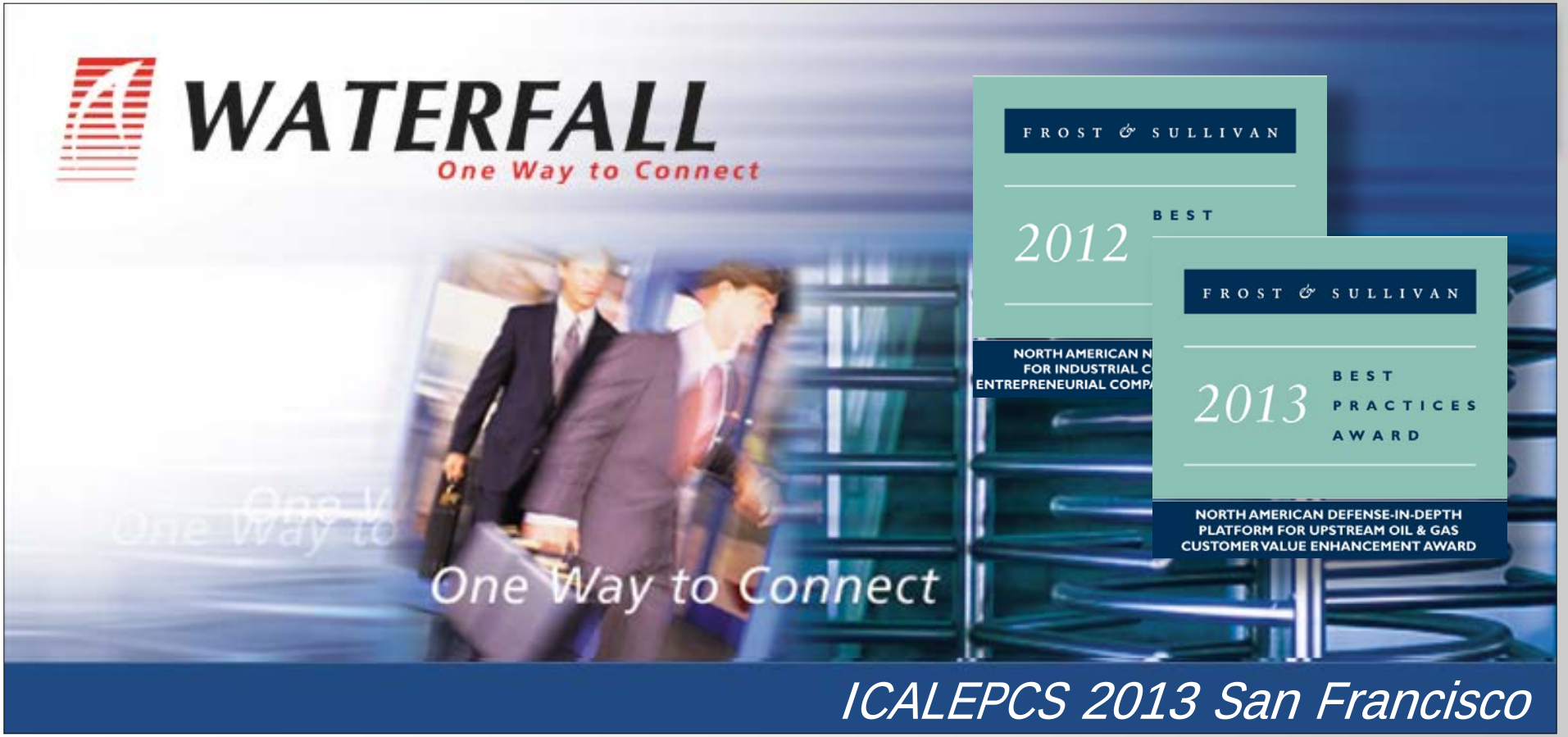

Unidirectional Security Gateways Stronger Than Firewalls

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13 Ways Through a Firewall

1) Phishing / drive-by-download – victim pulls attack
2) Social engineering / steal a password / keylogger
3) Compromise domain controller – create fwall acct
4) Attack exposed servers – SQL injection / DOS / etc
5) Attack exposed clients – compromise web servers
6) Session hijacking – MIM / steal HTTP cookies
7) Piggy-back on VPN – split tunnelling / malware
8) Firewall vulnerabilities –zero-days / design vulns
9) Errors and omissions – bad rules / IT errors
10) Forge an IP address –rules are IP-based
11) Bypass network perimeter – eg: rogue wireless
12) Physical access to firewall – reset to fact defaults
13) Sneakernet – removable media / laptops

Photo: Red Tiger Security

Every data path through a firewall is also an attack channel…

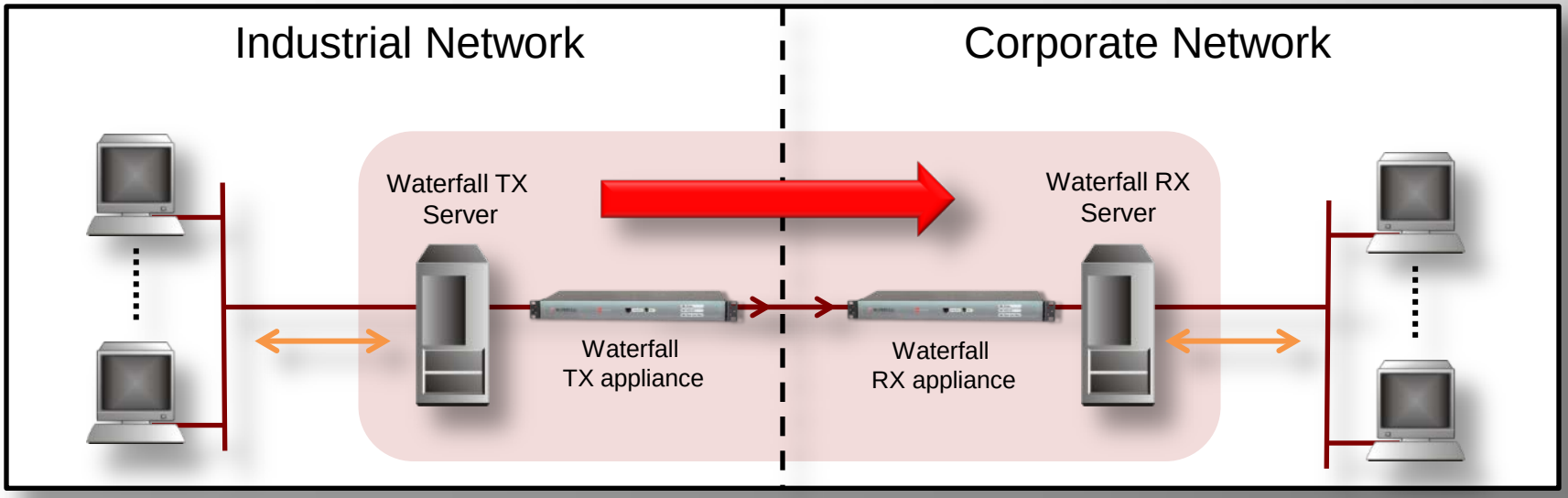
Targeted Attacks – How They Do It

- Fake email tricks users into providing passwords or installing malware
  - Or just attack exposed servers with buffer overflow, SQL injection
- Low-volume, custom malware defeats anti-virus
- Remote control: steal credentials, propagate
- Steal administrator credentials, create own passwords
- Patching: no need for vulnerabilities if you have passwords
- Create accounts, don't guess long passwords
- Firewalls allow connections with passwords

Well-known techniques are sufficient to defeat IT-style security technologies

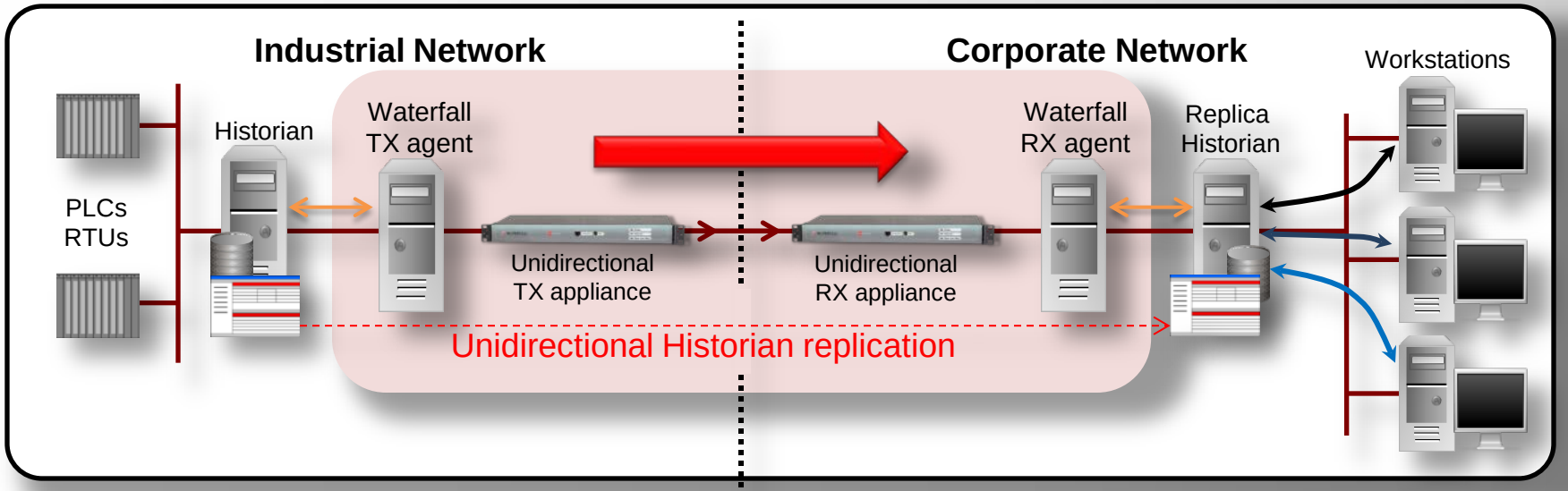
Unidirectional Security Gateways

- Laser in TX, photocell in RX, fibre-optic cable – you can send data out, but nothing can get back in to protected network
- TX uses 2-way protocols to gather data from protected network
- RX uses 2-way protocols to publish data to external network
- Absolute protection against online attacks from external networks



Secure Historian Replication

- Hardware-enforced unidirectional historian replication
- Replica historian contains all data and functionality of original
- Corporate workstations communicate only with replica historian
- Industrial network and critical assets are physically inaccessible from corporate network & 100% secure from any online attack



Unidirectional Security Gateway Connectors

Leading Industrial Applications/Historians

- OSIsoft PI, PI AF, GE iHistorian, GE iFIX
- Scientech R*Time, Instep eDNA, GE OSM
- Siemens: WinCC, SINAUT/Spectrum
- Emerson Ovation, Wonderware Historian
- SQLServer, Oracle, Postgres, MySQL, SAP
- AspenTech, Matrikon Alert Manager

Leading IT Monitoring Applications

- Log Transfer, SNMP, SYSLOG
- CA Unicenter, CA SIM, HP OpenView, IBM Tivoli
- HP ArcSight SIEM , McAfee ESM SIEM

File/Folder Mirroring

- Folder, tree mirroring, remote folders (CIFS)
- FTP/FTFP/SFTP/TFPS/RCP

Leading Industrial Protocols

- OPC: DA, HDA, A&E, UA
- DNP3, ICCP, Modbus

Remote Access

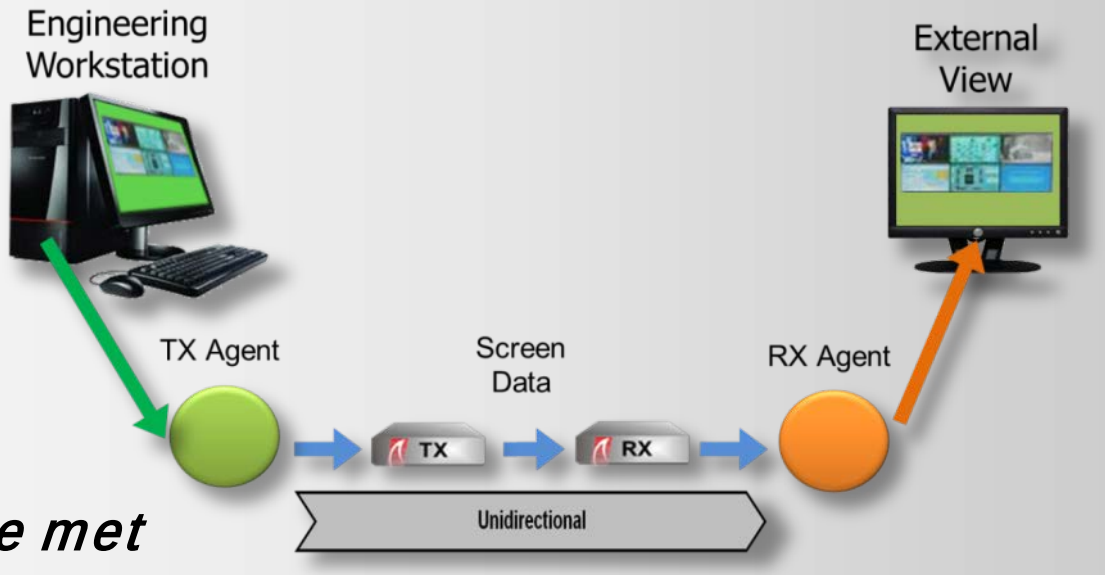
- Remote Screen View™
- Secure Manual Uplink

Other connectors

- UDP, TCP/IP
- NTP, Multicast Ethernet
- Video/Audio stream transfer
- Mail server/mail box replication
- IBM MQ series, Microsoft MSMQ
- Antivirus updater, patch (WSUS) updater
- Remote print server

Remote Screen View

- Screen shots replicated to external web server in real time
- Remote support is under control of on-site personnel
- Any changes to software or devices are carried out by on-site personnel, supervised by vendor personnel who can see site screens in real-time
- Vendors supervise site personnel
- Site people supervise the vendors



Each perspective is legitimate, both needs are met

Deployed World-Wide

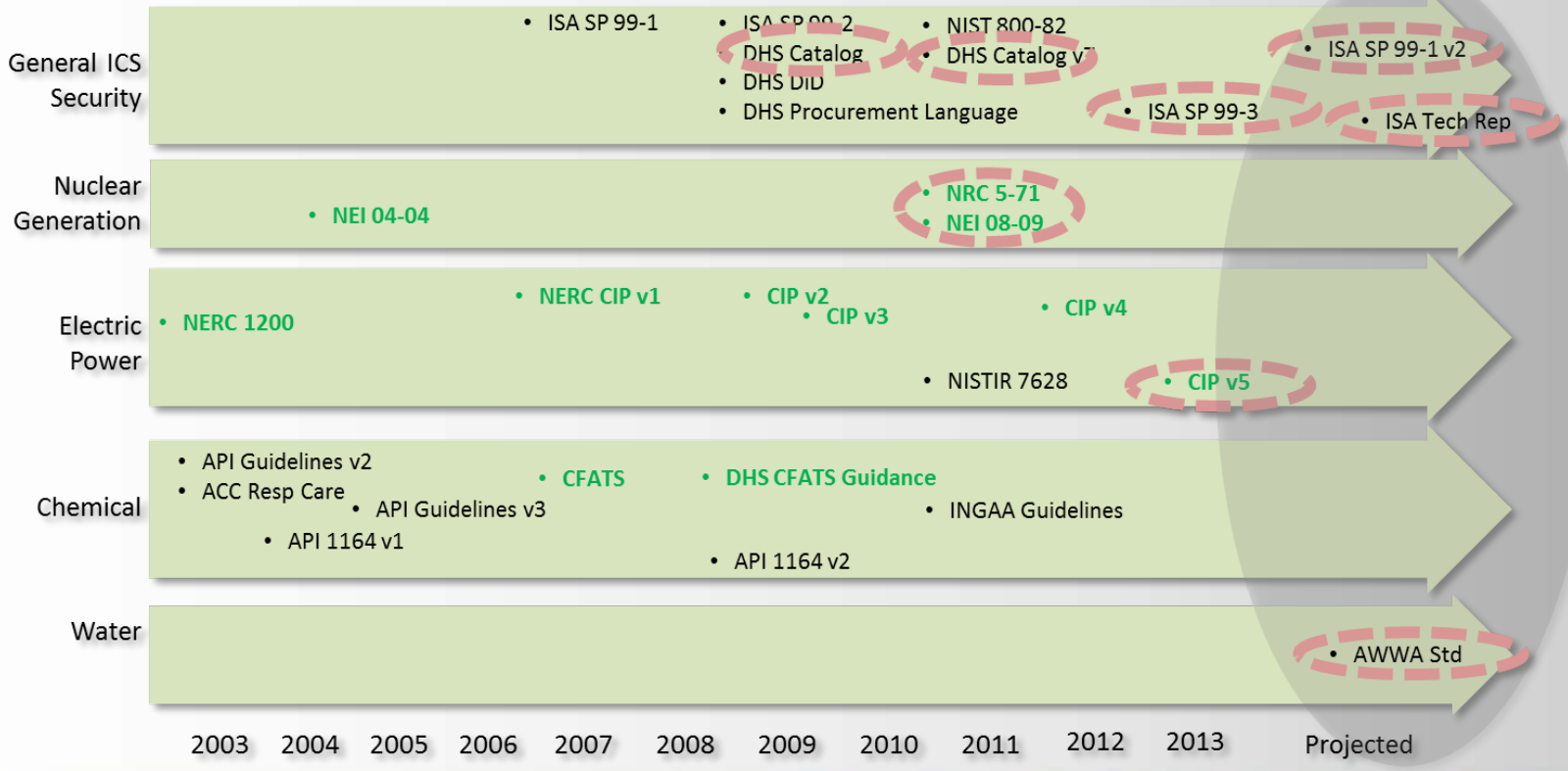
- All American nuclear generators use unidirectional gateways
- Hundreds of sites world-wide, in every critical infrastructure sector
- Remote support, central engineering, occasional remote control and other apparently bi-directional needs are met routinely

Control systems can safely be connected directly to Internet through unidirectional gateways

To try this with a firewall is heresy to security practitioners

Trends in Standards and Guidance

- Increasingly, regulations, standards and best-practice guidance recognizes hardware-enforced unidirectional communications
- Most recent: ISA SP-99-3-3/IEC 62443-3-3 and NERC-CIP V5



Unidirectional Gateways: Stronger Than Firewalls

- Security: absolute protection of safety and reliability of control system assets, from network attacks originating on external networks
- Compliance: best-practice guidance, standards and regulations are evolving to recognize strong security
- Costs: reduces security operating costs: improves security *and* saves money

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