Digital Data Telemetry for Air Quality Monitoring in Ohio

More reliable, less expensive, easier to manage and faster than Telemetry using analog dial-up systems.

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- Content is provided for Information purposes only and not intended to represent or endorse any product or service.

Air Quality Monitoring & Telemetry in Ohio

- 100 continuous and automated air quality monitoring sites in Ohio.
- Telemetry used was the Plain Old Telephone Services (POTS) analog lines at all sites.
  -- System ok for polling sites once daily.
  -- but, expensive to use for increased polling and reporting to support near real-time web reports, Ozone Mapping, Air Quality Index and Forecasting.
- Was there a better Alternatives for Ohio?
  - Yes, and we needed to do it in a cost effective way if we want to get data to our customers in a timely manner when useful.

TELEMTRY FOR DUMMIES (like me)

- Telemetry is a means for moving something from one point to another.
- Past popular equipment, analog land phone lines and analog modems for moving air data.
- New Alternatives to the above: leased lines, cable modems, Ethernet/LAN, Satellite & Cellular.
- Current Telemetry for air quality data collection and reporting in Ohio is Hybrid: Digital cellular 97%, analog phone lines 2%, Ethernet 1%.
- Current telemetry parts: analog modems, digital cellular modems, terminal servers, Ethernet direct.

Possible Digital-Cellular Issues

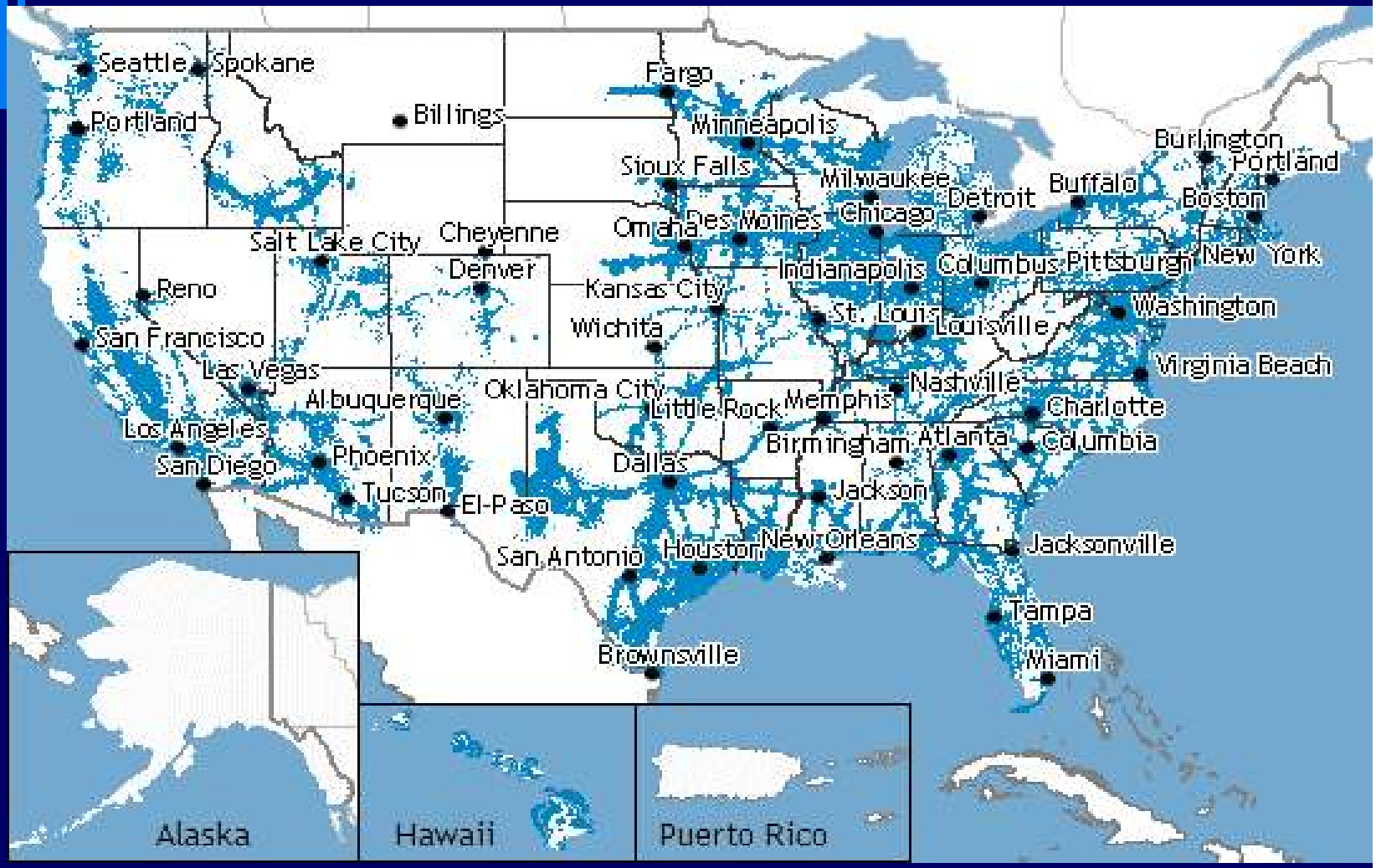
- Can our data acquisition system poll using IP addresses instead of phone numbers?
- Which data communication devices can be used with our data loggers?
- Does the remote system stay connected?
  - Stayalive ping feature for Ravens
- What type of interface cables are needed?
- Does it save money and improve performance?
- Is the remote equipment secure?

Telemetry Upgrade Solution: Digital Cellular

After evaluating available technologies and services, Ohio purchased and implemented:

- 100 Cellular Modem Devices @ $475 each at remote sites
- Data-Packet-Service -- with UNLIMITED bandwidth / site / month @ $10 / month allowing us to Poll for air data over the Internet from anywhere at anytime.
- Eliminates per-call and toll charges per connection.
- Uses static public IP addresses over the internet… just substitute IP Addresses w/port #s for phone numbers.

CELLULAR COVERAGE MAP



NEXTEL
IDEN

Data-
Packet-
Service

Digital Modem STUFF

- Airlink Raven
  - Has imbedded OS and operates similar to analog modems using “AT” command set.
  - Setup with a public and static IP address
  - Establishes connection via IP Socket.
  - Enables remote polling over internet.
  - Enables remote terminal session over internet using link-to-logger or hyper-terminal session.

Raven

Features

- High speed data transfer rate
- Full duplex transceiver
- Low power consumption
- IDEN - Nextel
- CDMA 1XRTT – VZW, SPCS, Alltel
- GPRS, EDGE – Cingular, Dobson
- Environmental operating range –30 to +75 C
- LEDs show status of modem operation
- Serial port for mobile data applications
- Over the air programmable firmware upgrades
- On-board ARM processor - ALEOS
- Class I Division II certified (Gas & Oil Industry)

Applications

- Utilities
- Telemetry/SCADA
- Fire/EMS/Police
- Workforce Automation
- ATM/POS
- Router Back-up

Security

- Ways to secure Ravens using static and public IP addresses.
  - Use “Friendly IP” list for Raven
  - Use Raven to Raven polling scenario
  - Only acknowledge approved IP addresses or subnets
- Getting Through Agency IT Firewalls
  <> Port usage for polling (use 9887 and 9881 to maintain compatibility with ESC/Agilaire)
- Do the Ravens stay connected (KeepAlive)?

Benefits Review

- Cost Savings.
- Faster.
- More Reliable.
- Unlimited bandwidth allows for greater access.
- More bandwidth available than current system?
- Multiple concurrent connections (polling and link-to-logger types)
- Allow data verification and system diagnostics from anywhere with a PC and internet connection.

Thank You for Your Time Today!

Questions?

For information contact chris.galilei@epa.state.oh.us

Air Quality Data Systems

- How to Configure EDAS-Ambient and ATX systems.
- Remote Telemetry Equipment Access and Maintenance.
- How to configure Raven cellular wireless modems.
- Cables.
- Logger Tweaking
- Abstract

EDAS-Ambient Configuration: Polling using Ethernet (1/3).

E-DAS Ambient Configure Site Information

Edit Site Information

Logger Id : 1A

Site Name : LIMA

Site Enabled : ☒

Logger Type : 8832

Time Zone : 05

IP Address/Host : 167.20.31.104:9887

Ethernet : ☒

Long Site Name : LIMA

Percent Validity

Base Average : 100

Extended Average : 75

Digital Settings

OR Non-Cal Digital Inputs ☐

Debounce Digital Inputs ☐

Digital Input / Output Settings

Line # : 01 02 03 04 05 06 07 08

Dig In Norm Open

Dig In Norm Closed

Dig Out Norm Open

Dig Out Norm Closed

Input Label :

Output Label :

Delete OK Cancel

EDAS-Ambient Configuration: Polling using Raven Modem (2/3).

E-DAS Ambient Configure Site Information

Edit Site Information

Logger Id : 1A
Site Name : LIMA
Baud Rate : 19200
Site Enabled : ☒
Logger Type : 8816
Time Zone : 05
Phone Number : 167.20.31.104/9887
Long Site Name : LIMA

Percent Validity
Base Average : 100
Extended Average : 75

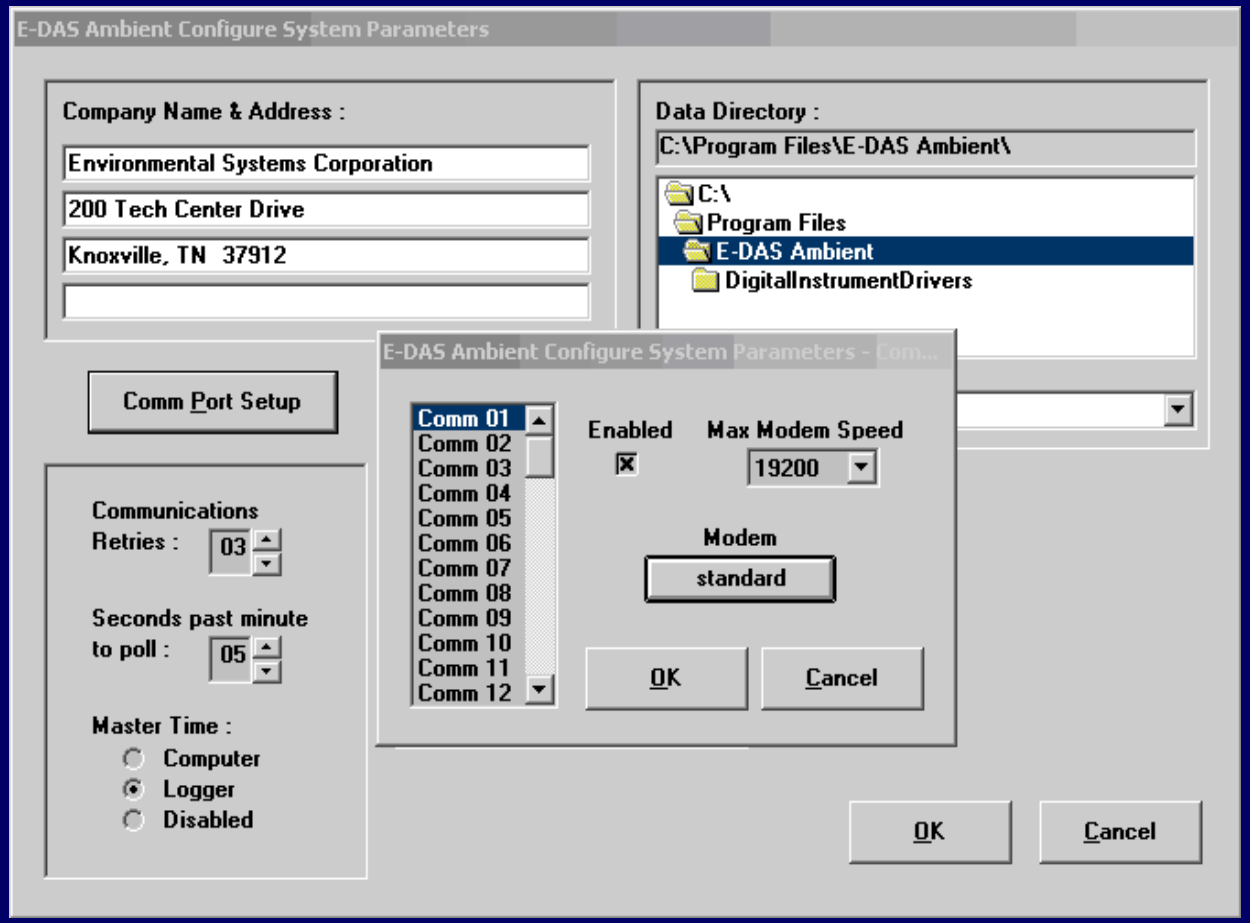
Digital Settings
OR Non-Cal Digital Inputs ☐
Debounce Digital Inputs ☐

Digital Input / Output Settings

Line # : 01 02 03 04 05 06 07 08
Dig In Norm Open
Dig In Norm Closed
Dig Out Norm Open
Dig Out Norm Closed
Input Label :
Output Label :

Delete OK Cancel

EDAS-Ambient Configuration: Polling using Raven Modem (3/3).



ATX Config Changes (1 of 3) Conduit Properties.

Conduit Properties - COMM10D

Type: COM

K Factor: 500

Definition: COM10,19200

Enabled?

Save

Restore

E-DAS/ATX Configuration Explorer

File Edit View Tools Help

- Facility
  - RADS
    - COMM1_12
      - LM9
    - COMM10D
      - LM8
    - COMM11_12
      - LM0
    - COMM12_96
      - LM10
    - COMM13D
      - LM11
    - COMM14D
      - LM12
    - COMM2_12
      - LM1
    - COMM3_96
      - LM2
    - COMM5D
      - LM3
    - COMM6D
      - LM4
    - COMM7D

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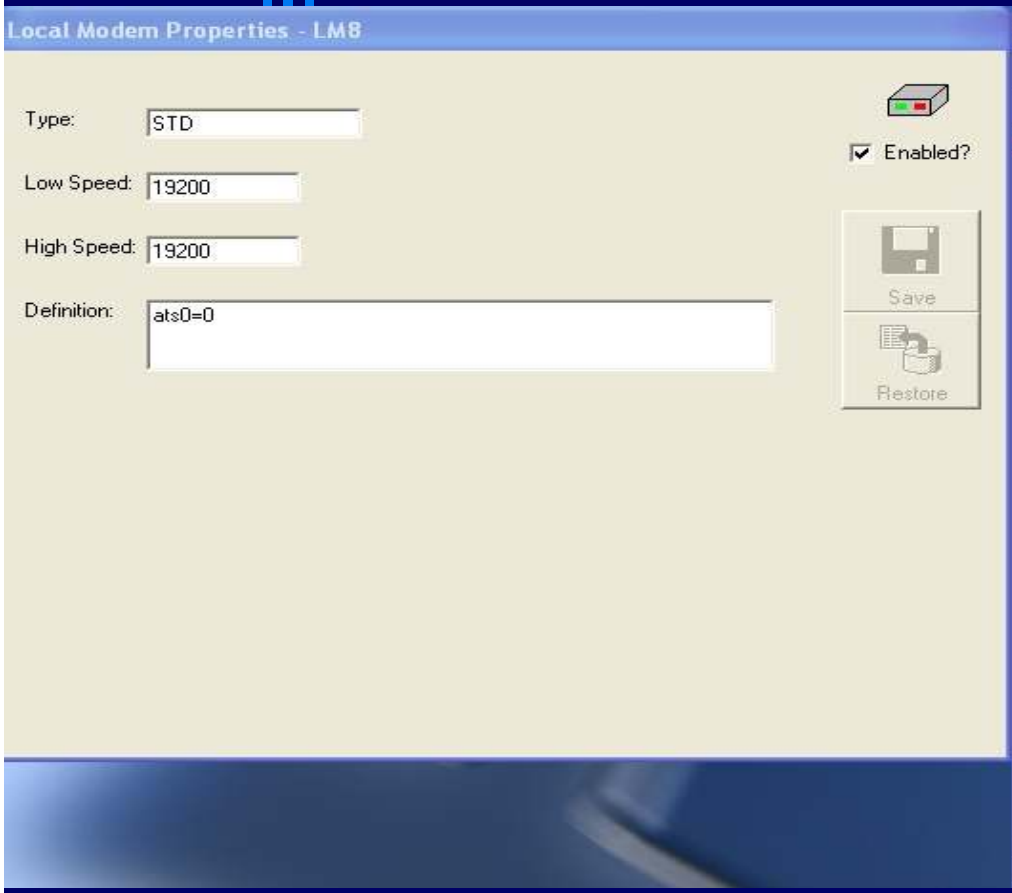
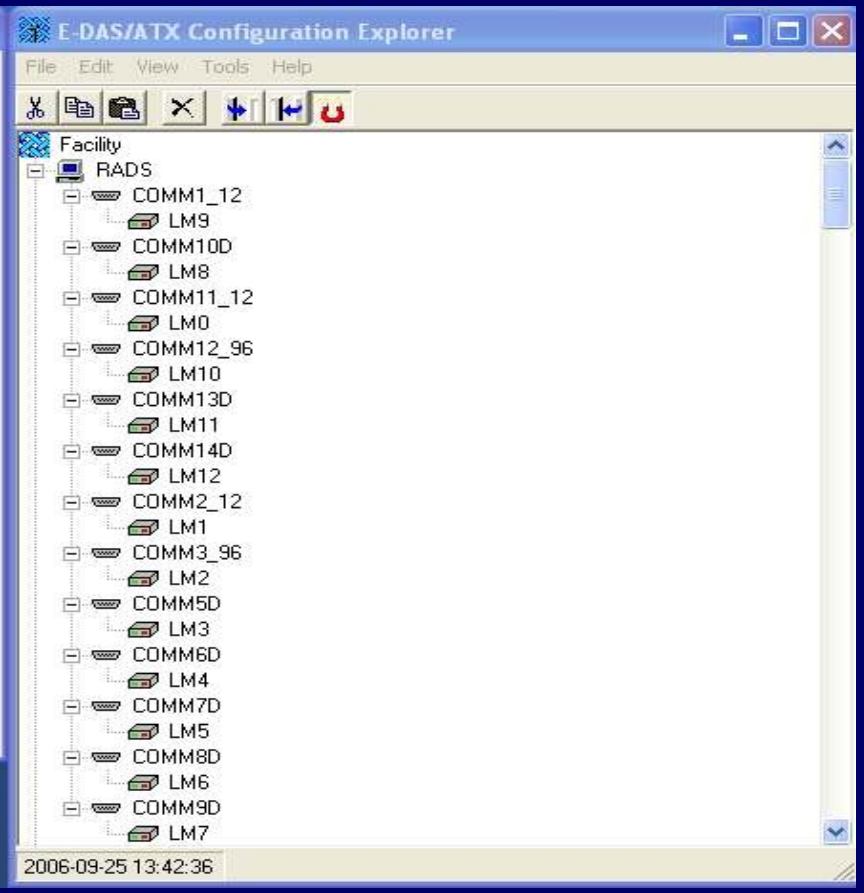
ATX Config Changes (2 of 3)
Local Command Properties





ATX Config Changes (3 of 3)
Remote Modem Properties

Remote Modem Properties - 0A

Phone: 072.007.069.207:9887

Enabled?

Low Speed: 19200

High Speed: 19200

Save

Restore

Redial Properties

Attempts: 3

Delay Interval: 0s

E-DAS/ATX Configuration Explorer

File Edit View Tools Help

- LM2
- COMM5D
  - LM3
- COMM6D
  - LM4
- COMM7D
  - LM5
- COMM8D
  - LM6
- COMM9D
  - LM7
- 0A
  - ST_THEODOS
    - SO2
- 0B
  - G_T_CRAIG
- 0C
  - TRANSOHIO
- 0D
  - MAYFIELD
- 0E
  - DISTRICT
- 0F

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Raven Setup – Info Page

File Modem Template Tools

Connect | Refresh | Refresh All | Disconnect | Write | Reset | Load | Save | Copy | Clear | Auto Refresh: Disabled

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value
*NETPHONE	Phone Number	
*DEVICEID	Device ID	0x01011F68D1ACA9B6
	Modem EID/IMEI	00150000807855
	Modem Type	Raven IDEN
I1	ALEOS Software Version	NIR200603B05 Apr 17 2006
	ALEOS Hardware Version	0307070000010000000000000000000000
	Boot Version	2.0.1
	Modem Software Version	R3C.00.02
	Modem Hardware Version	Motorola, iDEN - MS-PDGY-BER-LTL_PIN
	MSCI Version	5

Raven Setup – Status Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
Misc
Serial
TCP
UDP
DNS
Dynamic IP
PPP/Ethernet
PassThru
SMTP
Other
Low Power
Friends
LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value
*NETIP	Network IP	10.23.6.3
+WPNEI	iDEN Public Network IP	167.20.29.159
*NETSTATE	Network State	Network Ready
*NETCHAN	Channel	0
*NETRSSI	RSSI (dBm)	-69
*NETOP	Current Network Operator	NEXTEL, 31601
+CCID	SIM ID	00081683797631
*NETERR	Network Error Rate	99
	Serial Sent	6
	Serial Received	0
	Host Mode	AT
*POWERMODE	PinPoint Low Power Mode State	ON
	Number of System Resets	1393
	IP Reject Count	0
	IP Packet Sent (Host)	0
	IP Packet Recv (Host)	0
	IP Packet Sent (Network)	2
	IP Packet Recv (Network)	3
	% CPU Time	6
	% CPU Interrupt	2
	% CPU Time Busy	8

Raven Setup – Common Miscellaneous Page

File Modem Template Tools

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Auto Refresh: Disabled

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
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  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
*DATE	Date and Time	08/23/2006 13:36:52	
OPRG	Enable Over-the-Air Programing	1	
*NETPHONE	Phone Number		
*DPORT	Device Port	9887	
*NETUID	Network User ID		
*NETPW	Network Password		
*NETALLOWZEROIP	Allow Last Byte of net IP = Zero	0	
*HOSTPAP	Request PAP	0	
S53	Destination Address		
S53	Destination Port	0	
S53	Default Dial Code	T	

Raven Setup – Common Serial Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
- Misc
- Serial
- TCP
- UDP
- DNS
- Dynamic IP
- PPP/Ethernet
- PassThru
- SMTP
- Other
- Low Power
- Friends

LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
S23	Configure Serial Port	19200,8N1	
\Q	Serial Port Flow Control	2	
S50	Data Forwarding Timeout	1	
S51	Data Forwarding Character	0	
E	Command Echo	0	
V	AT Verbose Mode	1	
&D	DTR Mode	0	
S211	DTR Mode	1	
&S	Assert DSR	1	
&C	Assert DCD	1	
*CTSE	Enable CTS to Indicate Network Coverage	0	
Q	Quiet Mode	0	
X	Call Progress Result Mode	0	
*NUMTOIP	Convert 12 digit Number to IP	0	

Raven Setup – Common TCP Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
S0	TCP Auto Answer	1	
S7	TCP Connect Timeout	30	
TCPT	TCP Idle Timeout	0	
TCPS	TCP Idle Timeout Secs	0	
S221	TCP Connect Response Delay	0	
S60	Telnet Echo Mode	1	
*ENQ	Enable ENQ on TCP Connect	0	

Raven Setup – Common UDP Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
Misc
Serial
TCP
UDP
DNS
Dynamic IP
PPP/Ethernet
PassThru
SMTP
Other
Low Power
Friends
LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
MD	Startup Mode Default	00	
S82	UDP Auto Answer	2	
S83	UDP Idle Timeout	0	
HOR	UDP Auto Answer Response	0	
*UDPLAST	UDP Connect Last	0	
AIP	Allow Any IP	1	
*UALL	Allow All UDP	1	
*DU	Dial UDP Always	0	
*USD	UDP Serial Delay	0	

Raven Setup – Common DNS Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
- Misc
- Serial
- TCP
- UDP
- DNS
- Dynamic IP
- PPP/Ethernet
- PassThru
- SMTP
- Other
- Low Power
- Friends

LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
*DNS1	Modem DNS Server 1	170.206.225.21	
*DNS2	Modem DNS Server 2	170.206.225.22	
*DNSUSER	Use Alternate DNS	0.0.0.0	
*DNSUPDATE	DNS Updates	0	

Raven Setup – Common Dynamic Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
*MODEMNAME	Modem Name	00150000807855	
*DOMAIN	Domain		
*IPMANAGER1	IP Manager Server 1 (IP Adrs)		
*IPMGRUPDATE1	IPMServer1 Update (Minutes)	0	
*IPMGRKEY1	IPMServer1 Key	********	
*IPMANAGER2	IP Manager Server 2 (IP Adrs)		
*IPMGRUPDATE2	IPMServer2 Update (Minutes)	0	
*IPMGRKEY2	IPMServer2 Key	********	

Raven Setup – PPP / Ethernet Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
*HOSTPRIVMODE	Use Private IP	0	
*HOSTPRIVIP	Host Private IP	0.0.0.0	
*HOSTPEERIP	Modem Local IP	192.168.13.31	
*HOSTNETMASK	Host network mask	0.0.0.0	
*IDENUDPFWD	iDEN UDP Port Forwarding	0	
*IDENTCPFWD	iDEN TCP Port Forwarding	0	

Raven Setup – Common Passthru Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
- Misc
- Serial
- TCP
- UDP
- DNS
- Dynamic IP
- PPP/Ethernet
- PassThru
- SMTP
- Other
- Low Power
- Friends

LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
*PTINIT	Passthrough Init String		
*PTREFRESH	Passthrough Init Refresh (Minutes)	5	
*RESETPERIOD	Modem Reset Period (Hours)	1	
*CSX1	Passthrough Echo	0	

Raven Setup – Common SMTP Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
*SMTPADDR	SMTP Server IP Address		
*SMTPFROM	From email address		
*SMTPUSER	User Name (optional)		
*SMTPPW	Password (optional)	pqonrnOgJ5RRp4AZvVCa1D1CV2IOw6JgGgGpAeV9Es4=	
*SMTPSUBJ	SMTP Message Subject		

Raven Setup – common Other Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
Misc
Serial
TCP
UDP
DNS
Dynamic IP
PPP/Ethernet
PassThru
SMTP
Other
Low Power
Friends
LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
*IPPING	Keepalive Ping Time	60	
*IPPINGADDR	Keepalive Ping Address	156.63.195.2	
*MSCIUPDADDR	Status Update Address	/0	
*MSCIUPDPERIOD	Status Update Period (Seconds)	0	
*TPORT	AT Telnet Port	2332	
*TELNETTIMEOUT	AT Telnet Port Timeout (Minutes)	2	
DAE	Disable AT Escape	0	
*DATZ	Disable ATZ Reset	1	
*SNTP	Enable time update	0	
*SNTPADDR	SNTP Server Address		
*NETWDOG	Network Connection Wait	20	
*SNMPPORT	SNMP Port	0	
*SNMPSECLVL	SNMP Security Level	0	
*SNMPTRAPDEST	SNMP Trap Destination IP	/0	
*DBGINITSTR	Module Initialization String		

Raven Setup – Common Low Power Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
VLTG	Voltage Level Low Power Enable (.1 Volt)	0	
PTMR	Low Power Mode Delay (Minutes)	0	
DTRP	DTR Low Power Enable	0	

Raven Setup – Common Friends Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value	New Value
FM	Friends Mode	0	
F0	Friends List IP0	72.6.40.52	
F1	Friends List IP1	156.63.195.255	
F2	Friends List IP2	65.76.75.193	
F3	Friends List IP3	65.60.134.252	
F4	Friends List IP4	0.0.0.0	
F5	Friends List IP5	0.0.0.0	
F6	Friends List IP6	0.0.0.0	
F7	Friends List IP7	0.0.0.0	
F8	Friends List IP8	0.0.0.0	
F9	Friends List IP9	0.0.0.0	

Raven Setup – Logging Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
Misc
Serial
TCP
UDP
DNS
Dynamic IP
PPP/Ethernet
PassThru
SMTP
Other
Low Power
Friends
LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
*DBGPPPLVL	PPP Logging Detail	1	
*DBGIPLVL	IP Logging Detail	0	
*DBGCOMLVL	COM Port Logging Detail	0	

Raven Setup – Telemetry Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
Misc
Serial
TCP
UDP
DNS
Dynamic IP
PPP/Ethernet
PassThru
SMTP
Other
Low Power
Friends
LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
RKEY	Radio Keying Enabled	0	
MVTYP	Modbus Variable Type	0	
MVOFF	Modbus Variable Offset	0	
MVLEN	Modbus Variable Length	0	
MVMSK	Modbus VMask (hex)	00	
IPL	IP List Dial	0	

Raven Setup – Address List Page

GROUPS | MODEM DATA | PRINTABLE VIEW

INFO
STATUS
COMMON
Misc
Serial
TCP
UDP
DNS
Dynamic IP
PPP/Ethernet
PassThru
SMTP
Other
Low Power
Friends
LOGGING
TELEMETRY
ADDR LIST
???

AT	Name	Value	New Value
Decimal[0xHex]=...	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	
	Address Entry	0=	

Raven Setup – ??? Page

GROUPS | MODEM DATA | PRINTABLE VIEW

- INFO
- STATUS
- COMMON
  - Misc
  - Serial
  - TCP
  - UDP
  - DNS
  - Dynamic IP
  - PPP/Ethernet
  - PassThru
  - SMTP
  - Other
  - Low Power
  - Friends
- LOGGING
- TELEMETRY
- ADDR LIST
- ???

AT	Name	Value
	ID=11	00150000807855
	ID=264	IDEN
	ID=265	DCD: LOW DTR: HIGH DSR: LOW CTS: HIGH RTS: HIGH
	ID=283	126
	ID=284	464
	ID=1120	0
	ID=1121	ZCFzUUeLycb2ug01L+3Ikw==
	ID=1122	ZCFzUUeLycb2ug01L+3Ikw==
	ID=1123	0.0.0.0

CABLES

SITE: Raven modem with:

logger model	port	cable	Connector	Connection
8800	modem only	modem	9M/25M	Raven TO logger 9600
8800	modem only	null	25M/9F	Digi1-SP to logger
8816	modem or port1	modem	9M/9F	Raven TO logger 19200

Office:

Serial	port 1 or 2	modem	9M/9F	PC to Raven
Serial	port 1 or 2	null	9F/9F	PC to Digi1-SP
W/Ethernet:	RJ45s patch-cables # 20 @ 10' to 15' in length			

Using Terminal Server with:

Logger model	port	cable	Connector	Connection
8800	modem	null	25F/25M	T_Server/Logger
8800	rs232	modem	25F/25M	T_Server/Logger
8816	Modem	null	25F/9F	T_Server/Logger
8816	port1	null	25F/9F	T_Server/Logger

Old office and terminal server stuff:

Logger model	port	cable	Connector	Connection
Serial:	port 1 or 2	Null	25F/9F	T_Server to PC
	adapters	9F/9M @ # 10		

For information contact chris.galilei@epa.state.oh.us

Logger Tweaking

Here's a suggestion that can improve the reliability of remote communications with loggers using Raven modems that requires a slight change to the logger systems setup.

* NOTE: when implementing this logger setup change, all memory in the logger is wiped, including configurations and hourly pollutant data.

** NOTE_2: Before making these changes you should poll your logger(s) for current or missed data, then do a cold start on-site, and then reconfigure the logger.

The suggestion is to **change** logger port-settings in setup for a Raven modem to be:
Enabled: Yes
Baud/bits/Parity: **19200/8/N**
Delay: 0 (zero)
Device Type: **DU!TIME**
Interface:

For information contact chris.galilei@epa.state.oh.us

Ohio Telemetry Upgrades for Automated Systems that Collect and Report Air Quality Data

Abstract:

It became expensive for the Ohio EPA and Ohio Local Air Agencies to operate telemetry systems for collecting and reporting air quality data from remote air pollution monitoring sites in Ohio to varied and increasing number of customers. The Ohio network of complicated continuous air quality monitors has grown considerably since the end of the last century, and the demand for measuring, collecting and reporting more air quality data sooner, and more frequently for a growing number of data customers, has also increased dramatically.

The air sampling and data processing equipment and services involved in generating data used to demonstrate whether an area meets a NAAQS or to support enforcement or permit regulations is expensive. Usually, Capitol expenses are involved in just starting up a new ambient monitoring site. It was never inexpensive to collect data measured at these air monitoring sites for the aforementioned reasons and report them on a "monthly" basis in the past. Presently, however, we also report air quality data measured in Ohio to additional customers on an "hourly" update basis. More Environmental monitoring for public access & community tracking issues (EMPACT) informing the public about near real-time air pollutant conditions at ground-level has pushed the infrastructure supporting the ambient air monitoring work in Ohio to its efficiency and budgetary limits (EMPACT examples: air quality indexes, ozone and particulate mapping, forecasting, Ozone action days etc.).

We needed to determine and demonstrate that there is a better, less expensive more reliable and faster way to facilitate the automatic collection and reporting of air quality data from the field on an hourly basis to support newer public awareness (EMPACT) issues. In a short time, we would find that we can upgrade and improve the original telemetry system used to collect and report air quality data from the field.. Hybrid technology including a system using digital modems and data-packet services through cellular systems and the Internet is possible in place of analog modems and dial-up phone lines. Site data logger access via the Internet also simplifies and permits better means of remote on-line diagnostics for monitoring specialists, from anywhere.

After research, testing, purchasing implementation and tweaking occurred, our new telemetry system now operates at higher data transfer rates and the Ohio EPA pays only $13.00 (total) per month per site for service on each activated digital cellular modem, each having "an unlimited bandwidth." In contrast, DAPC used to pay $30 to $60 per month per analog phone line, varying toll charges and working with nine different phone companies to telemeter data at slower baud rates. We can now poll and report data from 100 automated continuous gaseous and particulate air quality monitoring sites in less than five minutes. In addition, the Ohio EPA now needs only process one invoice per month for all 100 digital cellular modems used.. Many other benefits exist for having made the telemetry upgrade and current estimates indicate that the Ohio EPA now spends approximately $135,000 less a year for telemetering air quality data. A technical discussion of elements involved in the telemetry Upgrade and transition is forthcoming.

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Thank You for Your Time Today!

Questions?

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