Internet of Things
FTC Workshop
November 19, 2013
Segment 1
Transcript

[first few minutes are missing]

HAVE WITH OTHER
OBJECTS AS WELL AS WITH
OURSELVES.
ALMOST ANYTHING TO WHICH A
SENSOR CAN BE ATTACHED CAN
BECOME A NOTICED IN UBIQUITOUS
NETWORK, TRANSMITTING IN
REALTIME.
THERE ARE ALREADY 3 BILLION SUCH
SENSORS AND SOME WOULD EXPECT
THEM TO INCREASE TRILLIONS.
FIVE YEARS AGO, FOR THE FIRST
TIME, MORE THINGS THAN PEOPLE
CONNECTED TO THE INTERNET.
BY 2020, AN ESTIMATED 90% OF
CONSUMER CARS WILL HAVE SOME
SORT OF VEHICLE PLATFORM.
UP FROM 10% TODAY.
AND IT'S ESTIMATED THAT BY 2015,
THERE WILL BE 25 BILLION THINGS
LOOKED UP TO THE INTERNET.
BY 2020, WE'RE TOLD THE NUMBER
WILL RISE TO 50 BILLION.
THE INTERNET IS POISED TO
TRANSFORM MANUFACTURING BUSINESS
AND AGRICULTURE.
MUCH OF THIS CAN OCCUR WITHOUT
CONNECTING DATA OR INDIVIDUALS.
BUT, AREN'T MONTH AN AGING
FAMILY MEMBER, REDUCE OUR
MONTHLY UTILITY BILLS AND ALERT
US THAT WE'RE OUT OF MILK.
THE BENEFITS TO CONSUMERS WILL
NO DOUBT BE GREAT BUT THESE
BENEFITS COME WITH UNDENIABLE
PRIVACY RISKS.
CAN ALSO COLLECT, TRANSMIT AND

COMIEL INFORMATION ABOUT YOUR ACTION HE.
-- COMPILE INFORMATION IS ABOUT YOUR ACTIONS.
AS I SEE IT THE EXPANSION OF THE INTERNET PRESENTS THREE MAIN CHALLENGES TO CONSUMER PRIVACY: FIRST, IT FACILITATES THE COLLECTION OF VAST AMOUNT OF CONSUMER DATA.
SECOND, IT OPENS THAT DATA TO USES THAT ARE UNEXPECTED BY CONSUMERS.
AND THIRD, IT PUTS THE SECURITY OF THAT DATA AT GREATER RISK.
I'D LIKE TO OFFER MY PERSPECTIVE ON EACH THESE CHALLENGES AND I KNOW THAT OTHERS ARE GOING TO BE ADDRESSING THEM THROUGHOUT THE COURSE OF THE DAY AS WELL.
LET ME TERM TO THE UBIQUITOUS COLLECTION OF DATA THAT THE INTERNET WILL UNABLE.
WE'RE TOLD TO EXPECT THAT IN THE NOT TOO DISTANCE FUTURE MANY IF NOT MOST ASPECTS OF OUR EVERYDAY LIVES WILL BE DIGITAL STORED.
THE ENORMOUS TROVE WHEN PATCHED TOGETHER MAY PRESENTLY A DEEPLY PERSONAL AND STARTLINGLY COMPLETE PICTURE OF EACH OF US.
OUR HEALTH, OUR RELIGIOUS PREFERENCES, OUR FINANCIAL CIRCUMSTANCES AND OUR FAMILY AND FRIENDS.
OUR PERSONAL PROFILES WILL BE PARSED, AUGMENTED AND SHARED AS THEY TRAVEL THROUGH AN INTERCONNECTED MOSAIC OF COMMERCE.
AS ONE TECH WRITER HAS EXPLAINED IN VERY TECHNICAL TERMS: "THE INTERNET OF THINGS WILL MEAN REALLY BIG DATA."
AS STORES OF THE DATA THEY COLLECT AND USE, THAT MEANS

ADHERENCE TO THE THREE CORE BEST
PRACTICES ESPOUSED BY THE FTC.
PRIVACY OF DESIGN, CONSUMER
CHOICE.
FIRST PRIVACY OF DESIGN.
COMPANIES SHOULD BUILD IN
CONSUMER PRIVACY FROM THE VERY
OUTSET.
PRIVACY SHOULD BE INTEGRAL, WITH
PRIVACY HARD-CODED IN.
COMPANIES SHOULD ALSO CONSIDER
HOW TO SHIFT THE BURDEN OF
PRIVACY PROTECTION OFF THE
SHOULDERS OF CONSUMERS.
FOR EXAMPLE, ARE THERE DEFAULTS
OR OTHER DESIGN FEATURES THAT
CAN HELP CONSUMERS FROM -- TO
PREVENT CONSUMERS FROM SHARING
DATA, AS EASY TO USE AS THE
UNDERLYING PRODUCT OR SERVICE.
THE SECOND CENTRAL PRINCIPLE IS
CONSUMER CHOICE.
SHOULD GIVE CONSUMERS CONTROL
OVER THEIR DATA.
OFTEN, THIS WILL MEAN JUST IN
TIME CHOICE.
AND THAT BRINGS ME TO THE THIRD
AND RELATED PRINCIPLE WHICH RUNS
THROUGH ALL OF THE FTC'S PRIVACY
RECOMMENDATIONS.
TRANSPARENCY.
TRANSPARENCY IS CRUCIAL.
AS MORE AND MORE OF OUR DEVICE
HE BECOME SMARTER AND
SENATORRER, IT'S ESSENTIAL WE
KNOW AS MUCH ABOUT THEM AS THEY
KNOW ABOUT US.
THAT WE UNDERSTAND WHAT
INFORMATION THE DEVICES ARE
COLLECTING, AND HOW IT'S BEING
USED OR SHARED.
NOW, I DON'T PRETEND THAT THESE
PRIVACY PRACTICES ARE A PAN SEE PANACEA.
PRIVACY ON THE WEB IS ALREADY
VERY CHALLENGING.
EVEN ON OUR WEBSITE OFTEN OUR

DESKTOP COMPUTER, CONSUMERS OFTEN LACK ABILITY TO UNDERSTAND HOW THEIR DATA IS COLLECTED AND USED.
ON A SMARTPHONE, THE SMALL SCREEN EXACERBATES THIS ISSUE, AS THE BOUNDARIES TWIN THE VIRTUAL AND PHYSICAL WORLDS DISAPPEAR, EVERYDAY OBJECTS ARE COLLECTING AND SHARING DATA ABOUT THEM.
HOW CAN THESE OBJECTS PROVIDE JUST IN TIME NOTICE AND CHOICE IF THERE'S NO USER INTERFACE AT ALL?
AND WILL WE BE ASKING CONSUMERS TO MAKE AN UNREASONABLE NUMBER OF DECISIONS ABOUT THE COLLECTION AND USE OF THEIR DATA?
THE ANSWERS TO THESE AND OTHER QUESTIONS MAY NOT BE SIMPLE BUT IN MY MIND, IS NOT WHETHER THE SIMPLIFIED CHOICE AND TRANSPARENCY SHOULD APPLY TO THE INTERNET OF THINGS, THE QUESTION IS HOW TO ADAPT THEM TO THE INTERNET OF THINGS.
THE UBIQUITOUS COLLECTION OF DATA IN OUR WILD WORLD INEVITABLY GIVES RISE TO CONCERNS ABOUT HOW ALL OF THIS PERSONAL INFORMATION IS USED.
IS THE DATA USED SOLELY TO PROVIDE SERVICE TO THE CONSUMER?
OR WILL THE INFORMATION FLOWING IN FROM OUR SMART CARS, SMART DEVICES AND SMART CITIES, JUST SWELL THE OCEAN OF BIG DATA, ALLOWING THE CREATION OF PROFILES ABOUT CONSUMERS AND PREDICTIONS ABOUT THEIR BEHAVIOR?
CONNECTED CARS MAY DIRECT EMERGENCY RESPONDERS TO AN ACCIDENT.

BUT WILL THE DATA TRANSMITTED BE SHARED WITH YOUR INSURER WHO MAY RAISE YOUR RATE OR CANCEL YOUR POLICY?
YOUR SMART TV MAY TRACK WHETHER YOU WATCH MASTERPEACE THEATER OR THE KARDASHIANS OR WILL IT BE SHARED WITH SCHOOLS OR DATA CONNECTORS W.H.O. WILL PUT THAT NUGGET TOGETHER, WHO WILL PUT THAT TOGETHER WITH YOUR SECURITY GATE, YOUR HEART MONITOR AND YOUR SMARTPHONE THAT WILL PAINT OPICTURE OF YOU THAT YOU WILL NOT SEE BUT WHO OTHERS WILL.
THAT MAY PLAY POOH PART IN WHETHER YOU RECEIVE CERTAIN SALE OFFERS OR WHERE YOUR CALL TO CUSTOMER SERVICE IS ROUTED.
AND FINALLY LET ME MOVE ON TO SECURITY.
ANY DEVICE CONNECTED TO THE INTERNET IS POTENTIALLY VULNERABLE TO HIJACK AND COMPANIES NEED TO BUILD SECURITY INTO THEIR PRODUCTS.
NO EXCEPTIONS.
IN THE INTERNET OF THINGS, DATA SECURITY WILL TAKE ON NEW IMPORTANCE AS IT MAY AFFECT THE SAFETY OF OUR CARS, MEDICAL DEVICES AND HOMES.
COMPANIES THAT DON'T PAY ATTENTION TO THEIR SECURITY PRACTICE MAY FIND THAT THE FTC WILL.
AS A COMPANY CALLED TREND NET RECENTLY LEARNED.
WE ALLEGED THE IP CONNECTED SECURITY CAMERAS ENABLED THE HACKER¦ TO GET HIS HANDS ON THE LIVE FEEDS OF 700 CAMERAS AND MAKE THEM AVAILABLE ON THE INTERNET.
THE FTC IS PARTICULARLY VIGILANT IN SAFEGUARDING HEALTH

INFORMATION.
I HIGHLIGHT THIS, FROM WEARABLE FITNESS DATA, OR SLEEP OR BLOOD PRESSURE TO SMART PILLS THAT TELL DOCTORS WHEN WE'RE TAKING OUR MEDICINE.
THESE DEVICES ARE POISED TO REVOLUTION AIZ HEALTH CARE BUT WE ALSO HAVE TO TAKE -- WRONG HANDS.
AND THIS IS AMONG THE CRUCIAL SUBJECTS THAT WE'RE GOING TO BE DISCUSSING DURING TODAY'S PROGRAM.
ARE SO IN CLOSING, LET ME END WHERE I GAP.
WE'RE AT THE DAWN OF THE INTERNET OF THINGS.
AND LIKE ALL DAWNS, THE FIRST LIGHT OF THE NEW DAY BOTH ILLUMINATES AND CASTS SHADOWS.
WE SEE THE PROMISE OF IMPROVED SAFETY, HEALTH AND EFFICIENCY AS THE ITEMS OF OUR EVERYDAY LIFE COME ALIVE.
BUT WE'RE ALSO ALERT TO THE CHALLENGE OF PROTECTING IN A CYBER ENVIRONMENT THAT BREATHES OUR PERSONAL DATA LIKE OXYGEN.
CONSUMERS WILL ENTHUSIASTICALLY INVITE THE INTERNET OF THINGS INTO HOAXTION AND WORKPLACES ONLY IF CONFIDENT THAT THEY REMAIN IN CONTROL OF THEIR DATA.
I KNOW WE CAN FIND THE WAY TO REAP THE REWARDS OF OUR CONNECTED FUTURE WHILE MITIGATING THE PRIVACY ISSUES IT BRINGS.
THE CHALLENGE FOR TODAY IS HOW.
I WANT TO THANK YOU FOR THE PLEASURE OF JOINING ME IN THAT ENDEAVOR.
THANK YOU.

>> OKAY OUR NEXT SPEAKER ISKEITH MARZULLO, HE'S THE
DIRECTOR OF THE DIVISION OF
COMPUTER AND NETWORK SYSTEMS, OF
THE NATIONAL SCIENCE FOUNDATION.
KEITH.
>> GOOD MORNING.I'M VERY HAPPY TO BE HERE TO
INTRODUCE THIS WORKSHOP ON THE
INTERNET OF THINGS.
I'VE BEEN ASKED TO GIVE THE SORT
OF TECHNICAL FRAMING OF THIS.
I KNOW MANY OF THE ISSUES WE'RE
TALKING ABOUT ARE ALSO SOMEBODY
YO TECHNICAL.
I'LL BE TOUCHING BRIEFLY ON
THOSE.
MY GOAL IS TO GIVE YOU A BASIC
OVERVIEW OF THE INTERNET OF
THINGS FROM A FOUNDATIONAL
SCIENTIFIC POINT OF VIEW,
NATIONAL INSTITUTE OF SCIENCE
POINT OF VIEW.
WHEN I WAS FLYING OUT TEN DAYS
AGO TO VISIT SOME PEOPLE U.C.
BERKELEY I WAS FLYING UNITED.
THERE IS AN ARTICLE I LOOKED AT,
IT'S ALL CONNECTED, PRETTY SOON
YOUR OWN TROUSERS WILL HAVE
THEIR OWN TWITTER ACCOUNT.
I'M NOT SURE WHY.
THERE WAS AN ARTICLE WRITTEN BY
PAUL FORD, WRITTEN RATHER TONGUE
IN ACADEMIC.
TALKING ABOUT THE VERY FIRST
INTERNET OF THINGS DEVICE WHICH
WAS A COFFEE POT AT THE TROJAN
LAB IN CAMBRIDGE UNIVERSITY, IN
FACT I HAVE A PICTURE OF IT,
IT'S RITE THERE, IN 1991, THIS
WAS A CAMERA PUT ON A COFFEE POT
IN THE LAB SO I -- YOU COULD SEE
IF THERE WAS COFFEE IN THE
COFFEE POT, EITHER BUG SOMEONE
TO CREDIT CLEAN IT OR MAKE
FRESH.
THIS IS A RATHER EASY ARTICLE TO
READ.

I RECOMMEND IT BECAUSE IT'S
RATHER FUN.
HE'S MADE SOME OF THE POINTS
THAT WE'VE ALREADY LAYERED.
SOME 25 BILLION DEVICES WILL BE
CONNECTING TO THE INTERNET BY
2015, GOING TO 50 BILLION BY
2020.
WATCHES OR WALLETS WILL HAVE AN
INTERNET CONNECTION.
HE TALKS ABOUT THE WATERFRONT IN
SOUTH KOREA, THIS IS A MODEL
WHERE ALL OF THIS IS HEADED.
WHEN IT'S COMPLETED IN 2015,
EVERYTHING WILL BE WIRED
TOGETHER AND CONNECTED TO THE
INTERNET.
STREET LAMPS WILL REACT TO THE
NUMBER OF PEOPLE WALK UNDER
THEM, FOR EXAMPLE.
HE TALKS ABOUT TOM COATS.
TOM COATS LIVES IN SAN
FRANCISCO, A TECHNOLOGIST.
HE HAS WIRED OUT HIS HOUSE TO
GIVE OUT TWEETS WHAT'S GOING ON.
ONE TWEET WAS THAT THE HOUSE
FELT AN EARTHQUAKE.
AND I WENT AND CHECKED ON THE
USGS SITE AND THERE WAS NO
EARTHQUAKE, BUT THE HOUSE
THOUGHT THERE WAS ONE.
THE MODEL HE'S GOING WITH IS
INFORMATION WILL BE SET OUT OF
THINGS OF INTEREST.
A KIND OF DATA FEED TO BE USED
BY COMPANIES TO ABSORB THIS
INFORMATION TO BE ABLE TO HELP
YOU BY OBSERVE BEING WHAT YOU
ARE DOING IN YOUR LIFE.
IT'S A FAIRLY BROAD VIEW OF WHY
WE'RE GOING.
I'M NOT SURE I WANT TWITTER AS A
DELIVERY OF MY INFORMATION BUT
IT'S CLEAR THERE'S A MARKET HERE
AND THIS LIGHT HARDED ARTICLE IS
POINTING TO THE DIRECTION WE'RE

GOING AS FAR AS
COMMERCIALIZATION OF THE
INFORMATION BEING COLLECTED BY
ALL THESE DEVICES, THESE 25
BILLION DEVICES ON THE INTERNET.
I'LL GIVE YOU MY OWN VERSION OF
THE ORIGINATION OF THIS.
I THINK THE -- ORIGINS OF THIS.
WHAT WAS CALLED UBIQUITOUS
COMPUTING OR UBIQUITY OF DATA.
THIS WAS DEVELOPED BY A FELLOW
NAMED MARK WISE ARE AT THE PALO
ALTO RESEARCH CENTER AT XEROX.
ONE THING THEY WERE DOING IS
CREATING A BATCH TO TRACK WHERE
YOU WERE.
IF A PHONE CALL CAME IN, THEY
ENVISIONED THE PHONE NEAREST YOU
WOULD RING, SO YOU DIDN'T HAVE
TO GO TO YOUR OFFICE OR A
PRINTER WOULD PRINT SOMETHING
YOU NEEDED RATHER THAN GOING
BACK TO YOUR OFFICE.
OR MONITORING WHERE YOU ARE?
LIKE HOW LONG HAVE YOU BEEN IN
THE BATHROOM, ALL BASS IN THE
'80S.
PUSHING COMPUTATION OUT INTO THE
WORLD, INSTEAD OF HAVING
COMPUTERS, IT WAS MEANT TO BE
UBIQUITOUS ALL AROUND YOU ALL
THE TIME.
HOW CAN YOU DECENTRALIZE ALL OF
THIS?
LOOKING AT SOME OF THE ISSUES IN
TERMS OF FAILURE.
THEN IN THE MID 20s THE TERM
INTERNET OF THINGS STARTED TO
APPEAR.
THE EARLIEST REPORT I FOUND WAS
IN FROF OF 2005, IN THIS THEY
SAID THAT THE MAIN 19ERS OF THE
INTERNET OF THINGS WERE THREE
THINGS.
FIRST WAS ITEM IS
IDENTIFICATION, YOU SHOULD KNOW

WHAT YOU'RE ARE DEALING WITH,
RFID, THE ABILITY TO PHYSICALLY,
DETECT THINGS AND PUSHING THINGS
OUT INTO THE ENVIRONMENT.
CYBERPHYSICAL, DR. HELEN GIL WAS
THE ONE WHO INVENTED THIS TERM.
LOOK MORE AT THE ISSUE OF
CONTROL THAT IS ONCE I HAVE ALL
THIS INFORMATION I HAVE THE
CYBERWORLD AND THE PHYSICAL
WORLD, HOW DO WE PUT THEM
TOGETHER?
LET ME BRIEFLY TALK ABOUT
CYBERPHYSICAL SYSTEM PROJECT
JUST TO TELL YOU THE THINGS
WE'RE DOING IN THIS AREA.
WE'RE DOING THIS BECAUSE OF
NATIONAL PRIORITIES, THERE ARE
THINGS WE NEED TO BE DOING.
IN TRANSPORTATION THERE ARE
WOISHES ABOUT FASTER -- WORRIES
ABOUT FASTER, SAFER AIRCRAFT,
ENERGY AND INDUSTRIAL ARE, AS
WELL AS BEING ABLE TO WORRY
ABOUT ALL THESE DEVICES WE'RE
PUTTING IN OUR SELVES.
CRITICAL INFRASTRUCTURE OF THE
POWER GRID, MORE DENSE HIGHWAYS
AND SO THE IDEA HERE WHAT'S
DRIVING THIS IS CAN WE USE THE
FACT THAT WE WITH GATHER THIS
INFORMATION TO HAVE MORE
EFFICIENT CONTROL OF THE
ENVIRONMENT.
THIS IS THE WAY WE LIKE TO
DESCRIBE OUR CPS PROGRAM.
WE CALL THIS THE DAISY DIAGRAM.
IT LOOKS RATHER LIKE A FLOWER.
THE ENERGIES THAT ARE WORKING IN
THIS SPACE, INSTRUMENTED TO BE
ABLE TO WORRY ABOUT GROWING
CROPS ON THE TOPS OF BUILDINGS.
CIVIL MATERIALS, CHEMICAL,
MEDICAL, SO ON.
CORE SCIENCE PASS COMMON ACROSS
ALL THESE APPLICATION SECTORS.

THESE INCLUDE CONTROL OF COURSE.
VERIFICATION AND CERTIFICATION,
SECURITY AND PRIVACY.
THESE ARE ALL ARE ITEMS THAT
COME UP IN OUR PROBLEMS OF CPS
OR CYBERPHYSICAL SYSTEMS.
SO THE GOALS WE'VE BEEN DOING
ARE TO OVERCOME THE COMPLEX
TECHNICAL SYSTEMS THAT INTERFACE
THE CYBER WITH THE PHYSICAL.
WE HAVE TO BE ABLE TO FIND WAYS
TO PROVE THAT THEY DO WHAT
THEY'RE SUPPOSED TON DOING.
THAT'S -- TO BE DOING.
THAT'S A TECHNICAL PROBLEM.
WE'RE LOOKING AT THE PRINCIPLES
THAT BRIDGE ALL ACROSS THESE
SECTORS.
A LARGE PARTS OF THIS IS
ENABLING SOCIETAL AND PHYSICAL
ACCEPTANCE OF THESE SYSTEMS.
NOT ONLY THAT THEY HAVE TO BE
WILLING TO BET THEIR LIVES ON
IT, AS WELL, THERE IS AN ISSUE
IN TERMS OF BEING TRANSPARENT IN
TERMS OF WHAT THEY DO.
AND PART OF WHAT WE'VE BEEN
DOING IS TRYING TO FUND A WHOLE
GROUP OF NEW RESEARCHERS IN THIS
AREA, EDUCATION, TO TRY TO BUILD
THIS AS A DISCIPLINE.
SO HAVING TOLD YOU WHAT WE'RE
DOING IN CYBER PHYSICAL SYSTEMS
AND HOW IT RELATES TO INTERNET
OF THINGS, I'M JUST GOING TO
GIVE YOU FOUR THINGS TO TRY TO
SHOW YOU HOW THIS WORKS
TOGETHER.
THE FIRST ONE IS WHAT'S CALLED
ACTION WEBZ.
ACTION WEBS IS A PROJECT BEING
PLED OUT OF BERKELEY, CLAIRE
THOMPSON, AND HANS CHRISTOBAL.
TASKABLE FOR COORDINATION OF
MULTIPLE DECISION MAKERS.
IDENTIFYING MODELS OF ACTION

WEBZ, DISTRESS STATE
REPRESENTATION OF
INTERCONNECTION AND EXUTION.
THAT'S FAIRLY HIGH WORDS FOR
WHAT THEY'RE TRYING TO DO.
ARE GO AND SEE WHAT THEY'RE
DOING IT'S DELIGHTFUL.
THEY'RE DOING ENERGY EFFICIENT
BUILDINGS FOR EXAMPLE.
THEY'VE INSTRUMENTED ONE OF --
ACTUALLY INSTRUMENTED WHEN IT
WAS BUILD BUILT, A COMPLETELY
INSTRUMENTED BUILDING, HOW CAN
YOU USE THIS SENSING TO CONTROL
ENERGY IN THE BUILDING.
AS PEOPLE RUN IN AND OUT OF
ROOMS CAN YOU BE SURE YOU ARE
ONLY HEATING THOSE ROOMS?
THIS TURNS OUT TO BE A HARD
LEVEL ON THE PHYSICAL SIDE,
COMPARED TO A WHOLE HOST OF
SENSORS THAT ARE AVAILABLE IF
THE SYSTEM.
BASICALLY THEY ARE DOING HVAC
SYSTEMS.
IT'S REALLY NICE WORK.
THEY'RE DOING ENERGY EFFICIENT
TRANSPORTATION STATEMENTS,
DR. VOL IS WORK ON THAT,
GATHERING INFORMATION TO BE ABLE
TO HAVE MORE EFFICIENT AIR
TRANSPORTATION.
SO OUT OF THIS BY LOOKING AT
THESE TWO SECTORS THEY ARE
HOPING TO LOOK AT A MORE
GENERALIZED MODEL SO IT CAN BE
APPLIED TO OTHER THINGS.
TAKING THEIR STEP ONE UNIT
FORWARD, RESILIENT CYBER
PHYSICAL SYSTEMS THIS IS A
WONDERFUL PROJECT BECAUSE
THEY'VE SPHWROWSED THE WORD
HCPS, H IS HUMANS.
HUMANS ARE PART OF THIS SYSTEM
AS MUCH AS ANYTHING ELSE.
RESILIENT CONTROL, HOW ARE YOU

ABLE TO BUILD SYSTEMS THAT
CONTINUE TO OPERATE, IN THE FACE
OF FAILURES, IN THE FACE OF
NATURAL DISASTERS?
EVEN IN THE FACE OF ATTACK.
AND THEY'RE DOING THIS IN PART
IN THE DESIGN BY PUTTING --
THEY'RE USING GAIN THEORY,
INCENTIVE THEORY TO MAKE THESE
SYSTEMS MORE RESILIENT.
CAN YOU COME UP WITH MODELS THE
ENCOURAGE PEOPLE TO DRIVE MORE
SAFELY FOR EXAMPLE GIVEN WAY
YOU'RE INSTRUMENTING THE SYSTEM.
I FIND THIS A VERY INTERESTING
PROBLEM, THEY ARE BREAKING OUT
OF THE SPACE AND BRINGING PEOPLE
INTO THE LOOP.
THIS IS THE THIRD PROJECT, THIS
IS A FUN ONE.
THIS IS ADVANCED TRANSPORTATION
STATEMENTS.
YOU PROBABLY HAVE HEARD OF THE
GOOGLE CAR.
I DON'T SEE VINT HERE.
HE WILL BE HERE LATER.
THIS IS NSF'S VERSION, THIS
GROUP WONDER THE DARPA
CHALLENGE.
THEY ARE REDEVELOPING CARS THAT
DRIVE AUTONOMOUSLY.
WHILE CARS VERY COMPLEX, YOU
HAVE TO BUILD NIECE SYSTEMS, BUT
MRS. THESE CARS HAVE TO INTERACT
WITH THEIR ENVIRONMENT.
THEY ARE LOOKING HOW CAN YOU
SENSE BICYCLISTS SO YOU DON'T
RUN INTO THEM.
HOW CAN YOU SENSE WHAT'S GOING
ON WITH CARS THAT ARE DRIVING
THAT ARE NOT AUTONOMOUSLY
DRIVEN.
THEY JUST HAD A GREAT DEMO OF
THIS, IN SEPTEMBER THEIR
AUTONOMOUS CADILLAC IT GOES THE
DISTANCE.

U.S. HOUSE OF TRANSPORTATION,
COMMITTEE MEMBER BILL SHUSTER
AND BARRY SCHOCKTER TO RIDE IN
THIS CAR FROM THE AIRPORT AND
NOBODY DIED.
IT'S A REALLY GOOD THING.
IT'S REALLY FUN.
THE FOURTH PROJECT I'M GOING
OTELL YOU IS SOMETHING ATHAT IS
PERHAPS FAIRLY OBVIOUS IN A CPS
SYSTEM.
I'M GOING TO LET THE PROJECT
SPEAK FOR ITSELF ABOUT MUCH.
>> A TEAM OF COMPUTERECOLOGISTS, SOFTWARE ENGINEERS
AND NATIONAL RESEARCH SCIENTISTS
IS CREATING AN INFORMATION WEB
TO MONITOR, ANALYZE AND REPORT
THE HEALTH OF A RIVER.
THEY'VE DEVELOPMENT INNOVATIVE
TECHNOLOGIES TO COLLECT DATA
FROM REMOTE LOCATIONS, OPERATED
FROM A SMARTPHONE, A BATTERY
OPERATED COMPUTER SMALLER THAN A
RUBIQ'S CUBE ALLOWS THIS
TECHNOLOGY.
ARE OPERATE AS A HIGHLY
EFFICIENT NETWORK.
THE MOAT-STACK IS ARE CHORD TO
THE RIVER FLOOR.
EXTERNAL SENSORS COLLECT WATER
QUALITY AND FLOW DATA.
THE MOAT STACK COLLECTS THE DATA
AND PROCESSES IT.
INFORMATION IS THEN DISPLAYED ON
AN INTERACTIVE WEBSITE, WHERE
WATER INFORMATION ENGINEERS CAN
ARE ARE WATCH.
MERRY CHRISTMAS CAN MAKE
INFORMED DECISIONS AS TO WHEN TO
RELEASE WATER OR RESPOND TO A
POLLUTION EVENT.
>> THE WHOLE CLIP IS ABOUT TWOAND A HALF MINUTES LONG.
I ENCOURAGE YOU TO TAKE A LOOK
AT IT.
IT'S QUITE A NICE PROJECT.
THEY ARE SUBMITTING THE SOIL AND

TREES, FOR EXAMPLE HOW FAST ARE
TREES GROWING.
IT'S A WONDERFUL PART OF THE
ENVIRONMENT TO BE ABLE TO HAVE
DASHBOARD CONTROL TO UNDERSTAND
WHAT'S GOING ON IN THE SWANEE
RIVER BASIN.
>>> I'M GOING TO MAKE THISFAIRLY BRIEF BECAUSE I THINK I
ONLY HAVE FIVE MORE MINUTES.
WE ARE FUNDING A CONSIDERABLE
AMOUNT OF RESEARCH IN BOTH THE
SECURITY AND PRIVACY OF SYSTEMS
MORE IN SECURITY THAN PRIVACY
ALTHOUGH IN THE LAST COUPLE OF
YEARS WE'VE BEEN TRYING TO
INCREASE THE ROLE OF PRIVACY BY
BRINGING IN OUR SISTER DIRECTOR
OF SOCIAL BEHAVIOR AND COMPLEK
SCIENCES.
SO LET ME GIVE YOU FOUR QUICK
EXAMPLES.
IN FIRST ONE IS SEMANTIC
SECURITY AND MONITORING OF
INDUSTRIAL CONTROL SYSTEMS.
THESE ARE LIKE SCADA NOT LIKE
TRADITIONAL I.T. INFRASTRUCTURE
IN AN OFFICE.
THESE ARE BUILT OUT OF HARDWARE,
IT HAS NO ABILITY TO UPGRADE
HARDWARE OR SOFTWARE.
AND THAT DON'T TEND TO BE BUILT
WITH SECURITY IN MIND.
AND SO WE HAVE DEVELOPED OVER
THE LAST 30 YEARS AGO A
CONSIDERABLE AMOUNT OF
TECHNOLOGY OF VARYING SUCCESS TO
TRY ODETECT BREAK-INS IN
COMPUTER SYSTEMS.
THIS TENDS TO BE HARD AS YOU ALL
KNOW.
AS YOU ALL RUN YOUR ANTIVIRUS
SOFTWARE WE CAN ONLY GO SO FAR
WITH THIS.
INDUSTRIAL CONTROL SYSTEMS ARE
ACTUALLY MORE PREDICTABLE.
WE KNOW HOW THEY OPERATE.

THEY ARE PRUNING A MUCH NARROW ARE -- ARE OPERATING A MUCH NARROWER SYSTEM.
THESE PEOPLE ARE LOOKING AT WAYS TO SEE IF YOU CAN ACTUALLY DETECT SOMETHING LIKE THAT TO STOP THAT KIND OF ATTACK.
REPROGRAMMING A PACEMAKER, PACEMAKERS AND DEFIBRILLATORS, THAT ALLOW SOME LEVEL OF PROGRAMMING.
THE REPROGRAMMING IS NECESSARY TO PERSONALIZE THEM FOR THE PATIENT.
AND THIS IS DONE OF KEVIN FU, NOW AT UNIVERSITY OF MICHIGAN.
THEY WERE LOOK AT ATTACK METHODS TO LOOK AT THE INFORMATION OR CHANGE THE INFORMATION IN A PACEMAKER TO LEAK PRIVACY OR DO MORE DAMAGE.
AND THEY ARE USING THE TECHNIQUES THAT ARE AVAILABLE SUCH AS THE KINDS OF CONTROLS THAT A DOCTOR WOULD USE TO BE ABLE TO ADJUST IT.
THIS CHART HERE JUST SHOWS YOU THE KINDS OF THINGS YOU COULD DO.
THESE ARE ATTACKS, SOFTWARE RADIO PROGRAMMER, YOU CAN SEE THAT THESE FIRST ISSUES ARE ALL PRIVACY, WHETHER THE PATIENT HAS AN ICD, THEM TRI DATA FROM THE ICD, OBTAIN INFORMATION FROM THE PATIENT, NAME, AGE, PRIVATE THEM TELEMETRY DATA.
IT'S SO TERRIFYING THAT HOLLYWOOD CAME INTO IT, AND CAN YOUR PACEMAKER BE HIJACKED AND THIS WAS ALSO PICKED UP BY WASHINGTON, WHEN MR. CHENEY WAS FEARING TERRORISTS WOULD HACK HIS PACEMAKER.
THERE ARE DEVICES AS YOU CAN IMAGINE THAT ARE NECESSARY FOR

SECURITY.
REPROGRAMMING AUTOMOBILES.
AUTOMOBILES YOU MAY OR MAY NOT KNOW ARE ALSO DEVICES THAT CONTAIN ANNAL AWFUL LOT OF COMPUTERS -- AN AWFUL LOT OF COMPUTERS.
I'M TOLD THE NUMBER OF COMPUTERS TO LOCK A BMW IS FIVE.
THE DOORS HAVE TO UNLOCK AND SO THEY'RE FAIRLY COMPLEX BEASTS.
AND BECAUSE OF THIS, WE ALL KNOW ABOUT THE ACCIDENTAL CAR PROBLEMS.
THINGS THAT MIGHT HAPPEN WITH CARS, BECAUSE OF PROGRAMMING ERRORS.
OR OF HARDWARE ERRORS.
BUT THERE'S ALSO ATTACK SERVICES THAT ARE CREATED BY THESE CARS.
AND SO THIS IS WORKED ON BY YOSHI KONA WHO IS GOING TO BE ON A PANEL LATER, WHERE THEY LOOKED AT WAYS OF BEING ABLE TO ATTACK A CAR GOING IN THROUGH VARIOUS PORTS.
IT COULD BE SOMETHING AS OBVIOUS AS GOING IN THROUGH DATA PORT AND NOT AS OBVIOUS AS GOING THROUGH THE ONSTAR SYSTEM REMOTELY.
THEY WERE ABLE TO SUCCESSFULLY BREAK INTO THE CAR AND CHANGE IT IN FAIRLY INTERESTING WAYS.
THIS IS ONE OF THEIR EXAMPLES.
IF YOU NOTICE HERE THE CAR IS GOING 140 MILES AN HOUR BUT IT'S IN PARK.
THIS IS REALLY HARD.
THIS CAR WAS ACTUALLY ON BLOCKS.
IT WASN'T GOING ANYWHERE.
YOU COULD ALSO PUT ON THE BRAKES, DEPLOY THE AIR BAG.
IT WAS A VECTOR OF -- BECAUSE THE WAY THE SYSTEM WAS DESIGNED IT COULD BE ATTACKED.

FIRST LET ME ALSO SAY THAT NSF ISN'T ACTIVELY FUNDING RESEARCH TO ALLOW PEOPLE TO BREAK INTO CARS AND MESS WITH SOMEONE'S PACEMAKER.
IDENTIFYING SYSTEMS THAT FELT TO BE SECURE BUT THEY WEREN'T.
THESE PEOPLE HAVE GONE ON TO SHOW HOW TO SECURE THEM.
THESE ARE THE RISKS THAT COME UP AS YOU START TO INSTRUMENT THE WORLD AROUND YOU.
THIS PROJECT HERE, BY MIT ARE LOOKING AT SECURITY PRIEIVES, IF YOU HAVE AN EASY PASS OR SIMILAR DEVICE YOU ARE NOT ONLY MONITORED WHEN YOU'RE DRIVING BUT IN MANY DIFFERENT AREAS.
IN SOME COUNTRIES AS YOU KNOW THERE IS PERVASIVE MONITORING.
RESTRICTING AREAS IN TOLLING, HIGH TOLLS FOR DRIVING IN DOWNTOWN LONDON FOR EXAMPLE, CONGESTION MONITORING SO ON.
YOU DON'T WANT YOUR CARDIOLOGIST TO KNOW WHERE YOU'RE HAVING LUNCH, THIS COULD BE AN ISSUE OR WHICH PLACES YOU VISIT OFF-HOURS.
THESE PEOPLE ARE LOOKING AT WAYS TO BE ABLE TO IF YOU THE INFORMATION, GEOGRAPHICALLY, TO BE ABLE TO PRESENT THE INFORMATION NECESSARY FOR THE INTENDED PURPOSES, BUT TO RESTRICT THE USE OUTSIDE.
FINALLY AS I SEE WE HAVE ANOTHER PROJECT BY YOSHI KONO, WE MUST LIKE YOSHI, A PERSON IN ONE OPERATION OPERATES A ROBOT SOMEWHERE ELSE.
THIS IS ALSO OFTEN USED FOR TELESURGERY, OPERATING ON SOLDIERS IN THE FIELD.
THIS IS IMPORTANT OBVIOUSLY LIFESAVING THINGS AND IT AVOIDS

PUTTING RARE AND IMPORTANT
DOCTORS AT RISK.
HOW DO YOU ENSURE THAT THE
ACTIONS BEING DONE ARE NOT
INTERCEPTED.
EVEN A SMALL CHANGE IN THE
TIMING CAN HAVE AN EFFECT ON
WHAT THE DOCTOR IS TRYING TO DO.
IN TERMS OF SCADA, HOW DO YOU
KNOW ROUGHLY WHAT THE DOCTOR IS
TRYING TO DO, SO YOU CAN LOOK AT
THIS THINGS MOVING OUTSIDE THE
ENVELOPE.
I'VE GIVEN YOU FOUR PROJECTS ON
INTERNET OF THINGS AND FOUR
IDEAS ON THINGS WE'RE TRYING TO
ADDRESS ON PRIVACY AND SECURITY.
LET ME SMARSZ UP.
INTERNET OF THINGS HAS BEEN
AROUND FOR ABOUT 25 YEARS, GOING
BACK TO THE WORK MARK WISER DID.
TECHNOLOGICAL PROJECTS ARE
MOVING VERY QUICKLY.
SMART DUST, A SMALL COMPUTER
USED FOR A SENSOR, ONE
MILLIMETER CUBIC IN SIZE THAT
HAS CAMERA AND COMMUNICATION
FACILITIES.
USING THEM, OBVIOUSLY CAN
SCATTER THEM ANYWHERE TO MEASURE
PRESSURE ON ANIMALS AND SUCH.
INTERNET OF THINGS QUITE
AFFORDABLY.
VERIFICATION AND BIG DATA HAVE
ALL LED TO TREMENDOUS COMMERCIAL
OPPORTUNITIES.
THERE'S A LOT OF COMMERCIAL
INTEREST IN THIS.
THE INTERNET OF EVERYTHING TO
USE QUALCOMM'S TERM OR TO USE
THE INDUSTRIAL INTERNET TO USE
G.E.'S TERMS.
USING IT BASICALLY BIG DATA
TECHNIQUES TO TRY TO DO THINGS
BETTER SAY PREDICT WHEN
AIRPLANES NEED TO HAVE

PREVENTIVE MAINTENANCE.
AND GIVEN ALL THIS SECURITY AND
PRIVACY ARE REAL ISSUES AND THEY
NEED TO BE ADDRESSED.
THANK YOU.
[APPLAUSE]

>> THANK YOU KEITH.OUR NEXT SPEAKER IS CAROLYN
NGUYEN.
SHE'S DIRECTOR OF MICROSOFT'S
TECHNOLOGY POLICY GROUP.
>> THANK YOU, KAREN FOR YOURKIND INTRODUCTION AND THANK YOU,
KEITH FOR GIVING US SUCH A
WONDERFUL OVERVIEW OF THE
TECHNOLOGY DEVELOPMENT OF THE
IOT.
SO GOOD MORNING.
I'M VERY HONORED TO BE INVITED
TO PARTICIPATE IN THE FTC
WORKSHOP TO SPEAK ABOUT THE
INTERNET OF THINGS AND REALLY TO
SHARE WITH YOU SOME OF MY
THOUGHTS REGARDING THE IMPACT OF
THE INTERNET OF THINGS, AND I'VE
BEEN ASKED TO SPEAK ABOUT THE
IMPACT ON THE INDIVIDUAL.
BECAUSE A LOT OF TIMES WHEN WE
SPEAK ABOUT THIS DATA WE FORGET
THERE IS AN INDIVIDUAL IN THE
MIDDLE OF THIS TRYING OFIGURE
OUT WHAT TO DO WITH THIS DATA
AND THE IMPACT OF THE DATA IN
THIS REALLY CONNECTED WORLD.
SO WHEN ONE STARTS TO DISCUSS
THE IOT AS CHAIRMAN RAMIREZ HAS
ALREADY MENTIONED AND KEITH HAS
MADE IT EVIDENT, THE FIRST THING
THAT REALLY COMES TO MIND ARE
THE SENSORS THAT ARE EXPECTED TO
BE UBIQUITOUSLY PRESENT AND TO
ANIMATE WHETHER IT BE IN THE
HOME IN THE CAR OR ATTACHED TO
THE INDIVIDUAL TO MEASURE AND
TRANSMIT DATA.
KEITH TOLD US THAT THIS GOT ALL
STARTED BECAUSE OF THE NEED FOR

CAFFEINE.
JUST LIKE THE INTERNET GOT
DRIVEN BECAUSE OF THE NEED FOR
E-MAIL, WELL SINCE THEN AT
CHAIRMAN RAMIREZ MENTIONED THIS
IS GROWN TO INCLUDE PLANTS,
TEAPOTS IN JAPAN THAT CAN NOTIFY
CAREGIVERS OF UNUSUAL TEA
DRINKING PATTERNS.
A HEADBAND THAT CAN TRACK
PEOPLE'S BRAIN ELECTRICAL
ACTIVITY AND ENABLING THEM DUMP,
AND MY FAVORITE ONE, SOCKS THAT
CAN LOOK FOR THEIR TWIN.
THE INTERNET OF THINGS IT IS
DEFINITELY A RADICAL NEW WORLD.
SO LOST SOCKS ASIDE, A UNIQUE
ASPECT OF THE IOT IT'S POTENTIAL
TO REVOLUTIONIZE HOW INDIVIDUALS
WILL INTERACT IN THE PHYSICAL
WORLD, BETWEEN DIGIT AND
PHYSICAL WORLD, IT IS THAT ABLE
THAT I WITH WILL ADDRESS AND
MATTERS OUR ATTENTION.
TODAY PEOPLE MUST MASTER
CONTROLS OF DIFFERENT TYPES OF
TECHNOLOGY AND DEVICES IN ORDER
TO MANAGE THEIR ENVIRONMENT TO
SOMETHING THAT CAN BE DONE AND
BEHAVE ACCORDING TO THEIR
PREFERENCES.
THE IOT WITH IT NETWORK OF
SENSORS AND ITS POTENTIAL TO
OPTIMIZE AND CONTEXT APPROPRIATE
DECISIONS.
AS SUCH THE IOT CAN BRING TO THE
PHYSICAL WORLD THE LEVEL OF
PERSONALIZATION TO A LEVEL THAT
IS ONLY POSSIBLE IN THE PHYSICAL
WORLD.
TRANSFORMATION WHERE MACHINES
ONLY RESPOND TO THE INDIVIDUAL.
SO BACK TO THE INDIVIDUAL.
AS THE INDIVIDUAL IS
INCREASINGLY OBJECTIFIED BY THE
WORLD AROUND THEM WE ARE AT THE

DAWN OF THE IOT TO CREATE A SUSTAINABLE ECOSYSTEM THAT IS CENTERED ON THE INDIVIDUAL.
I WANT TO EMPHASIZE THAT USER CENTER IS VERY DIFFERENT THAN HAVING THE INDIVIDUAL IN THE MIDDLE, TRYING TO CONTROL ALL THIS DATA ABOUT THEM.
SO THIS IS REALLY AN ECOSYSTEM THAT IS FOCUSING ON EMPOWERING AND ENGAGING THE INDIVIDUAL.
HERE IS WHAT I WILL COVER IN MY TALK.
IT IS REALLY ABOUT THE IMPACT ON THE INDIVIDUAL, WHY IS TRUST RELEVANT IN THIS CONVERSATION, HOW DO INDIVIDUAL DEFINE CONTEXT?
WE DON'T NORMALLY TALK SO MUCH ABOUT THAT, SO I'LL DISCUSS RESEARCH THAT WE'VE DONE AND LASTLY, WHAT ARE SOME POLICY RAMIFICATIONS.
WE HAVE ALREADY HEARD CHAIRMAN RAMIREZ SPEAK ABOUT THE CONTEXT.
AND BRINGING THE PEOPLE AND THE INDIVIDUAL INTO THE TMG.
FOR THIS TALK I WILL ASK YOU TO ASSUME THAT WE ARE ALREADY IN THE WORLD OF THE IOT, IT IS HERE AND LET'S THINK ABOUT HOW TO ENABLE IT, INSTEAD OF HOW TO STOP THE DATA FLOW.
SO LET'S FIRST EXPLORE THE ECOSYSTEM.
SO TAKING A LOOK AT THE EVOLUTION, ARE AND THE EMERGING DATA-DRIVEN ECONOMY, THIS IS HOW WE ALL STARTED.
WHERE A PERSON SHARES DATA WITH ANOTHER PERSON THAT THEY HAVE A GOOD RELATIONSHIP WITH, AND CAN TRUST THAT THE DATA WON'T BE MISUSED.
AND THE TERMINOLOGY THAT I USE IS THE DATA IS BEING ACTIVELY

PROVIDED TO THE INDIVIDUAL.
IN THE EVOLUTION GOING FORWARD,
I A STORE, A BANK, A POST
OFFICE, AGAIN THIS IS USUALLY AN
ENTITY WITH WHOM I EITHER HAVE A
GOOD RELATIONSHIP WITH OR KNOW I
CAN TRUST.
AND THIS IS TRUE WHETHER THIS IS
IN THE PHYSICAL WORLD OR IN THE
DIGITAL WORLD.
WE EVOLVE THIS A LITTLE BIT
FURTHER WHERE NOW SUCH AN ENTITY
MAY BE ABLE TO SHARE PERSONAL
DATA WITH OTHER ENTITIES WITH OR
WITHOUT MY KNOWLEDGE.
WE TALK ABOUT THE TERMINOLOGY
AND THIS DATA THAT IS BEING
GENERATED OR INFERRED AS DATA
THAT IS PASSIVELY GENERATED
ABOUT ME.
IN OTHER WORDS I'M NOT ACTIVELY
INVOLVED IN THIS TRANSACTION.
SO AS WE MOVE FURTHER IN THE
EVOLUTION, THERE IS MORE AND
MORE DATA BEING SHARED, AND
FURTHERMORE, IT IS NOW ALSO
POSSIBLE THAT OTHER PARTIES THAT
ARE IN MY SOCIAL NETWORK CAN
SHARE DATA ABOUT ME.SO FOR
EXAMPLE, A FRIEND UPLOADING MY
PHOTO INTO THE SERVICE.
IT IS ALREADY VERY DIFFICULT FOR
THE INDIVIDUAL TO CONTROL THE
DISTRIBUTION OF INFORMATION
ABOUT ME.
AND NOTICE AND CONSENT BEGINS TO
LOSE MEANING.
AS THE INDIVIDUAL MOST OFTEN
AUTOMATICALLY GIVE CONSENT
WITHOUT A TRUE UNDERSTANDING OF
HOW THE DATA IS DISTRIBUTED OR
USED.
MOVING FORWARD INTO THE INTERNET
OF THINGS WITH UBIQUITOUS
SENSORS, WE HAVE ALREADY HEARD
ABOUT FIT BITS, SENSORS IN MY

SHIRT THAT CAN -- OR SENSOR IN
THE PANTS THAT CAN TWEET OUT
INFORMATION ABOUT ME.
MY CARS GIVING OUT INFORMATION
ABOUT POTHOLES IN THE STREET,
AVERAGE SPEED, ET CETERA.
IT'S DEVICES IN MY HOMES THAT
ARE GIVING INFORMATION ABOUT
ACTIVITIES, TEMPERATURE, WHETHER
I'M HOME OR NOT.
DEVICES IN MY WORK SPACE.
AS WELL AS DEVICES IN THE PUBLIC
SPACE.
SO INCREASINGLY THE AMOUNT OF
DATA THAT IS GENERATED AS WAS
MENTIONED THIS MORNING WILL BE
PASSIVELY COLLECTED AND
GENERATED.
IT IS HOWEVER IN THE DATA-DRIVEN
ECONOMY IT IS THIS FLOW OF
CREDIT DATA THAT HAS THE ABILITY
TO CREATE THE FOUNDATION FOR A
NEW ECONOMY.
OVERT RESTRICTION OF THIS FLOW
CAN RESTRICT THE POTENTIAL VALUE
BUT LACKS REGULATION CAN CLEARLY
HARM THE INDIVIDUAL.
AND UPSET AND VIOLATE THE
RIGHTS.
SO WHAT I WILL BE TALKING ABOUT
FOR REST OF THE TALK IS THAT NEW
APPROACHES ARE REALLY NEEDED TO
ENABLE AND EMPOWER THE
INDIVIDUAL TO CONTROL THE USE OF
THEIR DATA, WHETHER DIRECTLY OR
INNATE REPLY BY USING THE
SENSORS IN THE -- INNATELY BY
THIRD PARTY PROXIES TO CONTROL
AND HELP ASSOCIATE THAT THE DATA
WILL BE USED IN AN APPROPRIATE
MANNER TO THE USER.
SO WHAT IS THE IMPACT OF THIS
DATA ON THE INDIVIDUAL?
TODAY, THERE'S ALREADY AN
ASYMMETRY OF POWER BETWEEN
BUSINESSES AND INDIVIDUALS DUE

TO THE AMOUNT THAT IS PERCEIVED
TO BE CONTROLLED BY BUSINESSES.
THIS IS CLEARLY NOT A
SUSTAINABLE SITUATION.
AND WE POSIT IN THE WORLD OF THE
INTERNET OF THINGS, IN THE WORLD
OF TOMORROW, FOR A DATA-DRIVEN
ECOSYSTEM TO BE SUSTAINABLE, THE
ISSUE THAT MUST BE ADDRESSED IS
THAT THE ECOSYSTEM MUST SHOW,
DEMONSTRATE THAT IT IS CAPABLE
OF EARNING THE INDIVIDUAL'S
TRUST.
AND AS SUCH IT MUST BE CENTERED
ON EMPOWERING THE INDIVIDUAL.
AND SUCH MECHANISMS NEED TO BE
AT THE ECOSYSTEM LEVEL.
BUT THIS IS WHAT IT TAKES WHAT
CHAIRMAN RAMIREZ TALKS ABOUT IN
TERMS OF PRIVACY BY DESIGN.
BUT INSTEAD OF HAVING IT AT THE
INDIVIDUAL INDUSTRY AND BUSINESS
LEVEL, THIS NEEDS TO HAPPEN AT
THE ECOSYSTEM LEVEL, IN OTHER
WORDS, INTEROPERABLE PRIVACY
MECHANISMS WHERE THE USER
PREFERENCES CAN BE OFFEND BY
MULTIPLE PARTIES ACROSS THE
ECOSYSTEMS CRM AS WELL AS TAKING
INTO CONSIDERATION, SOCIAL NORMS
ACROSS MULTIPLE COUNTRIES.
SO WHAT ARE SOME EXISTING WORK
THAT'S ALREADY MENTIONED ABOUT
CONTEXT?
I THINK YOU ARE VERY FAMILIAR
ALREADY HERE WITH WHAT THE WHITE
HOUSE REPORT HAS INCLUDED, WHICH
IS THE NOTION OF RESPECT FOR
CONTEXT WITHIN THE PRIVACY BILL
OF RIGHTS, THE FTC, CHAIRMAN
RAMIREZ ALREADY SPOKE ABOUT THIS
MORNING ABOUT THE IMPORTANCE OF
THE CONTEXT OF THE INTERACTION
AND HOW IF DATA IS USED OUT OF
CONTEXT IT REALLY NEEDS
INDIVIDUAL INPUT.

THE WORLD ECONOMIC FORUM IN A SERIES OF GLOBAL DISCUSSIONS ON ITS MULTIYEAR DATA PROJECT ON RETHINKING PERSONAL DATA HAS FOUND THAT IN THE WORLD OF DATA-DRIVEN ECONOMY THERE IS REALLY A NEED TO REALLY MOVE, MIGRATE TO WHAT IS A DATA USE MODEL, BUT IT IS CRIRL TO ENGAGE AND EMPOWER THE INDIVIDUALS.
FURTHERMORE REALLY VALIDATING THE NOTION THAT CONTEXT IS A KEY ELEMENT.
IT ALSO PUTS FORTH THE ROLE OF TECHNOLOGY AS PART OF THE SOLUTION AND TRUSTWORTHINESS OF THE DATA ECHO SYSTEM.
BASED ON THIS WORK WE UNDERTOOK A GLOBAL RESEARCH, WE TALK A LOT ABOUT CONTEXT BUT IT'S NOT CLEAR WHAT CONTEXT AWARENESS MEANS OR WHAT THE ELEMENTS DEFINE CONTEXT.
SO BETWEEN 2012 AND 13 MICROSOFT UNDERTOOK A MULTIPHASED PROJECTS QUALITATIVE AND QUANTITATIVE, TO LOOK AT WHAT ARE THE FACTORS THAT INDIVIDUALS TAKE INTO CONSIDERATION IN DETERMINING WHETHER A GIVEN SCENARIO INVOLVING USE OF DATA ABOUT THEM.
SO NOT JUST USE OF INADEQUATE THAT PROVIDED WOULD BE ACCEPTABLE.
WE TERMED THIS CONTEXT OR DATA USE CONTEXT GENERICALLY.
SO WHAT WE FOUND IS THAT THERE WERE REALLY TWO GROUPS OF VARIABLES.
ONE THAT ARE OBJECTIVE VARIABLES.
IN OTHER WORDS, THE FACTS ABOUT THE ACTUAL DATA USE, AND THEN A SET OF VARIABLES THAT ARE MORE SUBJECTIVE.

TRUST AND VALUE EXCHANGE.
IN THE OBJECTIVE VARIABLES IT HAS TO DID WITH THE TYPE OF DATA, THE TYPE OF ENTITY, IN OTHER WORDS, WHAT IS THE ENTITY I'M INTERACTING WITH?
IS IT A RETAILER, IS IT A BANK, IS IT A BOOKSELLER, IS IT MY EMPLOYER, IS IT A GOVERNMENT AGENCY?
WHAT IS THE DEVICE I'M USING, IS IT A MOBILE DEVICE?
IS IT MY HOME COMPUTER, IS IT A LATCH TOP, ET CETERA?
THE COLLECTION METHOD BY WHICH THE DATA IS COLLECTED, HOW THE DATA CAN IS USED WHETHER I ACTUALLY CONSENT TO ITS USE OR WHETHER IT'S USED TO AUTOMATE DECISIONS ABOUT ME.
IN THE SUBJECTIVE VARIABLES THIS IS WHERE PRIVACY BECOMES A DIFFICULT DECISION BECAUSE IT IS VERY SUBJECTIVE.
IT HAS TO DO WITH THE LEVEL OF TRUST WITH THE ENTITY THAT I'M INTERACTING WITH, IT ALSO HAS TO DO WITH THE PERCEIVED VALUE THAT I'M RECEIVING FROM THE USE OF INFORMATION.
IN THE SECOND PHASE THIS IS DATA THAT WAS, RESEARCH THAT WAS DONE IN FOUR COUNTRIES, CANADA, CHINA, GERMANY AND THE U.S.
THE COUNTRIES WERE CHOSEN BECAUSE OF THE VARIOUS DIFFERENT APPROACHES THEY HAVE TO ITS PRIVACY REGULATIONS.
WE FOLLOWED UP WITH A QUANTITATIVE RESEARCH IN EIGHT COUNTRIES TO LOOK AT SPECIFIC SCENARIOS SO THAT WE CAN DETERMINE WHAT ARE THERE RELEVANT IMPORTANCE OF THESE FACTORS IN THE DIFFERENT COUNTRIES AND HOW DO THEY VARY

IN THE DIFFERENT COUNTRIES.
SO LET ME WALK YOU THROUGH A SERIES OF SCENARIOS.
I'VE DELIBERATE PICKED A RATHER UNDESIRABLE SCENARIO THAT IS PROBABLY RELEVANT TO A LOT OF PEOPLE HERE.
LOOKING AT PRIVACY, THE SCENARIO IS LOCATION DATA BEING COLLECTED FROM A MOBILE DEVICE.
THE WORD SERVICE PROVIDER HERE COULD MEAN ANYONE'S IT COULD BE AN ONLINE BOOK RETAILER COLLECTING MY INFORMATION OR A COFFEE SELLER.
NOT GOING TO MENTION ANY NAMES.
TRYING TO COLLECT MY LOCATION INFORMATION AS IN THE AREA.
IN THE FIRST SCENARIO I SAY, INFORMATION GATHERED TO MAKE AUTOMATIC DECISION, I I AM UNFAMILIAR WITH THE COMPANY.
SO THIS IS THE FIRST TIME THAT I WALK INTO THAT COFFEE STORE OR THE FIRST TIME THAT I'M ENTERING INTO THE BOOK RETAILER.
AND THE USE OF THE INFORMATION WILL HAVE NO BENEFIT TO ME.
SO WHEN WE LOOK AT THE ACCEPTABILITY FACTOR, IT'S VERY LOW.
ALL RIGHT?
HOWEVER THERE ARE SOME CLEAR PATTERNS THAT ARE STARTING TO EMERGE WHICH ARE THE WESTERN COUNTRIES WHICH ARE THE COUNTRIES TO THE LEFT, THE ACCEPTABILITY IS VERY BELOW AND THIS INCLUDES THE U.S., GERMANY, U.K, CANADA AUSTRALIA AND SWEDEN WITH CHINA AND INDIA, THE LOCATION IS MORE TECH-AWARE, THE ACCEPTABILITY IS HIGHER.
WE VARY THIS TO SAY IN SCENARIO 2 WE KEEP IT THE SAME, THE BASE SCENARIO IS EXACTLY THE SAME.

IT IS STILL A COMPANY THAT IS UNFAMILIAR TO ME AND THERE'S NO BENEFIT TO ME BUT WE CHANGE THE DATA USAGE TO PERSONALIZE MY CHOICE.
SO WHAT'S THE IMPACT OF THIS ON ACCEPTABILITY?
SO WE SEE THAT THERE IS SOME INCREASE.
FROM A PROPORTIONAL PERSPECTIVE MUCH MORE IN THE WESTERN COUNTRIES DHAN IN THE CHINA AND INDIA.
FOR EXAMPLE, IN SWEDEN, ACCEPTABILITY RATE INCREASED MORE THAN TWO TIMES FROM 5% TO 12%.
AND IT'S MUCH, MUCH LESS AS YOU CAN SEE JUST KIND OF EYEBALLING IT.
SO WHAT THIS SAYS IS DATA USAGE IS A MORE IMPORTANT FACTOR PREFLT IN THE WESTERN COUNTRIES BUT NOT INCHINA.
LET'S VARY THE SCENARIO AGAIN.
WE KEEP IT THE SAME, THE DATA USAGE IS PERSONALIZE MY CHOICES.
AND THE VALUE IS STILL NO BENEFIT TO ME.
BUT THE COMPANY IS NOW SOMEONE WHO'S WELL-KNOWN TO ME.
WHAT'S THE IMPACT OF THIS?
SO YOU CAN START SANTO TO SEE THAT TRUST IS A LARGE FACTOR.
BOTH IN THE WESTERN COUNTRIES AS WELL AS IN THE EASTERN COUNTRIES ALTHOUGH PROPORTIONALLY MUCH MORE IN THE WESTERN COUNTRIES.
THE LAST VARIATION IS WHEN WE LOOK AT THE VALUE EXCHANGE FROM NO BENEFIT TO COMMUNITY BENEFIT.
WHAT WE SPEE MERE AND THIS IS A TREND THROUGH THE REST OF THE SURVEY IS THERE THE SPRAL EXCHANGE FOR COMMUNITY BENEFIT IS MUCH, MUCH GREATER IN CHINA

THAN IN THE WESTERN COUNTRIES.
NOT GOING TO MAKE ANY GENERAL
COMMENT ON THAT ONE.
HOPEFULLY WITH SOME OF THIS DATA
YOU CAN START TO SEE THE POINT
THAT THESE FACTORS REALLY IMPACT
ACCEPTABILITY OF DATA USE AND IT
IS VERY MUCH A NUANCED
CONVERSATION.
THIS IS WHAT MAKES PRIVACY SO
DIFFICULT AND THAT THESE FACTORS
DO VARY ACROSS PERSONAL SOCIAL
AND CULTURAL NORMS.
WHAT ARE SOME OF THE OTHER
FACTORS THAT CAN IMPACT
COMMERCE?
WE TOOK A FAIRLY DIFFICULT
PROBLEM AND TOOK A FAIRLY
STRAIGHTFORWARD AND LIMITED
APPROACH TO IT.
IN OUR RESEARCH WE FOUND THAT
DEMOGRAPHICS CULTURE AND
PERCEPTIONS ALSO HAS AN IMPACT.
AGE GENDER AND OCCUPATION IN
TERMS OF CULTURE IN TERMS OF
NATIONALITY, HISTORICAL IMPACT,
THE LEVEL OF TECHNOLOGY ADOPTION
OF A PARTICULAR COUNTRY IN TERMS
OF ITS POPULATION AND THE
REGULATIONS THAT ARE IN PLACE.
BELIEVE HAS TO DO WITH RISK
PERCEPTIONS AND SOME VARIATIONS
IN TERMS OF PERCEPTION OF THE
REGULATION.
SO AGAIN, WE TOOK A FIRST STEP
AT DEFINING CONTEXT BUT THIS IS
A REALLY COMPLICATED ISSUE.
HOW DO YOU ACTUALLY USE THIS
INFORMATION TO TRY TO BUILD OUT
A CONTEXT-AWARE SYSTEM WITHIN
THE WORLD OF THE INTERNET OF
THINGS, LET'S SAY I'M A USER
ACCESSING A MOBILE DEVICE, THE
APPLICATION IS BEING PROVIDED
AND THEN THERE IS A USER PROXY
THAT WOULD PERSONALIZE UX TO ME.

HOW IS THAT PERSONALIZED UX DRIVEN?
AN IMPLEMENTATION OF THE VARIATION OF THE MODEL I JUST DESCRIBED.
THAT IS HOW BY GETTING SOME INFORMATION EITHER THROUGH THE CREDIT APPLICATION OR THROUGH OTHER THINGS ABOUT THE USER AND THE SESSION, I CAN PERSONALIZE DATA RECOMMENDATION HE TO THE USER ITSELF.
THE NEXT STEP IN TERMS OF ENABLING TRUST WITHIN THIS SYSTEM SO THAT WE CAN HOLD ONTO THE PREFERENCES OF THE USER CONSISTENTLY.
NOW IF THE USER REMEMBER THAT THESE ARE JUST SYSTEMS AND THERE'S MODELS BEHIND THEM.
SO IF THE USER HATCHES TO MAKE A DIFFERENT CHOICE OR A DIFFERENT SETTING, THE NOTION IS THAT THIS SHOULD THEN BE CAPTURED IN SOMETHING WE CALL A USE PREFERENTIALS MODEL.
THE FTC HAS A NOTION OF COMMON ACCEPTABLE PREVENTIONS, WE CAN START LOOKING AT CHANGES IN USE PREFERENCES DYNAMIC CLI.
THIS STARTS TO CHANGE HOW CAN WE BUILD OUT DYNAMIC SYSTEMS AT THE END OF THE DAY AND AFTER ALL THE IOT IS A COMPLETELY DYNAMIC SYSTEM.
WHERE CAN THESE SYSTEMS BE USED?
PETER BY A SERVICE PROVIDER WHAT WE CALL CONTEXTUAL PRIVACY, THEY CAN BE USED BY BOTH SIDES AGAIN TO ASSIST THE END USER.
SO IN CONCLUSION, WHAT I'VE PRESENTED HERE ARE SOME PRELIMINARY FINDINGS THAT, HOPEFULLY, WILL MOTIVATE YOU TO THINK ABOUT THE ROLE OF THE USER AND WHAT USER ATTITUDES ARE,

WITH RESPECT TO THE USE OF THEIR DATA.
HOPEFULLY, WE CAN CONTINUE TO EXPLORE THIS THROUGHOUT THE DAY IN TERMS OF THE HEALTH CARE, THE CONNECTED HOMES, THE CONNECTED CARS.
WITH RESPECT TO THE WORLD OF THE INTERNET OF THINGS, THE ONLY THING THAT IS SURE IS YOU KNOW, THE EXISTING MODEL IN TERMS OF THEY REALLY NEED TO TRANSFER MORE TO USE BASE, AND WE FEEL IT'S ESSENTIAL TO CREATING A SUSTAINABLE ECOSYSTEM.
BUT JUST AS KEITH MENTIONED, PRIVACY IS DIFFICULT.
NOT JUST TECHNOLOGY BUT AT THE SAME TIME, ECONOMICS, ETHICAL USAGE OF DATA AND POLICY AT THE SAME TIME, WE TALK A LOT ABOUT TECHNOLOGY RESEARCH BUT WE DON'T OFTEN TALK ABOUT THE NEED TO DO POLICY RESEARCH.
AND WHAT I'M HOPING FOR IS WITH SOME OF THE MESSAGES THAT I'M TALKING ABOUT THIS MORNING, THAT THERE WOULD BE SOME EFFORTS TO TRY TO ALSO LOOK AT POLICY RESEARCH.
AGAIN, PUT YOURSELF IN THE FUTURE IN THE INTERNET OF THINGS.
THE LAST MESSAGE I WANT TO LEAVE IS THERE'S A LOT MORE WORK TO DO TO UNDERSTAND THE INTERNET OF THINGS.
WE HAVE NEVER ENCOUNTERED A SYSTEM THAT IS CHANGING SO QUICKLY.
WE NEED TO UNDERSTAND WHAT THE QUESTIONS ARE BEFORE WE CAN FORMULATE THE ANSWERS APPROPRIATELY, BEFORE WE JUMP TO AN ANSWER.
THANK YOU VERY MUCH.

[APPLAUSE]