

Leveraging Technology & Innovation to Help Local Governments Provide Broadband Services

Prepared for the Colorado Municipal League by HR Green, Inc.

Learn From the Pros

January 17, 2018





TRANSPORTATION
WATER
GOVERNMENTAL SERVICES
LAND DEVELOPMENT
ENVIRONMENTAL
CONSTRUCTION



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About HR Green, Inc.

Founded in 1913, HR Green provides **solutions that connect and shape communities.**

For more than a century, HR Green has provided **engineering, technical and management solutions** in the following markets:





TRANSPORTATION
WATER
GOVERNMENTAL SERVICES
LAND DEVELOPMENT
ENVIRONMENTAL
CONSTRUCTION



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Today's Presenters

George Wentz, PE

- 40+ Years Municipal Services Management including Colorado
- City Manager and Building Official
- Facilitated Management of Municipal Operations
- Current role: Vice President, Governmental Services, HR Green



David Zelenok, PE

- City Manager/Public Works Director in Colorado for 20+ years
- Current role: Local Government Services Manager
- Frequent presenter at CML






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Agenda



A CRISIS OF INNOVATION!
45 things you never saw coming in 45 minutes!

- Emerging technologies & terminologies
- Current legislative & regulatory environment
- Legal considerations
- Colorado street light replacement initiative

- Partnering with government
- Infrastructure programs, funding streams
- Developing a roadmap: What can you do right now?
- Q&A




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Example: No New “Fortress Malls,” – Replaced by “Urban Centers”



12% of ALL retail is now on-line
Q: What ELSE IS DYING?



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The END of the LINE for

- Fortress Malls?
- Road Widening Projects?
- Privately Owned Vehicles?
- Car Ownership - Car Dealers?
- Parking Garages?
- Parking Lots / Runoff?
- Mass Transit (Yes, \$1B Light Rails)?
- Gasoline Stations?
- Gas Tax (Electrification – Full Adoption: 2040)?
- Three-car garages?
- Congestion – Up AND down – profound changes

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But Say Hello To:



- Electric Cars & Car parts
- Self driving BUSES:
- Large, Dense City Centers(100,000/hr)
- Sensors: “V2V” & “V2I”
- 5G Cell Phones: Streetlight transmitters x 300' Spacing
- Parametrically and dynamically controlled traffic signals
- **Fiber:** Utility meters & Fiber to the premises (FTTP)




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What's Driving the Change?

- **#1: People as Sensors** (WAZE)
- **Uberization & Urbanization**
- Willingness to share data
- Explosion of data – 16x from 2007
- Ubiquity of mobile devices
- Broadband: 43% ANNUAL increase in demand
- “Cross sector dynamics”
- Increasing expectations




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Since 2013: Colorado SB-152 Exempt Cities/Counties now 100 and growing

Pre-Nov 2015 & Exemptions	Nov 3, 2015 Counties	2015 Cities	2016-2017 Cities
1. Longmont - 2011	1. Archuleta	1. Alma	1. Buena Vista
2. Centennial - 2013	2. Clear Creek	2. Bayfield	2. Colorado Springs
3. Boulder	3. Custer	3. Brighton	3. Cripple Creek
4. Cherry Hills Village	4. Eagle	4. Cedaredge	4. El Paso County
5. Montrose	5. Garfield	5. Craig	5. Fruita
6. Estes Park	6. Gilpin	6. Crawford	6. Mancos
7. Grand Junction	7. Huerfano	7. Crested Butte	7. Orchard City
8. Red Cliff	8. Jackson	8. Delta	8. Pagosa Spgs
9. Wray	9. Lake	9. Durango	9. Teller County
10. Yuma	10. LaPlata	10. Fairplay	10. Victor
11. Rio Blanco County	11. Moffat	11. Fort Collins	11. Westcliffe...
12. Yuma County	12. Park	12. Fraser	12. Manitou Spgs
13. San Miguel County	13. Pitkin	13. + 3 School Districts	13. Minturn
14. Glenwood (grandfather'd)	14. Routt	14. Hayden	
	15. San Juan	15. Hotchkiss	
	16. Summit	16. Ignacio	
	17. Washington		

NOW ~114!



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Emerging Trends Sensors & Dashboards

- **Crowd Sourcing** – “WAZE” App (Google owns)
- **PEOPLE AS SENSORS:** Data Sources Include:
 - In Pavement
 - Bluetooth – O & D (if discoverable)
 - Wi-Fi (more granular)
 - Overhead / Microwave: DOT
 - On-STAR (GM – 12% Samples)
 - Cell Phones
 - Users (Citizen Tweets)
- **FIRST:** City-Reported: WAZE Colorado Springs
- **Re-routing around tomorrow's cone zones**
- **Q: Cell Phone Messages Big Deal? (Ask Hawaii)**



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Cellular Trends – LTE to 5G Think: Flip Phone to Smart Phone

- A Transmitter on Every Block; 300 Feet vs. 3 Miles
- 5G will require fiber feeds to each transmitter

Fiber solutions can:

- ✓ Create revenue
- ✓ Control aesthetics
- ✓ Abandon the mega sites?



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Emerging Trends – Mobile Weather

NEXT: “Hypergranular” SENSING
Pavement Conditions
Friction Measurements: TOP Priority
NEXT UP: FIBER as the SENSOR itself!



Thanks: Vince Jordan, Fathym/Weather Cloud



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Emerging Trends: SMART Parking Sensors Where's my spot?

Thanks: S

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Autonomous – Driverless – Self-Driving

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So – WHAT's the BIG DEAL?

Transit – 5% (maybe)
 Carpooling – 5% (maybe)
 Telecommuting – 10-20% (maybe)
 Driverless Capacity

SCARY: 10% Driverless – 2025
 80% Driverless – 2040 Deloitte
 What about our 2040 plans? How about 2030?
 94% of COG's are **IGNORING** these facts

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Are just roads affected?

Quick "DEEP DIVE:"
 Parking Garages ~50% increase in capacity

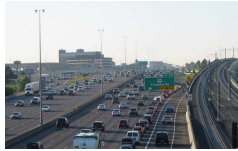
- Q: Who wants to pay for parking when you can send your car to run an errand for you?
- OR - Park itself in the neighborhood?
- OR - Go for a joyride – CLOG the FREEWAY(?)

Self-parking Cars	Cars With Driver

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Profound Impact of Driverless Cars



- With autonomous cars –
- Send your car **home** instead of paying for parking!
 - Are smart cars good for **drunk** drivers?
 - What about city **revenue drops** from no speeding tickets?
 - Might this be the end of **mass transit** as we know it?
 - Highways essentially become **"train tracks"**



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Profound Impact of Driverless Cars

- With reduced accident rates –
- Is the **Q: IS DRIVING BECOMING A DISTRACTION** to – **TEXTING -?!?**
 - **What Else – DON'T WE KNOW?**



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Smart Cities: Technology Integration



ADVANTAGES OF SMART CITY

CONTROL	UTILITY	SERVICES	TRANSIT	PUBLIC SAFETY
WATER TREATMENT	SMART WASTE MANAGEMENT	MOBILE PAYMENTS	INTELLIGENT RAIL AND TRANSIT SOLUTIONS	VIDEO SURVEILLANCE
WATER MANAGEMENT	SMART WASTE MANAGEMENT	REMOTE OUTAGE NOTIFICATION	INTELLIGENT RAIL AND TRANSIT SOLUTIONS	REMOTE SECURITY MONITORING
ENVIRONMENTAL CONTROL	RECYCLING	ONLINE ORDERING	FLIET MANAGEMENT	EMERGENCY RESPONSE
CONSERVATION OF ANIMAL POPULATIONS	EQUIPMENT MONITORING/CONTROL	REMOTE CONTROL	ASSET TRACKING	SMART STREET LIGHT
		24 HOUR ACCESS	MOBILE PAYMENTS	MASS NOTIFICATIONS
			SMART ROADS	



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Emerging Global Trends: Central Control

Smart Cities

Interconnecting everything

Streetlights	Utilities
Energy	Traffic Signals
Parking	Roads
Transit	People
Logistic Systems	Sensors



DASHBOARDS WILL BECOME CRUCIAL TO CENTRAL CONTROL!



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Technology Advancements

Wireless, coax, copper wires and fiber

- Coax & wire systems: ~20-40 mbps
- 1 fiber strand (virtual) can carry 100x more data than coax
- 20+ million households on one fiber strand
- 100+ Cities are now investing in broadband
 - Longmont, Centennial, Manitou, Breckenridge and more!

**Do you have the technology?
Are you doing all you can?**



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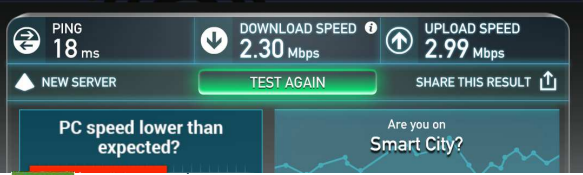
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TELECOM – 101

Terminology & TECHNOLOGY

- 2015: FCC redefined “Broadband:”
25 down & 3 up



PC speed lower than expected? Are you on Smart City?

- Only \$50-\$70/month
- Longmont: 20,000 customers x \$50 = \$1MM/month

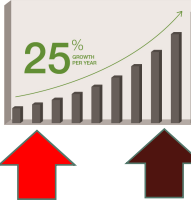
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What Is Driving Broadband Changes?

- Demand for bandwidth = 43% annual growth rate
- The technologies DO exist to support demand
- Incumbents: Difficult to invest in upgrades
- So what's changed?
 - Enter **GoogleFiber**
 - Broadband now seen as the 4th Utility
 - Utility Companies, Muni's, Co-ops
 - 110+ Colorado Cities and Counties



TV	HDTV	4K	8K	
2G	3G	4G	LTE	5G

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What's Driving 100+ Colorado Cities to Consider Broadband Involvement?

- Incumbents:
 - Speed/Prices/Service
 - Networks: Years Away
- Economic Development
 - Hi-Tech Businesses
 - Working from Home
 - Entrepreneurs
- Education: "Digital Divide"
- Property Values
- Citizen Service
- Revenue Potential
- Smart City Positioning




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Your City Is Already "Pre-positioned"

- **Traffic Signals**
 - Intelligent Transportation Systems
- **Utilities**
 - SCADA
 - AMR/AMI - Meter Reading
- **Street Lights**
- **Public Rights of Way**
- **IGA's:** Schools, hospitals, public safety
- **Plenty of existing public fiber**
- **Conduit is the key to fiber ~ 90% of cost**



Old Pipe? Fiber Conduit?

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Vail: Street Lighting & FREE WiFi

"5G" won't exist for 8-10 years
Requiring thousands of transmitters
5G Will Require ~300' spacing
"Perfect Backbone": Fiber...
Street lights, Signals & Utility Meters



4.34 Megabits

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It's "Just" a Streetlight



- **Municipalizing Lighting**
 - **Utility-owned lights**
- \$15-20/month
 - **City-Owned lights**
- \$2-4/month
 - 5-10 Year ROI
- **BETTER YET - Next Level**
 - "Smart" Streetlights
 - 5G Cellular Enabled
 - Digital Signage
 - Sensors & Counters
- **Now: Room in Electrical Conduit for Fiber Optics**
- **Own Your Streetlights!**

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What Else Can You Do?

Utility: Smart Meters

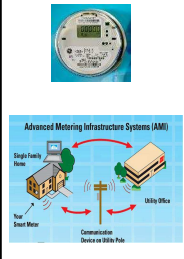
Meter Reading TODAY: RF system (~\$200-\$500 ea).

RF Will not support:

- Longer term investments
- Smart City initiatives

You NEED to decide:

- What role should fiber play?
- How soon?
- How to allocate the costs
 - Utility?
 - Gen'l Fund - CDOT?
 - Do Nothing (?)



AMI Metering

- Reliable
- Safe
- Secure
- Accurate

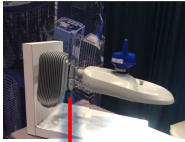
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Sensors → "Fog" → Dashboards → Cloud → Action

More Sensors = Real time alerts





- Stolen vehicle on a corridor
- Signal malfunction
- Abnormal vehicle congestion
- Obstruction on the road (tree falls tornado)
- Unusually large crowd
- Gunshots
- Water leak from aging pipeline
- Carbon monoxide levels (indicating a fire)
- Flood warnings
- Rain events: Traffic Signals: reduced accidents




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Sensors = Dashboards = Action

- Citizens often **don't** care about City Wide Alerts
- Citizens **do** care about conditions that affect them...
 - Kids' school:
 - Wanting: self-defined warnings, data & dashboards









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So – IF Smart Cities are Inevitable What Can I do TODAY?

1. **FIBER** = the common thread
2. Lacking Today
3. Under Your Control
4. You Can Do TODAY
5. Low Cost

Telecom & Infrastructure : CRUCIAL!







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Case Study – Centennial, CO

City paid to upgrade 1 – 24 CDOT fiber cable to 2 – 96 fibers, sharing 50/50

City of Centennial
IGA Conduit and Fiber

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Case Study – Centennial, CO

From 3 miles to 60+ miles Conduit value ~ **\$6,000,000** (\$20/foot)
 Conduit cost ~ \$ 600,000 (\$2/foot)

**2015
 Conduit and Fiber Communications System**

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Case Study – Centennial, CO

Pro-Fiber Policies

- P3s
- Joint-Build
- Piggyback
- Dig-once policies
- Reduced open trenching
- Co-locations
- Fee reductions, incentives, individual agreements
- US DOT/CDOT grants

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Case Study – Centennial, CO

Results

- Fewer street cutting permits
- Reduced potholes
- Less construction and traffic congestion
- Sharing of infrastructure – “P3s”
- Private Sector Investment – very robust
- Incumbents still improving service
- TING now installing
- MINIMAL COST
- Property Values - CLIMBING

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WHAT CAN WE DO TODAY?

1. **IMMEDIATE** – Public Policy: Co-location, Street Cut Rules & New Revenues, Incentives (Centennial Did)
2. **SHORT TERM**: “FIBER” (Centennial Did)
3. **MID TERM**: CO-LOCATION (Centennial Did)
4. **LONG TERM**: TECHNOLOGY ASSESSMENT

You Can't Have Too Much Fiber!

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#1: Immediate: Update Your Public Policies

- Develop **fiber friendly** policies
- Develop **co-location program**
- Consider **street light municipalization**
- Review your **street cut program**
 - Create revenue recovery systems
 - End city **subsidization** of street cutters
 - Apply revenues to new program
- Update your management systems -
 - New underground requirements



- Every inch of every utility should be mapped in **3D in your GIS** at no expense to the city

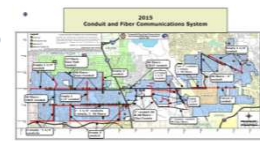


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#2: Short Term: Create Community **Fiber**

Identify fiber-related assets:

- GIS layers, records, conduits, strands, agreements, splice points, vaults, etc.
- Look for abandoned infrastructure
- Identify underutilized capacity
- **AGAIN: DEFINE OWNERSHIP OF EVERYTHING IN YOUR STREETS**
- **Identify community partners** and seek mutual benefit
- Leverage **Federal/Local grant** programs
 - E-Rate (School/Libraries)
 - Healthcare Connect Fund (Medical)
 - RUS (Electric Providers)
 - CDBG Funding
 - CDOT Fiber



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Developing a Broadband Roadmap



*"If I had an hour to solve a problem I'd spend 55 minutes thinking about the **problem** and 5 minutes thinking about **solutions**."*
- Albert Einstein



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#3: Mid-Term: From **Fiber** to **Broadband** (?)

Consider Broadband's Role: Strategic Planning

1. **Visioning** first
2. **Feasibility** for your city – every one is



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#4 Long Term:- Smart City Technologies

- More than just *Projects*
- Need: Integrated “Smart” **Programs**
- **CRUCIAL: “TECHNOLOGY ROADMAP”**

The diagram illustrates a cyclical process: Issue leads to Emerging Technologies, which leads to Consequences. Consequences lead to Cumulative Impact on Resources, which leads to Secondary Consequences. Secondary Consequences lead to Strategy Development, which leads to Action. Action leads back to Issue. A car icon is positioned at the bottom right of the diagram.

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Vision

Begin with the end in mind...

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Community Vision Preparing for Progress

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Advancing the Vision

Plan

Design

Build

Operate

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Key Attributes of a Successful Broadband Deployment

- Achieve:** Buy-In & Clarity on your Vision & Goals
- Appoint:** Cross-functional “Fiber team”
- Partner:** Anchor Institutions & Stakeholders

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Key Attributes of a Successful Broadband Deployment cont.

Involve: Economic Development advocates



Seek: All funding opportunities & revenue immediately

Create: Sustainable, Community-Centric Fiber

Identify: [unclear]

Fiber is Tomorrow's Cash Cow!

RESULT:
Improved Service at Lowest Cost, Customized to Your Needs





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Financing Alternatives


Grants & Programs

- FCC
- Dept. of Agriculture
 - Rural Utilities Service
- Dept. of Commerce
- Housing & Urban Development
- **DOLA**
- **DORA**
- Cost Avoidance
- 100% Revenue Recovery
- **STOP SUBSIDIZING YOUR STREET CUTTING!**



Bonding & Financing

- General Obligation Bonds
 - Often requires a vote
- Revenue Bonds
 - Requires existing revenue streams (generally a utility)
- Special District Assessments
- Bank Debt
- Private Financing
 - Symmetrical Networks
 - Google Fiber




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What About Small County's and Towns?

- **New Legislation Signed: 2017**

"A RURAL COUNTY MAY ESTABLISH A LOCAL IMPROVEMENT DISTRICT ONLY IN AN UNSERVED AREA TO CONTRACT WITH A TELECOMMUNICATIONS SERVICE PROVIDER OR AN ADVANCED SERVICE PROVIDER TO FUND THE CONSTRUCTION OF AN ADVANCED SERVICE IMPROVEMENT..."



- **What does it mean?**
- Many local governments can now set up - **Local Improvement Districts** for broadband
- In addition to setting up "stand alone" **Utility Enterprise** or a **Special** or **Metro District**
- Seek financing, minimize risk to the agency
- Similar to alleys and sidewalk paving



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Recap: Things You Can Do RIGHT NOW

1. **IMMEDIATE** – Public Policy: Co-locations, New Street Cut Rules & New Revenues, Inventory Your Assets
2. **SHORT TERM:** "FIBERIZE" Your City (As Centennial Did)
3. **MID TERM:** CONSIDER BROADBAND: Visioning then Feasibility
4. **LONG TERM:** SMART CITY: Technology Assessment



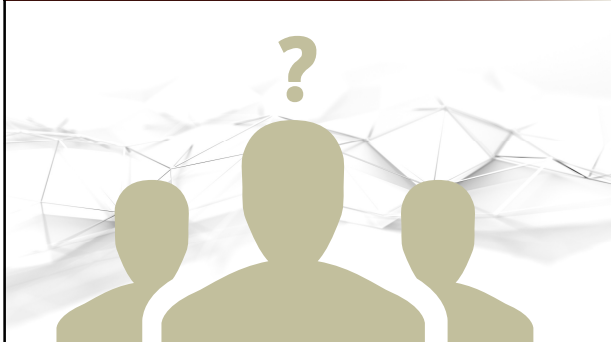






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Questions from the Audience?



Contact Information



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