassis is tested to 10,000 ft-lb (13,558 N•m) of torque in 9 5/8-in. casing and 25,000 ft-lb (33,895 N•m) in 13 3/8-in. casing.

Our state-of-the-art, single-trip whipstock reduces the duration, associated cost and risk of multilateral operations.

After milling, conventional solid whipstocks are replaced with hollow ones that allow oil and gas to flow through the main wellbore, while permitting access to the lateral bore. Alternatively, the original whipstock is removed, and bent-joint assemblies are used to achieve lateral access. However, the *OneTrip StarBurst* whipstock remains in the wellbore, providing permanent, reliable lateral bore access. Its lug and rail system enable the passage and accurate placement of the bit as it protects the pressure plate from wear—key to enabling the whipstock to stay in place. The whipstock's hollow design allows production access from the main wellbore using standard wireline or tubing conveyance methods. Eliminating whipstock retrieval saves rig time and associated expenses.

The packer enables the use of heavier drilling muds without damaging the reservoir.

Used to seal off and isolate the main bore during lateral drilling, the packer is retrievable, which expedites remediation and contributes to downhole flexibility. Its 3-in. ID allows oil and gas to flow through the tool after perforation of the whipstock. It can be run and, if necessary, retrieved on the same run as the whipstock—saving time. Well suited for harsh drilling environments, it is rated up to 5,000 psi (34.5 MPa) at 300ºF (150ºC) and tested to ISO 14310, grade V3 standards.

Our optional *OneTrip StarBurst* whipstock running tool is designed to reduce stress on the shear bolt, minimizing the risk of mishaps in extended reach wells.

Furthermore, its unique shoulder profile enables it to overcome torque-and-drag-related challenges, which facilitates whipstock running.

The zero-phase, short-length *OneTrip StarBurst* perforating gun maximizes hole size, while limiting perforation depth.

It is designed to allow charges to penetrate the liner, cement and whipstock pressure plate, but not the back of the hollow concave. Highly versatile, it can be run on tubing, coil, wireline or slickline.

Cobalt 60 RA tags enable precise positioning of the perforating gun.

A gamma ray tool logs the RA tags, preinstalled in the whipstock. The logs are used to pinpoint the whipstock's perforating zone, ensuring reliable and complete production access to the main bore reservoir.

A combination of several advanced technologies, our *OneTrip StarBurst* system received two prestigious industry awards for innovation in 2009. In both cases, the review panels consisted of third-party industry experts.

Offshore Technology Conference's (OTC) Spotlight on New Technology Award

Hart Energy Publishing's Meritorious Award for Engineering Innovation

OneTrip StarBurst system simplifies TAML Level 4 multilateral operations

We developed a simple, seven-step process to maximize the technological advantages of our *OneTrip StarBurst* TAML Level 4 multilateral system. The estimated time is provided.

1

Run gauge to remove debris in the wellbore and work string, ensuring that the packer and whipstock assembly clear the wellbore to setting depth.

Estimated Time to Complete

11 hr

2

Run whipstock and packer on the milling assembly. Once they reach setting depth, orient and set the assembly, shear the milling bottomhole assembly (BHA) from the whipstock and determine the milling parameters.

16 hr

3

Mill window and rathole, using our single-trip SAQC milling system. On completion of milling, ream the window to ensure a smooth, full-gauge exit hole and pull the milling BHA out of the hole.

16 hr

4

Drill lateral, immediately after running the drilling assembly—a rotary-steerable system (RSS) or drilling motor—in the hole. The 2° single-angle concave of our unique whipstock enables a smooth transition from the parent wellbore into the lateral section, facilitating the use of longer RSSs to drill long, step-out wells. The multilateral junction can be perforated immediately, depending on drilling objectives.

varies*

5

Install lateral liner anchoring it to the main bore above the window with conventional liner hanger systems; perform standard cementing operations; perforate the lateral reservoir and conduct any necessary sand-control or stimulation procedures. The resulting overlapping concentric casing strings, combined with the cement, ensure a Level 4 multilateral junction with maximum borehole support throughout the life of the well.

varies*

6

Perforate whipstock to re-establish production from the main bore below the junction, using a zero-phase perforating gun with charges specifically designed to provide maximum flow area through the hollow concave. Perforating operations can occur immediately after lateral bore completion or, if preferred, can be conducted later in the life of the well. Perforating can be performed on either wireline or tubing providing maximum flexibility to the operator. Radioactive tags implanted in the whipstock facilitate accurate depth correlation during the perforating process.

4 hr

*Durations for steps 4, 5 and 6 are contingent on numerous factors, including drilling conditions, formation characteristics, length of the lateral and client objectives.

7

Complete well and commence production from the primary and/or lateral wellbores. A wide variety of completion systems, including intelligent completion options, are available and allow for either commingled or isolated production and flow control from both the primary and lateral wells.

varies*

OneTrip StarBurst Product Specifications

System Assembly

Casing OD (in./*mm*)	Milled Window Length (ft/*m*)	Whipstock Angle	Material	Overall Length of Whipstock and Packer (ft/*m*)	System Torque Rating (ft-lb/*N•m*)	Shear Release Values		
						Lead Mill or Running Tool from Whipstock (lb/*kg*)	Whipstock and Packer (lb/*kg*)	Whipstock from Packer (lb/*kg*)
9-5/8 *244.5*	22 *6.71*	2°	Carbon steel	30.8 *9.39*	10,000 *13,558*	40,000 *18,144* 48,000 *21,772* 59,000 *26,762*	120,000 *54,431*	180,000 *81,647*

Milling System

Casing OD (in./*mm*)	Casing Weight (lb/ft, *kg/m*)	Concave OD (in./*mm*)	Lead Mill OD (in./*mm*)	Lead Mill Pilot OD (in./*mm*)	Lead Mill Connection	Secondary Mill OD (in./*mm*)	Secondary Mill Connection	Flex Mandrel Connection	Steering Mill OD (in./*mm*)	Steering Mill Connection
9-5/8 *244.5*	40.0 *59.5*	Special	8-5/8 *219.1*	7 *177.8*	4-1/2-in. Reg Box	Special	4-1/2-in. IF box x 4-1/2-in. Reg pin	4-1/2-in. IF box x 4-1/2-in. IF pin	Special	4-1/2-in. IF box x 4-1/2-in. IF pin
	43.5 *64.7*	8 *203.2*	8-1/2 *215.9*	6-3/8 *161.9*		8-1/2 *215.9*			8-1/2 *215.9*	
	47.0 *69.9*									
	53.5 SD* *79.6 SD*									
	53.5 *79.6*		8-3/8 *212.7*			8-3/8 *212.7*			8-3/8 *212.7*	

*Special drift

Packer

Casing OD (in./*mm*)	Casing Weight (lb/ft, *kg/m*)	Maximum OD (in./*mm*)	ISO 14310 V3 Testing Data					
			For Standard Service			For High Performance		
			Maximum Temperature (°F/°C)	Maximum Pressure Differential		Maximum Temperature (°F/°C)	Maximum Pressure Differential	
				From Above (psi/*kPa*)	From Below (psi/*kPa*)		From Above (psi/*kPa*)	From Below (psi/*kPa*)
9-5/8 *244.5*	40.0 *59.5*	8.437 *214.3*	275 *135*	2,500 *17,237*	3,000 *20,684*	Not available		
	43.0 *64.7*			3,500 *24,132*	5,000 *34,474*			
	47.0 *69.9*					302 *150*	5,000 *34,474*	
	53.5 SD* *79.6 SD*	8.350 *212.1*						

*Special drift

Perforating Gun

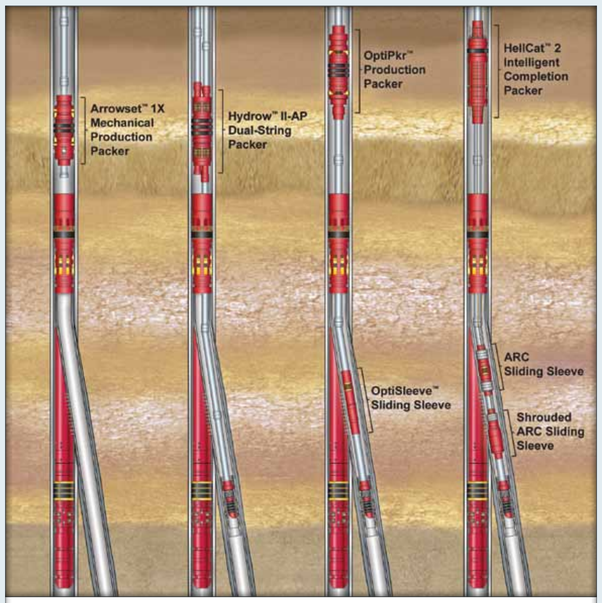
Nominal Liner OD (in./*mm*)	Perforating Gun OD (in./*mm*)	Standard Length (ft/*m*)	Shot Density (spf)	Charge Type	Number of Perforations	Gun Phase	Post-Perforation Flow Area (in.²/*cm²*)
7 *177.8*	3.375 *85.7*	12 *3.66*	4	HMX	33	0°	2.8 *18.1*

System Options

- High-pressure/high-temperature options are available.
- Running tool is available for extended-reach wells, where assembly must be pushed to setting depth.

OneTrip StarBurst Completion Examples

The *OneTrip StarBurst* multilateral system provides a wide range of completion options. You can choose independent or commingled production of the wellbores with various downhole or remotely operated flow-control options. With lateral full-bore access, you can use conventionally sized, reliable and proven completion products. Following are examples of completion systems that are possible with the *OneTrip StarBurst* system.



Our simple single-string completion provides commingled production from both wellbores.

By using a conventional dual-packer and lateral-seallbore-packer configuration, isolated production from each wellbore is possible.

Adding a Weatherford sliding-sleeve assembly provides reliable downhole flow control and production-isolation capability for each wellbore.

Surface flow control and production isolation are available by adding Weatherford's line of intelligent completion packers and sliding sleeves.

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The Art of Intervention

Weatherford's *OneTrip StarBurst* system is the world's first one-trip, TAML Level 4 multilateral system. To learn how it can reduce the duration, associated cost and risk of your TAML Level 4 multilateral installations, contact a Weatherford representative, or visit **weatherford.com/multilaterals.**

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