

Delivering Differentiated Business Value from the PI System Enabled NOV Max™ Industrial End-to-End IIOT Platform

Carl Fehres, VP Engineering Technology





Leading oilfield equipment and technology provider

Dependable partner in high-risk, high-cost world

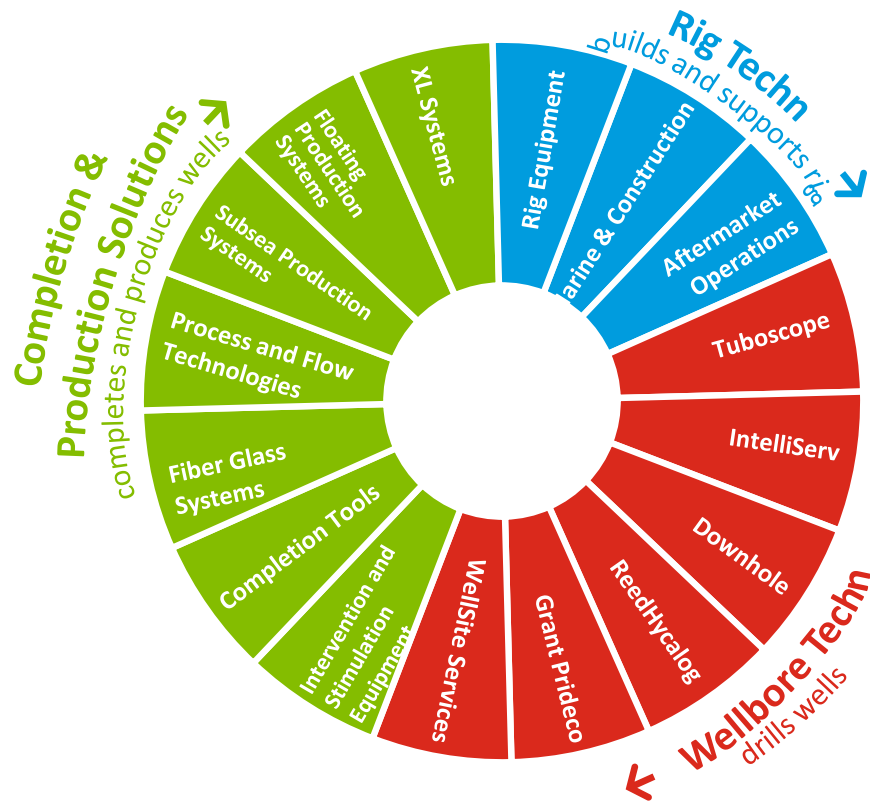
Capable of supporting **full-field development** needs

Committed to **lowering industry's** marginal cost per barrel

NOV at a Glance



Supporting Wells Across their lifecycle



Corporate Engineering Data

Center of Excellence

Charged with bringing IIOT and Big Data technologies to NOV to support the rapid development of new and enhanced products and services.

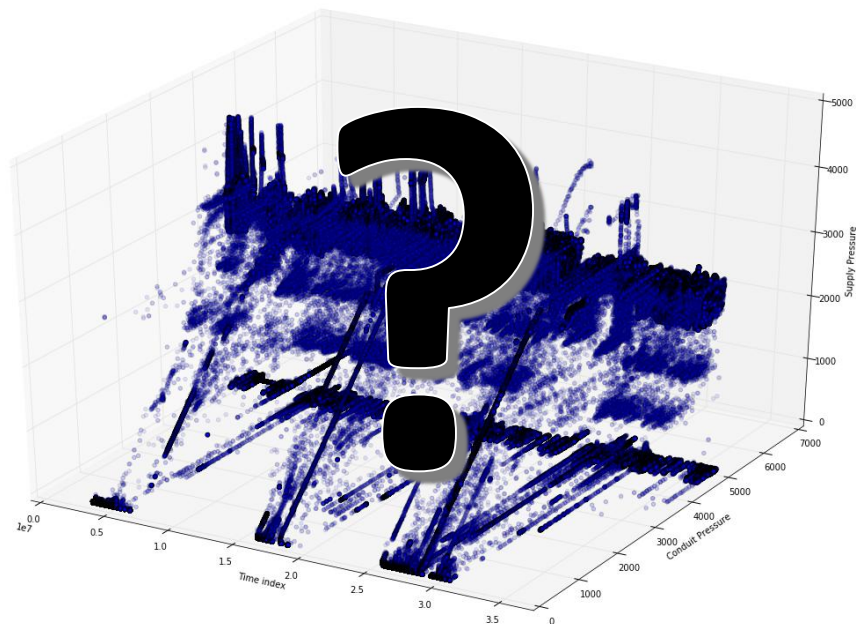


Big Data...Big Whoop

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6	B_COND_PRES	2014-10-22 00:00:14	4952.000000000000000000
7	B_COND_PRES	2014-10-22 00:00:16	4957.000000000000000000
8	B_COND_PRES	2014-10-22 00:00:21	4958.000000000000000000
9	B_COND_PRES	2014-10-22 00:00:24	4952.000000000000000000
10	B_COND_PRES	2014-10-22 00:00:26	4958.000000000000000000
11	B_COND_PRES	2014-10-22 00:00:28	4953.000000000000000000
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420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000



7909 Parkwood Circle
Houston, TX 77036

Dear Customer,

Your regulator valve is
going to fail in 18 days.
Spare part enclosed.

Rest Regards,

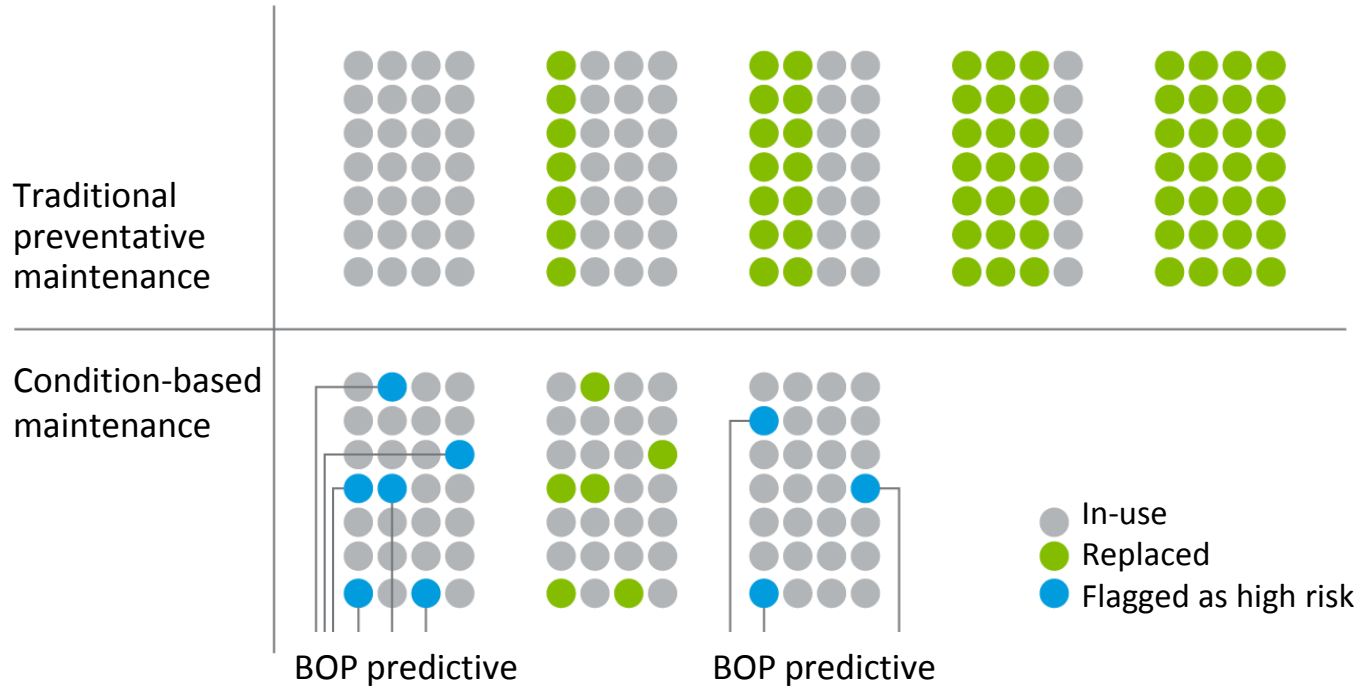
NOV



Asset performance management

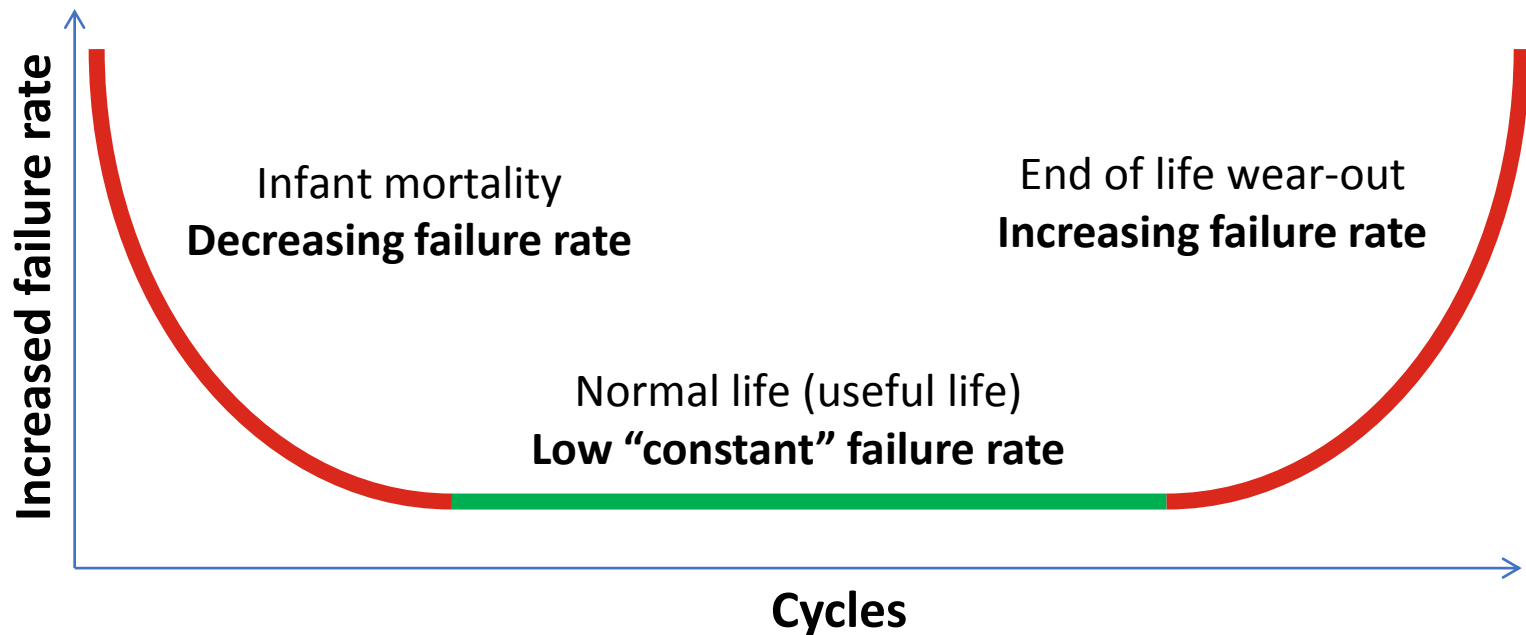
BOP regulator valve

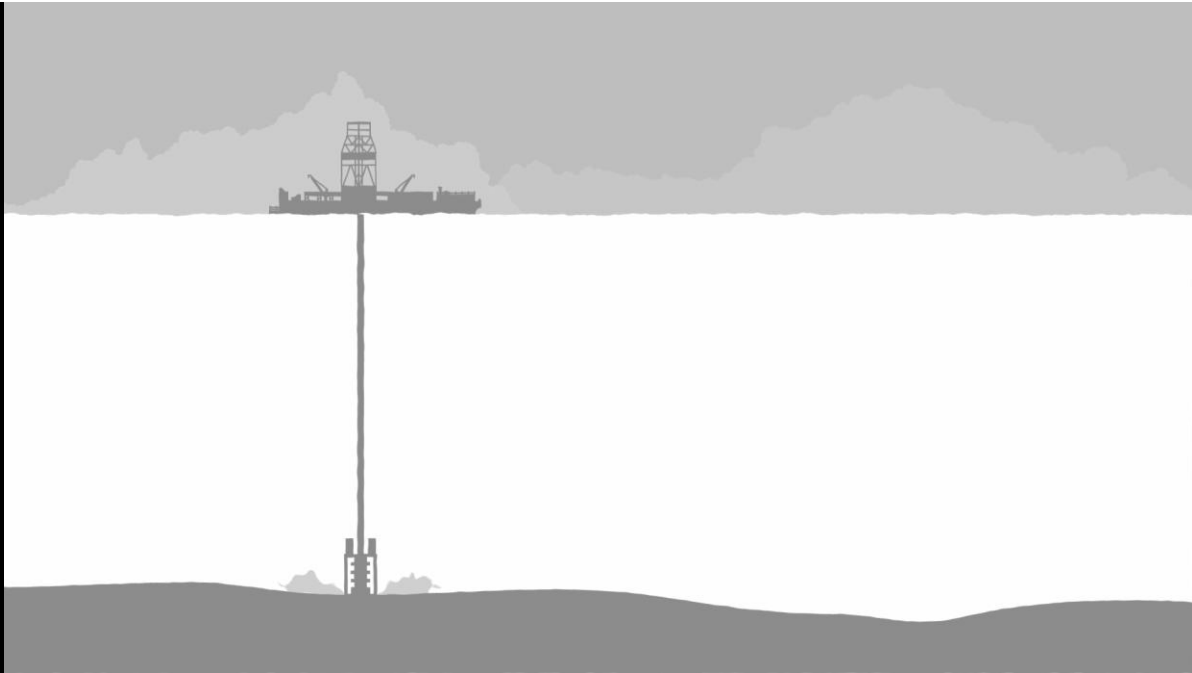
Traditional v. Condition-Based Maintenance



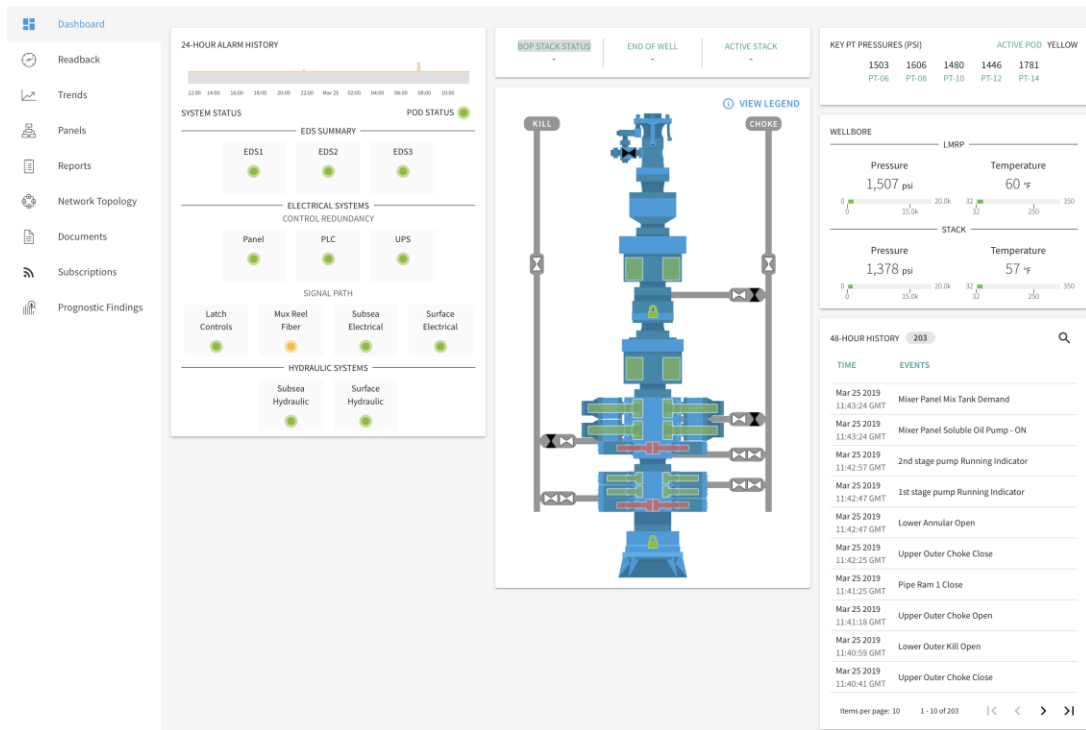
Condition-Based Maintenance: the Bathtub Curve

Hypothetical failure rate versus time

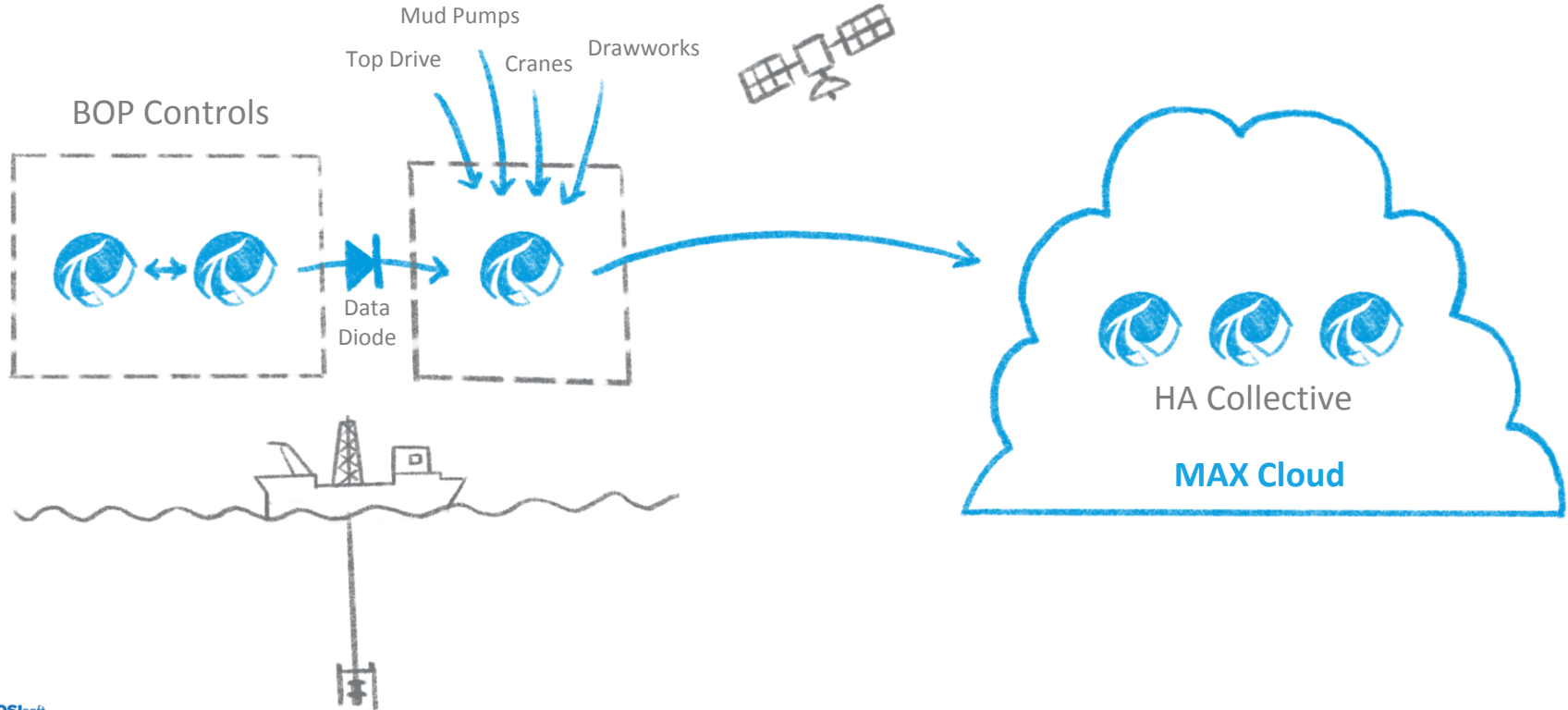




RigSentry BOP



RigSentry BOP Data Pathway



RigSentry BOP Analytics Engine

Elements

ENV-Prefix
RIG.NOV_d
RIG.NOV_c
RIG.NOV_b
RIG.NOV_a
RIG.NOV
RIG.NOV_1
RIG.NOV_2
BOPSentry
Dashboard
Active Pod
ConnectionStatus
Position History
Stack
Casing Shear Rams
Choke Isolation Valve
Connector
Flarepoint
Inner Gas Relief Valve
Kill Isolation Valve
Lower Annular
Alarms
Lower Inner Choke
Lower Inner Kill
Lower Outer Choke
Lower Outer Kill
Middle Inner Choke
Middle Outer Choke
Mud Boost Valve
Outer Gas Relief Valve
Alarms

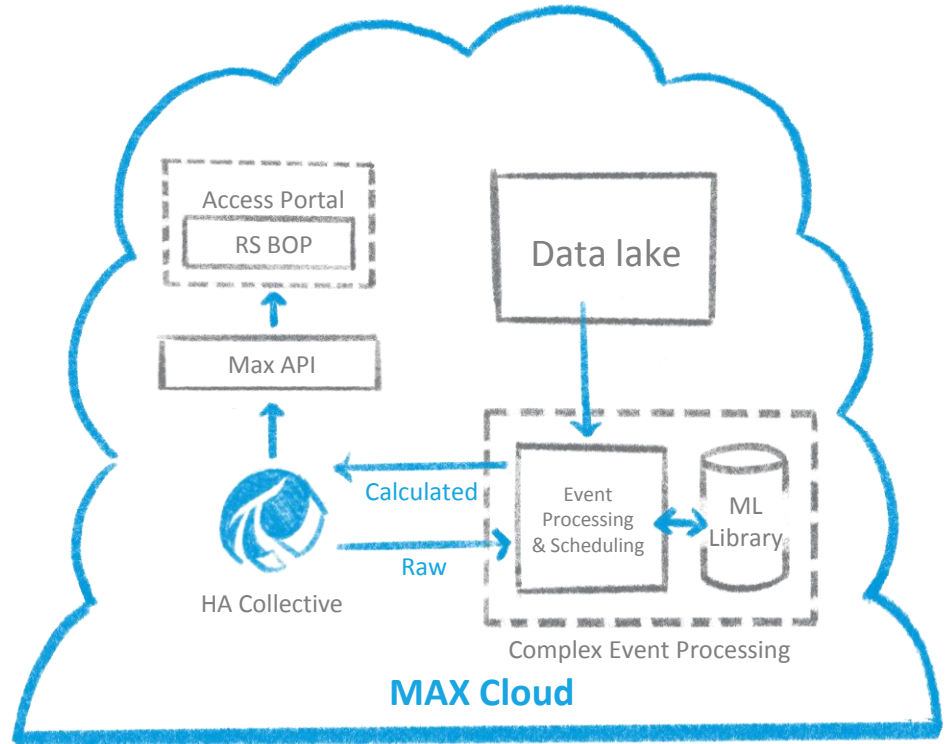
Lower Annular

General Child Elements Attributes Ports Analyses Notification Rules Version

Excluded attributes are hidden.

Filter

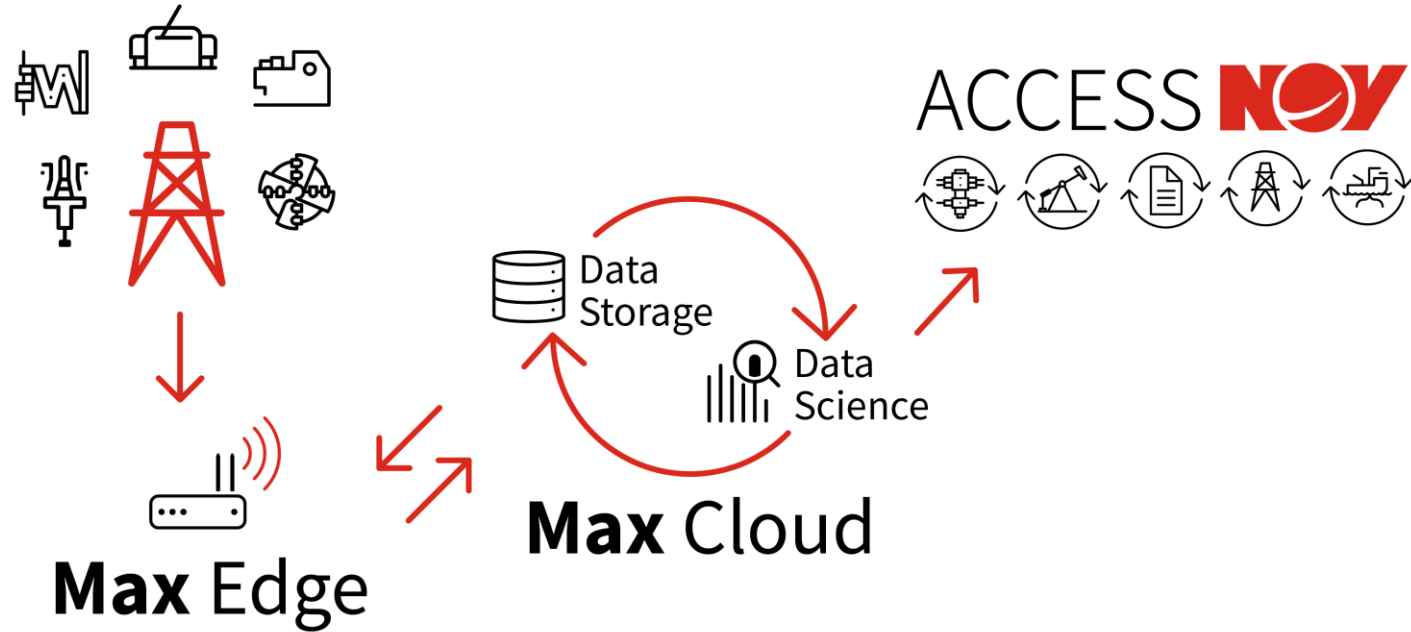
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Order	5	1/1/1970 12:00:00 AM	S
Type	LowerAnnular	1/1/1970 12:00:00 AM	S



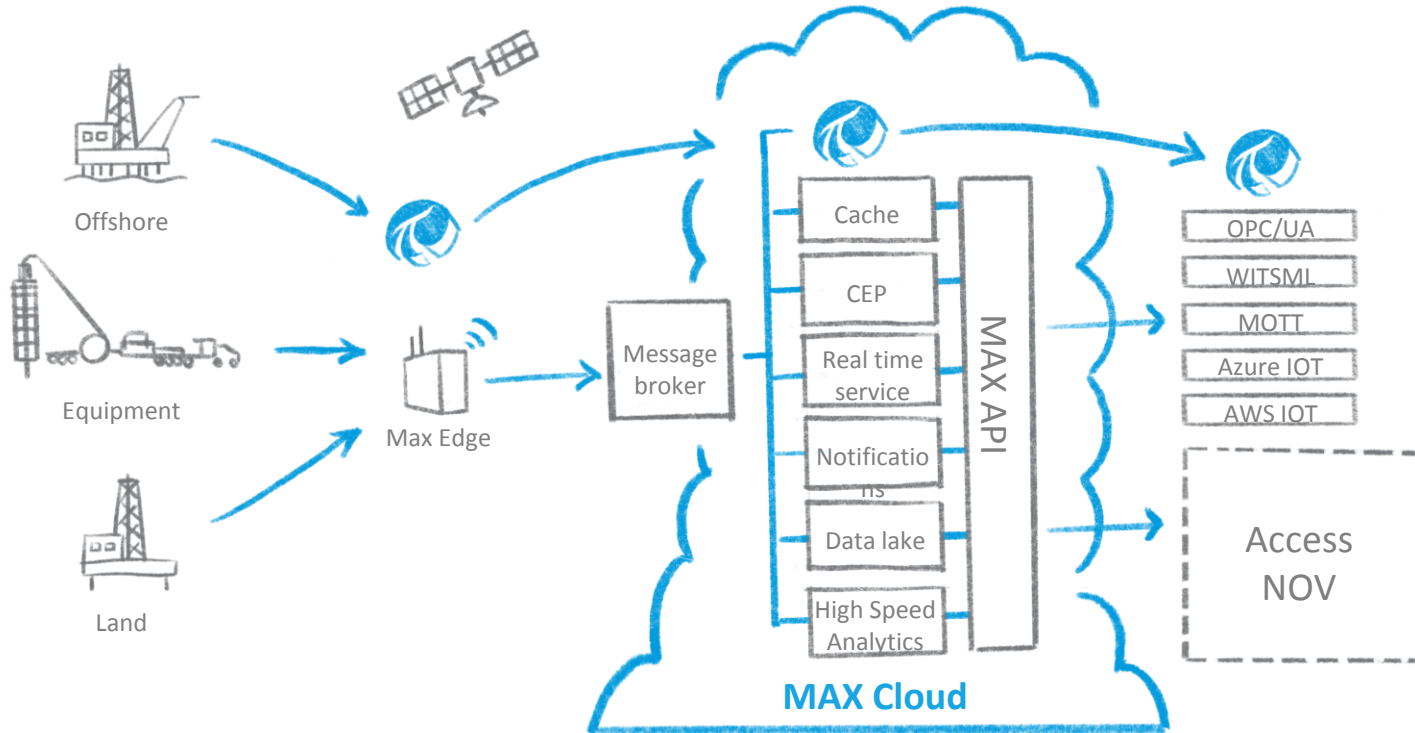


The Challenge

NOV's Max and Access Technology



NOV's Max and Access Technology



NOV's Max and Access Technology

Max Edge

TLS Secure Communication

Cert-based authentication / authorization

Optional VPN for private networks

Military grade AES256 encryption

Industrial OS

Remotely Manageable at Scale

**20+
inbound industrial
protocols**

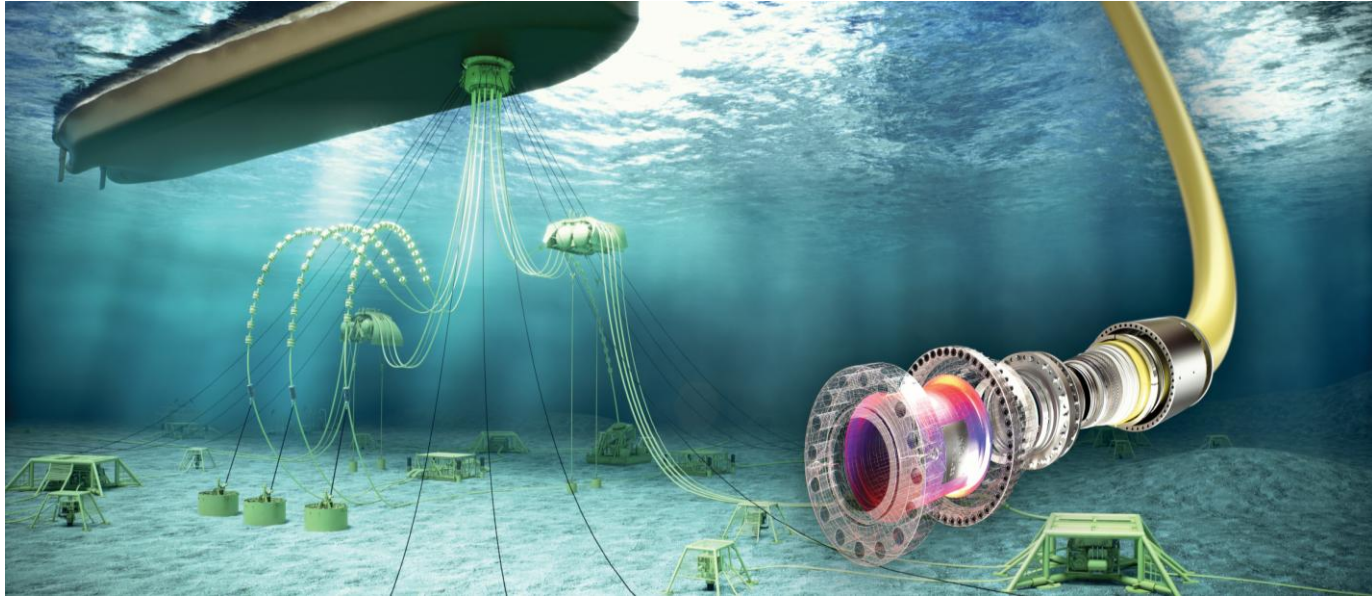


**OSISoft PI
OPC/UA
MQTT
Azure IoT Hub
AWS IoT**

NOV's Max and Access Technology



Flexible Riser System



- Transport oil & gas from well to FPSO/fixed asset
- Service life 20-40 years

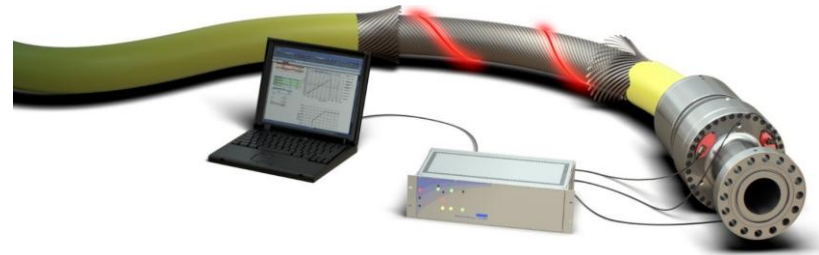
OptiFlex™

- **Condition monitoring of flexible risers**

- Continuous and real-time monitoring
- Built into pipe structure during manufacturing

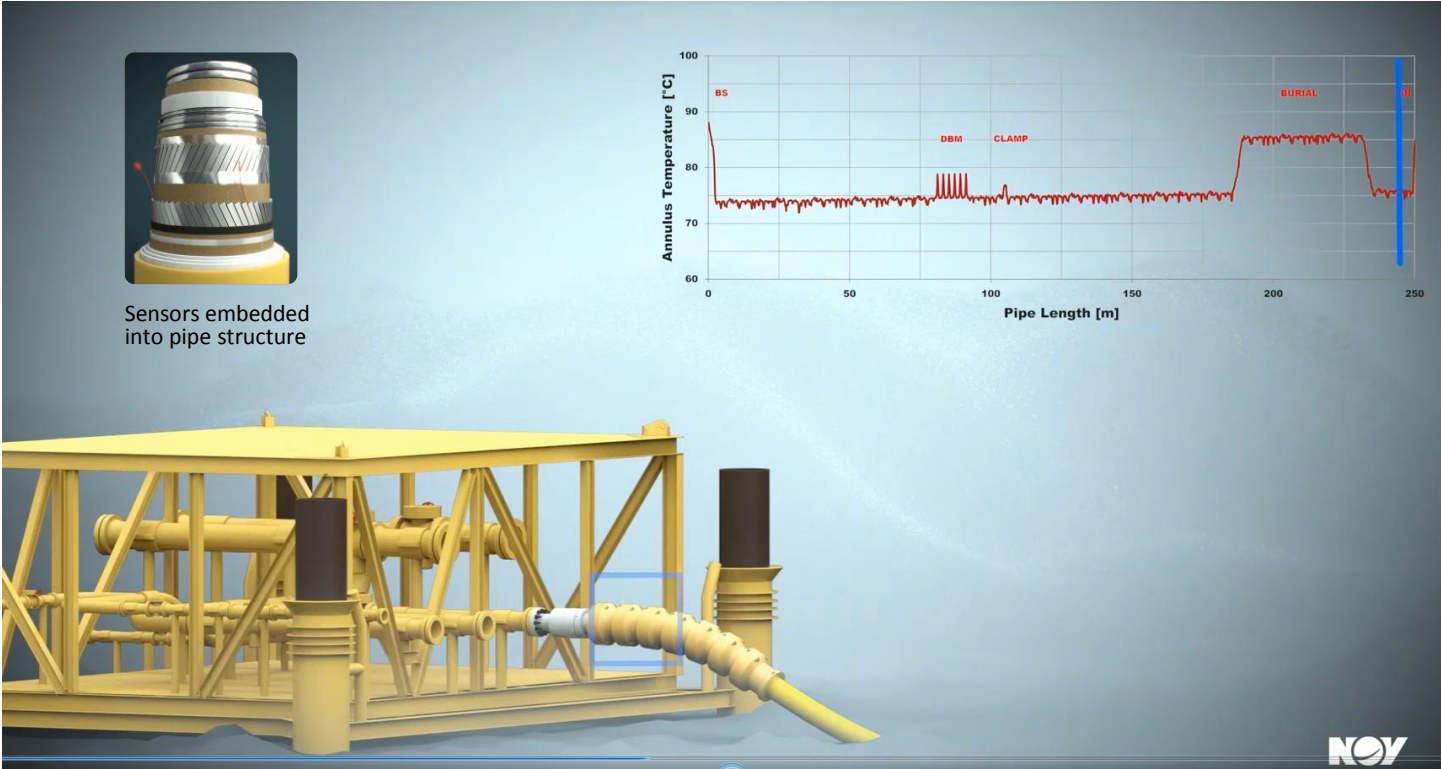
- **Key monitoring output:**

- Outer sheath breach
- Displacement of ancilliaries
- Hot/Cold spots
- Accumulated fatigue damage



Detect the most common failure modes observed in flexible pipes!

Illustration of event detection method



Monitoring of Outer Sheath Integrity

Time and Position of Breach

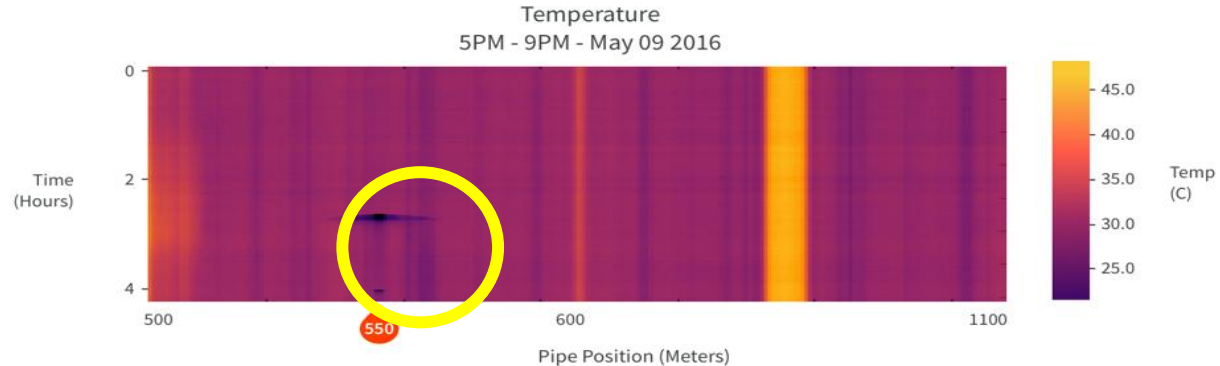


EVENT LOG 1 EVENT

View All

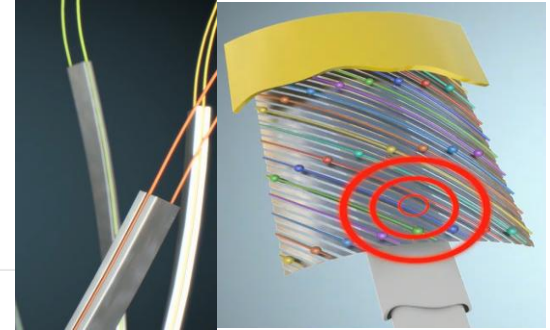
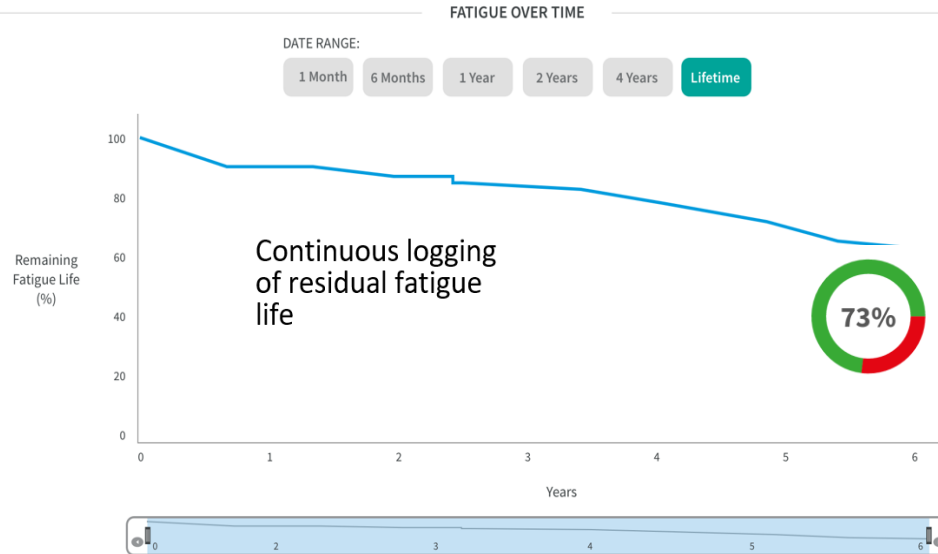
Search events...

DATE	LOCATION	TYPE	DESCRIPTION
MAY 9, 2016 5:20:05 PM	550m	Outer Sheath Breach	Breach detected with 5 degree temperature drop. Email alert sent to user@company.com

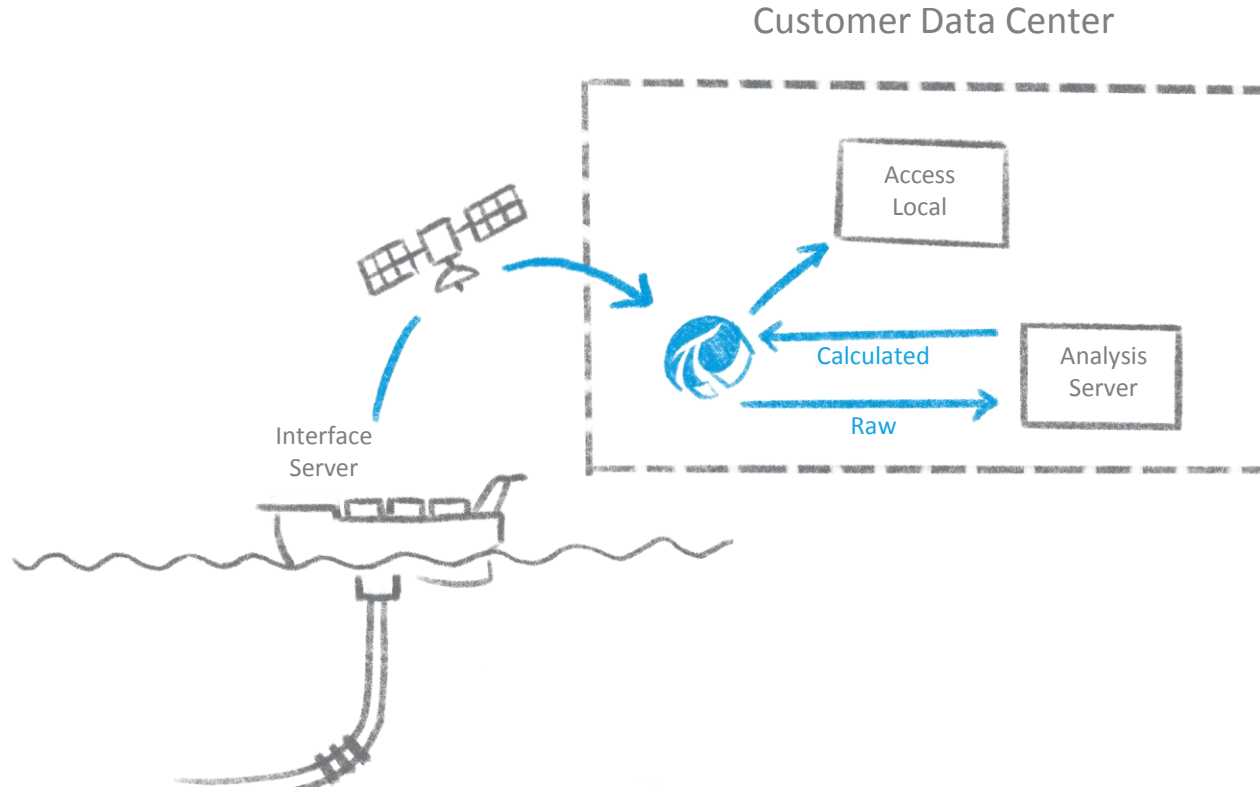


OptiFlex™ Strain Monitoring

- Embedded in tensile wires
- Data for lifetime extension



Optiflex Data Architecture



GoConnect for Intervention Stimulation Equipment



Drilling vs Completion Maintenance Cost

Land Rig

\$20 M

\$0.8 M

4%

Frac Spread

\$35 M

\$9 M

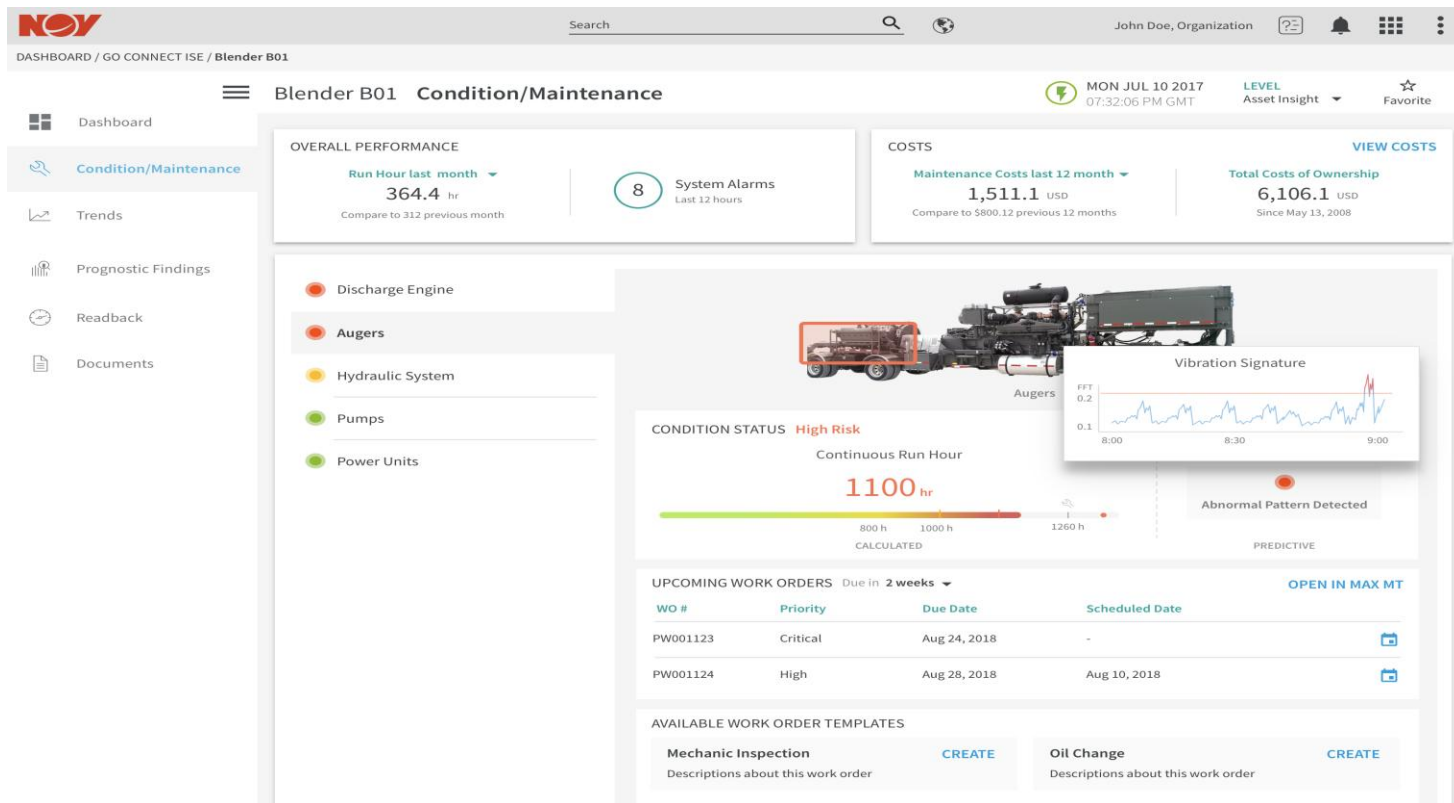
25%

Capital Investment

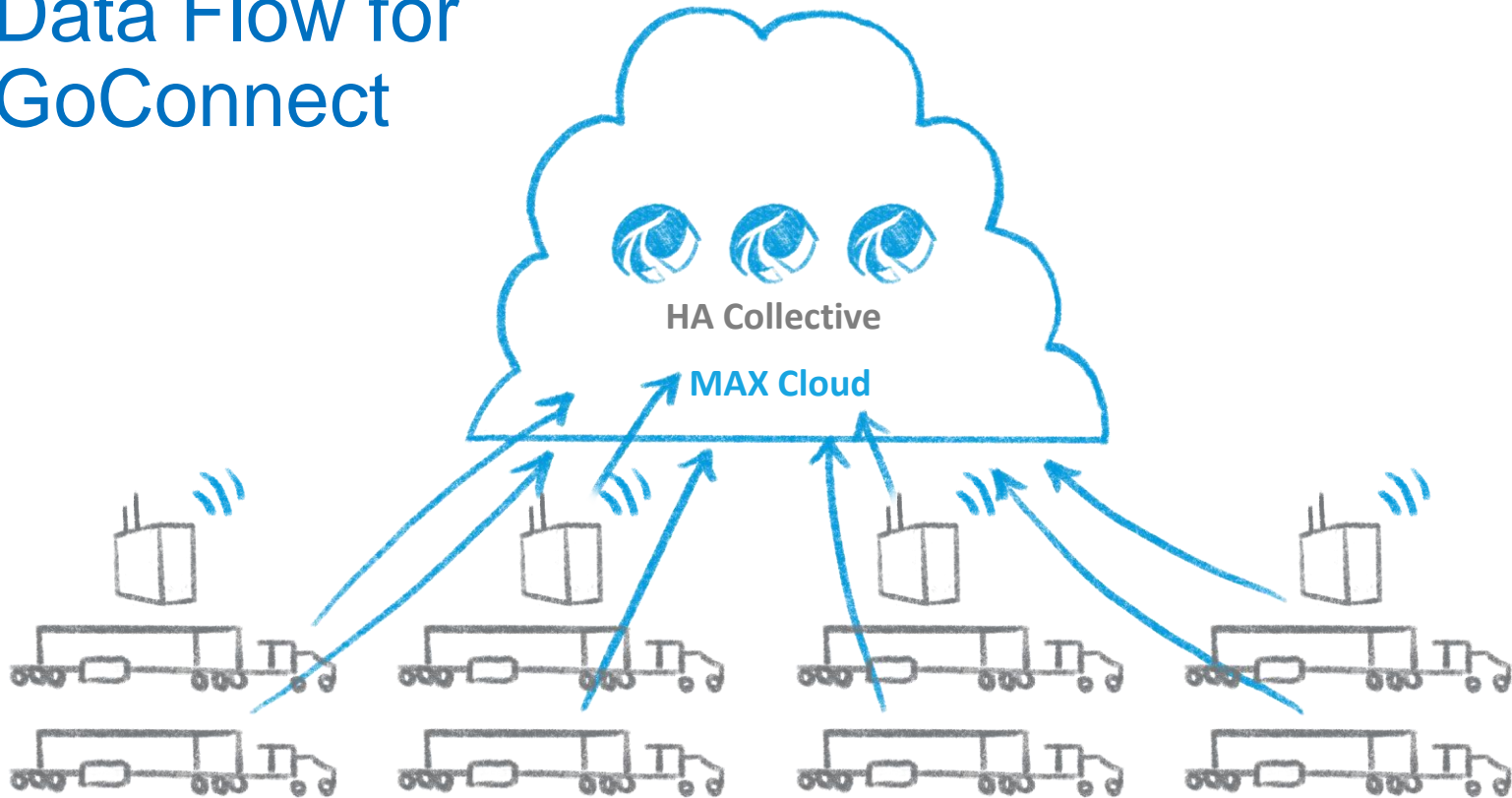
Yearly maintenance Cost

Ratio

GoConnect for Intervention Stimulation Equipment



Data Flow for GoConnect

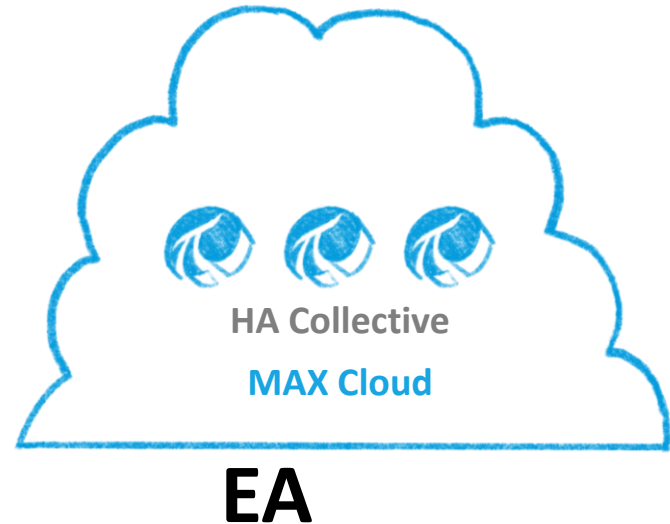
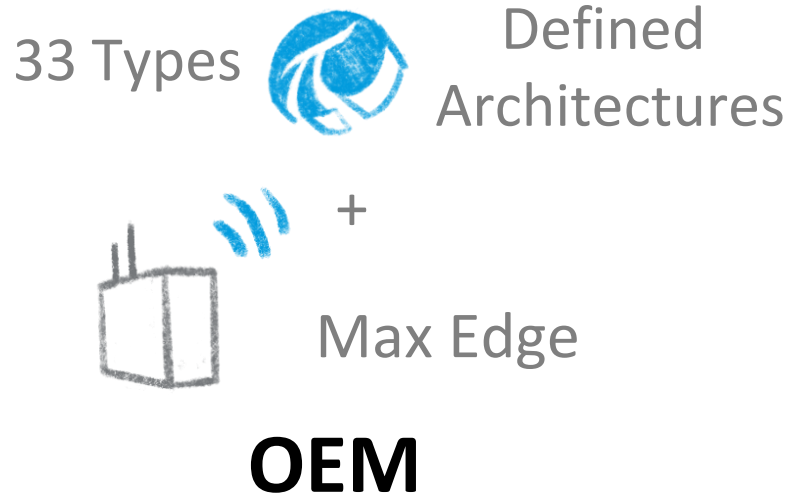


Our Journey with OSIsoft – Key Enablers

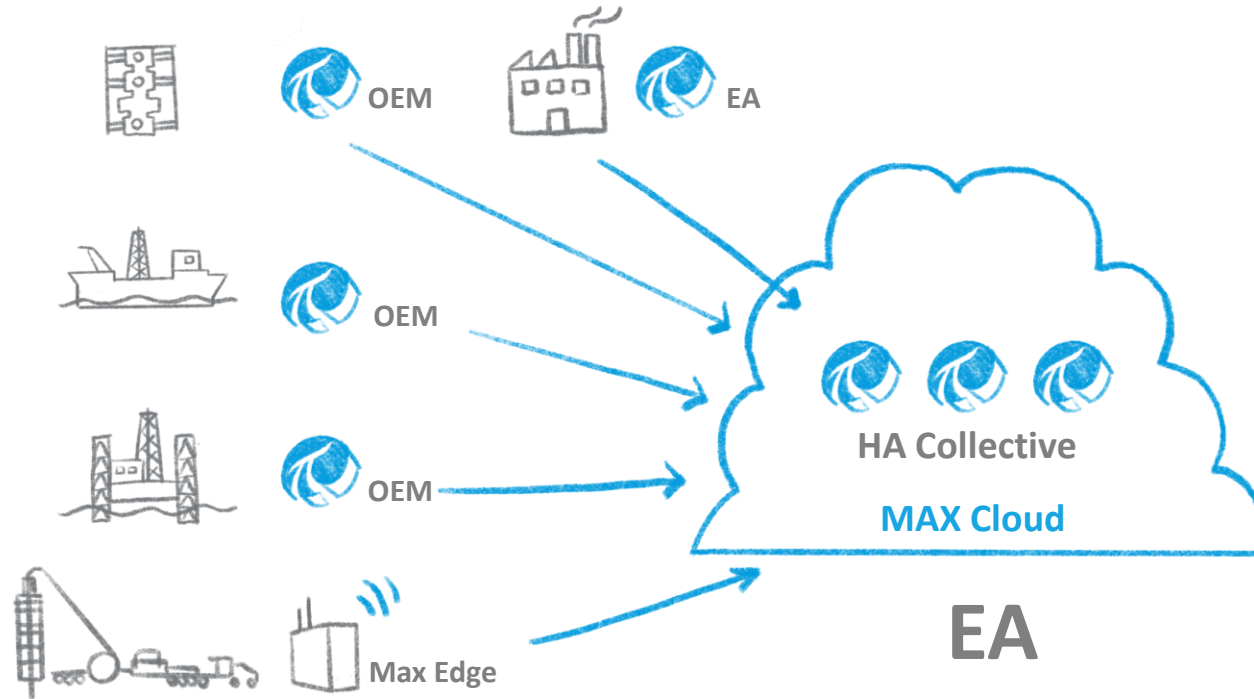
1. Speed to Market
2. The Enterprise Agreement
3. The Value of PI AF, PI Notifications and Calculations
4. Compatibility
5. License Flexibility
6. Partnership

Partnership Overview – “Hybrid OEM/EA”

Asset Classes:



Partnership Overview – A “Hybrid OEM/EA”



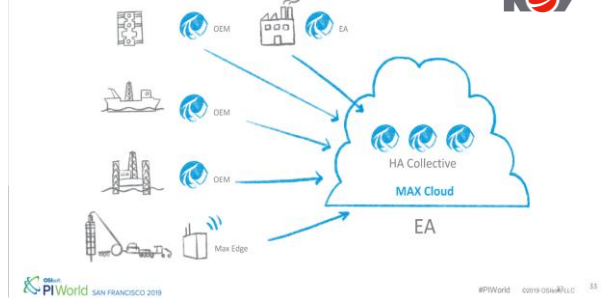


We enable a data ecosystem

Delivering Differentiated Business Value from the PI System Enabled Max™ IIOT Platform



Partnership Overview – Hybrid OEM/EA



CHALLENGE

Leverage new digital technologies to deliver transformative business value to internal and external customers

- Diversity of assets, solutions, and services – very large to very small
- Capture the opportunity to leverage new digital technologies like IIOT, advanced analytics, and cloud
- Need flexibility in commercial model to support a multitude of scenarios

SOLUTION

Created a flexible, ‘hybrid’ OEM/EA commercial model with a “share” based framework

- Created 33 different OEM packages with defined PI System license basis and a: “share” price, “share log” & “share block”
- Rolled out an EA for the NOV Max™ Cloud and associated NOV infrastructure
- Included NOV manufacturing and test facilities

RESULTS

Industry leading Max™ Edge, Max™ Cloud, and Access NOV

- Reduction in NOV “smart asset” O&M costs & Increase in reliability
- “layers of analytics” from the edge, PI AF to advanced analytics in Max Cloud
- Delivering advanced digital capabilities across the NOV diverse portfolio of divisions and offerings at scale & pace

Speaker Information



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NOV
Carl.Fehres@nov.com

Questions?

Please wait for
the **microphone**

State your
name & company



Please remember

TO DOWNLOAD
APP, SEARCH
OSISOFT



Download on the
App Store



GET IT ON
Google Play



THANK YOU

OSIsoft.
PIWorld

謝謝 KEA LEBONA
TAPADH LEIBH 고맙습니다
BAЯPЛAЛAА MISAOTRA ANAO
DZIĘKUJĘ CI NGIYABONGA TEŞEKKÜR EDERIM GRACIES
OBRIGADO شڪرا SALAMAT
DANKON TANK TAPADH LEAT
DANKIE TERIMA KASIH
KÖSZÖNÖM
СПАСИБО
PAKMET CIZGE
GO RAIBH MAITH AGAT
БЛАГОДАРЯ GRACIAS
ТИ БЛАГОДАРАМ MAHADSANID
TAK DANKE
RAHMAT MERCI
HATUR NUHUN
CẢM ƠN BẠN
WAZVIITA
FALEMINDERIT
DANK JE ΕΥΧΑΡΙΣΤΩ GRATIAS TIBI
AČIŲ SALAMAT MAHALO IĀ 'OE TAKK SKALDU HA
GRAZZI PAKKA PĒR PAXMAT CAĞA
SIPAS JI WERE TERIMA KASIH
UA TSAUG RAU KOJ
ТИ БЛАГОДАРАМ
СИПОС
MULTUMESC
FAAFETAİ
ESKERRIK ASKO
HVALA ХВАЛА ВАМ
TEŞEKKÜR EDERIM
HVALA
DZЯKYI
GRAZIE
DI OU MÈSI
ĎAKUJEM
MATUR NUWUN